

# A Study of Refugee Maternal Mortality in 10 Countries, 2008–2010

**CONTEXT:** Little is known about the prevalence of maternal mortality in refugee camps for populations displaced by conflict, or about the factors contributing to such deaths.

**METHODS:** Maternal Death Review Reports were used to analyze maternal deaths that occurred in 2008–2010 in 25 refugee camps in 10 countries. Assessed outcomes included causes of death; delays in women seeking, reaching or receiving care; and additional aspects of case management. We conducted detailed analyses of avoidable factors that contributed to deaths in Kenya, where the majority of reported cases occurred.

**RESULTS:** Reports were available on 108 deaths, including 68 in Kenya. In every country but Bangladesh, maternal mortality ratios were lower among refugees than among the host population. The proportion of women who had had four or more antenatal care visits was lower among refugee women who had died (33%) than among the general refugee population (79%). Seventy-eight percent of the maternal deaths followed delivery or abortion, and 56% of those deaths occurred within 24 hours. Delays in seeking and receiving care were more prevalent than delays in reaching care. In Kenya, delays in seeking or accepting care and provider failure to recognize the severity of the woman's condition were the most common avoidable contributing factors.

**CONCLUSIONS:** Additional interventions in community outreach, service delivery and supervision are needed to improve maternal outcomes in refugee populations.

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By Michelle Hynes,  
Ouahiba Sakani,  
Paul Spiegel and  
Nadine Cornier

Michelle Hynes is an independent research consultant, Roswell, GA, USA. Ouahiba Sakani is reproductive and child health officer, and Paul Spiegel is chief, Public Health and HIV Section; and Nadine Cornier is senior regional public health officer—all with the United Nations High Commissioner for Refugees, Geneva.

Reducing maternal mortality has been the focus of several global programs, including the Safe Motherhood Initiative, and is one of the elements of Millennium Development Goal 5, which seeks to improve maternal health.<sup>1</sup> Of the approximately 273,000 maternal deaths that occurred worldwide in 2011, nearly all were in developing countries, and more than half in Sub-Saharan Africa.<sup>2</sup> Hemorrhage, hypertensive disorders, abortion and sepsis are the leading direct causes of maternal deaths in developing countries.<sup>3</sup> Many of these deaths are avoidable if women with pregnancy-related complications have timely access to emergency obstetric care.<sup>4</sup> In addition, maternal mortality has been linked to the percentage of women who have four or more antenatal care visits, the percentage of deliveries attended by a skilled assistant and the percentage of deliveries performed by cesarean section.<sup>5</sup>

The direct, indirect and contributing causes of maternal death include not only medical causes, but also social factors, many of which are avoidable. A well-known framework outlines three specific types of delays that can play a role in maternal death: delay in seeking care, delay in reaching care and delay in receiving care.<sup>6</sup> The decision to seek care is influenced by myriad factors, including a woman's control over making that decision, financial considerations, the availability of health care, perceptions of the quality of care and the ability of decision makers to recognize the need for care. Delays in reaching care may

occur when those who seek treatment are hindered by the cost of, or by a lack of access to, transportation, or by the absence of local health care facilities. Finally, even if health care is available within a reasonable distance, other factors may delay the receipt of care, such as the unavailability of supplies or trained providers, or a poor referral system that impedes access to higher levels of care.<sup>6</sup> Often, more than one delay contributes to a maternal death.

In countries that experience civil conflict, maternal mortality may be especially high because of the lack of health infrastructure and social networks, and because resources may be diverted from health care to defense.<sup>7,8</sup> However, after a conflict, displaced populations that receive humanitarian aid may have better access to quality health care,<sup>9,10</sup> and hence have better maternal outcomes,<sup>11</sup> than do host populations or persons who remained in their country of origin. For example, a study of 52 refugee camps in seven countries found that residents had lower levels of maternal mortality than did women of the host countries or the countries of origin.<sup>12</sup> In the current study, we examine maternal mortality in refugee camps supervised by the United Nations High Commissioner for Refugees (UNHCR).

## Background

The UNHCR and its partners work to provide access to medical care, including quality emergency obstetric care, for women in refugee populations. Free antenatal care is

**TABLE 1. Number of refugees and reported maternal deaths, by country, according to year, 2008–2010**

Country	2008				2009				2010			
	Refugees	Maternal deaths			Refugees	Maternal deaths			Refugees	Maternal deaths		
		Esti- mated*	Actual	Investi- gated		Esti- mated*	Actual	Investi- gated		Esti- mated*	Actual	Investi- gated
Bangladesh	28,123	3	3	1	28,342	2	2	2	28,620	1	1	1
Chad	253,168	4	5	2	260,409	8	8	4	241,157	8	8	4
Ethiopia	67,030	2	2	2	98,460	3	3	0	108,104	0	0	0
Kenya	288,031	16	17	17	329,825	23	27	27	344,873	24	24	24
Nepal	101,638	1	1	1	85,830	4	4	4	81,701	0	0	0
Rwanda	53,846	1	1	1	52,205	0	0	0	38,320	0	0	0
Sudan	96,880	1	1	0	98,378	3	4	4	76,635	2	2	0
Tanzania	189,181	3	3	2	121,891	3	3	3	95,930	4	4	1
Uganda	115,294	9	9	1	115,361	2	2	2	111,732	5	5	2
Zambia	54,228	2	2	1	35,242	1	2	2	33,973	1	1	0
<b>All</b>	<b>1,247,419</b>	<b>42</b>	<b>44</b>	<b>28</b>	<b>1,225,943</b>	<b>49</b>	<b>55</b>	<b>48</b>	<b>1,161,045</b>	<b>45</b>	<b>45</b>	<b>32</b>

