

Epidemiology of Maternal Mortality in Malawi

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Definition

The World Health Organisation (WHO) defines a maternal death as

"the death of a woman while pregnant or within 42 days of termination of 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"

Maternal deaths can be categorised into two main groups:

- Direct obstetric deaths: those resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.
- Indirect obstetric deaths: those resulting from previous existing disease or disease that developed during pregnancy and that were not due to direct obstetric causes but that were aggravated by physiologic effects of pregnancy.

In practice, it is often impossible to determine the exact cause of death of a pregnant or recently pregnant woman particularly when deaths occur outside health facilities. For this reason, WHO and others working in this field often use a broader definition, namely pregnancy-related death. This dispenses with the need to determine cause of death and classifies as pregnancy-related all deaths of women of reproductive age in which the woman was pregnant at the time of death or had recently been so. This is more akin to the definition of infant death, which is defined solely in terms of the timing of the death. For all practical purposes, the difference between the two measures is minimal because only a very small proportion of deaths of pregnant or recently pregnant women are unrelated in some way to the pregnancy itself. In other words, the proportion of all deaths among these women that are incidental is very small in almost all settings.

Pregnancy-related death - the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death.

Distribution of maternal mortality

Measuring

Measuring maternal mortality

Maternal mortality incidence is usually expressed as the number of maternal deaths per 100,000 live births (the maternal mortality ratio), as the number of maternal deaths per year per 10,000 women of reproductive age (the maternal mortality rate) or as the lifetime chance of dying from pregnancy (the lifetime risk of maternal death).

The most widely used measure is the maternal mortality ratio, which only depends on the risk of dying once a woman is pregnant, i.e. the risk of developing a complication multiplied by the risk of dying from that complication. The maternal mortality rate also takes into account the annual probability of becoming pregnant for women of reproductive age. The lifetime risk is the most comprehensive measure as it incorporates the annual probability to become pregnant, the length of the reproductive period and the risk of dying a maternal death once pregnant. It is thus a cumulative incidence.

There are five possible sources of information on maternal deaths:

1. Vital registration systems, or death notification systems
2. Hospital-based surveys, including health management information statistics (HMIS)
3. Population-based surveys, including the sisterhood method
4. Community-based continuous surveillance systems
5. Reproductive Age Mortality Studies (RAMOS)

Ad 1. Vital registration systems are seldom available on a wide scale in developing countries. Even where they exist, they tend to under-report death or provide no information on cause of death or pregnancy status, which makes it impossible to classify a death as maternal.

Ad 2. Hospital-based surveys or HMIS statistics use data about patients who deliver in a health facility². For Malawi, this means that 45% of births are missed, because they occur outside a health facility. In addition, in-hospital deliveries usually concern a selection of high-risk women or emergency admissions. Together, these lead to a considerable but unknown bias in the estimate. They are very useful however to investigate the factors contributing to in-hospital maternal deaths.

Ad 3. Population-based surveys are less biased, but because a maternal death is a rare event, they require very large samples (often > 50,000 births), which makes them very costly – or when a large sample-size is not feasible, they produce imprecise estimates. A way to overcome this problem is to use the sisterhood-method³. Because one respondent provides information about several other women, the sample size can be reduced to less than 4,000 households. In the indirect sisterhood method adult female respondents are asked four simple questions about how many sisters reached adulthood, how many have died, and whether they were pregnant around the time of death. The overall estimate relates to a point in time around 10-12 years prior to the survey. The direct sisterhood method asks more elaborate questions about age at death and time of death and therefore allows estimating maternal mortality for a narrower time period. The most reliable estimate is around seven years before the survey. This latter one is used in the Malawi DHS.

Ad 4. Community-based surveillance systems (i.e. longitudinal studies) are also costly, but have the ability to provide current estimates, and insight into the determinants of maternal death.

Ad 5. RAMOS surveys assess the extent and causes of maternal mortality by identifying and investigating the causes of death of all women of reproductive age, using a variety of sources of information on maternal deaths, e.g. civil registers, health facilities, community leaders, schoolchildren, religious authorities, undertakers, cemetery officials etc. These are an economical way of measuring maternal death provided it is possible to trace deaths in women of reproductive age.

Currently, the IMMPACT programme (Initiative for Maternal Mortality Programme Assessment), based at the University of Aberdeen, is working on enhanced methods and tools for measuring maternal mortality and its underlying processes and on generating evidence on effective and cost-effective strategies for reducing maternal mortality⁴. IMMPACT collaborates with seven developing countries, of which Malawi is one. As a consequence, within the next few years, Malawi should have its own tailor-made measurement and evaluation methodologies for maternal mortality.

Measuring the process of emergency obstetric care

Because of the difficulties in timely and accurate measurement of maternal mortality, it is not a suitable indicator to evaluate the effectiveness of obstetric interven-

tions. WHO suggests the use of the following 6 process indicators⁵:

1. Number of facilities: at least 4 basic emergency obstetric care (EmOC) facilities⁶ and 1 comprehensive EmOC facility⁷ per 500,000 population
2. Geographical distribution: proper distribution so that 4 basic EmOC facilities and 1 comprehensive EmOC facility serve a catchment area of 500,000 population
3. Proportion of births in EmOC facilities: at least 15% of all births in the community
4. Met need for EmOC services: all women with emergency obstetric complications are treated in an EmOC facility
5. Caesarean Section as percentage of all births: between 5 and 15%
6. Case fatality rate: proportion of women with obstetric complications admitted to a facility that dies is less than 1%.

Malawi was one of the first countries to evaluate their use in practice, i.e. in the Safe motherhood Project^{8,9,10}.

Global maternal mortality

More than one woman dies every minute from complications of pregnancy and childbirth somewhere in the world, i.e. 585,000 women annually¹¹. Less than one percent of these deaths occur in developed countries, demonstrating that they could be avoided if resources and services were available. The lifetime risk for women in Africa is 1 in 16, as compared to 1 in 1,800 in developed countries¹¹. This makes maternal mortality the health indicator with the widest disparity between developed and developing countries.

Maternal mortality in Malawi

In Malawi, the number of maternal deaths has been estimated using hospital-based surveys and population-based surveys. The results of these studies, sorted by setting and year of the study, are presented in table 1.

In addition, large community-based surveillance systems are currently being implemented by the Karonga Prevention Study of the London School of Hygiene and Tropical Medicine in the South of Karonga District and by the Centre for Reproductive Health of the College of Medicine in the Lungwena area in Mangochi District.

Estimates from hospital-based studies, concerning the period 1977 to 1990 range from 32 to 945 maternal

Table 1. Maternal mortality rate, population based and hospital based studies in Malawi

Reference	Setting	Method	Year	Maternal Deaths	MMR
<i>Population based-surveys</i>					
Chipangwi 1992 ¹²	Community, Thyolo	Indirect sisterhood method	1989, but refers to approx 1976	150	409
McDermott 1996 ¹³	Four ANC in Mangochi district	Prospective population based survey among ANC attendees	September 1987 - July 1989	15	398
Malawi DHS 1992 ¹⁴	Random sample within 6 region / urban rural strata	Direct sisterhood method	1992, but refers to 1986 - 1992	71	620
Malawi DHS 2002 ²	Random sample, but with over-sampling for 11 districts	Direct sisterhood method	2000, but refers to 1994 - 2000	344	1120
<i>Hospital based surveys</i>					
Bullough 1981 ¹⁵	All health facilities, Central Region	Retrospective hospital based survey	1977	118	263
Knowles 1988 ¹⁶	Ekwendeni Hospital	Hospital survey	1976 - 1985	30	344
WHO 1985 ¹⁷	Six district hospitals, countrywide	?	1983	34	269
Keller 1989	Kamuzu Central Hospital, Liongwe	Retrospective hospital based survey	1985	77	945
Knowles 1989	Ekwendeni Hospital	Hospital survey	1986 - 1988	1	32
Driessen 1990 ¹⁹	Two central, 5 district and 5 mission hospitals	Retrospective survey	1989	214	113
Kempf 1990 ²⁰	Mulanje Mission Hospital	Hospital survey	1989	21	411
Wiebenga 1992 ²¹	Queen Elizabeth Central Hospital	Retrospective (1989) / prospective (1990) hospital survey	1989 - 1990	151	529
Sangala 1992	Kamuzu Central Hospital	Retrospective survey	1990	74	Not specified

deaths per 100,000 live births. More recent estimates have not been found.

The MMR estimated from community surveys in the eighties to early nineties varied from 398 to 620. For the late nineties only the MDHS estimate of the MMR is available, which is 1120 maternal deaths per 100,000 live births.

