Variation in stillbirth rates across high-income countries and large equity gaps within high-income countries persist. If all high-income countries achieved stillbirth rates equal to the best performing countries, 19 439 late gestation (28 weeks or more) stillbirths could have been avoided in 2015. The proportion of unexplained stillbirths is high and can be addressed through improvements in data collection, investigation, and classification, and with a better understanding of causal pathways. Substandard care contributes to 20–30% of all stillbirths and the contribution is even higher for late gestation intrapartum stillbirths. National perinatal audit programmes need to be implemented in all high-income countries. The need to reduce stigma and fatalism related to stillbirth and to improve bereavement care are also clear, persisting priorities for action. In high-income countries, a woman living under adverse socioeconomic circumstances twice the risk of having a stillborn child when compared to her more advantaged counterparts. Programmes at community and country level need to improve health in disadvantaged families to address these inequities.

**Introduction**

Stillbirth rate is a key indicator of women’s health and quality of care in pregnancy and childbirth.\(^1,2\) Although rates for high-income countries (HICs) are relatively low compared with low-income and middle-income countries (LMICs), stillbirth is a major health burden, with rates of more than double neonatal mortality,\(^3\) and often equal to all deaths of infants younger than 1 year. Neonatal mortality continues to reduce,\(^4\) whereas stillbirth rates are steady, and have increased in some regions.\(^5\) The death of any child is a tragedy for families, often with profound, longlasting psychosocial and economic effects.\(^6\) The *Lancet* Stillbirths Series in 2011 drew attention to the slow progress in the rate of reduction across HICs and emphasised prevention.\(^7\) In this fourth paper of the *Lancet*’s Ending preventable stillbirths Series, we summarise the status of stillbirths in HICs and suggest strategies to accelerate momentum in the reduction of stillbirths and to meet parents’ needs when their baby is stillborn.

**Stillbirth rates: is progress good enough?**

Worldwide, estimates\(^8\) show an average stillbirth rate (28 weeks gestation) in 49 HICs of 3.5 per 1000 total births. Country-specific rates varied widely from 1.3 to 8.8 (figure 1). The average annual rate of reductions (ARR) from 2000 to 2015 varied,\(^8\) with eight countries showing ARRs of less than 1%, and five countries with ARRs of more than 4%. Cross-country comparisons are hindered by data capture issues, including reporting practices for termination of pregnancy after the gestational age threshold; variation in data capture mechanisms, such as the use of cross-linkages between birth and death certificate data and birth registry data; and variation in definitions for reporting.\(^4\) Use of the WHO definition of stillbirth for the lowest gestational age limit of 28 weeks probably reduces the effect of these issues on reported stillbirth rates. Irrespective of data capture issues, real epidemiological variation in rates is present\(^8\) and shows that further reduction is possible. Stillbirth rates for disadvantaged groups are about double of those who are more advantaged,\(^9,10-12\) with evidence suggesting that these gaps can be narrowed.\(^11\) Although intrapartum stillbirths comprise a small proportion (less than 10%) of all stillbirths across HICs, variability in this indicator is also evident.\(^7\) Nonetheless, countries must monitor and understand their own temporal stillbirth trends rather than assess performance based on rankings with other countries.

Six of 49 countries (12%) showed third trimester stillbirth rates of 2.0 per 1000 births or lower, showing that this level is achievable (figure 1). If all countries had achieved a stillbirth rate in 2015 of 2.0 or less, 19 439 late gestation (28 weeks or more) stillbirths could have been avoided.

**Early gestation stillbirth**

Depending on the definition, 35%\(^13\) to 50%\(^14\) of stillbirths in HICs occur below the WHO recommended cutoff for the international comparison of 1000 g (or 28 weeks).\(^15\) Due to variability in definitions (eg, inclusion of terminations), comparisons of early gestation stillbirth rates are difficult between and within countries. When overall stillbirth rates (including early and late gestation stillbirths) were compared between 28 HICs, Sweden ranked third best and Australia last (28th), but Sweden dropped to tenth and Australia improved to 11th when rank was based on stillbirths who weighed 1000 g or more.\(^13\) Under-reporting of stillbirths less than 28 weeks is also evident in some regions.\(^7\) Ascertainment of data might be affected by perceptions of viability.\(^6\)
Understanding pathways leading to early stillbirth and spontaneous preterm birth at low to moderate community awareness that overweight and obesity increases the risk of advanced maternal age (older than 35 years), in-vitro fertilisation, multiple gestations, and overestimated the risks of advanced maternal age (older than 35 years, in-vitro fertilisation, multiple gestations, and overestimated the risks of advanced maternal age (older than 35 years). Risk factors leading to stillbirth and preterm birth at early gestation made a substantial contribution to high stillbirth rates in black and other minority populations. Socially marginalised and disadvantaged women often have twice or more the risk of stillbirth when compared to their more advantaged counterparts. Social determinants of maternal and fetal wellbeing should be monitored in all HICs, and addressed through education and alleviation of poverty, as well as improved access to health care, especially timely, culturally appropriate antenatal care. Stigma and fatalism Stigma and fatalism continue to exacerbate trauma for families and impede progress in stillbirth prevention. Strong parent and care provider partnerships are needed to dispel misperceptions and negative attitudes that persist in communities.

