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Elizabeth Anne Swedo

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Date

Stemming the tide: A study of technical and perceived quality of care and their  
associations with maternal health determinants

By

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Degree to be awarded: Master of Public Health

Hubert Department of Global Health

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Stemming the tide: A study of technical and perceived quality of care and their  
associations with maternal health determinants

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An abstract of  
A thesis submitted to the Faculty of the  
Rollins School of Public Health of Emory University  
in partial fulfillment of the requirements for the degree of  
Master of Public Health  
in the Hubert Department of Global Health  
2012

## ABSTRACT

Stemming the tide: A study of technical and perceived quality of care and their associations with maternal health determinants

By Elizabeth Swedo

**Background:** The impoverished West African nation of Mali has one of the worst maternal mortality rates in the world – 830 maternal deaths per 100,000 live births. Many of these deaths have been attributed to poor utilization of maternal health services. Little research has been done to investigate how quality of care – both technical and perceived – influences women’s decision to seek maternal care.

**Objective:** This study utilizes measures of both technical and perceived quality of care and household data to analyze associations between quality of care and maternal healthcare uptake.

**Methods:** Study participants were women who had given birth within the previous twelve months. Additionally, health facility audits were conducted in all CS-COM facilities in Bandiagara and Bankass, two regions of Mopti, Mali. Data from health facility audits and the household survey were linked and analyzed using bivariate analysis and logistic regression. Outcomes included skilled delivery in a healthcare facility, receipt of four antenatal care (ANC) visits, receipt of one ANC visit during the first trimester, and receipt of the WHO minimum standard of ANC.

**Results:** Bivariate analysis of household data revealed that parity, education, cohabitation with one’s mother-in-law, and employment outside the home were significant factors for maternal health service uptake. Among perceived quality of care domains, maternal health service utilization was associated with perceived physical accessibility, satisfaction with quality of service offered at CS-COM, perceived equipment functionality, and safety of delivery at CS-COM. Technical measurements of CS-COMs revealed sub-optimal signal function capabilities, avoidable maternal and neonatal deaths, absent or broken equipment, frequent medication stockouts, and a paucity of retrained staff; however, only equipment and medication stockouts were significantly associated with maternal health service uptake.

**Discussion:** The results of this study suggest that women’s perceived quality of care at their local healthcare institution influences their choice to utilize maternal health services. Efforts to improve maternal health services must include provisions for better technical quality of care and outreach to the community to improve perceived quality of care.

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The question should not be why do women not accept the service we offer, but why do we not offer a service that women will accept.  
– Mahmoud Fathalla, 1998 Egypt

## Introduction

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Maternal mortality is one of the leading killers of women in developing nations, with over 358,000 maternal deaths occurring worldwide in 2008 (WHO, 2010). The developing world bears the brunt of these deaths, with over 99% of maternal deaths occurring in the developing world. Nearly sixty percent of maternal deaths occur in sub-Saharan Africa; among these countries disproportionately burdened by maternal mortality is the West African nation of Mali. In 2010, the “State of the World’s Mothers” report rated Mali as the “seventh worst place for mothers on the planet” (Save the Children, 2010). Malian women frequently deliver at home, without skilled attendants, greatly increasing their risk of death from complications.

Current interventions aimed at decreasing maternal mortality demonstrate only modest effects. Novel approaches to the maternal mortality epidemic are needed in both research and intervention development to stem the tide of maternal deaths. Efforts to increase Malian women’s utilization of health services have largely focused on improved services in health facilities; comparatively few studies have investigated how social factors, decision-making ability, and perceived quality of care affect utilization of maternal health services.

The purpose of this thesis is to investigate the effect of perceived and technical quality of care measures on maternal health determinants in rural Mali. Specifically, this thesis hopes to address the following research objectives:



- Describe the current state of maternal health and quality of care literature and identify areas for further investigation
- Detail the methodology of a large, complex household survey and health facility audit in rural Mali
- Evaluate what technical quality of care factors affect maternal health service utilization through the use of community health facility audits and household surveys
- Investigate whether perceived quality of care factors affect maternal health service uptake through quantitative household survey
- Provide evidence-based intervention recommendations informed by local socioeconomic & cultural context, maternal health literature, and study results

As the problem of maternal mortality persists, innovative approaches to the problem must be explored. This thesis investigates whether actual quality of care provided in an institution, and perceptions of quality of care among the potential patient population, are potential avenues to effect lasting change in maternal health utilization patterns and outcomes.

## Definition of terms

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**Maternal mortality:** The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (WHO, 2010).

**Maternal health utilization:** the use of skilled antenatal care, healthcare facilities, skilled attendants for delivery, and skilled postnatal care by pregnant and delivering mothers.

**Maternal health determinants:** used broadly to identify the associations between factors of interest and maternal health outcomes. These factors include pathogenic causes of mortality; biologically causal risk factors; and outcome-associated risk indicators (Campbell & Graham, 1991).

**Technical quality of care:** the quality of care provided by a healthcare institution. This encompasses the health system infrastructure, availability and functionality of medical equipment, availability of medications, adherence to current evidence-based guidelines, existence of institution-initiated & routine quality assurance assessments, etc.

**Perceived quality of care:** the perceived quality of care by patients and potential patients. Patients' perceived quality of care domains include: perceived quality of interpersonal relations, perceived quality of technical expertise, patient satisfaction, and other domains.

**Health facility audit:** a qualitative, in-depth investigation of the equipment, personnel, facilities, diagnostic and therapeutic approaches, and medical records of a health facility for the purpose of assessing quality of care provided at that institution.

**Antenatal care:** routine or higher-level medical care received by a pregnant woman before delivery and provided by a skilled attendant.

**Skilled attendant:** a health care professional who has received formal training in medicine. This includes physicians, nurses, midwives, and community health workers. Traditional birth attendants are not considered skilled attendants.

**Healthcare facility:** a private or public health establishment recognized by the government that provides allopathic and/or osteopathic medical services.

Examples include local community health centers, clinics, and hospitals.

# Literature Review

---

As one of the leading causes of death for women in developing countries, maternal mortality has generated an impressive body of empirical and theoretical literature. The WHO defines maternal death as:

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (WHO, 2010).

Despite the quantity of research published on the topic of maternal mortality, women continue to die at unacceptably high rates and the panacea for maternal mortality remains elusive.

## Characterizing Maternal Mortality Worldwide

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Maternal mortality is considered “very difficult to measure”; even a task as elementary to the study of maternal mortality as quantifying the number of global maternal deaths has substantial literature describing its difficulty (Abou-Zahr & Wardlaw, 2001; Campbell, 1999; Graham, Ahmed, Stanton, Abou-Zahr, & Campbell, 2008; Yazbeck, 2007). Most recently, the WHO estimated that 358,000 maternal deaths occurred worldwide in 2008. This estimate was developed using complete civil registration data where available, and statistical modeling utilizing national-level data from surveys, censuses, surveillance systems, and death registration (WHO, 2010). Recently, Hogan et al. (2010) reassessed maternal mortality estimates from 1980 to 2009 by compiling the “proportion of all female deaths that were attributable to maternal cause” from

vital registration systems; sibling history data from household surveys; data from censuses and surveys for deaths in the household; and published work reporting national and subnational population-based studies of maternal mortality. They then created a model to generate estimates of maternal deaths and the maternal mortality ratio (MMR) for each year between 1980 and 2008. Using this model, Hogan et al. estimated 342,900 maternal deaths worldwide in 2008. They were also able to model the contribution of HIV to maternal deaths, estimating that over 60,000 maternal deaths were attributable to HIV/AIDS (Hogan et al., 2010). In addition to monitoring ‘impact’ indicators, such as the maternal mortality ratio, ‘process’, ‘output’, or ‘outcome’ indicators aid in the measurement of actions that prevent death or illness (WHO, 2009). These indicators (Figure 1), such as contraception prevalence, utilization of skilled birth attendants, proportion of women accessing skilled antenatal care, and others, are “helpful to follow the coverage of obstetric care and to identify problems within the health care system” (Gottlieb & Lindmark, 2002). However, in countries with poor skilled attendant and healthcare system usage, Gottlieb & Lindmark found that these “indicators [could not] be used as a tool [in Eritrea] to monitor the effect of maternal health care programmes on maternal mortality”. A large ecological study in West Africa found similar results – no single process indicator accurately predicted maternal mortality (C. Ronsmans et al., 2003). Process evaluation remains, nonetheless, an important method for describing the current access to and quality of maternal health services.

**Figure 1: Recommended process indicators for monitoring the effect of maternal health care programs on the maternal morbidity and mortality.**

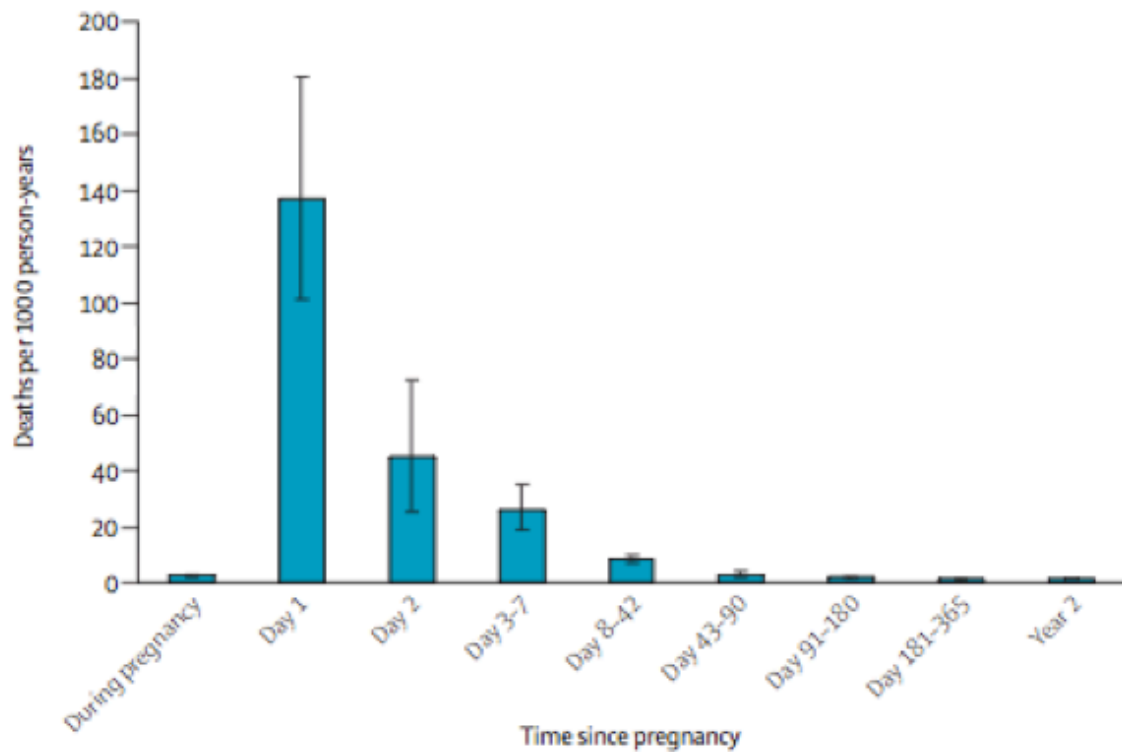
Source: Adapted from Gottlieb & Lindmark, 2002.

Recommended Process Indicators
<p><i>Process indicators aimed at maternal morbidity</i></p> <ul style="list-style-type: none"> <li>• Proportion of women attended by trained staff at least once during pregnancy</li> <li>• Proportion of births attended by trained staff</li> </ul>
<p><i>Process indicators aimed at maternal mortality</i></p> <ul style="list-style-type: none"> <li>• Number of health centers providing essential obstetric care (EOC) per 500,000 population</li> <li>• Proportion of complicated cases managed at EOC facilities</li> <li>• C-sections as a proportion of all births in the population</li> <li>• Percentage of population within one hour travel time to EOC facility</li> <li>• Case fatality rate for direct obstetric complications</li> <li>• Proportion of all births in EOC facilities</li> <li>• Prevalence of anemia and severe anemia</li> <li>• Anemia prophylaxis rate</li> <li>• Proportion of pregnant women screened for syphilis</li> </ul>

In addition to quantifying impact and process indicators, researchers strive to qualify: when, why, and where women die in pregnancy and childbirth. Most maternal deaths occur at the end of pregnancy, between the third trimester and the first week post-partum (Campbell & Graham, 1990; X. Li, Fortney, Kotelchuck, & Glover, 1996). A study in Matlab, Bangladesh found that the risk of death (expressed as deaths per 1000 woman-years of risk exposure) was 100 times higher on the first day postpartum than in the second year postpartum (Figure 2) (Hurt & Ronsmans, 2002).

**Figure 2: Mortality during pregnancy and by time since end of pregnancy in Matlab, Bangladesh**

Source: Data from Hurt & Ronsmans, 2002; Image from Ronsmans & Graham, 2006



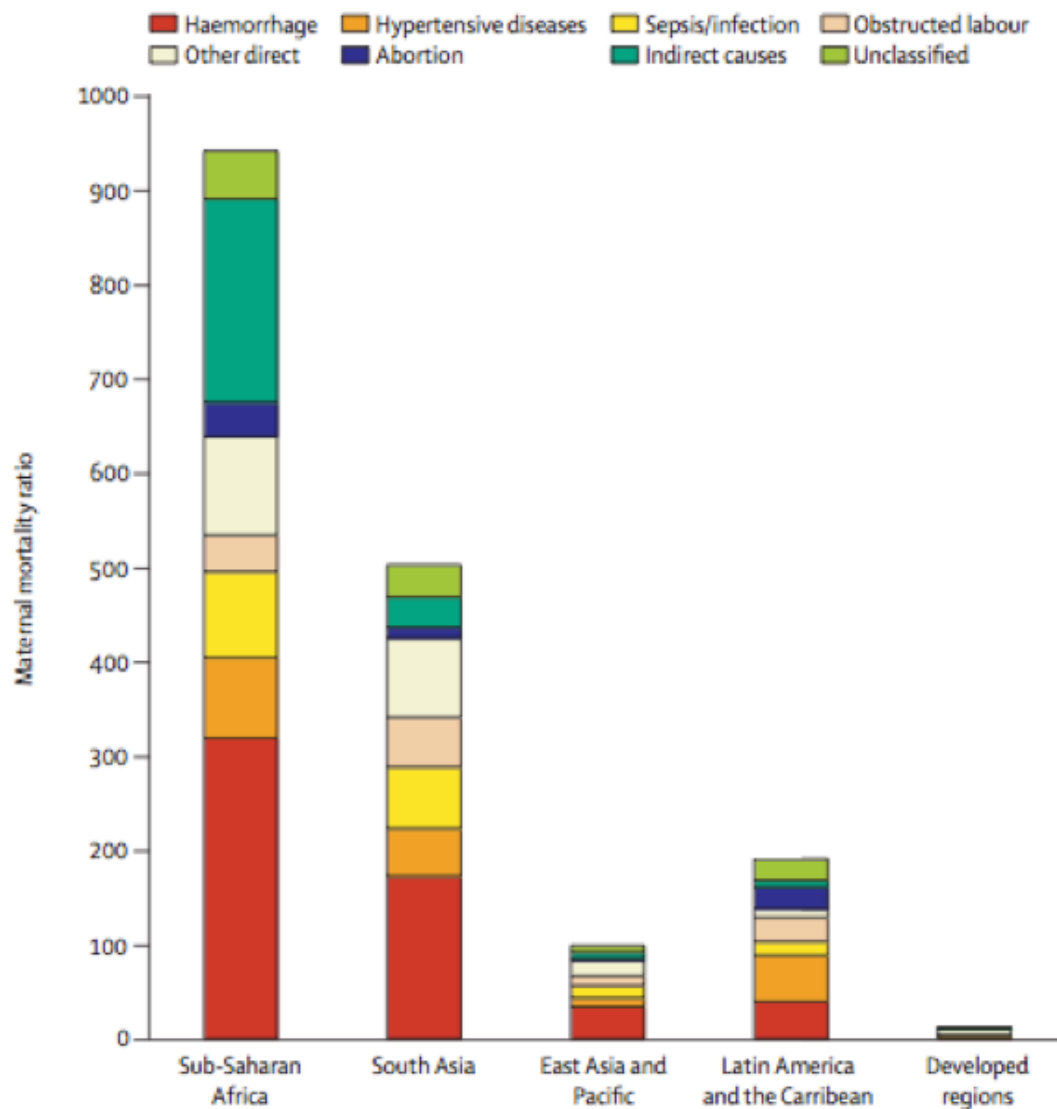
Women's risk of death remains elevated for up to six months after childbirth, highlighting the importance of skilled intrapartum and postpartum care (Hoj, da Silva, Hedegaard, Sandstrom, & Aaby, 2003; Hurt & Ronsmans, 2002; Pradhan et al., 2002).

Causes of maternal death have traditionally been divided into direct and indirect categories. Direct causes of maternal deaths are defined as obstetric complications of pregnancy, labor, and puerperium, or consequences of interventions or sequelae related to pregnancy, labor, and puerperium (Nasah, Mati, & Kasonde, 1994). The majority of maternal deaths are related to these direct consequences of pregnancy and childbirth; a 2006 Lancet review of causes of maternal mortality by Khan et al. found hemorrhage, hypertensive diseases,

and infections to be the leading causes of maternal death. The authors' analysis, however, was limited by availability of information; often, developing countries did not record cause of death, and were therefore excluded from the review (Khan, Wojdyla, Say, Gulmezoglu, & Van Look, 2006). Ronsmans & Graham (2006) used data from Khan et al., in conjunction with the WHO's 2000 estimates of maternal mortality, to compare regional cause-specific mortality ratios (Figure 3). Hemorrhage, a largely preventable cause of maternal death, takes the lives of over 166,000 women each year; half of these deaths occur in sub-Saharan Africa, and more than a third in south Asia. Access to skilled birth attendants and emergency obstetric care could drastically reduce these numbers.



**Figure 3: Maternal mortality ratios for 2000 by medical cause and world region**  
 Source: Ratios were obtained by Ronsman & Graham (2006) by applying proportional mortality from Khan et al. (2006) to regional estimates of maternal mortality in 2000 (WHO, 2004)



Unsafe abortion, another leading direct cause of maternal death, is difficult to quantify, given the sociopolitical stigma of abortion. The WHO estimates MMRs from induced abortion at 37 deaths per 100,000 live births in sub-Saharan Africa (Khan et al., 2006). A 2004 study of 12 hospitals in West Africa found nearly all early pregnancy deaths were due to induced abortion

(Thonneau, Goyaux, Goufodji, & Sundby, 2002). Thonneau et al. also found a third of all maternal deaths in the study hospitals were due to unsafe abortion.

Indirect maternal deaths result from “the aggravation of existing conditions by pregnancy or delivery” (Nasah et al., 1994). Estimates of indirect causes of maternal death are imprecise, given the difficulty in quantifying the contribution of other diseases (e.g. HIV, malaria) to pregnancy-related deaths. Unfortunately, most pregnant women in high HIV prevalence areas (such as Malawi, Zimbabwe, and South Africa) do not have access to HIV testing. The paucity of information about pregnant women’s HIV status makes interpretation of maternal deaths in the context of HIV nearly impossible. Two studies have investigated the maternal mortality rate among women with and without HIV (Coeur et al., 2005; Sewankambo et al., 2000). Sewankambo et al.’s study demonstrated a five-fold increase in maternal mortality among HIV-infected women in Rakai, Uganda; Coeur et al.’s study found similar results among pregnant women in Pointe Noire, Republic of Congo.

Death from other indirect causes, such as violence, is equally hard to quantify. A number of fascinating studies in south Asia found evidence suggesting pregnancy played a potentially causative role in violent deaths. A 1989 study in Matlab, Bangladesh found that 20% of deaths in pregnant unmarried women were due to suicide, compared with 5% of deaths in pregnant married women (Fauveau & Blanchet, 1989). In the same study, Fauveau and Blanchet found that pregnant girls were three times more likely to die from violent causes than non-pregnant girls. A review by Ballard et al. (1998) examined the prevalence of violence during pregnancy in three U.S. studies, with a particular

focus on women whose intimate partner violence started during their pregnancy. Among women who experienced violence during pregnancy, 12.5% to 88% had not previously experienced violence (Ballard et al., 1998). This wide range was attributed to differences in “the length of time period before pregnancy under consideration (e.g. at any time or within the past 6 months).” Dannenberg et al. found that pregnant black women in New York City were more likely to die from homicide during pregnancy than a specific medical condition (Dannenberg et al., 1995).

A number of studies have examined the location of maternal deaths; in many developing settings, a large portion of maternal deaths takes place in health facilities (Carine Ronsmans & Graham, 2006). Among these deaths include women who arrive in terminal condition, women who arrive with complications who could have been saved through earlier and/or more effective intervention, and women admitted for normal delivery who later develop fatal complications. Quality of care plays a significant role in the outcomes of mothers. Substandard care, such as delay in recognition and treatment of serious complications, has been implicated as a causative factor in more than a third of deaths in some countries (Macfarlane, 2001).

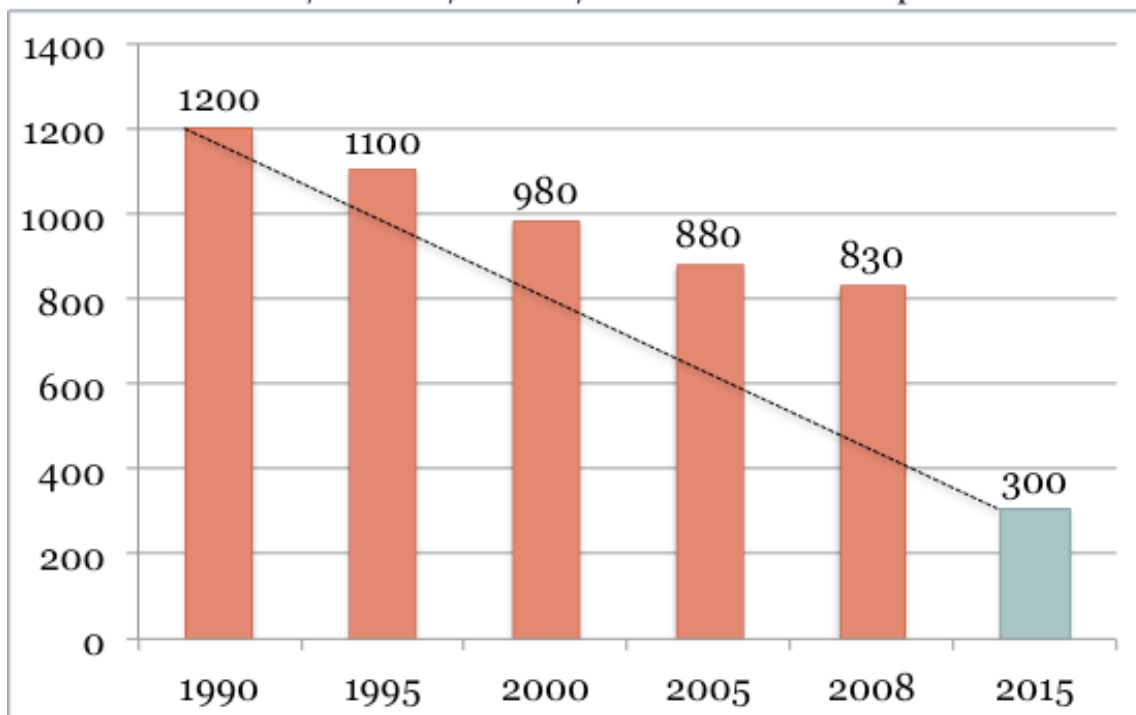
## Maternal Mortality in Mali

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At present, the developing world bears the brunt of maternal deaths. Of the estimated 358,000 maternal deaths in 2008, 99% took place in developing countries (WHO, 2010). Nearly sixty percent of maternal deaths occur in sub-

Saharan Africa. Mali has one of the worst maternal mortality ratios in the world – 830 maternal deaths/100,000 live births in 2008. A Malian woman’s lifetime risk of dying in childbirth is 1 in 22. Although Mali is characterized as “making progress” towards the Millennium Development Goal 5 to decrease maternal deaths by 75% from 1990 to 2015, it is not yet on track to achieve its 2015 target MMR of 300 (World Bank, 2011) (Figure 4).

**Figure 4: Mali maternal mortality ratio 1990-2008 and 2015 target**  
Source: 2010 WHO/UNICEF/UNFPA/World Bank MMR report



Recognizing the importance of improving the health of its citizens on a local level, Mali’s government has striven to improve health and health system performance despite its limited resources and vast land area. In 1991, Mali’s government implemented a health care policy that “emphasizes the decentralization of the health delivery system, the availability of essential medicines, district-level planning, and community participation in service

provision” (Gage, 2007). In each region of Mali, one or more regional hospitals exist. Below the level of these regional hospitals are the ‘Referral Health Centers’ or Centres de Santé de Référence (CS-REF). These CS-REFs are linked to the regional hospitals and are present in each cercle or district. Below the CS-REF is the Centre de Santé Communautaire (CS-COM) or ‘Community Health Center’. These CS-COMs provide basic preventative and curative services in maternal and child health. In an effort to limit the financial barriers to seeking treatment, Mali’s government has instituted cost-recovery for consultations, medications, and other supplies at the different levels of the health care system. Care is not free, however, and cost remains a burden to many. Unfortunately, the government’s attempt to create a decentralized, community-based health care system has been undermined by urban bias in public health expenditures, difficulties retaining CS-COM health practitioners, and inadequate financial resources (World Bank, 2011).

Over seventy percent of births in Mali take place in a rural setting; the impact of this socio-geographical environment on maternal health outcomes cannot be overemphasized. Most women do not live near health facilities: in 1998, only 39% of the population lived within 15 km of a health facility (Johnston, Faure, & Raney, 1998). When an obstetric emergency occurs, the physical distance between a woman and a health facility acts as a tremendous barrier to receiving Emergency Obstetric Care (EmOC). Only 10% of mothers live within 5 km of a facility offering EmOC services (Gage, 2007). Moreover, 17% of births occur in areas of Mali where the main road is seasonably impassable. Only 26% of births occur in areas less than 15 minutes away from public transportation; and

just 28% of births occur in areas with emergency auto transportation. When polled about their personal barriers to receiving adequate levels of maternity care, 58.1% of women cited financial barriers, followed next by physical distance (48.8%) and transportation issues (47.6%) (Gage, 2007). In addition to financial & physical barriers, Gage's study also highlighted the importance of:

Informational barriers (not knowing where to go), the low status of women (getting permission to go), and gender inequities in education (concern about the sex of the health provider) in limiting access to adequate maternity care. (Gage, 2007)

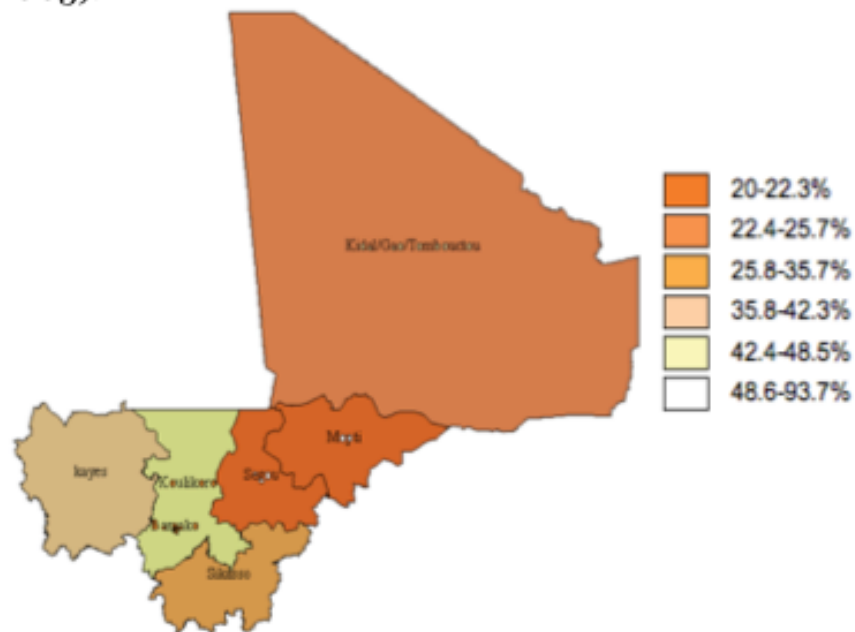
As a result of these barriers, uptake of maternity care services is poor in rural Mali. Only 14.6% of women polled in the 2001 Mali DHS obtained prenatal care in the first trimester of pregnancy; 21.5% received four or more prenatal visits; 28.8% were assisted during delivery by a trained provider (doctor, nurse, or midwife); and 26.3% delivered in a medical facility (Gage, 2007). Fifty four percent of mothers deliver at home, according to WHO estimates (WHO, 2006b). An alarming proportion of women have no contact with the medical establishment during their pregnancy: half of mothers polled in the 2001 Mali DHS received no prenatal care; nearly 90% received no counseling on pregnancy complications.

Further evaluation of Mali's DHS maternal health indicators paints a portrait of limited access, sub-standard care, and tremendous urban-rural disparities. Nationally, 7-8% of married women reported using modern contraceptive methods in 2006; in urban areas, 13% used modern contraception, in rural areas, just 4.2%. In the impoverished, rural region of Mopti, this number drops to just 2% of women using modern contraceptive methods (WHO, 2006b).

In urban areas, 80% of women used a skilled birth attendant (SBA) in 2006; in rural areas, only 37.6% used a SBA. When SBA utilization was broken down by sub-region of Mali, the imbalance is even more distinct: 93% of women use SBAs in urban Bamako, versus 34% in rural Mopti (Figure 5).

**Figure 5: Utilization of skilled birth services by subregion**

Source: USAID-funded FEW NET via the Africa Data Dissemination Service (ADDS) and modified by UN (2005).



At the national level, 1.6% of births were delivered by c-section; however, urban mothers were five times more likely than rural mothers to deliver by c-section (WHO, 2006b). The Mopti region had the poorest c-section rate, just 0.5% of mothers delivered via c-section. This is much lower than the WHO's suggested rate of 5-15% (WHO, 2009), and reflects the limited access of rural Malian women to emergency obstetric services. The nutritional status of mothers in Mali

is also insufficient: 73% of pregnant women surveyed in 2001 were anemic; of these, over half were moderately or severely anemic.

A 1999 study in Bamako, Mali by Etard, Kodio, and Traoré is one of few prospective studies of maternal mortality in Mali. Women were followed at six weeks and one year after delivery to collect information on their pregnancy, its outcome, the method of delivery, the puerperium, and the first year after birth. Although 80% of the women had at least one visit to an antenatal clinic, and nearly 90% delivered in a maternity hospital, the maternal mortality rate among the study cohort was 327 per 100,000 live births (Etard, Kodio, & Traore, 1999). When the researchers accounted for five late maternal deaths, the MMR rose to 436 per 100,000 live births. Etard et al. posited that this high maternal mortality rate highlighted the need for “improvement in the quality of maternity care”. Indeed, their study showed that “up to one third of the pregnant women being delivered in a Bamako maternity unit did not go to the unit that they had used for antenatal visits, and their delivery was managed without the benefit of information related to their antenatal visits” (Etard et al., 1999). Additionally, the majority of study deaths (87%) were due to direct causes (hemorrhage, hypertensive disorders in pregnancy, sepsis after caesarean section); the researchers cite these potentially preventable causes of death as evidence of inadequate emergency obstetric care, even in Bamako.



## Determinants of Maternal Mortality

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The causes of maternal mortality are numerous and complex; these causes are often part and parcel of the larger framework of poverty, malnutrition and gender inequity that affect a majority of women in developing countries. Seminal work creating a framework for understanding maternal mortality and its determinants took place during the early 1990s, starting with T.K. Sundari's 1992 review of maternal mortality. Prior to Sundari's review, it was common practice to describe a delay to seek care as a "patient factor", a term interpreted to be a "faulty action on the part of the patient, for which the health care system is not responsible and about which it is helpless to do anything" (Sundari, 1992). Sundari was one of the first to suggest that parlance shift from "patient factors" to "inaccessibility of health services":

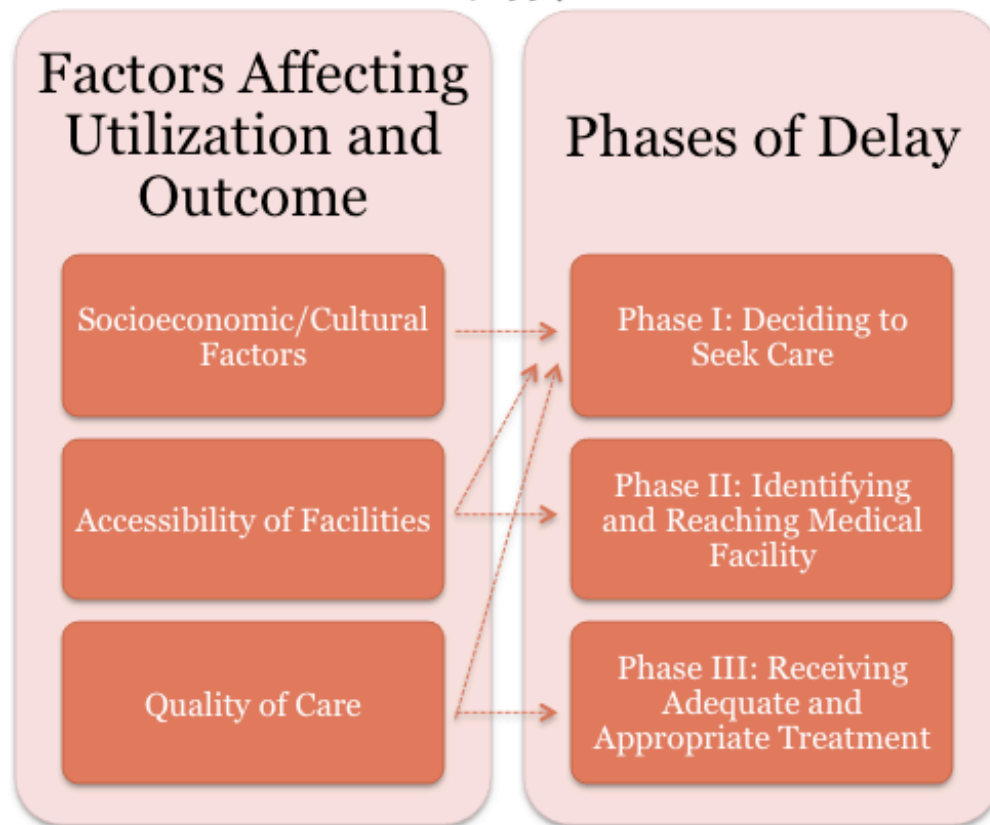
[These determinants] are a consequence not only of geographic inaccessibility but of the social, cultural, and economic inaccessibility of health services to pregnant women. Could we not consider attributing responsibility for these factors to the patient a case of "victim blaming"? (Sundari, 1992).