Causes and determinants of maternal mortality

Global causes of maternal mortality

Across the globe the causes of maternal deaths are strikingly similar, although their relative importance varies between countries (figure 1). Eighty percent of deaths are due to direct causes, i.e. obstetric complications, interventions, omissions or incorrect treatment. Out of all maternal deaths over sixty percent occur post-partum especially in the first week after delivery.²³

Causes of maternal mortality in Malawi

The same causes of maternal deaths that are found globally are seen in Malawi.

Table 2 presents the results from three hospital-based

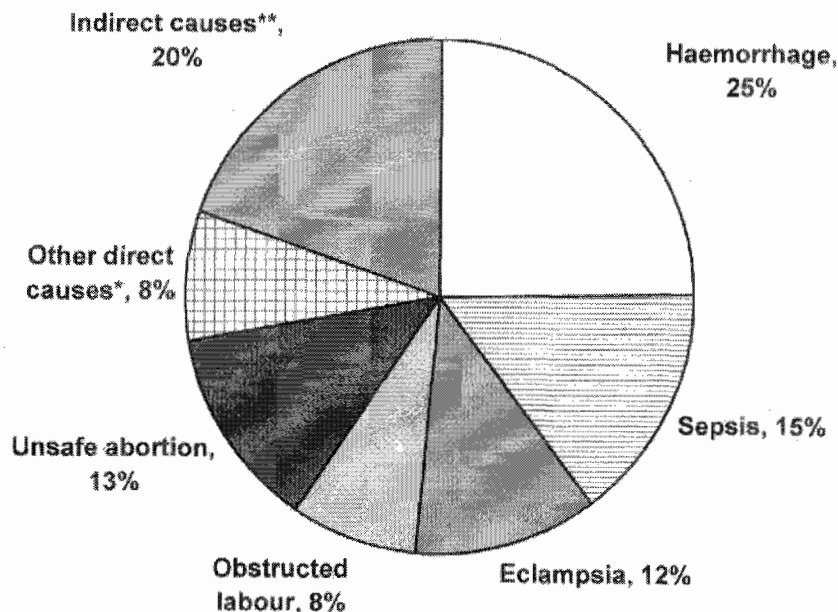
studies in the late eighties and early nineties 19,21,22, one hospital-based study from 2001²⁶ and one community-based study concerning 1998-2001.²⁷ Two studies were not included because information about cause of death was available for only 6 patients¹³ or reporting was erratic.

A maternal death is often characterised by a chain of events leading to death. For example, a woman might undergo a caesarean section for obstructed labour and die of postoperative sepsis. The cause of death is then the first event, in this case obstructed labour. In one of the studies²², this classification method seemed not to have been practiced throughout. Its results were therefore retabulated from the reported data.

The three most important causes of death in the three earlier hospital studies were sepsis, complications of abortion and obstructed labour, sometimes resulting in ruptured uterus. In the later hospital study, the relative importance of deaths from abortion appears to have declined, possibly because of higher uptake of family planning methods and consequently fewer unwanted pregnancies.²

The community based study by Hofman, which tracked both deaths that occurred in the community and in-hospital, haemorrhage and ruptured uterus were a much

Figure 1. Global distribution of causes of maternal mortality



* Other direct causes include: ectopic pregnancy, embolism, anaesthesia related

** Indirect causes include: anemia, malaria, AIDS, heart disease

Summary - incidence

The current best estimate of maternal mortality is 1,120 maternal deaths per 100,000 live births. With a current total fertility rate of 6.3 this means the lifetime risk for maternal death is 1 in 14.

more important cause of death. This is a reflection of the acute nature of these complications. Often acute care (within 2-12 hours for haemorrhage and within one day for ruptured uterus) is not available in time and thus a higher proportion of these maternal deaths occur in the community. The Farish study identified deaths through interviews with community members only and may have underreported those maternal deaths that occurred in the hospital, e.g. through RU and obstructed labour. As for the indirect causes of death, no major changes seemed to have occurred within the last ten years, with the exception of AIDS that seems to be diagnosed more often. However, the real contribution of AIDS to the incidence of maternal mortality cannot be estimated from these studies. Already in 1990 Wiebenga commented that in more than half of all puerperal sepsis cases HIV was thought to have contributed to death. Also more than half of meningitis cases and all pulmonary TB and septicaemia cases were thought to be HIV-associated²¹. Indeed, there is circumstantial evidence from the 1992 and 2000 demographic and health surveys^{14,2} that the HIV epidemic has contributed substantially to the rise in maternal mortality in the 1990s²⁸. It has been suggested that this is not only a direct effect but that the epidemic also leads to decreased quality of care resulting from crowded health facilities

due to HIV-related illnesses and loss of staff, see Sepsis is becoming the leading cause of death where HIV is prevalent.

Haemorrhage

Patients with haemorrhage should be treated as emergencies in health facilities. Both types, ante partum haemorrhage (APH) and postpartum haemorrhage (PPH), require urgent intervention, because the estimated average time to death is short (i.e. 12 hours for APH and 2 hours for PPH). Therefore, factors that delay timely access to appropriate care often contribute to death, e.g. limited knowledge of danger signs, delayed decision making, lack of transport and money for fees and delay in receiving care at the health facility. The patient needs to be resuscitated and the bleeding stopped, if necessary operatively. Lack of blood is often an important contributing factor to deaths from haemorrhage, especially in small or anaemic women, who tolerate blood loss less well.

Ante partum haemorrhage (APH)

APH is defined as bleeding from the genital tract after 28 weeks gestation and before the birth of the baby. Causes include placenta praevia (when the placenta covers all or part of the cervical opening), abruptio

Table 2 Causes of maternal mortality in Malawi

Reference	Direct deaths (% of all deaths)				Indirect deaths (% of all deaths)					Unknown or fortuitous (% of all deaths)
	Haemor.	Sepsis	R/U & Obst. Lab.	Abortion	Other	Anaemia	Mening.	AIDS	Other	
Weibenga* QECH, 1989 - 1990 ²¹	4%	13%	7%	17%	5%	5%	9%	4%	24%	15%
Driessen, hospitals, 1989 ¹⁹	10%	12%	14%	18%	6%	8%	3%	2%	17%	10%
Sangala, KCH, 1990 ²²	14%	24%	15%	18%	11%	8%	3%	-	8%	-
SMP, Hospitals, 2001 ²⁶	11%	20%	15%	6%	13%	9%	7%	9%	9%	3%
Hofman, community, 1998 - 2001 ²⁷	30%	5%	30%	14%	7%	7%	5%	-	-	2%
Farish*, community, 2003	33%	7%	7%	-	7%	7%	7%	7%	13%	7%

* Percentages do not add up to 100% due to rounding

placentae (when the placenta loosens from the uterus wall before the baby is born) and ruptured uterus. Data about the occurrence of these separate causes for APH in Malawi were not found.

Postpartum Haemorrhage

The most common site of bleeding in PPH is the placental bed, because the uterus does not contract well. This can happen because of too rapid separation of the placenta (e.g. by pulling on the umbilical cord), a retained placenta (a placenta or placental part that is not delivered within two hours after delivery of the infant), high parity, prolonged labour, twin delivery, polyhydramnios, anaesthesia or even a full bladder. PPH might also originate from lacerations that developed during childbirth, e.g. vulval or vaginal tears, from breakdown of the uterine wound after caesarean section or ruptured uterus or from sloughing of dead tissue following obstructed labour. It is not known for Malawi what is the contribution of these separate causes for PPH.

Sepsis

Puerperal sepsis can be caused by different micro-organisms, e.g. sexually transmitted micro-organisms, large bowel bacteria or skin bacteria. Risk factors for sepsis include poor hygiene during delivery (see paragraph 3.5.2), manipulations high in the birth canal, premature rupture of membranes, delivery through caesarean section and the presence of dead tissue in the birth canal after delivery.

Obstructed labour and ruptured uterus (RU)

Obstructed labour may lead to ruptured uterus. Phillips, in an overview of 194 women treated for a ruptured uterus in Mulanje Mission Hospital between 1974 and 1982, found a mortality rate of 10.3%; this figure was due largely to ruptured uterus, primigravidity, and being in shock when admitted²⁹.

Abortion

The main risks associated with induced or spontaneous incomplete abortion are the same as those of delivery, i.e. infection and bleeding. However, for induced abortion, lack of adequate family planning can be seen as a risk factor, because without unwanted pregnancies, no induced abortions would be carried out.

