



Maternal mortality in developing countries – the case of Malawi

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Abstract

More than 500 000 women die every year of maternal causes, 99% of these deaths occur in developing countries. Several initiatives have been made to combat this catastrophe, and 20 years after the first initiative, global maternal mortality is largely unchanged. In September 2000 the world leaders agreed to set measurable goals and targets for reducing by three quarters the maternal mortality ratio by the year 2015, and achieve universal access to reproductive health. They are called the Millennium Development Goals.

The methods we've used are literature review, and participant observation from our study trip to Malawi, one of the ten poorest countries in the world.

It is very dangerous to be pregnant and deliver in Africa; the lifetime risk for maternal mortality in Malawi is 1 in 7 compared to 1 in 7 300 in Norway. The pregnancies are too early, too late, too many and too close. Women suffer from direct (haemorrhage, infections, pre-eclampsia, obstructed labour) and indirect (HIV, malaria, malnutrition, non-communicable diseases) complications. When complications occur, they are not treated satisfactorily.

There are also political, economical, social and cultural factors that contributes to maternal morbidity and mortality in Africa. To make the achievement of the fifth MDG a reality, MMR will have to decrease much faster. The annual decline has so far been about 0.1%. Realizing the goal requires increased attention to improved healthcare for women.

List of abbreviations and acronyms

AIDS = Acquired Immune Deficiency Syndrome

ANC = Antenatal Care

CO = Clinical Officer

CS = Caesarean Section

DHS = Demographic and Health Survey

EHP = Essential Health Package

EPA = Economic Partnership Agreement

EU = European Union

FP = Family Planning

GDP = Gross Domestic Product

HDR = Human Development Report

HIV = Human Immunodeficiency Virus

ICPD = International Conference on Population and Development

IMF = International Monetary Fund

MM = Maternal mortality

MMR = Maternal Mortality Ratio

MMRate = Maternal Mortality Rate

MDG = The Eight Millennium Development Goals

MoH = Ministry of Health

PIH = Pregnancy Induced Hypertension

PPH = Postpartum Haemorrhage

PMTCT = Prevention of Mother-to-Child-Transmission

PPP-dollars = Purchasing power parity-dollar, which equalizes the purchasing power of different currencies in their home countries

RH = Reproductive Health

SHW = Substitute Health Worker

SMI = Safe Motherhood Initiative

SSA = Sub-Saharan Africa

TBA = Traditional Birth Attendants

TFR = Total Fertility Rate

UK = the United Kingdom

UN = United Nations

UNDP = the UN Development Program

UNFPA = United Nations Population Fund

UNICEF = United Nations International Children's Educational Fund

WHO = World Health Organization

1. Introduction

Our interest for women's reproductive health and the inequalities of the world brought us to Africa. In relation to the compulsory thesis in our medical education, we went to Malawi, one of the ten poorest countries in the world (8).

Worldwide, more than 500 000 women die every year from maternal causes. 99% of the maternal deaths occur in developing countries and less than 1% in more developed countries. The large regional differences in maternal deaths demonstrate that most of these deaths are preventable (68). Malawi's maternal mortality ratio (MMR, explained under Concepts and Definitions) is the highest in Africa; 1 800 maternal deaths per 100 000 live births compared to 9 in Norway. The lifetime risk for maternal mortality in Malawi is 1 in 7 compared to 1 in 7 300 in Norway (Table 1).

The UN millennium developmental goal (MDG) number 5 - Improve maternal health, form the foundation for our thesis.

1.2 Objectives and bound of the thesis

The aim of this thesis is a literature review of the heavy burden of maternal morbidity and mortality in developing countries. We also want to describe the dramatic situation partly by our experiences from Malawi in January 2007 and discuss what can be done to reduce the maternal mortality and to achieve the MDG-5.

In our thesis we use the term maternal deaths as the death of a mother caused by complications of pregnancy, childbirth and until 42 days after delivery. We exclude complications due to any kind of abortions, even if these also contribute to the burden of maternal mortality.

Generally it is hard to get hold of reliable demographic statistics in developing countries, and a comparison of data from different countries can easily be misleading. It is also difficult to measure maternal mortality, e.g. in populations where routine recordings of deaths are not complete within civil registration systems, although widely-used standardized definitions exist (68).

1.3 Concepts and Definitions

We use the following terms

Women of reproduction age as all women between 15 and 49 years of age.

Maternal mortality = Maternal death as the death of a woman whilst pregnant, during delivery or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by the pregnancy, but not from accidental or incidental causes (68).

Maternal mortality can be measured in different ways, and is the product of essentially two factors; the risk for mortality associated with a single pregnancy and birth and the numbers of pregnancies and births that the women of reproductive age goes through.

Maternal mortality ratio (MMR) is the number of maternal deaths during a given time period per 100 000 live births during the same time-period, often a year's time.

Maternal mortality rate (MMRate) is the number of maternal deaths in a given time-period per 100 000 women of reproductive age during the same time-period, often a year's time; thus, it reflects not only the risk of maternal death per pregnancy or per birth (live birth or stillbirth), but also the level of fertility in the population.

In addition to the MMR and the MMRate, it is possible to calculate the adult lifetime risk of maternal mortality for women in the population (68).

Lifetime risk of maternal death is the probability of dying from a maternal cause during a woman's reproductive lifespan (68).

Fertility rate is the ratio of live births in an area to the population of that area; expressed per 1000 population per year.

Developing Country is a country that is poor and whose citizens are mostly agricultural workers but that wants to become more advanced socially and economically (72).

Human Developing Index (HDI) is the normalized measure on life expectancy, literacy, education, standard of living and GDP per capita (see below) for countries worldwide. It is a standard means for measuring well-being, especially child welfare. It is used to determine and indicate whether a country is developed, developing or underdeveloped and also to measure the impact of economic policies on quality of life (16).

Gross Domestic Product (GDP) is the total output of goods and services for final use produced by an economy, by both residents and non-residents, regardless of the allocation to domestic and foreign claims. It does not include deductions for depreciation of physical capital or depletion and degradation of natural resources.

Purchasing Power Parity (PPP) is a rate of exchange that accounts for price differences across countries allowing international comparisons of real output and incomes. At the PPP US\$ rate, PPP US\$1 has the same purchasing power in the domestic economy as \$1 has in the United States.

Essential Health Package (EHP) is a basic cost-effective package of promotive, preventive and curative health services, to get the most significant impact on the health status of the population.

Population below the Poverty Line is national estimates of the percentage of the population falling below the poverty line and is based on surveys of sub-groups, with the results weighted by the number of people in each group. Definitions of poverty vary considerably among nations. For example, rich nations generally employ more generous standards of poverty than poor nations (8).

Birth Rate is the average annual number of deaths during a year per 1 000 population.

Death Rate is the average annual number of deaths during a year per 1 000 population. The death rate, is only a rough indicator of the mortality situation in a country, it accurately indicates the current mortality impact on population growth. This indicator is significantly affected by age distribution, and most countries will eventually show a rise in the overall death rate, in spite of continued decline in mortality at all ages, as declining fertility results in an aging population (8).

Antepartum is the pregnancy before the delivery.

Peripartum is the last month of gestation or the first few months after delivery, with reference to the mother.

Intrapartum means during labour and delivery.

Postpartum is the period just after delivery.

1.4 Methods

The methods we've used are literature review and participant observation.

2. Background

2.1 The UN Millennium Developments Goals

In 1987, Safe Motherhood Initiative was founded at a conference in Nairobi, by a coalition of The World Health Organization (WHO), United Nations International Children's Educational Fund (UNICEF), the World Bank and United Nations Population Fund (UNFPA). Safe Motherhood Initiative aimed to reduce maternal morbidity and mortality by 50% by the year 2000 by improving antenatal, delivery and post partum care.

In Cairo 1994 at the International Conference on Population and Development (ICPD), this goal was reiterated and further reduction added to the target.

In 1995, the Fourth World Conference on Women in Beijing, gave substantial attention to maternal mortality, and confirmed the commitments made in Cairo 1994.

20 years after the first initiative, global maternal mortality is largely unchanged. The aims have not been realised and the world is still facing an unacceptable high number of maternal deaths. Maternal health continues to be a major focus of WHO effort.

In September 2000, world leaders agreed to a set of time-bound and measurable goals and targets for combating poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women. They are called the Millennium Development Goals (MDGs).

The eight MDGs, all by the target date of 2015, are agreed to by all the world's countries and leading development institutions. They are made to meet the needs of the worlds poorest. The 8 Millennium Development Goals are:

1. Eradicate extreme poverty
2. Ensure that all boys and girls complete a full course of primary schooling
3. Promote gender equality and empower
4. Reduce child mortality
5. Reduce by three quarters the maternal mortality ratio, and achieve universal access to reproductive health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development (62).

It is the MDG-5; to reduce the maternal mortality, on which we focus in this thesis.

2.2 Malawi

2.2.1 Country profile

The Republic of Malawi is a densely populated country, with 13,6 million citizens, located in south-eastern Africa. Malawi is bordered by Zambia to the north-west, Tanzania to the north and Mozambique, which surrounds it on the east, south and west. Malawi has a sub-tropical

climate, with a rainy season from November to May and a dry season from May to November.

Malawi is one of the 42 countries in the Sub-Saharan region. The Sub-Saharan countries are the poorest and the least developed countries in the world, with South Africa as an exception (70). In Malawi, like in the other Sub-Saharan countries, the population is growing, poverty is widespread and the spread of HIV/AIDS is a major problem. 53% of the population in Malawi live below the poverty line (8). The Malawians typically live with their family in huts that are grouped together in villages.

