Maternal, Newborn and Infant Clinical Outcome Review Programme

MBRRACE-UK
Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK

Saving Lives, Improving Mothers' Care

Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2022-24

Compiled report including supplementary material

September 2026

HQIP Healthcare Quality Improvement Partnership
University of Leicester
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Allison Felker, Roshni Patel, Tina Evans, Marian Knight (Eds.)

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Key messages

from the surveillance report 2026

MBRRACE-UK
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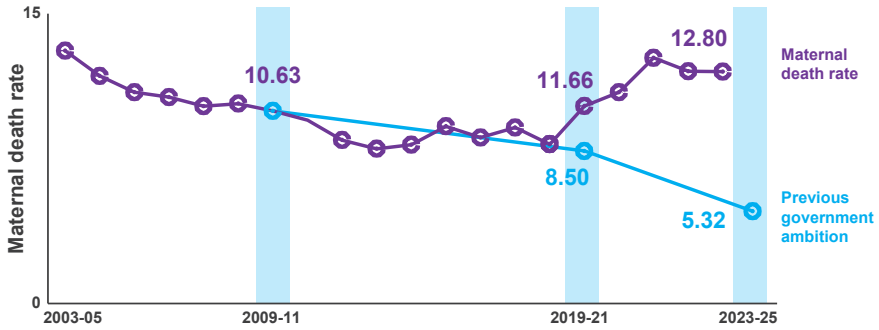
In 2022-24, **252 women died** during pregnancy or up to six weeks after pregnancy in the UK, a maternal death rate of **12.80 women per 100,000** women giving birth



This rate is 20% higher than the maternal death rate in 2009-11, when the previous government set an **ambition to halve the number of maternal deaths** in England by 2025

Inequalities in maternal mortality

Ethnic group

White women	Asian women	Black women
12/100,000	15/100,000	32/100,000
	1.3x	2.7x

Deprivation

Least deprived	Most deprived
9/100,000	18/100,000
	1.9x

Leading causes of maternal deaths

1. **Blood clots** (42 women)
2. **Heart disease** (39 women)
3. **Mental health conditions** (35 women)
4. **Epilepsy and stroke** (30 women)
5. **Infection (excl. COVID-19)*** (26 women)
6. **Other physical conditions*** (26 women)

*Responsible for the same number of maternal deaths in 2022-24

Key messages

from the report 2026

MBRRACE-UK
Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK

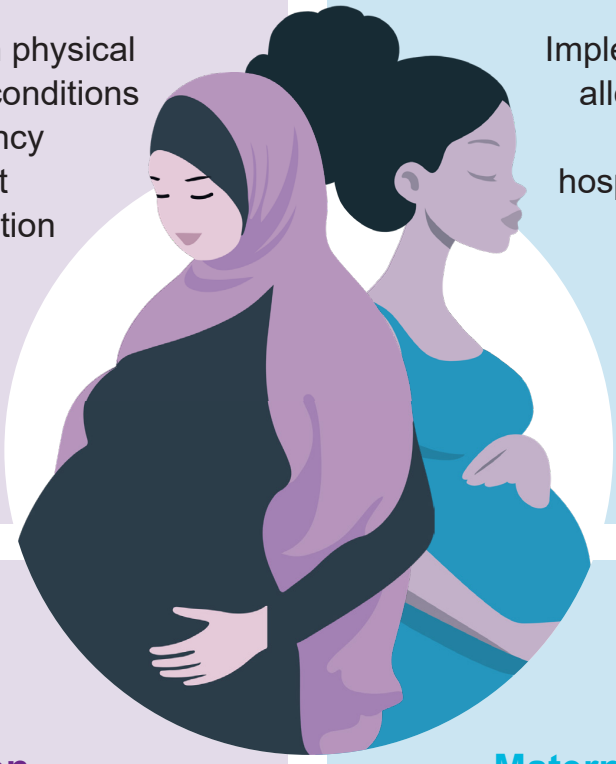
Proactive, not reactive, maternity care

Readiness

Plan ahead for changing needs

Pregnancy counselling and consistent advice

Ensure women with physical and mental health conditions receive pre-pregnancy counselling and that postnatal contraception is available in maternity services for future pregnancy planning



Service provision and clinical demand

Review staffing models and theatre capacity to keep up with changing maternity characteristics, including increased rates of caesarean birth

Response

Act early to avoid delays in management

Rapid access to antibiotics and medications

Implement processes to allow for rapid access to antibiotics in hospital-based settings or prescription of urgently needed medications at the point of care

Maternal observations and escalation of care

Assess and record women's vital signs using maternity early warning scores (MEWS) to recognise deterioration and escalate care if needed

Executive summary

Introduction

This report, the thirteenth MBRRACE-UK annual report of the Confidential Enquiry into Maternal Deaths and Morbidity, includes surveillance data on 598 women who died during or up to one year after pregnancy between 2022 and 2024 in the UK. In addition, it also includes confidential enquiries into the care of women who died between 2022 and 2024 in the UK and Ireland from haemorrhage, amniotic fluid embolism (AFE), infection, general medical and surgical disorders and neurological conditions.

The report also includes lessons for critical care, anaesthesia and pathology as well as a morbidity confidential enquiry into women requiring networked maternity care. The women reviewed for the morbidity enquiry were selected from a UK Obstetric Surveillance System (UKOSS) study on the use of biological agents in pregnancy conducted from May 2022 to October 2024. Stratified sampling included women spread across the UK nations with varied representation by age and ethnic group. The records of 33 women were received and reviewed. The lessons for the care of these women are included alongside those who died from general medical and surgical disorders.

Methods

Maternal deaths are reported to MBRRACE-UK, Northern Ireland Maternal and Child Health (NIMACH) or to Maternal Death Enquiry (MDE) Ireland by the staff caring for the women, or identified through other sources including coroners, procurators fiscal and media reports. Additional ascertainment comes from cross-checking of birth and death records from the Office for National Statistics, National Records of Scotland and Public Health Scotland. For all women who die, MBRRACE-UK requests the full medical records, post-mortem reports and, where relevant, copies of any local reviews or investigations, including those conducted by the Maternity and Newborn Safety Investigations (MNSI) programme in England. Full medical records are also requested for the women identified for the morbidity enquiry. All documents are fully anonymised prior to undergoing confidential review. Each woman's care is examined by multidisciplinary expert reviewers and assessed against current guidelines and standards (such as those produced by the National Institute for Health and Care Excellence (NICE), relevant Royal Colleges or other professional organisations). Subsequently, the expert reviews are examined by multidisciplinary chapter writing groups to enable the main themes for learning to be drawn out for the report. The new national recommendations to improve future care are presented in this report, alongside a surveillance chapter reporting three years of UK statistical surveillance data for 2022-24.

Causes and trends

1. There was no statistically significant difference in the overall maternal death rate in the UK between 2021-23 and 2022-24 but rates remained higher than the last complete triennium of 2019-21. In 2022-24 the overall rate of maternal death in the UK was 20% higher than it was in 2009-11 when the previous government set an ambition to halve the rate of maternal mortality in England by 2025.
2. The number of deaths due to COVID-19 dropped significantly with six women dying from COVID-19 complications in 2022-24. When these deaths due to COVID-19 were excluded, rates of overall and indirect maternal deaths remained statistically significantly increased in 2022-24 compared to the corresponding rates in 2019-21, the last complete triennium.
3. Thrombosis and thromboembolism remained the leading cause of maternal death in 2022-24 in the UK during or up to six weeks after the end of pregnancy. Cardiac disease was the second most common cause of maternal death followed by psychiatric causes.
4. Maternal suicides remained the leading cause of death occurring between six weeks and one year after the end of pregnancy. As a whole, deaths from psychiatric causes accounted for 33% of pregnancy-associated deaths in this period.
5. Inequalities in maternal mortality persisted in 2022-24. Compared to women aged 25-29, women aged 35 or older were nearly two times more likely to die. There was a nearly three-fold higher maternal mortality rate for Black women compared to White women and Asian women's risk of maternal death was also slightly higher compared to White women. Women living in the most deprived areas continued to have a maternal mortality rate twice that of women living in the least deprived areas.

Lessons learned from the confidential enquires

Assessors identified many common recurring themes across the topics, which are discussed throughout the report and highlighted as key clinical and safety messages. The importance of pre-pregnancy counselling and early senior, specialist review for women with high-risk medical conditions was re-emphasised. This was especially pertinent for the women who died from epilepsy and general medical and surgical disorders but was also relevant to the care of the women who died from haemorrhage and AFE, many of whom had obstetric histories placing them at higher risk of complications. It was noted that advice should also be given in the postnatal period to plan for subsequent pregnancies, including the prescribing and provision of postnatal contraception in maternity services. Assessors also noted that the quality and content of pre-pregnancy counselling varied significantly across the women whose care was reviewed. They stressed that any advice provided to women with complex medical comorbidities regarding birth planning, medications and vaccinations must be consistently delivered.

Areas for improvement in counselling were also identified with regard to women's individual risk. Risk counselling for women before, during or after pregnancy may include appropriate safety-netting advice concerning pregnancy-associated complications, such as haemorrhage or the development of sepsis, but may also involve the provision of balanced advice so women can make informed decisions about their care and the care of their baby. This includes, but is not limited to, decisions around the place and mode of birth and the use of medications during pregnancy. All risk counselling must be trauma informed and consider previous adverse experiences and complex social circumstances as well as women's unique medical and obstetric history.

A common safety message in this year's report was around service provision and acuity. Delays due to service pressures and workforce capacity were noted across all chapters for women who utilised pre-hospital and emergency services. In addition, for several of the women who died from haemorrhage and AFE, assessors felt that limited availability of operating theatres and appropriately skilled surgeons may have impacted their outcomes. Around 50% of births in the UK are by caesarean section but it is not clear if the safety of services is maintained in light of this increased demand. One of the new recommendations in this year's report highlights a need to review theatre and workforce capacity to effectively manage the increasing caesarean section rates and changing trends in maternal characteristics.

Improvements in clinical management were noted for many of the women who died. Symptom recognition was once again highlighted as an area requiring improvement. There were many examples of confirmation bias evident in the care women received as well as underappreciation or dismissal of 'red flag' symptoms, such as severe headaches, or symptoms requiring repeat presentations. Outside of maternity services, most women were not assessed using maternity early warning scores (MEWS) as has been recommended in previous MBRRACE-UK reports and emphasised as an element of best practice in the new Maternal Care Bundle developed by NHS England. Many women did not have maternal observations recorded and those that did often had inconsistent or incomplete assessments. In several instances, this resulted in missed recognition of deterioration and delayed escalation of care for definitive management. For the women who died from infectious causes, the Sepsis Six pathway was not always initiated leading to delays in the provision of antibiotics. A mechanism for rapid access to antibiotics must be implemented in all hospital-based care settings to allow for timely management at the point of care.

The need to ensure availability of medications at the point of care was also emphasised for acute community or hospital-based prescribing where an urgent initiation or change in medications is required. Many women who died from epilepsy were prescribed anti-seizure medications that did not adequately manage their condition and were not adjusted during pregnancy. Assessors noted that, as in previous enquiries, many women's medication levels were not monitored or were monitored inconsistently despite ongoing seizure activity in pregnancy. They re-emphasised the importance of joined-up care for women with epilepsy to ensure appropriate advice on medication safety and adherence as well as consideration of how pregnancy-related changes to metabolism may affect medication levels. Referral to a maternal medicine network, or an equivalent specialised centre, is recommended for all women with epilepsy and other high-risk medical conditions to provide consistent advice, appropriate senior oversight and multidisciplinary care.

Key messages to improve care

The majority of recommendations that MBRRACE-UK assessors identified to improve care are drawn directly from existing guidance or reports and denote areas where implementation of existing guidance needs strengthening. All recommendations based on existing guidance are presented in various chapters of this report. Actions needed for which national guidelines are not available are presented below.

New national recommendations to improve care

1. Review theatre and workforce capacity planning guidance to manage the additional workload associated with changing trends in maternal characteristics and associated caesarean section rates **[ACTION: Departments of Health in each of the devolved nations]**
2. Ensure postnatal contraception can be prescribed and administered in maternity services for future pregnancy planning **[ACTION: Integrated Care Boards in England and commissioning bodies in the devolved nations]**
3. Ensure there is a mechanism for rapid access to antibiotics in all hospital-based care settings to allow for rapid management of sepsis at the point of care **[ACTION: Hospitals, trusts and health boards]**
4. Implement processes for acute community or hospital-based prescribing of medications where an urgent initiation or change in medications is required **[ACTION: Integrated Care Boards, hospitals, trusts and health boards]**
5. Ensure appropriate multidisciplinary care to enable consistency of advice for high-risk women with complex medical comorbidities regarding birth planning, medication adherence and monitoring and vaccination, including advice for the vaccination of infants exposed to biologic medications **[ACTION: Integrated Care Boards in England and commissioning bodies in the devolved nations]**

Conclusions

This report includes the surveillance information for women who died during and after pregnancy for 2022-24. The maternal mortality rate for this period is similar to that reported in 2021-23 but represents a sustained increase in the rate of maternal death, which is now 20% higher than in 2009-11 when a previous government ambition was set to halve the rate of maternal death by 2025. The UK is not on track to meet this ambition.