\*Estimates are based on records of the health information system of the United Nations High Commissioner for Refugees. †Mean for 2008–2010.

widely available in the camps (and to local populations) from midwives or nurse-midwives at primary-care facilities. Women are encouraged to come for antenatal care visits as soon as they suspect they are pregnant and to enroll in the camp's safe motherhood program and receive related services. The UNHCR standard is that at least 90% of eligible women in camps should receive four or more antenatal care visits, as recommended by the World Health Organization.<sup>13</sup> Usually, the camp health facilities have equipped labor rooms and qualified staff who attend normal births and manage obstetric and newborn complications. Although basic emergency obstetric care is available at a facility's labor room, complicated cases are referred to the nearest hospital that can provide comprehensive emergency obstetric care. In some countries, the nearest accessible referral facility is the district hospital, while in others referral is made to regional hospitals. The camps are located in insecure areas, and public transportation is not available at night, although emergency transportation is available in most camps.

Many aspects of care—including capacity and availability of health care providers, adequacy of facilities, availability of equipment and types of services—vary across countries, including the countries included in this article. Induced abortion is not legal in most camp facilities, except to save the mother's life, and postabortion care is the only abortion-related care provided by the camps' implementing partners.

In 2007, the UNHCR developed, and introduced in all of its refugee camp programs, the Maternal Death Review Report, which investigative teams use to collect information on the demographic characteristics, pregnancies and deaths of women who die of pregnancy-related causes. In addition to asking for quantitative data, the report form prompts investigators to obtain contextual information from family and community members, such as block leaders and traditional birth attendants, on the circumstances surrounding the maternal death. In 2008, the UNHCR introduced a maternal death review system in which health

personnel, community leaders, the UNHCR and the host country's Ministry of Health staff reviewed every reported maternal death. Additional efforts to improve maternal health outcomes were implemented in early 2009, and included improvements in facilities and transportation, addition of staff, and community sensitization campaigns. However, cultural preferences for home births, and resistance to emergency obstetric care, continue to provide challenges to safe motherhood in these camps.<sup>14</sup>

We analyzed Maternal Death Review Report data on maternal deaths that occurred from January 2008 to September 2010. In addition to presenting descriptive data on the causes of death, on delays and other avoidable factors, and on additional aspects of case management, we provide recommendations on how to improve maternal mortality-related surveillance, investigations and interventions.

## METHODS

Refugee camps were included in this analysis if they were using the UNHCR's health information system in 2008–2010 and had at least 25,000 individuals. We focused particular attention on camps in Kenya, which experienced large influxes of arrivals beginning in early 2009, as more than half of all recorded maternal deaths in our sample occurred in these camps. Therefore, we conducted separate analyses for camps in all countries and for camps in Kenya. All reported maternal deaths, including those in Kenya, were investigated in detail by maternal death investigative teams using the Maternal Death Review Report; the teams consisted of UNHCR health care personnel and health service providers from partners and referral health facilities.

In accordance with WHO, we defined maternal mortality as “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.”<sup>15</sup> The maternal mortality ratio was defined as the number of maternal deaths per 100,000 live births. We calculated maternal mortal-

Country	2008–2010			
	Refugees†	Maternal deaths		
		Esti- mated*	Actual	Investi- gated
Bangladesh	28,362	6	6	4
Chad	251,578	20	21	10
Ethiopia	91,198	5	5	2
Kenya	320,910	63	68	68
Nepal	89,723	5	5	5
Rwanda	48,124	1	1	1
Sudan	90,631	6	7	4
Tanzania	135,667	10	10	6
Uganda	114,129	16	16	5
Zambia	41,148	4	5	3
<b>All</b>	<b>1,211,469</b>	<b>136</b>	<b>144</b>	<b>108</b>

ity ratios among refugees in each country using the data on deaths recorded in the UNHCR's health information system, other deaths uncovered by the research team and live births (identified from camp records and the health information system). We compared the resulting maternal mortality ratios to the most recent (2008) country-level ratios available from WHO.<sup>1</sup>

All outcome measures were taken from data fields in the Maternal Death Review Report. The demographic measures were the woman's age, nationality, host country and camp. Pregnancy-related measures of interest were number of pregnancies, parity, number of antenatal care visits, type of attending staff during those visits, number of postnatal visits and any risk factors for maternal death identified during care. Measures related to the death included whether the woman had given birth or aborted a pregnancy prior to her death, the time between the delivery or abortion and the death, and the location of death (at home, en route to the camp health facility, at the camp health facility, en route to the referral health facility or at the referral facility).