Sundari's review reframed maternal mortality determinants in the context of health care systems: how lack of access to health care, and lack of access to quality health care lead to women's deaths.

Thaddeus and Maine expanded on this theme in their seminal 1993 paper in which they introduced the concept of "the three phases of delay". This conceptual framework (Figure 6) is still utilized in intervention planning today. For the purposes of this review, the literature describing determinants of maternal mortality will be analyzed using the "three delays" framework.

**Figure 6: The three delays model**

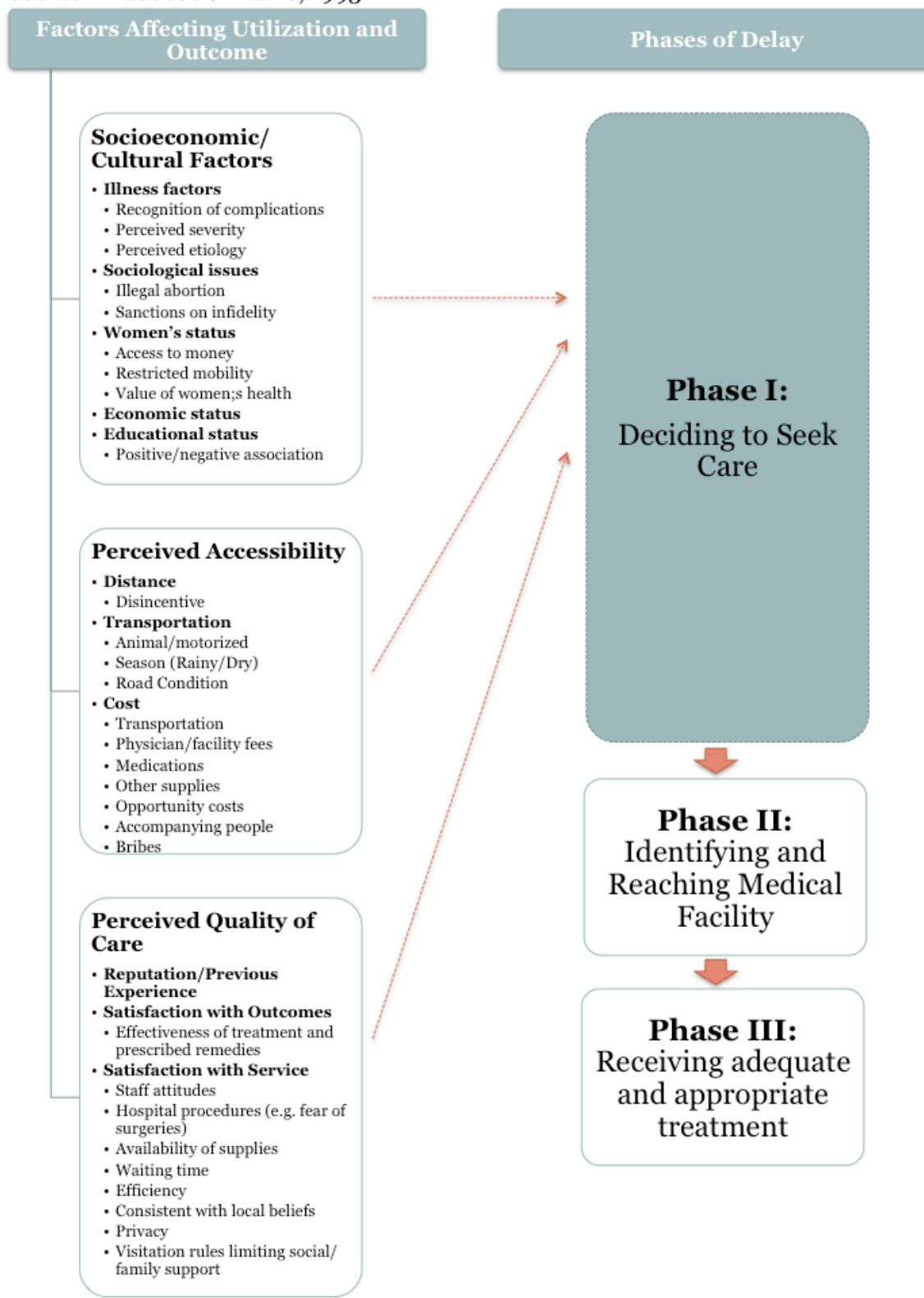
Source: Thaddeus & Maine, 1994



**Phase I delays.** Phase I delays are defined as a “delay in deciding to seek care on the part of the individual, the family, or both” (Thaddeus & Maine, 1994) (Figure 7).

**Figure 7: Phase I delay, detail.**

Source: Thaddeus &amp; Maine, 1993.



Causes for Phase I delays include:

...The actors involved in 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; and perceived quality of care. (Thaddeus & Maine, 1994)

These Phase I factors are often described as “barriers” or “constraints” to health care utilization; the most commonly studied of these include distance, cost, quality of care, and sociocultural factors.

Distance of the nearest health facility is a significant barrier to treatment for numerous women in developing countries. In many of these areas, it is not only long distances, but also treacherous roads and poor transportation options, which limit women’s health-care seeking behavior. Thaddeus and Maine describe this as the “dual influence” of distance—one part disincentive from perceived distance, one part true inaccessibility due to physical distance. A case study of four hospitals in Oyo State, Nigeria reported respondents not seeking care because the facility was too far, or choosing their hospital based on distance (Egunjobi, 1983). This study found that “nearness” of the health facility was the number one factor influencing choice of hospital. Distance has a significant effect on the decision to seek antenatal care (ANC), as well: an increase in distance or travel time to the nearest healthcare facility is associated with lower uptake of antenatal care (Nielsen, Hedegaard, Liljestrang, Thilsted, & Joseph, 2001) and fewer ANC visits (Magadi, Madise, & Rodrigues, 2000). Qualitative studies describe similar results; distance acts as a barrier to ANC service utilization (Griffith & Stephenson, 2001; Mathole, Lindmark, Majoko, & Maina Ahlberg, 2004; Myer & Harrison, 2003). Additionally, uncomfortable transport, poor road

conditions, and big river crossings are also barriers to ANC uptake (Mathole et al., 2004; Mumtaz & Salway, 2005). Distance is not the only factor affecting maternal health utilization, and it is not insurmountable. One study demonstrated that when a disease is considered more serious or when medical care is deemed essential, people travel farther to obtain care (Stock, 1983).

Cost of treatment, or lack of money, is a major deterrent to seeking medical help. Several studies have shown that use of maternal health services decreased after user fees were introduced (Mbugua, Bloom, & Segall, 1995; Owa, Osinaike, & Costello, 1992; Owa, Osinaike, & Makinde, 1995; Taylor, Sanders, Bassett, & Goings, 1993); or conversely, increased when user fees were eliminated (Gana & Louadi, 1982). A study in urban Bangladesh found that quick access to cash was a major issue for pregnant families. The majority of families needed to borrow money from a moneylender or relative when it came time for delivery: 51% of families did not have enough cash for a normal delivery and 74% did not have enough for a caesarean section (Nahar & Costello, 1998). Thaddeus & Maine describe the oft-forgotten cost of productivity:

The other important component is the opportunity cost of the time used to seek health services. Time spent getting to, waiting for and receiving health services is time lost from other, more productive activities, such as farming, fetching water and wood for fuel, herding, trading, cooking and so on. As women carry out a large majority of these tasks, the value of their time and the competing demands made on it are important to consider. (Thaddeus & Maine, 1993)

Simkhada's (2007) review of factors affecting the utilization of antenatal care in developing countries found twenty-one studies showing "significant relationships between economic factors (cost of services, socio-economic status or income of the household, occupation of woman/husband and employment) and ANC

utilization.

Quality of care is an important contributor of maternal health care utilization and a significant determinant of maternal mortality. Quality of care, and perceived quality of care, can affect the decision to seek care, and therefore contribute to Phase I delays (Thaddeus & Maine, 1994). Subjects in Mathole et al.'s (2004) qualitative study on women's perspectives of antenatal care in rural Zimbabwe described poor quality of care and negative perceptions of health providers as deterrents to seeking medical care. Women delayed seeking medical treatment until their labor was well advanced to avoid being referred to negatively perceived hospitals (Mathole et al., 2004).

Perceptions of the severity of illness strongly influence the health-seeking behaviors of potential patients. A cross-sectional study in Bangladesh examined perceived delays in healthcare-seeking for episodes of serious illness, including pregnancy (Killewo, Anwar, Bashir, Yunus, & Chakraborty, 2006). Among households where at least one member "experienced an episode of illness perceived to be serious enough to warrant seeking care from health facilities or informal providers", it took the shortest time (24 minutes) to make a decision about seeking care for pregnancy-related conditions versus the amount of time (120 minutes) it took to make a decision about seeking care for chronic conditions. One of the main reasons for delay in seeking care was the 'inability to judge the graveness of the illness', which was especially profound in pregnancy-related cases. Forty-five percent of households that sought medical care for a pregnancy-related morbidity cited "inability to judge the graveness of the situation during appearance of initial symptoms as the main reason for delay in

making a decision to seek care”(Killewo, Anwar, Bashir, Yunus, & Chakraborty, 2006). This inability to judge the graveness of pregnancy-related illness represents a lack of education on ‘pregnancy-danger signs’ and inadequate ability to accurately assess the severity of illness. A study in Tanzania found that use of skilled care at delivery significantly increased with knowledge of danger signs: from 39% among women who did not mention any danger signs (no knowledge) to 68% among those who mentioned 4 or more danger signs (moderate knowledge) (Mpembeni et al., 2007). The literature suggests that perception of severity of illness in pregnancy is a significant barrier to seeking health care; fortunately, “the [perception of expense] as a barrier seem[s] to decrease dramatically when the disorder is perceived as serious, debilitating or life-threatening, and the perceived benefits of seeking care seem to outweigh the constraints”, indicating that other barriers to care become less prominent once disease severity is known (Thaddeus & Maine, 1993).

Women’s societal status plays an incredibly important role in determining a woman’s access to health services. This is largely studied in terms of a woman’s autonomy, or “the ability to make and execute decisions regarding personal matters of importance on the basis of the woman’s power over others, access to information, control over material resources, and freedom from violence by her husband or other men.” Most studies linking autonomy with reproductive health outcomes are from South Asia; these studies show that lower family size and lower desired fertility are observed among women with higher levels of autonomy (Mason, 1987). Additionally, rates of contraceptive prevalence are higher in women with greater “interpersonal control” (Miles-Doan & Bisharat, 1990;

Moursund & Kravdal, 2003); and child mortality rates are lower among women with more decision-making power (Dharmalingam & Morgan, 1996).

More research is needed on the effects of autonomy on reproductive health decisions in sub-Saharan Africa. One of the few studies of an African population showed only weak links between place of delivery and markers of women's autonomy (Fotso, Ezech, & Essendi, 2009). The effects of women's autonomy in Fotso et al.'s study varied greatly by household wealth: among middle and wealthy households, women with high overall autonomy were slightly more likely to deliver in appropriate health facilities when compared with women with low or medium overall autonomy. However, the poorest women had counterintuitive results: those with low autonomy were more likely to deliver in a health care facility than those with high autonomy. When the authors adjusted for the effect of education, only modest effects were seen, suggesting that "autonomy may not be a major mediator of the link between education and use of health services for delivery" in this population (Fotso et al., 2009).

When education is considered on its own, as measured by the number of years of formal schooling, it seems to play an important, if complex role, in the decision to utilize health services. A large cross-sectional study of 287,305 inpatients in 373 health care institutions across 24 countries in Africa, Asia, and Latin America found that women with no education had 2.7 times the risk, and those with 1-6 years of education had 2 times the risk of maternal mortality, when compared to women with more than 12 years of education (Karlsen et al., 2011). Simkhada et al.'s review of antenatal care highlighted sixteen studies that found women's education to be the best predictor of ANC visits. Women with higher



levels of education were more likely to receive the recommended number of ANC visits (Nielsen et al., 2001), and were more likely to start ANC visits early (Matthews, Mahendra, Kilaru, & Ganapathy, 2001; Miles-Doan & Brewster, 1998).

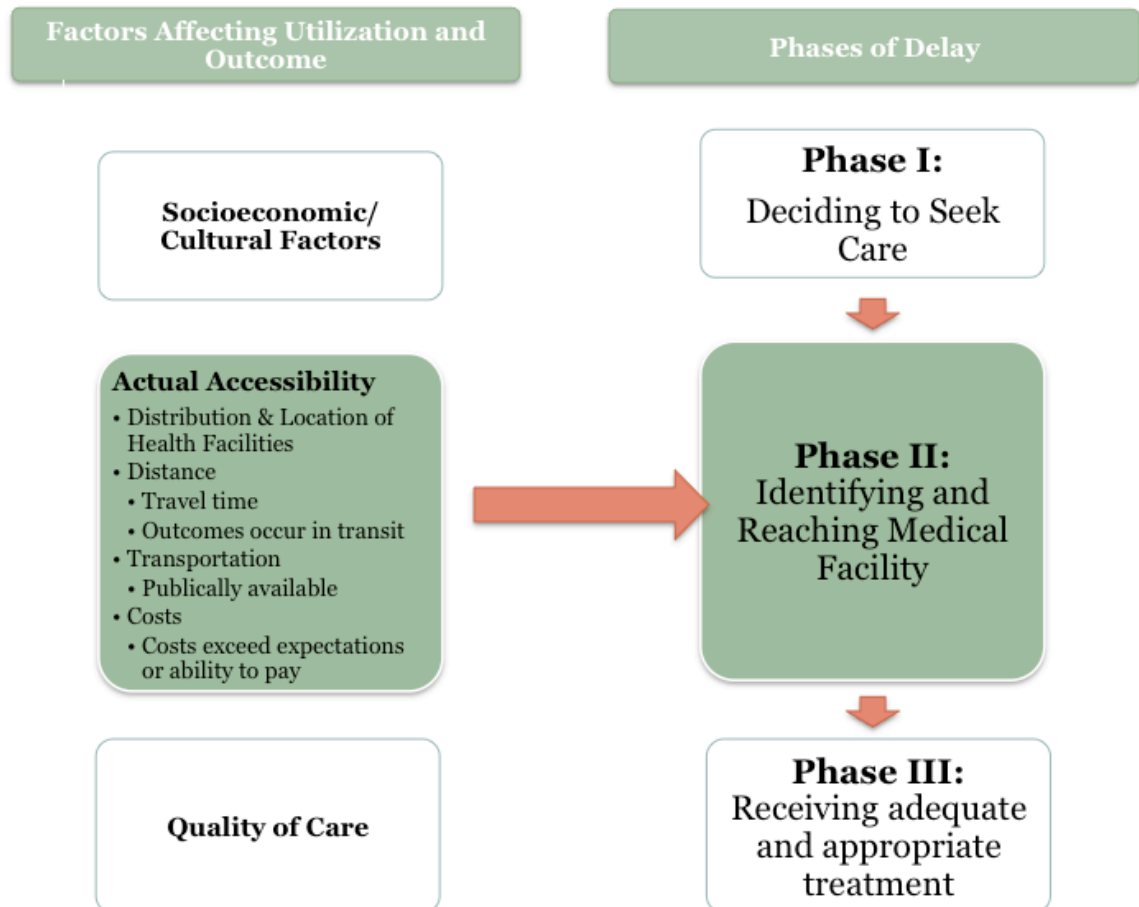
Fewer African studies examining the effect of education on utilization exist; those that do find that the relationship between educational status and health care uptake is not simple. One cross-sectional study in Kenya found a seemingly counter-intuitive relationship between education and early antenatal care in both bivariate and multivariate models: non-educated young women were 1.7 times more likely to seek ANC during the first trimester of pregnancy than their counterparts with primary education ( $p < 0.01$ ) (Ochako, Fotso, Ikamari, & Khasakhala, 2011). Secondary-level educated women in the Ochako study were more likely (OR: 2.8) to deliver with a TBA or skilled professional than women with no or primary-level education. A cross-sectional analysis in Nigeria found that increasing levels of education were associated with earlier booking of first ANC visit (Oladokun, Oladokun, Morhason-Bello, Bello, & Adedokun, 2010). A study across sub-Saharan Africa utilizing data from the 2002-2003 World Health Survey found that in poor households, women with higher literacy levels were less likely to lack maternal health care, indicating that higher levels of female literacy could potentially reduce income-related inequalities of maternal healthcare uptake (McTavish, Moore, Harper, & Lynch, 2010).

**Phase II delays.** Continuing with Thaddeus & Maine's "three delays" framework, Phase II delays are defined as "delay in reaching an adequate health care facility" (1993). These Phase II delays include "physical accessibility factors,

such as distribution of facilities, travel time from home to facility, availability and cost of transportation and condition of roads” (Thaddeus & Maine, 1993) (Figure 8). These Phase II delays can affect utilization of antenatal care, delivery in a skilled environment, and emergency obstetric care.

**Figure 8: Phase II delay, detail.**

Source: Thaddeus & Maine, 1993.



The inequitable distribution of healthcare facilities between rural and urban populations is well known, both in developed and developing countries. A systematic review by Say and Raine on the rural-urban difference in delivery service use found a large advantage for urban women compared to rural in all but two studies reviewed (Say & Raine, 2007).

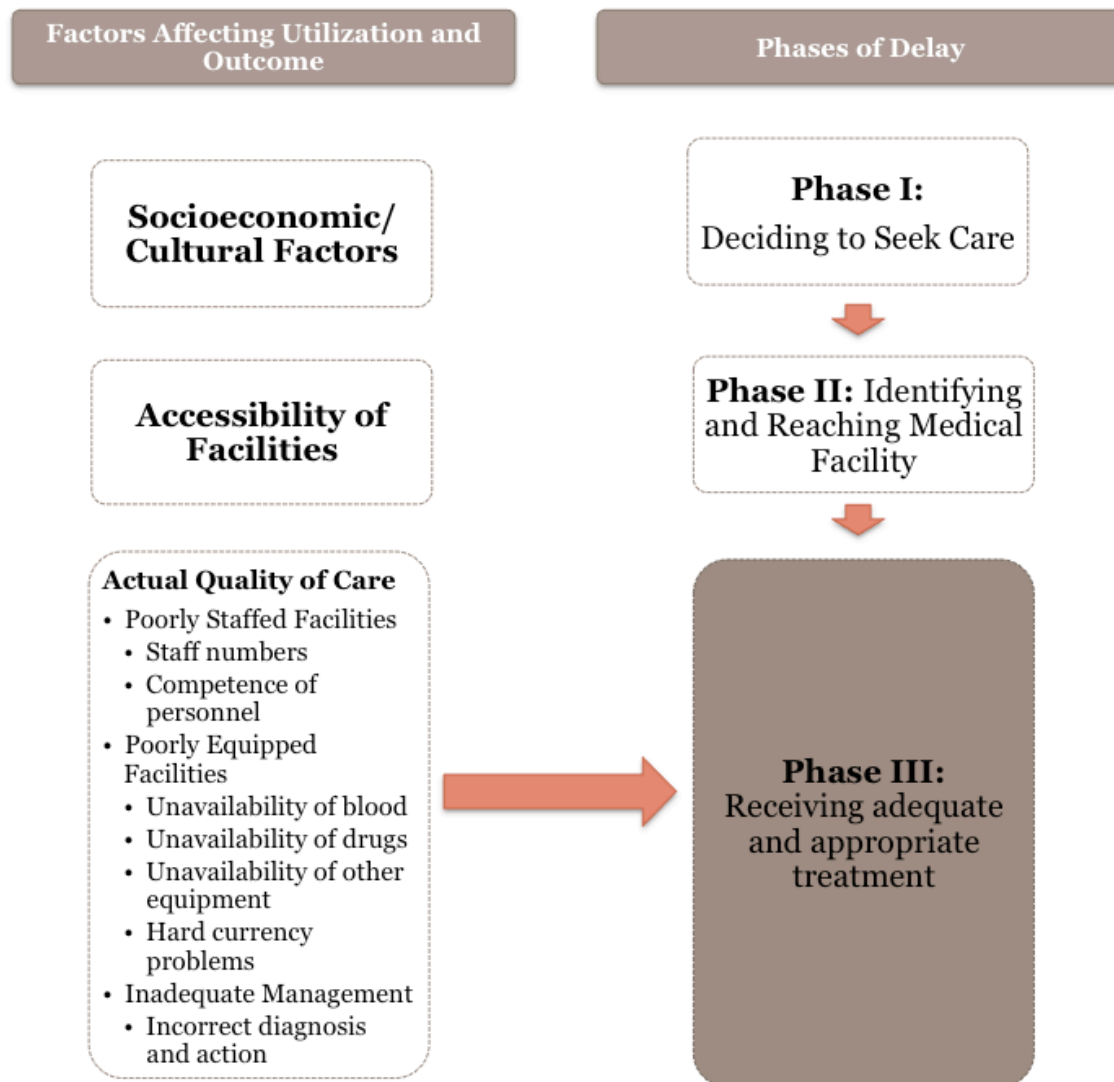
Travel distances play an important role in both Phase I and Phase II delays through the “dual influence” described by Thaddeus & Maine: first, as a disincentive to seeking medical care; and second, as a physical obstacle to reaching care after the decision has been made to seek it. Some argue that “distance to hospital also captures other aspects of remoteness such as poor road infrastructure, poor communication between communities, poverty, limited access to information, strong adherence to traditional values and other disadvantages that are difficult to measure quantitatively” (Hounton et al., 2008). Le Bacq & Rietsema’s study of accessibility in two remote rural districts in Zambia found that nearly 40% of deaths could have been avoided through improved accessibility (1997). Hoj et al.’s 2002 prospective survey of women of child-bearing age in Guinea-Bissau found the maternal mortality ratio increased significantly (OR: 7.4; CI: 1.6-132) when women lived more than 25 kilometers from a hospital (Hoj, da Silva, Hedegaard, Sandstrom, & Aaby, 2002). A fascinating study in Mali by Pirkle et al. looked at travel time during the rainy and dry seasons, a proxy for spatial access, and its effect on in-hospital maternal mortality. Travel times above 4 hours were significantly associated with in-hospital maternal mortality (OR: 3.83; CI: 1.31-11.27); travel times between 2 and

4 hours were associated with increased odds of maternal mortality (OR: 1.88), but were not significant (Pirkle, Fournier, Tourigny, Sangaré, & Haddad, 2011).

The scarcity of transportation in developing countries also plays a significant role in maternal mortality. T.G. Price's 1983 report cites a particularly sad example of a woman with placenta previa who "died only 20 miles from the Consultant Referral Hospital because the Land Rover assigned to her medical center was being used by an unauthorized person at the time, and she bled to death at the roadside waiting for a taxi" (Price, 1984). For many inhabitants of rural developing countries, the only option for transportation is by foot.

**Phase III delays.** The last delay in Thaddeus & Maine's (1993) three delays theory is Phase III: "delay in receiving adequate care at the facility" (Figure 9). This delay reflects the quality of the health care system; adequacy of the referral system; available supplies, equipment and trained personnel; and competency of available personnel. In many developing countries, the majority of maternal deaths are avoidable. Limited numbers of qualified staff, clinical mismanagement of mothers, unavailability of blood, drug shortages, missing supplies, and lack of equipment contribute to maternal mortality among women who seek care in a health care institution.

**Figure 9: Phase III delay, detail.**  
Source: Thaddeus & Maine, 1993.



Inadequate numbers of medical and nursing personnel at many facilities lead to delays in patients' receiving the necessary medical care. A 2004 WHO survey of trends between 1991 and 2000 in Cameroon, Ghana, Senegal, South Africa, Uganda and Zimbabwe found that "although the absolute numbers of health professionals had increased, the overall doctor:population ratio had fallen" (WHO, 2006a). Health workers migrate within countries from rural to urban areas, from the public to the private sector; and between countries, in search of

better facilities, higher salaries, and opportunities for career growth. The physician density in Mali is 8 physicians/100,000 population; the nurse density is 4.9 nurses/10,000 population; and the midwife population is 4 midwives/100,000 population (WHO, 2006a). Although there is no consensus about the optimal level of health workers for a population, these numbers are unacceptably low.

Inadequate supplies and ill-equipped facilities contribute significantly to deaths from Phase III delays. In sub-Saharan Africa, hemorrhage is the leading cause of maternal deaths. Therefore, emergency blood supplies are of utmost importance, but often in scarce supply. A 2008 review of literature on maternal deaths and near misses due to hemorrhage in sub-Saharan Africa found that 26% of maternal hemorrhage deaths were due to lack of blood; twenty of the thirty-seven selected studies described a direct association between lack of blood transfusions and maternal deaths (Bates, Chapotera, McKew, & van den Broek, 2008). An older, but important study, of maternal deaths in institutions in Mali found that only 2 of the 25 health facilities had a blood bank, most did not have intravenous fluids in stock, and oxytocic drugs were often not used because patients had to purchase them (Mallé, Ross, Campbell, & Huttly, 1994). A 2001 study of West African maternal deaths found the following percentages of deaths were related to substandard care: 97.1% of women who died from hemorrhage; 100% of uterine rupture deaths; 66.7% of eclampsia deaths; 50% of sepsis deaths; and 25% of other obstetric cause deaths. All told, 69.1% of maternal deaths were related to substandard care (Bouvier-Colle et al., 2001).

## Global Uptake of Maternal Health Services

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Regarding Thaddeus & Maine's "three delays" framework, it is clear that the determinants of maternal mortality are diverse and complex. Common to all these factors is the limited access of pregnant women to skilled healthcare facilities, whether by choice or by circumstance. Studies have demonstrated that the lowest rates of maternal mortality occur in areas where skilled birth attendant presence at deliveries is high, and where contraceptive prevalence is extensive (Prata, Sreenivas, Vahidnia, & Potts, 2009). Key interventions to limit maternal mortality include connecting women with the healthcare system: increasing utilization of antenatal care, delivering in a skilled facility, and receiving postpartum care. The following section is an analysis of factors affecting utilization of maternal health services on a global level.

### **ANTENATAL CARE**

Retrospective studies in Ethiopia, India, Nigeria, Senegal, and Zimbabwe have found that lack of antenatal care is an important risk factor for maternal mortality (Anandalakshmy, Talwar, Buckshee, & Hingorani, 1993; Bhatia, 1993; Garenne, Mbaye, Bah, & Correa, 1997; Hartfield, 1980; Kwast & Liff, 1988; Mbizvo, Fawcus, Lindmark, Nystrom, & Maternal Mortality Study Group, 1993). A study in urban India found that women with high levels of antenatal care were nearly four times more likely to use trained assistants at delivery than women with low levels of antenatal care (S. S. Bloom, Lippeveld, & Wypij, 1999), providing a potential explanation for the importance of antenatal care in maternal health outcomes.

A review by Simkhada et al. identified and analyzed the main factors affecting the utilization of antenatal care in developing countries: maternal education, husband's education, marital status, availability, cost, household income, women's employment, media exposure, history of obstetric complications, cultural beliefs about pregnancy, and parity (2007).

**Education.** Women with better education are more likely to receive the WHO recommended number of ANC visits (Erci, 2003; Nielsen et al., 2001). Educated women are also more likely to start ANC visits earlier than less educated women (Matthews et al., 2001; Miles-Doan & Brewster, 1998). Studies examining the effect of husband's education on use of ANC show mixed results: husband's education level was a statistically significant predictor in one province of India, but not another (Navaneetham & Dharmalingam, 2002); in the Philippines, husband's education level was a stronger predictor of ANC than a woman's education (Miles-Doan & Brewster, 1998). Women's autonomy appears to have mixed effects on reproductive health care utilization; a study in Tajikistan indicated:

...That a woman from a household in which female members make a decision on financial matters (buying major items and borrowing money) has a greater chance of receiving antenatal and delivery care relative to those who are not. Nonetheless, this female financial autonomy does not increase but rather decreases the probability of attending four times or more antenatal consultations. It suggests that whilst female autonomy is associated with a higher probability that women avail health care services, it rather has a negative influence on the use of sufficient number of antenatal care. One possible reason for this is women's increased responsibilities within the household. If women become more autonomous in the family, they tend to become responsible for household activities, which would decrease their time spent for utilizing health services outside the home. (Kamiya, 2011)



**Marital status.** Married women are more likely to receive ANC, and to seek earlier ANC than single or unmarried women (Glei & Goldman, 2000; McCaw-Binns, La Grenade, & Ashley, 1995). Age of a woman at marriage is also strongly associated with antenatal care utilization. Women studied in India (Pallikadavath, Foss, & Stones, 2004) and Nepal (Sharma, 2004) were more likely to use ANC if they were married at a later age; however, age at marriage was not statistically significant for ANC utilization in Jordan (Obermeyer & Potter, 1991).

**Age.** Review of effects of age on antenatal care utilization is inconclusive. The majority of studies indicate that women in their thirties attend ANC earlier and more frequently than teenagers and women greater than forty (Bhatia & Cleland, 1995; Matthews et al., 2001; McCaw-Binns et al., 1995; Miles-Doan & Brewster, 1998). Qualitative evaluation by Mathole et al. (2004) described women below 35 years preferring frequent clinic visits to be reassured that the baby was healthy, whereas older women who did not experience any problems were not concerned about having frequent visits. And yet, some studies suggest that women's age is not a significant predictor of utilization of ANC (Celik & Hotchkiss, 2000; Kabir, Iliyasu, Abubakar, & Sani, 2005; Nisar & White, 2003; Overbosch, Nsowah-Nuamah, van den Boom, & Damnyag, 2004), leaving the question of how age affects antenatal care utilization unanswered.

**Availability and accessibility of antenatal care.** Two quantitative studies demonstrated a significant association between the availability of healthcare services or workers, and waiting time for services. Women who had a health worker or nurse in their village were more likely to receive adequate and

early ANC visits than women without a village health worker (Magadi, Madise, et al., 2000; Nielsen et al., 2001). Qualitative studies also suggest that availability of local healthcare workers encourages usage of ANC (Griffith & Stephenson, 2001).

Say & Raine reviewed how women's place of residence and socioeconomic status contribute to maternal care utilization; their review of the effect of urban-rural residence on antenatal care during the first trimester revealed conflicting results. The highest quality study, conducted in Jamaica, found that urban women were significantly less likely than rural women to attend antenatal care in the first trimester (Gertler, Rahman, Feifer, & Ashley, 1993). In contrast, several moderate-quality studies demonstrated no significant difference between urban and rural women (Bhatia & Cleland, 1995; Navaneetham & Dharmalingam, 2002); or, reported that urban women were significantly more likely than rural women to attend antenatal care during the first trimester (Burgard, 2004). A study in Afghanistan found that significantly fewer women in rural districts received antenatal care than those in urban Kabul (Bartlett et al., 2005).

As previously discussed, distance to nearest healthcare facilities is a major determinant of maternal mortality. It also plays an important role in utilization of antenatal care. Quantitative studies suggest an increase in distance or travel time to the nearest healthcare facilities is associated with decreased antenatal visits (Glei & Goldman, 2000; Magadi, Madise, et al., 2000); and lower uptake of ANC (Nielsen et al., 2001). Qualitative studies also describe distance as a barrier to ANC service utilization (Griffith & Stephenson, 2001; Chowdhury et al., 2003; Myer & Harrison, 2003; Mathole et al., 2004).

**Cost of antenatal care.** Financial constraint is likely the most important factor contributing to non-use of ANC services. The cost of ANC service, including transportation and laboratory tests, is significantly prohibitive for many families (Adamu & Salihu, 2002; Griffith & Stephenson, 2001; Mathole et al., 2004; Mumtaz & Salway, 2005; Myer & Harrison, 2003; Overbosch et al., 2004). In a study of urban slum-dwelling women, free or subsidized services improved uptake of ANC (Chowdhury et al., 2003).

**Household income.** Recent studies demonstrated that women with high economic status were significantly more likely to receive early and adequate ANC than those with low economic status (Magadi et al., 2000; Matsumara & Gubhaja, 2001; Sharma, 2004). Proxy markers for economic status also revealed significant associations with ANC utilization; women who owned property or a car, had a flush toilet (McCaw-Binns et al., 1995; Miles-Doan & Brewster, 1998; Celik & Hotchkiss, 2000; Matthews et al., 2001; Gleit et al., 2003), had higher standards of living (Obermeyer & Potter, 1991; Navaneetham & Dharmalingam, 2002; Overbosch et al., 2004; Pallikadavath et al., 2004), or lived in communities characterized by frequent migration abroad (Gleit et al., 2003) were more likely to receive ANC. Women married to laborers or jobless men had inadequate ANC compared with those married to men in other vocations (Ciceklioglu et al., 2005).