It was evident from the care of the women reviewed in the confidential enquiries that the complexity of the maternity population and growing services pressures, as also highlighted in the 2026 National Maternity and Neonatal Investigation, are affecting safety and outcomes in maternity care. It is imperative that women with complex medical conditions or other significant risk factors are provided with consistent pre-pregnancy counselling and ongoing discussions of risk so that they can make informed decisions about their care and the care of their baby. Proactive planning, including system-level plans for staffing and acuity as well as multidisciplinary planning for birth and potential complications, can help prevent reactionary, inappropriate and delayed care. Appropriate monitoring and documentation of maternal observations can help ensure prompt recognition and management of maternal deterioration and multidisciplinary working with senior oversight remains fundamental in all aspects of care. Together, these messages reinforce that coordinated action is required across clinical practice, service delivery and workforce planning to meet the evolving needs of women and improve future outcomes.

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We would specifically like to thank Edel Manning, the Maternal Death Enquiry (MDE) Ireland coordinator, for her longstanding contributions to the MBRRACE-UK collaboration. Her tireless efforts coordinating the maternal death enquiry process within Ireland have been vital to the success of the overall programme, helping to ensure that learning is captured from all eligible maternal deaths to improve future outcomes.

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Munira Oza, The Ectopic Pregnancy Trust
Nicky Lyon, Campaign for Safer Births
Nikki Wilson, Maternal Mental Health Alliance
Pete Wallroth, Mummy's Star
Sara Ledger, Baby Lifeline
Shauna Leven, Twins Trust
Sonah Paton, Black Mothers Matter
Vicki Robinson, The Miscarriage Association

MBRRACE-UK Royal College and Professional Association Stakeholder Group and Representatives

Royal College of Obstetricians and Gynaecologists
Royal College of Midwives
Royal College of Paediatrics and Child Health
Royal College of Emergency Medicine
Royal College of Psychiatrists
Faculty of Public Health

Royal Society of Medicine
Royal College of Anaesthetists
Obstetric Anaesthetists' Association
Royal College of General Practitioners
Royal College of Nursing
Royal College of Pathologists
British Association of Perinatal Medicine
British Maternal and Fetal Medicine Society

Glossary of terms

AFE	Amniotic fluid embolism
ASM	Anti-seizure medication
BMI	Body mass index
BSOTS	Birmingham Symptom-specific Obstetric Triage System
CF	Cystic fibrosis
CI	Confidence interval
CPR	Cardiopulmonary resuscitation
COVID-19	Coronavirus disease 2019
CT	Computed tomography
DHSC	Department of Health and Social Care
DKA	Diabetic ketoacidosis
ECMO	Extracorporeal membrane oxygenation
E. coli	*Escherichia coli*
EEG	Electroencephalogram
EMC	Enhanced Maternal Care
ESN	Epilepsy specialist nurse
FDS	Functional/dissociative seizures
FICM	Faculty of Intensive Care Medicine
GAS	Group A streptococcus
GBS	Group B streptococcus
GP	General practitioner
HLH	Haemophagocytic lymphohistiocytosis
HQIP	Healthcare Quality Improvement Partnership
HSV	Herpes simplex virus
IBD	Inflammatory bowel disease
ICD-MM	International classification of diseases – Maternal mortality
ICU	Intensive care unit
IMD	Index of multiple deprivation
IV	Intravenous
JCVI	Joint Committee on Vaccination and Immunisation
JRCALC	Joint Royal Colleges Ambulance Liaison Committee
MBRRACE-UK	Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK
MCCD	Medical certificate cause of death
MDE Ireland	Maternal Death Enquiry Ireland
MEWS	Maternity early warning score
MMN	Maternal medicine network
MNI-CORP	Maternal, Newborn and Infant Clinical Outcome Review Programme
MNSI	Maternity and Newborn Safety Investigations
MRI	Magnetic resonance imaging
NEWS(2)	National Early Warning Score
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NIHR	National Institute for Health and Care Research
NIMACH	Northern Ireland Maternal and Child Health
NMPA	National Maternity and Perinatal Audit
ONS	Office for National Statistics
PPROM	Preterm prelabour rupture of membranes
RCOG	Royal College of Obstetricians and Gynaecologists
RCPath	Royal College of Pathologists
RH	Resuscitative hysterotomy
RR	Rate ratio (or relative risk)
RRR	Ratio of relative risks
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
SIGN	Scottish Intercollegiate Guidelines Network
SLE	Systemic lupus erythematosus
SUDEP	Sudden unexpected death in epilepsy
UKOSS	UK Obstetric Surveillance System
UTI	Urinary tract infection
VTE	Venous thromboembolism
WHO	World Health Organization

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1. Introduction and methods

Allison Felker and Marian Knight

1.1 MBRRACE-UK in the context of national maternity investigations

The preparation of this year's Saving Lives, Improving Mothers' Care report coincided with several high-profile investigations into maternity care. Alongside routine reviews by the Care Quality Commission (CQC) and Maternity and Newborn Safety Investigations (MNSI) programme, the Ockenden report on maternity services at Nottingham University Hospitals NHS Trust (Ockenden 2026) and the final report of the National Maternity and Neonatal Investigation (National Maternity and Neonatal Investigation 2026) led by Baroness Valerie Amos were released in June 2026. Both reports identified systemic challenges in leadership, culture and governance at a local and national level within England.

Distinct from these other investigations, MBRRACE-UK, and previous iterations of the Confidential Enquiries into Maternal Deaths, provides continuous surveillance and confidential review of all maternal deaths in the UK, including all four devolved nations, as well as the Republic of Ireland. Through detailed multidisciplinary review and population-level analysis, MBRRACE-UK identifies recurrent patterns in care, highlights examples of good practice and produces evidence-based recommendations aimed at improving outcomes for women and babies. Similar to the Amos and Ockenden reviews, MBRRACE-UK's confidential enquiries aim to amplify women's voices and individual experiences through care vignettes. This has been true of the Confidential Enquiries since their inception in 1952 and has been essential to reporting and translating individual care lessons into national learning.

The key themes for learning identified in this year's confidential enquiries will be familiar to those who have read previous MBRRACE-UK reports or other maternity reviews released this year. These include safety messages concerning workforce shortages and service capacity, ongoing challenges with discordant electronic record systems and a need for improved individual risk counselling before and during pregnancy. Other recurrent themes in this report focus on fragmented care and multidisciplinary working, ethnic and socioeconomic inequalities, the importance of listening to women and their families and the need to recognise and respond to worrying symptoms and clinical deterioration.

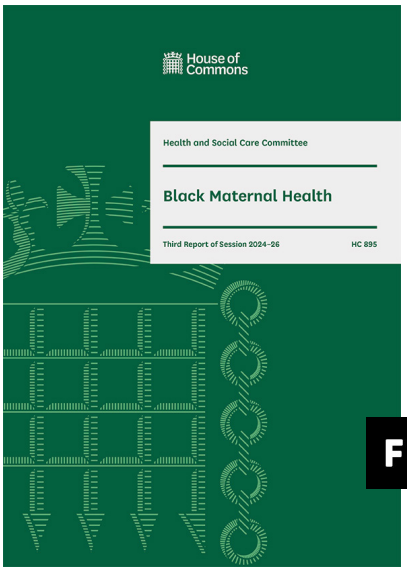
However, while MBRRACE-UK surveillance data are frequently cited in policy and reviews of maternity care, there seems to be limited recognition of the learning and lessons for care produced by MBRRACE-UK confidential enquiries over the last thirteen years. The abundance of recommendations produced by various investigations and programmes, including MBRRACE-UK, is often cited as a burden to maternity services. In response, increasing restrictions have been placed on many programmes to limit the number and nature of the recommendations they can make. The most recent of these restrictions suggests that repeating past recommendations, which have not been implemented or actioned, is ineffective (Lintern 2026). Yet, many of the recommendations repeated in this year's report, some of which were first made over a decade ago, target the same challenges that persist in 2026, and the same challenges identified by both Ockenden and Amos.

This is a watershed moment for maternity care in the UK. The clear, consistent findings across the Amos and Ockenden reviews and MBRRACE-UK confidential enquiries demonstrate a broad agreement on the priorities for safer maternity care. The collective challenge is no longer to identify what changes need to be made, but to work together to ensure this evidence is translated into meaningful, equitable and lasting improvements. MBRRACE-UK remains committed to these efforts and will continue to provide robust evidence, learn from the care of those who have died and can no longer speak for themselves, amplify the voices of women and families and support ongoing learning to improve care and save mothers' lives.

1.2 Actions following the release of the 2018-2025 reports

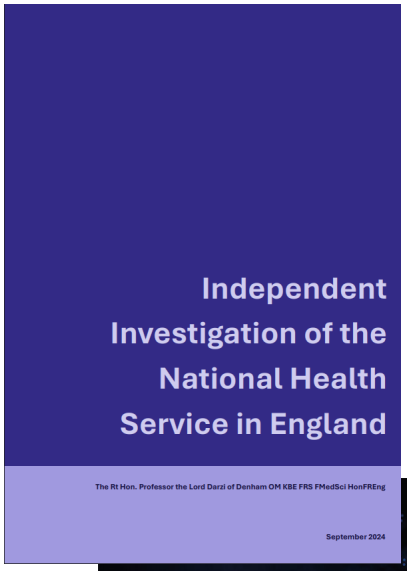
The 2018 MBRRACE-UK report (Knight, Bunch et al. 2018) detailed actions following the release of MBRRACE-UK reports published in 2014-2017. Following the 2018 report, the funders requested that details of impacts achieved be removed from subsequent reports, hence losing the ability to learn from implemented actions. This section provides an update on the some of the key impacts of the programme since then.

1.2.1 Inequalities data



The data produced by MBRRACE-UK concerning ethnic and deprivation-associated inequalities in maternal and perinatal deaths have been widely used to underpin policy initiatives and investigations. In response to data from the 2018 MBRRACE-UK report, which showed a five-fold higher risk of maternal death for Black women, the Five X More campaign was launched in 2019. This campaign grew into an organisation, and a key MBRRACE-UK stakeholder, with continued advocacy work including surveys on Black Maternity Experiences, the most recent of which was released in 2025 (Peter and Wheeler 2025). The same year, 2025, the UK government's inquiry into Black maternal health drew on MBRRACE-UK inequality findings, with programme representatives providing evidence to the inquiry (Health and Social Care Committee 2025).

FIVEXMORE



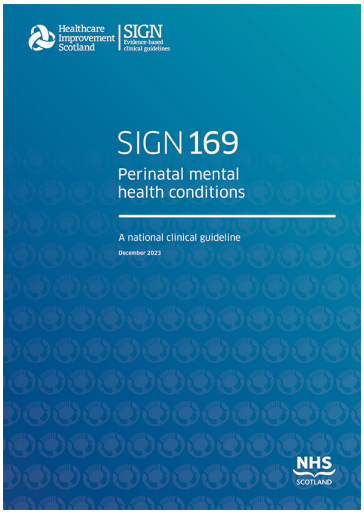
Several other government initiatives are underpinned by MBRRACE-UK data on inequalities, including, but not limited to:

- The Labour Party's 2024 manifesto (Labour Party 2024)
- Lord Darzi's 2025 report on the state of the National Health Service in England (Department of Health and Social Care 2024b)
- NHS England's three-year delivery plan for maternity and neonatal services published in March 2023 (NHS England 2023c)
- The updated 10 year health plan from the Department of Health and Social Care published in July 2025 (Department of Health and Social Care 2025)

- Both the original (Department of Health and Social Care 2022) and renewed women's health strategies for England published in 2022 and 2026, respectively (Department of Health and Social Care 2022, Department of Health and Social Care 2026)
- The Welsh Government's Anti-racist Wales Action Plan, which aims to reduce health inequalities in maternity and neonatal care by 2030 (Welsh Government 2022)

Inequalities data were also instrumental to the 2024 National Institute for Health and Care Research (NIHR) 'Challenge' funding call to invest £50m into research tackling inequalities in maternity care (National Institute for Health and Care Research 2024). Most recently, MBRRACE-UK has begun contributing data on maternal and perinatal deaths to NHS England for inclusion in their publicly available ***Maternity and Neonatal Equalities Dashboard***. Launched in January 2026, this dashboard is designed to make disparities in outcomes and experiences more visible, measurable and actionable to improve future care. Members of the MBRRACE-UK team also recently authored a chapter on the impact of ethnicity on maternal health outcomes for inclusion in the book 'Understanding Race and Health Inequity in the UK' published in August 2026 (Felker, Harrison et al. 2026).

1.2.2 Policy, government and other initiatives

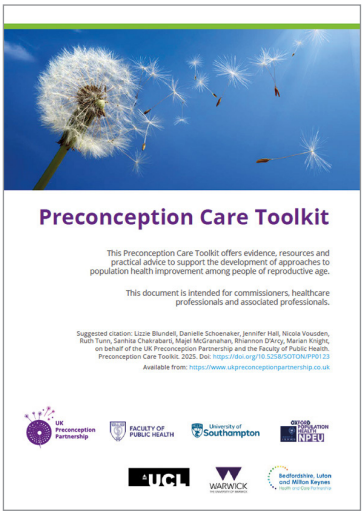


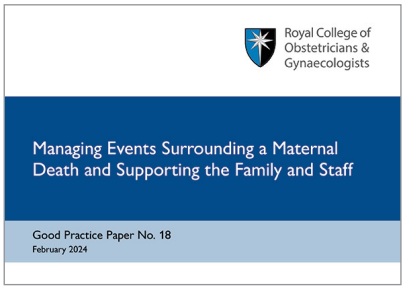
Various government and NHS policies and strategies around maternal health draw from MBRRACE-UK data and the evidence arising from the confidential enquiries.

