Maternal Mortality in Brazil

Euro Health Care Conference

Célia Landmann Szwarcwald
Valencia, September, 1 2015
celia.szwarcwald@icict.fiocruz.br

Team

Célia Landmann Szwarcwald Fiocruz, MoH

Wanessa Almeida Fiocruz, MoH

Paulo Roberto Borges de Souza Júnior, Fiocruz, MoH

Paulo Frias, Instituto de Medicina Integral Professor Fernando Figueira (IMIP), PE

Juan José Cortez Escalante, Secretary of Health Surveillance, MoH

Dácio de Lyra Rabello Neto, Secretary of Health Surveillance, MoH

Cesar Gomes Victora, Federal University of Pelotas, RS

Contextualization

- Mortality due to complications during pregnancy, childbirth or the postpartum period, known as maternal mortality, is considered a highly preventable cause of death and has been the focus of national and international efforts aimed at its reduction.

- Target of the fifth Millennium Development Goal – recommendation of reduction by three-quarters from 1990 to 2015.

Bhutta ZA, et al. Lancet 2010; 375:2032-44; Campbell OM, Graham WJ.. Lancet 2006; 368:1284-99.

Contextualization

➢However, monitoring progress towards this target is challenging, mainly due to difficulties in obtaining reliable data.

➢Even in developed countries, which have comprehensive vital registration systems, maternal deaths may be underreported due to:

- ✓misclassification in other causes of death
- ✓absence of specific information on maternal death in the death certificate.

Hill K et al. Lancet 2007; 370:1311-9; Graham WJ et al. BMC Medicine 2008; 6:12.

About Brazil

- Brazil is the fifth largest country in the world,, both by geographical area and population, with more than 200,000 inhabitants.
- Brazilian population is very diverse, comprising many races and ethnic groups.
- The country is divided into 27 states, which are subdivided into more than 5000 municipalities, with population varying from 800 to 11 million.

• About 34% of the population lives in small municipalities, which have, in general, worst socioeconomic conditions.



Socio-demographic changes in Brazil

- In the last 30 years, Brazil has undergone several changes in terms of socioeconomic development, urbanization and health care.
- The growth of urbanization, the improvement in women education, the greater female participation in the labor market and the increased availability of contraceptive methods resulted in a sharp decrease in fertility with direct and indirect effects on reproductive health.
- In the years 2000s, government cash transfer programs to the poorest resulted in the increase of the average income and in changes in the distribution of income. However, Brazil still is a country of contrasts.

Victora CG et al. Lancet 2011; 377:1863-76; Rasella et al. Lancet. 2013; 382(9886):57-64.

Rio de Janeiro: luxury buildings and the “favela of Rocinha” side by side.



Outdoor kitchen in the rural area of Amazonas, Brazil



Brazilian Health System

- In terms of health care, the country has evolved to a unified health system with profound changes in health care policies and a great expansion of primary health care.
- The Family Health Program was implemented as a national policy for primary care, giving priority to municipalities with the worst socioeconomic levels located in the North and Northeast.
- During these years, a set of programs was formulated by the Ministry of Health that focused on reducing child and maternal mortality.
- Coverage of prenatal care is 97% (at least one visit) and of 63% (at least 7 visits) ; Coverage of skill birth attendance is 98%.

Paim J et al. Lancet. 2011 May 21;377(9779):1778-97.

Primary Health Care Unit. Rural area of Amazonas, Brazil



Homebirth. Rural area, Northeast Region



Sources of Information: Vital Statistics

- The Brazilian Ministry of Health has two vital information systems:
  - **Mortality Information System:** created in 1976, based on the death certificate. Coverage: **95%**.
  - **Live Birth Information System**, created in 1994, which has information on the birth conditions and characteristics of the mothers. Coverage: **96%**.

Underreporting of deaths

- In recent years, many government initiatives have been taken to expand coverage and improve the quality of vital information including:
  - ✓Proactive search in the Amazonia and Northeast to capture vital events not informed to the MoH;
  - ✓Strategies for reducing ill-defined causes of death;
  - ✓Integration with other MoH information systems, such as the Hospitalization Information System and Primary Health Care Information System, at local, regional and national level.
- Despite the progress, there are still areas that have precarious information on vital events, making it necessary to use correction factors to obtain mortality indicators with reliability.

