

# Why more mothers die: confidential enquiries into institutional maternal deaths in the Southern Region of Malawi, 2001

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## Summary

### Purpose:

The 2000 Malawi Demographic and Health Survey (MDHS) estimated the Maternal Mortality Ratio (MMR) to be 1120 (95% CI 950-1288), exceeding by 80% the MMR of 620 (95% CI 410-830) from the 1992 MDHS. We studied maternal deaths that occurred in institutions in the Southern region of Malawi to understand why the MMR had increased significantly between 1992 and 2000.

### Methods:

This is a retrospective observational study involving review of maternal death records from 18 hospitals in the Southern region of Malawi for the year 2001. These hospitals routinely reviewed their maternal deaths and sent their records for 2001 (270 deaths) to the Malawi Safe Motherhood Project. In addition, hospitals that had gaps in their data collection were visited, their records were reviewed and an additional 42 maternal deaths were identified.

### Results:

The study identified and investigated 312 institutional maternal deaths. The major findings are as follows:

Puerperal sepsis is the leading cause of institutional death;

A high proportion of deaths from obstructed labor and

### Introduction

Globally in 2000, the number of women between the ages of 15 and 49 that died as a result of complications arising from pregnancy and childbirth was estimated to be 529,000. Of these deaths, almost half (251,000) occurred in Africa, and less than 1% (2,500) in developed countries. The maternal mortality ratio (MMR) in Africa was estimated to be 830 per 100,000 live births compared with 20 per 100,000 live births in developed countries (WHO 2003).

In 1995, the Government of Malawi, a small land-locked country in sub-Saharan Africa with a population of 11.5 million, established a national Safe Motherhood Programme in an attempt to lower the high levels of maternal and perinatal morbidity and mortality by improving access to quality essential obstetric and neonatal care. In 1997, it was agreed between the Government of Malawi and the British Department for International Development (DFID) to support the implementation of the program in the Southern region as the Safe Motherhood Project (SMP). Project activities commenced in 1998 covering all 12 districts over six years targeting both government and mission health facilities.

The 2000 Malawi Demographic and Health Survey (MDHS) estimated the MMR to be 1,120 maternal deaths per 100,000 live births (95% CI 950-1288) applicable to the calendar period 0-6 years before the survey. This figure exceeds by 80 percent the 620 maternal deaths per 100,000 live births (95% CI

ruptured uterus;

- A high proportion of deaths from obstetric hemorrhage; High proportions of indirect deaths from anemia and
- AIDS;
- A decline in abortion-related deaths;
- Substandard care is associated with half of maternal
- deaths.

### Conclusion:

- The fact that maternal mortality has almost doubled in
- Malawi over the past decade can be attributed not only to the impact of the AIDS epidemic but also to declining quality of obstetric care in health facilities.

### Keywords

Maternal mortality; confidential enquiries; Malawi; puerperal sepsis; AIDS; quality of obstetric care;

410-830), which were reported in the 1992 MDHS. The centres of the reference periods of the estimates from the 1992 and 2000 survey data are early 1989 and early 1997, respectively. Both the 1992 and 2000 MDHS used the direct sisterhood method. The 2000 MDHS advises that in-depth research is urgently needed to better understand the dramatic rise in maternal mortality during the 1990s.

### Study objectives

The Safe Motherhood Project carried out confidential enquiries into institutional maternal deaths in the Southern region of Malawi, aiming to increase our understanding of this sharp rise in maternal mortality from the institutional point of view. This study also aims to identify any avoidable factors, including substandard care, in order to reduce them and improve the care that pregnant and recently delivered women receive.

### Methods

#### Study design

This is a retrospective observational study involving review of maternal death records, describing the causes and contributing factors of institutional maternal deaths in the Southern region of Malawi.

#### Study period

Records on institutional maternal deaths were reviewed for the year 2001.

#### Study area

Data were collected from 9 district hospitals, 8 mission hospitals

Initiative. Staff who had participated in the care completed the biographic and maternal health care data. At each hospital, the analysis was completed by a committee that had to reach consensus on the avoidable factors and on the quality of care. These hospitals were requested to send a copy of their MDA records for the year 2001 to the SMP. Their records for 2001 (270 deaths) were compared with the data on direct and indirect maternal deaths as obtained from the SMP maternal health information system for the Southern region (287 deaths) and gaps were identified. We paid visits to those hospitals that had gaps in their data collection in an attempt to identify as many institutional maternal deaths as possible. We interviewed the district safe motherhood co-coordinators and looked at delivery books and nurses' reports. In some hospitals we had access to patient case notes of women who died, which maternity staff routinely kept separately. We also looked in the registers for deaths of women of reproductive age, which occurred in the female wards and operation theatres. In this way we identified an additional 42 maternal deaths that had originally not been classified as such.

