Maternal Mortality in Mozambique: Findings on the Timing of Death and the Role of HIV/AIDS

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Introduction

Addressing maternal health and mortality concerns has been the focus of several national and international initiatives, such as the Millennium Development Goals (MDGs) and Safe Motherhood Initiative, which have well-defined benchmarks to monitor and evaluate interventions. Assessing progress of these initiatives has been a challenge due to a lack of reliable data as well as weak and fragmented health information systems.

Maternal health is one of the priorities for the Mozambique Ministry of Health. However, data were needed to understand the current situation and to assess the effectiveness of maternal health improvement programs in decreasing maternal mortality rates. In response to this and other critical mortality data gaps, the government of Mozambique decided to implement a post-census mortality survey – the Inquérito Sobre Causas de Mortalidade (INCAM) – in conjunction with their 2007 population census. The National Institute of Statistics, in collaboration with the Ministry of Health, implemented INCAM between 2007 and 2008. INCAM provided valuable information about maternal mortality, as well as other causes of death in Mozambique. This paper will discuss the maternal mortality results, as well as compare the survey findings with the results of other studies. Specifically, the percentages of maternal deaths due to direct, indirect, and indirect-HIV related causes as well as the time of death in relation to pregnancy will be addressed.

Details on the 2007 INCAM and the application of verbal autopsies are presented in the following section. Next, the paper turns to a discussion of major results concerning maternal mortality from the survey. These findings are then compared to results from other studies.

Methodology

The 2007 Mozambique national population census served as the frame for selecting the post-census mortality survey sample. The sample was designed to yield representative results at the national, urban/rural, and provincial levels. Each of the 10 provinces was divided into rural and urban strata from which 32-48 clusters were randomly selected. Maputo City (the capital) is equivalent to a province and is entirely urban. Urban areas were oversampled in order to yield a sufficient number of deaths. Overall, this design called for approximately a five-percent sample of all households in Mozambique.

The 2007 census form contained questions regarding deaths that occurred in the household within the prior 12 months. Once specific clusters were chosen in each province, all households within the cluster which reported a death during the census interview were identified for a follow-up verbal autopsy (VA) interview. Three separate verbal autopsy forms, corresponding to newborns, infants and children, and adults, were developed based on the World Health Organization (WHO) international standardized versions.[1] Trained interviewers visited the household, identified an appropriate respondent, and administered the questionnaire. When forms were completed, they were turned over to a team of physicians, who had been trained on

[1] The WHO international standard verbal autopsy questionnaires are available at http://www.who.int/whosis/mort/verbal_autopsy_standards2.pdf.

the application of ICD-10 certification and coding.[2] The physicians used the information on the forms, their medical expertise, and ICD-10 certification and coding guidelines to complete a death certificate indicating the immediate and underlying causes of each death.

Definition of Maternal Mortality

Maternal deaths were classified according to the WHO ICD-10 volumes 1-3-10 index, Chapter XV Pregnancy, childbirth and the puerperium (O00–O99) which excludes human immunodeficiency virus [HIV/AIDS] disease (B20–B24), injury, poisoning and certain other consequences of external cause (S00–T98) and supervision of normal pregnancy (Z34).[3] However, all maternal deaths caused by HIV/AIDS were identified and included in the maternal mortality measures where appropriate. Thus, a maternal death was defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Direct obstetric deaths (O00-O97) included maternal deaths resulting from obstetric complications of the pregnant state, from interventions, omissions, incorrect treatment, or from a chain of events resulting from a maternal cause of death. Likewise, indirect obstetric deaths (O98-O99) included maternal deaths resulting from previous disease that developed during pregnancy and which were not due to direct obstetric causes but were aggravated by physiologic effects of pregnancy. Deaths which were not otherwise classified as direct obstetric deaths, but where the underlying cause was HIV/AIDS infection, were included as indirect obstetric deaths. There were, however, 10 unweighted instances where mothers were HIV positive yet died of direct obstetric causes; these deaths were included in the direct obstetric category.[4]

The timing of adult female deaths relative to pregnancy was determined from the adult verbal autopsy form that contains a series of questions that identify all women who died and were pregnant at time of death, within 42 days of death, or 43 days to 1 year before death (O96). Information from the verbal autopsy allowed the calculation of pregnancy-related deaths.