A study in Kamuzu Central Hospital reported that admissions for abortions constituted 40% of all admissions to the gynaecology ward. Seventy-one percent occurred in first trimester. Incomplete abortions made up 85% of total and of these women, 38% were septic on arrival. One third needed blood transfusion. Thirty-three cases (5.5%) were obvious induced abortions, 30 had sticks introduced in the vagina by traditional healers and three admitted having taken 'home medicine'. This is most likely an underestimation. Of the women with induced abortions, 72% were schoolgirls. The case fatality rate among women with obviously induced abortions was 9% and the overall case fatality rate was 0.5%³⁰. In another study, performed in Queen Elizabeth Central Hospital in Blantyre, Kamuzu Central Hospital in Lilongwe, Ekwendeni Mission Hospital in Mzuzu and Mangochi District Hospital, a total of 1325 incomplete abortions were recorded. No distinction was made between spontaneous and induced abortions. Again, two thirds occurred in the first trimester, the median age of women was 25.5 years (28% was younger than 20 years), median parity was 2 and a large majority of women were married. The facility based abortion case fatality rate was 2%. The most frequent occurring presenting complications according to service providers were localised infection, haemorrhage and sepsis³¹.

Hypertensive disorders of pregnancy (HDP)³²

HDP include pregnancy-induced hypertension (hypertension that occurs after 20 weeks gestation in a normally normotensive woman), pre-eclampsia (pregnancy-induced hypertension with proteinuria and possibly oedema, headache and visual distortions) and eclampsia (pregnancy-induced hypertension with convulsions).

The risk of HPD is increased for primiparous women, women who have suffered proteinuric pre-eclampsia in a previous pregnancy, in women with a positive family history, obesity, multiple gestation or excessive weight gain in pregnancy. However these factors in combination cannot adequately predict which individual woman will develop HDP. The wide variety in case fatality rates between countries (e.g. 7-25% in Africa and 1.4% in Sweden) implies that differences in care influence outcome. Confidential enquiries suggest that women who die of HPD have usually received substandard care, including failure to diagnose the condition until late in pregnancy. Measurement of a rise in arterial blood pressure is the most sensitive screening test for diagnosing HDP. Because baseline initial blood pressure measurements are often lacking in Malawi, the combination of proteinuria and repeated diastolic pressure > 90 mm Hg, or >110 mm Hg at a single reading is considered to represent mild and severe pre-eclampsia respectively. Women with convulsions are all treated as having eclampsia, unless another diagnosis is confirmed. No information was found on the incidence of HDP in Malawi.

HIV/AIDS

Complications of both early and late pregnancy have been reported to occur more often in women infected with HIV, e.g. spontaneous abortion, ectopic pregnancy, preterm labour, preterm rupture of membranes, abruptio placentae and postpartum infectious complications.³³ Infectious morbidity after caesarean section in HIV positive women was increased in a Rwandan study, with associated higher maternal mortality³⁴. See chapter on HIV/AIDS chapter for more information on the distribution of HIV in pregnant women.

Global determinants of maternal mortality

The MMRs^{2,3} express the risk of dying a maternal death once a woman is pregnant. Her lifetime risk of maternal death will also depend on the number of times she becomes pregnant.

Basically, three determinants together constitute the risk of maternal mortality:

1. The likelihood of a pregnancy occurring
 2. The likelihood of a complication arising
 3. The successful management of a complication
- Globally, women in Africa have the highest life time risk of maternal death because high mortality rates are coupled with high fertility.

Maternal death is nearly always multi-causal. Even where only one clinical cause of death can be identified, often several behavioural or socio-cultural/ economical

factors have contributed to that death.

Ad A. Likelihood of pregnancy occurring

The likelihood of pregnancy depends on the fertility pattern in a country or region. This pattern is determined by the fertility preferences and the unmet need for family planning. Both of these depend on women's educational status and rural / urban location. Obviously the difference between wanted and actual number of children is largest for those women who have the greatest unmet need for fertility control.

Ad B. Likelihood of a complication arising

Although every pregnant woman runs the risk of developing a complication during pregnancy, delivery or puerperium, complications are more common among teenagers, older women, women in their first pregnancy, women in their fourth or higher pregnancy, women with short birth intervals, short women and women who had a complication during a prior pregnancy. Most of these factors are mere proxies for underlying problems that increase the risk of maternal death.

Whereas these risk factors and proxies are useful in establishing which groups of women are at higher risk, they fail to correctly predict the risk for individual women. Although women in the high risk group have relatively more complications, in absolute numbers, more complications occur in the low-risk group. Also, many women who have one or more risk factors never develop a complication and conversely, of women who do develop a complication many had not been identified as being at high risk. Furthermore, most complications cannot be prevented. This so-called high-risk approach has therefore been abandoned. Whereas some risk screening is still useful (e.g. asking about complications in previous pregnancy), presently the general consensus is that every pregnancy faces risk and thus availability of and access to essential obstetric care is paramount.

Ad C. Successful management of a complication.

Most obstetric complications cannot be predicted nor prevented, but nearly all can be successfully treated. Availability, accessibility and quality of care are therefore crucial determinants for the prevention of maternal mortality. To describe the factors associated with acquiring timely care, the conceptual framework of the Three Phases of Delay is useful³⁵. These concern:

1. Delay in the decision to seek care
2. Delay in the arrival at a health facility
3. Delay in the provision of adequate care

Ad 1. Factors that delay the decision to seek care on the part of the individual, the family or both include: the centre of decision making (individual/spouse/relative/family); the status of women; illness characteristics; distance from the health facility; financial and opportunity costs; previous experience with the health care system; perceived quality of care.

Ad 2. Delay in reaching the health facility depends on distribution of facilities, travel time, availability and cost of transportation and condition of roads.

Ad 3. Receiving adequate care at the health facility can be delayed by inadequacy of the referral system, shortage of supplies, equipment and trained personnel and competence of the available personnel.

Determinants of maternal mortality in Malawi

Biological determinants

Cephalopelvic disproportion (CPD) and malpresentations

CPD and malpresentations are often the underlying cause of prolonged and obstructed labour, which may lead to ruptured uterus. For the women who ruptured an intact uterus in Phillips' study²⁹, factors contributing to the uterus rupture included cephalopelvic disproportion, malpresentation, prolonged labour, and herbal oxytocics.

In general, the following patients are at higher risk of CPD: nulliparae who are short, have a deformity of the spine or leg or who carry a large baby, multiparae with a history of caesarean section, symphysiotomy, vacuum extraction or forceps delivery, prolonged or difficult labour, repeated fresh stillbirths or neonatal deaths at term, or a large baby. WHO recommends to refer short nulliparae, women with a poor obstetric history and nulliparae younger than 17 years, especially if they are single, to deliver in an appropriate facility. In a study conducted in the Lower Shire Valley, CPD was present in 2.3% of pregnant women.³⁷ Nulliparous women, babies weighing more than 3400 grams and women shorter than 155 cm were at increased risk for CPD.

Nutritional status

Chronic protein energy malnutrition throughout childhood and adolescence leads to stunting which is associated with impaired pelvic growth and thus contributes

to cephalo-pelvic disproportion. The micronutrient deficiencies that appear to be most common and most important in pregnancy are iron deficiency and folate deficiency, which both are an underlying cause of anaemia in pregnancy (see Anaemia in Pregnancy chapter). Refer to nutrition and anaemia chapters for a distribution of these macro- and micronutrient deficiencies in Malawi.

Behavioural determinants

Fertility preferences and use of family planning methods

Because every pregnancy carries a risk, a lower fertility would result in less overall risk of maternal mortality. The ideal family size as measured in the 2000 MDHS was 5.2, which is more than one child less than the actual fertility rate of 6.3 children. The wanted fertility was highest in Mangochi (6.7) and lowest in Blantyre (3.3). The difference between wanted and actual number of children was highest in Salima and Lilongwe (1.3) and lowest in Karonga, Mangochi and Thyolo (0.7). This difference was also greater for rural and for less educated women. The current total fertility rate of 6.3 constitutes a decline of 6 percent over the last decade. The decline in fertility was more pronounced in urban (18 percent) than in rural areas (3 percent). The actual number of children in a family correlated well with the family's fertility preferences².

A wide variety of family planning methods exists, which can be grouped into modern methods and traditional methods. Modern methods include short-term methods (female or male condom, oral contraceptives, spermicides, diaphragms), long-term methods (injectable contraceptives, contraceptive implants, intrauterine devices, Lactational Amenorrhoea Method (LAM)) and permanent methods (male or female sterilisation). Traditional methods include periodic abstinence, withdrawal and local methods such as herbs and strings.

Acquiring knowledge about fertility control is an important step toward gaining access to and then using a suitable contraceptive method in a timely and effective manner. According to the 2000 MDHS, knowledge of several modern methods of family planning (i.e. the pill, injectables, condoms and female sterilisation) was high among married women and men and among

Summary - Causes

- Distribution of causes of maternal death in Malawi are similar to worldwide distribution
- The majority of maternal deaths have direct causes and occur post-partum
- The most common causes are sepsis, haemorrhage and obstructed labor/ruptured uterus
- Hospital-based studies underestimate complications that rapidly lead to death (e.g. haemorrhage)

women and men who were unmarried but had sex before. Other methods like male sterilisation, diaphragm and implants were less well known. People who had not had sex were less knowledgeable about family planning: 17% of women and 12% of men did not know any modern family planning method. Thirty-nine percent of married women and 56% of married men had ever used a modern method of family planning, in order of decreasing frequency: injectables, the pill, the male condom and LAM. The percentage of ever users of contraceptive methods was marginally higher among unmarried men and women, and the choice of methods was slightly different, i.e. in order of decreasing frequency: male condom, injectables and the pill.

