

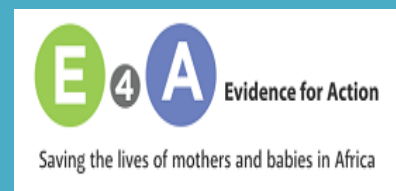


National Maternal Death Surveillance and Response (MDSR) System Annual Report, 2010 EFY



Ethiopian Public Health Institute
Public Health Emergency Management Center
(PHEM)

January, 2011 E.C



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Acronyms and Abbreviations

ANC	Antenatal Care
BP	Blood Pressure
E.C	Ethiopian Calendar
EDHS	Ethiopian Demographic Health Survey
EFY	Ethiopian Fiscal Year
EmONC	Emergency Obstetric and Neonatal Care
EPHI	Ethiopian Public Health Institute
FBAF	Facility Based Abstraction Form
FMOH	Federal Ministry of Health
HDP	Hypertensive Diseases of Pregnancy
HSTP	Health Sector Transformation Plan
MBB	Mini Blood Bank
MD	Maternal Death
MDRF	Maternal Death Report Format
MDSR	Maternal Death Surveillance and Response
MMR	Maternal Mortality Ratio
MNCH	Maternal Neonatal and Child Health
NASG	Non-pneumatic Anti-shock Garment
NICU	Neonatal Intensive Care Unit
PFSA	Pharmaceutical Fund and Supply Agency
PHEM	Public Health Emergency Management
PNC	Post Natal Care
PPH	Post-Partum Hemorrhage
QI	Quality Improvement
RHB	Regional Health Bureau
RRT	Rapid Response Team
SNNP	Southern Nations Nationality and Peoples
TWG	Technical Working Group
WHO	World Health Organization

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Forward

This 2010 EFY Ethiopian Maternal Death Surveillance and Response (MDSR) System report marks the fifth year of the national system's implementation, which was initiated in Ginbot 2006 E.C. During these five years, over 3000 maternal deaths have been identified, notified, reviewed, reported, and entered into the national database. The system has transitioned from being a standalone reporting structure, to becoming integrated within Public Health Emergency Management (PHEM). Every year, the number of reported deaths has increased, and for 2010 this report presents analysis of 1010 case-based reports from community and facility review processes. This is a tremendous achievement, particularly considering that MDSR systems can take 10-20 years to fully mature. There is, of course, more work to be done to improve the coverage, completeness, and quality of the data. Improving data collection across the system is critical, as analysis and action will depend on the accuracy and validity of information received into the system.

In this report, findings regarding the causes and determinants of maternal deaths are compared across the last 5 years to provide an indication of prevailing trends over time. Trends need to be interpreted with caution, as the MDSR system is still young and earlier years experienced significant under-reporting (for example, there were fewer than 100 maternal deaths reported in 2006 E.C). In line with this, we have observed that postpartum hemorrhage remains the leading cause of maternal deaths. Changes are seen in other areas, such as the increment of facility reporting, which suggests that a growing number of women deliver at or seek attention for complications from health facilities. Furthermore, it is a positive development that facility-based reports increasingly cite "delay 3" factors (which correspond to delay in receiving care once arriving in a facility) as contributing to maternal deaths. This might indicate that the culture of fear might be abating which could in turn imply providers' willingness to consider weaknesses within facilities and identify these for quality improvement measures.

As always, the response to maternal mortality is the most important step of MDSR. This report offers both good practice examples and recommendations for how the health system can learn from MDSR data at different levels and use the evidence to avert future deaths. In particular, this report links MDSR to the Quality Improvement (QI) cycle, demonstrating how the review process can help identify practical measures to improve quality of obstetric care, which can then be prospectively evaluated.



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Executive Summary

The national Maternal Death Surveillance and Response (MDSR) system has been implemented for the last five years nationwide. This is the first annual report to present trends in data since the 2006 EFY introduction of the system.

During the current 2010 EFY, the system captured 1302 maternal deaths with weekly notifications and 1010 maternal death case-based reports. Among case-based reports, 423 were reported via verbal autopsy and 454 via facility-based abstraction, and for 133 the data source was not known. This represents 10 % of maternal deaths captured by weekly notification and 8% captured by case-based reports, based on EDHS 2016 GC estimates of maternal deaths throughout the country. Slightly fewer case-based reports were reviewed in 2010 EFY compared to 2009 EFY, possibly as a result of political events during the year, and therefore some late reports may still be submitted in future.

Facility-based reporting continues to rise, now accounting for over half of all case-based reports for which source of data was recorded. Ethiopia's MDSR system is one of the few in the world that captures community-based deaths, and thus it is critical for the level of verbal autopsies conducted to increase over time. Each notified maternal death should be investigated by verbal autopsy and reviewed at community level, even if it is also reviewed within a facility. In a fully functioning system, only MDRFs from verbal autopsies will be used to analyze data and estimate total number of maternal deaths, to avoid duplication.

There remain significant variations in regional levels of reporting, ranging from 52% of expected deaths captured by the system in Dire-Dawa to under 1% in Somali Region. Attention needs to be paid to high-reporting zones and woredas, which should receive support for appropriate responses to address their maternal deaths, while low-reporting areas require more intensive technical assistance to bring their reporting levels in line with the rest of the country.

It is also worth highlighting that although perinatal death surveillance was added to the system in 2009, roll out of training and data collection tools have only recently been completed and the number of perinatal deaths reported is too low to analyze for this report.

The leading causes of maternal death identified by the MDSR system were haemorrhage in 417 cases (41.3%), hypertensive disorders of pregnancy (HDP) in 188 (18.6%), Anemia in 177 (17.5%), obstructed/ ruptured uterus in 98 (9.7%) and sepsis in 94 (9.3%). This pattern is broadly the same as in previous years, although there is a notable slight decline in haemorrhage cases. Most maternal deaths continue to occur in the post-partum period, with high parity women at highest risk.

In the last three years (2008-2010 EFY) hypertensive disorders in pregnancy (HDP) has also persisted as the second leading cause of maternal death accounting for more than 18% of the deaths. Anemia is the third leading cause of death contributing to 18% to 20% of maternal deaths.

The MDSR review process identifies factors that contributed to the death, classified into the 3-delay model where Delay One refers to delay in deciding to seek assistance, Delay Two relates to delay in reaching a facility, and Delay Three captures delays in receiving appropriate care after arrival at a facility. In 2010 EFY, delay one was cited in 675 (66.8%), delay two in 381 (37.7%) and delay three in 491 (48.6%) of reviewed maternal deaths. These proportions do not add up to 100% as more than one delay can be recorded for any maternal death report. The increase in Delay 3 factors from previous years' highlight that more women are delivering in facilities or seeking care when complications arise, and also that facilities are willing to identify internal problems and address these.

Responses to MDSR data take place at all levels of the health system including the community, all health facilities, and all administrative levels i.e. Woreda, zonal, regional and national. During 2009-2010, the Ethiopian Health system committed to a National Quality Improvement (QI) programme across the entire health system. This annual MDSR report features good examples of how MDSR and QI teams can work together to produce demonstrable impact. Four case studies from MDSR/QI projects undertaken in 2010 are detailed on the following topics

1. Basic emergency care for obstetric cases prior to arrival at hospital
2. Quality of ANC care of a health center
3. Access to blood transfusion at a primary hospital
4. Anticonvulsant treatment and monitoring of severe HDP at a Referral Hospital

Finally, the report concludes with key recommendation based on the data and targeted at different levels of the health system. These focus on (1) improving levels of reporting and review by strengthening leadership and committing adequate resources within EPHI and the Technical Working Group; (2) making antenatal care a national FMOH priority with intensive supervision to standardize services offered to pregnant women at community-level; (3) Ensuring facility managers take responsibility for the availability and use of critical job aids and supplies in labour wards such as the Safe Childbirth Checklist, Partograph, misoprostol, NASGs; and (4) increasing health system capacity including functional facility-to-facility referral systems, establishment of mini blood banks and training staff in efficient use of blood products (e.g. frozen plasma instead of whole blood where appropriate), and (5) introducing routine audit and quality improvement procedures, including QI staff representation on MDSR/ RRT review committees.

I. Maternal Death Surveillance and Response System Performance

Summary Findings:

- *Compared to previous years, capacity of the MDSR system has improved both in terms of **consistency of reporting** and **geographic coverage***
- ***Weekly** and **case-based reporting** of maternal deaths have significantly increased each year, although the system still captures only about 10% and 8% of estimated maternal deaths through weekly surveillance and case-based reports, respectively*
- *There are **variations across regions** in **MDSR performance**, and **low reporting** and **silent areas** remain*

Surveillance and Case Based Reporting

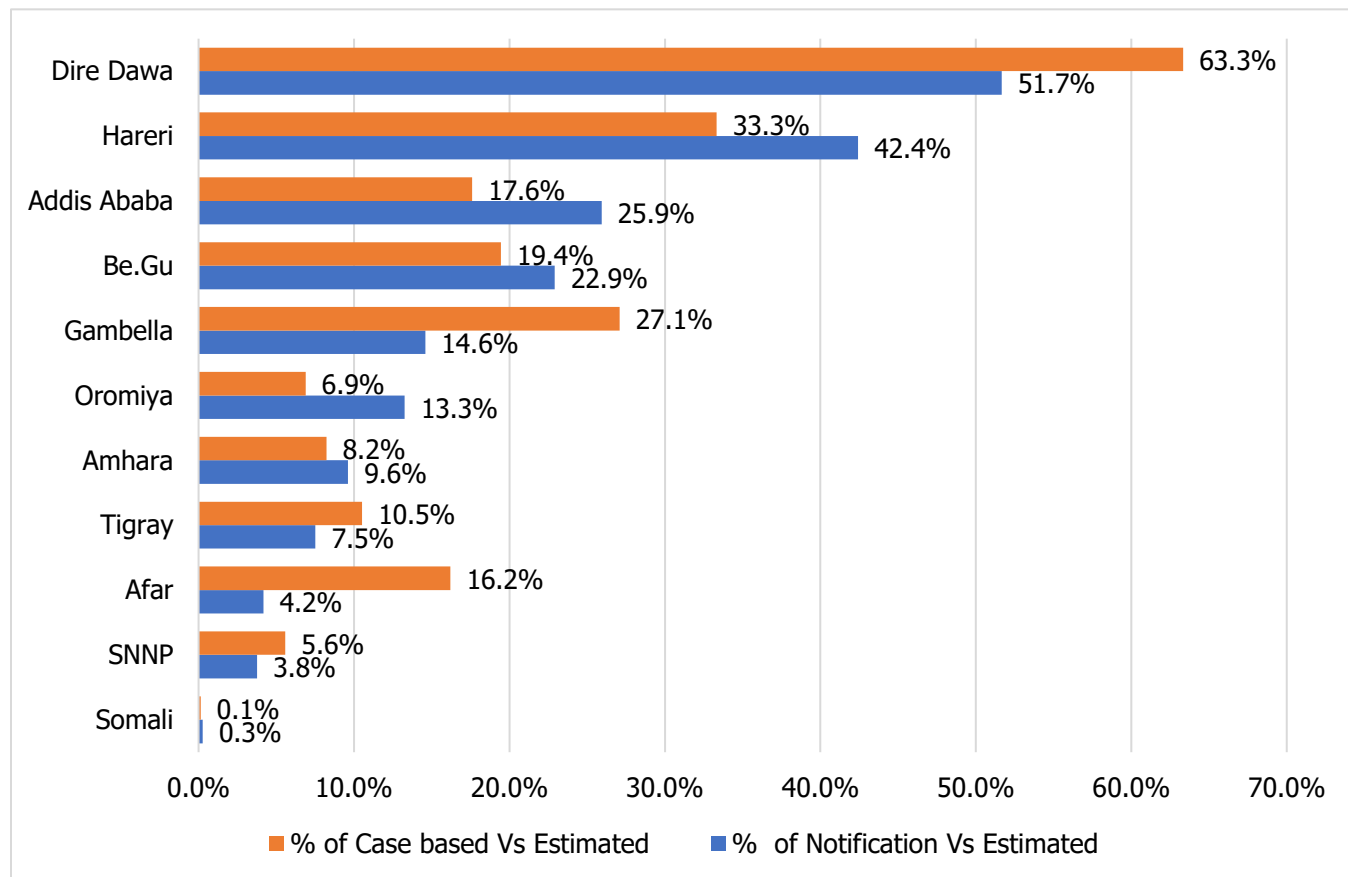
Reducing maternal mortality and improving maternal health is a top priority of the Ethiopian Federal Ministry of Health (FMOH) as reflected in Health Sector Transformation Plan and Reproductive Health Strategy for 2016 – 2020. The national Maternal Death Surveillance and Response (MDSR) system has been implemented for the last five years nationwide. The system operates as part of the national Public Health Emergency Management (PHEM) system at health facility and community level to identify and capture maternal deaths happening in both facilities and the community. In partnership with the FMOH, reviewed and reported data are analyzed to identify priority responses.

Although MDSR system has been implemented in its current form since 2007 throughout the country, gaps remain in reaching the all geographical areas. Reporting of maternal deaths through weekly surveillance lags behind the other reportable conditions within the surveillance system. Sensitivity of maternal mortality and the relative complexity of this specific surveillance may be responsible for relatively lower MDSR surveillance performance compared to the estimated maternal death. However, Ethiopia's MDSR system shows significant improvement in its capacity to capture maternal deaths occurring in communities as well as in health facilities compared with previous years.

During the current 2010 Ethiopian fiscal year (EFY), the system captured 1302 maternal deaths with weekly notifications and 1010 maternal death case-based reports. Among case-based reports, 423 were reported via verbal autopsy and 454 via facility-based abstraction, and for 133 the data source was not known. This represents 10 % of maternal deaths captured by weekly notification and 8% captured by case-based reports, based on EDHS 2016 estimates of maternal deaths throughout the country.

