WOMEN'S AND CHILDREN'S HEALTH KNOWLEDGE HUB

COMPASS

WORKING PAPER

MARCH 2010



Community-based care around the time of childbirth –

what role can it play in maternal and newborn survival in high mortality settings?

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Compass: The Women's and Children's Health Knowledge Hub

DRAFT FOR REVIEW

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The Knowledge Hubs for Health aim to build knowledge, evidence and expertise, as well as inform health policy dialogue relevant to Asia and the Pacific. In 2008, the Australian Agency for International Development (AusAID) established four Knowledge Hubs for health, each addressing different dimensions of the health system: Health Policy and Finance; Health Information Systems; Human Resources for Health; and Women and Children's Health. This responds to the Australian Government scaling up its commitment to improving health, mounting pressure to meet the Millennium Development Goals in this region, and recognition that evidence-informed, pro-poor health policy is crucial to these objectives. By generating knowledge and building a culture of evidence-based policy, the Hubs aim to improve the quality and effectiveness of Australia's investments in health.

Compass: Women's and Children's Health Knowledge Hub

Compass is a partnership between the Centre for International Child Health at University of Melbourne, Menzies School of Health Research and the Centre for International Health at Burnet Institute. The Hub draws on regional expertise to enhance the quality and effectiveness of WCH interventions in the Asia and Pacific regions. Our work focuses on supporting equitable progress towards Millennium Development Goals 4 and 5 – improved maternal and child health and universal access to reproductive health.

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These Working Papers are intended to provoke discussion on important issues in Women's and Children's Health.

As Working Papers, they are intended for periodic update, especially as feedback is received. The title page includes the date of the latest revision. Compass invites and encourages feedback anyone who reads or uses this paper. We are interested in corrections and suggestions for expansion – including any topics that health planners or policy makers would find helpful.

Please contact the lead author with any queries or feedback.

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COMPASS Working Paper:

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March 2010

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Maternal and newborn deaths in difficult settings:

High rates of maternal and newborn mortality persist in many settings in Asia and the Pacific[1,2] – and each death represents not just a family and community tragedy, but is a proxy for many more women and babies who suffer serious, often long-term morbidity. As well as slow progress in general[3], there is a particular difficulty with efforts to reduce maternal and newborn deaths, especially deaths of mothers, in difficult settings. The best guidance from global authorities promotes childbirth care in a health centre with a skilled birth attendant as the best means to reduce mortality[1,4,5]. But for many women in remote and marginalised settings, characterised by high mortality and difficult access to services, **most continue to deliver at home and the rates of either facility-based delivery and/or skilled attendance at delivery show very slow increase**, if any. This is true for many settings[2], including those studied for this paper in Papua New Guinea (PNG), Solomon Islands, Lao PDR and the East Nusa Tenggara (NTT) province of Indonesia.

There is no doubt that **work must continue to increase skilled childbirth care in facilities**. But while this is attempted, there may be additional, complementary strategies that can more quickly lift some of the burden of maternal and newborn deaths from the communities where they are greatest[6,7,8].

To be effective**,** new approaches must address some or all of the **major direct causes of death** in mothers[9]: post-partum haemorrhage, puerperal infection, hypertensive diseases (eclampsia), obstructed labour, unsafe abortion; and of newborn death[10,11]: post-partum infection, intra-partum related newborn deaths*, and complications of preterm birth. At the top of this list are post-partum haemorrhage and infection; there is some evidence to suggest that these two problems, in high-mortality settings, may be direct causes of more than half of deaths of mothers or newborns[11,12,13], while unsafe abortion will vary considerably in importance, depending on local policy and practices.

New approaches must also **act at the right time**: the period of "childbirth"[4]– encompassing labour, delivery and the immediate post-partum period – is when up to half of maternal and newborn deaths, and one third of stillbirths, occur[9,11]. In places where home-births are the norm, this is often because health services find it difficult or impossible to reach women on these days of highest risk.

In summary:

We reviewed recent systematic reviews, high quality modelling studies and new controlled trials reporting on the potential for community-based care to reduce maternal and newborn mortality around the time of childbirth.

We applied this to our analyses of high mortality settings, where most women give birth at home, in Papua New Guinea, Solomon Islands, Lao PDR and Indonesia (NTT).

There are forms of community-based care that are not in place in these settings, including interim measures to meet the immediate crisis in maternal deaths. These include community-based distribution of contraception, community-based prevention of haemorrhage, management of infection, and community newborn care.

Such interventions could be integrated into current efforts to strengthen health services and reduce maternal and newborn deaths by 30% or more. However, they must be introduced in a carefully measured fashion, using a systems approach, to monitor for impact and unforeseen consequences.

* Which used to be termed "birth asphyxia"

The potential of community-based care, learnt from settings like Nepal:

Community-based care is relevant to high-mortality settings because of its potential for rapid scale-up within existing resources, and the imperative to find new ways to reach women. There is strong consensus on the value of community-based care before pregnancy, during the antenatal period, and post-natally. However for health planners there are **critical questions around the concept of community-based care at the time of childbirth**: whether it is effective, whether community providers can provide care safely; and whether investing in community-based care would diminish their other efforts towards increased facility-based childbirth care.