### Definitions

A **maternal death** is defined as 'the death of a woman while pregnant or within 42 days of the end of the pregnancy irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes'.

**Direct maternal deaths** are those resulting from obstetric complications of the pregnant state (pregnancy, labor and puerperium), from interventions, omissions and incorrect treatment or from a chain of events resulting from any of the above. **Indirect maternal deaths** are those resulting from previous existing disease or disease that developed during pregnancy and was not due to direct obstetric causes, but which was aggravated by the physiologic effects of pregnancy. Deaths from unrelated causes that happen to occur in pregnancy or the puerperium are classified as **coincidental or fortuitous deaths** (ICD9).

Some maternal deaths had more than one cause or a number of causes operating in sequence. Such cases were booked under the first major cause in the sequence. Abortion is defined as 'the interruption of pregnancy before the 24<sup>th</sup> week of gestation'. Death related to gestational trophoblastic disease is also included here. Women who died due to septic abortion were classified as 'abortion complication'.

Quality of care was classified as '**substandard**' and a factor was classified as '**avoidable**' where there was departure from generally accepted standards of satisfactory care in Malawi.

### Data entry and analysis

The data obtained were entered into Epi Info Version 6, which was also used to obtain tabulations. Comparisons of proportions were done using Pearson's  $X^2$  test and relative risks in SPSS.

### Ethics

The sole purpose of Confidential Enquiries is to identify failures in the health care system and to save lives (Lewis 2003). Strict confidentiality and anonymity was maintained during this study to protect health care workers, community workers and family members against litigation, management sanctions or blame.

### Results

During 2001, the study identified 312 institutional maternal deaths in the Southern region of Malawi, of which six occurred

in 5 health centres and 306 in 18 hospitals.

### Age and Parity

Age and parity were both recorded for 232 (74%) women who died. The distribution of the age and parity of women in this study is shown in Table 1. Nineteen percent of women who died from all causes were below 20 years of age, while 9% were 35 years or over. Ten percent of women that died from all causes were parity 6 or more, while 61% were parity 1 to 5.

**Table 1: Age and Parity of women who died from all causes, 2001**

AGE (years)	PARITY						Total
	0	1	2-5	6-9	10+	Not known	
<15	1	-	-	-	-	-	1
15-19	12	40	3	-	-	3	58
20-24	8	29	29	1	1	1	69
25-29	4	9	33	5	-	4	55
30-34	-	1	25	5	-	5	36
35-40	-	-	9	10	1	-	20
40+	-	-	-	3	3	2	8
Not known	2	6	7	2	-	48	65
<b>Total</b>	<b>27</b>	<b>85</b>	<b>106</b>	<b>26</b>	<b>5</b>	<b>63</b>	<b>312</b>

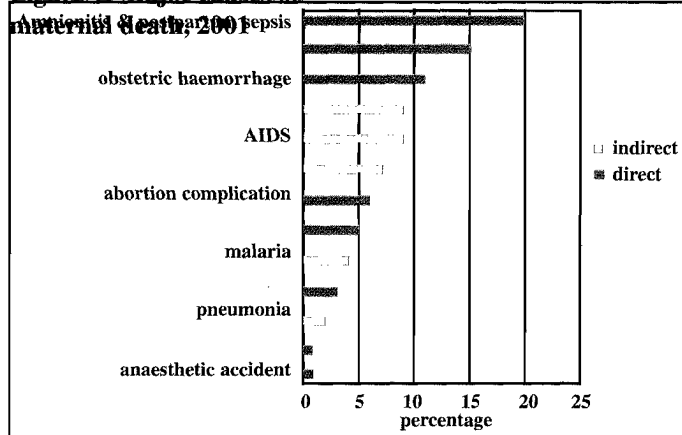
### Antenatal care

Out of 292 women in this study that died in 2001 from causes other than abortion, 152 (52%) attended antenatal clinic; 40 (14%) did not attend and for 100 (34%) it was not known. The maximum number of antenatal visits was 15 (two clients). Sixty-two women died despite making four or more antenatal visits.