Table 1; Comparative demographic statistics Malawi – Norway.
Sources (5, 7, 8, 22, 54).

	Malawi	Norway
Population; total	13 603 181	4 627 926
Age distribution		
- 0-14 years old	46%	19%
- 15-64	51%	64%
- >64	3%	15%
Birth rate per 1 000	42	11
Death rate per 1 000	18	9
Life expectancy at birth in years		
- Total	43	79,7
- Male	43,4	77
- Female	42,6	82,5
Total fertility rate	6	1,78
Life time risk for maternal mortality	1/7	1/7 300
MMR	1 800	9
Adult prevalence of HIV/AIDS	14,2%	0,1%
GDP per person in PPP-dollars	580	36 600
% of GDP used in healthcare	9,8	9,6
Physicians per 100 000 population	20	3 390
Nurses per 100 000 population	Not available	15 400
Population below poverty line	53%	Not available

2.2.2 Socioeconomic overview

From 1891 to 1964 Malawi was under British control. In 1964 The British protectorate of Nyasaland became the independent nation of Malawi (70). Today the Republic of Malawi is a multi-party democracy.

Malawi is one of the least developed countries in the world. 85% of the population lives in rural areas. Agriculture is the main contributor to the economy, although only 21% of the country's total land area of 94 000 sq km is arable land, and the country is highly vulnerable to adverse weather conditions. Farming accounts for 1/3 of GDP, the rest comes from economic assistance from the International Monetary Fund (IMF), The World Bank and individual donor nations. Tobacco is the main export earner, accounting for more than 70% of

the export, other agriculture products are sugarcane, cotton, tea, corn, potatoes, cassava, groundnuts, Macadamia nuts; cattle and goats. Some of the challenges for the government are developing a marked economy, environmental problems and the rapidly growing problem of HIV/AIDS (69).

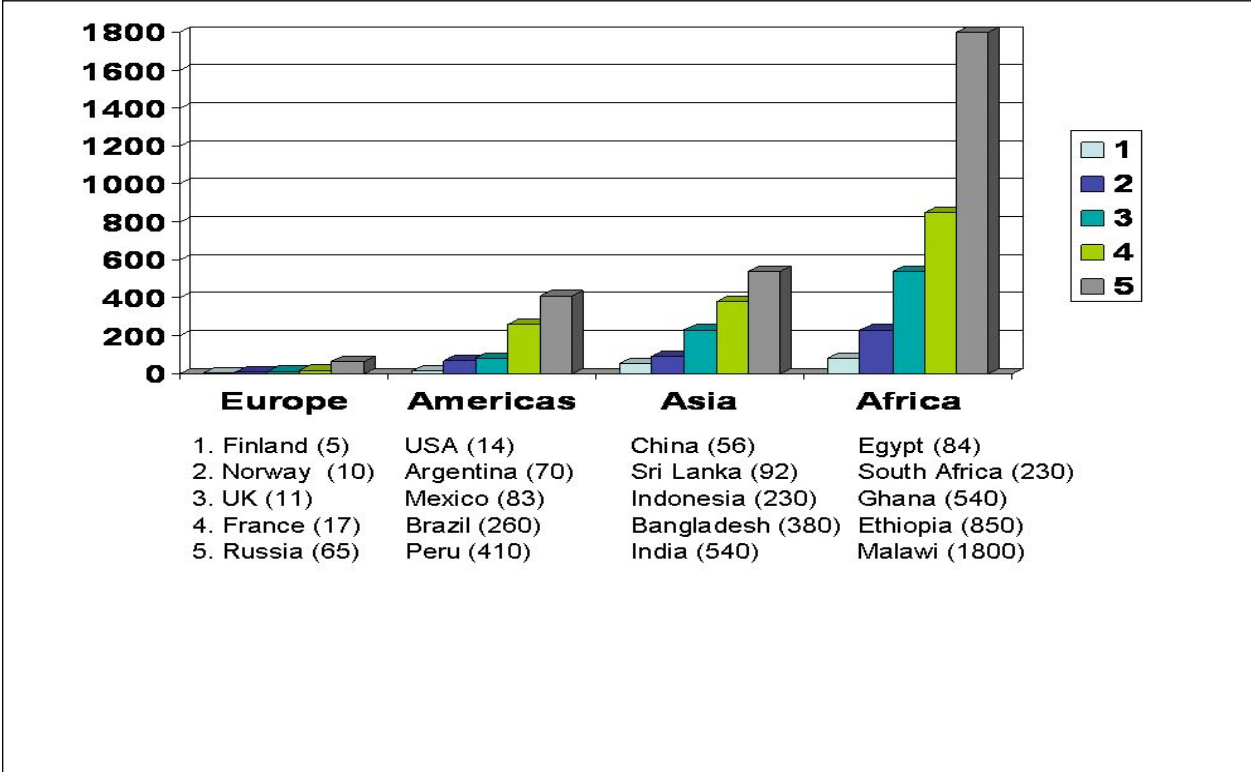
Two thirds of Malawi’s population are poor, living below US\$ 0.33 per day. The poverty is high because of low land productivity, limited and difficult access to land, and poor health status (69).

2.2.3 Health status and maternal mortality

Life expectancy at birth is 43 years in Malawi, compared to Norway where it is almost 80 years. The adult prevalence of HIV/AIDS is 14,2 %, and in Norway it is less than 0,1% (Table 1).

The estimates for maternal mortality in Malawi have increased dramatically during the last ten years. In the 1990s the maternal mortality ratio (MMR) was 620 per 100 000 live births, and in 2000 the MMR was estimated to 1120 per 100 000 live births (69). The lifetime risk of maternal death is 1 in 7, to be compared with the world average of 1 in 74, and especially to the lifetime risk in industrial countries at 1 in 4 085 (54)).

Figure 1; Maternal mortality ratio per 100 000 live births for selected countries. Sources (28, 67).



2.2.4 Health service

In Malawi 60% of the health care system is provided by the Ministry of Health (MoH), 37% by the Christian Health Association of Malawi (CHAM), 1% by the Ministry of Local Government and the remaining 2% by other providers like private practitioners, commercial companies, the army and the police. There are also an unknown number of Traditional Birth Attendants (TBA) and healers (69).

Health services are provided in three levels

- Primary: Rural hospitals, health centres, health posts, outreach clinics and community initiatives.
- Secondary: District hospitals and CHAM-hospitals, some of them with limited specialist functions.
- Tertiary: Similar to secondary level, but with a small range of specialist surgical and medical interventions (69).

Currently the public health services are free, and Malawi has a good geographic coverage of health facilities, 80% being within a 5-km radius. Still, most Malawians have difficulty accessing these facilities due to poor road networks and poor communication systems (69).

3. Theory: Maternal deaths in developing countries

3.1 Who?

High parity births, very young, and older women pose the highest risk of maternal mortality (37, 42). Women over 35 years are at the greatest risk of maternal death and are also less likely to deliver with skilled attendants, in developing countries (56). The risk of delivery complications increases with the mother's age, as does the risk of premature birth and infant death. Such complications include excessive bleeding during labour, prolonged labour lasting more than 20 hours, and dysfunctional labour that does not advance to the next stage. In addition, older pregnant women were more likely to have diabetes and hypertension during pregnancy (29).

A woman's education and wealth status have no association with the likelihood of having pregnancy complications, but poor women with low education level are less likely to seek medical assistance (37).

Berit Austveg (5) describes three risk groups for global maternal mortality, partly overlapping the risk groups mentioned above:

1. Young girls, 15-19 years old, have a 50% higher risk of dying in relation to pregnancy and delivery.
 - Mechanical disproportions; e.g. narrow pelvis increases the risk for delivery complications and fistula
 - Poverty or lack of money, little time to take care for themselves and efforts made to conceal the pregnancy are factors that can contribute to explain why young women get less professional help.
2. Refugee; their life situation is complicated and unpredictable and their physical and psychological health are threatened.
3. Circumcised women are more at risk of haemorrhage and caesarean section (CS).

3.2 Where?

99% of the maternal deaths occur in the developing parts of the world. These deaths were almost equally divided between Africa 48% and Asia 47%, with about 4% occurring in Latin America and the Caribbean, and less than 1% in the more developed regions of the world. By region, the maternal mortality ratio, MMR was highest in Africa, followed by Asia (68). The five countries with the highest MMR, above 750 per 100 000, are Malawi, Chad, Congo, Guinea and Rwanda. These countries are all economically poor, short of health personnel and have high fertility levels, unplanned pregnancies (except Chad and Guinea) and high level of teenage pregnancies. In comparison with developing countries with low levels of maternal mortality (South Africa, Namibia, Morocco, Bangladesh and China) these countries are more varied in terms of economic, social, and reproductive health indicators. They are economically better off (except for Bangladesh) and have better infrastructure. Their levels of fertility, teenage pregnancies and unplanned pregnancies are also lower than the five countries with the highest MMR (55, 67).

In developing countries a large proportion of maternal death takes place in hospital. There are mainly three categories:

- Women who arrive in dying condition, too late to benefit from emergency treatment.

