Maternal Mortality

Defined as death of either a pregnant woman or death of a woman within 42 days of delivery, miscarriage, termination or ectopic pregnancy providing the death is associated with pregnancy or its treatment. \[1\]

In the UK, maternal mortality rates can be calculated in two ways:

- Through official death certification to the Registrars General (the Office for National Statistics and its equivalents).
- Through deaths reported to the Confidential Enquiry into Maternal Deaths. The Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK) collaboration produces an annual report based on the maternal deaths in the UK and Ireland and this article draws its numbers from that report. \[2\]

Previously the report was produced every three years and referred to as ‘the triennial report’. The report continues to present information based on three years of data but focuses on different topic-specific areas on a triennial rolling cycle.

The overall maternal death rate for the Enquiry is calculated from the number of deaths assessed as being due to direct and indirect causes.

However, it is not possible to obtain accurate data on total number of pregnancies. The alternative is to use deaths from obstetric causes/million maternities - ie pregnancies that have been notified to a doctor.

- **Direct deaths** are defined as those related to obstetric complications during pregnancy, labour or puerperium (six weeks) or resulting from any treatment received.
- **Indirect deaths** are those associated with a disorder, the effect of which is exacerbated by pregnancy.
- **Late maternal deaths** occur ≥42 days but less than one year after end of pregnancy.

**Epidemiology**

In the triennium 2011-2013, 214 women in the UK died directly or indirectly related to pregnancy. The overall mortality rate was 9.02 per 100,000 maternities which is a decline from 2010-2012, although this only reaches statistical significance for direct maternal deaths. \[2\]

- Deaths related directly to pregnancy continue to decrease from 3.49 per 100,000 maternities (2009-2011) to 2.91 per 100,000 maternities. This is 35% less than it was between 2003-2005, primarily due to a reduction in deaths due to thromboembolism.
- Cardiac disease is the most common cause of indirect death. The indirect maternal mortality rate has not changed significantly since 2003; it is 6.11 per 100,000 maternities.

**Mortality rates and main causes of death**

Thrombosis and thromboembolism continue to be the leading cause of direct deaths in the UK and the rate has not changed significantly but the mortality rate due to pre-eclampsia and eclampsia is the lowest ever reported. There has been a continued decrease in deaths related to genital tract sepsis. The mortality rate related to genital tract sepsis decreased from 0.63 per 100,000 maternities in 2009-2011 to 0.29 deaths in 2011-2013. \[2\]

Postpartum haemorrhage is the most common cause of death worldwide and new initiatives in poorer countries are recommended - eg, non-pneumatic anti-shock garments and balloon tamponade. \[3\]
### Direct causes of death

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Rate per 100,000 maternities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thrombosis and thromboembolism</td>
<td>1.01</td>
</tr>
<tr>
<td>Antepartum haemorrhage and postpartum haemorrhage</td>
<td>0.55</td>
</tr>
<tr>
<td>Amniotic fluid embolism</td>
<td>0.42</td>
</tr>
<tr>
<td>Genital tract sepsis</td>
<td>0.29</td>
</tr>
<tr>
<td>Early pregnancy/ectopic pregnancy</td>
<td>0.25</td>
</tr>
<tr>
<td>Pre-eclampsia and eclampsia</td>
<td>0.25</td>
</tr>
<tr>
<td>Anaesthesia</td>
<td>0.13</td>
</tr>
</tbody>
</table>

### Indirect causes of death

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Rate per 100,000 maternities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac</td>
<td>2.06</td>
</tr>
<tr>
<td>Indirect sepsis - influenza, pneumonia/others</td>
<td>1.26</td>
</tr>
<tr>
<td>Indirect neurological conditions, including epilepsy</td>
<td>1.01</td>
</tr>
<tr>
<td>Psychiatric</td>
<td>0.80</td>
</tr>
<tr>
<td>Late maternal deaths</td>
<td>14.12</td>
</tr>
</tbody>
</table>

Late maternal deaths are increasingly the focus of attention. Medical advances in high-resource countries mean women may be kept alive for some weeks or months after a serious pregnancy-related illness. A review of late maternal deaths in the 2015 MBRRACE-UK report revealed that the largest cause of late maternal deaths was due to malignancy (28%) and the second most common cause was mental health-related (23%); 14% of late maternal deaths were due to suicide.[2]

### Risk factors

Most maternal mortality occurs in the developing world; every day in 2015, 830 women died worldwide as a result of a pregnancy-related problem, the vast majority in sub-Saharan Africa.[4] Maternal mortality has decreased significantly between 1990 and 2015 but not quickly enough to achieve the Millennium Development Goal of a reduction of 75% in the number of deaths per live births by 2030. However, some countries have made significant improvements, both as a result of improved access to healthcare but also, for example, by increasing the proportion of girls accessing education.[5]

**Risk factors for direct maternal deaths in the UK**[2, 6]

These include:

- Gestational diabetes.
- Hypertensive disorders of pregnancy.
- Anaemia.
- Multiple pregnancy.
- Inadequate use of antenatal care services, whether due to lack of access or other reasons:
  - 9% of the women who died between 2011 and 2013 received no antenatal care.
  - Only one third of women who died received the level of antenatal care recommended by the National Institute for Health and Care Excellence (NICE).[7]
  - Pregnant women who are recent migrants, asylum seekers or refugees or who have difficulty understanding English may not make full use of antenatal services.[8]

- Smoking.
- Substance misuse:
  - In the five-year period between 2009-2013, 58 women died as a result of substance misuse (alcohol and/or drugs) either during their pregnancy or up to one year later.
  - Clinicians need to ensure that their attitude does not prevent women who misuse substances from accessing the care and support that they need.[8]
• Previous pregnancy problems.
• Pre-existing medical conditions, including epilepsy, mental health problems (see also below), cardiac problems, essential hypertension:
  - 66% of the women who died in 2011-2013 were known to have medical comorbidities.