### Type and cause of death

The type of death was recorded for 305 of the women who died. Sixty-three percent (197 deaths) had a direct obstetric cause and 34% (107) an indirect cause. One fortuitous death was due to cholera.

**Figure 1: Major causes of maternal death, 2001**



**Figure 1** depicts the top thirteen causes of maternal death (93% of all maternal deaths) in the sample, highlighting the contribution of direct obstetric and indirect deaths. Puerperal sepsis exceeded all other causes of maternal death. Half of postpartum sepsis-related deaths occurred after caesarean delivery. There were also high proportions of direct deaths from obstructed labor and ruptured uterus, and from obstetric hemorrhage. There

## Pregnancy outcome

Stage of pregnancy at which death occurred was recorded for 262 (84%) women. Twenty (6%) of women died due to an abortion complication. Fifty-two (17%) deaths occurred pregnant and undelivered. Main causes of indirect deaths before delivery were anemia, malaria and meningitis. At least 190 (61%) women died after the delivery of the baby. Three percent (6) of these women died within one hour after delivery, 22% (42) died between 1-24 hours postpartum, one third (64) died between 2-7 days postpartum, almost one fifth (36) died from 2<sup>nd</sup>-6<sup>th</sup> week postpartum, and for one fifth (42) it was not stated.

For women who died following a delivery, 68 (36%) delivered a live infant, 63 (33%) had a stillbirth, 14 (7%) a neonatal death and for 45 women (24%) it was not stated.

For women who died following a delivery in hospital, 75 (41%) are known to have died after a spontaneous vertex delivery, 63 (34%) after a caesarean section, 16 (9%) after a laparotomy or hysterectomy for ruptured uterus, 7 (4%) after a breech delivery, 2 (1%) after a vacuum extraction and 2 (1%) after a destructive operation.

**Table 2: Time from hospital admission to death by major causes for direct obstetric deaths, 2001**

Direct deaths	Freq	No (%) of deaths		Not stated
		within 24 hours	after 24 hours	
(Postpartum) sepsis	62	4 (6.5)	39 (62.9)	19 (30.6)
Ruptured uterus/ obstructed labor	45	14 (31.1)	20 (44.4)	11 (24.4)
Obstetric hemorrhage	30	8 (26.7)	9 (30.0)	13 (43.3)
Abortion complication	20	4 (20.0)	11 (55.0)	5 (25.0)
(Pre-)eclampsia	16	10 (62.5)	4 (25.5)	2 (12.5)
Retained placenta	9	6 (66.7)	-	3 (33.3)

**Table 2** cross-tabulates the major causes of direct deaths by cause and time after hospital admission within the first 24 hours of admission and from over 24 hours onwards. The great majority of deaths due to sepsis happened after 24 hours from admission. All deaths due to retained placenta happened within the first 24 hours of admission.

## Referral pattern

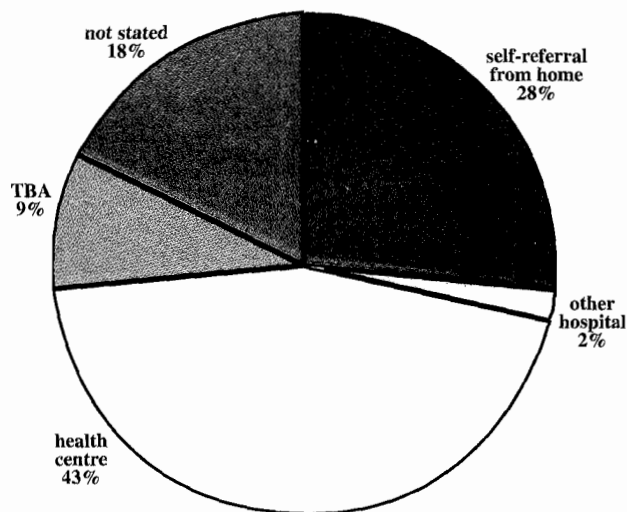
According to the maternal health information system on average 24% of the women who were admitted to hospital maternities in 2001 were referred from another health facility. Figure 2 shows that 28% of the women who died in hospital were self-referrals coming from home, whilst 45% were referred from another health facility.

