Trends in
Maternal Mortality: 1990 to 2013

Estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division

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WHO Library Cataloguing-in-Publication Data

Trends in maternal mortality: 1990 to 2013. Estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division

I.World Health Organization.

ISBN 978 92 4 150722 6

Subject headings are available from WHO institutional repository

Editing and layout by Inís Communication – www.iniscommunication.com

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Acknowledgements

The Maternal Mortality Estimation Inter-Agency Group (MMEIG), together with Leontine Alkema, of the National University of Singapore, Singapore, and Alison Gemmill, of the University of California at Berkeley, United States of America, collaborated in developing these maternal mortality estimates.

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An external technical advisory group (TAG) provided independent technical advice. The members of the TAG are: Saifuddin Ahmed of Johns Hopkins University, Baltimore, MD, USA; David Braunholz of Aberdeen University, Scotland; Peter Byass of Umeå University, Sweden; Wendy Graham of Aberdeen University, Scotland; Dr Namuunda Mutombo, African Population and Health Research Centre, Nairobi, Kenya; Thomas Pullum of ICF Macro Calverton, Maryland, USA; and Neff Walker of Johns Hopkins University, Baltimore, MD, USA.

The Department of Governing Bodies and External Relations of WHO, WHO country offices, UNFPA country offices, and UNICEF country offices, are gratefully acknowledged for facilitating the country consultations. Thanks to the WHO regional office staff:

Regional Office for Africa

Derege Kebede
Tigest Ketsela Mangestu
Gisele Carole Wabo Nitcheu
Triphonie Nkurunziza
Leopold Ouedraogo

Regional Office for Europe

Enrique Gerardo Loyola Elizondo
Gauden Galea
Gunta Lazdane
Claudia Elisabeth Stein

Regional Office for the Americas

Bremen De Mucio
Patricia Ruiz
Suzanne Serruya
Gina Tambini

Regional Office for South East Asia

Jyotsna Chikersal
Arvind Mathur
Neena Raina
Sangay Thinley
Martin Weber

Regional Office for the Eastern Mediterranean

Mohamed Mahmoud Ali
Haifa Madi
Ramez Khairi Mahaini

Regional Office for the Western Pacific

Mark Landry
Susan P. Mercado
Hiromi Obara
Howard Sobel

Joanne Simpson-Deprez and Armando Seuc of WHO provided translation during country consultations. Thanks to all focal points of governments who reviewed the preliminary estimates of maternal mortality ratios and provided valuable feedback.

WHO, UNICEF, The World Bank, and the United States Agency for International Development (USAID) provided financial support.

This report was prepared by Leontine Alkema, Doris Chou, Alison Gemmill, Daniel Hogan, Colin Mathers, Samuel Mills, Ann-Beth Moller, Lale Say and Emi Suzuki. The report was reviewed by Agbessi Amouzou, Victor Gaigbe-Togbe, Lianne Gonsalves and Edilberto Loaiza.

We also thank WHO staff who contributed to data collection and analysis, in particular, Doris Ma Fat and Jessica Ho. Grateful thanks are extended to Peter Byass, Andres de Francisco, and Mary Mahy, who reviewed the drafts of this report and provided valuable advice.

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Abbreviations

AIDS	acquired immunodeficiency syndrome
AIHW	Australian Institute of Health and Welfare
CEMD	Confidential Enquiry into Maternal Deaths
CEMACH	Confidential Enquiry into Maternal and Child Health
CMACE	Centre for Maternal and Child Enquiries
DHS	Demographic and Health Surveys
EmONC	emergency obstetric and newborn care
GDP	gross domestic product per capita (based on purchasing power parity conversion)
GFR	general fertility rate
HIV	human immunodeficiency virus
ICD-10	*International statistical classification of diseases and related health problems*, 10th edition
ICD-MM	*The WHO application of ICD-10 to deaths during pregnancy, childbirth, and the puerperium: ICD Maternal Mortality*
iERG	Independent Expert Review Group
MDG	Millennium Development Goal
MDSR	maternal death surveillances and response
MICS4	Multiple Indicator Cluster Surveys – Round 4
MMEIG	Maternal Mortality Estimation Inter-Agency Group
MMR	maternal mortality ratio
MMRate	maternal mortality rate
PM	proportion of deaths among women of reproductive age that are due to maternal causes
PMMRC	Perinatal and Maternal Mortality Review Committee (New Zealand)
PPP	purchasing power parity
RAMOS	reproductive-age mortality study
SAB	presence of a skilled attendant at birth as a proportion of live births
TAG	technical advisory group
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNPD	United Nations Population Division
USA	United States of America
WHO	World Health Organization

Executive summary

A number of initiatives that commenced in recent years are geared towards achievement of the fifth Millennium Development Goal (MDG 5: Improving maternal health), most notably the launch of the Global Strategy for Women's and Children's Health in 2010 by the United Nations (UN) Secretary-General. Subsequently, the high-level Commission on Information and Accountability for Women's and Children's Health was established to "determine the most effective international institutional arrangements for global reporting, oversight and accountability on women's and children's health." One of the ten recommendations of the commission was specific to improving measurement of maternal (and child) deaths. This recommendation requires that "by 2015, all countries have taken significant steps to establish a system for registration of births, deaths and causes of death, and have well-functioning health information systems that combine data from facilities, administrative sources and surveys". The first report of the independent Expert Review Group (iERG) established by the commission for overseeing the progress in achievement of the commission's 10 recommendations indicated insufficient progress in the implementation of the recommendations including the one on 'vital events' reporting.

Measuring the MDG 5 target of reducing the maternal mortality ratio (MMR) (target 5A) remains a challenge. Less than 40% of countries have a complete civil registration system with good attribution of cause of death, which is necessary for the accurate measurement of maternal mortality.

The estimates for 2013 presented in this report are the seventh in a series of analyses by the United Nations agencies. The Maternal Mortality Estimation Inter-Agency Group (MMEIG), comprising the World Health Organization (WHO), the United Nations Children's Fund (UNICEF), the United Nations Population Fund (UNFPA), the United Nations Population Division (UNPD) and The World Bank, together with a team at the National University of Singapore, Singapore and University of California at Berkeley, United States of America, have been working together to generate internationally comparable MMR estimates. A technical advisory group (TAG) provides independent technical advice. The methods, as well as the data sources for the estimation of MMR, have improved over time. Building on the methodological advancements from the previous round of analyses, newly available data collected by MMEIG and obtained during country consultation were incorporated, and trend estimates from 1990 to 2013 were generated. As with the previous round of estimates, the statistical code and input data necessary to produce the current estimates are made publicly available, underscoring the MMEIG's commitment to open access and transparency.

Globally, there were an estimated 289 000 maternal deaths in 2013, a decline of 45% from 1990. The sub-Saharan Africa region alone accounted for 62% (179 000) of global deaths followed by Southern Asia at 24% (69 000). At the country level, the two countries that accounted for one third of all global maternal deaths are India at 17% (50 000) and Nigeria at 14% (40 000). The global MMR in 2013 was 210 maternal deaths per 100 000 live births, down from 380 maternal deaths per 100 000 live births in 1990. The MMR in developing regions (230) was 14 times higher than in developed regions (16). Sub-Saharan Africa has the highest regional MMR (510). Of the remaining MDG developing regions, five had low MMR: Eastern Asia (33); Caucasus and Central Asia (39); Northern Africa (69); Western Asia (74); and

Latin America and the Caribbean (85). Three had moderate MMR: South-eastern Asia (140); Southern Asia (190); and Oceania (190).

Sierra Leone is estimated to have the highest MMR at 1100. A further 15 countries (all in sub-Saharan Africa) had very high MMR: Chad (980); Central African Republic (880); Somalia (850); Burundi (740); Democratic Republic of the Congo (730); South Sudan (730); Côte d'Ivoire (720); Guinea (650); Liberia (640); Niger (630); Cameroon (590); Guinea-Bissau (560); Nigeria (560); Mali (550); and Malawi (510). Only two countries outside the sub-Saharan African region had high MMR: Afghanistan (400) and Haiti (380). In contrast, Cabo Verde and Mauritius were the only two sub-Saharan African countries that had low MMR at 53 and 73, respectively. Regarding the likelihood that an adult woman will die from maternal causes, Chad and Somalia had the highest lifetime risks at 1 in 15 and 1 in 18, respectively. The estimated lifetime risk for maternal mortality in high-income countries is 1 in 3400 in comparison to low-income countries where the risk is 1 in 52.

Sub-Saharan Africa accounted for 6800 (91%) of the estimated 7500 maternal deaths attributed to acquired immunodeficiency syndrome (AIDS) worldwide. The proportion of maternal deaths attributed to AIDS in sub-Saharan Africa was 3.8%, yielding an AIDS-attributed MMR for sub-Saharan Africa of 19 maternal deaths per 100 000 live births. Although the MDG regional aggregated proportions of maternal deaths attributed to AIDS were relatively small, they were substantial for countries with high HIV prevalence. Thirteen countries had a proportion of maternal deaths attributed to AIDS of 10% or more.

While most countries/regions aspire to achieve MDG5 target 5A by 2015, some countries are unlikely to attain this goal if current trends persist. Countries with an MMR ≥100 in 1990 are categorized as 'on track' if their MMR has declined by at least 75% between 1990 and 2013.

The 11 countries categorized as 'on track' are: Maldives (93%); Bhutan (87%); Cambodia (86%); Equatorial Guinea (81%); Lao People's Democratic Republic (80%); Romania (80%); Timor-Leste (78%); Cabo Verde (77%); Eritrea (77%); Nepal (76%); Rwanda (76%). A further 63 countries are characterized as 'making progress', while 13 countries have made 'insufficient progress'.

When considering progress made towards achievement of MDGs, some common elements of success emerge, including: leadership and partnership, evidence and innovation, development and implementation of dual short-term and long-term strategies, and adaptation to change for sustained progress. Additionally, successful strategies and policies related to safer motherhood, neonatal health, nutrition and gender are anchored in the principles of human rights. Finally, improving the availability and quality of maternal death reviews provides an important tool for capturing maternal deaths, contributing to better estimates of maternal mortality, while also helping to initiate necessary actions to prevent deaths.

Discussions on the post-2015 UN development agenda are underway. In light of the steady progress observed for MDG 5, we can envision ending preventable maternal mortality in this lifetime.

1 Introduction

A number of initiatives that commenced in recent years are geared towards achievement of the fifth Millennium Development Goal (MDG 5: Improving maternal health), most notably the launch of the Global Strategy for Women's and Children's Health in 2010 by the United Nations (UN) Secretary-General *(1)*. Subsequently, the high-level Commission on Information and Accountability for Women's and Children's Health was established to "determine the most effective international institutional arrangements for global reporting, oversight and accountability on women's and children's health" *(2)*. One of the ten recommendations of the commission was specific to improving measurement of maternal (and child) deaths. This recommendation requires that "by 2015, all countries have taken significant steps to establish a system for registration of births, deaths and causes of death, and have well-functioning health information systems that combine data from facilities, administrative sources and surveys". The first report of the independent Expert Review Group (iERG) established by the commission for overseeing the progress in achievement of the commission's 10 recommendations indicated insufficient progress in the implementation of the recommendations, including the one on vital events reporting *(3)*.

Measuring the MDG 5 target of reducing the maternal mortality ratio (MMR) by three quarters between 1990 and 2015 remains a challenge. Less than two fifths of countries have a complete civil registration system with good attribution of cause of death, which is necessary for the accurate measurement of maternal mortality. Accordingly, the Maternal Mortality Estimation Inter-Agency Group (MMEIG), comprising the World Health Organization (WHO), the United Nations Children's Fund (UNICEF), the United Nations Population Fund (UNFPA), the United Nations Population Division (UNPD) and The World Bank, together with a team at the National University of Singapore, Singapore, and University of California at Berkeley, United States of America, have been working together to generate internationally comparable MMR estimates. A technical advisory group (TAG) provides independent technical advice. The estimates for 2013 presented in this report are the seventh in a series of analyses by the MMEIG to examine the global extent of maternal mortality *(4–9)*. The methods, as well as the data sources for the estimation of MMR, have improved over time.

Consultations with countries were carried out following the development of the MMR estimates. The purposes of the consultations were primarily: to give countries the opportunity to review the country estimates, data sources and methods; to obtain additional primary data sources that may not have been previously reported or used in the analyses; and to build mutual understanding of the strengths and weaknesses of available data and ensure broad ownership of the results. Appendix 17 presents a summary of the 2013 country consultations.

This report presents global, regional and country estimates of maternal mortality in 2013, as well as trends from 1990 to 2013. Chapter 2 provides an overview of the definitions and approaches for measuring maternal mortality. Chapter 3 is a detailed description of the methodology employed in generating the estimates. Chapter 4 presents the estimates and interpretation of the findings. Chapter 5 assesses the progress towards MDG 5. The annexes and appendices present the sources of data for the country estimates, as well as MMR estimates for the different regional groupings for UNFPA, UNICEF, the United Nations Population Division, WHO and The World Bank.

2 Measuring maternal mortality

2.1 Concepts and definitions

In the *International statistical classification of diseases health problems*, 10th revision (ICD-10) *(10)*, WHO defines maternal death as:

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

This definition allows identification of maternal deaths, based on their causes, as either direct or indirect. Direct maternal deaths are those resulting from obstetric complications of the pregnant state (i.e. pregnancy, delivery and postpartum), interventions, omissions, incorrect treatment, or a chain of events resulting from any of the above. Deaths due to, for example, obstetric haemorrhage or hypertensive disorders in pregnancy, or those due to complications of anaesthesia or caesarean section are classified as direct maternal deaths. Indirect maternal deaths are those resulting from previously existing diseases, or from diseases that developed during pregnancy and that were not due to direct obstetric causes but aggravated by physiological effects of pregnancy. For example, deaths due to aggravation of an existing cardiac or renal disease are considered indirect maternal deaths.

The concept of 'death during pregnancy, childbirth and the puerperium' is included in the ICD-10 and is defined as any death temporal to pregnancy, childbirth or the postpartum period, even if it is due to accidental or incidental causes (this was formerly referred to as 'pregnancy-related death', see Box 1). This alternative definition allows measurement of deaths that are related to pregnancy, even though they do not strictly conform to the standard 'maternal death' concept, in settings where accurate information about causes of death based on medical certificates is unavailable.

Box 1
Definitions related to maternal death in ICD-10

Maternal death

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

Pregnancy-related death

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death.

Late maternal death

The death of a woman from direct or indirect obstetric causes, more than 42 days, but less than one year after termination of pregnancy.

For instance, in population-based surveys, respondents provide information on the pregnancy status of a reproductive-aged sibling at the time of death, but no further information is elicited on the cause of death. These surveys, therefore, usually provide measures of pregnancy-related deaths rather than maternal deaths.

Further, complications of pregnancy or childbirth can lead to death beyond the six weeks postpartum period, and the increased availability of modern life-sustaining procedures and technologies enables more women to survive adverse outcomes of pregnancy and delivery, and to delay death beyond 42 days postpartum. Despite being caused by pregnancy-related events, these deaths do not count as maternal deaths in routine civil registration systems. Specific codes for 'late maternal deaths' are included in the ICD-10 (O96 and O97), in order to capture delayed maternal deaths occurring between six weeks and one year postpartum (see Box 1). Some countries, particularly those with more developed civil registration systems, use this definition.

This report aims to achieve a globally consistent set of estimates of maternal deaths in line with the ICD-10 definition of maternal death, although the various ways the data are collected do not always allow the above definition to be followed.

2.2 Coding of maternal deaths

Despite the standard definitions noted above, accurate identification of the causes of maternal deaths is not always possible. It can be a challenge for medical certifiers to correctly attribute cause of death to direct or indirect maternal causes, or to accidental or incidental events, particularly in settings where deliveries mostly occur at home. While several countries apply the ICD-10 in civil registration systems, the identification and classification of causes of death during pregnancy, childbirth and the puerperium remain inconsistent across countries.

With the publication of the ICD-10, WHO recommended adding a checkbox on the death certificate for recording a woman's pregnancy status at the time of death *(10)*. This was to help identify indirect maternal deaths, but it has not been implemented in many countries. For countries using ICD-10 coding for registered deaths, all deaths coded to the maternal chapter (O codes) and maternal tetanus (A34) were counted as maternal deaths.

