

## Helpdesk Report: Selective vs. integrated support for maternal and newborn health

Date: 7 September 2012

**Query:** Please provide a literature summary review of the evidence for interventions to reduce maternal and newborn mortality, including evidence of the impact of selective interventions such as training and equipment provision and the extent to which context is influential. Include cost benefit findings where relevant. Compare the strength of the evidence for selective versus comprehensive approaches.

### Content

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### 1. Overview

Many of the papers in this report identify key interventions which are then recommended to be delivered using an integrated or continuum of care approach. World Vision (2008) emphasise the need for attention to the local situation when implementing interventions and note the limitations of vertical programmes in addressing co-morbidities.

Bhutta et al (2008) find that inclusion of evidence-based interventions in primary healthcare in Pakistan and Uganda could prevent 20-30% of all maternal deaths and 20-21% of newborn deaths. Evjen-Olsen et al (2009) suggest an integrated and comprehensive hospital/community based health programme to reduce maternal and child mortality, drawing on experience in Tanzania.

Ekman et al (2008) find experiences from countries such as Iran, Malaysia, Sri Lanka, and China, and from projects in countries like Tanzania and India, show that outcomes in maternal, newborn, and child health can be improved through integrated packages of cost-effective health-care interventions that are implemented incrementally in accordance with the capacity of health systems.

Rahman (2011) evaluate the effect of packaged interventions given in pregnancy, delivery and post-partum periods through integration of community- and facility-based services on perinatal mortality in Bangladesh. Data from a health and demographic surveillance system found the odds of perinatal mortality decreased by 36% between the pre- and post-

intervention periods. The reduction in the intervention area was also significant relative to the reduction in the comparison area.

Paxton et al (2005) find 'strong evidence' based on studies, using quasi-experimental, observational and ecological designs, to support the contention that emergency obstetric care (EmOC) must be a critical component of any program to reduce maternal mortality. However, Campbell et al (2006) find no large-scale robust evidence to show that adequate provision solely of an EmOC package, with or without a strategy to remove barriers, could produce a substantial decline in maternal mortality. They recommend a health centre intrapartum-care strategy that incorporates EmOC.

von Lonkhuijzen et al (2010) conclude that training programmes may improve quality of care but that strong evidence is lacking. Koblinsky et al (2006) suggest that approaches focusing on individual health workers need to be complemented by efforts to strengthen overall management capacity.

Dudley & Garner (2011) find few studies of good quality, size and with rigorous study design have been carried out to investigate strategies to promote service integration in low and middle income countries. All describe the service supply side, and none examine or measure aspects of the demand side. They recommend future studies to assess the client's view, as this will influence uptake of integration strategies and their effectiveness on community health.

Other reviews question the strength of evidence. World Vision (2008) state that better information is critical and that major data gaps on maternal mortality is symptomatic of widespread weaknesses in routine health information systems. Haws et al (2007) conclude that the evidence base for the impact of neonatal health intervention packages is a weak foundation for guiding effective implementation of public health programmes addressing neonatal health.

Lassi et al (2010) find encouraging evidence on community-based interventions whilst Bhutta et al (2005) found a paucity of community-based data.

### **Cost effectiveness**

Adams et al (2005) use effectiveness data from trials, observational studies and expert opinion to find the most cost effective mix of interventions for countries in Africa and SE Asia with high mortality rates. These were:

- The community-based newborn care package, followed by antenatal care (tetanus toxoid, screening for pre-eclampsia, screening and treatment of asymptomatic bacteriuria and syphilis)
- Skilled attendance at birth, offering first level maternal and neonatal care around childbirth
- Emergency obstetric and neonatal care around and after birth

Scaling up all of the included interventions to 95% coverage would halve neonatal and maternal deaths.

Darmstadt et al (2005) identify 16 interventions with proven efficacy (implementation under ideal conditions) for neonatal survival and combine them into packages for scaling up in health systems, according to three service delivery modes (outreach, family-community, and facility-based clinical care). All the packages of care are cost effective compared with single interventions.

## **2. Evidence of the impact of selective interventions**

## **A systematic review of the effectiveness of training in emergency obstetric care in low-resource environments**

van Lonkhuijzen L et al, 2010, BJOG (117)

<http://onlinelibrary.wiley.com/doi/10.1111/j.1471-0528.2010.02561.x/pdf>

**Background:** Training of healthcare workers can play an important role in improving quality of care, and reducing maternal and perinatal mortality and morbidity.

**Objectives:** To assess the effectiveness of training programmes aimed at improving emergency obstetric care in low-resource environments.

**Search strategy:** The authors searched Pubmed, Embase, Popline and selected websites, and manually searched bibliographies of selected articles. Language was not an exclusion criterion.

**Selection criteria:** All papers describing postgraduate training programmes aimed at improving emergency obstetric care in low-resource environments were included.

**Data collection and analysis:** Two reviewers independently extracted the data and classified these according to the level of the measured effects (reaction of participants, improved knowledge and skills, changes in behaviour and outcomes in practice). Any disagreements were resolved by discussion with a third author until agreement was reached.

**Main results:** A total of 38 papers were selected. Training programmes vary considerably in length, content and design. The evaluation of effects is often hampered by inadequate study design and the use of non-validated measuring instruments. Most papers describe positive reactions, increased knowledge and skills, and improved behaviour after training. Outcome is assessed less frequently, and positive effects are not always demonstrated. Measures that can contribute to a positive effect of training programmes include hands-on practise, team approaches and follow-up on training efforts.

**Author's conclusions:** Training programmes may improve quality of care, but strong evidence is lacking. Policymakers need to include evaluation and reporting of effects in project budgets for new training programmes.