There is recent evidence and **new analysis that can help re-shape thinking for high-mortality settings in the Pacific and south-east Asia**, much of it from studies in South Asia. Nepal is of special interest because: it is ethnically diverse, resource-poor and geographically challenging; it measured high maternal mortality ratios that declined from 539/100,000 live-births in 1996 to 281 in 2006; and has high rates of home birth which although improved are still close to 80%[14]. Nepal has demonstrated the value of community-based care in reducing childhood mortality over many years[15,16], and more recently has successfully trialled a number of community-based approaches effective in reducing maternal and newborn deaths[12,17,18,19].

To prepare this paper we reviewed published and grey literature, focusing on good quality trials, systematic reviews, studies modelling potential impact, and commentary by global health leaders. This highlights the significant body of new work published on this issue since 2008. We interviewed public health researchers and program managers working in Nepal, India and Bangladesh and contacted global experts. To apply our findings, separate analyses were carried out for Papua New Guinea, Solomon Islands, Lao PDR and one province of Indonesia (with high mortality and home birth) by experienced public health practitioners familiar with those settings (annexed).

Community-based care before pregnancy and during the antenatal period:

There are a number of community-based interventions with high impact in mortality reduction for which there is now clear consensus. Among **interventions prior to pregnancy** the priorities are: **education** of young women, **access to family planning**, and prevention and treatment of sexually transmitted infections[4]. Analysis in Nepal[14], Bangladesh[20] and elsewhere[1] clearly identify these two factors as powerful drivers of improved maternal and newborn survival, even when skilled attendance at childbirth remains low, particularly when applied to settings with high maternal mortality and low contraceptive prevalence. There are many examples of **community-based staff distributing contraceptives**, even injectable forms, with successes in remote locations[2,4,21,22], including localised examples of good practice in Solomon Islands and Lao PDR demonstrated in our case studies.

Community antenatal visits can improve maternal and newborn outcomes [21,23] when focused on specific interventions. Some of the most important can be delivered in homes or communities: multi-micronutrient supplements[24] and intermittent malaria treatment, which improve birth-weight; as well as testing and treatment for sexually transmitted infections (including HIV)[4,21] both demonstrated feasible in locations in our case studies in NTT and PNG. **Calcium supplements**, which can reduce hypertension in undernourished mothers, are currently under-used, but easily distributed at community level and may halve the risk of pre-eclampsia, with significant reduction in deaths from this cause[25,26]. There is good evidence that well-supported **birth-preparedness counselling** can change care practices, including promotion of facility-based childbirth[19,27,28,29]. There is less evidence that maternal waiting homes improve outcomes[30], a finding confirmed by our Lao case study and in East Timor [31].

Participatory education and action groups for women before and during pregnancy, when targeted and well facilitated, have reduced newborn deaths and, in some cases maternal deaths, in Nepal[17] Pakistan[27] and elsewhere. They promote both better care in the home, and increases in childbirth in health facilities. These are cost effective[32], can operate in the community and link to other service improvements. Additional effectiveness trials of the approach are underway in India and Bangladesh, however they show significant promise for introduction elsewhere, and are echoed in Indonesia's "Village Alert" (Desa Siaga) program.

The careful analysis of safe motherhood options by Campbell and Graham in 2006[1] identified the top priorities complementing skilled care at childbirth as first, family planning, and second, **reduction in unsafe abortion**. In Bangladesh localised declines in maternal deaths were attributed, in part, to safer abortion and post-abortion care[20,33]. This has been echoed by recent modelling[8], demonstrating significant potential maternal mortality reductions with access to safer abortion (to the levels permitted by law) and post-abortion care. These analyses also show the potential for medical approaches to safe abortion at community level, by appropriately trained staff.

Community-based care at childbirth and in the immediate postnatal period:

There is general agreement that community-based care before childbirth, and community postnatal care of the newborn (discussed below) can reduce deaths. But for childbirth and the immediate post-partum period, **current global advice promotes the ideal** of all women receiving skilled care – with the birth preferably occurring in a health facility with access to emergency care of complications[1,4]. This was backed up with strong definitions of skilled birth attendants (SBAs)[4,3], as health professionals with sufficient midwifery or obstetric training. The seminal Lancet review[1] did acknowledge that implementation may be slow and that "a legitimate question is what to do in the meantime" but argued that attempts to promote alternative interventions for home births would dilute efforts to strengthen health systems with conflicting priorities.

However, recently there has been increasing argument for **practical support during childbirth at home**, even if skilled care, in the full definition, cannot be provided. This is usually promoted **as an interim measure suited for high mortality settings**[6,7,8,35,36,37], and has been spurred by recent evidence regarding the potential to reduce deaths from post-partum haemorrhage or infection. These interventions are not currently deployed in the four sites we analysed, although community misoprostol distribution and postnatal care have been trialled in other parts of Indonesia.