Indigenous community, MariMarí, Amazonas, 2014



Indigenous community, MariMarí, Amazonas, 2014



Underestimation of maternal deaths

- In Brazil, estimates of maternal mortality rates are affected not only by underreporting of deaths, but also by misclassification of maternal deaths in other causes.

- A *Reproductive Age Mortality Survey (RAMOS*) carried out in all state capitals, 2002 showed that many maternal deaths had been wrongly attributed to other causes of death.

- Similarly, research conducted in the State of São Paulo showed that maternal deaths were underestimated in official data.

Laurenti R et al. Rev Bras Epidemiol 2004; 7:449-60; Tognini S et al. Rev Assoc Med Bras 2011; 57:402-7

Investigation of deaths

- From 2006 on, with the government commitment in reducing maternal mortality, there is a recognition of the role of surveillance of maternal deaths:
  - Maternal Mortality Committees have been set up at the national, regional, state, municipal and hospital levels;
  - Investigation of deaths of women of childbearing age (10-49 years) has largely expanded
- These various government initiatives have promoted improvements in detecting and reporting maternal deaths.

MMR: Definition and Estimation Problems

- The maternal mortality ratio (MMR) is defined as the number of maternal deaths per 100,000 Live Births (LB).
- The MMR is the health indicator used both to scale the magnitude of maternal mortality as well as to assess spatial and time trends.
- Estimation problems of the MMR in Brazil:
  - ✓ Underreporting of deaths among women aged 10-49 years
  - ✓ Underreporting of Live Births
  - ✓ Underestimation of maternal deaths due to misclassification of maternal deaths in other causes of death

Estimation of MMR in Brazil

- Use factors to correct vital data for underreporting based on the proactive search of deaths and live births in the North and Northeast Regions.
- Use results of the investigation of deaths among women in childbearing age to reclassify non investigated deaths.
- Among investigated deaths, it is possible to know the cause of death initially informed (before investigation) and the cause of death after investigation.
- The investigated deaths are categorized according to:
  - ✓ Period in which death occurred (perinatal period or not);
  - ✓ Original cause of death (presumed maternal death* or not);
  - ✓ Final cause of death (maternal death of not);
- For each category, proportions of deaths classified as maternal deaths after investigation are calculated.

•(A400-A403; A408-A419; A542; D65; G400-G409; G932; I10; I210-I214; I219; I269; I429; I469; I500; I509; I64; I740-I749; J100-J101; J108; J110-J111; J118; J120-J122; J128-J129; J13-J14; J150-J160; J180- J182; J188-J189; J81; K650; K658-K659; K720; N170-N172; N178-N179; N710-N711; N719; N733-N739; R568; R571; R578; R58; R98; R99; Y480-485; Y579)

Szwarcwald et al., Population Health Metrics, 2014; Szwarcwald et al., Cadernos de Saúde Pública, 2014

Proportion of deaths reclassified as maternal deaths after investigation according to period in which death occurred and original cause of death. Brazil, 2008-13