## **Going to scale with professional skilled care**

Koblinsky M et al (Lancet Maternal Survival Series steering group), 2006, Lancet (368)

[http://ac.els-cdn.com/S0140673606693823/1-s2.0-S0140673606693823-](http://ac.els-cdn.com/S0140673606693823/1-s2.0-S0140673606693823-main.pdf?_tid=61c58184-f383-11e1-9d29-00000aab0f6c&acdnat=1346428320_4ed5ed3ee55eba519b36aadde7a64c87)

[main.pdf?\\_tid=61c58184-f383-11e1-9d29-](http://ac.els-cdn.com/S0140673606693823/1-s2.0-S0140673606693823-main.pdf?_tid=61c58184-f383-11e1-9d29-00000aab0f6c&acdnat=1346428320_4ed5ed3ee55eba519b36aadde7a64c87)

[00000aab0f6c&acdnat=1346428320\\_4ed5ed3ee55eba519b36aadde7a64c87](http://ac.els-cdn.com/S0140673606693823/1-s2.0-S0140673606693823-main.pdf?_tid=61c58184-f383-11e1-9d29-00000aab0f6c&acdnat=1346428320_4ed5ed3ee55eba519b36aadde7a64c87)

The authors state that most women prefer professionally provided maternity care when they have access to it, and that needed clinical interventions are well known. In light of this, they discuss what is needed to move forward from apparent global stagnation in provision and use of maternal health care where maternal mortality is high. The main obstacles to the expansion of care are the dire scarcity of skilled providers and health-system infrastructure, substandard quality of care, and women's reluctance to use maternity care where there are high costs and poorly attuned services. To increase the supply of professional skilled birthing care, strategic decisions must be made in three areas: training, deployment, and retention of health workers. Based on results from simulations, teams of midwives and midwife assistants working in facilities could increase coverage of maternity care by up to 40% by 2015. Teams of providers are the efficient option, creating the possibility of scaling up as much as 10 times more quickly than would be the case with deployment of solo health workers in home deliveries with dedicated or multipurpose workers.

## **Scaling up quality of care**

### **Little evidence**

The scarcity of evidence for how to scale up quality maternal services belies the complexity of the underlying issues. Individual providers are the heart of quality, and their performance can be said to be determined by their competence, motivation, and the resources available. Beyond the individual health-worker level, an adequate management capacity is needed to

ensure correct coordination and organisation of services, including supplies, training, and communications. Local health systems do not operate in a vacuum.

Overall health system attributes affect how managers and health workers behave (salary scales, supplies, etc). To deal with this complex and layered performance issue, approaches focusing on individual health workers need to be complemented by efforts to strengthen overall management capacity. Scaling up quality management requires context-sensitive responses. In view of the time-specific and place-specific configurations of the previously described elements, a blueprint approach is not desirable. Instead, what should be scaled up is a commitment to facilitating responsive management and organisation of services.

### **The starting point: tackling medical education**

Basic training of health workers needs to instil the essential competences, skills, and attitudes adapted to changing field realities. More investments are needed in the training system, including its staff, to ensure a thorough socialisation process. A responsive health workforce can be built on a horizontal cross-professional training to which modules are added in function of required mixes of competences and capped by validation of graduates through a transparent process.

### **What can in-service training do?**

Once in service, continuing medical education on the basis of didactic approaches might have little effect: knowledge is essential, but in itself is insufficient to induce change in practitioner behaviour. By contrast, provision of active learning opportunities (case discussions, hands-on practice sessions, and interactive workshops), with longitudinal, sequential programming (learn–work–learn) and provision of patient education material, flow charts, and clinical guidelines are effective. Assessment of learning needs and demands, interaction between physician-learners, and opportunities to practise what has been learned are essential. Continuing medical education could be linked to regular certification and accreditation of providers to ensure maintenance of competencies and accountability. Computer-assisted learning packages and distance learning show mixed results and might be difficult to sustain.

### **Improvement of management approaches**

Less evidence exists for the improvement of organisational and management capacity, and virtually none is available for techniques such as clinical audits. The public release of hospital performance data seems to be associated with an improvement in health outcomes, mainly owing to hospital responsiveness, but no evidence exists for developing countries. By contrast, supportive supervision has at least short-term effects on performance and might be appreciated by staff as a sign of organisational support, and increase their motivation. To ensure good staff motivation, managers should also ensure correct remuneration and adequate working conditions. Besides these approaches, health service managers can develop strategies that aim to increase staff involvement and commitment.

### **Working on the larger picture**

The larger institutional arrangements (legislation and norms), which guide the health sector, also have a role. These factors affect the decision spaces of managers, and can directly affect the practice of health workers at the operational level.

## **3. Key and packaged interventions**

### **Impact of packaged interventions on neonatal health: a review of the evidence**

Haws RA et al, 2007, Health Policy and Planning (22)

<http://heapol.oxfordjournals.org/content/22/4/193.full.pdf+html>

A disproportionate burden of infant and under-five childhood mortality occurs during the neonatal period, usually within a few days of birth and against a backdrop of socio-economic deprivation in developing countries. To guide programmes aimed at averting these 4 million annual deaths, recent reviews have evaluated the efficacy and cost-effectiveness of individual interventions during the antenatal, intrapartum and postnatal periods in reducing neonatal mortality, and packages of interventions have been proposed for wide-scale implementation. However, no systematic review of the empirical data on packages of interventions, including consideration of community-based intervention packages, has yet been performed.

To address this gap, the authors reviewed peer-reviewed journals and grey literature to evaluate the content, impact, efficacy (implementation under ideal circumstances), effectiveness (implementation within health systems), type of provider, and cost of packages of interventions reporting neonatal health outcomes. Studies employing more than one biologically plausible neonatal health intervention (i.e. package) and reporting neonatal morbidity or mortality outcomes were included. Studies were ordered by study design and mortality stratum, and their component interventions classified by time period of delivery and service delivery mode.

41 studies were found that implemented packages of interventions and reported neonatal health outcomes, including 19 randomised controlled trials. True effectiveness trials conducted at scale in health systems were completely lacking. No study targeted women prior to conception, antenatal interventions were largely micronutrient supplementation studies, and intrapartum interventions were limited principally to clean delivery. Few studies approximated complete packages recommended in The Lancet's Neonatal Survival Series. Interventions appeared largely bundled out of convenience or funding requirements, rather than based on anticipated synergistic effects, like service delivery mode or cost-effectiveness. Only two studies reported cost-effectiveness data.

The evidence base for the impact of neonatal health intervention packages is a weak foundation for guiding effective implementation of public health programmes addressing neonatal health. Significant investment in effectiveness trials carefully tailored to local health needs and conducted at scale in developing countries is required.

**Reducing maternal, newborn and child deaths in the Asia Pacific. Strategies that work**  
World Vision, 2008

<http://wvasiapacific.org/downloads/publications/StrategiesThatWork.pdf>

This paper summarises the interventions that have been proven to be effective in reducing maternal, newborn and child deaths in developing countries. Eight case studies of low cost projects that have resulted in significant (and sometimes huge) improvements in maternal, newborn and child health in our region are also presented. These case studies cover a range of regional countries and strategies, and show how evidence based interventions can be practically applied. The case studies show that significant improvements are possible in a wide range of social and economic environments and at low cost.

