



# Pregnancy and Childbirth

## Summary of contents

The 3.2 million stillbirths that occur worldwide each year are largely absent from global data tracking, policy dialogue and programmes. Limitations of global stillbirth data and a lack of consensus surrounding priority interventions render stillbirths invisible in policy and programmes. This supplement provides an in-depth analysis of the burden and evidence base for potential interventions to avert stillbirths. Lead investigators from the Aga Khan University (Karachi, Pakistan), supported by colleagues from Johns Hopkins University (Baltimore, USA) and Saving Newborn Lives (South Africa), reviewed evidence for impact of interventions to prevent stillbirths and strategies for delivering them.

**Paper 1** ([www.biomedcentral.com/1471-2393/9/S1/S2](http://www.biomedcentral.com/1471-2393/9/S1/S2)) describes risk factors for and causes of stillbirth, challenges in measuring the global burden of stillbirths including a lack of cause-specific data, social factors that keep stillbirths hidden, and the lack of a feasible, internationally comparable classification system for stillbirth. The paper concludes by outlining the methodology and framework for this comprehensive global assessment of evidence for intervention impact and health systems strategies to deliver interventions to reduce the global burden of stillbirths.

Poor nutritional status, inadequate antenatal care and social behaviours before and during pregnancy increase stillbirth risk in many resource-poor settings. **Paper 2** ([www.biomedcentral.com/1471-2393/9/S1/S3](http://www.biomedcentral.com/1471-2393/9/S1/S3)) reviews twelve interventions for behavioural and socially mediated risk factors, including exposures to harm from female genital mutilation, tobacco use, and indoor air pollution; antenatal care; and maternal nutritional supplementation.

Maternal infections including syphilis and malaria, and maternal conditions including hypertensive disorders, are known risk factors for stillbirth. **Paper 3** ([www.biomedcentral.com/1471-2393/9/S1/S4](http://www.biomedcentral.com/1471-2393/9/S1/S4)) reviews evidence for impact on stillbirths of 16 clinical interventions during pregnancy, including interventions to address chronic and pregnancy-induced hypertension and prevention of pre-eclampsia; auto-immune and coagulation disorders; obstetric intrahepatic cholestasis; cervical incompetence; and infections including helminthiasis, bacteriuria, periodontal disease, syphilis, and malaria.

Screening and monitoring technologies can identify high-risk pregnancies and monitor fetal well-being, and appropriate subsequent management of the maternal and fetal risk factors and complications identified could prevent stillbirths. **Paper 4** ([www.biomedcentral.com/1471-2393/9/S1/S5](http://www.biomedcentral.com/1471-2393/9/S1/S5)) examines the evidence for impact on stillbirth of 14 screening and monitoring interventions in pregnancy, including fetal movement monitoring, ultrasound and Doppler studies, diabetes screening and management; advanced fetal surveillance techniques including non-stress testing, amniotic fluid assessment, and biophysical profile; and monitoring of labour using the partograph or intrapartum cardiotocography.

Most intrapartum stillbirths occur in low- and middle-income countries and are associated with absent, inadequate, or delayed obstetric care. Because quality obstetric care could prevent intrapartum stillbirths, **Paper 5** ([www.biomedcentral.com/1471-2393/9/S1/S6](http://www.biomedcentral.com/1471-2393/9/S1/S6)) assesses the evidence for impact of eight interventions delivered antepartally or during labour, including operative delivery, emergency obstetric care, induction of labour, treatment of pre-eclampsia and eclampsia, maternal hyperoxygenation, and amnioinfusion.

The final paper in the series, **Paper 6** ([www.biomedcentral.com/1471-2393/9/S1/S7](http://www.biomedcentral.com/1471-2393/9/S1/S7)), assesses the evidence for strategies to deliver evidence-based interventions within health systems, particularly in low-/middle-income countries where 98% of the world's stillbirths occur. Innovative community and health systems strategies are evaluated, including community loan schemes and maternity waiting homes to minimise cost and distance barriers; training (including task-shifting and drills) for different cadres of health workers to improve quality of antenatal and intrapartum care; and perinatal audit systems to identify deficiencies in care. Findings are synthesized across the series of papers and used to formulate programme and policy recommendations for optimal delivery of evidence-based interventions to prevent stillbirths at all levels of the health system and across the continuum of care. Further analysis of interventions and delivery strategies is continuing in collaboration with the Global Alliance for Prevention of Prematurity and Stillbirths (GAPPS).