**Measurement for progress** All countries have the responsibility to implement high quality national audits for perinatal mortality, which translate into improvements in quality of care. Key performance indicators of quality maternity care should be measured and reported with the aim to eliminate substandard antepartum and intrapartum care, which is too often present when a stillbirth occurs. Bereavement care Bereavement care frequently does not meet the needs of parents, often with devastating consequences. Immediate bereavement care should be provided by appropriately trained health-care professionals with a sensitive and seamless transition to community support services in all settings.

**Improvements to data quality** Poor-quality data for stillbirths is a major problem across HICs. Access to high quality investigation into the causes of stillbirth, including autopsy and placental histopathology by a skilled perinatal pathologist, should be made available to all parents after stillbirth. Consensus on a classification system for stillbirth, which addresses the contribution of placental pathology, and a standard definition for reporting stillbirths that makes comparison possible for reports of early and late stillbirth rates across HICs, are needed.

**Future research** Future research must focus on stillbirth prediction, understanding placental pathways to stillbirth and causal pathways to unexplained stillbirth. Effective strategies are needed to reduce the prevalence of obesity and smoking in women of reproductive ages. Understanding pathways leading to early stillbirth and spontaneous preterm birth at early gestation is also important to pursue.

Despite these difficulties, stillbirth rates of those less than 28 weeks in HICs are not reducing, and some increases are evident.\(^1\) In Canada, recent increases in pregnancy terminations for prenatally diagnosed congenital anomalies at 20–23 weeks gestation explain increases are evident.\(^1\) In Canada, recent increases in pregnancy terminations for prenatally diagnosed congenital anomalies at 20–23 weeks gestation explain the increasing overall stillbirth rate.\(^1\) In the USA, spontaneous preterm birth at early gestation made a substantial contribution to high stillbirth rates in black non-Hispanic women.\(^2\) Thus, in HICs, stillbirths at less than 28 weeks comprise an important component of all adverse pregnancy outcomes, particularly in some racial and ethnic groups.

**Perceptions of stillbirth: are harmful attitudes holding back progress?** Fatalism and stigma about stillbirth persist in HICs, both across communities and in the healthcare workforce.\(^2\) In the International Stillbirth Alliance (ISA) surveys (panel 1), two in three respondents felt their community believed that “parents should not talk about their stillborn baby because it makes people feel uncomfortable”. One parent said “...many women told me that my son’s death was likely ‘nature taking care of mistakes’”. Perceptions and actions that denigrate grief, dismiss the importance of a stillborn child, or support notions that a child was never supposed to live, are harmful to bereaved parents and devalue efforts towards stillbirth prevention.\(^6\) Parent organisations provide powerful mechanisms to challenge stigma and fatalism about stillbirth (appendix pp 45–51).

**Risk factors leading to stillbirth** Is there sufficient awareness of the risks? Risk factors including demographic and lifestyle factors and medical or pregnancy disorders were reported in the *Lancet* Stillbirths Series.\(^7\) In the ISA survey of care providers, we asked respondents to select ten of 23 risk factors and associated disorders they believed posed the highest risk for stillbirth. We show the survey rankings alongside the adjusted odds ratio as reported in the *Lancet* Stillbirths Series\(^8\) and systematic reviews (appendix p 35).\(^9\) Perceptions were generally consistent with the evidence, but care providers underestimated the risks of advanced maternal age (older than 35 years), in-vitro fertilisation, multiple gestations, and overestimated the risk of pre-eclampsia, smoking, and substance misuse.

**Risk factors associated with maternal obesity were also underestimated.** In the survey of community members (n=1113), 72% of respondents felt that there was only very low to moderate community awareness that overweight and obesity increases the risk of stillbirth (appendix p 36). With increasing prevalence of overweight and obesity, interventions to increase the number of women beginning pregnancy with a normal bodyweight are crucially important to improve pregnancy outcomes and longer-term health. Modelling of a large Canadian cohort\(^10\) of about 225 000 pregnancies showed that a 10% decrease in prepregnancy body-mass index (across a range of prepregnancy body-mass indexes) could decrease stillbirth risk by 10%. However, targets to behavioural change alone fail to recognise the complexity of this issue, resulting in ineffective interventions and added stigma for women who are overweight.\(^11\) Antenatal care that labels women as problematic by focusing on bodyweight rather than a healthy pregnancy can produce feelings of embarrassment, guilt, and shame in the mother,\(^12\) leading these women to avoid or delay care.
Classification of causes: where to focus?
Despite the call in the *Lancet* Stillbirths Series for a uniform approach to the definition and classification of stillbirths, a systematic review of worldwide causes of stillbirth showed continued use of disparate approaches across HICs (appendix p 34), rendering interpretation between countries difficult. Irrespective of this challenge, placental pathologies were clearly important, accounting for about 40% of stillbirths in systems designed to capture these pathologies. Wide variation was evident in capture and definition of these pathologies, consistent with a review. The contribution of other important factors varied widely: congenital abnormalities were noted in 6–27% of stillbirths, infection in 5–22% of stillbirths, and spontaneous preterm birth or preterm ruptured membranes in 1–15% of stillbirths. In one high quality study, spontaneous preterm birth or preterm ruptured membranes were key factors in 41% of stillbirths less than 28 weeks.

