

Analysis of trends in maternal mortalities in Bicol region using national health surveys and maternal death reviews

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ABSTRACT

Background: Since 1976, Bicol Region had higher maternal mortality ratio (MMR) than the Philippine average and became the fourth region with the highest MMR in 2012. Looking at trends of maternal health outcomes and determining risk factors among mothers who died may guide interventions to reduce MMR.

Objectives: To determine the changes in maternal mortality ratio (MMR) in the Bicol region from 2004 to 2017 and determine the sociodemographic profile of pregnant women who died from 2015 to 2018.

Materials and Methods: A records review of Bicol's Regional Field Health Services Information System from 2004 to 2017 and maternal death review reports from 2015 to 2018 was done. Changes in MMR was determined using Poisson regression. The sociodemographic characteristics and causes of maternal deaths were analyzed using frequencies and proportion.

Results: From 2004 to 2017, MMR of 100.9 remained higher than the regional target of 31.6. Significant reductions in MMR were achieved in 2007 to 2008 and in 2011 to 2012 wherein MMR ranged between 75.3 to 89.3. However, by the end of 2012, maternal deaths again increased which reached 122.5 in 2017.

From the maternal death reviews, it was observed that 29.5% of maternal deaths were aged 35 years and above and 7.5% were less than 20 years old. Mothers who had more than five pregnancies were 30.1% of total deaths. In terms of place of death, 15.7% died at home or in-transit to referral facilities. Hemorrhage or hypertension-related causes were the leading reasons for maternal deaths.

Conclusion: Significant reduction in MMR was not sustained after 2012 and higher deaths were reported in the succeeding years. Maternal deaths can be further reduced by using a systems approach, by promoting family planning, and by strengthening service delivery networks to effectively manage hemorrhage and hypertension-related emergencies.

Keywords: Maternal Mortality, Maternal Health, Health Services Delivery

INTRODUCTION

Around 830 women die globally from pregnancy or child birth related complications every day. More than half of maternal mortalities resulted from hemorrhage, hypertensive disorders and sepsis worldwide. Indirect causes account for at least a quarter of maternal deaths.¹ In the Philippines, there were 1,721 registered maternal deaths for the year 2015 and in 2016,

an estimated 114 maternal deaths per 100, 000 live births were registered which was far from the Millennium Development Goal target of less than 52 maternal mortality ratio (MMR).^{2,3} One of the regions which contributed to high maternal deaths in the country was Bicol region (Region V) with the fourth highest reported MMR in 2012 and contributed to 9% of maternal deaths.⁴ From 1976 to 2012, Region V consistently had higher MMR than the national average of 70 to 140 MMR.⁵ Bicol region is composed of six provinces and has Bicol Regional Training and Teaching Hospital (BRTTH) as its government regional hospital which serves as the catchment area of Albay, Catanduanes, Masbate, Sorsogon, Camarines Norte and Sur and other nearby provinces.

Given that Bicol is one of the regions in the Philippines with high maternal mortality, it is important to look at the trend of maternal health outcomes in this

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area. determining risk factors present among the mothers who died may guide interventions to reduce MMR. Some of these risk factors include age, gravidity, and place of delivery. Adolescent pregnant women have 33% higher risk for mortality while the odds of maternal death increase linearly by 6% per year increase of maternal age.^{1,6} An age of 35 years and older was a risk factor for maternal death as seen in several studies.^{6,7} On the other hand, grand multiparous women (women giving birth for fifth or more time) were considered to be high risk obstetric patients and had increased prevalence of maternal complications.⁸⁻¹⁰ Lastly, home births and births unassisted by health professionals increases the risk for direct and indirect causes of maternal deaths.

There is an opportunity to gather information on these maternal risk factors from death reviews done in the region. Maternal death review is a systematic way of collecting and assessing data related to maternal deaths, especially the causes of death. Its purpose is to provide information that may improve the quality of maternal care services to prevent future morbidity and mortality.¹¹ Several studies had used maternal death review as a basis of identifying the risk factors of maternal mortality.¹²⁻¹⁴ As a result, the information may be utilized by both government and non-governmental organizations such as the Philippine Obstetrical and Gynecological Society (POGS) in planning future projects and programs to improve maternal health.

OBJECTIVES

General Objective:

To determine the changes in maternal mortality ratio (MMR) in the Bicol region from 2004 to 2017.

Specific Objectives:

1. To determine the changes in facility-based delivery rate (FBD) and skilled-birth attendant rate (SBA) in the Bicol region
2. To determine the sociodemographic profile of pregnant women who died in the Bicol region from 2015 to 2018
3. To determine the causes of maternal deaths in the Bicol region from 2015 to 2018.
4. To describe factors that may have effects on the trends in maternal mortality ratio

MATERIALS AND METHODS

This study is a descriptive analytical study utilizing a retrospective records review of Bicol's Regional Field Health Services Information System (FHSIS) report (2004 to 2017) and maternal death review reports

(2015 to 2018) after approval from the University of the Philippines Manila Research and Ethics Board (UPMREB 2018-010-01).

Maternal death reviews are reports describing the sociodemographic characteristics of pregnant women who died in a particular period in the different provinces. Information on circumstances surrounding their death after thorough investigation were also included in these reports. These are generated by the different birthing facilities in the Bicol region and submitted to respective Provincial Health Officers in charge of Maternal and Child Health and finally are collated by officers in charge in the DOH Region V. No data collection forms were used since the maternal death review reports already contained the necessary information needed for the study. Data from these reports are directly encoded in a Microsoft Excel Spreadsheet to collate and organize the data.