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# Stillbirths – the global picture and evidence-based solutions

An Executive Summary for the *BMC Pregnancy and Childbirth Supplement*



Photo credit: Save the Children/Jeff Holt

**The BMC Pregnancy and Childbirth Supplement, “Stillbirths – the global picture and evidence-based solutions”** provides a detailed assessment of the 3.2 million stillbirths that occur worldwide each year, which are largely absent from global data tracking, policy dialogue and programmes. Stillbirths are a major burden in both high-income and low- and middle-income countries, but have received low priority in both settings. However, stillbirth rates are particularly high and attention is most lacking in policy and programmes in low-income countries. This supplement contains six papers [1-6] and one commentary that provide an in-depth analysis of the burden and evidence base for interventions to avert stillbirths. Lead investigators from Aga Khan University (Karachi, Pakistan), supported by colleagues from Johns Hopkins University (Baltimore, USA) and Saving Newborn Lives/Save the Children (Cape Town, South Africa), reviewed the evidence for impact of interventions to prevent stillbirths and strategies for delivering effective interventions in low- and middle-income settings.

The aim of the Supplement was to provide a comprehensive, global review of available information on stillbirths, with main objectives to:

- 1) elucidate the epidemiology and major risk factors for stillbirths [1];
- 2) evaluate potential interventions and strategies to deliver these interventions, categorising their level of evidence and highlighting key implementation, monitoring and research gaps [2-6]; and
- 3) place the available evidence for interventions in a health systems context to guide programme implementation [6].

## KEY MESSAGES

1. Stillbirths are invisible in policy and programmes, yet constitute an enormous burden of deaths, and disproportionately affect the poor.
  - 3.2 million deaths: 2.2 million antepartum stillbirths and 1.0 million intrapartum stillbirths
  - 98% of the world’s stillbirths occur in low- and middle-income countries
2. We reviewed the evidence for interventions to be implemented at all levels of the health system, along the continuum of care from pre-pregnancy through labour, including interventions:
  - Before and during pregnancy, especially those that are feasible in family and community settings
  - For screening and monitoring during pregnancy and labour
  - During labour (i.e. intrapartum)
3. Many interventions of benefit for preventing stillbirths can be delivered effectively through or alongside existing maternal, newborn and child health (MNCH) programmes.
4. Recommended implementation and research actions include to:
  - Improve rates of skilled birth attendance and access to emergency obstetric care
  - Identify and address maternal infections, especially syphilis and malaria in endemic areas
  - Promote quality antenatal care and referral systems as a platform for improving coverage of evidence-based interventions
  - Systematically map and address stillbirth research gaps



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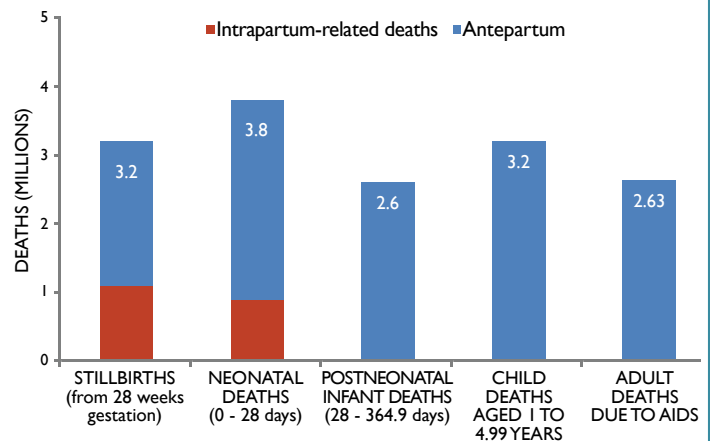
## INVISIBILITY OF STILLBIRTHS [Paper 1]

More than 3.2 million stillbirths occur globally each year, yet stillbirths are largely invisible in global health indicators, policies, and programmes [7]. This mismatch of burden to action is due to a number of factors that keep stillbirths hidden, notably a lack of data and a lack of consensus on priority interventions, but also social taboos that reduce the visibility and global count of stillbirths. Inconsistent definitions cause additional confusion and hamper the recognition of stillbirths as a public health concern (panel 1).

Whilst there are estimates of the numbers of stillbirths and the size of the burden relative to other time periods in the life cycle (Figure 1), there have been no systematic global analyses and estimates of the causes of stillbirths. A systematic estimate based on 194 countries, using data from 2005, suggested that a total of 1.02 million intrapartum stillbirths due to all causes occur globally per annum [8], emphasising the importance of interventions during childbirth.