In 2012, WHO published *Application of ICD-10 to deaths during pregnancy, childbirth and the puerperium: ICD Maternal Mortality (ICD-MM)*, to guide countries to reduce errors in coding maternal deaths and to improve the attribution of cause of maternal death *(11)*. The ICD-MM is to be used together with the three ICD-10 volumes. For example, the ICD-MM clarifies that the coding of maternal deaths among HIV-positive women may be due to:

Obstetric causes: Such as haemorrhage or hypertensive disorders in pregnancy – these should be identified as direct maternal deaths.

The interaction between human immunodeficiency virus (HIV) and pregnancy: In these cases, there is an aggravating effect of pregnancy on HIV and the interaction between pregnancy and HIV is the underlying cause of death. These deaths are considered as indirect maternal deaths. In this report, they are referred to as 'AIDS-related indirect maternal deaths', and in the ICD are those deaths coded to O98.7 and categorized in Group 7 (non-obstetric complications) in the ICD-MM.

Acquired immunodeficiency syndrome (*AIDS)*: In these cases, the woman's pregnancy status is incidental to the course of her HIV infection and her death is a result of an HIV complication, as described by ICD-10 codes B20–24. These are not considered maternal deaths. In this report, they are referred to as 'AIDS deaths'.[1]

Thus, proper reporting of the mutual influence of HIV or AIDS and pregnancy in Part 1 of the death certificate will facilitate the coding and identification of these deaths.

Measures of maternal mortality

The extent of maternal mortality in a population is essentially the combination of two factors:

(i) The risk of death in a single pregnancy or a single live birth.

(ii) The fertility level (i.e. the number of pregnancies or births that are experienced by women of reproductive age). The MMR is defined as the number of maternal deaths during a given time period per 100 000 live births during the same time period. It depicts the risk of maternal death relative to the number of live births and essentially captures (i) above.

By contrast, the maternal mortality rate (MMRate) is defined as the number of maternal deaths in a population divided by the number of women aged 15–49 years (or woman-years lived at ages 15–49 years). The MMRate captures both the risk of maternal death per pregnancy or per total birth (live birth or stillbirth), and the level of fertility in the population. In addition to the MMR and the MMRate, it is possible to calculate the adult lifetime risk of maternal mortality for women in the population (see Box 2). An alternate measure of maternal mortality, the proportion of deaths among women of reproductive age that are due to maternal causes (PM), is calculated as the number of maternal deaths divided by the total deaths among women aged 15–49 years.

Box 2
Statistical measures of maternal mortality

Maternal mortality ratio (MMR)

Number of maternal deaths during a given time period per 100 000 live births during the same time period.

Maternal mortality rate (MMRate)

Number of maternal deaths in a given period per 1000 women of reproductive age during the same time period.

Adult lifetime risk of maternal death

The probability that a 15-year-old women will die eventually from a maternal cause.

Proportion of deaths among women of reproductive age that are due to maternal causes (PM)

The number of maternal deaths in a given time period divided by the total deaths among women aged 15–49 years.

1 The deaths referred to in this document as 'AIDS deaths' are referred to as 'AIDS deaths' in Joint United Nations Programme on HIV/AIDS (UNAIDS) publications. These deaths include the estimated number of deaths related to HIV infection, including deaths that occur before reaching the clinical stage classified as AIDS.

2.3 Approaches for measuring maternal mortality

Ideally, civil registration systems with good attribution of cause of death provide accurate data on the level of maternal mortality and the causes of maternal deaths. In countries with incomplete civil registration systems, it is difficult to accurately measure levels of maternal mortality. First, it is challenging to identify maternal deaths precisely, as the deaths of women of reproductive age might not be recorded at all. Second, even if such deaths were recorded, the pregnancy status or cause of death may not have been known and the deaths would therefore not have been reported as maternal deaths. Third, in most developing-country settings where medical certification of cause of death does not exist, accurate attribution of a female death as a maternal death is difficult.

Even in developed countries where routine registration of deaths is in place, maternal deaths may be underreported, due to misclassification of ICD-10 coding, and identification of the true numbers of maternal deaths may require additional special investigations into the causes of death (Appendix 1). A specific example of such an investigation is the Confidential Enquiry into Maternal Deaths (CEMD), a system established in England and Wales in 1928 *(12,13)*. The most recent report of the CEMD (for 2006–2008) identified 60% more maternal deaths than were reported in the routine civil registration system *(14)*. Other studies on the accuracy of the number of maternal deaths reported in civil registration systems have shown that the true number of maternal deaths could be twice as high as indicated by routine reports, or even more *(15,16)*. Appendix 1 summarizes the results of a literature review (updated January 2014) for such studies where misclassification on coding in civil registration could be identified.

These studies are diverse, depending on the definition of maternal mortality used, the sources considered (death certificates, other vital event certificates, medical records, questionnaires or autopsy reports) and the way maternal deaths are identified (record linkage or assessment from experts). In addition, the system of reporting causes of death to a civil registry differs from one country to another, depending on the death certificate forms, the type of certifiers and the coding practice. These studies have estimated underreporting of maternal mortality due to misclassification in death registration data, ranging from 0.85 to 5.0, with a median value of 1.5.

Underreporting of maternal deaths was more common among:

- early pregnancy deaths, including those not linked to a reportable birth outcome;
- deaths in the later postpartum period (these were less likely to be reported than early postpartum deaths);
- deaths at extremes of maternal age (youngest and oldest);
- miscoding by the ICD-9 or ICD-10, most often seen in cases of deaths caused by:
  - cerebrovascular diseases;
  - cardiovascular diseases.

Potential reasons cited for underreporting/misclassification include:

- inadequate understanding of the ICD rules (either ICD-9 or ICD-10);
- death certificates completed without mention of pregnancy status;
- desire to avoid litigation;
- desire to suppress information (especially as related to abortion deaths).

The definitions of misclassification, incompleteness and underreporting of maternal deaths are shown in Box 3.

Box 3
Definitions of misclassification, incompleteness and underreporting

Misclassification

Refers to incorrect coding in civil registration, due either to error in the medical certification of cause of death or error in applying the correct code.

Incompleteness

Refers to incomplete death registration. Includes both the identification of individual deaths in each country and the national coverage of the register.

Underreporting

Is a combination of misclassification and incompleteness.

In the absence of complete and accurate civil registration systems, MMR estimates are based on data from a variety of sources – including censuses, household surveys, reproductive-age mortality studies (RAMOS) and verbal autopsies. Each of these methods has limitations in estimating the true levels of maternal mortality. Brief descriptions of these methods together with their limitations are shown in Box 4.

Box 4
Approaches to measuring maternal mortality

Civil registration system *(12,16)*

This approach involves routine registration of births and deaths. Ideally, maternal mortality statistics should be obtained through civil registration data. However, even where coverage is complete and the causes of all deaths are identified based on standard medical certificates, in the absence of active case finding, maternal deaths may be missed or misclassified; and therefore confidential enquiries are used to identify the extent of misclassification and underreporting.

Household surveys *(17,18)*

Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys – Round 4 (MICS4) employ the direct 'sisterhood' method using household survey data. This method obtains information by interviewing a representative sample of respondents about the survival of all their siblings (to determine the age of all siblings, how many are alive, how many are dead, age at death and year of death of those dead, and among sisters who reached reproductive age, how many died during pregnancy, delivery or within two months of pregnancy). This approach has the following limitations:

- Identifies pregnancy-related deaths, rather than maternal deaths.
- Produces estimates with wide confidence intervals, thereby diminishing opportunities for trend analysis.
- Provides a retrospective rather than a current maternal mortality estimate (referring to a period approximately five years prior to the survey); the analysis is more complicated.

Cont'd

Box 4
Approaches to measuring maternal mortality

Census *(19,20)*

A national census, with the addition of a limited number of questions, could produce estimates of maternal mortality. This approach eliminates sampling errors (because all women are covered) and hence allows a more detailed breakdown of the results, including trend analysis, geographic sub-divisions and social strata. Characteristics and limitations of a census are:

- This approach allows identification of deaths in the household in a relatively short reference period (1–2 years), thereby providing recent maternal mortality estimates, but is conducted at 10-year intervals and therefore limits monitoring of maternal mortality.
- Identifies pregnancy-related deaths (not maternal deaths); however, if combined with verbal autopsy, maternal deaths could be identified.
- Training of enumerators is crucial, since census activities collect information on a range of other topics unrelated to maternal deaths.
- Results must be adjusted for characteristics such as completeness of death and birth statistics and population structures, in order to arrive at reliable estimates.

Reproductive-age mortality studies (RAMOS) *(17,18)*

This approach involves identifying and investigating the causes of all deaths of women of reproductive age in a defined area/population, by using multiple sources of data (e.g. interviews of family members, civil registrations, health-facility records, burial records, traditional birth attendants), and has the following characteristics and limitations:

- Multiple and varied sources of information must be used to identify deaths of women of reproductive age; no single source identifies all the deaths.
- Interviews with household members and health care providers and reviews of facility records are used to classify the deaths as maternal or otherwise.
- If properly conducted, this approach provides a fairly complete estimation of maternal mortality (in the absence of reliable routine registration systems) and could provide sub-national MMRs. However, inadequate identification of all deaths of reproductive-aged women results in underestimation of maternal mortality levels.
- This approach can be complicated, time-consuming, and expensive to undertake – particularly on a large scale.
- The number of live births used in the computation may not be accurate, especially in settings where most women deliver at home.

Cont'd

Box 4
Approaches to measuring maternal mortality

Verbal autopsy *(21–23)*

This approach is used to assign cause of death through interviews with family or community members, where medical certification of cause of death is not available. Verbal autopsies may be conducted as part of a demographic surveillance system maintained by research institutions that collect records of births and deaths periodically among small populations (typically in a district). This approach may also be combined with household surveys or censuses. In special versions, and in combination with software that helps to identify the diagnosis, verbal autopsy is suitable for routine use as an inexpensive method in populations where no other method of assessing the cause of death is in place. The following limitations characterize this approach:

- Misclassification of causes of deaths in women of reproductive-age is not uncommon with this technique.
- It may fail to identify correctly a group of maternal deaths, particularly those occurring early in pregnancy (e.g. ectopic, abortion-related) and indirect causes of maternal death (e.g. malaria).
- The accuracy of the estimates depends on the extent of family members' knowledge of the events leading to the death, the skill of the interviewers, and the competence of physicians who do the diagnosis and coding. The latter two factors are largely overcome by the use of software.
- Detailed verbal autopsy for research purposes that aims to identify the cause of death of an individual requires physician assessment and long interviews. Such systems are expensive to maintain, and the findings cannot be extrapolated to obtain national MMRs. This limitation does not exist where simplified verbal autopsy is aiming to identify causes at a population level and where software helps to formulate the diagnosis.

3 Methodology for the 1990–2013 estimates of maternal mortality

The methodology employed in this round followed that used in the 2008 and 2010 exercises but included updated data inputs *(4, 5, 24, 25)*. A description of sources of data is presented next, followed by the methods used depending on the data source. The main differences in the methods used to produce the current estimates and previous publications are highlighted.

3.1 Sources of country data used for the 1990–2013 estimates

Data related to maternal mortality and covariates that were made available during the country consultation process (in July 2013), or obtained through databases maintained by UNAIDS, UNICEF, UNPD, WHO, The World Bank and the Center for International Comparisons at the University of Pennsylvania, United States were included in the estimates. New data were included until mid-January 2014. As the trend from 1990 to 2013 is estimated, the time reference of the data gathered starts from 1985, in order to fully cover the period around 1990. Deaths due to AIDS were obtained from UNAIDS (2012 estimates published in 2013) *(26)*; deaths among women aged 15–49 years from WHO life tables *(27)*; live births from UNPD *(28)*; the presence of a skilled attendant at birth (SAB) as a proportion of live births from UNICEF *(29)*; and gross domestic product per capita (GDP), measured in purchasing power parity (PPP), from The World Bank *(30)*, Penn World Tables *(31)* and WHO (unpublished data, health systems and information). These agencies revise their databases and estimates on a regular basis, to take into account new data and improved methods.

Maternal mortality data from civil registration were extracted primarily from the WHO Mortality Database (http://www.who.int/healthinfo/mortality_data/en/) for the years 1985 and onwards. For civil registration data using the ICD-9, deaths from Chapter X *Complication of pregnancy, childbirth and the puerperium* (codes 630–676) were included. For civil registration data using the ICD-10, deaths from Chapter XV *Pregnancy, childbirth and the puerperium* (codes O00–O99) plus maternal tetanus (A34) were extracted in order to match the ICD-9, which does not specifically identify late maternal deaths. To maintain comparability between these data sets, maternal deaths coded as late maternal deaths (ICD-10 codes O96, O97) were not excluded in the total numbers of maternal deaths. These late maternal deaths accounted globally for only 1–2% of the deaths coded with the ICD-10.

Periodic population-based surveys (such as DHS and MICS4) and censuses have collected information on maternal deaths using recent deaths in the household, reported in the time period specified for the survey prior to the actual dates of data collection or the direct sisterhood method. Studies have shown that reported deaths in the household surveys may lead to biased estimates of levels of maternal mortality *(32, 33)*. Two alternative measures of maternal mortality can typically be extracted from surveys. The first, the MMR, incorporates information on maternal deaths and live births, but tends to be systematically biased downward due to underreporting of deaths. The second, the PM, reflects the ratio of maternal deaths to total female deaths and, because both numerator and denominator tend to be biased in the same direction and to a similar degree, the PM is relatively unbiased. For this reason, the PM is the preferred measure of maternal mortality from surveys when both the MMR and PM are available.

A total of 183 countries and territories were included in this study, representing 99.7% of global births; countries and territories with populations under 100 000 in 2013 have not been included. In total, the database of observed MMR and PM includes 3347 country-years of data, of which 2121 country-years are derived from civil registration data, 1004 from survey-based sisterhood data, and the remainder from surveillance systems (119), other household surveys (46), censuses (18), sample registration systems (17) and other sources (22). Observation intervals refer to 1985 or later. Only national-level studies were included in the database, except those considered inadequate in terms of data quality or lacking the necessary information.

3.2 Methods used to estimate maternal mortality ratio in 1990–2013 according to data source

Two broad strategies were followed to develop maternal mortality estimates for 183 countries and territories. To determine how MMRs were estimated for each country, we classified countries according to the availability and quality of maternal mortality data.

Following the group classifications from the 2008 and 2010 rounds, we continued to classify countries into groups A, B, or C (Table 1). For Group A countries, data from civil registration systems were used directly to calculate estimates of MMR. For countries in Groups B and C, a two-part multi-level regression model was developed to estimate MMRs for all target years.

Table 1. Sources of maternal mortality data used in generating the 2013 maternal mortality ratio estimates

Group	Source of maternal mortality data	Number of countries/ territories	% of countries/ territories in each category	% of births in 183 countries/ territories covered
A	Civil registration characterized as complete, with good attribution of cause of death[a]	67	37	17
B	Incomplete civil registration and/ or other types of data	96	52	81
C	No national data	20	11	2
	Total	183	100	100

[a] For Bahamas, Belgium, Iceland, Malta, Saint Lucia and Saint Vincent and the Grenadines (0.1% of global births), the statistical multi-level regression model was used to obtain maternal mortality estimates because the scarce number of maternal mortality events resulted in erratic trends.

We considered a range of maternal mortality data, including national-level data from civil registration, surveys, surveillance systems, censuses, RAMOS, sample registration systems and others. A further classification scheme for countries with civil registration systems was developed to determine how civil registration data were used in the maternal mortality estimation. Box 5 describes the three types of classification groups for civil registration data,

according to specified criteria (Groups 1, 2, and 3). Countries that met the most restrictive criteria (Group 1) were classified as Group A countries. For six countries in Group A (Belgium, Bahamas, Iceland, Malta, Saint Lucia and Saint Vincent and the Grenadines), which have good-quality data from the civil registration systems but very few numbers of maternal deaths for the target periods (1990, 1995, 2000, 2005, 2010 and 2013), the multi-level regression model was used to generate estimates for all time periods.