There are regional differences in reporting rates as compared to estimated numbers of maternal deaths. As shown in Figure 1 below, Dire Dawa city administration and Harari regions reported 31 (52 %) and 14 (42 %) of expected maternal deaths. Lower reporting rates were received from Ethiopia Somali and Southern Nations, Nationalities and Peoples (SNNP) regions, which were 2 (0.1 %) and 104 (4 %) respectively. The other regions fell somewhere in between these extremes.

Figure 1: Proportion of reported maternal deaths against the estimated number of deaths by region based on EDHS 2016 MMR of 412 per 100,000 LBs, July 1, 2008 to June 30, 2009 E.C



The maternal deaths reported through weekly reporting are expected to be reviewed within one month after the weekly report, including submission of the Maternal Death Reporting Format (MDRF). Almost all regions and city administrations, with the exception of Somali region, have started to review and report weekly maternal deaths using the MDRF. Some gaps are observed in the number of MDRFs received compared to the number of deaths reported through weekly surveillance. In a well-functioning system, roughly the same number of MDRFs and weekly reported maternal deaths should be received. Some discrepancy between surveillance and review reports are expected, as not all weekly reported maternal

deaths will be eligible for investigation, reviewing and report by final case-based reporting formats. Furthermore, investigation for some deaths may not be carried out due to some families being difficult to locate following a death, refuse to participate in a verbal autopsy or suspected maternal deaths reported weekly may be turned to be accidental or incidental deaths during verification. Thus, the number of MDRFs is likely to be smaller than the total number of MDs reported through weekly surveillance.

As shown in table 1 below, among 1302 weekly notified maternal deaths 77.6 % overall (ranging from 50 % to 388.9 %) were reviewed and reported using the MDRF. Where this proportion is over 100% it suggests that while maternal deaths are being notified and reviewed, weekly surveillance is not capturing these. In Dire Dawa, Tigray, Gambella, SNNP and Afar there was a greater number of MDRFs compared with weekly notifications, respectively 122.6 %, 140 %, 185.7 % and 388.9 %.

Among all maternal case-based reports, 454 (45.0%) were extracted from verbal autopsies, which are meant to be used for all maternal deaths regardless of where they occur. The remaining 423 (41.9%) case-based reports were extracted from facility-based abstraction formats, which are used specifically to investigate maternal deaths occurring at health facilities, and include significantly more clinical detail.

Table 1: - Reported maternal deaths versus estimated maternal deaths and Weekly Vs MDRF reports based on EDHS 2016 estimate, 2010 EFY

Region	Estimated	Reported notification	Reported Case based	% of notification reporting Vs Reported	% of notification reporting Vs Estimated	% of case-based reporting Vs Estimated	Case based extracted from VA	Case based extracted from FBAF
Addis Ababa	324	84	57	67.9	25.9	17.6	39 (68.4%)	18 (31.6%)
Afar	216	9	35	388.9	4.2	16.2	17 (48.6%)	18 (51.4%)
Amhara	2964	285	244	85.6	9.6	8.2	71 (29.1%)	63 (25.8%)
Benishangul Gumuz	144	33	28	84.8	22.9	19.4	12 (42.9%)	16 (57.1%)
Dire Dawa	60	31	38	122.6	51.7	63.3	28 (73.7%)	6 (15.8%)
Gambella	48	7	13	185.7	14.6	27.1	6 (46.2%)	6 (46.2%)
Harari	33	14	11	78.6	42.4	33.3	10 (90.9%)	0
Oromiya	5112	678	352	51.9	13.3	6.9	163 (46.3%)	184 (52.3%)
SNNP	2760	104	154	148.1	3.8	5.6	91 (59.1%)	51 (33.1%)
Somali	756	2	1	50.0	0.3	0.1	1 (100.0%)	0
Tigray	732	55	77	140.0	7.5	10.5	16(20.8%)	61 (79.2%)
Total	13149	1302	1010	77.6	9.9	7.7	454 (45.0%)	423 (41.9%)

Note: - 133 Case based (MDRF) reports received have no information on whether extracted from VA or FBA Top maternal death reporting zonal/town and woredas

During the current fiscal year, 557 (55.1 %) of maternal deaths reported through case-based reporting were from just 20 zones or towns. The highest number of MDRFs were received from Hawassa of SNNPR. The 20 top reporting zones and woredas are shown in the table below. (Table 2 and Table 3)

Table 2: - Twenty high maternal death reporting zonal/ town structures, 2010 EFY.

S. N	Zone / Town Name	Region	Number of Case based reports	% regional total	% national total
1	Awassa	SNNPR	65	42.2%	6.4%
2	West Gojjam	Amhara	42	17.2%	4.2%
3	Arsi	Oromia	41	11.6%	4.1%
4	West Arsi	Oromia	39	11.1%	3.9%
5	North Shewa	Amhara	38	15.6%	3.8%
6	North Gondar	Amhara	36	14.8%	3.6%
7	South Gonder	Amhara	33	13.5%	3.3%
8	Bale	Oromia	30	8.5%	3.0%
9	East Hararge	Oromia	25	7.1%	2.5%
10	Guji	Oromia	22	6.3%	2.2%
11	Jimma	Oromia	21	6.0%	2.1%
12	East Gojjam	Amhara	21	8.6%	2.1%
13	East Wellega	Amhara	21	8.6%	2.1%
14	Zone 03	Afar	19	54.3%	1.9%
15	South Wolo	Amhara	18	7.4%	1.8%
16	Wolayita	SNNPR	18	11.7%	1.8%
17	South East Tigray	Tigray	17	22.1%	1.7%
18	West Shewa	Oromia	17	4.8%	1.7%
19	Kefa	SNNPR	17	11.0%	1.7%
20	Bahir Dar	Amhara	17	7.0%	1.7%
Total			557	NA	55.1%

Table 3: - Twenty high maternal death reporting Woreda structures, 2010 EFY

S. N	Zone / Town Name	Region	Number of Case based reports	% regional total
1	Hawassa Town	SNNPR	41	26.6%
2	Bahir Dar Liyu	Amhara	17	7.0%
3	Gondar town	Amhara	16	6.6%
4	Shashemene Town	Oromia	13	3.7%
5	AdolaTown	Oromia	13	3.7%
6	Libokemkem	Amhara	10	4.1%
7	Dubti	Afar	10	28.6%
8	Amibara	Afar	9	25.7%
9	Weliso Town	Oromia	9	2.6%
10	Tsegede	Tigray	9	11.7%
11	Dagua Temben	Tigray	9	11.7%
12	GINIR	Oromia	9	2.6%
13	Gomma	Oromia	8	2.3%
14	South Achefer	Amhara	8	3.3%
15	Habro	Amhara	8	3.3%
16	Robe Town	Oromia	7	2.0%
17	Mecha	Amhara	7	2.9%
18	Chelia	Oromia	7	2.0%
19	Jile Timuga	Amhara	7	2.9%
20	Gambela Town	Gambella	6	46.2%

Maternal Death Reporting Trend

Both weekly and case based maternal death reporting trend for current fiscal year shows decreasing trend throughout the year relative to the first month of reporting. In regard to maternal death case based (MDRF) reporting, it shows constantly declining starting from November (Figure 2). But compared to previous years, quarterly and annual maternal death reporting for both weekly and case-based reporting shows significant increase (Figure 3).

Figure 2: - Weekly and Case based reports (MDRF) trend per reporting months, 2010 EFY

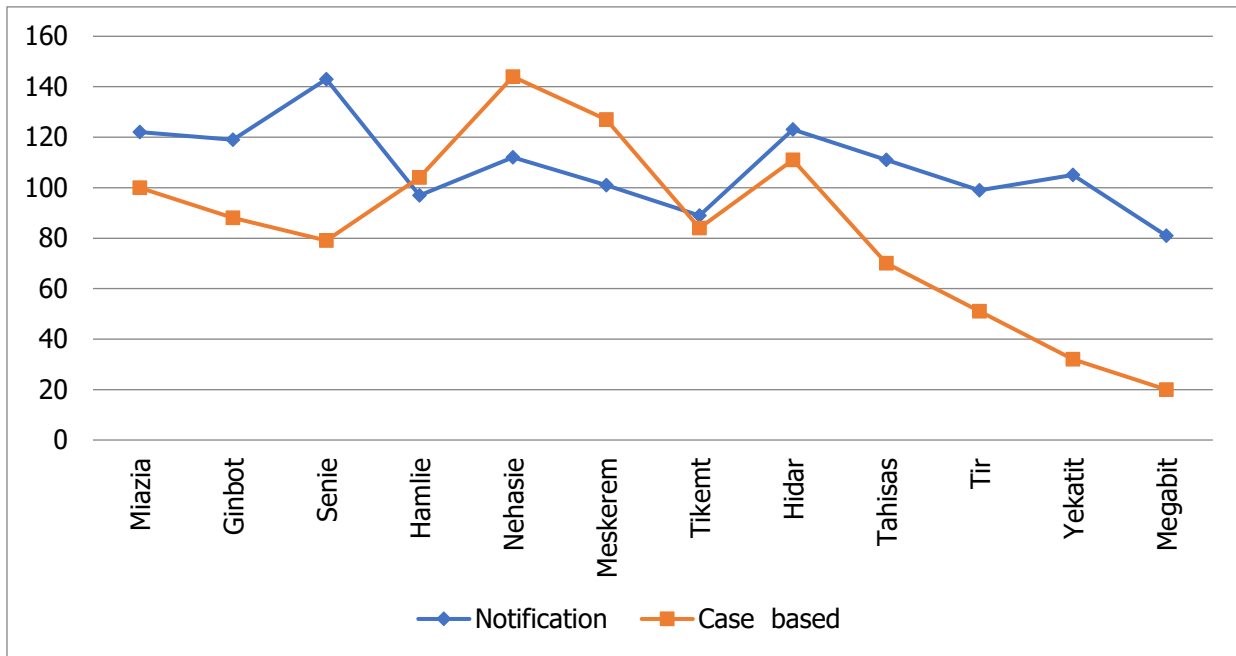
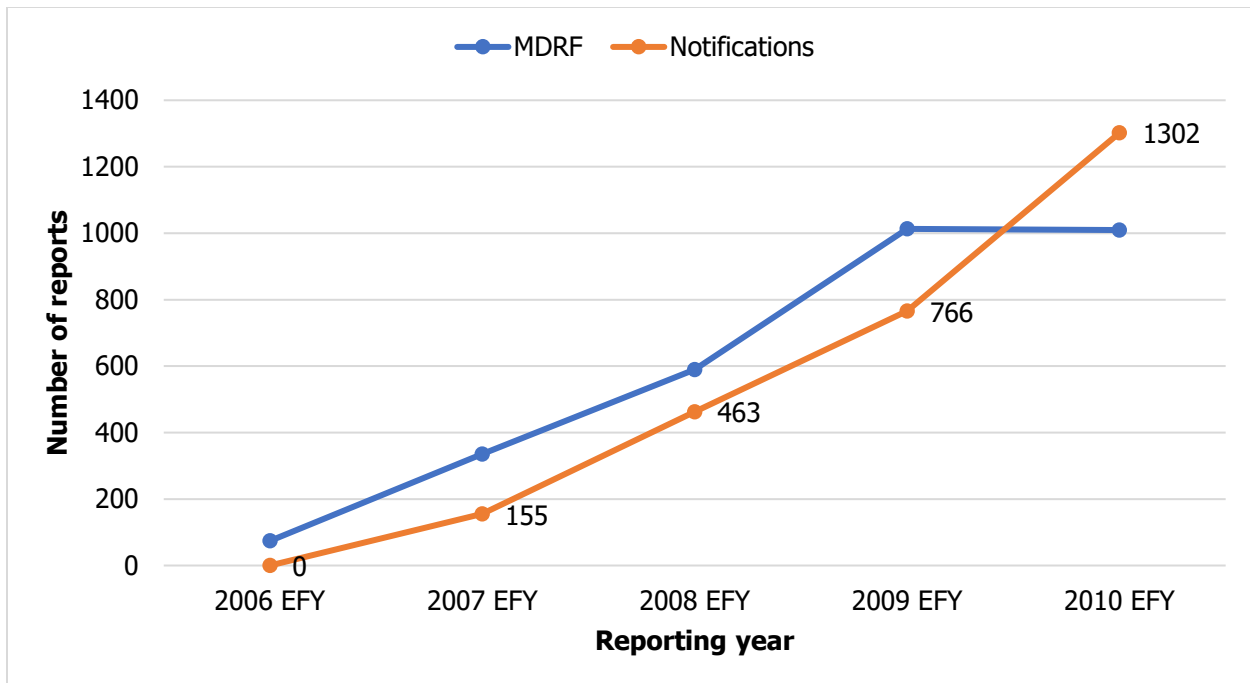


Figure 3: - Weekly and Case based reports (MDRF) trend per reporting months 2006 – 2010 EFY



There are variations between regions in weekly notification and MDRF reports. Reporting inconsistency may be due to weak integration of MDSR system and PHEM structure and / or availability and functionality of Rapid Response Teams (RRT)/MDSR committees responsible for reviewing and reporting maternal death reports. In a relatively strong system, weekly reports would be expected to be equivalent or greater than case-based reporting of MDRFs. For illustration purposes, the last 5 years reporting trends are presented for the 4 agrarian regions which started implementing MDSR in 2006, comparing weekly and MDRF reporting.