Studies with hierarchical approaches showed higher proportions of fetal growth restriction and congenital abnormalities depending on the classification system used. The categories other unspecified (up to 46%) and unexplained (up to 76%) showed the widest variation and highest proportions.

Diagnostic tests for finding the cause of stillbirth
The evidence for many routinely implemented stillbirth investigations is scarce. Although studies in progress in the Netherlands and Australia will help to address this scarcity of data, the value of placental histopathology, autopsy, and genetic analysis is clear. Nonetheless, in the ISA parent survey (n=3503), 23% reported not being counselled or given information about autopsy. Failure to offer autopsy denies parents a chance to understand the cause of their baby’s death, increases the proportion of unexplained stillbirths, and hinders the effectiveness of subsequent audits. A crucial shortage of perinatal pathologists also hampers efforts. Such a shortage was reported not being addressed or solved by countries including the Netherlands and Australia.

Changes in diagnostic testing might lead to revisions in the ISA parent survey (n=3503), 23% reported not being counselled or given information about autopsy. Failure to offer autopsy denies parents a chance to understand the cause of their baby’s death, increases the proportion of unexplained stillbirths, and hinders the effectiveness of subsequent audits. A crucial shortage of perinatal pathologists also hampers efforts. Such a shortage was reported not being addressed or solved by countries including the Netherlands and Australia.

In our survey of care providers, only 33% reported that autopsy was routinely completed after consent (appendix p 37). Parental consent and cost were frequently cited as barriers to investigations (appendix p 38), despite evidence that identification of the cause of stillbirth might reduce costs in subsequent pregnancies. As stated by Heazell and colleagues, the cost of care for subsequent pregnancies after a stillbirth with an assigned cause is less than for women whose stillbirths were of an unknown cause.

Changes in diagnostic testing might lead to revisions in the cause of stillbirth. Use of chromosomal microarray is now preferred to karyotyping because the microarray overcomes the issue of non-viable tissue. Microarrays also identify abnormalities that are not identified by karyotyping, such as microdeletions and micro-duplications. However, adoption of diagnostic advances is slow, with 30% of care providers from the ISA survey unsure how frequently microarray was used; only 4% said that microarray was routine. Whichever test is used, a perinatal pathology service is important to establish the cause of their baby’s death, increases the proportion of unexplained stillbirths, and hinders the effectiveness of subsequent audits. A crucial shortage of perinatal pathologists also hampers efforts. Such a shortage was reported not being addressed or solved by countries including the Netherlands and Australia.

Diagnostic tests for finding the cause of stillbirth include:

- **Microarrays** are now preferred to karyotyping because the microarray overcomes the issue of non-viable tissue. Microarrays also identify abnormalities that are not identified by karyotyping, such as microdeletions and micro-duplications. However, adoption of diagnostic advances is slow, with 30% of care providers from the ISA survey unsure how frequently microarray was used; only 4% said that microarray was routine. Whichever test is used, a perinatal pathology service is important to establish the stillbirth phenotype and to assess the meaning of newly described genetic variations.

Figure 1: Present stillbirth rates and reductions since 2000 in high-income countries
ARR=annual rate reduction. *Countries with less than 5000 annual births.

www.thelancet.com Published online January 18, 2016 http://dx.doi.org/10.1016/S0140-6736(15)01020-X 3
Addressing data quality in causes of stillbirth
Classification of cause of death in stillbirth needs to be standardised, especially with regard to placental pathologies. Collective agreement of definitions of placental lesions and their importance is also needed.41 Although the same lesions might be seen in stillbirths and in livebirths, placental lesions are more frequently noted in cases of stillbirth.42 Similarly, other causes of stillbirth can be seen in livebirths. In one review (Leisher SH, Teoh Z, Reinebrant HE, et al, unpublished), not one classification system met the criteria of a quality system, as defined by an expert panel. Development of WHO’s International Classification of Diseases-Perinatal Mortality,43 aims to address these standards. Although HICs are likely to continue with detailed classification of stillbirths on the basis of sophisticated diagnostics not accessible in LMICs, approaches must be consistent with the International Classification of Diseases-Perinatal Mortality system, and HICs must reach consensus on such a system. The availability of thorough medical history and diagnostic testing underpins accurate data for stillbirth causes. Standardised perinatal death datasets are essential. Such datasets are in place nationally in the UK, Ireland, and New Zealand, and are in pilot-testing in Australia.

