Global Public Health
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t716100712

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To cite this Article Prata, N. , Graff, M. , Graves, A. and Potts, M.(2009) 'Avoidable maternal deaths: Three ways to help now', Global Public Health, 4: 6, 575 — 587
To link to this Article: DOI: 10.1080/17441690802184894
URL: http://dx.doi.org/10.1080/17441690802184894

Global Public Health
Vol. 4, No. 6, November 2009, 575–587

Avoidable maternal deaths: Three ways to help now

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(Received 30 August 2007; final version received 24 September 2008)

The current paper examines the realities of women delivering in resource-poor settings, and recommends cost-effective, scalable strategies for making these deliveries safer. Ninety-five percent of maternal deaths occur in poor settings, and the largest proportion of these deaths are women who deliver at home, far away from health care facilities, and without financial access to skilled providers. This situation will improve only when policymakers and programme planners refocus their attention on service delivery and financing interventions, with the potential to reach the largest portion of women living in places where mortality is the highest. We suggest three feasible interventions that can potentially minimise both demand and supply side problems of safe delivery: (1) misoprostol to treat postpartum haemorrhage, an easy to use and heat stable technology to reduce the leading cause of maternal deaths; (2) alternative providers, such as clinical officers, trained to offer emergency obstetric care services; (3) financing safe delivery through vouchers or other mechanisms that can be implemented in poor settings and made attractive to the donor community through output-based assistance (OBA).

Keywords: postpartum haemorrhage; maternal mortality; safe delivery; vouchers; misoprostol

Introduction

More than half a million women died from pregnancy related complications in 2005, most of them in sub-Saharan Africa (50%) and Asia (45%) (Hill *et al.* 2007). In the least developed regions of the world, trends in maternal mortality suggest that pregnancy is not getting safer for poor women (World Health Organisation (WHO) 2004). Although some middle-income countries in North Africa, East Asia, and Latin America have decreased maternal mortality rates between 1990 and 2005, little progress has been made in reducing the global burden of maternal deaths in sub-Saharan Africa (Hill *et al.* 2007). If this sad situation is to be reversed, the focus must be on the interventions that will reach the poor women, most of whom deliver at home and without skilled attendants.

The purpose of this paper is to examine the evidence on what is feasible and effective in resource-poor settings to help women deliver safely and, thereby, decrease maternal mortality and morbidity where it is most egregious. Our aim is to identify service delivery systems and financing mechanisms that can protect the poor and, potentially, be implemented on a large scale.

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ISSN 1744-1692 print/ISSN 1744-1706 online

DOI: 10.1080/17441690802184894
http://www.informaworld.com

We reviewed available evidence by searching public databases, including PubMed, Population Information Online (Popline), Web of Science, and the Scholarly Journal Archive (JSTOR), using the terms: safe delivery; delivery complications; postpartum haemorrhage (PPH); developing countries; maternal health; maternal mortality; community-based maternal health interventions; financing reproductive health services; access to services; maternal health care in resource-poor settings; output-based assistance (OBA); and vouchers, among others. We also searched the reference lists from the articles found using these key terms. In addition, relevant documents and reports from the WHO and the United Nations Population Fund (UNFPA) were hand searched. We used Demographic Health Survey (DHS) data, from countries with available surveys from the last five years, for data on delivery place and the type of delivery assistance, by socioeconomic status. Demographic data were extracted from the Population Reference Bureau (PRB) population data sheet, and maternal mortality ratios estimates developed by the WHO, the United Nations Children's Fund (UNICEF) and UNFPA (WHO 2004), in addition to the estimates developed by the new maternal mortality working group established in 2006 (Hill *et al.* 2007).

The reality

The main reasons for the slow progress in reducing maternal deaths in resource poor settings can be summarised in three areas:

1. Inadequate number of health care facilities staffed with trained providers in emergency obstetric care (EmOC).
2. Financial barriers to care, with high costs for maternal health care services, including unofficial payments to access care, and the cost of drugs, supplies and transportation.
3. Lack of effective technology to manage complications in home births, where most of the deliveries occur in poor settings.

Poor and vulnerable women live in countries where the ratio of trained physicians and certified midwives to the population of pregnant women is low (AbouZahr and Wardlaw 2001). Current realities in developing countries make it virtually impossible for skilled workforces to reach the growing populations of women of fertile age. This is especially true when we consider: (1) the high number of skilled health workers, particularly in sub-Saharan Africa, who say they would like to emigrate (UNFPA 2005); (2) the fragile economies of some countries, such as most of sub-Saharan Africa; and (3) increasing socio-political instability in others. Physicians want to work in cities where they can educate their children, and where certified midwives are often married to men who work or migrate to urban areas. In parts of Africa, deaths from HIV/AIDS are decimating the health professional workforce (Chen *et al.* 2004).