Civil registration data belonging to Groups 1 and 2 were included in the multi-level regression model, whereas civil registration data in Group 3 were considered deficient and not included in the model. All non-Group A countries with either civil registration data of acceptable quality (Group 2) or other sources of quality data were classified as Group B countries. Countries with no data of acceptable quality were classified as Group C countries.

The steps taken for estimating maternal mortality with these strategies are summarized below. A description of the core methodology *(24)*, data sets including input data sets for each country by type of data source, and the statistical analysis code used to prepare these estimates, are made available at the WHO web site: www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2013/en/index.html.

Box 5
Classification of civil registration data quality

Group 1 criteria

- Earliest year of data available is before 1996.
- Latest year of data available is after 2007.
- Number of years of data >0.5 * (max year – min year + 1).
- Estimated completeness ≥0.85 for all years, or at most all except one or two years.
- Deaths coded to ill-defined causes (i.e. R codes in ICD-10) did not exceed 20% or exceeded 20% for only one or two years.

Group 2 criteria

- Estimated completeness ≥ 0.60 and < 0.85 for all years, or at most all except one or two years.
- Deaths coded to ill-defined causes (i.e. R codes in ICD-10) did not exceed 20% or exceeded 20% for only one or two years.

Group 3 criteria

- Estimated completeness <0.85 for all years, or at most all except one or two years.
- Deaths coded to ill-defined causes (i.e. R codes in ICD-10) exceeded 20% for all or almost all years.

Estimation of maternal mortality ratio from Group 1 civil registration data (Group A)

As noted above, mortality data from civil registration were extracted from the WHO Mortality Database. These data were used directly to estimate maternal mortality for 61 of the 67 countries that met the criteria of Group 1 in Box 5 (see Appendix 2 for the list of countries).

For these countries, MMR estimates were calculated directly after adjusting the numbers of maternal deaths for completeness and misclassification. Completeness refers to the extent of death registration, while misclassification refers to incorrect coding in civil registration systems. In assessing completeness, deaths of unknown age were distributed over the age range in proportion to the number of reported deaths where the age was known. Completeness was then assessed and adjusted by methods described by Mathers *et al* in 2005 *(34)*. To further adjust for underreporting of maternal deaths due to potential misclassification, the numbers of maternal deaths were multiplied by a factor of 1.5, or by a country-specific factor where appropriate evidence is available. The default factor of 1.5 was derived from previous studies (Appendix 1).

Having adjusted the numbers of maternal deaths for misclassification and completeness, the maternal mortality estimates were computed as follows: for the target years t = 1990, 1995, 2000, 2005, 2010 and 2013 the number of maternal deaths and the corresponding live births were pooled for the 5-year periods, i.e. years t – 2 to t + 2 (35). For the target year 2013, data were pooled from the years 2010, 2011, 2012 (2013 data were not available).The pooled maternal deaths were divided by the pooled live births.

For any 5-year period where no deaths are reported, the best estimates and uncertainty bounds from the main statistical model (multi-level regression model) were rescaled and used. For example, if no civil registration data were reported in a country after 2010, the estimate for the period 2011–2015 with a reference year 2013 was based on the multi-level model estimate for that period, multiplied by a rescaling factor R, where R was given by the ratio of the estimated MMR based on civil registration data and the multi-level model estimate for the previous 5-year period. By using this approach, the MMR estimate for future periods is informed by the estimated level in the most recently observed period and the projected rate of change from the multi-level model.

Estimation of maternal mortality ratio using a statistical model (Groups B and C)

For the majority of countries with limited or no reliable maternal mortality data, the multi-level regression model as developed in the 2008 round of MMR estimates *(24)* was used to derive estimates and projections of maternal mortality with updated information in maternal mortality and in covariates. The model permits an integrated comparison of trends over the full interval, from 1990 to 2013, for 5-year intervals centred on 1990, 1995, 2000, 2005, 2010 and 2013. The full model includes two parts: the first part is a multi-level linear regression model that predicts the PM due to direct obstetric causes or to indirect causes (other than AIDS) for which pregnancy was a substantial aggravating factor; the second part estimates the proportion of AIDS deaths that qualify as indirect maternal deaths out of the total number of AIDS deaths among women aged 15–49 years. The three selected predictor variables in the regression model are: GDP, the general fertility rate (GFR) and SAB. These predictor variables were chosen from a broader list of potential predictor variables

that fell into three groups: (i) indicators of social and economic development (such as GDP, human development index, and female life expectancy at birth); (ii) process variables (SAB, proportion of women receiving antenatal care, proportion of institutional births, etc.); and (iii) risk exposure as a function of fertility (GFR or the total fertility rate).

Annual series of predictor variable estimates

A complete series of annual estimates for each of the three covariates was obtained or constructed between 1985 and 2013. Weighted averages of annual values were then computed for time intervals corresponding to each of the PM or MMR observations, using an algorithm described elsewhere *(24)*.

GDP per capita measured in PPP or equivalent international dollars using 2005 as the base year were derived from The World Bank *(30)*. Where a complete series was unavailable, annual estimates were obtained using linear interpolation between two observations, and assuming constant values before the first observation and after the last data point.

GFR estimates were calculated using annual series of live births and the populations of women aged 15–49 years, which were constructed using estimates from UNPD *(28)*.

SAB coverage estimates consist of time series derived using data from household surveys and other sources, obtained from a database maintained by UNICEF. Although other sources of SAB data were consulted, only the UNICEF data were used because they adhere strictly to the indicator's definition *(29)*. Annual series were estimated by fitting a regression model with time as the sole predictor for the logit (log-odds) of SAB; such a model was estimated separately for each country. For countries with only one observation or no available SAB data, the SAB annual series were estimated using a multi-level model. In the multi-level model, logit (or log-odds) of observed SAB proportions for all countries were regressed against time. The model included region- and country-specific intercepts and slopes. The country-specific estimates of the intercept and slope were used to construct SAB estimates for countries with at least one data point, while the region-specific estimates of the intercept and slope were used to construct SAB estimates for countries without data. The multi-level model was also used in the following cases: 1) among series with more than one observation, when the observed change between the first and last observations was less than 20% and either the earliest year observed was after 1995 or the observation period was less than five years; 2) among series with two observations, the observed change was greater than 30% and the observed period was greater than two years; and 3) among series with two observations where the observed change was less than 5% and either the earliest year observed was after 1995 or the observation period was less than eight years.

Description of input data

Observed PMs from sisterhood data were age-standardized by imposing the age distribution of women in the sample population at the time of survey (rather than the age distribution implied by retrospective reports of sisters' lives). If only the MMR was available from a data source, the MMR was converted into a PM using estimates of all-cause deaths of women aged 15–49 years, derived from WHO life tables *(27)*, and live births data from UNPD *(28)*.

Where observations were derived from death registration data meeting Group 1 and Group 2 criteria in Box 5, adjusted MMRs were derived from PMs calculated for five-year averages and adjusted for misclassification. These five-year reference periods were determined by the last observed year of death registration data.

Adjustments to the input data

Prior to being used in the regression model, several adjustment factors were applied to all maternal mortality observations, to take into account the likely under identification of maternal deaths due to unreported abortion-related deaths or other causes.

Deaths from civil registration were adjusted upwards (by a factor of 1.5 by default or by a country-specific misclassification factor as noted earlier, see Appendix 1) for misclassification and then divided by the number of deaths of women aged 15–49 years to derive the PM. Observed deaths from other sources (e.g. surveys, surveillance systems, censuses, RAMOS, sample registration system and others) were adjusted upwards by a factor of 1.1 *(24)*.

In addition, in order to improve the comparability of data inputs in terms of the definition, as some referred to maternal deaths and others to pregnancy-related deaths, pregnancy-related deaths were adjusted down by removing a fraction of deaths that were assumed to be pregnancy related but not maternal (i.e. accidental or incidental deaths). Although the true fraction is typically unknown, an examination of studies that collected information on both maternal and pregnancy-related mortality showed average fractions of about 10–15%. The numbers of pregnancy-related deaths were therefore adjusted downwards by 10% for countries in sub-Saharan Africa and – because data on injury-related deaths *(35)* suggest higher risks outside of sub-Saharan Africa – maternal deaths were adjusted downwards by 15%.

Multi-level regression model

A multi-level linear regression model was used for deriving non-AIDS MMR estimates for 122 countries (all Group B and C countries as well as six Group A countries as explained previously), using available observations of PM from Group A and B countries. In earlier work *(24)*, a range of models were compared and the preferred model was chosen by assessing the statistical goodness of fit, the within-sample predictive accuracy and the plausibility of estimates out-of-sample. Goodness of fit was measured using deviance scores derived from standard log-likelihood calculations. The predictive accuracy of each model was evaluated by repeatedly holding out a portion of the data, fitting the model to the remaining subset of data and then comparing model predictions against the data that had been held out.

The model was fitted with three selected covariates (GDP, GFR and SAB) and random intercept effects for countries and regions. It can be described as follows:

$$\log(PM_i^{na}) = \beta_0 + \beta_1 \log(GDP_i) + \beta_2 \log(GFR_i) + \beta_3 SAB_i + \alpha^{c}_{j[i]} + \alpha^{R}_{K[i]} + \varepsilon_i$$

where the following are associated with each observation *i*, within country *j[i]*, within region *k[i]*:

PM_i^{na} = proportion of maternal among non-AIDS deaths in women aged 15–49 years (non-AIDS PM)

GDP_i = gross domestic product per capita (in 2005 PPP dollars)

GFR_i = general fertility rate (live births per woman aged 15–49 years)

SAB_i = skilled attendant at birth (as a proportion of live births)

$\alpha^{c}_{j[i]}$ = variable intercept component for country *j*

$\alpha^{R}_{K[i]}$ = variable intercept component for region *k*

ε_i = error.

The model was estimated using the *lme4* package *(36)* in R statistical software *(37)*.

Only non-AIDS-related maternal deaths are included in the dependent variable of the regression model, PM^{na}. The adjustment to the PM to remove AIDS deaths minimizes the influence of the HIV epidemic on observed PM values by removing AIDS deaths from both the numerator and the denominator. The methodology employed to remove AIDS deaths was unchanged from the previous revision; the adjustment parameters were updated in light of new data (see Appendix 5 for details).

Weights were not used in the model to adjust for differential uncertainty of observations. However, the weights of civil registration observations were implicitly reduced by a factor of five because these observations were collapsed into five-year time periods, and each such observation received a weight of one in the regression model. This approach was adopted to avoid giving excessive weight to civil registration data, which tend to come from countries where maternal mortality levels are low. Most other data sources (a single survey, census, special study, etc.) yielded a single observation that also refers to a multiple-year time period; such observations also received a weight of one in the regression model. Some surveys, however, yielded more than one data point for multiple time periods; in such cases all of the various observations were included in the model but with a combined weight of one.

To predict PM using the model, country covariate data and relevant country and regional effects were used. To estimate the multi-level regression model, countries were grouped into regions according to the global categories used by the UN Statistics Division *(38)*. For countries with data available on maternal mortality, predictions of non-AIDS PM were based on country and regional random effects, whereas for countries with no available data, predictions used regional random effects only. For Indonesia, non-AIDS PM estimates were obtained by fitting the same model as described above but using fixed country intercepts and random coefficients for the predictor variables to obtain a better fit to the available data.

After a final adjustment to add back the AIDS-related indirect maternal deaths to the PM (see below), the final PM values were converted to estimates of the MMR as follows:

$$MMR = PM\ (D/B)$$

where D is the number of deaths in women aged 15–49 years estimated from WHO death rates *(27)* and UNPD population estimates *(28)* and B is the number of live births from UNPD population estimates *(28)*.

Estimation of AIDS-related indirect maternal deaths

There is evidence from community studies that HIV-positive women have a higher risk of maternal death, although this may be offset by lower fertility *(39–41)*. If HIV is prevalent, then there will also be more AIDS deaths[2] among pregnant women that were incidental to pregnancy. It is thus important to address the issue of incidental and indirect maternal deaths among HIV-positive women, in estimating maternal mortality for these countries.

The dependent variable of the regression model described above includes only direct maternal deaths, but excludes all AIDS deaths from 'pregnancy-related' observations (even AIDS deaths that could properly be termed 'indirect maternal', in the sense that the pregnancy was a substantial aggravating factor for a death caused primarily by HIV infection). Thus, the regression model was used to estimate the number of maternal deaths not primarily due to HIV infection, and then the estimated number of AIDS-related indirect maternal deaths was added back to obtain the total number of maternal deaths (see Appendix 5 for details and an overview of changes in adjustment values).

Uncertainty of estimates

In this report, estimates of maternal mortality are presented along with upper and lower limits designed to depict the uncertainty of those estimates. The intervals are the product of a detailed probabilistic evaluation of the uncertainty attributable to the various components of the estimation process. The components of uncertainty can be divided into two groups: variability within the regression model (internal sources) and variability due to assumptions or calculations outside the model (external sources). Estimates of the total uncertainty reflect a combination of these various sources.

The internal component quantifies inferential uncertainty including variability in all elements of the multi-level regression model for deriving best estimates for individual countries (Groups B and C) and stochastic variability of estimates derived for countries with good civil registration data (Group A). Another internal component, predictive uncertainty associated with individual data points, was not included in the evaluation. The external component, on the other hand, includes uncertainty regarding assumptions about key parameters that are inputs into the estimation process (e.g. adjustment factors applied to observed data), as well as uncertainty about data inputs used for calculations that occur outside the regression model (e.g. estimated births, deaths and fraction of AIDS deaths).

2 The deaths referred to in this document as 'AIDS deaths' are referred to as 'AIDS deaths' in Joint United Nations Programme on HIV/AIDS (UNAIDS) publications. These deaths include the estimated number of deaths related to HIV infection, including deaths that occur before reaching the clinical stage classified as AIDS.

For estimates computed directly from civil registration data, the level of uncertainty includes both an external component, i.e. variability due to inputs and assumptions, and an internal component of stochastic uncertainty related to random variation of maternal deaths recorded in civil registration.

To obtain the uncertainty intervals presented here, simulations of values using probability distributions were performed to depict internal and external components of variability. For the internal component, the regression model was estimated and simulations of parameter coefficients were performed. Using the simulated results, the distribution of the dependent variable was approximated in order to quantify the inferential uncertainty computed using lme4 in the R Statistical Package *(36, 37)*. For the external component, probability distributions were set after considering a range of plausible alternatives and assessing the sensitivity of final estimates to choices within that range. It is worth noting that the uncertainty due to the external component is relatively small compared to the internal component; thus, the uncertainty due to choices of adjustment factors and unknown parameters appears rather small compared with the variability of observed data points around estimates of the regression model.

Using the distributions of the simulated estimates, 95% uncertainty intervals were derived from the 2.5th and 97.5th percentiles. Further details on estimating uncertainty levels can be found in Wilmoth et al. (2012) *(24)*, or on the WHO website.[3]

3.3 Computation of adult lifetime risk of maternal mortality

In countries where there is a high risk of maternal death, there is also an elevated likelihood of girls dying even before reaching reproductive age. For this reason, it makes sense to consider the lifetime risk of maternal mortality conditional on survival to adulthood. Information presented here includes a synthetic estimate of adult lifetime risk of maternal mortality, corresponding to the probability of a 15-year-old woman eventually dying from a maternal cause, assuming she is subjected throughout her lifetime to the age-specific risks of maternal death observed for a given population in a given year.

The adult lifetime risk of maternal mortality can be derived using either the MMR or the MMRate. However, a precise estimate of lifetime risk requires knowledge of how the MMR or the MMRate changes within the reproductive lifespan of women. Although such information is not generally available, it can be assumed that neither the MMR nor the MMRate is constant over the reproductive lifespan. Because this assumption is more realistic for the MMRate than for the MMR, the adult lifetime risk was calculated using the MMRate as shown in Box 6. This formula yields an estimate of the adult lifetime risk that takes into account competing causes of death.