The evidence is clear that an effective continuum of care using existing low cost interventions will prevent a majority of all the current maternal and child deaths. However, these proven and cost effective interventions are often not implemented or are implemented with insufficient attention to the local situation. For example, the provision of well equipped district comprehensive emergency obstetric units will not make much difference if mothers do not have effective transport to these services or if there are financial or other impediments to their attendance. Therefore the development of effective health services on the ground requires not just effective clinical strategies but approaches which also take account of the local

situation and which local people accept. This cannot be achieved without the active engagement of civil society.

The case studies in this report show the wide range of interventions required and also the sort of work with communities that is required to build acceptability, as well as demand for and use of services and practices. Often this requires challenging existing disadvantage, such as that suffered by the poor who often have less access to services and knowledge, and women who may enter pregnancy in sub-optimal health as a result of gender-based disadvantage.

In order to effectively implement the continuum of care, a basic foundation of effective health systems at the community and district level to provide health information and services is needed. This requires effective management and targeting, sufficient trained staff, adequate infrastructure and supplies, and effective monitoring of need and services. It also requires countries and donors to increase support for health systems. Countdown to 2015 found significant health system deficiencies in the 68 priority countries they review (Countdown to 2015 2008 *Tracking Progress in Maternal, Newborn and Child Survival: the 2008 report*). For example, 54 countries (80%) did not have the 2.5 health care professionals (doctors, nurses and midwives) per 1,000 population deemed the threshold for adequate coverage of maternal and child health interventions.

Programmes which focus on one disease (vertical programs) are also limited in their capacity to address co-morbidities, or to meet multiple needs during the same encounter as is possible with combined programs or packages delivered through an effective basic health service. These opportunity costs are exacerbated by decentralisation of health services, a trend that is common to much of the Asia Pacific region. There needs to be better integration of vertical program funding and the expansion of health systems.

Better information is also critical. The major data gaps on maternal mortality not only make it impossible to track progress on MDG 5, but are symptomatic of widespread weaknesses in routine health information systems. Graham et al have suggested relatively cheap, innovative mechanisms to measure maternal mortality in various settings, but they emphasise the need to invest in strengthening of reporting systems. They conclude: 'Ownership of information is necessary for it to be acted upon: *what you count is what you do.*' (Graham W et al 2008 "Measuring maternal mortality: An overview of opportunities and options for developing countries" *BMC Medicine*, 6:12 doi:10.1186/1741-7015-6-12.)

### **Effectiveness of an integrated approach to reduce perinatal mortality: recent experiences from Matlab, Bangladesh**

Rahman A, 2011, BMC Public Health (11)

<http://www.biomedcentral.com/1471-2458/11/914/>

Improving perinatal health is the key to achieving the Millennium Development Goal for child survival. Recently, several reviews suggest that scaling up available effective perinatal interventions in an integrated approach can substantially reduce the stillbirth and neonatal death rates worldwide. This research evaluated the effect of packaged interventions given in pregnancy, delivery and post-partum periods through integration of community- and facility-based services on perinatal mortality.

This study took advantage of an ongoing health and demographic surveillance system (HDSS) and a new Maternal, Neonatal and Child Health (MNCH) Project initiated in 2007 in Matlab, Bangladesh in half (intervention area) of the HDSS area. In the other half, women received usual care through the government health system (comparison area). The MNCH Project strengthened ongoing maternal and child health services as well as added new services. The intervention followed a continuum of care model for pregnancy, intrapartum,

and post-natal periods by improving established links between community- and facility-based services. With a separate pre-post samples design, the perinatal mortality rates between two periods--before (2005-2006) and after (2008-2009) implementation of MNCH interventions were compared. The difference-of-differences in perinatal mortality between intervention and comparison areas were evaluated.

Antenatal coverage, facility delivery and cesarean section rates were significantly higher in the post- intervention period in comparison with the period before intervention. In the intervention area, the odds of perinatal mortality decreased by 36% between the pre-intervention and post-intervention periods (odds ratio: 0.64; 95% confidence intervals: 0.52-0.78). The reduction in the intervention area was also significant relative to the reduction in the comparison area (OR 0.73, 95% CI: 0.56-0.95;  $P = 0.018$ ).

The continuum of care approach provided through the integration of service delivery modes decreased the perinatal mortality rate within a short period of time. Further testing of this model is warranted within the government health system in Bangladesh and other low-income countries.

### **Strategies for reducing maternal mortality: getting on with what works**

Campbell OM & Graham WJ (Lancet Maternal Survival Series steering group), 2006, Lancet (368)

[http://ac.els-cdn.com/S0140673606693811/1-s2.0-S0140673606693811-main.pdf?\\_tid=08eb3a74-f35e-11e1-a930-00000aab0f01&acdnat=1346412280\\_9332db1eb654882c3fc40e9f4369eaa9](http://ac.els-cdn.com/S0140673606693811/1-s2.0-S0140673606693811-main.pdf?_tid=08eb3a74-f35e-11e1-a930-00000aab0f01&acdnat=1346412280_9332db1eb654882c3fc40e9f4369eaa9)

The concept of knowing what works in terms of reducing maternal mortality is complicated by a huge diversity of country contexts and of determinants of maternal health. Here we aim to show that, despite this complexity, only a few strategic choices need to be made to reduce maternal mortality. This article presents the logic that informs our strategic choices. This logic suggests that implementation of an effective intrapartum-care strategy is an overwhelming priority. We also discuss the alternative configurations of such a strategy and, using the best available evidence, prioritise one strategy based on delivery in primary-level institutions (health centres), backed up by access to referral-level facilities. We then go on to discuss strategies that complement intrapartum care. We conclude by discussing the inexplicable hesitation in decision-making after nearly 20 years of safe motherhood programming: if MDG 5 is to be achieved, then what needs to be prioritised is obvious. Further delays in getting on with what works begs questions about the commitment of decision-makers to this goal.

An early review of options for reduction of maternal mortality argued cogently for assurance that sufficient emergency obstetric care was available—both at the health centre (basic emergency obstetric care) and the referral hospital (comprehensive emergency obstetric care)—to treat the complications that cause most maternal deaths. Targeting of women with complications while making no particular provision for routine intrapartum care has been widely termed the emergency-obstetric-care strategy. We agree that emergency care is an essential requirement for reduction of a substantial proportion of maternal mortality and our recommended health centre intrapartum-care strategy incorporates it.

Ensuring a ready supply of the emergency-obstetric care package requires that health centres and hospitals are equipped to deal with the emergencies that reach them, and that timely care is not hindered by the need to pay in advance for lifesaving treatments, or to purchase essential supplies and drugs from outside the facility, or organise blood donations. All intrapartum strategies have these requirements. However, the success of emergency obstetric care alone is also dependent on a means of distribution to ensure that its target—women with complications, particularly rapidly fatal intrapartum complications—can access such care, ideally within a couple of hours. This means overcoming delays in recognition of

complications (the so-called first delay) and in gaining timely access to appropriate emergency obstetric care facilities (the second delay).