The impact of poverty on maternal deaths is well described by Graham *et al.* (2004). The poor die disproportionately more from maternal causes than the non-poor. Thus, any achievable strategies to reduce maternal mortality among poor and vulnerable women must overcome two harsh realities. First, poorer people are more likely to get no medical care or to go to the private informal sector (Prata *et al.* 2005a). Second, poor people spend a higher proportion of their meager disposable income on health care, even though they rarely get value for their money (Fabricant

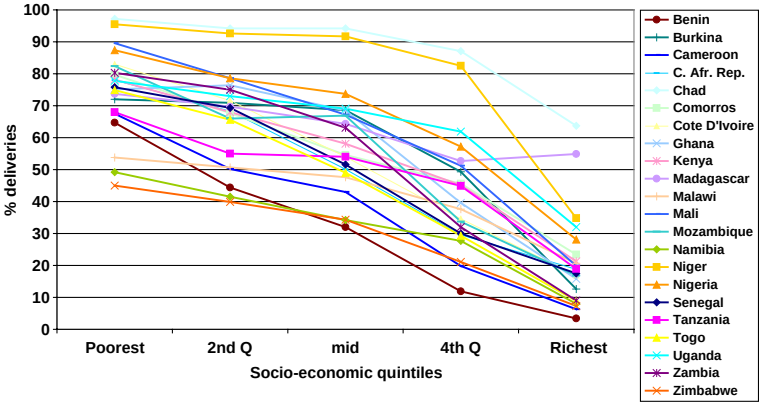

Figure 1. Home deliveries by socioeconomic status. Nigeria DHS 2003.

et al. 1999, Filippi *et al.* 2006). DHS data, on the place of delivery, provide evidence that poor women are less likely to deliver their babies in a health facility with a skilled provider (see Figure 1). In Nigeria, for example, a country with high maternal mortality accounting for approximately 10% of global maternal deaths, 80% of the women in the three lowest socio-economic groups deliver without the assistance of a skilled provider. These data indicate that, unless programmes are targeted to reach these disadvantaged groups, progress in safe delivery is compromised (see Figure 2). In addition, Nigerian women identified the following problems (in order of importance) to accessing health care for themselves: lack of money to pay for health expenditures (30%); distance to health facility (24%); and having to pay for transport (24%). Among the poorest quintile, these reasons amount to 48%, 48%, and 49%, respectively (NDHS 2004).

Paradoxically, even in resource-poor areas, existing facilities and trained personnel are not always fully utilised. Faith-based hospitals and maternity homes run by private midwives in small provincial towns often have empty beds. In Kenya, 88% of women go to at least one antenatal care visit, but only 42% are delivered by a skilled provider (CBS 2004). The reason for this discrepancy is simple: women cannot afford the private fees, or even the cost of public services. In many parts of

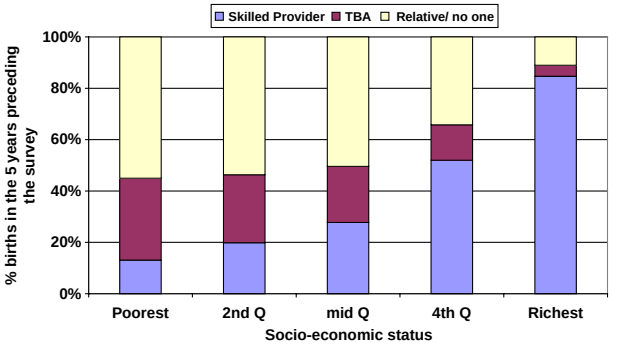

Figure 2. Type of person providing assistance during delivery according to socioeconomic status.

Africa, in addition to travel costs (Bicego *et al.* 1997), women must buy all drugs, pay for X-rays, and for operating room supplies. Those who can physically reach a public maternity ward may be deterred by the requirements to deliver in the lithotomic position, by lack of family support during labour, fear of negative provider attitudes (Velez *et al.* 2007), or the shame that their families are too poor to afford clothes and other necessities that are needed in the labour ward.