Finally, from the qualitative case histories gathered by the review teams, we compiled information on the three categories of delays that contribute to maternal death, as well as information on the causes of death, which were identified and classified according to recently revised WHO guidelines.<sup>16</sup> These guidelines delineate direct causes of death, various indirect causes of death (including nonobstetric complications and unknown or coincidental causes) and contributing causes (preexisting conditions or conditions that may arise during pregnancy and are aggravated by pregnancy, such as hepatitis, malaria, tuberculosis, anemia, heart disease, AIDS, tetanus and injuries).\*

In addition, using simple matrices, we collected context-

tual data on the emergency obstetric care services available in the camps, the staff providing those services and the barriers to access to care. Discussions with field staff were held to clarify this information and provide additional detail when needed. Two members of the research team entered data from reports into a spreadsheet. A subset of reports was coded by both investigators to check for coding consistency; discrepancies were discussed until a consensus was reached, and data entry rules were modified as needed. Data were then imported into SPSS version 18.0 to calculate descriptive statistics. We calculated maternal mortality ratios for each country, and coded the qualitative histories given in the Maternal Death Review Reports to tabulate avoidable factors mentioned by the maternal death investigating teams. Narratives were analyzed with a critical eye for the identification of additional information on the circumstances surrounding the maternal death,

**TABLE 2. Selected measures related to women who suffered maternal deaths in refugee camps, by site, 2008–2010**

Measure	Mean (range) or %	
	All camps (N=108)	Kenyan camps (N=68)
<b>MEANS</b>		
<b>Age</b>	26.7 (15–41)	25.9 (15–40)
<b>No. of prior pregnancies</b>	4.8 (0–13)	4.8 (0–13)
<b>No. of antenatal care visits*</b>	3.0 (0–10)	2.8 (0–10)
<b>PERCENTAGE DISTRIBUTIONS</b>		
<b>Age</b>		
≤18	11.2	10.3
19–26	38.3	47.1
27–34	35.5	32.4
≥35	15.0	10.3
<b>No. of antenatal care visits</b>		
0	5.0	4.7
1–3	62.0	65.1
≥4	33.0	30.2
<b>Provider of antenatal care</b>		
Doctor	5.3	8.3
Nurse/midwife	90.4	90.0
Trained traditional birth attendant	1.1	1.7
Untrained traditional birth attendant	3.2	0.0
<b>Time between delivery/abortion and death</b>		
Did not deliver/abort	17.6	17.2
<1 hr.	7.8	7.8
1–24 hrs.	38.2	34.4
1–7 days	22.5	25.0
8–42 days	13.7	15.6
<b>Location of death</b>		
Home	8.3	10.3
En route to camp facility	2.8	2.9
Camp facility	53.7	69.1
En route to referral facility	5.6	1.5
Referral facility	29.6	16.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>

\*We omitted from our analyses one of the possible direct causes of maternal death, "pregnancy with abortive outcome," because abortion is generally not legal in the study countries except to save the life of the mother. Therefore, the number of cases that fell into this category cannot be reliably determined.

\*During woman's last pregnancy. Notes: Percentages may not total 100.0 because of rounding. Information on age was missing for one case (none in Kenya), on prior pregnancies for five cases (four in Kenya), on antenatal care visits for eight cases (five in Kenya), antenatal care provider for 14 cases (eight in Kenya), and timing of death for 6 cases (4 in Kenya).

**TABLE 3. Number of live births and reported maternal deaths, and maternal mortality ratios, among refugees, by country, 2008–2010; and host population maternal mortality ratios (and 95% confidence intervals), 2008**

Country	2008			2009			2010		
	No. of live births	No. of maternal deaths	Refugee maternal mortality ratio	No. of live births	No. of maternal deaths	Refugee maternal mortality ratio	No. of live births	No. of maternal deaths	Refugee maternal mortality ratio
Bangladesh	1,277	3	235	1,100	2	182	869	1	115
Chad	7,680	5	65	9,356	8	86	8,753	8	91
Ethiopia	2,344	2	85	2,202	3	136	2,754	0	0
Kenya	8,062	17	211	8,485	27	318	7,872	24	305
Nepal	1,699	1	59	1,744	4	229	1,146	0	0
Rwanda	862	1	116	822	0	0	969	0	0
Sudan	2,251	1	44	2,148	4	186	1,892	2	106
Tanzania	7,008	3	43	4,445	3	67	3,417	4	117
Uganda	5,148	9	175	4,097	2	49	4,700	5	106
Zambia	1,236	2	162	4,079	2	49	1,831	1	55
<b>All</b>	<b>37,567</b>	<b>44</b>	<b>117</b>	<b>38,478</b>	<b>55</b>	<b>143</b>	<b>34,203</b>	<b>45</b>	<b>132</b>