• Parity.
• Body mass index (BMI):
  - 30% of the women who died in 2011-2013 were obese and 22% were overweight.

• Socio-economic status:
  - Women living in families where both partners are unemployed, where social exclusion is an associated problem, are more likely to die than women from more advantaged groups.
  - Women living in the most deprived areas have a higher death rate than women living in the most affluent areas; there have been no significant changes in the inequality gap.

• Maternal age:
  - The numbers and proportion of pregnancies which were to women aged over 35 remain high. The highest maternal mortality rates are among the older mothers.

• Ethnicity:
  - Women from minority ethnic groups have higher mortality rates than Caucasian women. This disparity in mortality rates between ethnic groups has been noted in other affluent societies.\[9\]

A UK national case control study identified six of these factors that were independently associated with direct maternal death - that is, after controlling for other factors that might be expected to be linked.\[6\] Among women who died compared with those who survived:

- Inadequate use of antenatal care services was 15x higher.
- Substance misuse was 10x higher.
- Medical comorbidities were 4x higher.
- Problems during previous pregnancies and hypertensive disorders of pregnancy were more than twice as likely.
- Belonging to the Indian ethnic group was more than two and a half times more likely.

Other considerations

• Mental health:
  - Women are at their highest risk of having severe mental illness when pregnant and soon afterwards than at any other time in their lives.
  - In the five-year period between 2009-2013, there were 101 late maternal deaths due to suicide (2.3 per 100,000 maternities) and 58 as a result of substance misuse.
  - 17% of the women who died by suicide were known to have a history of domestic abuse, although no history was available for 51%.
  - 75% of the women who committed suicide did not receive the recommended level of antenatal care; 25% of them booked later than 12 weeks of gestation.
  - A recent significant change in mental state or new symptoms, new thoughts or acts of self-harm or new and persistent expressions of inadequacy as a mother are all 'red flags' for urgent senior psychiatric assessment.

• Domestic violence:
  - Pregnancy and the postnatal period are high-risk times for domestic abuse.
  - 5% of all the women who died between 2009 and 2013 had previously declared that they were subject to violence in the home.
  - Almost half were murdered or died from psychiatric causes.
  - A named midwife should be responsible for and provide the majority of the antenatal care to a woman who has experienced domestic abuse.

Suboptimal clinical care
Substandard care was found in 59% of maternal deaths and in 38% it was considered that improvements in care might have made a difference to the outcome.

Lack of inter-professional and/or inter-agency communications
There were many cases where the care provided to the women who died was hampered by a lack of cross-disciplinary working. In several cases crucial clinical information, which may have affected the outcome, was not passed from the GP to the midwifery or obstetric services, or shared between consultants in other specialties. This was particularly an issue postnatally.

Management
It is the responsibility of the GP or community midwife to notify a death in the community to the local Director of Public Heath.

If death occurs in hospital, a co-ordinator - usually a midwife - should be appointed. They should perform the following and keep a complete record of all actions:
- Ensure relatives have a suitable member of staff as a single contact point.
- The consultant on-call should see relatives as soon as possible and the woman’s own consultant told of her death as soon as next in hospital.
- The supervisor of midwives is informed.
- The mortuary and pathologist on duty are informed.
- Try to obtain permission from next-of-kin for post-mortem examination to confirm cause of death (coroner may direct one to be performed if any doubt). **NB:** if there is a dead fetus in utero, there is no legal requirement for a death certificate but one can be supplied if wished.
- Ask relatives if they would like to see a culturally appropriate religious adviser.
- All relevant documents are sent to the coroner.
- Consider offering support to staff involved.

The following should be advised of the death:

- Chief Executive Officer.
- Clinical director/managers.
- Consumer affairs.
- Complaints.
- Risk manager.
- Community midwife.
- GP.
- Local Director of Public Health - will require the Confidential Enquiry form to be completed.
- Local Supervising Authority Officer.

**Further reading & references**

- Maternity services in England; National Audit Office (2013)
- Saving Lives Improving Mothers’ Care - Surveillance of maternal deaths in the UK 2011-13 and lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-13; MERRACE-UK, Dec 2015
- WHO recommendations for the prevention and treatment of postpartum haemorrhage; World Health Organization, 2012
- Global Health Observatory data: Maternal mortality; World Health Organization, 2015
- Antenatal care for uncomplicated pregnancies; NICE Clinical Guideline (March 2008, updated 2017)
- Pregnancy and complex social factors: a model for service provision for pregnant women with complex social factors; NICE Clinical Guideline (September 2010)

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