

# DISPARITY OF ACCESS & QUALITY

REVIEW OF MATERNAL MORTALITY  
IN FIVE REGION IN INDONESIA



KEMENTERIAN KESEHATAN REPUBLIK INDONESIA  
UNITED NATIONS POPULATION FUND (UNFPA)

2012

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# DISPARITY

## OF ACCESS *&* QUALITY

### REVIEW OF MATERNAL MORTALITY IN **FIVE REGION IN INDONESIA**

NATIONAL INSTITUTE OF HEALTH  
RESEARCH AND DEVELOPMENT  
MINISTRY OF HEALTH REPUBLIC OF INDONESIA  
UNITED NATIONS POPULATION FUND (UNFPA)  
2012



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# PREFACE

*Assalamu'alaikum wr. wb*

Praise to the Lord Almighty for His blessings, so this report on "Review of Maternal Mortality in 5 Region in Indonesia" is well prepared. This review is the first time that nearly 4000 cases of maternal mortality have been analyzed– that number is around 50 percent of all maternal deaths recorded the 2010 Population Census. With such a large number of cases being reviewed, it is possible to do inter-regional analysis, comparing results from Sumatera, Java-Bali, Kalimantan, Sulawesi, and Eastern Indonesia.

This publication examines characteristics and causes of maternal deaths, as well as information on quality of care and conditions in health facilities, which can be related to the maternal mortality ratio.

I would like to extend my appreciation to the research team, especially Dr. TetiTejayanti, MKM and Ms. Kristina Sabatini, SKM, M.Epid, who have worked so hard in analyzing and accommodating enormous inputs from many experts, enabling this report to be presented so well. I would like also to thank UNFPA for its support in developing and publishing this report. To all contributors, thank you for the invaluable inputs to developing the review.

This report will be a great reference for improvement in the general health programme and the maternal health programme in particular. This macro review is expected to be followed up with further research in every region. The results and recommendations are expected to be implemented to improve the maternal health programme to accelerate efforts to achieve MDGs, particularly maternal mortality reduction.

*Billahit taufiq walhidayah, wassalamu'alaikum wr. wb.*

**Head Of Balitbangkes**



Dr. dr. Trihono, M.Sc

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# EXECUTIVE SUMMARY

The Maternal Mortality Ratio (MMR) in Indonesia is higher than those of neighboring countries in ASEAN. It is estimated that 20,000 women die from complications of pregnancy or childbirth per five million births each year. According to a UNDP report, the risk of maternal death in Indonesia is 1 in 65 mothers, compared to 1 in 1,100 mothers in Thailand. To reduce maternal death, it is necessary to examine the causes of maternal death. Much information on the causes of death has been obtained, but this has not been adequately analyzed by region, despite the disparities among regions. Such information is very important because different health statuses require different interventions. Therefore, the National Institute of Health Research and Development (Balitbangkes), under the Ministry of Health, in collaboration with BPS-Statistics Indonesia and University of Indonesia conducted the SP2010 Follow-up Study and Review Maternal Mortality Determinant in five regions in order to obtain information on the causes of maternal deaths.

The results show a correlation between high maternal mortality ratio and the highest medical causes of maternal mortality with low quality of health services at Basic Emergency Obstetric and Neonatal Care (BEONC/ PONEC) and Comprehensive Emergency Obstetric and Neonatal Care (CEONC/ PONEK) facilities. The review found that the most common causes of maternal deaths are hypertension in pregnancy and post-partum hemorrhage. The highest maternal mortality ratio for both causes correlated with lowest antenatal care (ANC) coverage and quality of health services, particularly inadequate essential medicines for maternal health.

## Matrix MMR (SP2010) with proportion services performance in 5 regions in Indonesia (Risksdas 2010)

MMR	Region					Indonesia
	Sumatera	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
	262	227	340	459	434	278
THE RATIO OF MATERNAL DEATH CAUSES						
1. Hypertension during pregnancy	38	33	52	65	49	39
2. Post-partum bleeding	19	17	41	52	56	25
3. Other causes	32	34	40	48	56	37
DETERMINANTS OF MATERNAL DEATHS						
ACCESS						
1. Antenatal Care Visits (K4)	65,3	77,5	62,0	41,8	63,1	71,9
2. Skilled-Birth Attendance	86,1	80,1	68,5	63,6	67,9	78,6
QUALITY						
BEONC:						
% Of cities that have 4 BEONC facilities	6,0 (from 34 cities)	17,0 (from 35 cities)	-	36,0 (from 11 cities)	11,0 (from 9 cities)	-
% Of districts that have 4 BEONC	55,0 (from 117 cities)	75,0 (from 92 cities)	54,0 (from 46 cities)	66,0 (from 61 cities)	42,0 (from 82 cities)	-
Jumlah Puskesmas PONEC	390	709	132	238	205	1674
CEONC:						
24-hour operation room	69,7	81,1	67,6	62,2	62,5	-
24-hour operation team	70,2	84,1	63,5	45,6	62,5	-
24-hour blood transfusion services	50,5	63,1	56,8	46,7	43,8	-
24-hour blood transfusion unit	43,3	37,8	47,3	44,4	36,3	-
Essential CEONC team	38,5	57,1	24,3	34,4	42,5	-



# BACKGROUND

As the fourth most populated country in the world, Indonesia faces both opportunities and threats from its demographic conditions. More than 80 percent of Indonesians, or about 123 million people, are of working age (15-64 years), and at least 50 percent of this group are women.

One indicator that reflects the health status of women is the Maternal Mortality Ratio (MMR),<sup>1</sup> which is the ratio of maternal deaths per 100,000 live births.

When compared to other ASEAN countries, the MMR in Indonesia is relatively high. Here is a glimpse of the success in MMR reduction in other countries:

- According to a World Bank report (2009), Sri Lanka managed to reduce its MMR from 1,056 deaths per 100,000 live births in 1947 to 24 deaths per 100,000 live births by 1996.
- Egypt succeeded in reducing its Maternal Mortality Ratio from 174 to 84 during the period of 1992 to 1993.
- Malaysia, with an MMR of 1,085 per 100,000 live births in the period 1933-1950, decreased it to 19 by 1997.<sup>2</sup>
- Meanwhile, in Indonesia an estimated 20,000 women die from complications of pregnancy or childbirth per five million births each year. The risk of maternal death in Indonesia is 1 in 65 mothers, compared to 1 in 1,100 mothers in Thailand.<sup>3</sup>

In view of Indonesia's maternal mortality problem, it is necessary to examine the causes of maternal deaths so that intervention efforts can be launched to decrease the rate. The national statistics agency BPS-Statistics Indonesia conducted a Population Census in 2010 (SP2010), which for the first time collected information on maternal mortality and maternal death, defined as the death of a woman aged 10 years or older during the period of pregnancy until two months after giving birth. The resulting information on maternal mortality was then followed up by the National Institute of Health Research and Development (Balitbangkes), under the Ministry of Health, by conducting the SP2010 Follow-up Study (STL SP 2010). From the study, the causes of maternal mortality in five regions were examined.

Much information on the causes of death has been obtained, but this has not been adequately analyzed by region, despite the disparities among regions. Such information is very important because different health statuses require different interventions. In this study, the causes of death and disparities in health care in five regions from a variety of data sources are further examined. Data on maternal mortality and its causes were taken from the SP2010, while supporting data on the quality of health care were taken from surviving mothers in the 2010 Basic Health Research (Riskesdas2010) survey, which included data on antenatal care (ANC). Data on Basic Emergency Obstetric and Neonatal Care (BEONC/ PONEK) and Comprehensive Emergency Obstetric and Neonatal Care (CEONC/PONEK) were taken from Research on Health Facilities (Rifaskes 2011).<sup>4</sup>

# OBJECTIVES

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## GENERAL OBJECTIVE

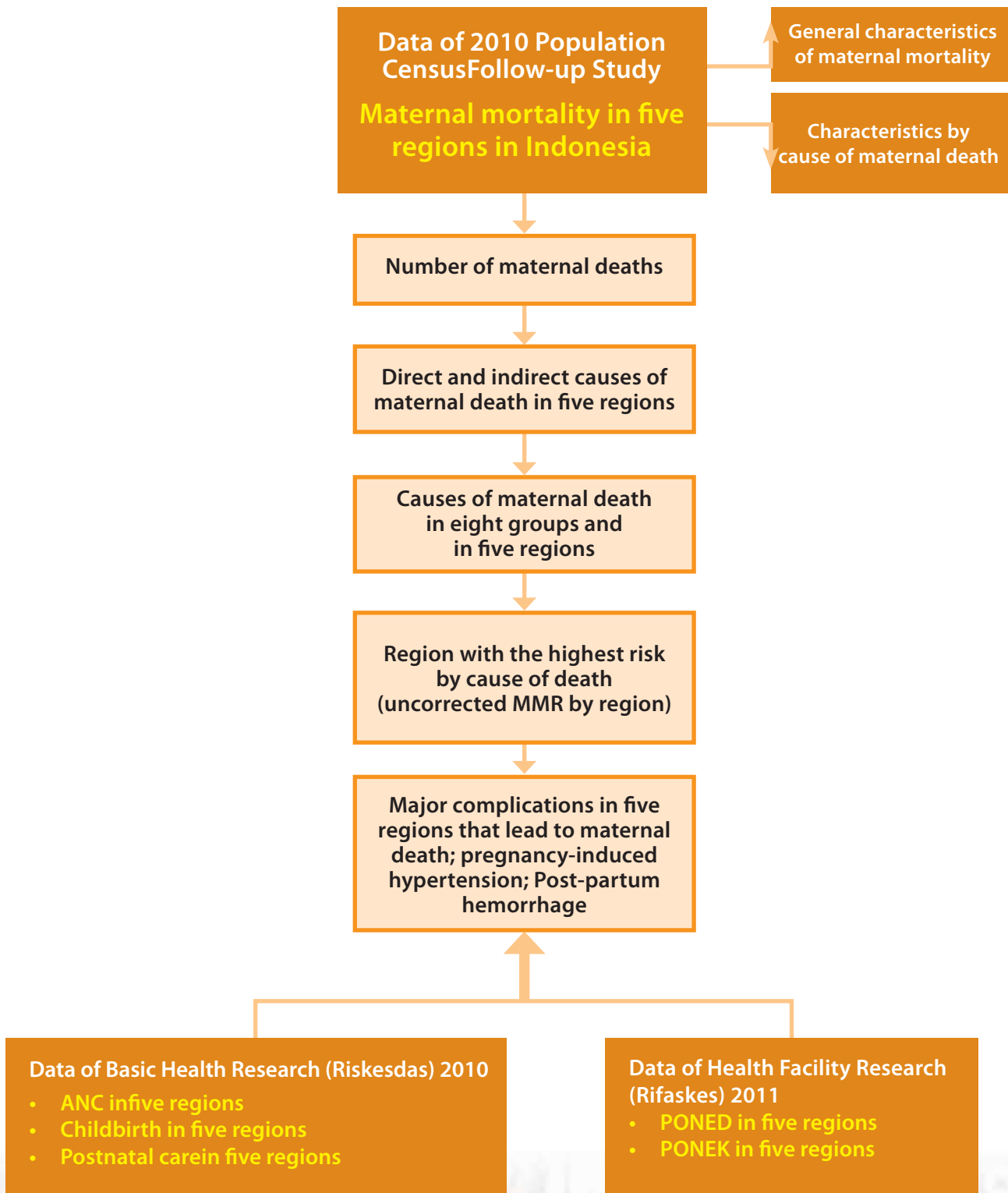
In general, this study aims to determine causes and characteristics of maternal mortality in five regions in Indonesia, based on the SP2010 Follow-up Study.