**Women's employment.** The effect of women's employment on antenatal care utilization may be a result of both increased financial capabilities of the family and increased autonomy of the woman. Women employed as civil servants or white-collar workers used ANC services more than housewives and unemployed women (Miles-Doan & Brewster, 1998; Kabir et al., 2005). All

women in paid employment tended to start ANC earlier (Magadi et al., 2000; Navaneetham & Dharmalingam, 2002). Women's employment outside the home during pregnancy was significantly related to ANC (Erci, 2003). One contrasting study from India showed uptake of ANC through healthcare facilities was higher among unemployed women than employed women (Pallikadavath et al., 2004). Working women in the Pallikadavath et al. study were more likely to receive ANC at home, although the relationship was not statistically significant.

**Media exposure.** Exposure to mass media, especially television and radio, can influence women's use of ANC by enhancing her knowledge about delivery risks and availability of services. Seven studies reviewed by Simkhada et al. demonstrated a positive association between exposure to mass media and utilization of ANC. Women with high levels of exposure to mass media were more likely to receive ANC (Navaneetham & Dharmalingam, 2002; Pallikadavath et al., 2004; Sharma, 2004).

**History of obstetric complications.** Sadly, many women learn about the importance of antenatal care through loss and personal tragedy. Women who experienced prior fetal loss or newborn death were more likely to receive ANC in several studies (Bhatia & Cleland, 1995; Gleib et al., 2003; Ciceklioglu et al., 2005). If complications were experienced during earlier pregnancies, women were more likely to have early and adequate ANC (McCaw-Binns et al., 1995; Paredes et al., 2005); conversely, pregnant women without previous obstetric problems were more likely to attend ANC late (Matthew et al., 2001).

**Knowledge, attitudes, beliefs, and culture.** Utilization of antenatal care is influenced by a number of cultural beliefs and knowledge about pregnancy,

including “women’s knowledge of the role of antenatal care, perceived health needs, booking systems, nurse-patient relationships, economics, child care, and transport” (Abrahams, Jewkes, & Mvo, 2001). Women with family planning knowledge were more likely to seek ANC care in Nepal (Sharma 2004).

Knowledge about topics such as diet (Nisar & White, 2003), danger signs in pregnancy (Paredes et al., 2005; Nisar & White, 2003), and personal hygiene (Bhatia & Cleland, 1995) made women more likely to use ANC. Qualitative studies in India revealed a belief that pregnancy is a natural process and one should only seek ANC if problems arise (Griffith & Stephenson, 2001).

Social interactions also play a significant role in utilization of antenatal care (Erci, 2003). In rural Bangladesh, older women, especially mothers-in-law, did not consider ANC necessary during pregnancy; daughters-in-law were often discouraged from attending ANC (Chowdhury et al., 2003). Women who felt their friends and family were unsupportive were twice as unlikely to attend ANC than other women (McCaw-Binns et al., 1995).

**Parity.** Eleven studies in Simkhada’s review found strong associations between parity and ANC uptake (2007). Higher parity is a barrier to adequate use of ANC in most areas (Abou-Zahr & Wardlaw, 2001; Celik & Hotchkiss, 2000; Erci, 2003; Magadi, Madise, et al., 2000; Overbosch et al., 2004; Paredes, Hidalgo, Chedraui, Palma, & Eugenio, 2005; Sharma, 2004); excepting Ethiopia and India, which had better utilization among multiparous women (Matthews et al., 2001; Mekonnen & Mekonnen, 2003).

## **SKILLED HEALTH WORKER AT DELIVERY**

Equally, if not more, important to women's pregnancy outcomes is utilization of a skilled health worker at the time of delivery. The WHO cited skilled attendance at delivery as the "single most important factor in preventing maternal deaths" and the "proportion of births attended by skilled health personnel" is one of the indicators for Millennium Development Goal number 5. Similarly to antenatal care utilization, skilled attendance at delivery is influenced by a number of social, cultural, economic, and geographical factors.

**Education.** Almost all studies reviewed by Gabrysch and Campbell (2009) found maternal education to be positively associated with use of skilled attendants. Their review found "nearly all studies that consider husband's education find that higher education is associated with skilled attendants at delivery, although the effect is often less than that of the mother's own education."

**Autonomy.** Several studies looked at the effects of autonomy dimensions, such as position in the household, financial independence, freedom of movement, communication and sharing of housework with the husband, sex of household head, presence of the mother-in-law in the household, and decision-making power, on use of skilled attendance at delivery (Hodgkin, 1996; Stephenson et al., 2006; Gleib, Goldman and Rodriguez, 2003; Duong, Binns, and Lee, 2004; Nwakoby, 1994; Stekelenburg et al., 2004; Mrisho et al, 2007; Magadi, Diamond, Rodrigues, 2000; Furuta & Salway, 2006; Bloom, Wypij, and Das Gupta, 2001; Bhatia & Cleland, 1995; Li, 2004; Obermeyer & Potter, 1991). Most of these studies find significant associations between some autonomy dimensions and skilled attendant use, but the significant dimensions vary from study to study.

**Marital status.** Several studies found no association between marital status and skilled attendance (Gyimah, Takyi, & Addai, 2006; Mekonnen & Mekonnen, 2003; Nwakoby, 1994); however, a number of these studies did not adjust for confounders, making interpretation of results difficult.

**Age.** Gabrysch and Campbell's 2009 review of the determinants of delivery service use reported most studies "find either no effect of age or a higher use of skilled attendance among older mothers compared to younger mothers."

**Availability & accessibility of skilled health workers.** Say & Raine identified seven low-to-moderate quality studies in developing settings; these studies found urban women were significantly more likely than rural women to have a skilled health worker at delivery (Say & Raine, 2007). Among socioeconomic factors, the economic status of women seemed to have increasing effects on having a skilled attendant at delivery. One high-quality study showed no effect of economic status on usage of skilled attendants at birth, versus moderate-quality studies which all showed greater use of a skilled health worker at delivery among affluent groups (Say & Raine, 2007).

**Cost.** Thaddeus & Maine's 1994 review revealed "that costs deter poorer women from using delivery services for preventive purposes, while they play a lesser role in case of complications where the cost-benefit ratio is different" (Gabrysch & Campbell, 2009). Despite this potential cost-benefit ratio, use of skilled attendants decreases with increasing costs. Increased use of skilled attendants is found in areas where facilities are free, as compared with women in the catchment area of a fee-charging facility (Mayhew et al., 2008).

**Household income.** Most quantitative studies on delivery service use include at least one measure of household wealth; the majority of these studies find that richer households are up to five times more likely to have skilled delivery care (Gabrysch & Campbell, 2009).

**Women's employment.** Three studies found that farming women are less likely to have skilled attendants at delivery than women in other jobs (Obermeyer & Potter, 1991; Nwakoby, 1994; Addai, 2000), a possible reflection of limited financial resources and health services in rural areas. Several studies found no effect of maternal working status or occupation on delivery service use (Elo, 1992; Toan et al., 1996; Mekonnen & Mekonnen, 2003; Duong, Binns, and Lee, 2004; Chowdhury et al., 2007), while others found that women with formal jobs were more likely to use delivery services (Pebley, Goldman, and Rodriguez, 1996; Stekelenburg et al., 2004). Most studies find that a higher status occupation of the husband is associated with skilled attendance at delivery (Gabrysch & Campbell, 2009).

**Knowledge, attitudes, and practices concerning skilled healthcare workers.** Few studies examine beliefs and attitudes about utilization directly; those that exist find that “women holding biomedical beliefs (Glei, Goldman, and Rodriguez, 2003), those who had used family planning (Magadi, Diamond, and Rodrigues, 2000), and those who did not mind being delivered by a male provider (Stekelenburg et al., 2004) are more likely to use skilled providers” (Gabrysch & Campbell, 2007).

Women who delivered previously with a skilled attendant were more likely to deliver with a skilled attendant in the future. However, this association is



possibly confounded by availability and access to services (Stephenson et al., 2006), attitude towards health services (Bell, Curtis, and Alayón, 2003), previous complications, knowledge about pregnancy danger signs, and other factors (Gabrysch & Campbell, 2009). Qualitative evaluation of women who have previously delivered find that women are likely to deliver with the same provider if a previous delivery went well, and change if they are dissatisfied (Duong, Binns, and Lee, 2004; Amooti-Kaguna & Nuwaha, 2000; D'Ambruoso, Abbey, and Hussein, 2005).

**Parity.** Most studies find higher levels of service use for first and lower order births, as compared with higher order births (Gabrysch & Campbell, 2009).

**Receipt of antenatal care.** The majority of studies find that women who use ANC are much more likely to receive skilled attendance at delivery (Gabrysch & Campbell, 2009).

## **MEDICAL SETTING FOR DELIVERY**

Theoretically, birth with a skilled attendant can be performed safely in a woman's home, a health center, or a hospital. The reality for most developing countries is that access to a skilled attendant is "synonymous with facility delivery" (Gabrysch & Campbell, 2009). It is therefore important to investigate the determinants of women's utilization of a medical setting for delivery, as these factors may indirectly influence the use of skilled attendants.

**Availability & accessibility of medical facilities for delivery.** All but one of the studies on urban-rural differences in delivery in medical settings reviewed by Say & Raine found that urban women were significantly more likely

to deliver in a medical setting (2007). Higher economic status was associated with increased probability of using medical settings for delivery in the majority of studies reviewed (Say & Raine, 2007). A study in India found that women of higher economic and educational status, younger age, and parity of zero were more likely to deliver in a healthcare facility (S. S. Bloom et al., 1999).

**Media exposure.** Some studies show an increased use of facilities for delivery in women exposed to radio or TV (Stephenson et al., 2006; Navaneetham & Dharmalingam, 2002); others do not (Pebley et al., 1996; Stephenson & Tsui, 2002), although the content of media studied in the Stephenson study was related to family planning messages.

**History of obstetric complications.** Qualitative studies find that a large proportion of women report they have facility deliveries because they experienced previous complications (Mesko et al., 2003; Afsana & Rashid, 2001; Telfer, Rowley, and Walraven, 2002). Quantitative studies also reflect this association (Gabrysch & Campbell, 2009).

**Quality of care.** Perceived quality of care plays an important role on health care seeking. As Gabrysch and Campbell point out, “nearly all qualitative studies of service use in the literature report quality of care to be an important issue, with staff attitudes featuring prominently” (2009). Women in Tajikistan preferentially delivered at home because they perceived the local healthcare setting to be of very low quality and unsafe (Falkingham, 2003). Women in rural Guatemala were less likely to deliver in a healthcare setting because of the lack of social support provided by healthcare professionals, as compared with traditional midwives (Glei & Goldman, 2000). Many women who report dissatisfaction with

perceived rude, arrogant or neglectful behavior at health facilities turn to the care of a TBA or relative (Mrisho et al., 2007; Kyomuhendo, 2003; Amooti-Kaguna & Nuwaha, 2000; D'Ambruoso, Abbey, and Hussein, 2005; Nilses & Knutsson, 2002; Paul & Rumsey, 2002).

Few quantitative studies look at quality of care. A Vietnamese study found that women who delivered in a medical facility gave a significantly higher mean quality score for “health care delivery”, but not for “communication and conduct of personnel” when compared to women with previous experience with the healthcare facility who delivered at home (Duong, Binns, Lee, 2004). Facility delivery rates were higher in areas of increased number of doctors in the facilities in Uttar Pradesh, however staffing levels did not affect utilization rates in Paraguay, Uganda, or Tanzania (Tsui et al., 2002). Studies in Morocco, Burkina Faso, and Afghanistan also did not find effects on facility utilization by number of health workers, infrastructure, or presence of obstetric equipment (Hotchkiss et al., 2003; Hounton et al., 2008; Mahew et al., 2008).

**Parity.** Studies investigating the effect of parity or family composition on facility delivery have conflicting results. Some find a significant impact of number of births in the previous five years on whether the mother delivers in a health facility (Magadi, Diamond, & Rodrigues, 2000; Mekonnen & Mekonnen, 2003); others do not find an association between preceding birth interval (Magadi et al., 2000), number of children under five in the household (Gage, 2007), or ratio of children to adults in the household (Hodgkin, 1996) with facility delivery.

**Receipt of antenatal care.** Women who received high levels of antenatal care were nearly three times as likely to deliver in a facility, when

compared with women who received low levels of antenatal care (Bloom et al., 1999). Gabrysch and Campbell describe the potential cause, and pitfalls, of this association:

ANC attendance can be a marker of familiarity in interacting with the health system and with the health facility. Women who use ANC may therefore be more likely to use facilities for delivery. Alternatively, use of ANC may signify availability of a nearby service, which may also provide delivery care. In many settings, however, ANC is also provided by mobile clinics and small facilities that do not offer delivery services. Moreover, while timing for ANC is flexible and the service free in most places, this is not true for delivery services.

Any observed association between ANC use and facility use for delivery is always suspect of arising from confounding by other factors, in particular availability of and access to services, since those women closer to facilities are more likely to go to both (Stephenson et al., 2006). Other confounding factors may be knowledge of pregnancy risks and attitude towards health services (Bell, Curtis, & Alayón, 2003), complications (Mishra & Retherford, 2006) and most other factors influencing service use. When examining the effect of other determinants on use of skilled attendance, controlling for ANC use may be inappropriate as it is likely to be on the causal pathway. (Gabrysch & Campbell, 2009)

Unfortunately, some women are essentially punished for not receiving ANC: a study in Uganda described nurses abusing women without ANC cards and hindering their admission for delivery; this has untold effects on women's desire to seek delivery in a healthcare facility if they haven't receive prenatal care (Amooti-Kaguna & Nuwaha, 2000).

## Determinants of Maternal Healthcare Uptake in Sub-Saharan Africa

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Many of the determinants of maternal healthcare uptake in sub-Saharan Africa are similar to those in other developing settings. However, given the

unique sociocultural environment in sub-Saharan Africa, we will now examine the determinants of antenatal care use, delivery in a skilled health facility, and use of skilled attendants in the context of sub-Saharan Africa.

## ANTENATAL CARE

Qualitative evaluation of women in South Africa revealed several reasons for scheduling antenatal care, including perception of the role of antenatal care, medical concerns, and perceived need to book ANC in order to receive timely, quality labor services in the hospital environment (Abraham, Jewkes, & Mvo, 2001). Reasons cited for delay in booking antenatal care included:

[Not knowing one was pregnant,] a lack of time, perceptions that booking was important only when sick or near to delivery, the weather, a lack of motivation due to an unwanted pregnancy, fears of poor care, economic factors such as a lack of transport money, difficulty getting transport, effort needed to travel to the services, having to wake up early, and difficulties in arranging for child care. (Abraham, Jewkes, & Mvo, 2001).

Among Malawian survey respondents, reasons given for attending antenatal clinics included: for obstetric check, for tetanus toxoid, to avoid being sent away when in labor, relatives requested attendance, for hematinics and anti-malarials, for ill health, for health education, and to accompany friends. Reasons for not using the health center for antenatal care included: poor facilities (56.5% of respondents), family refusal (66.2%), distance (34.4%), and poor staff attitude (1.0%) (Lule, Tugumisirize, & Ndekha, 2000).

**Education.** Like other developing areas, education of African mothers matters for antenatal care. Increasing levels of education for mothers were associated with increased utilization of ANC (Gage, 2007). Residence of Malian women in high education concentration areas was associated with increased odds

of receiving adequate ANC, even if the individual woman had poor education (Gage, 2007).

**Autonomy.** Malian women who had problems getting permission to go to antenatal care were significantly less likely to receive antenatal care in the first trimester or receive the recommended number of ANC visits, when compared with women who did not have problems getting permission to go (Gage, 2007).

**Availability & accessibility of antenatal care.** Malian women with problems knowing where to go, traveling the distance to the health facility, or getting transport to a health facility were significantly less likely to receive early and adequate ANC (Gage, 2007). Distance and transportation barriers were reported by nearly 50% of survey respondents in Mali (Gage, 2007). The odds of receiving four or more prenatal visits were 1.441 times higher in areas of Mali where it took less than 15 minutes to get public transportation, as compared with areas where it took 15 minutes or longer (Gage, 2007). Interestingly, women who lived near Emergency Obstetric Care (EOC) facilities in Mali were less likely to receive four or more antenatal visits (Gage, 2007).

**Cost.** Nearly 60% of Malian women cited financial barriers as the primary barrier to antenatal care for them (Gage, 2007). Women who had trouble getting money for treatment were significantly less likely to attend prenatal care in the first trimester, or receive four or more prenatal visits (Gage, 2007).

**Household income.** Increased household wealth had positive effects on antenatal care uptake in Malian women (Gage, 2007).

**Social factors.** A large percentage of Malawian women surveyed about their decision not to receive antenatal or delivery care at a healthcare facility cited

relatives' refusal as the chief reason for not seeking maternity services (Lule, Tugumisirize, & Ndekha, 2000). Women in Mali who were concerned about having a male health provider were significantly less likely to receive early or adequate ANC (Gage, 2007). Analysis of the 2001 Mali DHS data revealed that the odds of utilizing maternal health services were higher if mothers lived in close proximity to other women who used antenatal care (Gage, 2007).

**Parity.** Higher childcare burden and birth order significantly reduced the odds of receiving prenatal care in the first trimester (Gage, 2007).

### **USE OF SKILLED ATTENDANT AT DELIVERY**

A number of factors, including education, decision-making capacity, accessibility, economics, perceptions of quality of care, and previous exposure to the healthcare system determine whether women choose to use skilled attendants or not. While traditional demographic factors such as education and household wealth play an irrefutable role, the importance of culture and society, especially with regard to traditional birth attendants in sub-Saharan African births, cannot be overemphasized.

**Education & autonomy.** In Mali, women's education level had no significant impact on utilization of skilled attendants at delivery (Gage, 2007). Women who had "big problems getting permission to go" were significantly less likely to be attended to at delivery by trained medical personnel (Gage, 2007).

**Availability & accessibility of skilled health workers.** Malian women cited not knowing where to go, long distances to health facility, and difficulties getting transport as significant barriers to using skilled birth

attendants (Gage, 2007). Nearly all studies in Africa show that rural women have less access to skilled health workers: in Ethiopia, the odds of urban women delivering with a skilled attendant are more than 8.5 times those of rural women. Even more extreme, women in Addis Ababa are nearly 40 times more likely to have a skilled attendant than rural women (Mekonnen & Mekonnen, 2003).

**Cost.** Women who stated getting money for treatment was a “big problem” were significantly less likely to use a skilled attendant at delivery (Gage, 2007).

**Household income.** Increased household wealth had positive effects in Mali on use of skilled attendants at delivery (Gage, 2007). Mahmud et al. (2006) looked at community-level poverty effects of poverty on health and found that poorer communities in both rural and urban areas are 1) more distant from hospitals, 2) staffing, equipment, and drug supplies in the local health center are worse, and 3) delivery at medical facilities and with skilled providers is less common.

**Knowledge, attitudes, and practices concerning skilled healthcare workers.** Women who were concerned about having a male health provider were significantly less likely to use a skilled attendant at delivery (Gage, 2007). In Uganda, rural women bore negative feelings towards skilled health workers at the government hospitals, and subsequently avoided them (Kyomuhendo, 2003). Even among women who knew the shortcomings and dangers of delivering with a TBA, the preference was to deliver with them:

TBAs and relatives were known or seen as fellow community members; their services were familiar and acceptable in the community. Embarrassing questions were not asked, delivery was in the preferred position and when the pains came, a woman could respond as she wished. (Kyomuhendo, 2003).



Qualitative studies have demonstrated how important cultural understanding is for women deciding between a TBA and a SBA.

**Effect of antenatal care.** Studies show that contact with the medical community through antenatal care increases the likelihood of using a skilled attendant for delivery. If women in Mali received counseling about pregnancy complications during antenatal care, they were 1.422 times more likely to deliver with a skilled attendant (Gage, 2007). Women who received no prenatal care had significantly lower odds of using skilled attendants at delivery (OR=0.206) than women who received prenatal care but no maternal counseling about pregnancy complications (Gage, 2007). Births in Mali were 5.392 times more likely to be attended by a skilled attendant in areas with high uptake of prenatal services (Gage, 2007).

## **DELIVERY IN A MEDICAL FACILITY**

Predisposing factors, such as the demographic characteristics, pregnancy risk, and health beliefs of women and their communities, intersect with perceptions of the quality of healthcare services and providers to influence utilization of medical facilities for delivery.

**Education.** Use of medical facilities for delivery increased with both wives' and husbands' education levels: 12% of women in Eritrea with no education used delivery care, compared with the 40.4% of women in Eritrea with a primary education who used delivery care, and the 86% of women in Eritrea with a secondary education who used delivery care (Woldemicael, 2010). In Ethiopia, only 2% of women without education used a medical facility for delivery,

versus 53.3% of women with a secondary education (Woldemicael, 2010).

Women's education levels had a more significant influence on delivery care than men's education levels (Woldemicael, 2010). The overall education level of a community in Africa is often a stronger predictor of an individual woman's facility use than the "also substantial individual education effects" (Gabrysch & Campbell, 2009; Stephenson et al., 2006). Stephenson et al. looked at the percentage of women with secondary education in each study cluster: those with high concentrations of secondarily educated women had significantly higher facility use rates for delivery (2006). In Mali, the concentration of secondarily educated adults (both men and women) was associated with facility delivery, but was restricted to women who had lived in the area for at least 5 years (Gage, 2007).

**Autonomy.** Women in Eritrea and Ethiopia were more likely to deliver in a medical setting if they were the sole decision maker on large household purchases, daily household purchases, or visiting families and relatives (Woldemicael, 2010). Employed women were more likely than unemployed women to use a medical facility for delivery (Woldemicael, 2010). Malian women who described getting permission to go as a "big problem" were significantly less likely to deliver in a medical institution.

**Marital status.** One study in six African countries looked separately at monogamously married, polygamously married, never-married, and formerly-married mothers and their delivery service utilization: results varied from country to country showing no association (Tanzania, Ghana, Burkina Faso), to monogamous women seeking care more often than the other groups (Ivory Coast

and Kenya), to formerly married and polygamous women seeking more care (Malawi) (Stephenson et al., 2006).

**Availability & accessibility of medical facilities.** Gage's 2007 analysis of the 2001 Mali DHS data revealed that women who described "big problems" with: knowing where to go, the distance to health facility, or getting transport were significantly less likely to deliver in a medical institution. Distance from the health facility was one of the leading factors for low turnout of mothers for medical facility deliveries

**Cost.** Women in rural Tanzania were more likely to deliver in a health facility if they had community health insurance (OR: 2.05; 95% CI: 1.31-3.07) (Kruk, Rockers, Mbaruku, Paczkowski, & Galea, 2010). Only 21% of Malian women who said getting money for treatment was a big problem delivered in a medical institution; significantly less than the 33.7% of women who did not consider getting money for treatment a problem delivered in a medical institution (Gage, 2007).

**Household income.** Increased household wealth had positive effects in Mali on use of a medical facility for delivery (Gage, 2007). Kruk et al. (2010) found that poverty did not significantly influence facility delivery in Tanzania; further research is needed to clarify this issue, as transport, medical care, and opportunity costs for an emergency caesarean section can greatly exceed a family's annual income (Kowalewski, Mujinja, & Jahn, 2002).

**Knowledge, attitudes, and practices concerning medical facilities.** Tanzanian women who believed that delivering in a health facility was very important were more likely to deliver in a health facility (OR: 1.94, 95% CI:

1.15-3.25). Women who were concerned about having a male health provider were significantly less likely to deliver in a medical institution in Mali (Gage, 2007). Kenyan women who did not use medical facilities were surveyed about their by-pass reasons: 21% cited poor care, 17% cited lack of drugs and supplies, and 12% stated lack of/poor laboratory services (Audo, Ferguson, & Njoroge, 2005). Some cultural groups in Africa believe that obstructed labor is a sign of infidelity; this belief hinders care-seeking (Mrisho et al., 2007; Thaddeus & Maine, 1994). Qualitative studies of women in Uganda reveal that maternal deaths are viewed with sadness, but as a fundamentally normal event (Kyomuhendo, 2003); maternity services are seen as an option of last resort. Focus group discussions among Ugandan women revealed a common belief that “women go to health units only if they know that they usually get complications in labor” (Amooti-Kaguna & Nuwaha, 2000).

**Quality of care.** A study in a rural district of Zambia found no effect of perceived quality of care on facility deliveries, but the overall satisfaction level among participants was 96% (Stekelenburg et al., 2004). In Uganda, unprofessional behavior was reported, with providers encouraging women not to express pain openly (Kyomuhendo, 2003). Qualitative study of Ugandan women’s reasons for non-utilization illustrate the negative view of many:

Most mothers expressed cynicism about the efficacy and nature of maternity services at local health facilities. Giving birth at a health facility was viewed as an anti-climax, which compared negatively with traditional options. Formal government health services were described as a place where impersonal health workers focused on efficiency, hygiene, orderliness and above all the suppression of emotions, which were viewed as interfering with efficient birthing. (Kyomuhendo, 2003)

A study by Amooti-Kaguna & Nuwaha (2000) found no statistically significant association between Ugandan women “feeling uneasy at delivering in health units and place of delivery”; however, the majority of women surveyed in that study did not feel uneasy delivering in health units.

**Social factors.** Kruk et al. (2010) examined the effect of village-level variables: “women in villages with a higher percentage of women who stated that delivery in a health facility was very important were more likely to deliver in a health facility, as were women in villages with a higher percentage of inhabitants that stated the quality of care at their nearest facility was excellent.” Conversely, women who lived in villages with a high percentage of women who agreed that traditional birth attendants (TBAs) have good skills were significantly less likely to deliver in a medical facility (Kruk et al., 2010). Habit or previous experience was an important factor in focus group discussions of Ugandan women: “if the previous experience in the particular place was good then one is likely to go back in the next pregnancy” (Amooti-Kaguna & Nuwaha, 2000).

**Parity.** Nulliparous women in rural Tanzania were nearly four times as likely to deliver in a facility as women who had between 1 and 4 previous deliveries (OR: 3.46, 95% CI: 1.91-6.27) (Kruk et al., 2010).

**Receipt of antenatal care.** Tanzanian women in the 2010 Kruk et al. study were more likely to deliver in a medical facility if they had greater than four antenatal care visits for their most recent birth, although the result was not statistically significant (OR: 1.34; 95% CI: 0.97-1.86). Malian women who received counseling about pregnancy complications during prenatal care were 1.6 times more likely to deliver in an institution than those who didn’t receive

counseling (Gage, 2007). Women who received no prenatal care had significantly lower odds of using skilled attendants at delivery (OR=0.188) than women who received prenatal care but no maternal counseling about pregnancy complications (Gage, 2007). Women in Zambia who knew the danger signs of pregnancy were more likely to deliver in a health facility than those without such knowledge (Stekelenburg et al., 2004). One study in rural Uganda found that completing birth plans with women made them 1.86 times more likely to deliver in a health facility; fear of consequences of delivering at home was found to be the most important factor in birth plan completion, and subsequently, delivery in a health facility (Mulogo et al., 2006).

One adverse effect of antenatal care: focus group participants in Uganda reported that if they attended ANC and were told that the pregnancy was healthy, they felt no need to deliver in the health facility. The common assumption was that if the pregnancy was uneventful, then the labor would also be uncomplicated (Amooti Kaguna & Nuwaha, 2000).

## Quality of Care: A Quest Towards Definition

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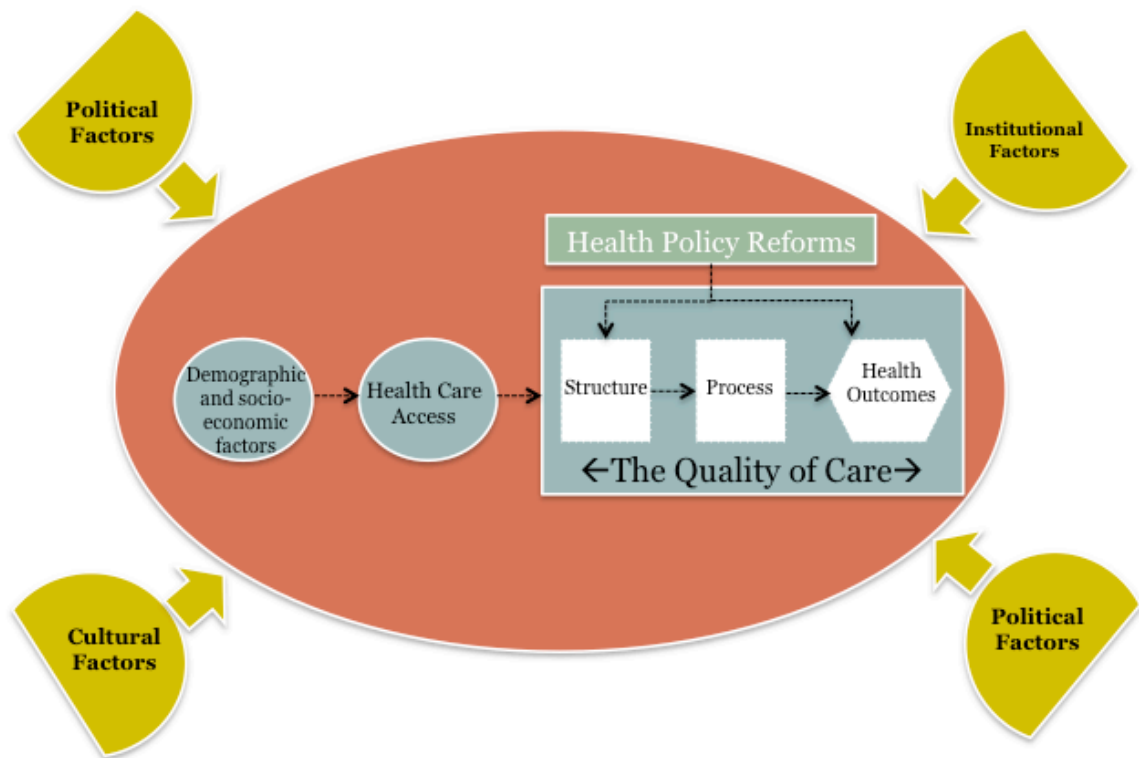
Clearly, barriers to healthcare access play a major role in maternal mortality. However, once healthcare is accessed, it must be of high quality in order to prevent maternal mortality and promote wellness. Though quality is often assessed through the interaction between patient and provider, mounting evidence suggests that the average quality of care given by providers in a population is an important determinant of the overall community's health status

(Peabody, Tozija, Munoz, Mordyke, & Luck, 2004). Given the importance of this subject, we now shift our focus to quality of care--both perceived and technical--to address the contributory role that quality of care plays in maternal health in developing countries.

At present, there is no “universally accepted definition of quality of care”, but a number of authors have proposed definitions that incorporate both the efficacy and safety of the treatment and the needs and values of patients and their families (van den Broek & Graham, 2009). In 2001, the Institute of Medicine listed six elements of quality to broaden the concept of quality of care; these elements include patient safety, effectiveness, patient centeredness, timeliness, efficiency, and equity. Avedis Donabedian (1980, 1988) was the first to propose that quality of care comprises three elements (Figures 10, 11):

- Structure refers to stable, material characteristics (infrastructure, tools, technology) and the resources of the organizations that provide care and the financing of care (levels of funding, staffing, payment schemes, incentives).
- Process is the interaction between caregivers and patients during which structural inputs from the health care system are transformed into health outcomes.
- Outcomes can be measured in terms of health status, deaths, or disability-adjusted life years—a measure that encompasses the morbidity and mortality of patients or groups of patients. Outcomes also include patient satisfaction or patient responsiveness to the health care system (WHO 2000).

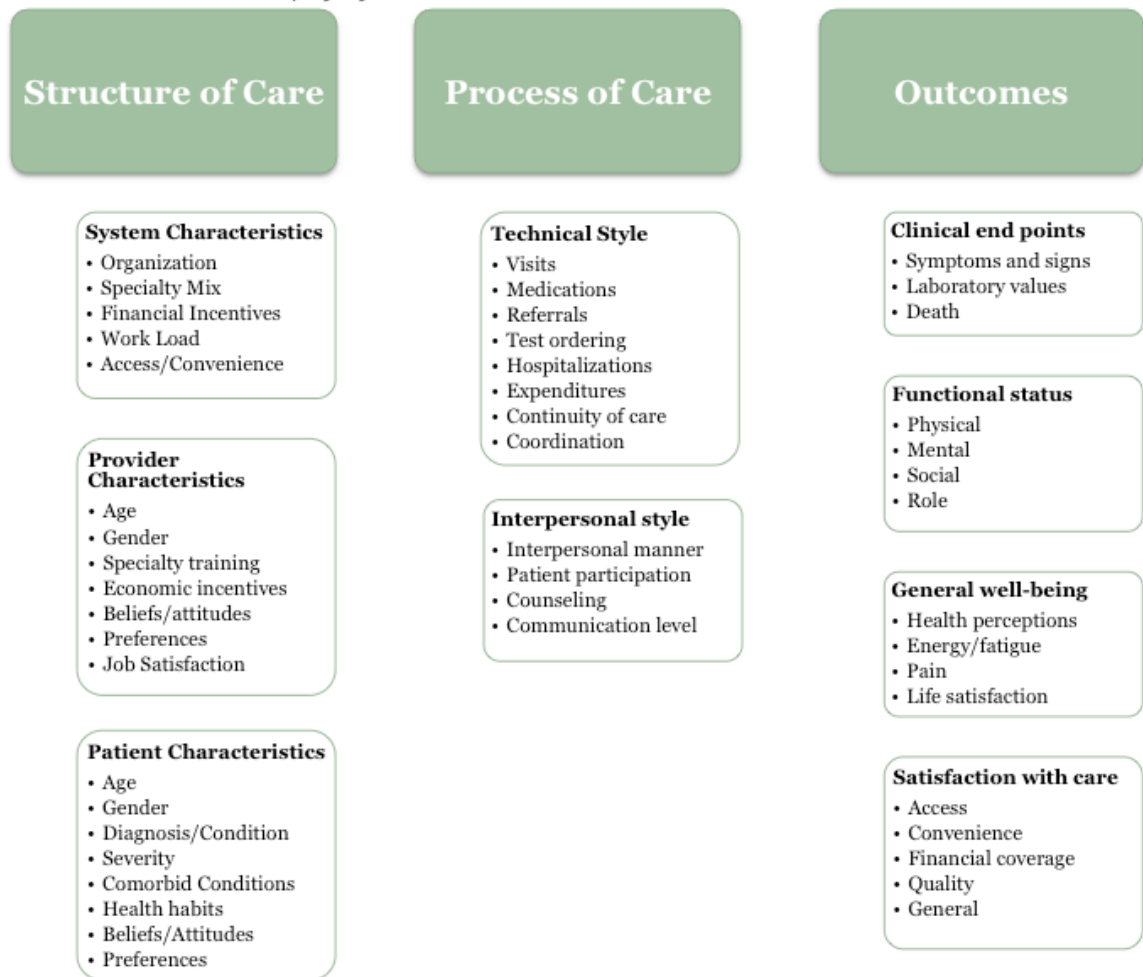
**Figure 10: Quality of Care Framework**  
Source: Peabody and others 1999.