Post-partum haemorrhage

Post-partum haemorrhage (PPH) causes around 30% of maternal deaths[38] and relevant measurements from Nepal in 1998[39], suggest that it may be a greater proportion, perhaps over 45%, in difficult settings such as those we studied. This has made PPH a focus of global effort[40] and there is consensus that **active management of third stage of labour** (AMTSL) can prevent most of these deaths[†]. Properly skilled SBAs should practice AMTSL, but many do not[34] – making this a focus of training. One key element of AMTSL is provision of a uterotonic drug immediately after the baby has delivered. The usual choice is oxytocin[4], which is given by injection and has special storage requirements.

Misoprostol is an alternative to oxytocin. It is heat-stable and can be administered orally or by other means. A number of studies demonstrated misoprostol's potential to treat or prevent PPH and a 2007 Cochrane review collated these and compared it with oxytocin[41]: both are effective in reducing PPH, but oxytocin is superior.

Misoprostol safety has been examined in a 2009 meta-analysis[42], which examined 46 trials of over 40,000 women, finding severe morbidity was rare and similar to placebo. Eight of the included trials

[†] those due to uterine atony – failure of the uterus to contract

recorded 11 deaths, which were slightly more frequent in the misoprostol than placebo group, but not at a level that was statistically significant. This and other studies examining side effects showed that shivering was more common with misoprostol, but that this was acceptable[42,43]. The more relevant comparison is whether misoprostol is better than no AMSTL at all. In a randomised controlled trial in India[44], 1,620 women received misoprostol or placebo, and delivered either at home or in a village sub-centre. There was **close to a 50% reduction in any PPH and an 80% reduction in severe life-threatening PPH**, as measured by auxiliary nurse midwives. Misoprostol is also used as part of medical abortion and there are concerns that misoprostol, taken early in pregnancy, can lead to premature labour and other complications[36]. Such concerns around mis-dosage were specifically studied in the operational field trials described below.

After viewing trials of community provision of misoprostol in Indonesia[45], the Government of Nepal, with USAID support, tested the **feasibility of community-based distribution of misoprostol**[12,46] in a setting with many home births. Female community health volunteers (FCHVs), working under the government health service, visited over 18,000 women in the eighth month of pregnancy and provided counselling (including promotion of facility-based childbirth) and misoprostol – with instructions to take it after the baby was delivered. In 2010[12] they reported good quality baseline and follow-up surveys that showed an **expansion in uterotonic coverage** from 11.6% to 74.2%, the expansion being due to use of misoprostol during home births, with special benefit to women who were poor, illiterate or in remote locations. It is important to note that **facility-based childbirth rates showed a statistically significant increase** (from 10.9 to 14.8%) during this intervention, and facility-based deliveries showed an improvement in AMSTL performance. The observed maternal mortality ratio was 72 per 100,000 live births (compared with the Nepal average of 281 and the district average of 173 – this used robust information systems assumed to be complete, but could not be tested statistically. There was only one recorded mis-dosage (with a good outcome) among 13,969 women and side-effects were acceptable. There are now recommendations for staged scale-up in other sites in the country.

Other community-based initiatives show promise for reduction of deaths from PPH, including the provision of **oxytocin using Uniject** (a simple pre-filled infection device) tested in Indonesia[47] and Mali[40] and expanding training in other aspects of AMTSL, including community-based staff for example among community midwives in Mali[40].

Prevention and treatment of infection

Global data suggests that sepsis causes about 10% of all maternal deaths and 26% of neonatal deaths but this contribution is likely to be significantly higher in high mortality settings where home births are common[13]. This recent review concluded that there were a mix of factors contributing – including poor conditions in the home, and infection as an addition to other complications (such as retained placenta). However many risk factors for mothers related to facility-based childbirth where instrumental or surgical delivery raised the risk of infection.

Community-based care likely to reduce infection includes **clean delivery kits** which may be provided to mothers, or whoever attends a home-birth, along with advice on hygiene at childbirth. The effectiveness of these is debated[48], however there is some evidence from studies in Egypt and Tanzania that they reduce perinatal infection for both mother and baby, although the effect is greatest in reduction of umbilical cord infection in the baby[49,50].

Most programs that trained traditional birth attendants (TBAs)[‡] emphasised clean delivery (often with provision of clean delivery kits) in addition to recognition of complications. A large (and unique) cluster randomised controlled trial of the training and integration of TBAs in Sindh, Pakistan[51], found that women and newborns whose birth was attended by **trained TBAs** were significantly less likely to have post-partum

[‡] Given global trends, most such programs were in the 1990s

infection, with a significant reduction in perinatal mortality that was attributed to reduced infections. There was a trend to lower maternal mortality, but it was not statistically significant.

The use of **antiseptics**, like chlorhexidine, for washing mother or baby is also under investigation – however, while simple, they have not yet convincingly demonstrated high impact[52,53].

One promising approach is the **prevention or treatment of maternal sepsis with antibiotics delivered at community-level**. However no properly structured programmatic trials have yet been reported[13,26] and this is less well-defined as a community intervention package. However advances in treatment of genitourinary infection, including the use of new antibiotics such as azithromycin, and the likelihood that infection plays a major role in high-mortality settings, suggests that this should be tested in future community-based approaches. Recent modelling shows strong potential benefit[21,26,36]. Detection and rapid treatment of newborn infection in the early postnatal period is a mainstay of community-based newborn care (discussed below). This is relevant to maternal sepsis because it demonstrates the capacity of community-based staff to provide injectable antibiotics (for example using the Uniject device)[18].

