Sources of data used for the Meningitis Progress Tracker.

Cases, deaths – meningitis and neonatal sepsis

Institute of Health Metrics and Evaluation (IHME) Global burden of disease study 2017

The Global Burden of Diseases, Injuries, and Risk Factors Study 2017 (GBD 2017) study by IHME estimates annual deaths and incident cases from neonatal sepsis ('Neonatal sepsis and other infections') and meningitis as separate cause categories. 'Meningitis' estimates are subcategorised into 'meningococcal meningitis', 'pneumococcal meningitis', 'Hib meningitis' and 'other meningitis'. Within the 'other meningitis' category, GBD 2017 includes other bacterial causes of meningitis and viral meningitis. Neonatal sepsis are not subcategorised by cause.

Incidence (cases/100,000 population) and mortality (deaths/100,000 population) are also estimated.

For more information:

Global Burden of Disease Collaborative Network. *Global Burden of Disease Study 2017 (GBD 2017) Results*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME) [cited 2019; Available from: http://ghdx.healthdata.org/gbd-results-tool.

World Health Organisation and Maternal Child Epidemiology Estimation (WHO-MCEE) 2000-2017 estimates

WHO-MCEE estimate deaths and mortality rates from meningitis/encephalitis in the under 5s as one cause category "meningitis/encephalitis". "Neonatal sepsis and other infectious conditions of the newborn" are reported as a separate cause category.

WHO-MCEE do not produce meningitis estimates broken down by cause or estimates of cases of disease.

For more information:

World Health Organisation. *Disease burden and mortality estimates. Child causes of death, 2000-2017.* 2018 [cited 2019; Available from: https://www.who.int/healthinfo/global_burden_disease/estimates/en/index2.html.

Maternal Child Epidemiology Estimation and Johns Hopkins University (MCEE/JHU)

MCEE/JHU have modelled the global burden of *Streptococcus pneumoniae* and *Haemophilus influenzae* type b (Hib) meningitis in children aged 1-59 months. Estimates of deaths and cases from

pneumococcal and Hib meningitis are derived from the WHO-MCEE meningitis/encephalitis death envelope with additional cases and deaths added to account for deaths and cases of meningitis in people living with HIV.

For more information:

Wahl, B., et al., *Burden of Streptococcus pneumoniae and Haemophilus influenzae type b disease in children in the era of conjugate vaccines: global, regional, and national estimates for 2000-15.* Lancet Glob Health, 2018. **6**(7): p. e744-e757.

Mortality rate – meningitis and neonatal sepsis

The two sources of estimates (IHME and WHO-MCEE) differ in the denominator used to report mortality rates. IHME report mortality as deaths per 100,000 population and WHO-MCEE report mortality in deaths per 1,000 live births.

For consistency a conversion was carried out on both sets of estimates to report mortality amongst neonates as deaths per 1,000 live births and deaths amongst 1-59 month olds as deaths per 100,000 population.

Institute of Health Metrics and Evaluation (IHME) Global burden of disease study 2017

Mortality in 1-59 months

Mortality rates for neonatal sepsis ('Neonatal sepsis and other infections'), 'meningitis' and subcategories 'meningococcal meningitis', 'pneumococcal meningitis', 'Hib meningitis' and 'other meningitis' in 1-59 months were obtained from IHME. Source: Global Burden of Disease Collaborative Network. *Global Burden of Disease Study 2017 (GBD 2017) Results*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME) [cited 2019; Available from: http://ghdx.healthdata.org/gbd-results-tool.

Neonatal mortality rates

To report IHME death estimates as a mortality rate per 1,000 live births, deaths were reported in relation to live birth estimates produced by WHO-MCEE. Source: World Health Organisation. *Disease burden and mortality estimates. Child causes of death, 2000-2017.* 2018 [cited 2019; Available from: https://www.who.int/healthinfo/global_burden_disease/estimates/en/index2.html.

World Health Organisation and Maternal Child Epidemiology Estimation (WHO-MCEE) 2000-2017 estimates[2]

Mortality in 1-59 months

WHO-MCEE estimated deaths from meningitis/encephalitis in the 1 to 59 month age group was converted to deaths per 100,000 population using country and age specific population data for the year 2017 produced by the United Nations. Source: Source of population data: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, custom data acquired via website.

Neonatal mortality rates

Mortality rates for "Neonatal sepsis and other infectious conditions of the newborn" and "meningitis/encephalitis" were obtained directly from WHO-MCEE. Source: World Health Organisation. *Disease burden and mortality estimates. Child causes of death, 2000-2017.* 2018 [cited 2019; Available from: https://www.who.int/healthinfo/global_burden_disease/estimates/en/index2.html.