3 See: www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2013/en/index.html

Box 6
Formula for estimating adult lifetime risk of maternal mortality

Adult lifetime risk of maternal mortality = $\frac{T_{15} - T_{50}}{\ell_{15}} \times \text{MMRate}$

Where ℓ_{15} equals the probability of survival from birth until age 15 years, and $(T_{15} - T_{50})/\ell_{15}$ equals the average number of years lived between ages 15 and 50 years (up to a maximum of 35 years) among survivors to age 15 years. The values for ℓ_{15}, T_{15} and T_{50} are life-table quantities for the female population during the period in question.

3.4 Global and regional estimates

Global and regional maternal mortality estimates (according to the MDG, UNFPA, UNICEF, UNPD, WHO and The World Bank regional groupings) were also computed. The MMR in a given region was computed as the estimated total number of maternal deaths divided by the number of live births for that region. Additionally, the adult lifetime risk of maternal mortality was based on the weighted average of $(T_{15} - T_{50})/\ell_{15}$ for a given region, multiplied by the MMRate of that region.

3.5 Methodological updates

Generally, the methods used for the 2013 maternal mortality estimation were similar to those for 2008 *(5)* and 2010 *(4)*. The main differences were related to data availability and treatment of maternal deaths due to HIV. The 2013 round draws from an expanding global database of empirical observations consisting of 3347 country-years of data compared to 3200 country-years of data in the 2010 round, a 5% increase.

Estimates of total female deaths in the reproductive age group for WHO Member States were revised from those used in the 2010 revision *(27)* to take into account new evidence and data on levels of adult mortality. This is a regular updating process carried out by WHO, with revised estimates published annually in the *World Health Statistics* (http://www.who.int/gho/publications/world_health_statistics/en/). These revisions have resulted in revisions to MMRs estimated for a number of Member States, in some cases for countries where the survey data available for maternal deaths have not changed.

New series of live birth and GFR data were obtained from the *World Population Prospects 2012* revision *(28)*. AIDS adjustment parameters were updated in light of new data (see Appendix 5).

4 Results

Globally, the maternal mortality ratio (MMR) has fallen by 45% between 1990 and 2013. All MDG regions of the world have experienced considerable reductions in maternal mortality. There were an estimated 289 000 maternal deaths in 2013, yielding an MMR of 210 maternal deaths per 100 000 live births among the 183 countries and territories that were covered in this analysis. The global adult lifetime risk of maternal mortality (i.e. the probability that a 15-year-old woman will die eventually from a maternal cause) was 1 in 190 in 2013 (Table 2).

4.1 Maternal mortality estimates for 2013

Table 2 displays estimates of the global and regional maternal mortality indicators including the MMR, the range of uncertainty of MMR, the number of maternal deaths and the lifetime risk. The uncertainty ranges demonstrate that although a point estimate is presented, the true MMR could be somewhere between the lower and upper uncertainty limits.

Developing countries account for 99% (286 000) of the **global maternal deaths** with sub-Saharan Africa region alone accounting for 62% (179 000) followed by Southern Asia (69 000). Oceania is the region with the fewest maternal deaths at 510.

The **MMR** in developing regions (230) was 14 times higher than in developed regions (16). MMR is considered to be high if it is ≥300–499[4] maternal deaths per 100 000 live births and extremely high if it is ≥1000 maternal deaths per 100 000 live births. While none of the MDG regions had extremely high MMR, sub-Saharan Africa was the only MDG developing region with very high MMR (510). Of the remaining MDG developing regions, five had low MMR Eastern Asia (33), Caucasus and Central Asia (39), Northern Africa (69), Western Asia (74), and Latin America and the Caribbean (85).The remaining MDG developing regions, which had moderate MMR, are South-eastern Asia (140), Southern Asia (190), and Oceania (190).

The **adult lifetime risk of maternal mortality** in women from sub-Saharan Africa was the highest at 1 in 38, in sharp contrast to 1 in 3700 among women in developed countries.

Country-level estimates are shown in Annex 1. Two countries accounted for one third of all global maternal deaths: India at 17% (50 000) and Nigeria at 14% (40 000). The ten countries that comprised 58% of the global maternal deaths reported in 2013 are: India (50 000, 17%); Nigeria (40 000, 14%); Democratic Republic of the Congo (21 000, 7%); Ethiopia (13 000, 4%); Indonesia (8800, 3%); Pakistan (7900, 3%); United Republic of Tanzania (7900, 3%); Kenya (6300, 2%); China (5900, 2%); Uganda (5900, 2%).

4 Extremely high MMR (maternal deaths per 100 000 live births) ≥1000, very high MMR 500–999, high MMR 300–499, moderate MMR 100–299, low MMR <100.

Table 2. Estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), number of maternal deaths, and lifetime risk, by United Nations MDG region, 2013

Region	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death[a] 1 in:
		Lower estimate	Upper estimate		
World	210	160	290	289000	190
Developed regions[b]	16	12	23	2300	3700
Developing regions	230	180	320	286 000	160
Northern Africa[c]	69	47	110	2700	500
Sub-Saharan Africa[d]	510	380	730	179 000	38
Eastern Asia[e]	33	21	54	6400	1800
Eastern Asia excluding China	54	35	97	480	1200
Southern Asia[f]	190	130	280	69 000	200
Southern Asia excluding India	170	110	270	19 000	210
South-eastern Asia[g]	140	98	210	16 000	310
Western Asia[h]	74	50	120	3600	450
Caucasus and Central Asia[i]	39	31	53	690	940
Latin America and the Caribbean	85	66	120	9300	520
Latin America[j]	77	59	110	7900	570
Caribbean[k]	190	130	310	1400	220
Oceania[l]	190	100	380	510	140

[a] The MMR, number of maternal deaths, and lifetime risk have been rounded according to the following scheme: <100, no rounding; 100–999, rounded to nearest 10; 1000–9999, rounded to nearest 100; and >10 000, rounded to nearest 1000.

[b] Albania, Australia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Montenegro, The Netherlands, New Zealand, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States of America.

[c] Algeria, Egypt, Libya, Morocco, Tunisia.

[d] Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cabo Verde, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe.

[e] China, Democratic People's Republic of Korea, Mongolia, Republic of Korea.

[f] Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan, Sri Lanka.

[g] Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, The Philippines, Singapore, Thailand, Timor-Leste, Viet Nam.

[h] Bahrain, Iraq, Jordan, Kuwait, Lebanon, Occupied Palestinian Territory, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, Yemen.

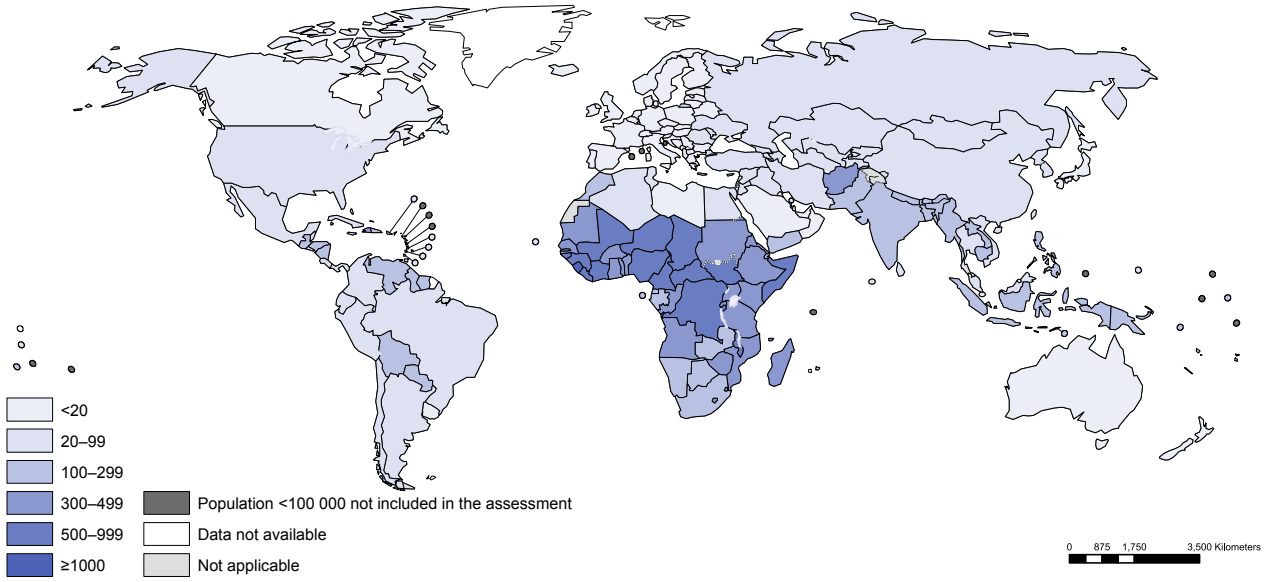
[i] Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.

[j] Argentina, Belize, Bolivia (Plurinational State of), Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay, Venezuela (Bolivarian Republic of).

[k] Bahamas, Barbados, Cuba, Dominican Republic, Grenada, Haiti, Jamaica, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago.

[l] Fiji, Kiribati, Micronesia (Federated States of), Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu.

Figure 1. Map with countries by category according to their maternal mortality ratio (MMR, death per 100 000 live births), 2013



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the WHO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Of the 40 countries with the highest **MMR** in 2013, Sierra Leone is estimated to have the highest, with an MMR of 1100. As shown in Annex 1 and in Figure 1, 15 countries (all in sub-Saharan Africa) had very high MMR: Chad (980); Central African Republic (880); Somalia (850); Burundi (740); Democratic Republic of the Congo (730); South Sudan (730); Cote d'Ivoire (720); Guinea (650); Liberia (640); Niger (630); Cameroon (590); Guinea-Bissau (560); Nigeria (560); Mali (550); Malawi (510). Only two countries outside the sub-Saharan African region had high MMR: Afghanistan (400) and Haiti (380). In contrast, Cabo Verde and Mauritius were the only two sub-Saharan African countries that had low MMR, at 53 and 73 maternal deaths per 100 000 live births, respectively.

Regarding **adult lifetime risk of maternal mortality**, Chad and Somalia had the highest at 1 in 15 and 1 in 18, respectively. The estimated adult lifetime maternal mortality risks in high-income countries is 1 in 3400 in comparison to low-income countries where the risk is 1 in 52.

Appendices 7, 9, 11, 13 and 15 present the MMR, range of uncertainty, number of maternal deaths and adult lifetime risk for WHO, UNICEF, UNFPA, The World Bank and UNPD regions, respectively.

Table 3 shows the number of maternal deaths, MMR and percentage of maternal deaths attributed to HIV by MDG region. Percentage of AIDS-related indirect maternal deaths by country is presented in Annex 1 for countries with an HIV prevalence ≥ 5.0% (among adults 15–49 years) between 1990 and 2013. Sub-Saharan Africa accounted for 6800 (91%) of the estimated 7500 maternal deaths attributed to HIV worldwide. Only three other MDG regions had more than 100 maternal deaths attributed to HIV: Southern Asia (340), Latin America and the Caribbean(130), and South-eastern Asia (110). The proportion of maternal deaths attributed to HIV in sub-Saharan Africa was 3.8%, yielding a HIV-attributed MMR for

sub-Saharan Africa of 19 maternal deaths per 100 000 live births. Without HIV, the MMR for sub-Saharan Africa would be 491 maternal deaths per 100 000 live births instead of 510.

Although the regional aggregates of the proportions of maternal deaths attributed to HIV were relatively small, they were substantial for countries with high HIV prevalence. Eight countries had a proportion of maternal deaths attributed to HIV of 10% or more: South Africa (41.4%); Botswana (23.5%); Swaziland (18.6%); Zambia (15.4%); Lesotho (14.8%); Namibia (13.9%); Mozambique (13%); Gabon (10.4%).

Table 3. Estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), number of maternal deaths and maternal deaths attributed to HIV/AIDS, by United Nations MDG region, 2013

Region	MMR[a]	Number of maternal deaths[a]	AIDS-attributed MMR	Number of AIDS-related indirect maternal deaths	Percentage of AIDS-related indirect maternal deaths[a]
World	210	289 000	5	7500	2.6
Developed regions[b]	16	2300	0	65	2.8
Developing regions	230	286 000	6	7400	2.6
Northern Africa[c]	69	2700	0	9	0.3
Sub-Saharan Africa[d]	510	179 000	19	6800	3.8
Eastern Asia[e]	33	6400	0	44	0.7
Eastern Asia excluding China	54	480	0	1	0.2
Southern Asia[f]	190	69 000	1	340	0.5
Southern Asia excluding India	170	19 000	0	20	0.1
South-eastern Asia[g]	140	16 000	1	110	0.7
Western Asia[h]	74	3600	0	3	0.1
Caucasus and Central Asia[i]	39	690	0	7	0.9
Latin America and the Caribbean	85	9300	1	130	1.4
Latin America[j]	77	7900	1	92	1.2
Caribbean[k]	190	1400	5	39	2.8
Oceania[l]	190	510	2	5	0.9

[a] The MMR have been rounded according to the following scheme: <100, no rounding; 100–999, rounded to nearest 10; and >1000, rounded to nearest 100. The numbers of maternal deaths have been rounded as follows: <100, no rounding; 100–999, rounded to nearest 10; 1000–9999, rounded to nearest 100; and >10 000, rounded to nearest 1000. Percentages have been calculated on unrounded estimates.

[b–l] See footnotes in Table 2.

Table 4. Comparison of 1990 and 2013 maternal mortality ratio (MMR, maternal deaths per 100 000 live births) and number of maternal deaths, by United Nations MDG regions

Region	1990[a]		2013[a]		% change in MMR between 1990 and 2013[b]	Average annual % change in MMR		
	MMR	Maternal deaths	MMR	Maternal deaths		1990–2013[b]	1990–2005[b]	2005–2013[b]
World	380	523 000	210	289 000	-45	-2.6	-2.2	-3.3
Developed regions[c]	26	3900	16	2300	-37	-2	-3.6	1
Developing regions	430	519 000	230	286 000	-46	-2.6	-2.2	-3.4
Northern Africa[d]	160	5900	69	2700	-57	-3.6	-4.1	-2.8
Sub-Saharan Africa[e]	990	222 000	510	179 000	-49	-2.9	-2.5	-3.6
Eastern Asia[f]	95	26 000	33	6400	-65	-4.5	-4.1	-5.2
Eastern Asia excluding China	47	550	54	480	15	0.6	1.6	-1.3
Southern Asia[g]	530	202 000	190	69 000	-64	-4.4	-4.2	-4.7
Southern Asia excluding India	450	54 000	170	19 000	-63	-4.2	-3.5	-5.5
South-eastern Asia[h]	320	39 000	140	16 000	-57	-3.6	-3.8	-3.2
Western Asia[i]	130	5400	74	3600	-43	-2.4	-2.5	-2.1
Caucasus and Central Asia[j]	70	1300	39	690	-44	-2.5	-2	-3.4
Latin America and the Caribbean	140	17 000	85	9300	-40	-2.2	-2.8	-1.1
Latin America[k]	130	14 000	77	7900	-40	-2.2	-2.9	-1
Caribbean[l]	300	2500	190	1400	-36	-1.9	-2	-1.9
Oceania[m]	390	780	190	510	-51	-3	-3.1	-2.8

[a] MMR estimates have been rounded according to the following scheme: <100, no rounding; 100–999, rounded to nearest 10; and >1000, rounded to nearest 100. The numbers of maternal deaths have been rounded as follows: <1000, rounded to nearest 10; 1000–9999, rounded to nearest 100; and >10 000, rounded to nearest 1000.

[b.] Negative values for % change indicate a decreasing MMR from 1990 to 2013, while positive values indicate an increasing MMR. Percentages have been calculated using unrounded estimates.

[c-m.] See footnote in Table 2.

4.2 Trends in maternal mortality from 1990 to 2013

Globally, the total **number of maternal deaths** decreased by 45% from 523 000 in 1990 to 289 000 in 2013 (Table 4). Similarly, global **MMR** declined by 45% from 380 maternal deaths per 100 000 live births in 1990 to 210 in 2013 yielding an average annual decline of 2.6%. Worldwide MMR declined annually by 3.3 % between 2005 and 2013, faster than the 2.2% average annual decline observed between 1990 and 2005.