Figure 4: - Oromia region Weekly and Case based MD reports (MDRF) trend 2006 – 2010 EFY

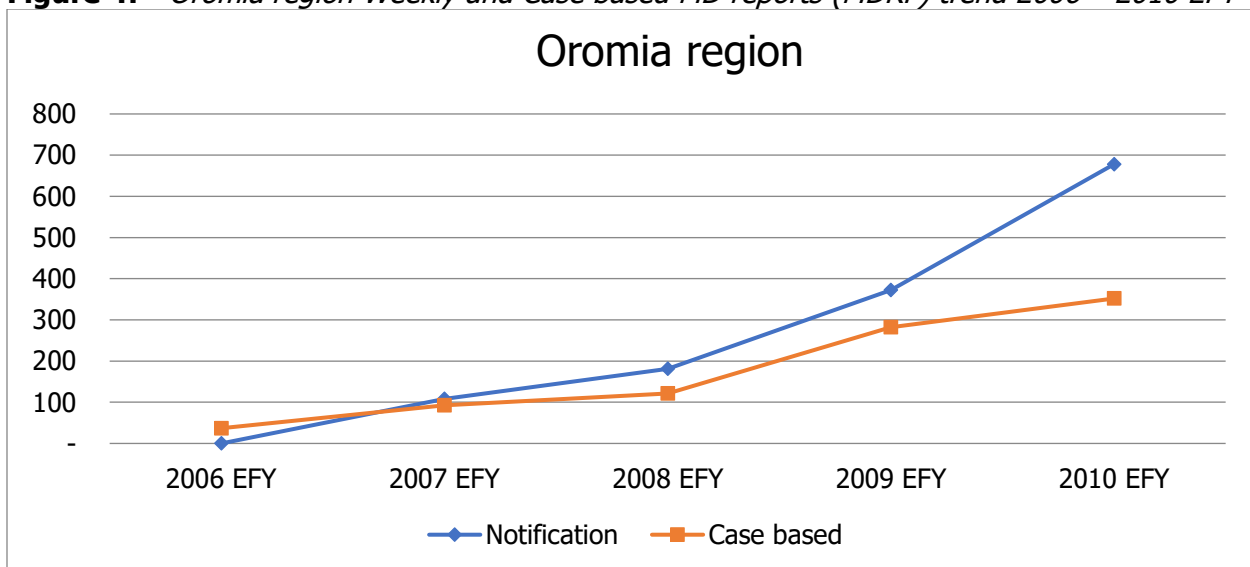


Figure 5: - *SNNP region Weekly and Case based MD reports (MDRF) trend 2006 – 2010 EFY*

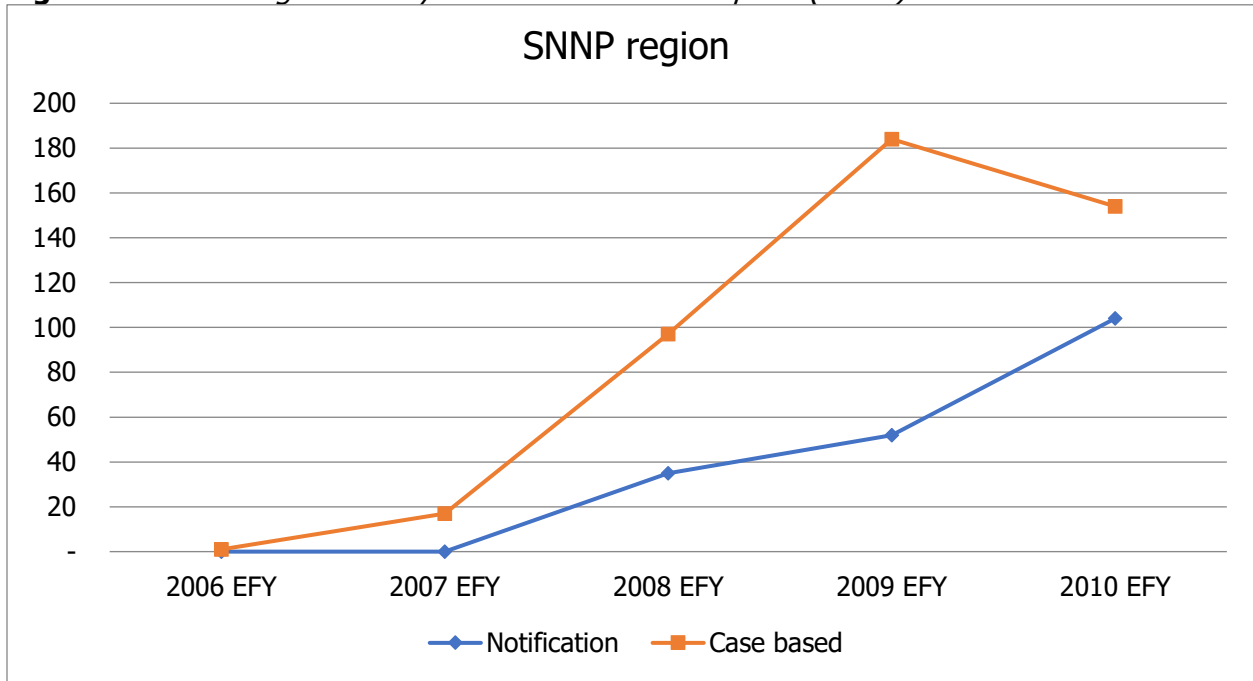


Figure 6: - *Amhara region Weekly and Case based MD reports (MDRF) trend 2006 – 2010 EFY*

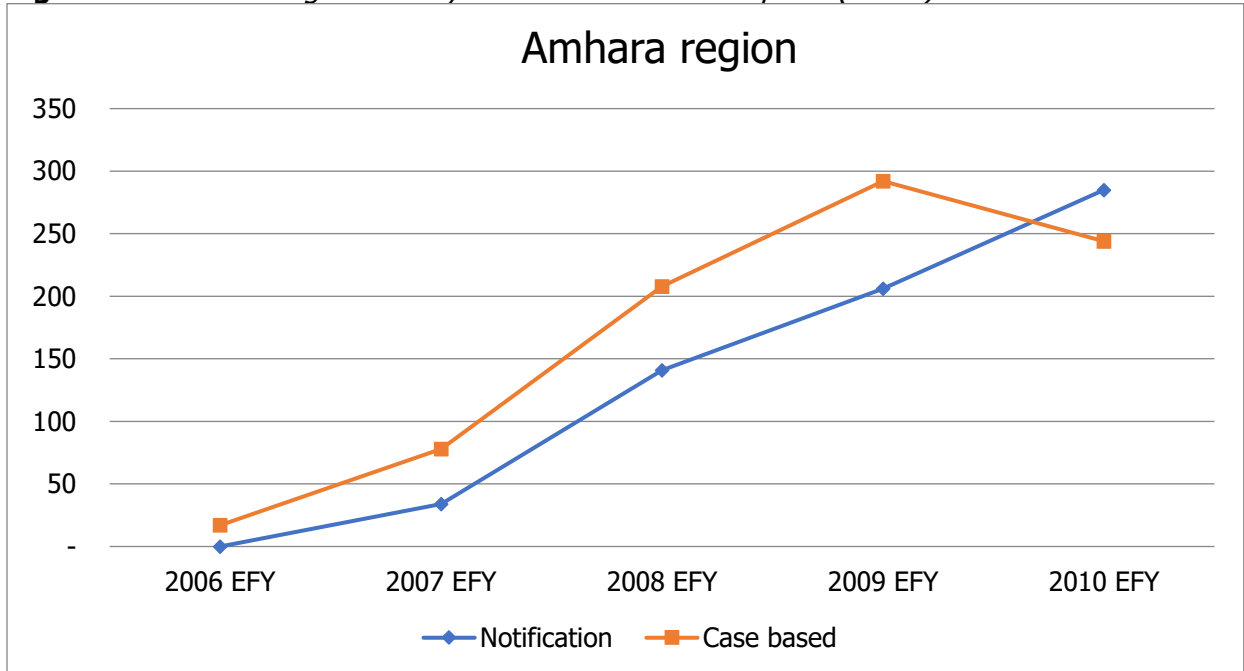
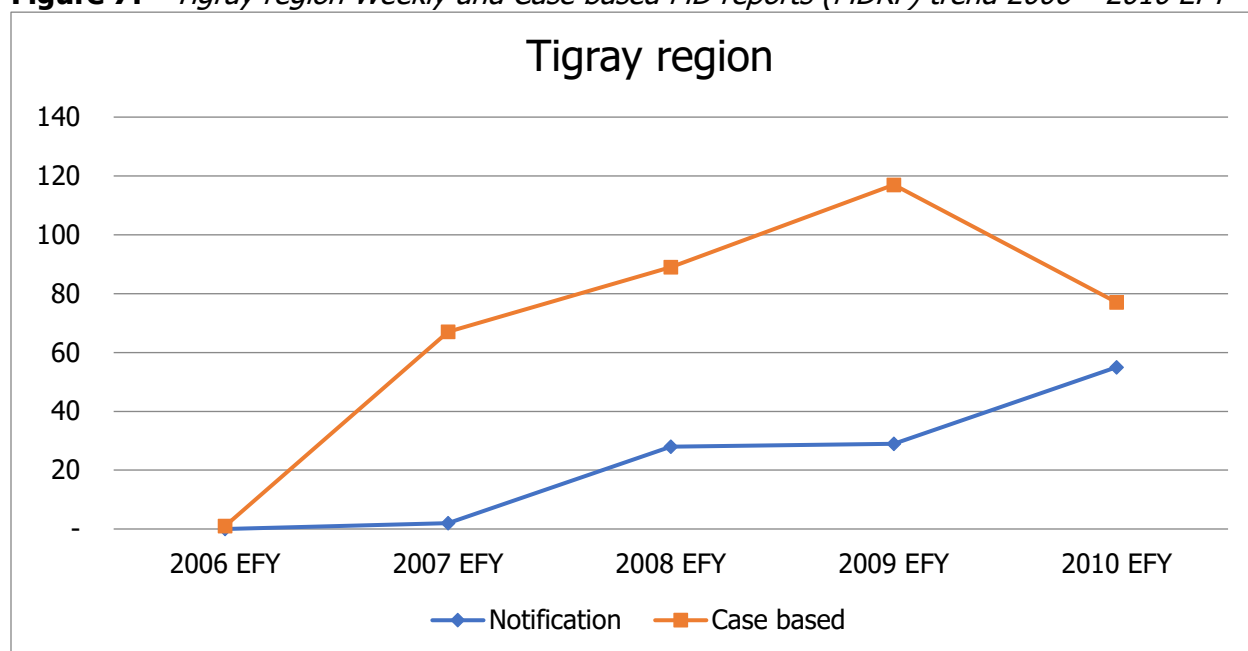


Figure 7: - Tigray region Weekly and Case based MD reports (MDRF) trend 2006 – 2010 EFY



Geographical Coverage of MDSR System

Geographical coverage of MDSR has markedly improved compared with previous years. Before the system was started to be implemented throughout the country at the end of 2007 E.C, the system started in 37 selected zones and sub-cities, within five regions and two city administrations, representing around 32.4% of zones in the country. The system has now been introduced nationally.

Nonetheless, even in 2010 there remain “silent areas”. Silent areas are defined as zones or woredas that did not report any maternal deaths during the reporting fiscal year. As it is unlikely that no maternal deaths occurred, silent areas serve as a warning sign of poor compliance with the MDSR system. As shown in figures 8 and 9, in 2010 there were 23 zones (20%) that were “silent” for weekly maternal death reporting. The highest numbers of silent areas were from Somali Region. Regarding MDRF reporting, 28 (25 %) of zones and sub-cities were “silent”. The highest number of silent areas for case-based reporting were also from Somali Region. The maps below illustrate rates of reporting for both weekly surveillance and MDRFs.

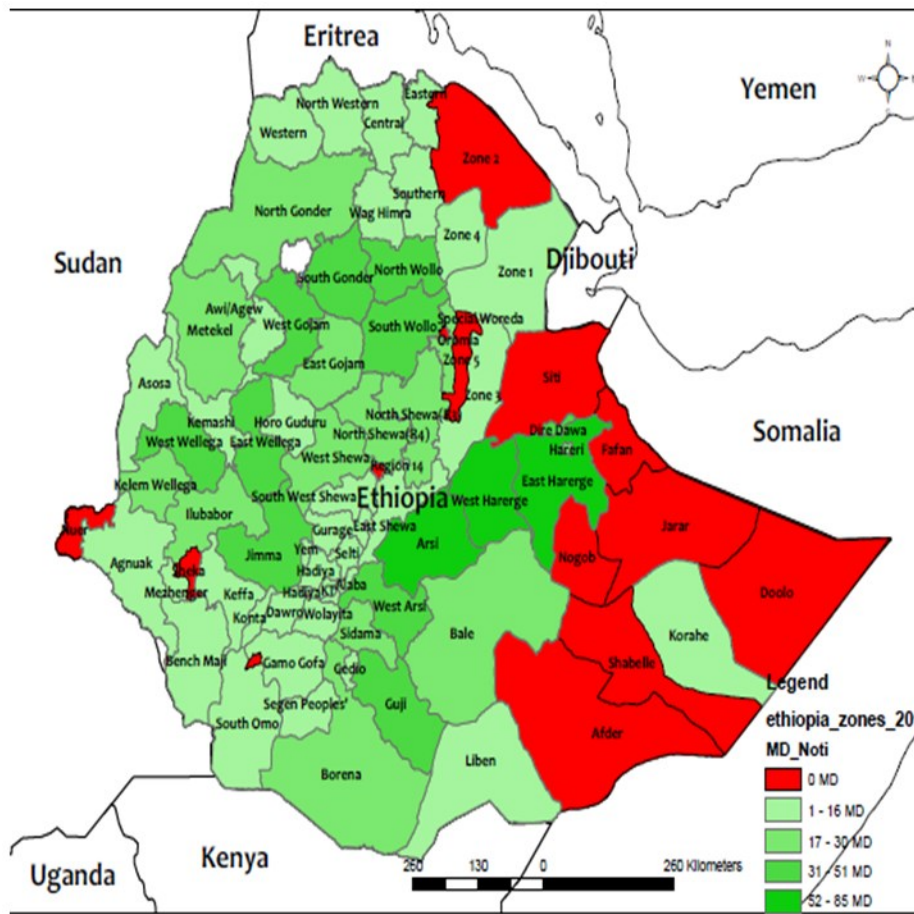


Figure 8: - Maternal death weekly reporting status in zones and sub-cities in 2010 EFY, Ethiopia

