

Maternal mortality in 2000-2017

Internationally comparable MMR estimates by the Maternal Mortality Estimation Inter-Agency Group (MMEIG)

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division

YEMEN

Year	Maternal mortality ratio (MMR) ^{a,*}	Maternal deaths [*]	HIV-related indirect maternal deaths [*]	Live births ^b	Proportion of maternal deaths among deaths of female reproductive age (PM, %) ^{a,*}
	Per 100 000 live births (lb)	Numbers	Numbers	Thousands	
2000	301 [238-382] ^c	2100	1	692	16
2005	242 [189-308]	1800	1	736	12
2010	192 [144-253]	1500	1	801	9
2015	169 [105-264]	1400	1	853	8
2017	164 [109-235]	1400	1	864	7

^a MMR and PM are calculated for women 15-49 years.

^b Live birth data are from United Nations, Population Division. World Population Prospects 2019. New York: UN Population Division, Department of Economic and Social Affairs, 2019.

^c The uncertainty intervals (UI) for all estimates refer to the 80% uncertainty intervals (10th and 90th percentiles of the posterior distributions). This was chosen as opposed to the more standard 95% intervals because of the substantial uncertainty inherent in maternal mortality outcomes.

^{*} Figures presented in the table are estimates based on national data, such as surveys or administrative records, or other sources, produced by the international agency when country data for some year(s) is not available, when multiple sources exist, or when there are data quality issues.

Annual rate of reduction based on estimated MMR (%)	
2000-2017	3.6 [1.7, 6.1]
2010-2017	2.2 [-0.3, 5.5]

Available data sources

Data from civil registration vital statistics system (CRVS):

** No national level maternal mortality data were identified **

Available data sources (continued)

Excluded data from CRVS:

** Not applicable **

Available data sources (continued)

Data from other sources:

Study period	Source	Maternal deaths ⁿ	Pregnancy-related deaths ^o	Female deaths, 15-49	Maternal PM ^p	Pregnancy-related PM ^q	Reported MMR per 100,000 lb	Adjusted MMR per 100,000 lb	F ^{r,u}	F ^{s,u}	U ^{t,u}
1987-1997	DHS 1997					38.2		588			
2001-2003	YFHS 2003					18.7	365	339			
2011-2013	YNDHS 2013					6.7	148	137			

ⁿ Maternal deaths defined according to the ICD-10.

^o Pregnancy-related deaths defined according to ICD-10.

^p Maternal PM is calculated when deaths are defined as "maternal".

^q Pregnancy-related PM is calculated when reported deaths are defined as pregnancy related deaths.

^r False positive: true non-maternal death which may be incorrectly labeled as a maternal death.

^s False negative: maternal death which may be incorrectly classified as a non-maternal death.

^t Maternal deaths not registered in the CRVS.

^u Calculated/derived from studies which undertake specialized analyses of routine reporting of maternal deaths.

Available data sources (continued)

Data from studies **excluded** in regression:

** No exclusions **

Predictor variables used in the model

Year	GDP per capita, PPP (constant 2011 Int \$) ^v	General Fertility Rate per 1000 women 15-49	Skilled Birth Attendant (% of births)
2000	3963	189	28.0
2005	4211	162	34.0
2010	4196	144	41.0
2015	3180	130	48.0
2017	2604	124	51.0

^v A 5-year moving average was calculated.

Gross Domestic Product (GDP) per capita measured in purchasing power parity (PPP) equivalent dollars using 2011 as the baseline year were taken from World Bank Group (World Development Indicators published July 30, 2019) supplemented by other sources (e.g. United Nations, the International Monetary Fund, the Organisation for Economic Co-operation and Development, and MMEIG member's estimates) used to inform trends in instances with missing country-years in the World Bank Group data set.

