

## Review

# Reflections on maternal mortality in two decades

M.H. Baldo<sup>1</sup>

**SUMMARY** The paper examines developments in the assessment and prevention of maternal mortality over the past 2 decades through review of the relevant literature. Problems of classifying and ranking causes, changing methodologies, discrepancies and illogical trends are demonstrated. Identifying causes of maternal mortality by surveillance and death reviews, rather than measuring ratios, appears to be more effective. Process indicators are considered as important as outcome indicators for monitoring safe motherhood. International technical reappraisal of maternal mortality is needed.

## Introduction

The World Health Organization (WHO) interregional meeting on the prevention of maternal mortality in November 1985 [1] set the stage for the international efforts to reduce maternal mortality by 50% by the year 2000. This goal was later reiterated at the Safe Motherhood Conference in Nairobi in 1987 and the World Summit for the Rights of the Child in New York in 1990. The aim of this paper is to reflect upon the evolution of the maternal mortality problem over the past 2 decades. The emphasis would appear to be changing with respect to the following issues.

- Is the assessment of maternal mortality a measurement or an estimate?
- What is preferable, to assess maternal mortality epidemiologically or by case review?

- Which is more useful and feasible, to assess magnitude or cause?
- Which of the causes are now more significant, obstetric/medical or standard care, socioeconomic factors, demographic factors or cultural factors?
- Do process indicators outweigh outcome indicators, or should they have equal emphasis?
- How reliable ultimately is the maternal mortality measurement/estimation as an indicator for health for all?
- What about the future?

The objectives of the paper were to:

- review the developments in assessing and preventing maternal mortality worldwide during the past 2 decades using relevant literature;
- appraise safe motherhood interventions and assessments that are relevant to maternal mortality.

<sup>1</sup>General Directorate of Health Centres, Ministry of Health, Riyadh, Saudi Arabia.

Received: 05/06/00; accepted: 03/07/00

## Methodology

The literature review was based on the following sources:

- WHO publications in the eighties
- Maternal mortality ratios and rates — a tabulation of available information [2]
- A Medline search on maternal mortality, 1994–96
- WHO/UNICEF revised estimates of maternal mortality, 1996 [3]
- Recently published WHO material and other sources, including the year 1999.

The above-mentioned references were reviewed in terms of the previously stated questions using tabulations, comparisons and interpretations. Two textbooks from the United Kingdom (UK) provided valuable sources on critical reading for primary care [4] and critical appraisal of research literature pertaining to obstetrics and gynaecology [5].

## Results

The majority of the maternal mortality studies presented at the interregional meeting in Geneva in 1985 [1] were hospital-based studies. The methodologies of maternal mortality studies are still dominated by the system of confidential enquiry of maternal deaths, which is an in-depth variation of a hospital-based study. In 1982, there was a concerted effort by WHO to establish confidential enquiry in a number of countries [3], namely Egypt, Jordan, Libyan Arab Jamahiriya and Sudan. A study in Jamaica, however, was an excellent example of an extended confidential enquiry system, involving all possible sources of information, including community sources, hospital death records and civil registration [6].

Epidemiological surveys, although more reliable, are costly [7]. To overcome the problem of cost, the sisterhood method was introduced in 1989 by Graham, Brass and Snow [8]. The results of the Bali indirect sisterhood maternal mortality study [9] were compared with the results of a direct community-based study. The authors concluded that the sisterhood method was faster and cheaper and appeared to be as accurate as direct methods. WHO later issued guidance notes on the sisterhood method for potential users [10]. Integrated assessment of childhood interventions and maternal and child mortality in Djibouti, Jordan, Syrian Arab Republic and the Republic of Yemen incorporated the sisterhood method [11].

In 1996, WHO/UNICEF published revised maternal mortality estimates for 1990 at global, regional and country levels [3] based on available information on the magnitude and causes of maternal mortality, the percentage of assisted deliveries by trained personnel and the general fertility rate. The estimates for maternal mortality were on the high side for some countries, e.g. Saudi Arabia — 130/100 000 live births compared to 18/100 000 live births reported in a study by Al-Meshari et al. [12].