Other intrapartum care for mother or baby

Perhaps the most difficult area for community-based care to address is that of providing good management of childbirth to **recognise and respond to obstructed labour, eclampsia and the other complications** noted above. The contribution of obstructed labour to maternal deaths varies from 4% to 13%, depending on region, but the contribution is probably lowest where mortality is high[54]. Intrapartum complications are also a major contributor to stillbirths and intrapartum-related newborn deaths[55].

For both mother and baby, this highlights the benefits of **skilled attendance during childbirth** in enabling rapid access to emergency obstetric care (EmOC) if needed. This requires a skilled attendant capable of assessing the progress of labour, possibly using the partogram, and recognising and treating complications such as high blood pressure or convulsions, with referral if needed[4,34]. The work required for the strengthening health system for improved skilled attendance at childbirth in health centres and hospitals is beyond the scope of this paper, however some points are relevant to discussion of community-based care.

Skilled care at birth may be feasible, at a basic level, in the home or community birthing centres. At present the two best-studied examples are in Bangladesh[20,56], and Indonesia[57,58] where community-based SBAs do seem to have increased access to EmOC or contributed to reduced stillbirths and intrapartum-related newborn deaths. There is also a large body of experience in community midwifery[59] for which it is hard to show clear impact using current standards of evidence. Descriptions of the SBA role include their potential to take EmOC into community birthing centres, or even the home[4,21], and this approach forms part of current practice in our cases studies in NTT and Solomon Islands, and of future strategy for PNG[60]. There is a well documented case study of home-based EmOC as part of outreach to difficult settings in Burma[61], but there are few well-researched broad-based program models.

While there is no convincing evidence that **training TBAs** reduces maternal deaths, there is evidence that this can reduce stillbirths, intrapartum-related newborn deaths and some maternal complications[27,51,62]. Apart from improved hygiene noted above, the main component seems to be through better recognition of complications. Thus, one determinant of successful programs[27,51] is the **strength of linkages made with health system** – a feature also seen in limited deployment of TBAs in our case studies in PNG and Laos.

Neonatal resuscitation is one specific childbirth intervention that can be delivered at community level, regardless of where the delivery took place, as long as a trained health worker is in attendance. A landmark study by the doctors Bang in 1999 included training of community volunteers in room-air resuscitation of newborns who fail to commence breathing[63]. This has since been proven as a feasible intervention in a variety of settings and cadres, because simple resuscitation in room air is usually sufficient to establish breathing[64] and it is able to be integrated into community newborn care packages[65] with significant effect. One example is found in the Saving Newborn Lives program in Indonesia, discussed in our case studies. From global evidence, facility-based resuscitation is estimated to reduce intrapartum related newborn deaths by 30%, and community-based resuscitation care by 20%[64].

Community-based care in the post-natal period

High quality evidence for improved survival with community-based postnatal care of the newborn has been evolving over more than a decade. The influential study[63] referred to above also included **community-based recognition and treatment of infection** with referral if possible. This included administration of oral and injected antibiotics. Recent trials in Nepal, as part of the USAID-funded National Family Health Program, include FCHVs providing similar care, but using Uniject for the injected antibiotic, with promising results[18 §].

More studies, from India[66], Bangladesh[67] and Pakistan[27] have demonstrated the power of simple educational interventions, delivered by a variety of cadres, that have proven effective in addressing the main direct causes of postnatal deaths[**] by **promoting changed behaviours in the home**. These include better temperature control (including kangaroo mother care for low birth-weight babies, and delayed bathing where this is a problem), hygiene, early exclusive breast-feeding and recognition of infection with appropriate care-seeking. Both community meetings[17,27] and home visits[67] have proven effective delivery mechanisms. The use of community-based staff to help make the link with health services has been a common theme[27,29] in successful programs.

Examples from a number of countries[27,66,68] and systematic reviews[69] have informed a new guideline from WHO/UNICEF on **home visits for post-natal care**. There is a clear recommendation for home visits to provide preventive and, where feasible, curative care with visits on day one of life for home births, and within the first days for facility births[70,71]. One aspect of early post-natal care that is included in this approach, but rarely discussed, is birth-dose vaccination with hepatitis B vaccine: for which regional strategies target delivery in the first 24 hours of birth[72]. Although this does not contribute to newborn survival, this could be an additional motivation for staff to reach newborns in the early postnatal period and there is one example of community-based delivery of birth-dose vaccination in our PNG case studies.

One concern with community-based postnatal care is whether it will add an unacceptable load to community staff – noting that much of the evidence above comes from programs that trained staff especially to undertake this intervention[68]. One example from Nepal[19] describes the scale-up of a program with an existing cadre of community volunteers (FCHVs) that form part of the government system and, in successful areas, work under and with paid government health staff.

This broad-based program for community-based maternal and newborn care provides a model not just for newborn care, but also for integration with interventions for maternal care.