Information from maternal death review reports from Camarines Norte and Camarines Sur were available from 2015 to 2016 only while reports from Albay, Catanduanes, and Sorsogon were available from 2017 to 2018. Maternal death review reports from 2017 to 2018 were also available from the Bicol Regional Teaching and Training Hospital.

Significant changes in MMR in each year compared to 2004 was determined using Poisson regression as described in the study by Sarpong and Brobbery.¹⁵ Since maternal deaths are considered as rare events and count data, a Poisson regression model was specified using the reported years as predictor variable. Livebirths were used as proxy to actual number of pregnant women at risk for death. The 2018 FBD and SBA rates were compared to the national target using one sample test of proportion.

The distributions of maternal deaths by gravidity, age, place of delivery, and causes of death were determined using frequencies and proportion. Information from maternal death review reports from Camarines Norte and Camarines Sur were available from 2015 to 2016 only while reports from Albay, Catanduanes, and Sorsogon were available from 2017 to 2018. Maternal death review reports from 2017 to 2018 were also available from the Bicol Regional Teaching and Training Hospital. Maternal death reviews are reports describing the sociodemographic characteristics of pregnant women who died in a particular period in the different provinces. Information on circumstances surrounding their death after thorough investigation were also included in these reports. These are generated by the different birthing facilities in the Bicol region and submitted to respective Provincial Health Officers in charge of Maternal and Child Health and finally are collated by officers in

charge in the DOH Region V. Microsoft Excel was used to manage, collate and organize the data. Reports were then summarized using tables and charts. STATA 14 was used for data analysis.

RESULTS

In 2004, MMR in the region was registered at 116.2 deaths per 100,000 livebirths. However, it can be seen in Table 1 that significant reductions in maternal mortality ratio from 2004 were achieved in the years 2007 to 2008 and in 2011 to 2012. MMR in these years ranged between 75.3 to 89.3 only. By the end of 2012, maternal deaths

again increased in the region and registered 122.5 MMR in 2017. From 2004 to 2017, the average MMR in Bicol Region of 100.⁹ remained higher than the regional target of 31.6 deaths per 100,000 livebirths. National health programs and policies on maternal health implemented within the region during the study period included the Women’s Health and Safe Motherhood Project 2 in 2006, Health Reforms for Rapid Reduction of Maternal and Neonatal Mortality in 2008, adoption of the Maternal Newborn and Child Health and Nutrition Operation Manual in 2011, adoption of the Reproductive Health Law in 2012, and establishment of the service delivery network guidelines in Bicol in 2016 (Figure 1).

Table 1. Changes in Maternal Mortality Ratio in Bicol Region, 2004 to 2017

Year	Maternal Deaths	MMR (/100,000 lb)	Rate Ratio	Std. Err.	Z	P-value	95% Conf. Int.	
2004	133	116.2	Baseline	n/a	n/a	n/a	n/a	n/a
2005	139	117.4	1.01	0.122	0.09	0.930	0.80	1.28
2006	135	119.0	1.02	0.125	0.20	0.843	0.81	1.30
2007	103	89.3	0.77	0.101	-2.00	0.045*	0.59	0.99
2008	94	79.3	0.68	0.092	-2.83	0.005*	0.52	0.89
2009	113	97.3	0.84	0.107	-1.38	0.167	0.65	1.08
2010	113	94.0	0.81	0.103	-1.66	0.098	0.63	1.04
2011	91	75.3	0.65	0.088	-3.19	0.001*	0.50	0.84
2012	93	77.0	0.66	0.089	-3.05	0.002*	0.51	0.86
2013	114	92.9	0.80	0.102	-1.76	0.079	0.62	1.03
2014	123	108.8	0.94	0.117	-0.52	0.600	0.73	1.20
2015	141	123.5	1.06	0.128	0.50	0.614	0.84	1.35
2016	138	102.0	0.88	0.107	-1.07	0.284	0.69	1.11
2017	142	122.5	1.05	0.127	0.44	0.661	0.83	1.33