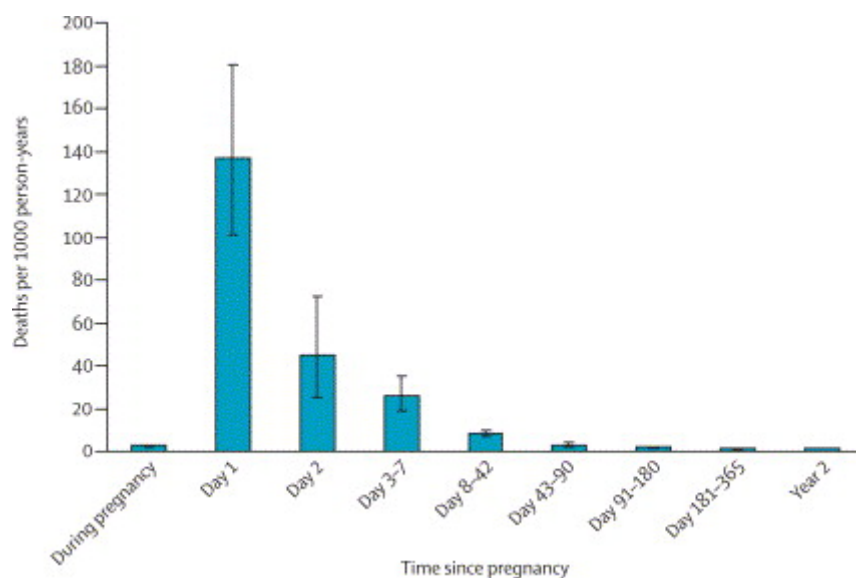
- Women who arrive with complications who could have been saved if they had received timely and effective interventions.
- Women admitted for normal delivery, and subsequently develop serious complications (51).

3.3 When?

Most of the maternal deaths occur between the third trimester and the first week after delivery. A study in Bangladesh showed that the first and second day after delivery maternal mortality can be extremely high (51).

Figure 2; Mortality during pregnancy and by time since end of pregnancy in Matlab, Bangladesh.

Source: (51).



3.4 Why?

Why is it so dangerous to be pregnant and deliver in Africa? This has to be explained from several points of views; political, economical, social, cultural as well as medical. Many of these factors are not specific for maternal health, nor health needs in general, but are a result of the political and economic constrains. The most important reasons why it is so dangerous to be pregnant and deliver in Africa are:

- High fertility rate pregnancies: too early, too late, too many and too close. Total fertility rate for Malawi is 6 births per woman
- Direct and indirect obstetric complications
- When complications occur, they are not treated satisfactorily (60, 66).

We have written about these risk factors for maternal morbidity, and divided them up in

- ❖ medical reasons and
- ❖ political, economic, social and cultural factors.

3.4.1 Medical reasons

Medical reasons for maternal morbidity and mortality can be either direct or indirect

3.4.1.1 Direct reasons

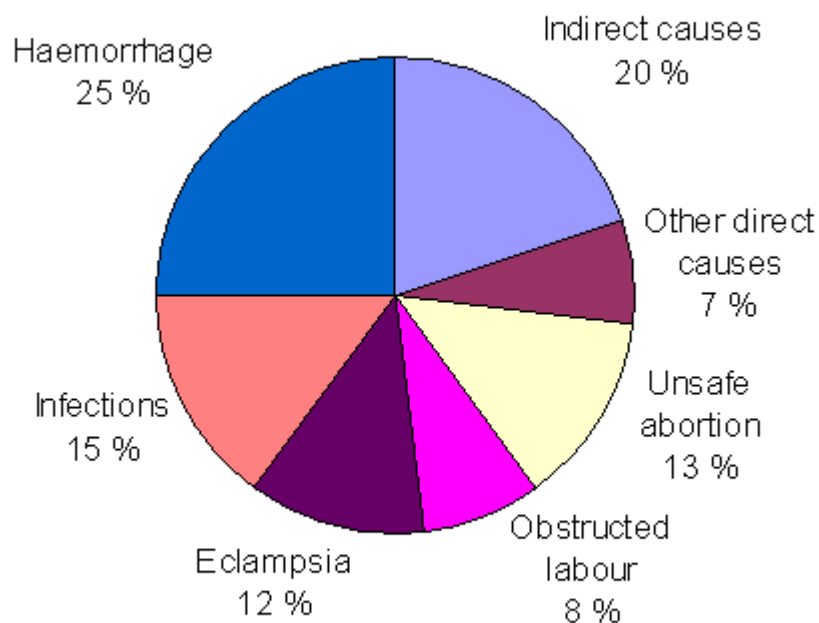
Maternal deaths are caused by complications of pregnancy and childbirth, or by any events, omissions, interventions or incorrect treatment that result from these complications, including complications from abortion.

The four major direct causes are

- Haemorrhage
- Infections and sepsis
- Hypertensive disorders of pregnancy; pre-eclampsia and eclampsia
- Complications during delivery

The levels of maternal mortality depend on whether these complications are dealt with adequately and in a timely manner (67).

Figure 3; Causes of maternal death. Source: (67).



3.4.1.1.1 Haemorrhage

Postpartum haemorrhage (PPH) is the most important single cause of maternal death. Antenatal haemorrhages are less common as a cause of maternal death; therefore we focus on the PPHs. PPH accounts for about 25% of the total of maternal death. PPH is defined as a blood loss of 500 ml or more from the genital tract. Primary PPH occurs within the first 24 hours after delivery, especially the first 4 hours, and is the result of problems during the third stage of labour. Secondary PPH occurs later than 24 hours after delivery. Causes of severe PPH are uterine atony, retained placenta, trauma to the genital tract like uterine, cervical or vaginal ruptures, and coagulation abnormalities. Risk factors for haemorrhages are placental abruption or placenta previa (ante-partum haemorrhages), prolonged labour, caesarean section and episiotomy (intra-partum haemorrhages), previous PPH, pre-eclampsia, multiple gestation and obesity (postpartum haemorrhages). Postnatal haemorrhages can be fatal especially when the woman is anaemic. Iron deficiency anaemia affects every second pregnant woman in developing countries. Anaemia is frequently exacerbated by HIV/AIDS, malaria, tuberculosis and worm diseases (9).

3.4.1.1.2 Infections and sepsis

Infection counts for 15% of the total maternal deaths, 75,000 deaths every year, most of them occur in developing countries. Predisposing factors include; CS, frequent vaginal examinations, sexually transmitted infections, prolonged rupture of the membranes and retained placenta (28, 67).

Puerperal sepsis is defined as “infection of the genital tract occurring at time between the onset of rupture of membranes or labour, and the 42nd day postpartum in which fever and one or more of the following are present:

- 1 Pelvic pain;
- 2 abnormal vaginal discharges;
- 3 abnormal odour of discharge and
- 4 delay in the rate of reduction of size of the uterus (65).

The classic infective organism in puerperal sepsis was the group A haemolytic streptococcus. Due to improvements in hygiene and antibiotics, group A streptococci now rarely cause puerperal infections. Other organisms such as group B streptococci, chlamydia, herpes simplex, genital mycoplasma, gonococci and bacterial vaginosis are more often implicated. Transmission of puerperal sepsis are categorised into nosocomial, exogenous and endogenous factors. Nosocomial infections are acquired in hospitals or other health facilities. Exogenous infections come from external contaminations when deliveries take place under unhygienic conditions. Endogenous infections are mixed flora colonizing the woman's own genital tract (26).

Despite the development of guidelines and protocols for infection control by the WHO, implementation difficulties remain. In domiciliary settings, lack of supplies and equipment, poor infrastructure (unreliable water or electricity supplies, lack of cloths, dirty and peeling ceilings, floors and walls of inappropriate materials, torn mattresses), low morale, poor accountability, lack of training and poor compliance among health workers contribute to the problem. Traditional beliefs can lead to deliveries taking place in unsanitary facilities like animal sheds. In hospital deliveries diagnoses and treatment of puerperal infections suffer from similar problems of implementation.

Identifying organisms and antibiotic sensitivity is often impossible leading to overuse of antibiotics and development of resistant organisms (26).

3.4.1.1.3 Hypertensive disorders of pregnancy; pre-eclampsia and eclampsia

Hypertensive disorders are complicating 12-22% of pregnancies. It is a major cause of maternal, foetal, and neonatal morbidity and mortality, and is responsible for many hospital admissions, labour inductions and operative interventions (10).

Pre-eclampsia is defined as gestational hypertension and significant proteinuria after 20 weeks of gestation, during labour or within 48 hours of delivery (28, 67).

An analysis of case records of poor women who had died due to eclamptic and non-eclamptic hypertensive disorders over a period of 20 years (April 1985-March 2005) by Chhabra & Kakani showed that 92 % of the women in the study had not received any antenatal care at all. 72% of the women with hypertensive disorders lived in rural areas. The majority of women who succumbed to hypertensive disorders were young, 32% of the total deaths were below the age of 20 years. The most common cause of mortality in cases of pre-eclampsia was HELLP syndrome, 83% (10).

3.4.1.1.4 Complications during delivery

Obstructed labour is an important cause of maternal death and short and long term disability. Obstructed labour comprises one of the five major causes of maternal mortality and morbidity in developing countries (38). Obstructed labours, which accounts for 8% of the maternal deaths, can be caused by cephalo-pelvic disproportion, mal presentation, deep transverse arrest, mechanical disproportion and foetal abnormalities, lock twins and pelvic tumours. Risk factors for cephalo-pelvic disproportion are highest in poor communities where it is associated with malnutrition in childhood which leads to women with short stature and underdeveloped pelvis. When these women become pregnant at a very young age and they live under better nutritional conditions while pregnant, their babies will be more appropriately nourished and of more normal birth weight. Childhood stunting combined with adequate nutrition during subsequent pregnancy, is a typical situation in developing counties that yield a normal sized baby that is too big for the small mother. This disproportion between the woman's pelvis and the baby's size is a common reason to obstructed labour and fistulas. Fistulas are a dreadful complication, and vesico-vaginal or recto-vaginal fistulas are the most serious complication from obstructed and prolonged labour. It has been estimated that between 1,5 and 2 million women in SSA are living with such fistulas (28, 38).