All regions experienced a decline of 37% or more in MMR between 1990 and 2013. The highest reduction in the 23-year period was in Eastern Asia (65%) followed by Southern Asia (64%), Northern Africa (57%), South-eastern Asia (57%), Oceania (51%), sub-Saharan Africa (49%), Caucasus and Central Asia (44%), Western Asia (43%), and Latin America and the Caribbean (40%).

Eastern Asia experienced the highest average annual decline between 2005 and 2013 at 5.2% while Latin America and the Caribbean experienced the least decline in the same period, at 1.1%. When interpreting change in MMR, consideration must be given to the relative ease of reducing MMR when levels are high compared to when they are low.

Appendices 8, 10, 12, 14 and 16 present similar tables for WHO, UNICEF, UNFPA, The World Bank and UNPD regions, respectively.

Country-level trends in maternal mortality levels are shown in Annex 2. Of the 183 countries and territories that were covered in this analysis, between 1990 and 2013, 166 countries experienced total MMR percentage declines, 17 countries had an increase. Notably, 19 countries have already experienced 75% reduction in MMR between 1990 and 2013, much earlier than the target year of 2015. These countries are: Belarus (96% reduction in MMR); Maldives (93%); Bhutan (87%); Cambodia (86%); Israel (84%); Equatorial Guinea (81%); Poland (81%); Lao People's Democratic Republic (80%); Romania (80%); Bulgaria (78%); Estonia (78%); Timor-Leste (78%); Eritrea (77%); Cabo Verde (77%); Latvia (77%); Oman (77%); Lebanon (76%); Nepal (76%) and Rwanda (76%).

For some countries in southern Africa such as Botswana and South Africa, MMR increased from the year 1990 to 2000, mainly as result of the HIV epidemic, and then started to decline, most likely due to increased availability of antiretroviral therapy *(42)*. In 1990, there were nearly 1700 AIDS-related indirect maternal deaths. Following the trend of the HIV epidemic, this subset of maternal deaths increased in numbers, peaking in 2005 at 12 000, but then showing evidence of decline in 2010 and 2013, when an estimated 8500 and 7500 AIDS-related indirect maternal deaths occurred.

4.3 Comparison with previous maternal mortality estimates

As explained in Section 3.5, the methodology employed for the 2013 estimates is similar to that for the 2008 and 2010 estimates. However, given that the global database used for the current 2013 increased in country-years of data by 5%, estimates of total female deaths in the reproductive age group were updated, and the number of countries increased from 181 to 183, the current estimates should be used for the interpretation of trends in maternal mortality from 1990 to 2013, rather than comparing to or extrapolating estimates from previously published estimates.

5 Progress towards Millennium Development Goal 5

The fifth MDG aims to improve maternal health, with a target of reducing the MMR by 75% between 1990 and 2015 and a second one on achieving universal access, by 2015, to reproductive health. While most countries or regions aspire to achieve MDG 5 by 2015, some countries will not attain this goal if current trends persist. One way to gauge progress is to examine if countries have had the expected average annual MMR decline of 5.5% from 1990 to 2013.

Accordingly, countries with MMR ≥100 in 1990 have been categorized as 'on track', 'making progress', 'insufficient progress' or 'no progress' in improving maternal health. The cut-off of 100 was arbitrarily chosen to focus assessment of progress in countries that have started with a relatively high level of mortality in the baseline year of 1990, and given the difficulty in reducing MMR further for countries that already had low MMR (<100) in 1990. A country is considered to be 'on track' if the average annual percentage decline between 1990 and 2013 is 5.5% or more. If the average annual decline in MMR is between 2% and 5.5%, the country is considered to be 'making progress'. Countries with an average annual decline of less than 2% are considered to have made 'insufficient progress' and countries with rising MMR have been categorized as making 'no progress'.

At the country level, as noted in Section 4.2, the 19 countries that had achieved MDG 5 by 2013 are: Belarus (96% reduction in MMR); Maldives (93%); Bhutan (87%); Cambodia (86%); Israel (84%); Equatorial Guinea (81%); Poland (81%); Lao People's Democratic Republic (80%); Romania (80%); Bulgaria (78%); Estonia (78%); Timor-Leste (78%); Eritrea (77%); Cabo Verde (77%); Latvia (77%); Oman (77%); Lebanon (76%); Nepal (76%) and Rwanda (76%). Among these, 11 had a baseline of MMR ≥100 in 1990, and are indicated as 'on track ' to achieve MDG 5 in Annex 2. Further, 63 countries were characterized as 'making progress' while 13 countries have made 'insufficient progress'.

Although the decline in MMR between 1990 and 2013 has been slower than expected, several countries, as seen above, have made substantial progress in reducing maternal deaths. An analysis of 10 countries that have made progress towards achievement of both MDG 4 and 5, showed common overarching elements of success including: leadership and partnership, evidence and innovation, development and implementation of dual short-term and long-term strategies, and adaptation to change for sustained progress *(44)*. These countries have adapted, tested and rapidly scaled up service delivery models.

The analysis highlights specific strategies that have contributed to success in some of the above countries deemed as being 'on track'. For example, Cambodia has prioritized preventing maternal and newborn deaths through an Emergency Obstetric and Newborn Care (EmONC) Improvement Plan. The plan recognizes that implementing targeted EmONC requires an enabling environment, and includes improving referral systems, communication, transport, equipment, drugs and other supplies. This enabling environment would eventually be able to support the effective delivery of a broader range of health services. Rwanda deployed community health workers and volunteers to address immediate, urgent health needs. At the same time, the country invested in its long-term vision to build a professional health workforce and kept colleges open, even if external funders did not think this was a priority, and despite there being few professors. Professors from neighbouring countries,

during their holidays, taught at Rwandan colleges. These investments paid off, with the country now having fully established colleges and partnerships with international medical, nursing, dental and health management colleges. In Nepal, reframing basic health needs as health rights has been the main thrust of the policies. Many government strategies and policies related to safer motherhood, neonatal health, nutrition and gender are anchored in the principles of human rights *(44)*.

Additionally, the rapid roll-out of antiretroviral therapy in the past decade in regions with high HIV prevalence has contributed to reduction of female deaths and maternal deaths. The 2013 UNAIDS report on AIDS in low- and middle-income countries indicates that the number of people on antiretroviral therapy reached 9.7 million in 2012, compared to just over 8.1 million in 2011 – an increase of 1.6 million in one year alone *(45)*. At least 10 countries (Botswana, Cabo Verde, Eritrea, Kenya, Namibia, Rwanda, South Africa, Swaziland, Zambia and Zimbabwe) reported reaching 80% or more of adults eligible for antiretroviral therapy *(46)*.

The UN Secretary-General's launch of the Global strategy for women's and children's health in September 2010 has helped to mobilize commitments by governments, civil society organizations and development partners to accelerate progress towards MDGs 4 and 5 *(1)*, especially during the past few years. The Commission on Information and Accountability for Women's and Children's Health – established to "determine the most effective international institutional arrangements for global reporting, oversight and accountability on women's and children's health" – recommended that all countries take "significant steps to establish a system for registration of births, deaths and causes of death, and have well-functioning health information systems that combine data from facilities, administrative sources and surveys" *(2)*. However, insufficient progress on this recommendation was noted by the iERG on their assessment of the implementation of the commission's recommendations *(3)*. This analysis highlights the limited availability of high quality data that is based on such complete and accurate registration systems, as shown in the range of data sources available to use for the analysis.

Maternal death reviews provide an important tool for capturing maternal deaths, thereby, contributing to better estimates of maternal mortality, while also helping to initiate necessary actions to prevent deaths. The WHO recent publication of technical guidance on maternal death surveillances and response (MDSR) aims to contribute to progress on the Commission's recommendation on registration of every maternal death *(47)*. MDSR is aimed at preventing maternal deaths and includes the key components of identification and notification of all maternal deaths; in-depth review of maternal deaths; analysis and interpretation of aggregated findings from reviews; and response to the recommendations of the reviews. Implementation of the MDSR system should help to accelerate progress towards MDG 5 and make maternal deaths rare events beyond 2015.

Discussions on the post-2015 UN development agenda are underway. Although levels of decline in maternal mortality seen during the past 23 years will not be sufficient to achieve MDG 5, the steady progress we have witnessed indicates that ending preventable maternal mortality is achievable in this lifetime. Analyses of past progress suggest the feasibility of realizing this vision indicated by a global MMR of less than 70 in 2030 *(48)*, within the sustainable development agenda beyond 2015.

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Annex 1. Estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), number of maternal deaths, lifetime risk and percentage of AIDS-related indirect maternal deaths, 2013

Country	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:	% of AIDS-related indirect maternal deaths[b]	PM[c] (%)	Group[d]
		Lower estimate	Upper estimate					
Afghanistan	400	220	750	4200	49		17.9	B
Albania	21	13	34	8	2800		0.9	B
Algeria	89	48	170	840	380		5.2	B
Angola	460	220	980	4400	35		14.5	C
Argentina	69	60	81	480	630		4.7	A
Armenia	29	19	44	12	1800		1.5	B
Australia	6	4	10	18	9000		0.5	A
Austria	4	1	10	3	19 200		0.2	A
Azerbaijan	26	17	40	43	1800		1.7	B
Bahamas	37	24	55	2	1400		1	A
Bahrain	22	14	35	4	2000		2.7	A
Bangladesh	170	94	300	5200	250		7.6	B
Barbados	52	33	83	2	1100		2.6	A
Belarus	1	1	2	1	45 200		0	A
Belgium	6	4	10	8	8700		0.5	A
Belize	45	30	68	3	750		3.5	A
Benin	340	200	580	1300	59		12.7	B
Bhutan	120	74	190	17	340		3.1	B
Bolivia (Plurinational State of)	200	130	310	550	140		8.2	B
Bosnia and Herzegovina	8	5	13	3	9700		0.4	B
Botswana	170	110	280	83	200	23.5	2.7	B
Brazil	69	44	110	2100	780		2.8	B
Brunei Darussalam	27	16	43	2	1900		1.8	B
Bulgaria	5	3	8	4	12 400		0.2	A
Burkina Faso	400	240	680	2800	44		15.5	B
Burundi	740	390	1400	3400	22	1	24.8	B
Cabo Verde	53	25	110	5	740		5.3	C
Cambodia	170	110	280	670	180		7	B
Cameroon	590	350	1000	4900	34	4.4	13.9	B
Canada[e]	11	7	18	45	5200		0.8	A
Central African Republic	880	470	1600	1400	27	5	13.2	B
Chad	980	550	1800	5800	15		29.3	B
Chile	22	14	35	55	2400		1.8	A
China	32	20	53	5900	1800		1.6	B
Colombia	83	56	130	760	500		5.9	A
Comoros	350	160	730	90	58		14	C
Congo	410	240	720	690	48	4.7	12	B
Costa Rica	38	25	57	28	1400		2.8	A

Country	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:	% of AIDS-related indirect maternal deaths[b]	PM[c] (%)	Group[d]
		Lower estimate	Upper estimate					
Côte d'Ivoire	720	440	1200	5300	29	3.8	13.9	B
Croatia	13	6	27	5	5200		0.8	A
Cuba	80	50	130	85	970		3.1	A
Cyprus	10	5	20	1	6600		1.1	C
Czech Republic	5	3	9	6	12 100		0.4	A
Democratic People's Republic of Korea	87	41	190	310	630		2.7	C
Democratic Republic of the Congo	730	380	1400	21 000	23		22.4	B
Denmark	5	2	12	3	12 000		0.4	A
Djibouti	230	110	470	55	130		5.6	C
Dominican Republic	100	71	150	220	360		6.2	B
Ecuador	87	58	130	290	420		5.9	B
Egypt	45	30	70	860	710		3.5	B
El Salvador	69	48	100	88	600		2.9	B
Equatorial Guinea	290	160	560	79	72	8.9	6.5	B
Eritrea	380	210	690	880	52		18	B
Estonia	11	5	25	2	5700		0.5	A
Ethiopia	420	240	720	13 000	52		16.1	B
Fiji	59	35	95	11	620		2.7	B
Finland	4	2	6	2	15 100		0.3	A
France	9	5	13	68	6100		0.7	A
Gabon	240	150	420	130	94	10.4	6.5	B
Gambia	430	210	930	340	39		18.8	C
Georgia	41	23	77	24	1300		2.6	B
Germany	7	5	9	47	11 000		0.4	A
Ghana	380	210	720	3100	66		11.9	B
Greece	5	2	13	6	12 000		0.4	A
Grenada	23	14	37	0	1800		1.4	B
Guatemala	140	89	210	660	170		9.4	A
Guinea	650	390	1100	2800	30		21	B
Guinea-Bissau	560	270	1200	360	36		15.1	C
Guyana	250	160	380	40	150		5.5	B
Haiti	380	220	680	1000	80		10	B
Honduras	120	73	190	240	260		6.6	B
Hungary	14	9	21	14	5000		0.6	A
Iceland	4	2	7	0	11 500		0.6	A
India	190	130	300	50 000	190		6.7	B
Indonesia	190	120	300	8800	220		8.4	B
Iran (Islamic Republic of)	23	16	35	340	2000		1.5	B
Iraq	67	40	110	710	340		8.1	B
Ireland	9	5	13	6	5500		0.9	A

Country	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:	% of AIDS-related indirect maternal deaths[b]	PM[c] (%)	Group[d]
		Lower estimate	Upper estimate					
Israel	2	1	4	3	17 400		0.4	A
Italy	4	3	6	23	17 100		0.3	A
Jamaica	80	57	110	40	540		3.1	B
Japan	6	5	7	63	12 100		0.4	A
Jordan	50	31	84	97	580		4.8	B
Kazakhstan	26	16	43	89	1500		1	A
Kenya	400	250	680	6300	53	5.4	11.3	B
Kiribati	130	62	280	3	260		6.8	C
Kuwait	14	6	32	9	2600		2.4	A
Kyrgyzstan	75	47	120	110	390		4.8	B
Lao People's Democratic Republic	220	130	370	400	130		10.8	B
Latvia	13	7	24	3	4600		0.5	A
Lebanon	16	9	29	10	3900		1.5	B
Lesotho	490	300	770	280	64	14.8	5.1	B
Liberia	640	350	1200	980	31		25	B
Libya	15	8	27	19	2700		1.2	B
Lithuania	11	6	21	4	5900		0.4	A
Luxembourg	11	7	18	1	5300		0.9	A
Madagascar	440	270	720	3500	47		18.9	B
Malawi	510	320	830	3400	34	7.2	14.8	B
Malaysia	29	18	46	150	1600		2	B
Maldives	31	19	52	2	1200		4.8	B
Mali	550	330	940	4000	26		23.6	B
Malta	9	5	14	0	8300		0.7	A
Mauritania	320	180	590	430	66		15.3	B
Mauritius	73	42	130	11	900		2.6	A
Mexico	49	31	77	1100	900		3	A
Micronesia (Federated States of)	96	45	200	2	320		5	C
Mongolia	68	40	120	43	560		3.1	B
Montenegro	7	4	12	0	8900		0.4	B
Morocco	120	75	190	880	300		6.2	B
Mozambique	480	300	780	4800	41	13	8.2	B
Myanmar	200	120	350	1900	250		4.3	B
Namibia	130	84	220	81	230	13.9	3.7	B
Nepal	190	110	340	1100	200		6.9	B
Netherlands	6	4	9	10	10 700		0.4	A
New Zealand	8	5	12	5	6600		0.6	A
Nicaragua	100	68	160	140	340		6.8	B
Niger	630	370	1100	5600	20		36.6	B
Nigeria	560	300	1000	40 000	31		15.6	B
Norway	4	2	8	2	14 900		0.4	A