*Statistically significant

Source: Bicol Region FHSIS report, 2004 to 2017

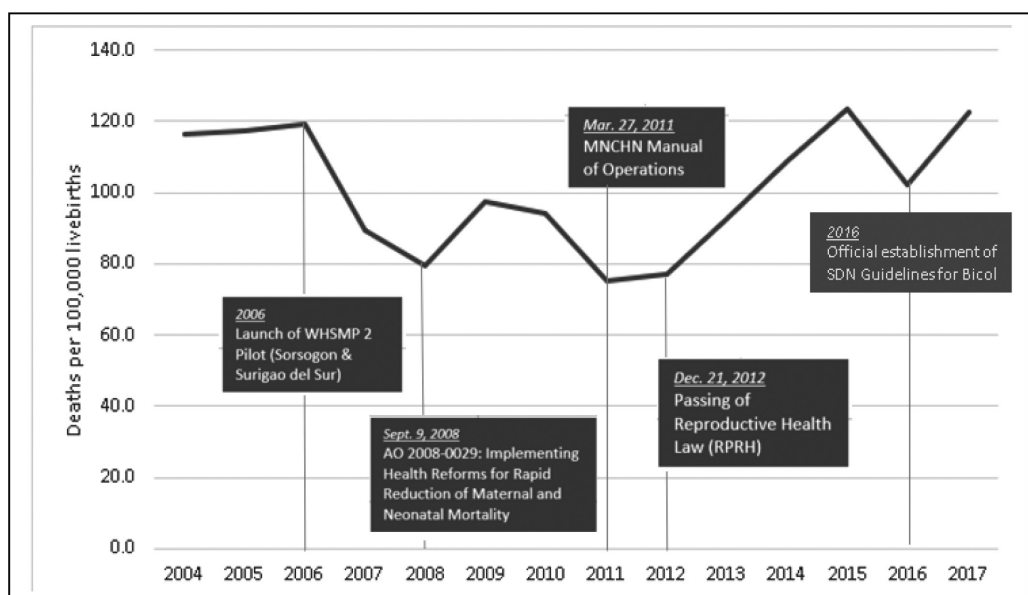


Figure 1. Programs and Policies on Maternal Health and Maternal Mortality Ratio in Bicol Region, 2004 to 2017
Source: Bicol Region FHSIS report, 2004 to 2017

Table 2 shows that Albay and Sorsogon showed a relatively lower MMR than the other provinces throughout the study period with Sorsogon showing a significant drop in MMR of 67% from 2005 to 2017. Masbate consistently reported a high MMR and Catanduanes showed a steady rise in MMR up to 2015. Ranking the average MMR of the 6 provinces from 2005 to 2017 from highest to lowest, Catanduanes and Masbate are first and second followed by Camarines Norte, Sorsogon, Albay and lastly, Camarines Sur. Figure 2 shows the trends in MMR per province from 2005 to 2017.

Table 3 shows the topography and poverty index of each province. Masbate has both high poverty index and MMR. Catanduanes is seen to have a high MMR despite its lower poverty index. On the other hand, Sorsogon showed a lower MMR despite a higher poverty index. Masbate and Catanduanes had the highest MMR and are both mountainous island provinces. All the other provinces are mountainous but are connected to each other by land.

Although MMR did not improve significantly in Bicol region, substantial improvements in Facility-Based Delivery (FBD) and Skilled-Birth Attendants (SBA) rates were observed from 2003 to 2018 (Table 4). FBD rate in 2018 was estimated to be 93.8% (95%CI= 93.7% to 94.0%) which was significantly higher than the national target of 90% (p-value=0.000). On the other hand, SBA rate in 2018 was estimated to be 94.9% (95%CI= 94.7% to 95.0%) and significantly higher than the national target of 90% (p-value=0.000).

Sociodemographic data from pregnant women who died were available from death reviews in 2015 to 2016 from Camarines Norte and Camarines Sur (CN-CS), and in 2017 to 2018 from Albay, Catanduanes, and Sorsogon (A-C-S). Also, information from maternal death reviews were available in 2017 to 2018 from patients admitted in the Bicol Regional Teaching and Training Hospital (BRTTH).

In terms of maternal age, it can be seen in Figures 3a-3c that 33.7% of maternal deaths were aged 35 years and above in CN-CS, 23.3% in A-C-S, and 26.3% in BRTTH. It was also observed that 7.5% of maternal deaths in the provinces and 10.5% in the hospital were aged less than 20 years old.

In terms of gravidity, Figures 4a-4c show that the proportion of gravida 5 or more was 37.6% in CN-CS, 21.1% in A-C-S, and 21.1% also in BRTTH. On the other hand, the proportion of primigravid mothers was 29.4% in CN-CS, 42.3% in A-C-S, and 34.2% in BRTTH.

The distribution of maternal deaths by place of death showed that more than 10% still died at home or in-transit to a referral facility (11.6% in CS-CN and 20.5% in A-C-S) (Figures 5a-5b).

Hemorrhage and hypertensive complications (e.g. eclampsia) were the leading reasons for maternal

Table 2. Maternal Mortality Ratio in Each Province of Bicol Region, 2005 to 2017

	2005		2007		2009		2011		2013		2015		2017	
	MD	MMR	MD	MMR	MD	MMR	MD	MMR	MD	MMR	MD	MMR	MD	MMR
Albay	15	64.67	16	71.18	16	66.79	15	64.85	9	33.55	28	117.53	22	102.78
Camarines Norte	16	153.98	4	32.48	11	92.03	5	44.99	29	266.91	21	135.93	7	61.45
Camarines Sur	23	75.07	21	69.07	23	78.14	19	59.14	22	66.02	25	91.86	11	36.12
Catanduanes	2	37.72	3	55.55	9	167.79	11	193.90	11	184.81	16	288.65	7	122.23
Masbate	37	173.71	24	122.54	27	133.65	23	107.58	28	147.48	31	187.28	17	152.91
Sorsogon	36	205.19	24	153.55	18	113.98	11	63.94	10	61.71	11	73.85	10	67.28

Source: Bicol Region FHSIS report, 2005 to 2017

Table 3. Topography, Maternal Mortality Ratio and Poverty Incidence in Each Province of Bicol Region, 2006 to 2015

	Topography	2006			2009			2012			2015		
		MD	MMR	PI	MD	MMR	PI	MD	MMR	PI	MD	MMR	PI
Albay	Mountainous	11	49.88	32.3	16	66.79	33.9	18	83.96	36.1	28	117.53	25.1
Camarines Norte	Mountainous	12	111.17	29.5	11	92.03	32.4	6	46.78	24.7	21	135.93	36.5
Camarines Sur	Mountainous	26	89.89	38.7	23	78.14	37.2	28	83.22	33.5	25	91.86	29.2
Catanduanes	Mountainous and Island	3	57.13	31.2	9	167.79	20.3	9	150.83	27.1	16	288.65	33.7
Masbate	Mountainous and Island	27	129.74	47.8	27	133.65	49.8	16	80.06	44.2	31	187.28	31.6
Sorsogon	Mountainous	42	254.21	30.6	18	113.98	34.3	10	60.35	32.1	11	73.85	35.7

