

Fifty years of the Confidential Enquiry into Maternal Deaths

Detailed analysis of maternal deaths in the UK has stimulated many improvements in pregnancy care. Recent reports, however, have identified groups at disturbingly high risk. Lessons learned in Britain are now being applied in other countries.

Death in pregnancy or after childbirth still occurs in the UK, producing reactions of shock among clinicians and public alike. It is felt that nowadays such things should not happen. Three or four generations ago, however, most people knew a family that had experienced a maternal death.

The shared memory of these tragedies has been lost and replaced by widespread misunderstanding of the risks of pregnancy and the reasons why it is now so safe. Britain's low maternal mortality rate is seen as a by-product of prosperity and a healthy population. In reality, it is the result of years of focussed initiatives, many of them stimulated by the Confidential Enquiry into Maternal Deaths (CEMD).

The start of the Confidential Enquiry

The CEMD began in England and Wales in 1952 and its reports have appeared every 3 years since 1957, making it the longest-running clinical audit in the world. Looking back, it is perhaps surprising that it was set up at all.

Before the CEMD

In 1928 the UK maternal mortality rate was 440 per 100 000. By 1951 it had fallen by 82%, mainly as a result of the introduction of antibiotics, which all but abolished deaths from puerperal sepsis (Ministry of Health, 1957) (*Figure 1*). Instead of relaxing, obstetricians redoubled their efforts. Their morale must have been high and, with the war over and the NHS just beginning, they saw their way to achieving even more success.

The method of the Confidential Enquiry

The CEMD was set up after discussion between the Ministry of Health and the Royal College of Obstetricians and Gynaecologists. The method they devised has stood the test of time and in its essentials has changed little over 50 years.

When a maternal death occurs a form is sent to all the professionals involved to obtain detailed information and comments. Confidentiality is assured, so reports are frank. The regional obstetric assessor (a clinician respected by local colleagues) reviews the completed form, adds further comments and sends it to a named doctor at the Department of Health, who keeps it under lock and key.

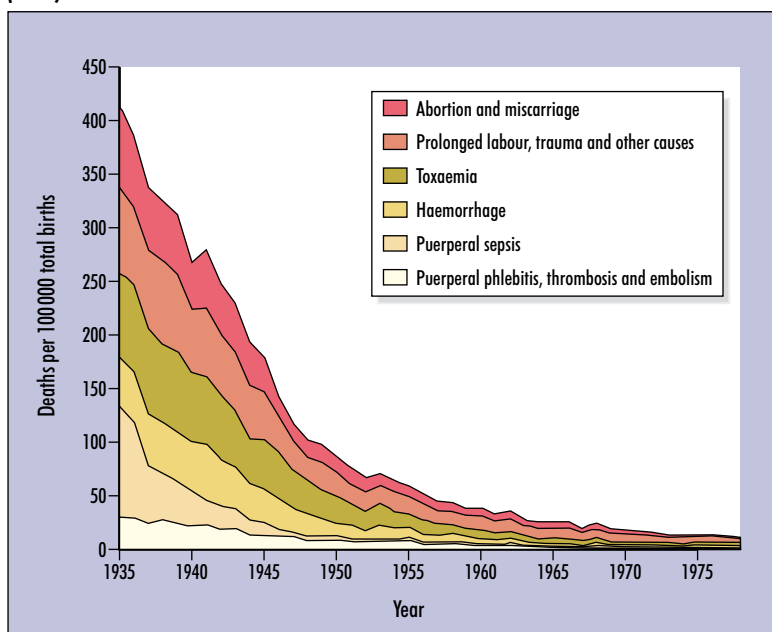
All cases are reviewed by national assessors – clinicians who look for patterns across the country and for lessons from individual cases. Together they write a comprehensive report for publication to the profession and the public. Once their manuscript has been sent to the printers, the original forms are destroyed.

Changes since the 1950s have included the appointment of assessors in general medicine, anaesthesia, psychiatry, intensive care and midwifery, to join those in obstetrics and pathology. In 1985 the CEMD became UK-wide.

Changes since 1952

Between 1952 and 2002 the UK maternal mortality rate has fallen from 80 to 13.1 per 100 000. Recommendations in successive reports have changed over the years but in general the proportion of 'avoidable factors' identified by the Enquiry has not fallen because there has been a steady rise in standards of care.

Figure 1. Maternal mortality by underlying cause; England and Wales 1935–78. From Lewis (2004).



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Table 1. Direct deaths reported to the Confidential Enquiry

Cause	1952-4 (England and Wales)	2000-2 (UK)
Hypertensive disease	246	14
Prolonged labour/obstetric trauma	197	1
Haemorrhage	188	17
Abortion	153	4
Thromboembolism	138	30
Anaesthesia	49	6
Sepsis	42	11

The annual number of births stayed fairly constant between 1952 and 2002 but *Table 1* shows the fall in deaths from direct causes between the first and the most recent reports.

