

## Maternal Mortality Italy 2000-2020

Internationally comparable MMR estimates by the Maternal Mortality Inter-Agency Group (MMEIG): WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division

Table 1: Estimates

Year	MMR <sup>a*†</sup>	PM <sup>b*†</sup>	HIV-related indirect deaths <sup>†</sup>	Live births <sup>c</sup> (Thousands)	Maternal deaths <sup>†</sup>
2000	10 [9, 12]	0.01 [0.01, 0.01]	0	541	54
2005	8 [7, 9]	0.01 [0.01, 0.01]	0	556	43
2010	7 [6, 7]	0.01 [0, 0.01]	0	563	38
2015	7 [6, 7]	0 [0, 0.01]	0	479	31
2020	5 [4, 6]	0 [0, 0]	0	410	19

<sup>a</sup> Maternal mortality ratio (MMR) defined as maternal deaths per 100,000 live births for women of reproductive age (15-49 years).

<sup>b</sup> Proportion maternal (PM) defined as the proportion of all-cause deaths for women of reproductive age (15-49 years) that are due to maternal causes.

<sup>c</sup> UN Population Division, Department of Economic and Social Affairs. World Population Prospects. New York; 2022.

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

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

Table 2: Estimates

Period	Annual rate reduction*	Percent change in MMR*
2000, 2020	3.92 [2.75, 5.36]	54.34 [42.3, 65.78]
2010, 2020	3.81 [1.73, 6.4]	31.7 [15.92, 47.25]

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

## Data from civil registration vital statistics system (CRVS)

Table 3: Data from civil registration vital statistics system (CRVS)

Study period <sup>*</sup>	Maternal deaths <sup>a</sup>	Female deaths <sup>b</sup>	CRVS adjustment factor <sup>c†</sup>	Sensitivity <sup>d†</sup>	Specificity <sup>e†</sup>	Completeness <sup>f†</sup>	Usability <sup>g</sup>	Maternal deaths not included <sup>h</sup>
[1985, 1986)	47	10541	3.230059	0.3020716	0.999925	100	0.9876672	NA
[1986, 1987)	31	10744	3.228600	0.3020716	0.999925	100	0.9828742	NA
[1987, 1988)	25	10407	3.227423	0.3020716	0.999925	100	0.9815509	NA
[1988, 1989)	44	10324	3.225384	0.3020716	0.999925	100	0.9844053	NA
[1989, 1990)	26	10130	3.223045	0.3020716	0.999925	100	0.9846989	NA
[1990, 1991)	50	10105	3.220219	0.3020716	0.999925	100	0.9816922	NA
[1991, 1992)	27	10361	3.217363	0.3020716	0.999925	100	0.9864878	NA
[1992, 1993)	41	10226	3.214393	0.3020716	0.999925	100	0.9852337	NA
[1993, 1994)	24	10225	3.210611	0.3020716	0.999925	100	0.9854279	NA
[1994, 1995)	19	10188	3.206898	0.3020716	0.999925	100	0.9872399	NA
[1995, 1996)	17	10446	3.203390	0.3020716	0.999925	100	0.9839173	NA
[1996, 1997)	20	10332	3.200087	0.3020716	0.999925	100	0.9817073	NA
[1997, 1998)	23	9403	3.196108	0.3020716	0.999925	100	0.9807508	NA
[1998, 1999)	17	9297	3.192428	0.3020716	0.999925	100	0.9848338	NA
[1999, 2000)	14	8671	3.188978	0.3020716	0.999925	100	0.9801638	NA
[2000, 2001)	16	8610	3.186318	0.3020716	0.999925	100	0.9793264	NA
[2001, 2002)	11	8436	3.183559	0.3020716	0.999925	100	0.9781887	NA
[2002, 2003)	17	8289	3.181132	0.3020716	0.999925	100	0.9791290	NA
[2003, 2004)	28	8355	3.178444	0.3020716	0.999925	100	0.9745063	NA
[2004, 2005)	20	7881	3.175540	0.3020716	0.999925	100	0.9788098	NA
[2005, 2006)	14	7893	3.172302	0.3020716	0.999925	100	0.9774484	NA

<sup>a</sup> Maternal deaths from CRVS defined as ICD10 codes O00-O95; O98-O99 Pregnancy, childbirth and the puerperium and A34 Obstetrical tetanus. Late maternal deaths (O96) and those deaths due to sequelae of obstetric complications (O97) are excluded for the purposes of international comparison. WHO. International statistical classification of diseases and related health problems. Geneva; 2010.