The World Health Organization (WHO), International Federation of Gynecology and Obstetrics (FIGO), and the International Confederation of Midwives (ICM) all support policies that endorse delivery by a skilled provider. In less developed countries (excluding China), where 59% of the population lives on less than US$2 per day (PRB 2005), an outside source must subsidise a poor woman's delivery. Even if the international community is willing and able to support safe motherhood, as Figure 3 shows, increasing resources to public facilities alone may not always help those who belong to the lowest economic quintiles. Thus, strategies involving the private sector would result in increased access to services, in addition to mitigating the demands on the already overburdened human resources of the public sector.

Evidence from the National Health Accounts research, economic studies of health seeking behaviour, and analysis of the DHS data, suggest that an increase in government services, when and if it comes, will not be sufficient to expand access to public health care services at the rates necessary to meet the maternal mortality levels set by the Millennium Development Goals (Ngalande-Banda and Walt 1995, Rosen and Conly 1999, Leonard 2000).

In short, in most countries with high maternal mortality, government health services do not reach, and may not reach for many decades, those at greatest risk of death from childbirth. Loans from international banks, or sector-wide support from donor nations, will not help large numbers of vulnerable women unless they reach beyond the facilities managed by the ministries of health.

Achievable strategies

In one of the articles in the Lancet series on maternal survival, Filippi *et al.* (2006) suggested that the key to reduction of maternal mortality should also include broader-based action, such as improvement of women's education, income, or status. Even though the safe motherhood community agrees with this approach, poor

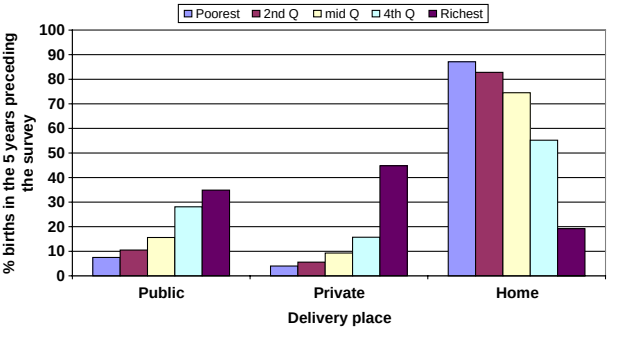

Figure 3. Delivery place and socioeconomic status. Nigeria DHS 2003.

countries have been struggling to improve the socioeconomic conditions of the women. Despite the enormous shortfall in financial and human resources, there are three strategies that could be implemented immediately at relatively low cost:

Promote a life-saving technology: misoprostol for postpartum haemorrhage (PPH) for home births

The vast majority of poor women deliver at home. Haemorrhage is the leading cause of maternal death in Africa and Asia, accounting for more than 30% of maternal mortality (Khan *et al.* 2006) (see Table 1). Whether or not PPH is correctly diagnosed and managed in a timely manner will determine the level of maternal deaths in poor settings. Fortunately, recent advances in the use of misoprostol offer promising ways to reduce the current intolerable and unacceptable burden of maternal mortality (Blanchard *et al.* 2002, Lazarus and Lalonde 2005, Derman 2006, Lalonde *et al.* 2006). Misoprostol is an effective uterotonic agent for prevention and treatment of PPH (Hofmeyr *et al.* 2005, Langenbach 2006). It is the first appropriate technology with the potential to save lives in the remote villages, where most women are illiterate. It is an off-patent, low cost, heat-stable oral (or rectal) medication, which can be administered at the community level, in effective, responsible ways (Walraven *et al.* 2005, Prata *et al.* 2005b, Prata *et al.* 2005c). The existing alternative for management of PPH, oxytocin, is impractical for home births in its current injectable form, thus, any attempts to compare misoprostol to oxytocin is irrelevant. Among feasible strategies ready for the widespread implementation and scale up, misoprostol would likely have the greatest potential impact on maternal mortality in remote areas. For example, data from India demonstrate that in the absence of active management of the third stage of labour, the use of misoprostol alone has the potential to reduce PPH by half (Derman *et al.* 2006).

Several decades of training traditional birth attendants (TBAs) has made little or no significant impact on maternal mortality (Smith *et al.* 2000, Ray and Salihu 2004). It is a policy which the WHO, UNICEF, and UNFPA no longer support (UNICEF 2003, UNFPA 2005). The reason for this disappointing result is not that TBAs are incompetent or disinterested, but that, until recently, there was no appropriate technology which could be delegated to illiterate village women. Moreover, most of the TBA programmes are not effectively linked to a functioning referral system (UNICEF 2003), which makes it even more difficult to attain positive outcomes.