Surveillance as a method for assessing maternal mortality has recently been promoted [13]. Maternal mortality death review, combining confidential enquiry and verbal autopsy, recently adopted by WHO and the Centers for Disease Control and Prevention [14], demonstrates the “road to maternal death concept”. This approach involves a qualitative, in-depth analysis of maternal deaths collected from a small number of selected hospitals. It emphasizes the cause rather than the magnitude of maternal mortality.

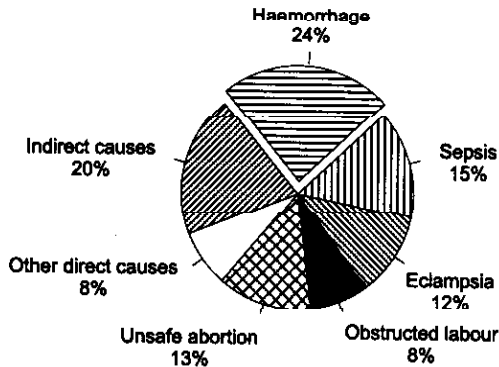


Figure 1 Causes of maternal death — varying global estimates [15]

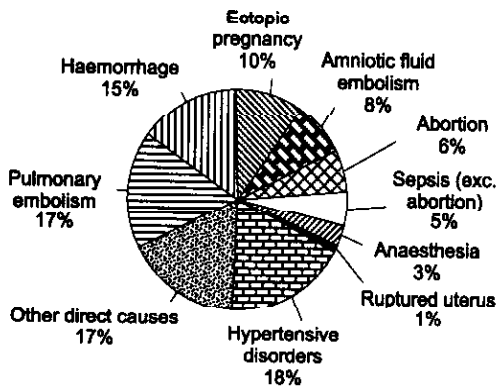


Figure 2 Direct causes of maternal death, United Kingdom 1988-90 [16]

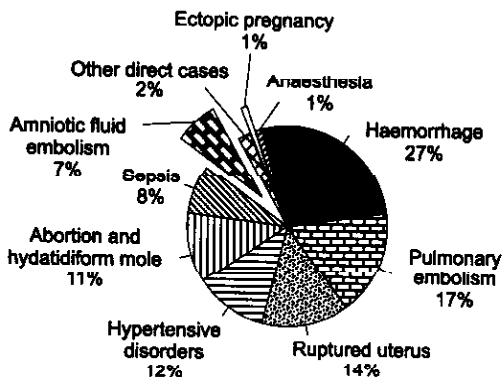


Figure 3 Direct causes of maternal death, Saudi Arabia 1989-92 [12]

Figures 1 and 2 show causes of maternal mortality in developing and industrialized countries. Figure 1 shows WHO global estimates [15]; preventable problems such as haemorrhage (24%), sepsis (15%), eclampsia (12%), obstructed labour (8%) and unsafe abortion (13%) are the predominant direct causes. Figure 2 shows the direct causes of maternal death in the UK for the period 1988-90 [16], and shows the well defined causes, including anaesthetic deaths, amniotic fluid embolism and ectopic pregnancy. In the UK, hypertensive diseases were the leading cause of maternal death (18%), probably the result of stress, but amniotic fluid embolism and pulmonary embolism combined (25%) resulted in more deaths. Haemorrhage (15%) was still a sizeable problem, but was not the most serious one.

Figure 3 shows Al-Meshari and colleagues' results for Saudi Arabia [12]. Haemorrhage (27%) was the leading cause of maternal death, followed by pulmonary embolism (17%), which together with amniotic fluid embolism (7%) resulted in 24% of maternal deaths. Hypertensive diseases (12%), unlike in the UK, ranked fourth.

Tables 1, 2 and 3 show maternal mortality ratios in the eighties and nineties for selected developing countries and member countries of the Gulf Cooperation Council. As can be seen in Table 1, the 1990 revised estimates were higher than some earlier estimates. The most recent figures, however, show sizeable reductions in maternal mortality ratios for most of the countries except Pakistan. To what extent the recent improvements in the maternal mortality ratios are real depends on the reliability and validity of the sources of information. Statistical analysis using confidence intervals would verify the validity of comparisons [14]. Also comparison with independent