Notes: Data on host population maternal mortality ratios are from reference 1. na=not applicable.

aspects of case management and the quality of available emergency obstetric care services. The identified factors were then classified using the categories developed by Fawcus and colleagues.<sup>17</sup>

## RESULTS

Twelve countries met the inclusion criteria. However, one country (Thailand) was excluded because no maternal death investigation reports could be generated from operational partners, and another (Yemen) was excluded because no maternal deaths were reported during 2008–2009. In the remaining 10 countries—Bangladesh, Chad, Ethiopia, Kenya, Nepal, Rwanda, Sudan, Tanzania, Uganda and Zambia—144 women who had died from maternal causes from January 2008 through September 2010 were identified through the UNHCR's health information system and additional inquiries by the research team. Of these deaths, 108 (75%) were successfully investigated by a maternal death investigative team using the Maternal Death Review Report (Table 1, pages 206–207). Investigations into the remaining 36 maternal deaths could not be completed because staff or family members were unavailable to discuss the death or because family members were unwilling to do so.

The 108 women represented 25 refugee camps and 12 nationalities (not shown). More than 1,161,000 refugees resided in the camps in 2010 (Table 1). Eight deaths (7%) were not reported in the health information system but were uncovered through the UNHCR's proactive requests for updates on maternal death investigations in the field (not shown). Information on the timing of investigation was available for 104 deaths. Of these, 74% were investigated within one week of the death; the timing ranged from less than one week to 91 weeks (the latter death occurred in Rwanda in 2008, but was investigated in 2010).

The mean age of the 108 women was 27 (range, 15–41); 11% were aged 18 or younger and 15% were 35 or older (Table 2, page 207). On average, women had had five prior pregnancies (range, 0–13). During their final pregnancy,

they had had an average of three antenatal care visits (range, 0–10); only 33% had had four or more visits, compared with 79% of all pregnant women in refugee camps in the 10 countries (not shown). The majority (96%) of women who died of maternal causes had received antenatal care from a doctor, nurse or midwife (Table 2). Eighty-four maternal deaths (82%) occurred after delivery or abortion; 46% occurred within 24 hours of delivery or abortion, and 69% occurred within seven days.

Sixty-eight of the deaths occurred in four refugee camps in Kenya. Most (96%) of the women were Somali, and the remainder were Ethiopian (not shown). In general, the demographic and pregnancy characteristics of women who died in Kenyan camps, including their age, number of pregnancies and use of antenatal care, were similar to those of women in the full sample. As with the full sample, women who died in Kenyan camps were less likely than all pregnant women in the camps to have had at least four antenatal visits (30% vs. 83%).

Most reported maternal deaths occurred at health facilities. For the full sample, 83% of deaths occurred in camp or referral health facilities, 8% en route to a facility and 8% at home; in Kenya, 85% occurred in facilities, 4% en route to a facility and 10% at home (Table 2). For both all camps and Kenyan camps, the percentage of reported deaths that occurred at referral facilities was greater in 2009–2010 than in 2008 (not shown).

In every country but one, the maternal mortality ratio in a country's refugee camps in 2008–2010 was lower than the host country's ratio in 2008 (Table 3).<sup>18</sup> The exception was Bangladesh, for which the ratio among refugees fell within the range of uncertainty of the host population's ratio. However, because maternal deaths among refugees were likely underreported, all of these estimates should be interpreted with caution. In Kenya, where maternal death reporting was most accurate, the refugee maternal mortality ratio was 278, compared with a ratio of 530 for the host population.

For the full sample, the most frequently cited direct cause

Country	2008–2010			Host population maternal mortality ratio, 2008
	No. of live births	No. of maternal deaths	Refugee maternal mortality ratio	
Bangladesh	3,246	6	185	340 (170–660)
Chad	25,789	21	81	1,200 (670–2,100)
Ethiopia	7,300	5	68	470 (270–790)
Kenya	24,419	68	278	530 (320–850)
Nepal	4,589	5	109	380 (210–650)
Rwanda	2,653	1	38	540 (320–910)
Sudan	6,291	7	111	750 (420–1,300)
Tanzania	14,870	10	67	790 (470–1,300)
Uganda	13,945	16	115	430 (270–630)
Zambia	7,146	5	70	470 (250–680)
<b>All</b>	<b>110,248</b>	<b>144</b>	<b>131</b>	<b>na</b>

of death was obstetric hemorrhage (31%), followed by hypertensive disorders (25%) and pregnancy-related sepsis (12%; Table 4). Thirty-one percent of reports listed indirect causes of death, in most cases nonobstetric complications. The three most commonly cited contributing causes of death were having had more than four prior pregnancies (41%), anemia (40%) and hypertension (29%). The direct, indirect and contributing causes of death in Kenyan camps were generally similar to those in the full sample, although the prevalence of hypertensive disorders (31%) was greater than that of obstetric hemorrhage (24%).