Hypertensive disease

Figure 2 shows the decline in mortality from hypertensive disease, relatively rapid between 1952 and 1964 and then much more gradual. This is a pattern seen with several conditions: after obvious problems are solved, further improvement is achieved more slowly.

Avoidable factors identified in the 1952-4 report are listed below (with numbers of cases). Today some seem old-fashioned but others are still familiar.

- Inadequate antenatal care (59): doctors or midwives ignored obvious signs
- Home confinement (17): inappropriate booking of high-risk women
- The patient's attitude (17): flat refusal to take advice, or a concealed pregnancy
- Confusion of responsibility (14): care fell between doctor and midwife
- Follow-up of antenatal patients (9): clinic defaulters were ignored
- Shortage of hospital beds (7): the report is scathing about this factor.

In 1979-81 cerebral haemorrhage was the most common cause of death resulting from hypertensive disease. The report recommended more widespread use of antihypertensive drugs and the establishment of regional centres to advise on management of severe pre-eclampsia (Department of Health and Social Security, 1986).

Later, fluid balance problems became the leading cause of death. The 1985-7 report stressed the dangers of excessive infusion and recommended re-evaluation of magnesium sulphate, which was subsequently shown in clinical trials to be superior to other drugs for treating eclampsia and in pre-eclampsia (Department of Health, 1991).

The 1994-6 report noted that severe pre-eclampsia can develop within days of normal observations and stressed the need to educate women about its symptoms (Department of Health, 1998).

Obstetric injury

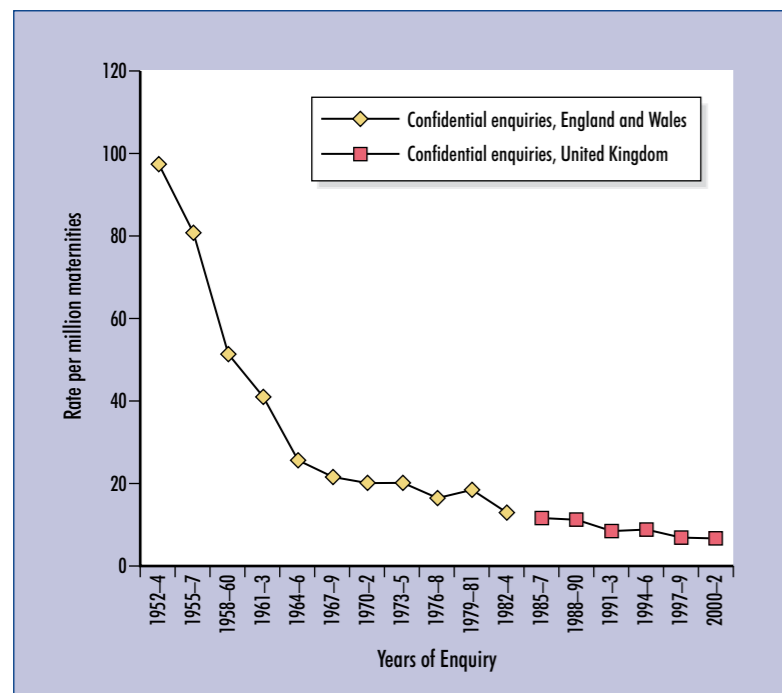
Obstetric injury is now rare but in 1952-4 it was the second most common cause of maternal death. The classification of obstetric problems in the first report was tantalizingly obscure:

Prolonged labour	63
Disproportion or malposition of the fetus	23
Other trauma	55
Other complications of childbirth	66
Total	197

Today the idea of a woman dying of prolonged labour in the UK is unthinkable. This cause disappeared from the reports in the 1950s as methods of accelerating labour were developed. While obstetricians were learning to use these safely, the reports included a chapter on 'uterine rupture', which resulted in 33 deaths in 1955-7 (Ministry of Health, 1960). The total then declined and the chapter was discontinued in 1982-4.

In 2000-2 there was one death from genital tract trauma, which was the result of a uterine tear (Lewis, 2004). The report commented that because such cases are now rare, consultants have limited experience of dealing with them. Their rarity is the result of high standards of obstetric practice and a greater willingness to undertake caesarean section.

Figure 2. Maternal mortality rate from hypertensive disease; England and Wales 1952-84; UK 1984-2002. From Lewis (2004).



Haemorrhage

Life-threatening haemorrhage occurs once in every 1000 births but death is rare because most women now deliver in hospitals where severe haemorrhage can be treated promptly. In the early 1950s it caused over 40 deaths every year but there was a rapid fall between 1952 and 1975. Among the recommendations of early CEMD reports were hospital delivery of high-risk women, and the use of obstetric flying squads to resuscitate women at home or in an isolated maternity home before transfer to hospital. By the 1980s the need for flying squads had disappeared as delivery at home and in isolated units became uncommon.