Country	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:	% of AIDS-related indirect maternal deaths[b]	PM[c] (%)	Group[d]
		Lower estimate	Upper estimate					
Occupied Palestinian Territory[f]	47	23	97	63	500		5.7	C
Oman	11	8	16	8	2800		1.8	B
Pakistan	170	93	320	7900	170		9.1	B
Panama	85	55	130	64	450		5.5	A
Papua New Guinea	220	110	450	460	120		7.8	C
Paraguay	110	71	170	170	290		9.1	B
Peru	89	61	130	530	440		5.7	B
Philippines	120	81	190	3000	250		7	A
Poland	3	2	5	14	19 800		0.2	A
Portugal	8	4	17	8	8800		0.5	A
Puerto Rico	20	13	32	9	3000		1.1	B
Qatar	6	3	12	1	7200		1.2	C
Republic of Korea	27	21	36	130	2900		1.5	A
Republic of Moldova	21	12	36	9	2900		0.8	A
Romania	33	26	44	75	2100		1.6	A
Russian Federation	24	16	37	400	2600		0.6	A
Rwanda	320	200	540	1300	66	2.4	13.6	B
Saint Lucia	34	21	54	1	1500		1.9	A
Saint Vincent and the Grenadines	45	29	70	1	1000		1.9	A
Samoa	58	28	120	3	430		6.6	C
Sao Tome and Principe	210	110	410	14	100		11.9	B
Saudi Arabia	16	9	29	89	2200		1.9	B
Senegal	320	190	560	1700	60		16.4	B
Serbia	16	10	27	15	4500		1	A
Sierra Leone	1100	580	2000	2400	21		16.7	B
Singapore	6	3	12	3	13 900		0.5	A
Slovakia	7	4	11	4	10 200		0.4	A
Slovenia	7	5	11	1	9300		0.6	A
Solomon Islands	130	63	270	23	180		7.6	C
Somalia	850	400	1800	3900	18		33.2	C
South Africa	140	85	210	1500	300	41.4	1.4	B
South Sudan	730	420	1300	3000	28		16.8	B
Spain	4	3	7	21	15100		0.3	A
Sri Lanka	29	21	42	110	1400		2.2	B
Sudan	360	220	590	4600	60		14.6	B
Suriname	130	87	190	12	330		6	A
Swaziland	310	170	560	120	94	18.6	3.9	B
Sweden	4	2	8	5	13 600		0.4	A
Switzerland	6	2	14	5	12 300		0.5	A
Syrian Arab Republic	49	28	83	260	630		5.9	B
Tajikistan	44	27	71	120	530		4.3	B

Country	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:	% of AIDS-related indirect maternal deaths[b]	PM[c] (%)	Group[d]
		Lower estimate	Upper estimate					
Thailand	26	18	38	180	2900		0.7	B
The former Yugoslav Republic of Macedonia	7	3	17	2	10 200		0.4	A
Timor-Leste	270	140	500	110	66		22.1	B
Togo	450	250	850	1100	46		12.6	B
Tonga	120	59	260	3	220		5.1	C
Trinidad and Tobago	84	53	140	16	640		2.6	A
Tunisia	46	25	85	86	1000		3.4	B
Turkey	20	14	31	260	2300		1.1	B
Turkmenistan	61	29	130	68	640		1.9	C
Uganda	360	230	580	5900	44	8.1	10.8	B
Ukraine	23	19	28	110	2900		0.6	A
United Arab Emirates	8	4	16	10	5800		1.3	C
United Kingdom	8	5	12	60	6900		0.6	A
United Republic of Tanzania	410	250	660	7900	44	5.9	13.3	B
United States of America	28	18	44	1200	1800		1.5	A
Uruguay	14	9	20	7	3500		0.8	A
Uzbekistan	36	31	42	220	1100		2.2	A
Vanuatu	86	41	180	6	320		6.9	C
Venezuela (Bolivarian Republic of)	110	70	170	650	360		7.2	A
Viet Nam	49	29	84	690	1100		3.3	B
Yemen	270	150	510	2100	88		11.6	B
Zambia	280	170	460	1800	59	15.4	7.9	B
Zimbabwe	470	270	790	2100	53	7.2	10.6	B

Estimates have been computed to ensure comparability across countries, thus they are not necessarily the same as official statistics of the countries, which may use alternative rigorous methods.

[a] The MMR and lifetime risk have been rounded according to the following scheme: <100, no rounding; 100–999, rounded to nearest 10; and >1000, rounded to nearest 100. The numbers of maternal deaths have been rounded as follows: <100, no rounding; 100–999, rounded to nearest 10; 1000–9999, rounded to nearest 100; and >10 000, rounded to nearest 1000.

[b] Percentage of AIDS-related maternal deaths are presented only for countries with an HIV prevalence ≥ 5.0% (among adults 15–49 years) between 1990 and 2013.

[c] Proportion of deaths among women of reproductive age that are due to maternal causes (PM).

[d] Group A indicates country estimates based on good civil registration data; Group B indicates modelled country estimates using available national data; and Group C indicates modelled country estimates where no national data are available on maternal mortality.

[e] Vital registration data were available for analysis only up to 2009. Recent hospital surveillance data for Canada excluding Quebec indicate a decline of maternal deaths per 100 000 deliveries from 8.8 in 2007-2009 to 6.1 in 2009-2011. 98% of deliveries in Canada occur in hospitals.

[f] Refers to a territory.

Annex 2. Trends in estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), 1990–2013, by country

Country	MMR[a]					% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]	Range of uncertainty on annual % change in MMR		Progress towards improving maternal health[c]
	1990	1995	2000	2005	2013			Lower estimate	Upper estimate	
Afghanistan	1200	1200	1100	730	400	-67	-4.7	-5.5	-3.9	making progress
Albania	31	29	28	24	21	-33	-1.7	-2.3	-1.1	–
Algeria	160	140	120	100	89	-44	-2.5	-2.9	-2	making progress
Angola	1400	1400	1100	750	460	-68	-4.9	-8.8	-0.7	making progress
Argentina	71	60	63	70	69	-2	-0.1	-0.5	0.4	–
Armenia	47	51	43	37	29	-39	-2.1	-2.5	-1.7	–
Australia	7	8	9	6	6	-14	-0.7	-2.8	1.5	–
Austria	10	7	5	5	4	-64	-4.3	-8.5	0.1	–
Azerbaijan	60	83	57	36	26	-57	-3.6	-4.1	-3.1	–
Bahamas	43	44	44	40	37	-14	-0.7	-1.5	0.4	–
Bahrain	21	22	27	16	22	3	0.1	-0.4	0.7	–
Bangladesh	550	440	340	260	170	-70	-5	-5.6	-4.5	making progress
Barbados	120	38	42	33	52	-56	-3.5	-6.7	-0.1	making progress
Belarus	37	29	32	21	1	-96	-13.2	-15	-11.3	–
Belgium	10	10	9	7	6	-35	-1.8	-2	-1.7	–
Belize	75	35	110	79	45	-40	-2.2	-4.8	0.6	–
Benin	600	520	490	420	340	-43	-2.4	-3	-1.8	making progress
Bhutan	900	610	390	240	120	-87	-8.4	-9.5	-7.3	on track
Bolivia (Plurinational State of)	510	420	330	270	200	-61	-4	-4.5	-3.5	making progress
Bosnia and Herzegovina	19	16	11	10	8	-57	-3.6	-4.3	-3	–
Botswana	360	370	390	340	170	-52	-3.1	-4.1	-1.8	making progress
Brazil	120	100	85	73	69	-43	-2.4	-2.9	-2	making progress
Brunei Darussalam	26	25	24	25	27	1	0	-0.6	0.7	–

Country	MMR[a]					% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]	Range of uncertainty on annual % change in MMR		Progress towards improving maternal health[c]
	1990	1995	2000	2005	2013			Lower estimate	Upper estimate	
Bulgaria	24	22	29	14	5	-78	-6.3	-8.2	-4.4	–
Burkina Faso	770	680	580	500	400	-49	-2.9	-3.4	-2.3	making progress
Burundi	1300	1300	1000	910	740	-41	-2.3	-3	-1.5	making progress
Cabo Verde	230	140	84	63	53	-77	-6.2	-10	-2.1	on track
Cambodia	1200	860	540	320	170	-86	-8.1	-9	-7.2	on track
Cameroon	720	760	740	690	590	-18	-0.9	-1.2	-0.5	insufficient progress
Canada[d]	6	7	7	11	11	81	2.6	0.5	4.7	–
Central African Republic	1200	1200	1200	1100	880	-27	-1.3	-1.6	-1	insufficient progress
Chad	1700	1600	1500	1200	980	-41	-2.3	-2.4	-2	making progress
Chile	55	40	29	26	22	-60	-3.9	-5.7	-2	–
China	97	76	63	50	32	-67	-4.7	-5.4	-4	–
Colombia	100	81	130	97	83	-17	-0.8	-2.5	0.9	insufficient progress
Comoros	630	560	480	430	350	-45	-2.6	-6.5	1.5	making progress
Congo	670	650	610	530	410	-39	-2.1	-2.7	-1.5	making progress
Costa Rica	38	45	44	46	38	-1	-0.1	-1.9	1.8	–
Côte d'Ivoire	740	710	670	750	720	-3	-0.1	-0.5	0.3	insufficient progress
Croatia	8	13	11	14	13	63	2.1	-1.4	5.8	–
Cuba	63	60	63	67	80	27	1	-1	3.1	–
Cyprus	18	18	16	13	10	-48	-2.8	-6.6	1.2	–
Czech Republic	15	9	7	7	5	-67	-4.7	-6.9	-2.4	–
Democratic People's Republic of Korea	85	83	120	110	87	3	0.1	-4	4.3	–
Democratic Republic of the Congo	1000	1100	1100	930	730	-29	-1.5	-2.4	-0.6	insufficient progress
Denmark	9	16	9	8	5	-50	-2.9	-7	1.2	–

Country	MMR[a]					% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]	Range of uncertainty on annual % change in MMR		Progress towards improving maternal health[c]
	1990	1995	2000	2005	2013			Lower estimate	Upper estimate	
Djibouti	400	390	360	310	230	-43	-2.4	-6.4	1.7	making progress
Dominican Republic	240	180	120	130	100	-57	-3.6	-4	-3.2	making progress
Ecuador	160	130	120	98	87	-44	-2.5	-2.9	-2.1	making progress
Egypt	120	96	75	62	45	-62	-4.1	-4.8	-3.4	making progress
El Salvador	110	96	80	72	69	-39	-2.1	-2.6	-1.6	making progress
Equatorial Guinea	1600	1300	790	480	290	-81	-7	-8	-5.9	on track
Eritrea	1700	1000	670	530	380	-77	-6.2	-6.8	-5.6	on track
Estonia	48	46	26	24	11	-78	-6.4	-10.1	-2.4	–
Ethiopia	1400	1200	990	740	420	-69	-5	-5.4	-4.6	making progress
Fiji	89	79	72	69	59	-34	-1.8	-2.1	-1.5	–
Finland	6	5	7	9	4	-36	-1.9	-4.3	0.6	–
France	12	10	9	8	9	-31	-1.6	-3.5	0.3	–
Gabon	380	340	330	300	240	-37	-2	-2.5	-1.2	making progress
Gambia	710	660	580	510	430	-39	-2.1	-6	2	making progress
Georgia	50	67	60	48	41	-18	-0.9	-1.1	-0.6	–
Germany	13	8	7	7	7	-47	-2.7	-3.7	-1.8	–
Ghana	760	650	570	470	380	-49	-2.9	-3.2	-2.5	making progress
Greece	6	2	5	3	5	-5	-0.2	-4.1	3.9	–
Grenada	34	33	29	25	23	-33	-1.7	-2.2	-1.2	–
Guatemala	270	220	160	140	140	-49	-2.8	-4.6	-1	making progress
Guinea	1100	1000	950	800	650	-40	-2.2	-2.6	-1.8	making progress
Guinea-Bissau	930	790	840	760	560	-40	-2.2	-6	1.8	making progress
Guyana	210	230	240	240	250	16	0.6	0.4	0.8	no progress
Haiti	670	580	510	470	380	-43	-2.4	-2.9	-1.9	making progress

Country	MMR[a]					% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]	Range of uncertainty on annual % change in MMR		Progress towards improving maternal health[c]
	1990	1995	2000	2005	2013			Lower estimate	Upper estimate	
Honduras	290	200	150	130	120	-60	-3.9	-4.5	-3.2	making progress
Hungary	23	23	10	13	14	-39	-2.1	-4.1	-0.2	–
Iceland	7	7	6	6	4	-45	-2.5	-2.7	-2.4	–
India	560	460	370	280	190	-65	-4.5	-4.9	-4	making progress
Indonesia	430	360	310	250	190	-56	-3.5	-4	-3.1	making progress
Iran (Islamic Republic of)	83	60	44	31	23	-72	-5.3	-6	-4.7	–
Iraq	110	84	71	77	67	-37	-2	-2.6	-1.4	making progress
Ireland	6	4	6	2	9	33	1.2	-1.6	4.1	–
Israel	12	10	9	7	2	-84	-7.6	-10.2	-5	–
Italy	10	6	4	5	4	-60	-3.9	-5.8	-2	–
Jamaica	98	89	88	85	80	-18	-0.8	-1.2	-0.5	–
Japan	14	10	10	7	6	-57	-3.6	-4.5	-2.8	–
Jordan	86	73	65	58	50	-42	-2.3	-2.7	-1.9	–
Kazakhstan	91	91	71	50	26	-71	-5.3	-7.2	-3.3	–
Kenya	490	530	570	550	400	-17	-0.8	-1.1	-0.4	insufficient progress
Kiribati	250	240	200	170	130	-47	-2.7	-6.6	1.3	making progress
Kuwait	12	10	8	6	14	13	0.6	-4.4	5.7	–
Kyrgyzstan	85	120	100	92	75	-11	-0.5	-0.8	-0.2	–
Lao People's Democratic Repblic	1100	830	600	410	220	-80	-6.8	-7.4	-6.3	on track
Latvia	57	58	42	21	13	-77	-6.1	-8.7	-3.5	–
Lebanon	64	47	37	26	16	-76	-6	-6.5	-5.4	–
Lesotho	720	630	680	670	490	-32	-1.7	-2.4	-0.6	insufficient progress
Liberia	1200	1600	1100	880	640	-48	-2.8	-3.2	-2.4	making progress
Libya	31	25	21	17	15	-52	-3.1	-3.6	-2.7	–

Country	MMR[a]					% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]	Range of uncertainty on annual % change in MMR		Progress towards improving maternal health[c]
	1990	1995	2000	2005	2013			Lower estimate	Upper estimate	
Lithuania	34	21	20	11	11	-68	-4.8	-7.7	-1.8	–
Luxembourg	6	11	11	17	11	83	2.7	-2.3	8	–
Madagascar	740	640	550	530	440	-41	-2.3	-2.7	-1.8	making progress
Malawi	1100	870	750	570	510	-53	-3.2	-3.4	-2.9	making progress
Malaysia	56	45	40	36	29	-48	-2.8	-3.3	-2.3	–
Maldives	430	210	110	57	31	-93	-10.8	-11.5	-10.2	on track
Mali	1100	1000	860	710	550	-51	-3.1	-3.4	-2.7	making progress
Malta	12	11	11	9	9	-31	-1.6	-2	-1.2	–
Mauritania	630	550	480	400	320	-49	-2.9	-3.3	-2.4	making progress
Mauritius	70	68	28	35	73	4	0.2	-2.4	2.7	–
Mexico	88	77	67	50	49	-45	-2.5	-4.4	-0.7	–
Micronesia (Federated States of)	170	140	130	120	96	-44	-2.5	-6.6	1.6	making progress
Mongolia	100	120	120	89	68	-34	-1.8	-2.2	-1.3	insufficient progress
Montenegro	8	9	10	8	7	-12	-0.6	-0.7	-0.4	–
Morocco	310	240	200	160	120	-61	-4.1	-4.7	-3.4	making progress
Mozambique	1300	1100	870	680	480	-64	-4.3	-4.9	-3.4	making progress
Myanmar	580	470	360	260	200	-65	-4.5	-5	-4	making progress
Namibia	320	280	270	250	130	-58	-3.7	-4.3	-2.7	making progress
Nepal	790	580	430	310	190	-76	-6	-6.6	-5.4	on track
Netherlands	11	11	15	10	6	-51	-3	-5.1	-0.9	–
New Zealand	18	13	12	12	8	-57	-3.6	-5.8	-1.5	–
Nicaragua	170	160	140	120	100	-38	-2.1	-2.6	-1.6	making progress
Niger	1000	920	850	760	630	-37	-2	-2.3	-1.6	making progress
Nigeria	1200	1100	950	740	560	-52	-3.1	-3.4	-2.8	making progress