There has been a quadrupling of modern contraceptive use over the last decade: from 7% in the 1992 MDHS and 14% in the 1996 MKAP survey to 26% in the 2000 MDHS, both among currently married and unmarried women.^{2,14} This increase was mainly due an increase in use of injectables. An additional 5% of married women and 1% of unmarried women used traditional contraceptive methods. The current use of modern contraceptives was higher in urban (38%) than rural areas (24%). Use varied widely per district, with highest use in Blantyre (38%) and lowest in Salima (16%), Mangochi (17%) and Karonga (17%). Uptake also increased with higher education and a higher number of living children.

Decision making to go to health facility

Delay in decision making to deliver in a health facility was a contributing factor to 77% of maternal deaths in the community based Nankumba study.²⁷ Qualitative research by the SMP suggested that decision making patterns vary between districts in South Malawi. In many matrilineal societies (like the Yao in Mangochi, the Mang'anja in Chikwawa, and the Lomwe and Mang'anja in Phalombe, Chiradzulu and Zomba) where the husband goes to live with his wife's family after marriage and thus his relatives often live far away, the wife's relatives (especially the uncles) are important decision makers. In the latter three districts, the husband was rated as second most important decision maker by women, but as most important by men. However, among the Yao in Mangochi, the husband's relatives also play an important role: they need to witness whether the labour is prolonged, because this is believed to be proof that the child is not the husband's. Especially in Mangochi, where girls marry and get pregnant at a very young age and thus experience prolonged labour more often, this leads to many complicated deliveries occurring at home. In complicated deliveries, husbands are the main decision makers in 40% of cases in Blantyre and 68% in

Nsanje (with a predominant patrilineal Sena population). In normal deliveries however, the woman herself most frequently decides where to go for delivery. In many societies the husbands play an important role in providing material and financial support during delivery, and may therefore in practice have a large influence on delivery site. Apart from these gender and hierarchical aspects, other factors also influence the decision to go to the health facility, i.e. distance to health facility, perception of danger signs), previous experience and perceived quality of care.

Infection prevention practices

With sepsis as a major cause of in-hospital maternal deaths, unhygienic practices are an important determinant of maternal mortality. A 2000 report by the East, Central and Southern Africa College of Nursing (ECA-SON) of seven health facilities and three schools of nursing in Malawi showed that the only national infection prevention guidelines that existed were those of the National AIDS Commission, but these were not known to most health care workers. In most hospitals, infection prevention (IP) committees were lacking, no monitoring systems were in place for nosocomial infections, knowledge about IP was limited and practices were inadequate. Although some staff had had training on IP (mostly as part of family planning training), follow up training and supervision (e.g. by an infection control coordinator or committee) were absent⁴³. Another study by the Safe Motherhood Project done in 2000 in the maternity wards of health facilities in the 12 districts in the Southern Region confirmed these findings. An in-depth study of infection prevention perceptions and practices was done at Mangochi District Hospital, after the Safe Motherhood Program provided training on IP to improve staff's knowledge and awareness. It revealed that general knowledge was good, but knowledge about details and implementation of knowledge was poor. Health care workers believed that most infections arise outside of the hospital after home deliveries. Much emphasis was being put on availability of supplies rather than on their appropriate use. Shortage of staff led to overworked nurses whose most pressing concern was to attend to all the deliveries occurring at the same time, with no time or attention for infection prevention. Also nursing duties were delegated to support staff (e.g. changing intravenous fluid), who had not been trained on infection prevention. Supervision was weak and hospital management had little or no role in the implementation of infection control⁴⁵. MOH in cooperation with JHPIEGO started training staff in IP and in the quality improvement process in 2001 in the four central hospitals and in Chiradzulu

District Hospital, St. Johns hospital and Likuni Hospital, resulting in steady progress in achievement of performance standards in all hospitals and three sites achieving standards for external recognition. This program was extended to Chitipa, Rumphi, Nkata Bay, Mzimba, Karonga, Salima and Mulanje District Hospitals in 2004 and will be further expanded to include more hospitals and NGOs in the near future.

Previous experience with health care system

Women in focus group discussions in Zomba, Phalombe and Chiradzulu Districts who had previously delivered in a health facility expressed a preference for institutional delivery for future pregnancies, because of perceived better management of complications. Women who had only delivered at home did so because they had never experienced any problems, because they wanted to avoid rude nurses, were afraid for a caesarean section and because of the unlimited support available at home³⁹. Findings from Thyolo, Mangochi and Chikwawa were similar⁴⁰.

Perceived quality of care

Like anywhere in the world, the perceived quality of care in delivery services in Malawi consists of perception about technical quality and the interpersonal communication with which it is delivered. Clients in Blantyre and Nsanje ranked good reception/staff behaviour and prompt, appropriate care as the most important factors for quality obstetric care. Whereas reception was often received as poor, still more than 90% were satisfied with the care provided. Many women had delivered alone or felt they had been insulted by staff. Also, the majority of staff themselves admitted they were often rude, reasons for which were poor working conditions, inadequate staffing levels and long working hours.⁴¹ In an SMP needs assessment study in Zomba, Phalombe and Chiradzulu districts, women mentioned health workers' unwillingness to assist pregnant women, beating pregnant women especially when they are in labour, rudeness, performing operations while drunk, use of abusive language, discrimination of poor women, delays in treating women and lack of privacy and confidentiality as important barriers. Reception was said to be better at CHAM health facilities than government facilities and also TBAs were said to humbly treat and assist pregnant women³⁹. CHAM was also perceived to offer cleaner facilities and always have drugs, but the user fees are a strong deterrent⁴¹. Similar to Nsanje and Blantyre, respondents did perceive the quality of technical care to be better at health facilities than at TBAs³⁹. In an evaluation of delivery preferences among women attending ANC at Nankumba health centre in Mangochi district,

95% of women indicated they wanted to deliver in the health centre, mainly because they expected quick referral to the hospital in case of problems. However, only 29% actually delivered there, mainly because they realised too late they were in labour (62%) or because the health centre was too far (27%)⁴⁶.

Perception of danger signs

In several needs assessment reports for SMP, knowledge about danger signs in the population was low: only 15% recognised bleeding and 0% recognised sepsis / fever as a danger sign. Community members with knowledge about danger signs were twice as likely to deliver in a health centre as those with minimal knowledge⁴⁷.

Socio-cultural and socio-economic determinants

Women's socio-economic status

Poverty level has been shown to have a strong association with maternal mortality. In Indonesia, the risk of maternal death in the poorest group was 3-4 times that of the richest group. In contrast, a recent review of poverty and health finds little difference in maternal mortality rates between the rich and poor (figure 2).⁴⁹ For this analysis called the familial method of assessing the effect of wealth on maternal mortality, an asset score is compiled using data from the DHS survey for each household, which is ranked and placed in one of five equal groups from a poorest quintile group to a richest group. The survival history of each sister is recorded in the previous five years and maternal mortality calculated. The method is called familial because the method categorises the wealth of the sister of the women who died or remain alive.

This equality occurs despite the fact, as shown in the Integrated Household Survey that poor women have more children than non-poor women, even when adjusted for education level (figure 3)⁵⁰.

Education level itself is an important determinant of access to family planning and obstetric care services. In the SMP, higher institutional delivery rates were observed in districts with higher female literacy rates. Number of years of education showed a dose response relation with maternity service attendance: women with primary, secondary or higher education were 4, 5 and 7 times more likely to use services than women without education⁵¹.

It has been stipulated that a woman's social status also influences how much control she takes over her own fertility. From the MDHS 2000 it appeared that the use of family planning slightly increased with an increased

number of decisions in the household in which a woman has a final say².

Urban / rural residence

Residence influences several determinants of maternal mortality, e.g. use of family planning, unmet need for family planning, access to health facilities and access to skilled attendants at birth.

Access to family planning

According to the 2000 MDHS, the unmet need for family planning among married women was 30%, 17% for child spacing and 13% for limiting child bearing. The unmet need among unmarried women was much lower, i.e. 4 percent. The unmet need for family planning was similar for all age groups, except that it was a bit lower for women approaching the end of their reproductive life. Unmet need was higher in rural than urban settings and for women with lower education and varied between districts, with Blantyre having the lowest unmet need (22%) and Salima the highest (35%)². Of the total demand for family planning, only 51% was met, although this represents a dramatic increase from the 26% measured in 1992, indicating that the coverage by family planning services has improved considerably. Demand satisfied was highest in Blantyre district (65%) and lowest in Salima (35%)². In the abortion study described in paragraph 3.2.4, most providers thought that offering post-procedure FP services was important, but comprehensive services did not exist in these hospitals. Whereas 25-78% of providers said that information about where to get FP in the community was offered to patients, only two of the 50 patients interviewed received such information³¹.