§ and personal communication from NFHP

** Apart from intra-partum related neonatal mortality dealt with in the preceding section

Conclusion and future work:

An annex to this Working Paper (available from Compass) reviews models for delivery of community-based care, including the types of health worker who may be effective in this, in various settings in Papua New Guinea, Solomon Islands, Lao PDR and NTT, Indonesia. This work is also summarised in a Compass Policy Brief, which also updates some of the conclusions in this paper. In summary, these site analyses found that:

- Community care has powerful potential to prevent or treat some of the direct causes of maternal/newborn death.
- All sites studied need health system strengthening but at least two sites (Papua New Guinea and Lao PDR) may benefit from additional expansion of community-based child-birth and perinatal care.
- A tailored approach to high-mortality sites can provide an alternative where standard approaches fail to provide universal coverage.
- Success is more likely if community-based care is within an established comprehensive primary health care program; synchronises community care with local health system improvements; and leverages post-natal care off other community-based interventions, which in the future may include those for birth-dose vaccination.

In conclusion, we propose that maternal and newborn deaths in intractable settings may be reduced by significant amounts, of the order of 30%, through a "two-track" approach that maximises coverage with new community-based interventions synchronised with other health system strengthening. In some high-mortality settings it may be possible to support safer childbirth and perinatal care in the home, as an interim measure, without compromising parallel efforts to increase facility-based childbirth. Implementation research methods can help trial new models of service delivery, providing immediate benefit across a whole district, as well as better detection of early impact and/or unforeseen adverse outcomes.

Future work

Other related work to be undertaken through Compass in 2011 and 2012 includes:

- Detailed application of global evidence for Family and Community Care in reduction of maternal, newborn and child mortality to the situation in Papua New Guinea, with systems-oriented suggestions for greater integration of this with health systems strengthening – with World Vision and the Burnet Institute;
- Comprehensive review of best practices in birth-dose vaccination, with study of both facility- and community-based service delivery – with Victorian Infectious Diseases Reference Laboratory and the World Health Organization, Vaccines and Biologicals.
- Systematic review of the qualitative evidence for deployment of Uniject™ by trained lay health workers – with the Norwegian Knowledge Centre for the Health Services
- Compass Working Paper on the use of implementation research approaches to trial community-based care at childbirth in high mortality settings.

References:

1. Campbell OM, Graham WJ. Strategies for reducing maternal mortality: getting on with what works. Lancet 2006; 368:1284-99.
2. Singh S, Darroch JE, Ashford LS, Vlassof M. Adding It Up: The Costs and Benefits of Investing in Family Planning and Maternal and Newborn Health. New York: Guttmacher Institute and United Nations Population Fund, 2009.
3. Countdown Coverage Writing Group. Countdown to 2015 for maternal, newborn, and child survival: the 2008 report on tracking coverage of interventions. Lancet 2008; 371: 1247–58
4. World Health Organization. WHO Recommended Interventions for Improving Maternal and Newborn Health. WHO/MPS/07.05 Second Edition, WHO 2009.
5. World Health Organization, Western Pacific Regional Office. Making Pregnancy Safer. Regional Strategy. WPRO WHO, 2005.
6. Costello A, Azad K, Barnett S. An alternative strategy to reduce maternal mortality. Lancet 2006; 368:1477-79.

   See also, published contemporaneously with this paper: Lassi Z., Haider B., and Bhutta Z. Community-Based Intervention Packages for Preventing Maternal Morbidity and Mortality and Improving Neonatal Outcomes, International Initiative for Impact Evaluation, Synthetic Review 005, 2010
7. Christian P, Sommer A, West KP Jr, on behalf of the Nepal Nutrition Intervention Project, Sarlahi, and the JiVitA Bangladesh Project. Reducing maternal mortality where rates are greatest. Lancet 2006; 368:2122-3.
8. Prata N, Sreenivas A, Vahidnia F, Potts M. Saving maternal lives in resource-poor settings: Facing reality. Health Policy 89 (2009) 131–148.
9. Ronsmans C, Graham WJ, on behalf of The Lancet Maternal Survival Series steering group. Maternal mortality: who, when, where, and why. Lancet 2006; 368: 1189–200.
10. Lawn JE, Cousens S, Zupan J, for the Lancet Neonatal Survival Steering Team. 4 million neonatal deaths: When? Where? Why? Lancet 2005; 365: 891–900.
11. Lawn J, Kerber K, Enweronu-Laryea C, Massee Bateman O. Newborn survival in low resource settings—are we delivering? BJOG 2009;116 (Suppl. 1): 49–59
12. Rajbhandari S, Hodgins S, Sanghvi H, McPherson R, Pradhan YV, Baqui AH, and Misoprostol Study Group. Expanding uterotonic protection following childbirth through community-based distribution of misoprostol: Operations research study in Nepal. Int J Gynecol Obstet 2010; 108: 282–288.
13. Seale AC, Mwaniki M, Newton CRJC, Berkley JA. Maternal and early onset neonatal bacterial sepsis: burden and strategies for prevention in sub-Saharan Africa. Lancet Infect Dis 2009; 9: 428–38.
14. Ministry of Health and Population, New ERA, and Macro International Inc Nepal Demographic and Health Survey 2006. MOHP Kathmandu, Nepal. May 2007.
15. Dawson P, Pradhan YV, Houston R, Karki S, Poudel D, Hodgins S. From research to national expansion: 20 years' experience of community-based management of childhood pneumonia in Nepal. Bull World Health Organ 2008; 86: 339–343.
16. Ghimire, M, Pradhan YV, Maskey MK. Community-based interventions for diarrhoeal diseases and acute respiratory infections in Nepal. Bull World Health Organ 2010; 88: 216–221.
17. Manandhar D, Osrin D, Shrestha B, et al. Effect of a participatory intervention with women's groups on birth outcomes in Nepal: cluster-randomised controlled trial. Lancet 2004; 364: 970–79.
18. Nepal Family Health Program. Technical Brief #5 The Morang Innovative Neonatal Intervention. NFHP 2007.
19. Hodgins S, McPherson R, Suvedi BK, Shrestha RB, Silwal RC, Ban B, Neupane S, Baqui AH. Testing a scalable community-based approach to improve maternal and neonatal health in rural Nepal. Journal of Perinatology advance online publication, 12 November 2009; doi:10.1038/jp.2009.181