Efforts to support an emergency obstetric-care strategy have mostly focused on raising families' awareness of danger signs with information, education, and communication, and on instituting birth preparedness. Assessments of information, education, and communication interventions suggest that this approach is not particularly effective at reducing delays, partly because danger-sign messages are complex. Trained traditional birth attendants can effect better referral, and skilled attendants in the home are assumed to recognise complications and act on them quickly. We are unaware of any robust assessments of the effect of birth-preparedness packages implemented on a large scale. Other efforts have sought to improve transport, including through community mobilisation, but these are usually small in scale and have not been rigorously assessed.

No large-scale robust evidence is available to show that adequate provision solely of an emergency obstetric care package, with or without a strategy to remove barriers, can produce a substantial decline in maternal mortality. Capacity to provide adequate and timely emergency obstetric care is, however, the minimum standard a health system is ethically obliged to provide to begin to address maternal mortality.

#### **The evidence for emergency obstetric care**

Paxton A et al, 2005, International Journal of Gynecology and Obstetrics (88)

<http://www.amddprogram.org/v1/resources/Paxton%20et%20al-%20Evidence%20for%20EmOC-%20IJGO%20Feb%202005.pdf>

The authors searched for evidence for the effectiveness of emergency obstetric care (EmOC) interventions in reducing maternal mortality primarily in developing countries. Population-based studies were reviewed with maternal mortality as the outcome variable, these were ranked according to the system for ranking the quality of evidence and strength of recommendations developed by the US Preventive Services Task Force. A systematic search of published literature was conducted for this review, including searches of Medline, PubMed, Cochrane Database of Systematic Reviews, the Cochrane Pregnancy and Childbirth Database and the Cochrane Controlled Trials Register.

The strength of the evidence is high in several studies with a design that places them in the second and third tier in the quality of evidence ranking system. No studies were found that are experimental in design that would give them a top ranking, due to the measurement challenges associated with maternal mortality, although many of the specific individual clinical interventions that comprise EmOC have been evaluated through experimental design. There is strong evidence based on studies, using quasi-experimental, observational and ecological designs, to support the contention that EmOC must be a critical component of any program to reduce maternal mortality.

#### **Review of global literature on maternal health interventions and outcomes related to skilled birth attendance**

Canavan A, 2009, KIT Working Papers Series H3

[http://www.kit.nl/net/KIT\\_Publicaties\\_output/ShowFile2.aspx?e=1552](http://www.kit.nl/net/KIT_Publicaties_output/ShowFile2.aspx?e=1552)

In a systematic review of strategies adopted to reduce maternal mortality; using grey literature sources and published reviews, Campbell et al (Campbell, O. Graham, W. *Strategies for reducing maternal mortality; getting on with what works*. Lancet (2006) 368, 1284-99) suggests a series of key messages extrapolated from the collective findings:

- No single intervention (e.g. drug treatments, health education) alone will reduce the rate of maternal mortality

- Strategies will work if the component packages are effective with high coverage of the target group
- Epidemiology of maternal mortality requires prioritization of the intrapartum period. This finding is further substantiated in the literature whereby health centre intrapartum care is advocated as a promising strategy by researchers<sup>53</sup>.

Further opportunities to avert maternal deaths will arise during the ante-natal care, post partum care, family planning and safe abortion. This affirms the need for a continuum of care approach which addresses the reproductive life cycle and not only pregnancy.

Essentially, this review concludes that a *comprehensive package of services* is required with a *continuum of care approach* from birth preparedness including ANC to delivery interventions and post partum care. Intrapartum care is identified as the most critical phase when complications can occur and can only be managed by qualified health professionals (here known as the cadre of SBAs).

### **Reducing Maternal Mortality: Strengthening the World Bank Response**

World Bank, 2009

<http://siteresources.worldbank.org/INTPRH/Resources/376374-1278599377733/MaternalHealth62910PRINT.pdf>

Health experts agree that the interventions needed to avert much of the burden of maternal and perinatal death and disability are known. However, it has become increasingly clear that the success of these interventions depends on the capacity of the health system in the country to deliver quality care as well as factors in other sectors such as girls' education, good roads, and available transport for emergencies. A review of key supply- and demand-side determinants of persistent high maternal mortality highlights the importance of health systems capacity to deliver these key interventions effectively at the community level, while ensuring that women seek care when they most need it.

Of the 60 countries with high maternal mortality, during the period from July 1, 1997, to June 30, 2008, the Bank financed 104 health projects with population and reproductive components in 44 countries, to the tune of US\$ 4.7 billion. In order that monitoring and evaluation (M&E) of World Bank maternal health projects be effective, appropriate indicators must be selected, realistic targets must be set, and both baseline and end-of-project data must be collected. All these are necessary in order to measure and evaluate the achievement of project objectives. Moreover, there are several strategies in which the Bank could take a leadership role, given its global presence and financial resources. These are described in detail in this paper.

### **Integrating health interventions for women, newborn babies, and children: a framework for action**

Ekman B et al, 2008, The Lancet (372)

[http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(08\)61408-7/fulltext#article\\_upsell](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(08)61408-7/fulltext#article_upsell)

For women and children, especially those who are poor and disadvantaged, to benefit from primary health care, they need to access and use cost-effective interventions for maternal, newborn, and child health. The challenge facing weak health systems is how to deliver such packages. Experiences from countries such as Iran, Malaysia, Sri Lanka, and China, and from projects in countries like Tanzania and India, show that outcomes in maternal, newborn, and child health can be improved through integrated packages of cost-effective health-care interventions that are implemented incrementally in accordance with the capacity of health systems. Such packages should include community-based interventions that act in

combination with social protection and intersectoral action in education, infrastructure, and poverty reduction. Interventions need to be planned and implemented at the district level, which requires strengthening of district planning and management skills. Furthermore, districts need to be supported by national strategies and policies, and, in the case of the least developed countries, also by international donors and other partners. If packages for maternal, newborn and child health care can be integrated within a gradually strengthened primary health-care system, continuity of care will be improved, including access to basic referral care before and during pregnancy, birth, the postpartum period, and throughout childhood.

#### 4. Integrated primary health care

##### **Strategies for integrating primary health services in low- and middle-income countries at the point of delivery**

Dudley L, Garner P. *Cochrane Database of Systematic Reviews* 2011, Issue 7. Art. No.: CD003318. DOI: 10.1002/14651858.CD003318.pub3.