## SPECIFIC OBJECTIVES

The specific objectives of the study are:

1. To obtain information on the causes of maternal mortality in five regions based on data from the SP2010 Follow-up Study.
2. To assess the characteristics of maternal mortality by cause of death, based on data from the SP2010 Follow-up Study.
3. To assess regional differentials in cases of pregnancy-induced hypertension under pregnancy, childbirth and post-partum care in five regions based on the Riskesdas 2010.
4. To assess regional differentials in cases of post-partum hemorrhage during pregnancy, childbirth and post-partum care in five regions, based on data from the Riskesdas 2010.
5. To assess the availability of services and facilities for PONED and PONEK in five regions based on the Rifaskes 2011.

# FRAMEWORK



# METHODOLOGY

**1. Type of research:** Secondary data study

**2. Data:**

**a) 2010 Follow-up Study to Population Census (STL SP 2010)**

The research scope of the SP 2010 Study of the Causes of Death included all incidents of pregnancy-related death from SP 2010 data. The sample provided by BPS provided an overview of all of Indonesia, and a specific focus on five regions. The sampling method was the Probability Proportional to Size (PPS) technique. Distribution of regions was as follows:

- a. All provinces in Sumatra;
- b. All provinces in Java and Bali;
- c. All provinces in Kalimantan;
- d. All provinces in Sulawesi;
- e. Eastern Indonesia, including the provinces of West Nusa Tenggara (NTB), East Nusa Tenggara (NTT), Maluku, North Maluku and Papua.

Out of 8,464 cases of pregnancy-related death in the results of SP 2010 data, 4,167 cases occurred in 134 sample districts/cities in 27 provinces, 3,384 of which have been selected based on the definition of maternal death.

The instrument used in data collection was a verbal autopsy questionnaire, responses to which were then summarized and a diagnosis or cause of death determined by a physician using MMDS rules, and coded based on the ICD 10, WHO. Identification of the cause of death was based on the underlying cause of death, not the direct cause of death. The reason for this is based on the interests of public health, which prioritizes preventive efforts, although curative efforts must still be carried out in cases of emergency as life-saving measures.

**b) Riskesdas 2010**

The scope of Riskesdas in this study is mothers who have been pregnant and have given birth in the last five years, selected from one particular year. Data was collected in 2010.

**c) Rifaskes 2011**

Rifaskes data looks at 8,981 puskesmas, or nearly all the puskesmas in Indonesia. In particular, this study focused on PONED and PONEK data throughout Indonesia.

**3. Data analysis:** Descriptive, using proportions and ratios.

#### 4. Operational definitions

a. Maternal mortality or death

Definition: The death of a woman while pregnant or within 42 days of termination of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (ICD 9, WHO).<sup>5</sup>

b. Direct cause

Definition: Deaths resulting from obstetric complications of the pregnant state (pregnancy, delivery and post-partum), interventions, omissions, incorrect treatment, or a chain of events resulting from any of the above. (ICD 9, WHO)<sup>5</sup>.

c. Indirect cause

Definition: Deaths resulting from previously existing diseases, or from diseases that developed during pregnancy and did not have direct obstetric causes but were aggravated by the physiological effects of pregnancy. (ICD 10, WHO).<sup>5</sup>

d. Pregnancy-related death

Definition: The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death. (ICD 10, WHO).<sup>5</sup>

e. *Maternal Mortality Ratio* (MMR)

$$\frac{\text{Maternal deaths (direct and indirect)}}{\text{Live births}} \times k$$

The numerator is the number of maternal deaths in the SP 2010 results, while the denominator is the number of live births, obtained from the SP 2010, then multiplied by 100,000. The result, which is verified and determined based on the final underlying cause of death, is called the Maternal Mortality Ratio (MMR), since it is a ratio of maternal deaths to live births.

f. Live Birth (LB) Refers to a live birth during the year as reported by girls and women aged 10-54 years who are still alive plus proxy live births from girls and women in this age group who have died from maternal causes (BPS, 2012).

g. Hypertension in pregnancy (HDK) : Hypertension in pregnancy (HDK), or pregnancy-induced hypertension, is classified as a disease according to code O10-O16, ICD 10, WHO, as follows:

Code O10 : Pre-existing hypertension complicating pregnancy, childbirth and the puerperium.

Code O11 : Pre-existing hypertension disorder with superimposed proteinuria.

Code O12 : Gestational (pregnancy-induced) edema and proteinuria without hypertension.

Code O13 : Gestational (pregnancy-induced) hypertension without significant proteinuria.

Code O14 : Pre eclampsia

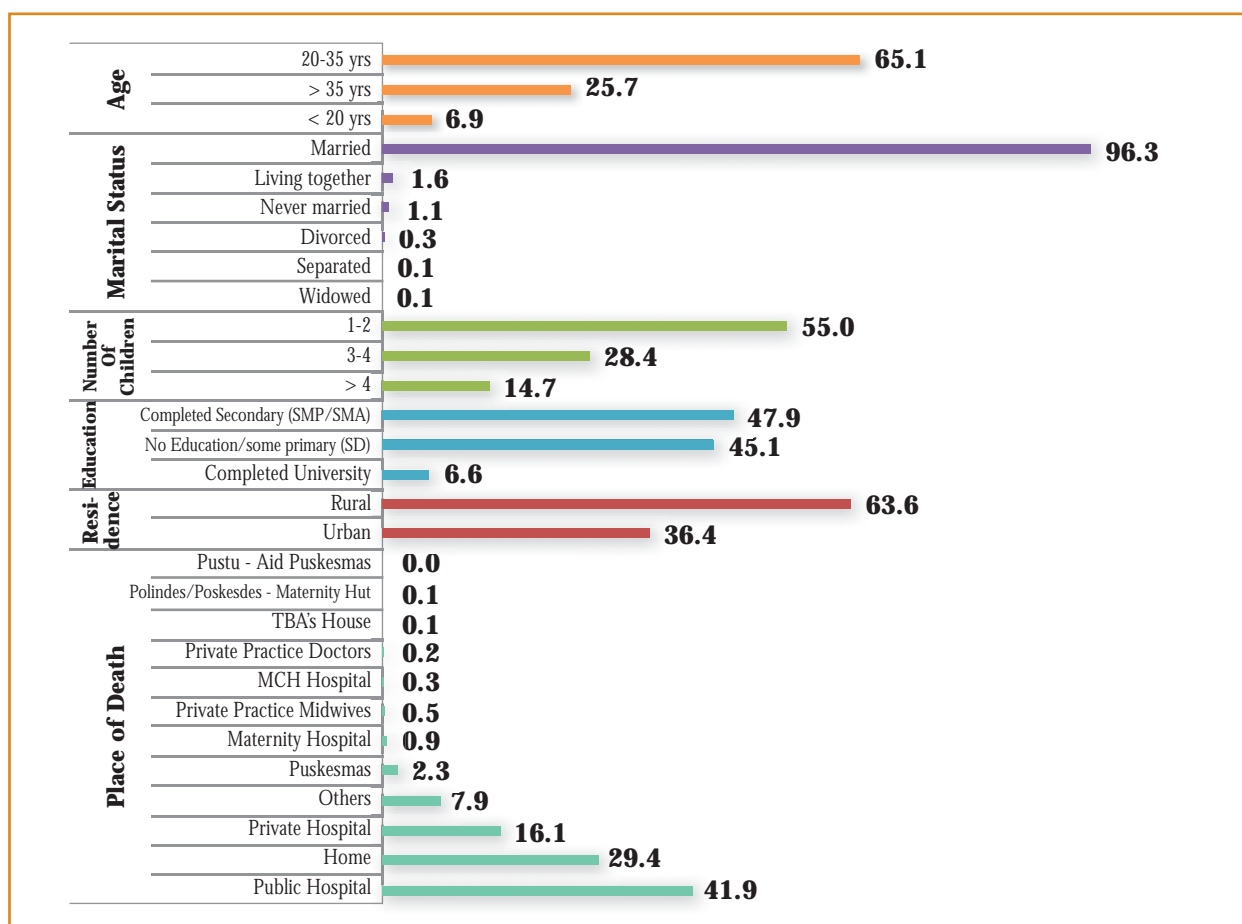
Code O15 : Eclampsia

Code O16 : Unspecified maternal hypertension

h. Post-partum hemorrhage according to code O72, ICD 10, WHO.

# RESULTS AND DISCUSSIONS

## 1. CHARACTERISTICS OF MATERNAL DEATH



Data Source : Follow Up Study SP 2010

**Chart 1: Characteristics of maternal death, as found in the SP2010 Follow-up Study.**

As shown in Chart 1, the SP 2010 Follow-up Study found the highest number of maternal deaths in the age group of 20-35 years, at 65.1 percent, with 96.3 percent of this group already married. In addition, 55 percent of mothers already had one child, and most lived in rural areas (63.6%), with educational attainment up to secondary level (junior or senior high school), at 47.9 percent. With regards to place of death, 41.9 percent of mothers died at public hospitals, 16.1 percent at private hospitals, 29.4 percent at home, and 7.9 percent in other places, including mothers who died in transportation (6%) and in the workplace (1.9%).

## 2. NUMBER OF MATERNAL DEATHS

An important aspect in reducing maternal death is not only to know the causes of maternal mortality, but also to determine whether efforts to reduce it have succeeded and efforts to prepare the next course of



action. For this, the Maternal Mortality Ratio (MMR) must be calculated. This study seeks to present MMR based on source data from the National Statistics Agency (BPS), which is then sorted out specifically for maternal mortality to produce an uncorrected ratio of maternal mortality by region and a corrected ratio based on the completeness.

From the SP2010 Follow-Up Study, it was found that 50 percent of the 8,609 cases of maternal mortality, or 4,167 deaths occurred within the 17-month period. Upon being assessed by doctors based on the definition of maternal mortality, 3,384 cases of maternal mortality were confirmed. To reflect the population, weighting is carried out by BPS, and the result was 7,524 maternal deaths. Meanwhile, data on the number of live births in the last 12 months were also obtained from BPS. Table 1 below shows the resulting Maternal Mortality Ratios:

**Table 1. Number of maternal deaths in Population Census, 2010**

Number of deaths in months	REGION					Indonesia
	Sumatera	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
Number of deaths in 17 months	1738	3333	587	979	888	7524
Number of deaths in 12 months	1227	2353	414	691	627	5311
Number of Live Births in 12 months	1.072.588	2.371.448	280.717	345.556	331.845	4.402.154
Uncorrected Maternal Mortality Ratio per 100.000 kelahiran hidup	114	99	148	200	189	121
Maternal Mortality ratio per 100.000 Live Births	261	227	340	459	434	278

From Table 1, the uncorrected Maternal Mortality Ratio in Indonesia was found to be 121 per 100,000 live births. The term ‘uncorrected ratio’ was used as the figure had yet to be corrected. Therefore, this ratio should not be used as a reference of maternal mortality. According to Kenneth Hill (2001), correction is necessary because upon examination of data collection for the SP 2010, evidence was found of under-reporting. For MMR calculation, the required correction is 0.4352 (R = 0.94) (Soemantri, 2012)<sup>6</sup>, so that when completeness is taken into account or corrected, Indonesia’s MMR increases from 121 to **278 per 100,000** live births. Results of this study revealed disparities of uncorrected ratios among regions, ranging from the highest in Sulawesi, with 200 per 100,000 live births, to the lowest in Java and Bali, with 99 per 100,000 live births.