Since 1976 deaths from haemorrhage have fallen and risen again in what looks like a regular pattern (*Table 2*).

This pattern may be the result of chance or may represent subtle changes in clinical practice, with rules being relaxed and then tightened as the consequences become clear. For example, successive reports recommended that caesarean section for placenta praevia should be carried out by a consultant. In 1988-90 deaths occurred in which this recommendation had been ignored (Department of Health, 1994). The sharp increase in 2000-2 was partly the result of women failing to seek care or refusing blood transfusion but the report also expressed concern about reduced training of obstetricians.

Abortion

The 1952-4 report included 153 deaths from abortions of which at least 108 were illegal. Two social groups were affected: 'the majority of single women were noted to be living in comfortable circumstances, whereas one-third of married women were noted to be living in poor circumstances and many had families of considerable size'. During the 1950s and 1960s there were about 30 deaths per year from illegal abortion and by 1967 this was the leading cause of maternal death in England and Wales.

The number of deaths 'clearly due to illegal abortion' decreased after the Abortion Act of 1967 but did not

Table 2. Deaths from haemorrhage

Period	Number of deaths
1976-8	24
1979-81	14
1982-4	9
1985-7	10
1988-90	22
1991-3	15
1994-6	12
1997-9	7
2000-2	22

fall to zero until 1982-4. Before 1967 the total had probably been underestimated. The 1979-81 report noted that deaths attributed to spontaneous miscarriage had decreased in parallel with those from illegal abortion.

In the early years, legal abortion was also unsafe. In 1970-2 deaths from legal and illegal abortion were virtually identical at 37 and 38 respectively (Department of Health and Social Security, 1975). Subsequently termination of pregnancy became much safer.

Thromboembolism

In 1952-4 most of the 138 deaths from thromboembolism occurred after vaginal delivery. When deep venous thrombosis (DVT) was diagnosed obstetricians were reluctant to use anticoagulants for fear of haemorrhage. In the 1960s the use of anticoagulants to treat DVT was still a matter of clinical judgment but the number of cases had fallen as the requirement for 'lying in' after delivery was relaxed.

In 1973-5 the number of deaths was 38 and the report drew attention to the risk factors of age, parity, obesity, operative delivery, bed rest and caesarean section (Department of Health and Social Security, 1979). During the 1980s the reports increasingly recommended that 'wider use of ... prophylaxis in high-risk cases could reduce the risk still further'.

In 1995 the Royal College of Obstetricians and Gynaecologists published recommendations on thromboprophylaxis that applied to caesarean section but not to vaginal delivery. In 1997-9 deaths after caesarean section, which had risen to 15 in the previous triennium, fell sharply to four. Deaths after vaginal delivery did not fall, however, and the 1997-9 CEMD report commented: 'There is a clear need for national guidelines on thromboprophylaxis after normal delivery.' These were published in 2004 (Royal College of Obstetricians and Gynaecologists, 2004).

Anaesthesia

About 10-15 deaths per year were a direct result of anaesthesia until 1981, after which the total steadily fell to a single death in the 1994-6 triennium. This improvement was all the more impressive in view of the rise in the caesarean section rate. Anaesthesia for caesarean section is now about 40 times safer than it was in the 1960s. This is partly a result of increased consultant involvement, and partly a result of changes in technique.

Tracheal intubation for caesarean section had become accepted by the 1960s to reduce the risk of aspiration. Initially there was an increase in deaths resulting from failed intubation but this was reduced by better training, assistance and monitoring.

Regional anaesthesia avoids airway problems, and epidural analgesia services started in the late 1960s. In 2000, 91% of elective and 77% of emergency caesarean sections were performed under regional block and 24%

of all women in labour had an epidural (Lewis, 2004). There were no deaths resulting from regional anaesthesia in 2000–2.

General anaesthesia is still sometimes needed for caesarean section, however, and the risk of death from general anaesthesia, estimated at one in 20 000, does not seem to have altered since 1982–4. There is some concern now over the lack of experience attained by some anaesthetists when general anaesthesia is required.

Sepsis

Although puerperal sepsis had been the leading cause of death until 1935 (Loudon, 2000), it caused only 42 deaths in 1952–4 and indeed the early reports had no separate chapter on sepsis. As other causes fell, however, septic abortion became more important. The 1964–6 report was the first to have a chapter on sepsis and commented that if abortion deaths were included: ‘...sepsis would appear as the second most common cause of maternal deaths, a fact that is not easy to accept.’ (Department of Health and Social Security, 1969).