Table 1 Maternal mortality ratios in selected developing countries

Country	Year	MMR <sup>a</sup>	1990 revised estimates <sup>b</sup>	Year	MMR <sup>c</sup>	Year	MMR <sup>d</sup>
Pakistan	1988	279	340	1994	300	-	-
Sudan	1985	522	600	1993	365	-	-
Republic of Yemen	1987	1040	1400	1991	1000	1997	351
Morocco	-	-	610	1992	332	1997	228
Tunisia	-	-	170	1994	69	1999	68.9

<sup>a</sup>Source: [12]<sup>b</sup>Source: [9]<sup>c</sup>Source: [17]<sup>d</sup>Source: [13]

MMR = maternal mortality ratio/100 000 live births

Table 2 Maternal mortality ratios for the member countries of the Gulf Cooperation Council 1980-1998

Country	Year	MMR <sup>a</sup>	1990 revised estimates <sup>b</sup>	Year	MMR <sup>c</sup>	Year	MMR <sup>d</sup>
Bahrain	1981	19	60	1994	1	1999	15.3
Kuwait	1980	10	29	1995	26	-	-
Oman	-	-	-	1994	27	1999	20
Qatar	1985	14	-	1994	0	-	-
United Arab Emirates	-	-	26	1994	1	-	-
Saudi Arabia	1988	41	130	1993	18	1999	17.6

<sup>a</sup>Source: [12]<sup>b</sup>Source: [3]<sup>c</sup>Source: [17]<sup>d</sup>Source: [13]

MMR = maternal mortality ratio/100 000 live births

national studies could challenge these estimates, as in the case of Saudi Arabia [12].

For the member countries of the Gulf Cooperation Council (Table 2), the 1990 revised estimates were about three times higher than earlier figures. Later data show the ratios to be considerably reduced, although there is a great discrepancy in the

recent figures for Bahrain with a maternal mortality ratio of 1/100 000 live births in 1994 and 15.3/100 000 live births in 1999.

## Discussion

Some of the lessons learned on safe motherhood were that the dimension of maternal

**Table 3 Maternal mortality ratios for selected countries of WHO Eastern Mediterranean Region**

Country	Year	MMR <sup>a</sup>	1990 revised estimates <sup>b</sup>
Djibouti	1989	740	570
Egypt	1991	51	170
Iraq	1992	117	320
Jordan	1992	50	150
Libyan Arab Jamahiriya	1990	60	220
Morocco	1992	332	610
Somalia	1990	1100	1600
Syrian Arab Republic	1994	97	180
Tunisia	1994	69	170

<sup>a</sup>Source: [17]

<sup>b</sup>Source: [3]

MMR = maternal mortality ratio/100 000 live births

mortality was greater than originally thought and that coverage remained inadequate in most developing countries, with no evidence of a reduction of maternal mortality [18]. Furthermore, there was little indication that the interventions needed to reduce maternal mortality were reaching more women than 10 years earlier. In Sierra Leone, the goal of the local primary health care programme established in the eighties was to reduce maternal mortality by 30% by the turn of the century but no progress appears to have been made in that direction [19]. This was ascribed to: failure to devise specific intervention techniques, the selfish and hostile attitudes of health workers, failure of women to attend prenatal and postnatal services, the slack attitudes of health workers towards supervision of traditional birth attendants (TBAs) and failure to organize outreach services and conduct home

births. However, such a bleak picture is to be viewed with reservation.

Historically, in the UK, the maternal mortality problem remained the same from Victorian times until the mid-thirties with the appearance of antibiotics and blood transfusion services [20]. At present, these two lifesaving items may be lacking in some developing countries. In Switzerland, the introduction of pregnancy counselling in clinical practice led to a decline in the maternal mortality rate from 7% to 0.04% in a hundred years [21]. In spite of Sri Lanka's good programme, it took more than 35 years for maternal mortality to decline dramatically from 15/1000 live births in 1940–45 to 95/100 000 live births in 1980 and 30/100 000 live births at present [18]. On the other hand, China was able to reduce maternal mortality by 98% in the first 10 years of the revolution, but it remained high in some rural areas [22]. Thus it is clear that maternal mortality decline is possible but it needs commitment, action and perseverance. It would seem the goal to reduce maternal mortality by 50% by the year 2000 was too ambitious.

