



GOAL 3

Ensure healthy lives and promote well-being for all at all ages

TARGET 3.2

By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births

Target overview

SDG monitoring

SDG Target 3.2 includes the following indicators, both of which are discussed in this briefing note:

- 3.2.1: Under-five mortality rate
- 3.2.2: Neonatal mortality rate

Broader monitoring context

There are a range of different demographic measures related to the mortality of children under age five. Examining mortality measures beyond just the neonatal and under-five mortality rates can provide more insight into vulnerable periods for children.

- *Stillbirth rate* – A foetal death or stillbirth is defined as a baby born with no signs of life at 28 weeks' gestation or more (third trimester), expressed as number of third trimester fetal deaths (≥ 28 weeks) per 1,000 births (live and stillbirths).
- *Neonatal mortality rate* – Probability of dying during the first 28 days of life, expressed per 1,000 live births
- *Post-neonatal mortality rate* – Probability of dying after the first 28 days and before reaching exactly 1 year of age, expressed per 1,000 children surviving the first 28 days. It is often calculated as the difference between infant and neonatal mortality in DHS and MICS survey reports.
- *Infant mortality rate* – Probability of dying between birth and exactly 1 year of age, expressed per 1,000 live births
- *Child mortality rate* – Probability of dying between the 1st and 5th birthdays, expressed as deaths per 1,000 children surviving to age one.
- *Under-five mortality rate* – Probability of dying between birth and exactly 5 years of age, expressed per 1,000 live births.

While the amount of data on neonatal and under-five mortality in low- and middle-income countries has grown in recent decades, many countries still lack accurate, reliable and timely data. Different data sources and calculation methods often yield widely differing estimates of mortality for a given time and place.



UNICEF role in monitoring

Goal 1 of UNICEF's Strategic Plan – Every Child Survives and Thrives—encompasses the mortality of children under age five. Over the years, UNICEF, the custodian agency for SDG indicators 3.2.1 and 3.2.2, has worked to advance methodologies to better estimate under-five and neonatal mortality. In 2004, UNICEF joined together with WHO, the World Bank Group, and the United Nations Population Division (UNPD) to form the Inter-agency Group for Child Mortality Estimation (UN IGME). The UN IGME aimed to share data on child mortality, harmonize estimates within the UN system, improve methods for child mortality estimation, report on progress towards child survival goals and enhance country capacity to produce timely and properly assessed estimates of child mortality. In recent years, the UN IGME's work has expanded to address sex-specific child mortality estimation, and mortality estimation among 5-14 year olds.

Given the challenges of child mortality estimation, and the fact that global monitoring and reporting has for many years relied on the UN IGME estimates, this briefing note has an expanded focus beyond the country data (from various data sources including household surveys, censuses and vital registration systems) to include the inter-agency estimates.

General information and resources

- CME Info: UN IGME's child mortality web portal: <http://childmortality.org/>
- UNICEF data: <https://data.unicef.org/>
- UNICEF Multiple Indicator Cluster Surveys (MICS): <http://mics.unicef.org>
- SDG indicators: <https://unstats.un.org/sdgs/>

For further information, please contact the mortality focal point in the Data & Analytics Section at UNICEF HQ via: data@unicef.org



INDICATOR 3.2.1

Under-five mortality rate

INDICATOR 3.2.2

Neonatal mortality rate

Description

Definition and key terms

The under-five mortality rate is the probability of a child born in a specific year or period dying before reaching the age of 5 years, if subject to age specific mortality rates of that period, expressed per 1000 live births.

The neonatal mortality rate is the probability that a child born in a specific year or period will die during the first 28 completed days of life, if subject to age-specific mortality rates of that period, expressed per 1000 live births.

The under-five mortality rate and the neonatal mortality rate as defined here are, strictly speaking, not rates (i.e. the number of deaths divided by the number of population at risk during a certain period of time) but a probability of dying expressed as a rate per 1000 live births.

Key terms:

- Live birth refers to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - e.g. beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live born.
- Under-five deaths: Under-five mortality rates and number of deaths are not interchangeable. The number of deaths does not only depend on the mortality rate of a country but also on the population size of children under age five.
- Neonatal deaths: Under-five deaths can be divided into neonatal deaths and deaths at age 1 to 59 months. Neonatal deaths (deaths during the first 28 completed days of life) may be further subdivided into early neonatal deaths, occurring during the first 7 days of life, and late neonatal deaths, occurring after the 7th day but before the 28th completed day of life.

National data sources

Nationally representative child mortality rates can be derived from a number of different sources, including civil registration, censuses and sample surveys.