Source: Bicol Region FHSIS report and Philippine Statistics Authority 2006, 2009, 2012, 2015

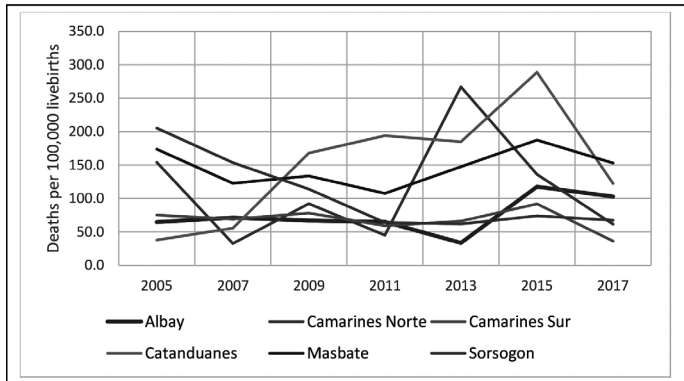


Figure 2. Maternal Mortality Ratio in Each Province of Bicol Region, 2005 to 2017

Table 4. Facility Based Delivery and Skilled-Birth Attendants Rate in Bicol Region, 2003 to 2018.

	Facility-Based Delivery Rate	Skilled-Birth Attendants Rate
2003	21.9%	47.8%
2008	32.5%	49.9%
2013	50.8%	65.0%
2018	93.8%	94.9%

Sources: Philippine Health Statistics Report, 2003, 2008, 2013
Bicol Region FHSIS report, 2008

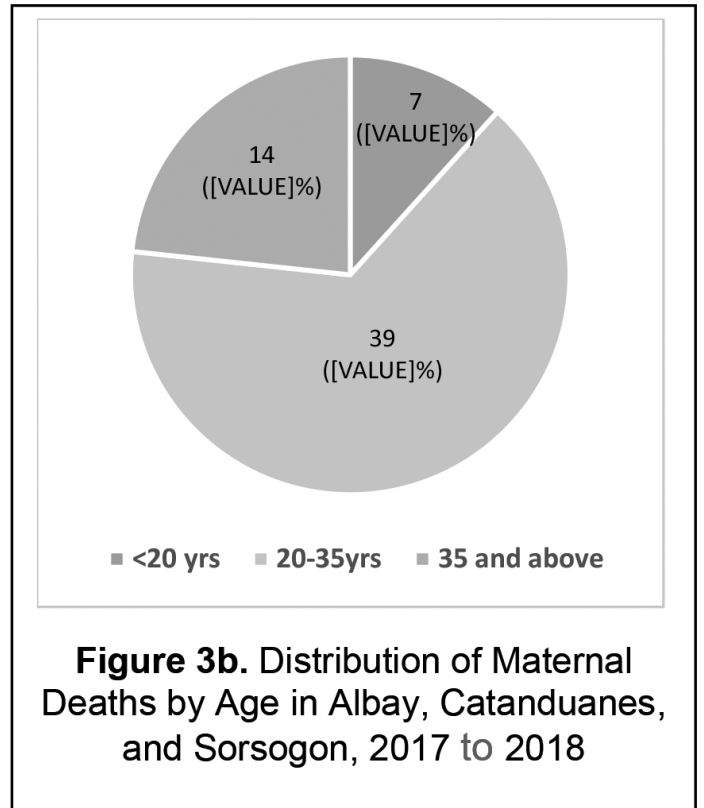


Figure 3b. Distribution of Maternal Deaths by Age in Albay, Catanduanes, and Sorsogon, 2017 to 2018

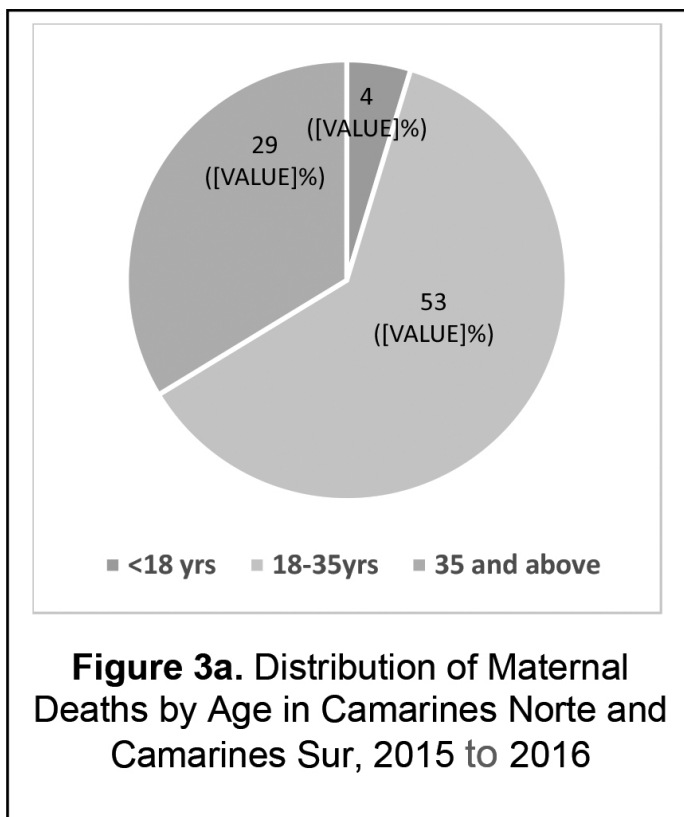


Figure 3a. Distribution of Maternal Deaths by Age in Camarines Norte and Camarines Sur, 2015 to 2016