Risk factors for the lethal complications of pregnancy are highly non-specific (Greenwood *et al.* 1987) and difficult to predict. Most PPH, for example, occurs in women whose age or parity does not fall into the high-risk pregnancy category. Washing one's hands before delivery, or cutting the cord with a clean razor blade instead of a piece of split bamboo, are good ideas, but it is difficult to demonstrate an epidemiological impact with these strategies (Goodburn *et al.* 2000). However, overall beneficial outcomes of TBA training are also documented (Sibley and Sipe 2004). For example, in northeastern Brazil, collaboration between health care providers and TBAs proved to be important in improving safe delivery for rural women. The collaboration included basic training for TBAs, and assistance of deliveries in small maternity centres provided by the local communities instead of the expectant mother's home (Araujo *et al.* 1983). In this way, rural women had the

Table 1. Maternal mortality ratios and distribution of causes of maternal deaths by region and available priority interventions.

	Average percent distribution [Khan *et al.* 2006]			
	Africa	Asia	Latin America, the Caribbean	Intervention (Prendiville, 2000, WHO, 2003, Tsu, 2004)
Haemorrhage	33.9	30.8	20.8	AMTSL* Uterotonics agents: Oxytocin, ergometrine, misoprostol Blood and IV fluids Anti-shock garment Balloon catheter Surgical procedures
Hypertensive disorders	9.1	9.1	25.7	Blood pressure monitoring Antihypertensive Magnesium sulphate Supportive air management
Infections/sepsis	9.7	11.6	7.7	STD treatment Clean delivery Antibiotics Vitamin A supplementation
Unsafe abortion	3.9	5.7	12.0	Family planning Safe abortion care Post-abortion care
Obstructed labour	4.1	9.4	13.4	Partograph Misoprostol for induction Instrumental delivery Caesarean section
Other direct	7.4	2.1	4.9	
Indirect†	32.0	31.4	15.7	
Maternal mortality ratio (uncertainty bound)	824 (414–1351)	329 (325–189)	132 (81–230)	

*AMTSL: Active management of third stage of labour (oxytocin; cord traction; uterine massage).
†Including anaemia, HIV/AIDS, and unclassified deaths.

social and cultural support provided by TBAs; TBAs were trained to identify and refer patients with complications; and the delivery occurred in a specified place with easy access to transportation and communication capacity.

Prata *et al.* (2005b), using community level control, have shown that TBAs can use misoprostol to treat PPH. In this study, East African TBAs diagnosed PPH using a folded *kanga* placed beneath the buttocks. The *kanga* is uniform in size, therefore providing an easy-to-calibrate method of measuring blood loss (Prata *et al.* 2005b). Using misoprostol to treat PPH (5×200 mcg tablets placed rectally) is low-cost and effective where: (a) TBAs attend many deliveries; and (b) a culturally appropriate way of measuring blood loss exists. In addition, treatment of PPH at the household level is a cost-effective intervention (Bradley *et al.* 2007). Where one, or neither, of these criteria is present, PPH prevention, using 3×200 mcg of misoprostol soon after the baby is delivered, is recommended. Operations research in Indonesia, Afghanistan, and Nepal, show that women, following counselling from a community volunteer during pregnancy, can self-administer misoprostol with gratifying results (Prata 2006).

In 2006, Nigeria became the first country in the world to approve the distribution of misoprostol for PPH, followed later that year by India, and by Tanzania in 2007 (http://venturestrategies.org). Several other African and Asian countries are poised for approval in the coming year.

Some of the existing barriers for making misoprostol more widely available include fear that women would use misoprostol to induce abortion, misuse at the home level, and concerns that home use would discourage facility deliveries. From the supply side, registration of misoprostol for obstetric indications is time consuming, and some countries do not have a drug distribution network that can reach poor women in the remote areas at affordable prices. However, these barriers can be addressed, and the benefits of saving lives by preventing PPH during home deliveries outweigh the risks.

Extend the reach of emergency obstetric care (EmOC): use of alternative providers such as medical officers for EmOC surgery

Comprehensive EmOC (offering injectable drugs, blood transfusions, and caesarean sections) has an important role in reducing maternal mortality in resource-poor settings (UNFPA 2003, Fauveau 2007). In rural Tanzania, Mbaruku and Bergstrom (1995) have shown how a holistic approach to EmOC, attention to detail, and establishing good relations with local TBAs, can reduce maternal mortality in a region served by a single hospital and a few satellite health care centres (Mbaruku and Bergstrom 1995).

