Global, regional, and national burden of breast cancer among females, 1990–2023, with forecasts to 2050: a systematic analysis for the Global Burden of Disease Study 2023

*GBD 2023 Breast Cancer Collaborators**

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*Collaborators listed at the end of the Article

Correspondence to:
Dr Lisa M Force, Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA 98195, USA
lforce@uw.edu

Summary

Background Breast cancer is a leading cause of mortality and morbidity among females worldwide. As part of the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2023, we provided an updated comprehensive assessment of the epidemiological trends, disease burden, and risk factors associated with breast cancer globally, regionally, and nationally from 1990 to 2023.

Methods Breast cancer incidence, mortality, prevalence, years lived with disability (YLDs), years of life lost (YLLs), and disability-adjusted life-years (DALYs) were estimated by age and sex for 204 countries and territories from 1990 to 2023. Mortality estimates were generated using GBD Cause of Death Ensemble models, leveraging data from population-based cancer registration systems, vital registration systems, and verbal autopsies. Mortality-to-incidence ratios were calculated to derive both mortality and incidence estimates. Prevalence was calculated by combining incidence and modelled survival estimates. YLLs were established by multiplying age-specific deaths with the GBD standard life expectancy at the age of death. YLDs were estimated by applying disability weights to prevalence estimates. The sum of YLLs and YLDs equalled the number of DALYs. Breast cancer burden attributable to seven risk factors was examined through the comparative risk assessment framework. The GBD forecasting framework was used to forecast breast cancer incidence and mortality from 2024 to 2050. Age-standardised rates were calculated for each metric using the GBD 2023 world standard population.

Findings In 2023, there were an estimated 2·30 million (95% uncertainty interval [UI] 2·01 to 2·61) breast cancer incident cases, 764 000 deaths (672 000 to 854 000), and 24·1 million (21·3 to 27·5) DALYs among females globally. In the World Bank low-income group, where a low age-standardised incidence rate (ASIR) was estimated (44·2 per 100 000 person-years [31·2 to 58·4]), the age-standardised mortality rate (ASMR) was the highest (24·1 per 100 000 [16·8 to 31·9]). The highest ASIR was in the high-income group (75·7 per 100 000 [67·1 to 84·0]), and the lowest ASMR was in the upper-middle-income group (11·2 per 100 000 [10·2 to 12·3]). Between 1990 and 2023, the ASIR in the low-income group increased by 147·2% (38·1 to 271·7), compared with a 1·2% (–11·5 to 17·2) change in the high-income group. The ASMR decreased in the high-income group, changing by –29·9% (–33·6 to –25·9), but increased by 99·3% (12·5 to 202·9) in the low-income group. The increase in age-standardised DALY rates followed that of ASMRs. Risk factors such as dietary risks, tobacco use, and high fasting plasma glucose contributed to 28·3% (16·6 to 38·9) of breast cancer DALYs in 2023. The risk factors with a decrease in attributable DALYs between 1990 and 2023 were high alcohol use and tobacco. By 2050, the global incident cases of breast cancer among females were forecast to reach 3·56 million (2·29 to 4·83), with 1·37 million (0·841 to 2·02) deaths.

Interpretation The stable incidence and declining mortality rates of female breast cancer in high-income nations reflect success in screening, diagnosis, and treatment. In contrast, the concurrent rise in incidence and mortality in other regions signals health system deficits. Without effective interventions, many countries will fall short of the WHO Global Breast Cancer Initiative's ambitious target of achieving an annual reduction of 2·5% in age-standardised mortality rates by 2040. The mounting breast cancer burden, disproportionately affecting some of the world's most vulnerable populations, will further exacerbate health inequalities across the globe without decisive immediate action.

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Introduction

Breast cancer is the most common cancer among females worldwide.[1] Nearly one in four cancer cases diagnosed globally among females in 2023 were due to breast cancer.[1] In recent decades, advances in prevention, diagnosis, and treatment of breast cancer have contributed to declines

Research in context

Evidence before this study

A search of the current literature was conducted to identify scientific journal articles, using the keywords "breast", "cancer", "neoplasm", or "malignancy" and "global", "regional", or "worldwide" and "statistics", "epidemiology", or "policy" and "burden", "mortality", "incidence", or "prevalence" in PubMed, from database inception to March 9, 2025, in English. Nearly 500 articles were identified. Among these, approximately 40% focused on a single country, 20% on regional estimates, and 40% on global estimates. One source of global estimates for breast cancer is GLOBOCAN, which reports incidence, prevalence, and mortality estimates for 185 countries, the most recent of which is for the year 2022. Another major source of global cancer results is the CONCORD programme, which focuses on survival estimates. The most recent CONCORD-3 study presented female breast cancer 5-year net survival estimates for 71 countries from 2000 to 2014.

To date, the Global Burden of Diseases, Injuries, and Risk Factors Study is the primary global resource providing the most recent, comprehensive global annual estimates of breast cancer disease burden, extending beyond incidence, prevalence, and mortality to capture years of life lost, years lived with disability, and disability-adjusted life-years (DALYs) by age, sex, and location, from 1990 to 2023, with forecasts to 2050. National-level, regional-level, and global-level literature has consistently documented geographical disparities in the incidence and outcomes of breast cancer. Survival continues to improve in high-income countries, with corresponding declines in mortality, whereas barriers to access to quality care and delayed diagnosis in low-income settings contribute to poor prognosis and higher mortality rates.

Added value of this study

This study provides the most recent global estimates of breast cancer incidence, mortality, and DALYs and presents the forecasted burden to 2050. Together, these measures underscore the evolving epidemiological patterns and the geographical disparities in breast cancer disease burden over time. Furthermore, the risk factor analysis presented in this study reveals both the current and emerging drivers of breast cancer trends, highlighting potential opportunities for prevention and early intervention.

Implications of all the available evidence

The escalating burden of breast cancer, especially in low-income and middle-income countries, results in substantial health losses due to premature mortality and disability among females, threatening to eclipse some of the progress achieved in maternal and women's health over the past several decades. Uneven distribution of breast cancer stage at diagnosis, compounded by inequitable access to health-care services, probably amplifies global health disparities in this disease. Collaborative and united efforts are required to mitigate the rising challenges.

in mortality and morbidity.[2] However, in 2023, breast cancer was the leading cause of cancer-related disability-adjusted life-years (DALYs) among females globally.[1]

With rapid epidemiological transitions and demographic shifts, breast cancer incident cases are rising across low-income and middle-income countries (LMICs).[3] The increase in obesity, along with changes in reproductive factors, such as early menarche, delayed childbirth, and late onset of menopause, have reshaped breast cancer risk profiles.[4] Limited access to early diagnosis and suboptimal treatment have led to poor survival outcomes in these settings.[5] A growing divide between LMICs and high-income countries (HICs) in stage distribution at diagnosis and prognosis of breast cancer is becoming increasingly evident, exposing disparities in detection, treatment, and broader health system access.[5,6]

The importance of addressing the mounting burden of breast cancer has garnered global attention:[7] from high-level declarations such as the Sustainable Development Goals target 3.4 indicator 3.4.1, which aims to reduce premature mortality from non-communicable diseases including cancers,[8] to more specific initiatives such as WHO's 2017 Cancer Prevention and Control resolution,[9] and the 2021 WHO Global Breast Cancer Initiative.[10] To ascertain progress and support global initiatives to reduce breast cancer burden, timely evidence is crucial. In this paper, we present findings from the 2023 Global Burden of Diseases, Injuries, and Risk Factors Study (GBD), extending beyond traditional measures of incidence and mortality to quantify morbidity and risk factor burden associated with breast cancer in females by age for 204 countries and territories from 1990 to 2023, with forecasts up to 2050. This paper was produced as part of the GBD Collaborator Network in accordance with the GBD Protocol.[11]

Methods

Study overview

Breast cancer is one of 32 level 3 cancer types among females included in GBD 2023, defined as malignant neoplasms of the breast, based on the ICD 10th Revision, under code C50. Estimates were generated for incidence, prevalence, mortality, years of life lost (YLLs), years lived with disability (YLDs), and disability-adjusted life-years (DALYs) for both males and females across age groups, ranging from 15 to 95 years and older, by 5-year age groups, for 204 countries and territories from 1990 to 2023, with forecasts extending to 2050. Considering that more than 98% of all breast cancer incidence occurred in females in GBD 2023, this analysis only reports on the results among females. This study additionally reports results by menopausal status; using age as a proxy, the premenopausal age group was defined

as females aged 20–54 years, and the postmenopausal age group as females aged 55 years and older.[12] This study complies with the Guidelines on Accurate and Transparent Health Estimates Reporting.[1,13] The full detailed methods are provided in the GBD 2023 Cancer Collaborators publication.[1]

Mortality and YLL estimates

For the **SEER programme** see www.seer.cancer.gov

Data on deaths due to breast cancer were gathered from vital registration systems, verbal autopsy, and population-based cancer registry data. Details of data included in the analysis, and details of the systematic preprocessing of the data, can be found in the GBD 2023 study.[1] Since cancer mortality data are not widely available from cancer registries, incidence data from cancer registries were leveraged to derive mortality estimates using the mortality-to-incidence ratio transformation.[1] The choice of covariates for inclusion in modelling was based on the face validity of plausible association and hierarchically evaluated through a forward-selection model building process. Details on models and covariate selection can be found in previous publications.[1,14] For GBD 2023, to enhance the robustness of cancer registry mortality data and reduce compositional bias across sources, cross-walking, a data adjustment approach, was performed to adjust cancer registry mortality data to align with vital registration data. Where high-quality vital registration data were available, cancer registry data were dropped. Details of this estimation process can be found in previous publications.[1,15] The resulting mortality estimates were subsequently combined with mortality data from other sources and served as inputs for cancer-specific Cause of Death Ensemble models (CODEm).[1,14]

CODEm uses a model-averaging approach that combines different individual models on the basis of predictive validity ranking, and model performance was evaluated through out-of-sample predictive validity tests. Details and results of model assessment can be found in previous publications.[16] Covariates chosen in the mortality estimation of breast cancer included tobacco and alcohol use; dietary factors; total fertility rate; the sociodemographic index; and the Healthcare Access and Quality index. Covariates considered in the models were based on possible predictive relationships between the covariates and breast cancer mortality. Additional details on the expected strength of relationship and direction of association are provided in the GBD 2023 Cancer Collaborators publication.[1] CODEm also accounted for multiple sources of uncertainty, including sampling variance, non-sampling variance, and uncertainty arising from data processing steps. By leveraging covariate information as well as spatiotemporal correlation, the models interpolated missing data, enabling the derivation of complete time series for each country and age group. The final mortality estimates by age, sex, year, and country were derived from the mean of 250 draws along with 95% uncertainty intervals (UIs). YLLs were calculated by multiplying the final mortality estimates by the standard GBD life expectancy based on age at death.[16]

Incidence, prevalence, YLD, and DALY estimates

Incidence estimates for breast cancer were calculated by dividing mortality estimates by corresponding mortality-to-incidence ratios. To estimate prevalence, incidence estimates were combined with annual survival estimates up to 10 years from diagnosis. Survival estimates were generated from a predicted survival curve based on data from the US SEER programme, taking into account background mortality. Prevalence estimates from 1 to 10 years since diagnosis were computed by combining absolute survival with incidence. Survival beyond 10 years was considered to be cured. Prevalence was split into four phases of cancer care: (1) diagnostic and primary therapy; (2) remission; (3) metastatic or disseminated; and (4) terminal.[17] For breast cancer, we estimated the proportion of people that underwent a mastectomy using available hospital data.[18] Patients who underwent a surgical procedure were split into a separate remission phase accounting for procedure-related disability, and the long-term disability of 10-year survivors was estimated. Each phase was assigned a disability weight representing the level of health loss associated with the procedural and general sequelae distributions. YLDs were calculated by multiplying the prevalence of each sequela with its respective disability weight. The sum of YLLs and YLDs equalled the number of DALYs. Additional details can be found in the GBD 2023 study.[1]

Risk factors

GBD 2023 examines seven level 3 risk factors contributing to the burden of breast cancer using the comparative risk assessment framework, comprising high red meat, second-hand smoke, high fasting plasma glucose, high BMI (adult), high alcohol use, low physical activity, and smoking. Risk–outcome pairs were identified on the basis of systematic reviews in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Relative risk data were analysed using the Meta-Regression Bayesian, Regularised Trimmed tool, a robust meta-analytical technique for synthesising data from different sources and accounting for interstudy and intrastudy heterogeneity.[19] Risk factor exposure levels and distributions were estimated using data from multiple sources including published studies, household surveys, and administrative records. For each risk factor, the theoretical minimum risk exposure level, which represents a counterfactual scenario of optimal level of exposure, was identified. The combination of relative risk function, exposure level, and theoretical minimum risk exposure resulted in the population attributable fraction for each risk–outcome pair. To quantify the breast cancer burden attributable to each risk factor,

YLLs, YLDs, and mortality were multiplied by the corresponding population attributable fraction.[1,15]

Forecasting cancer burden from 2024 to 2050

Detailed methods for forecasting cancer burden have been published previously,[20] and a summary was presented in the GBD 2023 Cancer Collaborators publication.[1] Briefly, the GBD forecasting framework generates cause-specific cancer burden forecasts each year from 2024 to 2050 that are coherent with all-cause mortality, disease incidence, and prevalence trends, as well as risk exposure and other sociodemographic associations. All forecasts were initially produced with GBD 2021 findings and subsequently adjusted, ensuring alignment with GBD 2023 results. More details on the process to shift forecasted values are described in the GBD 2023 Cancer Collaborators study.[1] The predictive validity of the forecast results was assessed using a 10-year holdout strategy.[1,20]

GBD reporting practices

Age-standardised rates were calculated for each measure using the GBD 2023 world standard population.[21] All rates, both crude and age-standardised, were expressed per 100 000 person-years. Data and modelling errors were propagated through each estimation step. Point estimates were derived from the mean of posterior distribution for each measure with 250 draws. 95% UIs were computed as the 2·5th and the 97·5th percentiles of the distribution. Analyses were completed with Python version 3.11.8, Stata version 15, and R version 4.4.0. All results from this study are publicly accessible. To download estimates used in these analyses, please visit the GBD Results Tool.

Role of the funding source

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

Results

In 2023, there were an estimated 2·30 million (95% UI 2·01 to 2·61) breast cancer incident cases in females globally, resulting in 764 000 deaths (672 000 to 854 000) and 24·1 million DALYs (21·3 to 27·5), with 93·5% (91·4 to 95·2) of total DALYs due to YLLs. These corresponded to an age-standardised rate of 49·3 per 100 000 person-years (43·3 to 56·1) for incidence, 16·1 per 100 000 (14·2 to 18·1) for mortality, and 529·2 per 100 000 (465·2 to 604·9) for DALYs. Overall, there were variable changes over time in age-standardised incidence, mortality, and DALY rates (table). Between 1990 and 2023, the global age-standardised incidence rate (ASIR) rose from 42·4 per 100 000 (38·3 to 47·2) in 1990 to 49·3 per 100 000 (43·3 to 56·1) in 2023, reflecting an increase of 16·4% (0·2 to 37·4). By contrast, the global age-standardised mortality rate (ASMR) changed from 17·0 per 100 000 (15·8 to 18·3) in 1990 to 16·1 per 100 000 (14·2 to 18·1) in 2023, representing a change of –5·3% (–17·0 to 7·1; table). There was not a marked change in the age-standardised DALY rate (ASDR) over the same time period. In 2023, the ASDR was 529·2 per 100 000 (465·2 to 604·9), compared with 527·4 per 100 000 (485·2 to 572·5) in 1990 (GBD Results Tool).

Across income groups in 2023, 1·67 million (95% UI 1·47 to 1·86) breast cancer cases (72·6% of global cases) occurred in World Bank high-income and upper-middle-income groups and 628 000 (497 000 to 780 000) cases (27·3% of global cases) occurred in low-income and lower-middle-income groups. The ASIR of breast cancer was highest in the high-income group in 2023, with an estimate of 75·7 per 100 000 (67·1 to 84·0). The ASIR was the lowest in upper-middle-income group (37·3 per 100 000 [32·0 to 42·8]), followed by the lower-middle-income group (39·3 per 100 000 [31·5 to 48·8]), with the low-income group estimated at 44·2 per 100 000 (31·2 to 58·4). However, the change in ASIR between 1990 and 2023 was greatest in the lower income groups, with an estimated increase of 147·2% (38·1 to 271·7) in the low-income group and 127·9% (63·3 to 207·4) in the lower-middle-income group, compared with an increase of 41·4% (12·5 to 69·3) in the upper-middle-income group and almost no change (1·2% [–11·5 to 17·2]) in the high-income group (table).

However, the high-income and upper-middle-income groups constituted 463 000 (95% UI 418 000 to 497 000) of all breast cancer deaths (60·7% of global deaths), whereas low-income and lower-middle-income groups constituted 300 000 (237 000 to 366 000) deaths in 2023 (39·2% of global deaths). The ASMR of breast cancer was the highest in the low-income group, with an estimate of 24·1 per 100 000 person-years (16·8 to 31·9), followed by the lower-middle-income group, with an estimate of 19·6 per 100 000 (15·6 to 23·7). Conversely, the ASMR in the upper-middle-income group was estimated at 11·2 per 100 000 (10·2 to 12·3), and in the high-income group at 16·3 per 100 000 (14·7 to 17·6). Between 1990 and 2023, ASMRs fell substantially in the high-income group, with a change of –29·9% (–33·6 to –25·9), whereas the change in the upper-middle-income group was –11·9% (–26·7 to 0·4). Opposite trends were estimated in the low-income group, where the ASMR increased by 99·3% (12·5 to 202·9) during the same period; and in the lower-middle-income group, increased by 72·6% (28·8 to 130·4; table). In 2023, the GBD regions with the highest ASIR of breast cancer included high-income North America at 91·4 per 100 000 (78·6 to 105·7), western Europe at 90·3 per 100 000 (80·5 to 101·1), and Australasia at 78·1 per 100 000 (68·3 to 88·7). Meanwhile, the GBD regions with the highest ASMRs were central sub-Saharan Africa at 35·6 per 100 000 (23·1 to 50·3), western sub-Saharan Africa at 34·0 per 100 000 (24·4 to 46·9), and Oceania at 27·0 per 100 000 (18·7 to 35·4).