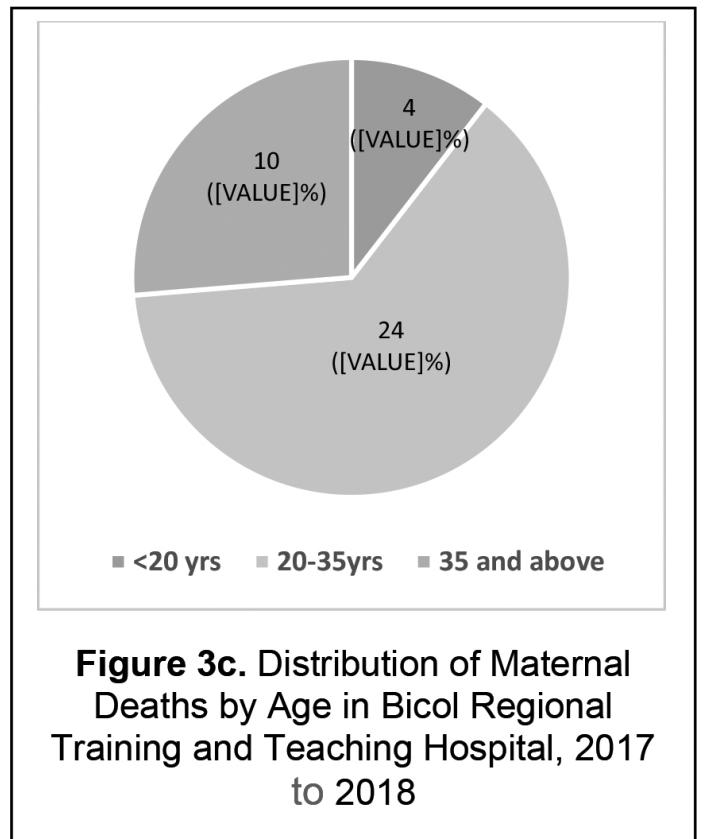
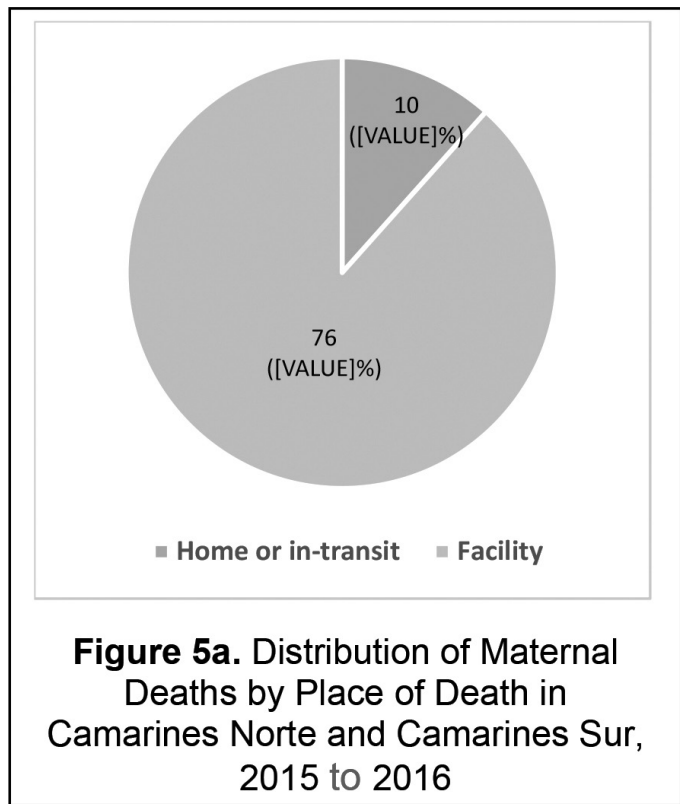
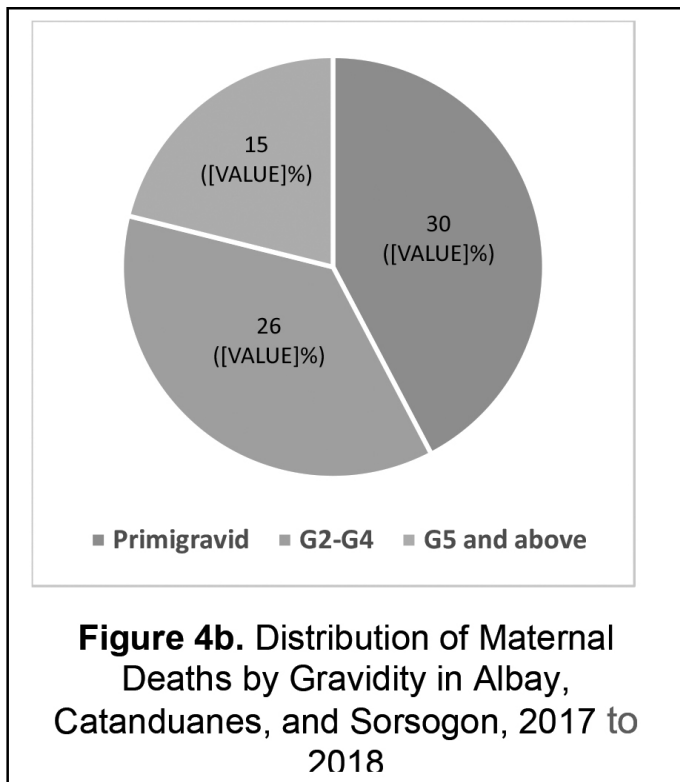