20. Chowdhury ME, Botlero R, Koblinsky M, Saha SK, Dieltiens G, Ronsmans C. Determinants of reduction in maternal mortality in Matlab, Bangladesh: a 30-year cohort study. Lancet 2007; 370: 1320–28.

21. Bhutta ZA, Ali S, Cousens S, Ali TM, Haider BA, Rizvi A, Okong P, Bhutta SZ, Black RE. Interventions to address maternal, newborn, and child survival: what difference can integrated primary health care strategies make? Lancet 2008; 372: 972–89

22. Huber D, Saeedi N, Samadi AK. Achieving success with family planning in rural Afghanistan. Bull World Health Organ 2010; 88: 227–231.

23. Kidney E, Winter HR, Khan KS, Gulmezoglu KM, Meads CA, Deeks JJ, MacArthur C. Systematic review of effect of community-level interventions to reduce maternal mortality. BMC Pregnancy and Childbirth 2009, 9:2 doi:10.1186/1471-2393-9-2. http://www.biomedcentral.com/1471-2393/9/2 accessed 1 Dec 2009.

See also, published contemporaneously with this paper: Lassi Z., Haider B., and Bhutta Z. Community-Based Intervention Packages for Preventing Maternal Morbidity and Mortality and Improving Neonatal Outcomes, International Initiative for Impact Evaluation, Synthetic Review 005, 2010

24. Shah PS, Ohlsson A, on behalf of the Knowledge Synthesis Group on Determinants of Low Birth Weight and Preterm Births. Effects of prenatal multimicronutrient supplementation on pregnancy outcomes: a meta-analysis. CMAJ 2009; 180(12): E99-E108

25. Hofmeyr GJ, Atallah ÁN, Duley L. Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems. Cochrane Database of Systematic Reviews 2006, Issue 3. Art. No.: CD001059. DOI: 10.1002/14651858.CD001059.pub2.

26. Collin SM, Baggaley RF, Pittrof R, Filippi V. Could a simple antenatal package combining micronutritional supplementation with presumptive treatment of infection prevent maternal deaths in sub-Saharan Africa? BMC Pregnancy and Childbirth 2007, 7:6 doi:10.1186/1471-2393-7-6

27. Bhutta ZA, Memon ZA, Soofi S, Salat MS, Cousens S, Martines J. Implementing community-based perinatal care: results from a pilot study in rural Pakistan. Bull World Health Organ 2008; 86: 452–459.

See also, published contemporaneously with this paper: Lassi Z., Haider B., and Bhutta Z. Community-Based Intervention Packages for Preventing Maternal Morbidity and Mortality and Improving Neonatal Outcomes, International Initiative for Impact Evaluation, Synthetic Review 005, 2010

28. McPherson RA, Khadka N, Moore JM, and Sharma M. Are Birth-preparedness Programmes Effective? Results From a Field Trial in Siraha District, Nepal. J Health Popul Nutr 2006; 24(4): 479-488.

29. Lee ACC, Lawn JE, Cousens S, Kumar V, Osrin D, Bhutta ZA, Wall SN, Nandakumar AK, Syed U, Darmstadt GL. Linking families and facilities for care at birth: What works to avert intrapartum-related deaths? Int J Gynecol Obstet 2009; 107: S65-88.

30. van Lonkhuijzen L, Stekelenburg J, van Roosmalen J. Maternity waiting facilities for improving maternal and neonatal outcome in low-resource countries. Cochrane Database of Systematic Reviews 2009, Issue 3. Art.No.: CD006759. DOI: 10.1002/14651858.CD006759.pub2.

31. Wild, K. (2009). Maternity waiting homes and the shaping of maternal health policy in Timor-Leste. Unpublished PhD thesis. Darwin: Graduate School for Health Practice and Menzies School of Health Research, Charles Darwin University.