Understanding and tackling disparities in stillbirth risk
Disparities in stillbirth rates suggest larger systems of structural inequality exist, including racism and systemic inequities in opportunities and power.44,45 Accordingly, health disparities reflect social and political determinants rather than biological origins.46-49 Within HICs, stillbirth rates for disadvantaged groups are often accessible in LMICs, approaches must be consistent with
double those of more advantaged groups, and are likely to be underestimated, because health disparities are often only measured with comparison of the most advantaged with the least advantaged.47 The relationship between stillbirth and social disadvantage is complex, with probable links across preconception, pregnancy pathways, and risk factors (figure 3).

Access to and quality of antenatal and maternity care
Disadvantaged women are less likely to receive adequate antenatal care.54 Access to, and quality of antenatal care also differs by populations55 and among ethnicities.56 Clear and specific circumstances have been noted where differential access or uptake of services contributes to disparities. These include antenatal diagnosis and pregnancy termination for congenital anomalies, timely diagnosis and treatment of pre-eclampsia, and labour induction for post-term pregnancy. Rural–urban differences in access to services are also likely to contribute, especially in populations in remote areas that are most at risk of stillbirth.50,57

Institutionalised racism is often reported by women accessing antenatal care.58 Beyond health-care delivery
Health disparities are only partly explained by disparities in maternity care.4 Complex social determinants, termed causes of the causes, include: poverty; experiences of discrimination; incarceration; addiction; chronic stress; and inadequate education, child care, employment, transportation, and living conditions.59 Intimate partner violence,60 mental health issues,61 and the cumulative effect of stressful life events62 are also hidden but potent risks. In a systematic review63 of nearly 1 000 000 births in the UK from 1993 to 2005, stillbirth rates were 1.5–2.0-fold greater in the lowest area deprivation quintiles compared with the highest.

In one study,64 women migrating to HICs had stillbirth rates double the average proportion of the host country, particularly when their country of birth was a humanitarian source country. Adjusted for age, parity,
socioeconomic status, and body-mass index, these differences disappeared, suggesting ethnicity might not always be a pathway to increased stillbirth. However, disparities in pregnancy outcomes continue between women of differing racial or ethnic background accessing the same health-care services.\(^{33–46}\) Stillbirth rates for women of south Asian and African origin giving birth in Europe or Australia are two to three times higher than white women.\(^{33–46}\) The challenge is to understand why and how we can manage the excess risk of stillbirth correlated with ethnicity within routine and comprehensive antenatal care.

**Addressing disparity**

To understand and address socioeconomic disparities in stillbirth, all HICs must monitor and report socioeconomic status in vital statistics.\(^2\) Maternal education is one relevant and feasible indicator for comparisons within a country and across a country.\(^3\) Across 19 European countries with a median population attributable risk of 26% (IQR 16–31), Zeitlin and colleagues\(^2\) showed 1606 of 6447 stillbirths would not have occurred in 2010 if rates for all women were the same as for women with post-secondary education (appendix p 39). School completion for pregnant women could therefore have a substantial effect on the reduction of disparities. Structural issues such as housing, employment, and food security policies must also be addressed.

Antenatal care, home visiting services, and financing of contraceptive services are examples of interventions with capacity to address reproductive health strategies\(^6\) and therefore to prevent stillbirths. Universal service platforms should be supplemented with efforts to engage populations especially at risk of stillbirth, including outreach strategies and transportation to health services.

In 2011, we nominated quality, accessible, culturally responsive, and appropriate preconception care as one of the top priorities to reduce disparity.\(^1\) Improvements in preconception care are an enormous challenge. Innovative community programmes addressing refugee maternal and child health inequalities\(^8\) and antenatal care programmes associated with partnerships between midwives and Aboriginal health workers are underway in Australia.\(^7\) Universally, women whose first language differs from the dominant national languages should be offered care and information in their own language,\(^9\) with a choice of the gender of the interpreter.\(^9\) The US Affordable Care Act\(^10\) will provide services such as free contraception, screening for infections, and programmes for alcohol and smoking cessation.\(^10\)

**Quality of care**

**Uptake of interventions in stillbirth prevention**

Through the ISA survey of care providers we assessed uptake and perceived barriers to implementation of the *Lancet* Stillbirths Series recommended interventions in stillbirth prevention (appendix pp 40, 41). Only 60% of respondents said their facility always provided smoking cessation advice. The most frequently cited barriers were scarcity of time or resources, or both (20%) and acceptance by women (35%). Only 36% of respondents said their facility always provided care that was culturally appropriate, with time and resources noted as the most frequent barrier (17%). Serial fundal height measurements were not done at all or only sometimes according to 14%, with 10% of care providers identifying absence of high quality evidence of effectiveness as a barrier. Most providers said their facility always or mostly used early ultrasound assessment of gestational age (83%), with cost and acceptance by women cited as barriers by about 12%. Screening for gestational diabetes at 28 weeks was always or mostly done according to 77% of respondents, with 12% citing acceptance by women as a barrier. Use of Doppler velocimetry in high-risk pregnancies had reasonably high usage (68%), with absence of high quality evidence of effectiveness (11%) and cost (9%) as the most regularly cited barriers. The least frequently used intervention (used always or mostly according to 43% of respondents) was low-dose aspirin for high-risk pregnancies, with 13% of care providers reporting absence of evidence as a barrier. Low-dose aspirin and heparin have been used to improve placental function and decrease stillbirth, but a high number needed to treat with aspirin and uncertain efficacy has prevented widespread adoption of these interventions.\(^7\)

Although evidence is incomplete, preconception care is a potentially valuable intervention in stillbirth prevention, yet only 28% of care providers said that preconception care for women with risk factors was implemented mostly or always in their facilities.