Countries in the meningitis belt

Source: World Health Organisation. Accessed February 2019

WHO African Region https://www.who.int/about/regions/afro/en/

WHO European Region https://www.who.int/about/regions/euro/en/

WHO Eastern Mediterranean Region https://www.who.int/about/regions/emro/en/

WHO Region of the Americas https://www.who.int/about/regions/amro/en/

WHO South East Asia Region https://www.who.int/about/regions/searo/en/

Country Income Classification

Source: The World Bank. Income classifications based on 2017 GNI per capita (Atlas method), released in July 2018. Retrieved from http://data.worldbank.org/about/country-and-lending-groups

Note: Income classifications set on 1 Jul 2018 remain in effect until 1 Jul 2019

The groups are: low income, $995 or less; lower middle income, $996–3,895; upper middle income, $3,896–12,055; and high income, $12,056 or more.

Vaccine introduction dates, programme types and vaccine coverage

PCV and Hib vaccine introduction dates, programme types and coverage data for the year 2017 taken from IVAC Viewhub http://view-hub.org/viz/ Accessed February 2019.

Quality of death registration

Quality of death registration has been categorised into high/medium quality, low quality or no death registration.

High/medium quality death registration is defined as countries with death registration that is over 80% complete. These countries must also have reported at least 5 years of data to WHO with the latest year of data reported using ICD10 code with average usability of 60% or over. Countries reporting at least 5 years of data to WHO with a condensed cause list would also fall into this category if the average usability of the data is 80% or over, where % usability is calculated as data completeness multiplied by the proportion of registered deaths that are assigned a meaningful cause of death.

Low quality death registration is defined as countries which report any data with a condensed cause list with average usability of less than 80%

No death registration refers to countries which have no formal state or national death registration system, so local death registration would fall into this category as would registration with cause of death based on verbal autopsy.

Source of completeness and quality of death registration data: World health statistics 2018: monitoring health for the SDGs, sustainable development goals. Geneva: World Health Organization; 2018. Licence: CC BY-NC-SA 3.0 IGO
https://apps.who.int/iris/bitstream/handle/10665/272596/9789241565585-eng.pdf?ua=1

Skilled health professional density

Represents the total number of physicians, nursing and midwifery personnel per 10,000 population.

Source: The 2017 update, Global Health Workforce Statistics, World Health Organization, Geneva (http://apps.who.int/gho/data/view.main.HWF10v).

SDI Index

SDI is a summary measure that identifies where countries sit on the spectrum of development. Expressed on a scale of 0 to 1, SDI is a composite average of the rankings of the incomes per capita, average educational attainment, and fertility rates. The lower the SDI score, the less developed a country is considered to be.

Source: Global Burden of Disease Study 2017 (GBD 2017) Socio-Demographic Index (SDI) 1950–2017. Available from: http://ghdx.healthdata.org/record/global-burden-disease-study-2017-gbd-2017-socio-demographic-index-sdi-1950%E2%80%932017

Years of Life lost (YLLs)

Years of life lost (YLLs) are years lost due to premature mortality. YLLs are calculated by subtracting the age at death from the longest possible life expectancy for a person at that age. For example, if the longest life expectancy for men in a given country is 75, but if man dies of meningitis aged 60, this would be 15 years of life lost due to meningitis.

Source: Global Burden of Disease Collaborative Network. *Global Burden of Disease Study 2017 (GBD 2017) Results*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME) [cited 2019; Available from: http://ghdx.healthdata.org/gbd-results-tool.

Years Lived with Disability (YLDs)

Years lived with disability (YLDs) can also be described as years lived in less than ideal health. It is measured by taking the prevalence of the condition multiplied by the disability weight for that condition. Disability weights reflect the severity of different conditions and are developed through surveys of the general public.

Source: Global Burden of Disease Collaborative Network. *Global Burden of Disease Study 2017 (GBD 2017) Results*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME) [cited 2019; Available from: http://ghdx.healthdata.org/gbd-results-tool.

Disability adjusted life years (DALYs)

Disability adjusted life years take into account loss of health as a result of disability following disease and life lost as a result of premature death.

DALYs are the sum of years of life lost from disease (YLLs) and years lived with disability (YLDs)

Source: Global Burden of Disease Collaborative Network. *Global Burden of Disease Study 2017 (GBD 2017) Results*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME) [cited 2019; Available from: http://ghdx.healthdata.org/gbd-results-tool.