Maternal Mortality Findings from INCAM

Distribution of Maternal Deaths

Table 1 presents the basic frequency distributions (numbers and percentages) of maternal deaths both weighted and unweighted from the post-census mortality survey. There were 213 unweighted cases of maternal death, including three women under fifteen years of age and one over 49 years of age. Weighted numbers were 4,803 maternal deaths plus 176 accidental or

[2] The International Classification of Diseases (ICD) is used to classify diseases and other health problems recorded on vital records including death certificates. ICD-10 has been in use by WHO member states since 1994.

[3] Ranges of codes from ICD-10 are indicated here in order to clarify which specific causes are included in each definition.

[4] ICD-10 generally assigns HIV/AIDS as the underlying cause of death for deaths which occur in HIV positive persons. In the case of known or suspected HIV positive maternal deaths, they were classified here as indirect obstetric deaths with one exception: if they would have been otherwise classified as direct obstetric deaths had they not been HIV positive, they were still classified as direct obstetric deaths.

incidental deaths for a total of 4,979 pregnancy-related deaths. In addition, there were 963 weighted late- maternal deaths (more than 42 days after the pregnancy ended).

In all of the tables and figures following Table 1, percentages refer to weighted distributions. Furthermore, unless otherwise indicated, only maternal deaths will be discussed – accidental or incidental pregnancy-related deaths and late maternal deaths are excluded.

Figure 1 shows the distribution of maternal deaths based on whether they were due to direct obstetric causes or indirect causes. Although ICD-10 coding excluded HIV/AIDS as an underlying direct or indirect cause of maternal death, it is classified here as an indirect cause. Again, there were ten instances where mothers were HIV positive yet died of direct obstetric causes; these deaths were included in the direct obstetric category.

Fifty-five percent of maternal deaths were due to direct obstetric causes. About 18 percent of maternal deaths were HIV/AIDS-related indirect obstetric deaths and the remaining 27 percent were due to indirect causes other than HIV/AIDS (these two shares are not significantly different). To our knowledge, this post-census mortality survey in Mozambique may be the most broad-based in a developing country to determine the share of maternal deaths due to direct vs. indirect obstetric causes, as well as the share due to HIV/AIDS.

Maternal Mortality Ratios

Maternal mortality as measured in the 2007 Mozambique Census was 500 deaths per 100,000 births (Table 2). The difference in maternal mortality between urban and rural areas was small. To achieve the Millennium Development target for 2015, maternal mortality will need to decline by half the 2007 level. Maternal mortality ratios are highest for girls at ages 12-14 years (1816 deaths per 100,000 births) and lowest for women at ages 20-24 years (377 deaths per 100,000 births).

Maternal mortality associated with direct causes is higher in rural areas compared to urban areas (Table 3). However, there is no statistical difference between maternal mortality ratios for urban and rural areas for HIV-related and non-HIV/AIDS related indirect causes of maternal deaths.

Time of Death in Relation to Pregnancy

Figure 2 shows the distribution of maternal deaths in relation to the duration of pregnancy or time since childbirth. Among all maternal deaths, 54 percent occurred during pregnancy but before delivery (which includes 14 percent due to abortion) and 46 percent occurred within delivery or 1-42 days after a birth.[5] However, these numbers are not statistically different from one another. For both direct and indirect causes, 40 percent of maternal deaths occurred during pregnancy and there were no statistical differences in the percent of deaths occurring in the period from delivery to 7 days after delivery.

Maternal Deaths by Type of Delivery

[5] There was no significant difference between the percentage of maternal deaths that occurred during pregnancy (including abortion) and the percentage of maternal deaths that occurred during and after childbirth.

Approximately 88 percent of maternal deaths occurring in women who gave birth were to women who had normal vaginal deliveries. (Table not shown.) A relatively small number of maternal deaths occurred to women who delivered by cesarean section (only 13 unweighted cases). However, deliveries by cesarean section apparently are rare in Mozambique. The 2003 Mozambique Demographic and Health Survey (DHS) found that just under 2 percent of all births occurred by cesarean. These results suggest that the risk of maternal death after a cesarean delivery is likely to be several times higher than that for vaginal delivery.