Distance to health facility, availability of transport and transport costs

Distance to a health facility can be an obstacle to reaching the facility, or it can act as a disincentive to try seeking care³⁵. A 'distance decay curve' exists, meaning that the farther away people live, the less likely they are to use a health facility. However, utilisation of health services is not a function of distance alone, but also of costs and quality (see rest of this paragraph).

Patient's delay (this may include a delay in the decision to go to the hospital) was the principal avoidable factor in 19% of the maternal deaths in Driessen's study¹⁹, in 15% of deaths in the Safe Motherhood Study²⁶ and in 16% in the Wiebenga study²¹.

Although the question was not specifically about problems during delivery, the 2000 MDHS asked women about big obstacles in accessing healthcare for themselves². The time required getting to the health facility,

the availability of transport and the cost of transport were mentioned by 56, 52 and 60 percent respectively. A higher number of children, low education, rural residence, living in the Central region or Southern region were all associated with reported less access to health facilities due to time and cost constraints. An SMP needs assessment in the 12 districts in the Southern region showed that most women lived 2 to 5 km from a health facility, and that walking was the main form of transport, irrespective of the severity of the obstetric condition. One third of women took longer than 2 hours to reach a health facility and one tenth took more than 4 hours⁵¹.

Availability of blood for transfusion

Lack of blood contributes to death from haemorrhage, especially in anaemic women. In the SMP study in 18 hospitals in the Southern Region, lack of blood for transfusion was the principal avoidable factor in 18% of maternal deaths.²⁶ In the Nankumba Safe Motherhood Project it was a contributing factor in 32% of maternal deaths.

Availability and quality of skilled attendants

A Millennium Development Goal is to have 80% of deliveries assisted by an attendant with midwifery skills by 2010. Because home delivery by skilled attendants is rare in Malawi (TBAs are not considered skilled attendants), this percentage roughly corresponds to the percentage of institutional deliveries. However, due to staff shortages, deliveries in health centres and hospitals might not always be performed by a person with midwifery skills, but by e.g. a ward attendant. According to the 2000 MDHS, 55% of deliveries in the five years preceding the survey were assisted by a skilled birth attendant.² This proportion varied hugely per district, from less than 45% in Karonga and Kasungu to over 80% in Blantyre. Urban residence was associated with a higher percentage of pregnancies assisted by a skilled attendant (82% versus 52% in rural areas). These data are self-reported by interviewed women and might therefore be subject to the woman's interpretation of what constitutes a skilled attendant. The survey also found higher rates in richer families with little change since the previous DHS in 1992.

In the 2003 HMIS data, which uses reports by hospitals, the estimated percentage of deliveries assisted by a skilled attendant was 41 %, ranging from a low of 22% in Chiradzulu to 84% in Rumphi. There may have been considerable underreporting in some districts. The SMP project reported that the percentage of institutional deliveries in the Southern Region increased from 34% in

Figure 2

Maternal mortality by wealth quintile - Malawi ; Sisters 15-49 years of age DHS2000 who died since 1991

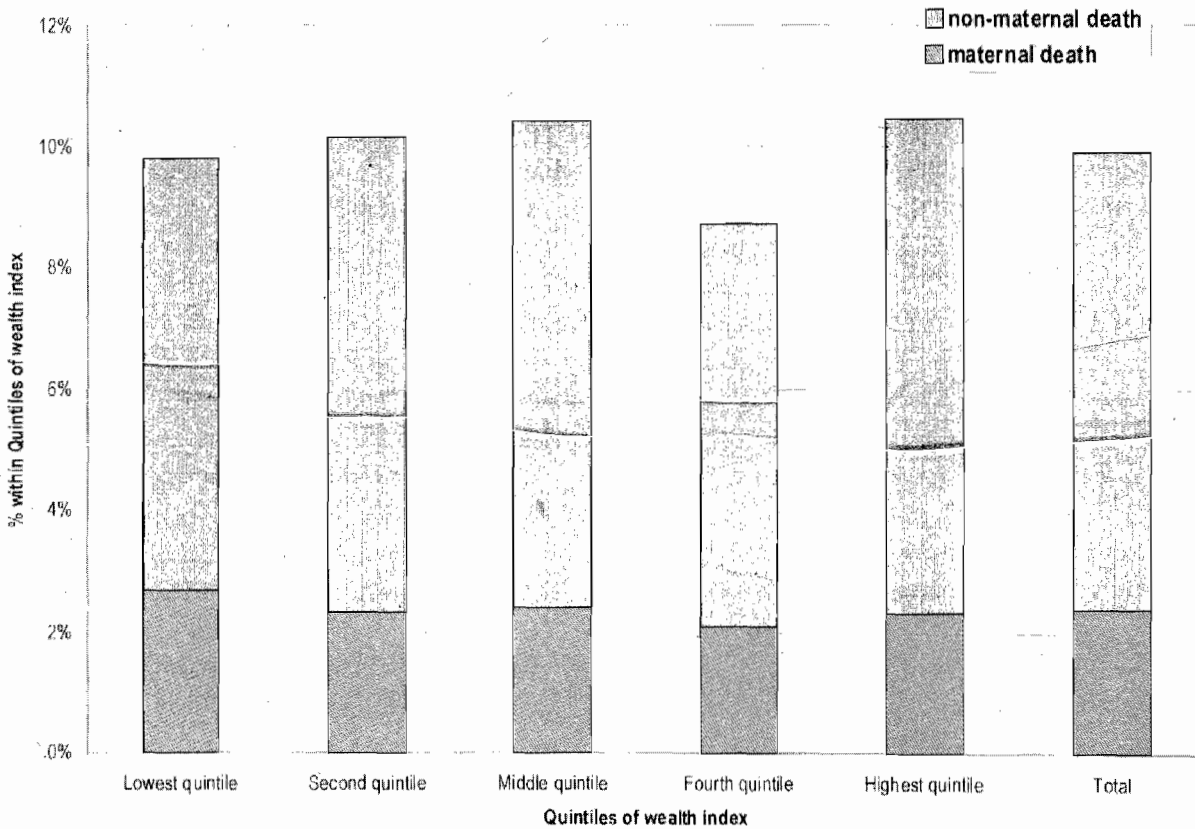
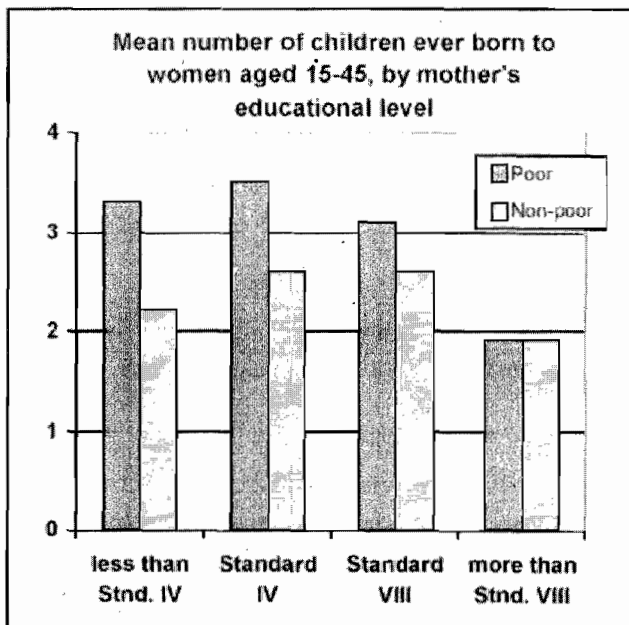


Figure 3



1998 to 57.4% in 2001.

Staff shortages severely affect the quality of care in Malawi. The vacancy rate for registered nurses was 47% in 1998 and has likely grown bigger. Ostergaard described that the two main forms of losses are that midwives die or go abroad. The latter is also a loss in quality as it

is the more experienced midwives who emigrate. Inadequate remuneration was the main 'push factor' and the midwives who did stay used multiple coping strategies to supplement their income, e.g. accessing training allowances and emergency loans, running small businesses, sell food or pharmacy drugs to patients and doing shifts in the private sector. These often had negative impact on the quality of care due to the opportunity costs. Poor working conditions, lack of career structure and lack of job satisfaction were also found to contribute to poor retention. The main 'pull factors' that attract midwives to stay with the MOH were the retirement package, access to postgraduate training, flexible leave policy and job security.