**Antenatal and bereavement care: information, communication, and support**

In addition to clinical care, quality maternity care incorporates interpersonal and emotional aspects of care.\(^3\) Because stillbirth is an indicator of quality of care, women’s experiences of care associated with stillbirth can be deemed to be an indicator of quality of care processes. Just as actions can be taken to prevent stillbirth, actions can be taken to prevent adverse psychosocial outcomes after stillbirth and, in both instances, suboptimum interpersonal care can undermine even the best clinical care and lead to harm.\(^1\) The ISA surveys asked parents and care providers eight questions designed to capture components of quality care consistently identified as important to women (appendix). The data (appendix p 42) show that care providers viewed various aspects of care more positively than bereaved parents. At least four in five providers (83–95%), but only three in five parents (54–70%), judged these aspects of quality care to be present always or most of the time. Not spending enough time with parents in antepartum care was a point of agreement for parents and care providers. Importantly,
more than a third of parents believed their concerns were not taken seriously or felt not listened to, either before or after their baby was stillborn.

Ratings of information provision and parental involvement in decision making after stillbirth were lower for parents and care providers compared with before stillbirth, underscoring the challenge of providing quality bereavement care. Parents’ views of the comprehensibility of information were also less positive than the views of care providers; barely half of the parents felt the time spent with care providers was adequate. Many of the questions parents had could be readily answered and procedures to answer such questions would be easy to implement (appendix p 25). Missed opportunities to answer parents’ questions might be avoided by measures that recognise parents’ need to know more about their child.

These survey findings corroborate the results of a systematic review on parents’ and care providers’ experiences of bereavement care. Care providers were reported to hide behind ritualising guidelines and checklists. These care providers were frequently not trained to expect and manage parents’ reactions and individual needs. In our survey of care providers, only 23% reported being satisfied with training opportunities in bereavement care at their facility, and 30% had no opportunities. As reported in the meta-analysis, care providers urgently need emotional, knowledge, and system-based support, and training in verbal and non-verbal communication skills.

Addressing quality of care

Stillbirth prevention needs emphasis on quality maternity care that is respectful of a woman’s rights and tailored to her needs. Quality can be improved through better communication and information provision, and timely delivery of evidence-based interventions. Quality bereavement care must also be emphasised, with greater access than at present to training being a crucial first step. Maternity units must decide whether this level of care is best accomplished through training and certification of competencies for all staff, or whether to assign the role of bereavement support to a dedicated group. Access to clinical practice guidelines is imperative, but active implementation and evaluation of clinical practice guidelines is needed. The UK provides an extensive range of national clinical guidelines acknowledging every aspect of the key messages of the Lancet Stillbirths Series HICs paper but, for other HICs with a high stillbirth burden, such resources are far less comprehensive. Publicly available reports of maternal satisfaction with care and other indicators of women’s maternity care experiences should be developed, as was done in Australia, New Zealand, and the UK. Audit and feedback and benchmarking programmes that include explicit targets for change and suggestions for how change can be achieved are also effective.

Panel 2: Essential steps to establish perinatal mortality audit at the national level

- Execute an information plan to make clear that stillbirths are not inevitable and that many stillbirths can be prevented by improving quality of care, particularly near term.
- Obtain support and budget from national bodies, including ministries of health and professional colleges.
- Develop a national network to coordinate data collection and identify missing cases of stillbirth in the data through a system to check birth and death certificates, and lead timely reporting and analysis.
- Establish a national multidisciplinary leadership or steering group to drive the process, agree on national priorities, develop and monitor formal audit methodology, establish consistent and robust definitions of stillbirth, ensure consistency across jurisdictions, and ensure perinatal audit is on the national agenda when the topic is relevant.
- Identify clinical champions at service delivery level.
- Develop a system for clinical and process data collection, preferably web based, to be completed by the clinical staff.
- Ensure that the underlying philosophy of data collection is based on shared ownership of the data to optimise data quality. This idea includes the ability of units to access their own data in a format that they can use for their own surveillance and perinatal mortality reviews.
- Allocate human resources to support local or regional audit initiatives.
- Complete a local review of perinatal cases with multidisciplinary teams that have a specific allocated amount of time.
- Develop a method to provide useful, automatically generated feedback to clinicians and facilities of the suggested improvements to support local quality and audit processes.
- Implement effective monitoring and evaluation of the audit programme with relevant and feasible performance indicators.
- Implement processes to ensure that disclosure of information cannot be used for disciplinary action.