[http://www.who.int/rpc/meetings/MCH\\_Integration\\_SR.pdf](http://www.who.int/rpc/meetings/MCH_Integration_SR.pdf)

##### **Background**

Strategies to integrate primary health care aim to bring together inputs, organisation, management and delivery of particular service functions to make them more efficient, and accessible to the service user. In some middle and low income countries, services have been fragmented by separate vertical programmes established to ensure delivery of particular technologies. The authors examined the effectiveness of integration strategies at the point of delivery.

##### **Objectives**

To assess the effects of strategies to integrate primary health care services on producing a more coherent product and improving health care delivery and health status.

##### **Search strategy**

The Cochrane Effective Practice and Organisation of Care Group specialised register (August 2005), MEDLINE (1966 to September 2005), EMBASE (1988 to 2005), Socio Files (1974 to September 2005), Popline (1970 to September 2005), HealthStar (1975 to September 2005), Cinahl (1982 to September 2005); Cab Health (1972 to 1999), International Bibliography of the Social Sciences (1970 to 1999), and reference lists of articles were searched. The authors also searched the Internet and World Health Organization (WHO) library database, hand searched relevant WHO publications and contacted experts in the field.

##### **Selection criteria**

Randomised trials, controlled before and after studies, and interrupted time series analyses of integration strategies in primary health care services. Health services in high-income countries were excluded. The primary outcomes were indicators of health care delivery, user views on any measure of service coherence, and health status. Information was also on comparative costs.

##### **Data collection and analysis**

Two authors independently extracted data and assessed study quality.

##### **Main results**

Three cluster randomised trials and two controlled before and after studies were included, with three types of comparison: integration by adding on an additional component to an existing service (family planning); integrated services versus single special services (for sex workers); integrated delivery systems versus a vertical service (for family planning); and packages of enhanced primary child care services (integrated management of childhood illnesses) vs. routine child care. Interventions were complex and in some studies inputs varied substantially between comparison arms. Overall, no consistent pattern emerged. Only one study attempted to assess the user's view of the service provided.

### **Authors' conclusions**

Few studies of good quality, large and with rigorous study design have been carried out to investigate strategies to promote service integration in low and middle income countries. All describe the service supply side, and none examine or measure aspects of the demand side. Future studies must also assess the client's view, as this will influence uptake of integration strategies and their effectiveness on community health.

### **Interventions to address maternal, newborn, and child survival: what difference can integrated primary health care strategies make?**

Bhutta Z et al, 2008, Lancet (372)

[http://www.hiseminars.org/uploads/media/Bhutta.Integrated Approaches to MCH in Primary Health Care.pdf](http://www.hiseminars.org/uploads/media/Bhutta.Integrated_Approaches_to_MCH_in_Primary_Health_Care.pdf)

Several recent reviews of maternal, newborn, and child health (MNCH) and mortality have emphasised that a large range of interventions are available with the potential to reduce deaths and disability. The emphasis within MNCH varies, with skilled care at facility levels recommended for saving maternal lives and scale-up of community and household care for improving newborn and child survival. Systematic review of new evidence on potentially useful interventions and delivery strategies identifies 37 key promotional, preventive, and treatment interventions and strategies for delivery in primary health care. Some are specially suitable for delivery through community support groups and health workers, whereas others can only be delivered by linking community-based strategies with functional first-level referral facilities.

Case studies of MNCH indicators in Pakistan and Uganda show how primary health-care interventions can be used effectively. Inclusion of evidence-based interventions in MNCH programmes in primary health care at pragmatic coverage in these two countries could prevent 20–30% of all maternal deaths (up to 32% with capability for caesarean section at first-level facilities), 20–21% of newborn deaths, and 29–40% of all postneonatal deaths in children aged less than 5 years. Strengthening MNCH at the primary health-care level should be a priority for countries to reach their Millennium Development Goal targets for reducing maternal and child mortality.

### **Achieving progress in maternal and neonatal health through integrated and comprehensive healthcare services – experiences from a programme in northern Tanzania**

Evjen-Olsen B et al, 2009, International Journal for Equity in Health

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2725038/>

An integrated and comprehensive hospital/community based health programme is presented in this paper, aimed at reducing maternal and child mortality and morbidity. It is run as part of a general programme of health care at a rural hospital situated in northern Tanzania. The purpose was through using research and statistics from the programme area, to illustrate how a hospital-based programme with a vision of integrated healthcare may have contributed to the lower figures on mortality found in the area. Such an approach may be of interest to policymakers, in relation to the global strategy that is now developed in order to meet the MDGs 4 and 5. Programme setting: The hospital provides reproductive and child health services, PMTCT-plus, comprehensive emergency obstetric care, ambulance, radio and transport services, paediatric care, an HIV/AIDS programme, and a generalised healthcare service to a population of approximately 500 000.

These services are described with their potential contribution to the reduction of the maternal and neonatal mortality ratios in the study area. Several studies from this area have showed a lower maternal mortality and neonatal mortality ratio compared to other studies from

Tanzania and the national estimates. Many donor-funded programmes focusing on maternal and child health are vertical in their framework. However, the hospital, being the dominant supplier of health services in its catchment area, has maintained a horizontal approach through a comprehensive care programme. The total cost of the comprehensive hospital programme described is 3.2 million USD per year, corresponding to 6.4 USD per capita.

Considering the relatively low cost of a comprehensive hospital programme including outreach services and the lower mortality ratios found in the catchment area of the hospital, the authors argue that donor funds should be used for supporting horizontal programmes aimed at comprehensive healthcare services. Through a strengthening of the collaboration between government and voluntary agency facilities, with clinical, preventive and managerial capabilities of the health facilities, the programmes will have a more sustainable impact and will achieve greater progress in the reduction of maternal and neonatal mortality, as opposed to vertical and segregated programmes that currently are commonly adopted for averting maternal and child deaths. Thus, it is concluded that horizontal and comprehensive services of the type described in this article should be considered as a prerequisite for sustainable health care delivery at all policy and decision-making levels of the local, national and international health care delivery pyramid.

## 5. Community-based interventions

### **Community-based intervention packages for reducing maternal and neonatal morbidity and mortality and improving neonatal outcomes (Review)**

Lassi ZS, Haider BA & Bhutta ZA, 2010, The Cochrane Collaboration  
<http://www.update-software.com/BCP/WileyPDF/EN/CD007754.pdf>

While women, newborn and under-five child death rates in developing countries have declined significantly in the past two to three decades, newborn mortalities have hardly changed. It is now been recognised that almost half of newborn deaths can be prevented by tetanus toxoid immunisation of the mothers; clean and skilled care at the birth; newborn resuscitation; exclusive breastfeeding; clean umbilical cord care; and management of infections in the newborns. In developing countries, almost two-thirds of births occur at home and only half are attended by a trained birth attendant. It has also been known that a large proportion of these deaths and diseases can be potentially addressed by developing community-based packaged interventions that should be integrated with local health systems.