<sup>b</sup> Female deaths 15-49 from the Civil Registration and Vital Statistics System (CRVS).

<sup>c</sup> CRVS adjustment factor = adjustment factor to account for the difference between CRVS-reported PM and true PM.

<sup>d</sup> Sensitivity = proportion of correctly classified maternal deaths out of all true maternal deaths.

<sup>e</sup> Specificity = proportion of correctly classified non-maternal deaths out of all true non-maternal deaths.

<sup>f</sup> Completeness = percentage of registered deaths of females of reproductive age.

<sup>g</sup> Usability = percentage of deaths that is estimated to be recorded with a well-defined code; completeness proportion\*(1-proportion ill-defined)\*100.

<sup>h</sup> Did not meet inclusion criteria due to: 1) low completeness and usability, or 2) other specialized studies are used. Please see next section of the profile for details.

\* Kindly note the interpretation of notation: for a period [a,b) the observation starts on date a and ends before date b; thus a period covering 1st January 2000 through 31st December 2000 is denoted [2000,2001).

† Peterson E, Chou D, Moller A-B, Gemmill A, Say L, Alkema L. Estimating maternal mortality using data from national civil registration vital statistics systems: A Bayesian hierarchical bivariate random walk model to estimate sensitivity and specificity of reporting. arXiv:190908578 [stat] [Internet]. 2019 Sep 18 [cited 2021 Aug 11]; Available from: <http://arxiv.org/abs/1909.08578>.

## Excluded data from CRVS

Table 4: Excluded data from CRVS

Study period*	Completeness <sup>a</sup>	Usability <sup>b</sup>	Reason for exclusion
[2006, 2007)	100	97.57695	CRVS overlaps with specialized study
[2007, 2008)	100	97.61812	CRVS overlaps with specialized study
[2008, 2009)	100	97.98640	CRVS overlaps with specialized study
[2009, 2010)	100	97.56608	CRVS overlaps with specialized study
[2010, 2011)	100	97.50475	CRVS overlaps with specialized study
[2011, 2012)	100	97.06204	CRVS overlaps with specialized study
[2012, 2013)	100	97.41927	CRVS overlaps with specialized study
[2013, 2014)	100	97.62240	CRVS overlaps with specialized study
[2014, 2015)	100	97.69752	CRVS overlaps with specialized study
[2015, 2016)	100	97.32291	CRVS overlaps with specialized study
[2016, 2017)	100	97.17141	CRVS overlaps with specialized study
[2017, 2018)	100	97.49723	CRVS overlaps with specialized study

<sup>a</sup> Completeness = percentage of registered deaths of females of reproductive age.

<sup>b</sup> Usability = percentage of deaths that is estimated to be recorded with a well-defined code; completeness proportion\*(1-proportion ill-defined)\*100.

\* Kindly note the interpretation of notation: for a period [a,b) the observation starts on date a and ends before date b; thus a period covering 1st January 2000 through 31st December 2000 is denoted [2000,2001).

## Data from other sources

Table 5: Data from other sources

Study period*	Source	Source type	Maternal deaths <sup>a</sup>	Preganancy-related deaths <sup>b</sup>	Female deaths, 15-49	Maternal PM <sup>c</sup>	Pregnancy-related PM <sup>d†</sup>	MMR per 100,000 lb <sup>e</sup>	Adjusted MMR per 100,000 lb	F+ <sup>f†</sup>	F- <sup>g†</sup>	U+ <sup>h†</sup>
[2006, 2007)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	42	NA	7635	0.0055010	NA	7.185658	7.185658	NA	NA	0
[2007, 2008)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	31	NA	7683	0.0040349	NA	5.238167	5.238167	NA	NA	0
[2008, 2009)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	40	NA	7499	0.0053340	NA	6.663381	6.663381	NA	NA	0
[2009, 2010)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	49	NA	7642	0.0064119	NA	8.260146	8.260146	NA	NA	0
[2010, 2011)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	39	NA	7374	0.0052889	NA	6.653809	6.653809	NA	NA	0
[2011, 2012)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	44	NA	7318	0.0060126	NA	7.761484	7.761484	NA	NA	0
[2012, 2013)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	33	NA	7246	0.0045542	NA	5.945241	5.945241	NA	NA	0
[2013, 2014)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	38	NA	7108	0.0053461	NA	7.116262	7.116262	NA	NA	0
[2014, 2015)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	36	NA	6645	0.0054176	NA	7.035228	7.035228	NA	NA	0
[2015, 2016)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	36	NA	6649	0.0054143	NA	7.274894	7.274894	NA	NA	0