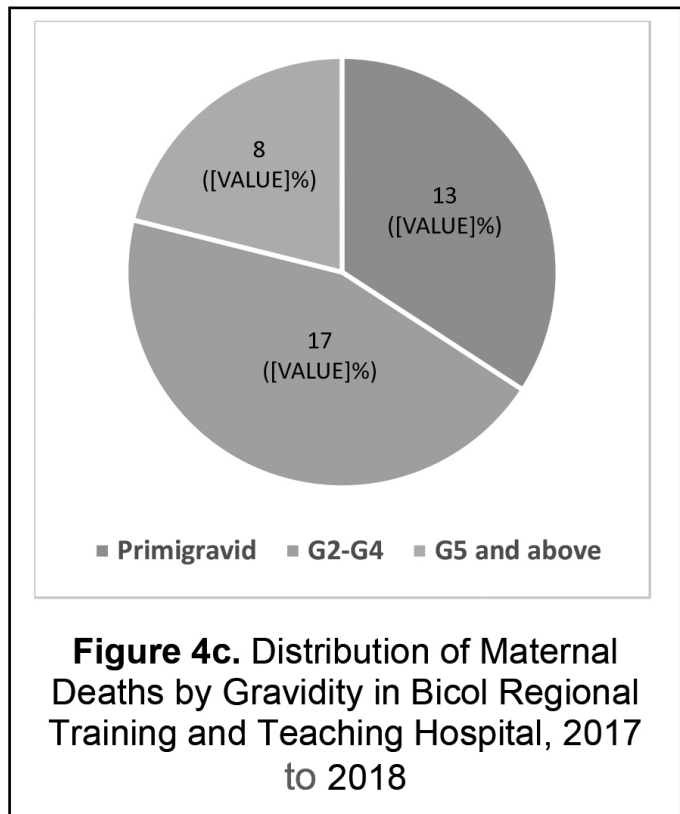
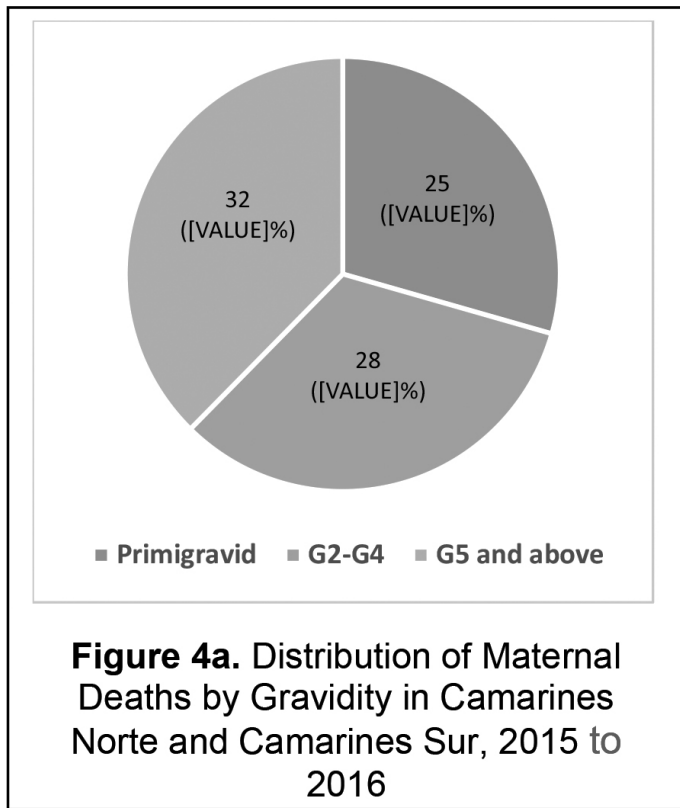