## Associated factors

Some patients had more than one associated factor that contributed to their death. In 34% of deaths it could be determined that the patient delayed in reporting to the health unit. In 13% of deaths the patient was not referred in time when a problem became manifest. Lack of means of communication and transport problems, which lead to delay in reaching the referral hospital, were associated with 14% of deaths. In 19% of deaths the woman did not receive prompt care at the health facility, in 11% of deaths the diagnosis was wrong and in 16% of cases the

patient received the wrong treatment. Lack of availability of blood for transfusion was a common problem contributing to 18% of the deaths. In 9% of deaths the use of traditional medicines was recorded as a possible contributing factor and in 8% of deaths refusal by patient or family to accept advice from the health provider.

**Figure 2: Referral source of 306 women that died in hospital, 2001**



## Quality of care

For only 81 (26%) women was the quality of care assessed as up to standard, whereas for 154 (49%) it was judged to have been substandard, and for the remaining 77 (25%) it was unknown or uncertain. Among direct obstetric deaths 107 (54%) were classified as having substandard care. Thirty (49%) deaths due to sepsis, 29 (62%) deaths due to ruptured uterus / obstructed labor and 16 (48%) deaths due to hemorrhage were classified as having received substandard care.

Among indirect deaths 45 (42%) were associated with substandard care. Seventeen (61%) deaths due to anemia and three (12%) deaths due to AIDS were associated with substandard care.

## Principal avoidable factor

The principal avoidable factor was assessed for all maternal deaths. Deficient hospital care appears to be the leading principal avoidable factor in 118 (38%) deaths. Delay on the part of the patient in utilizing the health service appears the principal avoidable factor in 48 (15%) deaths. A contra-indicated pregnancy was the principal avoidable factor in 17 (5%) women who died.

## Discussion

These confidential enquiries into maternal deaths for 2001 show that puerperal sepsis is the leading cause of institutional maternal mortality, which points to the importance of infection prevention. Obstructed labor and ruptured uterus is the second leading cause, which indicates that access to operative delivery may be inadequate. AIDS and anemia are the leading causes of indirect maternal mortality. Deficient hospital care is the leading principal avoidable factor.

## Age and parity

Forty percent of women who died were between 20 and 29 years

of age and 61% were parity 1 to 5, categories considered to be of low risk. This clearly demonstrates that every pregnancy faces risks, although there is a bias because these data are not population-based and do not account for the distribution of age and parity amongst those giving birth.

#### Antenatal care

The 2000 MDHS survey reports that 93% of mothers in the Southern region received antenatal care from a health professional. In contrast, only 152 out of 292 (52%) women in this study, who died in 2001 from causes other than abortion, attended antenatal clinic.

#### Mode of delivery

The Southern region maternal health information system reports that the hospital-based caesarean section rate in 2001 was 11.35% (95% confidence interval: 11.06 %, 11.64%), while the population-based caesarean section rate was 2.11% (95% confidence interval: 2.06%, 2.17%). However, for direct maternal deaths the caesarean section rate was 44%. Therefore, caesarean section births are over-represented in this sample of maternal deaths due to direct causes. Although one needs to acknowledge that women who deliver in an institution, and who are experiencing complications, would be expected to have a higher rate of caesarean delivery, the fact that half of the postpartum sepsis deaths were following caesarean section, does indicate substandard care.

#### Quality of care

The maximum acceptable level for the case fatality rate (CFR) among women with obstetric complications in Essential Obstetric Care facilities is 1% (Maine et al. 1997). However, the maternal health information system found that the average case fatality rate in hospitals in the Southern region in 2001 was 2.7%. High CFRs seen in most hospitals are consistent with deficiencies in quality of care.

#### Change over time

In 1977, Bullough analyzed 118 maternal deaths in the Central region of Malawi (Bullough 1981). Six occurred at home and 112 in hospital. However, the author thought it likely that many unreported deaths occurred at home. In 116 out of 118 deaths, information about the cause was retrieved.

Driessen investigated retrospectively 214 maternal deaths in 12 hospitals in all regions of Malawi, which had occurred in 1989. Two (out of 3) central hospitals, 5 (out of 22) district hospitals and 5 (out of 22) mission hospitals were included in his study. In each hospital he made a reasonable attempt to identify all institutional maternal deaths. For each death he tried to classify the cause, to determine the avoidable factors and to assign a principal avoidable factor.

We compared the findings from these two reports with our findings for 2001 in the Southern region in order to better understand the rise in maternal mortality in Malawi.