Age Distribution of Maternal Deaths and Percent Deaths in Women Age 15-49 Due to Maternal Causes

Table 4 shows the distribution of maternal deaths to women 15-49 years old reported in INCAM and the 2007 Census. INCAM results (first column) indicate that between 19 and 25 percent of maternal deaths occurred at each age group 15-19, 20-24, 25-29 and 30-34[6]. The average age of death for women who died of maternal causes was 27 years, while the median was 26 years (meaning that half of maternal deaths occurred before 26 years of age). It is worth highlighting that approximately 20 percent of maternal deaths occurred in girls who did not complete their twentieth year of age. Two out of three maternal deaths occurred among adolescents and young adults under 30 years of age. Cumulatively, 86 percent of maternal deaths occurred between ages 15-34. The distribution of maternal deaths from INCAM is similar to the full census except for women age 35-49, who comprised 14 percent of all maternal deaths to women 15-49 in INCAM compared to 21 percent in the 2007 census. The lower proportion of maternal deaths at older childbearing ages may reflect several factors, including a lower proportion of women giving birth at older ages and a smaller number of women at these ages. An examination of the age-specific fertility rates sheds light on the first factor. The 2007 census results (Table 4, third column) show lower fertility rates for both the younger and older ends of the childbearing age. Fertility peaks among women age 20-29 years with a slight decline among women 30-34 years old.

The INCAM sample shows that maternal deaths accounted for 14 percent of all deaths in women age 15-49 or about one maternal death for every six non-maternal deaths (Table 5, column 1). The proportion of all deaths among women age 15-49 that was due to maternal causes was higher in women age 15-24 than in women age 35 and above. Results from the complete 2007 census were similar (Table 5, column 2). Results from the 2003 DHS show proportions of total deaths being attributable to maternal causes range from 19 percent in women age 15-19 to 52 percent in women age 35-39 (Table 5, column 3).

Place of Delivery

Among those giving birth, 51 percent of maternal deaths occurred to mothers who delivered at home and 43 percent delivered at a hospital or medical facility.[7] (Table not shown.) Approximately half of all maternal deaths occurred when there was a trained professional (a doctor, nurse, or midwife) assisting with the birth. In the other half of maternal deaths, the women delivered without any trained medical assistant.

[6] There was no significant difference between these age groups.
[7] There was no significant difference between these two shares.

Despite the similar number of maternal deaths occurring at home and at medical facilities, one cannot conclude that the risk of maternal death is similar in both places. To determine appropriate death rates in each area, we would need to know the location where all births take place. Furthermore, even if such rates are calculated, there might still be questions about how to interpret the results, since women who are ill may choose to give birth in medical facilities rather than at home.

Treatment Prior to Death

Table 6 shows care seeking prior to death for maternal deaths compared to other women dying of non-maternal causes, and men in the same age group. This table indicates that 61 percent of maternal deaths were preceded by attempts at medical treatment. However, higher percentages of women age 15-49 who died from non-maternal causes sought clinical treatment than women in that same age group dying from maternal causes (73 vs. 61 percent). A smaller percentage of women who died of maternal causes received treatment from a traditional healer than did men of the same age (24 vs. 33 percent).

Place of Death

The distribution of location of death is outlined in Table 7 for maternal deaths, non-maternal female deaths, and male deaths in individuals age 15-49. As might be expected given the nature and causes of death involved, a higher proportion of maternal deaths took place at a health facility (37 percent) than for men at age 15-49 (26 percent). However, the percentage of maternal deaths that occurred at home was still quite high, highlighting the need for expanded medical care for women both before and after pregnancy.

Discussion of INCAM Findings in Comparison to Other Studies

Direct, Indirect, and HIV-Related Maternal Deaths

INCAM results differ from other studies in the share of deaths attributable to direct and indirect causes as well as due to HIV/AIDS. WHO estimates that 80 percent of maternal deaths worldwide were due to direct obstetric causes (WHO, 2005; United Nations Children's Fund, 2010; Nour, 2008). INCAM found just 55 percent of maternal deaths due to direct obstetric causes. Furthermore, Khan et al. (2006) estimated that only 6 percent of maternal deaths in Africa were due to HIV/AIDS while a more recent WHO report (2010) estimates that 9 percent of maternal deaths in sub-Saharan Africa were due to HIV/AIDS. The results from INCAM suggest that 18 percent of maternal deaths were due to HIV/AIDS in Mozambique. The discrepancy between the percentage of direct obstetric maternal deaths reported by WHO for the world and the INCAM results likely is due at least in part to the higher percentage of indirect obstetric deaths attributable to HIV/AIDS in Mozambique. HIV/AIDS appears to be reshaping the distribution of maternal deaths by direct and indirect causes.