One of the challenges in EmOC is to train non-physicians to undertake some of the roles traditionally reserved for physicians, such as caesarean operations. Demedicalisation refers to the process of making health service delivery as least restrictive as possible, while maintaining safety and efficacy. It is a necessary condition to reach the rural poor in countries with human resource capacity problems. Given the enormous discrepancy between unmet need for services and available providers, a re-examination of policies, dictating the level of qualification necessary for performing comprehensive obstetric care services, should be considered.

Delegating responsibilities to lower-level health care providers in developing countries has been documented since the 1980s. Mozambique reports successful practice of training assistant medical officers to perform fairly advanced surgical

procedures in the remote rural areas where services of consultants are virtually unobtainable. Their training programme focuses on three main areas: pregnancy-related complications trauma, and emergency inflammatory conditions. A review of data from Mozambique during the 1990s, shows extremely low levels of complications and low post-operative mortality for all of the surgical areas (Vaz *et al.* 1999). Moreover, Pereira *et al.* (1996) compared caesarean deliveries' post-operative complication rates and patient hospital stays between operations performed by assistant medical officers and obstetricians. The results from their study showed no significant difference between performance and outcome of high level and mid-level providers. Similar results were reported from northwestern rural Zaire, where there was no significant difference in maternal and neonatal outcomes for caesarean sections performed by nurses and physicians (White *et al.* 1987, Duale 1992). In summary, there is substantial evidence that with appropriate training, obstetric operations can be safely performed by mid-level providers. Delegating obstetric operations to mid-level providers would address the shortages of high-level providers and also their distribution within a country. Rural areas of developing countries are usually the ones with the highest shortage of skilled providers.

This strategy is not without opposition. Lessons from history have demonstrated that medical professionals sometimes feel threatened when less qualified workers manage components of their profession. This is particularly true when the delegation of services is perceived as the creation of competition for health service provision (Hutchinson *et al.* 2001). Although specific tasks may be delegated and re-distributed among lower-level providers during periods of high demand for services, this could create competition if demand reduces and the system is oversupplied with health professionals. However, when there is a workforce shortage, it is imperative that the healthcare services are provided through the utilisation of all available facilities and personnel. Furthermore, evidence presented by Nancarrow and Borthwick (2005) demonstrates that dynamic role boundaries in healthcare service delivery can be beneficial for many professional groups simultaneously when it leads to the expansion of existing roles and the creation of new ones. It is feasible, and necessary, for EmOC services to be delegated to lower level providers while remaining in the best interest of both the professionals and the public.

Financing safe motherhood: vouchers for safe delivery

A voucher scheme is a financing mechanism that delivers a specified service to a population or group identified as a priority by health policymakers. A government, or donor agency, provides funding for a payment organisation/voucher agency that provides the vouchers for potential clients. Redeeming the vouchers with the payment organisation/voucher agency, provides OBA for the provider. OBA voucher schemes can be used to contain costs, improve provider quality, stimulate utilisation of selected services, and target services to high-priority populations. OBA involves making an item of service payment for selected needed interventions. It is a way of reimbursing health care, used successfully in many developed countries. Germany has financed its health care systems with OBA since the 1950s (Janisch and Potts 2005).

In poor villages, the earning potential for midwives is often too low to enable a private practice. In 1997, the National Family Planning Coordinating Board

(BKKBN) and the Ministry of Health in Indonesia launched a project to engage contracted midwives to provide quality services to poor villagers. Targeted performance-based contracts (TPC) compensate private midwives for providing a package of services to the poor, in addition to assisting the village-level health programme with family planning and public health services. District health authorities also provide vouchers for a basic package of mother and child care and family planning services to poor women who are either pregnant or who have children under one year of age. Village leaders and representatives of village organisations distribute these to the women. Coupons are used to purchase services from the contracted midwives. The midwives then present the coupons to the district authorities for reimbursement at rates that are fixed in the contract. Evidence suggests that the pilots have stimulated the use of reproductive health services by those who received the vouchers, and that the distribution of the vouchers has benefited mostly the poor. Client contacts, created by the voucher scheme, have enabled private midwives to establish their practices more quickly as a result of this demand-side intervention (Gorter *et al.* 2003).