The review authors found 18 randomised and quasi-randomised controlled studies evaluating the impact of community-based intervention packages for the prevention of maternal illness and death in improving newborn health outcomes. These studies were mostly conducted in developing countries (India, Bangladesh, Pakistan, Gambia, Nepal, Indonesia) with one additional study in Greece. Women in areas assigned to receive a community-based intervention package with health workers receiving additional training had decreased illnesses and complications during pregnancy and birth associated with decreased stillbirths, perinatal and neonatal deaths. Referrals rates to health facilities for pregnancy related complications, and initiation of breastfeeding within an hour of birth were also improved. This review offers encouraging evidence of the value of integrating maternal and newborn care in community settings through a range of strategies, many of which can be packaged effectively for delivery through a range of community health workers.

### **Community-Based Interventions for Improving Perinatal and Neonatal Health Outcomes in Developing Countries: A Review of the Evidence**

Bhutta ZA et al, 2005,  
[http://www.pediatricsdigest.mobi/content/115/Supplement\\_2/519.short](http://www.pediatricsdigest.mobi/content/115/Supplement_2/519.short)

Infant and under-5 childhood mortality rates in developing countries have declined significantly in the past 2 to 3 decades. However, two critical indicators, maternal and newborn mortality, have hardly changed. World leaders at the United Nations Millennium Summit in September 2000 agreed on a critical goal to reduce deaths of children <5 years by two thirds, but this may be unattainable without halving newborn deaths, which now comprise 40% of all under-5 deaths. Greater emphasis on wide-scale implementation of proven, cost-effective measures is required to save women's and newborns' lives. Approximately 99% of neonatal deaths take place in developing countries, mostly in homes and communities. A comprehensive review of the evidence base for impact of interventions on neonatal health and survival in developing-country communities has not been reported.

This review of community-based antenatal, intrapartum, and postnatal intervention trials in developing countries aimed to identify (1) key behaviours and interventions for which the weight of evidence is sufficient to recommend their inclusion in community-based neonatal care programs and (2) key gaps in knowledge and priority areas for future research and program learning.

Available published and unpublished data on the impact of community-based strategies and interventions on perinatal and neonatal health status outcomes were reviewed. Evidence was summarized systematically and categorised into 4 levels of evidence based on study size, location, design, and reported impact, particularly on perinatal or neonatal mortality. The evidence was placed in the context of biological plausibility of the intervention; evidence from relevant developed-country studies; health care program experience in implementation; and recommendations from the World Health Organization and other leading agencies.

A paucity of community-based data was found from developing-country studies on health status impact for many interventions currently being considered for inclusion in neonatal health programs. However, review of the evidence and consideration of the broader context of knowledge, experience, and recommendations regarding these interventions enabled us to categorize them according to the strength of the evidence base and confidence regarding their inclusion now in programs. This article identifies a package of priority interventions to include in programs and formulates research priorities for advancing the state of the art in neonatal health care.

This review emphasises some new findings while recommending an integrated approach to safe motherhood and newborn health. The results of this study provide a foundation for policies and programs related to maternal and newborn health and emphasises the importance of health systems research and evaluation of interventions. The review offers compelling support for using research to identify the most effective measures to save newborn lives. It also may facilitate dialogue with policy makers about the importance of investing in neonatal health.

### **Household-to-hospital Continuum of Maternal and Newborn Care**

de GraftJohnson et al, 2005, JHPIEGO

[http://pdf.usaid.gov/pdf\\_docs/PNADE623.pdf](http://pdf.usaid.gov/pdf_docs/PNADE623.pdf)

Although effective interventions for many causes of maternal and newborn death are well documented, effective delivery of care remains an enormous challenge in developing countries, where more than 60 million women deliver without skilled providers—most at home. For many women, access to health facilities is hampered by distance to or cost of services, or because transport is unavailable or unaffordable.

In addition, social barriers—such as women's lack of decision-making power, freedom of movement, control over finances, or the cultural incompatibility of the facilities—deter them from using maternal and newborn services. Many countries have committed to the United

Nations Millennium Development Goals of reducing maternal mortality by three-quarters and child mortality by two thirds by 2015. To reach the latter goal, there must be a strategic focus to reduce newborn deaths because 38 percent of deaths among children under five occur during the newborn period. These goals will be unattainable unless barriers to health care are effectively addressed.

Studies have demonstrated that the implementation of essential maternal and newborn care (EMNC) in community-based settings can reduce the number of deaths among mothers and newborns dramatically, including those mothers who give birth at home attended by skilled providers. In one pilot study in India, newborn deaths were reduced by 62 percent using a model for home-based newborn care. However, the potential of community-based care for mothers and newborns has not yet been exploited at a regional or national scale.

Delivery of health care is also problematic. Many primary health care centres and district-level facilities in developing countries struggle to meet the existing demand for care. The challenges they face include:

- poor infrastructure
- shortages of basic or appropriate equipment and adequate supplies
- inadequate numbers of skilled health staff or low retention of existing skilled health staff at facilities close to the community
- lack of competency-based pre-service and continuing education programs;
- poor communications and referral linkages
- the absence of legal authority for service providers to perform certain life-saving procedures

Any approach to improve essential maternal and newborn care services must address the issues of the community and the health system together, systematically, and in close collaboration among all stakeholders if it is to be successful. Communities and health care providers need to join forces and work together to overcome these complex obstacles, with the long-term goal of ensuring that pregnant women and newborns receive appropriate and timely care—preferably as close to home as possible. Achieving significant reductions in maternal and newborn morbidity and mortality will be facilitated by developing a comprehensive approach to address the social and health system issues in the community, and at both peripheral and district-level facilities. This integrated approach to community- and facility-based maternal and newborn programming and implementation is called the Household-to-Hospital Continuum of Care (HHCC).

## 6. Cost findings

### **Achieving the millennium development goals for health: Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries**

Adams T et al, 2005, BMJ (335)

[http://www.bmj.com/highwire/filestream/393990/field\\_highwire\\_article\\_pdf/0/1107.full.pdf](http://www.bmj.com/highwire/filestream/393990/field_highwire_article_pdf/0/1107.full.pdf)

This study aimed to determine the costs and benefits of interventions for maternal and newborn health to assess the appropriateness of current strategies and guide future plans to attain the millennium development goals. Cost effectiveness analysis was used.