For the **GBD Results Tool** see https://vizhub.healthdata.org/gbd-results/

	Incident cases in 2023, in thousands	Incident cases, percentage change 1990–2023	Age-standardised incidence rate in 2023, per 100 000 person-years	Age-standardised incidence rate, percentage change 1990–2023	Deaths in 2023, in thousands	Deaths, percentage change 1990–2023	Age-standardised mortality rate in 2023, per 100 000 person-years	Age-standardised mortality rate, percentage change 1990–2023
Global	2300 (2010 to 2610)	148·5 (113·7 to 193·2)	49·3 (43·3 to 56·1)	16·4 (0·2 to 37·4)	764 (672 to 854)	110·3 (84·7 to 137·3)	16·1 (14·2 to 18·1)	−5·3 (−17·0 to 7·1)
World Bank income group								
High	946 (828 to 1 060)	59·1 (38·8 to 83·4)	75·7 (67·1 to 84·0)	1·2 (−11·5 to 17·2)	242 (213 to 263)	23·7 (14·5 to 31·9)	16·3 (14·7 to 17·6)	−29·9 (−33·6 to −25·9)
Upper-middle	720 (618 to 824)	221·8 (155·8 to 285·5)	37·3 (32·0 to 42·8)	41·4 (12·5 to 69·3)	221 (200 to 243)	114·7 (79·1 to 144·7)	11·2 (10·2 to 12·3)	−11·9 (−26·7 to 0·4)
Lower-middle	530 (427 to 659)	497·1 (326·0 to 700·6)	39·3 (31·5 to 48·8)	127·9 (63·3 to 207·4)	251 (201 to 305)	359·8 (241·2 to 519·6)	19·6 (15·6 to 23·7)	72·6 (28·8 to 130·4)
Low	97·6 (68·9 to 128)	531·0 (252·8 to 839·1)	44·2 (31·2 to 58·4)	147·2 (38·1 to 271·7)	49·3 (34·3 to 64·7)	410·6 (185·9 to 663·7)	24·1 (16·8 to 31·9)	99·3 (12·5 to 202·9)
GBD super-region, GBD region, and country								
GBD super-region: central Europe, eastern Europe, and central Asia	170 (151 to 188)	59·2 (38·1 to 82·2)	47·8 (42·3 to 52·9)	19·5 (4·1 to 37·5)	62·7 (58·0 to 66·1)	23·9 (15·2 to 32·4)	16·3 (15·2 to 17·2)	−11·1 (−17·3 to −5·0)
GBD region: central Asia	16·3 (14·3 to 18·2)	57·2 (32·6 to 83·8)	31·0 (27·4 to 34·6)	−17·3 (−30·1 to −3·6)	6·56 (6·08 to 7·00)	27·7 (15·3 to 40·4)	13·0 (12·0 to 13·9)	−31·3 (−38·0 to −24·3)
Armenia	1·04 (0·882 to 1·23)	6·9 (−15·6 to 32·6)	41·1 (35·1 to 48·1)	−31·7 (−46·0 to −15·5)	0·426 (0·372 to 0·484)	−3·9 (−20·9 to 14·6)	15·2 (13·3 to 17·3)	−45·3 (−54·6 to −35·1)
Azerbaijan	2·18 (1·64 to 2·77)	118·2 (64·1 to 197·1)	33·3 (25·2 to 42·3)	1·8 (−23·6 to 38·6)	0·893 (0·698 to 1·12)	73·1 (29·8 to 125·9)	14·1 (11·0 to 17·6)	−17·8 (−37·4 to 7·5)
Georgia	1·86 (1·56 to 2·19)	−9·1 (−30·6 to 17·2)	60·5 (51·1 to 71·9)	1·8 (−22·3 to 32·4)	0·865 (0·741 to 1·01)	−9·5 (−27·8 to 10·8)	25·2 (21·7 to 29·3)	−7·1 (−24·9 to 13·5)
Kazakhstan	3·42 (2·87 to 3·95)	6·9 (−11·4 to 27·7)	28·5 (24·0 to 32·8)	−28·9 (−41·3 to −15·0)	1·27 (1·09 to 1·42)	−22·4 (−33·3 to −11·9)	10·6 (9·1 to 11·8)	−48·9 (−56·0 to −41·9)
Kyrgyzstan	0·826 (0·704 to 0·970)	52·6 (22·3 to 94·0)	24·6 (21·1 to 28·9)	−22·0 (−37·3 to −1·5)	0·328 (0·285 to 0·378)	13·9 (−4·4 to 39·2)	10·6 (9·2 to 12·2)	−37·2 (−46·8 to −23·3)
Mongolia	0·222 (0·163 to 0·301)	254·7 (121·9 to 441·4)	12·9 (9·6 to 17·4)	28·9 (−19·5 to 96·9)	0·0932 (0·0706 to 0·123)	163·7 (69·2 to 290·0)	5·8 (4·4 to 7·8)	−0·4 (−36·5 to 49·0)
Tajikistan	1·12 (0·823 to 1·58)	153·2 (73·2 to 310·5)	29·3 (21·4 to 41·8)	4·0 (−29·1 to 69·1)	0·481 (0·350 to 0·691)	110·4 (52·3 to 226·9)	14·0 (10·3 to 20·4)	−5·9 (−31·9 to 47·6)
Turkmenistan	0·811 (0·647 to 0·977)	169·7 (112·4 to 249·1)	30·5 (24·5 to 36·8)	20·1 (−5·6 to 55·2)	0·347 (0·293 to 0·416)	122·4 (81·7 to 181·6)	13·5 (11·4 to 16·1)	−1·4 (−18·3 to 23·3)
Uzbekistan	4·81 (4·10 to 5·56)	167·7 (113·0 to 226·8)	27·7 (23·8 to 31·6)	−0·6 (−21·7 to 20·3)	1·85 (1·66 to 2·04)	111·9 (76·3 to 150·3)	11·4 (10·3 to 12·5)	−19·2 (−33·2 to −6·3)
GBD region: central Europe	60·5 (54·7 to 67·1)	67·8 (48·4 to 90·8)	56·7 (51·0 to 63·0)	25·3 (9·8 to 43·7)	23·9 (22·0 to 25·3)	37·0 (28·9 to 44·2)	19·2 (17·8 to 20·3)	−10·3 (−14·8 to −5·9)
Albania	0·617 (0·418 to 0·836)	189·3 (89·1 to 326·3)	32·0 (21·5 to 43·9)	78·1 (18·0 to 170·8)	0·217 (0·153 to 0·291)	109·7 (40·2 to 205·9)	10·0 (7·0 to 13·5)	10·4 (−25·6 to 63·0)
Bosnia and Herzegovina	1·63 (1·33 to 2·01)	117·9 (69·5 to 186·0)	54·5 (44·4 to 67·8)	76·2 (36·1 to 130·8)	0·660 (0·532 to 0·788)	91·1 (45·1 to 152·1)	19·7 (16·1 to 23·6)	30·9 (0·3 to 71·0)
Bulgaria	3·57 (3·06 to 4·16)	33·7 (12·2 to 59·2)	51·7 (43·8 to 60·7)	18·7 (−1·3 to 43·2)	1·41 (1·27 to 1·58)	19·6 (5·7 to 35·9)	17·8 (16·0 to 20·0)	−4·3 (−14·7 to 9·4)
Croatia	2·30 (1·95 to 2·73)	15·7 (−5·5 to 41·6)	62·2 (53·0 to 73·9)	9·2 (−10·8 to 33·5)	0·760 (0·665 to 0·842)	−14·0 (−26·9 to −0·9)	16·5 (14·7 to 18·3)	−32·7 (−42·4 to −22·8)

(Table continues on next page)

	Incident cases in 2023, in thousands	Incident cases, percentage change 1990–2023	Age-standardised incidence rate in 2023, per 100 000 person-years	Age-standardised incidence rate, percentage change 1990–2023	Deaths in 2023, in thousands	Deaths, percentage change 1990–2023	Age-standardised mortality rate in 2023, per 100 000 person-years	Age-standardised mortality rate, percentage change 1990–2023
(Continued from previous page)								
Czechia	5·91 (5·06 to 6·72)	34·6 (11·7 to 60·2)	59·8 (51·3 to 68·2)	−0·8 (−17·2 to 18·3)	1·95 (1·74 to 2·15)	−3·9 (−15·2 to 7·5)	16·2 (14·6 to 17·7)	−38·3 (−44·9 to −32·0)
Hungary	5·63 (4·86 to 6·41)	32·3 (12·5 to 54·7)	60·7 (52·4 to 69·2)	9·2 (−7·3 to 28·0)	2·20 (1·98 to 2·41)	2·1 (−6·7 to 12·1)	19·8 (18·0 to 21·8)	−25·3 (−31·8 to −17·6)
Montenegro	0·462 (0·344 to 0·601)	104·8 (40·4 to 196·9)	88·4 (66·4 to 114·3)	28·5 (−12·3 to 83·2)	0·155 (0·117 to 0·199)	102·2 (46·7 to 195·1)	27·0 (20·4 to 34·5)	9·0 (−22·2 to 58·9)
North Macedonia	0·897 (0·704 to 1·10)	119·1 (61·5 to 183·9)	58·8 (45·9 to 72·1)	46·1 (7·5 to 90·3)	0·391 (0·308 to 0·466)	94·5 (53·9 to 149·4)	23·6 (19·0 to 28·0)	12·8 (−10·7 to 44·8)
Poland	19·1 (17·4 to 20·9)	95·1 (72·2 to 120·1)	53·5 (48·3 to 59·1)	30·8 (15·0 to 49·0)	8·08 (7·40 to 8·58)	59·6 (47·5 to 71·7)	19·1 (17·7 to 20·2)	−6·9 (−13·1 to −0·1)
Romania	9·25 (7·80 to 10·8)	73·5 (42·2 to 111·3)	52·3 (43·9 to 61·5)	42·9 (16·4 to 74·0)	3·78 (3·22 to 4·30)	45·5 (23·8 to 67·2)	18·5 (15·7 to 21·1)	6·1 (−9·6 to 21·4)
Serbia	5·95 (4·94 to 7·02)	88·2 (40·6 to 148·2)	75·8 (64·3 to 89·1)	38·6 (3·3 to 84·7)	2·39 (2·05 to 2·79)	58·2 (18·1 to 100·8)	28·1 (24·3 to 32·6)	4·9 (−21·7 to 33·5)
Slovakia	2·82 (2·29 to 3·18)	96·4 (59·4 to 143·0)	58·4 (49·1 to 65·9)	29·1 (6·1 to 59·8)	1·10 (0·859 to 1·22)	61·7 (29·4 to 94·5)	20·1 (16·0 to 22·0)	−3·3 (−20·4 to 14·5)
Slovenia	1·43 (1·23 to 1·65)	67·9 (37·8 to 101·4)	71·9 (62·7 to 82·6)	11·4 (−8·7 to 35·2)	0·476 (0·417 to 0·538)	32·5 (17·9 to 53·1)	18·0 (16·1 to 20·1)	−30·5 (−38·0 to −20·3)
GBD region: eastern Europe	93·6 (81·8 to 105)	54·4 (28·6 to 83·7)	47·5 (41·4 to 53·2)	25·5 (3·8 to 49·9)	32·2 (29·6 to 35·0)	15·0 (3·3 to 30·2)	15·2 (14·1 to 16·6)	−9·4 (−18·8 to 2·5)
Belarus	5·33 (4·39 to 6·29)	83·1 (44·4 to 128·4)	60·5 (49·7 to 70·8)	47·6 (16·6 to 86·8)	1·46 (1·28 to 1·68)	27·7 (9·0 to 51·3)	15·2 (13·3 to 17·4)	−0·7 (−14·7 to 17·2)
Estonia	0·784 (0·673 to 0·913)	16·2 (−3·5 to 43·5)	56·8 (49·1 to 67·1)	−0·8 (−17·9 to 23·0)	0·247 (0·218 to 0·276)	−16·4 (−27·0 to −4·2)	14·6 (13·0 to 16·3)	−38·7 (−46·3 to −29·5)
Latvia	1·15 (0·996 to 1·34)	−5·6 (−22·0 to 15·0)	56·9 (49·1 to 66·8)	−2·8 (−20·3 to 18·5)	0·426 (0·381 to 0·479)	−20·3 (−28·9 to −7·8)	17·8 (15·9 to 19·8)	−27·1 (−35·7 to −16·3)
Lithuania	1·68 (1·45 to 1·95)	7·8 (−9·9 to 32·4)	58·8 (50·8 to 68·0)	−5·3 (−21·1 to 16·7)	0·569 (0·515 to 0·623)	−8·9 (−19·7 to 4·9)	16·9 (15·4 to 18·7)	−29·1 (−37·5 to −17·9)
Moldova	1·46 (1·27 to 1·69)	24·6 (3·6 to 48·9)	43·6 (37·6 to 50·7)	−3·7 (−21·2 to 16·1)	0·535 (0·490 to 0·592)	1·7 (−10·7 to 18·4)	15·1 (13·8 to 16·8)	−26·0 (−35·0 to −14·6)
Russia	68·3 (59·9 to 78·3)	76·9 (40·3 to 116·2)	49·1 (43·0 to 56·4)	33·6 (6·0 to 63·7)	22·3 (20·2 to 24·7)	29·0 (11·9 to 49·0)	15·1 (13·7 to 16·7)	−5·3 (−17·9 to 9·2)
Ukraine	14·9 (12·3 to 18·1)	3·0 (−17·7 to 32·7)	38·5 (32·2 to 46·1)	5·3 (−16·2 to 35·4)	6·67 (5·70 to 7·79)	−12·4 (−27·2 to 5·6)	15·7 (13·4 to 18·2)	−13·2 (−27·6 to 3·9)
GBD super-region: high income	816 (709 to 919)	55·2 (34·0 to 79·8)	82·3 (72·9 to 92·6)	−3·9 (−16·2 to 11·8)	200 (175 to 221)	20·9 (10·9 to 31·5)	16·6 (14·9 to 18·1)	−34·2 (−38·8 to −29·0)
GBD region: Australasia	20·4 (17·7 to 23·3)	111·4 (81·1 to 144·5)	78·1 (68·3 to 88·7)	−3·0 (−16·1 to 11·7)	4·61 (3·91 to 5·18)	36·1 (21·7 to 50·7)	15·2 (13·4 to 17·0)	−44·5 (−50·0 to −38·4)
Australia	16·5 (14·3 to 18·7)	109·9 (81·9 to 141·0)	74·5 (65·6 to 84·4)	−5·6 (−17·4 to 7·9)	3·74 (3·13 to 4·20)	37·4 (22·0 to 52·5)	14·4 (12·5 to 16·1)	−45·8 (−50·9 to −40·1)
New Zealand	3·86 (3·16 to 4·67)	118·0 (72·3 to 171·0)	97·9 (80·8 to 118·6)	10·5 (−12·4 to 37·5)	0·868 (0·757 to 1·01)	30·8 (11·7 to 50·6)	19·9 (17·6 to 23·1)	−37·9 (−46·9 to −28·7)
GBD region: high-income Asia Pacific	107 (92·2 to 121)	265·2 (202·2 to 335·5)	59·3 (51·7 to 66·6)	117·6 (83·7 to 156·9)	23·3 (19·1 to 26·2)	194·6 (147·1 to 237·3)	10·1 (8·8 to 10·9)	38·8 (20·2 to 54·8)

(Table continues on next page)

	Incident cases in 2023, in thousands	Incident cases, percentage change 1990–2023	Age-standardised incidence rate in 2023, per 100 000 person-years	Age-standardised incidence rate, percentage change 1990–2023	Deaths in 2023, in thousands	Deaths, percentage change 1990–2023	Age-standardised mortality rate in 2023, per 100 000 person-years	Age-standardised mortality rate, percentage change 1990–2023
(Continued from previous page)								
Brunei	0·130 (0·0988 to 0·166)	546·8 (357·0 to 845·6)	51·1 (38·4 to 65·3)	67·3 (19·2 to 143·9)	0·0450 (0·0343 to 0·0580)	375·0 (248·6 to 582·0)	18·4 (13·8 to 23·7)	17·2 (−14·3 to 69·0)
Japan	88·0 (74·0 to 102)	235·8 (177·1 to 302·6)	68·2 (60·3 to 76·1)	123·7 (86·5 to 162·3)	19·6 (15·7 to 22·1)	195·8 (148·6 to 236·9)	11·3 (10·0 to 12·2)	51·8 (36·1 to 66·6)
South Korea	16·4 (11·8 to 20·8)	537·1 (243·9 to 799·6)	37·9 (26·8 to 47·3)	197·1 (54·8 to 324·1)	3·10 (2·20 to 3·65)	190·7 (49·8 to 300·1)	6·4 (4·5 to 7·6)	15·9 (−42·5 to 61·5)
Singapore	2·78 (2·37 to 3·22)	369·9 (288·8 to 477·9)	62·3 (53·6 to 72·6)	49·9 (23·8 to 83·1)	0·585 (0·510 to 0·649)	169·8 (139·1 to 204·7)	12·5 (11·0 to 13·8)	−23·4 (−31·4 to −13·4)
GBD region: high-income North America	287 (247 to 333)	25·7 (2·6 to 50·1)	91·4 (78·6 to 105·7)	−28·0 (−41·3 to −13·6)	59·0 (51·6 to 65·9)	9·1 (−1·7 to 22·2)	16·8 (14·9 to 18·7)	−40·9 (−46·6 to −33·7)
Canada	28·1 (23·7 to 33·2)	51·4 (23·1 to 86·6)	82·5 (70·6 to 97·0)	−24·7 (−38·6 to −7·0)	6·79 (5·84 to 7·74)	30·8 (15·9 to 45·7)	16·8 (14·8 to 19·1)	−42·7 (−48·6 to −36·4)
Greenland	0·0189 (0·0142 to 0·0248)	67·7 (8·2 to 154·2)	58·6 (43·4 to 76·9)	−5·0 (−39·9 to 44·1)	0·00763 (0·00578 to 0·00996)	30·4 (−15·0 to 91·8)	26·0 (19·2 to 34·5)	−25·9 (−52·1 to 7·7)
USA	259 (223 to 301)	23·4 (0·7 to 48·1)	92·5 (79·6 to 107·4)	−28·1 (−41·3 to −13·7)	52·2 (45·7 to 58·2)	6·8 (−3·6 to 20·0)	16·8 (14·8 to 18·7)	−40·8 (−46·4 to −33·4)
GBD region: Southern Latin America	26·4 (23·4 to 29·7)	106·1 (79·2 to 136·5)	54·6 (48·3 to 61·8)	7·6 (−6·7 to 23·8)	11·1 (10·0 to 12·3)	55·8 (40·1 to 72·7)	21·2 (19·2 to 23·4)	−25·1 (−31·6 to −16·7)
Argentina	18·7 (16·1 to 21·5)	95·8 (67·7 to 130·5)	59·0 (51·0 to 67·9)	7·8 (−8·0 to 26·7)	8·19 (7·23 to 9·33)	51·8 (32·9 to 75·5)	23·9 (21·1 to 27·0)	−22·5 (−31·7 to −10·6)
Chile	5·42 (4·71 to 6·07)	196·0 (153·4 to 248·5)	39·4 (34·2 to 44·2)	24·5 (7·1 to 47·4)	1·94 (1·73 to 2·07)	95·8 (79·0 to 118·3)	13·0 (11·8 to 13·8)	−25·6 (−31·6 to −17·3)
Uruguay	2·27 (1·99 to 2·52)	59·6 (36·3 to 86·4)	81·9 (72·2 to 91·2)	14·2 (−2·3 to 32·4)	0·991 (0·887 to 1·07)	31·2 (15·2 to 46·6)	30·8 (28·2 to 32·8)	−15·1 (−24·3 to −6·2)
GBD region: western Europe	375 (327 to 419)	52·7 (32·8 to 73·7)	90·3 (80·5 to 101·1)	4·2 (−8·5 to 20·0)	102 (87·4 to 112)	9·8 (1·0 to 18·4)	19·2 (17·2 to 21·0)	−34·5 (−39·1 to −29·5)
Andorra	0·0840 (0·0599 to 0·110)	370·6 (169·1 to 604·2)	118·0 (83·2 to 154·3)	90·5 (9·5 to 182·6)	0·0160 (0·0114 to 0·0207)	225·0 (91·3 to 370·6)	19·4 (14·1 to 25·1)	11·8 (−34·8 to 60·6)
Austria	6·71 (5·67 to 7·90)	40·8 (16·1 to 70·1)	77·3 (66·1 to 91·0)	−2·5 (−19·9 to 18·6)	1·90 (1·63 to 2·18)	2·5 (−11·1 to 15·8)	17·7 (15·6 to 20·2)	−35·6 (−43·6 to −27·2)
Belgium	8·84 (7·39 to 10·5)	10·2 (−11·0 to 35·9)	83·2 (70·0 to 98·0)	−22·8 (−37·6 to −4·5)	2·62 (2·23 to 2·97)	−11·2 (−22·0 to 0·7)	19·6 (17·2 to 22·3)	−44·7 (−51·8 to −37·2)
Cyprus	0·900 (0·700 to 1·18)	324·5 (188·0 to 570·7)	89·4 (69·5 to 117·5)	77·2 (20·0 to 178·7)	0·231 (0·179 to 0·297)	132·1 (64·6 to 244·2)	22·3 (17·2 to 28·5)	−4·3 (−31·3 to 42·3)
Denmark	4·60 (3·96 to 5·25)	−3·7 (−18·1 to 12·6)	84·6 (73·2 to 96·9)	−31·7 (−42·9 to −20·4)	1·53 (1·32 to 1·71)	−30·9 (−38·6 to −22·9)	22·2 (19·7 to 24·3)	−57·2 (−61·2 to −53·0)
Finland	5·06 (4·25 to 5·89)	85·6 (55·8 to 122·8)	92·3 (77·9 to 107·7)	23·5 (3·0 to 48·8)	1·22 (1·02 to 1·41)	34·4 (14·5 to 56·1)	17·4 (14·7 to 20·0)	−24·4 (−35·2 to −12·2)
France	70·7 (60·6 to 83·2)	114·7 (76·2 to 161·3)	114·6 (98·4 to 134·0)	42·5 (16·3 to 73·3)	16·7 (14·3 to 19·3)	32·0 (15·8 to 50·4)	20·6 (18·0 to 23·6)	−23·7 (−32·9 to −13·3)
Germany	83·2 (73·7 to 92·0)	57·2 (36·6 to 80·0)	100·4 (89·8 to 111·5)	21·8 (5·3 to 40·5)	23·3 (20·3 to 25·9)	11·9 (−0·2 to 21·9)	22·2 (19·9 to 24·3)	−23·1 (−30·2 to −16·7)
Greece	8·85 (7·51 to 10·4)	41·4 (17·1 to 71·9)	79·4 (67·8 to 93·7)	−6·4 (−23·4 to 14·5)	2·89 (2·49 to 3·21)	46·0 (29·3 to 66·0)	20·4 (18·2 to 22·5)	−20·0 (−29·9 to −9·9)