3.4.1.2 Indirect reasons

Diseases that are aggravated by, and can complicate pregnancy:

HIV/AIDS

Malaria

Under/Malnutrition

Non-communicable diseases

3.4.1.2.1 HIV/AIDS

The high HIV/AIDS prevalence in young healthy and mobile groups is a double burden. These people movements between areas can aid the spread of HIV as well as it gives a direct negative effect on the young and strong part of the population that has to provide for their family (67). In addition to AIDS-related deaths, health personnel have left the profession for other less risky professions for fear of being exposed to the disease. A lot of staff has also been lost through prolonged periods of illness, funeral attendance and caring for sick relatives (61). In developing countries you are either infected or affected by HIV.

The first reported case of AIDS in Malawi occurred in 1985. Between 1985 and 1993, HIV prevalence among women attending urban antenatal clinics increased from 2% to 30%. President Banda's puritanical beliefs made it very difficult to spread HIV/AIDS education (58).

Since 1985 HIV/AIDS has affected all sectors of society. There is a devastating AIDS epidemic that already has caused over 650 000 deaths. AIDS takes around 20 people's lives every hour (12)! AIDS is the leading cause of death amongst adults, and is the major factor to the reduction in life expectancy over the last years. In 2005 almost a million Malawians were living with HIV. HIV prevalence is almost twice as high in urban areas as it is in rural areas, but new studies shows that the prevalence is declining in many urban areas and increasing in many rural areas (2).

HIV/AIDS strikes the young and healthy part of the population and the prevalence is higher in certain groups like sex-workers, truck drivers, fishermen and other "mobile" groups (67). HIV is mostly transmitted through heterosexual contacts. Women have a higher prevalence rate than men, and 60% of the infected adults are women (59).

Children are also heavily affected by HIV/AIDS. In 2005 it was estimated that 91 000 children had HIV, and over half a million children had been orphaned because of AIDS (59). Malawi's national HIV prevalence has stabilised between 12% and 17%, since the mid-nineties.

3.4.1.2.2 Malaria

Malaria infection in pregnancy is associated with maternal and foetal morbidity and mortality. There are more than 500 million episodes of clinical disease each year worldwide (14). 8 million episodes of malaria occur in Malawi each year, in the population of 13,6 millions (69).

Malaria is caused by infection with one or more of four species of Plasmodium, transfusion of infected blood, or transmission from the mother to the foetus. It is a devastating health problem in Sub-Saharan Africa. Malaria infection during pregnancy poses substantial risk to the mother and her foetus, and the risk is highest in her first pregnancy and among HIV

infected women (due to the lack of specific immunity). Malaria infection in pregnant women is associated with miscarriage, maternal anaemia, low infant birth weight, premature delivery, intrauterine demise and maternal and infant mortality (14).

3.4.1.2.3 Under/malnutrition

A pregnant woman's nutritional status affects her ability to successfully carry, deliver and care for her children. Most women in developing countries suffer from malnutrition during pregnancy and lactation. In general, frequent pregnancies and long lactation periods deplete maternal energy, iron and calcium storages.

56% of pregnant women attending antenatal clinics are anaemic due to iron depletion (69) and 8 % of Malawian mothers to children under age five are undernourished. This is among the lowest in the sub-Saharan countries. In Malawi there is no relation between maternal under nutrition statuses and where these mothers live or their level of education. Overweight rate, on the other hand, is highest in the cities and town areas and lowest in the countryside. We can also see that overweight is highest among Malawian women with at least secondary school education (43).

High fertility rates have a negative impact on maternal health as well as to the children's nutritional status. A Malawian woman will have given birth to an average of 6 children by the end of her childbearing years. This is one of the highest rates in the sub-Saharan countries. A woman in Malawi has one of the highest median birth intervals of 36 months, which reduces the risk for poor nutrition of mother and child (43).

Malnutrition leads to depletion of iron, folic acid, iodine, calcium, Vitamin A and D. Diseases like Malaria and intestinal worm causes the same loss of substances. Deficiency of these substances can lead to anaemia, infections, spontaneous abortions, stillbirths, pre-eclampsia, short stature and osteomalacia. Short stature and osteomalacia are possible reasons of obstructed labours which can lead to fistula (60). It has been pointed out that more girls than boys become severely malnourished. Maternal death can be caused by early life malnutrition, during infancy or even before her birth, when deficiencies of calcium, vitamin D or iron begin (30).

3.4.1.2.4 Non-communicable diseases - The double burden of disease

Common infectious and parasitic diseases such as malaria, HIV/AIDS and tuberculosis remain major unsolved health problems in many developing countries. Non-communicable diseases partly relating to diet and lifestyle, like hypertension, diabetes, cancer, asthma, mental illness and diseases have been increasing over the last two decades. This is creating a double burden of disease and impacting negatively on already over-stretched health services in these countries. Prevalence rates for type 2 diabetes and cardio vascular diseases in sub-Saharan Africa have seen a 10-fold increase in the last 20 years (4). These illnesses can cause maternal and foetal mortality. High blood pressure and high blood sugar level can lead to pre-eclampsia which easily can lead to maternal death. Large foetuses that can lead to obstructed labour for malnourished and short statured women, can lead to fistula.

3.4.2 Political, economical, social and cultural factors affecting maternal deaths

Behind maternal deaths there are important political, social, cultural and economical factors.

We have focused on

- Poverty and development
- Costs
- Insufficient infrastructure
- Women's illiteracy and education level
- Fertility rate
- Women's status and male involvement
- Maternity care

3.4.2.1 Poverty and development

The UN Development Program, UNDP, is using HDI to describe a country's development level. Numbers from 2005 shows that the western countries top the list and the last 20 places are taken by African countries. HDI are correlating with MMR and one can find that most countries with low HDI have high MMR (60).

Globally, poorer women particularly see childbirth as a non-illness, where modern medicine has little to contribute. There is also evidence that poor families may be less willing to spend money on women's health.

In some settings, uneducated rural women will deliver at home without professional care despite living close to maternity care facility. In contrast, richer and often better educated women and their families are more modern, have greater identification with modern health care systems and a greater ability and willingness to travel outside the community, which may facilitate use of professional maternity care (25).

3.4.2.2 Costs

In Malawi, the public health services including delivery care is said to be free (69). In areas that are served by a private health care centre, lack of money is said to be a reason for not using health facilities at deliveries (54). Even if public district hospital care is free, there are other costs associated with giving birth, like transportation to a delivery ward, as well as drugs and other supplies. Women attending a governmental driven hospital are expected to bring a razorblade for cutting the cord, a piece of plastic sheet to deliver upon so as not to soil the plastic mattress, and blankets and cloths.

3.4.2.3 Insufficient infrastructure

Many women live far from a hospital. Insufficient roads and lack of public transportation can impede the women to get to an attended delivery ward. In many rural areas the only, and not always available, transportation is bicycles, which isn't the first choice for a pregnant woman. It is difficult and dangerous to travel by night and during the rainy season the road conditions are bad. In addition to the uncertainty of the time for term, the transportation problem makes it difficult for the women to reach the hospital before the baby is delivered (54).

3.4.2.4 Women's illiteracy and education level

In Malawi, 58% of women and 28% of men over 15 years old, can neither read nor write. The number of children in primary and secondary school has increased so much in the last decade that there are not enough school facilities and teachers (140 pupils per teachers). Many of the pupils travel a long way to school and are kept at home to work or look after younger siblings or elderly relatives (46).

A woman's education and wealth status have no association with the likelihood of having pregnancy complications, but when the complications occur, they are less likely to get the medical care they need. Younger women, urban women, women with higher education or in the highest wealth quintile and first-order births are more likely to deliver in a health facility (37).

3.4.2.5 Fertility rate

The fertility rate is negatively correlated to HDI. The poor education and work possibilities compel women without other alternatives to marry, and start a family early. In many cultures the women's status rise with the number of children she produces. Use of contraceptives is not common which leads to the situation that women in developing countries become pregnant too soon and too often.

3.4.2.6 Women's status and male involvement

Health seeking behaviour is influenced by many factors, including the ability to make decisions regarding one's health and to have control over family income. Lack of these abilities is often a barrier for proper use of maternal health services (37). Husbands and mothers-in-law are heavily involved in the decision making process and members of these poorer households will favour home based delivery care. A barrier for seeking facility based delivery care may be male doctors (25). In the Sub-Saharan area 70% of the doctors are male and 70% of the nurses are female (20).

The husbands are head of the family in Malawi, and women have generally little power in decisions made in the family. Some husbands also refuse to pay for medical treatment (41). In areas where maternal mortality is high, women are often without influence and power, and with small means to give preference to their own health. In many low and middle income countries, men do not participate in reproductive and maternal health care services (5). A survey among Malawian women with live births in 1999-2004 indicates that women who are more empowered were generally more likely to receive health care during pregnancy, delivery, and in the postpartum period (37).

3.4.2.7 Maternity care

3.4.2.7.1 Antenatal care (ANC)

An important component of maternal health care is antenatal care. It covers a range of activities such as nutrition, education, immunisations, malaria prophylaxis, HIV information and services for monitoring of potential complications. These interventions can contribute directly or indirectly to reducing maternal deaths. WHO recommends 4 antenatal visits with doctor, nurse or midwife, during normal pregnancy (55).