**Figure 11: The medical outcomes study's conceptual framework.**

Source: Parlov et al., 1989.



When measuring these three elements, Longo & Daugird (1994) posit that there are:

...Three fundamental questions [to be asked] with regard to the measurement of the quality of care: “Will the method measure quality validly and reliably?”, “Will the method be useful in development of approaches to improve quality?” “Will the method produce better care?” (Longo & Daugird, 1994)

With this definition of quality of care in mind, one can evaluate measures in each section to approximate ‘true’ quality of care.

**Structure.** Measures of healthcare structure are often the easiest to obtain and most commonly used in studies of quality in developing countries (Peabody et al., 2006). One assumes that shortages in medical staff, medications, and other important supplies and facilities would be associated with lower quality of care, but Donabedian's groundbreaking work revealed that these structural elements are only weakly linked to better quality (Donabedian, 1980; Donabedian, 1988). Stronger associations between structural elements and quality of care exist in: 1) settings where physical improvements increase access to primary care in impoverished settings, or 2) increase the volume of a clinical procedure that is specifically linked to better health outcomes (Javitt, Venkataswamy, & Sommer, 1983).

Measurement of structure includes cataloging capital equipment, assessing staffing levels, and reviewing financial reports. These indicators are easily obtainable, but not necessarily helpful in assessing the quality of care being offered at a facility. Measuring the infrastructure and actual functioning of the health system, such as "patient flows, the patient referral system, or details of the relative pricing of services", is often more difficult (Peabody et al., 2006). Structural improvements alone do not have large impacts on the health of a population; these structural interventions must be made in the context of process and outcomes.

**Process.** Measurement of process, the interaction between caregivers and patients, is becoming increasingly more common. Process evaluation has great potential, as it can be measured with every visit to a provider, but also distinct measurement challenges. The private nature of physician-patient encounters,

paucity of process measurement criteria, and a lack of reliable measurement tools limit the ability of researchers to assess process (Peabody et al., 2004a). Despite these difficulties, clinical research suggests that process measures lead to better health outcomes. Given process' combination of universality, measurability, and linkage to health outcomes, it has become the preferred method of measuring quality.

Peabody et al. evaluated the strengths and weaknesses of five approaches to process measurement: chart abstraction, direct observation and recording of visits, administrative data, standardized patients, and clinical vignettes. Chart abstraction is the review of medical records for measurement of technical quality. Quality evaluations such as clinical audits, physician report cards, and profiles are based in chart abstraction. The strength of this method is the universality of medical records. Weaknesses include difficulties interpreting the record due to illegibility, or lack of pertinent information. A prospective study by Luck et al. revealed that only 70% of the clinical encounter was recorded in the medical chart. They also found 6.4% of the items recorded in the chart were false and had never actually occurred (J. Luck, Peabody, Dresselhaus, Lee, & Glassman, 2000). The inherent heterogenic quality of medical records and the difficulties and costs involved in medical record abstraction make chart review an adequate, but not ideal, method of measuring process.

Direct observation and recording of medical visits is a common approach to process measurement in developing nations (Nolan et al., 2001). The drawback of this method is that provider and patient must be informed of the observation or recording, for ethical reasons, and this inherently introduces participation bias.

The provider, knowing they are being watched, may change behaviors as a result of being evaluated. In addition to participation bias, the cost of training observers is significant, and variations exist from observer to observer (Peabody et al., 2006).

Another method of process measurement, audit of administrative data, can be performed in almost all healthcare settings. Once established, an administrative data collection system is ongoing and can deliver information on patient charges and cost inputs. Unfortunately, administrative data usually lacks sufficient clinical data to be useful in evaluating healthcare process. One study found that an incorrect diagnosis was recorded in administrative data 30% of the time, and that the administrative data only reflected the actual clinical diagnosis 57% of the time (Peabody et al., 2004a). Although accuracy can be improved, the lack of clinical data contained in administrative data will persist in limiting its utility in process evaluation.

Standardized patients are often used as the gold standard of process measurement (Luck and Peabody, 2002). Standardized patients are actors trained to simulate illness, who “present themselves unannounced into a clinical setting to providers who have previously given their consent to participate in the study” (Peabody et al., 2006). At the end of their visit, these standardized patients report on both the technical and interpersonal facets of the clinical encounter. The advantages of standardized patients are many: they can provide information on both the technical and personal aspects of quality of care, they are “reliable over a range of conditions”, and they “provide valid measurements that accurately capture variation in clinical practice among providers over time”.

Disadvantages of standardized patients include the costs of training and employment, and the limited range of conditions that can be simulated (Peabody et al., 2006).

The last process measurement method described by Peabody et al. is clinical vignettes. This tool was “developed explicitly for measuring quality within a group of providers and evaluating quality at the population level” (Peabody et al., 2006). Vignettes present providers with several cases; the participating provider is asked to “take a history, do an examination, order the necessary tests, make a diagnosis, and specify a treatment plan” (Peabody et al., 2006). Included in the vignettes are open-ended questions and interactive responses designed to simulate a clinical visit and evaluate the physician’s knowledge. Two prospective validation studies of clinical vignettes demonstrated vignettes to have “greater predictive validity of process [than the] abstracted medical record” (Peabody et al., 2006). Advantages of vignettes include responsiveness to variation in quality and provider acceptability if given anonymously (Peabody et al., 2004b). Identical vignettes can be given to multiple providers, limiting bias and revealing more accurate measures of quality. Vignettes can also be used for pre- and post-evaluation of policy interventions designed to improve quality. Lastly, “they are inexpensive to administer and straightforward to score, making them particularly useful in developing countries” (Peabody et al., 2006). They are, however, a written examination and therefore may not accurately reflect a provider’s normal response to a patient complaint.

**Outcomes.** Good outcomes are the primary goal of all health interventions. They are not, however, an efficient way to measure health care quality. Peabody et al. cite two reasons:

The first is the quality conundrum. A patient may receive poor-quality care but may recover fully, or a patient may receive high-quality care for an illness such as cerebral malaria and still not recover. Second, adverse health outcomes are relatively rare and obviously do not occur with every encounter. (Peabody et al., 2006)

At present, many of the statistics reported by the WHO are outcome measures (e.g. number of infant deaths, maternal mortality rates, rates of HIV infection). However, given the relative rarity of many of these outcomes, outcome measurement is often too macro-level to detect nuanced changes in quality.

## Quality in maternity care

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The Institute of Medicine defines quality of care in maternal health as encompassing six elements: effectiveness, safety, timeliness, efficiency, equity and responsiveness to the preferences, needs, and values of mothers and their families (Institute of Medicine, 2001). Adding to this definition, Hulton et al. defined quality of care as:

...The degree to which maternal health services for individuals and populations increase the likelihood of timely and appropriate treatment for the purpose of achieving desired outcomes that are both consistent with current professional knowledge and uphold basic reproductive rights. (Hulton, Mathews, & Stones, 2000)

A definition of maternal quality of care must encompass several important concepts: access, professional standards for treatment & outcomes, and

reproductive rights. Van den Broek & Graham posit that this definition of quality of care also highlights that:

The use of services and outcomes are the result not only of the provision of care but also of women's experience of that care. Provision of care may be deemed of high quality against recognized standards of care but unacceptable to the woman, her family, and the community. Conversely, some aspects of care may be popular with women but may be ineffective or harmful to their health and that of their babies. (van den Broek & Graham, 2009)

The Institute of Medicine and Hulton et al. advocate a definition of quality of care where both technical medical care and the patient's perception of medical care are satisfactory. This concept is important because it highlights how "provision of care may be deemed of high quality against recognized standards of care but unacceptable to the woman, her family and the community. Conversely, some aspects of care may be popular with women but ineffective or harmful to their health and that of their babies" (van den Broek & Graham, 2009).

Pittrof, Campbell, and Filippi (2002) point out that maternity care differs from other areas of health care in several ways, and propose that a definition of quality of care in maternal health must reflect these differences. First, maternal health care users are most often well; subsequently, maternity services should strive not to "over-treat" and "over-medicalize" pregnancy and childbirth, as this "can lead to iatrogenic complications and waste resources". Second, some users of maternal health services will develop conditions requiring higher acuity maternity care. As these conditions are unpredictable and often life threatening, services must be wary of "under-treating" expectant mothers. Third, maternal health services have two patients – mother and baby. Outcomes for both are important, and the advantages and disadvantages for each patient must be

considered in determining treatment. Last, maternity services deal with “the culturally and emotionally sensitive area of childbirth”; non-biomedical outcomes and factors may be more important in maternal health services than in other areas of health care (Pittrof, Campbell, and Filippi, 2002).

In consideration of these unique aspects of maternal health care, Pittrof et al. proposed the following definition for quality of care in maternity services:

High quality of care maternity services involves providing a minimum level of care to all pregnant women and their newborn babies and a higher level of care to those who need it. This should be done while obtaining the best possible medical outcome, and while providing care that satisfies women and their families and their care providers. Such care should maintain sound managerial and financial performance and develop existing services in order to raise the standards of care provided to all women. (Pittrof, Campbell, and Filippi, 2002)

Inherent in the aforementioned definition is a number of domains: 1) a minimum level of care for all pregnant women and their newborn babies, 2) capacity for higher level of care, 3) cultural competency, 4) conscientious resource distribution, 5) user satisfaction, and 6) sustainability.

Pittrof et al. define minimum care as “care that achieves the best outcomes on a population level if provided to all pregnant women and their newborn babies”. This care must be evidence-based and cost effective; the potential harm of interventions should be low, and interventions must have an acceptable cost-benefit ratio. As the majority of pregnancies, deliveries, and postpartum periods are uncomplicated, minimum care in this context should consist of preventative measures, screening, and cost-effective treatment of women who screen positively (Pittrof, Campbell, and Filippi, 2002). Examples of these preventative and screening measures: delivering in a hygienic environment; tetanus



vaccinations during pregnancy; iodine supplementation in iodine-deficient areas; screening for syphilis & HIV and treating identified individuals; and providing delivery in the presence of a skilled attendant (Ades, Sculpher, Gibb, Gupta, & Ratcliffe, 1999; Cameron, Thong, Young, & Liston, 1997; Mahomed & Gulmezoglu, 1998; Marseille et al., 1999). The WHO found that a basic regime of four antenatal visits, with an emphasis on evidence-based interventions with proven effectiveness, was as efficacious in preventing adverse events in low-risk women and their babies as a typical regime of up to 12 visits, and less costly (Villar, 2001). Also included in this definition of minimum care is “reaching all women” or the concept of accessibility and equity. Maternity services are to be considered low quality at a population level if they are not available to “rural, illiterate, very poor, young, unsupported and or minority ethnic-group women” (Belizan, Farnot, Carroli, & Al-Mazrou, 1998; Fawcus, Mbizvo, Lindmark, & Nystrom, 1996; Friedman, 1994; Pittrof et al., 2002).

Although most women will have uncomplicated pregnancies and deliveries, it is estimated that 9-15% of pregnant women require more than the minimum of medical care (Koblinsky, McLaurin, Russel-Brown, & Gorbach, 1995; Maine, McCarthy, & Ward, 1992; WHO, 1994). Unfortunately, the empiric basis for this estimate is weak at this time. A study in the US found that 8% of mothers or infants had serious complications in pregnancy, 12% necessitated higher-level care in labor, and 4% needed extra care after delivery (Rooks, Weatherby, & Ernst, 1992). In Sweden, 14% of low-risk mothers were transferred to a higher acuity birthing center antenatally, 23% of the remaining women were transferred during labor, and 3% in the postpartum period (Waldenstrom, Nilsson, &

Winbladh, 1997). A study in urban centers in West Africa found that 3-9% of pregnant women experienced severe obstetric morbidity (Bouvier-Colle, Prual, & de Bernis, 1998). At this time, it is not possible to predict what women will develop complications; thus, it is recommended that all women have a skilled attendant at birth (Inter Agency Group for Safe Motherhood, 1998). As Pittrof et al. mention: in developing countries, it is “impossible (and also not desirable) to concentrate all pregnant women in large hospitals for their labor and delivery, [and thus] an essential part of good maternity care is a good transportation system to enable referrals to a higher level of care” (2002).

Both minimum and higher-level care must be contextually and culturally specific. Maternal health interventions differ in how culturally acceptable they are, how easily they are introduced, how trained the provider needs to be, and how costly they are per adverse outcome prevented (Pittrof et al., 2002). In some areas, iodine-supplementation will be a critical intervention to prevent newborn morbidity, for others, this supplementation will be unnecessary. Quality care in maternal health must be evaluated on a local and national level. Minimum care packages will differ between countries.

Pittrof et al.’s definition of quality care considers resource distribution and the equitability of interventions on a population level. They state:

Providing higher-level care for some should generally not interfere with providing minimum care to the entire population. Primary care creates demands for secondary care and loses credibility if these cannot be met. (Pittrof et al., 2002)

Maternal health systems must maintain a balance between preventative measures for all and life-saving procedures for some. Life-saving care for a few

women might be worthwhile over a less efficacious preventive measure for all women “because the individual health loss (maternal death or near-miss) is far from negligible” (Pittrof et al., 2002).

High quality of care must, of course, achieve the best possible medical outcomes. These outcomes are influenced by a number of factors – the nature of the problem, the efficacy of available treatments, and the quality of care. Some adverse outcomes occur despite good quality of care. In addition, given the unique ‘two patients’ treated by maternal health services, outcomes can be different for mother and baby. Interventions that enhance the benefit for one patient may reduce benefits for the other, e.g. the benefits of caesarean section for a term baby in breech presentation may lead to more morbidity for the mother (Abrahams et al., 2001; Hannah et al., 2000; van-Ham, van-Dongen, & Mulder, 1997).

A critical component of quality of care, in both maternal health and other medical services, is user satisfaction. This user satisfaction depends on a variety of factors, including value assigned to medical outcomes; “users may feel satisfied with the care they receive despite poor biomedical outcomes, if they feel everything possible was done” (Pittrof et al., 2002). An examination of the literature reveals that user satisfaction and poor outcomes are often highly contextual and self-reinforcing: a qualitative study in Haiti found that women expected poor quality and therefore delayed seeking care. This delay then contributed to poor outcomes and reinforced the expectation of poor quality of care. The standard-of-care determined by providers may also be culturally unacceptable in certain areas: in Brazil, many mothers request cesarean section,

even when not medically indicated; in contrast, many women in sub-Saharan Africa try to avoid caesareans, as they are considered “an indicator of infidelity, are costly to the family, [and/or] are associated with death” (Barros, Vaughan, Victora, & Huttly, 1991; Betts, 1993; Grossman-Kendall, Filippi, De Koninck, & Kanhonou, 2001; Kamara, 1990; Pittrof et al., 2002). Maternal quality of care definitions must also consider the satisfaction of providers. Treatment plans may differ among doctors and midwives.

Lastly, quality maternal health services must be sustainable and financially sound. One caveat of improving maternal health services is the financial diversion away from current services:

Using resources to create future benefits means denying those resources to women using the services at present. Investing in future quality and sustainability of the health service could thus reduce the current quality of care. For example, sending the single midwife of a health center on a training course means that she is not available to deliver babies. Rationing antibiotics for use later during a year means denying them to some patients who may benefit from them now. (Pittroff et al., 2002)

Content of care must be constantly adapted to reflect the availability of resources and the evolving evidence base. One way to create a sustainable system is to use standards and guidelines to achieve a transparent system. Another is to measure performance and publicize findings and recommendations from audits and surveys; a historical analysis of the downtrend in maternal mortality in Western countries found a direct correlation with the availability of maternal death statistics (de Brouwere, Tonglet, & Van Lerberghe, 1998; Pittrof et al., 2002).

Defining quality of care in maternal health is not a simple task: local standards and criteria must be developed for the described domains, as all (minimum care for all women, higher level of care for some women, users' and

providers' satisfaction with care, best outcomes for mother and baby, and sound managerial and financial performance) are influenced by local culture, community expectations, and available resources (Pittrof et al., 2002). In the next section, we examine how technical quality of care and user satisfaction differ, and how they influence uptake of maternal health services.

## Distinguishing Technical Quality of Care and Patient Satisfaction

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In order to understand how healthcare quality affects utilization of healthcare, one must first examine the relationship between technical quality of care and perceived quality of care, or “service quality”. Unfortunately, a paucity of data is available on the relationship between measures of technical service quality and their correlation with perceived quality of care and patient satisfaction.

Interpersonal elements of the doctor-patient interaction are a notable part of quality of care, but these interpersonal elements are separate from the concepts of patient satisfaction and perceived quality of care. Certainly, interpersonal elements influence patients' perception of care and their satisfaction with care; interventions to improve patients' perceived quality of care and satisfaction will have direct effects on process measures of quality of care.

However, the relationship between patient satisfaction, patient perception of quality of care, and objective or technical quality of care is quite complex and the literature does little to bring these three concepts together. Perhaps the paucity of data comparing perceived quality of care and technical quality of care

arises from the inherent difficulties in teasing out the causality between patient satisfaction, perceived service quality, and true quality of care. Donabedian states:

It is futile to argue about the validity of patient satisfaction as a measure of quality. Whatever its strengths and limitations as an indicator of quality, information about patient satisfaction should be as indispensable to assessments of quality as to the design and management of health care systems. (Donabedian, 1988)

Doubtless, patient satisfaction is important to health care quality, but how does patient satisfaction differ from perception of health care quality? Most patients lack the medical expertise and skills to evaluate whether their physician's services are performed properly, or are necessary at all (Newcome, 1997; Williams, 1994). As a consequence of this naiveté, researchers propose that health consumers rely heavily on nontechnical process-related dimensions such as the patient-provider relationship and/or the surrounding service environment to evaluate perceived service quality (Bowers et al., 1994; Ettinger, 1998; Donabedian, 1988). One prevailing view is that "service quality represents a cognitive judgment, whereas satisfaction is a more affect-laden evaluation" (Choi et al., 2004; Oliver, 1993, 1998; Gooding, 1995). Using this framework, one can adapt Tse and Wilton's (1988) definition of customer satisfaction to fit a patient satisfaction model wherein patient satisfaction is "the [patient's] response to the evaluation of discrepancy between prior expectations and the actual performance of the [healthcare system] as perceived after [the medical encounter]".

Choi et al. (2004) used a patient population from South Korea to model the causal sequence of health care consumer satisfaction. They defined service

quality (or perceived quality of care) as a cognitive process evaluating perceived convenience of the care process, health care providers' concern for the patient, physicians' concern for the patient, and tangibles; patient satisfaction was evaluated from an "affect" frame of reference and involved patient's satisfaction with the treatment in the hospital and their decision to seek medical care. Using these variables to model the causal relationship of health care consumer satisfaction, Choi et al. found the following results:

**Cognition (Service Quality and Value) → Affect (Satisfaction) → Conation (Behavioral Intention)**

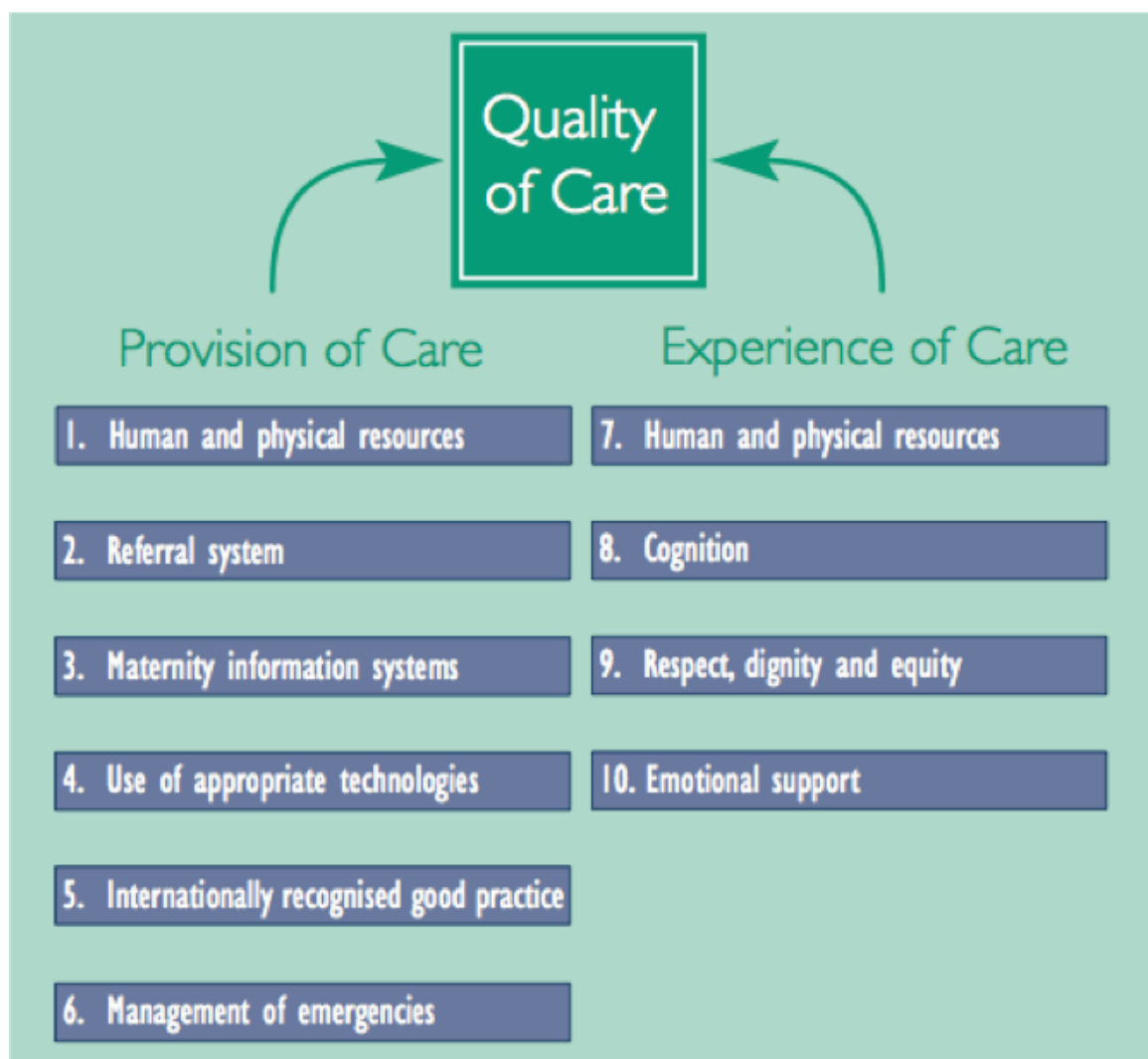
This model suggests that 1) perceived service quality influences patient satisfaction, 2) perceived service quality affects patient behavioral intentions, 3) patient satisfaction with health care services impacts behavioral intentions, 4) perceived health care service quality impacts the perception of service value, 5) perceived value influences patient satisfaction, and 6) perceived value influences patient behavioral intentions (Choi et al., 2004). Upon further analysis, service quality was more important than perceived value in defining patient satisfaction and behavioral intentions (Choi, Cho, Lee, Lee, & Kim, 2004).

The literature indicates that perceived quality of care is directly linked, and in fact partially responsible, for patient satisfaction. We turn now to the question: how does perceived quality of care relate to the Donabedian model of technical quality of care? A thorough review of the literature resulted in few studies examining the perceived and objective quality of care in maternal health services. Hulton, Matthews, and Stones (2007) suggested a quality of care framework encompassing two groups (Figure 12):

The first group concerns women’s experience of hospital maternity care—including their impression of the human and physical resources; their understanding of the situation; the respect that they are accorded, their sense of dignity and equity; and the emotional support that they receive. The second group reflects key aspects of care provision by the facility, including the quality of human and physical resources; the quality of their referral links and information management systems; the use of appropriate technologies in caring for women and hospitals’ adherence to internationally recognized good practice. (Hulton et al., 2007)

**Figure 12: A framework for assessing both perceived and technical quality of care in maternity services.**

Source: Hulton, Matthews, and Stone, 2000.



Both experience and provision of care are critical to ensuring effective maternal care. If a woman’s negative experience in a maternal health facility discourages



her from returning for future care or delivery, then objective measures of that facility's quality of care are purely conceptual.

Speizer & Bollen (2000) examined the relationship between objective measures of quality and perceptions of quality of family planning facilities in rural Tanzania. Results from this study indicated that the important determinants of perceptions of health care quality among study participants were perceived travel time to the facility, availability of immunizations, and availability of maternal and child health services. Men also rated the ratio of staff to outpatients as an important factor. Data from the Speizer & Bollen study showed a moderate amount of variance in quality measures, "indicating that perceived quality is not fully predicted by common objective measures of quality" (2000). Women's perception of quality was not related to a number of technical measures of quality, including: visible technical capacity, level of sanitation, number of types of staff trained in family planning, or the information provided to clients (Speizer & Bollen, 2000).

A survey among urban Indian women found that women's understanding of what was happening to them was an important determinant of their perception of quality of care (Hulton, Matthews, and Stones , 2007). In the Hulton study, 75% of women did not have any explanation from their primary healthcare attendant about what was happening to them during labor and delivery. Descriptive study of this population indicated that the quality of interpersonal care and respect was not adequate:

Users experienced unnecessary procedures and a number were unhappy at having to undergo these procedures. They were examined in crowded places, where curtains or blinds were not used regularly to shield women

being examined. Users labored in public areas, sometimes unsupported for long periods. While the majority of women delivering at public hospitals did report that staff treated them kindly and with understanding, one in four women delivering at a public institution described some level of negative experience of care from nurse-midwives, with 10% reporting that they felt their care was hurried or neglectful and an additional 15% reporting that they were shouted at or slapped during labour. (Hulton, Matthews, and Stones, 2007)

In addition to insufficient respect for privacy and confidentiality, Hulton et al. found that women being forced to deliver without the person of their choice were likely to feel alone. This enforced separation of family members can actually cause higher intervention rates: adequate psycho-social support during labor demonstrably decreases medical interventions such as the use of forceps, analgesics, and caesarean sections (Kennell & Klaus, 1991); support during labor speeds recovery, promotes early bonding between mother and infant, reduces post-partum anxiety and depression, and reduces time spent laboring (Hofmeyr, Nikodem, Wolman, Chalmers, & Kramer, 1991).

Hulton et al. examined not only women's experience of care, but also the human and physical resources available in study facilities. Situation analysis revealed lack of beds for delivering patients, non-utilization of curtains and blinds, caesarean sections being performed at institutions not equipped to perform life saving operations, inaccessibility of anesthetists, and lack of blood banks at surgical sites (Hulton, Matthews, and Stones, 2007). Some of the study institutions also regularly ran out of essential drugs, and disturbingly, dismissed women--unexamined and regardless of labor progression--if they had not booked prior to arrival. One of the three study hospitals had illegible, incomplete medical records; all three study hospitals did not review case notes of poor outcomes in

order to identify avoidable factors or improve future care (Hulton, Matthews, and Stones, 2007).

While quantitative data was not collected in the Hulton et al. study (2007), findings from their case study suggest that perceived quality of care and technical quality of care go hand in hand. Where there are shortcomings in one, there are likely shortcomings in the other. In order to improve quality of care, one must address both experience of care and provision of care.

A primary care study from Afghanistan linked health facility assessments with patient exit interviews to correlate technical and perceived quality of care (Hansen et al., 2008). Holding other variables constant, patient perception of quality is significantly higher when health workers conduct more detailed patient histories and physical examinations, and communicate more clearly with patients. Poorer patients are more likely to rate quality higher. Quality of care is perceived as better when patients are treated by a physician. Client's perception of care was lower when the patient had to spend more than 100 Afs (1 US Dollar = 50 Afs) for transportation to the facility; or when the wait before being seen by a provider was longer (Hansen et al., 2008). Type of facility, physical condition of the facility, visible technical capacity, maternal and child health service capacity, functional equipment availability, essential drug availability, and time spent with the patient were not significantly associated with increased or decreased perceptions of care among Afghani study participants (Hansen et al., 2008).

Patients' perceptions of healthcare quality depend on their individual characteristics, and affect their uptake, compliance, follow-up, and long-term lifestyle (Zaslavsky et al., 2000). The results from the 2008 Hansen et al. study

demonstrate that behavior of health personnel is strongly correlated with client perceived quality. The interpersonal relationship between patient and provider, cultural sensitivity, and gender awareness also affect patient access and utilization in both developed and developing countries. As a result, increasing research in measurement of patient satisfaction and patient responsiveness as an outcome measure is needed.

## Healthcare Quality and its Influence on Uptake

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Poor healthcare quality, or perceived healthcare quality, is a significant barrier to uptake of maternal health.

**Patient satisfaction.** It is undeniable that patient satisfaction leads to increased patient compliance and higher rates of patient retention; in this way, patient satisfaction directly influences health care outcomes (Peyrot et al., 1993; Zeithaml, 2000; Calnan, 1988; Pascoe, 1983). A study in rural Bangladesh found that the most powerful predictor for client satisfaction with government healthcare services was not technical competence, but rather provider behavior (Aldana, Piechulek, & Al-Sabir, 2001).

Lule et al. (2000) modeled dissatisfaction determinants of non-utilization of a health facility in Malawi. Dissatisfaction with constant lack of drugs, antibiotics, and analgesics at the health center was strongly associated with non-use of the health facility. When facilities and supplies were modeled together, women who were dissatisfied with the provisions were 13 times less likely to use the health center than women who were satisfied with the facilities and supplies.

**Perceived quality of care.** Mounting evidence suggests that perceived quality of care is one of the principal determining factors of utilization and non-utilization of services. A study of perceived quality of care among users and non-users of modern health care revealed significant variation between the two groups (Baltussen & Ye, 2006). The authors posit that these “barriers to increased utilization are likely related to those dimensions that are rated poorly by all respondents (as they may deter overall use) and/or that show large differences in perceived quality between users and non-users (as they may explain why the latter group refrains from using modern health services)” (Baltussen & Ye, 2006). Mathole et al. (2004) observed poor quality of care and negative attitudes of staff were barriers to utilization in Zimbabwe.

Users of modern health services in Burkina Faso were significantly more likely to rate physicians highly in compassion, respect for patients, honesty, follow-up, and clinical exam than those who did not use modern health services (Baltussen & Ye, 2006). Both users and non-users were negative about resources and services of the healthcare system, especially the availability of drugs. Non-users of modern health care rated the financial accessibility of health services much lower than users of health care, suggesting that perceived (& actual) cost is an important barrier to usage. The Baltussen & Ye study found that perceived technical aspects of quality of care (“good diagnosis” and “good drugs”) were not significantly different among users and non-users. The authors attributed this finding to the potential inability of lay people to adequately judge technical quality of care (Baltussen, Ye, Haddad, & Sauerborn, 2002).

Kiwanuka's review of barriers to receiving healthcare in Uganda revealed that perceived poor quality of services was a barrier to care in nine of nineteen studies. These barriers included perceived poor quality of services, unpleasant health worker attitudes, long waiting times, lack of skilled staff, complaints of abuse and neglect, poor infrastructure, poor management, perceived inadequate services, and low confidentiality (Kiwanuka et al., 2008). Audo et al. found similar results in Kenya. The main reasons cited for bypassing municipal health facilities were: poor care (21% of respondents), lack of drugs and supplies (17%), and lack of, or poor quality, laboratory services (12%). There was a strong association between the perceived quality of care and utilization of maternal child health services (Audo et al., 2005).

Several studies found that patients were willing to travel longer distances, skipping their local health center, in search of perceived better quality services, indicating that perceived quality of care can overcome other barriers to access, including distance and transportation difficulties (Ndyomugenyi, Neema, & Magnussen, 1998; Odaga, 2004; Okello, Lubanga, Guwatudde, & Sebina-Zziwa, 1998). Women who lived in villages where a high percentage of inhabitants stated the "quality of care at their nearest facility was excellent" were significantly more likely to deliver in a health facility (Kruk et al., 2010). Women who lived in villages with highly positive views of doctors and nurses' skills were more likely to deliver in a medical facility.

Prospective data from rural Bangladesh measuring perceived quality of care based on female study participants' responses to questions about interpersonal interactions with outreach workers revealed that women who

perceive their interactions with workers to be high-quality were more likely to continue using contraceptives than women who perceived their interaction to be low-quality (Koenig, Hossain, & Whittaker, 1997). On a community level, areas where quality is perceived to be better have higher use of contraception among women (Mroz, Bollen, Speizer, & Mancini, 1999).

**Technical quality of care.** Audo et al. found that the capacity of municipal health facilities was not significantly associated with utilization of maternal and child health services (2005).