In spite of their limitations, the maternal mortality rate (out of women of child-bearing age) and ratio (out of live births), if repeated using the same methodology, would certainly demonstrate improvements with a reasonable degree of reliability. Unfortunately, the methodology of assessment has changed from a frank epidemiological approach to the sisterhood one and, more recently, to the maternal death review. The cost of undertaking the same survey may not permit its repeatability. Because of the great variability within some countries, e.g. Guatemala [23], national surveys are needed to obtain a country figure but with cost considerations.

Originally, on defining causality, obstetric and medical causes were emphasized, in

spite of other long-term determinants, such as cultural, traditional, social and economic factors, which cannot be dramatically changed or ameliorated within a short span of time. Availability, accessibility, acceptability and affordability of care may not be adequately met. The flourishing private sector may deprive the majority of quality care since midwifery and obstetric services are more likely to be provided privately.

As for the preventability of direct causes of maternal mortality, haemorrhage has become less serious with improved blood transfusion services and with revised management of eclampsia. In 1996, the Royal College of Obstetricians and Gynaecologists issued a guideline on the management of eclampsia [24]. Recently in Saudi Arabia, a review of the state of the art care of eclampsia [25] and the results of the successful management of 135 episodes of hypertensive disease with pregnancy were published [26].

In Latin America, clandestine abortion is the commonest cause of maternal death [27]. Unfortunately, in most parts of the world, unsafe abortion as a cause of death cannot be confirmed or is concealed. What is most important is that unwanted pregnancy is avoided. Marital and fertility patterns as contributory causes of maternal mortality should be emphasized. However, direct causes still account for most maternal deaths in the majority of developing countries (Figure 1). Women with serious medical conditions should avoid pregnancy.

Although some causes can be anticipated in the prenatal period, maternal deaths still occur among women with bad obstetric history, mainly in those with previous postpartum haemorrhage, previous caesarian section and difficult labour because the necessary precautions are not taken in the subsequent pregnancy.

As preventable causes are reduced, other unavoidable causes become apparent. In Hong Kong, between 1961 and 1985, pulmonary embolism was not a major cause of maternal death [3,28]. However, during the period 1986–1990, when all maternal deaths were investigated by a coroner's postmortem, it became the most important cause of maternal death [3,28]. Thus, anticipatory treatment of pulmonary embolism was introduced. Some deaths are unfortunately iatrogenic. Therefore vigilance, acumen and a high level of responsibility of health personnel are vital [29]. These can only be inculcated thorough education and training with the emphasis on shared responsibility.

The content of routine antenatal care is being revised with a view to eliminating adverse outcomes [30]. Perhaps 4 antenatal visits instead of the standard 13 may be as effective and more efficient. Antenatal clinics (ANC) are now a primary health care (PHC) service rendered by general physicians, midwives, health visitors and TBAs. Thus, referral to hospital is either restricted or unnecessary. Hospitals may compete with health centres for normal low-risk cases and avoid more complicated cases because of the responsibility involved in the latter and the possible litigation which might ensue if things go wrong.

Curative care still supercedes preventive care. For example, in the Eastern Mediterranean Region, in 14 out of 19 countries less than 50% of pregnant women receive tetanus immunization, although it is encouraged [18]. The number of doses needed for full protection may be considered too many by patients or there may be shortages in the vaccine supply. Unfortunately, some influential obstetricians and administrators in tertiary hospitals are not aware of the need for it. In spite of routine iron and folate supplementation, anaemia is, still a

major pregnancy problem affecting up to one-third of pregnant women [31]. What proportion of them actually takes regular iron supplements needs to be determined and educational efforts should be directed at them to encourage regular iron and folate intake [31].

The intake of micronutrients, such as calcium [32], is believed to result in significant reduction of high blood pressure and eclampsia; zinc and magnesium are thought to be of value in preventing maternal mortality. In Nepal, providing women with supplements of either vitamin A or  $\beta$  carotene lowered maternal mortality related to pregnancy in an undernourished rural population [33]. However, differences in cause of death could not be reliably distinguished between the groups receiving supplements and those receiving the placebo.

In most countries, routine laboratory services for pregnant women are limited to haemoglobin estimation, urine analysis and blood group and rhesus factor determination. Nowadays, testing for diseases such as syphilis, hepatitis, tuberculosis and AIDS adds to the burden of routine prenatal care services.