In Malawi, urban women are more likely to have seen health professional for antenatal services than women living in rural areas. The level of education and wealth are associated with use of antenatal care – the higher educational level and wealth level a woman has, the more likely she gets antenatal care. The timing, content and quality of the antenatal service can influence the outcomes of pregnancy.

- Timing: Women in Malawi are advised to have a minimum of four ANC visits during the pregnancy, one of them during the first trimester. 57% of mothers to live born children in 1999-2004 met these recommendations. Lack of knowledge of the meaning of menstruation period and fertility possibilities, and equipment to measure the length of pregnancy with ultrasound makes the calculation of estimated time of delivery uncertain. Urban women make more frequent visits for ANC than rural women (37).
- Content: The afore mentioned study reports that 70% of the women were told about pregnancy complications and where to go in case of problems during pregnancy, 95% measured weight, 78% measured blood pressure, 36% took blood samples, 21% took urine sample, 90 % checked baby’s heartbeat and 67% were checked for anaemia.
- Quality: Women in urban areas, more educated women and women in the highest wealth quintile are more likely to receive care of good quality during pregnancy (37).

The most commonly self-reported complications at ANC are high blood pressure and swollen feet, both indicators of pre-eclampsia. Other often reported complications are anaemia and bleeding during pregnancy. These problems are slightly more prevalent in older women and women with higher order births. A woman’s education and wealth status have no association with the likelihood of having pregnancy complications (37).

3.4.2.7.2 Delivery care

Among Malawian women with live births in 1999-2004, 57% delivered in a health facility, 29% at home and 12% at TBA’s home (37).

3.4.2.7.2.1 Shortage of health professionals

This is a general problem in Malawi and reduces the number of facilities equipped to offer obstetric care. This is significantly related to quality of maternal health care and maternal mortality rates. The availability of skilled midwives, nurses, doctors and obstetricians is critical in assuring high-quality antenatal, delivery and emergency obstetric and post-natal services (21). There are several issues to consider about the shortage of health professionals:

There are not enough educated and trained health professionals. These are maldistributed and this affects the poor, rural areas with primary health care facilities, in favour for the urban and richer areas with tertiary care facilities. This has an add-on effect, because the primary health care facilities are more numerous and widespread and thereby more accessible for the majority of the population.

Staff loss from emigration, disability, burnout, death, retirement and employment in other positions or other sectors also drains the health staff.

“Brain drain” is one of the biggest problems in the Malawian health system. The lack of human resources and the fact that a large part of the health skilled people depart to

industrialized countries, makes 62% of all the established posts in MoH vacant. Only 9% of the Obstetric- gynaecology posts are filled (69). There are 20 physicians per 100 000 population in Malawi (Table 1).

Emigration, especially to the UK, has accelerated over the last 10 years in Malawi. In spite of training over 20 doctors a year for many years, there are only about 120 Malawian doctors working in Malawi. This total includes specialists, administrators and those working in the private sector. Over a hundred new Malawian health workers are registrated in the UK every year (63).

The fact that many of the Malawian trained doctors and other health workers have emigrated and are practising outside Malawi, leads to a disproportionate affect on a country with relatively small workforces. In addition comes the affect that the more qualified maternal health staff are, the more likely they are to seek employment internationally, where they can receive higher salaries, better job satisfaction, career opportunities, social security and benefits, and better availability of resources like infrastructure, equipment and supplies.

The fact that HIV/AIDS mostly strikes the young and healthy part of the population (67) also means that many health workers are infected.

3.4.2.7.2.2 Quality of the health professionals

The hospitals midwives are often described as discriminatory, casual and rude. The patients often feel neglected and have to wait for a long time before examination. They are left more or less to themselves, and often deliver without any assistance at all. The pregnant women are also being shouted at. In one survey from Zimbabwe 20% of the women were hit by the midwives during the delivery and the other 80% weren't treated very well either (5). Many women choose to deliver at home because they were feeling lonely as relatives are not allowed to accompany the woman in the delivery ward. Many of the rural Malawian women have the attitude that pregnant women die at hospital, and that they are better off without hospital care. (54). The delivery staff is less helpful due to their own fears of becoming infected with HIV (53). Shortage of staff, equipment and medication in addition to the frustrated patients increased the desperation of the midwives.

Emergency obstetric care is supposed to take care of the complications that can occur during delivery. It needs providers that are competent to administer the drugs and perform the procedures, and to check that the drugs and equipment are present and that the infrastructure to care for a patient exists. These services should be available 24 hours a day, 7 days a week (45). Approximately 15% of women that have complications during pregnancy, delivery and the post-partum period need emergency obstetric care to prevent maternal death. These facilities are often not available in resource-poor settings and this is one important reason why maternal mortality levels are so high in developing countries (55).

In sub-Saharan countries and southern-Asian countries, caesarean section rate in the poorest women was less than the minimum recommended frequency of 1%. This is a marginally low number. WHO recommend an upper limit to 15%. For the health of both the mother and the neonate a frequency of between 5% and 10% seems to achieve the best outcomes, rates less than 1% or higher than 15% seems to result in more harm than good (3). CS deliveries are more common among younger women,

first time pregnancy, high educated women and women living in urban areas In Malawian hospitals CSs are often performed by Clinical Officers.

Substitute health workers (SHW) is a term used to describe cadres of health workers who have taken on jobs, functions and roles that are normally the tasks of internationally recognized health professionals such as doctors, nurses and pharmacists. These "substitutes" usually receive shorter pre-service training than the original cadres and perform some or part of the tasks normally carried out by the higher cadre. These alternative cadres fulfil clear and defined roles in health services in Africa. In Malawi, they use two kinds of doctors' substitutes; Medical Assistant with basic level training and Clinical officers (COs) with post basic and specialized training in practical surgical techniques. Malawi's College of Health Sciences (MCHS) annually graduates 20 medical doctors and 100 Medical Assistants and Clinical Officers, with certificates in clinical medicine. They are trained for 18 to 36 months to perform some of a physician's procedures and are a welcome but not fully skilled complement to the educated medical doctors (11, 17).

3.4.2.7.3 Postnatal care

Since the majority of maternal deaths can be extremely high on the first and second day after delivery, postnatal care is an important component of obstetric and neonatal care. This is aimed to prevent and manage complications that might endanger the survival of the mother and baby. Among Malawian women with live births outside a health facility in 1999-2004 as many as 68% did not receive any postnatal check up at all during the postnatal period. Malawi's relatively low utilization of health facilities for delivery and postnatal care services means that most Malawian women do not get skilled care during delivery and in the postpartum period (37).

4 Our experiences from Malawi

In January 2007, we spent three weeks in Malawi, during the rainy season. The people in Malawi were warm and friendly and we understand why the country is called “the warm heart of Africa”. Despite their poverty and strain, we observed the people we met as happy and content.

Mangochi district is a rural and poor district in the southern region of Malawi. The population is approximately 600 000 and they live on fishing and farming. The health care system in Mangochi district is served by 29 primary health facilities and one district hospital. Mangochi District Hospital opened in 1982, and is driven by the government and is a referral hospital with a TB-ward, a male-ward, a female-ward, a child-ward, an out-patient clinic, antenatal-care, a maternity unit. There was one doctor at the hospital, supervising and serving all the wards, and 4-5 Clinical Officers, who among other things, took care of the obstetric emergencies like caesarean sections (54).

There were approximately 4000 deliveries conducted at Mangochi District Hospital per year, an average of ten per day. Nine nurses/midwives and Clinical Officers were employed at the maternity unit, which also had 70 beds for maternity admissions. Three nurses were on duty during the day shift and two during the night shift (54).

During our stay in Malawi we spent two weeks at Mangochi District Hospital, mostly in the delivery ward at the maternity unit. The delivery ward consisted of one room with eight beds, We could see that the room was made for six beds, because the track for the curtains were still there, even though most of the curtains were missing, so privacy was impossible to achieve. The beds were so high that the women had to climb up a two step footstool to get up, the mattresses were intact, covered with thick plastic and there were no sheets, blankets or pillows. One part of the room was the office for the midwives where they wrote down the necessary information in a birth book, ate their sandwiches and talked and laughed with each other and on their mobile phones, all in front of the patients. There was one sink in the delivery room with only cold water and one well used piece of soap, no paper- or material towels or cloths, no hot water, and one plastic cup for the patients to share, if they were so lucky as to get some water during the delivery. The oxygen supply was out of order, but a mobile oxygen aggregate was placed in the room. There were a number of plastic buckets placed on the floor in the delivery room. This is the World Health Organization’s colour-codes waste-disposal system for infection control: light blue for used instruments, orange for used gloves which were washed before they were burned, dark blue for infectious rubbish, brown for sharps like razor blades and syringes, green for used plastic papers which are burned and a red bucket for human tissues like the placenta, blood and excrements.

No one except the staff and the delivering women were allowed to be in the delivering room. The patients husbands seldom came to the hospital, but the women were often accompanied by their mothers. Several middle aged and elderly women were waiting in the corridors with the women’s older children.

Most of the women delivering at the Mangochi District Hospital were relatively poor. The richer often choose to deliver at a private delivery facility. Many of the women did not know their own age, could not read nor write, had no shoes and the clothes and wrappings they wore

were dirty and ragged. Mangochi District Hospital is a public hospital, so the health care is free, but the patients at the delivery ward are expected to bring with: a plastic paper to lie upon during delivery, a razor blade to cut the cord, and their own cloths and rags to wipe up the blood, wrap the babies and as sanitary pads for the mother. If this was not brought, the midwives became irritated, and the patients messed the mattresses, which had no sheets, and the cord had to be cut by one of the hospital's non sterile pairs of scissors.