Increasing rates of psychiatric maternal deaths resulted in expansion of specialist perinatal mental health services to every local area as part of the 2019 NHS Mental Health Implementation Plan (NHS England 2019). Similarly, the 2023 suicide prevention strategy for England included pregnant women and expansions to maternal mental health services and specialist perinatal mental health teams (Department of Health and Social Care 2023). In Scotland, lessons from the confidential enquiries into psychiatric deaths lead to the development of the Scottish Intercollegiate Guidelines Network (SIGN) national clinical guideline on perinatal mental health conditions (SIGN 169) (Scottish Intercollegiate Guidelines Network 2023).

The impact of MBRRACE-UK recommendations is visible in several updates to guidance and other initiatives. NHS England's service specification for abnormally invasive placenta, which was first published in 2020, was updated in 2023 in response to an MBRRACE-UK recommendation (NHS England 2023b).

Gaps in care, or ongoing challenges, highlighted by MBRRACE-UK reports have also contributed to several tools, resources and guidelines. The Royal College of Physicians acute care toolkit for managing medical problems in pregnancy (Royal College of Physicians 2019) was developed partially in response to MBRRACE-UK data on the high proportion of women who die who have pre-existing medical conditions. Also, in response to an MBRRACE-UK recommendation, the charity Mummy's Star's launched their '***Share the care***' campaign in May 2025, which advocated for holistic end-of-life care for pregnant women with cancer. NHS England 2023 guidance on GP visits for the six to eight week maternal postnatal consultation highlighted MBRRACE-UK findings on maternal deaths occurring soon after pregnancy (NHS England 2023a) and both a preconception (Blundell, Schoenaker et al. 2025) and postnatal toolkit (NHS England 2026a) have been developed to bridge the gaps in care before and after pregnancy.





Initiatives targeting care outside of maternity services have also demonstrated the impact of MBRRACE-UK. In 2024, the same year that MBRRACE-UK produced a recommendation to review ambulance service algorithms, the Joint Royal Colleges Ambulance Liaison Committee released their pre-hospital maternity decision tool (Joint Royal Colleges Ambulance Liaison Committee (JRCALC) and Association of Ambulance Chief Executives (AACE) 2024), which incorporates national maternity early warning scores and provides a structured assessment for pregnant or recently pregnant women. The Royal College of Obstetricians and Gynaecologists' (RCOG) 2024 guidance on managing events surrounding a maternal death (good practice paper No. 18) also includes requirements for reporting maternal deaths and participation in MBRRACE-UK enquiries (Royal College of Obstetricians and Gynaecologists 2024a).

Data from MBRRACE UK are often used in funder-approved research projects and extended outputs that permit more detailed analysis of data and care. Examples of studies conducted since 2018 include an investigation of the contribution of known risk factors, including deprivation, to ethnic disparities in maternal deaths (Vousden, Bunch et al. 2024), an examination of the characteristics and care received by women with social care involvement (De Backer, Felker et al. 2025, De Backer, Rose et al. 2026) and a similar investigation of the care received by migrant women (Stevenson, Ogunlana et al. 2026).

As above with NIHR's inequalities challenge, MBRRACE-UK recommendations have also resulted in several research programmes to drive quality improvement. These include a project aimed at improving the design and delivery of postnatal red flag information for women experiencing disadvantage (***fundingawards.nihr.ac.uk/award/NIHR204956***) and another study investigating delayed identification and escalation of maternal deterioration (the DREaMED programme) (***fundingawards.nihr.ac.uk/award/NIHR204430***).

1.2.3 Impacts during the COVID-19 pandemic

During the COVID-19 pandemic, MBRRACE-UK reporting shifted to incorporate enhanced surveillance of maternal deaths directly due to COVID-19. Two rapid confidential enquiries were produced that examined COVID-19-specific deaths and deaths of women whose care may have been affected by the changes to service delivery in response to the COVID-19 pandemic. The first report was released in August 2020 (Knight, Bunch et al. 2020a) and resulted in immediate changes to national guidance for professionals caring for pregnant women with COVID-19. Changes to the delivery of mental health crisis care and perinatal mental health services were also introduced in response to the findings on maternal suicides included in this report (Knight, Bunch et al. 2020a). The second report, published in July 2021 (Knight, Bunch et al. 2021a), resulted in further improvements in the management of women with COVID-19, including subsequent changes to the Joint Committee on Vaccination and Immunisation's (JCVI) vaccine recommendations to include pregnant women as a high-risk group within the vaccination programme. Successive provision of MBRRACE-UK data and evidence to JCVI in 2023, ensured that pregnant women continued to be regarded as a high-risk clinical risk group for COVID-19 permitting participation in booster campaigns that year. Data on deaths related to COVID-19 were also shared with central organisations including the Department of Health and Social Care, NHS England and the RCOG on a weekly basis during the pandemic. This allowed for timely monitoring of maternal deaths and provided vital information for pandemic control measures, guidance for health professionals and advice for pregnant and recently pregnant women.

1.2.4 NHS England's Maternal Care Bundle

One of the clearest pieces of evidence demonstrating MBRRACE-UK's impact on maternity safety initiatives is seen in NHS England's Maternal Care Bundle (NHS England 2026b), which was released in January 2026. This care bundle, referenced throughout this year's report, aims to improve maternity care in England to reduce maternal mortality and inequalities in adverse outcomes. It contains five key elements with best practice measures and specific interventions for implementation in trusts in England. These elements were chosen, in part, based on MBRRACE-UK evidence and some interventions are derived directly from MBRRACE-UK recommendations.

MBRRACE-UK recommendation	Maternal Care Bundle intervention
Clearly define the rapid access pathways for prescribing thromboprophylaxis to ensure that women known to be at risk are able to access thromboprophylaxis when they need it, particularly in the first trimester (Felker, Patel et al. 2024)	1.2 The integrated care board (ICB) has arrangements in place for low molecular weight heparin (LMWH) to be prescribed in early pregnancy (that is, before antenatal booking) within 72 hours, and for a follow-up consultation to take place within 4 weeks in secondary care
Ensure the appropriate national maternity early warning score is used to monitor a pregnant woman wherever in the hospital she receives care (Knight, Bunch et al. 2022)	2.1 Implement the national maternity early warning score (MEWS) tool across all settings for women who are or have been pregnant in the past 4 weeks. This means ensuring timely obstetric team and/or obstetric physician review in line with the MEWS escalation timeframes, according to the total score identified and relevant additional concerns.
Be aware of how to contact the regional maternal medicine lead for urgent advice to ensure multidisciplinary senior review of women who are unwell (Knight, Bunch et al. 2022)	2.3 Establish acute referral pathways from local services to the maternal medicine centre (MMC) for acutely unwell pregnant or recently pregnant women presenting with symptoms or diagnostic uncertainty necessitating maternal medicine expertise. Maternity services and the maternity medicine network (MMN) should review these pathways annually.
Ensure each regional maternal medicine network has a pathway to enable women to access their designated epilepsy care team within a maximum of two weeks (Knight, Bunch et al. 2020b)	3.1 Every pregnant woman with epilepsy has access to a local epilepsy in pregnancy team who will ordinarily lead the early pregnancy, intrapartum and postnatal care plans in line with the local maternal medicine network's (MMN) management and escalation protocol.
Pregnant women with epilepsy should have access to regular planned antenatal care with a designated epilepsy care team (Knight, Bunch et al. 2020b)	3.2 Women requiring more complex epilepsy care should be referred by the local epilepsy in pregnancy team to a maternal medicine network (MMN) multidisciplinary team (MDT) who can oversee and – where necessary – lead the provision of care.

1.3 The 2026 Saving Lives, Improving Mothers' Care report

In accordance with funder requirements, the findings of the Maternal, Newborn and Infant Clinical Outcome Review Programme, including the MBRRACE-UK confidential enquiries into maternal deaths and morbidity are now released as multiple outputs instead of one report as previously produced.

The following outputs have been produced and are available online: ***www.npeu.ox.ac.uk/mbrrace-uk/reports***

1. A Data Brief with basic statistics concerning maternal mortality published online in advance of the reports. In 2026 this includes information on women who died between 2022 and 2024 (published January 2026).
2. A State of the Nation report highlighting the key surveillance findings, new national recommendations and lessons learned from confidential enquiries. In 2022-24 this includes reviews of the care received by women who died from haemorrhage, amniotic fluid embolism (AFE), infection, general medical and surgical disorders and neurological conditions as well as lessons for critical care and morbidity findings for women requiring networked maternal medical care (published September 2026).
3. This compiled report, which includes the full data on maternal mortality rates, the characteristics of the women who died and further lessons and quality improvement messages identified in the mortality and morbidity confidential enquiries. Also included in this compiled report are the background, aims and scope of work, details of methods and author lists.

1.4 Key to colour coding

1.4.1 Vignettes

Vignettes concerning the care of women who died are described in blue boxes.

Vignettes concerning the care of women who had severe morbidity but survived are described in purple boxes with the character M in the corner. ***M***

1.4.2 Recommendations

Recommendations based on improvements to care identified by MBRRACE-UK reviewers, for which there is no current national guidance and which have not been noted in previous guidance or MBRRACE-UK reports are shown in purple boxes as below:

NEW **National recommendations**

New national recommendations are presented in purple boxes.

The majority of recommendations included in the report arise from existing national guidance or previous MBRRACE-UK reports. The source of these recommendations are cited within green boxes as below.

All previous recommendations or existing guidance requiring improved implementation are presented in green boxes.

All new recommendations and existing recommendations identified by MBRRACE-UK reviewers as frequently needing improvement are highlighted in the key messages section at the start of each chapter. The professional groups who need to take action are indicated alongside new recommendations.

1.4.3 Other summary messages

Clinical messages based on previous recommendations or existing guidance and identified by MBRRACE-UK reviewers as needing emphasis are presented in blue boxes.

Clinical messages

Clinical messages to emphasise previous recommendations or existing guidance are presented in blue boxes.

Safety messages based on repeat findings from MBRRACE-UK, which are thought to be areas of potential safety risk are accentuated in red boxes.

Safety messages

Safety messages to highlight areas of potential patient safety risk that clinicians and healthcare commissioners should be mindful of for future care and care planning are presented in red boxes.

This report is the first since the launch of NHS England's Maternal Care Bundle in January 2026 (available at: ***www.england.nhs.uk/long-read/the-maternal-care-bundle/***). Relevant best practice standards from the Maternal Care Bundle are highlighted in blue boxes.

NHS England's Maternal Care Bundle

Relevant best practice standards from *NHS England's Maternal Care Bundle are highlighted in blue boxes to indicate areas of care where continued implementation of these standards may improve future care.**

***Although this care bundle has been published by NHS England, the principles and standards described within it are relevant to maternity care across the UK.**

1.5 Terminology

MBRRACE-UK uses the terms 'mother' and 'women' throughout our reports to refer to those who are planning to become pregnant, are pregnant, or who have given birth. We acknowledge that not all people who are pregnant or give birth identify as women or mothers. It is important that evidence-based care for maternity, perinatal and post-natal health is inclusive and personalised to respect people's gender identities.

2. Maternal Mortality in the UK 2022-24: Surveillance and Epidemiology

Allison Felker and Marian Knight

2.1 Key surveillance findings

There was no statistically significant difference in the overall maternal death rate in the UK between 2021-23 and 2022-24 but rates remained higher than the last complete triennium of 2019-21. In 2022-24 the overall rate of maternal death in the UK was 20% higher than it was in 2009-11 when the previous government set an ambition to halve the rate of maternal mortality in England by 2025.

The number of deaths due to COVID-19 dropped significantly with six women dying from COVID-19 complications in 2022-24. When these deaths due to COVID-19 were excluded, rates of overall and indirect maternal deaths remained statistically significantly increased in 2022-24 compared to the corresponding rates in 2019-21, the last complete triennium.

Thrombosis and thromboembolism remained the leading cause of maternal death in 2022-24 in the UK during or up to six weeks after the end of pregnancy. Cardiac disease was the second most common cause of maternal death followed by psychiatric causes.

Maternal suicides remained the leading cause of maternal death occurring between six weeks and one year after the end of pregnancy. As a whole, deaths from psychiatric causes accounted for 33% of maternal deaths in this period.

Inequalities in maternal mortality persisted in 2022-24. Compared to women aged 25-29, women aged 35 or older were nearly two times more likely to die. There was a nearly three-fold higher maternal mortality rate for Black women compared to White women and Asian women's risk of maternal death was also slightly higher compared to White women. Women living in the most deprived areas continued to have a maternal mortality rate twice that of women living in the least deprived areas.

2.2 Causes and trends

In 2022-24, 276 women died during pregnancy or within 42 days of the end of pregnancy in the UK. The deaths of 24 women were classified as coincidental. Thus, in this triennium, 252 women died from direct and indirect causes, classified using ICD-MM (World Health Organisation 2010), among 1,969,321 maternities, a UK maternal mortality rate of 12.80 per 100,000 maternities (95% confidence interval (CI) 11.27-14.48). This is unchanged from the rate of 12.82 per 100,000 maternities (95% CI 11.30-14.49) in 2021-23 (rate ratio (RR) 1.00, 95% CI 0.84-1.19, p=0.981). Maternal mortality rates for England, Scotland and Wales were not significantly different from the overall UK rate, noting that these comparisons have very limited statistical power. The maternal mortality rate for Northern Ireland was statistically significantly lower than the overall UK rate; however, low numbers of deaths in Northern Ireland mean that this rate is subject to high levels of random variation. As in previous MBRRACE-UK maternal reports, information about deaths from the Republic of Ireland is not included in this chapter and therefore rates and numbers presented here are comparable with all previous UK reports.