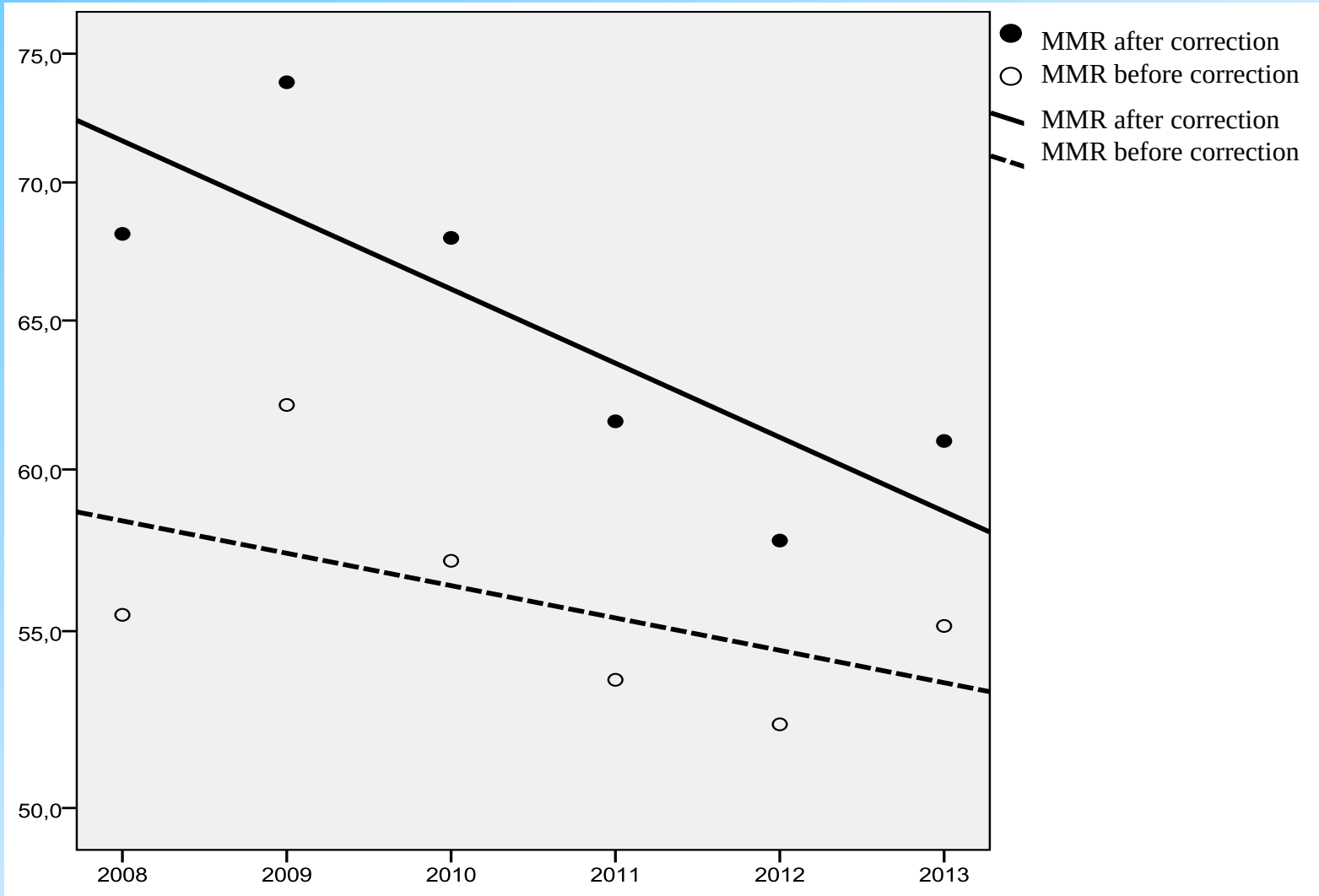
Period of death occurrence	Original cause of death (before investigation)	Classified as maternal death after investigation		Number of investigated deaths	Proportion (%) of deaths reclassified as maternal
		No	Yes		
Outside the perinatal period	Not presumed maternal death	151520	55	151575	0.04
	Presumed maternal death	40384	59	40443	0.15
	Maternal death	69	169	238	71.01
	Late Maternal death	1	0	1	0.00
Perinatal period (during pregnancy and the first year postpartum)	Not presumed maternal death	3735	1056	4791	**22.04**
	Presumed maternal death	1234	944	2178	**43.34**
	Maternal death	144	4313	4457	96.77
	Late Maternal death	95	12	107	11.21
Not known	Not presumed maternal death	12830	11	12841	0.09
	Presumed maternal death	3766	19	3785	0.50
	Maternal death	4	34	38	89.47
	Late Maternal death	0	0	0	0.00
Total		213782	6672	220454	3.03

Corrected number of maternal deaths* and corrected maternal mortality ratio . Brazil, 2008 -2013

Year	Number of investigated deaths	Expected maternal deaths among non investigated deaths	Corrected* number of maternal deaths	Corrected number of live births	MMR (/100000 LB)
2008	1001	917	2063	3029626	**68.1**
2009	1276	801	2226	3013692	**73.9**
2010	1090	825	2045	3009345	**67.9**
2011	1049	689	1850	3005005	**61.6**
2012	1033	613	1748	3026357	**57.7**
2013	1223	536	1862	3056878	**60.9**

* Corrected by misclassification of maternal deaths and underreporting of deaths among women aged 10-49 years.