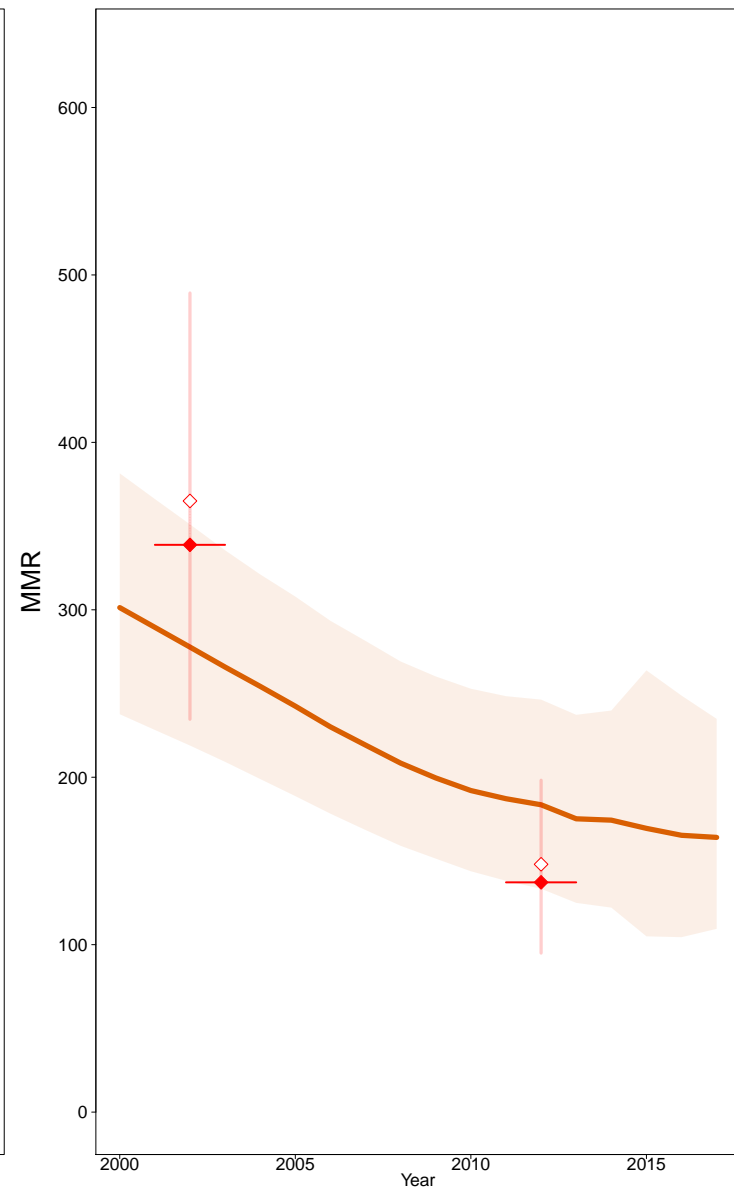
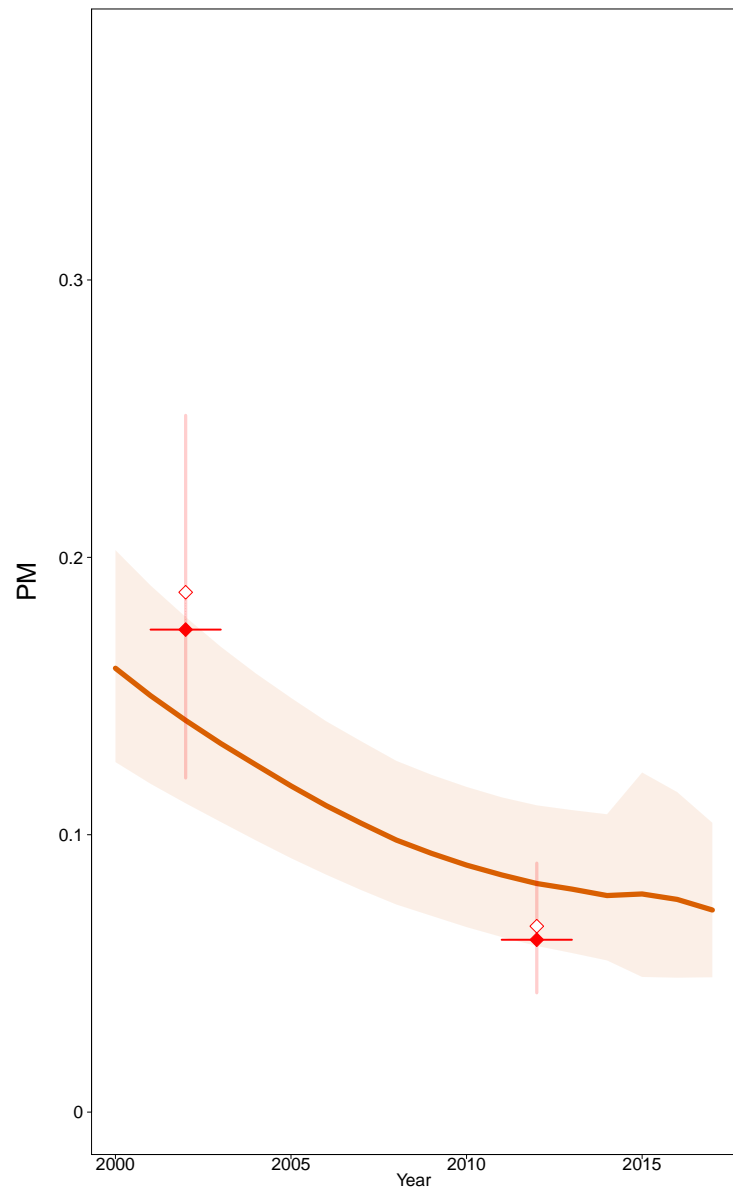
Source: World Bank, International Comparison Program Database. July 30, 2019.

General fertility rate

Source: World Population Prospects 2019. New York: UN Population Division, Department of Economic and Social Affairs, 2019.

Percentage of births attended by skilled health personnel (doctors, nurses or midwives).

