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**Examining Outliers towards the Improvement of
Maternal Health**

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University Honors in International Studies

Spring 2012

Abstract

The purpose of this study is to more deeply understand what causes variation in maternal mortality. As of 2010, 500,000 women die annually in childbirth; the majority of the deaths are preventable and occur in developing countries. The study incorporates an analysis of global trends and an in-depth comparison between Nigeria and Ethiopia. Ethiopia and Nigeria are deviant cases—countries that do not conform to the prediction that as women's status improves maternal mortality decreases. Globally, countries with unexpectedly high maternal mortality ratios given the level of women's status have a higher HIV prevalence while countries with unexpectedly low maternal mortality ratios are predominantly Muslim. Ethiopia has an unexpectedly low maternal mortality ratio compared to Nigeria's unexpectedly high maternal mortality ratio due to its liberal abortion policy, its higher prevalence of agriculture, and a smaller proportion of its population living below the poverty line. Nigeria has also experienced heightened problems due to their large oil reserves, this is known as the resource curse. This study highlights a multitude of factors affecting maternal health and the need to consider individual country indicators when designing health programs.

Introduction

As of 2010, 500,000 women die annually in childbirth (Falconer, 2010, p. 369). In fact, discrepancies in maternal mortality between developed and developing nations are higher than for any other public health indicator (Shiffman, 2000, p. 275). Maternal mortality is an issue that disproportionately affects the global poor and remains a major challenge to health systems worldwide (Moszynski, 2008, p. 529; Hogan et al., 2010, p. 1609). See Figure 1 for a map showing global maternal mortality ratios. Looking across countries globally, as well as comparing Nigeria and Ethiopia in-depth, the purpose of this study is to determine what causes variation in maternal mortality.

First is a basic overview about maternal mortality, including the direct and indirect causes. Second, the literature review examines the drivers of maternal mortality variation. Third is a global analysis of maternal mortality, followed by an in-depth analysis comparing Nigeria and Ethiopia. Finally, conclusions are made about effective actions towards improving maternal health.

Background

A maternal death is “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”(Ronsmans and Graham, 2006, p. 1190). The maternal mortality ratio is the number of maternal deaths per 100,000 live births during a given time period (ibid.). The overall causes of maternal death are: severe bleeding (25%), indirect causes (20%), infections (15%), unsafe abortion (13%), eclampsia (hypertensive disorder) (12%), obstructed labor (8%), and other direct causes (8%) (Sharma and Atri,

2010, p. 285). See Figure 2. These causes can be further divided between direct and indirect causes, which will be discussed in more detail.

Most maternal deaths are avoidable and most occur around labor, delivery, and the immediate postpartum period (Sharma and Atri, 2010, p. 286; Ronsmans and Graham, 2006, p. 1189). The most common cause of global maternal mortality is obstetric hemorrhage (Ronsmans and Graham, 2006, p. 1189). However, there are regional variations in the causes of maternal death. For instance, the main cause of maternal mortality in Africa is hemorrhage but in Latin America and the Caribbean it is hypertensive disorder. HIV/AIDS and unsafe abortion rates are also factors that can affect regional variation (*ibid.*). Causes of maternal death are divided into direct, indirect, and incidental causes.

Direct causes account for the majority of maternal deaths in developing countries (Ronsmans and Graham, 2006, p. 1193-1194). Direct causes include severe bleeding (usually hemorrhage), hypertensive diseases (commonly eclampsia), and infections (normally sepsis) (Ronsmans and Graham, 2006, p. 1194; Sharma and Atri, 2010, p. 284-285). Abortion and obstructed labor are important causes of maternal death as well (Khan et al., 2006, p. 1068). There are effective medical treatments for many of these causes, such as magnesium sulfate for eclampsia and prophylactic misoprostol for hemorrhage, that are just not commonly available or easily accessible in developing countries (Berer, 2007, p. 7).

Indirect causes are contributions to maternal death that are not unique to pregnancy (Ronsmans and Graham, 2006, p. 1194). The true effect of indirect causes on maternal death in developing countries is mostly unknown due to poor information

capability and lack of accurate reporting after death (ibid.). The most important indirect cause of maternal death is HIV. HIV can affect pregnant women in several ways, including increased risk of obstetric complications, HIV-related illness like tuberculosis or anemia, and an increased risk of HIV incidence or progression with pregnancy (ibid.). In areas with intense stigmatization against HIV-positive people, pregnant women may receive a lower quality of healthcare (ibid.). Maternal mortality ratio increases have been seen in countries with large HIV epidemics in southern Africa, as well as in Nigeria, Chad, Gabon, and Central African Republic (Hogan et al., 2010, p. 1619). Other indirect causes include anemia and other infectious diseases such as tuberculosis and malaria. Pregnant women are more vulnerable and more susceptible to severe consequences of infectious disease (Filippi et al., 2006, p. 1538). These indirect causes are preventable and treatable but are commonly not reported as a cause of maternal death; the death is often solely attributed to a direct cause instead (Ronsmans and Graham, 2006, p. 1195).

Incidental causes of maternal death include accidents, murders, or suicides of pregnant women and are not currently included in the maternal mortality ratio. However, there has been evidence that these accidents do have a connection to the pregnancy (ibid.). For instance, 16% of pregnancy deaths in India were due to domestic violence (ibid.). This means that when creating maternal health policy in India, domestic violence should be a crucial focus area whereas in Bangladesh there may not be the same problem. Incidental causes of maternal death are a peripheral concern but could provide valuable insight as to how to most effectively decrease maternal mortality ratios in specific countries.

Maternal mortality is difficult to measure (Hogan et al., 2010, p. 1609).

Countrywide data and estimates of maternal mortality are available for most countries, excluding the extremely wealthy and small countries. These estimates are calculated working with the definition of maternal death and looking at sources such as vital registration systems, sibling history data from household surveys, data from censuses and surveys for deaths in households, and published work reporting population-based studies of maternal mortality (Hogan et al., 2010, p. 1610). Sibling history data are particularly interesting because the survey asks people to account for all their siblings, whether they are alive or dead, and, if they are dead, how they died. Due to some subjectivity, these estimates are not without uncertainty and error. Sub-national data are difficult to get for most countries, particularly developing ones, due to weak organization of health systems. This lack of data makes it difficult to best target intervention programs.

Global initiatives to reduce maternal mortality intensified with the Safe Motherhood Initiative in 1987 (Hogan et al., 2010, p. 1609). The four pillars of the Safe Motherhood Initiative were: good prenatal care, access to obstetric care for women at higher risk, assistance of a trained person at all births, and adequate primary health care and food for women from infancy to adolescence (including universal availability of family planning) (Sharma and Atri, 2010, p. 287). However, the reduction of maternal mortality didn't become a main, global priority until its adage to the Millennium Development Goals in 2000 (Ronsmans and Graham, 2006, p. 1189). Under the more general goal of improving maternal health, the Millennium Development Goal target calls for a 75% reduction in global maternal mortality between 1990 and 2015 (Hogan et al.,

2010, p. 1609). Although it can be difficult to get accurate information about global maternal mortality ratios, it is clear that the target has not yet been met.

Literature Review: What causes variation in maternal mortality?

A literature on maternal mortality identifies four main drivers of variation: health system quality, individual poverty, women's status, and family planning. I discuss each of these areas in turn.

Health System Quality

Countries with better health systems tend to have lower maternal mortality. There are a number of different aspects that influence health system quality, including ease of access, number of healthcare workers, availability of emergency obstetric care, and the quality of care. The quality of a health system depends both on how an individual can get to a healthcare center when necessary as well as what care is received once inside the healthcare center.

A large proportion of maternal death takes place in hospitals. This is for three main reasons: women arrive too late to benefit from emergency care, women arrive with complications that could have been prevented if they had received timely and competent interventions, and women admitted for normal delivery experience serious complications while in the health center (Ronsmans and Graham, 2006, p. 1195). The first two reasons imply problems with access to proper healthcare, and the third could represent a lack of prenatal care. Most literature to this point explores the lack of available emergency obstetric care; this is because it is the cited cause of the greatest variation in global maternal mortality ratios and is also what most global solutions are geared towards changing.

Access to a healthcare system refers to both physical and financial access (Freedman, 2003, p. 102). Physical access is affected by distance from a health center, infrastructure of the health system, and transportation. Financial access refers to the difficulty in paying to reach a healthcare center as well as paying for services once there. A rise in income per head is directly correlated to an increase in physical and financial access to healthcare (Hogan et al., 2010, p. 1620) and ultimately a decrease in maternal mortality.