Country	MMR[a]					% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]	Range of uncertainty on annual % change in MMR		Progress towards improving maternal health[c]
	1990	1995	2000	2005	2013			Lower estimate	Upper estimate	
Norway	9	4	8	9	4	-61	-4	-7.6	-0.2	–
Occupied Palestinian Territory[e]	96	71	59	59	47	-51	-3	-6.9	1	–
Oman	48	32	22	16	11	-77	-6.2	-6.9	-5.6	–
Pakistan	400	330	280	230	170	-57	-3.6	-4.1	-3	making progress
Panama	98	91	79	83	85	-14	-0.6	-2.5	1.3	–
Papua New Guinea	470	370	340	280	220	-54	-3.3	-7.2	0.8	making progress
Paraguay	130	130	120	130	110	-19	-0.9	-1.3	-0.6	insufficient progress
Peru	250	220	160	120	89	-64	-4.4	-4.9	-3.8	making progress
Philippines	110	130	120	130	120	15	0.6	-1.1	2.4	no progress
Poland	17	14	8	5	3	-81	-6.9	-8.5	-5.3	–
Portugal	15	10	11	11	8	-44	-2.5	-5.2	0.6	–
Puerto Rico	29	28	24	21	20	-31	-1.6	-1.9	-1.3	–
Qatar	11	11	9	8	6	-51	-3	-7	1.1	–
Republic of Korea	18	18	19	18	27	53	1.9	0.8	3	–
Republic of Moldova	61	59	39	25	21	-66	-4.6	-6.9	-2.2	–
Romania	170	72	53	30	33	-80	-6.8	-7.8	-5.7	on track
Russian Federation	74	72	57	37	24	-68	-4.8	-6.5	-3	–
Rwanda	1400	1400	1000	610	320	-76	-6.1	-6.8	-5.4	on track
Saint Lucia	60	52	44	39	34	-43	-2.4	-3.1	-1.8	–
Saint Vincent and the Grenadines	48	72	75	55	45	-7	-0.3	-0.8	0.1	–
Samoa	150	110	89	73	58	-60	-3.9	-7.9	0.2	making progress
Sao Tome and Principe	410	360	300	260	210	-48	-2.8	-3.3	-2.3	making progress
Saudi Arabia	41	31	24	19	16	-61	-4	-4.6	-3.4	–
Senegal	530	510	480	420	320	-40	-2.2	-2.5	-1.9	making progress

Country	MMR[a]					% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]	Range of uncertainty on annual % change in MMR		Progress towards improving maternal health[c]
	1990	1995	2000	2005	2013			Lower estimate	Upper estimate	
Serbia	18	20	7	8	16	-12	-0.5	-3.3	2.4	–
Sierra Leone	2300	2400	2200	1600	1100	-54	-3.3	-4	-2.7	making progress
Singapore	8	8	19	10	6	-30	-1.5	-4.8	1.8	–
Slovakia	15	10	12	6	7	-54	-3.4	-5.5	-1	–
Slovenia	11	11	12	15	7	-34	-1.8	-4.6	1	–
Solomon Islands	320	250	210	170	130	-59	-3.8	-7.7	0.2	making progress
Somalia	1300	1300	1200	1100	850	-34	-1.8	-5.8	2.3	insufficient progress
South Africa	150	140	150	160	140	-9	-0.4	-2.2	2.4	insufficient progress
South Sudan	1800	1500	1200	1000	730	-59	-3.8	-4.2	-3.5	making progress
Spain	7	4	5	6	4	-36	-1.9	-3.7	0	–
Sri Lanka	49	71	55	41	29	-40	-2.2	-2.5	-1.9	–
Sudan	720	640	540	460	360	-50	-3	-3.3	-2.7	making progress
Suriname	84	39	120	110	130	54	1.9	-0.1	3.9	–
Swaziland	550	480	520	480	310	-44	-2.5	-3.4	-0.4	making progress
Sweden	6	5	5	4	4	-34	-1.8	-4.6	1.3	–
Switzerland	8	8	7	8	6	-29	-1.5	-5.4	2.7	–
Syrian Arab Republic	130	94	75	58	49	-64	-4.3	-4.8	-3.8	making progress
Tajikistan	68	120	89	59	44	-36	-1.9	-2.3	-1.5	–
Thailand	42	37	40	34	26	-37	-2	-2.6	-1.3	–
The former Yugoslav Republic of Macedonia	15	13	15	14	7	-57	-3.6	-8.4	1.2	–
Timor-Leste	1200	1000	680	500	270	-78	-6.4	-6.8	-6.1	on track
Togo	660	660	580	510	450	-31	-1.6	-2	-1.1	insufficient progress
Tonga	71	89	91	100	120	72	2.4	-1.8	6.7	–
Trinidad and Tobago	89	91	59	58	84	-6	-0.3	-2.3	1.9	–

Country	MMR[a]					% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]	Range of uncertainty on annual % change in MMR		Progress towards improving maternal health[c]
	1990	1995	2000	2005	2013			Lower estimate	Upper estimate	
Tunisia	91	81	65	55	46	-50	-3	-3.4	-2.5	–
Turkey	48	39	33	27	20	-57	-3.6	-4	-3.2	–
Turkmenistan	66	79	81	76	61	-7	-0.3	-4.3	3.9	–
Uganda	780	740	650	510	360	-53	-3.2	-3.6	-2.9	making progress
Ukraine	49	45	35	25	23	-54	-3.3	-4	-2.5	–
United Arab Emirates	16	13	11	8	8	-53	-3.3	-7.2	1	–
United Kingdom	10	11	11	12	8	-24	-1.2	-3.1	0.8	–
United Republic of Tanzania	910	890	770	610	410	-55	-3.5	-3.7	-3.1	making progress
United States of America	12	11	13	17	28	136	3.8	1.8	5.8	–
Uruguay	42	34	35	32	14	-67	-4.8	-6.3	-3.1	–
Uzbekistan	66	54	48	44	36	-45	-2.6	-3	-2.2	–
Vanuatu	170	140	120	100	86	-49	-2.9	-6.8	1.4	making progress
Venezuela (Bolivarian Republic of)	93	98	91	94	110	16	0.6	-1.2	2.6	–
Viet Nam	140	110	82	60	49	-64	-4.4	-4.9	-3.8	making progress
Yemen	460	420	370	330	270	-41	-2.3	-2.8	-1.7	making progress
Zambia	580	630	610	430	280	-51	-3.1	-3.4	-2.4	making progress
Zimbabwe	520	550	680	740	470	-10	-0.4	-0.8	0	insufficient progress

Estimates have been computed to ensure comparability across countries; thus they are not necessarily the same as official statistics of the countries, which may use alternative rigorous methods.

[a] MMR estimates have been rounded according to the following scheme: <100, no rounding; 100–999, rounded to nearest 10; and >1000, rounded to nearest 100.

[b] Negative values indicate a decreasing MMR from 1990 to 2013, while positive values indicate an increasing MMR. Percentages have been calculated using unrounded estimates. The average annual per cent change is estimated by:

$$\left[\left(\frac{MMR\,2013}{MMR\,1990}\right)^{\frac{1}{2013-1990}} - 1\right] \times 100$$

[c] For countries with MMR ≥100 in 1990, they are categorized as 'on track' if MMR has had 5.5% or more average annual decline; 'making progress' if MMR has had 2% to 5.5% average annual decline; 'insufficient progress' if MMR has had less than 2% average annual decline; and 'no progress' if MMR has had an average annual increase. Countries with MMR <100 in 1990 are not categorized.

[d] Vital registration data were available for analysis only up to 2009. Recent hospital surveillance data for Canada excluding Quebec indicate a decline of maternal deaths per 100 000 deliveries from 8.8 in 2007-2009 to 6.1 in 2009-2011. 98% of deliveries in Canada occur in hospitals.

[e] Refers to a territory.

Annex 3. Countries with 40% or more decrease in the maternal mortality ratio (maternal deaths per 100 000 live births) from 1990 to 2013

Country	% change in MMR between 1990 and 2013[a]
Belarus	-96
Maldives	-93
Bhutan	-87
Cambodia	-86
Israel	-84
Equatorial Guinea	-81
Poland	-81
Lao People's Democratic republic	-80
Romania	-80
Bulgaria	-78
Estonia	-78
Timor-Leste	-78
Cabo Verde	-77
Eritrea	-77
Latvia	-77
Oman	-77
Lebanon	-76
Nepal	-76
Rwanda	-76
Iran (Islamic Republic of)	-72
Kazakhstan	-71
Bangladesh	-70
Ethiopia	-69
Angola	-68
Lithuania	-68
Russian Federation	-68
Afghanistan	-67
China	-67
Czech Republic	-67
Uruguay	-67
Republic of Moldova	-66
India	-65
Myanmar	-65
Austria	-64
Mozambique	-64
Peru	-64
Syrian Arab Republic	-64
Viet Nam	-64
Egypt	-62

Country	% change in MMR between 1990 and 2013[a]
Bolivia (Plurinational State of)	-61
Morocco	-61
Norway	-61
Saudi Arabia	-61
Chile	-60
Honduras	-60
Italy	-60
Samoa	-60
Solomon Islands	-59
South Sudan	-59
Namibia	-58
Azerbaijan	-57
Bosnia and Herzegovina	-57
Dominican Republic	-57
Japan	-57
The former Yugoslav Republic of Macedonia	-57
New Zealand	-57
Pakistan	-57
Turkey	-57
Barbados	-56
Indonesia	-56
United Republic of Tanzania	-55
Papua New Guinea	-54
Sierra Leone	-54
Slovakia	-54
Ukraine	-54
United Arab Emirates	-53
Malawi	-53
Uganda	-53
Botswana	-52
Libya	-52
Nigeria	-52
Mali	-51
Netherlands	-51
Occupied Palestinian Territory[b]	-51

Country	% change in MMR between 1990 and 2013[a]
Qatar	-51
Zambia	-51
Denmark	-50
Sudan	-50
Tunisia	-50
Burkina Faso	-49
Ghana	-49
Guatemala	-49
Mauritania	-49
Vanuatu	-49
Cyprus	-48
Liberia	-48
Malaysia	-48
Sao Tome and Principe	-48
Germany	-47
Kiribati	-47
Comoros	-45
Iceland	-45
Mexico	-45
Uzbekistan	-45
Algeria	-44
Ecuador	-44
Micronesia (Federated States of)	-44
Portugal	-44
Swaziland	-44
Benin	-43
Brazil	-43
Djibouti	-43
Haiti	-43
Saint Lucia	-43
Jordan	-42
Burundi	-41
Madagascar	-41
Chad	-41
Yemen	-41
Belize	-40
Guinea	-40
Guinea-Bissau	-40
Sri Lanka	-40
Senegal	-40

[a] Percentages have been calculated using unrounded estimates and rounded to whole numbers.

[b] Refers to a territory.

Appendix 1. Adjustment factor to account for misclassification of maternal deaths in civil registration, literature review of reports and articles

Country	Period/year	Adjustment factor
Australia[a]	1994–1996	1.23
Australia[b]	1997–1999	1.80
Australia[c]	2000–2002	1.97
Australia[d]	2003–2005	2.03
Austria[e]	1980–1998	1.61
Brazil[f]	2002	1.40
Canada[g]	1988–1992	1.69
Canada[h]	1997–2000	1.52
Denmark[i]	1985–1994	1.94
Denmark[j]	2002–2006	1.04
Finland[k]	1987–1994	0.94
France[l]	Dec 1988–March 1989	2.38
France[m]	1999	1.29
France[n]	2001–2006	1.21
France[o]	2007–2009	1.21
Guatemala[p]	1989	1.84
Guatemala[p]	1996–1998	1.84
Guatemala[q]	2000	1.88
Guatemala[r]	2007	1.73
Ireland[s]	2009–2011	3.40
Japan[t]	2005	1.35
Mexico[u]	2008	0.99
Netherlands[v]	1983–1992	1.34
Netherlands[x]	1993–2005	1.48
New Zealand[y]	2006	1.11
New Zealand[z]	2007	0.85
New Zealand[aa]	2008	1.00
New Zealand[bb]	2009	0.92
New Zealand[cc]	2010	1.00
Portugal[dd]	2001–2007	2.04
Serbia[ee]	2007–2010	1.86
Singapore[ff]	1990–1999	1.79
Slovenia[gg]	2003–2005	5.00
South Africa[hh]	1999–2001	0.98
South Africa[ii]	2002–2004	1.16
South Africa[ii]	2005–2007	0.90
Sweden[jj]	1997–2005	1.33
Sweden[kk]	1988–2007	1.68
United Kingdom[ll]	1988–1990	1.39
United Kingdom[ll]	1991–1993	1.52
United Kingdom[ll]	1994–1996	1.64
United Kingdom[ll]	1997–1999	1.77
United Kingdom[ll]	2000–2002	1.80
United Kingdom[ll]	2003–2005	1.86
United Kingdom[ll]	2006–2008	1.60
United States[mm]	1991–1997	1.48
United States[nn]	1995–1997	1.54
United States[oo]	1999–2002	1.59
United States[oo]	2003–2005	1.41
Median		**1.5**

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Appendix 2. Sixty-seven countries with civil registration data characterized as complete, with good attribution of cause of death

Argentina, Australia, Austria, Bahamas, Bahrain, Barbados, Belarus, Belgium, Belize, Bulgaria, Canada, Chile, Colombia, Costa Rica, Croatia, Cuba, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Guatemala, Hungary, Iceland, Ireland, Israel, Italy, Japan, Kazakhstan, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Mauritius, Mexico, Netherlands, New Zealand, Norway, Panama, Philippines, Poland, Portugal, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Saint Lucia, Saint Vincent and the Grenadines, Serbia, Singapore, Slovakia, Slovenia, Spain, Suriname, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Trinidad and Tobago, Ukraine, United Kingdom, United States of America, Uruguay, Uzbekistan, Venezuela (Bolivarian Republic of).

Appendix 3. Ninety-six countries with incomplete civil registration and/or other types of maternal mortality data

Afghanistan, Albania, Algeria, Armenia, Azerbaijan, Bangladesh, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, China, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Ethiopia, Fiji, Gabon, Georgia, Ghana, Grenada, Guinea, Guyana, Haiti, Honduras, India, Indonesia, Iran (Islamic Republic of), Iraq, Jamaica, Jordan, Kenya, Kyrgyzstan, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritania, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Oman, Pakistan, Paraguay, Peru, Puerto Rico, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Sierra Leone, South Africa, South Sudan, Sri Lanka, Sudan, Swaziland, Syrian Arab Republic, Tajikistan, Thailand, Timor-Leste, Togo, Tunisia, Turkey, Uganda, United Republic of Tanzania, Viet Nam, Yemen, Zambia, Zimbabwe.

Appendix 4. Twenty countries with no national data on maternal mortality

Angola, Cabo Verde, Comoros, Cyprus, Democratic People's Republic of Korea, Djibouti, Gambia, Guinea-Bissau, Kiribati, Micronesia (Federated States of), Occupied Palestinian Territory,[1] Papua New Guinea, Qatar, Samoa, Solomon Islands, Somalia, Tonga, Turkmenistan, United Arab Emirates, Vanuatu.

[1] Refers to a territory.

Appendix 5. Estimation of maternal deaths due to HIV

In this estimation process, the full model has two parts, the first part to separately estimate maternal deaths not related to AIDS (discussed in Chapter 3) and the second part to estimate AIDS-related maternal deaths. AIDS-related maternal deaths refer to HIV-positive women who have died because of the aggravating effect of pregnancy on HIV; where the interaction between pregnancy and HIV becomes the underlying cause of death, these are counted as 'indirect maternal' deaths. It is important to note that direct maternal deaths among HIV-positive women are not estimated separately but are rather included within the first part of the model.