## Measuring quality in maternity care

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The Institute of Medicine's six elements of quality care—patient safety, effectiveness, patient centeredness, timeliness, efficiency, and equity—can be regarded from two perspectives: patient perception of quality, and technical or professional assessment (Peabody et al., 2006). In this section, we will discuss technical and professional assessment of quality of care in maternal health; in the next, we will consider how one measures patient perceptions of quality care.

### MEASURING TECHNICAL QUALITY

Several methods of measuring technical quality in maternity care have emerged. Many tools for measuring quality also act, purposively, as an intervention to improve quality. Adeyi & Morrow propose that any method used to assess the quality of essential obstetric care must satisfy seven criteria:

- i) Be derived from scientifically sound and locally defined guidelines for what constitute care of good quality; ii) enable objectively verifiable measurements of the performance of critical tasks; iii) be sufficiently

discriminating to detect variations in quality among health centers, thereby enabling managers to focus on improving care in those health centers providing care of lower quality; iv) facilitate production of visual aids within each health center, thereby enabling midwives, doctors and their supervisors to use information for improving their work on a daily basis; v) include qualitative assessments to facilitate interpretation of quantitative information; vi) be reasonably simple to use without unsustainable foreign technical assistance; and viii) be affordable within the limited resources of public health facilities and District Management Teams. (Adeyi & Morrow, 1996)

Although many approaches are interrelated, methodology of assessing maternal quality of care include (Longo & Daugird, 1994; Lewis, 2008):

- Appropriateness review: review of the necessity of a given procedure, medication or treatment.
- Incident reporting: identification and early warning system of potential litigation and/or sentinel events.
- Clinical audit: in-depth assessment of the functional status, equipment, and personnel of a health care facility.
- Facility-based maternal death review: a qualitative, in-depth investigation of the circumstances surrounding and potential causes of maternal deaths occurring at health facilities.
- Mortality audit (or confidential enquiry into maternal death): in-depth review of maternal deaths and potential contributory factors.
- Near-miss audit: identification and assessment of cases in which pregnant women survive obstetric complications.
- Community-based maternal death reviews (verbal autopsies): a method of determining the medical causes of death and ascertaining the personal,



familial, or community factors that may have contributed to the deaths in women who died outside of a medical facility.

- Continuous quality improvement: identification of variations in process in an effort to reduce these variations and improve quality of product, a method evolved from industrial engineering.
- Chart review: identification of quality of care concerns through detailed review of the medical record.
- Outcome studies: identification and analysis of patient outcomes.

Of these methods, facility-based audit, maternal death audit, near-miss audit, and chart review are most frequent in the literature.

The most common methods of quality evaluation in maternal mortality fall under the umbrella term maternal death review. All maternal death review methods “review, assess and identify the underlying factors that led to the mother’s death and learn lessons from these to develop and promulgate recommendations to overcome the barriers and impediments to safe maternity care in future” (Lewis, 2008).

**Verbal autopsy.** In developing settings, where many women die at home, verbal autopsies (also termed community-based death reviews) are often the only available method to determine the cause of maternal death. Prerequisite to administration of verbal autopsy is the “cooperation from the family of the woman who died, and sensitivity [...] in discussing the circumstances of the death” (Lewis, 2008). Verbal autopsies document the personal, family, and community factors that may have contributed to a maternal death. These factors are probed through a series of questions. Advantages of this method include its’ utility in

home-based deaths, its ability to allow medical and non-medical factors to be explored in a comprehensive manner, and its unique role in including the family's and community's "opinion on the access to and quality of health services, in efforts to improve maternal health services" (Lewis, 2008). Unfortunately, verbal autopsy relies heavily on the relatives' interpretation of the victim's symptoms, potentially leading to incorrect cause of death. Other disadvantages include the subjectivity of assignment of avoidable factors, divergence between cause of death according to lay informers and death certificate, and under-reporting for early-pregnancy deaths and deaths from indirect causes (Lewis, 2008).

**Facility-based maternal death review.** Facility-based maternal deaths review (FBMDR) is the examination of hospital deaths and potential avoidable factors that contributed to the patient's death. FBMDRs require the participation of healthcare providers who treated the woman who died, and these providers must be willing to report accurately on the management of the case (Lewis, 2008). In addition to health-related aspects, providers are often asked to identify community factors contributing to a woman's death. These facility reviews help identify areas where clinical care is sub-standard, or where guidelines and protocols can best be utilized. The results of FBMDR can be used to inform teaching curricula, create feedback mechanisms, and prioritize resources and service needs (Lewis, 2008).

Advantages of FBMDRs include ease of implementation: review of maternal deaths may already occur in a facility as a routine practice, facilitating approval and support for the extended review process. FBMDR enables a more complete picture of the factors surrounding a woman's death, especially when

supplemented with information from the community. FBMDRs are often less expensive than other research methods, as they utilize staff and infrastructure already in place. One advantage to FBMDR is the inherent learning experience for all staff involved in the audit. Lastly, the review often stimulates the production of standards of care as an end result (Lewis, 2008).

Disadvantages of FBMDR include its heavy dependence on staff buy-in and skill. The death review “requires committed and skilled individuals at the facility to drive the process and to follow through on any recommendations” (Lewis, 2008). These facility-based maternal death audits are not as systematic as clinical audits and can produce a large amount of data that is difficult to process and synthesize. FBMDR misses all deaths that take place in the community. Finding information about community factors, through contact with the dead woman’s family, can be difficult. Lastly, these reviews will not provide a complete picture of maternal deaths in a given population, especially in areas where the majority of women die in the community (Lewis, 2008).

**Confidential enquiry into maternal deaths.** Potentially the most comprehensive methodology for maternal death review is Confidential Enquiry into Maternal Deaths (CEMD). CEMDs examine all, or a representative sample of all, maternal deaths in a particular area through a standardized system of case identification. These examinations include women who died at home and those who died in healthcare facilities. CEMDs require the presence of either: 1) a functioning statistical infrastructure (such as vital records, statistical analysis of births and deaths, human resources, recording clerks, etc.); or 2) nominated professionals in each facility to regularly report maternal deaths to the CEMD

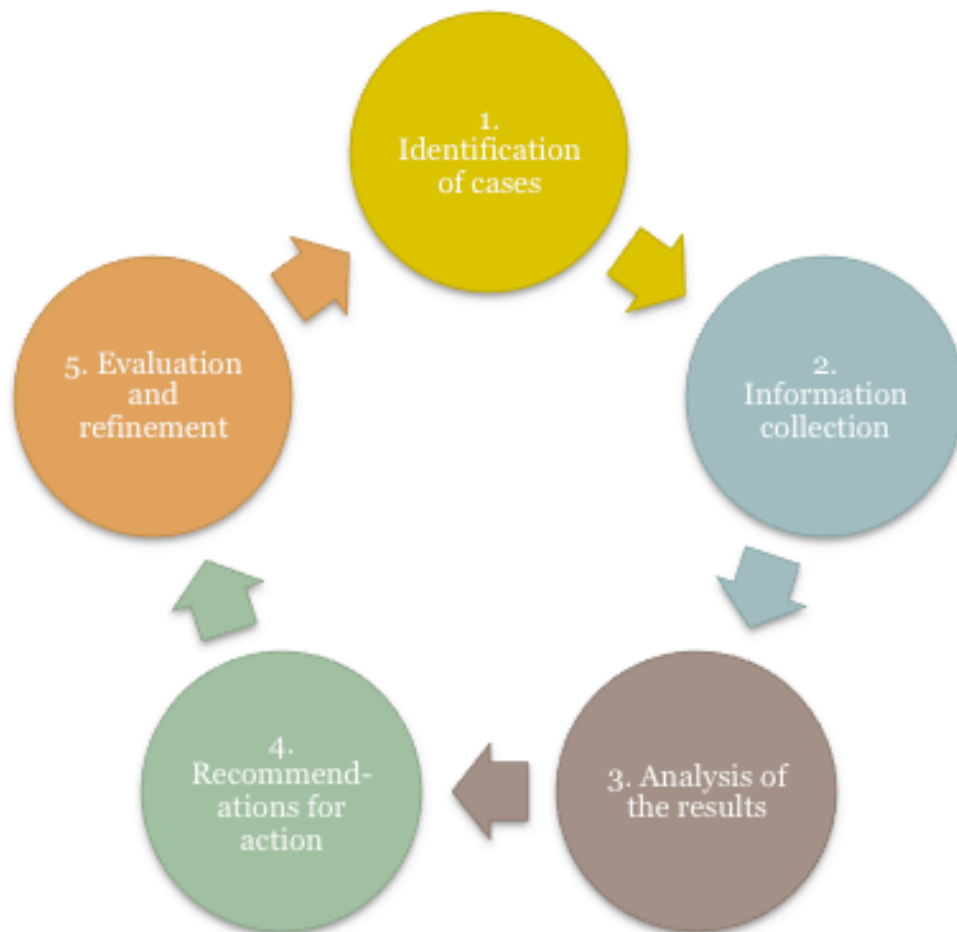
(Lewis, 2008). Advantages of the CEMD include: its ability to make policy recommendations on a larger scale; its more comprehensive view of maternal mortality; its potential for advocacy and quality of care improvements; and its ability to investigate maternal deaths thoroughly. Disadvantages include: its inability to provide information about all surviving women giving birth; it is time consuming and complex in areas where the number of maternal deaths is large; and its reliance on participant thoroughness. In areas with large numbers of maternal deaths, a representative sample for in-depth review can be taken to avoid over burdening enquiry participants. CEMD participants must concentrate on both the medical and socioeconomic & demographic factors to produce an acceptably complex portrait of maternal mortality in the study area (Lewis, 2008).

The longest running and perhaps most successful CEMD is in the United Kingdom. Local CEMDs began taking place in the United Kingdom in the early twentieth century, and the United Kingdom National CEMD was rolled out in 1952. Rochdale, an industrial town in a poor area of England, dropped its maternal mortality rate from 900 per 100,000 pregnancies in 1928, one of the highest in England, to 280 per 100,000 pregnancies by 1934, the lowest in England (Lewis, 2008). This impressive advancement was achieved through the resolution of excessive use of forceps during delivery and improving pregnancy knowledge among women, issues recognized by the CEMD. The report authors mention that “the results were obtained by a change in spirit and method and without any alteration in the personnel or any substantial increase in public expenditure” (Oxley, Phillips, & Young, 1935).

Several factors must be embedded into the methodology of maternal death review to be successful: surveillance, confidentiality, and healthcare worker buy-in. One key component of all maternal death review methods is the surveillance cycle— “the ongoing process of identifying cases, collecting and analysing information, devising recommendations for action and implementation, and then evaluating the outcome and refining the programme” (Lewis, 2008) (Figure 13).

**Figure 13: Maternal mortality surveillance cycle**

Source: Lewis, 2008.



All maternal death review methods must maintain the confidentiality of participants – healthcare and community workers, family members, and victims—to be

successful. Lastly, healthcare workers must buy into the maternal death review. Participation in maternal death review not only improves patient outcomes, but benefits healthcare workers, as well. As Lewis states:

Often, those participating in the review are motivated to change their practice or service delivery, even before the formal publication of the results. These healthcare workers, who have seen for themselves the benefits from such relatively simple reviews, including the adoption of simple changes in local practice, become advocates for change. They can then motivate and enthuse others to undertake similar work and to help spread evidence-based best-practice guidance (2008).

These components—surveillance, confidentiality, and healthcare worker participation—must be present in order for maternal death review to be informative.

**Standards, guidelines, and protocols.** Standards, guidelines, and protocols are a common method to standardize and better quality of care, and improve safety for patients and providers. Standards are defined as “a means of describing the level of quality that healthcare organizations are expected to meet or aspire to” (Department of Health, 2004). This level of quality is determined by authoritative bodies, such as medical professional organizations, ministries of health, WHO, or the institution itself. The performance of healthcare providers and services in an institution is compared with these standards (Raven et al., 2011). Guidelines are “key recommendations on the delivery of health care based on the best available evidence and expert opinions” (Raven et al., 2011). These guidelines may be used directly, or alternatively, translated into standards and protocols before implementation. Protocols are evidence-based instructions for diagnosis and management of illness, injury, or condition utilizing best available research and expert opinions (Raven et al., 2011). These standards, guidelines,

and protocols are then implemented on a clinic or hospital level to improve the quality of care in an institution.

One way in which standards are used to directly evaluate and improve quality of care is through criterion-based clinical audit (CBCA). CBCA involves the prior consensus by clinicians on a list of concise criteria for quality care, taking into account the available resources. Qualified audit assistants screen the medical records of pertinent patients and extract data to determine whether the patient received adequate care, using the agreed-upon standards and criteria. The audit team and healthcare facility staff then identify and implement changes to improve care (Penney, Glasier, & Templeton, 1993; Shaw, 1992). One unique feature of CBCA is that the “very process of revealing that an agreed level of care is not being met [...] also identifies the specific changes needed in clinical practice” (Wagaarachchi et al., 2001). The effectiveness of CBCA is “assessed in terms of changes in the proportion of cases where management met the agreed criteria for good quality care” (Wagaarachchi et al., 2001).

**Process indicators.** Maternal death review and its subsidiary methodologies are one of the most popular ways to evaluate technical quality of care in maternal health services. However, measurement of process indicators is becoming increasingly important in the surveillance of maternal mortality and progress towards achievement of the Millennium Development Goals. The WHO established a set of guidelines for the minimum standard of essential obstetric care: at a minimum, a basic essential obstetric care center (BEOC) must be able to perform six signal functions (Figure 14); comprehensive essential obstetric care centers (CEOC) must be able to carry out blood transfusion & caesarean

sections in addition to the six basic signal functions. Studies in Matlab, Bangladesh found that improving access to EOC services was crucial to decreasing maternal mortality (Fauveau, Stewart, Khan, & Chakraborty, 1991; C Ronsmans, Vanneste, Chakraborty, & van Ginneken, 1997).

**Figure 14: Signal functions for essential (or emergency) obstetric care.**  
Source: Kongnyuy, Hofman, and van den Broek, 2009.

EOC services	Comprehensive EOC services
Parenteral antibiotics	All included in Basic EOC (1-6) plus: Caesarean section Blood transfusion
Parenteral oxytocic drugs	
Parenteral anticonvulsants	
Manual removal of placenta	
Removal of retained products (e.g. by manual vacuum aspiration)	
Assisted vaginal delivery (usually suction delivery)	

In addition to defining basic and comprehensive essential obstetric services, the United Nations published a series of six process indicators as a benchmark for quality of care in developing countries (Figure 15). These indicators measure availability, utilization, and quality of care. Failure to achieve these indicators highlights potential areas of improvement for developing nations' provision of quality maternal health services.



**Figure 15: United Nations process indicators**

Source: UNICEF, WHO, and UNFPA, 1997

Indicator	Definition	Numerator	Denominator	Recommended Level
<b>Availability of EOC</b>	Number of BEOC and CEOC facilities per 500,000 population	Number of BEOC and CEOC facilities	Total population	At least 4 BEOC and 1 CEOC facility per 500,000 people
<b>Geographical distribution of EOC facilities</b>	Ratio of EOC facilities to population for each subnational geographical area	Number of BEOC and CEOC facilities	Subnational population	100% of all subnational areas have the minimum acceptable numbers of BEOC and CEOC
<b>Proportion of all births in EOC facilities</b>	Proportion of expected birth delivering in EOC facilities	Number of deliveries in EOC facilities	Total number of expected births	≥15%
<b>Met need for EOC</b>	Proportion of pregnant women expected to have complications who are admitted for treatment in EOC facilities	Number of women with direct obstetric complications admitted in EOC facilities	Total number of expected complications	100%
<b>Population-based Caesarean section rate</b>	Caesarean deliveries as a proportion of all births	Number of Caesarean sections	Total number of expected births	5-15%
<b>Case fatality rate</b>	Proportion of women with direct obstetric complications admitted to EOC facilities who die	Number of maternal deaths from direct obstetric complications in EOC facilities	Total number of direct obstetric complications admitted in EOC facilities	≤1%

## MEASURING PERCEIVED QUALITY

The current body of literature supports the assertion that perceived quality of care is an important determinant of uptake of healthcare services. Accurately measuring how patients assess an institution or providers' quality of care is critical to creating effective future interventions to address any identified shortcomings. The literature contains numerous patient satisfaction measures that differ with respect to the domains of care received (e.g. the technical versus interpersonal quality of care) and the timing of the episode of interest (e.g. a single visit or all care received from a practice during the past year). The examination of perceived quality of care is warranted by the desire to meet users' expectations and demands, thereby promoting the "process of democratization of health care services" (Calnan, 1988). Studies identifying the criteria that communities use to judge health care services are few in number, but growing.

**Patient Satisfaction Survey.** The most effective method of measuring patient's perceived quality of care is through the utilization of patient satisfaction surveys. These surveys assess quality of care from a patient's perspective, including 'perception of treatment quality, perception of clinical and psychological outcomes, behaviors, attitudes regarding treatment, and general impressions' (Longo & Daugird, 1994). Ware et al. developed a seminal patient satisfaction survey, the Patient Satisfaction Questionnaire (PSQ), in 1983 based on both a conceptual framework for defining and measuring patient satisfaction and previous patient satisfaction surveys. The PSQ uses a series of questions to assess the following aspects of patient satisfaction: interpersonal manner, technical quality, accessibility & convenience, finances, efficacy & outcomes,

continuity, physical environment, and availability on a Likert-type scale (Ware, Snyder, Russel Wright, & Davies, 1983). Patient satisfaction surveys can be adapted to examine the specific features of interest.

**Focus group discussion.** Focus group discussions (FGDs) utilize patients from the study population to obtain rich, qualitative descriptions of perceived quality of care in a healthcare setting. FGDs are open discussions on pre-identified themes – in this case, perceived quality of care – with a variable number of study participants and a moderator. FGDs are the preferred method when the study approach is “exploratory, whether the goal is to document opinions or points of view, and the researchers want to avoid a situation where the content of the messages expressed is influenced by their own preconceptions” (Haddad, Fournier, Machouf, & Yatara, 1998; Morgan, 1988). A 1998 study in Guinea coded focus group discussions to classify criteria of perceived quality of care into Donabedian classification of structure, process, and outcome (Haddad et al., 1998).

Both technical and perceived quality-of-care measurements require intensive participation by health care facilities and patients to identify barriers to quality care. Quality of care must be measured from both the providers’ perspective (technical aspects of treatment and management, health outcomes) and the women’s viewpoint (patient satisfaction), as improvements in one domain do not necessarily mean reciprocal improvements in the other. In the next section, we examine the current level of quality of maternal healthcare in sub-Saharan Africa.

## The current state of research in maternal quality of care in sub-Saharan Africa

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The quality of care received by mothers and babies in sub-Saharan Africa is often reputed to be poor. However, efforts to address this important contributory factor to maternal mortality have received scant attention and research dollars when compared with barriers of access to care. The majority of quality of care research in sub-Saharan Africa and other developing countries has been focused in maternal and perinatal death review and criterion-based clinical audit (CBCA).

### **TECHNICAL QUALITY OF CARE**

Aggregation of data from technical quality of care studies is difficult, as many use different standards or domains in their surveys and audits. The increasing use of WHO signal functions and essential obstetric care requirements as process indicators is promising, but systematic reviews of quality of care in sub-Saharan Africa are very few. An examination of individual studies and reported weaknesses in quality of care reveals continent-wide trends.

**Antenatal Care.** A study of antenatal care quality took place in seven health facilities of the Rufiji District, a rural area of southern Tanzania. The study used observations from over sixty antenatal care sessions evaluated with an ANC checklist, self-assessments of eleven health care workers, interviews with 28 pregnant women, and follow-up of 12 women hospitalized for complications related to their pregnancy (Sarker et al., 2010). The results from the ANC observations revealed that health workers perform the majority of clinical

examinations, including blood pressure checks (94%) and fundal height measurements (100%); however, tests that depended on supplies were often omitted. Only 8% of women were tested for the presence of albumin in the urine, and just 9% received a urine glucose test (Sarker et al., 2010). Patients often did not receive the information they needed to identify danger signs: only 61% of women received information regarding danger signs during an ANC visit and only 54% of women were able to mention at least one obstetric danger sign requiring medical attention. There was also a delay in the “start of timely interventions including checking vital signs, using a partograph, and detailed record keeping” (Sarker et al., 2010).

A study of women in Gambia found nearly 99% of surveyed women attended antenatal care clinics (Telfer, Rowley, & Walraven, 2002). Women were asked about the services performed at their ANC visits: nearly 100% had their weight taken, blood pressure measured, abdomen palpated, and fetal heart beat and movement measured. Ninety eight percent were given iron and folate tablets at least once. Only 39% of women had their urine tested for the presence of glucose and/or blood. Communication between provider and patient was sub-optimal across all domains: less than 10% of patients reported being told anything about a portion of the examination. Women received almost no health education at the ANC clinics, especially regarding pregnancy & delivery danger signs, where to seek help for problems, and postpartum care instructions. Only 2% of surveyed women reported being told during pregnancy or delivery to have a postpartum check.

**Delivery Care.** A number of studies utilized methods described previously in “Measuring Quality in Maternity Care” to examine the current state of maternal healthcare quality in sub-Saharan Africa. Of recent, the most popular method to measure quality of care in developing nations is the utilization of the UN/WHO Emergency Obstetric Care (EmOC) process indicators & signal functions.

Near-miss audit of four hospitals in Uganda revealed that both poorly perceived and inadequate technical quality of care influenced severe morbidity cases (Okong, Byamugisha, Mirembe, Byaruhanga, & Bergstrom, 2006). Although 20% of the patients who experienced acute complications were in the hospital, more than 40% were at home at the time of complication. Fifty-eight percent of women did not seek care immediately, because patients were unwilling or relatives were unhelpful. Thirty-six percent reported having to wait for health workers. Thirty-seven percent of women received a wrong diagnosis or were delayed in reaching the correct one. Approximately sixty percent of cases had health workers with necessary skills available for key interventions; of the forty percent lacking the appropriate health workers, doctors and anesthetists were most often cited as absent. Other staff reported as absent were from the laboratory, pharmacy, nursing, and midwifery departments. Thirty-four percent of patients did not receive a blood transfusion as requested, due to lack of blood or lack of transport to the blood bank. Thirty two percent of near-miss cases were influenced by medications not being available or being inadequate. Over half of the near-miss patients had unavailable, inadequate, or incomplete medical records (Okong et al., 2006). Substandard care and patient-related factors

contributed significantly to severe acute maternal morbidity in the Ugandan study population; it is likely that near-miss audit of neighboring countries would reveal similar results.

A perinatal needs assessment was conducted in Dar es Salaam, Tanzania in 2008 to evaluate the current gaps in care provision and assess the factors underlying the poor perinatal outcomes in the region (Nyamtema et al., 2008). The majority (72%) of all deliveries took place in four available public hospitals. If all areas hospitals and institutions were used, the potential coverage of BEOC and CEOC services would be 350% and 360%, respectively, of the United Nations minimum recommended health institution categories per 500,000 population. The coverage for health centers and dispensaries, by Tanzanian standards, was just 24% and 20%. Two of the study hospitals did not provide caesarean section and blood transfusion services 24 hours per day, as required in CEOCs. Two of the study hospitals did not provide any delivery services; and 83% of the dispensaries had poorly established obstetric services. Only one public neonatal unit existed in the area, and served as a referral institution for all sick newborns delivered in public hospitals in the region (estimated to be more than 6000 newborns per year) (Nyamtema et al., 2008). Shortage of supplies, such as umbilical ties, was reported in 50% of studied health institutions. There were no guidelines for antenatal, intrapartum, postnatal, or neonatal care in most surveyed institutions (69-94%) in the Dar es Salaam study (Nyamtema et al., 2008).

Ronsmans et al. conducted a study in Côte d'Ivoire to assess the quality of normal delivery care utilizing observation checklists and exit-interviews (Delvaux

et al., 2007). The results demonstrated that overall quality of care was poor, despite most women being delivered by a professional midwife. Vaginal examinations were performed on all women at admission, but blood pressure was obtained in less than half of women admitted. History-taking was poor, in general: only 26% of women were asked about the onset of contractions and 33% were asked about timing of membrane rupture. Assessment of fetal heart rate (60%) and fetal position (53%) was not universal. Partographs were completed during labor in only 5% of cases; in two sites, partograph was completed after delivery in more than 60% of deliveries. Contractions were not monitored in over 90% of cases. Episiotomy and uterine revision were performed at rates of 24% and 32%, respectively. Lack of universal hygiene precautions and little delivery support during labor also typified normal delivery care in Côte d'Ivoire. A positive quality of care finding was the active management of the third stage of labor and utilization of oxytocics (Delvaux et al., 2007).

Another study of Tanzanian quality of care took place in 2010 – Sorensen et al. conducted a confidential enquiry into maternal deaths. Results from this study indicated that substandard care was a causative factor in 46 of 62 reviewed maternal deaths (74%). Key BEOC signal functions such as evacuation of the uterus and administration of antibiotics, oxytocics, and anticonvulsants were frequently delayed or not performed (Sorensen et al., 2010).

A community-based investigation of maternal deaths in Zimbabwe examined avoidable factors' contribution to deaths to assess their preventability (Fawcus et al., 1996). One or more avoidable factors were identified in 90% of maternal deaths taking place in the rural study site; and 85% of the deaths at the



urban study site. Avoidable factors attributable to the health sector were identifiable in 67% and 70% of the rural and urban site deaths, respectively. Notable factors included “failure of health personnel to assess the severity of post-abortion conditions and puerperal sepsis and initiate aggressive treatment” (Fawcus et al., 1996). The implications of this study are that failure to identify and treat emergency conditions, a critical component of quality emergency obstetric care, is contributing to maternal deaths in Zimbabwe.

Researchers utilized emergency obstetric care guidelines to conduct an observational study and criterion-based audit between 2005 and 2007 in Malawi (Kongnyuy, Leigh, & van den Broek, 2008). The number of BEOC facilities in the study areas was insufficient and did not change over the 3-year study period--0.2 BEOC facilities per 500,000 population. With the exception of the functional CEOC facilities, only one facility provided all six BEOC signal functions during the study period. The signal functions requiring specific manual skills (e.g. vacuum extractions) were the least available. Facility deliveries, maternal deaths, case fatality rates, and met need for Emergency Obstetric Care (EmOC) changed significantly over the three-year study period. Quality of care in the survey was assessed using mortality data and case fatality rates for emergency obstetric complications. Maternal deaths decreased continuously, from a MMR of 250 per 100,000 births in 2005 to 182 per 100,000 births in 2007. The overall case fatality rate decreased significantly from 3.7% in 2005 to 1.5% in 2007; case fatality rates for obstetric hemorrhage, prolonged/obstructed labor, puerperal sepsis, and pre-eclampsia & eclampsia decreased significantly. Case fatality rates

for abortion and ectopic pregnancy did not change significantly during the study period (Kongnyuy et al., 2008).

Similar audit of facilities in Tanzania found that nearly 60% of the expected complicated deliveries in the study population were delivered at BEOC or CEOC-qualified health facilities; this falls short of the UN recommended level of 100% (Olsen, Ndeki, & Norheim, 2004). Caesarean section rates were outside the desired 5-15% range: study districts' c-section rates ranged from 0.0-23.2%. None of the study districts had an acceptable case-fatality rate (<1%); case-fatality rates ranged from 1.3 to 2.1% (Olsen, Ndeki, & Norheim, 2004). Audit of UN process indicators in Sofala, Mozambique, revealed similar results: for the population size, inadequate numbers of BEOC facilities were available (Bailey & Paxton, 2002). Twelve percent of births took place in EmOC facilities; as this is less than the recommended minimum, it indicated that women in need of services were not receiving them. Fewer than 8% of women (compared with recommended 100%) estimated to have severe obstetric complications received treatment at BEOC or CEOC facilities. Only 1% of all births in the population took place by caesarean; many Mozambican women who would potentially benefit from surgical deliveries did not receive the potentially life-saving intervention. Hospitals registering maternal deaths in Mozambique all exceeded the maximum recommended case fatality rate of 1%: they ranged from 2.4-11.1% (Bailey & Paxton, 2002).

The AMDD Working Group on Indicators, based out of Columbia University, analyzed data from Niger, Rwanda, and Tanzania to assess the countries' conformity with UN process indicator guidelines (AMDD Working

Group on Indicators, 2003). Results from Niger indicated that the country met the minimum recommended number of CEOC facilities, but fell short of the recommended number of BEOC facilities. Eleven percent of Niger's expected births took place in a health facility (UN recommended level >15%); of these facilities, 89% had the ability to provide EmOC. The percent of women with major, direct obstetric complications treated in EmOC facilities in Niger was 19.8%. Of deliveries, 0.5% of women expected to give birth in Niger were delivered by caesarean. The average case fatality rate in Niger was 2.2%, twice the maximum case fatality rate acceptable under UN recommendations (AMDD Working Group on Indicators, 2003).

Results from Rwanda's needs assessment revealed similar EmOC shortcomings and strengths (AMDD Working Group on Indicators, 2003), on a smaller scale. Three district hospitals were surveyed between 1999 and 2000; among surveyed districts, all had at least 1 CEOC facility thereby meeting UN recommendations. The proportion of births taking place in EmOC facilities was, on average, 10%. Met need for complications treated in EmOC facilities was between 30-35% in Rwandan study districts. Two to three percent of births were delivered by caesarean section. Case fatality rates varied widely in Rwandan study districts – from 2.4% in Rumera-Rukoma to 12.8% in Kabgayi (AMDD Working Group on Indicators, 2003).

Four hospitals in two districts of Tanzania were assessed between 1999 and 2000 (AMDD Working Group on Indicators, 2003). The surveyed districts had at least one CEOC facility available, meeting the UN recommended minimum. The proportion of births taking place in EmOC facilities varied by district: 10.3%

in Missungwi and 17.3% in Kwimba district. The met need for both Tanzanian districts was much lower than the recommended 100% minimum: 14.5% in Kwimba, and 14.9% in Missungwi. The caesarean rate was also sub-optimal in the Tanzanian study areas: caesarean rates varied from 0.8 to 1.3%. Case fatality rates were nearly four times the acceptable maximum level: 3.3% in Missungwi and 3.8% in Kwimba. The results from these three countries suggest that although coverage of comprehensive facilities is sufficient in surveyed areas, the outreach of these facilities is inadequate. The proportion of births taking place in EmOC facilities, met need for complications, caesarean section rates, and case fatality rates--surrogate markers for quality of care and outreach--were unacceptable in study areas.

A qualitative audit of severe acute morbidity in hypertensive pregnancies in South Africa revealed a number of avoidable factors in three categories: patient-oriented problems, administrative problems, and health-care worker problems (Panday, Mantel, & Moodley, 2004). Of the patient-oriented problems, the following were identified as causative factors: lack of information, knowledge, or insight; inadequate or no antenatal care; delay in seeking help; family or community pressure to consult a traditional healer; and self-discharge from hospital. Among administrative problems, the following were of particular importance: lack of transport from home to institution; delay in transport between institutions; barriers to access health care facilities; lack of health care facilities; lack of personnel; lack of skilled staff; communication problems; and missing files. Of health-care worker issues, the following were identified as avoidable contributors: inappropriate initial assessment; substandard

management including incorrect diagnosis, protocol not followed, treatment not given, and/or blood pressure not controlled; delayed referrals; incomplete or infrequent monitoring; delay/failure to detect new problems/complications with subsequent action; poor documentation; poor history-taking in terms of social history; and anesthetic complications (Panday, Mantel, & Moodley, 2004). The majority of avoidable factors contributing to severe acute morbidity in hypertensive pregnancies identified in the study were directly related to technical quality of care.

**Postpartum Care.** The Gambian study conducted by Telfer, Rowley, and Walraven (2002) followed women through antenatal, delivery, and postpartum periods. While nearly all women (94%) reported to a maternal & child health clinic in the postpartum period, only 30% of women reported being examined. Less than 25% reported receiving information on breastfeeding or family planning. A study of delivery and postpartum care in Côte d'Ivoire found that less than half of women were examined for uterine retraction in the immediate post-delivery period, and postpartum measurement of blood pressure varied by hospital facility (range: 7-67%) (Delvaux et al., 2007).

### **PERCEIVED QUALITY OF CARE**

It is evident that perceived quality of care heavily influences uptake of antenatal, delivery, and postpartum care services. As domains in perceived quality of care often supersede the importance of technical quality of care in determining utilization, the measurement of perceived quality of care and patient satisfaction in sub-Saharan Africa is of critical importance.

**Antenatal Care.** A study of perceived quality of care regarding family planning services in Tanzania found that increasing distance to an antenatal care facility was inversely related to perceived quality of care: the further the facility, the lower the perceived quality of care (Speizer & Bollen, 2000). Each additional maternal or child health service provided by a facility increased patients' perceived quality of care (Speizer & Bollen, 2000).

Perception of quality of antenatal care was surveyed among 452 pregnant women in southwest Nigeria. Women generally expressed a high level of satisfaction with their care, despite some discrepancies between received care and expectations of the facilities (Oladapo, Iyaniwura, & Sule-Odu, 2008). Women were polled on technical and interpersonal elements of quality of care. Nearly 97% of respondents were satisfied with the way their providers were monitoring their and their unborn babies' health. Similarly, nearly 93% were satisfied with the expertise demonstrated by their antenatal care provider. Interestingly, women who had used the same healthcare center for ANC in previous pregnancies were significantly less likely to express satisfaction with the level of expertise demonstrated by their provider, when compared with those who had never used the center for ANC. Women with education at a secondary level or higher were significantly less likely to state their care providers could effectively handle minor obstetric complications.

