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Global Burden of Disease 2023

Frequently Asked Questions

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This document aims to be a learning resource for colleagues within public health and the general public wanting to learn more about the Global Burden of Disease Study (GBD). It is not intended to be an exhaustive list of questions and answers but instead, an overview of areas encountered when working on a series of briefings summarising findings from the latest iteration, GBD 2023, in 2026.

It is recommended to read this FAQ document alongside a summary briefing which provides an overview of areas such as the measures included in the study etc. This briefing can be found on the Global Burden of Disease JSNA webpage.

When was the first GBD study published?

The first GBD study was commissioned in the early 1990s by the World Bank and published as part of the World Development Report 1993. This study provided estimates for eight regions, 108 conditions, ten risk factors and five age groups for the year 1990. Building on this work, the Institute for Health Metrics and Evaluation (IHME), an independent population health research organisation, published its first major update, GBD 2010, in 2012. This update was in collaboration with nearly 500 experts worldwide.

Since the publication of GBD 2010, the study has been co-ordinated by the IHME and is routinely updated to incorporate new data sources and changes in methodology, where appropriate (Bhutta, 2025). The latest iteration of the study, GBD 2023, was published in October 2025 and provides estimates for 375 diseases and injuries and 88 risk factors, across 204 countries and territories from 1990 to 2023.

What are the principles of the GBD?

The GBD is underpinned by five core principles: producing the best possible estimates; comprehensive accounting across diseases, injuries and risks; focus on comparable measurements, providing summary measures of fatal and non-fatal health outcomes (such as mortality, disability-adjusted life years etc), and the careful evaluation of face validity (e.g., whether or not something measures what it claims to measure). For further information on the principles of the study, refer to Murray's (2022) paper and presentation at the University of California in 2023.

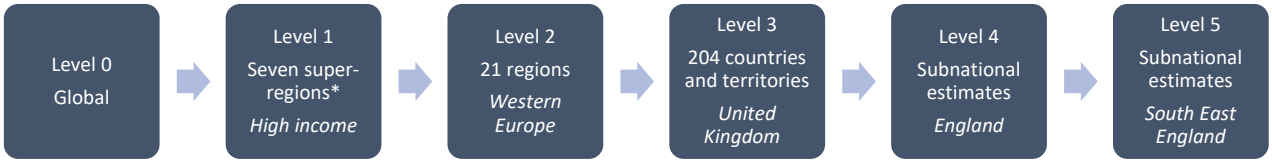
Can you compare estimates from the GBD 2023 with previous iterations?

For each new iteration of the GBD, estimates for the entire time series back to 1990 are updated to incorporate new data and change in methods, where appropriate. This allows estimates to be comparable to each other by using the same methods and approaches for all years. This means for the latest GBD 2023, estimates for the entire 1990–2023 time series therefore replace all previously published estimates.

What is the GBD 2023 location hierarchy?

The GBD is the world's largest systematic effort to quantify health loss over time, providing estimates for numerous countries and territories (Nature, 2026). For the GBD 2023, the 204 countries and territories included in the study were grouped into 21 regions and seven super regions. Subnational estimates were also provided for a small number of countries, depending on collaborations with in-country partners and data availability. This included England and the nine English regions, as shown in Figure 1. Previous iterations of the GBD did provide more granular breakdowns for upper-tier local authorities within each English region, such as West Sussex.

Figure 1 Summary of the GBD 2023 location hierarchy



* Super-regions refer to seven world regions whose countries are grouped based on cause of death patterns.

What is the GBD 2023 cause hierarchy?

The GBD 2023 categorises the 375 diseases and injuries into a hierarchal list of four levels, referred to as the GBD cause hierarchy. Level 1 refers to three broad categories (communicable, maternal, neonatal, and nutritional diseases; non-communicable diseases; and injuries) and level 4 focuses on the most detailed diseases. An overarching category for all causes is also presented.

How are estimates for risk factors produced?

GBD provides estimates on the burden of disease and injury attributable to specific risk factors based on the comparative risk assessment (CRA) framework. This framework, developed by Christopher Murray and Alan Lopez, provides estimates on the burden of disease and injury attributable to specific risk factors.

This framework accounts for changes in disease burden resulting from variations in multiple risk factors simultaneously. This is important as many factors can act through other, intermediate, factors, or in combination with other risks (Murray et al, 2003). As a result, this framework is based on a causal web of hierarchically organised, modifiable risk factors or causes which contribute to health outcomes. This causal web allows for risks or causes to be quantified at any level of the framework

In GBD 2023, in line with previous iterations, a set of behavioural, environmental and occupational; and metabolic risks were evaluated. Relationships between risk factors and specific health outcomes, known as risk outcome pairs, were then included based on evidence rules. Risks were then organised into four levels within the risk factor hierarchy ranging from level 1, where risk factors are grouped into three broad categories (metabolic, behavioural, and environmental/occupational), and level 4, risks of the most granular level, such as household air pollution from solid fuels.

An overarching category for all modifiable risk factors is also provided. However, this hierarchy is not collectively exhaustive. In other words, not all burden can be attributed to a risk factor (Estep, 2025).

Stages of the CRA framework:

Overtime, there have been advances to the methodology and scope of the CRA framework. A summary of the key stages used to calculate estimates for the GBD 2023 is provided below:

1. Estimate effect size

Risk-outcome pairs are included in the study based on convincing or probable evidence. From GBD 2010 to 2019, pairs were included if there was convincing or probable evidence, determined by the World Cancer Research Fund grading criteria. For further information on this criterion, refer to this World Cancer Research Fund report.