Over the period 1990-2008, the WHO (2009) estimates that 147 countries saw a decline in their maternal mortality ratio, two countries saw no change, and 23 countries experienced an increase. Among countries with maternal mortality ratios exceeding 25 maternal deaths per 100,000 live births, the countries with the largest percentage increase over the 18 year period were Botswana

(133 percent), Zimbabwe (102 percent), South Africa (80 percent), Swaziland (62 percent), and Lesotho (44 percent). These countries all are located in southern Africa, the region with the highest HIV prevalence in the world (WHO et al., 2010), and most of these countries are neighbors to Mozambique. Clearly, HIV/AIDS must be considered as a contributing factor to maternal deaths as nearly three-fifths of world-wide maternal deaths in 2008 occurred in sub-Saharan Africa, a region afflicted with the disease (WHO et al., 2010; Abdool-Karim, 2010).

In South Africa there was a 20 percent increase in the number of maternal deaths in the 3-year period 2005-2007 as compared to 2002-2004 (NCCEMD, n.d.). While some of these deaths likely were due to an increase in reporting, the increase was also attributed to an increase in non-pregnancy related infections such as HIV/AIDS. A higher percentage of deaths due to indirect (52 percent) than direct causes (48 percent) was found for 2005-2007, partially because HIV/AIDS accounted for 24 percent of all maternal deaths.

In Maputo City, deaths occurring in Maputo Central Hospital were reviewed by three different research teams, each covering a different time period. Collectively, the results of these studies appear to indicate that the percentage of maternal deaths due to direct causes has decreased over time. Granja et al. (2001) found that 60 percent of maternal deaths in the period 1989-1993 were due to direct causes, while Romagosa et al. (2007) reported a 51 percent share for direct obstetric maternal deaths occurring in 2001-2003.[8] Menendez et al. (2008) reviewed deaths from 2002-2004 and determined that only 40 percent of maternal deaths were due to direct causes. Furthermore, this latter study broke out indirect HIV/AIDS related deaths, which accounted for 14 percent of all maternal deaths with known causes of death. The 14 percent of deaths due to indirect HIV/AIDS-related causes found by Menendez et al. (2008) is in line with the results from INCAM. It is important to remember that these three studies only covered maternal deaths that occurred in the central hospital in the capital city of Maputo while INCAM was nationally representative. INCAM found that 61 percent of maternal deaths occurred at home; these are all deaths that would have been missed by studies focused on hospital deaths. Clearly, more research needs to be done at the national level to elucidate the relationship between HIV/AIDS and maternal deaths in Mozambique, but the high prevalence of HIV most likely plays some role in shaping the distribution of direct and indirect maternal deaths. This should be taken into consideration when establishing pre- and post-natal health care programs for expectant mothers.

Timing of Maternal Deaths Relative to Pregnancy

It is believed that most maternal deaths occur between the third trimester and the first week following the end of pregnancy (Li et al., 1996, Ronsmans et al., 2006). However, there is a paucity of data regarding more specific timing of maternal deaths relative to pregnancy, especially for countries with high maternal mortality ratios. One of the few studies on the subject was done by Li et al. (1996). In the mid 1990s, Li et al. found only nine reports on maternal mortality that included information on the timing of death for women in the following

[8] Calculation was done for known causes of death. Maternal deaths where cause of death was unknown were excluded from these results.

developing countries: Bangladesh, China, Egypt, India, and Malawi. They compared their findings on the timing of death in these countries to information on maternal deaths in the United States. This study, along with others that provide some level of detail on the timing of maternal deaths over a 40 year period from 1967-2007 can be seen in Table 8 along with the findings from INCAM.