Seventy one percent of respondents were not pleased with the existing method of referral at their center. Factors contributing to this discontent included: lack of ambulance and absence of accompanying health worker. Over three-quarters of survey respondents were satisfied with the extent to which they

were involved in decision-making regarding procedures and tests, and planning for infant feeding and care. However, two-thirds of women were unhappy with the extent to which they were involved in decisions regarding birth planning and post-partum contraception. Over half of the respondents were also dissatisfied with their inability to choose their provider. Women rated interpersonal domains very highly: over 90% of respondents reported satisfaction with all the assessed components of client-provider interactions (Oladapo et al., 2008). In general, the women surveyed by Oladapo et al. were satisfied with the quality of care they received. Specifically, women reported the interpersonal relations, expertise, and basic technical competence of their providers to be satisfactory. Women identified the referral system, and patient involvement in decision-making, as potential areas of improvement (Oladapo et al., 2008).

**Delivery Care.** The bulk of patient satisfaction research in sub-Saharan Africa has focused on women's perceptions of delivery care quality. This focus is likely a result of the life-saving potential of improving perceptions of delivery care and the subsequent increased utilization of these services.

Focus-group discussions among Nigerian women revealed a host of inadequacies in the quality of care provided by traditional birth attendants (TBAs) and healthcare professionals (Okafor & Rizzuto, 1994) (Figure 16).

**Figure 16: Nigerian women's attitudes toward health services, as revealed in focus-group discussions**

Source: Okafor & Rizzuto, 1994.

Traditional birth attendants	
<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Located within walking distance</li> <li>• Inexpensive</li> <li>• Kind and friendly</li> <li>• Willing to accept payment installments or goods</li> <li>• Offer traditional herbs</li> <li>• Personally known</li> <li>• Better at taking care of labor pains</li> <li>• Experienced</li> </ul>	<p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Use rusted or dirty instruments</li> <li>• Delay referral of difficult labor</li> <li>• Make women lie on bare floor or plantain leaves</li> <li>• Need more training</li> <li>• Midwives and hospitals refuse their referrals</li> <li>• Make women push or run up and down</li> <li>• Give overdoses of drugs</li> </ul>
Maternity centers and hospitals	
<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Provide efficient service</li> <li>• Staff are trained</li> </ul>	<p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Nurses and midwives are impersonal or hostile</li> <li>• Supply of medicine is insufficient</li> <li>• Supplies and equipment are insufficient</li> <li>• Drugs and services are expensive</li> <li>• Payment required in full before treatment</li> <li>• Transportation is expensive</li> <li>• Transportation is unavailable</li> <li>• Procedures may include surgery</li> <li>• Refuse or mistreat referred women</li> </ul>
Prayer houses and churches	
<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Service is free</li> <li>• Provide support during pregnancy and delivery</li> <li>• Pray for easy pregnancy and delivery</li> </ul>	<p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Do not always assist deliveries</li> <li>• Refuse to refer difficult deliveries to hospitals</li> <li>• Are not trained to manage pregnancies</li> </ul>

These inadequacies included poor hygiene and medical treatment, and reprimands and abuse from health workers. Shortage of medical supplies and requirements to provide one's own "dressings, infusions sets and liquids, surgical gloves, soap, sanitary pads, antiseptic liquid, medicines, and even detergent for



washing their bedclothes” were major deterrents to seeking medical care in a formal healthcare establishment (Okafor & Rizzuto, 1994).

In order to understand people’s perceptions of the quality of maternal health services, qualitative and quantitative studies are needed to explore which specific characteristics of healthcare facilities are important to patients as they form their quality judgments (Speizer & Bollen 2000). As Speizer & Bollen suggest: “Objective and subjective determinants of perceived quality are required beyond those that commonly are included in existing surveys” (2000).

A study among Nigerian women of childbearing age revealed discouraging opinions among study participants toward healthcare professionals (Asuquo, Etuk, & Duke, 2000). The majority of women surveyed “abhorred the attitude of hospital staff towards patients”. As a result, women reported that most of them visited TBAs and would only visit hospitals when unorthodox attempts to correct complications like hemorrhage, eclampsia, and prolonged labor failed. Other reports of poor quality of care included absent staff, lack of transportation, rude staff, and bribes being required. Male partners had similar complaints of inadequate quality of care: abuses from the nurses, neglect, and absent staff. Even hospital staff agreed that their attitudes were negative, potentially alienating patients. Hospital staff ascribed their negative attitude to women’s delay to report to the hospital, and their inability to pay for necessary supplies (Asuquo, Etuk, & Duke, 2000).

Rural Tanzanian women were more likely to accept referral if they perceived quality of care at their local health center to be of higher quality (Pembe, Urassa, Darj, Carlstedt, & Olsson, 2008). Focus group discussions with

childbearing-age women revealed that quality of care was “perceived as having several intertwined components, including the mothers’ chances of recovery, the provision of free medicine and other services and respectful treatment by care providers” (Pembe et al., 2008). Referral hospitals in the study area were considered to be of higher quality than local health centers. Other factors that contributed to a perception of good quality of care included: immediate provision of services; ability to work as a team among health workers; health workers’ kindness and willingness to listen and explain the health problem; instruction of mothers and relatives on cleanliness; regular change of bedclothes; and cleaning of the floor. Factors that contributed to poor perception of quality were: delay in opening health centers; absence of health workers during working hours; relatives being refused access; breach of confidentiality; and not listening carefully to patients. Women also reported an inability to voice their concerns at the healthcare facility, for fear of retribution from staff: “And there is nothing we can say because if they hear you, never attempt to go there for treatment...They will not accept you again as a form of punishment” (Pembe et al., 2008). Quality of care in health centers and hospitals was less than satisfactory.

## Improving maternal healthcare quality

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The ultimate purpose of all maternal health research is to inform the effectiveness of interventions to prevent maternal morbidity and mortality. In low and middle-income countries, where resources are scarce and the demand is greatest, interventions must maximize efficiency and effectiveness. Interventions

must also consider the cultural context in which they are to be implemented. Taking into account the determinants of maternal health and the components of quality health care, we now review the literature on how maternal healthcare quality can best be improved in the developing world utilizing the framework outlined by Althabe et al. (2008).

**Distribution of educational materials.** Passive distribution of printed or audiovisual materials with educational information was reported in numerous studies. Six systematic reviews of this strategy were conducted (Grimshaw et al., 2004; Hulscher, Wensing, van der Weijden, & Grol, 2001; Jepson et al., 2000; Oxman, Thomson, Davis, & Haynes, 1995; Wensing, Weijen, & Grol, 1998; Worrall, Chaulk, & Freake, 1997). Five of the six reviews found that distribution of educational materials, by itself, was ineffective in changing professional practice. Distribution of educational materials became significantly more helpful when combined with a more active strategy, such as interactive meetings or educational outreach visits. One systematic review found a median effect of +8.1% (range: +3.6 to +17.0) on absolute performance improvement in the implementation of guidelines (Grimshaw et al., 2004).

**Audit and feedback.** Although audit and feedback are preferred methods for quality assessment, these strategies are only moderately effective at improving quality. Three trials in developing countries demonstrated small to moderate effects on professional practice (Jamtvedt, Young, Kristoffersen, O'Briden, & Oxman, 2006; Moongtui, Gauthier, & Turner, 2000; Wahlstrom et al., 2003). In two of the studies, audit and feedback were used as a component of a multifaceted intervention. One important consideration of utilizing audit as a

quality improvement method is the potential lack of routine data-collection in rural, impoverished settings. For large-scale use, health systems should be organized and promote the routine collection of data for the most important health care practices in maternal health. This “system must be acceptable to, and developed in conjunction with, health care providers who [are then] adequately trained in its use and necessary audit practices” (Althabe et al., 2008).

**Reminders.** Use of manual reminders, such as medical chart reminders and posters, has small to moderate positive effects on quality improvement when used alone. Reminders can also be implemented in electronic settings. Three reviews assessed the efficacy of reminders in maternal and child health preventive services (Balas et al., 1996; Jamtvedt et al., 2006; Jepson et al., 2000). The reminder method’s advantages include: ease of implementation, cost-efficiency, and scalability. Evidence suggests that reminders are the “most effective single strategy for guideline implementation” (Althabe et al., 2008).

**Educational meetings.** Reviews based on a small number of studies suggest that interactive workshops are more likely to be successful than didactic training workshops (Angunawela, Diwan, & Tomson, 1991; Bexell et al., 1996; Gutiérrez et al., 1994; Hadiyono, Suryawati, Danu, & Sunartono, 1996; Westphal, Taddei, Vanancio, & Bogus, 1995). Potentially successful workshops are used with the aim of improving skills or challenging attitudes. Small interactive workshops are often difficult to implement in isolated, rural areas in which health providers are few; this method is also difficult in areas where health providers cannot easily be replaced for clinical activities while they attend trainings.

**Education outreach visits.** Educational outreach visits were shown to be effective in both urban and rural settings of South Africa. This method is more expensive than other methods, but could potentially be more effective. Educational outreach programs demonstrate small to modest effects in systematic guideline review (Althabe et al., 2008). Advantages of outreach visits over educational meetings include: ‘easier to ensure good coverage’; ‘less costly’; ‘easier to tailor outreach to the specific needs/circumstances of each profession’ (Althabe et al., 2008). Althabe et al. suggest “the use of a train-the-trainers model could be a strategy to make programmes more easily replicable and cost-effective, although there is no strong evidence to support this assumption” (2008).

**Patient-mediated interventions.** This strategy alone does not prove to be effective. The drawbacks of this strategy limit its potential utility in rural, impoverished, and un-empowered populations. In populations where women are not sufficiently educated and empowered, it is unreasonable to expect them to challenge the authority of health providers. This method is also likely to be resisted by providers at all levels of care. Patient-mediated interventions are more effective in middle- or high-income countries, where mass media coverage is good and literacy is high (Althabe et al., 2008).

**Multifaceted interventions.** The significant of this strategy is difficult to elucidate, as the potential iterations of heterogeneous combinations of strategies are numerous. This strategy must be judged by the individual components contained there within. The advantage of this strategy is that multiple methods can be combined to “overcome several barriers at the same time and [...] address training, dissemination and implementation objectives”.

The disadvantages include difficulty assessing efficacy and expense (Althabe et al., 2008). As an example, an intervention including “replicable interactive workshops (train-the-trainers methods), distribution of simple printed materials, and implementation of manual reminders could be a potentially relevant intervention to train in EOC, ENC, and neonatal resuscitation, and to develop and implement clinical guidelines” (Althabe et al., 2008).

**Integration of primary health care services.** Evidence on integration of services is inconsistent at this time. Theoretically, this method is highly relevant to maternal health services; primary care services in developing countries are often poorly organized and fragmented, and patients are required to see multiple providers at different health facilities on many occasions.

This intervention is particularly applicable in settings where a partially developed and/or fragmented primary health care system exists. Although this strategy can require considerable planning and resources, it can ultimately provide effective streamlining and improved efficacy and quality of healthcare (Althabe et al., 2008).

**Improving office systems.** Better organization of preventative service delivery is a simple and cost-effective strategy to improve health care quality. This strategy can be targeted to problems prevalent in impoverished settings (Althabe et al., 2008).

**Changes in medical record systems.** This intervention requires highly qualified health professionals to design and implement the systems. Scaling up of this strategy is difficult, as it requires professionals with expertise in medical records. However, it has myriad potential benefits (Althabe et al., 2008).

**Clinical practice guidelines.** Although this strategy is not technically considered an intervention, effective implementation of clinical guidelines is likely to improve quality of care. As yet, supporting evidence of its efficacy is limited, but clinical guideline advantages are numerous. Guidelines are easily scaled-up in a developing setting and applicable to a variety of health care settings and disease-states (Althabe et al., 2008).

**Training programs in MCH essential care.** Effective training of birth attendants, midwives, nurses, and physicians in skills to manage obstetric emergencies is relevant to both quality improvement and reduction of maternal morbidity and mortality. Knowledge and skills contained in a training program should be evidence-based basic essential obstetric care, management of acute obstetric complications, and essential neonatal care and resuscitation. These programs can be conducted as interactive workshops using dummies, simulation models, and exercises. Althabe et al. (2008) state that training programs allow for:

- 1) The development or introduction and discussion of clinical practice guidelines recommending the best practices, 2) learning how to deliver preventative practices and identify and treat complications, and 3) certifying the health providers based on evaluation of competency on the simulation models, before applying the skills to real patients. These training workshops can also include plans and strategies to implement the recommended forms of care in the health care setting, including providing appropriate materials; the training workshops can be designed to be replicable and scaled up, using a train-the-trainers model. (Althabe et al., 2008).

These training programs can act as a sort of multifaceted intervention, using the best aspects of educational materials, feedback, and educational meetings to improve the skills of local providers.

**Interventions to improve quality of care.** There is no panacea for poor quality of services. No single intervention will address the shortcomings of the low-income country's health care system, nor break down the barriers to quality care access. Multiple interventions "should be selected or tailored to deliver effective services" (Althabe et al., 2008). Althabe et al. (2008) propose that the aforementioned categories of intervention should be considered "a tool box, from which the most appropriate tools must be selected for specific problems". Quality improvement requires a concerted effort from all parties involved, and assignment of responsibility to local, regional, and national governance structures for quality improvement activities, priority setting, selection and design of interventions to address quality issues, and evaluation (Althabe et al., 2008).

## Gaps in the Literature

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The complex & interwoven issues related to maternal mortality have generated a large body of empirical and theoretical literature. However, despite the amount of information published on the topic of maternal mortality and its myriad causes, women continue to die during childbirth at high rates and a clear solution to the problem has not yet been uncovered. Scientific research on maternal mortality determinants has focused largely on clinical factors. Although almost all causes of maternal death are avoidable, traditional programs aimed at combatting maternal death have been less than successful in curbing the epidemic of maternal mortality. One must look at the problem of maternal



mortality “as a whole and appreciate the importance of economical, political and social macrostructural factors” (Gil-González, Carrasco-Portiño, & Ruiz, 2006) if one hopes to draw nearer to the elusive solution to maternal mortality.

Current safe-motherhood strategies have come under fire, with concerns that interventions are poorly implemented or lack an evidence base (M. Luck, 2000). Critics charge that component programs of maternal mortality reduction interventions are mostly based on poor-quality evidence from retrospective and observational studies, in addition to empirical knowledge and deductive reasoning. Additionally, most research is concentrated on evidence for clinical decision-making. Strategies at the population level, requiring a complex public health and multidisciplinary approach, lack evidence.

Gil-González, Carrasco-Portiño, & Ruiz (2006) conducted a systematic review of scientific studies examining causes of maternal death between 2000 and 2004 to compare the proportion of papers on each cause with the corresponding burden of each cause. Articles on eclampsia or pre-eclampsia (28.3% of all scientific papers about causes of maternal death) and all indirect causes (26.7%) were over-represented when compared with the burden of causes reported by the WHO (12% and 20%, respectively). In contrast, obstructed labor (2.5%) and unsafe abortions (3.7%) were underrepresented in the literature, in light of their prevalence (8% and 13%, respectively). Literature regarding hemorrhage was also underrepresented in the literature (19.7% of papers versus burden of 25%). The proportion of papers on infectious disease (18.3%) was similar to its causative prevalence (15%).

The authors identified 2250 potential papers for review; however, all but 27 were excluded because they did not focus on the possible relation between maternal mortality and socioeconomic, political, and cultural factors. Of the 27 papers reviewed, 23 (85%) examined the influence of macrostructural determinants on maternal mortality in low-income countries (Gil-González, Carrasco-Portiño, & Ruiz, 2006). Interestingly, 70% of the studies in developing countries were conducted by scientists from developed countries. Regarding study design, 17 of the 27 papers were cross-sectional studies; three case-control studies, one cohort study; three ecological studies; and three qualitative studies (Gil-González, Carrasco-Portiño, & Ruiz, 2006).

Socioeconomic status was mentioned in eighteen of the 27 reviewed studies (Gil-González, Carrasco-Portiño, & Ruiz, 2006). Educational level of the woman was considered in sixteen. Only one study considered political stability as a factor that might influence rates of maternal death. Nine of twenty-seven papers researched the effect of culture on maternal mortality. Confusingly, the messages of these papers were contradictory—“some supported the local culture and proposed integration with the official health system while other papers criticized the local culture as a risk factor in maternal mortality” (Gil-González, Carrasco-Portiño, & Ruiz, 2006). Too often, potentially causative factors were mentioned in the introduction or results, but not in the methods. Gil-González, Carrasco-Portiño, & Ruiz found that mention of attendance by TBAs appeared in 12 results sections (44%) but in only seven (26%) methods sections; distance between a woman’s home and health-care facility is mentioned in 11 results sections (41%) but in only 3 methods sections (11%) (Gil-González, Carrasco-

Portiño, & Ruiz, 2006). The clinical variables most frequently mentioned in results sections about macrostructural determinants of maternal mortality are care during delivery (44%) and perinatal care (41%).

Few studies on maternal mortality have investigated the relationship between macrostructural determinants and healthcare and services. As Gil-González, Carrasco-Portiño, & Ruiz discovered, “there may be an inverse scientific interest pattern – understood as a knowledge-base gap—between the burden of the causes of maternal mortality and scientific interest in these determinants.” Research is focused on clinical issues, rather than social, economic, and political factors that may influence rates of maternal death. This may be a result of measurement facility--clinical factors are easier to measure, and potentially easier to correct.

Unfortunately, most studies on maternal mortality in developing countries are carried out by investigators from developed countries. This is often done without the participation of the developing countries where maternal mortality is being studied. To gain a whole perspective of the problem of maternal mortality, participation from the affected country and its citizens will be necessary to capture the sociocultural context. Lack of knowledge about cultural and political structures of affected countries undoubtedly contributes to the failure of some interventions. Additionally, robustly designed studies are lacking in maternal mortality research. The quality of such research “will need to be improved to produce knowledge about macrostructural causes of maternal mortality” (Gil-González, Carrasco-Portiño, & Ruiz, 2006).

Studies linking perceived and technical quality of care are few and far between, especially in maternal mortality research. It is clear that perception of quality of care influences utilization; and technical quality of care influences utilization and outcomes. These domains need to be examined in tandem if an effective solution is to be established. Research linking facility audits and other technical measures of quality of care to patient satisfaction and perceptions of care should be prioritized.

Where possible, rigorous study design should be incorporated into quality of care studies to prove causality. Studies of the specific dimensions of quality needed to improve maternal health outcomes are one potential way to ensure cost-effective interventions in the future. Quality of care interventions should be studied and implemented in a responsible, equitable, and evidence-based manner. Control groups should be utilized so that observed change can be attributed to the intervention itself. Efforts to improve the external validity of studies should also be undertaken: the highly specific nature of some study sites makes their applicability to the greater developing context difficult (Peabody et al., 2006). If possible, randomized control trials should be attempted; where these studies are not possible, quasi-experimental studies with clear control groups and longitudinal design should be implemented (Peabody et al., 1999). These studies should be complemented by cost-benefit and cost-effectiveness analyses to ensure ethical utilization of limited resources.

The epidemic of maternal mortality is daunting, but not insurmountable. The amount of research dedicated to maternal health, and its quality, is an encouraging sign of the global pledge to make childbirth safe for all mothers. No

single intervention will stem the tide of maternal deaths. What is clear from the literature is that a multifaceted approach to reducing maternal mortality, and improving the quality of care in our mothers' hospitals, is a step in the right direction.

# Methods

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**Introduction.** The data utilized for this analysis was collected as part of a larger two-year study called Projet Espoir (Project Hope). This project--a collaboration between CARE USA, CARE Mali, and Emory University--is a two-year study designed to evaluate the effect of social change on maternal and neonatal health determinants. In June & July 2011, the baseline qualitative and quantitative data was collected. At the end of the summer, reproductive and social interventions were designed based on the initial results of the baseline study. In 2013, the same quantitative and qualitative survey instruments will be repeated in the study area to evaluate the effect of the interventions on knowledge, attitudes, and practices in Mopti. The methodology used to collect cross-sectional household and health facility data is outlined in the following section.

**Background of study area.** The study took place in the Mopti region of Mali, an impoverished country in West Africa (Figure 17).

### Figure 17: Map of Mali

Source: UN, <http://un.org/Depts/Cartographic/map/profile/mali.pdf>



Mopti is centrally located in Mali: bordered by the Tombouctou region to the north, Ségou region to the southwest, and Burkina Faso to the southeast. The Niger traverses the Mopti region, providing irrigation to the area's farmers and a livelihood for the region's fishermen (USAID, 2010). The population of Mopti is approximately 2 million people. Its largely rural populace relies on agriculture and animal husbandry: approximately 10% of the population is nomadic and 80% of the Malian labor force is engaged in farming and fishing (USAID, 2010). Ninety percent of Mopti's residents are Muslim; the remaining population practices indigenous religions (9%) and Christianity (1%).

Two districts, Bandiagara and Bankass, within Mopti were chosen for study based on their proximity to the CARE headquarters in Sevaré; and the similarity of their populations. Two ethnic groups dominate the districts of Bandiagara & Bankass: the Dogon and Peulh. The Dogon are farmers, known for their mud homes on the Dogon plateau in Bandiagara (Figure 18a). Dogon families are typically polygamous. The Peulh are nomads who travel central Mali with their cattle during the dry season; Peulh families are traditionally monogamous. A typical Peulh home is depicted in Figure 18b.

**Figure 18a: Traditional Dogon homes in Mopti, Mali**

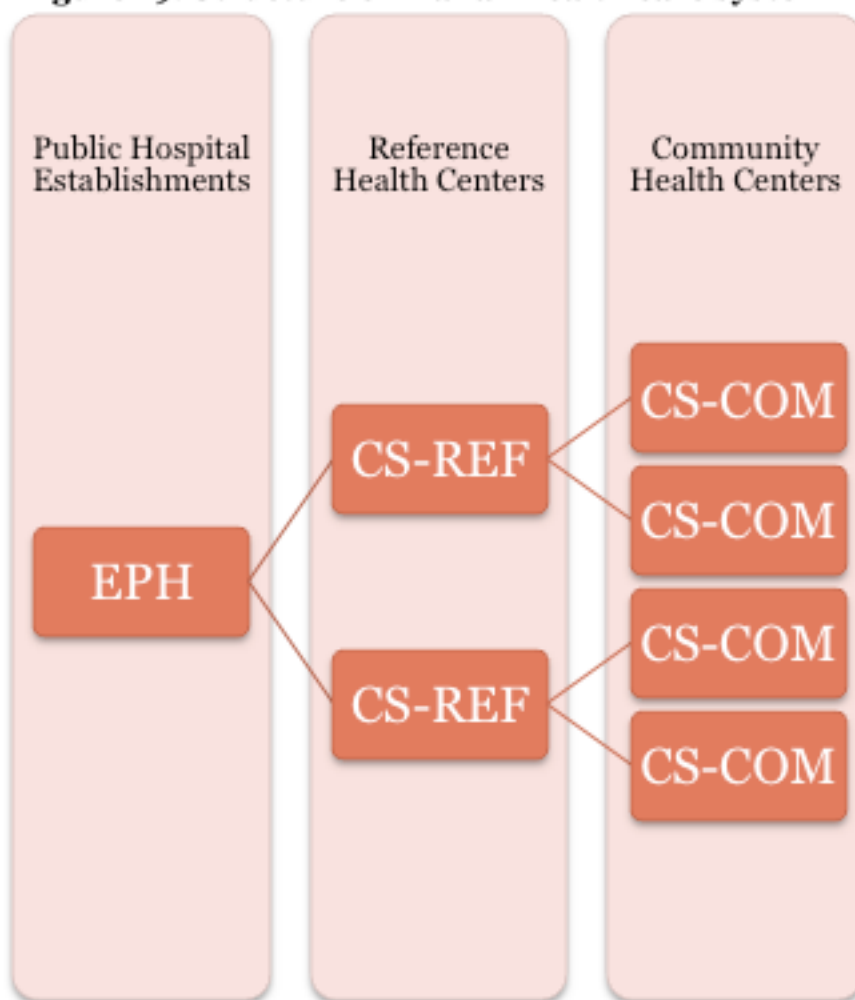


**Figure 18b: Traditional Peulh home in Mopti, Mali**



**Malian health care system.** Both the household survey and health facility audits were designed around the existing health care system in Mali (Figure 19).



**Figure 19: Structure of Malian health care system**

There are five tertiary-care EPHs (*Etablissements Public Hospitalier* or public hospital establishments) in Mali (Hoy, 2010). Below the level of EPHs are CS-REFs (*Centres de Santé Références* or regional health centers). There is one CS-REF in each district. CS-REFs provide prenatal consultations, labor and delivery services, postpartum consultations, pediatrics, family planning, vaccinations, surgical care, post-op care, laboratory facilities, ophthalmology, stomatology, and pharmacy services. They are referral centers for the primary level CS-COMs (*Centres de Santé Communitaires* or community health centers). CS-COMs provide minimal basic care and services, known as *paquet minimum d'activités*

(PMA). PMAs provide basic preventative and curative services in maternal and child health. CS-COM catchment areas generally cover between 5,000-20,000 people (Hoy, 2010). There are between 20 and 30 CS-COMs in each district. Our study examined 44 CS-COMs in both Bandiagara & Bankass.

**Purpose of household survey.** The purpose of the survey was multifold: 1) to identify levels and patterns of pregnancy and maternal health among adult females; 2) describe the social environment in which maternal health exists on a household level; 3) provide information to develop and implement a community-based intervention that promotes gender equity, social change and safe deliveries; and ultimately, 4) describe the effects of community-based interventions on social environment and maternal health indicators.

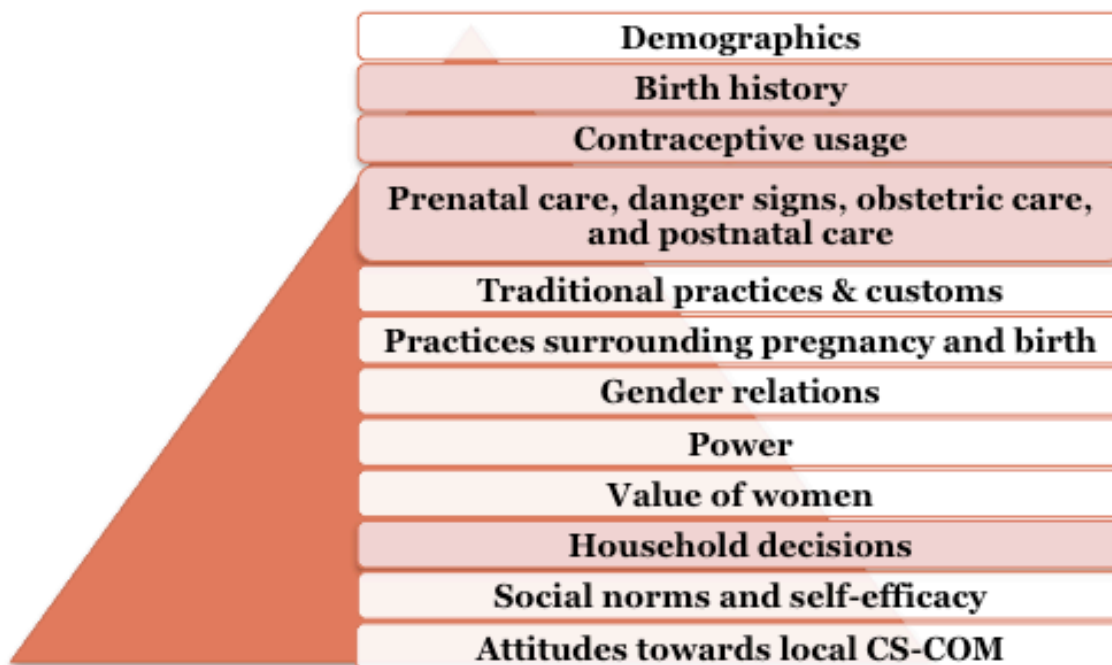
**Purpose of health facility audit.** The purpose of the health facility audit was to assess the functional status, equipment availability, and personnel of health facilities in Bandiagara & Bankass. Additionally, in-depth assessment of UN signal functions of basic & comprehensive essential obstetric care was conducted in each CS-COM and CS-REF in Bandiagara and Bankass.

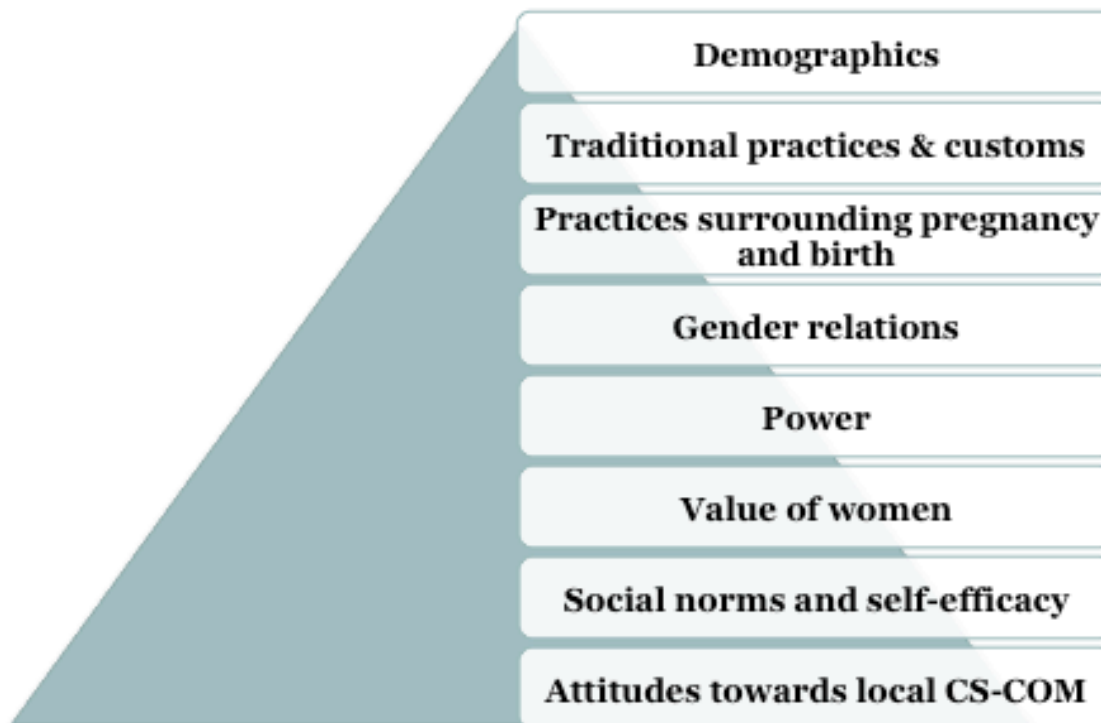
**Household survey structure & content.** Comprehensive household baseline surveys were designed to assess patterns of pregnancy; social, cultural, economic, and attitudinal factors; and maternal health determinants on a household level. The central theme of each survey instrument was the assessment of how social customs, gender norms, attitudes, and behaviors influence maternal health service uptake. Four surveys were developed – one for a woman who had given birth within the last twelve months, one for her husband, one for her mother-in-law, and one for her co-wife (if applicable).

Survey instruments were created by modifying the Demographic and Health Survey (DHS) Model B. Surveys were initially written in English and then translated to written French. Surveys contained questions on cultural practices of pregnancy specific to the sociocultural context of the study area.

The central theme for all four survey instruments was the same; each survey was worded to refer to the index *femme*—the woman who had given birth within the last 12 months—in the appropriate context (as a wife, daughter-in-law, or co-wife). The survey for the *femme* was more in-depth; for example, the index woman was asked questions in reference to her experience of her most recent pregnancy. The domains of the survey instruments for each family member are outlined in Figures 20-23.

**Figure 20: Domains of wife survey**



**Figure 21: Domains of husband survey****Figure 22: Domains of mother-in-law survey**

**Figure 23: Domains of co-wife survey**

Inclusion criteria for the survey index woman were: age greater than 14 years, gave birth within last 12 months, and currently married. Potential index women were excluded if no other members of the household (husband, mother-in-law, co-wife) were available. Study respondents were not excluded if they did not have a co-wife or if their mother-in-law or husband was deceased, provided other familial survey participants were available.

One of the key components of the household survey was the ladder tool. The ladder tool utilized a picture of a simple household ladder with each rung numbered sequentially one through ten. Survey participants were shown the ladder by the data collector, and asked to rate how much they agreed or disagreed with a statement by pointing with their finger on the ladder. Participants were told that pointing to a “10” meant that they completely agreed with the

statement; likewise, pointing to the “1” meant they completely disagreed with the statement. Participants were told to utilize the full ladder to indicate how much they agreed or disagreed with the statement (Figure 24).

**Figure 24: A data collector utilizing the ladder tool**

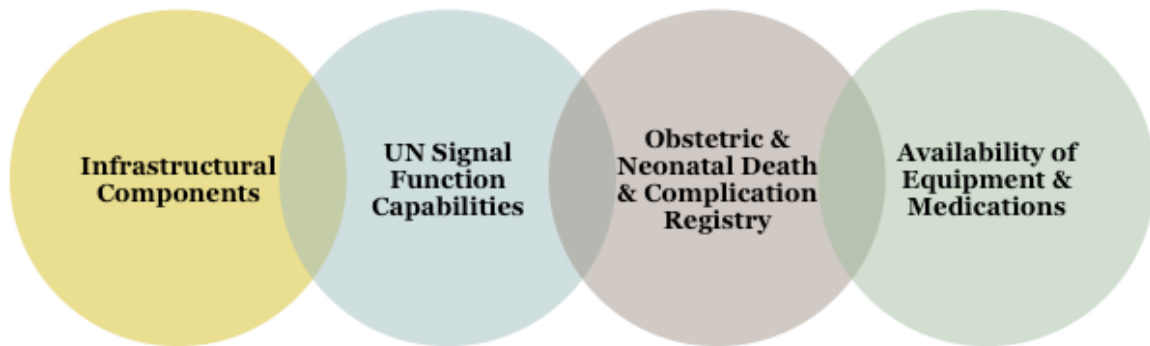


The household survey instrument was validated in the study setting in spring 2011. The Emory University Internal Review Board (IRB) and the Mali National IRB approved the household study design prior to study administration.