Thus, the final PM estimates are the result of adding the results of this two-part model: the estimated number of non-AIDS-related maternal deaths and the estimated number of AIDS-related indirect maternal deaths:

$$PM = (1 - a)\,PM^{na} + a\,PM^{a} \qquad (A1)$$

where:

PM^{na} is the proportion of non-AIDS maternal deaths among all non-AIDS deaths (women aged 15–49 years);

PM^{a} is the proportion of AIDS-related maternal deaths among all AIDS deaths (women aged 15–49 years);

a is the proportion of AIDS deaths among all deaths (women aged 15–49 years).

This appendix describes the second part of the two-part model, that is, the estimation of indirect maternal AIDS-related deaths, PM^{a}. The sources of data for estimating the fraction of AIDS-related indirect maternal deaths are the UNAIDS 2013 estimates of AIDS-related deaths[2] and the total number of deaths estimated by WHO from its life tables. The approach used to estimate the proportion of AIDS deaths that qualify as indirect maternal deaths, PM^{a}, is the product of two quantities:

$$PM^{a} = \upsilon u \qquad (A2)$$

where:

υ is the proportion of AIDS deaths in women aged 15–49 years that occur during pregnancy or the childbirth period. The value of υ is computed as follows:

$$\upsilon = \frac{ck\,GFR}{1 + c\,(k-1)\,GFR} \qquad (A3)$$

u is the fraction of AIDS deaths among pregnant women that qualify as maternal because of some causal relationship with the pregnancy, delivery or postpartum period;

GFR is the general fertility rate;

c is the average woman-years lived in the maternal risk period per live birth (set equal to 1 year, including the 9 month gestation, plus 42 days postpartum, and an additional 1.5 months to account for pregnancies not ending in a live birth);

k is the relative risk of dying from AIDS for a pregnant versus non-pregnant woman.

[2] The deaths referred to in this document as AIDS deaths are referred to as AIDS deaths in UNAIDS publications. These deaths include the estimated number of deaths related to HIV infection, including deaths that occur before reaching the clinical stage classified as AIDS.

In the 2013 estimates, updated values for *k* and *u* were used, in light of new data from the network for Analyzing Longitudinal Population-based HIV/AIDS data on Africa (ALPHA).[3] Based on the findings in the paper and further exploration of the data, both *k* as well as *u* were set equal to 0.3. The uncertainty distributions for both parameters were updated as well, the standard deviation for *k* was set to 0.1 and for *u*, a uniform distribution with outcomes between 0.1 and 0.5 was used.

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Appendix 6. Trends in estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), 1990–2013, by United Nations Millennium Development Goal region (indicated in bold) and other grouping

Region	MMR[a]						% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]
	1990	1995	2000	2005	2010	2013		
World	380	360	330	270	230	210	-45	-2.6
Developed regions[c]	26	20	17	15	18	16	-37	-2
Developing regions	430	410	370	300	250	230	-46	-2.6
Africa	870	840	750	620	510	460	-47	-2.7
Northern Africa[d]	160	130	110	87	74	69	-57	-3.6
Sub-Saharan Africa	990	930	830	680	560	510	-49	-2.9
Eastern Africa[e]	1000	920	790	630	500	440	-57	-3.6
Middle Africa[f]	1100	1100	1100	880	750	680	-38	-2.1
Southern Africa[g]	200	180	200	200	170	160	-22	-1.1
Western Africa[h]	1000	950	850	700	590	540	-47	-2.8
Asia	330	300	250	190	150	130	-61	-4
Eastern Asia[i]	95	74	63	51	37	33	-65	-4.5
Eastern Asia excluding China	47	48	66	60	56	54	15	0.6
Southern Asia[j]	530	440	360	270	210	190	-64	-4.4
Southern Asia excluding India	450	400	350	270	200	170	-63	-4.2
South-eastern Asia[k]	320	270	220	180	150	140	-57	-3.6
Western Asia[l]	130	110	97	88	78	74	-43	-2.4
Caucasus and Central Asia[m]	70	78	65	52	45	39	-44	-2.5
Latin America and the Caribbean	140	120	110	93	88	85	-40	-2.2
Latin America[n]	130	110	98	84	79	77	-40	-2.2
Caribbean[o]	300	270	230	230	210	190	-36	-1.9
Oceania[p]	390	320	290	240	210	190	-51	-3

[a,b] See footnotes in Annex 2.

[c] Albania, Australia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, New Zealand, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Ukraine, United Kingdom, United States of America.

[d] Algeria, Egypt, Libya, Morocco, Tunisia.

[e] Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Somalia, South Sudan, Sudan, Uganda, United Republic of Tanzania, Zambia, Zimbabwe.

[f] Angola, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Sao Tome and Principe.

[g] Botswana, Lesotho, Namibia, South Africa, Swaziland.

[h] Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.

[i] People's Republic of China, Democratic People's Republic of Korea, Mongolia, Republic of Korea.

[j] Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan, Sri Lanka.

[k] Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, Viet Nam.

[l] Bahrain, Iraq, Jordan, Kuwait, Lebanon, Occupied Palestinian Territory, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, Yemen.

[m] Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.

[n] Argentina, Belize, Bolivia (Plurinational State of), Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay, Venezuela (Bolivarian Republic of).

[o] Bahamas, Barbados, Cuba, Dominican Republic, Grenada, Haiti, Jamaica, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago.

[p] Fiji, Kiribati, Micronesia (Federated States of), Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu.

Appendix 7. Estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), number of maternal deaths, and lifetime risk by WHO region, 2013

Region	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:
		Lower estimate	Upper estimate		
Africa	500	370	720	171 000	40
Americas	68	52	92	11 000	680
Eastern Mediterranean	170	120	260	26 000	180
Europe	17	14	22	1900	3300
South-East Asia	190	130	270	68 000	210
Western Pacific	45	32	66	12 000	1200
World	210	160	290	289 000	190

[a] See footnote in Annex 1.

Appendix 8. Trends in estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), 1990–2013, by WHO region

Region	MMR[a]						% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]
	1990	1995	2000	2005	2010	2013		
Africa	960	920	820	670	550	500	-49	-2.8
Americas	110	92	81	71	70	68	-37	-2
Eastern Mediterranean	340	330	300	240	190	170	-50	-3
Europe	42	36	29	22	20	17	-59	-3.8
South-East Asia	520	430	340	260	210	190	-64	-4.4
Western Pacific	110	93	78	63	49	45	-60	-3.9
World	380	360	330	270	230	210	-45	-2.6

[a,b] See footnotes in Annex 2.

Appendix 9. Estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), number of maternal deaths, and lifetime risk by UNICEF region, 2013

Region	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:
		Lower Estimate	Upper estimate		
Africa	460	350	670	181 000	45
Sub-Saharan Africa	510	380	730	179 000	38
Eastern and Southern Africa	420	310	610	68 000	49
West and Central Africa	590	420	910	106 000	30
Middle East and North Africa	110	78	160	11 000	300
Asia	140	100	200	91 000	320
South Asia	190	130	290	68 000	190
East Asia and the Pacific	74	54	110	23 000	720
Latin America and Caribbean	85	66	120	9300	510
Central and Eastern Europe and the Commonwealth of Independent States	27	22	35	1600	1900
Industrialized countries	15	10	21	1700	4000
Developing countries	230	180	320	286 000	160
Least developed countries	440	330	630	131 000	51
World	210	160	290	289 000	190

Appendix 10. Trends in estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), 1990–2013, by UNICEF region

Region	MMR[a]						% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]
	1990	1995	2000	2005	2010	2013		
Africa	870	840	750	620	510	460	-47	-2.7
Sub-Saharan Africa	990	930	830	680	560	510	-49	-2.9
Eastern and Southern Africa	960	900	770	620	480	420	-56	-3.5
West and Central Africa	1000	990	910	750	650	590	-43	-2.4
Middle East and North Africa	200	180	160	140	120	110	-46	-2.7
Asia	350	310	260	200	150	140	-61	-4
South Asia	550	460	370	280	220	190	-65	-4.4
East Asia and the Pacific	170	150	130	100	81	74	-56	-3.5
Latin America and Caribbean	140	120	110	93	88	85	-40	-2.2
Central and Eastern Europe and the Commonwealth of Independent States	65	59	48	36	32	27	-58	-3.8
Industrialized countries	12	10	10	11	15	15	21	0.8
Developing countries	430	400	370	300	250	230	-46	-2.6
Least developed countries	940	870	750	610	490	440	-53	-3.2
World	380	360	330	270	230	210	-45	-2.6

[a,b] See footnotes in Annex 2.

Appendix 11. Estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), number of maternal deaths, and lifetime risk by UNFPA region, 2013

Region	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:
		Lower estimate	Upper estimate		
Arab States	170	120	260	14 000	170
Asia and the Pacific	140	99	200	91 000	320
Eastern and Southern Africa	410	300	590	64 000	51
Eastern Europe and Central Asia	27	22	35	1600	1900
Latin America and the Caribbean	85	66	120	9300	510
West and Central Africa	590	420	910	106 000	30
Non-UNFPA list	15	11	21	1900	3800
World	210	160	290	289 000	190

[a] See footnote in Annex 1.

Appendix 12. Trends in estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births) 1990–2013, by UNFPA region

Region	MMR[a]						% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]
	1990	1995	2000	2005	2010	2013		
Arab States	300	270	250	210	180	170	-42	-2.3
Asia and the Pacific	350	310	260	200	150	140	-61	-4
Eastern and Southern Africa	950	890	750	600	470	410	-57	-3.6
Eastern Europe and Central Asia	66	59	48	36	32	27	-59	-3.8
Latin America and the Caribbean	140	120	110	93	88	85	-40	-2.2
West and Central Africa	1000	990	910	750	650	590	-43	-2.4
Non-UNFPA list	14	12	12	12	15	15	10	0.4
World	380	360	330	270	230	210	-45	-2.6

[a,b] See footnotes in Annex 2.

Appendix 13. Estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), number of maternal deaths, and lifetime risk by The World Bank region and income group, 2013

Region and income group	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:
		Lower estimate	Upper estimate		
Low income	450	330	640	124 000	52
Middle income	170	130	240	162 000	240
Lower middle income	240	170	340	142 000	140
Upper middle income	57	43	82	21 000	910
Low and middle income	230	180	320	286 000	160
East Asia and Pacific	75	54	110	23 000	700
Europe and Central Asia	28	23	36	1200	1700
Latin America and the Caribbean	87	67	120	9200	500
Middle East and North Africa	78	56	110	6300	430
South Asia	190	130	290	68 000	190
Sub-Saharan Africa	510	380	730	178 000	38
High income	17	13	24	2500	3400
World	210	160	290	289 000	190

[a] See footnote in Annex 1.

Appendix 14. Trends in estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), 1990–2013, by The World Bank region and income group

Region and income group	MMR[a]						% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]
	1990	1995	2000	2005	2010	2013		
Low income	900	840	740	610	500	450	-50	-3
Middle income	330	300	270	220	180	170	-49	-2.9
Lower middle income	500	440	380	310	260	240	-53	-3.2
Upper middle income	120	100	93	77	62	57	-51	-3
Low and middle income	430	410	370	300	250	230	-46	-2.6
East Asia and Pacific	170	150	130	110	82	75	-56	-3.5
Europe and Central Asia	61	54	44	35	31	28	-54	-3.3
Latin America and the Caribbean	150	130	110	95	90	87	-40	-2.2
Middle East and North Africa	160	130	110	97	83	78	-51	-3
South Asia	550	460	370	280	220	190	-65	-4.4
Sub-Saharan Africa	990	930	830	680	560	510	-49	-2.9
High income	24	20	18	16	18	17	-31	-1.6
World	380	360	330	270	230	210	-45	-2.6

[a,b] See footnotes in Annex 2.

Appendix 15. Estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), number of maternal deaths, and lifetime risk by UNPD region, 2013

Region	MMR[a]	Range of MMR uncertainty		Number of maternal deaths[a]	Lifetime risk of maternal death:[a] 1 in:
		Lower estimate	Upper estimate		
Africa	460	350	670	181 000	45
Sub-Saharan Africa	510	380	730	179 000	38
Asia	130	92	180	95 000	340
Europe	12	10	16	990	5100
Latin America and the Caribbean	85	66	120	9300	520
Northern America	26	17	42	1200	2000
Oceania	84	47	160	530	490
More developed countries	16	12	23	2300	3700
Less developed countries	230	180	320	286 000	160
Least developed countries	440	330	630	131 000	51
Other less developed countries	160	120	230	155 000	250
World	210	160	290	289 000	190

[a] See footnote in Annex 1.

Appendix 16. Trends in estimates of maternal mortality ratio (MMR, maternal deaths per 100 000 live births), 1990–2013, by UNPD region

Region	MMR[a]						% change in MMR between 1990 and 2013[b]	Average annual % change in MMR between 1990 and 2013[b]
	1990	1995	2000	2005	2010	2013		
Africa	870	840	750	620	510	460	-47	-2.7
Sub-Saharan Africa	990	930	830	680	560	510	-49	-2.9
Asia	320	290	240	190	140	130	-61	-4
Europe	35	26	21	16	15	12	-65	-4.5
Latin America and the Caribbean	140	120	110	93	88	85	-40	-2.2
Northern America	11	11	13	16	26	26	134	3.8
Oceania	160	140	130	110	92	84	-46	-2.7
More developed countries	26	20	17	15	18	16	-37	-2
Less developed countries	430	400	370	300	250	230	-46	-2.6
Least developed countries	940	870	750	610	490	440	-53	-3.2
Other less developed countries	310	290	260	210	180	160	-48	-2.8
World	380	360	330	270	230	210	-45	-2.6

[a,b] See footnotes in Annex 2.

Appendix 17. Summary of country consultations

The generation of global, regional, and country-level estimates and trends in morbidity and mortality is one of the core functions of WHO, which is the agency within the UN system that leads the production of updated maternal mortality estimates. In 2001, the WHO Executive Board endorsed a resolution (EB.107. R8) seeking to "establish a technical consultation process bringing together personnel and perspectives from Member States in different WHO regions." A key objective of this consultation process is "to ensure that each Member State is consulted on the best data to be used." Since the process is an integral step in the overall estimation strategy, it is described briefly here.

The country consultation process entails an exchange between WHO and technical focal person(s) in each country. It is carried out prior to the publication of estimates. During the consultation period, WHO invites focal person(s) to review input data sources, methods for estimation, and the preliminary estimates. Focal person(s) are encouraged to submit additional data that may not have been taken into account in the preliminary estimates.

The country consultation process for the 2014 round of maternal mortality estimates was initiated with an official communication from WHO to all Member States on 15 April 2013. This letter informed Member States of the forthcoming exercise in maternal mortality estimation and requested the designation of an official contact (typically within the national health ministry and/or the central statistics office) to participate in the consultation. The designated officials received the following items by e-mail: (1) a copy of official communication; (2) draft estimates and data sources; and (3) a summary of the methodology used. WHO regional offices actively collaborated in identifying focal persons through their networks.

The formal consultation process was officially completed by 22 August 2013. Of the 183 Member States included in the analysis, WHO received designated officials from 121 Member States; AFRO[4] (20), AMRO (18), EMRO (19), EURO (35), SEARO (10), WPRO (19), and received feedback, comments and/or data from 71 Member States. During the consultation period, new data submitted by countries were reviewed to determine whether they met the study's inclusion criteria. Data were considered acceptable to use as new input data if they were representative of the national population and referred to a specific time interval within the period from the late 1980s until the present

As a result of the country consultation and updated civil registration data, 232 new country-years of data observations were included for the maternal mortality estimates from 65 countries and consisted of 94 country-years of civil registration data and 138 country-years from other sources, mainly from sisterhood survey data and maternal mortality surveillance systems.

As in the previous country consultation, the new observations were from civil registration systems and surveys; however, the increase in number of other new observations also shows that countries lacking functioning civil registration systems are increasingly investing in monitoring maternal mortality with empirical data from alternative sources.

[4] AFRO: Regional Office for Africa; AMRO: Regional Office for the Americas; EMRO: Regional Office for the Eastern Mediterranean; EURO: Regional Office for Europe; SEARO: Regional Office for South-East Asia; WPRO: Regional Office for the Western Pacific.

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ISBN 978 92 4 150722 6

Cover photos (left to right): WHO, WHO, Gates Foundation - T. Greaves, UNICEF - Pirozzi