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(Continued from previous page)								
Iceland	0·233 (0·192 to 0·281)	84·5 (42·2 to 144·6)	86·6 (70·5 to 104·9)	−6·1 (−27·6 to 24·1)	0·0550 (0·0471 to 0·0630)	36·5 (13·6 to 67·2)	18·0 (15·4 to 20·4)	−35·0 (−46·1 to −21·1)
Ireland	4·08 (3·41 to 4·83)	114·8 (75·8 to 161·4)	100·0 (83·2 to 118·4)	4·8 (−14·1 to 27·9)	0·934 (0·811 to 1·05)	32·2 (15·0 to 53·7)	20·5 (17·9 to 23·2)	−38·7 (−46·9 to −29·0)
Israel	4·94 (4·19 to 5·76)	153·1 (108·6 to 208·6)	80·4 (68·8 to 93·7)	1·4 (−16·1 to 23·2)	1·39 (1·21 to 1·55)	85·6 (61·7 to 111·3)	19·7 (17·4 to 21·8)	−34·3 (−42·5 to −25·3)
Italy	51·1 (42·5 to 58·8)	29·6 (7·7 to 54·8)	85·1 (72·4 to 97·5)	−8·0 (−23·8 to 10·5)	14·7 (12·4 to 16·5)	12·3 (−0·9 to 25·0)	18·1 (15·7 to 20·1)	−34·7 (−41·4 to −28·4)
Luxembourg	0·419 (0·347 to 0·493)	62·0 (26·9 to 101·5)	79·5 (66·3 to 94·6)	−13·6 (−32·0 to 8·3)	0·111 (0·0970 to 0·125)	8·9 (−10·5 to 28·9)	18·5 (16·2 to 20·6)	−45·1 (−54·0 to −35·2)
Malta	0·396 (0·325 to 0·476)	84·6 (45·2 to 138·0)	85·2 (70·5 to 102·8)	−7·6 (−28·0 to 18·4)	0·110 (0·0917 to 0·127)	33·9 (11·9 to 59·9)	21·0 (17·6 to 23·9)	−40·6 (−50·1 to −29·9)
Monaco	0·0675 (0·0464 to 0·0929)	81·3 (6·9 to 178·3)	162·0 (113·7 to 218·7)	33·5 (−20·0 to 101·9)	0·0206 (0·0137 to 0·0295)	52·2 (−11·3 to 148·2)	37·0 (25·9 to 51·1)	1·4 (−38·0 to 58·5)
Netherlands	13·8 (12·0 to 15·9)	41·9 (22·1 to 64·0)	87·6 (76·1 to 100·9)	−10·2 (−24·6 to 5·3)	4·01 (3·44 to 4·52)	4·0 (−6·8 to 16·3)	20·3 (17·8 to 22·6)	−43·0 (−48·8 to −36·8)
Norway	2·82 (2·38 to 3·29)	34·8 (7·1 to 67·4)	63·4 (53·6 to 73·5)	−5·7 (−25·7 to 17·6)	0·722 (0·615 to 0·811)	−16·4 (−29·6 to −1·9)	13·2 (11·5 to 14·8)	−46·9 (−54·9 to −37·5)
Portugal	9·83 (8·18 to 11·5)	95·5 (57·8 to 138·4)	94·3 (78·5 to 110·6)	29·4 (3·2 to 56·6)	2·24 (1·88 to 2·49)	23·6 (8·6 to 37·8)	16·4 (13·9 to 18·5)	−33·4 (−41·3 to −24·4)
San Marino	0·0285 (0·0199 to 0·0379)	152·8 (51·8 to 293·1)	85·2 (60·9 to 112·4)	13·9 (−30·8 to 77·6)	0·00615 (0·00433 to 0·00842)	85·3 (10·8 to 178·2)	14·6 (10·5 to 19·2)	−28·0 (−55·6 to 5·3)
Spain	29·4 (24·6 to 34·4)	65·5 (38·9 to 97·5)	65·0 (55·1 to 75·9)	−5·4 (−21·4 to 14·1)	7·89 (6·69 to 8·72)	16·3 (3·4 to 26·3)	13·9 (12·2 to 15·3)	−41·9 (−47·2 to −36·7)
Sweden	6·98 (5·96 to 8·04)	37·7 (16·8 to 59·8)	73·3 (63·8 to 83·1)	−2·5 (−16·4 to 13·7)	1·73 (1·48 to 1·98)	4·0 (−8·5 to 19·4)	14·5 (12·8 to 16·4)	−34·5 (−41·8 to −24·6)
Switzerland	6·33 (5·27 to 7·53)	31·0 (4·3 to 64·3)	75·8 (64·2 to 89·9)	−20·0 (−36·1 to 1·0)	1·64 (1·34 to 1·85)	1·6 (−16·7 to 19·2)	15·5 (13·1 to 17·2)	−45·3 (−54·3 to −36·7)
UK	54·8 (48·5 to 61·2)	24·6 (7·4 to 43·6)	89·5 (79·7 to 100·8)	−13·1 (−24·8 to 0·6)	15·5 (13·6 to 17·1)	−11·7 (−19·7 to −3·8)	20·8 (18·8 to 22·4)	−43·0 (−47·1 to −38·5)
GBD super-region: Latin America and Caribbean	156 (140 to 176)	323·2 (271·6 to 393·4)	43·8 (39·2 to 49·3)	54·1 (35·3 to 78·6)	56·3 (52·9 to 58·7)	222·8 (207·6 to 237·3)	15·7 (14·8 to 16·4)	10·9 (5·8 to 15·8)
GBD region: Andean Latin America	18·6 (15·3 to 22·5)	673·6 (485·0 to 892·4)	53·4 (44·0 to 64·8)	166·6 (101·7 to 240·9)	4·81 (4·13 to 5·50)	378·0 (281·1 to 467·4)	13·9 (11·9 to 15·9)	58·0 (25·7 to 87·6)
Bolivia	2·83 (1·96 to 4·07)	810·2 (397·6 to 1363·6)	48·9 (33·8 to 70·3)	212·8 (71·0 to 401·9)	0·966 (0·672 to 1·38)	506·1 (233·8 to 857·2)	17·3 (12·0 to 24·7)	101·1 (11·3 to 222·1)
Ecuador	3·86 (3·35 to 4·45)	540·8 (434·3 to 684·8)	40·3 (34·9 to 46·4)	106·2 (71·0 to 151·5)	1·05 (0·960 to 1·14)	294·8 (251·4 to 336·1)	11·0 (10·0 to 11·9)	19·6 (6·1 to 31·9)
Peru	11·9 (9·36 to 14·7)	698·8 (500·8 to 945·2)	61·1 (48·1 to 75·5)	183·1 (113·0 to 269·5)	2·79 (2·25 to 3·34)	381·0 (277·2 to 498·7)	14·3 (11·5 to 17·1)	63·5 (28·0 to 103·0)
GBD region: Caribbean	17·0 (14·9 to 19·2)	189·0 (148·2 to 240·2)	58·6 (51·3 to 66·2)	40·9 (21·3 to 66·0)	6·61 (5·96 to 7·27)	155·8 (134·3 to 177·2)	22·3 (20·1 to 24·6)	20·7 (10·3 to 31·2)
Antigua and Barbuda	0·0555 (0·0459 to 0·0670)	219·6 (151·8 to 317·5)	89·7 (74·2 to 108·4)	41·3 (11·3 to 85·0)	0·0188 (0·0160 to 0·0221)	130·4 (89·6 to 188·6)	30·2 (25·7 to 35·4)	4·3 (−14·1 to 30·7)

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The Bahamas	0·283 (0·234 to 0·333)	320·9 (230·4 to 432·1)	111·2 (92·2 to 131·6)	61·0 (27·0 to 103·7)	0·103 (0·0881 to 0·120)	245·0 (178·3 to 313·3)	42·4 (36·2 to 49·0)	31·0 (5·9 to 56·9)
Barbados	0·295 (0·244 to 0·350)	189·3 (125·6 to 272·4)	113·9 (94·3 to 133·9)	63·5 (26·7 to 108·9)	0·107 (0·0901 to 0·125)	119·2 (77·6 to 171·9)	38·0 (32·0 to 44·6)	23·1 (0·1 to 52·5)
Belize	0·0598 (0·0488 to 0·0740)	536·1 (375·4 to 756·8)	32·7 (26·6 to 40·2)	69·0 (26·5 to 127·1)	0·0218 (0·0182 to 0·0264)	397·9 (292·0 to 527·9)	12·8 (10·7 to 15·5)	37·5 (9·0 to 74·3)
Bermuda	0·0744 (0·0601 to 0·0906)	140·8 (84·6 to 211·9)	112·0 (90·9 to 136·3)	28·2 (–1·6 to 66·5)	0·0196 (0·0164 to 0·0234)	65·4 (33·9 to 112·1)	25·8 (21·7 to 30·2)	–23·9 (–37·6 to –3·5)
Cuba	5·96 (5·00 to 7·18)	136·2 (87·7 to 189·9)	60·4 (51·0 to 73·0)	26·2 (0·7 to 54·9)	1·99 (1·72 to 2·32)	102·5 (69·9 to 136·5)	18·7 (16·2 to 21·7)	0·4 (–15·8 to 17·1)
Dominica	0·0271 (0·0189 to 0·0384)	87·0 (27·4 to 208·4)	59·6 (41·8 to 83·5)	46·0 (–1·0 to 139·8)	0·0131 (0·00915 to 0·0193)	65·7 (11·5 to 182·9)	26·3 (18·7 to 38·3)	27·1 (–13·9 to 113·6)
Dominican Republic	2·63 (1·99 to 3·13)	352·3 (246·0 to 527·3)	47·8 (36·4 to 56·7)	82·5 (38·3 to 153·0)	1·16 (0·880 to 1·37)	295·2 (209·5 to 452·9)	21·5 (16·3 to 25·4)	54·1 (20·4 to 116·0)
Grenada	0·0456 (0·0364 to 0·0571)	135·9 (80·3 to 207·7)	62·5 (50·4 to 77·6)	29·5 (0·1 to 68·3)	0·0198 (0·0159 to 0·0241)	87·1 (46·3 to 133·1)	25·6 (20·7 to 31·2)	2·4 (–20·8 to 27·1)
Guyana	0·229 (0·182 to 0·282)	212·7 (138·7 to 306·6)	56·1 (44·7 to 68·8)	72·9 (31·3 to 124·6)	0·108 (0·0874 to 0·132)	165·1 (102·5 to 240·9)	27·2 (22·0 to 33·1)	41·9 (7·9 to 82·5)
Haiti	2·42 (1·62 to 3·46)	378·2 (163·2 to 690·6)	46·5 (30·5 to 65·6)	87·4 (4·0 to 208·3)	1·31 (0·861 to 1·88)	318·8 (132·6 to 576·2)	27·5 (18·0 to 40·0)	68·4 (–8·1 to 168·5)
Jamaica	1·30 (1·05 to 1·57)	225·6 (155·6 to 322·2)	79·8 (64·6 to 96·9)	79·1 (40·5 to 131·5)	0·484 (0·396 to 0·577)	158·9 (107·5 to 217·7)	28·7 (23·5 to 34·1)	43·2 (14·6 to 74·9)
Puerto Rico	1·96 (1·71 to 2·28)	103·4 (68·5 to 147·0)	56·1 (48·6 to 65·4)	12·6 (–5·9 to 35·4)	0·604 (0·533 to 0·658)	61·8 (45·5 to 81·8)	14·2 (12·7 to 15·5)	–24·3 (–31·4 to –16·2)
Saint Kitts and Nevis	0·0228 (0·0192 to 0·0270)	108·5 (60·5 to 164·4)	71·1 (59·7 to 83·8)	17·4 (–9·1 to 48·3)	0·00935 (0·00793 to 0·0109)	40·2 (8·4 to 77·1)	29·7 (25·1 to 34·6)	–12·8 (–32·0 to 9·9)
Saint Lucia	0·0707 (0·0574 to 0·0863)	155·4 (89·8 to 242·6)	56·5 (46·0 to 69·1)	–0·2 (–25·9 to 33·4)	0·0275 (0·0228 to 0·0325)	95·2 (52·1 to 163·5)	21·5 (17·9 to 25·3)	–24·1 (–41·2 to 1·7)
Saint Vincent and the Grenadines	0·0506 (0·0405 to 0·0605)	149·6 (82·4 to 224·4)	69·6 (55·7 to 82·7)	32·8 (–2·9 to 73·7)	0·0214 (0·0176 to 0·0258)	104·8 (55·0 to 158·6)	28·3 (23·1 to 34·2)	8·7 (–17·5 to 36·6)
Suriname	0·137 (0·0979 to 0·192)	257·9 (128·7 to 513·0)	38·6 (27·7 to 54·3)	45·0 (–7·3 to 149·4)	0·0645 (0·0466 to 0·0898)	207·5 (99·4 to 418·6)	18·1 (13·1 to 25·3)	20·0 (–22·2 to 102·2)
Trinidad and Tobago	0·754 (0·625 to 0·909)	207·8 (151·5 to 277·2)	77·9 (64·7 to 94·1)	41·1 (15·7 to 73·5)	0·299 (0·257 to 0·354)	142·4 (107·3 to 186·7)	31·5 (27·2 to 37·0)	5·9 (–9·0 to 24·0)
Virgin Islands	0·0588 (0·0475 to 0·0727)	85·0 (42·7 to 142·1)	75·9 (62·5 to 94·2)	14·3 (–11·2 to 48·2)	0·0209 (0·0173 to 0·0248)	53·2 (21·1 to 95·8)	22·8 (18·8 to 27·1)	–31·6 (–45·7 to –13·1)
GBD region: central Latin America	56·6 (50·7 to 63·4)	372·8 (306·4 to 454·2)	38·3 (34·2 to 42·8)	58·9 (37·1 to 85·9)	20·4 (19·1 to 21·4)	259·6 (234·8 to 287·2)	13·9 (13·0 to 14·6)	15·0 (7·1 to 24·1)
Colombia	13·7 (12·1 to 15·6)	358·2 (282·4 to 448·1)	43·4 (38·5 to 49·3)	50·3 (25·9 to 79·8)	4·24 (3·90 to 4·53)	196·8 (167·2 to 229·6)	13·1 (12·1 to 14·0)	–10·5 (–19·0 to –1·4)
Costa Rica	1·99 (1·69 to 2·36)	405·5 (305·1 to 536·9)	63·3 (53·7 to 75·2)	58·1 (27·0 to 99·0)	0·574 (0·511 to 0·640)	305·7 (244·5 to 377·5)	18·0 (16·0 to 20·1)	19·6 (1·6 to 40·2)
El Salvador	1·62 (1·31 to 1·93)	478·3 (322·3 to 657·2)	44·8 (36·3 to 53·5)	174·1 (100·1 to 259·1)	0·596 (0·504 to 0·695)	322·6 (230·0 to 432·5)	16·4 (13·9 to 19·2)	94·0 (51·1 to 144·2)

(Table continues on next page)

	Incident cases in 2023, in thousands	Incident cases, percentage change 1990–2023	Age-standardised incidence rate in 2023, per 100 000 person-years	Age-standardised incidence rate, percentage change 1990–2023	Deaths in 2023, in thousands	Deaths, percentage change 1990–2023	Age-standardised mortality rate in 2023, per 100 000 person-years	Age-standardised mortality rate, percentage change 1990–2023
(Continued from previous page)								
Guatemala	1·53 (1·30 to 1·80)	627·5 (460·2 to 827·7)	22·4 (19·0 to 26·4)	122·9 (73·1 to 182·4)	0·628 (0·541 to 0·733)	430·6 (322·7 to 563·2)	9·7 (8·4 to 11·3)	58·6 (26·7 to 97·0)
Honduras	0·770 (0·520 to 1·05)	503·3 (243·2 to 820·5)	18·7 (12·6 to 25·4)	71·7 (–3·1 to 165·7)	0·373 (0·253 to 0·505)	429·9 (203·6 to 712·8)	9·8 (6·6 to 13·3)	52·3 (–13·5 to 136·2)
Mexico	24·5 (21·8 to 27·4)	320·3 (261·6 to 394·9)	32·2 (28·7 to 36·1)	42·7 (23·1 to 67·9)	9·12 (8·62 to 9·61)	227·0 (197·0 to 257·0)	12·2 (11·5 to 12·8)	6·5 (–3·4 to 16·8)
Nicaragua	1·10 (0·835 to 1·43)	618·3 (401·2 to 950·4)	35·1 (26·7 to 45·1)	122·5 (53·8 to 227·3)	0·357 (0·279 to 0·451)	421·3 (290·8 to 630·4)	12·1 (9·3 to 15·2)	59·0 (17·7 to 124·5)
Panama	1·17 (0·975 to 1·39)	395·8 (278·0 to 549·5)	50·1 (41·6 to 59·3)	71·5 (31·2 to 124·6)	0·357 (0·310 to 0·412)	260·1 (197·9 to 353·7)	14·9 (13·0 to 17·2)	15·9 (–4·3 to 46·0)
Venezuela	10·2 (8·18 to 12·5)	484·3 (362·8 to 640·7)	59·8 (48·3 to 73·2)	98·0 (57·2 to 151·0)	4·11 (3·39 to 4·92)	411·4 (327·5 to 515·4)	24·8 (20·7 to 29·5)	63·6 (37·9 to 94·7)
GBD region: tropical Latin America	63·8 (57·0 to 71·8)	284·2 (239·3 to 346·4)	44·1 (39·4 to 49·7)	43·8 (27·2 to 66·5)	24·5 (22·4 to 26·2)	199·4 (175·5 to 224·3)	16·7 (15·3 to 17·8)	3·6 (–3·8 to 11·7)
Brazil	62·3 (55·5 to 70·3)	282·5 (237·7 to 344·2)	44·0 (39·3 to 49·7)	43·0 (26·4 to 65·5)	23·9 (21·8 to 25·5)	197·3 (173·2 to 222·2)	16·6 (15·2 to 17·7)	2·6 (–5·0 to 10·7)
Paraguay	1·50 (1·20 to 1·86)	369·5 (266·3 to 520·4)	48·4 (38·8 to 60·0)	89·4 (48·1 to 150·2)	0·651 (0·539 to 0·804)	306·7 (225·8 to 439·3)	21·6 (17·8 to 26·6)	61·3 (29·2 to 113·7)
GBD super-region: north Africa and Middle East	128 (102 to 156)	633·9 (431·1 to 981·8)	45·3 (36·0 to 55·3)	153·3 (81·3 to 274·9)	41·1 (33·5 to 49·2)	345·9 (227·5 to 532·6)	15·6 (12·7 to 18·6)	53·2 (11·8 to 120·4)
GBD region: north Africa and Middle East	128 (102 to 156)	633·9 (431·1 to 981·8)	45·3 (36·0 to 55·3)	153·3 (81·3 to 274·9)	41·1 (33·5 to 49·2)	345·9 (227·5 to 532·6)	15·6 (12·7 to 18·6)	53·2 (11·8 to 120·4)
Afghanistan	0·966 (0·581 to 1·48)	361·9 (159·2 to 666·6)	11·0 (6·7 to 17·5)	91·8 (9·5 to 213·6)	0·527 (0·324 to 0·826)	252·8 (102·6 to 497·7)	6·8 (4·1 to 11·0)	56·4 (–9·0 to 159·7)
Algeria	9·41 (6·29 to 13·1)	644·5 (347·3 to 1078·4)	40·7 (26·8 to 57·0)	133·2 (38·9 to 266·1)	2·79 (1·81 to 3·94)	364·1 (175·0 to 604·0)	12·8 (8·3 to 18·2)	42·3 (–16·6 to 118·7)
Bahrain	0·333 (0·243 to 0·439)	608·7 (347·1 to 964·6)	60·4 (43·8 to 79·8)	34·6 (–14·8 to 100·5)	0·0901 (0·0667 to 0·115)	294·2 (152·6 to 474·6)	19·4 (14·4 to 25·0)	–21·9 (–49·9 to 14·6)
Egypt	21·3 (15·4 to 30·9)	832·1 (493·8 to 1445·9)	53·5 (37·9 to 77·0)	314·1 (148·4 to 596·6)	8·09 (5·73 to 11·4)	528·4 (280·2 to 947·2)	22·8 (15·8 to 32·1)	188·6 (61·2 to 399·4)
Iran	16·5 (12·1 to 20·4)	618·8 (368·7 to 1059·6)	33·3 (24·8 to 41·2)	115·2 (40·9 to 251·9)	4·17 (3·21 to 5·08)	299·1 (182·5 to 529·7)	9·2 (7·1 to 11·2)	19·7 (–15·7 to 89·2)
Iraq	15·3 (10·6 to 21·0)	1062·4 (579·2 to 1737·3)	91·2 (62·8 to 125·6)	232·1 (94·7 to 424·9)	4·55 (3·22 to 6·25)	582·2 (319·5 to 994·8)	29·6 (20·9 to 41·2)	100·8 (23·0 to 221·3)
Jordan	3·56 (2·93 to 4·27)	1294·3 (883·9 to 1909·7)	70·7 (58·3 to 84·5)	143·8 (71·2 to 255·0)	0·963 (0·826 to 1·13)	735·3 (505·4 to 1075·7)	21·2 (17·9 to 24·9)	48·4 (7·7 to 114·1)
Kuwait	1·21 (0·994 to 1·45)	694·3 (485·8 to 913·8)	74·7 (61·5 to 89·3)	40·9 (5·6 to 79·2)	0·227 (0·194 to 0·258)	374·8 (289·0 to 478·6)	17·6 (14·6 to 20·4)	–15·8 (–31·5 to 4·5)
Lebanon	2·73 (2·06 to 3·50)	860·2 (490·8 to 1433·2)	85·2 (64·4 to 109·3)	271·6 (129·9 to 500·2)	0·767 (0·581 to 0·972)	414·8 (232·5 to 716·3)	23·6 (17·8 to 29·8)	88·7 (21·8 to 197·2)
Libya	1·57 (1·10 to 2·21)	684·9 (349·3 to 1164·2)	41·1 (28·9 to 57·8)	110·2 (18·8 to 234·7)	0·508 (0·350 to 0·703)	441·0 (210·3 to 732·2)	14·6 (9·9 to 20·0)	52·1 (–14·5 to 134·0)
Morocco	11·7 (7·32 to 17·1)	809·4 (440·5 to 1381·1)	58·0 (36·2 to 85·1)	264·7 (117·8 to 497·5)	4·38 (2·78 to 6·60)	486·4 (256·1 to 842·5)	22·5 (14·2 to 34·4)	126·2 (38·7 to 267·5)