There were six women who died during or within 42 days of the end of pregnancy in 2022-24 whose deaths were directly attributed to complications of COVID-19 infection; none of these deaths occurred in 2024. If the women's deaths attributable to COVID-19 were excluded, the maternal mortality rate for 2022-24 would be 12.49 per 100,000 maternities (95% CI 10.98-14.15). This is statistically significantly higher than the corresponding rate excluding deaths due to COVID-19 for 2019-21, the last complete triennium (RR 1.24, 95% CI 1.03-1.50, p=0.022). The rate of indirect maternal deaths was similarly higher in 2022-24 compared to 2019-21 when deaths due to COVID-19 were excluded (RR 1.43, 95% CI 1.09-1.88, p=0.009).

Progress towards the previous government ambition to reduce maternal mortality by 50% between 2010 and 2025 in England (Department of Health 2017) can be assessed by comparing the rates of maternal deaths between 2009-11 and 2022-24. Over this time, the maternal mortality rate in the UK has increased by 20% (RR 1.20, 95% CI 1.01-1.44, p=0.038). The magnitude of this increase is only slightly reduced when deaths due to COVID-19 are excluded (RR 1.17, 95% CI 0.98-1.41, p=0.073). The rate of direct maternal deaths increased by 57% over this same period (RR 1.57, 95% CI 1.18-2.09, p=0.001) and rates of indirect maternal deaths remained unchanged when deaths due to COVID-19 were included (RR 1.00, 95% CI 0.79-1.26) or excluded (RR 0.96, 95% CI 0.75-1.21).

Table 2.1 and Figure 2.1 show rolling three-yearly maternal death rates since 2003 classified using ICD-MM. As in previous years' reports, there was no statistically significant change in the rate of maternal death between 2003-05 and 2022-24 (RR 0.92, 95% CI 0.77-1.09, p=0.916 for trend in rolling rates over time). This was also true when deaths directly due to COVID-19 were excluded (RR 0.90, 95% CI 0.75-1.06, p=0.243 for trend in rolling rates over time). Similarly, despite increasing rates in recent triennia, there were no statistically significant differences in the rate of direct or indirect maternal deaths between 2003-05 and 2022-24 and, if the six deaths attributable to COVID-19 were excluded, the indirect maternal death rate in 2022-24 would be statistically significantly lower compared to 2003-05 (RR 0.91, 95% CI 0.71-1.16, p=0.008 for trend in rolling rates over time).

Discrete triennial rates since 2003 are shown in Table 2.2 and Figure 2.2. Note that these figures are unchanged from those in last year's report as there has not been a complete new triennium since.

Table 2.1: Three-year rolling average direct and indirect maternal mortality rates per 100,000 maternities, deaths classified using ICD-MM, UK 2003-24 (illustrated in Figure 2.1)

Triennium	Total UK maternities	Direct deaths			Indirect deaths			Total direct and indirect deaths		
		n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI
2003-05	2,114,004	143	6.76	5.70 - 7.97	152	7.19	6.09 - 8.43	295	13.95	12.45 – 15.64
2004-06	2,165,909	124	5.73	4.76 - 6.83	148	6.83	5.78 - 8.03	272	12.56	11.15 – 14.14
2005-07	2,220,979	120	5.40	4.48 - 6.46	139	6.26	5.26 - 7.39	259	11.66	10.32 – 13.17
2006-08	2,291,493	120	5.24	4.34 - 6.26	141	6.15	5.18 - 7.26	261	11.39	10.09 – 12.86
2007-09	2,331,835	112	4.80	3.95 - 5.78	142	6.09	5.13 - 7.18	254	10.89	9.59 - 12.32
2008-10	2,366,082	99	4.18	3.40 - 5.09	162	6.85	5.83 - 7.99	261	11.03	9.73 - 12.45
2009-11	2,379,014	90	3.78	3.04 - 4.65	163	6.85	5.84 - 7.99	253	10.63	9.36 – 12.03
2010-12	2,401,624	89	3.71	2.98 - 4.56	154	6.41	5.44 - 7.51	243	10.12	8.89 – 11.47
2011-13	2,373,213	83	3.50	2.79 - 4.34	131	5.52	4.62 - 6.55	214	9.02	7.85 – 10.31
2012-14	2,341,745	81	3.46	2.75 – 4.30	119	5.08	4.21 – 6.08	200	8.54	7.40 – 9.81
2013-15	2,305,920	88	3.82	3.06 – 4.70	114	4.94	4.08 – 5.94	202	8.76	7.59 – 10.05
2014-16	2,301,628	98	4.26	3.46 – 5.19	127	5.52	4.60 – 6.57	225	9.78	8.54 – 11.14
2015-17	2,280,451	87	3.82	3.06 – 4.71	122	5.35	4.44 – 6.39	209	9.16	7.96 – 10.50
2016-18	2,235,159	92	4.12	3.32 – 5.05	125	5.59	4.66 – 6.66	217	9.71	8.46 – 11.09
2017-19	2,173,810	78	3.59	2.84 – 4.48	113	5.20	4.28 – 6.25	191	8.79	7.58 – 10.12
2018-20	2,101,829	109	5.19	4.26 – 6.26	120	5.71	4.73 – 6.83	229	10.90	9.53 – 12.40
2019-21	2,066,997	113	5.47	4.51 – 6.57	128	6.19	5.17 - 7.36	241	11.66	10.23 – 13.23
2020-22	2,028,543	129	6.36	5.31 – 7.56	146	7.20	6.08 - 8.46	275	13.56	12.00 - 15.26
2021-23	2,004,184	117	5.84	4.83 – 7.00	140	6.99	5.88 – 8.24	257	12.82	11.30 – 14.49
2022-24	1,969,321	117	5.94	4.91 – 7.12	135	6.86	5.75 – 8.11	252	12.80	11.27 – 14.48

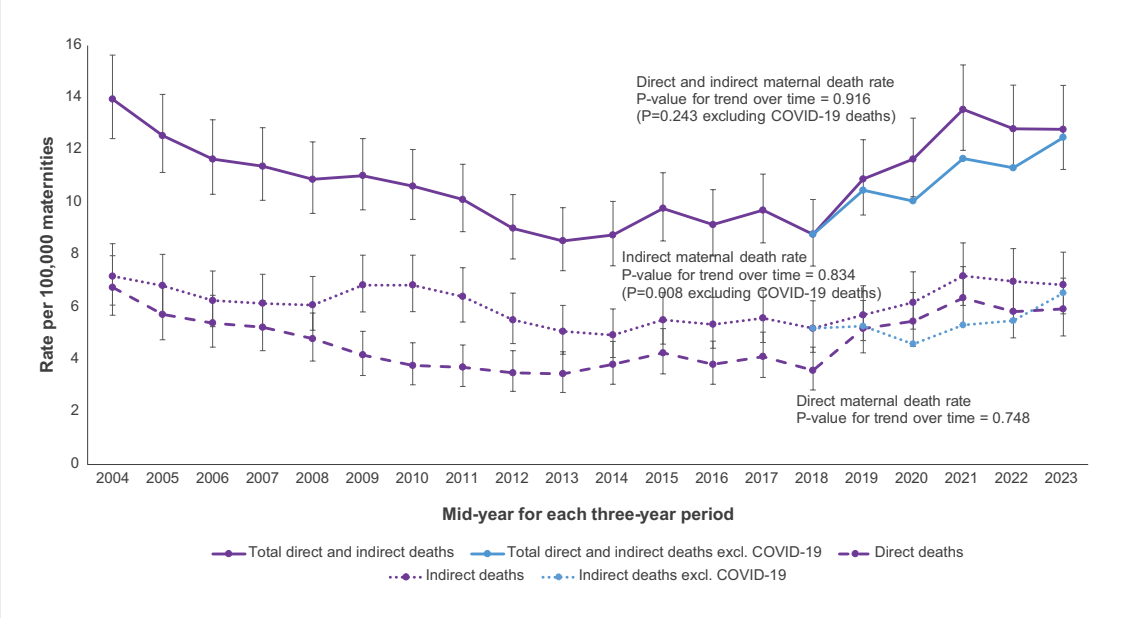
Sources: CMACE, MBRRACE-UK, Office for National Statistics, General Register Office for Scotland, Northern Ireland Statistics and Research Agency

Table 2.2: Direct and Indirect maternal deaths and mortality rates per 100,000 maternities by discrete triennia, deaths classified using ICD-MM, UK 2003-23 (illustrated in Figure 2.2)

Triennium	Direct deaths			Indirect deaths			Total direct and indirect deaths		
	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI
2003–05	143	6.76	5.70 - 7.97	152	7.19	6.09 - 8.43	295	13.95	12.45 - 15.64
2006–08	120	5.24	4.34 - 6.26	141	6.15	5.18 - 7.26	261	11.39	10.09 - 12.86
2009-11	90	3.78	3.04 - 4.65	163	6.85	5.84 - 7.99	253	10.63	9.36 - 12.03
2012–14	81	3.46	2.75 - 4.30	119	5.08	4.21 - 6.08	200	8.54	7.40 - 9.81
2015-17	87	3.82	3.06 - 4.71	122	5.35	4.44 - 6.39	209	9.16	7.96 - 10.50
2018-20	109	5.19	4.26 - 6.26	120	5.71	4.73 - 6.83	229	10.90	9.53 - 12.40
2021-23	117	5.84	4.83 – 7.00	140	6.99	5.88 – 8.24	257	12.82	11.30 – 14.49

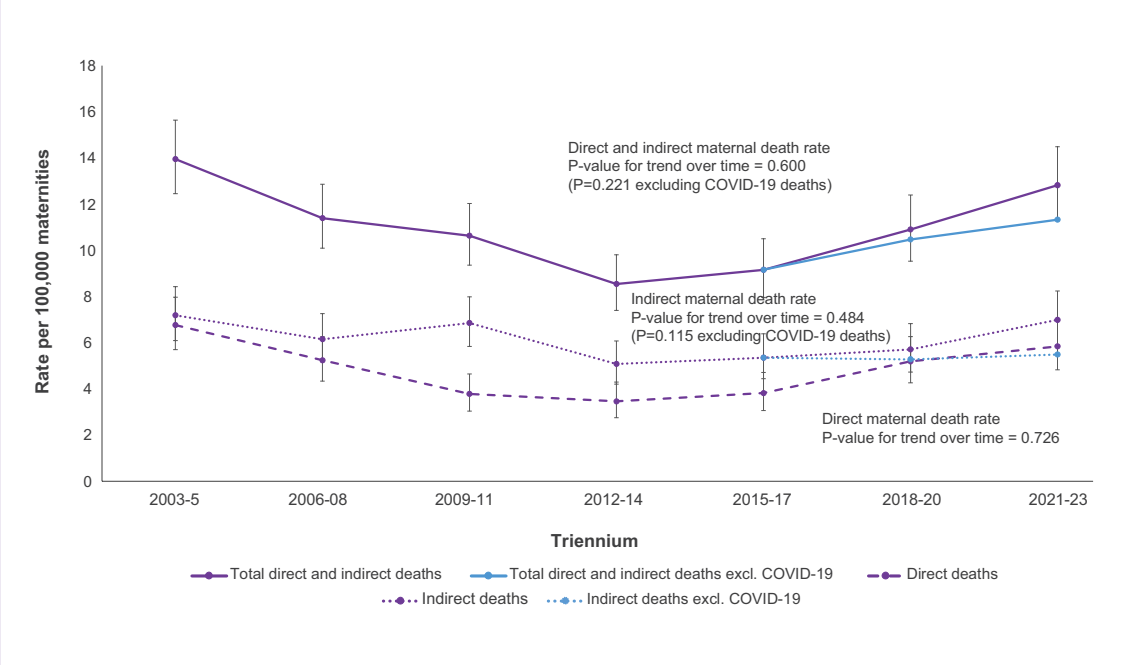
Sources: CMACE, MBRRACE-UK, Office for National Statistics, General Register Office for Scotland, Northern Ireland Statistics and Research Agency

Figure 2.1: Three-year rolling average direct and indirect maternal mortality rates per 100,000 maternities, deaths classified using ICD-MM and previous UK classification systems, UK 2003-24



Sources: CMACE, MBRRACE-UK

Figure 2.2: Direct and Indirect maternal mortality rates per 100,000 maternities by discrete triennia, deaths classified using ICD-MM, UK 2003-2023