Figure 3c. Distribution of Maternal Deaths by Age in Bicol Regional Training and Teaching Hospital, 2017 to 2018



deaths reported in the provinces (Figures 6a-6c). Hemorrhage accounts for 37.3% of maternal deaths in CN-CS and 28.2% in A-C-S while hypertension-related causes account for 24.1% of deaths in CN-CS

and 38.0% in A-C-S. In BRTTH, hemorrhage is the leading cause of maternal deaths (42.1%) followed by indirect causes (34.2%).

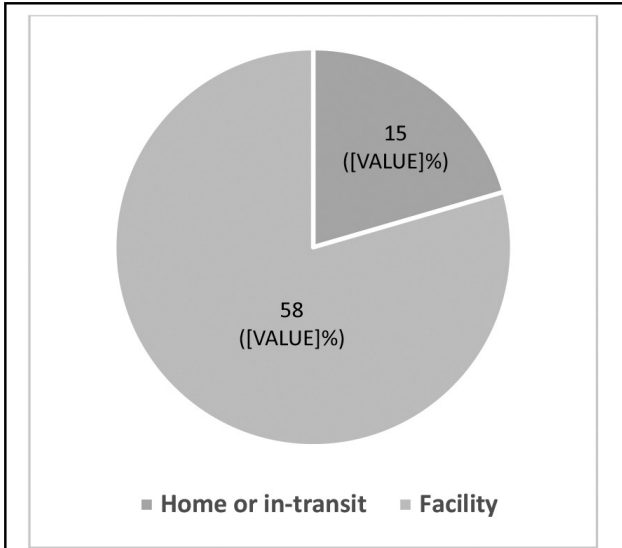


Figure 5b. Distribution of Maternal Deaths by Place of Death in Albay, Catanduanes, and Sorsogon, 2017 to 2018

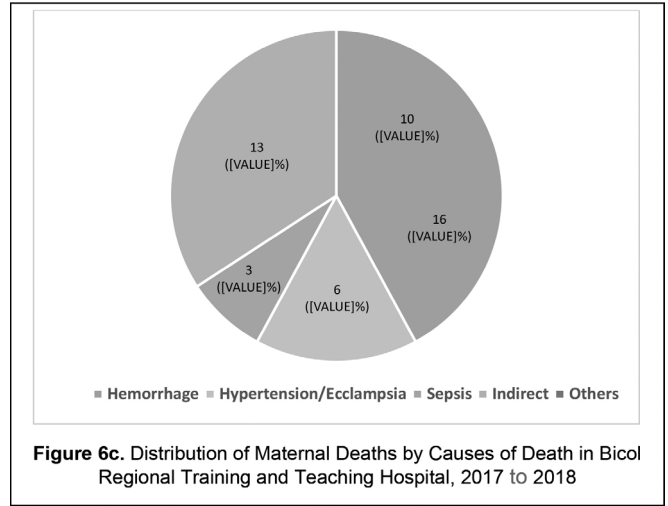


Figure 6c. Distribution of Maternal Deaths by Causes of Death in Bicol Regional Training and Teaching Hospital, 2017 to 2018

DISCUSSION

Although maternal mortality ratio (MMR) in the Philippines dropped from 96 per 100, 000 livebirths in 2000 to 74 in 2015, it is still one of the countries globally which did not meet its target of reducing maternal mortality by three-quarters from 1990.¹⁶ Bicol region continued to have higher MMR than most regions in the country.⁵

It is noted that the highest MMR were consistently observed in Masbate and Catanduanes, both island provinces and relatively detached from the rest of the provinces. Masbate also has one of the highest poverty indices in the region and poverty can predispose to poorer access to maternal health services. Mothers in far-flung areas are not able to go for prenatal check-ups, or have their babies delivered in health facilities because of distance and lack of transportation. Other determinants to accessing service delivery for mothers and their children among areas within the same region include other sociogeopolitical factors.^{5,17,18} However, it is noted that in the Bicol region, poverty alone does not consistently affect MMR. Moreover, Maglaya (2009) posited that the familial environment and beliefs significantly impacts the ability to maintain maternal health and even personal development. Familial environment encouraging beliefs, such as not taking a bath a few days or even months after birth, significantly increases the risk of puerperal infection and complications.¹⁹

The national government with the support of funding agencies employed a systems approach to

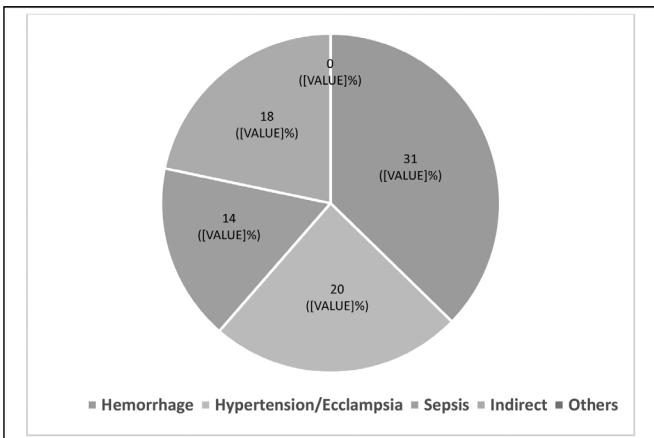


Figure 6a. Distribution of Maternal Deaths by Causes of Death in Camarines Norte and Camarines Sur, 2015 to 2016

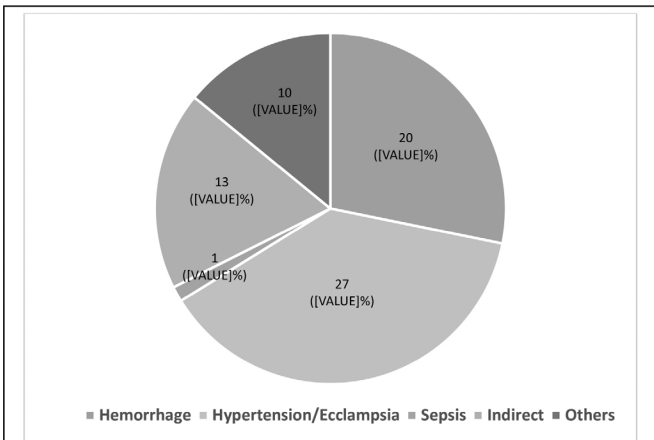


Figure 6b. Distribution of Maternal Deaths by Causes of Death in Albay, Catanduanes, and Sorsogon, 2017 to 2018

address the complex underlying causes of maternal mortalities. One of the drivers of the reduction in MMR was the “Health Facilities Enhancement Program (HFEP)” introduced by the Philippine’s Department of Health (DOH) in 2006. Through this program, local government units were able to request technical assistance, funding and PhilHealth accreditation from DOH to develop their local health facilities. These reimbursements from the national health insurance program encouraged patients to access maternal health services such as antenatal care and birthing at a health facility.²⁰