The effects of a course on life saving skills by SMP were evaluated by MacLean for SMP in 2000. The course resulted in increased knowledge, but understanding of critical concepts and clinical skills remained substandard. For example, although two thirds of respondents accurately prioritised the first action in the management of PPH (rub up a uterine contraction), only 9% correctly prioritised all subsequent actions. MacLean concluded that the SMP course laid a good foundation for improving quality, but that to be effective, this course should be followed-up by teaching on clinical practice and analytical thinking that leads into action at the prac-

tical level.

Adequacy of referral system

The UN indicator target for women with obstetric complications who receive appropriate treatment is 100%. From the 2003 HMIS data it appeared that only 40% of the 83,000 women who were expected to experience an obstetric complication actually delivered in an emergency obstetric facility, but again underreporting most likely existed. From this and the previous paragraph it can be concluded that although the percentage of women that delivers in an EmOC facility is higher than the UN target of 15%, this does not meet the need of all of those with complications. Thus the referral system is not adequate.

Availability, accessibility and quality of antenatal care services

According to the 2000 DHS data, antenatal care attendance is nearly universal in Malawi, with 95.4% of women attending at least once during pregnancy. The majority attended 2-3 times (34.6%) or 4 or more times (the recommended frequency, 56.0 %). However, only 6.5% came in the first trimester of their pregnancy, as recommended. The median pregnancy duration at the first visit was 5.9 months. Standard ANC in Malawi consists of:

- IEC for danger signs
- blood pressure measurement
- urine sampling to detect protein and diabetes
- blood sampling for syphilis
- injection with tetanus toxoid
- provision of iron and antimalarial tablets

Good quality care would mean that all these services are provided to all women. The self-reported coverage of these services according to women in the MDHS data showed that in over 80% of women tetanus toxoid was given and blood pressure measured, approximately 70% of women received IEC, iron tablets and antimalarials, but blood and urine samples were only taken in 43% and 23% respectively. The HMIS 2002-2003 annual report showed a different picture, with ANC coverage of 100%. This figure conceals the variation between districts which ranged from 45% in Chiradzulu to 165% in Mwanza. However, in some cases, not all antenatal cases were captured in the report and in other cases repeat visits were counted as new visits.

Availability, accessibility and quality of emergency ob-

stetric care services

Whereas at the end of the SMP the availability of basic EmOC and comprehensive EmOC units in the Southern region in Malawi exceeded the UN target of 4 and 1 facility respectively per 500,000 population on paper, basic EmOC units with the six signal functions were rare and their quality was not always up to standard. In the SMP study in 2001, substandard intramural care was responsible for 49% of deaths²⁶, an increase of 10% from the 32% reported in 1989 in the study by Driessen¹⁹. Lack of clinical history taking, diagnostic tests, errors in clinical judgment, deficient nursing care and lack of blood transfusion were the main problems. The case fatality rate for obstetric complications was 2.5%⁵², i.e. higher than the UN indicator of 1% (see 2.1.2). Interestingly though, it was 5.3% in the Northern and Central regions, but only 1.4% in the Southern region (where the Safe Motherhood Project took place), possibly indicating that the in-hospital quality of care has improved. Only 24% of women came for a postnatal check up⁵².

A 2005 random sample survey of EmOC facilities at 27 hospitals and 94 healthcenters by the MOH finds :-

- Malawi has almost double the recommended number of Comprehensive EmOC facilities (1.8 facilities per 500,000 population) and only 2% of the recommended number of basic EmOC facilities (0.1 facilities per 500,000 population).
- Of the 94 health centres assessed 92 did not qualify as basic EmOC facilities as they were not providing all six basic EmOC signal functions (see Figure 5 below for the proportion of health centres offering these functions)
- The met need for EmOC was 18.5 % which is below the UN recommended level of 100%.
- Of expected births in Malawi 2.8% are by caesarean section which is below the recommended minimum of 5% indicating that many women are not receiving the care that they need.
- Major barriers mentioned include:
 - Lack of decision making power of the women with complications,
 - Inadequate transport and communication linkages between community and health facilities, and between health facilities,
 - High cost related to service delivery
 - Problems related with the service delivery (e.g staff attitude, inadequate equipment, drugs and supplies)
 - Quality of EMOC services was generally poor as evidenced by the high maternal mortality within the facilities and high case fatality rate of (3.4%) which is much higher than the UN

Summary - Determinants

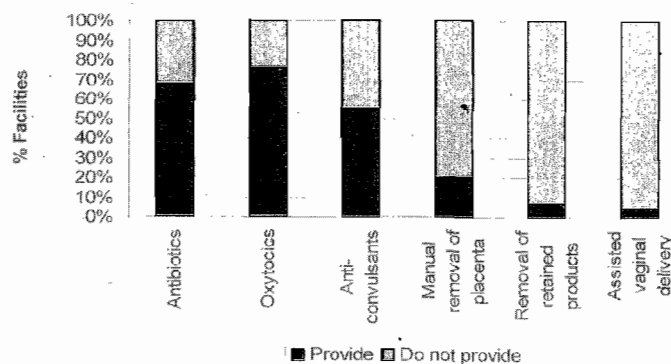
- Decreased number of pregnancies will decrease number of maternal deaths
 - Met need for family planning increased to 51% in last decade, 26% of women use modern family planning method.
 - Ideal family size (5.2) is still one child less than actual family size (6.3), unmet need for family planning is highest among rural and less educated women.
- Complications cannot be predicted, but screening for some conditions is possible
 - Access to antenatal care is good, but quality of care substandard, especially screening for diabetes and syphilis is often not performed
- Patient delay is the primary avoidable factor in 15-20% of deaths.
 - Time and costs constraints to get to health facility are obstacle for 2/3 of women.
 - Even where women take decision about place of delivery, in practice they depend on husband providing material and financial support.
 - Women think quality of technical care in health facilities is better than at TBAs, but staff attitude and service are bad.
 - Knowledge of danger signs increases likelihood of institutional delivery, but is low.
 - Districts with higher female literacy levels have higher institutional delivery rates.
 - Half of all women and only 40% of those with complications deliver in health facility.
- Once at the health facility, timely care of good quality determines outcome.
 - Availability of CemOC facilities is sufficient, but quality is substandard. Availability of BEmOC facilities is grossly insufficient.
 - Staff shortage is huge. Main push factor is low salary, main pull factors are retirement package, post-graduate training, flexible leave policy and job security.
 - Infection prevention practice was inadequate before quality improvement program started.
 - Life skills theory was improved by training, but clinical skills needed improvement.
 - Lack of blood is important contributing factor to 18-32% of deaths.
 - Case fatality rate in complicated institutional deliveries in the Northern and Central regions was 5.3% and in the Southern region (where SMP was carried out) 1.4%.

recommended level of less than 1%

- o Low staffing levels in all facilities

Figure 4 – Health Centres in Malawi in 2005 providing Basic EmOC signal functions (Source – MOH EmOC Survey 2005)

Impact of maternal mortality



Mortality & life expectancy

The mortality rate from maternal causes rose from 1.4 in the DHS 1992 survey to 2.4/1000 women between 15-49 years in the DHS 2000 survey². Given that the rise in non-maternal mortality is mainly

AIDS driven, one would expect a disproportionate rise in non-maternal mortality and thus a decrease of the proportion of female deaths that is maternity-related. However, the proportion of all maternity-related female deaths has remained constant at 20-21% between the late 1980s and the late 1990s. This means that measured maternal mortality has risen at roughly the same pace as non-maternal mortality. Several explanations for this phenomenon exist:

- underestimation of the maternal death component of all female deaths in the 1992 MDHS
- overestimation of the maternal death component in the 2000 MDHS, e.g. over-reporting of an AIDS-related death as a maternal death because of stigma
- a real rise in HIV-related indirect obstetric deaths
- underreporting of AIDS deaths in the 2000 MDHS
- a real rise in maternal deaths due to deterioration of health services associated with the AIDS epidemic.

Because the AIDS epidemic affected urban populations earlier and more severely than rural populations, one would expect a higher increase in maternal mortality in urban populations if AIDS was to have an impact on

maternal mortality. Bicego and colleagues showed that this was indeed the case for Malawi²⁸.

Infant and child morbidity and mortality in households affected by the disease

A maternal death has a detrimental effect on the wellbeing of the family, but especially on young infants. McDermott described that among infants of mothers who died a maternal death in Mangochi, the mortality was 3.7 times higher than among infants whose mother survived. Only 31% of children born to deceased mothers survived through infancy¹³.

Economic & social

Women are the backbone of the agricultural part of Malawi's economy. Their average work day lasts 15 hours as compared to 6 hours for men. They carry out 70% of all the farm work in the small-holder agricultural sub-sector. From a societal perspective, women are the main carers, not just for their own family, but also within the community. Over one quarter of all households is female-headed.² It can therefore be expected that a woman dying a maternal death has a large impact on the economic and social status of her family, but no data have been found.