32. Borghi J, Thapa B, Osrin D, Jan S, Morrison J, Tamang S, Shrestha BP, Wade A, Manandhar DS, Costello AML. Economic assessment of a women's group intervention to improve birth outcomes in rural Nepal. Lancet 2005; 366: 1882–84

33. Chowdhury ME, Ahmed A, Kalim, N, Koblinsky M. Causes of Maternal Mortality Decline in Matlab, Bangladesh. J Health Popul Nutr 2009; 27(2): 108-123

34. Harvey SA, Blandón YCW, McCaw-Binns A, Sandino I, Urbina L, Rodríguez C, Gómez I, Ayabaca P, Djibrinaf S and the Nicaraguan

maternal and neonatal health quality improvement group. Are skilled birth attendants really skilled? A measurement method, some disturbing results and a potential way forward. Bull World Health Organ 2007; 85: 783–790.

35. Horton R. What will it take to stop maternal deaths? Lancet 2009; 374: 1400-02.

36. Pagel C, Lewycka S, Colbourn T, Mwansambo C, Meguid T, Chiudzu G, Utley M, Costello AML. Estimation of potential effects of improved community-based drug provision, to augment health-facility strengthening, on maternal mortality due to post-partum haemorrhage and sepsis in sub-Saharan Africa: an equity-effectiveness model. Lancet 2009; 374: 1441 - 1448.

See also, published contemporaneously with this paper: Lassi Z., Haider B., and Bhutta Z. Community-Based Intervention Packages for Preventing Maternal Morbidity and Mortality and Improving Neonatal Outcomes, International Initiative for Impact Evaluation, Synthetic Review 005, 2010

37. Darmstadt GL, Lee AC, Cousens S, Sibley L, Bhutta ZA, Donnay F, Osrin D, Bang A, Kumar V, Wall SN, Baqui A, Lawn JE. 60 million non-facility births: Who can deliver in community settings to reduce intrapartum-related deaths? Int J Gynecol Obstet 2009; 107: S89–S112.

See also, published contemporaneously with this paper: Lassi Z., Haider B., and Bhutta Z. Community-Based Intervention Packages for Preventing Maternal Morbidity and Mortality and Improving Neonatal Outcomes, International Initiative for Impact Evaluation, Synthetic Review 005, 2010

38. World Health Organization. Maternal Mortality in 2005. Geneva: World Health Organization, 2007

See also, published contemporaneously with this paper: Lassi Z., Haider B., and Bhutta Z. Community-Based Intervention Packages for Preventing Maternal Morbidity and Mortality and Improving Neonatal Outcomes, International Initiative for Impact Evaluation, Synthetic Review 005, 2010

39. Pathak LR. Maternal Mortality and Morbidity Study, Family Health Division, Department of Health Services, Ministry of Health and Population, Kathmandu, Government of Nepal. 1998.

40. Program for Appropriate Technology in Health. Prevention of Postpartum Hemorrhage Initiative. Tackling the Biggest Maternal Killer: How the Prevention of Postpartum Hemorrhage Initiative Strengthened Efforts Around the World. Washington, DC: PATH; 2009.

41. Gulmezoglu AM, Forna F, Villar J, Hofmeyr GJ. Prostaglandins for preventing postpartum haemorrhage. Cochrane Database of Systematic Reviews 2007, Issue 3. Art. No.: CD000494. DOI: 10.1002/14651858.CD000494.pub3.

42. Hofmeyr GJ, Gulmezoglu AM, Novikova N, Linder V, Ferreira S, Piaggio G. Misoprostol to prevent and treat postpartum haemorrhage: a systematic review and meta-analysis of maternal deaths and dose-related effects. Bull World Health Organ 2009; 87: 666–677.

43. Prata N, Mbaruku G, Grossman AA, Holston M, Hsieh K. Community-Based Availability of Misoprostol: Is It Safe? Afr J Reprod Health 2009; 13[2]:117-128

44. Derman RJ, Kodkany BS, Goudar SS, Geller SE, Naik VA, Bellad MB, et al. Oral misoprostol in preventing postpartum haemorrhage in resource-poor communities: a randomised controlled trial. Lancet 2006;368:1248-53.

45. Sanghvi H, Wiknjosastro G, Chanpong G, Fishel J, Ahmed S, Zulkarnain M. Prevention of postpartum hemorrhage study, West Java, Indonesia. Baltimore, JHPIEGO/Johns Hopkins University; 2004.

46. Rajbhandari S, Pun A, Hodgins S, Rajendra PK. Prevention of postpartum haemorrhage at homebirth with use of misoprostol in Banke District, Nepal. Int J Gyn Obs 2006; 94: S143---S144

47. Tsu VD, Sutantob A, Vaidyac K, Coffeya P, Widjayad A. Oxytocin in prefilled Uniject injection devices for managing third-stage labor in Indonesia. Int J Gyn Obs 2003; 83: 103–111.

48. Maine D. Detours and shortcuts on the road to maternal mortality reduction. Lancet 2007; 370: 1380–82.

49. Winani S, Wood S, Coffey P, Chirwa T, Mosha F, Changalucha J. Use of a clean delivery kit and factors associated with cord infection and puerperal sepsis in Mwanza, Tanzania. J Midwifery Womens Health 2007;52:37-43

50. Darmstadt GL, Hassan M, Balsara ZP, Winch PJ, Gipson R, Santosham M. Impact of Clean Delivery-kit use on Newborn Umbilical Cord and Maternal Puerperal Infections in Egypt. J Health Popul Nutr 2009; 27(6): 746-754.

