



## Maternal mortality in a Kenyan pastoralist population

Ruth Mace and Rebecca Sear

LSE has developed LSE Research Online so that users may access research output of the School. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LSE Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain. You may freely distribute the URL (<http://eprints.lse.ac.uk>) of the LSE Research Online website.

**You may cite this version as:**

Mace, Ruth and Sear, Rebecca (1996). Maternal mortality in a Kenyan pastoralist population [online]. London: LSE Research Online.

Available at: <http://eprints.lse.ac.uk/archive/00000686>

This is an electronic version of an Article published in International journal of gynecology & obstetrics, 54 (2). pp. 137-141 © 1996 Elsevier Science Ireland Ltd.

<http://www.elsevier.com/locate/ijgo>

<http://eprints.lse.ac.uk>

Contact LSE Research Online at: [Library.Researchonline@lse.ac.uk](mailto:Library.Researchonline@lse.ac.uk)

# Maternal mortality in a Kenyan pastoralist population

R. Mace and R. Sear

Dept. Anthropology, University College London,  
Gower Street, London, WC1E 6BT UK

Keywords: maternal mortality; sisterhood method; Kenya; nomadic pastoralists

## Abstract

*Objective:* to measure maternal mortality among the Gabbra, a group of nomadic pastoralists living in a remote area of Kenya. *Method:* as part of a survey of 851 households information on the number of sisters of respondents who died of pregnancy-related causes was collected, and this data was used to calculate maternal mortality statistics using the sisterhood (an indirect) method. *Results:* the maternal mortality ratio for this population is 599 deaths per 100,000 births (95% confidence intervals 424, 775). The lifetime risk of dying around childbirth is 1 in 30, and the proportion of ever-married sisters under 50 years of age who died from maternal causes is 0.48 (95% confidence intervals 0.38, 0.58). *Conclusion:* the risk of dying of maternal causes is high in this population.

## **Introduction**

An estimated 500,000 women die each year from pregnancy related causes, and the vast majority (99%) of these deaths occur in developing countries [1]. The disparity between maternal mortality ratios in some parts of sub-Saharan Africa and the developed world is the greatest in health indicators yet reported, maternal mortality ratios in this area of Africa may be as much as 200 times those in developed countries [2]. There is thus considerable interest in reducing maternal mortality and morbidity and information on the prevalence of maternal deaths is needed as a first step to implementing prevention strategies. This information is not easily available in areas where this problem is most acute and a number of methods have been used to obtain estimates of maternal mortality. The main sources of data are vital registration, health service statistics and population based enquiries [3]. However, in many parts of the developing world vital registration systems have low levels of coverage and completeness and health services statistics tend to be biased towards a particular subset of women, either women at high risk of complicated births or women of high socioeconomic status. Population based enquiries may therefore be necessary in areas where the former data sources are inadequate. The sisterhood method was developed as a convenient indirect method of estimating maternal mortality rates using data collected as part of a survey or census [4]. It only requires four questions to be added on to a questionnaire if a survey is to be carried out in a relevant area, and, as information is collected on sisters, the number of interviewees needed is relatively small in high fertility areas as respondents will be able to provide information on several women (compared to the orphanhood or widowhood methods which involve questions about the respondents' mothers or spouses respectively).

## **Data**

The data used for this analysis were obtained from a survey of 851 Gabbra households, undertaken during 1993-1994. The Gabbra are a group of camel-herding pastoralists living in northern Kenya in a very arid and remote area; medical care is limited to

immunisations and contraception is unavailable. The vast majority of births take place at home, often with a traditional midwife as a helper. Girls are circumcised and infibulated at around age 5 years. Only women who are or who have been married reproduce in this society; widows are not permitted to remarry but may continue to give birth, although their fertility (controlled for age) is slightly lower than that of women whose husbands are still alive. The average age of marriage for women is 19 years and of first birth is 21 years. Most marriages are monogamous (88% of women are the only living wife of their husband) and polygyny seems to be related to the number and sex of children that the first wife has given birth to. The probability of a man taking a second wife while the first is still alive increases if the first wife has few or no sons (having few or no daughters also has a slight effect) [5,6]. The total fertility rate (TFR) for this population is 5.63 (see Table 1 for age-specific fertility rates in 1993). This is similar to the average for rural Kenya of 5.89 [7]. We believe our TFR to be a slight underestimate of fertility as, although women were asked to list all live births, they were often reluctant to talk about children that had since died and some women may not have given complete birth histories.

## **Methods**

The following information is required to calculate maternal mortality using the sisterhood method: the age of each respondent, the number of sisters who have been exposed to the risk of death from maternal causes, the number of these sisters that have died and whether these deaths were related to maternity. Those sisters who are at risk of maternal deaths may be defined either as the number of sisters who reach child-bearing age (usually 15) or the number of ever-married sisters. The latter definition is used in this study as unmarried women do not reproduce in this society. Information from both men and women was included in the analysis. There is no reason to assume that one sex will be better informed than the other on the fate of their sisters as women

leave their natal home at marriage; analysing the data from men and women separately give results not significantly different to those obtained from the entire data set.