Health services

Assuming that all women who deliver in hospital are admitted, deliveries constitute nearly half of the total of admissions.⁵² Any change to the rate of institutional deliveries or the structures and procedures of maternity services thus impacts significantly on the health system.

Effective interventions

Interventions should focus on one of the three main determinants mentioned :

1. the likelihood of a pregnancy occurring
2. the likelihood of a complication arising
3. the successful management of a complication

Ad A. This concerns family planning methods because

they reduce overall fertility and increase child spacing.

Ad B. These concern 1) family planning methods because they reduce the risk of unwanted pregnancy and therefore induced abortion and 2) interventions to increase women's overall well-being and health through prevention of and screening for existing problems that contribute to poor maternal health, including anaemia and deficiencies of essential nutrients.

Ad C. Even when the interventions mentioned under B are adequately implemented, many women will experience pregnancy complications that could not have been predicted or prevented.

Therefore, important safe motherhood interventions focus on:

- educating women and their families about the fact that all women face the risk of pregnancy complications, and the actions they should take if and when there is a problem;
- providing adequate care as close as possible to where women live, including skilled attendance at delivery, prompt recognition and referral of complications, and adequate treatment for women with complications;
- ensuring functioning systems of communication and transport that link community-based health workers, health centres, and hospitals to ensure that women receive needed care quickly.

Below, all interventions are described that have proven efficacy in preventing either maternal deaths or the complications that often precede maternal deaths. The highest quality evidence comes from (systematic reviews of) randomised trials such as done by the Cochrane Collaboration and included in the WHO Reproductive Health Library (RHL). Because nearly no behavioural or socio-cultural/ socio-economic interventions have been subject of such thorough studies, we included evidence from observational studies as well.

Biological interventions

Family planning

Aspects of two family planning methods are included in the RHL, i.e. emergency contraception (EC) and the surgical approach to tubal ligation.

Summary - Impact

- 2.4 out of 1000 women between 15 and 49 die a maternal death
- Maternal mortality has risen at the same rate as (mainly AIDS driven) non-maternal mortality
- Mortality in infants of deceased mothers is 3.7 times the mortality in infants of living mothers
- Deliveries form half of all hospital admissions

Emergency contraception

Emergency contraception is the use of a drug or device as an emergency measure to prevent pregnancy after unprotected intercourse. In many developing countries the lack of access to emergency contraception may subject women to unsafe abortions. Currently, there are several different interventions available for emergency contraception, such as estrogen+progestogen, progestogen alone (levonorgestrel), mifepristone, danazol etc. A recent Cochrane review concluded that levonorgestrel and mifepristone offered the highest efficacy with an acceptable side-effect profile. In Malawi, a nationwide EC program is being implemented through JH-PIEGO. First choice for Malawi is the Postinor 2 regimen (levonorgestrel) which requires the woman to take one pill within 72 hours of unprotected intercourse and another one 12 hours later. EC services are now available in 11 health facilities in the Northern region, 13 in the Central region and 23 in the Southern region. The development of IEC messages and materials is in progress.

Surgical approach to tubal ligation

Worldwide, the most commonly used method of fertility regulation is tubal sterilisation. In developing countries, where the resources are limited for the purchase and maintenance of the more sophisticated laparoscopic equipment, minilaparotomy is a more common approach than laparoscopy. A Cochrane review showed that major morbidity seems to be a rare outcome for both laparoscopy and minilaparotomy. Personal preference of the woman and/or of the surgeon and of course practical considerations (cost, maintenance and sterilisation of the instruments) can guide the choice of technique. In Malawi, minilaparotomy is the method of choice. Tubal ligation at Caesarean Section is also common.

Iron and/or folate supplementation

According to three Cochrane reviews, supplementation of iron or folate or both during pregnancy prevents low haemoglobin in late pregnancy or at delivery. , , However, no conclusions could be drawn in terms of any effects, beneficial or harmful, on clinical outcomes for mother and baby. The reviewer concluded that routine iron and folate supplementation could be warranted in populations where deficiency for these micronutrients is common (as is the case in Malawi: refer to Nutrition and Anaemia in pregnancy chapter). The reduction in the proportion of women with low haemoglobin levels at term should in theory reduce the need for blood transfusion, which is relevant in countries with

high HIV prevalence like Malawi. The reviewer further commented that data from countries where anaemia is a serious clinical problem and iron and folate deficiency is common are scarce, and called for trials in these populations that also are large enough to establish the effects of iron and folate supplementation on clinical outcomes in mother and child.

In Malawi iron, but not folate supplementation is part of routine antenatal care. However data from the 2000 DHS show that only 70% of pregnant women received iron tablets. This figure ranged from 63% in Machinga to 86% in Karonga. Among women going for antenatal care, older mothers, mothers with low education and multiparae were less likely to have received iron tablets.² The 2002-2003 HMIS data suggest 84% of pregnant women received iron tablets⁵².

Presumptive treatment of malaria

The use of antimalarial drugs for the prevention of malaria during pregnancy reduces severe antenatal anaemia in the mother and is associated with higher birth weight of the baby and probably fewer perinatal deaths. This effect appears to be limited to women of low parity. The policy in Malawi is to give SP twice during pregnancy. According to the MDHS 2000 72% of women received antimalarials and according to the 2002-2003 HMIS data 90%.^{2,52} Refer to the anaemia chapter for more details.

Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems.

Calcium supplementation was shown to be beneficial to women at high risk of gestational hypertension and in communities with low dietary calcium intake, in a Cochrane review including eleven clinical trials. In women at high risk (i.e. teenagers, women with previous pre-eclampsia, women with increased sensitivity to angiotensin II, women with pre-existing hypertension) the reduction in risk of hypertension with or without proteinuria was 53%, in women with low baseline dietary calcium intake it was 62%. The risk of pre-eclampsia was reduced with 78% for high-risk women and with 71% for those with low baseline dietary calcium intake. No side effects were noticed in any of the trials. Data were inadequate to establish the effect of calcium supplementation on maternal deaths. Optimum dosage also requires further investigation. Baseline calcium intake in Malawi is unknown but is thought to be reasonable in view of the quantity of fish consumed. No programmes have been identified in Malawi that offer calcium supplementation.

External cephalic version (ECV) for breech presentation at term

The six studies included in the Cochrane review on external cephalic version at term showed that this intervention reduced the risk of a non-cephalic birth by 58% and the risk of caesarean section by 48%. The direct effect on maternal mortality was not assessed. The studies were too small to assess any risks associated with the procedure. Another Cochrane review showed that giving tocolytic drugs before ECV (to relax the uterus) results in an increased number of successful external cephalic versions. Attempts have been made to introduce ECV in Malawi, but when initial results were negative this approach was abandoned.

Active management in the third stage of labour

Expectant management of the third stage of labour involves allowing the placenta to deliver spontaneously or aiding by gravity or nipple stimulation. Active management involves administration of a prophylactic oxytocic before delivery of the placenta, and usually early cord clamping and cutting, and controlled traction of the umbilical cord. A Cochrane review concluded that active management is superior to expectant management in terms of blood loss, post partum haemorrhage and other serious complications of the third stage of labour, but was associated with increased risk of nausea and vomiting and hypertension, where ergometrine was used. On average, maternal blood loss was 79 millilitres less, third stage of labour lasted 9.8 minutes less and the risk of PPH was reduced by 62%. Maternal death was not included in the outcomes studied. Active management of third stage of labour requires economic and human resources for drugs, needles and syringes, training of health personnel and availability of refrigerators. Active management of third stage of labour is in the midwifery curriculum and is considered standard practice, but data about its use in practice were not found

Antibiotic prophylaxis for caesarean section

Caesarean delivery is the most important risk factor for postpartum maternal infection. Prophylactic antibiotics were shown to reduce the risk of endometritis by two thirds to three quarters in a systematic review of 66 trials. They also reduced the risk of wound infections by 60% and of other serious infectious morbidity by 56%. Another review, which analysed the best antibiotic regimen, concluded that ampicillin and first generation cephalosporins are as good as a more broad-spectrum agent. Multi-dose regimens showed no additional benefit. There appeared to be no difference in efficacy based on whether the antibiotic was administered sys-

temically or by a lavage route. There was insufficient evidence regarding the optimal timing of administration.

The current obstetric protocols in Malawi are to give chloramphenicol 1g IV, or ampicillin 2g IV or cefotaxime 1g IV, but no data exist on how well these protocols are followed in practice.