The connection of the community to the health workers and the health system is necessary for timely access to competent healthcare, and the lack of these critical elements causes variation in outcomes. Timely access to competent healthcare is one of the main causes of maternal mortality, because most maternal mortality happens during labor, delivery, and the immediate postpartum period (Ronsmans and Graham, 2006, p. 1189). One aspect that determines the quality of a health system is the capacity of the referral chain capacity between facilities. Such capacity refers to the ability of a small, local health center to transport a mother to a larger, more advanced hospital in a timely manner as well as the ability of trained midwives to bring women from their home to the health center in order for more advanced treatment.

Trained midwives or skilled birth attendants can handle normal births safely and effectively. The problems arise when an obstetric emergency happens and there is no way to get the mother the care she needs to live. ten Hoope-Bender et al. (2006, p. 227) argue that skilled birth attendants need to have a strong relationship with the healthcare system and the community for the referral chain to work effectively. Falconer (2010, p. 371) also states that successful maternity systems need a strong community midwifery component.

Trained midwives are important community health workers due to their deeply rooted connection to local communities; it is essential to train them to understand when a health center or hospital is needed during labor, delivery, or the immediate postpartum period. Trained midwives are also extremely important to women's access to antenatal care, which refers to the care of the mother from the beginning of pregnancy to labor (Sharma and Atri, 2010, p. 285). Midwives are effective antenatal care providers because of their close connection with their community.

Many scholars view the high rates of maternal mortality as a human resources issue. There are not enough skilled healthcare workers in the healthcare systems of countries with high maternal mortality ratios (ten Hoope-Bender et al., 2006, p. 232). According to Gerein et al. (2006, p. 43), doctor, nurse, and midwife densities were significantly related to maternal mortality rates even after controlling for other confounding variables like per capita income and female literacy. In the United States there are 773 nurses per 100,000 population compared to 6 nurses per 100,000 population in Uganda (Gerein et al., 2006, p. 41). These shortages occur mostly in rural and poor areas (Gerein et al., 2006, p. 40), because it is especially hard to attract and retain skilled health workers in these environments (Hoope-Bender et al., 2006, p. 230). This makes the rural and the poor mothers the most vulnerable to maternal mortality (Ronsmans and Graham, 2006, p. 1189; Gerein et al., 2006, p. 46).

Available healthcare workers in developing countries often migrate to other countries with better opportunities (Gerein et al., 2006, p. 40). Factors encouraging healthcare workers to emigrate include better salaries and benefits as well as the chance to leave war, civil unrest, and economic deterioration (Gerein et al., 2006, p. 43). The

brain drain resulting from emigration of healthcare workers away from the developing world to the developed one occurs throughout the world (Freedman, 2003, p. 104). There is also domestic brain drain, which means available healthcare workers flock to work in the private sector and with non-governmental organizations instead of the public health system. Particularly in African nations, there is also the issue of losing healthcare workers to HIV-related illness (Gerein et al., 2006, p. 42). High prevalence of HIV/AIDS in countries also increases the workload of the hospital staff, changes their responsibilities as healthcare professionals, and many of them worry about contracting HIV themselves (Dovlo, 2007, 1383). Staff shortages mean that health systems are unable to deliver services, especially because the workers lost possess a critical set of skills that are difficult to rapidly replace (Dovlo, 2007, 1382).

Emergency obstetric care is needed to prevent maternal death due to direct obstetric complications (Bailey et al., 2006, p. 292). The majority of maternal deaths occur during labor so providing emergency obstetric care is an effective intervention. Emergency obstetric care involves administration of intravenous antibiotics, manual removal of the placenta, assisted vaginal delivery, cesarean section, and blood transfusions (Sharma and Atri, 2010, p. 288). Presently, there are too few health centers in the developing world that have the staff and equipment needed to perform emergency obstetric surgeries. The availability of emergency obstetric care is so important because “obstetric complications cannot be predicted or prevented” but virtually all the complications are treatable (Freedman, 2003, p. 100-101). Lack of emergency obstetric care is closely connected to the human resources problem because shortages of health professionals decrease the number of facilities that can offer emergency obstetric care

(Gerein et al., 2006, p. 40). However other barriers to implementing emergency obstetric care include lack of necessary equipment and limited numbers of health centers.

Individual Poverty

There is clear relationship between poverty and maternal health: the more poverty there is, the more maternal death there is. This relationship is evident both between and within countries (Ronsmans and Graham, 2006, p. 1197). In fact, 99 percent of maternal death occurs in poor countries, and higher GDP is associated with lower rates of maternal mortality (Freedman, 2003, p. 99; Hogan et al., 2010, p. 1613). Poverty is both a micro- and a macro-level issue. The costs to run a health system affects the quality of treatment mothers receive as a general population and as individuals. This study focuses on micro-level individual poverty and its effect on maternal mortality. Depending on the society in which the impoverished live, race, marital status, and stress could affect their ability to receive treatment (Ronsmans and Graham, 2006, p. 1197). Ultimately, poor populations are some of the most vulnerable to maternal mortality (Ronsmans and Graham, 2006, p. 1189; Cantero et al., 2007, p. 370).

Hogan et al. (2010, p. 1620) state that a rise in income per head positively affects both the nutritional status of mothers and physical and financial access to health care. Women who are able to acquire proper nutrition are less likely to get sick and therefore more likely to be healthy throughout pregnancy. More income also tends to correlate with better education and job opportunities, especially for women. The positive effects of increased income per head are broad and highly connected.

Individual poverty can be divided into two causes of poor maternal health, the direct causes and the indirect causes. The direct causes include nutritional status, water

sanitation, quality of housing, and access to healthcare. If a mother is consistently malnourished and exposed to unclean water, she will be more susceptible to maternal death. Quality of housing includes issues like using cook stoves inside, which is very bad for a woman's respiratory health because of the toxins they release into the air, and the cleanliness of her living condition, which could either protect her from or leave her more vulnerable to infection depending on its state. Finally, access to healthcare focuses on whether a woman has the time or financial capabilities to reach a healthcare center in order to receive treatment. Indirect causes include education and women's status, which are both discussed in more detail below. Overall, individual poverty means less access to necessary resources, both goods and services, which are beneficial for a women's health, especially the increased health needs of a woman during pregnancy.

Women's Status

As women's status increases, the maternal mortality ratio decreases. This is the assumption that this study is built upon. Women's status is based on education and gender equity, which in turn affect total fertility. Women's health improves with women's status because women have more freedom of movement, which allows women to seek treatment without the company of their husband or another male relative. The opportunity to work affords women the income to pay for health services. The ability and knowledge to access healthcare provides women greater independence to choose when, where, and for what reason they see a healthcare professional.

Women's education level drives maternal mortality variation. As education has increased globally, so has women's status. With increased women's status, women are afforded greater access to education and opportunity. Important factors reduce the

availability of education to women, namely poverty and disease. Poverty often keeps women out of school, because they are required to stay home and work in order to support a family even at a young age. The prevalence of disease also affects the amount of time women can partake in education; this issue is both connected to women's overall status and the effectiveness of the healthcare system. HIV/AIDS has undermined education systems and school attendance, especially among women (ten Hoope-Bender et al., 2006, p. 230). This is because women who get sick no longer have time to go to school due to other responsibilities and physical weakness. Education is a clear example of how connected causes of variation are.

Gender equity is essential to the improvement of maternal mortality (ten Hoope-Bender et al., 2006, p. 228). The greater the gender equity, the longer a woman will stay in school, and the greater her status in society will be. The better a woman's status, the better a woman's health, because a woman with higher status will be empowered to seek out healthcare when needed, have the ability to access healthcare independently, and have the knowledge to know when and where to find what she needs. In Madagascar, women who have lower status are not allowed by their husbands to see a male doctor about reproductive health issues. This means that there are many women who do not have access to family planning and skilled birth attendance when there is only a male doctor in the area.

Also, total fertility decreases with an increase in women's status. This is due to later age of marriage, differential aspirations, greater involvement in the labor market, and better knowledge and more consistent use of family planning. The longer women

stay in school, the later they get married; which increases generation time and means women have fewer children over their lifetime (Culver, 2012).

Family Planning

There is a clear relationship between lower fertility and lower maternal mortality. Effective family planning lowers total fertility and thus maternal mortality. There are unmet family planning needs around the world (Falconer, 2010, p. 370). These unmet needs can have two major consequences: high total fertility and abortion, which will be discussed later. Variations in fertility are thus related to variations in maternal mortality. In fact, a study by Hogan et al. states that total fertility rates showed the strongest relation with maternal mortality when compared to all the other causes of maternal death (Hogan et al., 2010, p. 1613). A World Health Organization (WHO) study also highlights that high adolescent pregnancy can be an indicator for high maternal mortality, perhaps due to a greater likelihood of abortion among adolescent women (Shah and Say, 2007, p. 24). High fertility means more pregnancy and births, which means more chances for something to go wrong and cause maternal death (Sharma and Atri, 2010, p. 287).