There are at least 35 classification systems for stillbirths, and most are complex and primarily focused on data available only in high-income countries. This is a major challenge to developing national and global estimates for causes of stillbirth. This Supplement proposes a programmatic classification that is feasible and comparable across settings.

**FIGURE 1: Stillbirths – the mortality burden compared to other linked global mortality burdens**



## METHODS AND SEARCHES [Paper 1]

A systematic review was undertaken of all available evidence for the impact of interventions on stillbirths. Searches included electronic reference libraries of indexed (PubMed/MEDLINE, POPLINE, LILACS, and WHO regional databases) and non-indexed medical journals, as well as published analytical reviews and meta-analyses (Cochrane Reference Libraries). Manual reviews were conducted to incorporate relevant grey literature, including theses, monographs, and project documentation. Studies were included if they (1) detailed an intervention that could reduce stillbirth incidence through a biologically plausible pathway, and (2) reported stillbirth rate, fetal death rate, perinatal mortality rate, or data allowing calculation of such a rate as an outcome measure.

Altogether, over 97,000 paper titles and nearly 12,800 abstracts were screened, and over 1000 reviews and studies on interventions to avert stillbirths or perinatal deaths were reviewed in detail using SIGN and GRADE criteria. The evidence of benefit for each intervention was synthesised within the following categories: clear evidence (recommended for inclusion and scaling up in programmes), some evidence (can include in programmes but further research is recommended), uncertain evidence (more research is needed before including in programmes), or no/negative evidence (not recommended for inclusion in programmes). The evidence was then separated into 1) specific interventions, and 2) strategies to improve service delivery and community demand.

### PANEL 1 - DEFINITIONS [1]

**Fetal death:** According to International Classification of Disease, revision 10 (ICD 10), an early fetal death is death of a fetus weighing at least 500 g (or if birthweight is unavailable then after 22 weeks gestation, or with a crown-heel length of 25 cm or more). A late fetal death is defined as death of a fetus weighing at least 1000 g (or a gestational age of 28 completed weeks or a crown heel length of 35 cm or more). Late fetal deaths are recommended by the World Health Organization as the measure for international comparison.

**Stillbirths:** Stillbirth is the colloquial term commonly used for fetal death, and is the term used in this series to refer to both early and late fetal deaths.

**Stillbirth rate:** As the data used here is for international comparison, all stillbirth rate data refer to late fetal deaths i.e. the number of babies born dead after 28 weeks of gestation per 1,000 total births.

**Perinatal period:** This time interval includes some portion of late pregnancy and some or all of the first month of life. It has been used to refer to at least 10 different time periods depending on the time period cut-offs used. The term “perinatal” is also used to refer to some, but not all, causes of neonatal death in the ICD-10. Hence, the term often causes confusion. We use perinatal deaths to include stillbirths after 28 weeks gestational age and early neonatal deaths in the first 7 days of life. In general, however, we have specified the outcome (stillbirth, or neonatal death) or the cause of death where the data have allowed this distinction.

## RESULTS [Papers 2-6]

The Supplement systematically evaluated a total of 62 different maternal interventions for prevention of stillbirths. These interventions included general supportive measures to improve environmental and social conditions, as well as interventions that address maternal nutrition, infections, and other conditions during pregnancy and childbirth. The selection of these specific interventions was based on biological plausibility and possibility of inclusion as a component in antenatal and intrapartum health care programmes. Figure 2 displays these interventions along the continuum of care from pre-pregnancy through labour.

The intervention evaluations were separated into six papers as follows: epidemiology, global burden and risk factors for stillbirths [1]; behavioural and nutritional interventions before and during pregnancy [2]; interventions during pregnancy for management and prevention of medical disorders and infections [3]; interventions for screening and monitoring [4]; interventions during labour [5]; and strategies to improve service delivery and community demand [6].