Umbilical vein injection for management of retained placenta

If a retained placenta is left untreated, there is a high risk of maternal death. However, manual removal of the placenta is an invasive procedure with its own serious complications of haemorrhage, infection or genital tract trauma. Any management simple and safe enough to be performed at the place of delivery, which reduces the need for manual removal of placenta, could be of major benefit to women world-wide. In a Cochrane review of 12 trials, umbilical vein injection of saline solution plus oxytocin compared with expectant management reduced manual removal by 14%, although this was not statistically significant. Saline solution with oxytocin compared with saline solution alone showed a 21% statistically significant reduction. Provided that health workers are trained in the technique it would be feasible to implement this intervention. Umbilical vein injection for retained placenta is currently not standard practice in Malawi.

Vacuum aspiration versus sharp curettage for incomplete abortion

Surgical evacuation of the uterus for incomplete abortion usually involves vacuum aspiration or sharp curettage. Vacuum aspiration utilises a vacuum source and can be performed on an outpatient basis with local anaesthesia or analgesics. It can be used without electricity using a hand-held vacuum syringe (Manual Vacuum Aspiration, MVA). In sharp metal curettage (also called dilatation and curettage, D&C) a metal curette is used to evacuate the contents of the uterus. It is often performed in an operating room under general anaesthesia. In two trials included in a Cochrane review, vacuum aspiration was associated with on average 17 millilitres less blood loss, 26% less pain and a 1.2 minutes shorter procedure. The main advantage of MVA however is that provided health care workers are adequately trained, it can be performed at health centre level, and thus increases the access of women to quality post abortion services. In Malawi, the RHU and JHPIEGO instigated a comprehensive post abortion care (PAC) programme, that not only includes emergency treatment of incomplete abortion and its complications (through MVA if in first trimester and through sharp curettage if in sec-

ond or third trimester), but also provides family planning counselling and service, counselling for emotional and reproductive health concerns, medical conditions, social issues and legal and sexual rights issues. Comprehensive PAC services are now available in eight sites in the Northern region and 13 each in the Central and Southern regions. These are planned to be expanded with 14 services.

Choice of anticonvulsant for eclampsia

A number of different anticonvulsants are used to control eclamptic fits and prevent future seizures. In three Cochrane Reviews, Duley et al reviewed the evidence on treatment with magnesium sulphate, diazepam (valium), phenytoin and lytic cocktail (a mixture of chlorpromazine, promethazine and pethidine). , , Magnesium sulphate was superior to the three other drugs in preventing recurrent convulsions (by 56%, 69% and 91% respectively) and maternal mortality (by 41%, 50% and 75% respectively), be it that the latter was not statistically significant. In Malawi magnesium sulphate is the drug of choice, but diazepam is still used at health centre level to control fits prior to referral.

Antibiotics for preterm premature rupture of membranes

Preterm prelabour rupture of membranes not only results in neonatal morbidity and mortality, but also increases maternal infectious morbidity. A Cochrane review concluded that the use of antibiotics in this situation statistically significantly reduced the risk of chorioamnionitis by 43%. Because of an increased risk of necrotising enterocolitis associated with beta lactams (co-amoxiclav), macrolides (erythromycin) are recommended as the drug of choice. The standard protocol in Malawi is to give erythromycin 250 mg by mouth 3 x per day for 7 days plus metronidazole 400 mg by mouth 3x per day for 7 days, but again information about how well these protocols are followed is lacking.

Behavioural interventions

IEC for family planning

The provision of education on contraceptive use to postpartum mothers has come to be considered a standard component of postnatal care in many countries, but data from the SMP show that only one third of women in Blantyre and Nsanje districts received information on family planning at discharge. A Cochrane review showed that such education may be effective in increasing the short-term use of contraception. There are only limited data examining a more important longer-term effect on the prevention of unplanned pregnancies. Re-

search on the effectiveness of various aspects of family planning programs in developing countries is needed, examining the content, timing, range and organisation of postpartum education on contraceptive use.

IEC to reduce delays in decision making and reaching a health facility

Only very limited evidence exists from developing countries about the efficacy of IEC for reducing maternal mortality (or any other health problem for that matter). SMP based their IEC strategy on a review of 81 articles which concluded that:

1. The IEC strategy should focus on the topics danger signs in pregnancy and the post partum period, use of health services especially with obstetric complications, immediate referral to health facilities and antenatal care
2. Pregnant women, opinion leaders, health professionals and policymakers should all be targeted
3. Radio would be the most cost effective communication channel to reach the public, to be reinforced with messages through mobile video units, pictographs at health centres and interactive health talks.

Three years into the SMP, after the IEC campaign had been implemented, over 80% of women and around 60% of men in Blantyre and Nsanje districts reported to have received information about danger signs, mostly at health facilities or through the radio. However, when asked, only half of men and women named bleeding as a danger sign and other complications were reported even less frequently.

Socio-cultural and socio-economic interventions

Improvement of socio-economic status of women

As expected, no trials or systematic reviews have been done on this subject. However, history teaches us some lessons. Improving socio-economic status in itself does not lead to a reduction in maternal mortality, as evidence from the early 20th century in industrialised countries has shown. Until the 1930s, maternal mortality ratios in the USA and UK were as high as they are now in Africa and they had not declined with increased education levels or with economic development. They only dropped when obstetric care improved, especially when antibiotics and blood transfusion became widely available. In Holland and Scandinavia MMRs dropped even earlier due to the establishment of a professional midwifery cadre that was taught and supervised to implement strict asepsis. This is further illustrated by the example of a religious sect in the USA called the Faith Assembly of God, whose members are well fed, well educated and relatively well off, but who refuse modern

medical services. Their MMR stood at 872 per 100,000 live births in 1983, more than 100 times as high as the average in the USA.⁷⁹ In Malawi, improved educational status of women is associated with better access to obstetric care and, if the quality of obstetric care would be sufficient, improving women's educational status might reduce maternal deaths by ensuring that they get care in time.

Provision of safe, legal abortion services

Millennia of experience worldwide have shown that despite religious, cultural or government rules and regulations prohibiting induced abortions, women have always sought ways to terminate their unwanted pregnancies. Many risk their lives doing so out of powerful reasons such as concern for their own health, for the wellbeing of the children they already have or their ability to continue schooling or work. Whereas access to modern contraceptives does reduce the demand for induced abortion, it does not eliminate it. Even if all women who do not want to become pregnant were to use a contraceptive, there would still be need for abortion services, because no contraceptive is 100% effective. The efficacy of abortion services has not been formally evaluated, but again, historical evidence suggests that providing safe, legal abortion services reduces maternal mortality, both by reducing the number of illegal abortions and by improving the quality of legal abortion services. E.g. in the USA, the number of deaths from illegal and legal abortions two years after introduction of legal abortion services dropped by 84% and 75% respectively.⁷⁹ In Malawi, abortion is only permitted on medical grounds, not on social grounds or on demand.

Improving transport and referral systems

In an SMP study, provision of bicycle ambulances or establishment of community transport schemes did not reduce transport time from home to the health centre. Most women still preferred to walk, because the cultural belief that publicising the onset of labour summons evil spirits deterred many pregnant women from using the transport schemes.

SMP also evaluated the effect of an upgraded radio communications system on the referral of obstetric emergencies in a before-after study. The percentage of women who were transported from health centre to hospital in an ambulance rose from 54% to 82% and the median transport time decreased from 3 to 2 hours. Although this is an improvement, this is still too long, especially for someone with PPH.

Improve availability of maternity waiting homes

The purpose of maternity waiting homes is to provide

a setting where high-risk women can be accommodated during the final weeks of their pregnancy near a hospital with essential obstetric facilities. Some have expanded their purpose to include improved maternal and neonatal health. In these homes additional emphasis is put on education and counselling regarding pregnancy, delivery and care of the newborn infant and family. Whereas common sense and anecdotal evidence suggests these are effective in reducing maternal deaths, a formal evaluation has not been found. For Ekwendeni hospital in Malawi, Knowles reported that the maternal death rate was reduced to zero, partly because women have been persuaded to use an antenatal shelter situated about 50 metres from the delivery ward.¹⁶ SMP reported that maternity waiting huts were available in 4 of 9 CHAM hospitals and none of the government hospitals in the Southern region. The huts were acceptable for women, but an evaluation showed that staff attitude, supervision by midwives and provision of cooking and washing facilities needed to be improved if they were to be fully utilised.

Training of traditional birth attendants

Training of TBAs is intuitively appealing because many women deliver at home, TBAs are already in the rural areas where women have least access to health facilities, TBAs are acceptable to the women, they are reimbursed by the women and their families and training them is relatively cheap. However, up till now, no demonstrable effects of training TBAs on maternal mortality exists. Two often proposed roles of TBAs in the reduction of maternal mortality are to educate women about nutrition and hygiene and to screen them and refer high risk women for medical attention. However, these interventions have inherent problems that are not solved by moving the process further into the community. The most valuable training of TBAs would be in the field of recognising complications and referring the women to EmOC facilities and to train them and supply them with means to treat some of the complications. The Malawi government has decided not to train any new TBAs until a revised policy has been agreed.

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