It was also in 2006 that the Women’s Health and Safe Motherhood Project 2 (WHSMP2) was launched by the DOH in partnership with World Bank. It shifted focus on preventive care by preparing all women for potential obstetric complications rather than identifying and treating high-risk pregnancies. This project fast-tracked system-wide reforms in maternal health in a few selected provinces through pillars of intervention which included 1) sector governance 2) infrastructure and essential medical products and equipment; 3) human resource development 4) financing and 5) service delivery.²¹

Sorsogon, a province in Bicol, was one of the local government units chosen for its pilot implementation. Sorsogon was selected because of its high poverty incidence, poor maternal health status, and willingness of local government to support the project. Sorsogon is poorer than most of the other provinces in the region and reported a poverty incidence of 43.5% in 2006. Despite this, it can be seen in this study that Sorsogon showed the most substantial decrease in MMR compared to other provinces in Bicol. This is consistent with a case study report on the province wherein a systems approach in Sorsogon was seen to have positive synergistic effects in improving maternal health.²¹ The experience of Sorsogon showed that improvement in maternal health can be achieved when investments through domestic and foreign assistance is coupled with good local governance to develop multiple areas of the health system.

It can be seen in this study that MMR in Bicol region began to increase again after 2012 at the time of completion of the WHSMP2. This may be due to existing gaps in the health system that were still unanswered throughout the years. A study done by Lee et. al. in 2012 to determine the access of

maternal health care services among poor women in Bicol showed these women received incomplete services for antenatal care. Only 13.0% to 32.4% of women delivered in a health facility and appropriate post-natal care was obtained by most mothers only after 4 hours or longer following delivery. Only 20.6% to 38.7% had health insurance. Overall, as much as 7 to 9 of every 10 poor women in Bicol had at least one problem accessing maternal health care services.²²

In addition to adopting a systems approach which was seen to be effective in Sorsogon, promotion of family planning may help further reduce MMR in the region. It was seen that the proportion of high-risk mothers who became pregnant and eventually die (grand multigravidas and those aged >35 years old) still contributed to >20% of maternal deaths. Advanced maternal age and having more than 4 pregnancies have consistently been associated with maternal mortality. This is further complicated when these mothers have birth intervals of less than 2 years.²³

The results of this study also showed that at least 10% of pregnant women still died at home or in-transit to referral facilities. To prevent these deaths especially those caused by hemorrhage or by hypertension-related causes, service delivery networks including referral systems for high risk pregnancies should be improved.

The DOH introduced the concept of service delivery networks (SDN) to address the gaps in maternal health referral systems. SDN is defined as a province- or city-wide network of health facilities, both public and private, which can provide MNCHN services.²⁴ An organized SDN draws in the capacities of public and private health facilities in its catchment area in such a way that regardless of the point of entry of pregnant women in the system, she will be referred and treated appropriately.²⁵

This study reviewed secondary data only. The accuracy of results depend on how complete and precise maternal deaths were reported in each province. The reporting of maternal mortality using facility service statistics and vital registries have several limitations especially for countries without well-established information systems. In this scenario, variations in the number of maternal mortalities across the years may be due to changes in reporting system rather than true changes in

risk for mortalities. The timeliness, completeness and accuracy of maternal death reporting may vary from province to province despite initiatives from the regional office to standardize reports. However, no alternative means are currently available for the Philippines and Bicol region to generate more accurate estimates of maternal mortality ratio. The FHSIS and maternal death review reports remain to be the region's primary source of data for monitoring and planning for programs to improve maternal health outcomes.

CONCLUSION

Significant reduction in MMR was achieved in the years 2007 to 2008 and 2011 to 2012 in the Bicol region. However, these were not sustained and higher numbers of maternal deaths were reported in the succeeding years which reached 122.5 MMR in 2017. This despite the substantial improvements and achievement of targets in facility-based delivery rates and skilled-birth attendant rates in the region. A systems approach may be considered to further reduce maternal deaths. Since majority of mothers who died were not at risk because of age or high gravidity, other systems factors may have increased the likelihood of mortality for these mothers. Nonetheless, as much as 20% of mothers who died were aged ≥ 35 years and more than 20% were grand multigravidas. Thus, interventions on preventing these high-risk pregnancies may be relevant. The capacity of referral systems and facilities to address hemorrhage and hypertension-related emergencies must also be improved.

RECOMMENDATIONS

Maternal deaths can be further reduced through interventions targeting different components of the health system. Strengthening the referral system is encouraged to prevent deaths at home or during in-transit to facilities. Capacity building for comprehensive emergency obstetrics within hospitals are recommended to reduce maternal deaths within facilities. Finally, reporting system for maternal mortalities must be improved to generate timely, complete and accurate reports. The conduct of household surveys or pregnancy tracking may be helpful to validate information generated from

facility service statistics and vital registries. Further studies are recommended in terms of determining other factors related to maternal mortality such as poverty level, accessibility of health services, and health beliefs and practices which can be assessed in a mixed quantitative and qualitative study design. ■

CONFLICTS OF INTEREST

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

FUNDING STATEMENT

This research was funded by a grant from the National Institutes of Health University of the Philippines Manila [Project Code: NIH 2018-001].

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