The wide range in the distribution of the timing of maternal deaths shown in Table 8 is striking. The percentages of deaths that occurred during pregnancy prior to delivery ranged from 8 percent in Afghanistan to 54 percent in Mozambique. The percent of deaths occurring during delivery also covered a wide range from just 2 percent in Mozambique[9] to 44 percent in Bangladesh. The Bangladesh intrapartum share of 44 percent is from 1967-68, while other Bangladesh studies from the 1980s show this share as 10-17 percent. The percentage of deaths that occurred after delivery ranged from 45 percent in Mozambique and South Africa to 88 percent in Ethiopia. These findings suggest that Mozambique has a higher percentage of deaths in the antepartum period and a lower percentage of death in the postpartum period than do most of the other studies.

When the postpartum period is subdivided, the results also vary across the different studies as seen in Table 9. The percent of deaths that occurred within one day of delivery was also quite variable. This ranged anywhere from 11 percent in Bangladesh to 32 percent in Egypt. INCAM found that about 13 percent of all maternal deaths occurred within the first day in Mozambique. When looking at the percent of maternal deaths that occur within roughly the first week after delivery, the range is anywhere from 7-42 percent, with Bangladesh representing both ends of that extreme at different points in time. About one- quarter of maternal deaths in Mozambique occurred within one week of delivery while approximately one- fifth of maternal deaths in Mozambique occurred 8-42 days after delivery, which is within the range seen in other studies.

Globally, the most common cause of maternal death is severe bleeding, which is a direct cause of death that tends to occur during delivery or shortly thereafter (AbouZahr, 2003). In countries with high HIV/AIDS prevalence rates, HIV and other infectious diseases are leading to more indirect maternal deaths, thus shifting the timing of death to occur before delivery. In South Africa, of the maternal deaths where HIV status was known, 79 percent were HIV positive (NCCEMD, n.d.). Three- quarters of the HIV positive women died of indirect maternal causes. Of all the pregnant women who died from indirect causes and whose HIV status was known, 93 percent were HIV positive. HIV negative women in South Africa were more likely to die from direct causes (72 percent). Of all the maternal deaths due to direct causes whose HIV status was known, only 47 percent were HIV positive, a much lower percent than all maternal deaths as a whole. In the context of Mozambique, an autopsy study (Menendez et al., 2008) in Maputo Central Hospital found 53 percent of pregnant women were HIV positive. For the women with known HIV status and cause of death, 62 percent of HIV- positive women died from indirect causes. Interestingly, 55 percent of HIV-negative women also died of indirect causes. About half of all indirect obstetric deaths were HIV positive while 59 percent of direct obstetric deaths were HIV negative.

[9] Based on 3 unweighted cases.

Conclusion

Globally, in 2004 the two leading causes of death in women aged 15-44 were HIV/AIDS and maternal conditions, accounting for 19 and 15 percent of deaths, respectively (WHO, 2009). In regions where women face both high HIV prevalence and high maternal mortality, the effects are compounded and increases in maternal mortality are seen (McIntyre, 2003). The effect of HIV/AIDS on maternal mortality is likely to change the characteristics of maternal deaths, such as the cause and timing of death. This should be taken into consideration when establishing pre- and post-natal health care for expectant mothers in regions with high HIV/AIDS. If gone unrecognized, focusing only on direct causes of maternal deaths would miss a large portion of the expectant female population. Furthermore, the causes of maternal death also affect the timing of maternal death. The distribution of causes should be taken into consideration when trying to determine prevention of maternal mortality, especially when targeting certain periods during the pregnancy. Pregnant women will benefit both from good antenatal care as well as from postpartum follow up, especially when anywhere from 45-88 percent of deaths occur after delivery (see Table 8). Furthermore, the detection and treatment of infectious diseases, such as HIV/AIDS, will also greatly reduce the incidence of indirect maternal deaths.