More than one fourth of pregnancies worldwide culminate in abortion (Sharma and Atri, 2010, p. 287). Unsafe abortion accounts for 60,000 deaths per annum and is a clear contributor to maternal mortality ratios (Falconer, 2010, p. 370). Abortion deaths are almost exclusively due to unsafe abortion (Khan et al., 2006, p. 1073). Women are forced to seek unsafe abortions due to restrictive abortion laws or the inability to access a safe abortion. Restrictive abortion laws are not associated with lower abortion rates and are thus ineffective policies for governments to keep (Sedgh et al., 2012, p. 1). In fact, restrictive abortion laws often lead to a higher rate of unsafe abortions. Romania, for

example, saw a decline from 159 deaths per 100,000 live births in 1989 to 83 deaths per 100,000 live births in 1991 due to a restrictive abortion law being revoked (Ronsmans and Graham, 2006, p. 1192). Lower levels of support for family planning can also drive abortion rates up, which is especially important when considering the United States policy towards supporting abortion abroad. The United States' refusal to support abortion abroad has increased induced abortion rates of sub-Saharan Africa, which in turn decreases maternal health (Bendavid et al., 2011). Globally, the proportion of unsafe abortions has increased since 1995 (Sedgh et al., 2012, p. 6), and it is driving up maternal mortality rates.

Data and Methods

In order to identify focal countries for the analysis, I graphed women's status (proxied by youth female literacy rate) versus maternal mortality. As discussed above, maternal mortality is inversely proportional to women's status. Because these data do not exist for female literacy for every country for every year, I took the maximum value available for each country between 2005 and 2009 of the percent of women aged 15-24 who can, with understanding, read and write a short, simple statement on their everyday life. I used the literacy rate among *young* women because those are the women who are most likely to be giving birth. The maternal mortality ratio is the modeled estimate of the number of women per 100,000 who died between the beginning of pregnancy and 42 weeks after delivery due to maternal causes in 2008. All data came from the World Bank's World Development Indicator database. 70% of the world's countries were included in the study; countries missing from the study are disproportionately wealthy or small.

There was a strong, negative correlation between women's status and maternal mortality, with 54 percent of the variation in maternal mortality explained by female literacy. I created this graph in order to identify the countries that either underachieved or overachieved in terms of maternal mortality. I constructed a 95% confidence interval around the regression line in order to identify the underachieving and overachieving countries. See Figure 3. Countries falling within that interval have the expected relationship between female literacy and maternal mortality. Those that fall above the upper bound and to the right are the underachieving countries because they have high women's status but a high maternal mortality ratio. Those that fall below the lower bound and to the left are the overachieving countries because they have low women's status and unexpectedly low maternal mortality ratios. See Table 1 and Table 5.

The groupings of countries identified by this analysis helped to identify global patterns of maternal mortality variation. In order to identify two countries to serve as cases for further analysis, I sought to identify a pair of countries that was otherwise largely similar except for their underachiever or overachiever status such that I could identify any other dissimilarity as potential drivers of the observed difference in maternal mortality. I chose one country each from the underachiever and overachiever lists. Using this method, I chose deviant cases, countries that did not conform to the original prediction made that as women's status improved maternal mortality decreased (Bennett and Elman, 2007, p. 176-177). I limited the analysis to sub-Saharan Africa because it's home to a vast majority of the countries with high maternal mortality and to help control for confounding factors. Ethiopia and Nigeria both have low HIV prevalence rates, high levels of ethnic fractionalization, similar amounts of international aid funding, similar

average age at first marriage, similar fertility rates, similar levels of contraceptive prevalence, and a similar religious composition (see Tables 3 and 4). I conducted an in-depth comparison of Nigeria and Ethiopia by examining comparative numerical indicators associated with maternal mortality and by doing a critical literature review structured around the factors identified in the literature review as driving maternal mortality variation.

Global Trend Analysis

The quantitative analysis helped to identify good countries for comparison and also highlighted important global trends in maternal mortality variation. Overall, underachiever countries have high prevalence of HIV/AIDS and overachiever countries are predominantly Muslim and the majority of them are not located in sub-Saharan Africa. See Figure 4 and Table 2. There are regional trends, religious trends, and HIV/AIDS infection trends associated with my analysis.

Of the twenty-four countries in the underachiever country group, twenty of them are in sub-Saharan Africa. The other four countries are in Asia. Of the thirty-two overachieving countries, seven are in the Middle East and five are in northern Africa. The overachiever group had more regional variation with countries from Africa, Asia, Europe, the Middle East, Oceania, and the Americas.

Out of twenty-four underachieving countries, twelve of them had a majority of the population practicing Christianity and seven had a majority Islamic population. Out of thirty-two overachieving countries, eighteen of them had a majority of the population following Islam and eight of them had a practicing Christian majority. Discounting countries with other religious majorities and countries without available data, it is clear

that more Christian countries are underachieving and more Muslim countries are overachieving.

Seventeen out of the twenty-four underachieving countries were ranked within the top thirty HIV prevalence rates in the world according to CIA World Factbook (Central Intelligence Agency, 2009). This is compared to only two out of thirty-two overachieving countries with HIV prevalence rates among the top thirty in the world (Central Intelligence Agency, 2009). This is obviously a significant difference between the two country groups and could also account for the regional trend of underachieving countries being mostly in sub-Saharan Africa because sub-Saharan Africa has been severely affected by the HIV/AIDS epidemic.

Once compiled, the data showed clear global trends including the tendency for underachieving countries to also be severely impacted by an HIV/AIDS epidemic and for overachieving countries to have a majority Muslim population. As discussed in the literature review, HIV/AIDS has a serious impact on the functioning of a country's health system so it is clear why countries with HIV/AIDS epidemics are also struggling to reduce maternal mortality even though women's status is high. The best explanation of overachieving countries being majority Muslim is the general acceptance of family planning within Islam (Boonstra, 2001, p. 4). Unlike Christianity, contraception has a long history in Islam and does not conflict with Islamic thought (Boonstra, 2001, p. 4-5). A general acceptance of family planning leads to lower unwanted fertility and lower abortion rates, which could significantly reduce maternal mortality ratios even with a generally low women's status. There are, as always, exceptions to the trends and the increased regional variation of overachievers when compared to underachievers has not

been explained. But, the two clear trends were critical in choosing the two close comparison countries, Ethiopia and Nigeria, in order to control as many variables as possible.

Comparison between Nigeria (Underachiever) and Ethiopia (Overachiever)

Ethiopia and Nigeria both have poor maternal mortality statistics: 470 and 840 women dying per 100,000 live births respectively, which ranks them among the highest 20% maternal mortality rates in the world (World Bank, 2011). Ethiopia is an overachiever according to this study because of its low women's status and lower than expected maternal mortality ratio, but most of the world regards it as a failure. Ethiopia and Nigeria are good comparison countries because they have many similarities, which serve as controls in the analysis. Ethiopia has achieved greater maternal mortality success than Nigeria despite its lower status of women because: Ethiopia has free antenatal care is available, Ethiopia has more political will to reduce maternal mortality, Ethiopia has a smaller percent of the population living below the poverty line, Ethiopia is a more agricultural society, Ethiopia escaped the natural resource trap, Ethiopia has a lower rate of adolescent fertility, and Ethiopia has a liberal abortion policy.

Ethiopia and Nigeria are similar in many aspects, which makes them effective comparison countries. To start, both have large populations compared to other countries in Africa. Nigeria has a population of 170 million and Ethiopia has a population of 94 million (Central Intelligence Agency, 2009). Although these are drastically different populations, Nigeria is twice to size of Ethiopia and both countries are large populations relative to other countries in the world. Due to their size, both countries face similar health challenges that are related to large populations, including difficulty reaching rural

populations, difficulty evaluating and measuring health indicators or the success of interventions, and difficulty having enough medicine and healthcare workers available for such a large population. Also, Nigeria and Ethiopia have similar religious makeups. Ethiopia is majority Christian and Nigeria is majority Muslim. Ethiopia is approximately two thirds Christian and one-third Muslim (Central Intelligence Agency, 2009). Nigeria is approximately one half Muslim and one half Christian (Central Intelligence Agency, 2009). It is important that neither Christianity nor Islam is overwhelmingly dominant in either country. Nigeria and Ethiopia also have similar HIV prevalence rates, in Ethiopia the HIV adult prevalence rate is 2.1% and in Nigeria it is 3.6% (United States Agency for International Development, 2010). Although Nigeria does in fact have a higher adult prevalence rate both countries have low prevalence rates compared to southern and eastern Africa.