As for natal care, institutional delivery is now encouraged, or otherwise assisted home delivery where resources allow. This provides more accurate and complete information on maternal deaths and live births. Institutional delivery is not without risk, such as hospital infections and premature interventions. Regular audit of caesarian sections, especially where they depart from the accepted 5%–15% range, and other surgeries could lead to more well defined indications for surgery [34]. As about 24% of maternal deaths occur during pregnancy, 16.0% during labour and 60% in the postpartum period [18], 72% of the latter occurring in the first week, with 40% due to postpartum haemorrhage [35], institutional

delivery should help prevent deaths in the immediate postpartum period. The timing of death should be included in the results of maternal mortality as it will help to enhance preventability of maternal death.

Home deliveries that take place because of personal preference or a lack of institutional services should be assisted by trained attendants and monitored. Maternity waiting homes have been beneficial in some developing countries [36]. Home delivery by an untrained TBA or a relative is undesirable, while essential obstetric services from a professional are often unaffordable [37]. The organization of delivery services has to be realistic and cost-effective. However, the indicator to have one basic or essential obstetric unit for every 500 000 population is not precise, considering the uneven distribution of facilities and the urban bias. Restructuring of facilities may be considered in future plans, as redistribution of the population is unlikely. The success of health care should be judged by its quality, mainly patient satisfaction.

Home-based records, the pathograph, are not correctly used in developing countries and may be too elaborate. Their availability cannot be guaranteed, patients do not realise their value and the data they provide are not made use of. Continued orientation, training and monitoring on their use, as well as demonstrations of their usefulness as sources of valuable data both to the health worker and patient, may improve their applicability. Suitable process and outcome indicators should be used. Modified birth certificates provide an untapped information source.

Postpartum hospital stay or home-visiting provide an occasion for opportunistic interventions to promote breastfeeding and discourage artificial feeding, and to educate mothers and staff on the steps to successful breastfeeding. It is a time to

convince new mothers about the need for postpartum care, including having cervical smears and family planning advice and services. The postnatal visit at 6 weeks is an opportunity to provide integrated care to the mother and her baby and to uncover maternal deaths. In this regard, motivation of health workers, facilitating their transportation and acknowledging their efforts are all necessary.

Although the effectiveness of the risk approach and TBA training and use without health systems support as approaches to reduce maternal mortality have not been confirmed, this does not mean that the implementation of such strategies should be discouraged where they are found to be successful. Only evidence-based field assessments of such programmes can judge their individual appropriateness and suitability. For example, in Guatemala, the maternal mortality ratio for women attended by a physician was 91.5/100 000 live births compared with 96.6/100 000 live births for those attended by a TBA [23]. On the other hand, a simple risk system without scoring is believed to be of value in preventing maternal death [27].

As for the fate of the newborn, in Mexico, in 50% of rural areas, a baby died either immediately or within a year [38]. The risk of a child dying is much higher after a mother dies than after a father dies and the risk for girls is about three times higher than for boys [39].

Programme planning, implementation, monitoring, supervision and evaluation are crucial to the success of safe motherhood and reduction of maternal mortality. Exemplary programme leadership is a prerequisite for success. Strict discipline and prompt action ensure good quality of care and prevent mismanagement and remedy flaws. Appropriate financial management

ensures cost-effectiveness, an important criterion of success.

Funding in-depth field appraisals is difficult. In fact, lack of funding may lead to the premature discontinuation of reasonably successful programmes, a frustrating experience for field staff. Competition for funding with other global programmes, such as AIDS, tuberculosis and poliomyelitis programmes, may affect the funding of programmes such as safe motherhood.

Intervention rather than descriptive studies are needed. Evidence-based medicine and meta-analyses are recommended as analytical approaches. Case-control, double-blind studies on maternal mortality are rarely conducted. Examples of these are the study in Nepal [33] and a study conducted in China [40] where the incidence of eclampsia, postpartum haemorrhage and obstructed labour did not change in the control area but were impressively reduced in the pilot area. The maternal mortality ratio declined by 75% in the pilot area to 47/100 000 live births compared with 114/100 000 live births in the control area. The interventions in the pilot area included improved access to care, mass health education and strengthened obstetric emergency services.