51. Jokhio AH, Winter HR, Cheng KK. An intervention involving traditional birth attendants and perinatal and maternal mortality in Pakistan. N Engl J Med 2005; 352(20): 2091–9.

52. Cutland CL, Madhi SA, Zell ER, et al, and the PoPS Trial Team. Chlorhexidine maternal-vaginal and neonate body wipes in sepsis and vertical transmission of pathogenic bacteria in South Africa: a randomised, controlled trial. Lancet 2009; published online Oct 20. DOI:10.1016/S0140-6736(09)61339-8

53. Mullany LC, Biggar RJ. Vaginal and neonatal skin cleansing with chlorhexidine. Lancet 2009; Published Online Oct 20, 2009. DOI:10.1016/S0140 6736(09)61593-2.

54. UNICEF. State of the World's Children 2009. New York: UNICEF; 2009.

55. Lawn JE, Lee AC, Kinney M, Sibley I, Carlo WA, Paul VK, et al. Two million intrapartum stillbirths and neonatal deaths: where, why, and what can we do? Int J Gynecol Obstet 2009; 107: S5–S19.

56. Ronsmans C, Chowdhury ME, Alam N, Koblinsky M, El AS. Trends in stillbirths, early and late neonatal mortality in rural Bangladesh: the role of public health interventions. Paediatr Perinat Epidemiol 2008; 22(3): 269–79.

57. Shankar A, Sebayang S, Guarenti L, Utomo B, Islam M, Fauveau V, et al. The village based midwife programme in Indonesia. Lancet 2008; 371 (9620):1226–9.

58. Ronsmans C, Scott S, Qomariyah SN, Achadi E, Braunholtz D, Marshall T, Pambudi E, Witten KH Graham WJ. Professional assistance during birth and maternal mortality in two Indonesian districts. Bull World Health Organ 2009;87:416–423.

59. Pettersson KO, Sherratt D, Moyo N. Midwifery In The Community: Lessons Learned. 1st International Forum on Midwifery in the Community December 2006 Tunisia. UNFPA, ICM, WHO in collaboration with SIDA (Sweden), IMMPACT & FCI. 2007.

60. National Department of Health. Ministerial Taskforce on Maternal Health in Papua New Guinea Report. NDOH May 2009.

61. Mullany LC, Lee CI, Paw P, Oo EKS, Maung C, Kuiper H, Mansenior N, Beyrer C, Lee TJ. The MOM Project: Delivering Maternal Health Services among Internally Displaced Populations in Eastern Burma. Reproductive Health Matters 2008;16(31):44–56.

62. Sibley LM, Sipe TA, Brown CM, Diallo MM, McNatt K, Habarta N. Traditional birth attendant training for improving health behaviours and pregnancy outcomes. Cochrane Database of Systematic Reviews 2007, Issue 3. Art. No.: CD005460. DOI: 10.1002/14651858.CD005460.pub2.

63. Bang AT, Bang RA, Baitule SB, Reddy MH, Deshmukh MD. Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. Lancet 1999; 354: 1955–61.

64. Wall SN, Lee AC, Niermeyer S, English M, Carlo W, Bang A, et al. Neonatal resuscitation in low resource settings: What, who, and how to overcome challenges to scale up? Int J Gynecol Obstet 2009;107:S47–S64.

65. Haws RA, Thomas AL, Bhutta ZA, Darmstadt GL. Impact of packaged interventions on neonatal health: a review of the evidence. Health Policy Plan 2007; 22: 193–215

66. Kumar V, Mohanty S, Kumar A, Misra RP, Santosham M, Awasthi S, et al. Effect of community-based behaviour change management on neonatal mortality in Shivgarh, Uttar Pradesh, India: a cluster-randomised controlled trial. Lancet 2008; 372: 1151–62.

67. Baqui AH, El-Arifeen S, Darmstadt GL, Ahmed S, Williams EK, Seraji HR, et al. Effect of community-based newborn-care intervention package implemented through two service-delivery strategies in Sylhet district,

Bangladesh: a cluster randomised controlled trial. Lancet 2008; 371: 1936–44.

68. Bhutta ZA, Sufi S. Community-based newborn care: are we there yet? Lancet 2008; 372: 1124-6.

69. Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L, for the Lancet Neonatal Survival Steering Team. Evidence-based, cost-effective interventions: how many newborn babies can we save? Lancet 2005; 365: 977–88.

70. WHO/UNICEF Joint Statement. Home visits for the newborn. WHO/FCH/CAH/09.02 WHO and UNICEF 2009.

71. Gogia S., Sachdev H. Home visits by community health workers to prevent neonatal deaths in developing countries: a systematic review. Bull World Health Organ 2010; 88: 658–666B

72. Rani M, Yang B, Nesbit R. Hepatitis B control by 2012 in the WHO Western Pacific Region: rationale and implications. Bull World Health Organ 2009; 87:707–713.

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A strategic partnerships initiative funded by the Australian Agency for International Development

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