The setting was two regions classified by the World Health Organization according to their epidemiological grouping: Afr-E, those countries in sub-Saharan Africa with very high adult and high child mortality, and Sear-D, comprising countries in South East Asia with high adult and high child mortality.

Effectiveness data was used from several sources, including trials, observational studies, and expert opinion. For resource inputs, quantities came from WHO guidelines, literature, and expert opinion, and prices from the WHO choosing interventions that are cost effective database. The main outcome measures were cost per disability adjusted life year (DALY) averted in year 2000 international dollars.

The most cost effective mix of interventions was similar in Afr-E and Sear-D. These were the community based newborn care package, followed by antenatal care (tetanus toxoid, screening for pre-eclampsia, screening and treatment of asymptomatic bacteriuria and syphilis); skilled attendance at birth, offering first level maternal and neonatal care around childbirth; and emergency obstetric and neonatal care around and after birth. Screening and treatment of maternal syphilis, community based management of neonatal pneumonia, and steroids given during the antenatal period were relatively less cost effective in Sear-D. Scaling up all of the included interventions to 95% coverage would halve neonatal and maternal deaths.

The study concluded that preventive interventions at the community level for newborn babies and at the primary care level for mothers and newborn babies are extremely cost effective, but the millennium development goals for maternal and child health will not be achieved without universal access to clinical services as well.

#### **Evidence-based, cost-effective interventions: how many newborn babies can we save?**

Darmstadt GL et al (Lancet Neonatal Survival Steering Team), 2005, Lancet (365)  
<http://www.sciencedirect.com/science/article/pii/S0140673605710886>

In this article of the neonatal survival series, the authors identify 16 interventions with proven efficacy (implementation under ideal conditions) for neonatal survival and combine them into packages for scaling up in health systems, according to three service delivery modes (outreach, family-community, and facility-based clinical care). All the packages of care are cost effective compared with single interventions. Universal (99%) coverage of these interventions could avert an estimated 41–72% of neonatal deaths worldwide. At 90% coverage, intrapartum and postnatal packages have similar effects on neonatal mortality—two-fold to three-fold greater than that of antenatal care.

However, running costs are two-fold higher for intrapartum than for postnatal care. A combination of universal—i.e. for all settings—outreach and family-community care at 90% coverage averts 18–37% of neonatal deaths. Most of this benefit is derived from family-community care, and greater effect is seen in settings with very high neonatal mortality. Reductions in neonatal mortality that exceed 50% can be achieved with an integrated, high coverage programme of universal outreach and family-community care, consisting of 12% and 26%, respectively, of total running costs, plus universal facility-based clinical services, which make up 62% of the total cost. Early success in averting neonatal deaths is possible in settings with high mortality and weak health systems through outreach and family-community care, including health education to improve home-care practices, to create demand for skilled care, and to improve care seeking. Simultaneous expansion of clinical care for babies and mothers is essential to achieve the reduction in neonatal deaths needed to meet the Millennium Development Goal for child survival.

#### **Alternative Strategies to Reduce Maternal Mortality in India: A Cost-Effectiveness Analysis**

Goldie SJ et al, 2010, PLoS Med (7)

<http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1000264>

#### **Background**

Approximately one quarter of all pregnancy- and delivery-related maternal deaths worldwide occur in India. Taking into account the costs, feasibility, and operational complexity of alternative interventions, we estimate the clinical and population-level benefits associated with strategies to improve the safety of pregnancy and childbirth in India.

### **Methods and Findings**

Country- and region-specific data were synthesized using a computer-based model that simulates the natural history of pregnancy (both planned and unintended) and pregnancy- and childbirth-associated complications in individual women; and considers delivery location, attendant, and facility level. Model outcomes included clinical events, population measures, costs, and cost-effectiveness ratios. Separate models were adapted to urban and rural India using survey-based data (e.g., unmet need for birth spacing/limiting, facility births, skilled birth attendants). Model validation compared projected maternal indicators with empiric data.

Strategies consisted of improving coverage of effective interventions that could be provided individually or packaged as integrated services, could reduce the incidence of a complication or its case fatality rate, and could include improved logistics such as reliable transport to an appropriate referral facility as well as recognition of referral need and quality of care. Increasing family planning was the most effective individual intervention to reduce pregnancy-related mortality. If over the next 5 years the unmet need for spacing and limiting births was met, more than 150,000 maternal deaths would be prevented; more than US\$1 billion saved; and at least one of every two abortion-related deaths averted. Still, reductions in maternal mortality reached a threshold (~23%–35%) without including strategies that ensured reliable access to intrapartum and emergency obstetrical care (EmOC). An integrated and stepwise approach was identified that would ultimately prevent four of five maternal deaths; this approach coupled stepwise improvements in family planning and safe abortion with consecutively implemented strategies that incrementally increased skilled attendants, improved antenatal/postpartum care, shifted births away from home, and improved recognition of referral need, transport, and availability/quality of EmOC. The strategies in this approach ranged from being cost-saving to having incremental cost-effectiveness ratios less than US\$500 per year of life saved (YLS), well below India's per capita gross domestic product (GDP), a common benchmark for cost-effectiveness.

### **Conclusions**

Early intensive efforts to improve family planning and control of fertility choices and to provide safe abortion, accompanied by a paced systematic and stepwise effort to scale up capacity for integrated maternal health services over several years, is as cost-effective as childhood immunization or treatment of malaria, tuberculosis, or HIV. In just 5 y, more than 150,000 maternal deaths would be averted through increasing contraception rates to meet women's needs for spacing and limiting births; nearly US\$1.5 billion would be saved by coupling safe abortion to aggressive family planning efforts; and with stepwise investments to improve access to pregnancy-related health services and to high-quality facility-based intrapartum care, more than 75% of maternal deaths could be prevented. If accomplished over the next decade, the lives of more than one million women would be saved.

### **Applying the net-benefit framework for analyzing and presenting cost-effectiveness analysis of a maternal and newborn health intervention**

Hounton S, Newlands D. PLoS One. 2012;7(7):e40995. Epub 2012 Jul 19.

<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0040995>

### **Background**

Coverage of maternal and newborn health (MNH) interventions is often influenced by important determinants and decision makers are often concerned with equity issues. The net-benefit framework developed and applied alongside clinical trials and in pharmacoeconomics offers the potential for exploring how cost-effectiveness of MNH interventions varies at the

margin by important covariates as well as for handling uncertainties around the ICER estimate.

### **Aim**

We applied the net-benefit framework to analyse cost-effectiveness of the Skilled Care Initiative and assessed relative advantages over a standard computation of incremental cost effectiveness ratios.