Bullough reported the institutional delivery rate in the Central region in 1977 as 37% and Driessen reported the institutional delivery rate in Malawi in 1989 as about 40%. The MDHS surveys of both 1992 and 2000 report that 55% of births were delivered in health facilities. This indicates that, although there was an improvement in the use of maternity services in Malawi between 1977 and 1992, there was no further improvement between 1992 and 2000. Moreover, the maternal health information system in the Southern region showed a decrease in the

institutional delivery rate from 55% in 2000 to 43% in 2001, which reflects a more recent decline in utilization of maternity care.

**Table 3: Distributions of causes of direct obstetric deaths in 1977, 1989 and 2001**

	No (%) of deaths		
	1977	1989	2001
Puerperal sepsis	10 (10.3)	25 (19.7)	62 (31.5)
Ruptured uterus	19 (19.6)	18 (14.2)	27 (13.7)
Postpartum hemorrhage (PPH)	12 (12.4)	12 (9.4)	25 (12.7)
Obstructed labor/Disproportion	11 (11.3)	11 (8.7)	20 (10.2)
Abortion complication	4 (4.1)	41 (32.3)	20 (10.2)
(Pre-)eclampsia	1 (1.0)	6 (4.7)	16 (8.1)
Retained placenta	8 (8.2)		10 (5.1)
Antepartum hemorrhage	8 (8.2)	5 (3.9)	8 (4.1)
Ectopic pregnancy	3 (3.1)	3 (2.4)	3 (1.5)
Anesthetic accident		1 (0.8)	3 (1.5)
Caesarean complication		5 (3.9)	2 (1.0)
Puerperal psychosis			1 (0.5)
Other	21 (21.6)		
<b>Total</b>	<b>97 (100)</b>	<b>127 (100)</b>	<b>197 (100)</b>

Source for 1977: Bullough (1981)

Source for 1989: Driessen (1990)

#### Type of death

In our study, the ratio of direct to indirect deaths was similar to those recorded in the two previous studies (Bullough and Driessen).

#### Direct deaths

Table 3 compares the pattern of direct maternal deaths between the three studies. In 2001, the most frequent direct obstetric causes of maternal deaths were puerperal sepsis (32% of all direct deaths), ruptured uterus combined with obstructed labor (24%), hemorrhage after 24 weeks gestation (17%), abortion (10%), (pre-)eclampsia (8%) and retained placenta (5%).

A statistically significant decrease in the proportion of deaths due to complications of abortion ( $X^2=24.7$ ,  $df=1$ ,  $p<0.001$ ) is observed between 1989 and 2001. The 2000 MDHS indicates that 26% of currently married women are using a modern method of family planning. This represents a remarkable increase in the use of modern methods from 7% in the 1992 MDHS. This increase in utilization of modern methods of family planning may have played a role in the reduced incidence of deaths due to complications of abortion.

Table 3 also shows a marked increase in the relative frequency of deaths as a result of puerperal sepsis over time. Even after exclusion of deaths due to abortion, this increase is statistically significant ( $M^2=17.04$ ,  $df=1$ ,  $p<0.0001$ ).

P.T.O. FOR TABLE 3.

**Table 4: Distributions of causes of indirect maternal deaths in 1977, 1989 and 2001**

	No (%) of deaths		
	1977	1989	2001
Anemia	7 (36.8)	17 (25.8)	28 (26.2)
AIDS		5 (7.6)	27 (25.2)
Meningitis		7 (10.6)	23 (21.5)
Malaria		2 (3.0)	11 (10.3)
Pneumonia	3 (15.8)		7 (6.5)
Pulmonary embolism	1 (5.3)		2 (1.9)
Hepatitis	1 (5.3)		2 (1.9)
Ascites			2 (1.9)
Gastro-enteritis			2 (1.9)
Fever without further diagnosis		14 (21.2)	
Other	7 (36.8)	21 (31.8)	3 (2.8)
<b>Total</b>	<b>19 (100)</b>	<b>66 (100)</b>	<b>107 (100)</b>

Source for 1977: Bullough (1981)

Source for 1989: Driessen (1990)

### Indirect deaths

Table 4 compares the pattern of indirect maternal deaths between the three studies. In 2001, the most frequent indirect causes of maternal deaths were anemia and AIDS. Table 4 shows a sharp proportional increase in deaths due to AIDS over the past decade. The proportion of deaths due to AIDS in indirect maternal deaths is now estimated to be 25%, with a 95% confidence interval of (17.0%, 33.4%). Underestimation of the contribution of HIV infection to maternal mortality is likely, because HIV serostatus is unknown in most women and HIV infection may have contributed to death from anemia, puerperal sepsis and other infections, such as meningitis and pneumonia.