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	Incident cases in 2023, in thousands	Incident cases, percentage change 1990–2023	Age-standardised incidence rate in 2023, per 100 000 person-years	Age-standardised incidence rate, percentage change 1990–2023	Deaths in 2023, in thousands	Deaths, percentage change 1990–2023	Age-standardised mortality rate in 2023, per 100 000 person-years	Age-standardised mortality rate, percentage change 1990–2023
(Continued from previous page)								
Oman	0·387 (0·269 to 0·538)	807·7 (429·8 to 1362·0)	27·9 (19·2 to 39·2)	129·6 (33·2 to 264·9)	0·109 (0·0748 to 0·149)	397·5 (199·1 to 684·6)	9·4 (6·4 to 12·9)	39·7 (–16·5 to 124·2)
Palestine	1·03 (0·785 to 1·36)	696·5 (421·6 to 1123·2)	59·9 (45·1 to 79·4)	141·2 (59·2 to 275·3)	0·333 (0·258 to 0·425)	369·4 (220·3 to 596·7)	21·5 (16·6 to 27·8)	51·3 (2·2 to 125·5)
Qatar	0·397 (0·280 to 0·526)	1445·5 (819·5 to 2479·7)	63·1 (45·8 to 81·9)	36·1 (–17·8 to 112·3)	0·0758 (0·0561 to 0·0984)	594·1 (332·6 to 986·3)	16·9 (12·5 to 22·1)	–30·8 (–57·0 to 7·4)
Saudi Arabia	4·03 (2·89 to 5·84)	818·6 (470·1 to 1407·7)	49·4 (36·2 to 66·1)	223·1 (109·8 to 410·6)	1·15 (0·852 to 1·63)	392·6 (221·0 to 722·5)	17·9 (13·0 to 22·5)	90·3 (20·8 to 199·7)
Sudan	4·38 (2·82 to 6·47)	520·3 (241·2 to 992·4)	31·3 (20·1 to 47·3)	133·7 (31·0 to 314·1)	1·75 (1·10 to 2·69)	312·5 (129·7 to 582·3)	13·5 (8·4 to 21·3)	53·8 (–13·1 to 149·7)
Syria	2·30 (1·70 to 3·09)	424·4 (212·7 to 749·1)	27·0 (20·4 to 35·9)	90·8 (14·1 to 205·7)	0·770 (0·570 to 1·01)	250·6 (108·6 to 447·5)	10·3 (7·7 to 13·4)	33·4 (–20·2 to 106·2)
Tunisia	6·59 (4·77 to 8·51)	553·7 (332·2 to 927·2)	88·3 (63·9 to 114·1)	136·2 (56·6 to 273·4)	1·97 (1·50 to 2·45)	310·6 (181·0 to 526·4)	27·2 (20·5 to 33·9)	40·8 (–4·4 to 117·8)
Türkiye	22·0 (17·8 to 26·5)	358·4 (205·6 to 599·2)	41·7 (33·9 to 50·1)	75·1 (15·9 to 169·8)	6·83 (5·58 to 8·06)	157·8 (78·0 to 288·1)	12·9 (10·5 to 15·2)	–7·5 (–36·0 to 39·6)
United Arab Emirates	0·903 (0·644 to 1·23)	861·0 (480·2 to 1439·6)	42·5 (29·7 to 56·5)	–15·0 (–50·7 to 37·6)	0·277 (0·196 to 0·370)	455·0 (245·1 to 759·9)	19·2 (13·2 to 26·0)	–35·5 (–61·7 to 7·3)
Yemen	1·54 (0·969 to 2·20)	727·6 (366·4 to 1356·3)	15·2 (9·5 to 22·4)	120·3 (21·7 to 292·9)	0·712 (0·446 to 1·04)	491·3 (224·1 to 924·7)	7·8 (4·9 to 12·1)	63·0 (–9·5 to 182·3)
GBD super-region: south Asia	285 (224 to 357)	491·6 (330·5 to 716·5)	33·1 (26·0 to 41·5)	129·5 (67·7 to 217·6)	140 (112 to 173)	357·0 (243·5 to 516·5)	17·3 (13·5 to 21·4)	74·3 (30·2 to 137·6)
GBD region: south Asia	285 (224 to 357)	491·6 (330·5 to 716·5)	33·1 (26·0 to 41·5)	129·5 (67·7 to 217·6)	140 (112 to 173)	357·0 (243·5 to 516·5)	17·3 (13·5 to 21·4)	74·3 (30·2 to 137·6)
Bangladesh	29·7 (18·5 to 40·7)	663·5 (370·2 to 1126·4)	38·0 (23·9 to 52·6)	183·2 (77·2 to 345·4)	12·1 (7·49 to 16·7)	414·0 (230·9 to 708·0)	16·4 (10·4 to 22·7)	90·8 (18·0 to 190·1)
Bhutan	0·125 (0·0770 to 0·185)	491·5 (230·4 to 899·0)	34·2 (21·0 to 50·4)	145·9 (33·9 to 325·6)	0·0576 (0·0353 to 0·0820)	330·6 (139·2 to 638·7)	16·4 (10·1 to 23·6)	73·8 (–4·1 to 200·0)
India	203 (157 to 257)	477·8 (321·6 to 709·4)	29·4 (22·8 to 37·1)	126·9 (67·6 to 219·9)	102 (78·4 to 128)	352·3 (236·6 to 516·2)	15·5 (11·8 to 19·5)	74·0 (30·7 to 138·6)
Nepal	2·69 (1·72 to 3·90)	396·3 (152·0 to 741·8)	18·3 (11·6 to 26·6)	99·2 (1·8 to 236·6)	1·41 (0·929 to 2·02)	302·3 (105·2 to 566·0)	10·1 (6·7 to 14·6)	57·2 (–20·5 to 159·5)
Pakistan	49·6 (32·9 to 66·1)	476·5 (225·4 to 817·2)	61·6 (40·8 to 81·7)	109·9 (16·9 to 238·2)	25·2 (16·8 to 33·4)	355·5 (157·3 to 616·0)	34·0 (22·7 to 45·0)	65·5 (–6·7 to 162·1)
GBD super-region: southeast Asia, east Asia, and Oceania	536 (452 to 623)	244·3 (160·5 to 331·5)	35·4 (30·0 to 41·4)	52·5 (15·1 to 91·3)	159 (134 to 180)	128·4 (78·5 to 174·7)	10·3 (8·7 to 11·6)	–5·5 (–26·3 to 13·9)
GBD region: east Asia	362 (290 to 434)	193·8 (122·3 to 288·0)	32·3 (26·2 to 38·7)	32·3 (–1·2 to 76·7)	82·6 (69·5 to 97·2)	61·0 (19·5 to 108·7)	7·0 (6·0 to 8·3)	–33·7 (–50·8 to –14·1)
China	343 (271 to 413)	187·2 (115·8 to 280·5)	31·6 (25·4 to 38·2)	28·8 (–4·0 to 72·6)	76·7 (64·2 to 90·8)	54·7 (14·0 to 103·0)	6·8 (5·7 to 8·0)	–36·6 (–53·2 to –16·8)
North Korea	6·81 (4·80 to 9·10)	361·1 (148·7 to 634·0)	36·9 (26·2 to 49·3)	161·8 (38·2 to 315·2)	2·78 (1·93 to 3·72)	259·9 (92·6 to 469·5)	14·7 (10·2 to 19·6)	90·0 (1·8 to 201·3)
Taiwan*	12·6 (10·7 to 14·9)	410·3 (331·9 to 504·5)	62·7 (53·6 to 74·5)	120·6 (85·6 to 159·4)	3·08 (2·68 to 3·53)	238·3 (195·7 to 284·3)	14·0 (12·2 to 16·2)	23·4 (7·9 to 39·0)

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	Incident cases in 2023, in thousands	Incident cases, percentage change 1990–2023	Age-standardised incidence rate in 2023, per 100 000 person-years	Age-standardised incidence rate, percentage change 1990–2023	Deaths in 2023, in thousands	Deaths, percentage change 1990–2023	Age-standardised mortality rate in 2023, per 100 000 person-years	Age-standardised mortality rate, percentage change 1990–2023
(Continued from previous page)								
GBD region: Oceania	2·20 (1·56 to 2·99)	324·9 (161·2 to 533·9)	43·4 (30·2 to 57·7)	50·0 (−7·5 to 124·4)	1·24 (0·871 to 1·64)	321·8 (161·4 to 524·7)	27·0 (18·7 to 35·4)	45·6 (−11·0 to 116·6)
American Samoa	0·0158 (0·0109 to 0·0215)	197·6 (84·4 to 387·9)	63·4 (43·5 to 85·5)	57·6 (−3·6 to 157·6)	0·00908 (0·00616 to 0·0124)	211·0 (91·0 to 386·3)	37·7 (25·5 to 51·3)	49·0 (−8·4 to 137·0)
Cook Islands	0·0136 (0·00961 to 0·0179)	256·3 (114·9 to 429·8)	142·6 (101·3 to 187·8)	148·9 (50·7 to 268·5)	0·00641 (0·00449 to 0·00849)	252·1 (113·5 to 424·9)	64·4 (45·1 to 85·4)	115·0 (30·5 to 220·5)
Fiji	0·309 (0·245 to 0·387)	206·9 (111·5 to 351·5)	69·3 (54·8 to 87·4)	60·0 (10·6 to 133·9)	0·194 (0·152 to 0·244)	244·4 (140·6 to 393·2)	45·7 (35·8 to 57·0)	65·1 (13·9 to 142·7)
Guam	0·0400 (0·0331 to 0·0480)	260·9 (182·9 to 363·7)	40·9 (33·8 to 49·3)	66·5 (31·3 to 113·2)	0·0185 (0·0153 to 0·0214)	281·8 (205·5 to 370·7)	18·2 (15·0 to 21·0)	47·6 (18·2 to 80·8)
Kiribati	0·0135 (0·00931 to 0·0190)	284·9 (115·4 to 507·4)	25·1 (17·2 to 35·2)	76·9 (−0·9 to 178·4)	0·00842 (0·00571 to 0·0119)	290·9 (119·8 to 504·3)	16·5 (11·1 to 23·0)	74·6 (−2·4 to 169·4)
Marshall Islands	0·0124 (0·00841 to 0·0173)	233·8 (94·5 to 420·8)	82·1 (55·0 to 114·1)	101·9 (17·6 to 216·1)	0·00782 (0·00525 to 0·0107)	228·6 (93·0 to 407·9)	56·7 (38·1 to 78·1)	98·8 (14·8 to 208·3)
Federated States of Micronesia	0·0198 (0·0137 to 0·0269)	137·1 (39·4 to 283·4)	45·0 (31·0 to 61·5)	39·0 (−18·6 to 124·2)	0·0125 (0·00867 to 0·0168)	129·7 (37·3 to 259·3)	30·3 (20·7 to 40·9)	32·7 (−21·9 to 109·2)
Nauru	0·00488 (0·00335 to 0·00715)	166·7 (46·5 to 311·1)	116·7 (78·7 to 171·5)	60·6 (−9·8 to 151·3)	0·00285 (0·00196 to 0·00412)	182·6 (58·0 to 332·5)	76·3 (52·1 to 112·2)	60·5 (−10·2 to 153·3)
Niue	0·000645 (0·000440 to 0·000908)	29·5 (−28·0 to 102·4)	56·7 (38·5 to 79·0)	36·7 (−23·9 to 114·5)	0·000427 (0·000288 to 0·000597)	29·9 (−29·6 to 102·0)	34·3 (23·5 to 47·6)	38·9 (−24·3 to 116·3)
Northern Mariana Islands	0·0166 (0·0118 to 0·0221)	232·9 (106·9 to 437·5)	67·4 (47·0 to 88·9)	39·6 (−13·9 to 127·3)	0·00799 (0·00564 to 0·0107)	280·7 (146·7 to 490·1)	36·0 (24·7 to 47·6)	33·4 (−15·3 to 106·9)
Palau	0·00954 (0·00647 to 0·0129)	177·9 (63·6 to 321·2)	90·8 (61·0 to 122·5)	42·3 (−17·0 to 116·8)	0·00586 (0·00403 to 0·00782)	192·3 (67·6 to 338·3)	59·1 (39·9 to 79·1)	40·0 (−19·7 to 111·2)
Papua New Guinea	1·40 (0·940 to 1·99)	380·0 (178·0 to 637·5)	37·6 (24·7 to 52·3)	47·2 (−14·3 to 129·1)	0·760 (0·509 to 1·06)	358·5 (163·3 to 606·9)	22·8 (14·7 to 31·2)	40·3 (−20·1 to 116·4)
Samoa	0·0223 (0·0146 to 0·0325)	174·5 (55·2 to 314·6)	25·2 (16·4 to 36·7)	53·5 (−13·2 to 131·0)	0·0127 (0·00832 to 0·0182)	180·9 (60·0 to 321·2)	14·5 (9·5 to 20·7)	53·3 (−12·8 to 130·3)
Solomon Islands	0·161 (0·111 to 0·226)	744·6 (372·0 to 1279·6)	55·9 (38·1 to 79·4)	122·5 (25·1 to 264·0)	0·0954 (0·0653 to 0·133)	715·1 (371·7 to 1237·7)	36·4 (24·6 to 51·9)	112·0 (21·5 to 251·5)
Tokelau	0·000344 (0·000230 to 0·000494)	104·0 (14·5 to 215·2)	37·1 (24·8 to 53·1)	64·4 (−7·4 to 153·3)	0·000242 (0·000165 to 0·000354)	94·4 (5·3 to 188·7)	25·6 (17·5 to 37·3)	56·3 (−15·5 to 131·8)
Tonga	0·0356 (0·0246 to 0·0502)	166·0 (49·6 to 308·8)	76·0 (52·3 to 107·3)	79·6 (1·0 to 177·0)	0·0203 (0·0137 to 0·0279)	173·8 (56·1 to 310·5)	44·0 (29·7 to 60·5)	77·3 (0·9 to 169·4)
Tuvalu	0·00290 (0·00199 to 0·00399)	106·2 (15·2 to 220·3)	60·7 (41·4 to 84·2)	74·1 (−3·0 to 168·9)	0·00188 (0·00127 to 0·00257)	101·6 (13·5 to 199·8)	40·3 (27·0 to 55·8)	62·0 (−9·7 to 144·5)
Vanuatu	0·0367 (0·0243 to 0·0517)	519·5 (244·3 to 877·9)	30·5 (20·2 to 42·7)	85·7 (2·4 to 192·1)	0·0231 (0·0153 to 0·0335)	530·7 (245·5 to 868·7)	20·5 (13·6 to 29·7)	81·8 (−1·7 to 176·8)
GBD region: southeast Asia	172 (140 to 208)	437·8 (305·6 to 634·9)	42·4 (34·6 to 51·5)	115·3 (62·2 to 194·8)	75·3 (61·8 to 91·1)	316·9 (210·7 to 461·3)	18·8 (15·5 to 22·8)	59·5 (19·3 to 114·2)
Cambodia	2·65 (1·76 to 3·77)	458·4 (199·4 to 805·1)	31·8 (21·0 to 45·2)	121·9 (18·8 to 260·2)	1·44 (0·939 to 2·07)	398·6 (163·1 to 717·2)	17·7 (11·5 to 25·5)	89·1 (−0·5 to 209·0)
Indonesia	60·4 (40·3 to 84·4)	489·6 (225·0 to 862·8)	37·2 (24·9 to 51·9)	133·3 (26·9 to 283·0)	28·3 (19·0 to 39·7)	362·1 (155·5 to 629·4)	18·0 (12·1 to 25·1)	78·0 (−3·1 to 179·4)

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	Incident cases in 2023, in thousands	Incident cases, percentage change 1990–2023	Age-standardised incidence rate in 2023, per 100 000 person-years	Age-standardised incidence rate, percentage change 1990–2023	Deaths in 2023, in thousands	Deaths, percentage change 1990–2023	Age-standardised mortality rate in 2023, per 100 000 person-years	Age-standardised mortality rate, percentage change 1990–2023
(Continued from previous page)								
Laos	1·74 (1·14 to 2·51)	925·3 (437·1 to 1664·2)	53·9 (35·7 to 77·1)	311·9 (114·7 to 607·9)	0·897 (0·596 to 1·28)	674·0 (308·2 to 1232·3)	29·6 (19·8 to 41·9)	214·4 (64·8 to 446·2)
Malaysia	9·65 (8·06 to 11·7)	615·3 (404·3 to 921·6)	56·5 (47·1 to 68·2)	134·2 (67·4 to 234·8)	3·93 (3·31 to 4·46)	425·9 (278·6 to 642·5)	23·7 (19·9 to 27·0)	63·2 (16·9 to 128·2)
Maldives	0·0517 (0·0389 to 0·0666)	628·0 (339·8 to 1074·3)	30·4 (22·8 to 39·1)	109·2 (26·7 to 233·1)	0·0198 (0·0151 to 0·0254)	372·4 (194·5 to 637·9)	13·6 (10·1 to 17·5)	44·8 (–10·7 to 123·5)
Mauritius	0·552 (0·482 to 0·629)	499·8 (383·5 to 675·5)	59·5 (52·1 to 68·0)	183·0 (129·0 to 263·9)	0·236 (0·212 to 0·259)	395·5 (320·5 to 504·6)	24·4 (22·0 to 26·8)	113·4 (80·7 to 159·7)
Myanmar	14·5 (10·3 to 19·9)	327·3 (138·9 to 534·8)	47·2 (33·5 to 64·5)	107·1 (15·8 to 208·2)	7·46 (5·18 to 9·64)	238·3 (96·7 to 418·0)	24·7 (17·2 to 31·8)	57·8 (–8·4 to 145·7)
Philippines	24·8 (20·7 to 29·2)	364·1 (248·9 to 501·9)	48·4 (40·5 to 57·1)	68·5 (27·0 to 119·2)	12·3 (10·2 to 14·3)	311·8 (215·0 to 412·3)	25·0 (20·7 to 29·2)	41·1 (8·5 to 76·5)
Seychelles	0·0311 (0·0225 to 0·0410)	318·7 (179·2 to 527·5)	51·5 (37·2 to 67·8)	104·8 (35·3 to 207·1)	0·0135 (0·00979 to 0·0172)	199·9 (104·9 to 347·5)	21·6 (15·7 to 27·6)	45·9 (0·1 to 117·5)
Sri Lanka	7·29 (5·96 to 8·61)	483·4 (334·9 to 752·1)	47·6 (38·8 to 55·9)	139·7 (77·7 to 243·7)	2·78 (2·27 to 3·24)	324·6 (212·9 to 485·3)	17·5 (14·4 to 20·2)	54·5 (15·6 to 108·2)
Thailand	25·3 (19·4 to 32·1)	299·2 (188·7 to 450·9)	46·9 (35·7 to 59·1)	70·2 (24·4 to 139·1)	9·16 (7·29 to 11·7)	198·7 (131·7 to 315·6)	15·8 (12·5 to 19·8)	10·4 (–13·8 to 55·4)
Timor-Leste	0·182 (0·119 to 0·264)	573·9 (281·8 to 976·9)	35·3 (23·1 to 51·4)	161·8 (45·4 to 318·0)	0·0903 (0·0595 to 0·128)	466·3 (225·5 to 802·3)	18·6 (12·0 to 26·3)	99·6 (10·1 to 219·7)
Viet Nam	24·5 (16·5 to 36·5)	661·9 (359·9 to 1049·8)	39·3 (26·3 to 58·5)	189·1 (75·9 to 339·3)	8·55 (5·91 to 12·2)	384·1 (196·8 to 645·7)	13·5 (9·3 to 19·3)	79·7 (10·7 to 175·5)
GBD super-region: sub-Saharan Africa	205 (149 to 273)	521·4 (265·1 to 802·9)	53·6 (38·9 to 71·1)	122·2 (32·7 to 225·6)	105 (74·4 to 137)	406·4 (199·1 to 632·0)	29·7 (21·2 to 39·0)	83·0 (9·2 to 164·8)
GBD region: central sub-Saharan Africa	30·2 (19·4 to 42·6)	714·3 (326·5 to 1198·9)	64·8 (41·8 to 91·0)	186·0 (50·8 to 358·4)	15·7 (10·2 to 22·1)	572·7 (262·6 to 957·1)	35·6 (23·1 to 50·3)	135·5 (27·6 to 268·7)
Angola	5·10 (3·30 to 7·58)	915·5 (461·4 to 1603·1)	44·1 (28·5 to 64·2)	151·5 (41·9 to 307·8)	2·64 (1·69 to 3·81)	723·8 (357·6 to 1223·6)	24·4 (16·0 to 34·2)	104·2 (15·9 to 228·3)
Central African Republic	0·728 (0·412 to 1·12)	296·4 (114·4 to 535·5)	36·7 (20·8 to 56·5)	68·7 (–6·1 to 168·7)	0·440 (0·251 to 0·673)	259·4 (101·4 to 469·2)	23·3 (13·3 to 35·4)	52·9 (–13·3 to 139·4)
Congo (Brazzaville)	1·48 (0·984 to 2·25)	521·8 (274·4 to 974·6)	73·7 (49·8 to 110·7)	135·2 (41·2 to 303·9)	0·762 (0·497 to 1·17)	421·5 (218·8 to 796·4)	40·7 (27·7 to 61·2)	102·3 (23·6 to 236·5)
Democratic Republic of the Congo	21·7 (13·0 to 31·1)	720·2 (325·6 to 1217·2)	73·0 (44·0 to 105·1)	215·9 (64·4 to 408·8)	11·3 (6·81 to 16·3)	582·4 (257·9 to 966·6)	39·9 (24·4 to 57·6)	160·0 (37·2 to 304·0)
Equatorial Guinea	0·518 (0·316 to 0·716)	1485·9 (713·6 to 2673·3)	107·0 (67·9 to 151·1)	354·2 (137·8 to 678·1)	0·230 (0·142 to 0·317)	957·9 (458·2 to 1700·1)	51·3 (32·2 to 72·0)	212·0 (67·0 to 416·2)
Gabon	0·698 (0·478 to 0·986)	539·3 (266·8 to 938·7)	88·8 (60·4 to 125·1)	159·8 (49·5 to 320·5)	0·331 (0·230 to 0·454)	390·8 (185·2 to 682·0)	43·9 (30·6 to 60·2)	105·3 (18·8 to 225·7)
GBD region: eastern sub-Saharan Africa	62·1 (42·9 to 82·1)	487·9 (227·1 to 778·5)	44·4 (30·8 to 58·2)	121·0 (24·0 to 230·7)	31·9 (21·9 to 42·3)	384·5 (166·5 to 607·1)	25·0 (17·3 to 33·3)	83·5 (1·8 to 171·9)
Burundi	1·34 (0·850 to 1·90)	315·7 (116·6 to 675·1)	33·4 (21·4 to 46·8)	78·3 (–6·2 to 221·3)	0·726 (0·458 to 1·01)	250·0 (86·6 to 507·8)	20·1 (12·7 to 28·2)	56·6 (–16·5 to 161·5)
Comoros	0·0452 (0·0307 to 0·0620)	269·4 (90·7 to 495·9)	14·1 (9·5 to 19·4)	53·4 (–20·6 to 146·5)	0·0283 (0·0188 to 0·0386)	241·0 (79·0 to 433·0)	8·6 (5·8 to 11·8)	34·6 (–29·3 to 109·4)