One commitment of the MDGs is to reduce maternal mortality by three-quarters between 1990 and 2015, implying that by 2015 Indonesia’s MMR will have reached 102 per 100,000 live births.<sup>7</sup> The uncorrected MMR that has been corrected in this study on causes of death, as well as the calculation of experts mentioned above, shows that maternal mortality remains high, demanding intensive efforts by the Government of Indonesia to reduce MMR. As an effort to reduce maternal mortality, antenatal care (ANC) must be **“available, accessible and acceptable to all women in the service area”**.<sup>8</sup> In essence, this

means that planned interventions should consider the “persistent disparity issue” that occurs in Indonesia. People should be able to access health care at the desired place and time, regardless of income, culture and physical location<sup>8</sup>. The MMR disparities and subsequent results of this study are expected to be considered in the planning of health services for mothers to reduce disparities among regions.

### 3. CAUSES OF MATERNAL DEATH

#### a. Maternal death causes by group/tabulation

To find a way of reducing MMR, it is necessary to know the causes of death. Causes of maternal death according to ICD 10 and the WHO classification table are grouped into direct and indirect causes. The SP2010 Follow-up Study results are as follows in Table 2:

**Table 2. Proportion of Causes of Maternal Death**

Cause of maternal death	Region					Indonesia
	Sumatera	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
Direct obstetric deaths (O00-O95)	81.5	73.8	80.9	80.2	75.7	77.2
Indirect obstetric deaths (O98-O99)	18.5	26.2	19.1	19.8	24.3	22.8
Total	100.0 (N=1738)	100.0 (N=3333)	100.0 (N=587)	100.0 (N=979)	100.0 (N=888)	100.0 (N=7524)

Source : STL SP2010

The results indicate that the causes of maternal death in the form of obstetric complication during pregnancy, delivery and post-partum (direct causes) are still higher than indirect causes in Indonesia. Interestingly, the percentage of indirect causes (Table 2) in Java, Bali and Eastern Indonesia is higher than in other regions. However, the indirect causes in these regions are different. In Java and Bali, the main indirect causes are cardiovascular (O99.4=7.7%) and cardiomyopathic (O90.3=2%) diseases, whereas in Eastern Indonesia, indirect causes are non-puerperal infections such as malaria (O98.6=5%) and tuberculosis (O98.0=4.9%).

To get more specific causes, there are groups of causes of death in the ICD 10, WHO tabulation list. Below is a table of diagnosis codes of eight groups of causes of maternal death, along with results of proportion analysis of maternal deaths by region based on SP2010:

**Table 3. Diagnosis code and proportion of causes of maternal death in five regions based on ICD 10 WHO**

Kode ICD 10, WHO	Underlying cause of maternal death	Region					Indonesia
		Sumatera	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
000-008	Pregnancy with abortive outcome	3.7	4.2	2.7	5.6	4.2	4.1
010-016	Oedema, proteinuria, and hypertensive disorder (HDK)	33.3	33.1	34.9	32.6	25.8	<b>32.4</b>
044-046	Placenta previa, premature separation of placenta and Antepartum haemorrhage	4.4	2.7	4.3	2.3	3.6	3.3
030-043, 047-048	Other maternal care related to fetus and amniotic cavity and possible delivery problems	3.0	1.7	0.0	0.8	0.1	1.6
064-066	Obstructed Labour	0.5	1.1	0.0	0.6	1.0	0.8
072	Postpartum haemorrhage (PPP)	16.4	16.8	28.1	26.3	29.8	<b>20.3</b>
020-029, 060-063, 067-071, 073-075, 081-084	Other complications of pregnancy and delivery	11.1	6.0	2.9	7.9	5.9	7.2
085-099	Complication predominantly related puerperium and other conditions	27.6	34.3	27.1	23.9	29.7	30.2
Total		100.0 (N=1737)	100.0 (N=3334)	100.0 (N=587)	100.0 (N=979)	100.0 (N=887)	1000 (N=7524)

In the tabulation above, a modification has been made. According to ICD 10 WHO, spontaneous abortion, medical abortion and other pregnancies with abortive outcome are not in one group of diagnosis, but in this study they are lumped together in the group of pregnancies with abortive outcome due to small number of cases (Table 3).

In Table 3, it can be seen that the highest percentage of maternal death causes is the group of edema, proteinuria, and hypertensive disorder, or pregnancy-induced hypertension (HDK/Hipertensi Dalam Kehamilan) at 32.4 percent. The percentages of cases of death from the HDK group are as follows:

**Table 4. Diagnosis under the HDK group**

Code	Pregnancy-induced hypertension group (010-016)	Number	%
010	Pre-existing hypertension complicating pregnancy, childbirth and the puerperium	227	3
011	Pre-existing hypertension disorder with superimposed proteinuria	18	0.2
012	Gestational (pregnancy induced) oedema and proteinuria without hypertension	67	0.9
013	Gestational (pregnancy induced) hypertension without significant proteinuria	281	3.7
014	Pre eclampsia	538	7.1
015	Eclampsia	1222	16.2
016	Unspecified maternal hypertension	96	1.3
Total		2449	32.4

Establishment of death diagnosis in this study is limited to the underlying cause of death that provides one single diagnosis; the multiple diagnoses option is not yet possible. Although maternal mortality can be caused by a variety of complications, it is understood that those complications may include a basic cause, intermediate cause and direct cause. In the HDK group, it can be traced to mothers who have two complications, namely HDK as the primary cause and post-partum hemorrhage (PPP) as

the direct, intermediate or contributing cause, which makes up 13.6 percent of HDK, or 0.1 percent of total cases, so the case of post-partum hemorrhages is 20.4 percent. The second highest cause of maternal mortality is other groups, or complications predominantly related to puerperium and other conditions, at 30.2 percent (Table 3). The following is a list of causes in the predominantly related complications of puerperium and other conditions:

**Table 5. Causes of maternal death in the group of Complications Predominantly Related to Puerperium and Other Conditions**

Code	Description	n	%
O85	Puerperal sepsis	222	2.9
O86	Other puerperal infections	32	0.4
O87	Venous complications in the puerperium	2	0.2
O88	Obstetric embolism	80	1.1
O90	Complications of the puerperium, not elsewhere classified	194	2.6
O92	Other disorders of breast and lactation associated with childbirth	3	0
O95	Death from sequelae of direct obstetric causes	20	0.3
O98	Maternal infectious and parasitic diseases classifiable elsewhere but complicating pregnancy, childbirth and the puerperium	684	9.1
O99	Other maternal diseases classifiable elsewhere but complicating pregnancy, childbirth and the puerperium	1024	13.6
<b>Total Cases</b>		<b>2262</b>	<b>30.2</b>

From Table 5, the most common cause is the group of puerperal sepsis at 2.9 percent, and other maternal diseases classifiable elsewhere but complicating pregnancy, childbirth and the puerperium at 13.6 percent. The last group of O99 is broken down into:

- O99.0 : Anemia.
- O99.1 : Other diseases of the blood.
- O99.2 : Endocrine, nutritional and metabolic disorders.
- O99.3 : Mental disorders
- O99.4 : Disorders of circulatory system
- O99.5 : Disorders of respiratory system
- O99.6 : Disorders of digestive system
- O99.7 : Diseases of skin & subcutaneous
- O99.8 : Other specific condition

Because other maternal diseases classifiable elsewhere but complicating pregnancy, childbirth and the puerperium was a pathophysiologically different group and too small a percentage, the cause will not be discussed in this study.

To determine the risk of maternal mortality in a region, calculation of a ratio was conducted, i.e. the number of maternal deaths in a region divided by the number of live births in the region. To understand more about the risk of maternal mortality by cause, see the following table based on SP 2010:

**Table 6. Ratios of maternal death causes in five regions based on ICD 10 WHO**

No	Underlying cause of maternal death	Region*					Indonesia
		Sumatera	Jawa-Bali	Kalimantan	Sulawesi	EI	
1	Pregnancy with abortive outcome	4	4	4	11	8	5
2	Oedema, proteinuria, and hypertensive disorder (HDK)	38	33	52	65	49	39
3	Placenta previa, premature separation of placenta and Antepartum haemorrhage	5	3	6	5	7	4
4	Other maternal care related to fetus and amniotic cavity and possible delivery problems	3	2	0	2	0	2
5	Obstructed Labour	1	1	0	1	2	1
6	Postpartum haemorrhage (PPP)	19	17	41	52	56	25
7	Other complications of pregnancy and delivery	13	6	4	15	11	9
8	Complication predominantly related puerperium and other conditions	32	34	40	48	56	37
Uncorrected Maternal Mortality Ratio per 100.000 Live Births		114	99	148	200	189	121
Maternal Mortality Ratio per 100.000 Live Births		261	227	340	459	434	278

\*denominator: live birth data of SP 2010 (BPS)

The result of this study (Table 6) shows that rank of regions at the greatest risk of HDK is as follows:

1. Sulawesi at 65 per 100,000 live births
2. Kalimantan at 52 per 100,000 live births
3. Eastern Indonesia at 49 per 100,000 live births
4. Sumatra at 38 per 100,000 live births
5. Java-Bali at 33 per 100,000 live births

After HDK, the most frequent cause found in this study was post-partum hemorrhage (PPP/Pendarahan Post-partum). PPP caused by retained placenta was at 43.3 percent. The following is a ranking of regions at the greatest risk of PPP:

1. Eastern Indonesia at 56 per 100,000 live births
2. Sulawesi at 52 per 100,000 live births
3. Kalimantan at 41 per 100,000 live births
4. Sumatra at 19 per 100,000 live births
5. Java-Bali at 17 per 100,000 live births

Based on the tables above, the leading causes of death in Indonesia are HDK and post-partum hemorrhage. Deaths from HDK and PPP are preventable. Based on the results of research conducted in Australia, England and Wales, and the United States, the percentage of deaths that can be avoided due to HDK and PPP is 50 percent (Table 7).<sup>9</sup>

To what extent can these two complications be managed? The following table consist of the sources that inform cases of preventable death from pregnancy complications:

**Table 7. The most common causes of maternal death**

Cause	Percentage of deaths	Proportion preventable
Pregnancy-induced hypertension	10 – 25	50
Pulmonary embolism	5 - 20	30
Abortion	5 - 10	25
Ectopic pregnancy	5 - 15	20
Hemorrhage	5 - 10	50
Sepsis	5 - 10	30
Cardio-respiratory (including anesthesia)	5 - 15	30

Data source: Harrison, 1985

A performance study of the Emergency Obstetrics-Gynecology Facilities of RSUP CiptoMangunkusumo, which is the national referral hospital, gives similar results (Table 8). Standard Case Fatality Rate (CFR) in eclampsia can be reduced by 12 percent to 5.5 percent. In cases of hemorrhage, CFR can be reduced to 7.4 percent from 14 percent. It means that deaths from both of these complications in CiptoMangunkusumo General Hospital can be prevented, although they are complications that pose a high risk of death.<sup>10</sup> The results of this study may not be sufficient to reflect the national situation, as the number of cases is too small. The cases were taken from 19 percent of total births in 2011. However, the results indicate that causes of maternal death can be addressed by providing adequate health care facilities.