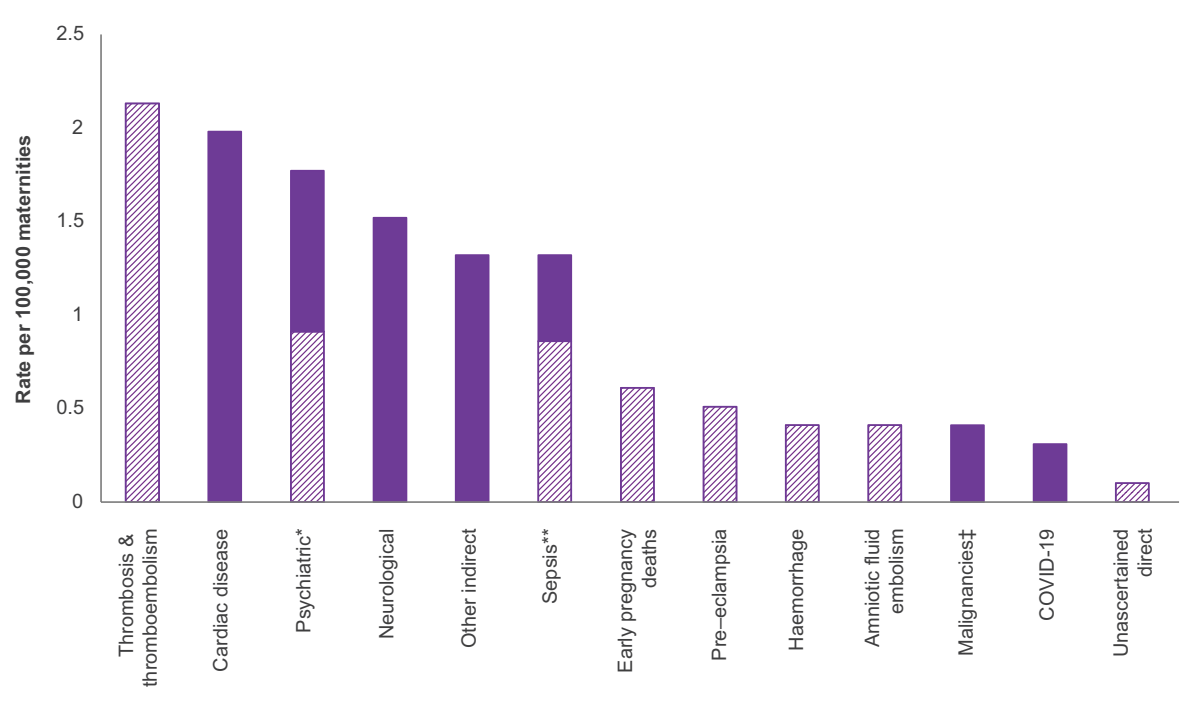
Sources: CMACE, MBRRACE-UK

2.2.1 Deaths due to individual causes

Maternal deaths by cause are shown in Tables 2.3 and 2.4 and Figure 2.3. Rolling three-year rates for individual causes are presented for five overlapping triennial reporting periods (2018-20, 2019-21, 2020-22, 2021-23 and 2022-24) (Table 2.3) and for discrete, non-overlapping triennial periods between 2009-11 and 2021-23 (Table 2.4). As this report is the first in a new three-year cycle, Table 2.4 remains unchanged from the 2025 report.

Three-year rolling rates for causes of death classified according to ICD-MM sub-groups are presented in Table 2.5 and Figure 2.4.

Figure 2.3: Maternal mortality rates by cause per 100,000 maternities, UK 2022-24



Hatched bars show direct causes of death, solid bars indicate indirect causes of death

*Rate for suicides (direct) is shown in hatched and rate for indirect psychiatric causes (drugs/alcohol) in solid bar

**Rate for direct sepsis (genital tract sepsis and other pregnancy-related infections) is shown in hatched and rate for indirect sepsis (influenza, pneumonia, others) in solid bar

‡Rate for indirect malignancies (breast/ovary/cervix)

Source: MBRRACE-UK

Table 2.3: Maternal mortality rates per 100,000 maternities, by cause and overlapping triennia, UK 2018-24

	2018-20			2019-21			2020-22			2021-23			2022-24		
	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI
All Direct and Indirect deaths	229	10.90	9.53 – 12.40	241	11.66	10.23 – 13.23	275	13.56	12.00 - 15.26	257	12.82	11.30 – 14.49	252	12.80	11.27 – 14.48
Direct deaths															
Pregnancy related infections - Sepsis*	17	0.81	0.47 - 1.29	15	0.73	0.41 – 1.20	18	0.89	0.53 - 1.40	16	0.80	0.46 – 1.30	17	0.86	0.50 – 1.38
Pre-eclampsia and eclampsia	8	0.38	0.16 – 0.75	9	0.44	0.20 – 0.83	7	0.35	0.14 – 0.71	4	0.20	0.05 – 0.51	10	0.51	0.24 – 0.93
Thrombosis and thromboembolism	29	1.38	0.92 – 1.98	33	1.60	1.10 – 2.24	43	2.12	1.53 - 2.86	42	2.10	1.51 – 2.83	42	2.13	1.54 - 2.88
Amniotic fluid embolism	9	0.43	0.20 – 0.81	8	0.39	0.17 – 0.76	8	0.39	0.17 – 0.78	9	0.45	0.21 – 0.85	8	0.41	0.18 – 0.80
Early pregnancy deaths	9	0.43	0.20 – 0.81	14	0.68	0.37 – 1.14	15	0.74	0.41 - 1.22	14	0.70	0.38 – 1.17	12	0.61	0.32 – 1.06
Haemorrhage	16	0.76	0.44 – 1.24	17	0.82	0.48 – 1.32	18	0.89	0.53 - 1.40	14	0.70	0.38 – 1.17	8	0.41	0.18 – 0.80
Anaesthesia	1	0.05	0.001 – 0.27	1	0.05	0.001 – 0.27	-	-	-	-			-	-	-
Psychiatric causes - Suicides	20	0.95	0.58 – 1.47	16	0.77	0.44 – 1.26	18	0.89	0.53 – 1.40	16	0.80	0.46 – 1.30	18	0.91	0.54 - 1.44
Malignancy - direct	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unascertained - direct	-	-	-	-	-	-	2	0.10	0.01 – 0.34	2	0.10	0.01 – 0.36	2	0.10	0.01 -0.37
All Direct	109	5.19	4.26 – 6.26	113	5.47	4.51 – 6.57	129	6.36	5.31 – 7.56	117	5.84	4.83 – 7.00	117	5.94	4.91 – 7.12
Indirect deaths															
Cardiac disease	34	1.62	1.12 – 2.26	33	1.60	1.01 – 2.24	36	1.77	1.24 - 2.46	30	1.77	1.24 - 2.46	39	1.98	1.41 - 2.71
Indirect Sepsis - Influenza	2	0.10	0.01 – 0.34	1	0.05	0.001 – 0.27	1	0.05	0.001 - 0.28	1	0.05	0.001 – 0.28	1	0.05	0.001 - 0.28
Indirect Sepsis – Pneumonia/ others	6	0.29	0.11 – 0.62	7	0.34	0.14 – 0.70	6	0.30	0.11 - 0.64	9	0.45	0.21 – 0.85	8	0.41	0.18 – 0.80
Indirect Sepsis – COVID-19	9	1.60	0.73 – 3.04	33	2.64	1.82 – 3.71	38	1.98	1.40 – 2.72	30	1.50	1.01 – 2.14	6	0.31	0.11 - 0.66
Other Indirect causes	24	1.14	0.73 – 1.70	19	0.92	0.55 – 1.44	20	0.99	0.60 - 1.52	24	7.20	6.08 - 8.46	26	1.32	0.86 - 1.93
Indirect neurological conditions	27	1.28	0.85 – 1.87	22	1.06	0.67 – 1.61	25	1.23	0.80 - 1.82	27	1.35	0.88 - 1.96	30	1.52	1.03 - 2.17
Psychiatric causes – Drugs/alcohol/others	14	0.67	0.36 – 1.12	9	0.44	0.20 – 0.83	13	0.64	0.34 – 1.10	13	0.65	0.35 – 1.11	17	0.86	0.50 - 1.38
Indirect malignancies	4	0.19	0.05 – 0.49	4	0.19	0.05 – 0.50	7	0.35	0.14 – 0.71	6	0.30	0.11 – 0.65	8	0.41	0.18 - 0.80
All Indirect	120	5.71	4.73 – 6.83	128	6.19	5.17 – 7.36	146	7.20	6.08 - 8.46	140	6.99	5.88 – 8.24	135	6.86	5.75 – 8.11
Coincidental															
Homicide	4	0.19	0.05 – 0.49	5	0.24	0.08 – 0.57	6	0.30	0.11 – 0.64	7	0.35	0.14 – 0.72	4	0.20	0.06 - 0.52
Other coincidental	14	0.67	0.36 – 1.12	15	0.73	0.41 – 1.20	15	0.74	0.41 – 1.22	20	1.0	0.61 – 1.54	20	1.02	0.62 - 1.57
All coincidental	18	0.86	0.51 – 1.35	20	0.97	0.56 – 1.49	21	1.04	0.64 – 1.58	27	1.35	0.89 – 1.96	24	1.22	0.78 - 1.81
Late deaths	289	13.75	12.21 – 15.43	311	15.05	13.42 – 16.81	329	16.22	14.51 - 18.07	327	16.32	14.60 – 18.81	322	16.35	14.61 – 18.24

*Genital/ urinary tract sepsis deaths, including early pregnancy deaths as a result of genital/urinary tract sepsis. Other deaths from infectious causes are classified under indirect causes.

Source: MBRRACE-UK, Office for National Statistics, National Records Scotland, Northern Ireland Statistics and Research Agency

Table 2.4: UK Maternal mortality rates per 100,000 maternities, by cause and discrete triennia, UK 2009-23

	2009-11			2012-14			2015-17			2018-20			2021-23		
	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI
All Direct and Indirect deaths	253	10.63	9.36 – 12.03	200	8.54	7.40 – 9.81	209	9.16	7.96 – 10.50	229	10.90	9.53 – 12.40	257	12.82	11.30 – 14.49
Direct deaths															
Sepsis*	16	0.67	0.38 – 1.09	7	0.29	0.12 – 0.61	10	0.44	0.21 – 0.81	17	0.81	0.47 - 1.29	16	0.80	0.46 – 1.30
Pre-eclampsia and eclampsia	10	0.42	0.20 – 0.77	2	0.08	0.01 – 0.31	5	0.22	0.07 – 0.51	8	0.38	0.16 – 0.75	4	0.20	0.05 – 0.51
Thrombosis and thromboembolism	30	1.26	0.85 – 1.80	20	0.85	0.52 – 1.32	34	1.49	1.03 – 2.08	29	1.38	0.92 – 1.98	42	2.10	1.51 – 2.83
Amniotic fluid embolism	7	0.29	0.12 – 0.61	16	0.68	0.39 – 1.11	6	0.26	0.10 – 0.57	9	0.43	0.20 – 0.81	9	0.45	0.21 – 0.85
Early pregnancy deaths	4	0.17	0.05 – 0.43	7	0.29	0.12 – 0.61	4	0.18	0.05 - 4.49	9	0.43	0.20 – 0.81	14	0.70	0.38 – 1.17
Haemorrhage	14	0.59	0.32 – 0.99	13	0.56	0.29 – 0.95	11	0.48	0.24 – 0.86	16	0.76	0.44 – 1.24	14	0.70	0.38 – 1.17
Anaesthesia	3	0.12	0.03 – 0.37	2	0.09	0.01 – 0.31	1	0.04	0.001 – 0.24	1	0.05	0.001 – 0.27	-	-	-
Psychiatric causes - Suicides	6	0.25	0.09 – 0.55	14	0.60	0.33 – 1.00	13	0.57	0.30 – 0.98	20	0.95	0.58 – 1.47	16	0.80	0.46 – 1.30
Malignancy - direct	-	-	-	-	-	-	1	0.04	0.001 – 0.24	-	-	-	-	-	-
Other Direct	-	-	-	-	-	-	2	0.09	0.01 – 0.32	-	-	-	2	0.10	0.01 – 0.36
All direct	90	3.78	3.04 – 4.65	81	3.46	2.75 – 4.30	87	3.82	3.06 – 4.71	109	5.19	4.26 – 6.26	117	5.84	4.83 – 7.00
Indirect deaths															
Cardiac disease	51	2.14	1.60 – 2.82	51	2.18	1.62 – 2.86	48	2.10	1.55 – 2.79	34	1.62	1.12 – 2.26	30	1.50	1.01 - 2.14
Indirect sepsis – Influenza	27	1.13	0.75 – 1.65	1	0.04	0.001 – 0.24	1	0.04	0.001 – 0.24	2	0.10	0.01 – 0.34	1	0.05	0.001 – 0.28
Indirect sepsis – Pneumonia/others	15	0.63	0.35 – 1.04	14	0.60	0.33 – 1.00	9	0.39	0.18 – 0.75	6	0.29	0.11 – 0.62	9	0.45	0.21 - 0.85
Other Indirect causes	29	1.22	0.82 – 1.75	23	0.98	0.62 – 1.47	23	1.01	0.64 – 1.51	24	1.14	0.73 – 1.70	24	1.20	0.77 - 1.78
Indirect neurological conditions	30	1.26	0.85 – 1.80	22	0.94	0.59 – 1.42	27	1.18	0.78 – 1.72	27	1.28	0.85 – 1.87	27	1.35	0.88 – 1.96
Psychiatric causes – Drugs/alcohol/others	7	0.29	0.12 – 0.61	4	0.17	0.05 – 0.44	7	0.31	0.12 – 0.63	14	0.67	0.36 – 1.12	13	0.65	0.35 – 1.11
Indirect malignancies	4	0.17	0.05 – 0.45	4	0.17	0.05 – 1.44	7	0.31	0.12 – 0.63	4	0.19	0.05 – 0.49	6	0.30	0.11 – 0.65
All Indirect	163	6.85	5.84 – 7.99	119	5.08	4.21 – 6.08	122	5.35	4.44 – 6.39	120	5.71	4.73 – 6.83	140	6.99	5.88 – 8.24
Coincidental deaths	23	0.98	0.61 – 1.45	41	1.75	1.26 – 2.38	27	1.18	0.78 – 1.72	18	0.86	0.51 – 1.35	27	1.35	0.89 – 1.96

*Genital/ urinary tract sepsis deaths, including early pregnancy deaths as a result of genital/ urinary tract sepsis. Other deaths from infectious causes are classified under indirect causes.

