The challenge of reducing maternal mortality is increasingly being addressed by area-based efforts to improve access to care of obstetric emergencies. Improving coverage and quality of skilled attendance at birth is also being increasingly emphasized. Post-abortion care, better reproductive health services for adolescents, and improved family planning care are important ingredients in maternal mortality reduction. New developments in malaria, nutrition, violence and HIV/AIDS in relation to maternal health are highlighted, as well as measurement issues. Maternal mortality reduction is also being promoted today by using a human rights approach. Curr Opin Obstet Gynecol 12:513–517. © 2000 Lippincott Williams & Wilkins.

Introduction
While worldwide infant mortality and total fertility rates have been cut in half in recent decades, and life expectancy at birth has increased greatly, maternal mortality has shown no major reduction over a similar period [1].

After the publication of the now famous article ‘Where is the M in MCH?’ [2], and the introduction of the Safe Motherhood Initiative in Nairobi in 1987, maternal mortality reduction has been getting more attention than previously. The heightened awareness of this long neglected tragedy [3] has led to increased commitment [4], more research on specific interventions, and critical assessment of the strategies used. The main challenge today is not the lack of knowledge of key, effective interventions to save mothers, but rather how to deliver these healthcare interventions to the poor and underserved.

This article evaluates the recent developments in mortality reduction, starting with the intriguing topic of measurement issues, thereafter analysing health system strategies, broader and more specific, and ending by discussing maternal healthcare in its societal context including issues of violence and rights.

Measuring maternal mortality
The shocking reality of a woman dying in childbirth or from pregnancy-related causes is, even at its extreme levels, a rare event when compared to infant mortality rates (IMR). Without any health care whatsoever, some 2% of women will die during their pregnancy due to complications. This figure is roughly one fifth of IMR in the poorest countries. The confidence interval of any maternal mortality rate (MMR) estimate will therefore always be wider than for IMR, and this uncertainty is further impacted by underreporting in all countries where it has been studied. Another feature is that MMR is expressed as maternal deaths/100 000 live born. Thus, even if the absolute number of maternal deaths declines due to fertility decline, MMR will remain the same if the risk for the woman, once pregnant, is unchanged. ‘Life-time risk’ of maternal death expresses the risk for the individual woman to die a maternal death, and is derived from the MMR and the fertility rate in a given country.

So how do we measure the problem, and how do we monitor progress?
The various ways of measuring maternal mortality [5•] all give a rough estimate of the MMR level. As precision is
In 1999, concern was raised regarding the appropriateness of the strategies of the Safe Motherhood Initiative: Why were the above area-based approaches focusing on obstetric emergencies not being used? Why were the interventions suggested so complicated [17,18]? Part of the response is to be found in a recent Joint Statement from UN agencies [19] as well as in ICPD+5: yes, better care of obstetric emergencies is a must, but not enough. Increasing age at marriage/first birth, improving family planning, especially for adolescents, and addressing unsafe abortion are also necessary. Long-term plans to improve the coverage and quality of skilled attendance at birth appears also to be the key for substantial MMR reduction in the long term [20,21]. The two approaches are not contradictory but rather supplementary. The operations research performed by the Columbia group has been crucial to inspire confidence in the fact that progress can be achieved in the short term. However, countries like Malaysia, Sri Lanka, Vietnam [22], the Gambia [23] and most recently Honduras (personal communication, I. Danel) that have succeeded to diminish MMR levels have addressed a number of other points, too.

One analysis of the ways of organizing essential obstetric care in countries having reached MMR under 100/100 000, yielded four basic models of care [24]. In Model 1, deliveries were conducted at home by a community member who had received a brief training, with back-up of a referral system. Although there have been some successes with this model in China and in parts of Brazil, there is no evidence that MMR can be brought down under 100 per 100 000 live-births using this method. In Model 2, skilled attendance is provided at home births, and in Model 3, skilled attendance is given in a basic facility, with both models having back-up of referral systems. In Model 4, all women give birth in a facility with comprehensive obstetric services (which includes cesarean section, etc.). Model 4, though the most advanced, interestingly does not necessarily bring down MMR under 100/100 000 and is also out of reach for many poor countries. This leaves models 2 and 3. No clear data indicate which of these is most effective or cost-effective. Transition to any of models 2–4 requires strong links with the community through either traditional providers or popular demand.

Overall, it is recognized that MMR reduction requires more and better health care, i.e. a stronger health system at all levels [25,26,27]. Maternal health can therefore be seen as a ‘tracer condition’ for the health system, and improvements in maternal health care can be expected to benefit other conditions also, e.g. accident care, district hospital care or primary health care in general [28]. To improve maternal health care approaches, more health services research is needed [29].
As in all healthcare system areas, use of a continuous quality improvement methodology is important, e.g. auditing routines, improving teamwork [26•,27,30].

In resource-poor countries in particular, traditional birth attendants can provide a link to formal maternal health care systems even if they themselves can only to a limited extent care for unexpected obstetric complications [31]. Based on evidence to date, there is no reason to believe that traditional birth attendant training in isolation can contribute significantly to MMR reduction [19•].