**Table 8. The Result of a 2011 Case Fatality Rate(CFR) Study in RSUP Cipto Mangun Kusumo**

No	Main Cause	Σ Death*	Σ Case*	CFR	Standard
1	Hemorrhage	1	27	7.4%	14%
2	Eclampsia	1	36	5.5%	12%
3	Sepsis	3	3	100%	6%
4	Pulmonary infection	2	2	100%	5%
5	Embolism	3	3	100%	3%

Data source : JNPK-RSUP Cipto Mangun kusumo

\*Note: 1) Patients referred without stabilization, 2) Emergency Response Rate is more than 15 minutes (standard is 5 minutes) and Average SC Emergency is more than 1 hour (standard is 30 minutes)

Meanwhile, based on the results of SP2010 data analysis, the highest incidence of death occurs during the post-partum stage (after the delivery of placenta) at 62 percent (Table 9). In HDK cases, maternal death during pregnancy is at 24.37 percent, during labor 8.21 percent, and post-partum 63.23 percent. Of the post-partum deaths, the percentage of mothers who die in the first 0-48 hours is at 28.09 percent. On the other hand, mothers dying after 48 hours ranged from 0-5 percent. Thus, the critical time for mothers with HDK complications is in the first 48 hours of the post-partum period. This can be used as a reference for intensive monitoring procedures in HDK cases. The following is a table of maternal death periods:

**Table 9. Maternal death periods**

No	Time of death	n	%
1	Pregnancy ≤ 20 weeks	543	7.22
2	Pregnancy > 20 weeks	1372	18.24
3	Labor	974	12.95
4	Post-partum	4634	61.59
	Total	7524	100.00

## b. Causes of death without grouping (except for hypertension disorder and abortion)

If causes of maternal death were not grouped according to ICD 10 WHO (except for hypertension disorder and abortion), there would be 64 causes of maternal death. In this study, the top 20 causes of maternal mortality in Indonesia are presented. The number one cause is post-partum hemorrhage, the second is eclampsia, the third is hypertension and edema disorder, and so on (Table 10). As seen in Table 10, the highest is post-partum hemorrhage, which differs when causes of death are grouped, in which case the highest is HDK followed by eclampsia, pre-eclampsia and hypertension. In addition, edema disorders were not included in the HDK group, but stood alone. The HDK group starts with symptoms of high blood pressure (hypertension), which is induced in pregnancy or before pregnancy, swelling (edema) and elevated protein levels in the urine (proteinuria), which will end up with poisoning of pregnancy or pre-eclampsia or eclampsia. Intervention for the HDK group is the same, that is, to prevent complication of hypertension from becoming a dangerous and difficult complication, i.e. eclampsia. The conclusion from the intervention point of view is in grouping: HDK is the highest cause of death followed by post-partum hemorrhage. Intervention on both causes of death is important since the HDK group accounts for one-third of maternal mortality and post-partum hemorrhage if combined with ante-partum hemorrhage and placenta previa will account for another one third of maternal deaths. For more details see the table below:

**Tabel 10. 20 Penyebab Tertinggi Kematian Ibu di Indonesia**

No.	Code ICD 10	Cause of death	N	%
1	O72	Post-partum hemorrhage	1533	20.4
2	O15	Eclampsia	1222	16.2
3	O10-O13,O16	Hypertension and Edema disorder	694	9.2
4	O14	Pre-eclampsia	535	7.1
5	O99.4	Diseases of circulatory system	480	6.4
6	O00-O08	Abortion outcome (abortion, KET, MolaHidatidosa)	311	4.1
7	O98.0	Tuberculosis	307	4.1
8	O85	Puerperal sepsis	222	2.9
9	O99.5	Diseases of Respiratory System	196	2.6
10	O46	Antepartum Hemorrhage	174	2.3
11	O99.8	Other specific diseases & conditions	167	2.2
12	O90.3	Cardiomyopathy in puerperium	126	1.7
13	O32	Malpresentation of fetus	108	1.4
14	O88	Obstetric embolism	82	1.1
15	O36	Suspect fetal problems	80	1.1
16	O63	Long Labor	77	1
17	O42	Prematurely ruptured membrane	74	1
18	O44	Placenta previa	72	1
19	O45	Premature separation of placenta (abruptio placenta)	75	1
20	O21	Excessive vomiting in pregnancy	66	0.9

## 4. CHARACTERISTICS OF MATERNAL MORTALITY BY CAUSE OF DEATH

The characteristics of maternal mortality discussed herein are specifically in the HDK and PPP groups, as both are the highest compared to other maternal death causes. The following table explains the

characteristics of maternal mortality by cause of death according to SP2010.

### Age at death

Characteristics of age of maternal death are classified into three groups, namely aged below 20, 20 to 35, and over 35. Table 11 shows that more mothers who died from HDK were in the age group of below

**Table 11. Characteristics of maternal mortality by cause of death**

Characteristics of the mothers	Underlying cause of maternal death								Total
	1*	2*	3*	4*	5*	6*	7*	8*	
<b>Age</b>									
• <20	5.7	38.6	2.9	1.0	0.6	17.0	5.4	28.9	100.0 (N=521)
• 20-35	4.3	29.5	3.1	1.9	0.9	20.7	7.3	32.3	100.0 (N=4901)
• >35	3.7	37.6	3.8	1.0	0.6	20.8	7.0	25.4	100.0 (N=1931)
<b>Status kawin</b>									
• Single	5.7	37.9	5.7	0.0	0.0	27.6	4.6	18.4	100.0 (N=86)
• Married	4.0	32.5	3.3	1.6	0.8	20.0	7.3	30.5	100.0 (N=7243)
• Live together	11.5	23.8	2.5	0.0	0.0	33.6	0.8	27.9	100.0 (N=123)
• Separated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0 (N=8)
• Divorced	12.5	29.2	0.0	0.0	0.0	29.2	8.3	20.8	100.0 (N=24)
• Widowed	0.0	0.0	0.0	0.0	0.0	20.0	0.0	80.0	100.0 (N=6)
<b>Number of children</b>									
• 1-2 children	4.4	31.2	3.4	1.6	0.8	18.0	7.3	33.2	100.0 (N=4138)
• 3-4 children	3.8	35.1	2.8	1.4	0.5	23.0	6.6	26.8	100.0 (N=2136)
• >4 children	4.0	30.5	3.6	2.2	1.3	25.2	7.3	26.0	100.0 (N=1103)
<b>Level of education</b>									
• No education/ elementary school graduate	3.4	29.4	3.5	1.3	1.0	25.4	6.9	29.1	100.0 (N=3604)
• Secondary school graduate	4.9	34.9	3.4	1.9	0.5	15.9	7.3	31.1	100.0 (N=500)
• Higher education	3.4	34.1	0.8	1.0	1.6	17.4	8.0	33.7	100.0 (N=2740)
<b>Area</b>									
• Urban	4.6	36.2	3.6	1.5	0.8	14.3	6.6	32.5	100.0 (N=2740)
• Rural	3.9	30.2	3.1	1.7	0.8	23.8	7.4	29.1	100.0 (N=4784)
<b>Place of death</b>									
• Government hospital	3.7	38.7	3.9	1.4	0.8	16.4	6.8	28.2	100.0 (N=3150)
• Private hospital	2.6	33.8	4.0	2.6	1.4	18.0	6.5	30.9	100.0 (N=1211)
• RSIA	0.0	32.0	0.0	0.0	0.0	36.0	8.0	24.0	100.0 (N=25)
• RSB	8.7	24.6	1.4	2.9	0.0	40.6	2.9	18.8	100.0 (N=69)
• Puskesmas	5.8	26.7	2.9	0.0	1.2	33.7	5.8	23.8	100.0 (N=172)
• Pustu	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0 (N=2)
• Polindes/poskesdes	0.0	16.7	0.0	0.0	0.0	50.0	0.0	33.3	100.0 (N=6)
• Private practicing doctor	20.0	13.3	0.0	0.0	0.0	40.0	13.3	13.3	100.0 (N=16)
• Private practicing midwife	0.0	12.5	7.5	0.0	0.0	32.5	20.0	27.5	100.0 (N=39)
• Trad. midwife's home	0.0	62.5	0.0	0.0	0.0	0.0	25.0	12.5	100.0 (N=7)
• Own home	5.6	25.2	2.3	1.4	0.6	21.2	6.9	36.6	100.0 (N=7)
• Others	2.3	26.3	2.3	1.8	0.2	33.6	11.2	22.1	100.0 (N=595)

\*Note: 1. Pregnancy with abortive outcome, 2.Oedema, proteinuria, and hypertensive disorder (HDK), 3.Placenta previa, premature separation of placenta and Antepartum hemorrhage, 4. Other maternal care related to fetus and amniotic cavity and possible delivery problems, 5. Obstructed Labor, 6.Post-partum hemorrhage (PPP), 7.Other complications of pregnancy and delivery, 8. Complication predominantly related puerperium and other conditions



20 (38.6%) and over 35 (37.6%) than those in the age group of 20-35 (29.5%). In Nigeria, women aged 15 have an MMR seven times higher than those of women aged 20-25.<sup>10,11</sup> Another study suggests that teenagers under 20 years old are more vulnerable to preeclampsia.<sup>12</sup> Upon knowing the proportion of HDK in such specific age groups, we recommend that efforts should be taken to prevent pregnancy before age 20 and after 35. However, in the event of pregnancy in that age group, improved ANC is needed to prevent HDK complications. In the case of maternal death from PPP, there is no significant difference in the percentage across age groups (Table 11).

### **Marital status**

Table 11 shows the percentage of mothers who died from HDK, which is higher in the single group (37.9%) compared to those with HDK in other status groups. Whereas among mothers died from PPP, the highest is in the live-together group (33.6%), compared to those with PPP in other status groups.

### **Number of children (parity)**

The results of this study showed that among mothers who died from HDK, the percentages across different parity groups were virtually the same (Table 11). Whereas among mothers died of PPP complications, those having more than four children had a higher percentage than those in other groups.

### **Education**

According to Table 11, the highest percentage of mothers dying from HDK were in the junior-senior high school graduate group, at 34.9 percent, whereas among mothers with PPP, the percentage of no-education to elementary school graduates was higher (25.4%) compared to mothers with PPP in other education level groups.

### **Area (Rural / Urban)**

The result of this study showed that the number of mothers who died from HDK was higher in urban areas (36.2%) than in rural areas (30.2%). Conversely, the number of mothers who died from PPP was higher in rural areas (23.8%) than urban areas (14.3%). PPP is a case of complications that requires immediate emergency care. The results showed that access in rural areas is more difficult than that in urban areas, leading to high maternal mortality from PPP in rural areas.

### **Place of death**

Table 11 shows that at government hospitals, private hospitals and traditional midwives' homes, many mothers died from HDK complications. Meanwhile, at RSIA, RSB, Puskesmas, Polindes, and private doctors' or midwives' practices, and also on the way to one of these options (others), more mothers died from PPP complications. Other mothers died at home from HDK (25.3%) and PPP (21.2%) complications. Many mothers died at home from other complications, and under further examination, the main cause was found to be cardiovascular diseases.

### Access : Place of death in rural and urban areas

Rural and urban areas may reflect access to health services. Urban areas are assumed to have better access than rural areas. In Chart 2B, it can be seen that more mothers died at hospitals in urban areas, whereas more mothers died at home in rural areas. This indicates greater difficulties for access to health facilities in rural areas.