### Principal avoidable factor

Table 5 compares the principal avoidable factors in the 1989 and 2001 studies.

This table shows a statistically significant increase in deficient hospital and health center care ( $c_{\chi^2}=7.29$ ,  $p=0.007$ ) with a relative risk of 1.37 (95% confidence interval: 1.08, 1.74).

**Table 5: Distributions of principal avoidable factors in 1989 and 2001**

	No (%) of deaths	
	1989	2001
Patient's delay	41 (19.2)	48 (15.4)
Other patient related problem	1 (0.5)	7 (2.2)
Pregnancy contraindicated	11 (5.1)	17 (5.4)
Transfer problem between health units	4 (1.9)	8 (2.6)
Deficient health center care	6 (2.8)	16 (5.1)
Deficient hospital care	61 (28.5)	118 (37.8)
None	43 (20.1)	12 (3.8)
Uncertain or unrecorded	47 (22.0)	86 (27.6)
<b>Total</b>	<b>214 (100)</b>	<b>312 (100)</b>

Source for 1989: Driessen (1990)

### Limitations of the study

The institutional delivery rate in Malawi is reported at 55 percent (MDHS 2000). Thus, a limitation of this study is that it does not take account of maternal deaths occurring at home. Only six maternal deaths were identified from health centers.

Most severely ill patients get referred to hospital and most health center staff had not yet been oriented to maternal death review, which might have resulted in under-reporting.

This study does not include the data from Queen Elizabeth Central Hospital, the tertiary referral hospital in Blantyre, because these data will be published elsewhere. In 2001 this hospital reported 100 maternal deaths and 9237 deliveries (8776 live births) (Eyob Tadesse – personal communication).

The written records (registers, case notes, MDA forms) were often incomplete. About one fifth of the data for many variables was not recorded; this may cause some of the derived estimates to be underestimated.

Regarding the change over time, the three studies are not entirely comparable, because there are differences in study populations and study areas.

### Conclusion

The main findings of the confidential enquiries into institutional maternal deaths for 2001 are:

1. There has been a significant reduction in abortion complications over the past decade, which may be related to the increasing contraceptive prevalence rate.
2. There has been a dramatic increase in maternal deaths due to non-pregnancy related infections (mainly AIDS) over the past decade.
3. The high proportion of maternal deaths attributed to obstructed labor and ruptured uterus indicates that access to operative delivery may be inadequate.
4. There has been a statistically significant decline in quality of hospital and health center care over the past decade. Substandard care by health care providers is associated with half of the maternal deaths. Important examples of substandard hospital care are as follows:
  - a. Puerperal sepsis is the leading cause of institutional maternal mortality and is frequently related to obstetric surgery, which points to the importance of infection prevention.
  - b. Lack of availability of blood for transfusion is a common serious problem.

### Overall conclusion

The fact that maternal mortality has almost doubled in Malawi over the past decade can be attributed in part to the impact of the AIDS epidemic and in part to declining quality of obstetric care in health facilities, to which the critical and increasing shortage of skilled attendants in maternity units may have contributed.

### KEY RECOMMENDATIONS

1. Enforce adherence to high standards of hygiene and infection prevention in all labor wards and operating theatres.
2. Improve the availability of basic essential obstetric care.
3. Improve the accessibility of comprehensive essential obstetric care.
4. Focus the behavioral change strategy on safer sex both within and outside marriage.
5. Voluntary counseling and testing for HIV should be promoted for women of reproductive age and linked with family planning counseling in order to avoid undesired pregnancies in HIV positive women.

6. Based on the 2000 MDHS survey 30% of married women has an unmet need for family planning services. Therefore there should be an urgent and intensive effort to meet this evident need.
7. All pregnant women should be given iron and folic acid supplements over a period of at least 90 days during pregnancy and Intermittent Presumptive Treatment of malaria.
8. Ensure an adequate safe blood supply in all hospitals.
9. Introduce a criterion-based audit (AMDD 2002) on all cases (also on those women who did not die) for the following conditions:

Management of sepsis  
 Management of obstructed labor/ruptured uterus  
 Management of PPH  
 Management of anemia

The United Nations Millennium Development Goal aimed at improving maternal health strives to reduce the maternal mortality ratio by three-quarters between 1990 and 2015. Therefore, it is of prime importance that these recommendations should be implemented as a matter of urgency. Overcoming the obstacles on the pathway to improved essential obstetric care is a matter of political and moral choice and will.

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