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(Continued from previous page)								
Djibouti	0·196 (0·125 to 0·284)	572·5 (248·7 to 933·9)	36·9 (24·2 to 52·4)	40·0 (−28·0 to 111·4)	0·0988 (0·0642 to 0·141)	484·0 (203·0 to 766·6)	20·6 (13·3 to 28·4)	21·6 (−34·9 to 81·9)
Eritrea	1·15 (0·771 to 1·58)	483·0 (185·3 to 797·5)	45·7 (30·9 to 62·6)	142·3 (21·6 to 271·1)	0·642 (0·433 to 0·892)	396·6 (156·3 to 661·7)	27·0 (18·5 to 36·8)	102·1 (5·1 to 210·1)
Ethiopia	18·7 (12·4 to 27·9)	921·2 (504·7 to 1560·5)	54·8 (37·0 to 79·5)	301·8 (127·5 to 560·6)	9·40 (6·22 to 13·4)	678·1 (349·1 to 1142·4)	31·3 (21·5 to 42·2)	207·0 (67·3 to 396·9)
Kenya	9·44 (6·72 to 12·4)	578·2 (275·2 to 976·0)	49·7 (35·6 to 65·6)	105·7 (14·8 to 220·2)	4·44 (3·06 to 5·84)	470·5 (212·9 to 780·9)	25·2 (17·5 to 33·4)	71·7 (−4·8 to 168·8)
Madagascar	4·40 (2·93 to 5·98)	270·9 (98·9 to 499·7)	48·5 (33·0 to 66·4)	36·7 (−26·4 to 123·2)	2·43 (1·62 to 3·30)	227·8 (78·4 to 427·7)	30·2 (20·2 to 40·9)	25·2 (−30·2 to 99·2)
Malawi	2·68 (1·74 to 3·91)	343·2 (126·2 to 679·7)	41·8 (27·2 to 60·6)	94·7 (3·5 to 234·2)	1·45 (0·935 to 2·09)	286·8 (97·5 to 539·1)	24·2 (15·6 to 34·9)	72·9 (−8·0 to 181·7)
Mozambique	1·13 (0·743 to 1·65)	92·0 (10·6 to 214·5)	12·8 (8·7 to 18·2)	−0·4 (−41·9 to 60·0)	0·734 (0·491 to 1·05)	94·9 (14·9 to 203·0)	9·0 (6·0 to 12·7)	0·5 (−41·2 to 55·2)
Rwanda	2·84 (1·94 to 4·00)	303·4 (112·5 to 547·8)	54·3 (37·1 to 75·9)	76·5 (−5·9 to 181·2)	1·51 (1·03 to 2·11)	237·4 (75·3 to 449·9)	31·2 (21·5 to 43·5)	50·5 (−21·2 to 144·4)
Somalia	0·680 (0·406 to 1·04)	415·2 (186·8 to 757·3)	11·1 (6·7 to 16·9)	79·8 (1·7 to 196·0)	0·433 (0·262 to 0·658)	396·4 (183·7 to 712·4)	7·6 (4·6 to 11·4)	65·0 (−6·8 to 162·1)
South Sudan	1·44 (0·930 to 2·02)	283·1 (97·7 to 511·9)	43·5 (28·2 to 60·8)	69·2 (−10·8 to 161·8)	0·816 (0·525 to 1·13)	249·7 (85·2 to 429·6)	27·1 (17·7 to 37·4)	56·6 (−17·1 to 137·0)
Uganda	9·19 (6·22 to 12·3)	832·1 (462·6 to 1327·6)	68·7 (46·3 to 90·9)	203·1 (84·8 to 354·5)	4·39 (3·03 to 5·69)	623·6 (342·3 to 957·1)	35·4 (24·0 to 46·1)	135·3 (42·8 to 233·4)
Tanzania	5·03 (3·21 to 7·05)	213·6 (68·0 to 394·7)	26·2 (17·0 to 36·5)	17·6 (−34·8 to 82·8)	2·85 (1·82 to 4·01)	182·5 (52·7 to 332·6)	15·9 (10·3 to 22·5)	5·9 (−41·4 to 58·9)
Zambia	3·85 (2·60 to 5·46)	542·3 (258·4 to 922·6)	65·8 (45·1 to 92·8)	120·8 (23·7 to 246·3)	1·98 (1·35 to 2·79)	441·5 (212·2 to 752·5)	38·4 (25·9 to 53·8)	88·1 (7·8 to 189·6)
GBD region: southern sub-Saharan Africa	16·6 (13·4 to 20·3)	360·0 (235·9 to 535·3)	39·6 (32·5 to 47·7)	84·2 (35·8 to 150·9)	8·94 (7·34 to 10·6)	291·9 (190·6 to 409·9)	22·1 (18·3 to 25·9)	56·5 (17·2 to 104·9)
Botswana	0·406 (0·242 to 0·624)	565·5 (278·8 to 1046·7)	34·7 (21·7 to 52·3)	125·7 (28·8 to 283·2)	0·193 (0·122 to 0·290)	412·7 (199·0 to 728·3)	17·1 (11·1 to 25·2)	72·7 (1·9 to 179·4)
Eswatini	0·191 (0·118 to 0·308)	87·1 (−1·6 to 244·1)	37·7 (23·5 to 59·9)	−5·6 (−49·7 to 72·0)	0·100 (0·0637 to 0·157)	77·0 (−3·0 to 211·4)	20·4 (13·1 to 31·5)	−12·6 (−51·8 to 51·2)
Lesotho	0·221 (0·140 to 0·322)	72·5 (−5·6 to 199·1)	28·5 (18·1 to 41·3)	24·5 (−32·1 to 114·7)	0·147 (0·0968 to 0·205)	71·5 (−4·6 to 184·1)	19·1 (12·5 to 26·6)	20·1 (−33·3 to 98·7)
Namibia	0·784 (0·524 to 1·04)	427·0 (262·1 to 680·0)	63·0 (43·5 to 81·9)	96·7 (39·6 to 194·9)	0·379 (0·262 to 0·486)	340·5 (214·2 to 556·8)	32·0 (22·6 to 40·9)	64·6 (17·2 to 147·7)
South Africa	13·7 (11·0 to 17·2)	378·5 (241·6 to 542·9)	41·9 (34·3 to 51·7)	84·4 (32·0 to 146·6)	7·30 (6·11 to 8·75)	304·0 (199·0 to 439·0)	23·2 (19·2 to 27·2)	55·5 (15·7 to 106·8)
Zimbabwe	1·32 (0·865 to 1·90)	325·2 (146·3 to 611·9)	23·2 (15·5 to 33·0)	87·4 (7·6 to 212·8)	0·815 (0·536 to 1·16)	293·8 (124·5 to 547·3)	14·9 (10·0 to 21·2)	73·3 (−1·7 to 181·5)
GBD region: western sub-Saharan Africa	96·2 (69·2 to 134)	536·1 (276·4 to 823·4)	61·8 (44·4 to 86·2)	114·5 (26·9 to 214·4)	48·5 (34·8 to 66·6)	408·3 (197·9 to 659·0)	34·0 (24·4 to 46·9)	76·3 (3·5 to 164·7)
Benin	1·42 (0·943 to 2·05)	584·7 (272·5 to 981·4)	33·3 (22·8 to 47·6)	103·2 (10·5 to 218·1)	0·732 (0·505 to 1·05)	420·7 (184·5 to 705·3)	18·5 (13·0 to 26·6)	58·6 (−14·0 to 143·6)

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Burkina Faso	2·75 (1·79 to 3·76)	373·2 (149·6 to 664·2)	39·6 (25·4 to 54·1)	78·9 (–5·9 to 185·3)	1·58 (1·04 to 2·13)	297·8 (113·6 to 539·4)	25·0 (16·3 to 33·5)	51·5 (–21·2 to 145·3)
Cabo Verde	0·105 (0·0702 to 0·146)	332·9 (128·2 to 631·7)	41·8 (28·0 to 58·5)	111·8 (11·8 to 259·9)	0·0488 (0·0339 to 0·0670)	203·7 (59·7 to 369·4)	19·0 (13·2 to 26·0)	48·0 (–22·1 to 128·7)
Cameroon	6·30 (4·31 to 8·72)	537·6 (263·6 to 872·9)	65·1 (44·7 to 89·1)	85·9 (6·3 to 183·0)	3·27 (2·22 to 4·46)	413·7 (195·6 to 687·3)	38·0 (25·8 to 52·2)	55·2 (–11·4 to 138·3)
Chad	1·41 (0·880 to 2·05)	283·9 (103·4 to 513·1)	33·0 (20·6 to 48·1)	51·7 (–19·5 to 138·9)	0·823 (0·508 to 1·19)	230·8 (75·6 to 402·8)	21·6 (13·6 to 31·2)	37·4 (–28·9 to 108·5)
Côte d'Ivoire	8·62 (5·68 to 11·7)	856·8 (494·9 to 1412·5)	86·7 (58·6 to 116·5)	153·8 (55·3 to 299·6)	4·27 (2·84 to 5·79)	658·6 (373·4 to 1055·3)	47·3 (31·3 to 63·6)	97·7 (23·8 to 211·0)
The Gambia	0·263 (0·167 to 0·384)	631·2 (283·9 to 1091·5)	34·8 (22·9 to 50·5)	128·8 (18·1 to 267·2)	0·144 (0·0939 to 0·207)	548·7 (233·8 to 944·9)	20·5 (13·7 to 29·7)	98·5 (1·5 to 225·4)
Ghana	5·63 (4·13 to 7·41)	363·4 (176·9 to 617·4)	45·3 (33·1 to 60·0)	64·6 (–0·5 to 153·3)	2·81 (2·10 to 3·67)	285·1 (140·8 to 481·4)	24·1 (18·0 to 31·7)	34·9 (–19·3 to 101·6)
Guinea	1·45 (0·985 to 2·11)	369·9 (161·4 to 676·3)	33·8 (23·1 to 49·4)	106·5 (15·4 to 242·4)	0·808 (0·553 to 1·16)	275·0 (107·1 to 513·4)	20·2 (13·8 to 28·9)	69·8 (–6·7 to 178·6)
Guinea-Bissau	0·319 (0·215 to 0·456)	507·8 (217·1 to 829·9)	47·3 (32·3 to 66·8)	154·4 (31·9 to 295·6)	0·186 (0·128 to 0·264)	413·5 (169·9 to 695·4)	30·5 (21·3 to 42·6)	119·1 (13·7 to 235·9)
Liberia	1·29 (0·891 to 1·84)	743·9 (345·7 to 1243·0)	67·1 (46·6 to 94·6)	192·8 (54·1 to 370·6)	0·644 (0·440 to 0·906)	536·3 (251·8 to 910·7)	37·0 (25·2 to 52·1)	129·3 (24·7 to 267·8)
Mali	4·45 (2·82 to 6·35)	650·1 (341·8 to 1151·0)	68·0 (43·7 to 95·6)	187·2 (72·9 to 371·2)	2·36 (1·51 to 3·33)	508·0 (267·7 to 874·5)	38·7 (25·0 to 53·6)	132·9 (43·6 to 272·2)
Mauritania	0·966 (0·602 to 1·39)	713·5 (344·1 to 1212·5)	66·2 (42·0 to 96·5)	228·9 (77·4 to 437·3)	0·463 (0·299 to 0·670)	481·0 (209·4 to 857·1)	34·3 (22·8 to 49·0)	141·0 (29·6 to 298·6)
Niger	2·46 (1·62 to 3·63)	463·3 (188·5 to 800·5)	39·7 (26·7 to 58·6)	69·3 (–12·0 to 163·8)	1·34 (0·890 to 1·98)	373·5 (144·4 to 647·1)	24·1 (16·0 to 35·0)	43·3 (–24·3 to 123·1)
Nigeria	53·5 (37·6 to 77·5)	542·9 (267·7 to 880·7)	72·1 (50·6 to 103·8)	108·8 (19·1 to 220·3)	26·2 (18·0 to 37·9)	408·3 (187·7 to 681·7)	38·7 (26·1 to 56·3)	73·5 (–1·7 to 169·1)
São Tomé and Príncipe	0·0402 (0·0256 to 0·0570)	573·2 (258·6 to 934·5)	49·1 (31·5 to 69·1)	196·5 (57·6 to 356·6)	0·0192 (0·0120 to 0·0270)	383·3 (158·0 to 652·6)	25·1 (15·8 to 35·8)	126·7 (20·4 to 256·6)
Senegal	2·47 (1·65 to 3·48)	651·5 (284·2 to 1109·4)	42·0 (28·2 to 58·8)	161·9 (34·7 to 319·4)	1·31 (0·871 to 1·81)	523·4 (222·3 to 910·1)	23·8 (15·8 to 33·3)	117·3 (11·2 to 246·5)
Sierra Leone	1·06 (0·698 to 1·49)	292·3 (123·6 to 541·2)	38·7 (26·0 to 52·8)	88·6 (9·1 to 207·4)	0·544 (0·363 to 0·766)	219·8 (84·1 to 411·5)	22·1 (14·8 to 30·3)	59·0 (–9·4 to 155·6)
Togo	1·65 (1·09 to 2·28)	692·9 (319·2 to 1088·3)	51·3 (34·0 to 71·0)	120·5 (16·9 to 240·3)	0·884 (0·600 to 1·21)	568·2 (249·9 to 924·8)	29·7 (20·5 to 40·2)	81·4 (–5·4 to 183·7)

Values presented are for all ages combined. Data in parentheses are 95% uncertainty intervals. Rates are reported per 100 000 person-years. Counts are presented to three significant figures, and percentages and rates are presented to one decimal place. Countries are nested alphabetically under their respective GBD region. GBD regions are nested alphabetically under their respective GBD super-region. GBD=Global Burden of Diseases, Injuries, and Risk Factors Study. *The United Nations convention recognises Taiwan as a province of China.

Table: **Incident cases, death counts, age-standardised rates in 2023, and the corresponding percentage change between 1990 and 2023 for breast cancer globally, by World Bank income group, and by seven GBD super-regions, 21 GBD regions, and 204 countries and territories**

ASDRs followed a similar pattern, with the highest 2023 rates estimated in the low-income (870·8 per 100 000 [95% UI 601·9 to 1140·2]) and lower-middle-income groups (651·3 per 100 000 [521·8 to 798·7]). Collectively, these two income groups accounted for 45·4% of global breast cancer DALYs. By contrast, the estimated rate was 486·1 per 100 000 (447·1 to 527·2) in the high-income group and 376·9 per 100 000 (339·8 to 415·1) in the upper-middle-income group (GBD Results Tool). These two groups accounted for 54·5% of global breast cancer DALYs. Figure 1 illustrates the global variation in ASDRs and the regional disparities, with sub-Saharan African regions having some of the highest rates. Compared with 1990, ASDRs increased by 104·8% (14·2 to 202·4) in the low-income group and 71·6% (26·2 to 131·1) in the lower-middle-income group, and decreased by 32·1% (28·3 to 35·8) in the high-income group. No notable change was detected in the upper-middle-income group (–10·5% [–24·5 to 1·4]; GBD Results Tool).

Breast cancer incidence rates among females in 2023 increased with age, peaking in the 85–89 year age group (figure 2). Substantial differences in the incidence and mortality rates of breast cancer were noted in the pre-menopausal age group (20–54 years) and post-menopausal age group (55 years and older). In 2023, the crude incidence rate among pre-menopausal females was 50·4 per 100 000 (95% UI 43·5–59·1) globally, whereas the rate among post-menopausal females was 160·7 per 100 000 (138·2–180·7), over three times higher. The crude mortality rate for pre-menopausal females globally was 13·7 per 100 000 (11·4–16·0) in 2023, compared with 60·4 per 100 000 (52·9–66·6) in post-menopausal females (GBD Results Tool).

Trends in ASIR and ASMR since 1990 differed between pre-menopausal and post-menopausal females. Among pre-menopausal females, ASIR rose by 29·0% (95% UI 7·1 to 56·0) between 1990 and 2023, whereas among post-menopausal females, ASIR did not change substantially (8·2% [–5·0 to 25·0]). In contrast, ASMR was stable between 1990 and 2023, with a change of 9·9% (–11·6 to 29·5) from the 1990 level of 11·9 per 100 000 (10·8 to 13·1) among pre-menopausal females, but declined by 12·4% (2·8 to 21·0) among post-menopausal females from the 1990 level of 68·2 per 100 000 (63·1 to 73·0; GBD Results Tool).

In 2023, 28·3% (95% UI 16·6 to 38·9) of the breast cancer DALYs in females globally were attributed to GBD risk factors (panel). The leading risk factor was dietary risks (specifically a diet high in red meat), followed by tobacco (smoking and second-hand smoke), high fasting plasma glucose, high BMI (adult), high alcohol consumption, and finally low physical activity (panel). Between 1990 and 2023, breast cancer DALYs attributable

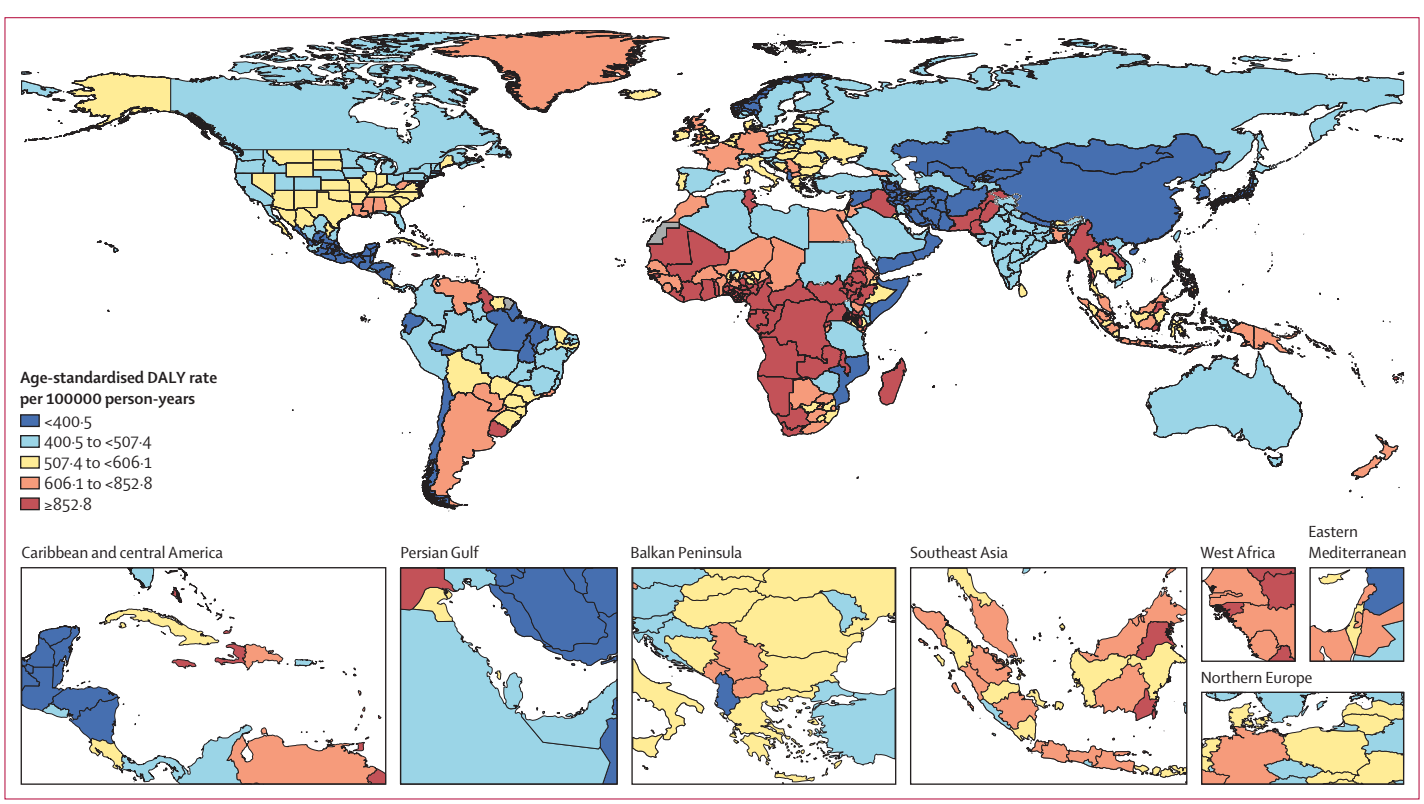

Figure 1: **Global map of age-standardised DALY rate quintiles for breast cancer in 2023**
Values presented are for all ages combined. Quintiles are based on DALYs per 100 000 person-years. DALYs=disability-adjusted life-years.