Delays in care were identified in 102 (94%) of the 108 maternal death reports (not shown). Of those, 51 (50%) identified a single delay in women seeking, reaching or receiving care: Twenty-seven cited a delay in seeking care, one a delay in reaching care and 23 a delay in receiving care. Thirty-six reports (35% of those with delays) identified two types of delays, and 15 (15%) identified all three types. Overall, 68 reports (67%) mentioned a delay in women's seeking care, either as a single delay or in combination with other delays; 36 reports (35%) cited a delay in reaching care, either alone or in combination with other delays; and 64 reports (63%) cited a delay in women's receiving care, either alone or in conjunction with other types of delays.

In Kenya, delays in care were identified in 62 (91%) of 68 maternal death reports. Of those, 37 (60%) identified a single delay in seeking, reaching or receiving care: Twenty-four (39%) had a delay in seeking care, one (2%) a delay in reaching care and 12 (19%) a delay in receiving care. Twenty reports (32%) identified two types of delays, and five (8%) all three types. Overall, 47 reports (76%) cited a delay in seeking care, either alone or in combination with other delays; 13 reports (21%) cited a delay in reaching care, either singly or with other delays; and 32 (52%) cited a delay in receiving care, either alone or in conjunction with other delays. Although delays in seeking care were more common than delays in reaching and receiving care, they accounted for a declining proportion of all cases that involved delays—92% of cases involving delays in 2008

and 65% in 2010. The proportion involving delays in reaching care remained about the same between 2008 and 2010 (19–23%), while the proportion involving delays in receiving care increased from 38% to 87%.

We assessed the prevalence of avoidable contributing factors among the 68 reported deaths in Kenya and categorized these factors according to whether they were related to the community, the camp health facility or the referral health facility. The community-level factors were further divided into three subcategories: patient-related factors, traditional birth attendant-related factors and barriers to access to camp health facilities. Throughout the study period, patient-related community factors and camp health facility factors were the most commonly mentioned avoidable factors (Table 5). Of the patient-related factors, delay in deciding to seek or accept care for symptoms was the most common; it was cited as a factor in 69% of deaths during the three-year period, although the percentage declined from 70% in 2008 to 63% in 2010. At the camp health facility level, a diagnosis that failed to recognize the severity of the woman's condition was the most frequently cited factor (32%). In eight cases (12%), most of which occurred in 2008, blood was unavailable for transfusion, and in four (6%) resources were inadequate or unavailable (in three of these cases staff were not sufficiently qualified or available on time, and in one there was no postoperative room or equipment). At the referral facility level, in-

**TABLE 4. Prevalence of direct, indirect and contributing medical causes of reported maternal deaths in refugee camps, by site, 2008–2010**

Cause	All camps (N=108)		Kenyan camps (N=68)	
	N	%	N	%
<b>Direct</b>				
Obstetric hemorrhage	33	30.6	16	23.5
Hypertensive disorders of pregnancy	27	25.0	21	30.9
Pregnancy-related sepsis	13	12.0	9	13.2
Other obstetric complications	5	4.6	2	2.9
Unanticipated complications of management	4	3.7	2	2.9
<b>Indirect</b>				
Nonobstetric complications	29	26.9	20	29.4
Unknown/undetermined	5	4.6	5	7.4
Coincidental causes	0	0.0	0	0.0
<b>Contributing</b>				
Multigravida (>4 pregnancies)	44	40.7	25	36.8
Anemia	43	39.8	36	52.9
Hypertension	31	28.7	27	39.7
Young or old age ( $\leq 18$ or $\geq 35$ )	22	20.4	10	14.7
Primipara	20	18.5	13	19.1
History of cesarean delivery	11	10.2	6	8.8
Multiple pregnancy	7	6.5	3	4.4
History of antepartum hemorrhage	7	6.5	6	8.8
History of postpartum hemorrhage	2	1.9	1	1.5
Diabetes	2	1.9	0	0.0
Malaria	0	0.0	1	1.5
HIV/AIDS	0	0.0	0	0.0
Other	16	14.8	10	14.7
None	9	8.3	6	8.8

**TABLE 5. Number and percentage of reported maternal deaths associated with selected community and health facility-related avoidable factors, by year, Kenya, 2008–2010**