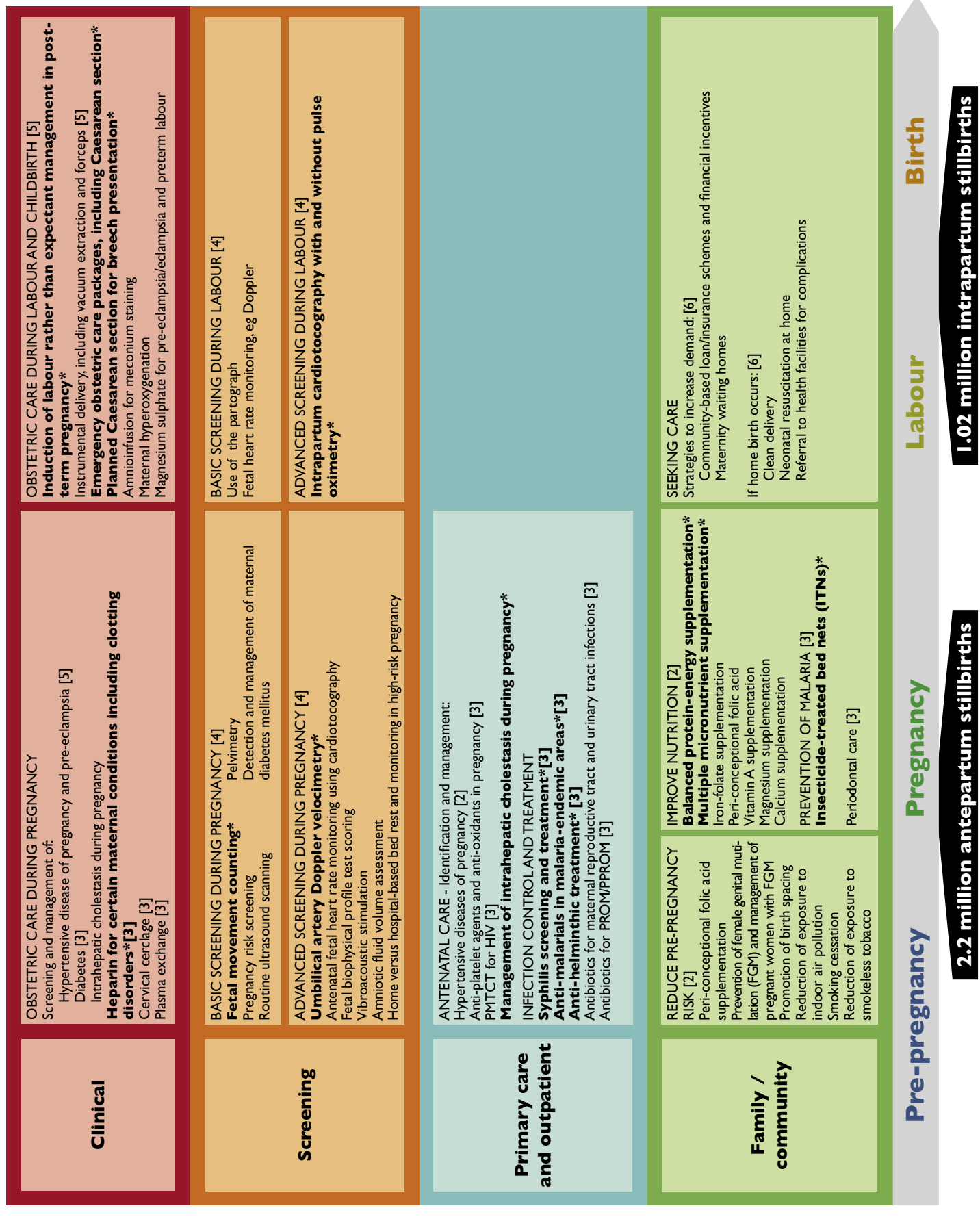
Based on analysis of the evidence for impact of the different peri-conceptual, antenatal, and intrapartum maternal interventions on prevention of stillbirths, the interventions were categorised into levels according to the strength and quality of evidence, and therefore, the level of confidence in recommending interventions for wide-scale delivery in programmes. Five interventions with proven benefit in reducing stillbirths were identified, while another nine interventions had some evidence of impact (Table 1).

**Table 1: Interventions with proven benefit or some evidence in reducing stillbirths**

<b>Interventions with proven benefit in reducing stillbirths</b>	<ul style="list-style-type: none"> <li>• Syphilis screening and treatment</li> <li>• Use of insecticide-treated bednets in malaria-endemic areas during pregnancy</li> <li>• Administration of heparin for certain maternal conditions including auto-immune and clotting disorders</li> <li>• Emergency obstetric care</li> <li>• Planned Caesarean section for breech delivery</li> </ul>
<b>Interventions with some evidence of impact</b>	<ul style="list-style-type: none"> <li>• Multiple micronutrient supplementation during pregnancy</li> <li>• Balanced protein-energy supplementation during pregnancy</li> <li>• Management of intrahepatic cholestasis during pregnancy</li> <li>• Anti-helminthic treatment</li> <li>• Anti-malarials in malaria-endemic areas</li> <li>• Fetal movement counting for high-risk pregnancies</li> <li>• Umbilical artery Doppler velocimetry for high-risk pregnancies</li> <li>• Intrapartum cardiotocography with or without pulse oximetry</li> <li>• Elective induction of labour in post-term pregnancy.</li> </ul>