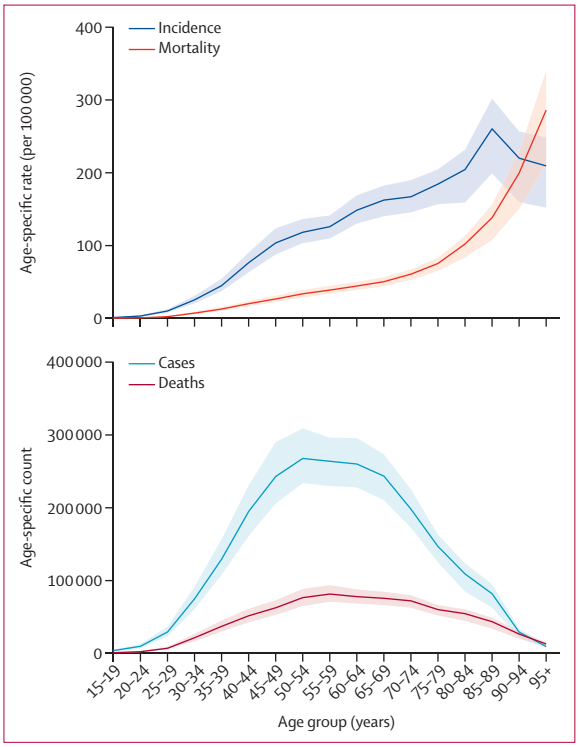

Figure 2: **Global age-specific breast cancer incidence and mortality rates and counts in 2023**
Solid line represents age-specific values and shaded section represents 95% uncertainty intervals. Rates are reported per 100 000 person-years.

to high alcohol use and tobacco declined by 46·8% (34·6 to 57·1) and 28·1% (19·1 to 35·6), respectively. Among pre-menopausal females, 23·6% (11·8 to 34·8) of breast cancer DALYs in 2023 were attributed to risk factors, whereas 33·6% (19·7 to 45·1) were attributable to risk factors among post-menopausal females. Globally, 1·10 million (47 900 to 2·02 million) DALYs were attributed to a high BMI among post-menopausal females, whereas 111 000 (–69 800 to 327 000) breast cancer DALYs were estimated to be averted due to a high BMI among pre-menopausal females (GBD Results Tool).

Global breast cancer cases were forecasted to be 3·56 million (95% UI 2·29–4·83) in 2050, increasing from 2·34 million (2·04–2·67) cases in 2024. Deaths in 2050 were forecasted to be 1·37 million (0·841–2·02), representing a 1·7-times increase from the 2024 estimate of 782 000 (688 000–875 000) deaths. Global ASIRs were expected to be constant, with a forecast of 49·3 per 100 000 person-years (43·4–56·0) in 2024 and 49·1 per 100 000 (35·1–63·9) in 2050. Global ASMRs between the same years were forecasted to change slightly from 16·1 per 100 000 (14·1–18·1) in 2024 to 16·7 per 100 000 (11·3–24·0) in 2050. The mean ASMR in the sub-Saharan Africa super-region is forecasted to be more than the mean global ASMR over time, increasing from 29·8 per 100 000 (21·0–39·0) in 2024 to 32·8 per 100 000 (17·9–50·9) in 2050 (figure 3).

***Panel*: Global proportion of breast cancer DALYs due to risk factors in 2023**

- Dietary risks: 10·8 (95% UI 0·0–23·7)
- Tobacco: 7·6 (95% UI 5·2–10·0)
- High fasting plasma glucose: 5·8 (95% UI 3·9–8·4)
- High BMI: 4·1 (95% UI 0·5–7·5)
- High alcohol consumption: 2·1 (95% UI 1·1–3·4)
- Low physical activity: 2·0 (95% UI 0·4–3·3)
- All risk factors: 28·3 (95% UI 16·6–38·9)

Values presented are for all ages. Risk factors are listed in order of greatest to least proportional burden of level 2 risk factors, except for the final row, which is all risk factors combined for breast cancer. DALYs=disability-adjusted life-years. UI=uncertainty interval.

Discussion

As part of GBD 2023, this study provides an updated overview of epidemiological trends and burden of breast cancer across 204 countries and territories from 1990 to 2023, with forecasts to 2050. In 2023, there were an estimated 2·30 million incident breast cancer cases globally among females, with 764 000 deaths and 24·1 million DALYs. Substantial geographical disparities exist. Although the 2023 ASIRs were highest in the high-income group, the largest increase from 1990 was in the low-income group. Over the past 34 years, ASMRs decreased in high-income and upper-middle-income groups but increased in low-income and lower-middle-income groups. The ASMR was highest in the low-income group in 2023, representing an increase of nearly 100% since 1990, the largest change among all income groups.

Our results are largely consistent with findings from published literature. GLOBOCAN reported 2·30 million cases of breast cancer globally in 2022, with an ASIR of 46·8, 666 000 deaths, and an ASMR of 12·7,[22] similar to our estimates for the same year: 2·22 million cases, an ASIR of 48·6, 737 000 deaths, and an ASMR of 15·9 (GBD Results Tool). The higher number of deaths reported in our results is partly due to our method of reassigning an undefined or ill-defined ICD code.[23] Our results also showed alignment with observed data patterns in regions and countries where high-quality registry data are available, such as the USA and the Nordic countries,[24] because the GBD estimation process is designed to prioritise reliable data sources.

GBD is the only global epidemiological study offering a comprehensive estimation of breast cancer disease burden as measured in DALYs across 204 countries and territories, analysed by age and sex annually over time. DALYs extend beyond incidence and mortality estimates, reflecting both YLLs and a reduction in health status due to a disease.[6,25] Since 1990, the total number of DALYs globally increased by 107·2% from 11·7 million to 24·1 million in 2023. Although the incident cases in low-income and lower-middle-income groups accounted for

27·3% of the global incidence, the total DALYs of breast cancer in these regions represented 45·4% of the global DALYs. The reduction in DALYs among HICs reflects the improvements in early detection and treatment success,[26] which has rendered the disease increasingly manageable with enhanced long-term survival prospects.[27] In HICs, 5-year net survival of breast cancer in 2010–14 was 85–90%.[25] By contrast, survival is notably lower in LMICs. The African Breast Cancer-Disparities in Outcomes study reported a 3-year net survival of 50% from 2014 to 2017.[28] For HICs, a lingering question is whether YLDs can be further reduced through targeted therapies and quality-of-life optimisation.[29] Globally, the fundamental challenge is achieving the same conversion from premature mortality to morbidity seen in HICs within LMICs.[3]

Some of the divergence in breast cancer burden is driven by variable patterns of risk factor exposures and uneven distribution of breast cancer stage at diagnosis.[5] Breast cancer is a malignancy where early detection and effective treatments can substantially alter survival prospects.[5,28] However, health system constraints and sociocultural and financial barriers[30,31] impede timely access to life-saving screenings and diagnosis.[32] In many sub-Saharan African countries, fewer than 30% of people with breast cancer are diagnosed at stage I or II, whereas a large proportion are diagnosed at the distant metastatic stage.[5] The scarcity of efficacious radiotherapy, essential chemotherapy, and targeted medicines further compromises prognosis after diagnosis, reducing the chances of survival.[28,30,33] As of 2020, only approximately half of African countries had any external beam radiotherapy service for breast cancer treatments, and none had sufficient capacity to meet population needs.[33] In the absence of radiotherapy, mastectomies become the primary treatment of choice.[34] Yet, the effectiveness of mastectomies is hampered by insufficient extra-operative services in resource-scarce countries.[35] Essential chemotherapy drugs and hormonal therapies listed on the WHO Essential Medicines List[36] are either unavailable or unaffordable in many LMICs.[3,29,37] The WHO Global Breast Cancer Initiative outlines three pillars of action: promoting early detection through education and awareness, ensuring timely diagnosis, and advancing comprehensive breast cancer management.[10] A phased approach expanding treatment capacity alongside screening and early detection has been shown to be effective in low-resource settings, leading to earlier diagnoses and better outcomes.[38,39] The development and implementation of comprehensive and contextually grounded national cancer control plans spanning the entire continuum of cancer care is an urgent need, and yet are exceptionally difficult in practice.[40]

HICs have achieved remarkable gains in reducing the burden of breast cancer, with age-standardised mortality and DALY rates falling by approximately 30% over the past three decades. However, these successes should not be construed as an overarching triumph. Substantial local disparities exist. In the USA, Black non-Hispanic women had a 1·4 times higher mortality rate from breast cancer than White women in 2020.[41] In Australia, Indigenous women diagnosed between 2004 and 2008 faced breast cancer mortality rates 1·2 times higher than non-Indigenous women.[42] In New Zealand, Māori and Pacific women diagnosed between 2000 and 2014 had breast cancer mortality rates 1·76 to 1·97 times higher than their counterparts.[43] Reducing the national breast cancer burden in HICs hinges on bridging inequities across subpopulations, aligning health service provisions with individual risk profiles, and continued investment in innovative therapies.[44] Beyond racial and ethnic disparities, changes in reproductive risk factors such as delayed pregnancy and the lower rates of childbirth in HICs imply that fewer women benefit from the long-term

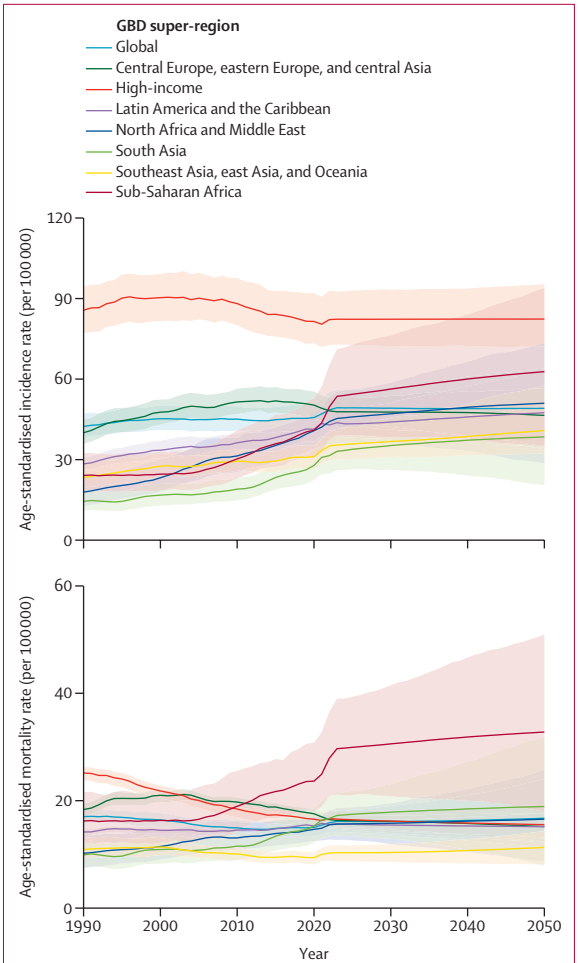

Figure 3: **Age-standardised incidence and mortality rates of breast cancer from 1990 to 2023 and forecasts to 2050, globally and by GBD super-region**
Values presented are for all ages combined. Solid line represents age-standardised values and shaded section represents 95% uncertainty intervals. Rates are reported per 100 000 person-years. GBD=Global Burden of Diseases, Injuries, and Risk Factors Study.

protective effects of childbirth.[45] However, these changes are unlikely to be the major drivers of breast cancer incidence.[46] Instead, the steady rise in exposure to other risk factors, such as an early menarche,[47] late age at menopause,[48,49] and increased obesity,[50] might result in stable breast cancer incidence trends by offsetting improvements to other risk factor exposures, such as alcohol and tobacco use.[4,51] Strengthening risk factor prevention and management will play a crucial role in halting a future rise in incidence, both in HICs and globally.[44]

Our forecasts suggest that, although ASIRs and ASMRs are expected to be stable, continued population growth and ageing will accentuate the rise in breast cancer cases and deaths over the next 27 years. Failure to manage key drivers of breast cancer and mitigate growing cases will result in considerable economic consequences. A recent study projected the global macroeconomic cost of breast cancer at 2·0 trillion (2017 international dollars) between 2020 and 2050,[52] making it one of the costliest cancers. In the EU, breast cancer incurred the highest health-care cost of any cancer, accounting for €6·73 billion in 2009 (13% of total cancer health-care costs).[53] In the USA, breast cancer represents a similarly large share, with estimated expenditures of $29·8 billion in 2020 (14% of total national cancer treatment costs).[54] In middle-income countries such as India, the total economic burden of breast cancer was estimated at $8·13 billion in 2021 and is projected to rise to $14·0 billion by 2030 as incidence continues to increase.[55–57] At the individual level, the diagnosis of breast cancer often triggers a negative financial impact caused by economic hardship or financial burden as a result of medical care.[58] In some LMICs, a course of trastuzumab treatment combined with chemotherapy, a standard of care for people with HER2-positive breast cancer,[59] costs the equivalent of a decade of average income.[37] Few national cancer plans explicitly incorporate financing schemes or insurance expansion for cancer, although this is slowly improving in some countries.[40] To safeguard individuals from financial catastrophe, a multifaceted strategy—akin to the approaches used to lower HIV and AIDS drug prices—could be instrumental in reducing the cost of cancer drugs.[60] Moreover, expanding universal health coverage to comprehensively encompass cancer care is necessary to improve treatment completion and outcomes in all countries.[61]

For the many strengths of the GBD, there are known limitations to be considered. First, data availability from cancer registries in many LMICs is limited, necessitating the use of modelling to derive estimates for specific locations and years. Moreover, even in places where cancer registry data are available, variability in representativeness and quality can increase statistical uncertainty in the resulting estimates, highlighting the need for further investments in cancer surveillance. Second, due to the sparsity of, and limitations in access to, national-level cancer patient cohort data, data from the US SEER programme were used as the primary data source for modelling the relationship among incidence, mortality, and survival. This estimated relationship was subsequently applied to the country-specific mortality-to-incidence ratio to generate country-specific survival estimates, which were then used to derive country-specific prevalence estimates, although this association might vary across countries. The current generalisation could potentially lead to underestimation or overestimation in some countries or regions. As additional data become available, more refined modelling approaches could be leveraged to obtain robust relationships among incidence, mortality, and survival, as well as incorporating the longer term burden of surviving or living with breast cancer. Third, owing to differences in diagnostic testing infrastructure, many existing data sources do not have histological subtype information, hindering subtype-specific estimation of breast cancer burden globally. Given the distinct survival patterns and resource implications of different subtypes, more comprehensive data across different geographical regions are needed to better characterise the global burden of breast cancer by subtype. Fourth, information on stage at diagnosis is not currently incorporated into the GBD breast cancer estimates, because such data are not routinely collected. The outcome of breast cancer is heavily dependent on stage at diagnosis. As stage-specific data become more widely available, future GBD iterations could consider the incorporation of incidence and outcome by stage to more effectively monitor patterns in breast cancer detection and progression. Fifth, within GBD, we only considered seven risk factors associated with breast cancer. There are other risk factors, including genetic predisposition, age of menarche and menopause, age at first full-term pregnancy, and hormone replacement therapy or oral contraceptive hormone use.[45,62] As more systematic evidence accumulates, the list of risk factors could be expanded in future iterations of GBD. Sixth, considerable heterogeneity exists in the strength of evidence linking various risk factors to breast cancer. For example, tobacco use and diets high in red meat received a two-star rating under the Burden of Proof framework (a metric used to quantify the strength of evidence for a risk–outcome pair),[63,64] whereas second-hand smoke received only a one-star rating[65] indicating weak evidence. Nonetheless, these associations were statistically significant and were therefore included in our analysis. Such variability, however, contributes to the greater uncertainty surrounding some of our risk-attribution estimates. Seventh, there is considerable heterogeneity in menopausal status across individuals and diverse populations, and our use of age 55 years and older as the post-menopausal group as a proxy has limitations. To accurately ascertain differences in breast cancer incidence, mortality, and DALYs by pre-menopausal and post-menopausal states, country-specific

cutoff ages would be preferable; however, such information is not currently widely available. Finally, the current analysis might not reflect the effect of the COVID-19 pandemic on breast cancer epidemiology and disease burden. Studies suggest that the disruption of health-care services caused by COVID-19 delayed breast cancer screening and diagnosis in specific countries, which could potentially result in poorer outcomes.[66] However, other studies indicate that the disruption might have been minimal, and long-term effects have yet to be fully understood.[67]

In conclusion, there have been transformative strides in breast cancer detection and treatment over the past 34 years, along with substantial reductions in mortality and DALYs in HICs. However, these advances have been unequally distributed. At the global level, age-standardised mortality and DALY rates have been stagnant. As the number of breast cancer cases is forecasted to rise in the future—particularly in LMICs—the growing burden threatens to reverse decades of progress in women's health, carrying far-reaching societal and economic consequences. The global health community should honour its commitments to international declarations and breast-cancer-specific initiatives and translate aspirations into actions, ensuring that all patients have an equitable chance to overcome breast cancer. Although the pursuit of medical innovation should continue across the resource spectrum, attention should be given to developing pragmatic strategies that optimise the delivery of effective care in resource-limited settings.