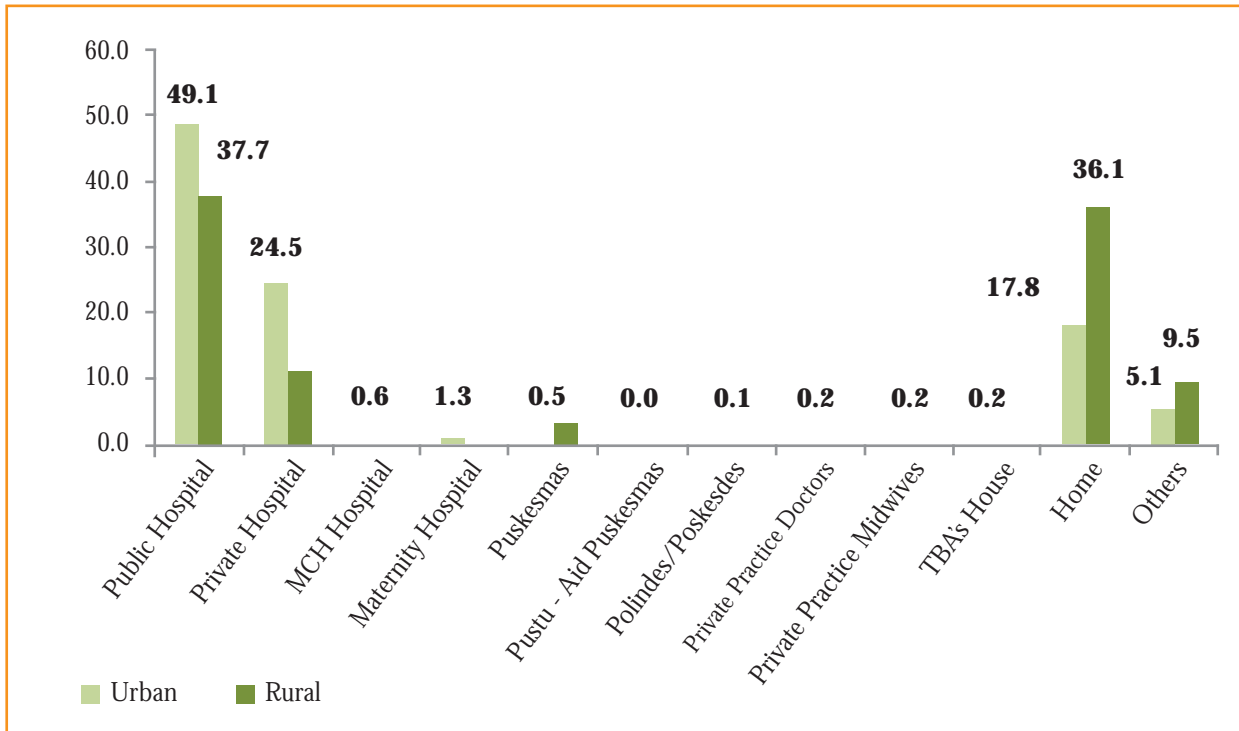


Chart 2. Place of death proportion by rural and urban areas

## 5. QUALITY OF CARE

The purpose of analyzing quality of care is to see the difference in service patterns that exist among regions. The analysis on service performance uses data from Riskesdas2010.<sup>13</sup> The performance indicator used is ANC (antenatal care) by nakes (health workers), ANC examination types (blood pressure, blood and urine), ANC K4 visits (1,1,2), birth attendants by health worker (Linakes/ SBA) and post-natal visits one day after delivery (KunjunganNifas/ KF). The results of service performance based on the cause of maternal death are as follows:

### a. The overall cause of maternal death

Below is the proportion of service performance in five regions based on Riskesdas 2010:

**Table 12. Maternal death Uncorrected Ratio (SP2010 data) with service performance proportion in five regions in Indonesia**

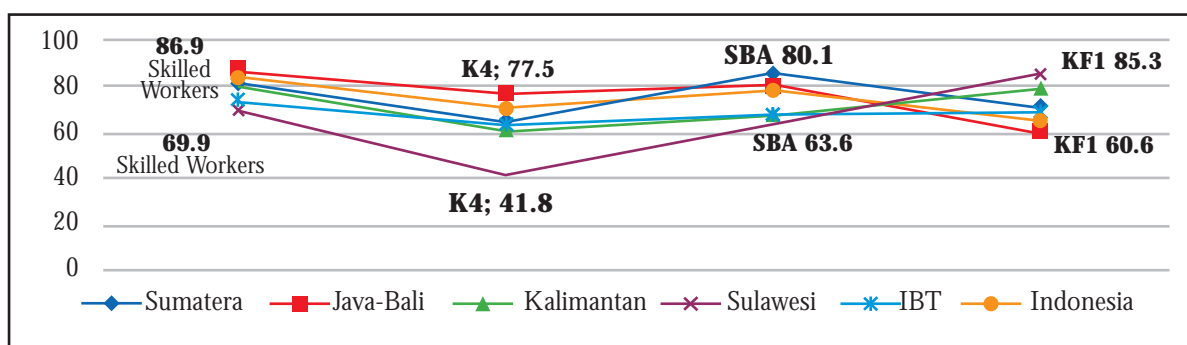
	Region					Indonesia
	Sumatera	Jawa-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
Maternal Death Uncorrected Ratio	261	227	390	459	434	278
Health Service Performance Proportion (Data from Riskesdas 2010)						
<b>Pregnancy Check Examiner</b>						
~ Health Worker (Nakes)	83.2	86.9	79.9	69.6	73.6	83.8
	(N=883320)	(N=3945334)	(N=112935)	(N=411173)	(N=321729)	(N=5674491)
<b>ANC (K4) Visit</b>						
~ K4	65.3	77.5	62	41.8	63.1	71.5
	(N=634543)	(N=3388520)	(N=76389)	(N=222236)	(N=242005)	(N=4563693)
<b>Last Birth Attendant (Linakes)</b>						
~ Health Worker	86.1	80.1	68.5	63.6	67.9	78.6
	(N=903425)	(N=3587247)	(N=96134)	(N=363598)	(N=289397)	(N=5239801)
<b>Post-natal Visit (KF1)</b>						
~ Day 1-3 Visits	71.8	60.6	79.4	85.3	68.9	65.1
	(N=530903)	(N=2142836)	(N=80601)	(N=351555)	(N=197513)	(N=3303408)

The above table indicates whether a high uncorrected ratio of maternal death rate is followed by low quality service. The study shows consistent figures between a high maternal death rate uncorrected ratio with low quality service. Such figures are found in Sulawesi, where the uncorrected ratio of maternal death is high (201/100,000 live births) and service and coverage quality of ANC, K4, and Linakes is the lowest.

Eastern Indonesia showed the second highest uncorrected ratio of maternal death after Sulawesi, at 191/100,000 live births. The service performance also appeared to be the second lowest after Sulawesi. It can be concluded that a high maternal death uncorrected ratio is followed by low quality ANC, K4, Linakes and post-natal visit (KF) service coverage.

Other crucial issues are ANC, K4 and Linakes coverages in Java and Bali, which performed better than the others. However, the KF, or post-natal visit coverage, is lower. It is surprising that in terms of accessibility, Java- and Bali perform better than the other regions. This implies poor KF service quality. In Java and Bali, unvisited KF by the health workers in the first three days are between 0.8 and 15.6 percent. STI SP 2010 sample shows that the unvisited regions with above 10-percent range are West Jakarta (15.6%) and Tangerang (11.7%). Further study is required to respond to the problem.

This study revealed a service performance proportion toward maternal death. Furthermore, the study also described pregnancy, labor, and post-natal health service outcomes as shown in the following chart based on Riskesdas 2010:



**Chart 3. Service Performance Coverage (Data from Riskesdas 2010)**

As shown in Chart 3, there is a disparity in pregnancy, labor and post-natal service in all regions. In aggregated data, Sulawesi is the lowest in the coverage of competent health workers in examining pregnancy and ANC (K4) visits at 41.8 percent, while ANC coverage standard is at 100 percent and K4 is at 95 percent.<sup>14</sup>

**b. Pregnancy-Induced Hypertension (HDK/Hipertensi dalam Kehamilan)**

The table below describes service performance proportion among mothers with HDK in the five selected regions in Indonesia, based on Riskesdas 2010:

**Table 13. Maternal death uncorrected ratio (Data of SP2010) with service performance proportion among mothers with HDK in five regions in Indonesia with weighted N.**

	Region					Indonesia
	Sumatera	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
HDK Related Maternal Death Uncorrected Ratio (Data of SP2010)	38	33	52	65	49	39
Health Service Performance Proportion (Data from Riskesdas 2010)						
<b>Pregnancy Check Examiner</b>						
• Health Worker (Nakes)	81.1 (N=67213)	82.8 (N=329712)	70.9 (N=13840)	73.3 (N=42889)	82.8 (N=31534)	81.2 (N=485188)
<b>Test Type</b>						
• No blood pressure test	11.2 (N=8663)	6.2 (N=23809)	0.0 (N=0)	4.6 (N=2471)	8.5 (N=2914)	6.7 (N=37857)
• No urine test	51.0 (N=39339)	49.6 (N=188931)	58.9 (N=9166)	80.7 (N=43632)	55.0 (N=18941)	53.3 (N=301009)
• No blood test	70.3 (N=54171)	59 (N=383266)	74.5 (N=11597)	76.9 (N=41578)	44.7 (N=15370)	61.8 (N=348684)
<b>ANC (K4) Visit</b>						
• K4	56.1 (N=43277)	78.4 (N=300464)	44.7 (N=6956)	47.5 (N=25713)	71.6 (N=24644)	71.1 (N=401054)
<b>Last Birth Attendant (Linakes)</b>						
• Health Worker	89.6 (N=70805)	80.3 (N=307849)	54.6 (N=10664)	59.1 (N=32683)	78.5 (N=26857)	78.5 (N=448858)
<b>Post-natal Visit (KF1)</b>						
• Day 1-3 Visit	61.4 (N=34896)	62.9 (N=197114)	86.9 (N=14614)	82.6 (N=35504)	59.5 (N=17945)	65.2 (N=300073)

\*Note: N were weighted

The regional disparity regarding HDK cases as shown in the table above shows that the highest uncorrected ratio of HDK-related maternal death is in Sulawesi, followed by Kalimantan in second place. By service quality, based on Riskesdas 2010 data in Table 13, both regions have low ANC (K4) and Linakes coverage. This shows a consistency between a high maternal death ratio and low service quality.

The primary indicators in HDK cases are increased blood pressure, protein in the urine, and edema. When the high HDK-related maternal death uncorrected ratio is compared with no blood and urine tests, Sulawesi is of the highest in maternal death uncorrected ratio (495/100,000 live births). It is followed by Kalimantan with (420/100,000 live births). It is also found that ANC (K4) and Linakes coverage in both regions are lower than the others. Hypertension is often examined by urine testing. Few urine tests for hypertension were carried out in Sulawesi (80.7%) compared to the other regions.

Meanwhile, blood pressure test results were inconsistent with HDK cases. Fewer blood pressure tests were carried out in Sumatra than in Sulawesi. Therefore, a crosscheck regarding the availability of stethoscopes in admission and non-admission facilities (Puskesmas) is carried out, with results as follows:

**Table 14. Proportions of stethoscope unavailability in five regions in Indonesia**

No stethoscope available	Sumatra	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia
Puskesmas with beds	17.3%	7.6%	17.2%	20.9%	24.0%
Puskesmas without beds	22.1%	7.0%	15.3%	22.3%	33.7%

Based on the table above, it is found that stethoscope availability in Sulawesi is lower than that in Sumatera. Other factors accounted for were whether or not blood pressure meters worked well in the facilities. If such instruments were not regularly calibrated, test results may not have been valid. It can be concluded that the quality of ANC (K4) tests, Linakes, and urine tests is of importance in order to avoid maternal deaths related to hypertension complications.