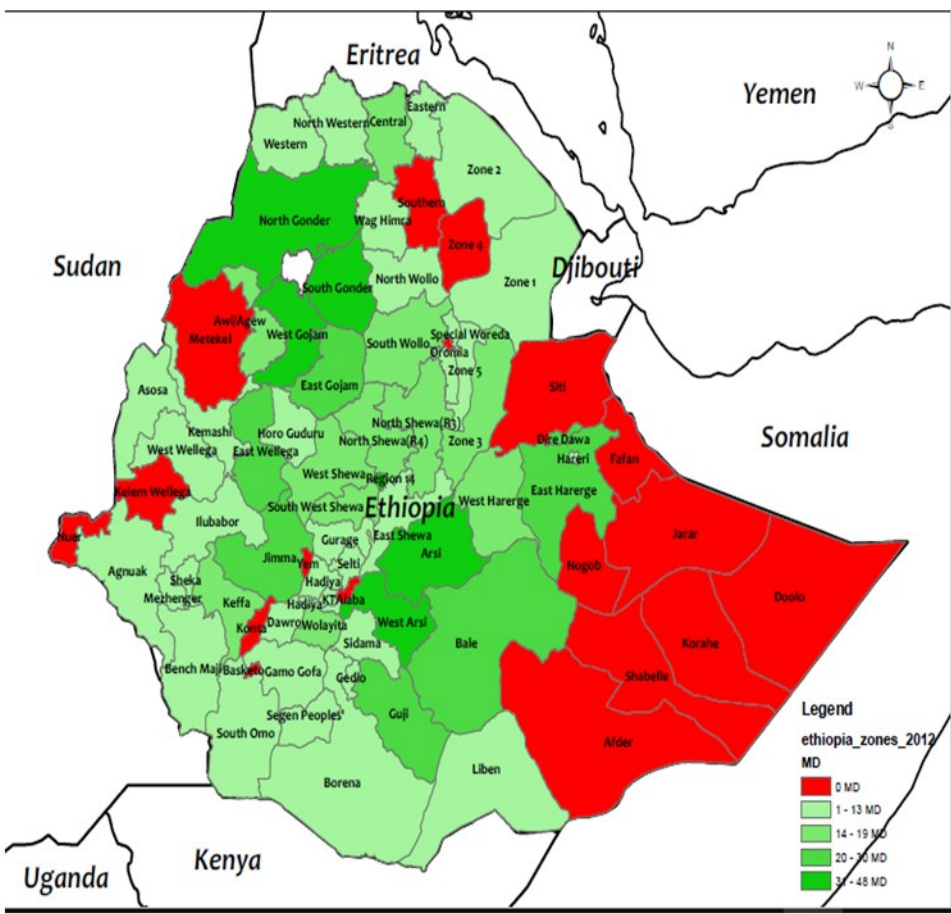


Figure 9: - Maternal death MDRF reporting status in zones and sub-cities in 2010 EFY, Ethiopia

Timeliness and Completeness

Surveillance data quality measures are directly related to the system capability to receive real time data with acceptable quality for decision making to improve health status of the community. In regard to the mean time to receive maternal death case-based report, it took 28 days, on average, from the reported date of death for an MDRF to be received by the PHEM national database, which is exactly the number expected. This varies across regions, from 11 to 66 days. There is further variation by source of data, with an average of 20 days for MDRFs based on facility-based abstractions to be received and 34 days for MDRFs based on verbal autopsies. These figures are show below.

Table 4: - *Reporting regions mean time of reporting for maternal death case-based reporting, by data sources 2010 EFY*

Region	Mean number of days		
	FBAF	VA	Both sources
Addis Ababa	17	16	17
Afar	30	70	50
Amhara	24	46	37
Benishangul Gumuz	16	46	33
Dire Dawa	28	47	31
Gambella	9	15	11
Harari	67	0	66
Oromiya	18	32	26
SNNP	14	16	14
Somali	NA	NA	NA
Tigray	19	34	31
National average	20	34	28

Completeness of Maternal death case-based reports received at national level during the current fiscal year was 67%, meaning that roughly 2/3rds of the MDRFs received were comprehensively filled out. Again, there were some geographical discrepancies. Benishangul-Gumuz had the highest completeness, with 85% of the 28 MDRFs they submitted fully filled out. Similarly, Afar submitted 35 MDRFs of which 80% were complete. It is worth noting, however, that new forms were introduced in 2008 with additional variables (such as ANC history, place of delivery). These new formats were only recently distributed, and so some areas are transitioning from the older to the newer formats.

II. Background Characteristics of Deceased Women

Socio-Demographic Profile

Details of the socio-demographic and pregnancy related characteristics of women who died in 2010 EFY is presented in the Annex. Figure 10 shows that the majority of women who died were in the 20-34-year age group (68.7% of 1010 total reported maternal deaths). The youngest mother who died was a girl of 15 and the oldest was above 49 years of age. As illustrated in Figure 11, most deceased women had a history of 2-4 births.

As to the timing of deaths in relation to pregnancy, the majority (64.9%) of the deaths occurred either during delivery or postpartum period (Figure 11). Overall 15.3% died during pregnancy, 15.7% during delivery and 64.9% during the postpartum period.

Figure 10: - Age groups for all reported of maternal deaths, N=1010

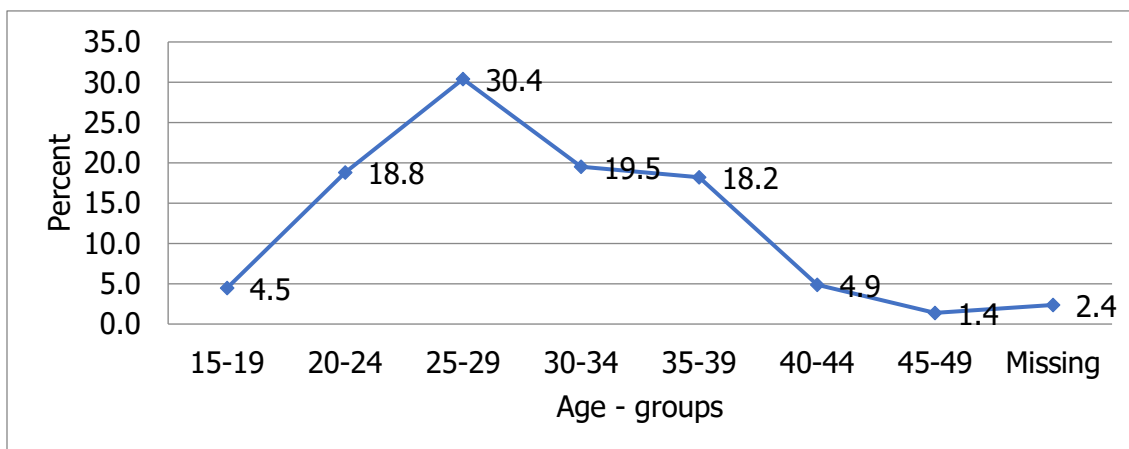
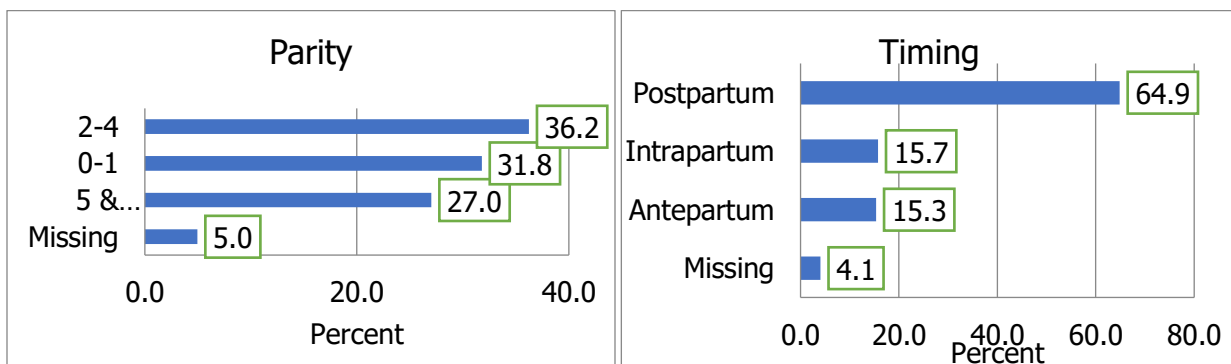


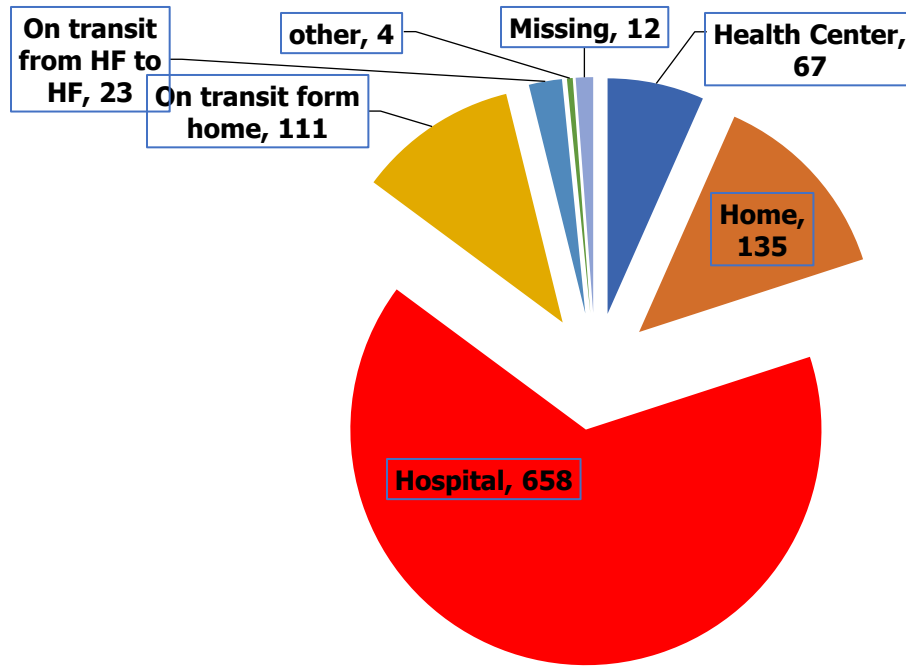
Figure 11: - Parity status and Timing for all reported of maternal deaths, N=1010



Place of Death

As is shown in Figure 12, of 1010 reported maternal deaths, the majority (71.7 %) died in health facilities: about 65.1% died at hospital and 6.6% in health centers; while about 11 % died on the way to health facilities and 13.4 % at home.

Figure 12: - *Places of death for all reported of maternal deaths, N=1010*



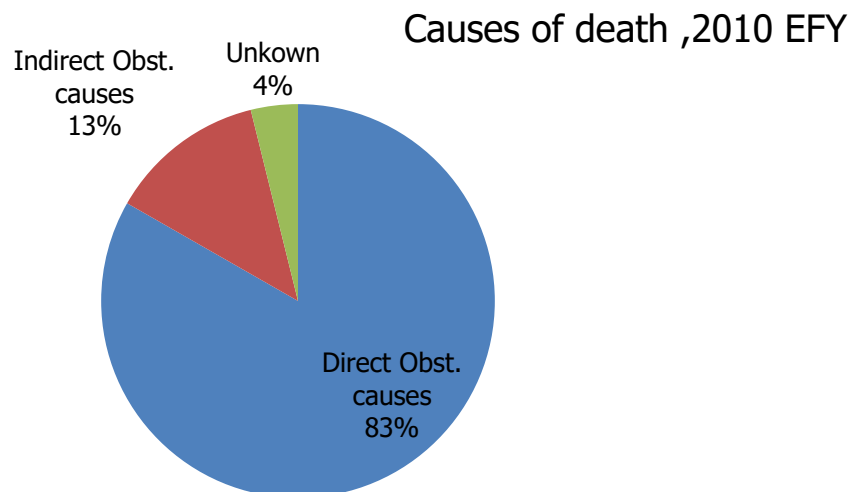
III. Causes of Maternal Death

Summary Findings:

- **Direct causes** of maternal death account for **85%** of maternal deaths.
- The leading causes of maternal death were **haemorrhage (41.3%), HDP (18.6%), anemia (17.5%), obstructed/ ruptured uterus (9.7%) and sepsis (9.3%)** in 2010EFY.
- **Obstetric haemorrhage** persisted as the top cause of death for five years (2006 to 2010 E.C.).
- There appears to be a **slight downwards trend** in hemorrhage deaths over time.
- **Delay one** was cited as a contributing factor in **66.8%** reports, **delay two** in **37.7%** and **delay three** in **48.6%** in 2010 EFY.
- Generally, **delay one factors** persisted as the top contributing factors to maternal death in five years (2006-2010 E.C.)

In 2010 EFY there were 1010 maternal death review summary reports captured by the national MDSR system. Analysis of the review report for causes of maternal death showed that 841 (83%) were due to direct (obstetric) causes and 130 (13%) were due to indirect causes (Figure 13).