GBD 2023 Breast Cancer Collaborators

Kayleigh Bhangdia, Miranda L May, Jonathan M Kocarnik, Natalie Pritchett, Andrew Crist, Louise Penberthy, Alistair Acheson, Lee Deitesfeld, Bhoomadevi A, Hasan Aalruz, Hazim S Ababneh, Ukachukwu O Abaraogu, Nasir Abbas, Samar Abd ElHafeez, Reda Abdel-Hameed, Wael M Abdel-Rahman, Siddig Ibrahim Abdelwahab, Sepideh Abdi, Arash Abdollahi, Meriem Abdoun, Deldar Morad Abdulah, Abdullah , Auwal Abdullahi, Toufik Abdul-Rahman, Kulmira Abdykerimova, Mesfin Abebe, Armita Abedi, Mehrandokht Abedini, Kedir Hussein Abegaz, Alemwork Abie, Dagninet Derebe Abie, Olumide Abiodun, Richard Gyan Aboagye, Hassan Abolhassani, Ulric Sena Abonie, Mohammed Mehdi Abrar, Zhanar Abu, Rana Kamal Abu Farha, Fuad Hamdi A Abuadas, Aminu Kende Abubakar, Bilyaminu Abubakar, Eman Abu-Gharbieh, Hana J Abukhadijah, Mai Abdel Haleem Abusalah, Dina Abushanab, Swetha Acharya, Juan Manuel Acuna, Lisa C Adams, Isaac Yeboah Addo, Babatope Oluwadamilare Adebiyi, David Adedia, Kamoru Ademola Adedokun, Nurudeen A Adegoke, Victor Adekanmbi, Saheed Ayodeji Adekola, Miracle Ayomikun Adesina, Habeeb Omoponle Adewuyi, Temitayo Esther Adeyeoluwa, Usha Adiga, Mohd Adnan, Qorinah Estiningtyas Sakilah Adnani, Leticia Akua Adzigbli, Aanuoluwapo Adeyimika Afolabi, Muhammad Sohail Afzal, Feleke Doyore Agide, César Agostinis Sobrinho, Williams Agyemang-Duah, Bright Opoku Ahinkorah, Austin J Ahlstrom, Aqeel Ahmad, Danish Ahmad, Khurshid Ahmad, Muayyad M Ahmad, Ali Ahmadi, Mahnaz Ahmadi, Anisuddin Ahmed, Aram Mahmood Ahmed, Ayman Ahmed, Gasha Salih Ahmed, Haroon Ahmed, MD Faisal Ahmed, Mehrunnisha Sharif Ahmed, Meqdad Saleh Ahmed, Muktar Beshir Ahmed, Naveed Ahmed, Syed Anees Ahmed, Dolapo Emmanuel Ajala, Marjan Ajami, Roland Eghoghosoa Akhigbe, Muhammad Nadeem Akhtar, Salah Al Awaidy, Hanadi Al Hamad, Syed Mahfuz Al Hasan, Mohammad Al Qadire, Yazan Al Thaher, Mohammad Ahmmad Mahmoud Al Zoubi, Rabail Alam, Abebaw Alamrew, Domenico Albano, Mohammed Albashtawy, Laila Al-Daken, Mohammed S Aldossary, Shereen M Aleidi, Bezawit Abeje Alemayehu, Fentahun Alemnew, Ali M Alfalki, Abdelazeem M Algammal, Fadwa Naji Alhalaiqa, Mohammed Khaled Al-Hanawi, Irfan Ali, Mohammad Daud Ali, Mohammed Usman Ali, Rafat Ali, Syed Shujait Shujait Ali, Sheikh Mohammad Alif, Mina Alimohammadi, Hamid Alinejad Rokny, Morteza Alipour, Samah W Al-Jabi, Mohammad A Aljasir, Adel Al-Jumaily, Syed Mohamed Aljunid, Ahmad Alkhatib, Mohmmad Minwer Alnaeem, Hasan Yaser Alniss, Mahmoud A Alomari, Mohammad AlQudah, Mohammad A Y Alqudah, Ahmad Rajeh Al-Qudimat, Wafa Mohammed Alseragi, Heba Alshaeri, Najim Z Alshahrani, Hamad Alshetaiwi, Zaid Altaany, Diala Altwalbeh, Nelson Alvis-Guzman, Yaser Mohammed Al-Worafi, Hany Aly, Mohammad Sharif Ibrahim Alyahya, Karem H Alzoubi, Adel S Al-Zubairi, Tarek Tawfik Amin, Alireza Amindarolzarbi, Nafiu Aminu, Ayodeji Amobonye, Hubert Amu, Jimoh Amzat, Robert Ancuceanu, Deanna Anderlini, Abhishek Anil, Hossein Ansariniya, Maxwell Hubert Antwi, Iyadunni Adesola Anuoluwa, Saeid Anvari, Sumadi Lukman Anwar, Razique Anwer, Hossein Arabi, Jalal Arabloo, Mosab Arafat, Aleksandr Y Aravkin, Demelash Areda, Ghazal Arjmand, Mahwish Arooj, Santhosh Arul, Deepavalli Arumuganainar, Nurila Aryntayeva, Mulu Tiruneh Asemu, Mohammad Asghari-Jafarabadi, Haftaab Berhe Ashebr, Syed Amir Ashraf, Tahira Ashraf, Mitra Ashrafi, Muhammad Shahzad Aslam, Anil Raj Assariparambil, Batyrbek Assembekov, Abadi Hailay Atsbaha, Julie Alaere Atta, Khursheed Aurangzeb, Manal Awad, Sana Javaid Awan, Seyed Mohammad Ayyoubzadeh, AKM Azad, Sina Azadnajafabad, Arian Azadnia, Hiva Azami, Alireza Azarboo, Mohd Yusmaidie Aziz, Nouman Aziz, Sheeba B, Muhammad Badar, Ashish D Badiye, Nasser Bagheri, Yogesh Bahurupi, Atif Amin Baig, Lovenish Bains, Mohamad Amin Bakhshali, Wondu Feyisa Balcha, Maciej Banach, Shirin Barati, Mainak Bardhan, Hiba Jawdat Barqawi, MD Abu Bashar, Mohammad-Mahdi Bastan, Kavita Batra, Matteo Bauckneht, Narasimha M Beeraka, Babak Behnam, Payam Behzadi, Alemayehu Sayih Belay, Asnake Gashaw Belayneh, Melesse Belayneh, Gokce Belge Bilgin, Arielle Wilder Bell, Riyad Bendardaf, Samiun Nazrin Bente Kamal Tune, Alemshet Yirga Berhie, Abiye Assefa Berihun, Fentahun Yenealem Beyene, Ajeet Singh Bhadoria, Pankaj Bhardwaj, Prarthna V Bhardwaj, Arushee Bhatnagar, Shuvarthi Bhattacharjee, Ashmin Hari Bhattarai, Gurjit Kaur Bhatti, Jasvinder Singh Bhatti, Soumitra S Bhuyan, Bijit Biswas, Monirujjaman Biswas, Asmamaw Demis Bizuneh, Tone Bjørge, Paria Bolourinejad, Samuel Adolf Bosoka, Alejandro Botero Carvajal, Souad Bouaoud, Meriem Boukhiam, Dejana Braithwaite, Hermann Brenner, Felix Busch, Yasser Bustanji, Shujin Cao, Giulia Carreras, Felix Carvalho, Carlos A Castañeda-Orjuela, Monica Cattafesta, Luca Cegolon, Francieli Cembranel, Sonia Cerrai, Madhu Chakkere Shivamadhu, Chiranjib Chakraborty, Sandip Chakraborty, Rama Mohan Chandika, Jung-Chen Chang, Vijay Kumar Chattu, Anis Ahmad Chaudhary, Sirshendu Chaudhuri, Galmesa Bekana Chemeda, Haiyan Chen, Hana Chen, Xing Chen, William C S Cho, Jakir Ahmed Chowdhury, Dinh-Toi Chu, Chidozie Williams Chukwu, Isaac Sunday Chukwu, Sunghyun Chung, Iolanda Cioffi, Daniel Collado-Mateo, Alyssa Columbus, Joao Conde, Claudia Cosma, Vera Marisa Costa, Susanna Cramb, Natalia Cruz-Martins, Alanna Gomes da Silva, Omid Dadras, Gizachew Worku Dagnew, Xiaochen Dai, Lalit Dandona, Rakhi Dandona, Latefa Ali Dardas, Edward Christopher Dee, Paria Dehesh, Edgar Denova-Gutiérrez, Muamer Dervišević, Aragaw Tesfaw Desale, Abraham Aregay Desta, Vinoth Gnana Chellaiyan Devanbu, Devananda Devegowda, Syed Masudur Rahman Dewan, Shalik Ram Dhital, Bibha Dhungel, Marcello Di Pumpo, Daniel Diaz, Kimia Didehvar, Thao Huynh Phuong Do, Sushil Dohare, Klara Georgieva Dokova, Francesco Dondi, Fariba Dorostkar, Wendel Mombaque dos Santos, Ojas Prakashbhai Doshi, Robert Kokou Dowou, Jiang Du, Senbagam Duraisamy, Siddhartha Dutta, Sulagna Dutta,

Aziz Eftekharimehrabad, Foolad Eghbali, Terje Andreas Eikemo, Michael Ekholuenetale, Temitope Cyrus Ekundayo, Eman D El Desouky, Abdelfatteh EL Omri, Iman El Sayed, Maysaa El Sayed Zaki, Mohamed Ahmed Eladl, Iffat Elbarazi, Marwan El-Deyarbi, Noha Mousaad Elemam, Muhammed Elhadi, Yasir Ahmed Mohammed Elhadi, Rami Elmorsi, Adel B Elmoselhi, Abdelgawad Salah Eltahawy, Tadele Emagneneh, Setegn Eshetie, Sharareh Eskandarieh, Elochukwu Ezenwankwo, Elisa Fabbro, Heidar Fadavian, Adeniyi Francis Fagbamigbe, Ayesha Fahim, Razana Faiz, Ildar Ravisovich Fakhradiyev, Luca Falzone, Mohammad Farahmand, Seyed Nooreddin Faraji, Mahsa Faramarzpour, Mohammad Fareed, Aisha Farhana, Zaki Farhana, MoezAlIslam Ezzat Mahmoud Faris, Syed Muhammad Yousaf Farooq, Zareen Fatima, Alireza Feizkhah, Ginenus Fekadu, Allegra Ferrari, Nuno Ferreira, Florian Fischer, James L Fisher, Luisa S Flor, Bobirca Teodor Florin, Alina-Ioana Forray, Celia Fortuna Rodrigues, Takeshi Fukumoto, Peter Andras Gaal, Muktar A Gadanya, Dominic Dormenyo Gadeka, Márió Gajdács, Silvano Gallus, Dingwei Gao, Jacopo Garlasco, Anteneh Gashaw, Rupesh K Gautam, Miglas Welay Gebregergis, Teferi Gebru Gebremeskel, Beza A Gelaw, Ali Gerami Matin, Urge Gerema, Genanew K Getahun, Fataneh Ghadirian, Kazem Ghaffari, Arin Ghamkhar, Mohammadreza Ghasemi, Mohammad-Reza Ghasemi, Shakiba Ghasemi Assl, Ahmad Ghashghaee, Fariba Ghassemi, Ramy Mohamed Ghazy, Ehsan Gholami, Elena Ghotbi, Arun Ghuge, Konstantinos Giannakis, Syed Abdullah Gilani, Alessandro Girombelli, Kimiya Gohari, Ali Golchin, Mahaveer Golechha, Melika Golmohammadi, Giuseppe Gorini, Swati Goyal, Teklit Grum, Shi-Yang Guan, Mohammed Ibrahim Mohialdeen Gubari, Avirup Guha, Damitha Asanga Gunawardane, Zheng Guo, Zhifeng Guo, Bhawna Gupta, Vivek Kumar Gupta, Najah R Hadi, Dariush Haghmorad, Arvin Haj-Mirzaian, Pritam Halder, Islam M Hamad, Randah R Hamadeh, Nadia M Hamdy, Asif Hanif, Victoria Funmilayo Hanson, Mohd Anul Haq, Ashanul Haque, Md Aminul Haque, Josep Maria Haro, Sara Harsini, Eka Mishbahatul Marah Has, Ahmed I Hasaballah, Ikramul Hasan, Md Kamrul Hasan, Mohammad Hashem Hashempur, Treska S Hassan, Simon I Hay, Golnaz Heidari, Mohammad Heidari, Hossein Heli, Claudiu Herteliu, Kasuni Akalanka Hewa Marambage, Sumudu Avanthi Hewage, Majid Heydari, Ramesh Holla, Mehdi Hoseinzadeh, Alamgir Hossain, Md Jubayer Hossain, Md Sabbir Hossain, Mohammad Bellal Hossain, Mohamed Hsairi, Junjie Huang, Yefei Huang, Mega Hasanul Huda, Waqar Husain, Kiavash Hushmandi, Javid Hussain, Salman Hussain, Dursa Hussein, Mohammed Asif Hussein, Bing-Fang Hwang, Olabisi Fatimo Ibitoye, Segun Emmanuel Ibitoye, Reem Ibrahim, Anel Ibrayeva, Pulwasha Maria Iftikhar, Adalia Ikiroma, Olayinka Stephen Ilesanmi, Irena M Ilic, Milena D Ilic, Muhammad Hamza Ilyas, Andreea Iuliana Ionescu, Radu Tudor Ionescu, Lalu Muhammad Irham, Mustafa Alhaji Isa, Md Rabiul Islam, Md Shahinul Islam, Farhad Islami, Faisal Ismail, Louis Jacob, Kathryn H Jacobsen, Farhad Jadidi-Niaragh, Vennila Jaganathan, Fatemeh Jahanshahi, Haitham Jahrami, Ammar Abdulrahman Jairoun, Abhishek Jaiswal, Mihajlo Jakovljevic, Sahbanathul Missiriya Jalal, Pooya Jalali, Mohamed Jalloh, Armaan Jamal, Qazi Mohammad Sajid Jamal, Navid Jamali, Jerin James, Hasan Jamil, Rajiv Janardhanan, Talha Jawaid, Qassim Jawell Odah Abed, Shubha Jayaram, Yovanthi Anurangi Jayasinghe, Harerimana Jean de Dieu, Sun Ha Jee, Alelign Tasew Jema, Seogsong Jeong, Fan Jiang, Min Jiang, Wenyi Jin, Mohammad Jokar, Jost B Jonas, Tamas Joo, Jobinse Jose, Akaninyene Paul Joseph, Nitin Joseph, Krupal Joshi, Charity Ehimwenma Joshua, Jacek Jerzy Jozwiak, Billingsley Kaambwa, Ali Kabir, Leila R Kalankesh, Khalil Kalavani, Md Moustafa Kamal, Samuel Berchi Kankam, Kehinde Kazeem Kanmodi, Suthanthira Kannan S, Rami S Kantar, Neeti Kapoor, Dattatreya Kar, Sujita Kumar Kar, Mehrdad Karajizadeh, Reema A Karasneh, Mohammad Amin Karimi, Arman Karimi Behnagh, Faizan Zaffar Kashoo, Manoj Kumar Kashyap, Nigussie Assefa Kassaw, Mohd Adnan Kausar, Yousef Saleh Khader, Pantea Khalili, Alireza Khalilian, Ghazaleh Khalili-Tanha, Mohamed Khalis, Faham Khamesipour, Amjad Khan, Gulfaraz Khan, Iqra Hamid Khan, Md Abdullah Saeed Khan, Muhammad Hamza Khan, Muhammad Umer Khan, Muzamil Khan, Salman Ali Khan, Serab Khan, Sumaiya Khan, Yusuf Saleem Khan, Sameer Uttamaro Khasbage, Khaled Khatab, Moawiah Mohammad Khatatbeh, Peyman Kheirandish Zarandi, Feriha Fatima Khidri, Parisa Khoshvaght, Jagdish Khubchandani, Ermias A Kibru, Ruth W Kimokoti, Yohannes Kinfu, Adnan Kisa, Nazarii Kobyliak, Timea Kocsis, Farzad Kompani, Elizabeth Koomson-Yalley, Karel Kostev, Archana Koul, Irene Akwo Kretchy, Ananya Kuanar, Raja Amir Hassan Kuchay, Mohammed Kuddus, Mukhtar Kulimbet, G Anil Kumar, Nithin Kumar, Rakesh Kumar, Vijay Kumar, Aria Kusuma, Dian Kusuma, Assylkhan Kuttybayev, Grace Kwakyewaa Kyei, Carlo La Vecchia, Chandrakant Lahariya, Daphne Teck Ching Lai, Jianguo Lai, Balzhan Lakanova, Judit Lám, Tian Lan, Iván Landires, Francesco Lanfranchi, Tamás Lantos, Mahrukh Latif, Caterina Ledda, Ivan Lee, Seung Won Lee, Wei-Chen Lee, Gebretsadik Kiros Lema, Elvynna Leong, Cheru Tesema Leshargie, Jinbo Li, Ming-Chieh Li, Yanxue Lian, Rong Liu, Xianliang Liu, Xiaofeng Liu, Xuefeng Liu, Tewachew Muche Liyeh, Madeeha Shahzad Lodhi, Platon D Lopukhov, Alessandra Lugo, Peng Luo, Angelina M Lutambi, Miltiadis D Lytras, Hawraz Ibrahim M Amin, Kevin Sheng-Kai Ma, Zheng Feei Ma, Raymond Saa-Eru Maalman, Edward Augustine Magwe, Nozad Hussein Mahmood, Mansour Adam Mahmoud, Rashidul Alam Mahumud, Ahmad Azam Malik, Tabarak Malik, Deborah Carvalho Malta, Doste Rashid Mamand, Farheen Mansoor, Marjan Mansourian, Mohammad Ali Mansournia, Lorenzo Giovanni Mantovani, Shaista Manzoor, Kaleem Maqsood, Hamid Reza Marateb, Santi Martini, Miquel Martorell, Roy Rillera Marzo, Sammer Marzouk, Medha Mathur, Neeta Mathur, Fernanda Penido Matozinhos, Steven M McPhail, Jitendra Kumar Meena, Ravi Mehrotra, Subhash Mehto, Hadush Negash Meles, Satish Melwani, Godfred Antony Menezes, Emiru Ayalew Mengistie, Sultan Ayoub Meo, Tuomo J Meretoja, Rahwa Adisu Mesfin, Tomislav Mestrovic, Mohamed M M Metwally, Malathi Mini, Mojgan Mirghafourvand, Seyed Ali Mirshahvalad, Amaresh Mishra, Sanjeev Misra, Prasanna Mithra, Jama Mohamed, Mona Gamal Mohamed, Nouh Saad Mohamed, Taj Mohammad, Mohammad Kazem Mohammadi, Abdollah Mohammadian-Hafshejani, Al-Kassim Hassan Mohammed, Ammas Siraj Mohammed, Shafiu Mohammed, Syam Mohan, Parvin Mohseni, Nagaishwarya Moka, Ali H Mokdad, Shaher Momani, Maryam Moradi, Yousef Moradi, Paula Moraga, Shane Douglas Morrison, Fatemeh Motaharinezhad, Rohith Motappa, Seyed Mohamad Sadegh Mousavi Kiasary, Mohamed Awad Abdalaziz Mousnad, Rabia Mubarak, Sumaira Mubarik, Jibran Sualeh Muhammad, Sukhes Mukherjee, Francesk Mulita, Chalie Mulugeta, Sara Mumtaz, Anjana Munshi, Efren Murillo-Zamora, Christopher J L Murray, Abdisalam Hassan Muse, Ali Mushtaq, Saima Mushtaq, Ana-Maria Musina, Mubarak Taiwo Mustapha, Saravanan Muthupandian, Woojae Myung, Ahamarshan Jayaraman Nagarajan, Mohsen Naghavi, Pirouz Naghavi, Tapas Sadasivan Nair, Hastyar Hama Rashid Najmuldeen, Yvonne Nartey, Abdulqadir J Nashwan, Hamide Nasiri, Zuhair S Natto, Javaid Nauman, Muhammad Naveed, Nawsherwan , Shalini Ganesh Nayak, Md Fahad Shahariar Nayon, Athare Nazri-Panjaki, Amanuel Tebabal Nega, Alina Gabriela Negru, Mohammad Hadi Nematollahi, Robina Khan Niazi, Luciano Nieddu, Taxiarchis Konstantinos Nikolouzakis, Amin Reza Nikpoor, Vikram Niranjan, Abebe Melis Nisro, Lawrence Achilles Nnyanzi, Shuhei Nomura, Mamoona Noreen, Sana Noreen, Fred Nugen, Felix Kwasi Nyande, Chimezie Igwegbe Nzoputam, Ogochukwu Janet Nzoputam, Bogdan Oancea, Vincent Adeiza Obakachi, Onome Bright Oghenetega, In-Hwan Oh, Hassan Okati-Aliabad, Sylvester Reuben Okeke, Akinkunmi Paul Okekunle, Osaretin Christabel Okonji, Andrew T Olagunju, Abdullahi Olaleye Olawuyi, Folorunsho Bright Omage, Abidemi E Omonisi, Alicia H Ong, Obinna E Onwujekwe, Michal Ordak, Hans Orru, Doris Verónica Ortega-Altamirano, Esteban Ortiz-Prado, Augustus Osborne, Eric Osei, Elham H Othman, Irene Amoakoh Owusu, Ifeoluwa Temitayo Oyeyemi, Ilker Ozsahin, Mahesh P A, Alicia Padron-Monedero, Jagadish Rao Padubidri, Dimpal Manilal Paija, Giuseppina Palena, Tejasri Paluvai, Adrian Pana,