Maternal Mortality Rate(per 100000 LB) before and after correction of data. Brazil, 2008 to 2013



Proportion (%) of investigated deaths of women aged 10-49 years. Brazil, 2008-13

Year	Number of deaths Women 10-49 y	% Investigation	Initial number of maternal deaths	Number of maternal deaths after investigation
2008	65391	47.0	1379	1681
2009	67116	54.2	1472	1872
2010	66497	57.3	1430	1719
2011	67006	56.0	1298	1610
2012	66874	56.3	1230	1583
2013	66790	60.9	1288	1686

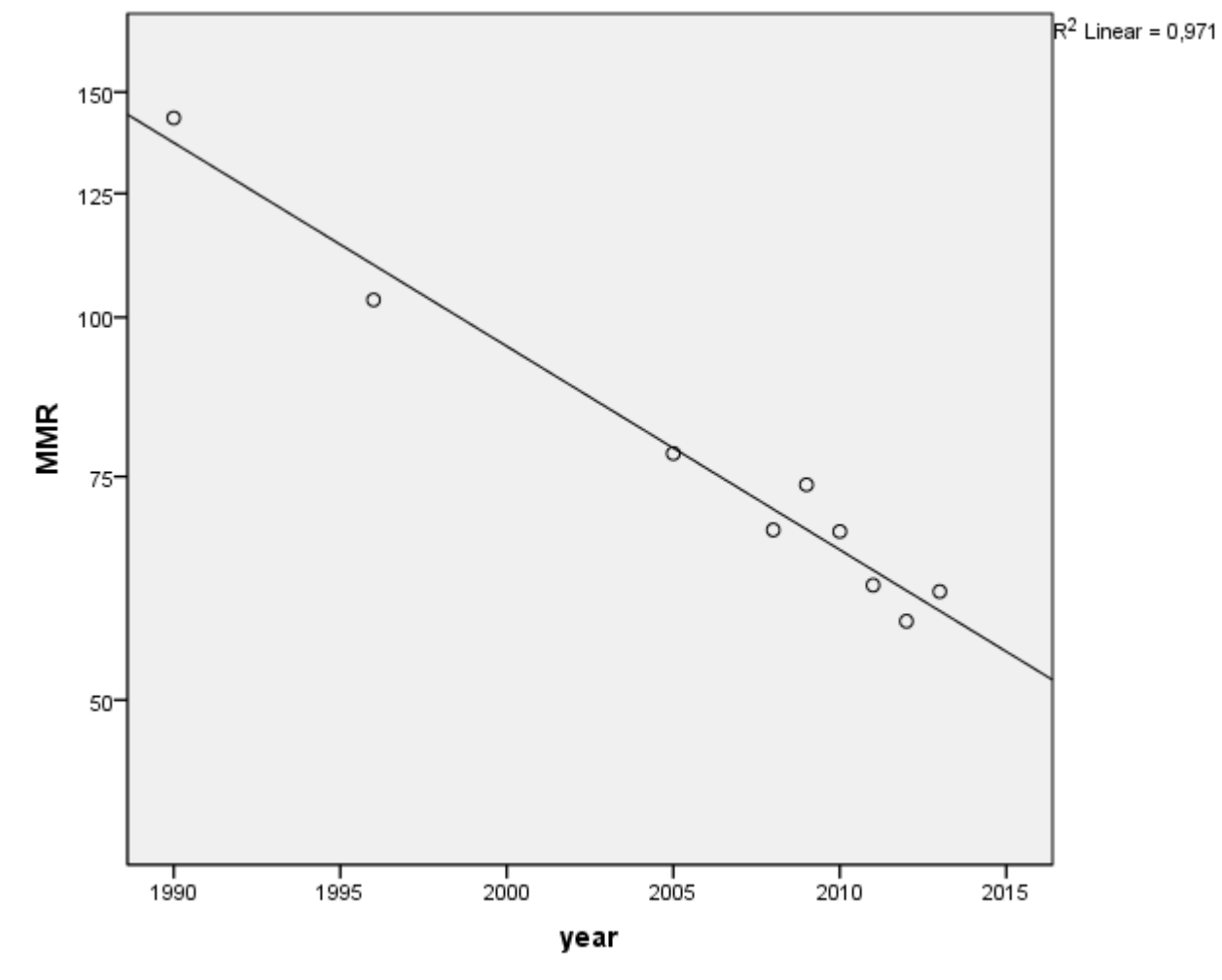
Correction factors due to misclassification of maternal deaths and correction factors due to cause misclassification and underreporting. Brazil, 2008 a 2013