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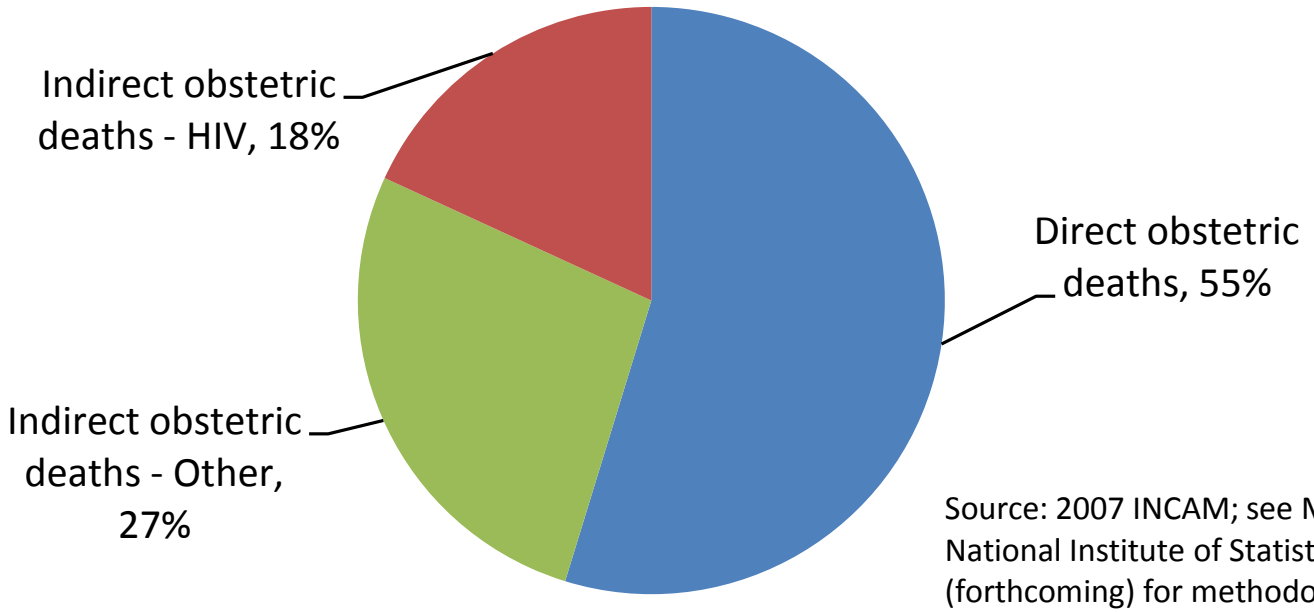
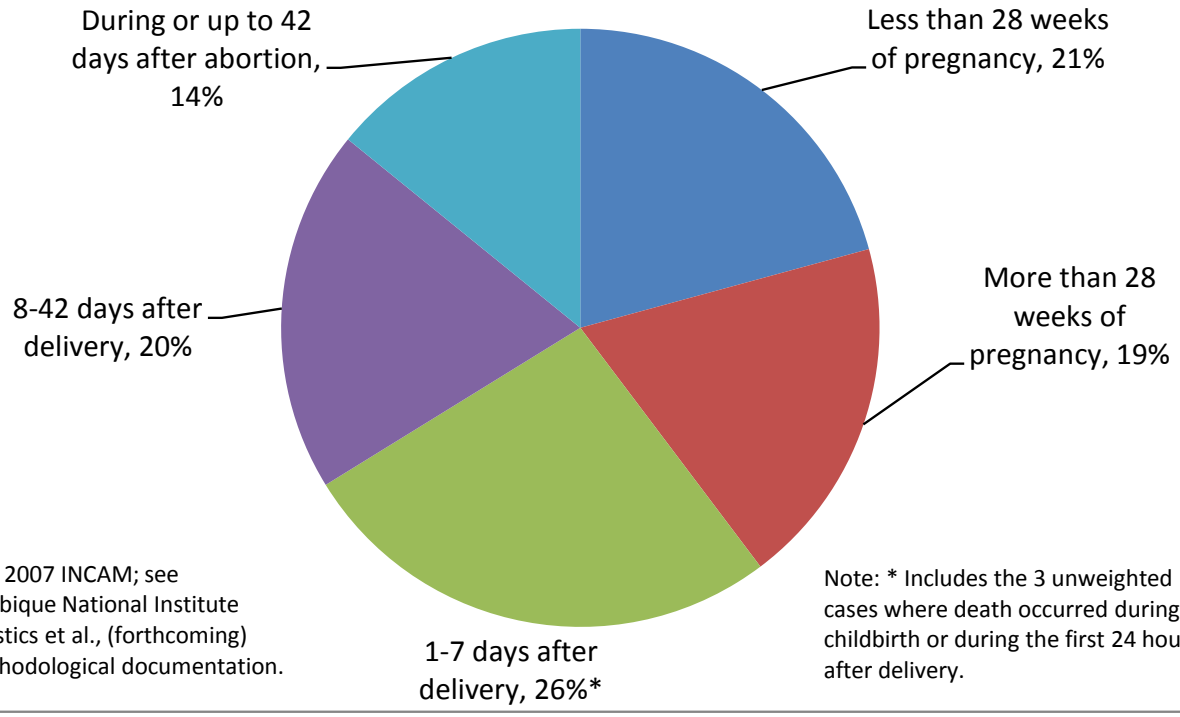
Figure 1. Distribution of Maternal Deaths: 2006-2007



Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation.

Figure 2.

Distribution of Maternal Deaths by Duration of Pregnancy Or Time Since Childbirth in Percent: 2006-2007



Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation.

Note: * Includes the 3 unweighted cases where death occurred during childbirth or during the first 24 hours after delivery.

Table 1.

Distribution of Maternal Deaths Along With Number of Accidental and Late Maternal Deaths: 2006-2007

		Pregnancy Related Deaths						
		Maternal Deaths						
		Direct Obstetric Deaths[1]	Indirect Obstetric Deaths		Total Maternal Deaths	Accidental/ Incidental	Total Pregnancy-Related Deaths	Late Maternal Deaths
			Other	HIV[2]				
Unweighted	Frequency	114	58	41	213	8	221	46
	Percent Maternal Deaths	53.5%	27.2%	19.2%	100.0%			
Weighted	Frequency	2,629	1,302	872	4,803	176	4,979	963
	Percent Maternal Deaths	54.7%	27.1%	18.1%	100.0%			

[1] Ten cases were HIV+ but the underlying cause of death was a direct obstetric death.

[2] Although ICD-10 codes exclude HIV as either a direct or indirect cause of maternal deaths, it is classified here as an indirect cause.

Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation.

Table 2.

Maternal Mortality Ratios by Age Group and Area of Residence: 2007

(Per 100,000 births)

Age Group	National	Urban	Rural
12-49 Years	500.0	490.0	504.0
15-49 Years	489.3	484.2	491.0
12-14 Years	1815.9	1268.3	1962.7
15-19 Years	589.4	491.8	630.1
20-24 Years	376.7	340.7	391.1
25-29 Years	465.2	525.6	445.5
30-34 Years	539.9	557.6	534.8
35-39 Years	511.7	576.9	494.8
40-44 Years	631.8	675.2	620.8
45-49 Years	649.0	867.5	605.0

Source: Mozambique 2007 Census.

Table 3.

Maternal Mortality Ratios (Ages 12-49) by Direct and Indirect Causes and Area of Residence: 2007

(Per 100,000 births)

Type of Maternal Death	National	Urban	Rural
Total	500	490	504
Direct	274	208	299
Indirect- Non-HIV	136	175	120
Indirect- HIV-related	91	107	84

Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation.

Table 4.

Distribution of Maternal Deaths to Women 15-49 Years Old from INCAM and 2007 Census and Age-Specific Fertility Rates

Age	INCAM (percent)	2007 Census (percent)	Age-Specific Fertility Rates (births per 1,000 women)
Total	100	100	
15-19	20	17	122.2
20-24	22	21	231.6
25-29	25	22	236.5
30-34	19	19	213.7
35-49	14	21	123.4

Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation.

Table 5.

Maternal Deaths as a Share of Total Female Deaths by Age Group from INCAM, 2007 Census, and 2003 DHS in percent

Age	INCAM	2007 Census	2003 DHS
Total (15-49)	14	13	19
15-19	25	19	24
20-24	21	17	12
25-29	17	15	20
30-34	15	14	22
35-49	6	8	52

Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation; Mozambique 2007 Census; Mozambique 2003 Demographic Health Survey.

Table 6.