Perinatal mortality audit: why and how?

Perinatal audit has been described as: “The systematic, critical analysis of the quality of perinatal care, including the procedures used for diagnosis and treatment, the use of resources and the resultant outcome and quality of life for women and their babies.” Audits in the Netherlands, the UK, and New Zealand show substandard care factors are present in an unacceptably high proportion of cases (20–30%, and up to 60% for intrapartum stillbirths). In New Zealand, stillbirth rates at term have reduced over the 7 years since the national perinatal audit began (appendix p 43). This reduction was specifically attributed to a decrease in stillbirth at a gestation of 37–41 weeks or more. Despite the value of the perinatal audit programmes at the national level, few countries have implemented these schemes (appendix). Norway, which originally introduced its national perinatal audit programme in 1984, has now abandoned this practice because of changes in the national organisational structure of its care systems. Among the care providers we surveyed, only 37% reported that their facility completes regular perinatal audit meetings; these meetings were most often held only monthly (34%) or quarterly (26%), and used only case discussion (61%) as opposed to formal audit methodology (12%).
The need for a greater focus on effective, sustainable implementation of perinatal audit is clear to ensure health services identify areas with suboptimum care. Establishment of the perinatal mortality audit needs both service-level support and ministerial-level support, and quarantined time for multidisciplinary team engagement. Other crucial components include an agreed set of definitions, adoption of a formal audit methodology, appropriate indicators for monitoring and evaluation, and effective data systems (panel 2). Innovative solutions for electronic health and mobile health that are being implemented hold promise, as well as structured education programmes about institutional perinatal mortality audit and classification, such as the IMPOVE (IMproving Perinatal Mortality Review and Outcomes Via Education) programme (Gardiner P, Kent AL, Rodriguez V, et al, unpublished).

Antenatal screening and interventions to prevent stillbirth

Early delivery

Routine induction of labour at term and post-term reduces the risk of perinatal mortality and caesarean birth. However, birth before 39 weeks increases the risk of morbidity and is associated with increased risk of long-term mortality. Therefore, before 39 weeks, early delivery needs to balance any reduction in stillbirth risk against morbidity and long-term mortality of the offspring, and should only be considered in the presence of a substantial risk for maternal or neonatal complications. For induction of labour, provision of adequate information to women is essential, because women have reported not being aware of the risks of induction or the implications for future pregnancies until after the induction had been completed.

The ARRIVE trial (NCT01990612) in the USA, comparing elective induction of labour at 39 weeks with expectant management in singleton uncomplicated term pregnancies, might help to clarify the risks and benefits of term induction.

Ultrasonic and biochemical prediction of stillbirth risk

Various pathophysiological processes result in stillbirth, making prediction difficult. A test is likely to do poorly when assessed against all stillbirths, but might be more specific for a particular cause of stillbirth. A systematic review of biomarker and ultrasonic tests noted that none of 16 single, or five combined, tests did well as predictors of stillbirth. However, stillbirth attributed to placental dysfunction was moderately to strongly associated (positive likelihood ratios between five and 15) with low first-trimester pregnancy associated plasma protein A and abnormal uterine artery Doppler velocimetry in the second trimester. More studies are needed to establish whether close vigilance or any treatment is effective to prevent stillbirth in this group who are at an increased risk.

Routine late pregnancy ultrasound to screen for fetal growth restriction

Of the estimated 30–50% of stillbirths related to fetal growth restriction, most are undetected and many occur in women who do not have risk factors.

Ultrasonic fetal biometry is widely used in high-risk pregnancies as a means of detecting fetal growth restriction, thus universal ultrasound is one potential approach to screening low-risk women. Until recently, high quality evidence of the diagnostic effectiveness of ultrasound was absent. However, a prospective cohort study has recently reported that universal scanning was associated with about a three-fold increase in the detection of fetuses who were small for their gestational age (from 20% to 57%). Further, these small fetuses with reduced growth velocity of the abdominal circumference were at an increased risk of morbidity, whereas those small fetuses with normal growth velocity were not. This study confirms universal ultrasound is effective in the identification of fetal growth restriction. However, the costs and potential adverse iatrogenic consequences of implementing such an intervention need consideration.

Challenges in gaining high quality evidence for screening

Sample size calculations suggest that even if a screening test has a positive likelihood ratio of ten and was coupled with an intervention that reduced stillbirth by 50%, a study of screening and intervention would still need about 130 000 women to be adequately powered (appendix p 44). Possible approaches to address this issue are the inclusion of stillbirth as part of a composite outcome and the use of study designs with randomisation at the hospital level, including cluster randomised controlled trials or stepped wedge randomised controlled trials, such as those of fetal movement awareness interventions (NCT01777022 and ACTRN12614000291684).

Promising antenatal interventions?