Year	Number of Maternal Deaths				Correction factors			
	Initial (1)	After investigation (2)	Corrected by incorrect classification (3)	Corrected by incorrect classification and underreporting (4)	(3)/(1)	(3)/(2)	(4)/(1)	(4)/(2)
2008	1379	1681	1918	2063	1.39	1.14	1.50	**1.23**
2009	1472	1872	2077	2226	1.41	1.11	1.51	**1.19**
2010	1430	1719	1915	2045	1.34	1.11	1.43	**1.19**
2011	1298	1610	1738	1850	1.34	1.08	1.43	**1.15**
2012	1230	1583	1646	1748	1.34	1.04	1.42	**1.10**
2013	1288	1686	1759	1862	1.37	1.04	1.45	**1.10**

Maternal mortality rate estimates. Brazil, selected years

Ano	RMM (por 100000 NV)
1990	143.2
1996	103.2
2005	78.2
2008	68.1
2009	73.9
2010	67.9
2011	61.6
2012	57.7
2013	60.9
Taxa Anual de Decréscimo (%)	3,7% * (p<1%)

Time trend of the maternal mortality ratio (MMR/100000 LB). Brazil, 1990-2012



MMR Subnational Estimates. States and Regions. Brazil, 2011-13

State/Region	MMR (/ 100000 LB)	
	2010	2012
Rondônia	71.3	69.5
Acre	41.4	52.0
Amazonas	93.9	72.3
Roraima	64.6	58.9
Pará	74.3	81.6
Amapá	59.5	71.7
Tocantins	96.1	75.8
North	**77.8**	**75.0**
Maranhão	**114.0**	**97.4**
Piauí	**101.8**	**101.2**
Ceará	73.4	70.9
Rio Grande do Norte	61.4	67.8
Paraíba	56.6	59.4
Pernambuco	63.3	62.7
Alagoas	55.1	56.9
Sergipe	90.1	76.5
Bahia	87.9	76.1
Northeast	**80.8**	**74.9**

State/Region	MMR (/ 100000 LB)	
	2010	2012
Minas Gerais	55.5	49.2
Espírito Santo	72.3	58.6
Rio de Janeiro	**85.7**	**79.0**
São Paulo	52.3	41.8
Southeast	**60.4**	**51.4**
Paraná	63.3	45.3
Santa Catarina	36.9	37.2
Rio Grande do Sul	55.7	51.0
South	**54.5**	**45.5**
Mato Grosso do Sul	76.4	64.1
Mato Grosso	76.7	72.6
Goiás	61.0	60.7
Distrito Federal	48.7	48.0
Center-West	**65.0**	**61.6**

Causes of Maternal Deaths. Brazil, 2013

Causes	Direct [1]		Indirect [2]		Not Specified	
Total	**1148**	**68.1**	**480**	**28.5**	**58**	**3.4**
Related to HIV	-	-	34	7,1	-	-
Abortions	141	**12,3**		0,0	-	-
Hypertensive Disorders	342	**29,8**	30	6,3	-	-
Provided care to the mother (related to problems with the fetus, amniotic cavity, placenta, and childbirth)	75	**6,5**		0,0	-	-
Other disorders related to pregnancy	95	**8,3**	8	1,7	-	-
Complications related to labor and delivery	259	**22,6**		0,0	-	-
Hemorrhage postpartum	98	**8,5**				
Puerperal infections	106	**9,2**				
Other complications related to the puerperium	25	**2,2**		0,0	-	-
Other maternal complications not classified elsewhere	7	0,6	408	85,0	58	100,0

1. **Direct causes** are those related to obstetric complications of pregnancy, labor and delivery, and the post-partum periods.
2. **Indirect causes** are those relating to pre-existing medical conditions that may be aggravated by pregnancy.