Specific strategies
It is generally recognized today that antenatal care in itself can only to a limited extent reduce maternal mortality, while many of its interventions benefit health of the baby. A cohort study from Bangladesh underlines that detecting current complications is more important during antenatal care than finding high risk [32•]. A recent multi-country study coordinated by WHO also shows that more than four visits is not useful for low-risk pregnancy, either for the mother or child [33•]. Postpartum care is a neglected area [34] and should receive much more attention both in research and action as most maternal deaths occur postpartum.

Elimination of abortion related deaths requires different interventions in policy and care provision, depending on the country situation [35•]. For better post-abortion care (accepted by almost all countries at the International Conference on Population and Development in Cairo 1994) community involvement is needed to sensitize people and decision makers regarding the relative simplicity of saving lives [36•]. The arrival of the cheap abortifacient misoprostol [37,38•] appears to already have changed the abortion panorama in many developing countries.

Misoprostol given orally has also been recently compared to intramuscular oxytocin for use for the routine, active management of the third stage of labour [39]. While the latter is still the drug of choice for this routine, and increasingly promoted by WHO [40•], oral misoprostol appears to be a good alternative when unsafe injections are a problem.

In eclampsia management, the access to and use of magnesium sulphate is fortunately gaining ground, and a WHO collaborative trial is ongoing to establish its role also in cases of severe preeclampsia.

As regards nutritional interventions, vitamin A supplementation and anemia reduction have potential maternal benefits. The dramatic results seen in Nepal when supplementing pregnant women with vitamin A (a 40% reduction of MMR [41•]) has still not been corroborated elsewhere, nor led to clear programmatic implications. Vitamin A deficiency is quite common and low-dose substitution is safe [42], and evidently vitamin A deficiency is a neglected area that increasingly must be addressed inside and outside maternal health care. Iron supplementation has been reviewed recently [43,44•],[45•], and is one important aspect of reduction of maternal anemia. Less anemia means reduced risk of dying from postpartum haemorrhage, often the biggest killer. For anemia reduction, malaria prevention and management in pregnancy must also be intensified in many developing countries. Where drug resistance and/or low compliance so indicates, single dose treatment with sulphadoxine-pyrimethamine 2–3 times during pregnancy is now being recommended for 0- and 1-parae [45•], and also supported by the WHO. This regimen reduces maternal anemia and low birth weight, but can only be expected to be effective for a limited number of years ahead, however, as drug resistance develops fairly rapidly.

One major threat to maternal health, and infant health, is the rapidly evolving AIDS epidemic. Any strategy for maternal mortality reduction in sub-Saharan Africa or South Asia today needs to take the rapidly evolving pandemic into account. In countries such as South Africa and Zambia [46•], AIDS and related complications already contribute significantly to indirect causes of maternal death. Multisectoral approaches and non-governmental organization involvement must be directed towards a few clear and generally accepted goals to be effective in mitigating this major developmental crisis that is threatening to eliminate decades of hard-won victories in health [47•]. In maternal health care, it is important to capitalize on existing work, by collaborating between MMR and HIV reduction strategies [48].

Human rights issues
Maternal mortality is associated with women’s status and economic dependency [49•]. Decisive interventions, such as skilled attendance at birth, are in fact significantly more inequitably distributed than antenatal care or child immunization (personal communication, D.R. Gwatkin). Poverty is thus a major contributory factor behind maternal deaths, and providing maternal health care is a necessary component of poverty alleviation strategies.

In recent years, maternal health has increasingly been promoted using a human rights perspective. If a certain frequency of potentially lethal complications always will occur in the process of human procreation, specifically during pregnancy and childbirth, why do we permit the continuation of such a tragedy? Recent work highlights how human rights arguments can be used to make governments increase access and coverage of maternal
health care provision [50*]. Evidently much remains to 
be done in this and other areas of implementing the 
Cairo agenda on reproductive health, however [51,52]. 
Human rights are also at the centre of the abortion issue, 
where some progress can be seen internationally in 
recent years, in the legalization and de-penalization of 
induced abortions to save women’s lives [53*,54]. A key 
issue is also the provision of youth friendly reproductive 
health services to young people [55*], including counsel-
ing and care on contraception, sexually transmitted 
diseases and pregnancy.

Another aspect of human rights issues concerns violence 
against women. An increasing body of evidence indicates 
that many negative maternal and perinatal health 
outcomes are linked to discrimination, coercion and 
violence against women. International studies have 
shown that as many as one in four women are physically 
or sexually assaulted during pregnancy, most frequently 
by their husbands or intimate partners. Violence during 
pregnancy can lead to such serious consequences as 
infections, unsafe abortions, miscarriages, low birth 
weight, suicide and homicide. Therefore, efforts to 
address gender-based violence must be included in a 
global strategy for reducing maternal mortality [56**]. 
Overall, actions and research on the involvement of men 
in maternal health is important.

Conclusion
Reducing maternal mortality requires strengthening of 
the health care system. This process takes time, and 
must be fueled by public commitment sustained by, for 
example, maternal death reviews. One valuable entry 
point is the improvement of care of obstetric emergen-
cies, but skilled attendance at birth in general also 
demands long-term planning. Newer technical interven-
tions need to be integrated into existing systems, while 
AIDS poses an increasing threat. The attention and care 
given to women before, during and after pregnancy, 
inside and outside the health system, reflects the relative 
value a society accords to women.

References and recommended reading
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A good multi-country analysis reminding maternal health care professionals to look outside the medical field.

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