Factor	2008		2009		2010		2008–2010	
	N	%	N	%	N	%	N	%
<b>All</b>	<b>17</b>	<b>100.0</b>	<b>27</b>	<b>100.0</b>	<b>24</b>	<b>100.0</b>	<b>68</b>	<b>100.0</b>
<b>COMMUNITY LEVEL</b>								
<b>Patient-related</b>								
Delay in decision to seek/accept care	12	70.6	20	74.1	15	62.5	47	69.1
Refusal to seek/accept care	5	29.4	10	37.0	5	20.8	20	29.4
No/poor antenatal care	3	17.6	5	18.5	6	25.0	14	20.6
Poor postnatal care	0	0.0	3	11.1	1	4.3	4	5.9
<b>Traditional birth assistant-related</b>								
Inappropriate care for delivery	1	5.9	0	0.0	0	0.0	1	1.5
<b>Barriers to camp health facility access</b>								
Lack of emergency transportation	2	11.8	2	7.4	1	4.2	5	7.4
<b>CAMP HEALTH FACILITY LEVEL</b>								
Failure to assess severity of condition	3	17.6	7	25.9	12	50.0	22	32.4
Inadequate/delayed treatment	2	11.8	8	29.6	11	45.8	20	29.4
Lack of blood for transfusion	5	29.4	0	0.0	3	12.5	8	11.8
Delay in decision to refer	1	5.9	3	11.1	3	12.5	7	10.3
Inadequate/lack of resources	2	11.8	0	0.0	2	8.3	4	5.9
No transportation to referral facility	0	0.0	2	7.4	0	0.0	2	2.9
<b>REFERRAL HEALTH FACILITY LEVEL</b>								
Inadequate treatment	0	0.0	3	11.1	1	4.2	4	5.9
Inadequate/lack of resources	0	0.0	3	11.1	0	0.0	3	4.4
Delay in assessing severity of condition	0	0.0	1	3.7	1	4.2	2	2.9
Incorrect treatment	0	0.0	1	3.7	0	0.0	1	1.5
Delay in decision to refer	0	0.0	1	3.7	0	0.0	1	1.5

Note: Tabulations are based on categories devised by Fawcus et al. (reference 17).

adequate treatment (i.e., staff made a correct diagnosis but failed to follow protocol) was the most commonly mentioned factor (6%). In addition, there were three cases (4%) of inadequate or no resources (in one case no qualified staff member was available to perform a caesarian section, in another there was no intensive care facility and in the third no personnel were available for postoperative monitoring).

## DISCUSSION

Our findings are consistent with those from other studies showing that refugees receiving targeted humanitarian aid appear to have better reproductive health outcomes than do local populations. Maternal mortality ratios were lower among refugees than among the host population for every country but Bangladesh, where the refugee maternal mortality ratio fell within the uncertainty range of the host country estimate. Ratios may be lower among refugees than among the host country's population for numerous reasons; for example, compared with the host population, refugees may have better access to care (through provision of free services), to transportation to referral hospitals (which can perform cesarean sections) and to facilities with sufficient equipment and supplies and with staff who have received training in emergency obstetric care.

It is important to note, however, that because maternal deaths were likely underreported in the study locations, the finding that maternal mortality ratios were lower in ref-

ugee camps than in host populations should be interpreted with caution. The deaths of women who die at home, particularly from abortion-related complications, may be less likely than deaths that occur in facilities to be captured in the health information system. Nonetheless, our results are consistent with findings from a variety of locations that maternal outcomes are better in stable camp settings than in host populations.<sup>11,12</sup> One study found that refugee women in Kenya had better access to emergency obstetric care than did local women, and subsequently had better surgical outcomes and shorter hospital stays after cesarean sections.<sup>19</sup> Refugees in rural Uganda had better access to health care, higher rates of obstetrical intervention and lower rates of maternal mortality than did rural host populations.<sup>20</sup>

Within refugee camps, antenatal care is widely provided at primary care facilities by midwives or nurse-midwives. These facilities are located close to women's place of residence, and providers often follow up with women who had an initial antenatal care visit but did not show up for subsequent visits. However, even with these advantages, some camps still face challenges in reaching the UNHCR's coverage goal of providing four or more antenatal care visits for 90% of pregnant women. Data from the UNHCR's health information system show that antenatal care coverage among the refugee populations in Bangladesh, Ethiopia, Tanzania, Sudan and Nepal exceeded 90% in 2010.<sup>21</sup> However, coverage did not reach 90% in the remaining five countries in our analysis; it ranged from 26% in Rwanda to

83% in Kenya.<sup>21</sup> McClure and colleagues found that in developing countries, significant reductions in maternal mortality did not occur unless at least 60% of the population were receiving four or more antenatal care visits.<sup>5</sup> Refugee populations in two countries in our study, Uganda and Rwanda, failed to meet this threshold. Among women who died of maternal causes, the proportion who had had four or more antenatal visits was 33% in the full sample and 30% in Kenyan camps; these figures are well below the averages for all women in refugee camps in the 10 countries (79%) and for all women in Kenyan camps (83%) during the same time period, according to data from the UNHCR health information system, and slightly lower than the average among women in the corresponding host countries (36%).<sup>20</sup> Lack of surveillance by health care staff may have contributed to these maternal deaths.

Although the links between antenatal care and maternal mortality have been debated, specific interventions during pregnancy have been shown to reduce maternal morbidity and mortality.<sup>22,23</sup> Antenatal care may also provide additional (albeit indirect) benefits, such as encouraging pregnant women to use health services (particularly emergency obstetric care) earlier and more often than they would otherwise. The UNHCR's emphasis on free antenatal care services, together with the relative ease of providing services in camp settings rather than in dispersed rural communities, may help in lowering maternal mortality.