Since GBD 2021, IHME introduced their burden of proof methodology which ranks each risk-outcome pair a star rating from one to five, based on the strength of the evidence and severity of the risk. For GBD 2023, risk-outcome pairs included in GBD 2021 remained unless updated burden of proof analysis indicated exclusion. New risk factors were added if they had a minimum one-star rating, alongside a review and majority vote for inclusion by the GBD Scientific Council.

After risk-outcome pairs are included, estimates of relative risk (effect size) as a function of exposure were undertaken separately for each risk–outcome pair. To generate relative risk estimates for each pair, data was collated from primarily randomised control trials, cohort, and pooled cohort studies and case-control studies (where appropriate).

2. Estimate mean exposure

To estimate mean exposure for each risk factor, systematic literature reviews were conducted to identify risk factor exposure studies published or identified since GBD 2021. For GBD 2023, these reviews were undertaken for three additional risks: lead exposure, high fasting plasma glucose, and high systolic blood pressure. For remaining risk factors, other data sources were used such as survey, measurement, or satellite data.

Adjustments were then made to the risk exposure data to deal with alternative case definitions or study methods. Once data was compiled, the levels and distribution of exposure to each risk factor were estimated primarily using two Bayesian statistical models (spatiotemporal Gaussian process regression [ST-GPR] and disease model meta-regression [DisMod-MR 2.1]. This helped to pool heterogeneous data (collection of different data types, formats, structures, or origins) and to control and adjust for bias.

3. Determine theoretical minimum risk exposure level (TMREL)

For each risk evaluated in GBD 2023, the TMREL needs to be determined. This refers to the level or distribution of exposure that minimises population risk and is identified by using the best available epidemiological evidence for each risk factor (Ursa et al., 2026).

4. Estimates the population attributable fraction (PAF)

Estimates of exposure, TMREL, and relative risk produced in the steps outlined above are used to calculate the PAF for each risk-outcome pair. This fraction represents the proportion of risk that would be reduced in a given year if exposure to a risk factor in the past was reduced to the TMREL.

5. Calculate summary exposure values (SEV)

After PAF were estimated, SEVs can be calculated. This measures a population's exposure to a risk factor, considering the extent of the exposure by risk level and severity of that risk's contribution to disease burden. SEVs range from 0-100 with 0 indicating that the entire population included in the evaluation is exposed at the TMREL (e.g., ideal level of exposure) and 100 indicates the entire population is exposed at the maximum risk

6. Mediation

Some associations included in the study involve risk factors which are associated with outcomes via intermediate risks. An example of this could be the relationship between diet high in sodium (risk factor) and hypertensive heart disease (health outcome) mediated through high systolic blood pressure (risk factor). Overlapping or intermediate risks could be double-counted and therefore, to account for this, mediation factors were estimated and used to adjust PAFs for overstimulation.

7. Calculate estimates of attributable burden for each combination of age group, sex, location, and year

For each risk-outcome pair, estimates of deaths, years of life lost (YLLs), years lived with a disability (YLDs) and disability-adjusted life years (DALYs) attributable to a particular risk factor or combination of risks were calculated by multiplying the estimated disease burden associated for each measure by the PAF.

For further information on the methodology, refer to published findings by the GBD 2023 Disease and Injury and Risk Factor Collaborators.

How does the GBD calculate age-standardised rates?

The GBD provides estimates of the population aged from zero to 95+ years. Alongside this, estimates are provided by five-year age groups and for children under five, smaller sub-groups such as zero to six days (early neonatal) and seven to twenty-seven days (late neonatal) are available.

The GBD uses age-standardised rates per 100,000 population to compare health outcomes, such as prevalence and mortality, across countries and time-periods. To calculate these rates, the GBD needs a standard population which represents a hypothetical population with a defined age structure. This standard population accounts for varying age structures across populations.

For GBD 2010, age-standardised mortality rates and rates of YLLs were calculated from the world standard population issued by the World Health Organisation in 2001 (GBD 2013 Mortality and Causes of Death Collaborators, 2015). For subsequent iterations of the GBD in 2013, 2015, and 2016, this world standard population was updated to account for changes in global demographics (GBD 2013 Mortality and Causes of Death Collaborators, 2015).

From GBD 2017 onwards, the IHME transitioned to using its own world standard population to calculate age-standardised rates. This approach used the non-weighted mean of age-specific proportional distributions for countries with over five million people in that GBD iteration. This approach has been applied to subsequent iterations of the GBD.

As this is an independent approach, it cannot be compared against rates calculated using other standard populations such as the European Standard Population (ESP2013).

How were uncertainty intervals calculated?

Uncertainty intervals refer to a range of values which reflect the certainty of an estimate. For the GBD 2023, every estimate is calculated 250 times for each metric, location, age-group, sex and year and the mean value of these draws is used.

The 95% uncertainty intervals are determined by the 2.5th and 97.5th percentile value of the 250 draws after ordering them from smallest to largest (GBD 2023 Disease and Injury and Risk Factor Collaborators, 2023). Larger uncertainty intervals can result from factors such as limited data availability, use of small studies and conflicting data, while smaller uncertainty intervals can result from extensive data availability, large studies, and data which is consistent across sources (IHME, n.d.)

The number of draws reduced from 500 used in GBD 2021, with the aim of reducing computing power and time.

What does the percentage of prevalence refer to? Can this be compared with other percentages e.g., Quality Outcomes Framework?

The percentage of the prevalence refers to the percentage of total cases of a particular cause relative to cases from all causes included in the GBD study. For example, the percentage of COPD compared to all prevalent cases across all causes in the GBD combined for all ages in the South East in 2023.

These estimates are not directly comparable with other sources, such as data from the Quality Outcomes Framework, as the datasets are based on different populations and methodologies.

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