Diana Ioana Panaite, Sujogya Kumar Panda, Songhomitra Panda-Jonas, Deepshikha Pande Katare, Seithikurippu R Pandi-Perumal, Sunil Kumar Panigrahi, Parinaz Paranjkhoo, Romil R Parikh, Chulwoo Park, Sungchul Park, Tae Hwan Park, S Yasamin Parvar, Maja Pasovic, Roberto Passera, Heta Pavan Patel, Jenish Patel, Mitesh Patel, Niki Rut Patel, Riya Jayesh Patel, Satyananda Patel, Hamidreza Pazoki Toroudi, Jarmila Pekarcikova, Richard G Pestell, Olumuyiwa James Peter, Tung Thanh Pham, Daniela Pierannunzio, Zahra Zahid Piracha, Saeed Pirouzpanah, Evgenii Plotnikov, Thantrira Porntaveetus, Sajjad Pourasghary, Farzad Pourghazi, Naeimeh Pourtaheri, Jalandhar Pradhan, Thejeswar N Prakasham, Chandra P Prasad, Akila Prashant, Elton Junio Sady Prates, Harsh Priya, Shuby Puthussery, Husam Qanash, Nameer Hashim Qasim, Asma Saleem Qazi, Zhipeng Qi, Shahazad Niwazi Qurashi, Deepthi R, Venkatraman Radhakrishnan, Hadi Raeisi Shahraki, Yashpal Singh Raghav Raghav, Pracheth Raghuveer, Hawbash Mohammed-Amin Rahim, Sajjad Rahimi, Fryad Majeed Rahman, Md Mijanur Rahman, Mohammad Meshbahur Rahman, Mosiur Rahman, Muhammad Aziz Rahman, Amir Masoud Rahmani, Masoud Rahmati, Jeffrey Pradeep Raj, Sathish Rajaa, Judah Rajendran, Mohammad Amin Rajizadeh, Kairolla Dyusenbayevich Rakhimov, Majed Ramadan, Chitra Ramasamy, Shakthi Kumaran Ramasamy, Marzieh Ramezani Farani, Robinson Ramírez-Vélez, Muhammad Ramzan, Nemanja Rancic, Devarajan Rathish, Santosh Kumar Rauniyar, Salman Rawaf, Asit Ray, Mohammad Rayati, Aqeeb Ur Rehman, Najeeb Ur Rehman, Ana Reis-Mendes, Mina Rezaei, Nazila Rezaei, Nima Rezaei, Hermano Alexandre Lima Rocha, Thales Philipe Rodrigues da Silva, David Rojas-Rueda, Gholamreza Roshandel, Amirhossein Roshanshad, Hanieh Rouzbahani, Reza Rouzbahani, Shiva Rouzbahani, Sharmistha Roy, Maha Mohamed Saber-Ayad, Kabir P Sadarangani, Basema Ahmad Saddik, Tarannom Sadegh, Erfan Sadeghi, Fatemeh Sadeghi-Ghyassi, Mohd Saeed, Umar Saeed, Maryam Saeedi, Ashok Kumar Sah, Ahmad Sahban Rafsanjani, Fatemeh Saheb Sharif-Askari, Narjes Saheb Sharif-Askari, Amirhossein Sahebkar, Umakanta Sahoo, Pragyan Monalisa Sahoo, Zahra Saif, Morteza Saki, Dorsa Salabat, Afeez Abolarinwa Salami, Luciane B Salaroli, Rahman Shah Zaib Saleem, Mohamed A Saleh, Mahdi Salehi, Saad Samargandy, Yoseph Leonardo Samodra, Abdallah M Samy, Sandeep G Sangle, Elaheh Sanjari, Milena M Santric-Milicevic, Aswini Saravanan, Saman Sargazi, Mohammad Sarmadi, Sachin C Sarode, Brijesh Sathian, Aanchal Satija, Naghmeh Sattarahmady, Mehrdad Savabi Far, Monika Sawhney, Christophe Schinckus, Amin Sedigh, Hamidreza Seifmanesh, Mario Šekerija, Siddharthan Selvaraj, Vimalraj Selvaraj, Mohammad H Semreen, Pallav Sengupta, Subramanian Senthilkumaran, Dragos Serban, Yashendra Sethi, Seyed Mohammad Seyed Alshohadaei, Allen Seylani, Muhammad Shahab, Muhammad Shahbaz, Samiah Shahid, Syed Ahsan Shahid, Wajeehah Shahid, Fatemeh Shahrahmani, Hamid R Shahsavari, Masood Ali Shaikh, Sunder Sham, Muhammad Aaqib Shamim, Farzane Shams, Anas Shamsi, Alfiya Shamsutdinova, Mohd Shanawaz, Abhishek Shankar, Muhammad Junaid Hassan Sharif, Amin Sharifan, Bunty Sharma, Manoj Sharma, Ravi Kumar Sharma, Ujjawal Sharma, Vishal Sharma, Ramzi Shawahna, Maryam Shayan, Fateme Sheida, Ali Sheidaei, Rekha Raghuveer Shenoy, Mahabalesh Shetty, Suraj S Shetty, Desalegn Shiferaw, Tariku Shimels, Aminu Shittu, Chandan Shivamallu, Velizar Shivarov, Ambreen Shoaib, Zahra Shokati Eshkiki, Seyed Afshin Shorofi, Aman Shrestha, Gambhir Shrestha, Sunil Shrestha, Kerem Shuval, Yafei Si, Zahra Siavashpour, Nicole Remaliah Samantha Sibuyi, Emmanuel Edwar Siddig, Mithun Sikdar, Baljinder Singh, Harmanjit Singh, Jasvinder A Singh, Kalpana Singh, Lucky Singh, Paramdeep Singh, Poornima Suryanath Singh, Puneetpal Singh, Ritesh Singh, Rohit Singh, Satwinder Singh, Surendra Singh, Surjit Singh, Mukesh Kumar Sinha, Mahdieh SobhZahedi, Farrukh Sobia, Lencho Kajela Solbana, Anvar Soleimani, Solikhah Solikhah, Sameh S M Soliman, Weiyi Song, Aayushi Sood, Prashant Sood, Manraj Singh Sra, Lokasani Vijaya Sree, Vetriselvan Subramaniyan, Oksana Sulaieva, Muritala Suleiman Odidi, Muhammad Suleman, Anusha Sultan Meo, Zhong Sun, Shanthosh Priyan Sundaram, Thanigaivel Sundaram, Vasuki Suresh, Chandan Kumar Swain, Lukasz Szarpak, Sree Sudha T Y, Rafael Tabarés-Seisdedos, Seyyed Mohammad Tabatabaei, Seyed-Amir Tabatabaeizadeh, Farzad Taghizadeh-Hesary, Seyed Reza Taha, Jabeen Taiba, Iman M Talaat, Ker-Kan Tan, Shynar Tanabayeva, Mohsan Tanveer, Saba Tariq, Seyed Mohammad Tavangar, Abdelghani Tbakhi, Fanuel Alemayehu Tefera, Abainash Tekola, Mohamad-Hani Temsah, Fisaha Haile Tesfay, Azimeraw Arega Tesfu, Rekha Thapar, Hadiza Theyra-Enias, Muthu Thiruvengadam, Rekha Thiruvengadam, Jansje Henny Vera Ticoalu, Krishna Tiwari, Roman Topor-Madry, Adetunji T Toriola, Mathilde Touvier, Tam Quoc Minh Tran, Thang Huu Tran, Aniefiok John Udoakang, Atta Ullah, Saeed Ullah, Srikanth Umakanthan, Shehu Salihu Umar, Brigid Unim, Bhaskaran Unnikrishnan, Jeba Mahiad Urmey, Asokan Govindaraj Vaithinathan, Javad Varasteh, Pavani Varma, Sampara Vasishta, Baskar Venkidasamy, Poonam Verma, Francesco S Violante, Sergey Konstantinovitch Vladimirov, Vasily Vlassov, Simona Ruxandra Volovat, Yasir Waheed, Mugi Wahidin, Xingxin Wang, Yanzhong Wang, Ronny Westerman, Yohanes Cakrapradipta Wibowo, Dakshitha Praneeth Wickramasinghe, Nuwan Darshana Wickramasinghe, Andrew Awuah Wireko, Nathnael Abera Woldehana, Axel Walter Wolf, Florence Gyembuzie Wongnaah, Minichil Chanie Worku, James Fan Wu, Peng Wu, Shulan Wu, Ratna Dwi Wulandari, Guangqin Xiao, Wanqing Xie, Wanqing Xu, Yuyan Xu, Saba Yahoo (Syed), Galal Yahya, Yuichiro Yano, Laiang Yao, Amir Yarahmadi, Sanni Yaya, Meghdad Yeganeh, Mohammad Hossein YektaKooshali, Saber Yezli, Yazachew Engida Yismaw, Dong Keon Yon, Naohiro Yonemoto, Chuanhua Yu, Chun-Wei Yuan, Quan Yuan, Meliz Yuvali, Vesna Zadnik, Mubashir Zafar, Manijeh Zaghampour, Dilmurat Zairov, Nazar Zaki, Giulia Zamagni, Iman Zare, Mohammad Javad Zare Sakhvidi, Mohammed Zawiah, Mohammed G M Zeariya, Qibing Zeng, Daniel Xin Zhang, Liqun Zhang, Xiaoyi Zhang, Hanqing Zhao, Zhongyi Zhao, Claire Chenwen Zhong, Bin Zhu, Shijie Zhu, Zhounan Zhu, Abzal Zhumagaliuly, Hafsa Zia, Magdalena Zielińska, Mohamed Ali Zoromba, Sa'ed H Zyoud, Stein Emil Vollset, Theo Vos, Lisa M Force, and Marie Ng.

Affiliations

For the affiliations of individual authors, please see the appendix (pp 2–27).

See **Online** for appendix

Contributors

Please see appendix (pp 27–38) for more detailed information about individual author contributions to the research, divided into the following categories: managing the overall research enterprise; writing the first draft of the manuscript; primary responsibility for applying analytical methods to produce estimates; primary responsibility for seeking, cataloguing, extracting, or cleaning data; designing or coding figures and tables; providing data or critical feedback on data sources; developing methods or computational machinery; providing critical feedback on methods or results; drafting the manuscript or revising it critically for important intellectual content; and managing the estimation or publications process.

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Data sharing

To download the input data used in these analyses, please visit the Global Health Data Exchange Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2023 website (http://ghdx.healthdata.org/gbd-2023). All results from this study are publicly accessible. To download estimates used in these analyses, please visit the GBD Results tool (https://vizhub.healthdata.org/gbd-results/).

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References

1 GBD 2023 Cancer Collaborators. The global, regional, and national burden of cancer, 1990-2023, with forecasts to 2050: a systematic analysis for the Global Burden of Disease Study 2023. *Lancet* 2025; **406:** 1565–86.
2 Amato O, Guarneri V, Girardi F. Epidemiology trends and progress in breast cancer survival: earlier diagnosis, new therapeutics. *Curr Opin Oncol* 2023; **35:** 612–19.
3 Anderson BO, Ilbawi AM, El Saghir NS. Breast cancer in low and middle income countries (LMICs): a shifting tide in global health. *Breast J* 2015; **21:** 111–18.
4 Collaborative Group on Hormonal Factors in Breast Cancer. Menarche, menopause, and breast cancer risk: individual participant meta-analysis, including 118 964 women with breast cancer from 117 epidemiological studies. *Lancet Oncol* 2012; **13:** 1141–51.
5 Benitez Fuentes JD, Morgan E, de Luna Aguilar A, et al. Global stage distribution of breast cancer at diagnosis: a systematic review and meta-analysis. *JAMA Oncol* 2024; **10:** 71–78.
6 Loibl S, Poortmans P, Morrow M, Denkert C, Curigliano G. Breast cancer. *Lancet* 2021; **397:** 1750–69.
7 Wilkinson L, Gathani T. Understanding breast cancer as a global health concern. *Br J Radiol* 2022; **95:** 20211033.
8 WHO. SDG target 3.4 non-communicable diseases and mental health. https://www.who.int/data/gho/data/themes/topics/sdg-target-3_4-noncommunicable-diseases-and-mental-health (accessed March 6, 2025).
9 WHO. Cancer prevention and control in the context of an integrated approach. May 31, 2017. https://apps.who.int/gb/ebwha/pdf_files/wha70/a70_r12-en.pdf (accessed March 3, 2025).
10 Anderson BO, Ilbawi AM, Fidarova E, et al. The Global Breast Cancer Initiative: a strategic collaboration to strengthen health care for non-communicable diseases. *Lancet Oncol* 2021; **22:** 578–81.
11 Institute for Health Metrics and Evaluation. Protocol for the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD). Version 4.0. March, 2020. http://www.healthdata.org/sites/default/files/files/Projects/GBD/March2020_GBD%20Protocol_v4.pdf (accessed June 27, 2024).
12 Phipps AI, Ichikawa L, Bowles EJA, et al. Defining menopausal status in epidemiologic studies: a comparison of multiple approaches and their effects on breast cancer rates. *Maturitas* 2010; **67:** 60–66.
13 Stevens GA, Alkema L, Black RE, et al, and the The GATHER Working Group. Guidelines for Accurate and Transparent Health Estimates Reporting: the GATHER statement. *Lancet* 2016; **388:** e19–23.
14 Foreman KJ, Lozano R, Lopez AD, Murray CJ. Modeling causes of death: an integrated approach using CODEm. *Popul Health Metr* 2012; **10:** 1.
15 GBD 2023 Disease and Injury and Risk Factor Collaborators. Burden of 375 diseases and injuries, risk-attributable burden of 88 risk factors, and healthy life expectancy in 204 countries and territories, including 660 subnational locations, 1990-2023: a systematic analysis for the Global Burden of Disease Study 2023. *Lancet* 2025; **406:** 1873–922.
16 GBD 2023 Causes of Death Collaborators. Global burden of 292 causes of death in 204 countries and territories and 660 subnational locations, 1990-2023: a systematic analysis for the Global Burden of Disease Study 2023. *Lancet* 2025; **406:** 1811–72.
17 Allgar VL, Neal RD. Delays in the diagnosis of six cancers: analysis of data from the National Survey of NHS Patients: Cancer. *Br J Cancer* 2005; **92:** 1959–70.
18 IHME. Mexico Secretariat of Health Hospital Discharges 2012. 2012. https://ghdx.healthdata.org/record/mexico-secretariat-health-hospital-discharges-2012 (accessed March 10, 2025).
19 Zheng P, Afshin A, Biryukov S, et al. The burden of proof studies: assessing the evidence of risk. *Nat Med* 2022; **28:** 2038–44.
20 GBD 2021 Forecasting Collaborators. Burden of disease scenarios for 204 countries and territories, 2022-2050: a forecasting analysis for the Global Burden of Disease Study 2021. *Lancet* 2024; **403:** 2204–56.
21 GBD 2023 Demographics Collaborators. Global age-sex-specific all-cause mortality and life expectancy estimates for 204 countries and territories and 660 subnational locations, 1950-2023: a demographic analysis for the Global Burden of Disease Study 2023. *Lancet* 2025; **406:** 1731–810.
22 Kim J, Harper A, McCormack V, et al. Global patterns and trends in breast cancer incidence and mortality across 185 countries. *Nat Med* 2025; **31:** 1154–62.
23 Naghavi M, Richards N, Chowdhury H, et al. Improving the quality of cause of death data for public health policy: are all 'garbage' codes equally problematic? *BMC Med* 2020; **18:** 55.
24 Nordcan. Fact sheets. https://nordcan.iarc.fr/en/factsheets (accessed March 9, 2025).
25 Allemani C, Matsuda T, Di Carlo V, et al, and the CONCORD Working Group. Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. *Lancet* 2018; **391:** 1023–75.

26 Berry DA, Cronin KA, Plevritis SK, et al, and the Cancer Intervention and Surveillance Modeling Network (CISNET) Collaborators. Effect of screening and adjuvant therapy on mortality from breast cancer. *N Engl J Med* 2005; **353:** 1784–92.

27 Cardoso F, Paluch-Shimon S, Schumacher-Wulf E, et al. 6th and 7th International consensus guidelines for the management of advanced breast cancer (ABC guidelines 6 and 7). *Breast* 2024; **76:** 103756.

28 McCormack V, McKenzie F, Foerster M, et al. Breast cancer survival and survival gap apportionment in sub-Saharan Africa (ABC-DO): a prospective cohort study. *Lancet Glob Health* 2020; **8:** e1203–12.

29 Coles CE, Earl H, Anderson BO, et al, and the Lancet Breast Cancer Commission. The Lancet Breast Cancer Commission. *Lancet* 2024; **403:** 1895–950.

30 Afaya A, Ramazanu S, Bolarinwa OA, et al. Health system barriers influencing timely breast cancer diagnosis and treatment among women in low and middle-income Asian countries: evidence from a mixed-methods systematic review. *BMC Health Serv Res* 2022; **22:** 1601.

31 Rivera-Franco MM, Leon-Rodriguez E. Delays in breast cancer detection and treatment in developing countries. *Breast Cancer (Auckl)* 2018; **12:** 1178223417752677.

32 Martei YM, Pace LE, Brock JE, Shulman LN. Breast cancer in low- and middle-income countries: why we need pathology capability to solve this challenge. *Clin Lab Med* 2018; **38:** 161–73.

33 Elmore SNC, Polo A, Bourque J-M, et al. Radiotherapy resources in Africa: an International Atomic Energy Agency update and analysis of projected needs. *Lancet Oncol* 2021; **22:** e391–99.

34 Francies FZ, Hull R, Khanyile R, Dlamini Z. Breast cancer in low-middle income countries: abnormality in splicing and lack of targeted treatment options. *Am J Cancer Res* 2020; **10:** 1568–91.

35 Sadler SJ, Torio EF, Golby AJ. Global cancer surgery in low-resource settings: a strengths, weaknesses, opportunities, and threats analysis. *Cancer* 2023; **129:** 671–84.

36 WHO. WHO model lists of essential medicines. https://www.who.int/groups/expert-committee-on-selection-and-use-of-essential-medicines/essential-medicines-lists (accessed March 15, 2025).

37 WHO. Technical report: pricing of cancer medicines and its impacts: a comprehensive technical report for the World Health Assembly Resolution 70.12: operative paragraph 2.9 on pricing approaches and their impacts on availability and affordability of medicines for the prevention and treatment of cancer. 2018. https://iris.who.int/items/e707bc03-4c09-4469-ab26-3d014eb81b39 (accessed March 10, 2025).

38 Talib Z, Amersi F, Harit A, Saleh M. Promoting breast cancer awareness and clinical breast examination in the LMIC: experiences from Tajikistan, Pakistan and Kenya. *Curr Breast Cancer Rep* 2019; **11:** 152–57.

39 Pace LE, Dusengimana JMV, Shulman LN, et al. Cluster randomized trial to facilitate breast cancer early diagnosis in a rural district of Rwanda. *J Glob Oncol* 2019; **5:** 1–13.

40 Romero Y, Tittenbrun Z, Trapani D, et al, and the NCCP Global Review Consortium. The changing global landscape of national cancer control plans. *Lancet Oncol* 2025; **26:** e46–54.

41 Ellington TD, Henley SJ, Wilson RJ, Miller JW, Wu M, Richardson LC. Trends in breast cancer mortality by race/ethnicity, age, and US census region, United States—1999-2020. *Cancer* 2023; **129:** 32–38.

42 Christie V, Riley L, Green D, et al. Improving breast cancer outcomes for Indigenous women in Australia. *Cancers (Basel)* 2024; **16:** 1736.

43 Tin Tin S, Elwood JM, Brown C, et al. Ethnic disparities in breast cancer survival in New Zealand: which factors contribute? *BMC Cancer* 2018; **18:** 58.

44 Kaklamani VG, Arteaga CL. Breast cancer: The good, the bad, and an important call to effective risk reduction strategies. *CA Cancer J Clin* 2024; **74:** 471–74.

45 Colditz GA, Rosner B. Cumulative risk of breast cancer to age 70 years according to risk factor status: data from the Nurses' Health Study. *Am J Epidemiol* 2000; **152:** 950–64.

46 Lima SM, Kehm RD, Terry MB. Global breast cancer incidence and mortality trends by region, age-groups, and fertility patterns. *EClinicalMedicine* 2021; **38:** 100985.

47 Wang Z, Asokan G, Onnela J-P, et al. Menarche and time to cycle regularity among individuals born between 1950 and 2005 in the US. *JAMA Netw Open* 2024; **7:** e2412854.

48 Appiah D, Nwabuo CC, Ebong IA, Wellons MF, Winters SJ. Trends in age at natural menopause and reproductive life span among US women, 1959-2018. *JAMA* 2021; **325:** 1328–30.

49 Kono S, Sunagawa Y, Higa H, Sunagawa H. Age of menopause in Japanese women: trends and recent changes. *Maturitas* 1990; **12:** 43–49.

50 GBD 2021 Adult BMI Collaborators. Global, regional, and national prevalence of adult overweight and obesity, 1990-2021, with forecasts to 2050: a forecasting study for the Global Burden of Disease Study 2021. *Lancet* 2025; **405:** 813–38.

51 Picon-Ruiz M, Morata-Tarifa C, Valle-Goffin JJ, Friedman ER, Slingerland JM. Obesity and adverse breast cancer risk and outcome: mechanistic insights and strategies for intervention. *CA Cancer J Clin* 2017; **67:** 378–97.

52 Chen S, Cao Z, Prettner K, et al. Estimates and projections of the global economic cost of 29 cancers in 204 countries and territories from 2020 to 2050. *JAMA Oncol* 2023; **9:** 465–72.

53 Luengo-Fernandez R, Leal J, Gray A, Sullivan R. Economic burden of cancer across the European Union: a population-based cost analysis. *Lancet Oncol* 2013; **14:** 1165–74.

54 National Cancer Institute. Financial burden of cancer care. https://progressreport.cancer.gov/after/economic_burden (accessed March 6, 2025).

55 Pillai RN, Alex A, S NM, et al. Economic burden of breast cancer in India, 2000-2021 and forecast to 2030. *Sci Rep* 2025; **15:** 1323.

56 Daroudi R, Akbari Sari A, Nahvijou A, Kalaghchi B, Najafi M, Zendehdel K. The economic burden of breast cancer in Iran. *Iran J Public Health* 2015; **44:** 1225–33.

57 Rezende LFM, Ferrari G, Bahia LR, et al. Economic burden of colorectal and breast cancers attributable to lack of physical activity in Brazil. *BMC Public Health* 2021; **21:** 1190.

58 Ehsan AN, Wu CA, Minasian A, et al. Financial toxicity among patients with breast cancer worldwide: a systematic review and meta-analysis. *JAMA Netw Open* 2023; **6:** e2255388.

59 Loibl S, André F, Bachelot T, et al, and the ESMO Guidelines Committee. Early breast cancer: ESMO Clinical Practice Guideline for diagnosis, treatment and follow-up. *Ann Oncol* 2024; **35:** 159–82.

60 Fundytus A, Sengar M, Lombe D, et al. Access to cancer medicines deemed essential by oncologists in 82 countries: an international, cross-sectional survey. *Lancet Oncol* 2021; **22:** 1367–77.

61 Maruthappu M, Watkins J, Noor AM, et al. Economic downturns, universal health coverage, and cancer mortality in high-income and middle-income countries, 1990-2010: a longitudinal analysis. *Lancet* 2016; **388:** 684–95.

62 Momenimovahed Z, Salehiniya H. Epidemiological characteristics of and risk factors for breast cancer in the world. *Breast Cancer (Dove Med Press)* 2019; **11:** 151–64.

63 Dai X, Gil GF, Reitsma MB, et al. Health effects associated with smoking: a Burden of Proof study. *Nat Med* 2022; **28:** 2045–55.

64 Lescinsky H, Afshin A, Ashbaugh C, et al. Health effects associated with consumption of unprocessed red meat: a burden of proof study. *Nat Med* 2022; **28:** 2075–82.

65 Flor LS, Anderson JA, Ahmad N, et al. Health effects associated with exposure to secondhand smoke: a burden of proof study. *Nat Med* 2024; **30:** 149–67.

66 Figueroa JD, Gray E, Pashayan N, et al, and the Breast Screening Working Group (WG2) of the Covid-19 and Cancer Global Modelling Consortium. The impact of the COVID-19 pandemic on breast cancer early detection and screening. *Prev Med* 2021; **151:** 106585.

67 Leone JP, Leone J, Hassett MJ, et al. Incidence, treatment patterns, and mortality for patients with breast cancer during the first year of the COVID-19 pandemic: a population-based study. *Breast Cancer Res Treat* 2025; **210:** 285–94.