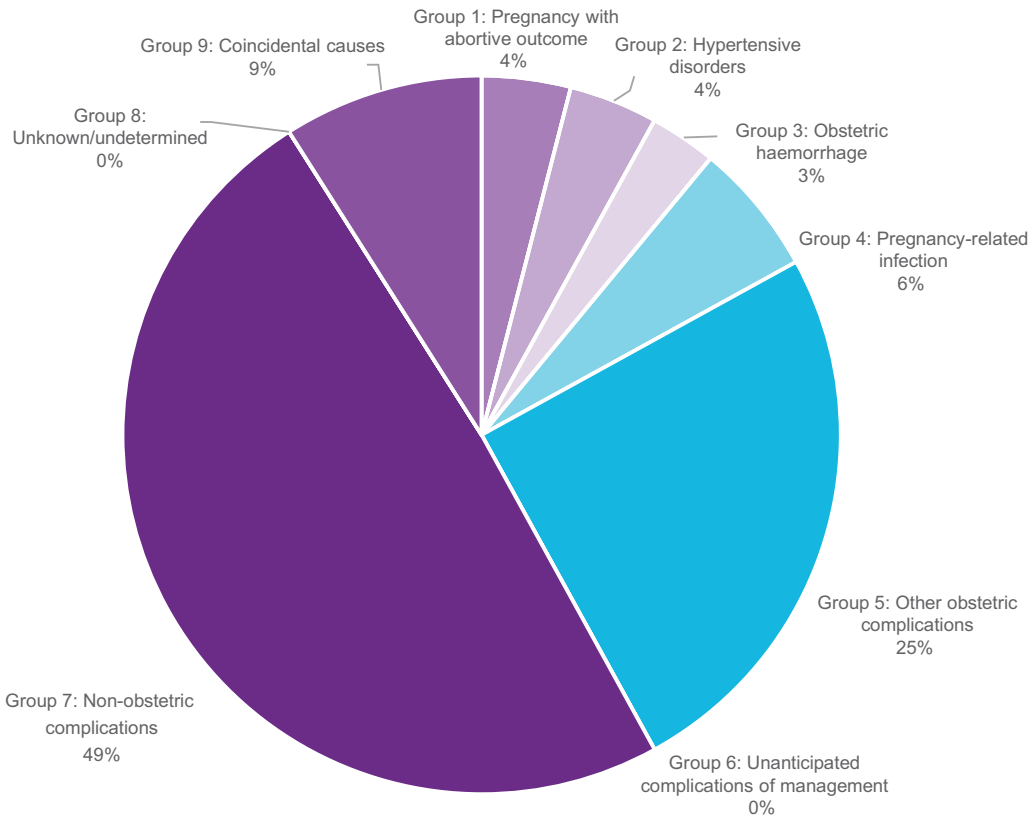
Sources: MBRRACE-UK

Table 2.5: Maternal mortality rates per 100,000 maternities, by cause and overlapping triennia, causes of deaths classified using ICD-MM, UK 2018-24

Cause of death	2018-20			2019-21			2020-22			2021-23			2022-24		
	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI	n	Rate	95% CI
Direct causes															
Group 1: Pregnancy with abortive outcome	9	0.43	0.20 – 0.81	14	0.68	0.37 – 1.14	15	0.74	0.41 - 1.22	14	0.70	0.38 – 1.17	12	0.61	0.32 – 1.06
Group 2: Hypertensive disorders	8	0.38	0.16 – 0.75	9	0.44	0.20 – 0.83	7	0.35	0.14 - 0.71	4	0.20	0.05 – 0.51	10	0.51	0.24 – 0.93
Group 3: Obstetric haemorrhage	16	0.76	0.44 – 1.24	17	0.82	0.48 – 1.32	18	0.89	0.53 - 1.40	14	0.70	0.38 – 1.17	8	0.41	0.18 – 0.80
Group 4: Pregnancy-related infection	17	0.81	0.47 - 1.29	15	0.73	0.41 – 1.20	18	0.88	0.53 - 1.40	16	0.80	0.46 – 1.30	17	0.86	0.50 – 1.38
Group 5: Other obstetric complications	58	2.76	2.10 – 3.57	57	2.76	2.09 – 3.57	71	3.50	2.73 - 4.41	69	3.44	2.68 – 4.36	70	3.55	2.77 – 4.49
Group 6: Unanticipated complications of management	1	0.05	0.001 – 0.27	1	0.05	0.001 – 0.27	-	-	-	-	-	-	-	-	-
Indirect causes															
Group 7: Non-obstetric complications	120	5.71	4.73 – 6.83	128	6.19	5.17 – 7.36	146	7.20	6.08 - 8.46	140	6.99	5.88 – 8.24	135	6.86	5.75 - 8.11
Group 8: Unknown/ undetermined	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coincidental causes															
Group 9: Coincidental causes	18	0.86	0.51 – 1.35	20	0.97	0.559 – 1.49	21	1.04	0.64 - 1.58	27	1.35	0.89 – 1.96	24	1.22	0.78 - 1.81

Source: MBRRACE-UK, Office for National Statistics, National Records Scotland, Northern Ireland Statistics and Research Agency.

Figure 2.4: Proportion of maternal deaths by cause, classified using ICD-MM, UK 2022-24



2.2.2 Direct deaths

As in the two previous overlapping triennia, in 2022-24 thrombosis and thromboembolism (VTE) remained the leading cause of maternal death in the UK during or up to 42 days after pregnancy. The rate of VTE remains unchanged from 2021-23 (RR 1.02, 95% CI 0.65-1.60, p=0.936) but has increased 34% since 2019-21, the last complete triennium (RR 1.34, 95% CI 0.83-2.18, p=0.215). The rate of VTE in 2022-24 was more than twice that of the next leading direct cause of maternal death, suicide, which occurred at a rate of 0.91 per 100,000 maternities (95% CI 0.54-1.44). This rate is now comparable with 2018-20, which had the highest reported rate of maternal death due to suicide (RR 0.96, 95% CI 0.48-1.91). Note that, as described in previous reports, the majority of maternal suicide deaths occur between six weeks and a year after pregnancy.

After suicide, the next most frequent direct cause of maternal death was sepsis, emphasising the importance of the lessons in Chapter 4 of this report. In 2022-24, the rate of maternal death due to direct sepsis was 0.86 per 100,000 maternities (95% CI 0.50-1.38), which is similar to previous overlapping triennia. The rate of maternal deaths in early pregnancy continued to decline from its peak in the 2022-22 triennium (RR 0.82, 95% CI 0.35-1.89) while, in contrast, the rate of maternal deaths due to pre-eclampsia and eclampsia was higher than in previous triennia, though not statistically significantly so. Maternal deaths due to obstetric haemorrhage and amniotic fluid embolism (AFE) occurred at equal rates in 2022-24 (0.41 per 100,000 maternities (95% CI 0.18-0.80)). Lessons for the care of women who died from haemorrhage and AFE are described in Chapter 3 of this report.

2.2.3 Indirect deaths

Indirect causes continued to account for more than half (54%) of all direct and indirect maternal deaths in the UK in 2022-24. Cardiac disease remained the leading indirect cause of maternal death during or up to 42 days after pregnancy with a maternal mortality rate of 1.98 per 100,000 maternities (95% CI 1.41-2.71). There has been an overall decrease in the rate of maternal death from cardiac disease since enhanced case ascertainment was introduced (2003-05: RR 0.87, 95% CI 0.56-1.36), but rates in 2022-24 were statistically non-significantly higher than in 2021-23 (RR 1.32, 95% CI 0.80-2.21) and 2019-21 (RR 1.24, 95% CI 0.76-2.04).

After cardiac disease, the next leading cause of indirect maternal deaths in 2022-24 was neurological conditions (1.52 per 100,000 maternities (95% CI 1.03-2.17)) and other indirect causes (1.32 per 100,000 maternities (95% CI 0.86-1.93)). Although not statistically significantly higher, rates of maternal death due to neurological conditions or other indirect causes, including general medical or surgical disorders, have been steadily increasing and are now 43% (RR 1.43, 95% CI 0.79-2.60) and 44% higher (RR 1.44, 95% CI 0.76-2.75), respectively, than in 2019-21. This suggests that the lessons for the care of these women described in Chapters 5 and 6 remain imperative to reduce the risk of maternal death in women with pre-existing conditions and physical comorbidities.

The rate of maternal deaths due to other psychiatric causes, which had been relatively consistent across previous triennia, increased in 2022-24 to 0.86 per 100,000 maternities (95% CI 0.50-1.38). This rate is three-fold higher than in 2009-11 when MBRRACE-UK reporting began (RR 2.93, 95% CI 1.16-8.37, p=0.013)) and two-fold higher than in the last complete triennium, 2019-21 (RR 1.98, 95% CI 0.84-5.05, p=0.095).

Importantly, COVID-19 was no longer a leading cause of maternal death in 2022-24. Rates of maternal death due to COVID-19 continued to decline and were statistically significantly lower in 2022-24 compared with all previous triennia encompassing the COVID-19 pandemic. As in previous enquiries, none of the women who died had adverse outcomes, including VTE, following SARS-CoV-2 vaccination. Despite the significant decline in maternal deaths associated with COVID-19, the lessons for the care of women with COVID-19, as outlined in Chapter 4, remain important to ensure continued equity in the treatment of all women with respiratory infections or other causes of sepsis.

2.2.4 International comparison

For international comparison, the maternal mortality ratios estimated for the UK using routinely reported data are presented in Table 2.6. As this report is the first in a new three-year cycle, this table has not been updated from last year's report. The rate estimate from routine sources of data is much lower (just over half) than the actual rates as identified through MBRRACE-UK, which uses multiple sources of death identification. This emphasises the importance of the additional case identification and checking undertaken by the MBRRACE-UK team to give an accurate maternal mortality estimate.

Table 2.6: Maternal mortality ratios* per 100,000 live births calculated based on deaths identified from routine sources of data, UK, 1985-2023

Triennium	Denominator number of live births	No. of deaths identified through death certificates	Maternal mortality ratio	95% CI
1985-87	2,268,766	174	7.67	6.61 - 8.90
1988-90	2,360,309	171	7.24	6.24 - 8.42
1991-93	2,315,204	150	6.48	5.52 - 7.60
1994-96	2,197,640	158	7.19	6.15 - 8.40
1997-99	2,123,614	128	6.03	5.70 - 7.17
2000-02	1,997,472	136	6.81	5.76 - 8.05
2003-05	2,114,004	149	7.05	6.00 - 8.27
2006-08	2,291,493	155	6.76	5.78 - 7.92
2009-11	2,405,251	134	5.57	4.67 - 6.60
2012-14	2,368,125	110	4.65	3.82 - 5.60
2015-17	2,317,363	95	4.10	3.32 - 5.01
2018-20	2,136,242	129	6.04	5.04 - 7.18
2021-23	2,030,431	140	6.90	5.80 – 8.14

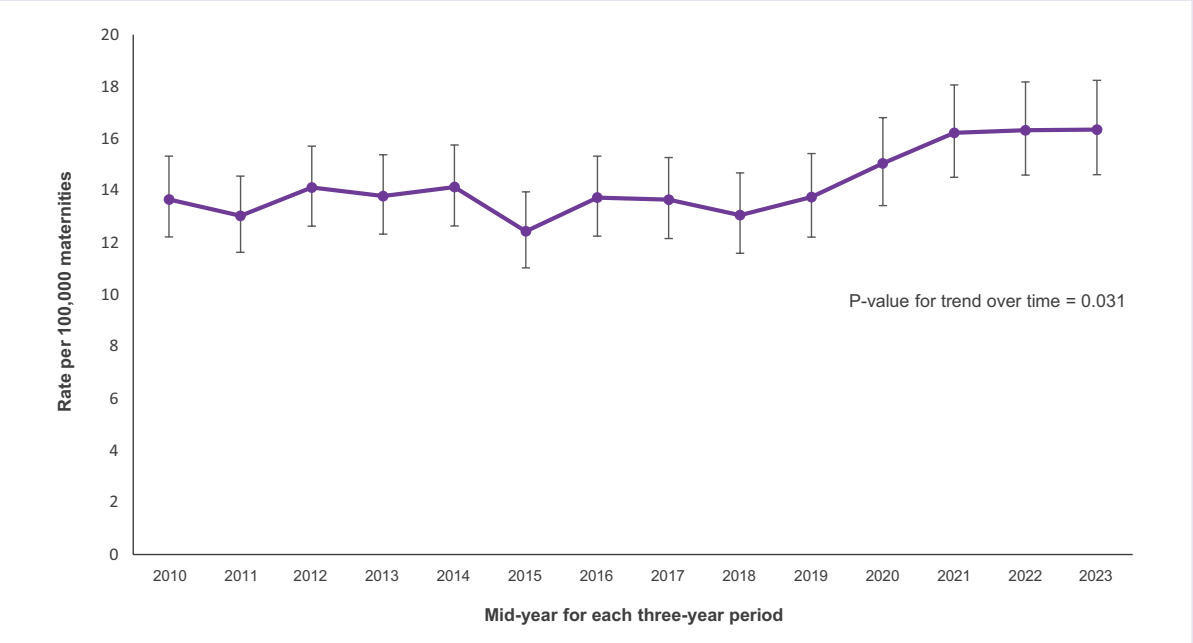
*For the purposes of international comparison, this table reports the maternal mortality ratio per 100,000 live births and not the maternal mortality rate per 100,000 maternities (including live births and stillbirths) as elsewhere in the report