Strategies to deliver these interventions, including overcoming barriers to accessing care, task-shifting to other cadres of community health workers, and quality improvement strategies including obstetric drills and perinatal audit, were also evaluated. Evidence clearly supported financial incentives to improve access to emergency obstetric care and—in settings where adequate skilled personnel cannot be trained in the short term—training traditional birth attendants in clean delivery, while building linkages with health systems for referrals. Other delivery strategies had some evidence of impact but require further operational research, including training cadres of community health workers, training professional midwives in antenatal and intrapartum care, training in neonatal resuscitation for physicians and other health workers, and home birth with skilled attendance (versus hospital birth). Some evidence suggests that perinatal audit can improve care quality and subsequent perinatal outcomes, but data were unavailable to assess the impact on stillbirths of promising quality improvement strategies such as obstetric drills for Caesarean section and shoulder dystocia.

**FIGURE 2: Potential interventions and integrated packages of interventions for stillbirths [2-6]**



(Please note that this figure is focused on potential interventions to avert stillbirths, and does not include all MNCH interventions implementable during these time periods; there are other important evidence-based interventions to improve maternal and neonatal health. The interventions listed above are specifically for reducing stillbirths. Those marked with an \* and in bold have proven benefit or some evidence of impact for reduction of stillbirths/perinatal mortality.)

## WHO CAN DO WHAT? [Paper 6]

**Table 2: Possible delivery strategies for interventions with some or clear evidence of impact on stillbirths**

	Mass media (including social marketing strategies, health days, etc)	Facilitated community and advocacy groups	TBAs	Trained CHWs (outreach workers)	Community-based professional midwives	Other cadres of facility-based health workers	Medical/nursing staff in first-level facilities
Multiple micronutrient supplementation		+	+	✓	✓	✓	✓
Balanced protein-energy supplementation		+	+	✓	✓	✓	✓
Anti-malarials in pregnancy	+	+		✓	✓	✓	✓
Insecticide-treated bed nets in pregnancy	+	✓	✓	✓	✓	✓	
Heparin in pregnancy for clotting disorders and antiphospholipid syndrome							✓
Anti-helminthic treatment in pregnancy				✓	✓	✓	✓
Syphilis screening and treatment in pregnancy				+	✓		✓
Management of intrahepatic cholestasis in pregnancy							✓
Fetal movement counting (in high-risk pregnancy)			+	+	✓	✓	✓
Doppler monitoring (in high-risk pregnancy)							✓
Intrapartum cardiotocography (with access to Caesarean section)							✓
Amniotic fluid volume assessment in pregnancy							✓
Emergency obstetric care packages, including Caesarean section		+	+	+	+	✓	✓
Elective induction of labour in post-term pregnancies			+		+		✓
Planned Caesarean section for term breech presentation*					+		✓
Perinatal audit		✓			✓		✓

✓ Provision of intervention      + Promotion of intervention

\* Only advised in areas with ability to perform safe Caesarean section

### PANEL 2 - Key programme recommendations to reduce stillbirths [Paper 6]

1. Community demand creation strategies and training of appropriate human resources for health promotion and preventive interventions
2. Antenatal care to deliver quality interventions and to screen for high risk pregnancies
3. Recognition and prompt and appropriate management of maternal infections during pregnancy, such as syphilis and malaria
4. Skilled attendance at birth and emergency obstetric care availability (including Caesarean section)