Health System Quality

Health system quality is highly dependent upon the national government. Ethiopia and Nigeria spend 4.3% and 5.8% of their gross domestic products towards health, respectively (Central Intelligence Agency, 2009; World Bank, 2011). The literature generally agrees that as health spending goes up maternal mortality should decrease. This is obviously not the case when comparing Nigeria and Ethiopia. Nigeria spends \$69.30 per capita on health expenditures when Ethiopia only spends \$14.68 per capita (World Bank, 2011). It is clear that health expenditure does not account for the variation in maternal mortality between Ethiopia and Nigeria.

Ethiopia and Nigeria are both federal republics and the Mo Ibrahim Foundation rates them as having very similar levels of government effectiveness (Mo Ibrahim

Foundation, 2011). Similar levels of government effectiveness are important because it means there are similar levels of corruption, services to the citizens, and similar public goods (Mo Ibrahim Foundation, 2011). Overall, both countries have low levels of government effectiveness compared to the rest of the world. The two countries also receive similar amounts of foreign aid. Using PEPFAR as an example, Nigeria received \$1.539 million and Ethiopia received \$1.197 million between 2004 and 2009 (United States Department of State). These serve as important controls, showing that the governments' approach health with similar foreign aid funding and government organization. However, Ethiopia has a greater government focus on maternal health.

It is clear that Ethiopia has made a greater effort to start programs and institutions solely focused on women's health and this could be a significant reason why it is an overachieving country, set apart from Nigeria. An anecdotal analysis of World Bank and World Health Organization (WHO) programs in both Nigeria and Ethiopia show that Ethiopia is more concerned with maternal health than Nigeria is and has more specific goals towards the improvement of maternal mortality. The World Bank has pledged seven billion dollars to Ethiopia since 1991, but the website does not state exactly how much money has been pledged to Nigeria (World Bank, 2012). The World Bank publishes the specific goal for Ethiopia to reduce its maternal mortality ratio by half, included specific efforts towards increased supplementation of pregnant women and increased skilled attendance at birth (World Bank, 2012). The World Bank's Nigeria strategies do not directly mention reduction of maternal health but rather the achievement of the Millennium Development Goals in general (World Bank, 2012). Health discussion

about Nigeria and the World Bank revolves around HIV/AIDS and malaria with no direct mention of maternal mortality (World Bank, 2012).

Nigeria had one WHO program that was concentrated on both family and reproductive health, with no direct focus on maternal health (World Health Organization Regional Office for Africa). Ethiopia, on the other hand, had two programs devoted to maternal health. One was the “Making Pregnancy Safer” campaign, which is a WHO focus strategy that has been implemented in one in five African countries (World Health Organization Regional Office for Africa). The second was a general women’s health program that works closely with the Women’s Affairs Department of the Ministry of Health in Ethiopia (World Health Organization Regional Office for Africa). Some authors have argued that Nigeria has been unsuccessful in reducing their levels of maternal mortality because there is no recognized leader of the safe motherhood community, which leads to a lack of government coherence (Shiffman, 2007, p. 800). Nigeria has been criticized overall for its lack of political will towards reducing maternal health (Thomson, 2005, p. 203). The Women’s Affairs Department in Ethiopia is a start towards coherence and organization of the political community and could have led to some of Ethiopia’s success. Nigeria has a Ministry of Women’s Affairs and Social Development, but it has not yet paired with organizations like WHO and the World Bank to create large-scale programs about maternal health.

Ethnic fractionalization can lead to poor quality of institutions, including the potential to affect the health quality that certain ethnicities receive due to discrimination or regional distribution of certain ethnic groups (Alesina et al., 2003). Easterly and Levine (1997, p. 1205-1206) state that countries with high levels of fractionalization have

insufficient infrastructure for public goods, like healthcare, because they cannot politically agree to effective policies. Nigeria and Ethiopia are good comparison countries because there is a high level of ethnic fractionalization in both countries, 0.85 in Nigeria and 0.72 in Ethiopia on a scale of zero to one (Alesina et al., 2003). Therefore ethnic fractionalization acts as another analytic control and is an explanation for weak health systems in both Ethiopia and Nigeria.

A key general difference between the government effectiveness of Ethiopia and Nigeria is the fact that the northern half and the southern half of Nigeria experience great divides in health and education while Ethiopia does not experience the same regional disparity, despite its high level of ethnic fractionalization. This divide in Nigeria affects all four determinants of maternal mortality variation. The Hausa-Fulani are the people who live mostly in the north; the Igbo and the Yoruba live mostly in the south (LeVan et al., 2012, p. 627-628). The northern part of Nigeria is the half of the country that experiences worse conditions than the rest of Nigeria. In a 2005 Nigerian case study, Hausa-Fulani women experienced a disproportionately high number of maternal deaths compared to the other ethnic groups (Ujah et al., 2005, p. 32). This is mostly because the women are illiterate, do not seek antenatal care, and carry low status within society (Ujah et al., 2005, p. 37). There are also inequalities of health spending allocation between north and south in Nigeria (The Lancet, 2011, p. 1891). Formal education is something the Nigerians are very proud of; the southern part of Nigeria invested greatly in the expansion of the education system while the northern part of the country prohibited missionaries from entering (LeVan et al., 2012, p. 629; LeVan et al., 2012, p. 633). This has created a North-South education gap that affects women's status and subsequently

maternal mortality (LeVan et al., 2012, p. 629). This regional disparity that exists in Nigeria is important in the comparison between the countries, because even though it may appear like Nigeria may have seemingly better conditions for maternal health than Ethiopia, it is known that these successes are not equally distributed throughout the country. Even though both countries have high levels of ethnic fractionalization, Ethiopia does not have the same debilitating North-South gap that Nigeria does.

As mentioned in the literature review, skilled attendance at birth is crucial to reducing maternal mortality. While skilled health staff attended 38.9% of births in 2005 in Nigeria, the figure for Ethiopia in 2008 was a mere 5.7% (World Bank, 2011). This difference between percentages of skilled attendance at birth is opposite what the literature findings would have predicted; this means that there are other factors more strongly influencing the maternal mortality in these countries than skilled attendance at birth.

Antenatal care is another strong determinant of maternal mortality. The percent of pregnant women receiving antenatal care in Nigeria is 57.7% compared to a small 27.6% in Ethiopia (World Bank, 2011). This is also a confounding determinant because, when comparing Ethiopia and Nigeria, the results do not match the overall findings from the literature. So, antenatal care is also not a major factor in determining the variation of maternal mortality between Nigeria and Ethiopia. However, the cost of antenatal care could be an important determining factor. As of 2010, Ethiopia offered free antenatal care and Nigeria did not (Aspen Global Health and Development, 2010; Ramoni, 2010). This could affect the poorest women's access to healthcare, and Ramoni argued for free antenatal care in Nigeria in order to reduce the maternal mortality ratio (Ramoni, 2010).

So, it is likely that Ethiopia's free antenatal care impacts the poorest women and thus women that are more likely to die during pregnancy, labor, delivery, or after birth (Ronsmans and Graham, 2006, p. 1189). Ethiopia's free antenatal care could potentially be a product of the maternal health programs that Ethiopia has developed in partnership with organizations such as the World Bank. As mentioned above, Ethiopia's government focus on specific maternal health programs is a potential contributor to Ethiopia's lower rate of maternal mortality compared to Nigeria.

Individual Poverty

Ethiopia and Nigeria do differ significantly based on economic determinants. The relationship found in the literature between economics and maternal health is that as individual wealth improves maternal health increases as well. The gross domestic product per capita of Nigeria is more than double that of Ethiopia, which may seem strange that the maternal mortality ratio is then also about double that of Ethiopia's (Central Intelligence Agency, 2009; World Bank, 2011). More importantly is that in 2007 70% of Nigeria's population was living below the poverty line compared to only 29.2% in Ethiopia in 2009 (Central Intelligence Agency, 2009). A woman living below the poverty line would have a hard time finding transportation to the nearest health clinic, paying for health services, or feeding herself enough to keep her and her unborn child healthy. The stark difference in poverty levels most likely contributes to the overachiever status of Ethiopia compared to the underachiever status of Nigeria. The disparity between gross domestic product per capita and population below the poverty line in Nigeria is most likely due to the inequality created by the prevalence of oil in Nigeria, which will be

discussed later. Even though Nigeria has a higher GDP per capita, it is most important that Ethiopia has significantly fewer people living below the poverty line.