The joint WHO/UNICEF/World Bank statement of action [15] called for the achievement of safe motherhood by ensuring the services and assessing implementation. Societal commitment to ensuring safe pregnancy and birth, improvements in access to and quality of health care and commitment to the social needs of girls and women throughout their lives were highlighted. It is hoped that the sixteenth FIGO World Congress of Obstetrics and Gynecology to be held in Washington DC in September 2000 will set the stage for future action to reduce maternal mortality worldwide.



## Conclusion

Assessment of the magnitude and causes of maternal mortality is important in order to elucidate the problem and tackle it. However, determining levels, trends and causes of maternal mortality is fraught with problems, mainly a lack of a uniform methodology and of resources to undertake reliable assessments. Measuring process indicators and surveillance of maternal deaths with emphasis on its cause are the most suitable approach. This conforms to the message of the meeting on safe motherhood in Colom-

bo in 1998 [41], which stressed quality aspects, namely process and outcome indicators, recognizing that it was both difficult and costly to estimate maternal mortality accurately.

## Acknowledgements

The author is grateful to Dr K.S. Aziz for the literature search, Dr Arif Mutawali for reviewing the paper and his valuable comments and Dr Tajudeen Akerele for his remarks and great efforts and patience in printing the paper.

## References

1. *Interregional meeting on the prevention of maternal mortality, Geneva, 11-15 November, 1985*. Geneva, World Health Organization, 1985 (Unpublished document No. FHE/PMM/85.9.13).
2. *Maternal mortality ratios and rates — tabulation of available information*, 3rd ed. Geneva, World Health Organization, 1991:56, 72-74, 84.
3. *Revised 1990 estimates of maternal mortality: a new approach by WHO and UNICEF*. Geneva, World Health Organization, 1996.
4. Freeman G. Approaching the literature. In: Jones R, Kinmonth A, eds. *Critical reading for primary care*. London, Oxford University Press, 1995.
5. Greenhalgh T. Critical appraisal of research literature. In: O'Brien S, Pipkin FB, eds. *Introduction to research methodology for specialists and trainees*. London, RCOG Press, 1999.
6. Walker GJA et al. Maternal deaths in Jamaica. *World health forum*, 1987, 8(1):75-9.
7. Fortney J et al. Reproductive mortality in two developing countries. *American journal of public health*, 1986, 76(2):134-8.
8. Graham W, Brass W, Snow RW. Estimating maternal mortality: the sisterhood method. *Studies in family planning*, 1989, 20(3):125-35.
9. Wirawan DN, Linnan M. The Bali indirect maternal mortality study. *Studies in family planning*, 1994, 25(5):304-9.
10. *The sisterhood method for estimating maternal mortality: guidance notes for potential users*. Geneva, World Health Organization, 1997.
11. David PH, Bisharat L, Kavar S. Using routine surveys to measure mortality: a tool for programme managers. *Social science and medicine*, 1991, 33(3):309-19.
12. Al-Meshari A et al. Epidemiology of maternal mortality in Saudi Arabia. *Annals of Saudi Medicine*, 1995, 15(4):317-23.
13. *Report on the intercountry workshop on developing national capacity in safe motherhood surveillance and neonatal health, Cairo, Egypt 26-29 April 1999*.