Civil registration: A civil registration system which records births and deaths on a continuous basis is the preferred source of data. If registration is complete and the system functions efficiently, the resulting estimates will be accurate and timely. A related source of mortality data is the sample vital registration system which assesses vital events at the national level from information collected in sample areas. From both of these sources, number of deaths at age 0-4 and population of the same age or live births are used to calculate death rates which are then converted into age-specific probability of dying.

Household surveys: Because many countries do not have well-functioning vital registration systems, household surveys, such as the UNICEF-supported Multiple Indicator Cluster Surveys (MICS), the USAID-supported Demographic and Health Surveys (DHS) have become the primary source of data on under-five and neonatal mortality in many low and lower middle income countries. These surveys ask women about the survival of their children, and it is these reports that provide the basis of child mortality estimates. Specifically, in most of these surveys a direct method is used based on a series of detailed questions on each child a woman has given birth to during her lifetime. Neonatal, post-neonatal, infant, child and under-five mortality trend estimates over a 25-year period before the survey can be derived from this "full birth history" module. The sample size of surveys needs to be sufficiently large to produce statistically reliable estimates of child mortality, which are relatively uncommon events. Some surveys also use an indirect method to gather information on mortality. The indirect method is based on questions to each woman of reproductive age on how many children she has ever given birth to and how many are still alive.

Censuses: Periodic population censuses can also provide data on under-five mortality. Censuses often use the indirect method and/or include questions on household deaths in the last 12 months, which can also be used to calculate mortality estimates.

Many countries lack a single source of high-quality data covering the last several decades. Data from different sources require different calculation methods and may suffer from different errors, for example random errors in sample surveys or systematic errors due to misreporting. As a result, various sources often yield widely different estimates of mortality for a given time period and available data are often inconsistent across sources.



Using the indicators

Interpretation

Mortality rates among young children are key indicators for child health and well-being, and, more broadly, for social and economic development. The under-five mortality rate, for example, a closely watched public health indicator because it reflects the access of children and communities to basic health interventions such as vaccination, medical treatment of infectious diseases, and adequate nutrition.

There are various ways to interpret under-five and neonatal mortality rates. In terms of overall levels, under-five mortality rates exceeding 40 deaths per 1,000 live births are considered to be high. Assessing the share of neonatal in under-five deaths is also a useful measure for understanding where the mortality burden lies and, together with measures of intervention coverage, can provide programmatic insight. And numbers of deaths are important both for advocacy and planning.

In order to assess progress over time, the average rate of reduction (ARR) can be calculated to quantify the rate of change from a baseline to the most recent estimate. To assess if countries are on track to achieve SDG targets, the current ARR can be compared with the ARR required to achieve the target on time. While the ARR assesses relative reductions, one can also assess the absolute reductions over a period.

Disaggregation

The common disaggregation for mortality indicators includes disaggregation by sex, age, wealth quintile, residence, and mother's education. Disaggregated data are not always available. Disaggregation by geographic location is usually at regional level, or the minimum provincial level for survey or census data. Data from well-functioning vital registration systems can provide further geographical breakdowns, but not wealth, educational level of mother, or other correlates, except in the rare cases where systems are linked. Data from surveys can also provide disaggregation by demographic risk factors such as mother's age, birth interval, birth order and size at birth. Often disaggregated data from surveys refer to a period of 10 years before the survey since the sample size does not allow for estimates over shorter periods.

Common pitfalls

Many countries do not have timely and reliable child mortality data but rather have differing mortality rates from different sources. Available data suffer from sampling and nonsampling errors. For example, misreporting of age and sex and survivor selection bias. Underreporting of child deaths is also common. Recall errors are common as data are collected retrospectively. Further misclassifications can impact on the accuracy of data, for example early neonatal deaths may be classified as stillbirths. This is why

simply comparing two country data points from different sources and drawing a line between them is not a technically sound way to assess levels and trends. Given varying levels of data quality across different sources, this sort of trend assessment will provide misleading results.

It is important to keep these challenges in mind when looking at available country data and also when discrepancies between country data and the UN IGME estimates are being discussed. The following points are important to highlight:

- The UN IGME aims to minimize the errors for each estimate, harmonize trends over time and produce up-to-date and properly assessed estimates of child mortality. Thus, UN IGME estimates are *derived* from country data. Notably, UN IGME assesses the quality of underlying data sources and adjusts data when necessary.
- National estimates may refer to an earlier calendar year than the UN IGME estimates. This is particularly the case where estimates from the most recent national survey are used, as these typically refer to a period before the year of the survey, which may be several years behind the target year for the UN IGME estimates. National estimates may also use a different combination of data sources, or different projection or calculation methods.
- In the absence of error-free data, there will always be uncertainty around data and estimates, both national and internationally. To allow for added comparability, the UN IGME generates such estimates with uncertainty bounds. When discussing the UN IGME estimates, it's important to look at the uncertainty ranges, which might be fairly wide in the case of some countries.