**Health facility audit structure & content.** The health facility audit collected data on the following domains: administrative structure, UN essential obstetric signal functions, medication stocking issues, number of births, neonatal

and maternal deaths, maternal complications, equipment availability and functionality, available personnel, and continuing education level among staff. Additionally, gender and decision-making attitudes of staff were collected. The domains of the health facility audit are outlined in Figure 25.

**Figure 25: Surveyed domains in Health Facility Audit**



**Training of data collectors.** Twenty data collectors with a background in sociology and/or demography were recruited to conduct the quantitative survey. An effort was made to find data collectors who spoke multiple languages; at a minimum, all data collectors spoke French & Bambara. Some spoke Dogon, Peulh, Bozo, or other regional languages. Data collectors received thirty hours of training on the content of the survey, the meaning of each survey question, the study structure, the correct manner of using the ladder tool, and the importance and process of obtaining informed consent. Prior to commencement of the data collection, all data collectors were field tested in a local village, Goundaka. After the field test, field trainers met with each data collector to go over their test and discuss any errors.

The most common mistakes during training and the field test involved the birth history section of the *femme* survey. These errors were usually

mathematical in nature: one would find that a woman reportedly had more live children than live births. Data collectors also struggled with the correct way to document a stillborn. Additionally, some data collectors initially neglected to ask the questions in the “Power” section of the survey in the correct manner.

Prior to study design, field exploration of regional gender dynamics was undertaken in the study area. Fortunately, female study participants expressed no discomfort being interviewed by male data collectors and vice versa. Despite special attempts to recruit female data collectors prior to training, data collectors were 75% male.

**Sampling.** CS-COM was used as the sampling unit for the purposes of this survey. In total, thirty villages were selected for the survey. A number of villages are assigned to each CS-COM by the government, based on their geographic location. For our survey, each village received a weight proportional to the number of villages in its corresponding CS-COM and the total number of villages in the district. To achieve this sampling weight, investigators divided the number of villages in the CS-COM by the total number of villages in the district, then multiplied this number by thirty to receive the number of villages one should sample from each CS-COM. Each CS-COM contributed one, two, or three villages to the sample pool. After calculating the number of villages to sample from each CS-COM, investigators randomly chose the names of villages from a list of the CS-COM catchment area.

**Household data collection.** Data collection took place over twenty days in July 2011. Three teams of eight data collectors, plus a team leader, were created prior to the start of data collection. Each day, prior to commencement of



the survey, the team leader and a CARE junior expert would meet with the chief of the village to explain the purpose of the visit and ask his permission to conduct the survey. The team would also visit the local CS-COM to inform the CS-COM medical director of CARE's activities in the area (Figure 26).

**Figure 26: Data collectors tour a survey village with a village elder**

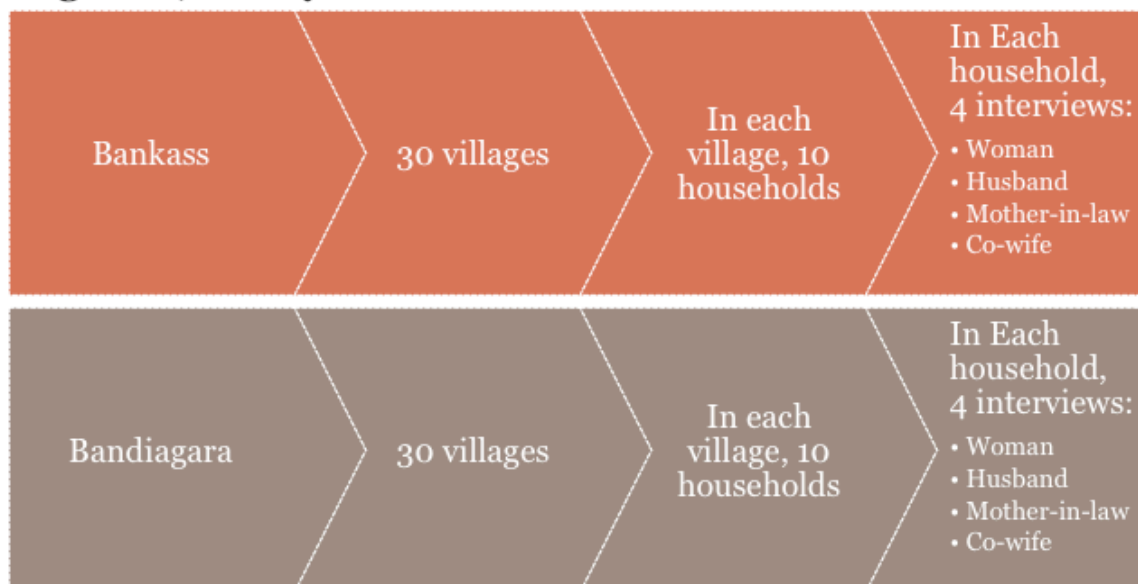


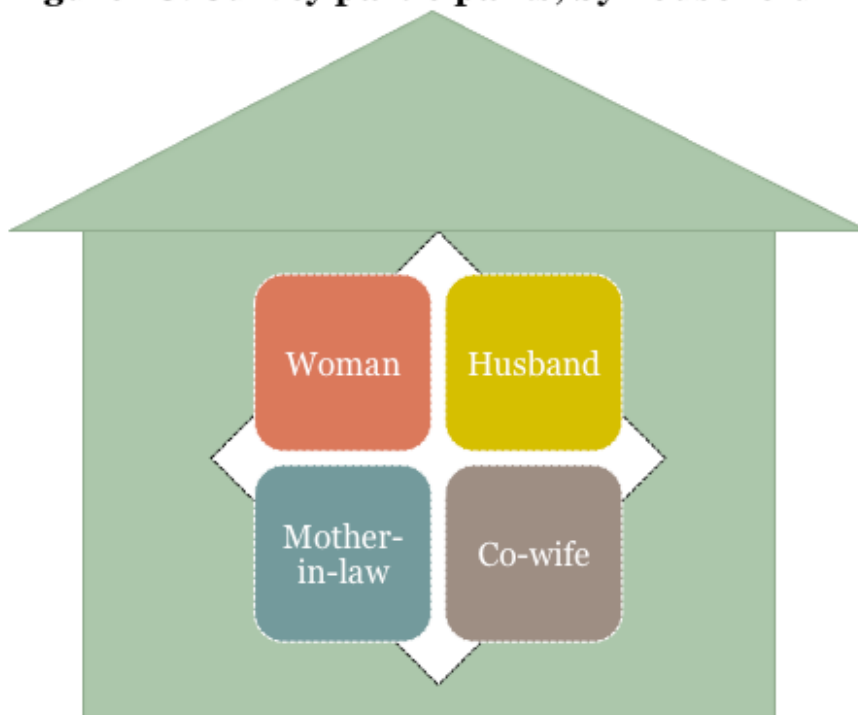
Ten households from each village were randomly selected from eligible households. To be eligible, households needed to have a woman greater than age 14 years who had given birth within the last twelve months. Additionally, at least one of the other study subjects (husband, mother-in-law, co-wife) needed to be available for survey administration. Only one recently pregnant woman was interviewed per household. Surveys from a common household were given the same number to facilitate future linking of the data.

Each team was charged with conducting ten household surveys each day, for a potential daily sum of 40 interviews per team (120 interviews total). At the

end of the survey period, each team collected 800 surveys from 200 households (Figure 27 & 28). All told, the study collected 2400 surveys at the end of twenty days, less those with missing family members and/or monogamous family structure.

**Figure 27: Study structure**



**Figure 28: Survey participants, by household**

Quantitative data was collected using the four survey instruments in both districts. Verbal and written informed consents were obtained from all respondents. Data collectors verbally translated the written French survey into spoken Bambara, Dogon, Peulh, or other regional language as necessitated by the survey respondent. Surveys were carried out face-to-face in a private area and lasted approximately thirty minutes. Often, not all members of the household were present. In this case, efforts to find the missing family members in the fields or elsewhere in the village were attempted. If necessary, another more complete household was selected to be surveyed. In small villages with a limited number of women who'd given birth in the last twelve months, surveys were collected from any available & eligible family members. As approximately 50% of the population was monogamous, investigators expected approximately 50% of the co-wife surveys to be missing from the completed household surveys.

After each household was surveyed, team leaders verified the surveys for completeness, correctness, and quality of work. Mathematical errors or missing data were corrected and if needed, re-collected from study participants.

**Health facility audit administration.** Two junior experts from CARE visited each CS-COM and CS-REF over the course of two months to audit the health facilities. The junior experts met with a senior staff member, usually a medical director or chief nurse, to obtain the HFA information contained in the questionnaire. They also extracted data from the maternal & infant death registries where applicable. They toured the facilities to obtain additional information on the cleanliness of the facilities and availability & functionality of the equipment.

**Data entry and cleaning.** The field surveys contained the database variable name to facilitate accurate and effective transcription of data from written survey to Microsoft Excel spreadsheet. Two data entry personnel were trained on data entry methods for both the household survey and the health facility audit. Household survey members were listed sequentially in the database, linked by their common household number. Each group of four rows began with the household femme's data.

Each individual woman was linked to her local CS-COM's health facility audit data utilizing STATA. Health facility audit data was merged with the household database using the CS-COM variable. Two CS-COMs (Diallaye & Sama) with HFA data did not have corresponding household data; these CS-COMs were included in HFA analysis but not analysis of the woman dataset.

Completed surveys were available for 534 women who had a birth in the past year and were currently married. Of these, one was dropped for missing information on parity. Another twenty-four women were omitted because they did not participate in the scales section of the survey. The final sample size for the woman dataset was 509. Twenty-three respondents who said they were monogamous were recoded as polygamous when they reported having at least one co-wife. Three women who said they were polygamous but had zero co-wives were recoded as not polygamous. Additionally, three women who said they were not polygamous were recoded as polygamous because one of their co-wives had participated in the household survey.

**Analysis.** The analysis sample was 509 women who participated in the household survey, linked with their local CS-COM's HFA data.

The key outcome variables were: 1) Did the woman meet the WHO standards for a safe delivery? 2) Did the woman meet WHO standards for adequate antenatal care? 3) Did the woman receive antenatal care during the first trimester? 4) Did the woman receive at least four antenatal care visits? WHO standards for a safe delivery were defined as delivering in a health facility with a skilled birth attendant. An acceptable health facility was defined as a CS-COM, government hospital, or private hospital. Skilled birth attendants included health extension workers, midwives, nurses, physicians, or other clinicians. Traditional birth attendants (TBAs) were not considered skilled health care workers. The WHO minimum standards for adequate antenatal care are a minimum of four ANC visits and at least one visit during the first trimester. Women met the WHO ANC standard if they fulfilled these criteria. The first trimester ANC outcome

variable was defined as women who stated their first ANC visit was during month 1, 2, or 3 (Figure 29).

**Figure 29: Outcome Variables Defined**

Variable	Definition
Met WHO standards for safe delivery	Delivered in a health care facility (CS-COM, government hospital, private hospital) with a skilled attendant (health extension workers, midwives, nurses, physicians, or other clinicians)
Met WHO standards for antenatal care	Received antenatal care during first trimester & four ANC visits
Received antenatal care during first trimester	Patient received antenatal care prior to week thirteen of pregnancy
Received adequate antenatal care visits	Patient received at least four ANC visits prior to birth

Covariates considered included both woman household data and health facility audit data (Figure 30). From the woman household data, we considered age, education level (having any schooling), cohabitation with mother-in-law (defined by existence of mother-in-law data in corresponding household number), polygamous family, and employment outside the home. Parity was assessed using three categories: 1-2 children, 3-4 children, and 5+ children.

**Figure 30: Covariables Defined**

Variable	Definition
Age	Age of survey participant, in years
Education Level	Received any education versus none
Cohabitation with mother-in-law	Defined by existence of mother-in-law in corresponding household number
Polygamous family	More than one wife in household
Employment outside the home	Any income gained outside the home
Parity	Categorized as: 1-2 children, 3-4 children, 5+ children

To capture the effect of perceived health care quality, we included nine variables related to women's perceptions of the healthcare system. Eight of these variables were Likert scale-type statements about various domains of quality of care at their local CS-COM, utilizing the survey ladder. The ninth variable was a composite CS-COM score, summing the woman's responses to the eight CS-COM domain questions. Responses from one of the CS-COM domains—"I receive better treatment if I am accompanied by my husband"—were inversed before being added to the CS-COM score, as this statement was phrased such that "1" was a positive response and "10" was a negative response (Figure 31).

**Figure 31: Perceived CS-COM Quality Variables**

Perceived Quality of Care Domain	Survey Statement
Overall quality	“The CS-COM offers high quality services.”
Interpersonal relations	“The CS-COM staff is welcoming and respects me.”
Gender dynamics	“The CS-COM personnel give better services if I am accompanied by a male.” “The CS-COM personnel give better services if I accompany my wife.”
Information	“The CS-COM personnel give me/my wife/my daughter-in-law/my co-wife all the information she needs for her health.”
Technical quality	“The CS-COM has the necessary equipment to take care of my/my wife/my daughter-in-law/my co-wife’s birth.”
Safety	“The CS-COM is the safest place to give birth.”
Physical accessibility	“I/my wife/my daughter-in-law/my co-wife can get to the CS-COM to give birth if I/she needs to.”
Cost-benefit balance	“The cost-benefit balance of services at the CS-COM is acceptable.”

Health facility data included in analysis included the following: total births at the CS-COM in previous seven months (including both live and still births); maternal mortality rate (calculated using total number of maternal deaths divided by total number of births in previous seven months, multiplied by 100,000); infant mortality rate (calculated using total number of live births, divided by total number of births, multiplied by 1,000); and total number of maternal deaths. The total complication rate was calculated using the total



number of complications (summed number of hemorrhages, dystocia, pre-eclampsia, uterine rupture, puerperal infections, complicated abortions, and other complications), then dividing that number by the total number of births and multiplying by 100. Health facility data also included a variable considering whether or not the CS-COM had run out of any medications in the prior six months. The percent of staff retrained in maternal health in the prior twelve months was calculated. Additionally, a “functioning equipment” variable was defined as the percent of the CS-COM’s equipment that was functioning at the time of the audit. We considered the UN process indicators for essential obstetric care, the signal functions, and created a variable that assessed the number of signal functions the CS-COM was capable of carrying out. We also created a variable to describe how many signal functions the CS-COM had performed in the prior six months (Figure 32).

**Figure 32: Health Facility Audit Variables Defined**

Variable	Definition
Total births	Both live and still births delivered at CS-COM in prior seven months
Maternal mortality rate	Total number of maternal deaths divided by total number of births in previous seven months, multiplied by 100,000
Infant mortality rate	Total number of live births, divided by total number of births, multiplied by 1,000
Total number of maternal deaths	Total number of maternal deaths as recorded in maternal registry data
Total complication rate	Total number of complications (summed number of hemorrhages, dystocia, pre-eclampsia, uterine rupture, puerperal infections, complicated abortions, and other complications), then divided by total number of births (live and dead) and multiplying by 100
Medication stock-out	CS-COM ran out of any medication in the prior six months
Staff retraining	Percent of staff retrained in maternal health in prior six months, divided by total number of staff, multiplied by 100
Equipment functionality	Percent of the CS-COM's equipment that was functioning at the time of audit (total number of functioning equipment divided by total number of equipment, multiplied by 100)
Signal function capability	Number of signal functions (out of six UN signal functions) that CS-COM was capable of carrying out
Number of signal functions performed	Number of signal functions performed by CS-COM in the previous six months

Univariate analysis, bivariate analysis, and logistic regression were performed using STATA SE, version 11.2. After calculation of chi-square and t-tests for bivariate analysis, logistic regression was performed for each of the four outcome variables. These models were used to determine the independent

contribution of study variables to use or non-use of maternal health services.

Total number of maternal deaths was excluded from logistic regression because there were so few deaths. The individual CS-COM domains were used in lieu of the composite CS-COM score to identify specific domains of significance in the logistic regression models.

## Results

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The characteristics of the CS-COM health facilities are summarized in Table 1. Overall, forty-four CS-COMs were audited in Bandiagara and Bankass. There were three deaths recorded in the maternal death registries compiled by the CS-COMs. Across all forty-four CS-COMs, 2818 births (both live and stillborn) were registered. The mean number of births per CS-COM was 64 births (SD=57.0) over a seven-month period. The mean maternal mortality ratio was 212.7; the range varied from 0-3225.8 maternal deaths/100,000 births. The mean infant mortality ratio was 24 infant deaths/1,000 births (range: 0-166.7). The total complication rate, accounting for all documented complications in a seven-month period, was 6.2% (range: 0-33.3%) of deliveries. The mean number of medical staff per CS-COM varied according to profession; in general, there were far fewer physicians and nurses than community health workers and administrators. The mean number of medical staff per CS-COM was: 0.2 surgeons (SD: 0.4); 0.2 general physicians (SD: 0.4); 0.1 midwives (SD: 0.3); 0.2 obstetric nurses (SD: 0.5); 0.3 general nurses (SD: 0.4); 1.4 chief nurses (SD: 0.5); 0.8 health aides (SD: 0.5); 0.9 administrators (SD: 0.3); 43.7 community health workers (SD: 30.1). When polled for percent of staff retrained in maternal health within the last twelve months, CS-COMs reported a mean of 15.1% (SD: 15.2) of their staff. The percent of essential obstetric medical equipment that was present and functioning in the CS-COMs was, on average, 45.8% (SD: 13.0). Over 85% (86.4) of CS-COMs ran out of a least one essential medicine in the six months prior to health facility audit.

**Table 1: Characteristics of CS-COM maternal health service provision**

<b>Characteristics</b>	<b>Summary (n=44)</b>
Number of CS-COMs (%)	44 (100)
Maternal deaths	
Total (%)	3 (100)
Mean per CS-COM (SD)	0.1 (0.3)
Births	
Total (%)	2818 (100)
Mean per CS-COM (SD)	64.0 (57.0)
Maternal mortality ratio (range)*†	212.7 (0-3225.8)
Infant mortality ratio (range)*‡	24.0 (0-166.7)
Total complication rate (range)*§	6.2 (0-33.3)
Mean number of medical staff*	
Surgeons (SD)	0.2 (0.4)
General physicians (SD)	0.2 (0.4)
Midwives (SD)	0.1 (0.3)
Obstetric nurses (SD)	0.2 (0.5)
General nurses (SD)	0.3 (0.4)
Chief nurses (SD)	1.4 (0.5)
Health aides (SD)	0.8 (0.5)
Administrators (SD)	0.9 (0.3)
Community health workers (SD)	43.7 (30.1)
Percent of medical staff retrained in maternal health within last 12 months*	
Mean (SD)	15.1 (15.2)
Percent of essential obstetric medical equipment that was present and functioning in CS-COM*	
Mean (SD)	45.8 (13.0)
Number of CS-COMs that ran out of at least one essential medicine in prior 6 months (%)*	38 (86.4)
Number of CS-COMs that were capable of carrying out all 7 signal functions (%)*	0 (100)
Number of CS-COMs that were capable of carrying out any signal functions (%)*	43 (97.7)
Mean number of signal functions that CS-COM was capable of performing (SD)*	5.0 (1.4)
Number of CS-COMs that carried out all signal functions in prior 6 months (%)*	0 (100)
Number of CS-COMs that carried out at least one signal function in prior 6 months (%)*	43 (97.7)
Mean number of signal functions that CS-COM performed in prior 6 months (%)*	4.3 (1.3)

\*Contains missing observations

†Maternal mortality ratio=number of maternal deaths/100,000 births

‡Infant mortality ratio=number of infant deaths/1,000 births

§Total complication rate=(total number of complications/total number of births over 7 month period) x 100

CS-COMs were assessed on their ability to carry out the UN essential obstetric care signal functions; none of the forty-four CS-COMs were able to carry out all 7 signal functions. One CS-COM was not capable of carrying out any signal functions. On average, CS-COMs were capable of performing 5.0 (SD: 1.4) signal functions. None of the forty-four CS-COMs had carried out all signal functions in the previous six months. All but one of the CS-COMs had carried out at least one signal function in the prior six months (97.7%). CS-COMs performed a mean number of 4.3 signal functions (SD: 1.3) in the six months prior to audit.

Table 2 summarizes the demographic characteristics of women participating in the household survey. A total of 509 women delivering within the past year met eligibility requirements for analysis. The majority of women (77.6%) delivered at home; 20.8% delivered at a CS-COM; 0.8% delivered at a government hospital; 0.6% delivered in someone else's home; and 0.2% delivered in a private hospital or clinic. Women were assisted in delivery by a variety of people, the majority assisted by their mother-in-law. The most popular skilled attendant was a midwife: 20.2% of surveyed women reported using a midwife for delivery. Nearly an equal number used traditional birth attendants: 12.8% used a TBA without formal training; another 8.5% used a TBA with formal training. Nearly 31% of women received adequate (four or more visits) antenatal care. The remainder (69.2%) received between zero and three visits. The mean number of antenatal care visits received was 3.1 (SD: 0.1). The mean age of woman survey respondents was 26.3 (SD: 0.4) years. A large proportion (39.2%) did not know their age. Only 10.7% of women reported receiving any education. Over a quarter of women worked outside the home (26.2%). The majority of women (42.3%)

were grand multipara (defined as delivery of five or more infants); the rest had delivered 1-2 infants (27.4%) or 3-4 infants (30.4%). Almost half (48.3%) of women surveyed lived in polygamous homes. Over sixty percent (62.3%) of women cohabited with their mother-in-law.

**Table 2: Characteristics of women delivering within past year**

<b>Characteristic</b>	<b>Summary</b>
Number of women delivering within past year (%)	509 (100)
Location of delivery	
Home (%)	395 (77.6)
Someone else's home (%)	3 (0.6)
CS-COM (%)	106 (20.8)
Government Hospital (%)	4 (0.8)
Private hospital or clinic (%)	1 (0.2)
Attended in delivery by	
Mother (%)	77 (15.1)
Mother-in-law (%)	166 (32.6)
Sister (%)	15 (3.0)
Other family (%)	20 (3.9)
Neighbors/friends (%)	25 (4.9)
Traditional birth attendant (TBA) without formal training (%)	65 (12.8)
TBA with formal training (%)	43 (8.5)
Community health worker (%)	5 (1.0)
Midwife (%)	103 (20.2)
Nurse (%)	15 (3.0)
Doctor (%)	7 (1.4)
Other clinician (%)	7 (1.4)
Antenatal care received*	
4+ visits (%)	119 (30.8)
0-3 visits (%)	267 (69.2)
Mean (SD)	3.1 (0.1)
Age*	
Mean (SD)	26.3 (0.4)
Don't know (%)	197 (39.2)
Education*	
Yes (%)	54 (10.7)
Work outside the home	
Yes (%)	133 (26.2)
Parity	
1-2 (%)	138 (27.4)
3-4 (%)	153 (30.4)
5+ (%)	213 (42.3)
Polygamous household	
Yes (%)	245 (48.3)
Cohabits with Mother-in-law	317 (62.3)

\*Contains missing observations; †WHO standards for safe birth defined as delivering in healthcare institution with a skilled attendant

The results of women's attitudes towards eight CS-COM quality domains are found in Table 3. All scores were assessed out of a possible ten points: 1 meaning "strongly disagree", 10 meaning "strongly agree". Women assigned a mean score of 7.9 (SD: 0.1) to the statement "The CS-COM offers services of high quality." The statement, "CS-COM staff are welcoming and respectful" received a mean score of 7.4 (SD: 0.1). Women assigned the statement "The CS-COM gives better services if I am accompanied by my spouse" a mean score of 7.0 (SD: 0.1). The statement "The CS-COM provides information that I need for my health" received a mean score of 7.0 (SD: 0.1). Women indicated a mean score of 6.7 (SD: 0.1) for the statement "The CS-COM has the necessary equipment for labor and delivery". Most women rated the statement "The CS-COM is the safest place to give birth" very highly; the mean score for this statement was 8.4 (SD: 0.1). The statement, "I can physically get to the CS-COM for labor if needed" received the lowest mean score, 5.3 (SD: 0.1). Women rated "The cost-benefit ratio of the CS-COM score is acceptable" a mean of 7.1 (SD: 0.1). When totaled to create a CS-COM index score, summing all scores from the different domains, the mean CS-COM index score was 60.2 (SD: 0.7) out of a possible 80 points.

**Table 3: Women's attitudes towards CS-COM services & quality**

<b>CS-COM Domain*</b>	<b>Mean Score (SD)</b>
CS-COM offers services of high quality	7.9 (0.1)
CS-COM staff are welcoming and respectful	7.4 (0.1)
CS-COM gives better services if I am accompanied by my spouse	7.0 (0.1)
CS-COM provides information that I need for my health	7.0 (0.1)
CS-COM has necessary equipment for labor & delivery	6.7 (0.1)
CS-COM is the safest place to give birth	8.4 (0.1)
I can physically get to the CS-COM for labor if needed	5.3 (0.1)
The cost-benefit ratio of the CS-COM is acceptable	7.1 (0.1)
<b>Mean CS-COM index score<sup>†</sup> (SD)</b>	<b>60.2 (0.7)</b>

\*Contains missing observations

<sup>†</sup>Index of 0-80, summing scores assigned to different CS-COM attitude domains



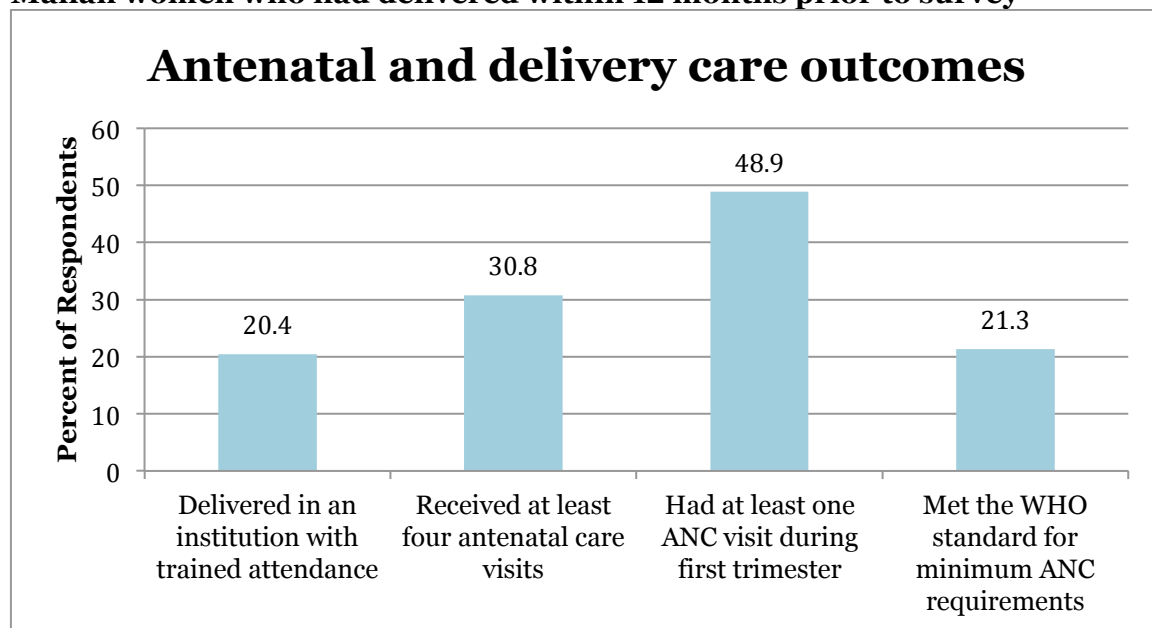
Table 4 displays the study outcomes for the woman household data. One hundred and four women (20.4%) delivered in a healthcare institution with a trained attendant. Over 30% of women received at least four antenatal care visits, the WHO recommended minimum. Nearly half of women (48.9%) received at least one antenatal care visit during their first trimester of pregnancy, as recommended by the WHO. Only 21.3% of women met the WHO minimum standards for ANC: at least one visit during the first trimester, and at least four ANC visits during the pregnancy. Figure 33 depicts these results graphically; it is clear that many more women receive appropriately timed first antenatal care (48.9%) than deliver in an institution with trained attendance (20.4%).

**Table 4: Antenatal care and delivery location outcomes**

<b>Outcome*</b>	<b>Summary</b>
Delivered in an institution with trained attendance (%)	104 (20.4)
Received at least four antenatal care visits (%)	119 (30.8)
Had at least one ANC visit during first trimester (%)	176 (48.9)
Met the WHO standard for minimum ANC requirements (%)	76 (21.3)

\*Contains missing data

**Figure 33: Antenatal and delivery care outcomes assessed among rural Malian women who had delivered within 12 months prior to survey**



Bivariate analysis of demographic characteristics and maternal health utilization outcomes yielded interesting results, as depicted in Table 5. Age of women participants was not significantly associated with any of the four outcomes. Increasing parity was significantly associated with receiving adequate antenatal care visits ( $p=0.024$ ), timing of first ANC visit during first trimester ( $p=0.005$ ), and meeting WHO standards for ANC ( $p=0.008$ ). Interestingly, it was not significantly associated with delivery in a healthcare facility with skilled attendant ( $p=0.978$ ). Cohabiting with mother-in-law was significantly associated with receiving at least four ANC visits ( $p=0.009$ ), but was not significant for any of the other outcomes. Receiving any education did not have significant associations with any of the four outcomes. Employment outside the home was significantly associated with skilled delivery in a healthcare facility ( $p=0.003$ ), but not significantly associated with any of the ANC outcomes. Living in a polygamous household was not significantly associated with any of the outcomes.

**Table 5: Bivariate analysis of demographic characteristics and maternal health utilization outcomes**

Characteristic	Number of ANC visits	Timing of first ANC visit	WHO standards for ANC Met	Delivered in healthcare facility with skilled attendant
Age*	0.586	0.249	0.414	0.597
Parity†	<b>0.024</b>	<b>0.005</b>	<b>0.008</b>	0.978
Education†	0.170	0.346	0.112	0.498
Cohabits with mother-in-law†	<b>0.009</b>	0.278	0.351	0.613
Employed outside the home†	0.620	0.796	0.968	<b>0.003</b>
Polygamous household†	0.443	0.594	0.440	0.441

\*p-value calculated with two-sample t-test with equal variances

†p-value calculated with Pearson chi-square test

Table 6 shows the results of bivariate analysis of CS-COM characteristics and the four maternal health utilization outcomes. Interestingly, increasing mean number of maternal deaths per CS-COM was significantly associated with increased likelihood of skilled healthcare delivery ( $p=0.012$ ). Mean maternal deaths per CS-COM were not significantly associated with any of the ANC outcomes. Mean number of births per CS-COM was also significantly associated with increased likelihood of delivery in a healthcare facility with a skilled attendant ( $p<0.0001$ ). Mean number of births was not associated with any of the ANC outcomes. Increasing maternal mortality ratio was significantly associated with delivery in a skilled healthcare setting ( $p=0.008$ ), but not the ANC outcomes. Women who lived near CS-COMs with higher complication rates were significantly more likely to have received antenatal care during the first trimester ( $p=0.031$ ). None of the other outcomes were associated with the total complication rate. The percent of staff retrained in maternal health within the last twelve months was not significantly associated with any of the outcomes. Women's likelihood to deliver in a healthcare facility with a skilled attendant increased significantly with the percentage of essential obstetric medical equipment present and functioning at the CS-COM ( $p<0.0001$ ). Equipment functionality was not significantly associated with any of the ANC outcomes. Medication stock-outs were also significantly associated with utilization of skilled attendant healthcare deliveries ( $p=0.010$ ) but not ANC outcomes. Neither of the signal function variables – both capability to perform and number performed— were significantly associated with the utilization outcomes.

**Table 6: Bivariate analysis of health facility characteristics and maternal health utilization outcomes**

Characteristic	Number of ANC visits	Timing of first ANC visit	WHO standards for ANC Met	Delivered in healthcare facility with skilled attendant
Mean maternal deaths per CS-COM*	0.594	1.000	0.690	<b>0.012</b>
Mean births per CS-COM*	0.223	0.076	0.290	<b>&lt;0.0001</b>
Maternal mortality ratio*	0.533	0.987	0.823	<b>0.008</b>
Infant mortality ratio*	0.873	0.990	0.121	0.982
Total complication rate*	0.514	<b>0.031</b>	0.290	0.674
Percent of medical staff retrained in maternal health within last 12 months*	0.639	0.277	0.100	0.580
Percent present & functioning essential obstetric medical equipment*	0.934	0.218	0.598	<b>&lt;0.0001</b>
Ran out of at least one essential medicine in last six months <sup>†</sup>	0.973	0.354	0.126	<b>0.010</b>
Number of signal functions capable of*	0.441	0.545	0.614	0.129
Number of signal functions that CS-COM performed in prior six months*	0.509	0.763	0.631	0.516

\*p-value calculated with two-sample t-test with equal variances

<sup>†</sup>p-value calculated with Pearson chi-square test

Table 7 shows the bivariate analysis results of perceived health care quality and maternal health utilization outcomes. In general, positive ratings of the CS-COM quality domains (indicated by a higher score) were significantly associated with increased maternal health utilization. Women who thought CS-COM services to be of high quality were significantly more likely to deliver in a healthcare facility with a skilled attendant (p=0.017). However, belief that the CS-COM offered high quality services was not

significantly associated with ANC outcomes. Women who agreed with the statement, “CS-COM staff are welcoming and respectful”, were significantly more likely to receive ANC during the first trimester. Women were also significantly more likely to receive first trimester care if they believed they received better services when accompanied by their spouse ( $p=0.009$ ), or that the CS-COM provides the information they need for their health ( $p=0.008$ ). Agreeing with the statement, “The CS-COM has necessary equipment for labor & delivery”, was significantly associated with receiving first trimester ANC ( $p<0.0001$ ), meeting WHO ANC standards ( $p=0.008$ ), and delivering with a skilled attendant in a healthcare setting ( $p=0.001$ ). Women who agreed that the “CS-COM is the safest place to give birth” were much more likely to deliver in a healthcare setting with a skilled attendant ( $p<0.0001$ ). This belief did not have significant associations with any of the ANC outcomes. Agreement with the statement, “I can physically get to the CS-COM for labor if needed” was significantly associated with increased utilization of all outcomes, save first trimester ANC. This self-perceived physical accessibility of the CS-COMs was significantly associated with adequate number of ANC visits ( $p=0.010$ ), meeting WHO ANC standards ( $p=0.038$ ), and delivery in a healthcare facility with a skilled attendant ( $p=0.012$ ). Positive scores for the acceptability of the CS-COM’s cost-benefit ratio were not significantly associated with any of the utilization outcomes. When all the domains were summed to create a CS-COM index score, only first trimester ANC was significantly associated ( $p=0.008$ ) with increasing mean CS-COM index scores.