Ethiopia has a larger agricultural sector and lower urbanization that may help the poorest people to still eat during time of food insecurity. In 1999, 70% of Nigeria's labor force worked in agriculture and, as of 2010, 50% of the population lives in an urban area (Central Intelligence Agency, 2009). Compared to Ethiopia, which had 85% of its labor force working in agriculture in 2009 and only 17% of the general population living in an urban area in 2010, Nigeria is significantly more urbanized and less agricultural (Central Intelligence Agency, 2009). Due to urbanization, a smaller proportion of the population are available for agriculture work, so unless agricultural productivity increases there will be a drop in food production in Nigeria (LeVan et al., 2012, p. 624). Urbanization is an important factor connected to agriculture because the more urban a nation gets the more difficult it is for its urban inhabitants to farm and could lead to food deserts in cities where people have a hard time producing for themselves. This means that in Ethiopia extremely poor people are more likely to have the land and skill for subsistence farming due to smaller rates of urbanization. Food security is an issue connected to agriculture in both countries. Ethiopia has areas that live in a chronic state of food insecurity due to drought, degradation of resources, rapid population growth (Food and Agricultural Organization of the United Nations, 2006). Nigeria also has issues with food security, including the need for water control and assistance from the Food and Agricultural Organization of the United Nations (Food and Agricultural Organization of the United Nations, 2011). In times of food shortages, Ethiopia could have better maternal health

because more women can subsistence farm to feed themselves through agriculture. This could contribute to the lower than expected maternal mortality ratio of Ethiopia.

Nigeria's poverty, despite greater wealth, may be the result of the resource curse. Nigeria has oil, which has been historically understood as a curse because reliance on oil revenues can create conflict, make democracy malfunction, inflate the value of local currency, and destroy the diversity of markets (Collier, 2007). In the 1970s, Nigeria was greatly profiting from oil revenue, which inflated the value of local currency and destroyed the peanut and cocoa export markets (Collier, 2007). Also, the 1970s oil boom in Nigeria led to a bust that sharply decreased living standards, and some of the effects may still remain today (Collier, 2007, p. 42). Ethiopia was not subject to this natural resource trap because it does not have the oil that Nigeria does. This is a significant difference between the two countries that could influence the variation poverty, and in turn the variation in maternal mortality ratios.

Women's Status

Education is vital in determining a woman's status in society and thus the quality of maternal health. In a case study in North-Central Nigeria, 70% of all maternal deaths were women who were illiterate (Ujah et al., 2005, p. 32). A case in Ethiopia also highlighted the fact that educated women are more likely to use health services (Mekonnen and Mekonnen, 2003, p. 380). In Nigeria, 83% of women in 2009 completed the last grade of primary school (World Bank, 2011). The Nigerian government takes great pride in their formal education system (LeVan et al., 2012, p. 633). In Ethiopia, a mere 48% of women completed the last grade of primary school (World Bank, 2011). Literacy rates between the countries seem to follow a similar trend, with Nigeria at

49.81% youth female literacy rate and Ethiopia at 17.98% (World Bank, 2011). It would appear that Nigeria has the better education system and thus better women's status throughout the country. However, literature also refers to Nigeria as having a broken-down educational system (Harrison, 2009, p. 9). Based on the information, it is clear that Nigeria has a better overall education system than Ethiopia. However, ultimately, both countries have struggling education systems that potentially act to diminish women's status in society.

There is a clear demographic connection between age of first marriage and women's education—the more education a woman has, the more likely she will marry at a later age (Culver, 2012). Later age of first marriage means decrease in fertility rate and an increase in life expectancy (Culver, 2012; Cohen, 1995, p. 157). In a Nigerian case study, early marriage and educational attainment were found to be the two most important factors in determining the rate of maternal mortality (Marchie and Anyanwu, 2009, p. 109). Age of first marriage in Nigeria and Ethiopia are nearly identical, at 17 and 18 years of age respectively (Central Intelligence Agency, 2009). This means that even though age of first marriage is an important indicator of the quality of women's education as well as possible fertility ratios, it is not a significant measure when comparing Ethiopia and Nigeria.

Gender equity is also a main factor in determining women's status. The World Economic Forum compiles a Global Gender Gap Index each year that aims to measure the magnitude of gender-based disparities that exist in the 134 countries included in the index (Hausmann et al., 2011). The Global Gender Gap Index is based on gender disparities in four categories: economic participation and opportunity, educational

attainment, health and survival and political empowerment (Hausmann et al., 2011).

Nigeria and Ethiopia have low gender equity, being the 120th and 116th ranking countries out of 134 (Hausmann et al., 2011). This means that although gender equity is critical in the understanding of women's status, it is not a major factor when comparing Ethiopia and Nigeria.

After looking at all the factors that influence women's status, Ethiopia and Nigeria are similar except for their education systems. Nigeria clearly has a better education system than Ethiopia does. After synthesizing the information, there are two possibilities concerning the relationship between Ethiopia and Nigeria's women's status. First, Nigeria could have overall better women's status than Ethiopia, mostly demonstrated by their focus on education. Second, Nigeria does not ultimately have higher women's status because gender equity and age at first marriage are so similar to Ethiopia, but does have a better education system. Because education is so highly valued by the government and its people and the other indicators of women's status are not significantly different from Ethiopia, it would seem that Nigerian women have a similar status in society that Ethiopian women do despite their higher levels of education. Either way, Nigeria's strong education system should lead to improved maternal health over Ethiopia, but, due to other influencing factors, does not.

Family Planning

Both Ethiopia and Nigeria have similar total fertility rates, with Nigeria at 5.7 children born per woman and Ethiopia at 5.4 children per woman (ICF International, 2012). High fertility rates can cause maternal health problems; the more pregnancies women have the greater the risk of complication. However, total fertility rate is not a

crucial comparative factor when looking at Ethiopia and Nigeria because the numbers are so similar. The crucial aspect of fertility when comparing Ethiopia and Nigeria is the difference in adolescent fertility between the two countries. High levels of teenage pregnancy are correlated with high levels of maternal mortality (Shah and Say, 2007, p. 24). In a Nigerian case study, young teenagers (girls under fifteen years of age) and older women (over the age of forty) were the two age groups at the greatest risk of maternal mortality (Ujah et al., 2005, p. 27). In 2007, Nigeria had 118 births per 1,000 women aged 15-19 and Ethiopia only had 72 (World Bank, 2011). Ethiopia's lower rate of teenage pregnancy could be due to the liberal abortion law that allows minors to legally terminate pregnancy, because, in Ethiopia, 45% of women seeking abortions are adolescents (Not Yet Rain). This will be discussed in more detail. Ethiopia has a significantly lower rate of teenage pregnancy and this could contribute to its lower overall maternal mortality ratio compared to Nigeria.

Unmet need for contraception and contraceptive prevalence are important factors in family planning. Nigeria and Ethiopia have similar contraceptive prevalence, 13% and 15% respectively (World Bank, 2011). This indicator acts as another analytic control. Ethiopia has a higher unmet need for contraception at 34% compared to Nigeria's 17% (World Bank, 2011). This comparison contradicts the findings from the literature that unmet need for contraception is correlated with maternal mortality. Therefore, unmet need for contraception is obviously not a significant factor in the analysis of Nigeria versus Ethiopia.

The difference in abortion policy between Nigeria and Ethiopia may, however, be a crucial factor driving the difference in maternal mortality. Abortion laws in Nigeria

remain restrictive (Ujah et al., 2005, p. 36). The law officially says abortion is “prohibited, or permitted only to save a woman’s life”(The Futures Group International, 2012). Ethiopia, on the other hand, broadened the criteria in 2004 for legal abortion to the point where a substantial number of abortions are now legal (Sedgh et al., 2011, p. 189; Not Yet Rain). Officially the law says abortion is “permitted on physical or mental health grounds”(The Futures Group International, 2012). The most liberal part of the Ethiopian abortion law is that a woman is allowed to terminate her pregnancy when “continuation of the pregnancy endangers the health of the woman or the fetus, and when the woman is unable to bring up the child owing to her status as a minor or to a physical or mental infirmity”(Sedgh et al., 2011, p. 195). Brought on by a growing death toll of unsafe abortions, which causes more than half of maternal deaths in Ethiopia, the government took legal action to improve maternal health by passing this liberal abortion law (Not Yet Rain). This abortion law in Ethiopia has led to 27% of all abortions being performed legally (ibid.). A liberal abortion law alone does not ensure safe abortions (Sedgh et al., 2012, p. 7), but it is a good place to start. Legal abortions are safer and reduce the rate of maternal mortality. Nigeria and Ethiopia significantly differ on their approach to abortion policy and it has a significant effect on the maternal mortality ratio.