Table 5: Data from other sources (*continued*)

Study period <sup>*</sup>	Source	Source type	Maternal deaths <sup>a</sup>	Preganancy-related deaths <sup>b</sup>	Female deaths, 15-49	Maternal PM <sup>c</sup>	Pregnancy-related PM <sup>d‡</sup>	MMR per 100,000 lb <sup>e</sup>	Adjusted MMR per 100,000 lb	F+ <sup>f†</sup>	F- <sup>g†</sup>	U+ <sup>h†</sup>
[2016, 2017)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	27	NA	6505	0.0041507	NA	5.592694	5.592694	NA	NA	0
[2017, 2018)	Italian Obstetric Surveillance System (ItOSS), 2022	Specialized study	25	NA	6313	0.0039601	NA	5.533578	5.533578	NA	NA	0

<sup>a</sup> Maternal deaths defined according to the ICD-10.

<sup>b</sup> Pregnancy-related deaths defined according to ICD-10.

<sup>c</sup> Maternal PM is calculated when deaths are defined as maternal.

<sup>d</sup> Pregnancy-related PM is calculated when reported deaths are defined as pregnancy related deaths.

<sup>e</sup> The MMR in this column is calculated from the PM.

<sup>f</sup> False positive: true non-maternal death which may be incorrectly labeled as a maternal death.

<sup>g</sup> False negative: maternal death which may be incorrectly classified as a non-maternal death.

<sup>h</sup> Maternal deaths not registered in the CRVS.

<sup>\*</sup> Kindly note the interpretation of notation: for a period [a,b) the observation starts on date a and ends before date b; thus a period covering 1st January 2000 through 31st December 2000 is denoted [2000,2001).

<sup>†</sup> Calculated from studies which undertake specialized analyses of routine reporting of maternal deaths.

<sup>‡</sup> Survey data has been adjusted by 1.1 for underreporting and standardized by age when obtained using the direct sisterhood method.

<sup>§</sup> For further information on the ItOSS methodology see: Donati S, Maraschini A, Lega I, D'Aloja P, Buoncristiano M, Manno V, et al. Maternal mortality in Italy: Results and perspectives of record-linkage analysis. *Acta Obstet Gynecol Scand* 2018 Nov; 97(11):1317-1324

## Data from studies excluded in regression

No data excluded

## Predictor variables used in the model

Table 6: Predictor variables used in the model

Year	GDP <sup>a*</sup> (Per capita, PPP)	GFR <sup>b</sup> (Per 1000 women ages 15-49)	SBA <sup>c</sup> (%)
2000	42637	40	100
2005	44487	40	100
2010	42751	40	100
2015	40567	40	100
2020	41450	30	100

<sup>a</sup> WHO, MMEIG. Gross domestic product (GDP) per capita measured in purchasing power parity (PPP) equivalent dollars using 2017 as the baseline year were taken from World Bank's World Development Indicators (WDI) database, and in instances supplemented by unofficial estimates derived by MMEIG using growth rates in United Nations GDP data and/or previous MMEIG GDP estimates. Geneva; 2021.

<sup>b</sup> General fertility rate (GFR) from UN Population Division, Department of Economic and Social Affairs. World Population Prospects. New York; 2022.

<sup>c</sup> Skilled Birth Attendant (SBA) from WHO, UNICEF joint SBA database. Geneva; 2022. In some instances, supplemented with unofficial estimates derived by MMEIG. Annual series were estimated by fitting a multilevel time series (AR1) model with region- and country-specific intercepts and slopes.

\* A 5-year moving average was calculated.



## Estimates

(Input data) The following adjustments were applied to maternal deaths depending on the source type:

1. An age-standardization was applied to population based surveys that obtained data from the direct sisterhood method.
2. An upward adjustment of 10% was applied to all input data that were not obtained from CRVS or specialized studies, to account for underreporting.

(Model adjusted data) The following model adjustments were applied to maternal deaths depending on the source type and the definition of reported deaths

1. A model adjustment derived from BMIs was applied to maternal deaths obtained from CRVS.
2. A model adjustment was applied to observations of pregnancy-related deaths to remove accidental/incidental (non-maternal) deaths from the count.