Final Considerations

- Interest in health indicator estimates has grown considerably with the looming deadline for achieving the *Millennium Development Goal*.
- However, estimating reductions in maternal mortality is more complex than other health indicators such as infant and child mortality.
- First, confusion exists between **maternal deaths** and **mortality during pregnancy** caused by infectious diseases and external causes which are considered non-maternal deaths. So, household surveys using verbal autopsy may lead to an overestimation of maternal mortality.
- Secondly, in countries where abortion is illegal, maternal deaths due to unsafe practices are hidden and not always reported.

Hill et al. Bull World Health Organ 2009; 87:288-95; Diniz & Medeiros. Ciênc Saúde Coletiva 2012; 17:1671-81; Singh S. Lancet 2006; 368:1887-92.

Final Considerations

- Another difficulty in estimating maternal mortality is the misclassification of maternal deaths in other causes. This requires specific investigation procedures to obtain reliable statistics.

- Studies conducted in different countries to identify maternal deaths wrongly attributed to other causes showed an average correction factor of **1.5**, corroborating the results here depicted.

- In Brazil, due to expansion of investigation of deaths among women aged 10-49 years the correction factor decreased from 1.4 (before investigation) to 1.04 (after investigation).

- The MMR estimates showed an annual reduction rate of **3.7%**, decreasing from **143** to **61**/100000 LB, from 1990 to 2013. However, 2009 was an atypical year and the MMR increased to over 70 per 100,000 live births, probably due to the H1N1 influenza epidemic which hit Brazil and other countries that year.

Final Considerations

- Despite the downward trend during the period 1990 to 2011, the results presented by this study indicate that MMR in Brazil is still unacceptably high.

- These high rates seem to be inconsistent with progress in health care, such as an increase in coverage of antenatal and childbirth care, and the social transformations experienced by Brazilian society, including improved socioeconomic status and a sharp drop in fertility.

- Based on the MDG, MMR in Brazil in 2013 was expected to be 40 per 100,000 live births, far below the estimated rate.

- In relation to sub-national MMR estimates, in 8 states and in the North and Northeast regions, the MMR exceeded 70 per 100000 LB.

Lozano et al. Lancet 2011; 378:1139-65; Victora et al. Lancet 2011; 377:1863-76; Hogan et al. Lancet 2010;375:1609-23.

The 3 Delays

➢A conceptual framework proposed by *Thorsen et al. (2012)* for the analysis of maternal mortality or “maternal near miss” is based on delays in care during the three stages of labor :

1. Delay in the decision to seek skilled attendance;
2. Delay in access to a health care facility that is able to provide emergency obstetric care services;
3. Delay in receiving adequate care on entering the health care facility.

➢ These three delays are not independent, and one delay can affect the other, resulting in complications or death.

Thorsen et al. PLoS One 2012.

Brazilian Scenario

- Although all Brazilian women have a guaranteed right to receive free care during pregnancy and childbirth, many still experience difficulty in being admitted to hospital during labor (10%) due to lack of hospital beds, causing a delay in receiving care.
- Other delays are related to the lack of quality in health care provided and the insufficient number and unequally distributed units of intensive care. The proportion of deaths among women with **direct** obstetric complications is significantly lower in the developed world.
- The most frequent cause of death was “pre-eclampsia, and eclampsia” (29.8%), which was followed by “complications related to labor and deliver” (22.6%) and “complications in the puerperium” (19.9%).
- Another problem is the excessive number of unnecessary caesarean sections and excessive medicalization.

Khalid et al. Lancet 2006; 367: 1066–74.

Conclusions

- Although the maternal mortality rates observed by this study do not meet the target of the fifth Millennium Development Goal, the findings point to an overall reduction in MMR during the period 1990 to 2013, with an average annual reduction rate of 3.7%.
- Despite the improvements, these results must not be viewed with complacency. On the contrary, each maternal death needs to be understood as a failure of the health system and a violation of reproductive rights.
- Advances should stimulate expansion of coverage and quality of death investigation in all states, so that barriers that limit access to quality maternal health services can be identified and addressed at all levels of the health system.

Thank You!