Conclusion

The causes of maternal mortality variation are diverse and include health system quality, individual poverty, women’s status, and family planning. Global maternal mortality variation between underachiever and overachiever nations is due to regional, religious, and HIV trends. Underachiever countries have high prevalence of HIV/AIDS and overachiever countries are predominantly Muslim. In the comparison between Ethiopia

and Nigeria, factors controlled for included religion, population size, HIV prevalence, national health expenditure, government effectiveness, ethnic fractionalization, age at first marriage, total fertility, contraceptive prevalence, and gender equity. Indicators did not follow the patterns expected in the literature: health expenditure per capita, skilled attendance at birth, percent of women receiving antenatal care, unmet need for contraception, and percentage of females completed the last grade of primary school. Ethiopia has achieved greater maternal mortality success than Nigeria despite its lower status of women because: Ethiopia has free antenatal care available, Ethiopia has more political will to reduce maternal mortality, Ethiopia has a smaller percent of the population living below the poverty line, Ethiopia is a more agricultural society, Ethiopia escaped the natural resource trap, Ethiopia has a lower rate of adolescent fertility, and Ethiopia has a liberal abortion policy. See Table 3 and Table 4.

The analysis of deviant cases serves to highlight the myriad of factors affecting the maternal mortality ratio. Because the causes of maternal mortality variation are so diverse, there is a need for country specific programs that address unique country weaknesses. Looking at Nigeria and Ethiopia on a global scale, they both have poor maternal health. However, their comparison is so important because Ethiopia has managed to enact certain policies that drastically improve its maternal health beyond the expected level. When creating health policy for Nigeria, it may be important to focus on the things that Ethiopia already has, such as a liberal abortion policy that has led to a lower rate of adolescent fertility. A campaign for liberal abortion policies would be ineffective in Ethiopia because it is already in place and would not address the other factors contributing Ethiopia's high level of maternal mortality. An effective Ethiopian

health policy might focus on the unmet need for contraception or having skilled attendance at birth to improve maternal health. From a global perspective, global health policy aimed at reducing maternal death should focus on entirely different issues, such as joining the improvement of maternal health and HIV/AIDS prevention and treatment programs together.

The most important conclusion of this study is that programs focusing on one key change can make a big difference in improving a wide range of indicators of maternal health. In Ethiopia, the entire family planning sector did not need to be fixed in order for a liberal abortion law to save lives. Especially in developing countries, an overhaul of the health system or education system is not likely to be successful immediately. In order to improve maternal health now—especially with the Millennium Development Goals deadline fast approaching—country-focused, effective changes will need to be made. Ethiopia and the other overachiever countries are excellent examples that all country operations do not need to be high functioning in order to reduce maternal mortality; a handful of effective policy changes can save many lives.

Tables

Table 1 Table of countries divided into Underachiever and Overachiever.

High literacy, high maternal mortality (Underachiever)	Low literacy, low maternal mortality (Overachiever)	
Angola	Algeria	Libya
Burundi	Bangladesh	Mauritius
Cameroon	Benin	Morocco
Central African Republic	Bhutan	Nepal
Chad	Burkina Faso	Nicaragua
Congo, Dem. Rep.	Cape Verde	Oman
Equatorial Guinea	Egypt	Pakistan
Guinea-Bissau	Eritrea	Papua New Guinea
Indonesia	Ethiopia	Saudi Arabia
Kenya	The Gambia	Senegal
Korea, Dem. Rep. (North)	Guatemala	Syrian Arab Republic
Lao PDR	Haiti	Timor-Leste
Lesotho	India	Togo
Liberia	Iran	Tunisia
Malawi	Iraq	Turkey
Myanmar	Lebanon	Yemen, Rep.
Nigeria		
Rwanda		
Sierra Leone		
South Africa		
Sudan		
Swaziland		
Tanzania		
Zimbabwe		

Table 2 Table of underachievers and overachievers divided by global region and color-coded by religious majority. Christian is red, Muslim is purple, other is blue, and data unavailable is black.

World Region	Northern Africa	Sub-Saharan Africa	Asia	The Americas	Middle East	Europe	Oceania
Underachiever	Sudan	Angola	Indonesia				
		Burundi	Korea, Dem. Rep. (North)				
		Cameroon	Lao PDR				
		Central African Republic	Myanmar				
		Chad					
		Congo, Dem. Rep.					
		Equatorial Guinea					
		Guinea-Bissau					
		Kenya					
		Lesotho					
		Liberia					
		Malawi					
		Nigeria					
		Rwanda					
		Sierra Leone					
		South Africa					
		Swaziland					
		Tanzania					
		Zimbabwe					
Overachiever	Algeria	Benin	Bangladesh	Guatemala	Iran	Turkey	Papua New Guinea
	Egypt	Burkina Faso	Bhutan	Haiti	Iraq		
	Libya	Cape Verde	India	Nicaragua	Lebanon		
	Morocco	Eritrea	Nepal		Oman		
	Tunisia	Ethiopia	Pakistan		Saudi Arabia		
		The Gambia	Timor-Leste		Syrian Arab Republic		
		Mauritius			Yemen, Rep.		
		Senegal					
		Togo					

Table 3 Table of background information on Nigeria and Ethiopia.

Criteria	Nigeria	Ethiopia	Source
Type of government	Federal republic	Federal republic	CIA World Factbook
Ethnic fractionalization	0.8505	0.7235	Alesina, Alberto et al.
Government effectiveness	41	46	Mo Ibrahim Foundation
Population	170,123,740 (July 2012 est.)	93,815,992 (July 2012 est.)	CIA World Factbook
Religions	Muslim 50%, Christian 40%, indigenous beliefs 10%	Orthodox 43.5%, Muslim 33.9%, Protestant 18.6%, traditional 2.6%, Catholic 0.7%, other 0.7% (2007 Census)	CIA World Factbook
HIV Prevalence	3.6% (2007)	2.1% (2007)	USAID, HIV/AIDS Health Profile

Table 4 Table of comparison indicators of Nigeria and Ethiopia, distinguished by cause of maternal mortality variation (either health system quality, individual poverty, education, family planning, and other). Key differences include births attended by skilled health staff, pregnant women receiving prenatal care, GDP per capita, percent of population below the poverty line, abortion policy, adolescent fertility, and unmet need for contraception. Expected differences (those that indicate potential reasons why Ethiopia has a lower maternal mortality ratio), based on findings from the literature, are in green and unexpected differences are in blue.

Criteria	Nigeria	Ethiopia	Source
Maternal mortality ratio (modeled estimate, per 100,000 live births)	840 (2008)	470 (2008)	WDI
Literacy rate (% of women age 15-24)	49.81	17.98	WDI
<i>Health System Quality</i>			
Births attended by skilled health staff (% of total)	38.9 (2005)	5.7 (2008)	WDI
Health expenditure per capita (current US\$)	69.29 (2009)	14.68 (2009)	WDI
Health expenditure,	5.82	4.26	WDI

total (% of GDP)	(2009)	(2009)	
Pregnant women receiving prenatal care (%)	57.7 (2008)	27.6 (2005)	WDI
PEPFAR Funding (between 2004 and 2009)	\$1,539 million	\$1,197 million	PEPFAR
<i>Individual Poverty</i>			
GDP per capita (PPP)	\$2,600 (2011 est.)	\$1,100 (2011 est.)	CIA World Factbook
Population below the poverty line	70% (2007 est.)	29.2% (2009/2010 est.)	CIA World Factbook
Percent of Labor Force in Agriculture	70 (1999)	85 (2009)	CIA World Factbook
Percent Urban Population	50% (2010)	17% (2010)	CIA World Factbook
<i>Education</i>			
Average age at first marriage, all women	17 years	18 years	MNPI
Persistence to last grade of primary school, female (% of cohort)	83 (2009)	48 (2009)	WDI
Global Gender Gap Index	0.6011 (2011)	0.6136 (2011)	World Economic Forum
<i>Family Planning</i>			
Fertility rate, total (children per woman)	5.7 (2008)	5.4 (2005)	Measure DHS
Abortion policy	Prohibited, or permitted only to save a woman's life	Permitted on physical or mental health grounds	MNPI
Adolescent fertility rate (births per 1,000 women age 15-19)	118 (2007)	72 (2007)	WDI
Unmet need for contraception (% of married women ages 15-49)	17 (2003)	34 (2005)	WDI
Contraceptive prevalence (% of women ages 15-49)	13 (2003)	15 (2005)	WDI