The most common direct causes of death found in our study were similar to those found globally, although the order of ranking of the top two causes, hypertension and hemorrhage, was different in Kenyan camps than in a previous study of Sub-Saharan Africa.<sup>3</sup> Two-thirds of reported maternal deaths occurred within a week of delivery or abortion, indicating that childbirth and the puerperium are critical periods in which timely recognition of complications and access to emergency obstetric care services (as well as adequate diagnosis and correct treatment) is imperative. Moreover, approximately half of deaths occurred within 24 hours of the delivery or abortion. This highlights the need for skilled attendance at delivery and for follow-up care within this critical period. Implementing facility-based strategies that target the intrapartum period (labor, delivery and the first 24 hours postpartum) may be the most effective way of reducing maternal mortality.<sup>24</sup>

The reasons for delays in women seeking, reaching and receiving care are complex and often interact.<sup>25</sup> For example, women who experience delays in receiving care at a particular health center may become reluctant to seek care from that facility in the future. Although delays were a prominent factor in the maternal death reports, delays in reaching care were less common than the other two types. Targeted efforts in refugee camps to ensure surveillance of pregnancies by health care staff and provide transportation to maternal health services may have helped to minimize the prevalence of these types of delays, despite the lack of transportation at night (because of security concerns) in some camps. Transportation issues and other delays in

reaching care often play a greater role in nonrefugee settings. For example, transportation problems contributed to 55% of maternal deaths in a study of a nonrefugee population in Eastern Sudan,<sup>26</sup> and difficulties in reaching health services were mentioned as a factor in 75% of maternal deaths in a hospital-based study in Kenya.<sup>27</sup>

Delays in seeking and receiving care can result in women with complicated cases reaching health facilities in critical condition, thus lessening their chances for positive outcomes. More than 80% of recorded deaths, both overall and in Kenya, took place at health facilities. Although this is an indication that many refugee women are reaching care, it also suggests that delays and other avoidable factors may be contributing to unsuccessful outcomes. Of particular concern is the increase during the study period in the percentage of maternal death reports citing delays in receiving care. Such delays may undermine the benefits from the reduction in the percentage of reports citing delays in seeking care. Improving the quality of care—during both basic and referral services—would improve maternal outcomes and boost the confidence of women and their families that such services are worth seeking.

In Kenya, the avoidable factors most often mentioned in the case histories were patient-centered community factors and camp health center-related factors. In the community, the low proportion of deceased women who had had sufficient antenatal care suggests that some women are reluctant to make use of available facilities even when no evident impediments to obtaining care exist. Actual and perceived quality of care may contribute to low use of antenatal care services. However, as the percentage of deaths involving refusal of care or delay in seeking care declined between 2008 and 2010, it may be that the perception of curative services has improved, or that people are more willing to seek care when problems arise.

At the health center level, the percentage of cases in which providers initially failed to recognize the severity of the woman's condition or to provide adequate, timely treatment increased during the study period. These factors could erode refugees' confidence in the health services and contribute to women hesitating or refusing to seek care. The only camp facility-level factor for which the percentage and number of cases declined during the study period was lack of blood for transfusion. Inadequate resources were cited as a contributing factor in some reports; in particular, facilities sometimes did not have sufficient qualified staff on call or the necessary equipment. Relatively few avoidable factors were mentioned at the referral health facility-level. However, inadequate or incorrect treatment was mentioned in 6% of all reports, and inadequate resources were mentioned in 4%. Resource deficiencies included lack of equipment and the absence of an obstetrician; in the latter cases, a trained doctor who could manage obstetric complications was on call but had other duties (administrative and clinical functions) to perform.

Some limitations of this study should be noted. As with the collection of maternal death data in any setting, the

number of women who died in the refugee camps from maternal causes was likely underreported. In particular, data may be missing on women who died early in pregnancy (such cases may not have been recognized as maternal deaths) or died during home deliveries. The characteristics and contributing factors associated with maternal deaths in Thailand and Yemen, which were excluded from our analysis, may have differed from those in our sample, and thus may have biased our results. Moreover, we were able to investigate only 108 of 144 reported maternal deaths, and there may have been important differences between the deaths that were investigated and those that were not (more than half of which occurred in Chad and Uganda); again, the missing data may have affected our findings. Factors not mentioned by the review team may have played a role in maternal deaths and contributed to delays. For example, although economic constraints were not specifically mentioned in any reports, they may have played a role in women's deciding not to seek or accept care. The length of report narratives varied greatly, and some relevant information may have been omitted in the more succinct reports. Finally, reports on deaths that occurred outside of the health care system may have been missing contextual details because of difficulties in interviewing family members and birth attendants.