Source: Office for National Statistics, General Register Office for Scotland, Northern Ireland Statistics and Research Agency

2.2.5 Women who died between six weeks and one year after the end of pregnancy

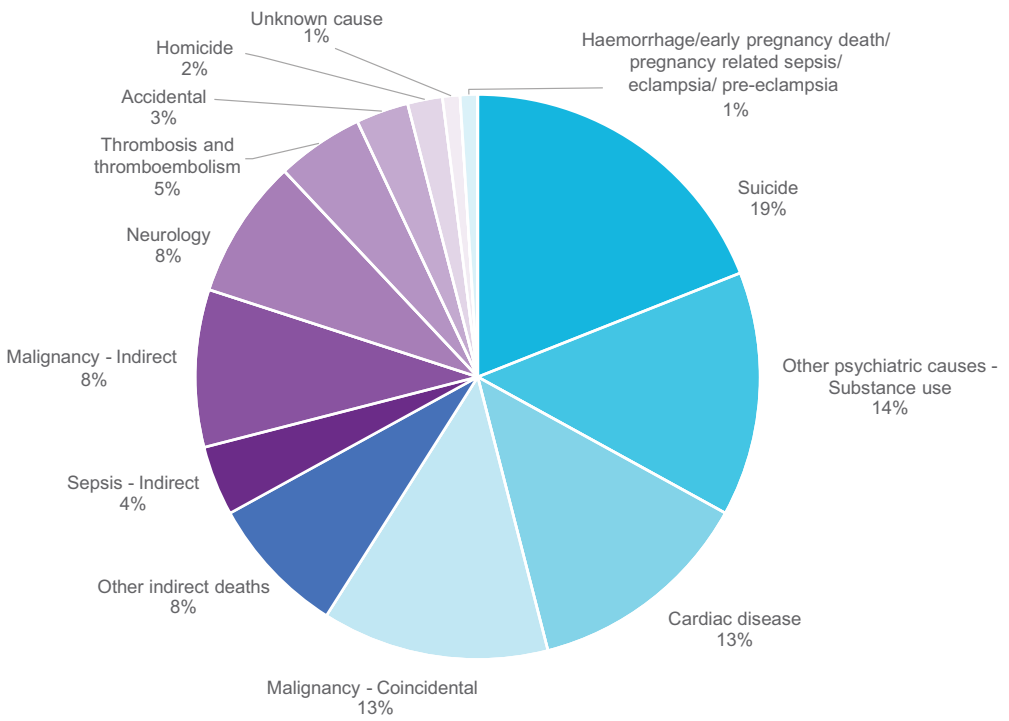
Rolling triennial rates of late pregnancy-associated deaths are shown in Figure 2.5 and causes of late pregnancy-associated deaths in Figure 2.6. The rate of late pregnancy-associated deaths has been consistently rising over previous overlapping triennia. In 2022-24, 322 women died between six weeks and one year after the end of pregnancy, representing a mortality rate of 16.35 per 100,000 maternities (95% CI 14.61-18.24). This compares to a rate of 13.66 per 100,000 maternities in 2009-11, the first MBRRACE-UK confidential enquiry report (RR 1.20, 95% CI 1.02-1.40, p=0.031 for trend in rolling rates over time). The 2009-11 triennium also corresponds with the start of the previous government ambition to reduce maternal mortality by 50% between 2010 and 2025 in England (Department of Health 2017). While this ambition applies only to maternal deaths occurring during or up to 42 days after pregnancy, it is important to highlight that late pregnancy-associated deaths also increased by 20% from 2009-11 to 2022-24.

Figure 2.5: Rates of pregnancy-associated deaths occurring between six weeks and one year after the end of pregnancy, UK 2009-24



Suicide remained the leading cause of late deaths occurring between six weeks and one year after the end of pregnancy. As a whole, deaths from psychiatric causes accounted for 33% of late pregnancy-associated deaths in 2022-24 (Figure 2.6).

Figure 2.6: Proportion of deaths, by cause, amongst women who died between six weeks and one year after the end of pregnancy, UK 2021-24)



2.3 The characteristics of women who died 2022-24

2.3.1 The women and babies

Of the 252 women who died from direct and indirect causes during or up to 42 days after the end of their pregnancy in 2022-24, 79 women (31%) were still pregnant at the time of their death. Of these women, 51 (65%) died when they were ≤20 weeks' pregnant. There were 173 women who were not pregnant at the time of their death, the majority of whom died 1-41 days after delivery or pregnancy loss (n=116, 67%) (Table 2.7).

Table 2.7: Timing of direct and indirect maternal deaths in relation to pregnancy, UK 2022-24

Timing of death	Direct (n=117) Frequency (%)	Indirect (n=135) Frequency (%)	Total (n=252) Frequency (%)
Antenatal period			
≤20 weeks	32 (28)	19 (14)	51 (20)
>20 weeks	4 (3)	24 (18)	28 (11)
On day of delivery or pregnancy loss	31 (27)	26 (19)	57 (23)
1 - 41 days after the end of pregnancy	50 (43)	66 (49)	116 (46)

Of the 173 women who were not pregnant at the time of their death, 34 experienced an early pregnancy loss at ≤20 weeks' gestation (20%). The remaining 139 women gave birth to 145 infants. Of these infants, 99 (68%) survived and 46 died (27 babies were stillborn and 19 died in the neonatal period). The 252 women who died in 2022-24 also left behind a further 339 children from previous pregnancies. Thus, a total of 438 motherless children remains.

Of the 139 women who gave birth, the majority did so in hospital (80%). A further 9% of women gave birth in an emergency department or an ambulance and 11% at home (Table 2.8). The majority of women who gave birth at home had intended to have a hospital birth (87%). There were four women who died who had planned a home birth; one gave birth at home and three in hospital.

The majority of the 139 women who gave birth at ≥20 weeks had a caesarean birth (n=109, 78%). Thirty-nine of the caesarean births were a resuscitative hysterotomy (RH) performed as part of attempted resuscitation of the woman (36%). There were 41 babies born following a RH, of which 24 (59%) were born after 32 weeks' gestation. Thirteen out of the 24 babies born after 32 weeks' gestation survived (four were stillborn and seven died in the neonatal period). Of the 17 babies delivered at 32 weeks' gestation or less, four survived, nine were stillborn and four died in the neonatal period. Thus, of the 41 babies born following a resuscitative hysterotomy, 17 (41%) survived, 13 (32%) were stillborn and 11 (27%) died in the neonatal period. Note that the overall proportion of babies who survived after RH is 15% higher than in the last complete triennium (41% in 2022-24 vs. 26% in 2019-21) with the greatest increase in survival seen for babies born after 32 weeks' gestation (54% in 2022-24 compared to 32% in 2019-21). While these increases are not statistically significant, these data represent a potentially promising trend in infant survival following RH.

Table 2.8: Place of childbirth amongst women who died after giving birth at ≥20 weeks' gestation,UK 2022-24

Place of childbirth	Direct (n=64) Frequency (%)	Indirect (n=75) Frequency (%)	Total (n=139) Frequency (%)
Home	7 (11)	8 (11)	15 (11)
Hospital (except emergency department)	53 (83)	58 (77)	111 (80)
Emergency department or ambulance	4 (6)	9 (12)	13 (9)

2.3.2 Socio-demographic characteristics

The socio-demographic characteristics of women who died in 2022-24 are shown in Table 2.9.

The majority of women who died were over age 30, not in their first pregnancy and were from White ethnic backgrounds. The highest proportion of the women who died lived in the most deprived areas and for most women, they or their partners were employed and they were living with their partner. Almost all the women who died were able to speak or understand English.

Over a quarter of women who died in 2022-24 (28%), and whose place of birth was known, were born outside the UK. The 68 women who were born abroad were primarily from Asia (n=29, 43%, largely Pakistan, India and Sri Lanka), Africa (n=23, 34%, in particular Nigeria, Somalia, Zimbabwe and the Democratic Republic of the Congo) and Eastern Europe (n=6, 9%, predominantly Romania) with the remainder (n=10, 15%) from other parts of Europe, the Americas, Australasia and the Caribbean (Table 2.9).

Table 2.9: Sociodemographic characteristics of women who died from direct and indirect causes, UK 2022-24

Characteristics	Direct (n=117) Frequency (%)	Indirect (n=135) Frequency (%)	Total (n=252) Frequency (%)
Age			
<20	0 (0)	1 (1)	1 (1)
20 – 24	9 (8)	7 (5)	16 (6)
25 – 29	29 (25)	34 (25)	63 (25)
30 – 34	36 (31)	35 (26)	71 (28)
35 – 39	24 (21)	41 (30)	65 (26)
≥ 40	19 (16)	17 (13)	36 (14)
Parity			
0	44 (38)	46 (34)	90 (36)
1 to 2	50 (43)	52 (39)	102 (40)
≥3	20 (17)	35 (26)	55 (22)
Missing	3 (3)	2 (1)	5 (2)
Ethnicity			
White European	70 (60)	96 (71)	166 (66)
Indian	6 (5)	3 (2)	9 (4)
Pakistani	7 (6)	8 (6)	15 (6)
Bangladeshi	2 (2)	3 (2)	5 (2)
Other Asian	6 (5)	5 (4)	11 (4)
Black Caribbean	7 (6)	3 (2)	10 (4)
Black African	8 (7)	12 (9)	20 (8)
Others/ Mixed	10 (9)	4 (3)	14 (6)
Missing	1 (1)	1 (1)	2 (1)
Woman's region of birth			
United Kingdom	73 (62)	99 (73)	172 (68)
Eastern Europe	2 (2)	4 (3)	6 (3)
Western Europe	1 (1)	3 (2)	4 (2)
Asia	18 (15)	11 (8)	29 (12)
Africa	11 (9)	12 (9)	23 (9)
Australia and North America	2 (2)	0 (0)	2 (1)
Central & South America & Caribbean	4 (3)	0 (0)	4 (2)
Missing	6 (5)	6 (4)	12 (5)
UK citizen			
Yes	90 (77)	124 (92)	214 (85)
No	20 (17)	8 (6)	28 (11)
Missing	7 (6)	3 (2)	10 (4)
Socioeconomic status (Index of multiple deprivation (IMD) of postcode of residence)			
First quintile (Least deprived)	9 (8)	15 (11)	24 (10)
Second quintile	18 (15)	13 (10)	31 (12)
Third quintile	21 (18)	22 (16)	43 (17)
Fourth quintile	33 (28)	27 (20)	60 (24)
Fifth quintile (Most deprived)	34 (29)	51 (38)	85 (34)
Missing	2 (2)	7 (5)	9 (4)
Socioeconomic status (Occupational classification)			
Employed (Either woman or partner)	78 (67)	97 (72)	175 (69)
Unemployed (Both)	19 (16)	23 (17)	42 (17)
Missing	20 (17)	15 (11)	35 (14)
Able to speak/understand English			
Yes	105 (90)	131 (97)	236 (94)
No	9 (8)	3 (2)	12 (5)
Missing	3 (3)	1 (1)	4 (2)
Living arrangements			
With partner	89 (76)	92 (68)	181 (72)
Living alone	8 (7)	12 (9)	20 (8)
With parents/extended family	10 (9)	11 (8)	21 (8)
Others	5 (4)	12 (9)	17 (7)
Missing	5 (4)	8 (6)	13 (5)
Domestic abuse (prior to pregnancy/ during pregnancy)			
Yes	23 (20)	31 (23)	54 (21)
No	55 (47)	76 (56)	131 (52)
Missing	39 (33)	28 (21)	67 (27)
History of abuse as a child			
Yes	8 (7)	9 (7)	17 (7)
No	47 (40)	69 (51)	116 (46)
Missing	62 (53)	57 (42)	119 (47)
Known to social services			
Yes	19 (16)	31 (23)	50 (20)
No	78 (67)	87 (64)	165 (65)
Missing	20 (17)	17 (13)	37 (15)

Overall, most of the women who died were UK citizens (85%) including over half (53%, n=36) of the women who were born outside the UK. Twenty-eight (41%) of the women who died and who were born abroad were not UK citizens at the time of their death. For these women, the median time spent in the UK before they died was 1 year and 9 months (range 3 months to 27 years). Table 2.10 shows the rates of death amongst women born in selected countries with the highest number of deaths. The rate of maternal death amongst women born outside the UK is not statistically significantly different than the rate for women born in the UK (RR 0.90, 95% CI 0.67-1.19). While women born in certain countries, including Nigeria, Pakistan, India, and Bangladesh, are frequently overrepresented amongst maternal deaths in the UK, this report shows a higher number of maternal deaths amongst women born in Sri Lanka, Somalia, Democratic Republic of the Congo and Zimbabwe than in previous reports (Table 2.10). Mortality rates for women born in Sri Lanka and Democratic Republic of Congo were statistically significantly higher compared to women born in the UK; however, small numbers of maternities in these populations mean that these rates are subject to high levels of variation (Table 2.10).