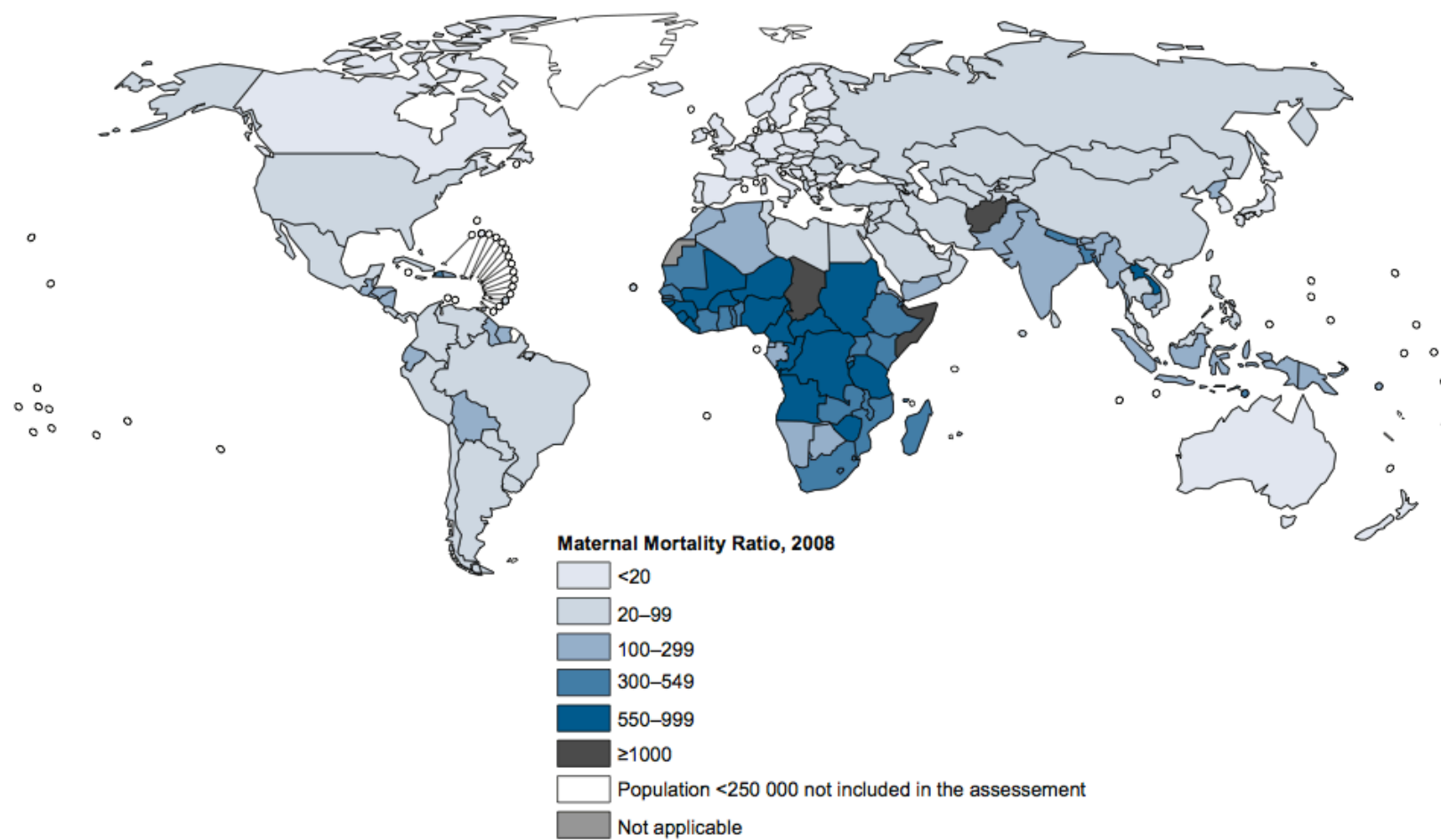
Figures

Figure 1 Map showing maternal mortality ratios across the world in 2008 (WHO, UNICEF, UNFPA and The World Bank).

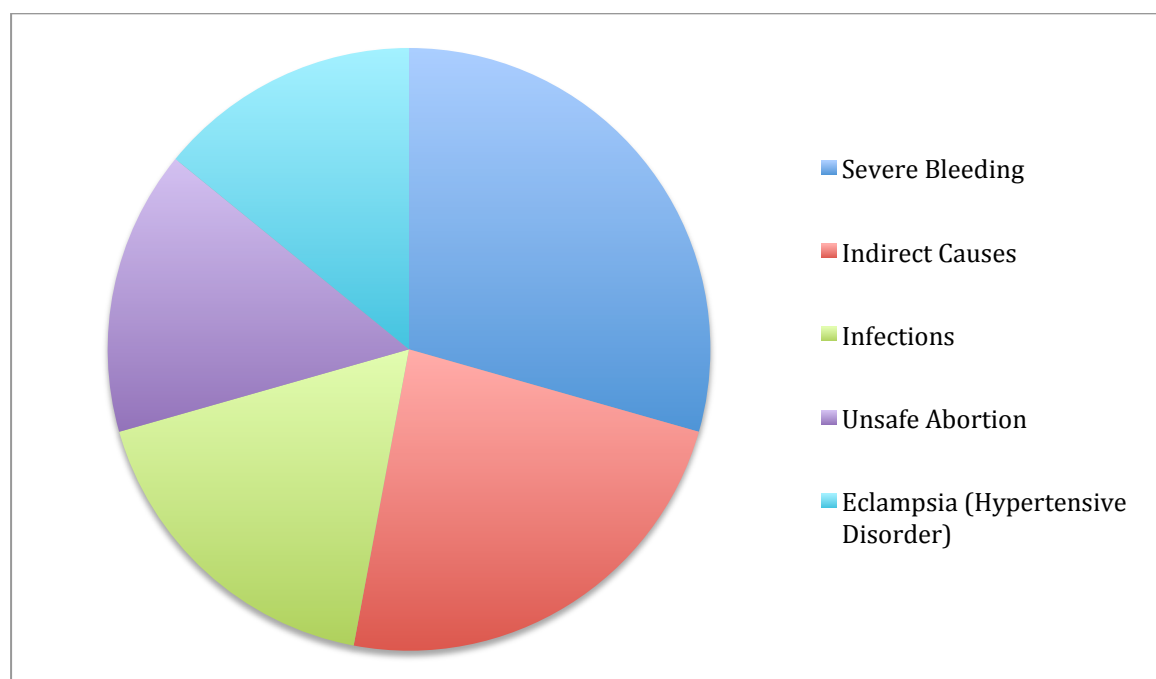


Figure 2 Chart showing the distribution of causes of maternal mortality.