This is a summary of what the midwives at Mangochi District Hospital were supposed to do to assist the delivering women, told by one of the midwives:

1. Take up a case history:
Age (if they know), village of residence, religion, gravida, para, week of pregnancy and if the woman had taken "African Pitocin" – a home made medicine for accelerating contractions.
2. Presenting Status:
Vital signs: blood pressure, heart rate, temperature.
Anaemia: examination of the conjunctiva
Oedema: feel/palpate for oedema on the feet, legs
Inspection: look for scars on the abdomen after previous caesarean sections or laparotomy.
Palpation: Labour signs and the baby's orientation and presentation.
Auscultation: Counting the baby's heart beat.
Evaluate the contractions, by feeling the abdomen, and timing two contractions; <20 sec week, 20-40 sec moderate, >40 sec strong contraction.
3. A gynaecological examination was done with sterile gloves put on as non-sterile gloves. First, labia majora and vulva was washed with Chlorhexidine, then they were examined and the opening of cervix was estimated.
4. Every 30 minutes the baby's heart rate was supposed to be checked and every hour the mother's blood pressure and heart rate was checked, and after four hours they did another vaginal examination if the baby was not delivered.

There was no pain relief medication given to the delivering women, except for the ones who had to go to the surgical theatre for a caesarean section, who got anaesthesia. The women were left alone during most of the delivery, but when the head was showing, the midwives put on an apron and sterile gloves and helped ending the second stage and the third stage by cord clamping, injection of Oxytocin and controlled cord traction.

After the delivery, the woman's vagina was cleaned, inspected and possibly sutured. She was placed on one of the cloths she had brought along to the hospital, between her legs and was told to lay still on her back for one hour. During this time the baby was dried and weighed, the cord was tied up with two pieces of flat cotton ribbon and after being wrapped, the baby was placed on the mother's chest or to her breast. After one hour the woman's vital signs were checked and she could climb down from the bed and was pushed in a wheelchair to the maternity ward. The woman and the baby could stay there for 24 hours and were cared for by the grandmother.

During the weeks we were at the delivery ward at Mangochi District Hospital, it was seldom enough time and staff to follow these guidelines, so we all did as much as we could to keep it up. The guidelines for case history and checking the vital signs of the mother and the baby were followed, but the rest was not always done, even when there was enough time and staff. We did not regard the midwives and the midwife students very dedicated neither to the job nor the patients.

A couple of times we followed patients with obstructed labours or other complications to the Theatre for caesarean section. Our first impression of the Theatre was that it looked like a public toilet at an underground station in Norway! The sterile hand wash was made without brush and sponge, with a well used piece of soap that lay on the sink. The staff consisted of three people: the man responsible for the anaesthesia seemed to be more interested in his three mobile phones that he was charging, sending and receiving messages on and he ran in and out of the theatre throughout the operation. The operation was performed by a 22 year old Clinical Officer, and the first CS we saw him do, was the 5th he had performed after having assisted at 15. The third member of staff was the operation nurse, who seemed to be the most professional and most experienced of them all. Her problem was the lack of equipment; trying to find sutures that had not expired and enough sterile water to flush the abdomen before suturing. If they were expecting the baby to be alive, a midwife came in the minute before the baby was delivered and took care of the baby. The hygiene was far from what we demand in Norway, and we were surprised that anyone survived a caesarean section under these conditions! The sterile covering was stained, spotted, torn and with holes. While covering the patient the staff contaminated washed areas with the covering dragged over non sterile parts of the body. And she had been lying upon her plastic sheet, crawling around in labour, sliding about in her own sweat, blood, amniotic fluid and excrements naked and with sandy feet after walking barefoot for years.

One young woman, who had given birth to her first child, got very sick the day after the delivery. She had malaria and probably meningitis, with a high fever and was unconscious most of the time. Her husband and his mother looked after her and the baby. When the doctor finally had time to take a look at her, he made a spinal puncture under sub optimal conditions; in a dirty bed, with poor light. He used an ordinary vein canula, sterile gloves, but put on as non sterile ones, and he handled non sterile items before and between the attempts. No anaesthetics were given. When the doctor had made a successful attempt, he left the test tube on the patient's bed, together with the syringe and a note for the nurse, where he had written Chloramfenicol. Next time the nurse passed this patient's bed and saw the sample and the note she was supposed to take the sample to the lab (if it wasn't closed for redecorating, then it would have to wait until the next day) and then give the patient the only antibiotics the hospital had: Chloramfenicol.

At Queen Elisabeth Central Hospital, a tertiary hospital in Blantyre, we visited the delivery ward where we saw the same colour-codes waste-disposal system for infection control, similar delivery care but of a slightly higher standard. Every woman could have some privacy, with curtains they could draw around the bed and the staff even asked the women if we could have a look and talk to them. In the corridor there was a blackboard where staff marked the outcome of the pregnancies: dead or alive, how many babies, gender and whether the mother survived or not.

Outreach clinic. One day, we left the hospital at 8 o'clock, with the outreach clinic, heading for a small village 29 km away. We were going to give immunisation to children,

contraception and antenatal care to women and treat illnesses with the small means we brought with us in the worn-out ambulance. There were the driver, a community nurse and the two of us. We drove for two hours on wet, slippery gravelled roads before we had to turn back due to the rainy season's effect on the road. This meant that the people living in this village had to wait another month for these supplies...

5 Discussion: What can be done to reduce maternal mortality and thereby achieve the 5th MDG?

Becoming pregnant and giving birth in the western world is an occasion to celebrate life and hope. For millions of women in the developing world, pregnancy and childbirth is an experience risking death and disability. In Chichewa, Malawi's national language, the risks of pregnancy are indicated by the words used to describe a pregnant woman; *pakati* (between life and death) or *matenda* (sick) (52).

Worldwide, nearly 1 600 women and more than 10 000 newborns die every day from complications of pregnancy and childbirth that could have been treated or prevented with adequate care. The maternal deaths- over 500 000 per year-have left millions of orphaned children. For every maternal death in the developing world, it is estimated that 30 women suffer morbidity during childbirth, such as chronic anaemia, infertility, stress incontinence, vaginal fistula and chronic pelvic pain (13).

5.1 Changes in maternal mortality since 2000

Between 1990 and 2002 the world made significant progress achieving some of the MDGs. Average incomes increased by 21%, people living in extreme poverty declined by 130 million, life expectancy rose from 63 to 65 years. Access to safe drinking water and sanitation increased. Across regions and between and within countries the progress varied. Some countries in Africa saw the slowest progress. In SSA the number of people living in extreme poverty, on \$US1 a day or less, rose from 217 million in 1990 to 290 million in 2000. The majority of these people are women. Life expectancy has fallen from a little over 50 years to 46 years in the SSA. The MMR has only declined from 920 per 100 000 to 917 from 1990 to 2000, the target for 2015 is 230. This trend over the past 15 years shows that the SSA will not achieve the MDGs 1 and 5 on time (18).

5.2 Short and long term strategies to reduce maternal mortality

We distinguish between short term strategies like medical factors at delivery facilities and at home, and long term strategies like political, economic, social and cultural factors that influence maternal health and death. Improvements in the medical factors can give a quick and local decrease in maternal mortality, but to make a long term and lasting change in MMR and MMRate there is a need for deep and comprehensive political decisions and changes.

5.2.1 Short term

5.2.1.1 Improve the delivery care

In Kigoma in Tanzania a region hospital the average annual MMR for the period from 1984-86 was 849 per 100 000. The corresponding average in 1987-91 was 275 per 100 000. This decrease was a result of 22 specific interventions carried out at the Kigoma Region Hospital (32). Some of the improvements were:

- Professional responsibilities were clarified and the senior obstetrician was nominated leader.

- A number of training activities for all cadres in the delivery department were initiated; the doctors taught the medical assistants and the midwives taught the nursing assistants.
- Regular monthly meetings were arranged, so the staff could be informed and receive feedback. Problems were spelt out and solutions discussed.
- Efforts were made to use available recourses to solve equipment problems through local repairs and only to refer to outside donors when local resources were exhausted.
- Improvement of patient management, by early diagnosis and treatment of diseases, known to be common causes of maternal death.
- Improvement of resuscitation, proper sterilization and disinfection of equipment, use of broad-spectrum antibiotics for women undergoing caesarean section, was emphasized. Better management routines in cases of severe anaemia were also introduced.
- Public complaints of patient management were taken into consideration.
- A detailed plan for the supply of essential drugs and early provision of blood for transfusion were made by stimulating blood donor recruitment.

The conclusion of this study that, given the financial constrains, health workers still remain the corner stones for improvement of maternal health care, but they need basic working tools, continuous on-the-job-training, adequate problem solving avenues and encouraging conducive working environments (32).

5.2.1.1.1 Haemorrhage

Active management of the third stage of labour which consists of interventions designed to speed the delivery of placenta and thereby shortening the third stage of labour, is an important way to minimize the risk of PPH. The usual components are giving a uterus contraction drug within one minute after delivery, clamping and cutting the umbilical cord and controlled cord contraction while applying simultaneous counter-pressure to the uterus through the abdomen (47).

A study from Egypt, where PPH is the leading factor of maternal deaths, contributing to 27 %, showed that poor obstetric management contributed to 43% of maternal deaths. The study from Egypt showed that 85% of the 176 observed deliveries were inappropriately managed. In 19% no uterotonic drug was given, in 49% no cord traction was done, in 7% early clamping of cord was not done, and in 65% uterotonic drugs was given after delivery of placenta (9).