Figure 13: - Causes of maternal death from MDSR, 2010 EFY (N= 1010)



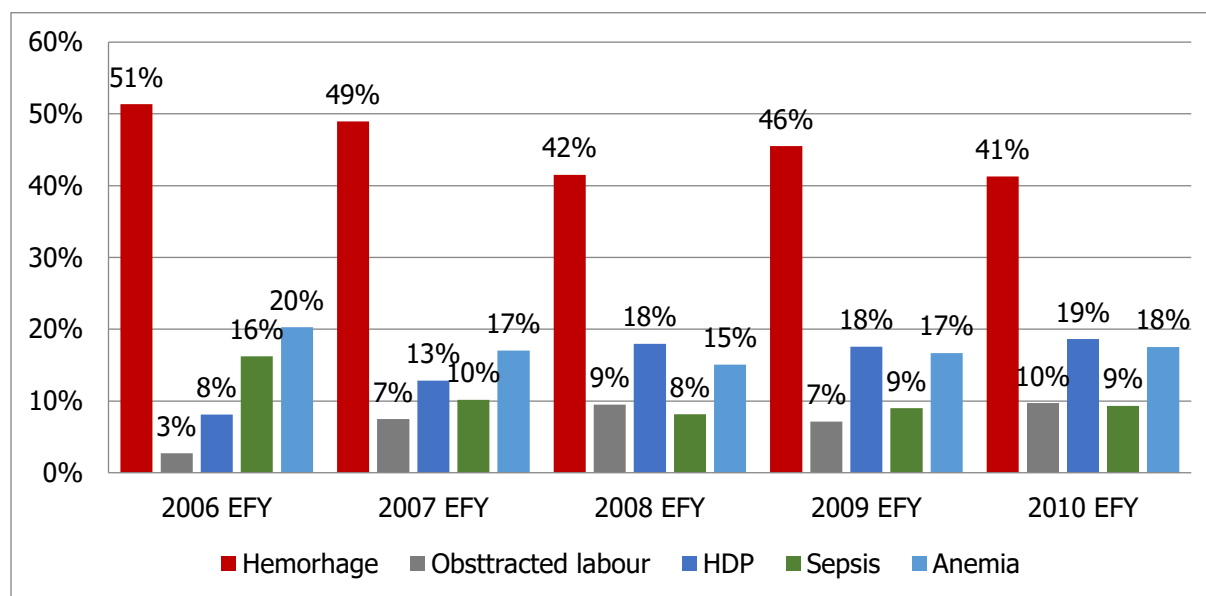
The leading causes of maternal death identified by the MDSR system were haemorrhage in 417 cases (41.3%), hypertensive disorders of in pregnancy (HDP) in 188 (18.6%), anemia in 177 (17.5%), obstructed/ ruptured uterus in 98 (9.7%) and sepsis in 94 (9.3%) (Table 5).

Table 5: - *Direct and indirect Causes of maternal deaths from MDSR system, 2010 EFY*

Causes of death		Frequency	Percent
Direct Obstetric causes	Hemorrhage	417	41.3
	HDP	188	18.6
	Prolonged/Obstructed labour and ruptured uterus	98	9.7
	Sepsis	94	9.3
	Other direct causes	74	7.3
	Abortion	32	3.2
	Embolism	15	1.5
	Anesthesia complication	13	1.3
Indirect obstetric causes	Anemia	177	17.5
	Other indirect causes	81	8.0
	Malaria	20	2.0
	Cardiac	17	1.7
	HIV	13	1.3
	TB	8	0.8

Looking at the trend in major causes of death in the last five years of MDSR implementation (2006-2010 EFY), obstetric haemorrhage has persisted as the top cause of maternal death accounting for 41% to 51% of maternal death review reports. In the last three years (2008-2010 EFY) hypertensive disorders in pregnancy (HDP) has also persisted as the second leading cause of maternal death accounting for more than 18% of the deaths. Furthermore, sepsis and obstructed labour were among the major causes of maternal death in the last five years while anemia has continued as the third leading cause of death contributing to 18% to 20% of maternal deaths.

Figure 14: - Trend of the major causes of maternal death from MDSR system 2006-2010 EFY



Contributing factors to Maternal Death

Contributing factors to maternal death were analysed from maternal death review summary reports using the three-delay model of Thaddeus and Maine. Out of 1010 maternal death review reports delay one was cited in 675 (66.8%), delay two in 381 (37.7%) and delay three in 491 (48.6%). The proportion of each of the delay factors were computed out of the total reports, since more than one delay can contribute to the death of a mother.

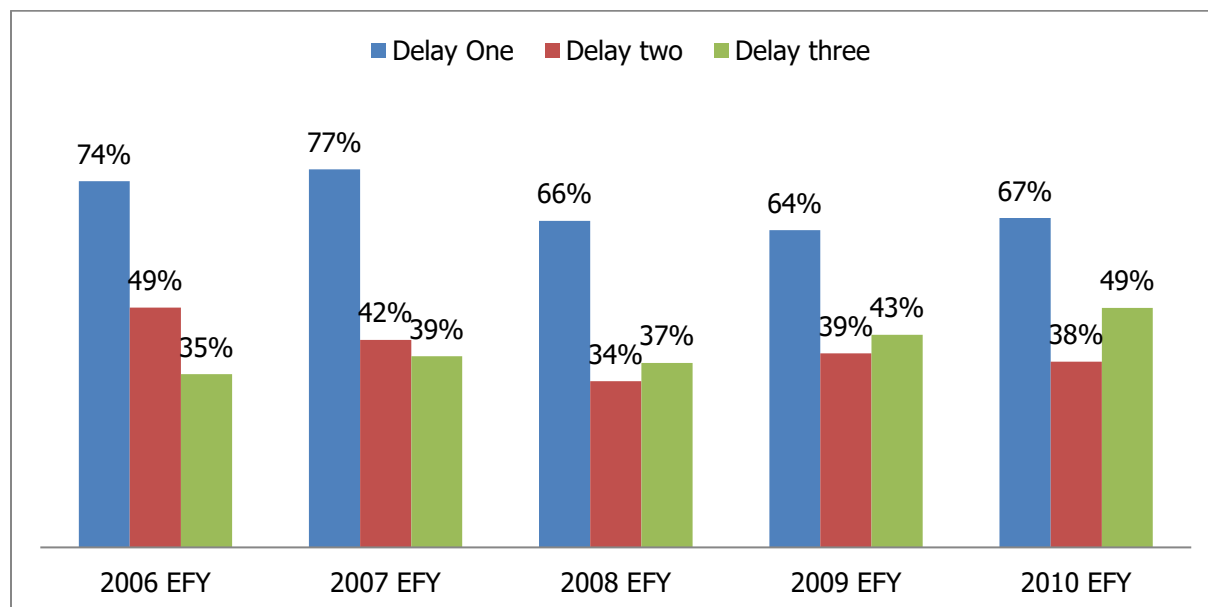
Out of the maternal death review reports the main specific reasons for delay one contributing to maternal death were *lack of decision to go to health facility* in 359 (35.5%), *delayed referral from home to a health facility* in 318 (31.5%), *failure to recognise the problem* in 272 (26.9%) and *traditional practices* in 153 (15.1%). Similarly, the main specific reasons for delay two were *delayed arrival to referred facility* in 242 (24%) and *lack of money for transport* in 147 (14.6%) of the maternal death review reports. Additionally, the predominantly reported specific delay three factors were *delayed arrival to next facility from another facility during referral* in 278 (27.5%), *lack of supplies and equipment* in 137 (13.6%) and *delayed management after admission* in 116 (11.5%) (Table 6).

Table 6: - Contributing factors to maternal death, 2010 EFY

	Characteristics	Frequency	Percent
Contributing factors	Delay One	675	66.8
	Delay Two	381	37.7
	Delay Three	491	48.6
Delay one factors	Traditional Practices	153	15.1
	Family poverty	66	6.5
	Failure of recognition of the problem	272	26.9
	Lack of decision to go to health facility	359	35.5
	Delayed referral from home	318	31.5
Delay two factors	Lack of roads	74	7.3
	Delayed arrival to referred facility	242	24.0
	Lack of money for transport	31	3.1
	Lack of transportation	147	14.6
	No facility within reasonable distance	51	5.0
Delay three factors	Delayed arrival to next facility from another facility on referral	278	27.5
	Delayed or lacking supplies and equipment's	137	13.6
	Delayed management after admission	116	11.5
	Human error or mismanagement	65	6.4

Considering trend in reported delays contributing to maternal deaths over the last five years shows delay one to have been the top contributing factors, with 64% to 77% of maternal death review reports documenting delay one factors. Since 2008, delay three factors have become the second leading contributed factor (documented in 37%-49% of maternal death review reports) to maternal death as more case reports come from facilities and willingness to report delay three factors increases. Furthermore, more than a third of maternal death review reports have documented delay two factors across the entire five years of MDSR implementation (Figure 15).

Figure 15: - Trend of delay factors contributing to maternal death 2006-2010 EFY



Data from verbal autopsies reflect the general trend in reported delays pictured (Figure 16). However, those maternal death review reports generated from facility-based abstractions show an increasing trend in delay three since 2008 EFY (documented in 47%-61% of reports) and it became the leading delay factor in 2010 EFY (Figure 17). This signifies that health facilities were scrutinising their own practices more carefully and using more evidence from MDSR to improve the quality of services in their own facilities.

Figure 16: -Delay factors from verbal autopsies 2006 - 2010 EFY

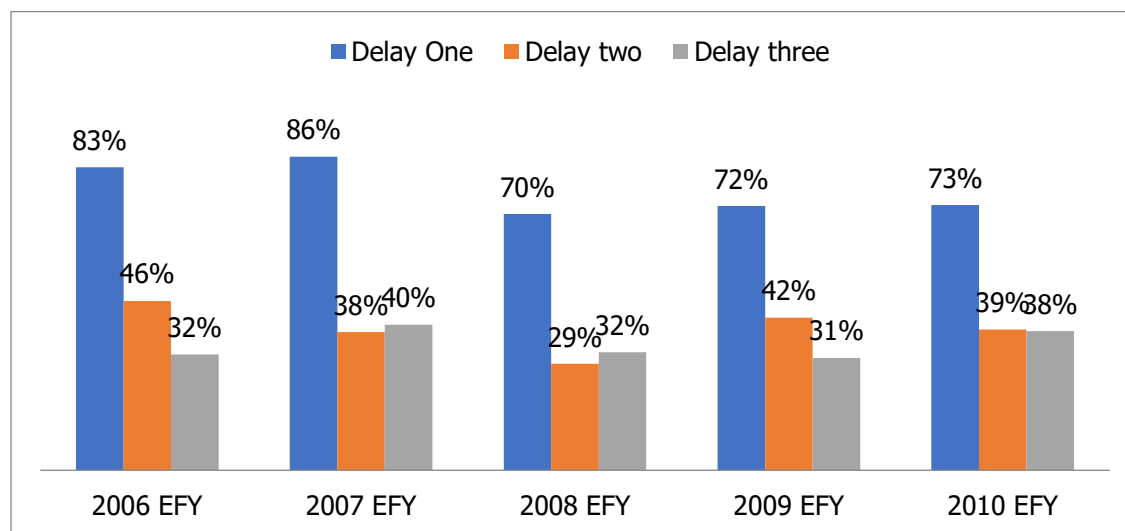
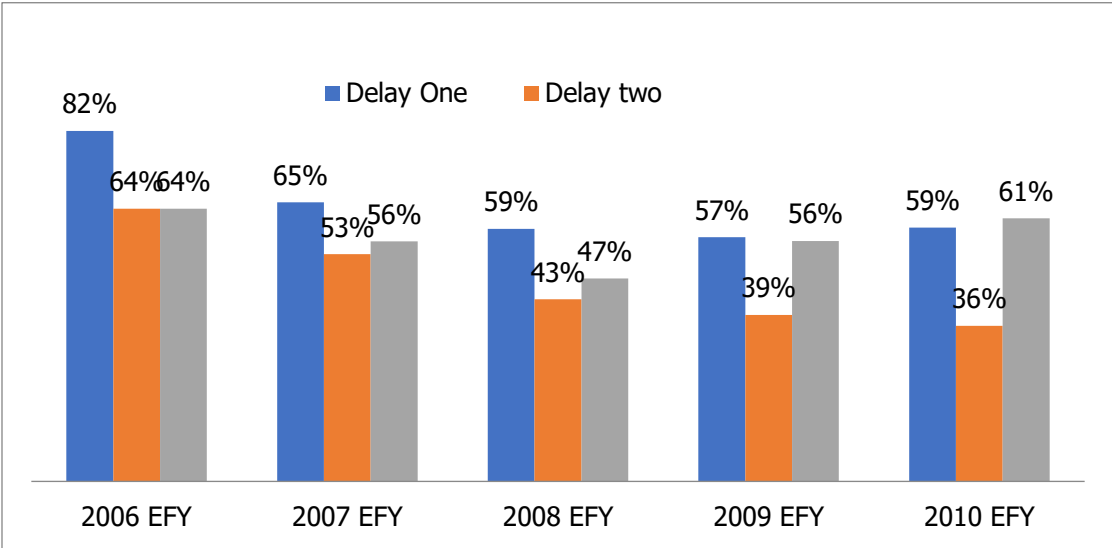


Figure 17: - Delay factors from facility-based abstractions 2006-2010 EFY



IV. Specific Causes of Death

Summary Findings:

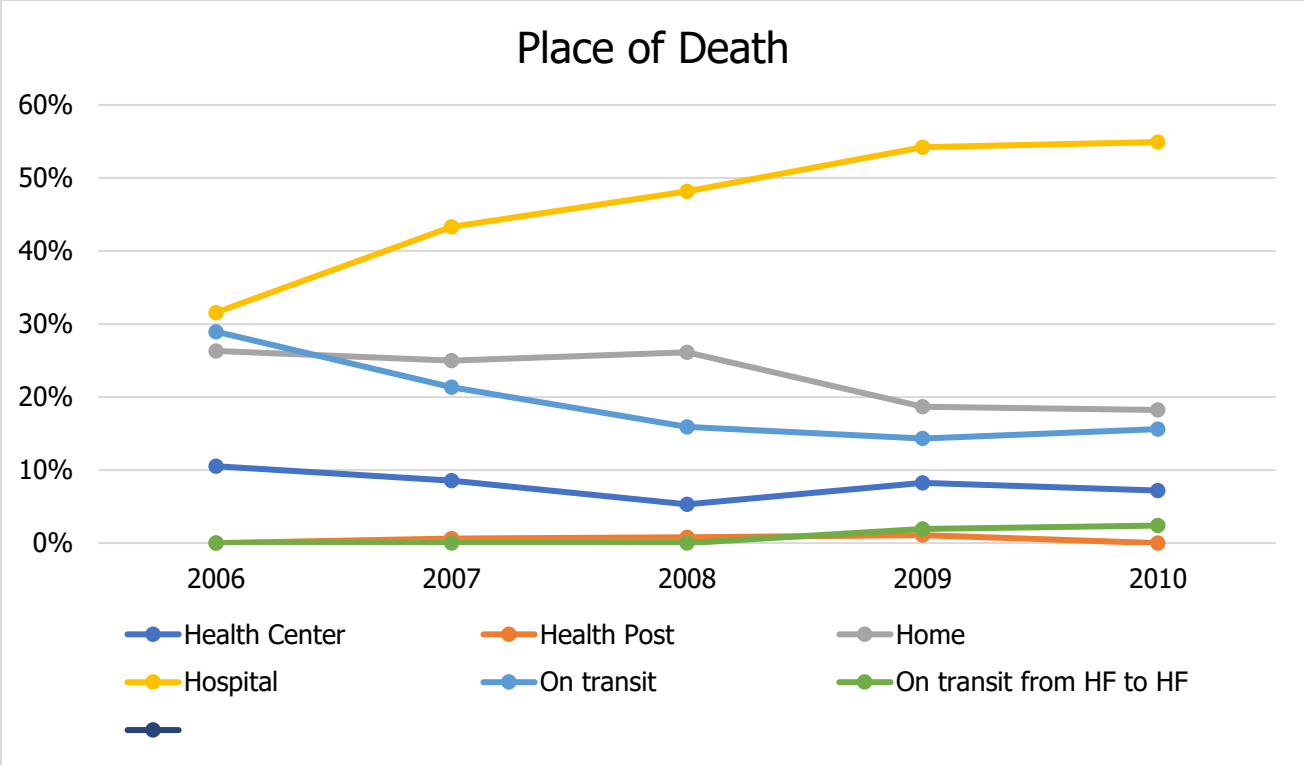
- **Obstetric Hemorrhage** was the leading cause of reported maternal deaths, accounting for **41.3 % of all reviews**, **76%** of these deaths were from **PPH**.
- **HDP** was the **second leading cause** of reported maternal deaths, accounting for **17.6%**
- **40% of deaths** from **HDP** were in the **antenatal period** suggesting delay in delivery. Delivery of the fetus is the most important component of the management of severe HDP

Obstetric Hemorrhage

Obstetric hemorrhage was the leading causes of death and it was identified as a cause of maternal death in 417 maternal death review reports, accounting for 41.3 % of the total maternal death review reports. The review reports revealed that majority (88.3%) of the deaths were due to obstetric hemorrhage occurred either during child birth or within 42 days after delivery. More than half (51.6 %) of these deaths were between 25 to 34 years of age and 55% of them occurred in hospitals. Among the reported maternal death review a quarter of them were in their first pregnancy and more than one third (35%) of them died from grand multipara group (who delivered 5 or more).

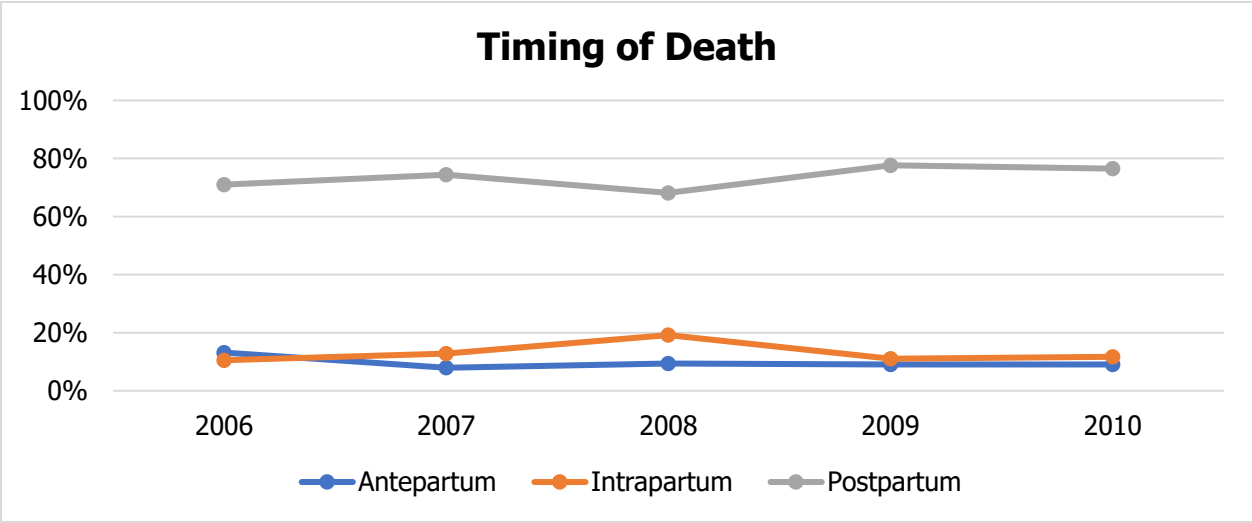
Regarding place of the death due to obstetric hemorrhage in the past five years, there has been an increasing trend for deaths to occur in hospitals, with a decline or reported deaths at home. This is probably due to increased facility delivery and increased reporting from facilities (figure 18).

Figure 18: - *Reported maternal death due to hemorrhage by place death from 2006 - 2010EFY*



The timing of death in relation to pregnancy from reviewed maternal death report due to obstetric hemorrhage in the past five years from 2006 – 2010 EFY is not changing. Most reported maternal deaths due to obstetric hemorrhage occurred in the postpartum period (Figure 19).

Figure 19: - Maternal death due to hemorrhage by timing of death in relation to pregnancy 2006 - 2010 EFY



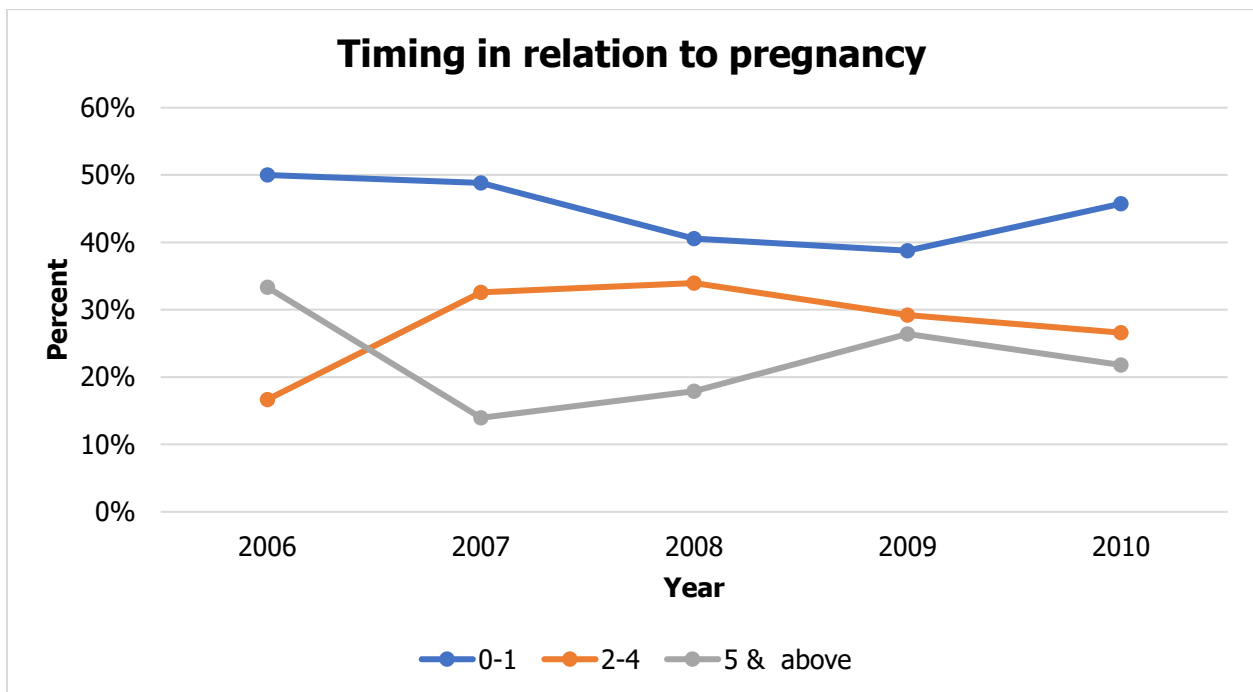
Hypertensive Disorder of Pregnancy (Preeclampsia/ Eclampsia)

From the reviewed maternal death reports 188 (18.6%) of them were due to pre-eclampsia and eclampsia, which makes it the second leading cause of death. More than half (53.2%) of the reported deceased women due to HDP were between ages 20 to 29 years. Close to half (45.7%) of the deaths reported were in association with their first pregnancy and most of them reported from hospital (81.4%) and during postpartum period (60.6%). However, 40% of women who died of HDP did so prior to delivery. In cases of HDP, delivery of the fetus and placenta is a key factor in treatment. The data therefore suggest that delivery should be expedited where possible during severe HDP.

Among the reviewed maternal deaths due hypertensive disorder of pregnancy, most occurred post-partum. This cause of death has increased as a proportion of all reviewed reports from 4% in 2006 EFY to 11% in 2010 EFY.

Deaths due to hypertensive disorder of pregnancy also vary by parity. The trend over the past five years shows that the majority of deaths occurred in primigravida's (figure 20); a first pregnancy is one of the risk factors for HDP.

Figure 20: -Reported maternal deaths due to HDP by parity 2006 – 2010 EFY



Obstructed labor/Uterine rupture

In 2010 EFY obstructed labor/uterine rupture accounted for about 10% (98) of all reported maternal deaths. Nearly half (46 %) were among the age group of 20-29-year. Forty three percent of deceased mother had of 2-4 pregnancies followed by 27% multiparous and 23.0% were their first pregnancy. Half (50%) of the deaths from obstructed labor occurred during labor and delivery. One third (36.7%) occurred in the postpartum period. Most of the reported deaths were from the hospital (62.2%), consistent with data from the previous years.

Sepsis

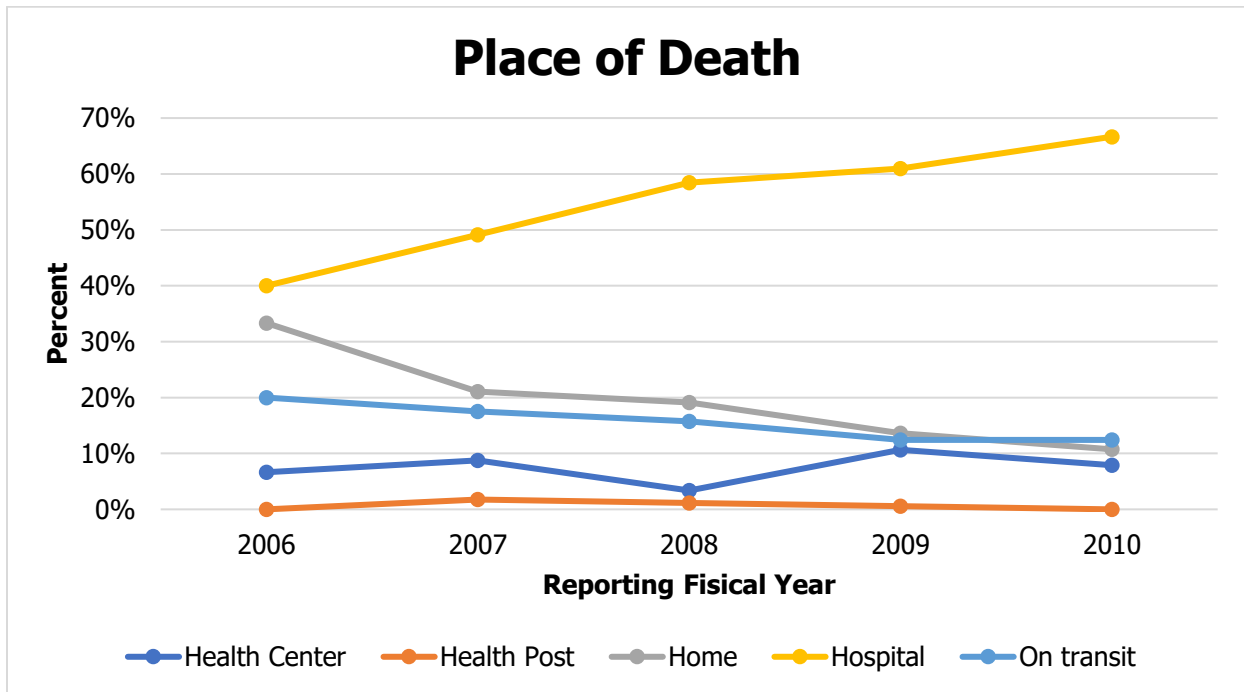
There were 94 maternal death review reports due to sepsis in 2010 EFY. The majority (57.5%) of them occurred among 20 - 29-year-old women. Nearly one third (31%) of the reports were associated with the first pregnancy and most (80%) of them were in the postpartum period. Three fourth (74.5%) of the reports were coming from the hospital as it was in the past years' trend

Anemia

As in previous years, anemia was the third most frequent cause of all maternal deaths. There were 177 reviewed maternal death reports from anemia, primarily (63.7%) among women with multiparous (two or more children), age group of 20-29yrs (55.4%) and during post-partum period (66.1%). Among maternal death reports citing anemia as the cause of death, the majority occurred in the post-partum period, showing an increasing trend from 9% in 2006 to 12% in 2010 EC.

As shown in Figure 21, the majority of the deaths were reported as occurring within hospitals (66.7%), again reflecting both increased facility-based delivery and health seeking, and a greater number of case-based reports coming from facilities.

Figure 21: - *Reported maternal deaths due to anemia by place of death, 2010 EFY*



V. Response

Summary Findings:

- ***Taking action in response*** to maternal death is the ***primary function*** of the MDSR system.
- ***Responses*** have been taken at national, regional, woreda, community and facility levels throughout the health system.
- MDSR data can usefully contribute to the ***Quality Improvement process***, by identifying ***key problems for further investigation***.