OBA was used with great success for family planning services in South Korea and Taiwan (Lin and Huang 1981, Janisch and Potts 2005). It has been used to deliver sexually transmitted infection (STI) treatment, cervical cancer screening, and adolescent reproductive health in Nicaragua (Meuwissen *et al.* 2006). Vouchers have been used for maternal and child health services in rural Yunnan, China (Kelin *et al.* 2001), and a safe delivery voucher scheme has shown great results in Gujarat, India (Bhat *et al.* 2007). Several OBA through voucher schemes initiatives are currently under way in Africa. A project to subsidise maternal health was launched in 2006 in parts of Kenya, with support from Kreditanstalt für Wiederaufbau (KfW), the German Credit Bank (http://www.output-based-aid.net/index_eng.html). In Kenya, an autonomous management agency negotiates the fee to be reimbursed for antenatal care (including diagnosis and treatment of malaria) and safe delivery. Women then buy safe delivery vouchers at a highly subsidised price. They can take the vouchers to a governmental hospital, a faith-based hospital, an accredited private physician, or a certified midwife. In this way, a poor woman can be given the chance for a safe delivery by a trained provider. A similar project is being carried out in Uganda for treatment of STIs (http://www.oba-uganda.net/publish.html).

The advantages of OBA for safe motherhood are numerous. Vouchers can be used to target vulnerable groups, such as rural or slum dwelling women. By giving poor women a choice of provider, vouchers improve the quality of care from the bottom up, rather than from the top down. Subsidies can go both to the public and the private sectors, ensuring existing capacity is used cost-effectively. Once providers establish a consistent cash flow by working hard and offering quality service, they are empowered to make their own decisions about further investments in buildings and equipment. In Kenya, for example, the money generated in public hospitals will stay in the front line facility, rather than being passed to the Ministry of Health (MoH), and local staff will allocate the money according to the needs that they know best. OBA provides quick and clear feedback on success or failure; it is easy to administer; and can be expanded rapidly as resources permit. Over time, it could evolve into a more comprehensive health insurance system. By increasing the income of qualified private providers, OBA has the potential to partially counter the skill drain discussed earlier.

The downside of OBA is possible 'fraud and abuse'. Dishonest providers might claim reimbursement for fictitious patients and/or not provide the required quality of services for the price paid. However, good risk management practices and audit systems can be put in place at a reasonable cost to the programme. In summary, the need and potential benefits justify voucher programmes that could include transportation costs to and from the provider.

Other innovative financing mechanisms that have been piloted are Community Health Funds (CHF) and Community-Based Health Insurance (CBHI) (Sommerfeld *et al.* 2002, Dong *et al.* 2003, Bennet 2004, Musau 2004, Carrin *et al.* 2005, de Allegri *et al.* 2005). Although relatively recent and fewer in number, their aim is to contribute to the performance of the health care financing systems. Careful evaluation of such schemes is imperative to explore how CBHI and the broader health care financing system interact. Available literature suggests, under certain circumstances, CBHI can be an attractive strategy to improve access to health services, quality of health services, and can potentially empower consumers.

Conclusion

In the decades from 2005 to 2015, the number of fertile women will grow by roughly 159 million, and 99% of this increase will occur in low-income countries (UNFPA 2005). Inevitably, the goal of ensuring that every woman receives skilled assistance at birth will take time to achieve (Chen *et al.* 2004). It is not contradictory to advocate for greater resources for safe motherhood while also ensuring that the funds available today are used as cost-effectively as possible. There is nothing insincere about recommending to pregnant women that they deliver in an equipped facility while simultaneously making misoprostol available for use at the household level. It is somewhat disingenuous to insist poor rural women deliver at a facility, when – as is often the case – they cannot afford the fees, have no transportation, live several hours walking distance from the nearest facility, and may not be allowed to travel. While empowerment, economic reform, improvement of roads, and building medical facilities, are good and noble pursuits, they are all expensive long-term strategies. On the other hand, there are inexpensive proven ways to reach women until such time as universal access to skilled assistance at delivery is realised.

It is possible, that more women will die of maternal causes in the coming decade than in any 10 years of human history. If we are serious about maternal health, one of the most pressing questions is, 'How do we help poor women deliver safely'? The answer relies on policymakers and the safe motherhood community, to take bold and innovative steps to reach the poor on a large scale. Such initiatives should include, financing safe delivery, promoting life-saving technologies (such as misoprostol for PPH) to the communities, and demedicalising EmOC. Donors, policymakers, programme planners, and implementation researchers, must review the evidence, and accept the challenge of helping poor women in vulnerable situations, who we know have suffered greatly, and who will continue to suffer unless major changes are made as expeditiously as possible.

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