Several other large scale randomized controlled studies have compared the outcomes of active and passive management of the third stage. Active management was associated with reduced maternal blood loss, reduced postpartum anaemia, decreased need for blood transfusions, reduced risk for prolonged third stage labour and less use of uterotonic drugs (47). Postpartum haemorrhages can also kill healthy women within 2 hours if unattended. In the developing world, where 60% of the deliveries occur outside delivery facilities, the health system needs to be strengthened and skilled attendants need to be present at the deliveries to achieve the reduction in maternal morbidity and mortality outlined in the millennium declaration. Preventing and controlling nutritional deficiencies like iron, vitamin B12, folic acid and vitamin A could improve maternal health and prevent maternal mortality associated with PPH (64). Caring for women with haemorrhage is often beyond the capacity of developing country health systems and communities. Medication used for standard treatment requires

refrigeration and injection and are often only available in limited areas. In a study in Dar es Salaam in Tanzania it was found that a large proportion maternal death, were linked to lack of possibilities for blood transfusion and lack of drugs, even in the tertiary referral centre (28, 47).

5.2.1.1.2 Infections and sepsis

Failure to prevent and manage infection is not only a problem of lack of technology. It is more a problem of compliance with long-established procedures and system failures. Promising opportunities for specific technological innovations are few and include developing of rapid microbiological diagnostic tests and production of low-cost-hand-cleaning agents. Management of puerperal sepsis is dependent on the successful implementation of established technologies within the context of a program for maternal mortality reduction. The priorities for action are introduction of infection prevention programs in health facilities and communities, such as prophylactic antibiotics for SC and preterm rupture of membranes and updated regimes for antibiotic use. Continuing research is being done on the effectiveness of vaginal application of antiseptics, vitamin A supplementation, and for high-risk populations, use of prophylactic antibiotics (26).

5.2.1.1.3 Hypertensive disorders of pregnancy; pre-eclampsia and eclampsia

Hypertensive disorders continue to be major killers. Antenatal care and improved health services remain keys to attempt to reduce mortality due to these disorders. Early diagnosis and management at all levels of healthcare are necessary. Regular antenatal care for recognition and treatment for pregnancy induced hypertension, PIH, and especially during the last trimester is essential. Standardised treatment and improved facilities for intensive care may not help in the prevention of eclampsia but prevention of mortality is possible. High quality critical care is necessary and essential to reduce maternal mortality (10).

5.2.1.1.4 Complications during delivery

In many parts of the western world, caesarean section rates steadily rise without evidence of a reduction in perinatal mortality and morbidity. In contrast, in many parts of the developing world, women with a clear need for operative delivery are not able to access this. In the struggle to balance early diagnosis and correction of prolonged labour with the use of unnecessary intervention, no consensus has yet been reached. Amongst midwives and obstetricians a definition of normality is vague, with a resulting variation in hospital guidelines.

Obstructed labour remains an important cause of maternal and foetal morbidity and mortality in many parts of the world. It is important with better understanding of the pathophysiology of myometrial contractility in obstructed labour. Much can be done at the moment, with simple clinical facilities to identify dystocia and treat it appropriately. The incidence of obstructed labour will be minimised by adequate nutrition for girls and young women (38).

5.2.1.2 Improve general health

Diseases that are aggravated by and also can complicate pregnancy are f ex HIV/AIDS, tuberculoses, anaemia and malaria. In our discussion we focus on malaria and HIV/AIDS.

5.2.1.2.1 Malaria

About 20 new drugs are at different stages of development (www.mmv.org) and some are very promising alone or in combination. Malaria vaccines can protect young children from infection and several other vaccines are currently being developed.

Non-pharmacological interventions like insecticide treated nets, indoor residual spraying and source reduction (larval control) are important to reduce the risk of mosquito bite. Women should remain indoors between dusk and dawn, and if outdoors they should cover their skin with clothes or insect repellent. Three independent studies in East-Africa showed that insecticide treated nets use during pregnancy results in significant health benefits for both the mother and her infant (31, 39, 57). WHO is currently recommending its use in Sub-Saharan Africa. The recommendation is that nets should be offered to all pregnant women attending antenatal clinics. The goal of achieving a target of 60% of pregnant women sleeping under an insecticide treated net by 2005 is far from being reached. Access to drugs and availability of antenatal care are factors that have to be considered to improve malarial control on pregnancy. Different strategies have to be put in place to overcome local problems in each different setting (14).

5.2.1.2.2 HIV/AIDS

More than two million HIV positive women become pregnant each year. Pregnancy itself also increases the chance of HIV infection, probably through a combination of physiological and behavioural factors (34).

Due to the increasing AIDS-epidemic, screening for HIV-infection and follow up of HIV positive pregnant women, are becoming more important issues in the antenatal care. In several places, focus is set on preventing vertical transmission of HIV during pregnancy, by giving HIV-positive women antiretroviral drugs around the time for delivery. To avoid transmission of HIV when the baby is born women are advised not to breastfeed or not to give the baby anything else than breast milk during the lactating period. These recommendations are difficult to follow and create several difficult dilemmas. It is important to reveal pregnant women's HIV status to prevent the babies becoming infected, and in some places the woman receives treatment in her own right. But this can lead to problems in the marriage relationship, with violence, and in relations with the rest of the family and other networks, because HIV is very stigmatising in many parts of the world. In places where women receive treatment just to avoid transmission to the baby, it can be difficult to motivate them for treatment, as they predict a prompt death for the baby anyway. To be motherless, are hard many places, with high mortality (5).

In rural Malawi, 75 HIV positive pregnant women were registered in a programme for prevention of mother-to-child-transmission (PMTCT) of HIV. 35 delivered at home, and 27 of them were traced. 16 (59.3%) had access to Nevrinapine and had taken tablets during labour. None had returned to the health facility for Nevrinapine Syrup for their babies. In Botswana, HIV positive pregnant women did not access a PMTCT programme because of

fear of knowing their HIV status, formula feeding distribution stigma, lack of male partner support and negative attitudes of health workers (27, 50).

Although some pilot and demonstration projects have been successful, progress in scaling up PMTCT has been slow, reaching just 11% of pregnant HIV positive women in Africa. Despite ongoing efforts to promote comprehensive, significant policy, financing and institutional barriers, and weak coordination and leadership, continue to hamper progress. Moreover, Botswana, Kenya and Rwanda have shown that progress can be made where national commitment and increased resources are enabling maternal and newborn care to address HIV (50).

5.2.2 Long term

Several of the MDGs are linked to maternity health, e.g.:

MDG-1: Poverty reduction. Improved and more equitably available maternal health services can reduce the gap between rich and poor people, as well as reduce the negative economic effect on a poor family, if the mother dies or becomes disabled.

MDG-3: Women's empowerment: Maternal mortality is high where women's status is low, especially with regard to educational level.

MDG-4: Child survival: improved maternal survival will enhance the survival of young children.

MDG-6: Infectious diseases: Good maternity care will give opportunities to prevent and treat malaria in mothers and newborn babies, and to prevent mother-to-child transmission of HIV (19).

In the long term several of these MDGs must be "seen as one" and we must use strategies and methods that give a positive effect on several of the MDGs. Working towards achievement of one MDG can move us closer to obtaining some of the others.

Malawi needs general political, socioeconomic and cultural development to produce better health for the population. High levels of poverty and illiteracy, especially in the rural areas and a poorly functioning economy are challenges. Another challenge for the government is improving educational facilities and retaining educated people in Malawi. The main challenge in the health sector development is how to implement the reforms successfully, simultaneously with financing, decentralization and provision of new services, e.g. anti-retroviral drug treatment of AIDS to an already stressed health care system (69).

The government in Malawi has tried various reforms to improve the health sector through the years, in addition to a more or less successful separately financed project. But it is difficult to detect a measurable improvement in general health indicators. They have set down six core and over-riding areas targeted for reform: decentralizing the health service management, human resources for health development, health financing, hospital autonomy, essential health package, EHP, and managerial capacity building for districts (69)

The country is also exposed to frequent natural disasters, like floods, landslides, droughts as well as disease outbreaks, e.g. epidemics of cholera, plague and pneumonia. Disasters are often associated with increased incidence of diarrhoeal diseases, malaria and maternal mortality. The natural disasters are impossible to prevent but the accompanying disease

outbreaks and their consequences could be better managed, but this is not within the bounds of this thesis.

We discuss the following issues further:

- Poverty and development
- Women's illiteracy, educational level, status and male involvement
- Family planning
- Maternity care
- Quality and shortage of health professionals

5.2.2.1 Poverty and development

Poverty can be seen as the main cause of poor health and also a largely contributing factor to the high MMR and MMRate in the developing countries both in itself and as the start of the negative spiral of poverty, malnutrition, low education, low status, little knowledge, restricted opportunities. Many women in this situation marry early and also become pregnant very early. Another big challenge is that many of the developing countries lack an infrastructure and social security that makes it possible to provide health facilities that will reach the whole population. Even though the public health care is free, there are geographic, cultural and social factors that makes it non attainable for some groups of the population (6, 25).

5.2.2.2 Women's illiteracy, educational level, status and male involvement

In developing countries, where the population is poor, the level of knowledge about health factors and the general education level often are low too. These women are often illiterate, have limited access to information and restricted financial possibilities to access the health care we in developed countries take for granted.