- Alexandria, World Health Organization Regional Office for the Eastern Mediterranean, 1999.
14. *Safe motherhood needs assessment — maternal death review guidelines*. Geneva, World Health Organization, 1994.
  15. *Reduction of maternal mortality. A joint WHO/UNICEF/World Bank Statement*. Geneva, World Health Organization, 1999.
  16. Department of Health. *Why mothers dies. Report on confidential enquiries into maternal deaths in the United Kingdom 1998–1990*. London, Her Majesty's Stationery Office, 1994.
  17. Regional demographic and socio-economic data. *Eastern Mediterranean health journal*, 1996, 2(2):347–53.
  18. Abou-Zahr CL. Lessons on safe motherhood *World health forum*, 1995, 19(3):253–60.
  19. Konteh R. Saving mothers lives: things can go wrong. *World health forum*, 1998, 19:136–9.
  20. Chamberlain G. *ABC of antenatal care*, 3rd ed. London, BMJ Publishing Group, 1997:83–7.
  21. Zimmerman R. Schwangerschaftsberatung in der Praxis. [Pregnancy counselling in clinical practice.] *Schweizerische Rundschau für Medizin Praxis*, 1996, 85(39):1221–5.
  22. Yan RY. Maternal mortality in China. *World health forum*, 1989, 10(3/4):327–30.
  23. Kestler EE. Guatemala: maternal mortality in Guatemala: assessing the gap, beginning to bridge it. *World health statistics quarterly*, 1995, 48(1):28–33.
  24. *Management of eclampsia*. London, Royal College of Obstetricians and Gynaecologists, 1996 ( RCOG Guideline No. 10).
  25. Habib F, Lingman G. Pre-eclampsia state of the art. *Saudi medical journal*, 1998, 19(6):657–62.
  26. Hussein MM, Mooji JMV, Roujouleh H. Hypertension in pregnancy: presentation, management and outcome — a retrospective analysis of 135 cases. *Saudi kidney disease and transplantation*, 1998, 9(4):416–24.
  27. Szmoisz S et al. Argentina: risk factors and maternal mortality in La Mantanza Province of Buenos Aires, 1990. *World health statistics quarterly*, 1995, 48(1):4–7.
  28. Duthie SJ, Lee CP, Ma HK. Maternal mortality in Hong Kong 1986–1990 *British journal of obstetrics and gynaecology*, 1994, 101(10):906–7.
  29. Suleiman AB et al. A strategy for reducing maternal mortality. *Bulletin of the World Health Organization*, 1999, 77(2):190–3.
  30. Villar J, Bergsjö P. Scientific basis for the content of routine antenatal care. I. Philosophy, recent studies and power to eliminate or alleviate adverse maternal outcomes. *Acta obstetrica et gynecologica Scandinavica*, 1997, 76(1):1–14.
  31. Kafle KK et al. Can licensed drug-sellers contribute to safe motherhood? A survey of treatment of pregnancy-related anaemia in Nepal. *Social science and medicine*, 1996, 42(11):1577–86.
  32. Kulier R et al. Nutritional interventions for the prevention of maternal morbidity. *International journal of gynaecology and obstetrics*, 1998, 63(3):231–46.
  33. West Jr KP et al. Double-blind cluster randomized trial of low dose supplementation with vitamin A or  $\beta$  carotene on mortality related to pregnancy in Nepal.

- British medical journal*, 1999, 318:570-5.
34. El-Hag BI, Milaat WA, Taylouni ER. An audit of caesarian section among Saudi females in Jeddah, Saudi Arabia. *Journal of the Egyptian Public Health Association*, 1994, 69(1-2):1-17.
  35. Fauveau VA. The Lao Peoples' Democratic Republic: maternal mortality and female mortality: determining the causes of death. *World health statistics quarterly*, 1995, 48(1):44-6.
  36. Figa-Talamanca I. Maternal mortality and the problem of accessibility and obstetric care; the strategy of maternity waiting homes. *Social science and medicine*, 1996, 42(10):1381-90.
  37. Koblinsky MA, Campboll O, Heichelheim J. Organizing delivery care: what works for safe motherhood? *Bulletin of the World Health Organization*, 1999, 7(5):399-405.
  38. Elu MC. Mexico: maternal deaths and fertility patterns and social cost. An anthropological study. *World health statistics quarterly*, 1995, 48(1):47-9.
  39. Strong MA. The health of adults in the developing world: the view from Bangladesh. *Health transition review*, 1992, 2(2):215-24.
  40. Xu Z. China: lowering maternal mortality in Miyun County, Beijing. *World health statistics quarterly*, 1995, 48(1):11-4.
  41. *The Safe Motherhood Agenda: priorities for the next decade*. Report of the Safe Motherhood Technical Consultation 18-23 October 1997, Colombo Sri Lanka. New York, Safe Motherhood Interagency Group, 1998.

We will intensify our work on reducing maternal mortality. To push the agenda on reproductive health forward, WHO has developed a strategy to make pregnancy safer. The Making Pregnancy Safer Initiative will encourage governments and our international partners to ensure that safe motherhood is placed high on the political agenda. It is a matter of social responsibility and economic good sense.

Source: Address by Dr Gro Harlem Brundtland, WHO Director-General to the Forty-sixth Session of the Regional Committee for the Eastern Mediterranean, Cairo, Egypt, 20-23 September 1999