# PRIORITIES FOR REDUCING STILLBIRTHS [Paper 1 and 6]

## Global data and policy priorities

- **Tracking mortality reduction:** Almost all (98%) of the world's 3.2 million stillbirths occur in low- or middle-income countries, yet stillbirths are rarely mentioned by global decision makers or UN agencies. This is a missed opportunity for large-scale MNCH programmes to track significant mortality benefit. Stillbirths should be included in mortality tracking wherever child and/or maternal outcomes are being assessed in household surveys or in health system or research evaluations.
- **Intrapartum priority:** Given that 1 million stillbirths occur during the time of labour and that half of the world's births are in facilities, improved obstetric care offers an immediate opportunity to reduce these deaths and the associated 904,000 neonatal deaths due to so-called 'birth asphyxia' that are intrapartum-related. However, many intrapartum stillbirths occur at home or on the way to a facility, so innovative approaches are required to address delays in accessing obstetric care.
- **Effective antenatal care:** Around 2.2 million stillbirths occur during the last trimester but before the onset of labour. Given that over 75% of pregnant women globally access antenatal care (72% in Africa and 68% in South Asia), there are many missed opportunities for effective interventions to be provided through antenatal care. Priority conditions to address include pregnancy-induced hypertension; antepartum haemorrhage; maternal infections such as syphilis and malaria; and obstetric risk conditions such as multiple pregnancy and abnormal lie.

## National data and programme priorities

- **In many high-income countries,** stillbirth rates have not been declining at the expected rate. Improvements are possible with increased use of confidential enquiry data and attention not only to implement evidence-based interventions well, but also to innovate to address key challenges.
- **In middle-income countries,** strengthening vital registration data for stillbirths and scaling up perinatal audit will give more data for priority setting and tracking of programme effectiveness.
- **In low-income countries,** urgent attention should be given to how to better measure stillbirth rates in existing large-scale household surveys (for example, the use of pregnancy history instead of birth history modules) and consideration of post-survey verbal autopsy to increase data on stillbirth cause of death.
- **In all country programmes** for maternal and neonatal health, when scaling up, specific attention should be paid to including high-impact interventions to reduce stillbirths and to tracking key indicators for quality of care such as intrapartum stillbirth rate.
- **Research studies** for maternal and neonatal health outcomes should consider measuring and reporting stillbirth outcomes.

Given the large annual burden of at least 3.2 million stillbirths and the opportunity to reduce this burden through existing MNCH programmes, the low policy and programme priority given to stillbirths may be unparalleled compared to any other need in global health today. Is this a simple oversight and lack of coherent communication of the data and the solutions? Or do stillbirths not count?



Photo credit: Save the Children/Jenny Matthews

## The Series –

Goldenberg RL, McClure EM, Belizán JM: **Commentary: reducing the world's stillbirths, 9(Suppl 1):S1.**

- 1 Lawn JE, Yakoob MY, Haws RA, Soomro T, Darmstadt GL, Bhutta ZA: **3.2 million stillbirths Epidemiology and overview of the evidence review.** *BMC Pregnancy and Childbirth* 2009, **9(Suppl 1):S2.**
- 2 Yakoob MY, Menezes EV, Soomro T, Haws RA, Darmstadt GL, Bhutta ZA: **Reducing stillbirths: behavioural and nutritional interventions before and during pregnancy.** *BMC Pregnancy and Childbirth* 2009, **9(Suppl 1):S3.**
- 3 Menezes EV, Yakoob MY, Soomro T, Haws RA, Darmstadt GL, Bhutta ZA: **Reducing stillbirths: prevention and management of medical disorders and infections during pregnancy.** *BMC Pregnancy and Childbirth* 2009, **9(Suppl 1):S4.**
- 4 Haws RA, Yakoob MY, Soomro T, Menezes EV, Darmstadt GL, Bhutta ZA: **Reducing stillbirths: screening and monitoring during pregnancy and labour.** *BMC Pregnancy and Childbirth* 2009, **9(Suppl 1):S5.**
- 5 Darmstadt GL, Yakoob MY, Haws RA, Menezes EV, Soomro T, Bhutta ZA: **Reducing stillbirths: interventions during labour.** *BMC Pregnancy and Childbirth* 2009, **9(Suppl 1):S6.**
- 6 Bhutta ZA, Darmstadt GL, Haws RA, Yakoob MY, Lawn JE: **Delivering interventions to reduce the global burden of stillbirths: improving service supply and community demand.** *BMC Pregnancy and Childbirth* 2009, **9(Suppl 1):S7.**

All the papers can be accessed free of charge at <http://www.biomedcentral.com/1471-2393/9?issue=S1>

## Additional references

- 7 Stanton C, Lawn JE, Rahman H, Wilczynka-Ketende K, Hill K: **Stillbirth rates: delivering estimates in 190 countries.** *Lancet* 2006, **367**: 1487-1494.
- 8 Lawn J, Shibuya K, Stein C: **No cry at birth: global estimates of intrapartum stillbirths and intrapartum-related neonatal deaths.** *Bulletin of World Health Organization* 2005, **83(6)**: 409-417.

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