Table 2 shows the information collected in 5 year age groups. In order to calculate the risk over the entire child-bearing period for each age group the number of ever-married sisters was multiplied by an adjustment factor (previously calculated: see [4] ). This adjusted figure was then used to obtain an estimate of the lifetime risk of dying from maternal causes. The following formula was used to calculate the maternal mortality ratio:

$$MMR = 1 - [(Probability\ of\ survival)^{1/TFR}]$$

## Results

The total number of people interviewed for this survey was 2043, and data suitable for this analysis was obtained from 1890 individuals (the remainder were uncertain of their age) of whom 1270 were under 50 years of age. It is usual to restrict this analysis to respondents under the age of 50 to avoid bias due to poor memory in older respondents (any maternal deaths of their sisters would have occurred some time ago) and because fertility may have changed during the period for which we are estimating mortality rates. This results in a relatively small number of respondents but maternal mortality is high in this area, so a significant number of maternal deaths was reported and we feel that using these data to calculate maternal mortality rates is justified; we have also attached confidence intervals to our results [8].

Respondents under 50 in this survey reported 45 sisters dead from maternal causes (all respondents reported a total of 82 maternal deaths). Using only younger respondents

the lifetime risk of maternal mortality in this population is therefore estimated to be 0.033 (1 in 30) and the MMR is 599 deaths per 100,000 births (95% confidence intervals 424, 775). The proportion of ever-married sisters dying from maternal causes is 0.48 (95% confidence intervals 0.38, 0.58). Our estimate of maternal mortality covers the period approximately 28 years before the survey took place. It should be noted that the possible under-reporting of births mentioned earlier would have the effect of increasing the TFR and slightly reducing the MMR.

## **Discussion**

These figures indicate high levels of maternal mortality in this population. This is not unexpected given that medical care which may have a significant impact on maternal mortality ratios (*e.g.* the use of antibiotics and caesarean section) are unavailable in this area [9]. Although no other studies in Kenya have used the sisterhood method two other studies have used population-based enquiries to estimate maternal mortality in this country. The estimate of maternal mortality for the Gabbra agrees well with the maternal mortality ratio of 660 per 100,000 births found in the Kwale District of the Coast Province [10], despite the availability of medical care in this district (72% of women attended an antenatal clinic at least once during pregnancy and 13% delivered in hospital). Both these estimates differ from a ratio of 80 maternal deaths per 100,000 births calculated from a longitudinal study in the northwestern part of the Machakos District 80km east of Nairobi [11]. However, this latter figure was based on only 4 deaths and adult mortality in general was calculated to be remarkably low in this area [12].

Table 4 gives maternal mortality data from six other published African studies which have used the sisterhood method [4,13,14,15,16,17] and unpublished data from Burkina Faso. Only studies using this method were included for comparison because other methods of calculating maternal mortality statistics may give widely differing results. Using hospital data may considerably overestimate MMRs, for example, if only women

who have developed life-threatening conditions during labour tend to use hospitals, or conversely may underestimate maternal deaths where hospitals are used by wealthy women. It can be seen from this table that maternal mortality is high in all the African populations where the sisterhood method has been used (cf MMR of about 30 for the developed world as a whole [18]). When comparing levels of maternal mortality, the proportion of deaths that are due to maternal causes may be a more useful statistic to use than the MMR. This is because the MMR will be high if mortality rates in the population in general are high. In the area where this survey took place mortality rates are not generally very high for rural Kenya, despite its remote location (for example the infant mortality rate [5q0] is 65.9 per 1000 births for the Eastern province of Kenya compared to a 95.6 average for the whole of rural Kenya [6]). Yet the proportion of deaths due to maternal causes is the highest observed of any of the sample of studies.

### **Acknowledgements**

This research was funded by the EC (DGXII) through a grant to the International Institute of Environment and Development (IIED), by the Royal Society and the Simon Population Trust. We thank Oona Campbell for comments and advice.