In addition to proportion and ratio description, HDK complication distribution is also described by districts across Indonesia, as shown in the map below:

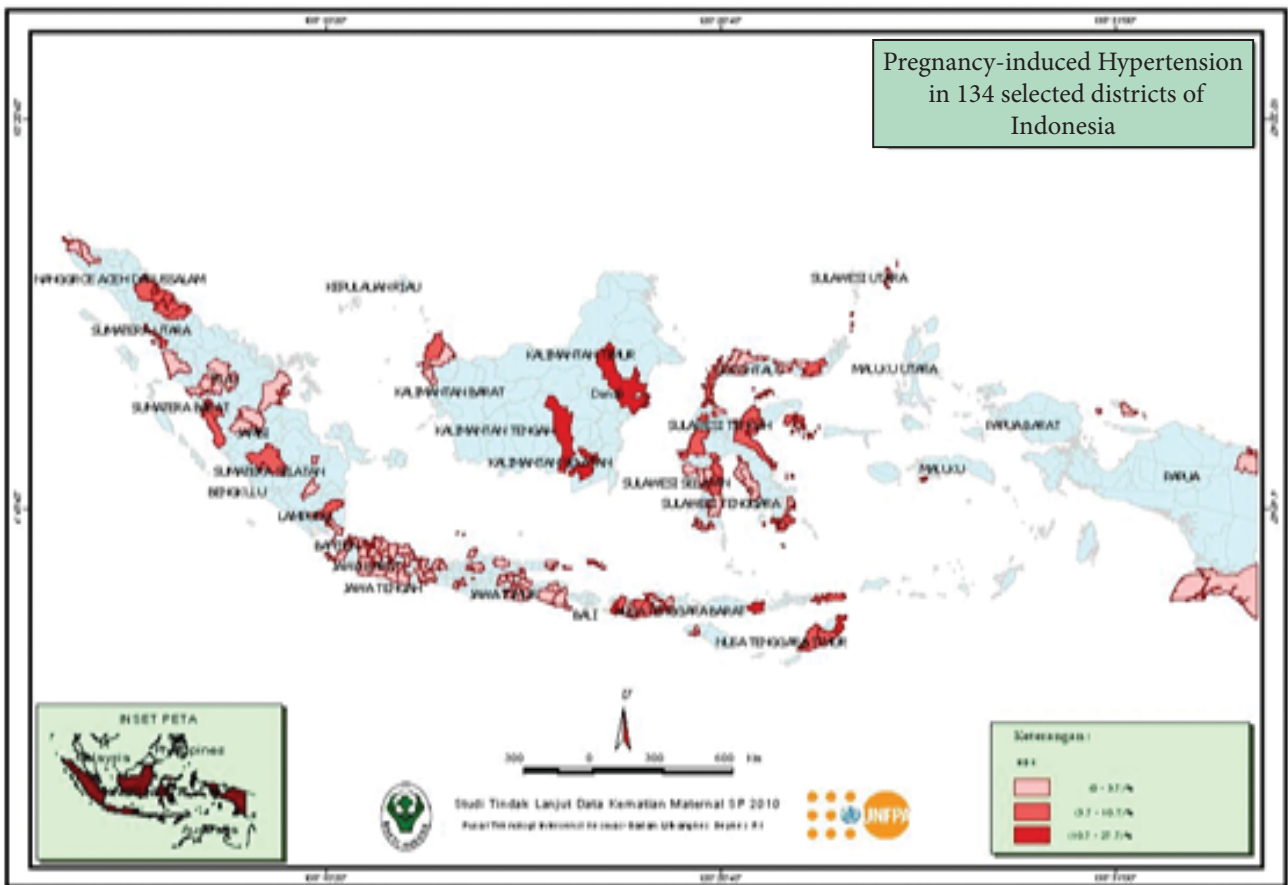


Chart 4. HDK distribution map by districts/cities in Indonesia

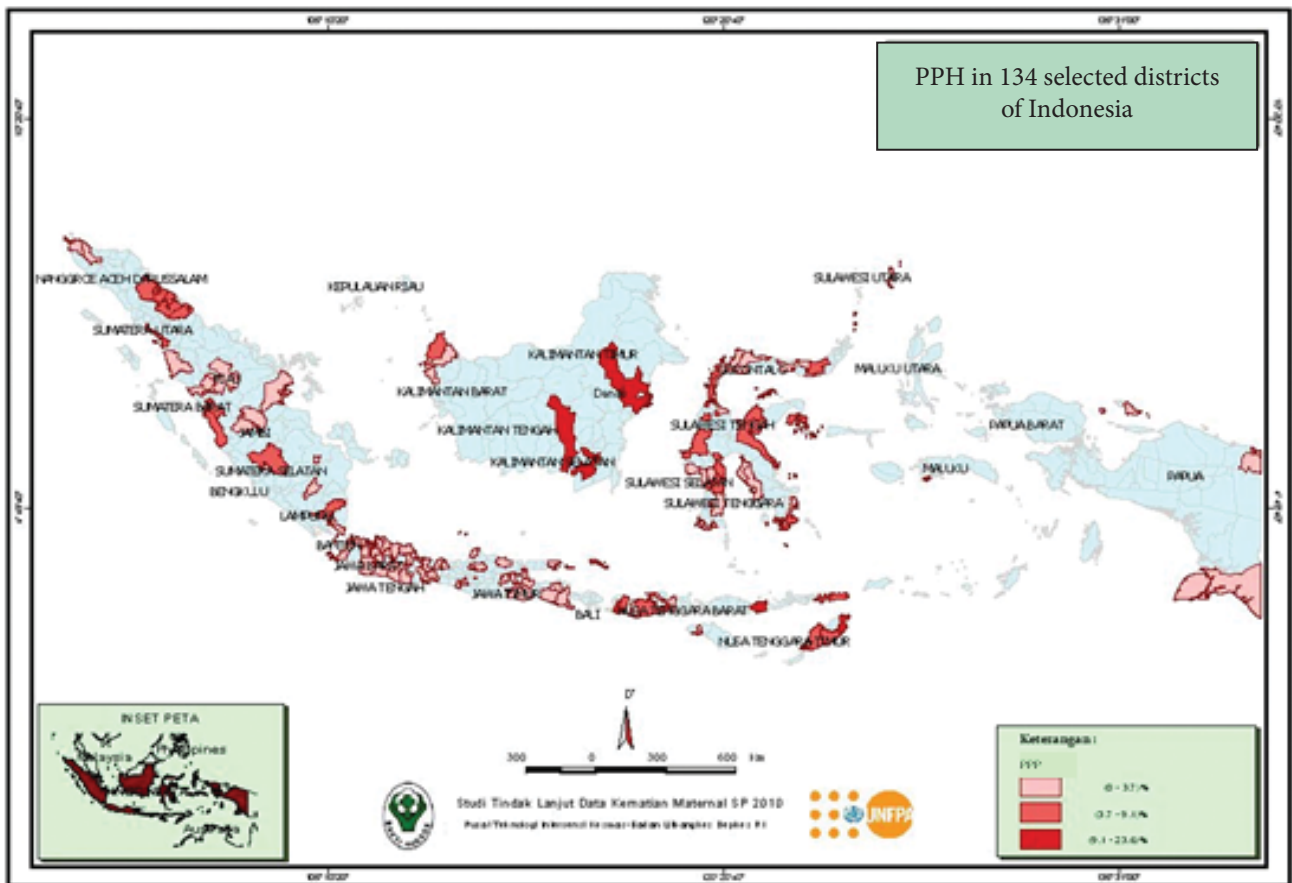


Chart 5. PPP distribution map by districts/cities in Indonesia

### c. Post-partum Hemorrhage (PPP/Perdarahan Post-partum)

Below is a table of service performance proportion among mothers with PPP in the five regions in Indonesia, based on Riskesdas 2010:

**Table 15. Maternal death uncorrected ratio (Data of SP2010) with service performance proportion among mothers with PPP in five regions in Indonesia with weighted N.**

	Region					Indonesia
	Sumatera	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
PPP Related Maternal Death Uncorrected Ratio (Data of SP2010)	43	39	94	119	128	57
Health Service Performance Proportion (Data from Riskesdas 2010)						
<b>Pregnancy Check Examiner (K1)</b>						
• Health Workers	83.7	85.0	79.1	69.6	81.5	82.8
	(N=22591)	(N=132121)	(N=6540)	(N=17218)	(N=10310)	(N=188780)
<b>Test Type</b>						
• No blood pressure test	6.4	7.6	0.0	0.0	4.4	6.2
	(N=1716)	(N=11732)	(N=0)	(N=0)	(N=551)	(N=13999)
• No urine test	47.9	50.7	46.5	80.4	49.8	53.0
	(N=12936)	(N=78543)	(N=3846)	(N=17353)	(N=6303)	(N=118981)
• No blood test	73.1	60.3	70.5	74.6	35.9	62.2
	(N=19718)	(N=93348)	(N=5831)	(N=16095)	(N=4535)	(N=139527)
<b>ANC (K4) Visit</b>						
• K4	56.5	74.5	54.0	46.2	73.2	68.8
	(N=15248)	(N=115390)	(N=4465)	(N=9977)	(N=9252)	(N=154332)
<b>Last Birth Attendant</b>						
• Health Workers	96.5	88.5	65.6	61.8	92.0	86
	(N=24080)	(N=129727)	(N=5426)	(N=13622)	(N=10926)	(N=183781)
<b>Post-natal Visit</b>						
• Day 1-3 Visit	76.1	67.3	80.5	89.8	44.1	70.1
	(N=16151)	(N=90656)	(N=6068)	(N=19763)	(N=4488)	(N=137126)

\*Keterangan : N sudat dibobot.

The highest PPP-related maternal death uncorrected ratio is found in Eastern Indonesia. However, ANC (K4), Linakes, and KF coverage did not show lower findings when compared to the other regions. This is because PPP is a complication case that requires a quick response. When a mother suffers from severe bleeding and does not get a blood transfusion immediately, or treatment in less than one hour, the mother will not survive. The above coverage only mentions Linakes, but not the facilities. The only facility with capacity to give a blood transfusion is a hospital. Meanwhile, in the access section of this study, the geographical condition of the villages, cities and the patient's location of death in Eastern Indonesia impedes them from reaching a hospital in the rural regions. Therefore, it is concluded that to prevent death due to PPP complications, access to immediate blood transfusion should be improved and maintained.

## 6. HEALTH FACILITIES

This analysis of the Rifaskes 2011 study cannot clearly describe the population needs for ratio-based analysis. Basic Obstetric and Neonatal Emergency Services (PONED) are conducted in Puskesmas. A policy

from the Ministry of Health determines that there should be at least four PONEDs available in a district, providing 24-hour health services.