Raising awareness of decreased fetal movements might aid stillbirth prevention through timely detection and reporting, although concerns exist about the potential to increase anxiety and use of health services. Two large-scale trials of fetal movement awareness interventions are in progress in Australasia (ACTRN12614000291684), and Ireland and the UK (NCT01777022). In a large non-randomised study, an educational programme of standardised measurement of fundal height, plotting on customised charts and referral protocols, has also been associated with reduced stillbirth. Data from randomised controlled trials are needed to confirm or refute these findings. The adverse effect of supine sleep position in late pregnancy has been emphasised as a potentially modifiable risk factor for stillbirth. Although these findings are biologically plausible, results from further studies in the UK and New Zealand study are awaited.
The research agenda

The Lancet Stillbirths Series identified 30 questions derived from opinions of professionals and researchers. Methods for setting research priorities have since developed to include patient and public views. As part of the ISA surveys, more than 7000 parents, care providers, and community members provided stillbirth action and research priorities. Although the ISA project is in progress, preliminary data support the Lancet Stillbirths Series and a recent UK project. Major topics included: stillbirth prevention by application of tests and development of novel investigations for optimum timing of delivery, the need to increase understanding of placental pathways in stillbirth and the causes of unexplained stillbirth, optimum bereavement care, and subsequent pregnancy care.

Perinatal mortality audit programmes, interventions to reduce the prevalence of overweight and obesity, and initiatives to increase the coverage of programmes for smoking cessation in pregnancy are also priorities. With static rates of stillbirths less than 28 weeks across HICs, and with spontaneous preterm labour or preterm ruptured membrane as major contributors, continuing efforts in prediction and prevention of preterm birth are important in stillbirth prevention. Strengthening of collaboration between researchers and parents to address priorities with similar protocols is key to address stillbirths in HICs.

Conclusions

Stillbirths are a major public health issue in HICs and reductions in rates have not matched those for neonatal mortality. Variation and socioeconomic disparities in stillbirth rates, suboptimum uptake of interventions, low proportions of stillbirths attributed to congenital abnormality and high proportions classified as unexplained, and the contribution of substandard care factors suggest stillbirths are not inevitable, and that further reduction in HICs is possible. Ending preventable stillbirths in HICs can be achieved through improvements in the health status of women, through improvements in quality of maternity care, and with reductions in social inequities. High quality perinatal mortality audit informed by thorough investigation is attainable in all HICs and holds the key to fairly rapid reductions in stillbirth rates. The death of a child before birth is a tragedy for families, and stigma and fatalism must be eliminated to optimise bereavement care and to reduce the number of these deaths.

Contributors

VF was responsible for the overall development and writing of the manuscript. AMW assisted with the development and writing of the manuscript and coordination of author contributions. DE and PM assisted in editing. VF, AMW, DE, FMB, DH, AV, CR, JC, PC, JFF, LF, MMG, PM, JJE, GS, TYK, RMS, SHL, LM, DS, AEPH, and SP contributed to the development and dissemination of the web-based surveys. AMW coordinated the dissemination of surveys and SHL and AMW coordinated the survey translations. AMW led the quantitative survey data analyses with VF and MC. FMB and DH undertook qualitative survey data analysis. JEL and HB did data analyses for stillbirth rates and risk factors. TYK, RMS, SHL, and JJE developed the diagnostic test section. DE developed the risk factor and interventions sections. VF, MC, and HER undertook the causes of stillbirth analysis. JJE, CF, and LS developed the perinatal mortality audit section. PM, LF, SJB, KSJ, JZ, and EW developed the disparity section. DS, AEPH, and CS contributed a meta-analysis on experiences of bereavement care. GS and LM developed the antenatal screening and interventions to prevent stillbirth section. FB, GS, JFF, and RLG drafted the manuscript. All authors read and approved the final version of the manuscript.

The Lancet Ending Preventable Stillbirths study group

Australia: Vicki Flenady (Mater Research Institute, University of Queensland, QLD, Brisbane), Norway: J Frederik Frenen (Norwegian Institute of Public Health, Oslo); South Africa: Mary V Kinney (Save the Children, Edgemead); Switzerland: Luc de Bernis (UN Population Fund, Geneva); UK: Joy E Lown, Hannah Blencowe (London School of Hygiene & Tropical Medicine, London). Alexander Heazell (University of Manchester, Manchester), USA: Susannah Hopkins Leicher (International Stillbirth Alliance, NJ).