**Table 7: Bivariate analysis of perceptions of health care quality and maternal health utilization outcomes**

Characteristic	Number of ANC visits	Timing of first ANC visit	WHO standards for ANC Met	Delivered in healthcare facility with skilled attendant
CS-COM offers services of high quality*†	0.764	0.106	0.990	<b>0.017</b>
CS-COM staff are welcoming and respectful*†	0.715	<b>0.026</b>	0.869	0.126
CS-COM gives better services if I am accompanied by my spouse*†	0.666	<b>0.009</b>	0.854	0.262
CS-COM provides information that I need for my health*†	0.199	<b>0.008</b>	0.065	0.086
CS-COM has necessary equipment for labor & delivery*†	0.066	<b>&lt;0.0001</b>	<b>0.008</b>	<b>0.001</b>
CS-COM is the safest place to give birth*†	0.672	0.272	0.519	<b>&lt;0.0001</b>
I can physically get to the CS-COM for labor if needed*†	<b>0.010</b>	0.192	<b>0.038</b>	<b>0.012</b>
The cost-benefit ratio of the CS-COM is acceptable*†	0.264	0.270	0.168	0.086
Mean CS-COM index score†‡	0.925	<b>0.008</b>	0.242	0.092

\*Mean attitude score for CS-COM domain

†p-value calculated with two-sample t-test with equal variances

‡index score of 0-80 based on summed responses to CS-COM domains

Table 8 depicts the results of logistic regression for the outcome measuring women's history of delivering in a healthcare facility with a skilled assistant. The odds of having a skilled delivery were significantly higher (OR: 2.13,  $p=0.048$ ) in women who cohabited with their mother in law. Employment outside the home also significantly increased the odds of a skilled delivery (OR: 2.79,  $p=0.008$ ). No other woman demographic variables were significantly associated with delivering in a healthcare facility with a skilled assistant when analyzed by logistic regression. The characteristics of the health care facility itself yielded significant results. Increasing number of births at a CS-COM facility increased the odds that a woman would deliver in a health facility with a skilled attendant (OR: 1.01,  $p=0.016$ ). Also of significant importance was the percent of present & functioning essential obstetric equipment: as the CS-COM's equipment functionality increased, the odds of a woman having a skilled delivery increased (OR: 1.09,  $p<0.001$ ). The odds of a woman delivering in a skilled health care facility decreased with the number of signal functions a CS-COM performed in the previous six months (OR: 0.52,  $p=0.012$ ). The odds of a woman receiving a skilled delivery were not significantly affected by the number of signal functions a CS-COM was capable of performing (OR: 0.66,  $p=0.185$ ). No other CS-COM variables were significant in logistic regression analysis. In logistic regression of perceived quality of care, two variables emerged as significant. Women's odds of delivering in a healthcare facility with a skilled attendant were significantly increased if they: 1) agreed that "the CS-COM is the safest place to give birth" (OR: 1.27,  $p=0.027$ ), or 2) agreed that they "can physically get to the CS-COM for labor if needed" (OR: 1.12,  $p=0.039$ ).

**Table 8: Variables associated with delivery in a healthcare facility with a trained assistant, logistic regression**

Variable	Odds Ratio	Standard Error	z	P> z	95% CI
Woman demographics					
Age	0.97	0.04	-0.86	0.391	0.90-1.04
Parity (3-4 compared with 1-2)	1.32	0.61	0.60	0.551	0.53-3.25
Parity (4+ compared with 1-2)	1.91	1.11	1.11	0.267	0.61-5.94
Education	0.72	0.40	-0.59	0.558	0.24-2.15
Cohabits with mother-in-law	2.13	0.82	1.98	<b>0.048</b>	1.01-4.53
Employed outside home	2.79	1.07	2.67	<b>0.008</b>	1.31-5.91
Polygamous household	1.37	0.47	0.92	0.360	0.70-2.67
Local CS-COM health facility audit results					
Number of births	1.01	0.00	2.41	<b>0.016</b>	1.00-1.01
Maternal mortality ratio	1.00	0.00	-0.68	0.495	1.00-1.00
Infant mortality ratio	1.00	0.01	0.62	0.537	0.99-1.02
Total complication rate	0.98	0.04	-0.53	0.599	0.91-1.05
Ran out of an essential medicine in last six months	2.32	1.55	1.26	0.209	0.62-8.62
Percent of staff retrained in maternal health in last 12 months	0.99	0.01	-0.54	0.588	0.96-1.02
Percent of essential obstetric medical equipment that was present and functioning	1.09	0.02	4.20	<b>&lt;0.001</b>	1.05-1.13
Number of signal functions capable of	0.66	0.21	-1.32	0.185	0.35-1.22
Number of signal functions performed in last six months	0.52	0.13	-2.52	<b>0.012</b>	0.32-0.87
Attitudes towards local CS-COM					
CS-COM offers services of high quality*†	0.91	0.09	-1.03	0.305	0.75-1.09
CS-COM staff are welcoming and respectful*†	0.97	0.09	-0.28	0.779	0.81-1.17
CS-COM gives better services if I am accompanied by my spouse*†	1.00	0.08	-0.01	0.993	0.85-1.17
CS-COM provides information that I need for my health*†	0.92	0.08	-1.00	0.316	0.78-1.08
CS-COM has necessary equipment for labor & delivery*†	1.11	0.08	1.37	0.170	0.96-1.28
CS-COM is the safest place to give birth*†	1.27	0.14	2.21	<b>0.027</b>	1.03-1.57
I can physically get to the CS-COM for labor if needed*†	1.12	0.06	2.07	<b>0.039</b>	1.01-1.26
The cost-benefit ratio of the CS-COM is acceptable*†	1.05	0.07	0.72	0.472	0.93-1.18



Table 9 outlines the results of logistic regression for the variable measuring women's compliance with the WHO ANC standards: receipt of at least four ANC visits during pregnancy and one ANC visit during the first trimester. The odds of meeting WHO ANC standards were 2.54 times higher in women with 3-4 previous pregnancies when compared with women with 1-2 previous pregnancies ( $p=0.012$ ). No other survey participant demographic data variables were significantly associated with WHO ANC standard compliance. No variables associated with the technical quality of care at the local CS-COM were significantly associated with history of complying with WHO ANC standards. Women who believed the CS-COM offers services of high quality had lower odds (OR: 0.87,  $p=0.046$ ) of receiving adequate and timely antenatal care. Women who rated the physical accessibility of the CS-COM higher were more likely to receive adequate and timely ANC (OR=1.09,  $p=0.061$ ). No other CS-COM attitudinal variables were significant when analyzed by logistic regression.

Logistic regression analysis of women's receipt of adequate antenatal care (4 ANC visits during pregnancy) is represented in Table 10. Women with higher parity were much more likely to receive adequate antenatal care when compared with women of lower parity. Women with 3-4 previous pregnancies had significantly higher odds (OR: 3.99,  $p=0.003$ ) of receiving at least four antenatal care visits when compared with women of lower parity (1-2 previous pregnancies). Grand multiparous women (4+ previous pregnancies) had significantly higher odds (OR: 3.51,  $p=0.023$ ) of receiving adequate ANC when compared with women of lower parity (1-2 previous pregnancies). Women who cohabited with their mother-in-law had higher odds of receiving adequate ANC (OR: 2.07,  $p=0.047$ ). No variables from the local CS-COM audit were significantly associated with adequate ANC. Women who agreed that the CS-COM was physically accessible had higher odds of receiving adequate ANC (OR: 1.16,  $p=0.007$ ).

**Table 9: Variables associated with meeting WHO ANC standards, logistic regression**

Variable	Odds Ratio	Standard Error	z	P> z	95% CI
Woman demographics					
Age	0.98	0.03	-0.60	0.547	0.93-1.04
Parity (3-4 compared with 1-2)	2.54	0.94	2.51	<b>0.012</b>	1.23-5.26
Parity (4+ compared with 1-2)	1.63	0.74	1.08	0.281	0.67-3.99
Education	1.18	0.52	0.38	0.703	0.50-2.82
Cohabits with mother-in-law	1.21	0.34	0.68	0.496	0.70-2.11
Employed outside home	0.74	0.24	-0.92	0.356	0.39-1.40
Polygamous household	1.21	0.33	0.70	0.485	0.71-2.07
Local CS-COM health facility audit results					
Number of births	1.00	0.003	-0.30	0.764	0.99-1.00
Maternal mortality ratio	1.00	0.0002	-0.63	0.527	0.99-1.00
Infant mortality ratio	0.99	0.005	-1.51	0.132	0.98-1.00
Total complication rate	0.98	0.03	-0.77	0.439	0.92-1.04
Ran out of an essential medicine in last six months	0.76	0.37	-0.56	0.579	0.30-1.97
Percent of staff retrained in maternal health in last 12 months	1.00	0.01	-0.28	0.782	0.98-1.02
Percent of essential obstetric medical equipment that was present and functioning	1.01	0.01	0.77	0.440	0.98-1.04
Number of signal functions capable of	1.07	0.29	0.25	0.806	0.63-1.82
Number of signal functions performed in last six months	1.11	0.22	0.54	0.589	0.75-1.65
Attitudes towards local CS-COM					
CS-COM offers services of high quality*†	0.87	0.06	-2.00	<b>0.046</b>	0.76-1.00
CS-COM staff are welcoming and respectful*†	0.98	0.07	-0.29	0.768	0.85-1.13
CS-COM gives better services if I am accompanied by my spouse*†	0.93	0.06	-1.12	0.265	0.82-1.05
CS-COM provides information that I need for my health*†	1.05	0.07	0.71	0.475	0.92-1.19
CS-COM has necessary equipment for labor & delivery*†	1.06	0.06	1.09	0.276	0.95-1.19
CS-COM is the safest place to give birth*†	0.93	0.06	-1.21	0.225	0.82-1.05
I can physically get to the CS-COM for labor if needed*†	1.09	0.05	1.87	<b>0.061</b>	1.00-1.19
The cost-benefit ratio of the CS-COM is acceptable*†	0.96	0.05	-0.94	0.347	0.87-1.05

**Table 10: Variables associated with receiving at least four antenatal care visits, logistic regression**

Variable	Odds Ratio	Standard Error	z	P> z	95% CI
Woman demographics					
Age	0.93	0.03	-1.85	0.064	0.87-1.00
Parity (3-4 compared with 1-2)	3.99	1.84	3.01	<b>0.003</b>	1.62-9.84
Parity (4+ compared with 1-2)	3.51	1.93	2.28	<b>0.023</b>	1.19-10.34
Education	1.03	0.54	0.06	0.950	0.37-2.88
Cohabits with mother-in-law	2.06	0.75	1.99	<b>0.047</b>	1.01-4.21
Employed outside home	1.21	0.45	0.50	0.617	0.58-2.52
Polygamous household	0.84	0.28	-0.51	0.607	0.44-1.62
Local CS-COM health facility audit results					
Number of births	1.00	0.00	-0.77	0.441	0.99-1.00
Maternal mortality ratio	1.00	0.00	-0.14	0.888	0.99-1.00
Infant mortality ratio	1.00	0.01	-0.36	0.716	0.99-1.01
Total complication rate	0.98	0.03	-0.51	0.610	0.92-1.05
Ran out of an essential medicine in last six months	0.65	0.37	-0.76	0.449	0.21-2.01
Percent of staff retrained in maternal health in last 12 months	1.00	0.01	-0.22	0.827	0.97-1.02
Percent of essential obstetric medical equipment that was present and functioning	1.01	0.02	0.62	0.537	0.98-1.05
Number of signal functions capable of	0.66	0.22	-1.22	0.221	0.34-1.28
Number of signal functions performed in last six months	1.13	0.28	0.5	0.615	0.70-1.83
Attitudes towards local CS-COM					
CS-COM offers services of high quality*†	0.94	0.09	-0.63	0.530	0.79-1.13
CS-COM staff are welcoming and respectful*†	1.02	0.09	0.21	0.832	0.85-1.22
CS-COM gives better services if I am accompanied by my spouse*†	0.99	0.08	-0.08	0.937	0.85-1.16
CS-COM provides information that I need for my health*†	0.96	0.08	-0.51	0.613	0.82-1.13
CS-COM has necessary equipment for labor & delivery*†	1.15	0.08	1.93	0.054	1.00-1.33
CS-COM is the safest place to give birth*†	1.01	0.08	0.14	0.892	0.86-1.19
I can physically get to the CS-COM for labor if needed*†	1.16	0.06	2.69	<b>0.007</b>	1.04-1.29
The cost-benefit ratio of the CS-COM is acceptable*†	0.93	0.06	-1.19	0.235	0.83-1.05

Table 11 describes the variables associated with women receiving timely first trimester antenatal care when analyzed by logistic regression. No demographic or technical quality of care variables were significantly associated with timely antenatal care. Women who rated the CS-COM highly for necessary equipment for labor & delivery had significantly higher odds (OR: 1.21,  $p=0.004$ ) of receiving antenatal care during the first trimester. Women who rated the cost-benefit ratio of the CS-COM as acceptable were less likely to receive adequate antenatal care during the first trimester (OR: 0.89,  $p=0.045$ ). No other domains of perceived quality of care were significant by logistic regression.

**Table 11: Variables associated with receiving antenatal care during the first trimester, logistic regression**

Variable	Odds Ratio	Standard Error	z	P> z	95% CI
Woman demographics					
Age	0.99	0.03	-0.31	0.755	0.93-1.06
Parity (3-4 compared with 1-2)	2.12	0.93	1.72	0.085	0.90-5.01
Parity (4+ compared with 1-2)	0.93	0.47	-0.15	0.881	0.34-2.50
Education	2.51	1.34	1.72	0.085	0.88-7.12
Cohabits with mother-in-law	0.79	0.27	-0.68	0.496	0.41-1.54
Employed outside home	1.02	0.37	0.06	0.955	0.50-2.07
Polygamous household	0.77	0.25	-0.79	0.428	0.41-1.46
Local CS-COM health facility audit results					
Number of births	1.00	0.003	0.94	0.348	1.00-1.01
Maternal mortality ratio	1.00	0.0003	-0.97	0.333	0.99-1.00
Infant mortality ratio	1.00	0.005	-0.67	0.505	0.99-1.01
Total complication rate	0.99	0.03	-0.26	0.798	0.93-1.06
Ran out of an essential medicine in last six months	0.62	0.37	-0.8	0.422	0.20-1.98
Percent of staff retrained in maternal health in last 12 months	0.99	0.01	-0.45	0.656	0.97-1.02
Percent of essential obstetric medical equipment that was present and functioning	1.02	0.02	1.22	0.223	0.99-1.06
Number of signal functions capable of	1.12	0.35	0.38	0.706	0.61-2.07
Number of signal functions performed in last six months	0.75	0.17	-1.29	0.199	0.48-1.16
Attitudes towards local CS-COM					
CS-COM offers services of high quality*†	0.93	0.08	-0.85	0.393	0.78-1.10
CS-COM staff are welcoming and respectful*†	1.10	0.10	1.08	0.282	0.93-1.30
CS-COM gives better services if I am accompanied by my spouse*†	1.07	0.08	0.87	0.386	0.92-1.23
CS-COM provides information that I need for my health*†	1.01	0.08	0.07	0.945	0.87-1.16
CS-COM has necessary equipment for labor & delivery*†	1.21	0.08	2.84	<b>0.004</b>	1.06-1.39
CS-COM is the safest place to give birth*†	1.00	0.08	0.00	0.997	0.86-1.17
I can physically get to the CS-COM for labor if needed*†	1.04	0.05	0.85	0.396	0.95-1.15
The cost-benefit ratio of the CS-COM is acceptable*†	0.89	0.05	-2.00	<b>0.045</b>	0.79-1.00

## Discussion

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The results of this study suggest that maternal health outcomes are influenced by a variety of factors, both socioeconomic and related to quality of care. These results hold important implications for local and national healthcare policy and interventions aimed at increasing Malian women's utilization of maternal health services. As one of the first maternal health studies to link both technical and perceived quality of care in a developing setting, this study's unique methods provide a more comprehensive view of how quality of care influences utilization and suggests a new avenue for study in the expanding maternal health literature.

### Results: a closer look

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The results of the health facility audits conducted in the 44 CS-COMs of Bankass and Bandiagara suggest that the quality of care provided in these venues is varied and frequently sub-optimal. Though maternal deaths were a relatively rare event, facilities that registered maternal deaths had MMRs of nearly 3,226 maternal deaths per 100,000 births. While these inordinately high MMRs belie a high-risk population with poor health literacy and limited access to care, they also suggest an unsafe birth environment unequipped to handle complications. The mean infant mortality ratio – 24 infant deaths/1,000 births – also echoes the limited resources of CS-COMs and the disadvantages faced by neonates in this population.

The relatively low complication rate reported by CS-COMs is unexpected, and perhaps explained by underreporting or inadequate recording of complications at the CS-COM level. One would expect complication rates to be at a minimum 10-15%, as this is the worldwide average for obstetric complications. Moreover, women in the study area frequently only report to CS-COMs or hospitals for birth if they experience a complication, thereby elevating rates of complication at local health centers. As the complications recorded by CS-COMS include obstruction, hemorrhage, eclampsia and pre-eclampsia, and other complications related to women's pathophysiology (and separate from the quality of care provided at a healthcare center), there is no theoretical disincentive to report these statistics. Complication rates reflect the acuity of care necessitated by the population and correct reporting of these complications should only serve to procure focused training and increased resources for staff. Other possible explanations for the low rates of complications: 1) women perceive that local CS-COMs are unequipped to handle complicated births and seek higher level care at regional health centers; or 2) accessibility is so limited that women deliver en route to seeking health care and their complications or deaths are never reported.

In general, CS-COMs were understaffed by professional health workers. The average CS-COM had 0.2 surgeons, 0.2 general physicians, 0.1 midwives, 0.2 obstetric nurses, and 0.3 general nurses. While there was usually at least one trained health professional on staff at the CS-COM, these low numbers of medical staff suggest a limited ability of CS-COMs to handle increased volume and increased acuity. Particularly troubling is the lack of health care staff retrained in maternal health. Only 15.1% of staff, in the average CS-COM, had received any

retraining on maternal health in the twelve months prior to audit. This lack of continuing medical education can perpetuate dangerous medical practices, limit improvement of quality, and reflect a general under-education of staff members. The inability of staff members to be retrained in maternal health may also reflect: 1) a lack of training opportunities, 2) an inability to leave behind one's practice given the demand and understaffing experienced at many health centers, and 3) an underemphasis on continuing medical education.

Perhaps most telling of the limited resources intrinsic to most CS-COMs in the study region is the limited functionality of equipment. On average, less than half (45.8%) of essential obstetric medical equipment was present and functioning at the CS-COM at the time of audit. This troubling statistic reflects the limited resources and out-datedness of many facilities. Further evidence to the financial and infrastructural difficulties faced by CS-COMs is the perpetual stockouts encountered by these facilities. Over 85% of CS-COMs ran out of at least one life-saving obstetric medication in the six months prior to health facility audit.

Study CS-COMs fell short of UN guidelines for essential obstetric care. No CS-COMs were capable of carrying out all six UN essential obstetric care signal functions. One CS-COM was not capable of carrying out any of the signal functions. On average, CS-COMs were capable of carrying out 5 of the 7 study signal functions; CS-COMs carried out, on average, 4.3 signal functions in the six months prior to audit. Fortunately, all CS-COMs were aware of the importance of signal functions and kept detailed record specifically on their signal functionality, evidence suggestive of national policy focusing on these indicators.



Review of the literature suggests the importance of education, employment outside the home, parity, and place of delivery on maternal health outcomes. Study participants were largely uneducated – only 10.7% had received any schooling. Additionally, only a quarter of women were employed outside the home, suggestive of limited autonomy in the study population. Other factors potentially limiting autonomy in this population: 48.3% of study participants lived in polygamous homes and 62.3% lived with their mother-in-law. Many women were grand multiparous (42.3%), with greater than 5 previous pregnancies. These statistics are troubling, given the increased risk of maternal mortality in the study population. The vast majority of women (77.6%) delivered their previous pregnancy in their home. Less than 22% of women delivered in a healthcare facility (CS-COM, government hospital, or private hospital or clinic). Most women were attended in delivery by their mother-in-law, mother, or TBA. A midwife frequently attended to those women who delivered in a health-care setting.

In general, women viewed the CS-COMs relatively favorably. Women rated CS-COMs highly (mean score >7.5) in the domains of ‘high quality services’ and ‘safety’. Women were very positive about the potential safety benefits of delivering in a CS-COM (mean score: 8.4), suggesting that women do perceive the danger associated with delivering at home. Women were most negative about the physical accessibility of CS-COMs, with a mean score of 5.3. They also were relatively negative about the equipment availability and functionality at CS-COMs, with a mean score of 6.7. Women tended to agree that CS-COM staff provide better services if women are accompanied by their husband (mean score:

7.0), suggesting that gender inequality is perceived, and perhaps practiced, at the CS-COM.

Few women met UN criteria for safe pregnancy and delivery. Only one fifth of women delivered in a medical institution with a trained attendant – the gold standard for a safe delivery. Approximately thirty-one percent of women received adequate antenatal care – four or more visits during their pregnancy, and almost half of women had at least one ANC visit during their first trimester. However, the percent of women who received both adequate and timely ANC--the UN standard--was only 21.3%. These outcomes suggest that current efforts to improve utilization of maternal health services are far from achieving their goal.

An evaluation of the bivariate and logistic regression analysis reveals several factors that could potentially improve utilization of maternal health services. Bivariate analysis of household data showed that increasing parity increased utilization of several maternal health services, suggesting that increasing exposure to pregnancy, and perhaps to the healthcare system, improve women's chances of using maternal health services. Cohabitation with one's mother-in-law was significantly associated with receiving at least four antenatal care visits, suggesting mother in laws have a potential positive effect on women's ANC utilization. Employment outside the home was associated with increased odds of skilled delivery in a healthcare facility: this may be due to increased autonomy, increased financial capacity, and/or increased health literacy. Cohabitation with mother-in-law and employment outside the home remained statistically significant for skilled delivery in logistic regression. Increasing parity was statistically associated with meeting WHO ANC standards, by logistic

regression, again suggesting that increased exposure to the healthcare system and the dangers of pregnancy may increase women's desire to use ANC.

Bivariate and logistic regression analysis of CS-COM data revealed several potential policy and programmatic targets. CS-COMs with increasing number of births were more likely to attract women to skilled delivery ( $p=0.016$ ), perhaps given their perceived experience and ability to provide safe deliveries. Women were more likely to deliver in a healthcare facility with a skilled attendant in facilities with, on average, more maternal deaths and a higher MMR. The association behind these statistics is likely circumstantial: CS-COMs with more deliveries are statistically more likely to experience maternal deaths. Timely first ANC visits were statistically associated with increasing complication rates: this association may also be circumstantial. Women who receive early ANC may be more invested in their pregnancy because they have experienced previous complications, or may be made aware of the danger signs and subsequently report to a skilled facility. Women were more likely to deliver in a healthcare facility with a skilled attendant with increasing functionality and availability of essential obstetric equipment: this association remained statistically significant in logistic regression and suggests that women value technical quality of care. Equipment functionality and the physical healthcare environment are often the most accessible, and thereby influential, domains of technical quality of care for laypersons. There was a statistical association between delivery in a healthcare facility and medication stockouts at the CS-COM: this is likely a reflection of the increased utilization of these CS-COMs.

Logistic regression revealed that increasing number of births at a CS-COM was associated with increased utilization of healthcare facilities for delivery on an individual level. Women were less likely to deliver in a healthcare facility if the CS-COM had performed more signal functions in the previous six months: this may be due to a “negative press effect”. Women may hear that complications arose at their local CS-COM and be scared away from delivering at the healthcare facility for fear that they, too, will have an obstructed labor or other complication.

A variety of perceived quality-of-care domains were significant in bivariate analysis. Women who rated the CS-COM highly on offering services of high quality were more likely to deliver in a healthcare facility with a skilled attendant. Other factors important for skilled healthcare delivery were: acceptable equipment, perceived safety, and physical accessibility of the CS-COM. For timely antenatal care visits, women’s perceptions of staff attitude, gender dynamics, information provision, necessary equipment, and overall CS-COM index score were statistically significant. Women were more likely to receive an adequate number of ANC visits if the CS-COM was physically accessible: this makes good sense, as women with physical access to the CS-COM are more likely to make multiple visits. Perceived equipment availability & functionality, and physical accessibility of the CS-COM were statistically significant for meeting WHO standards for ANC visits. These results, in general, suggest that perceived quality of care plays an important role in utilization of maternal health services and that healthcare facilities must provide good quality services, possess the necessary equipment, and be physically accessible.

Logistic regression revealed similar themes: perceived physical accessibility, quality of care, and safety of CS-COM births were statistically important for maternal health utilization. For antenatal care outcomes, often the only significant variable influencing utilization was physical accessibility. This result harkens back to Thaddeus & Maine's "three delays" theory and the importance of both perceived and actual physical barriers to receiving care. Interestingly, for women's reception of first trimester ANC, the only significant factors were belief that: 1) the CS-COM had the necessary equipment for labor and delivery, and 2) perceived acceptability of the CS-COM cost-benefit ratio. One possible interpretation of these results is to view the decision to receive early ANC as an economic decision: the patient, as a health consumer, must believe that they are making an acceptable investment in their future health (through both perceived cost-benefit ratio and technical capacity of the CS-COM) to justify the expense of early ANC.

## The results in context

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The results from this study largely support the greater literature on maternal health utilization. Factors such as parity, education, employment outside the home, accessibility of facilities, and quality of care influence women's decision to seek care and their ability to receive adequate and appropriate treatment. Results from our bivariate and logistic regression suggest that Malian women's economic status, educational status, perceived accessibility of

healthcare facilities, and perceived quality of care all contribute to Phase I, II, and III delays, as described by Thaddeus & Maine (1994).

Thaddeus & Maine suggest that previous experience with the healthcare field, satisfaction with outcomes, and satisfaction with service are all important for the decision to seek care. Our study results indicate that only certain domains within perceived quality of care influence the utilization of maternal health services. Staff attitudes are important for decisions related to antenatal care, but did not show statistical associations with skilled delivery in a healthcare setting. The availability of supplies and functionality of equipment showed statistical importance in women's decision to seek skilled healthcare deliveries and receive timely ANC. Efficiency, privacy, waiting times, consistency with local beliefs, and visitation rules limiting social or family support were not evaluated in this study; their importance for Malian women's uptake of maternal health services is, at this point, unknown. Perceived accessibility of healthcare facilities (or lack thereof) was of consistent statistical significance. This study demonstrates clear associations between women's perceived ability to get to a healthcare facility, and their subsequent utilization of the facility for antenatal and delivery care. Perceived cost-benefit ratio was also important for timely first trimester antenatal care, indicating that perceived economic benefit is a determinant in pursuit of antenatal care.

Many of the technical quality of care measurements gleaned from health facility audits had no statistical association with maternal health utilization outcomes, suggesting that perception of quality of care is more important than technical quality of care when determining whether or not to use healthcare

services. Logistic regression analysis showed no statistical association between maternal health ANC outcomes and CS-COM complication rates, staff retraining, signal function capability, or actual percentage of present and functional equipment. This is consistent with the literature, where “poor facilities” or “poor staff attitude” were among reasons cited for refusing antenatal care, without mention of specific technical shortcomings of medical facilities (Lule, Tugumisirize, & Ndekha, 2000). Measures of technical care were statistically associated with the decision to delivery in a healthcare facility in our study; this also coincides with current research findings. Women who did not use medical facilities cited poor care, lack of drugs and supplies, and poor laboratory services as by-pass reasons in Audo et al.’s 2005 study in Kenya.

## Limitations

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This study is, to the author’s knowledge, one of the first to link perceived and technical quality of maternal healthcare measurements, and the first to link these measures to utilization of maternal health services. Rigorous study methods and a commitment to data quality contribute to the internal validity of this study. However, a relatively small sample size ( $n=509$ ) was used for data analysis. This limited our ability to detect small differences in the study population. Additionally, as this was an observational study, conclusions about the causality of these associations cannot be drawn. Health facility data was only taken from the six months prior to health facility audit – this relatively short period of time limited our ability to assess trends in technical quality of care, and was not adequate in some CS-COMs to capture rare events such as maternal death. Also,

given the low complication rate, underreporting by health staff may be taking place. If present, underreporting would introduce bias into the technical quality of care measurements and minimize the severity of shortages, medical errors, and adverse outcomes. Although documented as important contributors to Phase I delays and patient satisfaction, this study did not ask about patient's perceptions of CS-COM's efficiency, privacy, waiting times, consistency with local beliefs, and visitation rules limiting social or family support. These factors may influence women's decision to utilize healthcare facilities. This study only looked at the responses of women who had recently given birth; however, it is known in the developing world context that the woman is often not the chief decision for healthcare decisions. As perceived quality of care and sociodemographic data was also collected from other family members, future analysis utilizing similar methods and different survey respondents (such as the husband or mother-in-law) could yield important results for program development. Lastly, repetition of this study at a later date could provide invaluable data and the ability to glean inferences about causality and changes over time.

## Policy and program implications

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The results of this study have important implications for improving women's health in Bandiagara, Bankass, and beyond. Technical and perceived quality of care go hand-in-hand, and efforts must be made to improve both the actual quality of care provided in healthcare establishments and the community's perception of health care quality in their local healthcare facility. Improvements in perceived quality of care will likely go towards improving utilization of



maternal health services, but outcomes will not improve if the infrastructure and resources of CS-COMs are not expanded and augmented. The following are a list of concrete policy and programmatic interventions based on the results of this study and the local context:

- Expand the signal function capacity of CS-COMs.
  - Each CS-COM should be capable of all six UN essential obstetric signal functions, in addition to basic neonatal resuscitation. Where possible, CS-COMs should also strive to expand their coverage to Comprehensive Essential Obstetric Care (CEOOC) by providing blood transfusions and caesarean sections.
- Standardize CS-COM continuing medical education.
  - Key evidence-based changes to standard medical practice should be concisely and effectively summarized in retraining modules, in a format that is easily distributable to all governmental health facilities.
  - Employees should be required to complete a certain number of retraining modules, provided by the Ministry of Health, in maternal health and other topics. Employees who go above and beyond the minimum requirement could receive financial incentives or extra vacation days.
- Expand equipment and medication provision.
  - The Ministry of Health (MOH), or a committed partner organization, should conduct inventories and audits of all health facilities, noting medications that frequently stockout and

equipment in need of repair. Expanding the medication supply and obtaining funding to replace faulty equipment should be prioritized.

- Community outreach should be prioritized.
  - As the perceived quality of care has noted significant associations with maternal health utilization, efforts to improve CS-COM & community relations should be undertaken.
  - When possible, CS-COM employees should engage in community visits to educate community members about services provided at the CS-COM. Chief medical officers and nurses can visit village meetings to advertise their services, or set up mobile immunization clinics at popular water gathering sites.
  - If culturally appropriate, CS-COMs could offer “open houses” for pregnant community members. Potential patients could tour birthing rooms with their family members, inquire about costs, and obtain information about danger signs.
  - The results of this study suggest that women’s perceptions of the health facility’s equipment and safety are important determinants of utilization, therefore showing families the equipment and facilities could boost confidence in the CS-COM’s capabilities.
- Waiting houses can be implemented in areas of physical inaccessibility.
  - Some programs have built “waiting houses” in close proximity to local health centers for women to “wait out” the end of their pregnancy.

- The waiting houses would be near CS-COMs; women, with known obstetric complications or physical barriers to care, would spend their last few weeks of pregnancy in the waiting house. These women could engage in activities such as basket weaving or jewelry making to pay for their stay, and when ready to deliver, could easily be transferred to the CS-COM for labor.
- Promote accurate record keeping.
  - Accurate record keeping by hospital administration and staff is of the utmost importance for maintaining up-to-date registries of common complications and medical issues facing patients.
  - Staff should be encouraged to accurately report complications and deaths without fear of retribution.
  - Where possible, staff should be trained to conduct internal audits and promote continuous quality improvement measures.
  - Health facility audits similar to the one employed in this study should be undertaken every three to five years. The results of these audits should be shared with the health facility administration.
- Create and propagate standards and guidelines.
  - Diagnostic and therapeutic standards and guidelines should be created for common complications. Materials describing diagnostic & treatment guidelines should be distributed in all governmental health facilities and staff should be required to follow these guidelines.

## Conclusion

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The results of this study suggest that women consider a variety of factors when considering where to receive antenatal care and deliver their child. It is clear that both technical and perceived quality of care are important determinants of utilization, and studies looking at both of these facets of quality of care should be undertaken. Efforts by NGOs and governmental staff to improve women's perceptions of healthcare quality should also be backed by resources and programs to improve the technical quality of care provided. Through the dedicated and integrative efforts of Mali's government, non-governmental organizations, and community, the quality of care provided in Mali's health centers can be improved.

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