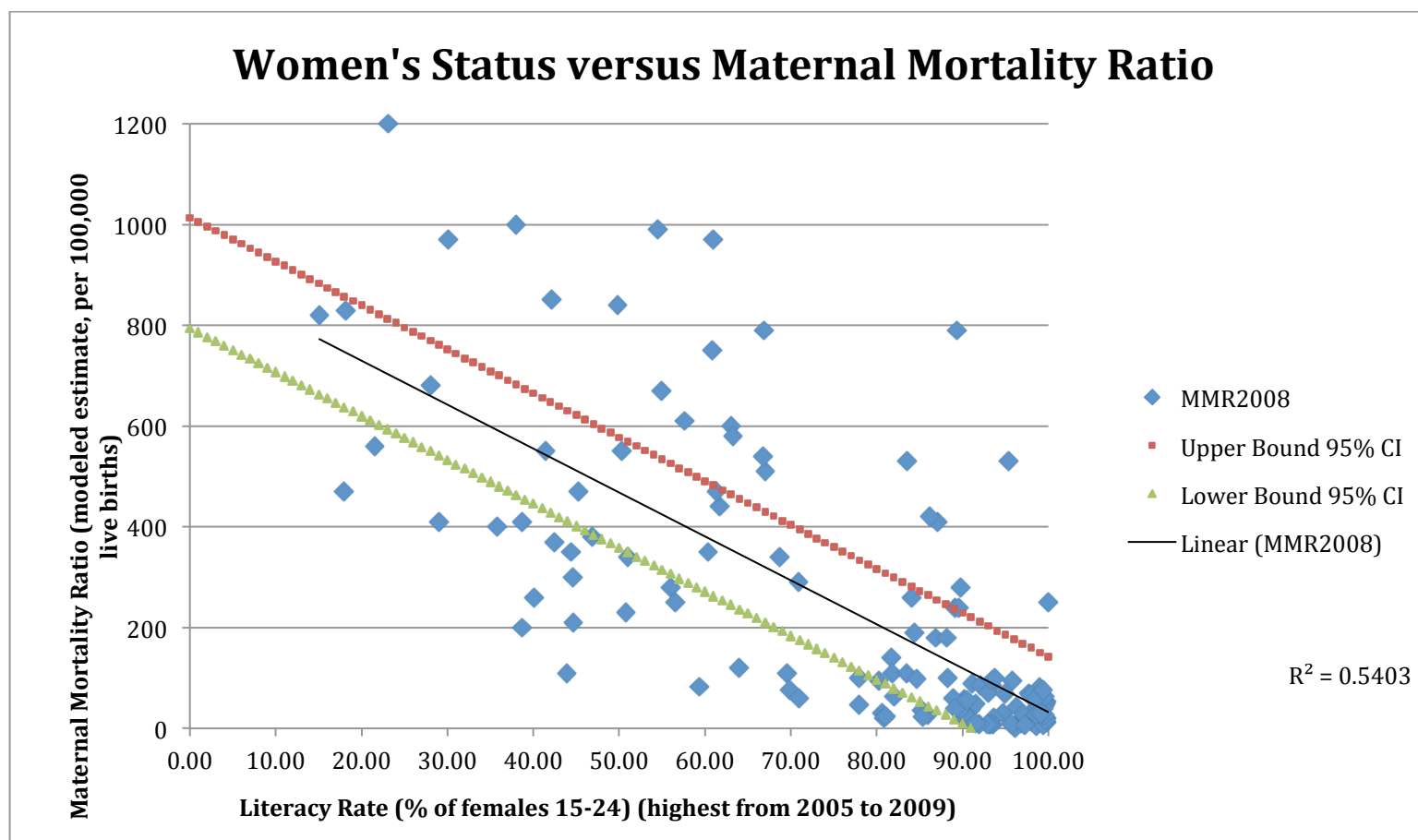


Figure 3 This scatterplot graphs women's status (proxied as female youth literacy rate) versus maternal mortality ratio. The line of best fit is shown in black; with an r-squared value was 0.5403. The red and green lines are a 95% confidence interval around the line of best fit. Countries that fall below the lower line are overachievers (low literacy, but low maternal mortality), while those that fall above are overachievers (high literacy, but high maternal mortality).

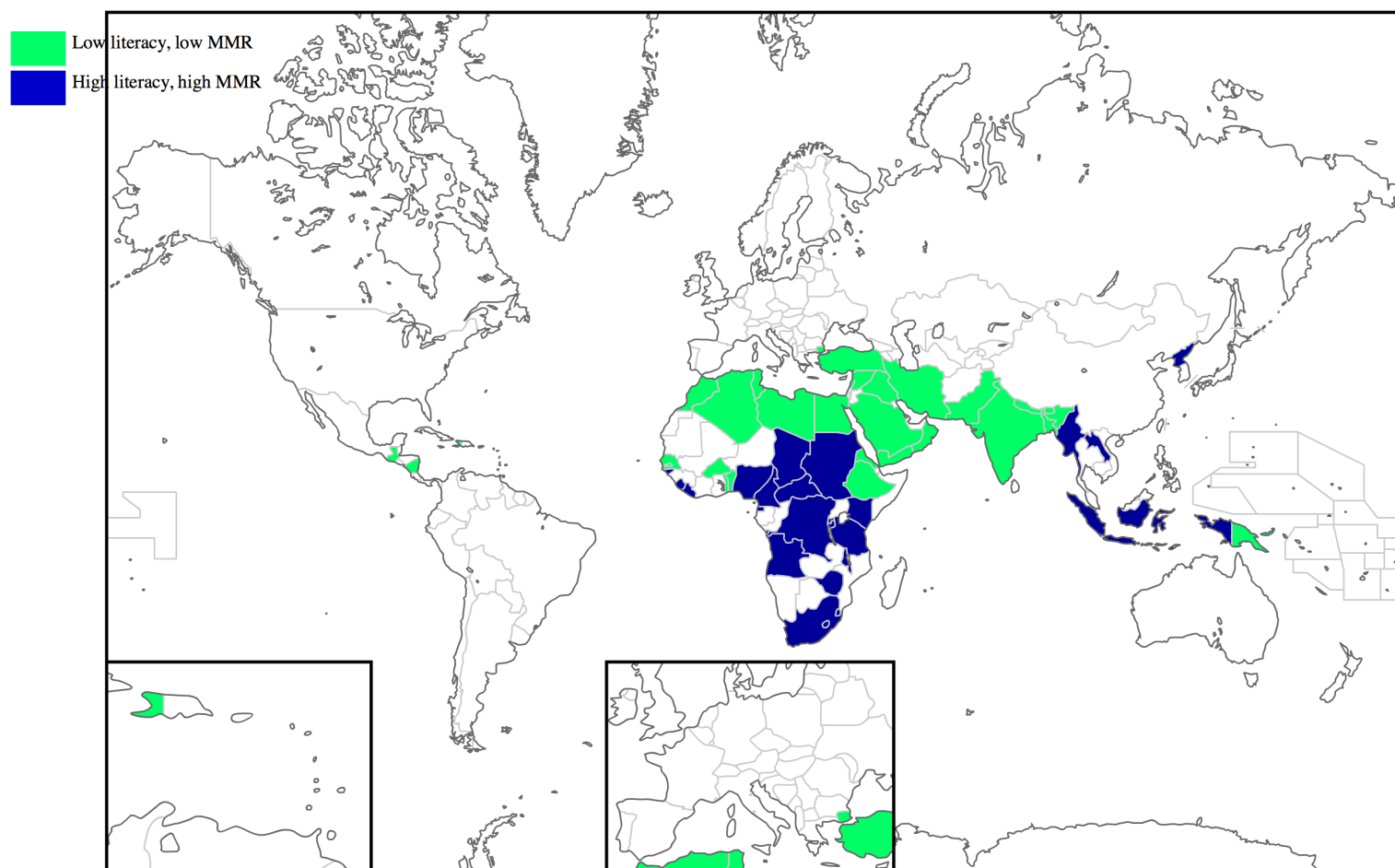


Figure 4 Map of underachievers (in blue) versus overachievers (in green), highlighting the global trends found in the study.

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Appendix

Table 5 Table of countries divided into Normal and Missing.

Normal		Missing Countries (based on UN Member States)	
Albania	Lithuania	Afghanistan	Saint Vincent and the Grenadines
Argentina	Macedonia, FYR	Andorra	Samoa
Armenia	Madagascar	Antigua and Barbuda	San Marino
Azerbaijan	Malaysia	Australia	Sao Tome and Principe
Bahrain	Maldives	Austria	Serbia
Belarus	Mali	Bahamas	Seychelles
Bolivia	Malta	Barbados	Slovakia
Bosnia & Herzegovina	Mauritania	Belgium	Solomon Islands
Botswana	Mexico	Belize	Somalia
Brazil	Moldova	Canada	South Sudan (did not exist at time of data)
Brunei Darussalam	Mongolia	Congo, Rep.	Sweden
Bulgaria	Mozambique	Czech Republic	Switzerland
Cambodia	Namibia	Denmark	Tonga
Chile	Niger	Djibouti	Tuvalu
China	Panama	Dominica	Uganda
Colombia	Paraguay	Fiji	United Kingdom
Comoros	Peru	Finland	United States
Costa Rica	Philippines	France	Vanuatu
Cote d'Ivoire	Poland	Germany	
Croatia	Portugal	Grenada	
Cuba	Puerto Rico	Guyana	
Cyprus	Qatar	Iceland	
Dominican Republic	Romania	Ireland	
Ecuador	Russian Federation	Israel	
El Salvador	Singapore	Japan	
Estonia	Slovenia	Kiribati	
Gabon	Spain	Korea, South	
Georgia	Sri Lanka	Liechtenstein	
Ghana	Suriname	Luxembourg	
Greece	Tajikistan	Marshall Islands	
Guinea	Thailand	Micronesia	
Honduras	Trinidad & Tobago	Monaco	
Hungary	Turkmenistan	Montenegro	
Italy	Ukraine	Nauru	
Jamaica	United Arab Emirates	Netherlands	
Jordan	Uruguay	New Zealand	
Kazakhstan	Uzbekistan	Norway	

Kuwait	Venezuela, RB	Palau
Kyrgyz Republic	Vietnam	Saint Kitts and Nevis
Latvia	Zambia	Saint Lucia