In 1964–6, there were 66 deaths caused by septic abortion, 28 by puerperal sepsis, and 29 by sepsis after surgery. After the Abortion Act 1967 deaths from septic abortion steadily fell. In 1982–4 obstetrics passed a remarkable milestone, as there was not a single death from puerperal sepsis in that triennium – a fact that was detailed without comment in the 1982–4 report (Department of Health, 1989).

Unfortunately cases of streptococcal infection reappeared and in 2000–2 there were 13 deaths resulting from sepsis, two of which occurred after home delivery. Because puerperal sepsis is now rare, midwives and doctors may not recognize the seriousness of its early signs until the woman is gravely ill.

‘Why Mothers Die’

In 1994–6 the CEMD reports changed to a larger format with a cover picture and the title *Why Mothers Die* (Department of Health, 1998). The intention was to increase their impact not only among obstetricians and midwives but also among other clinicians, as the numbers of indirect deaths began to overtake direct deaths.

With so few direct deaths, the continuing need for the CEMD was questioned; however, its strengths were recognized and its methods have now been extended to surgery, paediatrics and psychiatry. The CEMD has combined with the Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI) to form the Confidential Enquiry into Maternal and Child Health (CEMACH), a part of the National Patient Safety Agency of England and Wales.

Risk factors

A major feature of recent reports has been the identification of risk factors, both medical and social. Maternal mortality increases fivefold between the ages of 20 and 40 years. This is particularly relevant as the average age

at childbearing in the UK has risen sharply. Obesity is also a major factor, with 35% of the women in the 2000–2 report classified as obese.

These are dwarfed by the effect of social class. In 1999 the maternal mortality rate in social class 1 was under 3 per 100 000, but among social class 9 – the unemployed and socially excluded – it was over 135 per 100 000. Of the 242 direct and indirect deaths in 1997–9, no fewer than 97 came from social class 9 (Lewis, 2001). And this is 50 years after the establishment of the ‘welfare state’.

In the early 1990s CEMD assessors formed the impression that ethnic minorities were over-represented among the deaths. Denominator data were hard to obtain but estimates show that overall, ethnic minority women have three times the risk of white women. The 2000–2 report concluded that the risk among black African women is increased sevenfold compared to white women. Similar differences are found in other developed countries (Drife, 2000).

Early booking, regular attendance and access to services may all be difficult for socially excluded women, recent immigrants or asylum seekers, who need a system geared to their needs.

Global relevance

Across the globe there are over 600 000 maternal deaths annually, most of them preventable (World Health Organization, 2004). The causes in many countries reflect those in Britain when the CEMD was set up. Sepsis and unsafe abortion still account for 28% of all direct maternal deaths in the world (Rodeck, 2003).

Increasingly, countries are seeking to take advantage of the UK’s experience and adapt the Confidential Enquiry method for use elsewhere. South Africa began its Saving Mothers reports in the 1990s (Pattinson, 2003). Sri Lanka (MacLean and Neilson, 2002) and Malaysia (Matthews, 2000) have enquiries and Moldova will begin in 2006. In each country, the method needs to be adapted to local circumstances but the basic requirements of maintaining confidentiality and having the enquiry run by clinicians are the same everywhere.

Conclusions

Over the last 50 years the UK maternal mortality rate has been reduced by regular analysis and reanalysis of the causes of death. Recommendations for improvement have changed over the years, ranging from political action like the Abortion Act 1967, to changes in practice and the development of sophisticated clinical guidelines. There is still room for improvement, and the rising mortality rates from some direct causes emphasize the need for constant vigilance. **BJHM**

Figures 1 and 2 are reproduced from Lewis (2004).

Conflict of interest: The author has been a Central Obstetric Assessor for England for the Confidential Enquiry into Maternal Death since 1992.

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KEY POINTS

- The maternal mortality rate fell from 440 per 100 000 births in 1928 to 80 per 100 000 in 1951 when the Confidential Enquiry into Maternal Deaths was set up.
- Confidential reporting is essential to ensure that those involved feel able to report the full facts to the Enquiry.
- The triennial reports, with anonymized data, have been available to clinicians and the public in an unbroken series since the report of 1952–4.
- The UK maternal mortality rate is currently 13.1 per 100 000 maternities, with direct deaths now accounting for less than half of the total.
- The leading cause of death in 1952–4 was hypertensive disease, which accounted for 246 deaths, compared to 14 in 2000–2.
- Initiatives to reduce maternal death have included legalization of abortion and detailed clinical guidelines.
- The triennial reports contain many lessons for individual clinicians as well as for those running the services.
- Socially excluded women now have a 20-fold higher risk of death in pregnancy than women from high social classes.
- Black African women in the UK have seven times the risk of white women.
- Across the world, one maternal death occurs every minute. Most of these deaths are preventable.