### **Methods**

Household and facility surveys were carried out from January to July 2006 in Ouargaye district (where the Skilled Care Initiative was implemented) and Diapaga (comparison site) district in Burkina Faso. Pregnancy-related and perinatal mortality were retrospectively assessed and data were collected on place of delivery, education, asset ownership, place, and distance to health facilities, costs borne by households for institutional delivery, and cost of standard provision of maternal care. Descriptive and regression analyses were performed.

### **Results**

There was a 30% increase in institutional births in the intervention district compared to 10% increase in comparison district, and a significant reduction of perinatal mortality rates (OR 0.75, CI 0.70–0.80) in intervention district. The incremental cost for achieving one additional institutional delivery in Ouargaye district compared to Diapaga district was estimated to be 170 international dollars and varied significantly by covariates. However, the joint probability distribution (net-benefit framework) of the effectiveness measure (institutional delivery), the cost data and covariates indicated distance to health facilities as the single most important determinant of the cost-effectiveness analysis with implications for policymaking.

### **Conclusion**

The net-benefit framework, the application of which requires household-level effects and cost data, has proven more insightful (than traditional ICER) in presenting and interpreting cost-effectiveness results of the Skilled Care Initiative.

### **Reducing errors in health care: cost-effectiveness of multidisciplinary team training in obstetric emergencies (TOSTI study); a randomised controlled trial**

van de Ven J, Houterman S, Steinweg RA, Scherpbier AJ, Wijers W, Mol BW, Oei SG; TOSTI-Trial Group. BMC Pregnancy Childbirth. 2010 Oct 8;10:59.

<http://www.biomedcentral.com/content/pdf/1471-2393-10-59.pdf>

**Background:** There are many avoidable deaths in hospitals because the care team is not well attuned. Training in emergency situations is generally followed on an individual basis. In practice, however, hospital patients are treated by a team composed of various disciplines. To prevent communication errors, it is important to focus the training on the team as a whole, rather than on the individual. Team training appears to be important in contributing toward preventing these errors. Obstetrics lends itself to multidisciplinary team training. It is a field in which nurses, midwives, obstetricians and paediatricians work together and where decisions must be made and actions must be carried out under extreme time pressure.

It is attractive to believe that multidisciplinary team training will reduce the number of errors in obstetrics. The other side of the medal is that many hospitals are buying expensive patient simulators without proper evaluation of the training method. In the Netherlands many hospitals have 1,000 or less annual deliveries. In our small country it might therefore be more cost-effective to train obstetric teams in medical simulation centres with well trained personnel, high fidelity patient simulators, and well defined training programmes.

**Methods/design:** The aim of the present study is to evaluate the cost-effectiveness of multidisciplinary team training in a medical simulation centre in the Netherlands to reduce the

number of medical errors in obstetric emergency situations. The researchers plan a multicentre randomised study with the centre as unit of analysis. Obstetric departments will be randomly assigned to receive multidisciplinary team training in a medical simulation centre or to a control arm without any team training.

The composite measure of poor perinatal and maternal outcome in the non training group was thought to be 15%, on the basis of data obtained from the National Dutch Perinatal Registry and the guidelines of the Dutch Society of Obstetrics and Gynaecology (NVOG). The researchers anticipated that multidisciplinary team training would reduce this risk to 5%. A sample size of 24 centres with a cluster size of each at least 200 deliveries, each 12 centres per group, was needed for 80% power and a 5% type 1 error probability (two-sided). An Intraclass Correlation Coefficient (ICC) value of maximum 0.08 was assumed. The analysis will be performed according to the intention-to-treat principle and stratified for teaching or nonteaching hospitals.

Primary outcome is the number of obstetric complications throughout the first year period after the intervention. If multidisciplinary team training appears to be effective a cost-effective analysis will be performed.

## 7. Specialist input from IPACT

*IPACT is the training and consultancy arm of Immpact, an internationally recognised maternal and newborn health research group based at the University of Aberdeen. IPACT has recently joined the DFID Health and Education PEAKS consortium.*

**Summary:** The international literature provides some evidence of the benefits of providing obstetric and reproductive health services but there is no evidence available on the cost effectiveness of training alone, compared to other single or multifaceted interventions. Training in emergency obstetric care is likely to improve knowledge, skills and behaviour, but quality of evidence is not high. Evidence of the effectiveness of training on health impact is not available. There is no consistent evidence that delivery of special services like maternity care on its own, is better or not, than if delivered in combination with other interventions.

**Evidence of the impact of selective interventions:** A systematic review of training in emergency obstetric care was completed in 2010. The authors show that positive effects such as improved knowledge, skills and behaviour are frequently reported. Effects on health outcome are not available, and the quality of evidence as a whole is not strong (van Lonkhuijzen et al 2010). Assessments are limited by the variation (didactic, hands on practice, longitudinal programmes) found between different training programmes (see also Panel 2 'What can in-service training do?' in Koblinsky et al 2006).

**Evidence on interventions to reduce maternal and newborn mortality:** A comprehensive review of the evidence for interventions to reduce maternal and neonatal mortality is provided in Campbell et al 2006 and Darmstadt et al 2005. The assessments of benefits and costs in these papers are of single interventions (e.g. clean delivery, partograph use) rather than 'packaged' according to type of intervention like training. Although there are several examples of work done on cost effectiveness/benefit of maternal health strategies like skilled care and provision of essential obstetric services (see for example, Graham et al 2006; Goldie et al 2010; Hounton and Newlands 2012), the analyses does not provide data on cost benefit of training. To our knowledge, there have been no studies on cost effectiveness of obstetric training in developing countries, although there is a trial being conducted in the Netherlands (van de Ven et al 2010) which is unlikely to be of relevance to the Kenyan context. Studies using modelling techniques have suggested that 'integrated' strategies to improve obstetric care have incremental cost effectiveness ratios of US\$500 per life saved in

India (Goldie et al 2010). In sub Saharan Africa, the incremental cost per life year saved for improved quality of comprehensive emergency obstetric care is US\$195 (Graham et al 2006).

**Selective versus comprehensive:** Evidence regarding vertical and integrated service delivery modalities is contradictory. A Cochrane review concludes that there is evidence of efficiency gains of integration in family planning, HIV testing and sexually transmitted infection services in some contexts while in others, vertical programmes perform better (Dudley and Garner 2011).

Note that this Cochrane review investigated 'integration' from two perspectives: adding a service to an existing service and delivery of a special service like maternity care vertically or integrated into routine healthcare delivery. The helpdesk question refers to 'integrated health system strengthening' but this is not a precise term.

## 8. Additional information

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