The information obtained in this study suggests some immediate and long-term actions that may reduce maternal mortality in protracted refugee settings. Practical actions that can be taken immediately include increased communication to refugee communities about the warning signs of high-risk pregnancies, the availability of emergency obstetric care and referral facilities, and ongoing improvements in the quality of services. Other potentially valuable steps include provision of equipment and supplies to health facilities with shortages; the establishment of clear standard operating procedures for emergency obstetric care case management, in combination with appropriate training; and the strengthening of supervision and monitoring of emergency obstetric care services provided by partner organizations in the camps. Of particular importance are the last two actions, which focus on improvement of services. The high proportion of deaths attributed to delays in receiving care and to the failure of staff to recognize the severity of the patient's condition indicate that targeting services will have a great impact on reducing maternal mortality.

In the long term, improved community outreach activities will increase refugee awareness of high-risk pregnancies and deliveries as well as of the importance of antenatal and postnatal care. Additional outreach should be conducted to inform refugee communities about any improvements that are made in service delivery and staff training, which in turn will foster greater trust and willingness to make use of available services. In some countries, labor rooms may need rehabilitation, and camp staff should consider providing additional support to referral facilities. Service providers should receive competency-based train-

ing and on-the-job refresher training on a regular basis.

Finally, the qualitative narratives from the Maternal Death Review Reports do not completely convey the complex interplay of factors that contribute to maternal deaths in refugee communities. Cultural beliefs and practices, decision-making control by the woman's family members, and other underlying factors contributing to delays in seeking and accepting care cannot be addressed by this study. More in-depth qualitative work on these issues is needed to tease out the multiple influences on maternal mortality.

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## RESUMEN

**Contexto:** Poco se sabe sobre la incidencia de la mortalidad materna en los campos de refugiados para poblaciones desplazadas por conflictos, o acerca de los factores que contribuyen a tales muertes.

**Métodos:** Se utilizaron informes que revisaron los casos de muertes maternas para analizar las muertes ocurridas en 2008–2010 en 25 campos de refugiados en 10 países. Los datos analizados incluyeron las causas de la muerte; los retrasos en iniciar la búsqueda del tratamiento médico, en llegar a un centro de salud y en recibir dicho tratamiento; y los aspectos adicionales de manejo de casos. Condujimos análisis detallados de los factores evitables que contribuyeron a las muertes maternas en Kenia, país en donde ocurrió la mayoría de los casos reportados.

**Resultados:** Estaban disponibles datos sobre 108 muertes maternas, incluidas 68 en Kenia. En cada país, con excepción de Bangladesh, las razones de mortalidad materna fueron menores entre las mujeres refugiadas que en la población anfitriona. La proporción de mujeres que habían hecho cuatro o más visitas de atención prenatal fue menor en las mujeres refugiadas que habían fallecido (33%) que entre la población

refugiada en general (79%). Setenta y ocho por ciento de las muertes maternas ocurrieron después de un parto o aborto; y 56% de esas muertes ocurrieron en un plazo de 24 horas después. Los retrasos en la búsqueda y el recibo de la atención médica fueron más comunes que los retrasos en llegar a un centro de salud. En Kenia, los retrasos en la búsqueda o el recibo de la atención, así como la falla del proveedor para reconocer la severidad de la condición de las mujeres, fueron los factores evitables más comunes que contribuyeron a las muertes maternas.

**Conclusiones:** Se necesitan intervenciones adicionales en materia de programas de alcance comunitario y de la prestación de servicios y su supervisión, para mejorar la salud materna en poblaciones de personas refugiadas.

## RÉSUMÉ

**Contexte:** Il existe peu de données sur l'incidence de la mortalité maternelle dans les camps de réfugiés pour populations déplacées pour cause de conflit, ou sur les facteurs contribuant à ces décès.

**Méthodes:** Les rapports d'examen des décès maternels ont servi à l'analyse des décès survenus en 2008–2010 dans 25 camps de réfugiés de 10 pays. Les causes de décès, les retards de demande, d'accès ou d'obtention de soins et d'autres aspects de gestion des cas ont été étudiés. Des analyses détaillées des facteurs évitables ayant contribué aux décès au Kenya, lieu de la majorité des cas déclarés, ont été effectuées.

**Résultats:** Des rapports étaient disponibles concernant 108 décès, dont 68 au Kenya. Dans tous les pays à l'exception du Bangladesh, les taux de mortalité maternelle se sont révélés plus faibles parmi les réfugiées que parmi la population hôte. La proportion de femmes qui avaient bénéficié d'au moins quatre consultations de soins prénatals était moindre parmi les réfugiées décédées (33%) que parmi la population générale réfugiée (79%). Soixante-dix-huit pour cent des décès maternels étaient survenus après un accouchement ou un avortement, en l'espace de 24 heures dans 56% des cas. Les retards de demande et d'obtention de soins étaient plus fréquents que ceux d'accès aux soins. Au Kenya, les retards de demande ou d'acceptation de soins et le défaut de reconnaissance par le prestataire de la gravité de l'état de la femme étaient les facteurs contributifs évitables les plus courants.

**Conclusions:** Des interventions supplémentaires d'approche communautaire, de prestation et de surveillance sont nécessaires pour améliorer les bilans maternels dans les populations réfugiées.

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**Author contact:** mhynes@alum.emory.edu