In terms of social and political development, women's human rights have not evolved in many developing countries to the same extent as they have in the developed world. McAlister and Baskett examined the relationship between women's status and human development and maternal mortality. They investigated the impact of gender-related predictors, including education, political activity, economic status, and health, and human development predictors, such as infant mortality and Human Development Index, HDI, in 148 countries, using data from the United Nations Human Development Report 2003. They found that HDI and Gender Development Index are powerful predictors of both maternal and infant mortality rates. Female literacy rate and combined enrolment in educational programs are moderate predictors of maternal mortality rates. This suggests that strategic investment to improve quality of life through female education will have the greatest impact on maternal mortality reduction (33).

Women's perceptions of health problems are crucial to the success of community mobilisation interventions. Rural areas in developing countries especially need strategies to improve preventive and care-seeking behaviour, to reduce maternal mortality. Rosato et al have evaluated the effect of Women's groups on maternal mortality. 6 000 women between 15 and 78 years were included. These groups followed a participatory community-action cycle and met several times and the discussion moves through the cycles four phases:

- identify and prioritise maternal and neonatal health problems,
- develop locally feasible and appropriate strategies to address them,
- implement the strategies and
- address them (52).

Anaemia, malaria and haemorrhages were by far the most commonly identified maternal health problems in the antepartum period. In the intrapartum period, obstructed labour, malpresentation and haemorrhage were the worst and in the postpartum period, haemorrhage and retained placenta the predominant problems. This study suggests that a great deal of knowledge and experience exists in communities, and can be accessed and channelled through women meeting and collectively discussing these issues. Their voices need to be heard by decision-makers and the women themselves participating in finding solutions to the huge risk of pregnancy in Africa is an important part of the solution (52).

Reproductive health does not only involve women. Men's need for reproduction, the inequalities between men and women and men's sexual behaviour are as important for determining reproduction. It is important to make men responsible for all factors involved in reproductive health (40).

5.2.2.3 Family planning

Family planning (FP) programs, in the developing countries, consists of traditional clinic based strategies, mobile clinics, community based distributions and social marketing. These methods have been implemented all over the world. A small maternal mortality risk is associated with contraception, although all methods are safer than pregnancy and delivery. Globally, coverage of contraception is 61%, whereas unmet needs for contraception range from 6% in Europe to 23% in Sub-Saharan Africa. 41% of global pregnancies are unwanted, 22% of these result in induced abortion. The global maternal mortality ratio (MMR) is 400 per 100 000 live births and 1 100 in Sub-Saharan Africa. These data suggest that around a third of maternal deaths could be eliminated if unplanned and unwanted pregnancies were prevented. (42, 68).

FP is one of the most effective tools for reducing maternal mortality. There is no doubt that counselling, education and contraceptive options make women more likely to delay childbearing, have fewer children and thereby reduce their risk for obstetric complications, as fewer women will be exposed to the risk of pregnancy. During the 1980's family planning was one of the key strategies to reduce maternal mortality in developing countries (Partners in health: Woman's health). It seems logical that the effects on the MMR, that is the risk of death once the woman is pregnant, are not so clear (6). There are many barriers limiting women's access to family planning methods, including gender inequality, myths and lack of knowledge about and availability to services and clinics (44). Surveys show that those women who use family planning are the ones that also have the best access to delivery care (5, 43). This underlines the problem of the poorest and most rural women, who have difficulties in reaching the health facilities and therefore experience the worse outcomes.

A family planning project in Bangladesh, the Matlab project, aiming at fertility reduction, resulted in a dramatic fertility decline, and thereby a decrease of MMRate. Logically this intense family planning did not improve the MMR (32).

Family planning reduces maternal mortality in several ways, it reduces the number of times the woman gets pregnant, it reduces the number of unintended and unwanted pregnancies and reduces the number of pregnancies of women in groups with increased risk of maternal deaths; too young, too old, too often and too many pregnancies. It is more effective in preventing pregnancies in young women (<20 years old) than older women, this is important because early childbearing increases the risk of obstructed labour which can lead to death and

long term disabilities such as fistula. FP can delay first births until the reproductive organs are fully developed and pregnancy safer. In countries where illegal abortions are common, family planning can save many women's lives. Ideally, family planning and obstetric care should go hand-in-hand (32).

5.2.2.4 Maternity care

There are many barriers to reduce maternal mortality in poor and poorly developed countries like Malawi. One main factor is to provide good access to skilled maternal care; antenatal controls, delivery facilities, post-partum-care and referral options (21).

An important component in the effort to reduce the health risks of mothers is to increase the proportion of babies that are delivered in facilities where skilled attendance and referral options are available. In addition to the training and retention of health workers, appropriate supplies and equipment to identify and manage complications are needed as well as maintenance of hygienic conditions to prevent infections (37).

In North Africa the MMR is less than 150 per 100 000 births. In Egypt, the assistance from skilled attendants at deliveries increases from 35% in 1988 to 61% in 1999, this led to a 50% decline in all maternal deaths in only 11 years (1, 18).

Postnatal care has to be focused upon to prevent and treat e.g. fistulas and pelvic pain. This can be done in postnatal check ups.

5.2.2.5 Quality and shortage of health professionals

5.2.2.5.1 Traditional birth attendants, TBA

Most TBAs are older women who are already known to attend to mothers in rural areas during delivery. They can assist a delivery at the pregnant woman's home or in their own home. These women are well known in their localities, and have varying skills and attitudes. The TBA's delivery services are liked by most mothers (36). Among Malawian women with live births in 1999-2004 26% of the deliveries were assisted by TBAs, compared with 50% by nurses or midwives, 6% by doctors and COs, 14% by relatives, 1% by another patient and 2% by them selves (37)! The traditional birth attendants' attitude to the mother is often better than skilled midwives' at delivery facilities, which are described as discriminatory, casual and rude.

An attempt was made to identify these TBAs in the 70's and 80's and they sat a 2-week training in theory and practice on simple and safe obstetrics (23). International agencies and academics meant that TBAs received a brief training but were left without a backup system, and research has shown that TBA training has no effect on maternal mortality, and since 1990 has advised governments to stop the training.

Instead of excluding TBAs from providing maternal care, they may be considered a resource under close supervision of authorized midwives (48). This could be part of the solution for the poorest women that never come to the health facilities with skilled attendants, to deliver. This raises the question whether TBAs are a better alternative to nothing, for these women.

5.2.2.5.2 Stop brain drain or make it a brain gain

The medical brain drain has been described as rich countries exploiting developing countries by employing their doctors and nurses and thereby undermining their health systems and public health. There are possibilities to restrict or even find ways to change this brain drain to brain gain in favour also of the developing countries like Malawi. Record and Mohiddin emphasize that the migration of health staff might also be seen as benefits for the individuals working abroad and remittances should be seen as a benefit that goes directly to poor households in Malawi. It can also be seen as a success in the training of health professionals that the country it self could benefit from (49). Here are some of their suggestions:

- Charge fees for medical training in Malawi that would be written off over a given times of public service within Malawi. Staffs that choose to emigrate could pay off the fees through overseas earnings. This would allow Malawi to scale up the training of medical personnel in order to train for the domestic needs and to produce for export, like the Philippines has done (24).
- An Economic Partnership Agreement (EPA) between some African countries and the EU, which should provide training and technical assistance to compensate African governments which carry the cost of training skilled medical workers, who then emigrate to the EU.
- Temporary migration, e.g. by non renewable work permits and other methods to ensure that migrant health professionals return to their country of origin, might violate the human rights of the migrants.
- Salary top-ups for the Malawian's public health workers, as they have tried out in Malawi in 2004-2005, are attractive and may reduce the incentives for health personnel to move out of their profession and instead remain in Malawi. The differences between Malawi salaries and those of other countries are still too big, so it is unlikely to prevent international departures from Malawi's public health system.
- Separate medical professional training into two tracks:
 - An advanced training program
 - A basic training program, like the Clinical Officer scheme already present in Malawi that produces staff that are not sufficiently qualified to be recruited abroad but is a cheaper alternative to remedy some of the health needs in Malawi.
- Improving the incentives for migrants to send money home, the Government of Malawi could permit the holding of foreign currency accounts by Malawian's working abroad and reducing the costs of sending small and regular money amounts home to Malawi.
- An agreement between the Malawian and the UK Government (or other countries where Malawian medical staff are working) whereby a portion of income tax or national insurance levied on migrant earnings in the UK, is remitted to the Malawian Government for reinvestments in public health (21, 49).

Other possibilities are, by government negotiation, reduced recruitment by higher-income countries, improved workforce planning, and legalization of mid-level health workers to perform procedures restricted to high-level health workers, bonding graduates to work in the public sector and increasing inflow through training. Stop brain drain and adequate numbers and distribution of health professionals (21).

6. Conclusions

There is no doubt that the high rate of maternal deaths can be reduced with the right means. There is unanimity about the need for more investments, political commitment and research to reduce the unacceptable annual burden of more than half a million maternal deaths. It is not in doubt that it is a woman's right to have a choice of place of birth with skilled delivery care (15).

To make the achievement of the fifth MDG a reality, MMR will have to decrease much faster. In Sub-Saharan Africa, the annual decline has so far been about 0.1 % (68). To realize the goal, requires increased attention to improved health care for women. It is also important to prevent unplanned pregnancies and unsafe abortions and to provide high-quality pregnancy, delivery, postnatal care and emergency obstetric care.

In many areas with high maternal mortality, some of the strategies suggested are simply not achievable with current resources and infrastructure. There is a need to combine longer-term strategies with shorter-term strategies to reduce the maternal mortality (15). Bring service to women or bring women to service.

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