Source: WHO, UNICEF. WHO and UNICEF Joint Skilled Birth Attendant (SBA) database. Geneva: WHO; 2019.



- Estimates –
- BMat 2019
- — — — —
- ◊ Observed Data
- ◆ Adjusted Data
- Data type –
- ◆ DHS
- ◆ Misc. studies

Maternal crisis deaths

Years with crisis mortality	Crisis deaths to women 15-49 ^v
2015	2633
2016	921

^v Please see next page for details on how maternal mortality was calculated in years with crisis deaths.

Calculation of maternal mortality during crisis years

Crisis years and mortality shocks

The 1990–2016 life tables published by WHO in 2018 (1) account for “crises” due to natural disasters and conflict (as defined by the International statistical classification of diseases and related health problems [ICD], 10th revision [2]), because of the potential for substantial increases in death rates during the crisis-affected years, a phenomenon described as “mortality shocks”. According to the life tables, “mortality shocks” include deaths whose underlying cause was due to a natural disaster or – in the case of war and conflict deaths – “an injury due to war, civil insurrection or organized conflict, whether or not that injury occurred during the time of war or after cessation of hostilities” (1).

A crisis year for the purpose of estimated maternal mortality is defined in the following two ways (all years that meet either definition are included as crisis years):

- a year in which (a) there are at least 10 deaths attributable to mortality shocks among women of reproductive age (i.e. 15–49 years) and (b) these deaths constitute at least 10% of the total number of deaths to women aged 15–49 in that respective country-year (1) and in addition (c) in the five-year period surrounding the year, there are at most two additional crisis years; and
- a year identified by the United Nations Inter-agency Group for Child Mortality Estimation (UN IGME) as a crisis year for the estimation of child mortality (3) (this includes crises in potentially longer periods, i.e. for recent ongoing crises).

Maternal mortality estimation

The approach taken in this round of maternal mortality estimation was to estimate the “crisis-free” proportion maternal (PM) to maintain consistency across all countries.

The method for estimation of maternal deaths for countries with one or more crisis years is described below.

Any data points that overlap with the crisis period are recalculated to refer to the proportion of crisis-free maternal or pregnancy-related deaths among the total number of crisis-free deaths to women of reproductive age, referred to as “crisis-free observed PM”. Pregnancy-related PMs are adjusted based on the assumption that the proportion of pregnancy-related deaths among the deaths attributable to mortality shocks is equal to the proportion of women in the population who are pregnant or postpartum at the time of the crisis. The proportion of pregnant women in the population is set equal to the general fertility rate, based on the assumption of a one-year period associated with a live birth (4).

For each year, the MMEIG Bayesian maternal mortality estimation (BMat) model provides posterior samples of maternal deaths:

- The median of this sample constitutes the point estimate for the number of maternal deaths. The reported estimates of PM are the crisis-free PMs, the point estimate for the number of maternal deaths divided by the total number of crisis-free deaths among women of reproductive age.

- For non-crisis years, the 10th and 90th percentiles of the BMat samples for maternal deaths constitute the 80% uncertainty interval (UI). For crisis years, we include additional uncertainty by multiplying the samples of maternal deaths by values between 0.9 and 1.2.

This approach results in estimates of maternal mortality that are considered crisis-free within the larger envelope of all deaths among women of reproductive age, because deaths among pregnant women that are attributable to mortality shocks would be considered pregnancy-related deaths but not maternal deaths, according to the ICD definition. It is possible that crisis-related factors may contribute to maternal mortality but empirical evidence to distinguish maternal deaths from among pregnancy-related deaths in the context of mortality shocks is limited. To reflect the paucity of evidence on the effect of crisis on maternal mortality, UIs were widened. Future estimation exercises will continue to review the methods developed to account for natural disasters, conflict and other types of mortality shocks (e.g. disease pandemics).

References

1. WHO methods and data sources for life tables 1990–2016. Global Health Estimates Technical Paper. Geneva: World Health Organization; 2018 (WHO/HIS/IER/GHE/2018.2; https://www.who.int/healthinfo/statistics/LT_method.pdf, accessed 5 July 2019).
2. International Statistical Classification of Diseases and Related Health Problems 10th Revision. Geneva: World Health Organization; 2016 (current version) (<https://icd.who.int/browse10/2016/en#/>, accessed 26 August 2019).
3. United Nations Inter-agency Group for Child Mortality Estimation (UN IGME). Levels & trends in child mortality: report 2018: estimates developed by the UN Inter-agency Group for Child Mortality Estimation. New York (NY): United Nations Children's Fund; 2018 (https://www.unicef.org/publications/index_103264.html, accessed 5 July 2019).
4. Wilmoth JR, Mizoguchi N, Oestergaard MZ, Say L, Mathers CD, Zureick-Brown S, et al. A new method for deriving global estimates of maternal mortality. *Stat Politics Policy*. 2012;3(2):2151-7509.1038.