Responses to MDSR data should take place at all levels of the health system including the community, all health facilities, and all administrative levels i.e. Woreda, zonal, regional and national.

In this chapter, the national level response to MDSR in 2009-2010 will be described first, followed by good practice examples of responses at woreda, facility and community levels. These examples demonstrate how MDSR data are used at facility and woreda levels in conjunction with the quality improvement programme.

National Level Response

Longer term strategic plans are expected at this level to focus on key priorities.

At national level there have been the following responses to MDSR data:

1. Coordination of National MDSR Committee which met in Bishoftu in June 2010 to review maternal death data.
2. The above meeting resulted in development of the following policy briefs, which are being distributed to Regions and partners:
 - A. Strengthening data collection and quality
 - B. Informing MNH research Priority areas
 - C. Linking MDSR and QI
3. The MDSR data for 2009 were presented to Regional representatives and partners at the Annual RMNCHA meeting in Addis Ababa in August 2009.
4. The MPDSR Technical Working Group meets regularly and involves members from EPHI, MCH directorate, National Blood Bank Agency, PMLU/PFSA, and implementing partners.

5. FMOH also established a TWG for inter-regional collaboration, with the aim of strengthening referral systems and response to MDSR. Initially this involved Oromia and Addis Ababa but will extend to SNNPR & Oromia and Oromia and Dire Dawa/Hareri.
6. The FMOH/MCH directorate response to Hemorrhage is being implemented as a five-year plan and actions are being taken:
 - Establishing Mini-Blood-Bank at all hospitals without MBB (procurement of essential equipment process continuing)
 - Initiation of catchment based clinical RMNCH mentorship focusing on creating sustainable linkage between primary/general hospitals and health centers.
 - National RMNCH mentorship guideline developed, training of mentors and initiation of the program in 100 hospitals in Ethiopia for the first phase was done following the finalization of the guideline.
 - Procurement of 1500 NASG has been finalized, and the FMOH is planning to procure more. Training package of NASG was integrated to BEMONC training manual.
 - Plan to procure 3000 ambulances, 300 now delivered and 750 ready for delivery.
 - FMOH financially and technically supported advocacy workshop on MDSR program at woreda and zonal level in all region except Addis Ababa and Amhara.

Woreda, Facility and Community Response

There are increasing examples of facilities, communities and woredas responding to MDSR data. These are too numerous to detail in this report.

During 2009-2010, the Ethiopian Health system committed to a National Quality Improvement (QI) programme across the entire health system. A prime focus is on maternal health care, with the key aim of reducing the maternal mortality rate. In this year's annual MDSR report, it was decided to feature good examples of how MDSR and QI teams can work together to produce demonstrable impact.

MDSR data is an excellent source of contemporaneous data, which shines a spotlight on poor quality care. QI process ensures that responses/interventions are assessed and if successful that the response is impactful. It must be remembered, however, that many responses to maternal death can be successfully implemented without inclusion in QI projects. There will not be enough capacity to subject all responses to the QI approach.

Prioritization of responses that are appropriate to the QI process is required. This is the responsibility of the MDSR Committee. The MDSR committee must use local knowledge to identify which interventions/ responses are most relevant to the QI process in their own context.

QI projects should not delay implementation of essential improvements e.g. availability of emergency drugs and provision of essential equipment. If the problem recurs, however, it may be wise to undertake a QI project to ascertain the root cause for the recurrence of the problem.

Membership of the MDSR committee should include a focal person from the QI team.

Quality Improvement Case Studies

The following examples of MDSR/QI projects were undertaken in 2010. It is noted that other facilities have also undertaken similar interventions, and these examples were chosen because they were of the highest quality available to the authors at the time of report writing.

The four case studies demonstrate how a problem is identified by the MDSR committee. The problem is then examined in more detail to confirm that the issue is recurring. Interventions are identified and implemented, and prospective data subsequently collected to assess the impact of the interventions.

The four topics included here are

1. Basic emergency care for obstetric cases prior to arrival at hospital
2. Quality of ANC care of a health centre
3. Access to blood transfusion at a primary hospital
4. Anticonvulsant treatment and monitoring of severe HDP at a Referral Hospital

Case Study 1

Improving the Basic Emergency Management for referred obstetric cases at catchment Health Centers, Deder General Hospital, Oromia Region.

Problem: A women who had delivered her 4th baby was referred from a health center because of PPH. On arrival at the hospital she was unconscious with unrecordable blood pressure. She had no intravenous (IV) access and was not escorted. Resuscitation at the hospital was unsuccessful and she died within 30 minutes of arrival.

The Hospital MDSR committee reviewed the case and identified a lack of basic emergency care before and during referral by the referring facility. To further understand the problem, the team reviewed records of 85 referred women from the previous five months. They found that from all obstetric referrals, only 22 % were provided with basic care before and during referral. Basic care comprises: documentations of vital signs, IV access, and drug treatment as indicated e.g. oxytocin for hemorrhage, antibiotic for sepsis. The team therefore aimed to increase basic care before referral for obstetric cases from catchment health centers to 60 % by the end of 2017.

Interventions:

1. Training provided to 16 referring health centers, including identification of early signs of complications, revision of first-line emergency obstetric care, and emphasis on necessity of phone communication from the health center to the hospital at the time of referral. The training was for 1 day and was provided by the IESO from the hospital.
2. Orientation of hospital maternity staff to improve the obstetric referral system, particularly in relation to receiving referral phone calls and giving prompt feedback to the referring facility. This feedback was both verbal and written.
3. The feedback form was adapted to include the referring facility's diagnosis, final diagnosis, whether phone communication was made or not, and whether basic obstetric care given or not before arrival.
4. The engagement and support of district health offices was obtained by leaders of the hospital presenting the interventions at the District cabinet meeting.

Result: A total of 211 obstetric referrals were prospectively monitored. The proportion of obstetric cases given basic care at health centers before referral increased from 25% to 74 %, and appropriateness of cases referred to the hospital (according to national criteria for referral) increased from 47% to 65%. (Figure 22).

In addition to the main outcome measures

- Telephone communication before referral increased from 0 to 69 %,
- Proportion of referrals with a completed referral note increased from 39% to 60 %
- Proportion of provision of timely feedback provision had increased from 22% to 78%

Figure 22: - Proportion of obstetric cases referred after basic emergency care given at health centers

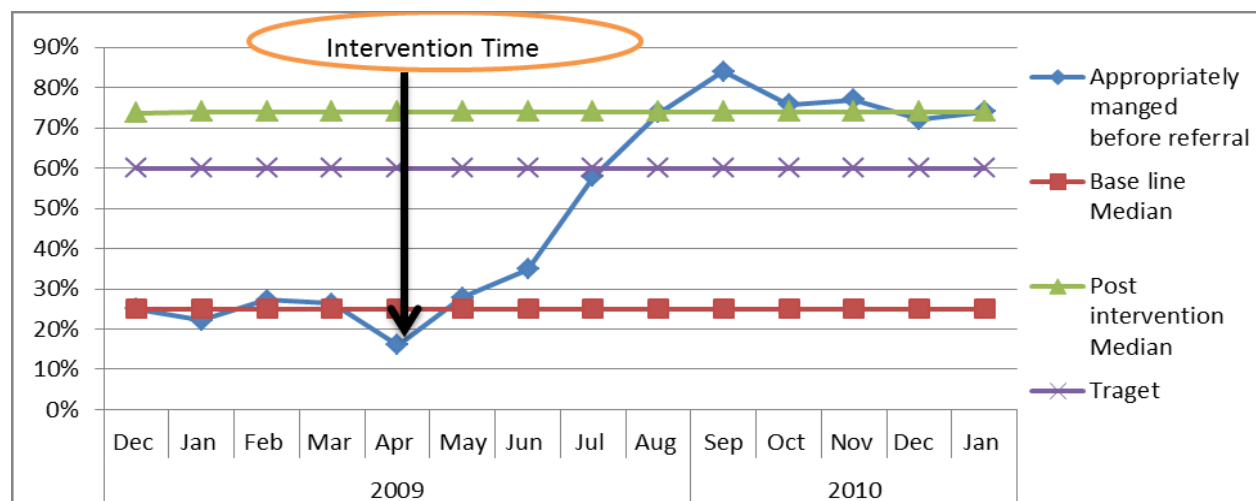
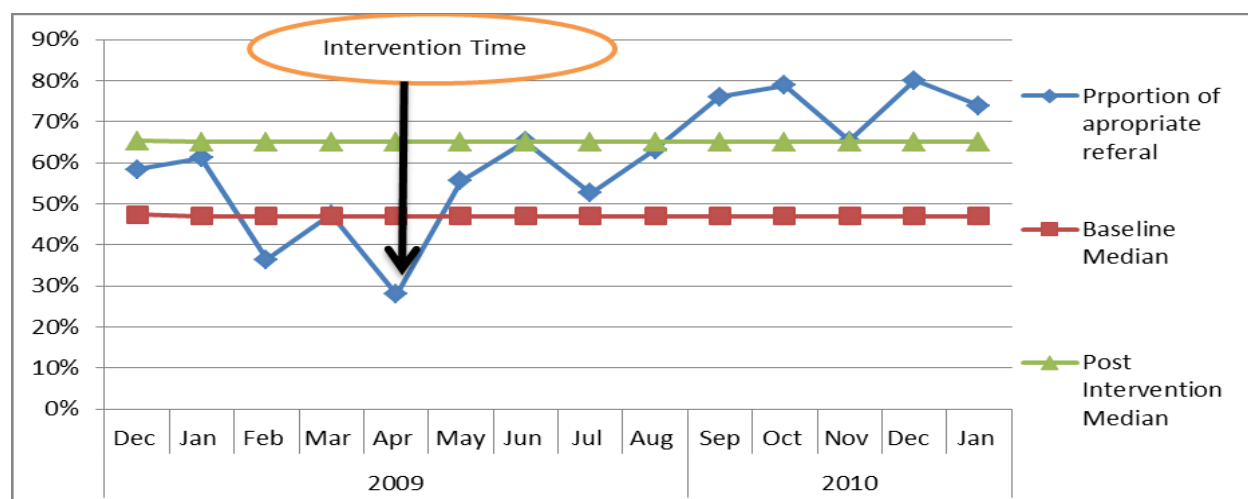


Figure 23: - Proportion of Appropriate Referral among Referred obstetric cases.



Lessons learnt and Limitations:

The interventions had significant impact on improving the referral system in this catchment area. Training on basic emergency care and objective and timely feedback to the health center improved health worker performance on emergency obstetric case management before and during referrals. Unnecessary referrals also decreased, reducing the burden on the hospital.

The limitation in this quality improvement project was that while there appeared to be increased acknowledgment of improvements across the staff, variation in the hospital midwives' technical capacity to give feedback remains. Written feedback was often not timely in reaching the health center.

Case Study 2

Improving the quality of ANC service in Semen Health Center, Addis Ababa

Problem: A 22-year-old women in her first pregnancy presented to the referral Hospital emergency room with abnormal body movements and raised blood pressure. She was treated appropriately with Magnesium Sulphate and Nifedipine and transferred to ICU, but she died 24 hours after admission. She had had ANC at the local health center and had been seen at the health center two days before admission with a complaint of headache. She had been given analgesia and reassured.

The Hospital MDSR/QI team reviewed this case and noted that this mother could have been saved if her BP was measured 3 days earlier when she visited the health center. The team identified that the ANC follow-up in that facility was sub-optimal and provided written feedback. The MDSR/QI team at the health center reviewed the feedback and agreed that quality ANC service was a problem. With this in mind, the health center QI team retrospectively assessed 45 ANC cases over a 7-week period using a random sampling technique, and assessed the quality of ANC using the following criteria;

- Provision of oral iron tablets,
- Measurement of blood pressure,
- Counselling on danger signs
- Laboratory tests (HIV, UA, Hgb, VDRL, and RH)

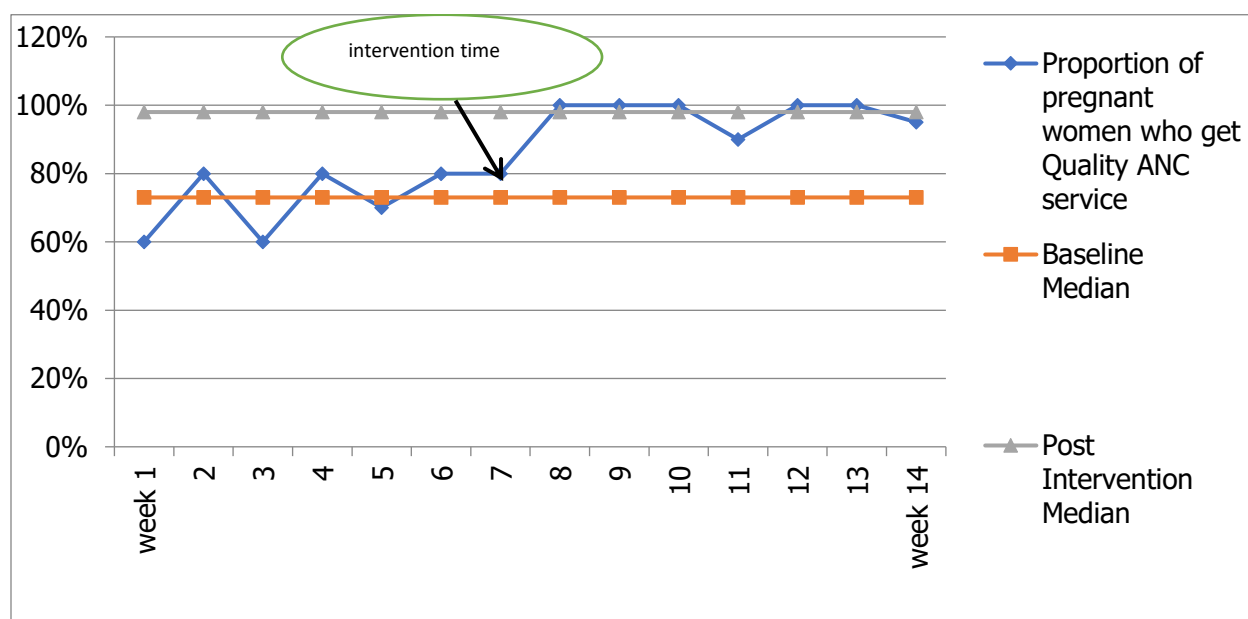
The assessment found the quality of ANC service to be 73%. The MDSR QI team aimed to improve this rate to 95% within 2 months.