Distribution of Maternal Deaths Compared to Non-Maternal Deaths By Treatment Sought in Percent: 2006-2007

Population group	Received any type of treatment	Clinical treatment	Community outreach	Traditional healer
Women aged 15-49, maternal causes	66.5	61.1	8.5	23.7
Women aged 15-49, non-maternal deaths	78.9	73.1	9.1	30.8
Men aged 15-49	75.9	69.3	7.8	33.1
All deaths	69.2	62.2	6.6	26.5

Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation.

Table 7.

Distribution of Maternal Deaths Compared to Non-Maternal Deaths by Location of Death in Percent: 2006-2007

Population Group	Total	Medical Facility	House	Other
Women aged 15-49, maternal causes	100.0	37.1	60.5	2.4
Women aged 15-49, non-maternal deaths	100.0	27.9	68.9	3.1
Men aged 15-49	100.0	26.0	67.7	6.4
All deaths	100.0	21.4	74.6	3.8

Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation.

Table 8.

Timing of Maternal Deaths, Results from Various Studies

Source	Data Year	Countries	Antepartum	Intrapartum	Postpartum
Chen et al. (1974)	1967-1968	Bangladesh	27%	44%	29%
Li et al. (1996)	1976-1987	Bangladesh, China, Egypt, India, & Malawi	24%	15%	61%
Koenig et al. (1988)	1976-1985	Bangladesh	37%	16%	47%
Alauddin (1986)	1982-1983	Bangladesh	27%	17%	56%
Khan et al. (1986)	1982-1983	Bangladesh	50%	10%	40%
Kane et al. (1992)	1985-1986	Egypt	29%	0%	71%
Atrash et al. (1990)	1979-1986	United States	22%	7%	72%
Rahman (2009)	1982-2002	Bangladesh (Matlab)	38%	NA	62%
Hurt et al. (2008)	1983-2001	Bangladesh (Matlab)	52%[b]	NA	48%
MacLeod and Rhode (1998)	1993	Tanzania	NA	15%	71%
Bartlett et al. (2005)	1999-2002	Afghanistan	8%	NA	53%
Hailu et al. (2009)	2005-2006	Ethiopia	NA	NA	88%
National Committee on Confidential Enquiries into Maternal Deaths (n.d.)	2005-2007	South Africa	46%	9%	45%
National Institute of Population Studies (Pakistan) and Macro International (2008)	2006-2007	Pakistan	32%	13%	56%
INCAM[a]	2006-2007	Mozambique	54%	2%[c]	45%

n.d.: No date.

NA: Not available.

[a]Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation.

[b]Includes both the antepartum and intrapartum period.

[c]Based on 3 unweighted cases.

Table 9.

Postpartum Deaths as a Percent of All Maternal Deaths, Results from Various Studies

Source	Data Year	Countries	Postpartum		
			1 Day	2-7 Days	8-42 Days
Chen et al. (1974)	1967-1968	Bangladesh	NA	7%	22%
Koenig et al. (1988)	1976-1985	Bangladesh	22%	11%	14%
Alauddin (1986)	1982-1983	Bangladesh	NA	42%[d]	15%
Khan et al. (1986)	1982-1983	Bangladesh	10%	12%[e]	28%
Bhatia (1993)	1984-1985	India	NA	14%[f]	40%
Kane et al. (1992)	1985-1986	Egypt	32%	23%	16%
Rahman (2009)	1982-2002	Bangladesh (Matlab)	NA	35%[g]	27%[h]
Hurt et al. (2008)	1983-2001	Bangladesh (Matlab)	11%[b]	15%	23%
MacLeod and Rhode (1998)	1993	Tanzania	26%	NA	NA
Bartlett et al. (2005)	1999-2002	Afghanistan	28%[c]	NA	NA
INCAM (Forthcoming)[a]	2006-2007	Mozambique	13%	12%	20%

n.d.: No date.

NA: Not available.

[a]Source: 2007 INCAM; see Mozambique National Institute of Statistics et al., (forthcoming) for methodological documentation.

[b]First calendar day after birth.

[c]Within 24 hours postpartum

[d]0-7 days after delivery.

[e]1-7 days after delivery.

[f]1-5 days after delivery.

[g]0-6 days after delivery.

[h]Interval was 7-42 days after delivery.