## References

- [1] World Health Organisation. Maternal Mortality Rates: A Tabulation of Available Information. Second edition. Geneva: World Health Organisation, Division of Family Health
- [2] Koblinsky MA. Beyond maternal mortality - magnitude, interrelationship and consequences of women's health, pregnancy-related complications and nutritional status on pregnancy outcomes. *Int J Gynecol Obstet* 1995; 48 Suppl: S21- S32
- [3] Graham W. Maternal mortality: levels, trends and data deficiencies. In: Feachem R, Jamison D, editors. *Disease and Mortality in Sub-Saharan Africa*. Oxford University Press, 1991; 101- 126
- [4] Graham W, Brass W, Snow RW. Estimating maternal mortality: the sisterhood method. *Stud Fam Plann* 1989; 20: 125-135
- [5] Mace R. Biased parental investment and reproductive success in Gabbra pastoralists. *Behav Ecol Sociobiol* 1996; 38:71-85
- [6] Mace R. When to have another baby: a dynamic model of reproductive decision-making and evidence from Gabbra pastoralists. *Ethol Sociobiol* (in press)
- [7] Kenya Demographic Health Survey 1993. Kenya National Council for Population and Development 1994
- [8] Hernandez B, Chirinos J, Romero M, Langer A. Estimating maternal mortality in rural areas of Mexico: the application of an indirect demographic method. *Int J Gynecol Obstet* 1994; 46: 285-289
- [9] Maine D. *Safe Motherhood Programs: options and issues*. Center for Population and Family Health, Columbia University, New York, 1991
- [10] Boerma J, Mati J. Identifying maternal mortality through networking: results from coastal Kenya. *Stud Fam Plann* 1989; 20: 245-253
- [11] van Ginneken J, Muller A. *Maternal and Child Health in Rural Kenya: an Epidemiological Study*. London: Croom Helm. 1984
- [12] Muller A, van Ginneken J. Morbidity and mortality in Machakos, Kenya, 1974-81. In: Feachem R, Jamison D, editors. *Disease and Mortality in Sub-Saharan Africa*. Oxford University Press, 1991; 264-285
- [13] Ministry of Economic and National Planning Khartoum, Sudan. *Sudan Demographic Health Survey 1989/1990*. Institute for Resource Development/Macro International, Inc. Columbia, Maryland USA. 1991
- [14] David P, Kawari S, Graham W. Estimating maternal mortality in Djibouti: an application of the sisterhood method. *Int J Epidemiol* 1991; 20: 551-557
- [15] Chipangwi JD, Zamaere TP, Graham WJ, Duncan B, Kenyon T, Chinyama R. Maternal mortality in the Thyolo district of southern Malawi. *East African Med J* 1992; 69: 675-679
- [16] Walraven GEL, Mkanje RJB, van Roosmalen J, van Dongen PWJ, Dolmans WMV. Assessment of maternal mortality in Tanzania. *Brit J Obstet Gynaecol* 1994; 101: 414- 417
- [17] De Groof D, Seyni Bagnou A, Sekou H. Estimating mortality in rural Niger: using the sisterhood method. *Annales de la Soc Belge de Med Trop* 1993; 73: 279-285
- [18] AbouZahr C, Royston E. *Maternal Mortality: A Global Factbook*. Geneva: World Health Organisation. 1991



**Table 1:** Age-specific fertility rates for 1993

Age group	No.women	ASFR
15-19	254	0.29
20-24	228	1.18
25-29	196	1.35
30-34	147	1.46
35-39	137	0.66
40-44	82	0.43
45-49	98	0.25
<b>TFR</b>	<b>1142</b>	<b>5.63</b>

**Table 2:** Estimation of maternal mortality in the Gabbra using the sisterhood method

Age group of respondents (a)	Number of respondents (b)	Sisters ever married (c)	Maternal deaths (d)	Adjustment factor (e)	Sister units of risk exposure (f=ce)	Lifetime risk of maternal death (g=d/f)	Proportion of deaths due to maternal causes (h)
15-19	59	115 <sup>1</sup>	0	0.107	12	0	0
20-24	172	335 <sup>1</sup>	2	0.206	69	1/34	0.50
25-29	222	340	2	0.343	117	1/59	0.50
30-34	236	444	7	0.503	223	1/32	0.47
35-39	228	449	15	0.664	298	1/20	0.60
40-44	195	396	9	0.802	318	1/36	0.47
45-49	158	351	10	0.900	316	1/31	0.38
50-54	183	361	9	0.958	346	1/38	0.30
55-59	116	234	6	0.986	231	1/38	0.23
60-64	133	279	11	1.000	279	1/26	0.33
65+	188	374	11	1.000	374	1/34	0.18
<b>Total</b>	<b>1890</b>	<b>3678</b>	<b>82</b>		<b>2583</b>	<b>1/31<sup>2</sup></b>	<b>0.33<sup>3</sup></b>

<sup>1</sup> adjusted figures derived by multiplying the number of respondents by the average number of ever-married sisters per respondent reported for the age groups over 25 (1.94) to obtain the expected ultimate number of ever-married sisters for the younger age groups.

<sup>2</sup> using only respondents under 50 LTR = 1 in 30; MMR = 599 per 100,000

<sup>3</sup> using only respondents under 50 proportion of sister dead from maternal causes = 0.48

**Table 3:** Maternal mortality estimates from sub-Saharan Africa using the sisterhood method

Location	Number of respondents	Lifetime risk of maternal death	MMR (deaths/100,000 births)	Proportion maternal deaths	Reference
North Bank Division, the Gambia	1652	1 in 17	1005	0.29	Graham, Brass and Snow 1989
Northern Burkina Faso	4923	1 in 18	854	0.24	Hampshire (pers comm.)
Niger	3058	1 in 14	1050		Degroof <i>et al</i> 1993
Sudan	5860	1 in 27	537	0.34	Sudan Demographic and Health Survey 1989-90
Djibouti	7463	1 in 20	740	0.26	David, Kawari and Graham 1991
Northeastern Kenya	1890	1 in 31	571	0.48	This study
Northwestern Tanzania	2865	1 in 52	297	0.14 <sup>1</sup>	Walraven <i>et al</i> 1994
Southern Malawi	3333	1 in 33	409	0.12	Chiphangwi <i>et al</i> 1992

<sup>1</sup> calculated using some respondents over 50 years