Interventions:

1. One day on-site revision of focused antenatal care was given. This was based on the national guideline and included orientation on all its relevant contents
2. National ANC job aids and protocols were posted in the ANC clinic.
3. An additional midwife was assigned to the ANC clinic

Result: After the interventions a total of 83 ANC cases were randomly selected from the ANC clinic at weekly intervals. The results showed that there is improvement in the quality of ANC service indicated by more than six consecutive points above the baseline median.

Figure 24: - Proportion of pregnant women who received quality ANC



Lessons Learnt and Limitations:

The QI team learned that simple and low-cost interventions as described above can lead to a significant improvement in the quality of ANC service.

Selected components of antenatal care were chosen in this quality improvement initiative. All components of ANC were not included (E.g. Ultrasound).

Case study 3

Improving the Management of Hypertensive Disease of pregnancy (HDP) cases in Assosa Hospital, Benishangul gumuz Region.

Problem: A 35-year-old woman came with a referral from a refugee clinic for her neonate 7 days after delivery, with an indication to admit to NICU. She was admitted to the maternity ward. After two days she developed abnormal body movement with high blood pressure. She was diagnosed with Eclampsia. She later became unconscious and developed aspiration pneumonia. She was given a loading dose of magnesium sulphate but died following a prolonged seizure.

The hospital MDSR/QI review committee identified that there was delayed management of HDP. The hospital QI team assessed six months' data from 39 cases with HDP diagnoses, looking

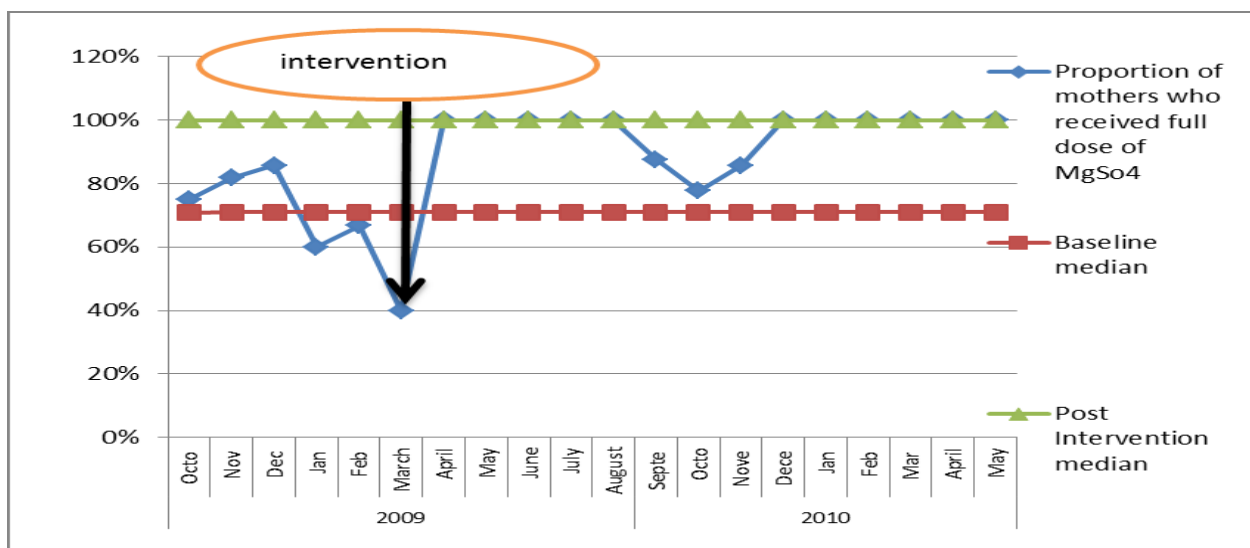
particularly at administration of the correct magnesium sulphate dosage and monitoring of BP and proteinuria. They found that only 68% of these cases were properly managed and followed the HDP management national guideline. The QI team developed a project aiming to increase correct follow-up and management of HDP from 68% to 100%.

Interventions:

1. Functional BP apparatus provided to maternity ward
2. All maternity ward staff oriented on HDP case management and monitoring according to the national guideline.
3. The national HDP management protocol was posted in the ward.
4. A dedicated midwife was assigned to the ward for management and follow-up of severe HDP cases.
5. Emergency anticonvulsant and antihypertensive medications were made available as stock at ward level.

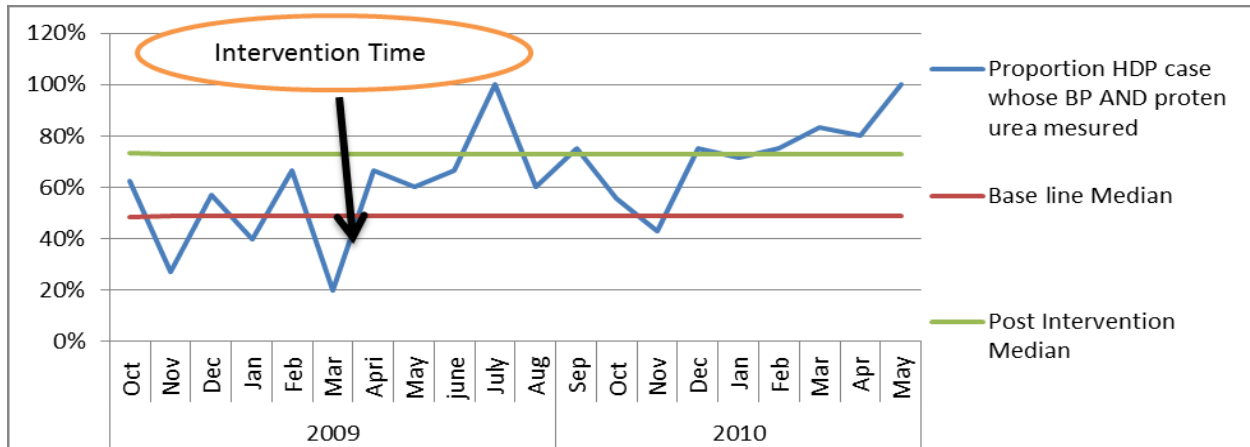
Result: After the interventions prospective data were collected from 90 cases diagnosed as HDP. The outcome measures were: 1. provision of full dose of MgSo4. 2. measurement of both BP and proteinuria. The mean provision of full dose of MgSo4 increased from 71 % to 96 %. As the run chart below shows (Figure 25) more than six consecutive data points above the median baseline demonstrated improvement.

Figure 25: - *Proportion of HDP cases provided with full dose of MgSO4*



Similarly, an improvement from a mean of 44% to 70 % in BP measurements and proteinuria monitoring was noted although the change was not sustained, as indicated in the run chart (Figure 26).

Figure 26: - Proportion of HDP cases with Vital sign and UA followed as per the physician order.



Lessons Learnt and Limitations: The QI team learned that vital sign monitoring is an essential component of good quality of care and a very cost-effective way of improving quality of care.

A limitation of this project was that the frequency and duration for urine protein and vital sign monitoring were limited to the first 48 hours after diagnosis. This is suboptimal as HDP may take several weeks to resolve.

Case study 4

Improving access to blood transfusion at Malka Oda General Hospital Oromia Region

Problem: A woman was referred from a health center at term in her tenth pregnancy with antepartum bleeding. She had no ante natal care. She looked acutely sick, with a BP 100/60 and pale conjunctiva. On vaginal examination she was fully dilated and on abdominal examination fetal parts were palpable, but fetal heart was absent. Uterine rupture was diagnosed and it was decided to undertake an urgent laparotomy. Three units of blood were requested. However, there was no blood available and the Senior Obstetrician referred the patient to Hawassa Referral Hospital (located 30 km from Shashamene). The woman died a few days after referral.

The MDSR committee reviewed the case and identified that this mother could have been saved if blood had been available and used at Melka Oda Hospital. Lack of blood in the Hospital was identified as a major problem that contributed to this death. Other similar cases had been reviewed by the MDSR committee.

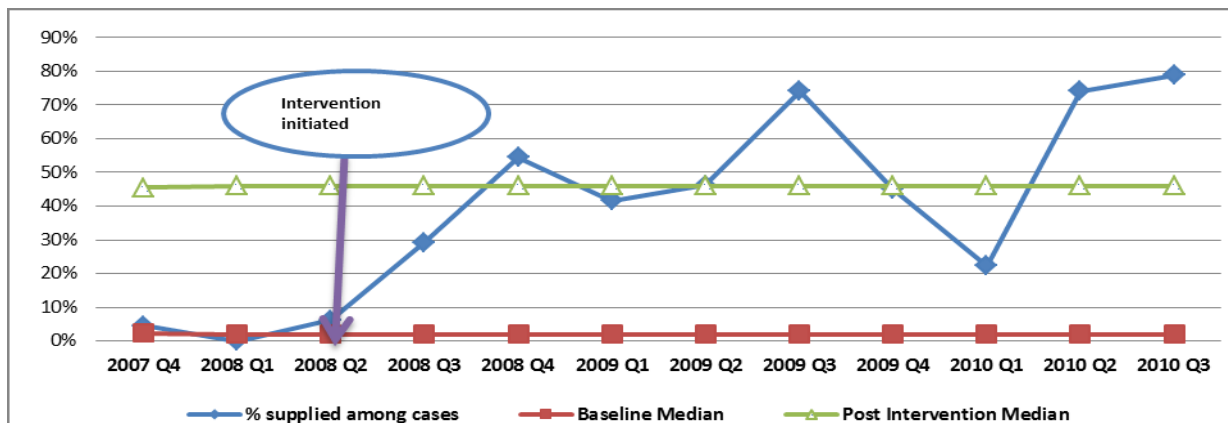
The MDSR committee initiated a QI project on blood access with the aim to increase blood access from 2% to 60% among obstetric cases in need of blood transfusion over a 2-year period.

Interventions:

1. Hospital managers raised the issue at the next level to secure the needed laboratory equipment, support and space for re-establishment of a mini blood bank.
2. A standard refrigerator for the mini blood bank was secured from Regional Health Bureau.
3. The Hospital laboratory department assigned a focal person for overall mini blood bank activities including appropriate monitoring of the supply of blood.
4. A blood transfusion committee was established and conducted monthly meetings on Hospital blood transfusion services.
5. Training for the three laboratory personnel was provided on blood safety.
6. Orientation to all hospital staff on the re-establishment of mini blood bank, process of blood request and supply were provided.

Result: The interventions that were implemented had a significant effect on improving access to blood for obstetric cases in need of blood transfusion. Data was collected from 329 mothers and was plotted on a run chart. The availability of blood supply after the interventions increased from 2% to 79% and this is confirmed by six data points on the chart shown below.

Figure 27: - *Proportion of pregnant women who required and received blood transfusion*



Lessons Learnt: The MDSR review committee used the review process to identify and prioritize problems to improve the quality of maternal health services. In this particular case, a well-functioning mini blood bank has made a significant contribution to improving access to blood. This directly contributes to improved maternal health outcome and decreased referrals to the referral hospital. The role of hospital leadership is critical in establishing and maintaining properly functioning health care services.

VI. Recommendations

National & Regional Level

1. Strengthen the integrated implementation of MDSR in the National and regional PHEM system
 - Increase human resources in national and regional PHEM directorate to establish RH surveillance case team that can regularly support, monitor and provide feedback to all regions and zones/woredas respectively.
 - Engage more stakeholders working on MCH and public health emergency in the implementation of MDSR program
 - Explore all opportunities for capacity building: such as preservice education, in-service trainings, supportive supervision and review meetings of public health emergencies and MCH.
 - Give special emphasis to
 - SNNP and Tigray to fully integrate the ongoing MDSR implementation with the PHEM system.
 - All emerging regions and silent areas of the other regions to start proper MDSR program implementation.
2. The national MDSR taskforce should provide a focused and enhanced support in responding to maternal deaths by targeting areas mapped as better maternal death reporting sites in the MDSR system.
3. Make quality ANC service the theme for annual Safe Motherhood Month to emphasize the importance of providing good information to pregnant women, particularly about danger signs.
4. RHB should fully inform Woreda Health Offices of MDSR/QI projects and provide support as required

Health Facility Level

5. Support all hospitals to conduct quality audit or self-assessment on the clinical management of obstetric hemorrhage and hypertensive disorders of pregnancy (HDP) and implement quality improvement projects on the identified gaps.
6. Strengthen and establish functional mini blood banks with a proper supply and stock management system in all hospitals

7. Build the capacity of skilled birth attendants to request and use blood and blood product appropriately
8. Introduce audits mechanism between hospital and their catchment health facilities to improve emergency obstetric referrals in all zones
9. Improve postpartum care provision by implement the nationally adapted WHO's safe child birth checklist in all health facilities.
10. Avail and use non-pneumatic anti-shock garment (NASG) in all hospitals and health centers in the country
11. Introduce audit mechanisms to improve the quality of ANC service at primary health care units (health centers and health posts) in all places
12. Support better maternal death reporting sites in the MDSR system to implement the national standards for maternity waiting homes
13. Ensure misoprostol is available at facilities for the prevention and treatment of postpartum hemorrhage by health extension workers
14. All facilities should include a focal person from Quality Improvement programme in the core membership of the MDSR Committee. This will ensure good communication between those working on MDSR and Quality Improvement.