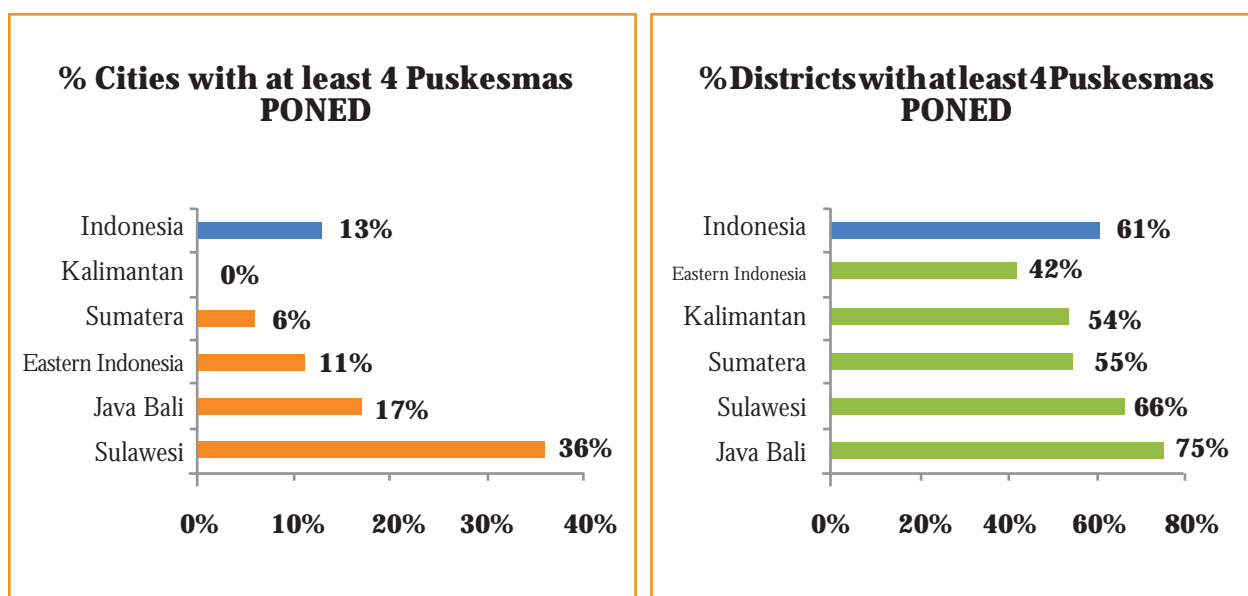
Based on the data of Rifaskes 2011, Indonesia has approximately 98 cities and 398 districts. From among the 98 cities, only 13 percent of them have at least four Puskesmas PONED. From 398 districts, only 61 percent of them have at least four Puskesmas PONED.<sup>15</sup> The percentage of cities with at least four Puskesmas PONED by region is as follows:

- 1) Sulawesi: 36% of 11 cities
- 2) Java-Bali: 17% of 35 cities
- 3) Eastern Indonesia: 11% of 9 cities
- 4) Sumatera : 6% of 34 cities

Meanwhile, the districts with at least four PONED Puskesmas are as follows:

- 1) Java-Bali: 75% of 92 districts
- 2) Sulawesi: 66% of 61 districts
- 3) Sumatra : 55% of 117 districts
- 4) Kalimantan: 54% of 46 districts
- 5) Eastern Indonesia: 42% of 82 46 districts

Description of Puskesmas PONED in the districts by region can be observed from the following chart:



**Chart 6. Proportion of districts with Puskesmas PONED in five regions in Indonesia**



## Service in Puskesmas PONED (BEONC/ Basic Emergency Obstetric and Neonatal Care)

Puskesmas PONED is defined as an emergency service for obstetric and neonatal emergency cases which can be handled in Puskesmas. It means that Puskesmas have to provide appropriate services as required by the standards. Service provided by Puskesmas PONED by region can be observed from the table below, based on Rifaskes 2011 findings:

**Table 16. Maternal death uncorrected ratio (Data of SP2010) with Puskesmas PONED service by five regions in Indonesia**

	Region					Indonesia
	Sumatera	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
Maternal Death Uncorrected Ratio	115	99	148	201	191	121
24 hour service	73%	82%	75%	83%	71%	78%
Skilled worker	50%	41%	55%	39%	48%	45%
Fully equipped						
≥ 80% equipped	10%	14%	11%	7%	7%	12%
40-79% equipped	44%	55%	36%	45%	40%	48%
< 40% equipped	46%	31%	54%	48%	53%	40%
Full-length Drugs						
≥ 80% equipped	2%	5%	1%	2%	1%	3%
40-79% equipped	28%	35%	31%	17%	23%	30%
< 40% equipped	<b>70%</b>	<b>60%</b>	<b>68%</b>	<b>81%</b>	<b>76%</b>	<b>66%</b>
	100% (N= 390)	100% (N=709)	100% (N=132)	100% (N=238)	100% (N=205)	100% (N=1674)

\*Skilled worker = PONED skilled doctors, midwives and nurses are available

Nationally, from the existing total of 1,674 Puskesmas PONED, as many as 78 percent provide 24-hour service, while 28 percent of the remainder do not. Regionally, the percentage of Puskesmas PONED with 24-hour service is 71 percent in Eastern Indonesia, which is the least and is almost on par with in Sumatera (73%) (Table 16). However, the maternal death uncorrected ratio in Eastern Indonesia and Sumatera shows disparity. This suggests that 24-hour provision will not guarantee the prevention of death risks when access remains difficult and supporting instruments and drugs are not available. It can be concluded that Puskesmas PONED can reduce maternal risk when access is made available.

In Rifaskes 2011, information regarding the availability of skilled workers at PONE D was collected in 2009 and 2010. Availability of skilled workers can be defined as the availability of at least one doctor, one midwife and one nurse skilled in PONE D. Regionally, Java and Bali together have the second-lowest percentage of skilled workers (41%) compared to other regions. However, Java and Bali also have the highest number of Puskesmas PONE D compared to the other regions. The uncorrected proportion in Java and Bali is also the lowest. This means that a low percentage of skilled workers can reduce maternal death risks, since it is accompanied by its equivalent with population numbers and easier access to facilities across the region of Java and Bali.

Well equipped facilities and availability of drugs are the fundamental requirements to deal with complicated cases. Regionally, Sulawesi and Eastern Indonesia clearly show the highest maternal death uncorrected ratio compared to other regions. Supporting equipment and drugs are also the poorest of all regions. It can be concluded that availability of equipment and drugs can reduce the risk of maternal death.

### **Puskesmas PONE D Readiness in Dealing with Pre-eclampsia/Eclampsia and Post-Partum Hemorrhage Cases (PPP)**

Major causes of maternal death include post-partum hemorrhage, pre-eclampsia/eclampsia and hypertension during pregnancy. Puskesmas PONE D must be able to deal with these cases, or at least provide first aid prior to referring the patient to a PONE K facility. The readiness of Puskesmas PONE D to provide services in such cases can be observed from the availability of equipment and drugs needed for treatment. For instance, in the case of pre-eclampsia/eclampsia,  $MgSO_4$  20-percent and 40-percent injections must be available. The following table describes the availability of  $MgSO_4$  and vacuum instruments used in delivery. Immediate delivery for mothers with eclampsia complications can reduce the risk of maternal death. Therefore, such instruments are badly needed to save the lives of mothers and babies (Rifaskes 2011).

**Table 17. Percentage of Puskesmas PONE D providing primary drugs and instruments for treating pre-eclampsia/eclampsia cases**

	Region					Indonesia
	Sumatera	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
Number of PONE D	390	709	132	238	205	1674
$MgSO_4$ 20%	35%	46%	44%	35%	23%	42%
$MgSO_4$ 40%	34%	51%	46%	39%	24%	47%
Extraction vacuum	54%	54%	46%	48%	39%	52%

It can be observed from the above table that 52 percent of Puskesmas PONE D are equipped with extraction vacuums, while the remaining 48 percent are not. The lowest availability of extraction vacuums was found in Eastern Indonesia (39%) with  $MgSO_4$  of 20 percent and 40 percent when compared to that of other regions.

**Table 18. Percentage of Puskesmas PONED providing primary drugs and instruments in the post-partum hemorrhage service**

	Region					Indonesia
	Sumatera	Java-Bali	Kalimantan	Sulawesi	Eastern Indonesia	
Number of PONED	390	709	132	238	205	1674
Dextrose 5%	64%	79%	73%	64%	72%	76%
NaCl 0.9%	66%	77%	70%	65%	68%	75%
Ergometrine inj.	57%	80%	70%	71%	69%	74%
Oxytocine inj.	55%	82%	69%	74%	63%	75%

Table 18 above describes the availability of drugs for dealing with bleeding emergency cases. Generally, drug availability is less than 80 percent, and regionally, there is no disparity. However, the uncorrected ratio shows a big disparity between Eastern Indonesia and other regions. Such inequality suggests that drugs may not be adequately available. In addition, blood supply, which is a crucial need, has yet to be made immediately available. In severe bleeding cases, there is a risk of death in less than one hour. In reality, blood transfusions are often unavailable in Puskesmas PONED. Blood transfusions are conducted only in hospitals. Because of this, deaths due to post-partum bleeding can take place on the way to the hospital (as in other cases), making up 33.3 percent of incidences. It is crucial that the problem of transfusion supply should be addressed.

### **Comprehensive Obstetric and Neonatal Emergency Services (PONEK) in Public Hospitals (RSU)**

In order to reduce maternal death in hospitals, Comprehensive Obstetric and Neonatal Services (PONEK) are conducted. Regionally, there is a disparity in PONEK services. The Java-Bali region has a better proportion of public hospitals with the capacity to meet PONEK requirements compared to other regions, including the provision of an Essential PONEK team. In the Java-Bali region, about 57.1 percent out of 233 public hospitals have an Essential PONEK team. PONEK teams are assigned based on a Director Decision Letter and are comprised of one obstetric and gynecology specialist, one pediatrician, one doctor in the emergency unit, three midwives (one coordinator and two supervisors) and two nurses. Rifaskes 2011 results are shown in the table below:

**Table 19. The proportion of public hospitals based on the fulfilment of PONEK criteria in five regions in Indonesia**

No.	PONEK Criteria	Sumatera		Jabal		Kalimantan		Sulawesi		Eastern Indonesia	
		N	%	N	%	N	%	N	%	n	%
1	24-hour operation room	208	69.7	233	81.1	74	67.6	90	62.2	80	62.5
2	24-hour operation team	208	70.2	233	84.1	74	63.5	90	45.6	80	62.5
3	24-hour blood service	208	50.5	233	63.1	74	56.8	90	46.7	80	43.8
4	24-hour laboratory service	208	61.1	233	75.1	74	63.5	90	52.2	80	52.5
5	24-hour radiology service	208	56.3	233	70.0	74	55.4	90	41.1	80	47.5
6	24-hour pharmacy and other supporting instruments/services	208	60.1	233	77.3	74	67.6	90	60.0	80	55.0
7	24-hour admission room	208	49.0	233	68.7	74	44.6	90	40.0	80	35.0
8	24-hour blood service unit	208	43.3	233	37.8	74	47.3	90	44.4	80	36.3
9	Essential PONEK Team	208	38.5	233	57.1	74	24.3	90	34.4	80	42.5

This study acknowledges that the major cause of maternal death is HDK complication. The region with the highest maternal death ratio due to hypertension is Sulawesi. In terms of facility services in Puskesmas PONEK, the region with the lowest proportion of drug availability in overcoming HDK is Sulawesi, which is why referral to a hospital is possible. This study shows that HDK-related maternal death mostly happens in public hospitals. The above table shows a consistency between the high maternal death uncorrected ratio in Sulawesi with the low PONEK criteria coverage in the region. Among nine PONEK criteria, Sulawesi only covers six of them, making this region the lowest in coverage. It can be concluded that maternal death at the regional level due to HDK cases is related to PONEK and PONEK facilities with low coverage.