Monitoring and reporting

National

National Statistical Offices, Ministries of Health

Global

Agencies: UNICEF

Note that UNICEF works together with the UN Inter-agency Group for Child Mortality Estimation (UN IGME), which is led by UNICEF, and also includes WHO, the World Bank Group and the United Nations Population Division. UN IGME's independent Technical Advisory Group (TAG), comprising leading academic scholars and independent experts in demography and biostatistics, provides guidance on estimation methods, technical issues and strategies for data analysis and data quality assessment.



Process: UN IGME follows the following broad strategy to arrive at annual estimates of child mortality:

1. Compile and assess the quality of all available nationally representative data relevant to the estimation of child mortality, including data from vital registration systems, population censuses, household surveys and sample registration systems.
2. Assess data quality, recalculate data inputs and make adjustments, if needed, by applying standard methods.
3. Fit a statistical model to these data to generate a smooth trend curve that averages over possibly disparate estimates from the different data sources for a country.
4. Extrapolate the model to a target year.

Then the UN IGME conducts a country consultation with government counterparts for feedback on the UN IGME estimates and the country data. Governments review the UN IGME estimates and country data and send feedback or comments and additional country data if these data are not included in the UN IGME database.

Timing: Updated databases with underlying data are released on annual basis together with new round of UN IGME estimates.

Discrepancies with national estimates: The UN IGME's estimation method fits a smoothed trend curve to a set of observations from the country and then carries forward that trend to a recent reference year common for all countries (see sample country figure presented in Data Sources section above). Applying a consistent methodology allows for comparisons both over time and between countries, despite the varied number and types of data sources.

Countries, however, often use one single source as their official estimates or apply methods different from the UN IGME methods to derive estimates. Also the latest data produced by countries often are not current estimates but refer to an earlier reference period, whereas the UN IGME projects estimates to a common reference year.

The differences between the UN IGME estimates and national official estimates are usually not large if country data has good quality. In the case of countries with sparse and/or inconsistent data, however, differences can be substantial.

The best way to understand discrepancies between the national level data and the UN IGME estimates is to look at the country data pages on CME Info.

Key resources

Indicator information and cross-country comparable estimates:

- CME Info: <http://www.childmortality.org/>
- UNICEF Data: <https://data.unicef.org/topic/child-survival/under-five-mortality/>
- UNICEF Data: <https://data.unicef.org/topic/child-survival/neonatal-mortality/>
- SDG metadata: <https://unstats.un.org/sdgs/metadata/>

Tools and measurement guidance:

- MICS: <http://mics.unicef.org/tools>
- DHS: <https://dhsprogram.com/What-We-Do/Survey-Types/DHS-Questionnaires.cfm>
- IUSSP Tools for Demographic Estimation—Child mortality estimation: <http://demographicestimation.iussp.org/content/child-mortality>

Estimation models:

- Levels & Trends in Child Mortality: Report 2017, Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation, United Nations Children's Fund, New York, 2017: http://childmortality.org/files_v21/download/IGME%20report%202017%20child%20mortality%20final.pdf
- Global Estimation of Child Mortality using a Bayesian B-Spline Bias-Reduction Method: <http://arxiv.org/abs/1309.1602>
- Global Estimation of Neonatal Mortality Using a Bayesian Hierarchical Splines Regression Model: <https://www.demographic-research.org/volumes/vol38/15/>
- National, regional, and global sex ratios of infant, child, and under-5 mortality and identification of countries with outlying ratios: a systematic assessment: <http://www.thelancet.com/journals/langlo/article/PIIS2214-109X%2814%2970280-3/abstract>

Other:

- PLoS Medicine Collection: Child Mortality Estimation Methods: <http://www.ploscollections.org/childmortalityestimation>
- Global, regional, and national levels and trends in under-5 mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Inter-agency Group for Child Mortality Estimation: [http://thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)00120-8/abstract](http://thelancet.com/journals/lancet/article/PIIS0140-6736(15)00120-8/abstract)
- National, regional, and worldwide estimates of stillbirth rates in 2015, with trends from 2000: a systematic analysis: [http://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(15\)00275-2/fulltext](http://www.thelancet.com/journals/langlo/article/PIIS2214-109X(15)00275-2/fulltext)