The Lancet Stillbirths in High-Income Countries Investigator Group

Argentina: Jessica Ruidiaz (Fundación Era en Abril, Buenos Aires); Australia: Andre Carvalho (SANDS Australia, Melbourne), Jane Dahlstrom (Australian National University, Canberra), Christine East (Monash University and Monash Health, Melbourne, VIC), Jane P Fox, Kristen Gibbons, Iainabo Ibiebele, Sue Kíide (Mater Research Institute, University of Queensland, Brisbane, QLD), Glenn Gardener, Rohan Lourie, Patricia Wilson (Mater Health Services, Brisbane, QLD), Adrienne Gordon (University of Sydney, Sydney, NSW), Belinda Jennings (Health Department Western Australia, Perth), Alison Kent (Australian National University Medical School and Centenary Hospital for Women and Children, Canberra), Susan McDonald (La Trobe University and Mercy Hospital for Women, Melbourne, VIC), Jecky Merchant (Bears of Hope, Sydney, Australia), Jeremy Oats, Susan P Walker (University of Melbourne, Melbourne, VIC), Jeanne Raven (SIDS and Kids, Melbourne), Anne Schirrmann (University of Queensland, Brisbane, QLD); Canada: Francine de Montigny (Université du Québec en Outaouais, Gatineau), Grace Goyon (Alberta Health Services Perinatal Program, Alberta); France: Beatrice Blondel (Institut National de la Santé et de la Recherche Médicale, Paris); Germany: Sahinte de Wall (Hannover Medical School, Hannover); Ireland: Sinead Bonham (Healthcare Pricing Office, Dublin); Paul Corcoran, Mairé Gregan (Feileacain, Cork), Sarah Meaney, Margaret Murphy (University College Cork, Cork); Japan: Stephanie Fukui (SIDS Family Association, Tokyo); Netherlands: Sanne Gordijn (University of Groningen, University Medical Center Groningen, Groningen), Fleurusca Rorteweg (University of Groningen, Martini Hospital, Groningen); New Zealand: Robin Cronin, Vicki Mason (University of Auckland, Auckland), Vicki Culling (Sands Wellington-Hutt Valley, Wellington); Russia: Anna Usynina (Northern State Medical University, Arkhangelsk); Sweden: Karin Pettersson (Karolinska University Hospital, Stockholm), Ingela Radestad (Sophiahemmet University, Stockholm); Switzerland: Susanne van Gogh (Zurich University of Applied Sciences, Institute for Midwifery, Winterthur); UK: Bia Bichara (London School of Hygiene & Tropical Medicine, London), Stephanie Bradley, Alison Ellis (University of Bristol, Bristol), Sue Downe (University of Central Lancashire, Preston), Elizabeth Draper, Helen Mankelow, Janet Scott (SANDS UK, London), Lucy Simm (Department of Health Sciences, University of Leicester, Leicester), William Stones (University of St Andrews, Scotland), Tina Lavender (University of Manchester, Manchester); USA: Joanne Caciott (Arizona State University, Tempe, AZ), Wes Duke (US Department of Health and Human Services, Washington, WA), Ruth C Fretts (Huard Vanguard Medical Associates, Wellesley, MA), Katherine J Gold (Department of Family Medicine and Department of Obstetrics, University of Michigan), Ann Arbor, MI), Elizabeth McClure (Research Triangle Institute, NC, USA), Uma Reddy (Eunice Kennedy Shriver National Institute of Child Health and Human Development, Rockville, MD).

Declarations of interest

SJB received salary support from a Future Fellowship from the Australian Research Council, during the conduct of the study. LF received personal fees from Health Quality and Safety Commission in New Zealand, during the conduct of the study. FS received grants from Sands, outside the submitted work and is a member of the Executive Committee of the...
Stillbirth Clinical Study Group, UK (Royal College of Obstetricians and Gynaecologists and Sands), the Department of Health Stillbirth task-and-finish groups, and the PROMPT Maternity Foundation. GS received non-financial support from GE Healthcare, personal fees and non-financial support from Roche, grants and personal fees from GlaxoSmithKline, outside the submitted work. All other authors declare no competing interests.

Acknowledgments

HB received grants from Saving Newborn Lives/Save the Children, during the conduct of the study. JFF was funded in part by a technical support grant from the Norwegian Agency for Development Cooperation and by the Centre for Intervention Science in Maternal and Child Health, which is funded by the Research Council of Norway through its Centers of Excellence scheme and the University of Bergen, Norway. We sincerely thank every parent, care provider, and community member who gave their time to complete the International Stillbirth Alliance (ISA) web-based surveys. We thank the ISA Network, the International Confederation of Midwives, the International Federation of Gynaecology and Obstetrics, ISA member organisations, and further national organisations that supported the dissemination of surveys. We also thank Translators Without Borders for assisting with survey translations. Mater Research Institute, University of Queensland, Australia provided infrastructure and funding for the research team to enable this work to be undertaken. The Canadian Research Chair in Psychosocial Family Health provided funding for revision of the translation of the French web-based survey of care providers.

References

25 Smith D, Lavender T. The maternity experience for women with a body mass index ≥30 kg/m2: a meta-synthesis. BJOG 2011; 118: 779–89.
57 Marmot M. BMA presidency acceptance speech: fighting the alligators of health inequalities. BMJ 2010; 341: C610.
71 Adams EK, Markowitz S, Dietz PM, Tong VT. Expansion of Medicaid covered smoking cessation services: maternal smoking and birth outcomes. Med Care Medicaid Res Rev 2013; 3: pii: mmr003.03.a02.
99 McCowan LME, Thompson JMD, Cronin R, et al. Supine sleep position in late pregnancy is associated with increased risk of late stillbirth. The International Conference on Stillbirth, SIDS and Baby Survival 2014; Amsterdam; Sept 18–21, 2014. 038.