An immediate emergency system is badly needed for handling post-partum bleeding complications. The percentage of emergency readiness in Eastern Indonesia is not too different from that of Sulawesi: only six out of nine criteria can be covered with a low percentage. The primary response for post-partum hemorrhage is blood transfusion. The results of this study show that Eastern Indonesia has the highest post-partum HDK-related maternal death uncorrected ratio. As for the availability of 24-hour blood service units, Eastern Indonesia showed the lowest percentage. Hence, it can be concluded that blood transfusion supply is a first priority at hospitals, and primarily public hospitals as referral hospitals. The following table based on Rifaskes 2011 data describes the proportion of public hospitals based on the availability of anesthetic specialists, surgeons, pediatricians, midwives and gynecologists in five regions in Indonesia:

**Table 20. Proportion of public hospitals based on the availability of anesthetic specialists, surgeons, pediatricians, midwives and gynecologists in five regions in Indonesia**

Specialization	Sumatera		Java-Bali		Kalimantan		Sulawesi		Eastern Indonesia	
	N	%	N	%	N	%	N	%	N	%
Anesthetists	208	37.5	233	74.2	74	35.1	90	38.9	80	27.5
Surgeons	208	76.4	233	91.0	74	71.6	90	82.2	80	58.8
Pediatricians	208	76.0	233	86.7	74	68.9	90	71.1	80	52.5
Obstetric Gynecologists	208	82.2	233	90.6	74	82.3	90	87.8	80	57.5

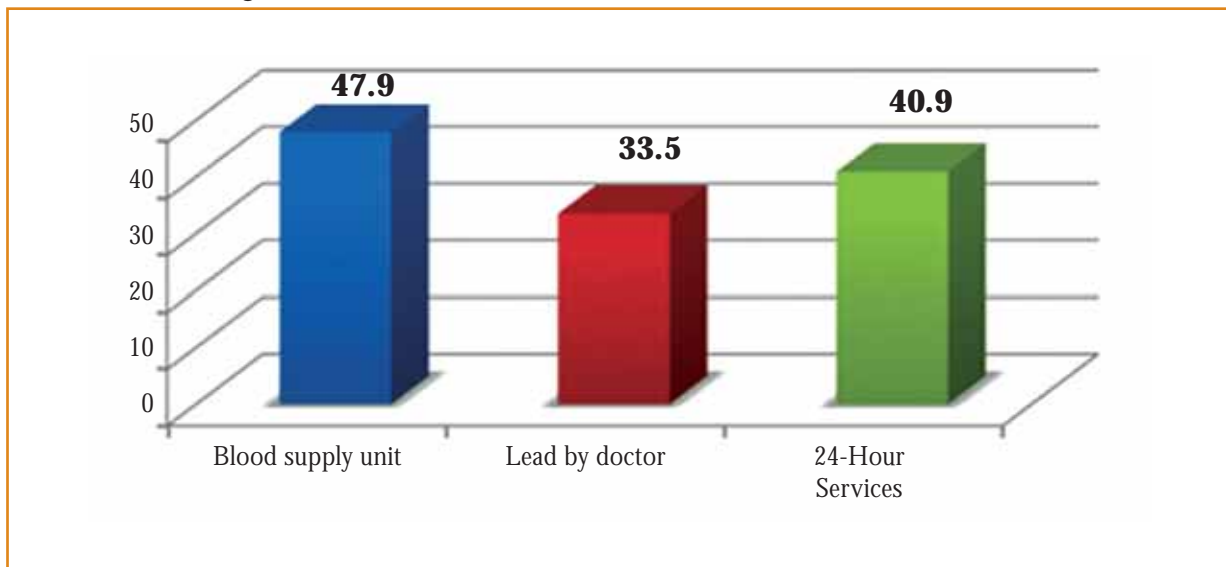
As far as the availability of obstetric gynecologists is concerned, Sulawesi has a good percentage of available gynecologists after the Java-Bali region. However, the maternal death uncorrected ratio in Sulawesi is high compared to that in other regions. This suggests that competence of education, training and operational matters for human resources should be supported by competence of facilities and equipment. When those competence standards are neglected, the risk of maternal death remains high. The following table based on Rifaskes 2011 describes the proportion:

**Table 21. Proportion of public hospitals based on the availability of supporting facilities for mother and child health by five regions in Indonesia**

Mother and Child Health Supporting Facility	Sumatera		Jabal		Kalimantan		Sulawesi		Eastern Indonesia	
	N	%	N	%	N	%	N	%	N	%
24-hour clean water	208	90.9	233	99.1	74	91.9	90	87.8	80	91.3
Water Reservoir	208	91.8	233	98.7	74	97.3	90	93.3	80	96.3
Water Availability	208	82.7	233	97.4	74	89.2	90	81.1	80	86.3
24-hour electricity	208	98.6	233	100	74	97.3	90	97.8	80	91.3
Electricity generator	208	98.1	233	98.7	74	100.0	90	95.6	80	92.5
Telephone	208	100.0	233	100	74	94.6	90	84.4	80	85.0
Ambulance	208	99.0	233	100	74	98.6	90	98.9	80	98.8

The correlation of emergency and electrical power is vital. Due to cases that require immediate operation, electricity should be available 24 hours a day. At present, this is fulfilled in 90 percent of public hospitals. However, the remaining 10 percent should be addressed immediately, since an electrical blackout in the middle of an emergency procedure or operation could prove fatal.

Nationally, blood supply units are available in about 47.9 percent of public hospitals, with doctors as the leading managers in about 33.5 percent of units, and 40.9 percent of units ready to provide 24-hour service. The following table, based on Rifaskes 2011 data, describes the situation:



**Chart 7. Proportion of hospitals based on the emergency handling capability**

It has been previously mentioned in this report that ANC, K4, Linakes and KF coverage cannot prevent maternal deaths. Maternal deaths may be avoided by an effort to provide immediate and reachable blood supply to deal with difficult PPP complications in less than one hour. Based on information and experience from the Head of Obstetrics and Gynecology in the Emergency Unit of Cipto Mangunkusumo General Hospital in Jakarta, success in preventing the fatality rate caused by bleeding complications depends on the availability of 3-5 bags of blood per patient to ensure survival.

# CONCLUSIONS

1. The results show that the uncorrected ratio for maternal deaths in Indonesia is 121 per 100,000 live births, based on data related to maternal deaths and live birth rates in the 2010 Population Census. An uncorrected ratio for maternal deaths signifies figures that have not yet been corrected and cannot be considered to represent an official maternal death ratio. Correction of figures will be carried with recognition of underreporting in data collection for the 2010 Population Census.
2. In this review, correction with complete calculation of 0.4352 (121/0.4352) is required to gain a more accurate maternal mortality ratio (MMR), specifically for this review, the MMR is 278 per 100,000 live births.
3. Ratios for maternal deaths are shown in the following list, from the highest in number by region:
  - Sulawesi (200/100,000 live births)
  - Eastern Indonesia (189/100,000 live births)
  - Kalimantan (148/100,000 live births)
  - Sumatra (114/100,000 live births)
  - Java and Bali (99/100,000 live births)Indonesia total : 121/100,000 live births.
4. There is some a disparity in the uncorrected ratio for maternal deaths in the five regions. However, Sulawesi and Eastern Indonesia only show a small difference. Only when Nusa Tenggara, Maluku and Papua, which comprise Eastern Indonesia, were separated did one of the three provinces show a possible higher maternal death rate than that in Sulawesi.
5. An estimated 77.2 percent of maternal deaths were due to direct causes, while 22.8 percent were due to indirect causes.
6. In Java and Bali as a single region, indirect causes for maternal deaths were higher than that of other regions. Cardiovascular and TB cases were mostly responsible for indirect causes of maternal death in Java and Bali. Meanwhile, in Eastern Indonesia, TB and malaria cases were a more common cause of maternal death.
7. Patterns of causes of death in the five regions based on the causal groups were no different. The highest cause of maternal death in the five regions was hypertension, at 32.4 percent, and post-partum hemorrhage, at 20.3 percent.
8. The high maternal death ratio, according to SP2010, is related to low service performance, as per Riskesdas 2010 and Rifaskes 2011, and is consistent with low availability of equipment and drugs supplies.
9. Sulawesi shows the highest uncorrected ratio for HDK-related maternal deaths. In addition, Sulawesi's service performance coverage – i.e. health worker examination, ANC K4 visit quality, delivery assistance by health workers (Linakes) – was low compared to the other regions (Riskesdas 2010). Sulawesi also showed the lowest PONEK criteria, i.e. the lowest skilled workers and lowest availability of drugs. Similarly, six of the nine PONEK criteria were also the lowest in Sulawesi, according to Rifaskes 2011 data.
10. The highest uncorrected ratio for HDK-related maternal death was in Sulawesi, according to its coverage quality in ANC test, in which Sulawesi showed the highest rates of a lack of urine testing and blood testing compared to the other regions under study.

11. Urine tests became an important indicator as a preventive measure to avoid maternal deaths due to severe complications.
12. Availability of HDK drugs was found to be crucial for reducing case fatality rate (CFR) in HDK cases.
13. The critical period of HDK cases during treatment is 0 to 48 hours after delivery. Efforts to provide complete supplies of HDK drugs in PONED and PONEK should be the first priority.
14. The highest post-partum hemorrhage (PPP)-related maternal death rate was recorded in Eastern Indonesia, where service coverage, or that of post-natal visit coverage, was the lowest.
15. The case fatality rate (CFR) of post-partum hemorrhage (PPP) can be reduced by a continuously supplied blood unit system.
16. Although ANC, K4, Linakes and KF coverage is good, delivery in places other than health facilities with an immediate blood supply in less than one hour may have caused an increased risk of death due to post-partum haemorrhage complications.
17. There is no guarantee that a large number of OBGYN doctors can help lower maternal death rates without decent hospital facilities and competent human resources, as shown in the case of Sulawesi, where the rate of maternal death is still high despite having such facilities.
18. There was a disparity of PONED and PONEK instruments and facilities in the five regions.
19. Overall, the disparity was closely related to access and service quality.



# RECOMMENDATIONS

- Regional disparity in access and quality of maternal health care should be accounted for in reducing maternal deaths.
- In minimally setting facilities, there is a need for improving collaboration
- Pregnancy before the mother turns 20 years old or after 35 years old should be avoided, however, when such cases happened, the coverage of quality of care should be improved.
- Case fatality rate (CFR) for pregnancy induced Hypertension and post-partumhaemorrhage is very high, therefore prevention is the main effort to overcome this.
- For preventive scheme, first priority is ensuring the quality of urine and blood pressure tests and laboratory functions should be improved.
- For curative scheme:
  - Availability of pre-eclampsia and eclampsia drugs in puskesmas and hospitals.
  - Access to blood transfusion unit is improved.
  - Availability of Caesarean Section and Vacuum Extraction to reduce mortality cases.
- According to prevailing regulations, the Government of Indonesia is responsible for the improvement of blood service quality and access. Therefore, it is essential that the National Commission on Blood Services (*Komite Nasional Pelayanan Darah*) and other inter-sectoral parties ensure improvement in the systems and organization of blood supply.
- PONED and PONEK shall always refer to the 3A principles of availability, accessibility and acceptability
- It is suggested that further studies should be conducted on HDK and post-partum hemorrhage (PPP) intervention such as operational research or implementation research.

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