Table 2.10: Maternal mortality rates per 100,000 maternities, by mother's country of birth (select countries), UK 2022-24

Woman's country of birth	Maternities 2022-24	Total Deaths	Rate per 100,000 maternities	95% CI	Relative risk (RR)	95% CI
UK	1,365,974*	172	12.59	10.78 – 14.62	1 (Ref)	-
Outside UK	603,347*	68	11.27	8.75 – 14.29	0.90	0.67 – 1.19
Specific countries						
Nigeria‡	38,220	9	23.55	10.77 – 44.70	1.87	0.84 – 3.63
Pakistan‡	56,154	8	14.25	6.15 – 28.07	1.13	0.48 – 2.28
India‡	67,725	6	8.86	3.25 – 19.28	0.70	0.25 – 1.56
Sri Lanka‡	6,874	4	58.19	15.86 – 148.92	4.62	1.25 – 12.05
Romania‡	42,753	3	7.02	1.45 - 20.51	0.56	0.11 – 1.66
Bangladesh‡	24,975	3	12.01	2.48 – 35.10	0.95	0.19 – 2.83
Somalia‡	8,876	3	33.80	6.97 – 98.74	2.68	0.55 – 7.98
Zimbabwe‡	6,505	3	46.12	9.51 – 134.72	3.66	0.75 – 10.88
Democratic Republic of the Congo‡	2,275	3	131.87	2.72 – 384.89	10.47	2.14 – 31.12

*Estimates based on proportions of births to UK and non-UK born mothers applied to number of maternities

‡Estimates based on ratio of maternities to births applied to number of births recorded to mothers born in stated country

**Country of birth not recorded for 12 women who died

2.3.3 Inequalities in maternal mortality rates

It has been consistently noted in these enquiries that women at severe disadvantage appear to be over-represented amongst the women who die. Twenty-one percent of the women who died were subject to domestic abuse either prior to or during pregnancy. This proportion has been continually increasing since MBRRACE-UK reporting began, and in 2022-24, was 7% higher than the proportion noted in 2019-21, the last complete triennium. In addition, 7% of the women who died had a history of abuse as a child and 20% were known to social services; these figures are similar to last year's report and the last complete triennium (Table 2.9). It is worth noting, however, that social risk factors remain amongst the most poorly recorded data in women's medical records and so these figures may be a minimum estimate.

Women can be considered to have severe and multiple disadvantages if they have three or more of substance use, domestic abuse, previous abuse in childhood, recent arrival in UK (≤5 years), refugee or asylum seeker status, a mental health diagnosis, female genital mutilation, or known learning difficulties. In total, of the 252 women who died during pregnancy or up to six weeks after pregnancy from direct or indirect causes in 2022-24, 40 (16%) were considered to have multiple disadvantages on the basis of the data available (Table 2.11). This is similar to the proportions reported in recent triennia but is more than double the 6% first reported in 2015-17. If all 598 women who died during or up to one year after pregnancy in the UK in 2022-24 are considered, 93 women (16%) had severe and multiple disadvantages (Table 2.11). As in past years, the main contributors to multiple disadvantages were a mental health diagnosis (either current or in the past) (91/93 women with multiple disadvantages), domestic abuse (83/93 women with multiple disadvantages) and substance use (78/93 women with multiple disadvantages).

Table 2.11: Proportion of women who died who had severe and multiple disadvantages*, UK 2022-24

	Direct (n=117) Frequency (%)	Indirect (n=135) Frequency (%)	Coincidental (n=24) Frequency (%)	Late Deaths (n=322) Frequency (%)	Total (n=598) Frequency (%)
Score <3	98 (84)	114 (84)	22 (92)	271 (84)	505 (84)
Score ≥3 (severe and multiple disadvantages)	19 (16)	21 (16)	2 (8)	51 (16)	93 (16)

*Three or more of substance use, domestic abuse, abuse in childhood, arrival in UK within last 5 years, refugee or asylum seeker, mental health diagnosis, female genital mutilation, and known learning difficulties

As shown in Table 2.12, the rates of maternal mortality in 2022-24 varied by age, socioeconomic status and ethnic background of the women, factors that are known to be independently associated with an increased risk of maternal death in the UK (Geddes-Barton, Baldelli et al. 2024, Geddes-Barton, Ramakrishnan et al. 2024, Vousden, Bunch et al. 2024).

The average age of women giving birth in the UK has been steadily rising and this is reflected in the characteristics of the women who died. In 2022-24, the median age amongst the women who died during or up to six weeks after pregnancy from direct and indirect causes was 33. To reflect these changing demographics, Table 2.12 shows the relative risk of maternal death using women aged 25-29 as the comparator. Compared to women aged 25-29, women aged 35 or older had significantly increased rates of maternal death (RR 1.62, 95% CI 1.17-2.26, p=0.002). This was largely driven by a nearly three-fold higher risk of death amongst women aged 40 and over (RR 2.89, 95% CI 1.87-4.43, p<0.001). Women aged 35-39 were also at an increased risk of death compared to women aged 25-29, but this was not statistically significant (RR 1.30, 95% CI 0.91-1.87, p=0.136).

In order to maintain consistency, the relative risks for women who died in 2019-21 (Table 2.13) have also been updated using women aged 25-29 as the reference group. Thus, this table will show relative risks different to those published in Tables 2.10 and 2.11 of the 2023 MBRRACE-UK report. There were no statistically significant differences in the relative risks for any age groups between 2019-21 and 2022-24 (Table 2.13).

Women living in the most deprived areas of England continued to have the highest maternal mortality rates in 2022-24, twice as twice as high as the maternal mortality rate of women living in the 20% least deprived areas (RR 1.94, 95% CI 1.19-3.29, p=0.005) (Table 2.12 and Figure 2.7). While maternal mortality rates for women living in most areas of England either declined or remained the same in recent triennia, rates of maternal mortality for women living in the second most deprived areas (IMD IV) have continued to rise and, in 2022-24, were also nearly twice that of women living in the least deprived areas (RR 1.68, 95% CI 1.00-2.90, p=0.038) (Table 2.12 and Figure 2.7).

Table 2.12: Maternal mortality rates per 100,000 maternities amongst different population groups, UK or England* 2022-24 (illustrated in Figures 2.7 and 2.8)

	Total maternities 2022-24	Total deaths	Rate per 100,000 maternities	95% CI	Relative risk (RR)	95% CI
Age						
<20	46,503	1	2.15	0.05 – 11.98	0.17	0.004 – 1.00
20–24	230,155	16	6.95	3.97 – 11.29	0.56	0.30 – 0.98
25–29	508,312	63	12.39	9.52 – 15.86	1 (Ref)	-
30–34	681,376	71	10.42	8.14 – 13.14	0.84	0.59 – 1.20
35–39	402,531	65	16.15	12.46 – 20.58	1.30	0.91 – 1.87
≥ 40	100,327	36	35.88	25.13 – 49.67	2.89	1.87 – 4.43
IMD Quintiles (England only*)						
I (Least deprived/ highest 20%)	236,014	22	9.32	5.84 – 14.11	1 (Ref)	-
II	267,287	27	10.10	6.66 – 14.70	1.08	0.59 – 2.00
III	297,756	41	13.77	9.88 – 18.68	1.48	0.86 – 2.60
IV	339,075	53	15.63	11.71 – 20.44	1.68	1.00 – 2.90
V (Most deprived/ lowest 20%)	397,728	72	18.10	14.16 – 22.80	1.94	1.19 – 3.29
Ethnic group (England only*)						
White (inc. not known)	1,173,996	140	11.93	10.03 – 14.07	1 (Ref)	-
Asian	244,326	37	15.14	10.66 – 20.87	1.27	0.86 – 1.84
Black	101,796	33	32.42	22.32 – 45.52	2.72	1.80 – 4.00
Chinese/ others	72,164	4	5.54	1.51 – 14.19	0.46	0.12 – 1.22
Mixed	42,346	7	16.53	6.65 – 34.06	1.39	0.55 – 2.93

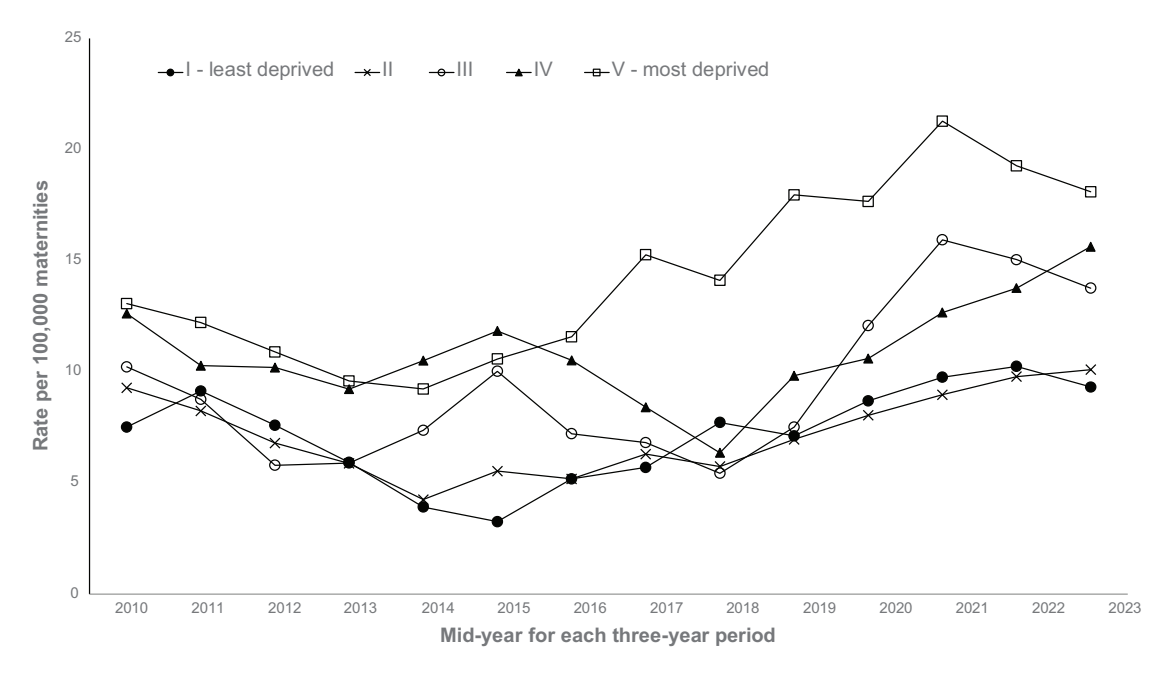
*Data for England only due to availability of denominator data

Table 2.13: Comparison of the relative risk of maternal death amongst different population groups between 2019-21 and 2022-24 (illustrated in Figures 2.7 and 2.8)

	2019-21		2022-24		Ratio of the relative risks (RRR) (comparing 2022-24	95% CI	P-value
	Relative risk (RR)	95% CI	Relative risk (RR)	95% CI			
Age							
<20	1.58	0.65 – 3.35	0.17	0.004 – 1.00	0.11	0.006 – 1.92	0.129
20–24	0.94	0.55 – 1.55	0.56	0.30 – 0.98	0.60	0.27 – 1.31	0.197
25–29	1 (Ref)	-	1 (Ref)	-	-	-	-
30–34	1.08	0.75 – 1.57	0.84	0.59 – 1.20	0.78	0.47 – 1.30	0.336
35–39	1.53	1.04 – 2.26	1.30	0.91 – 1.87	0.85	0.50 – 1.44	0.546
≥ 40	2.69	1.60 – 4.41	2.89	1.87 – 4.43	1.07	0.55 – 2.09	0.833
IMD Quintiles (England only)							
I (Least deprived/ highest 20%)	1 (Ref)	-	1 (Ref)	-	-	-	-
II	0.93	0.49 – 1.74	1.08	0.59 – 2.00	1.16	0.48 – 2.80	0.739
III	1.39	0.80 – 2.47	1.48	0.86 – 2.60	1.06	0.48 – 2.35	0.876
IV	1.22	0.70 – 2.16	1.68	1.00 – 2.90	1.38	0.63 – 2.99	0.419
V (Most deprived/ lowest 20%)	2.03	1.25 – 3.43	1.94	1.19 – 3.29	0.96	0.47 – 1.96	0.901
Ethnic group (England only)							
White (inc. not known)	1 (Ref)	-	1 (Ref)	-	-	-	-
Asian	1.82	1.21 – 2.67	1.27	0.86 – 1.84	0.70	0.40 – 1.21	0.199
Black	3.84	2.48 – 5.78	2.72	1.80 – 4.00	0.71	0.40 – 1.27	0.245
Chinese/ others	0.87	0.31 – 1.93	0.46	0.12 – 1.22	0.55	0.13 – 2.40	0.424
Mixed	0.90	0.18 – 2.67	1.39	0.55 – 2.93	1.54	0.32 – 7.55	0.591

*Data for England only due to availability of denominator data

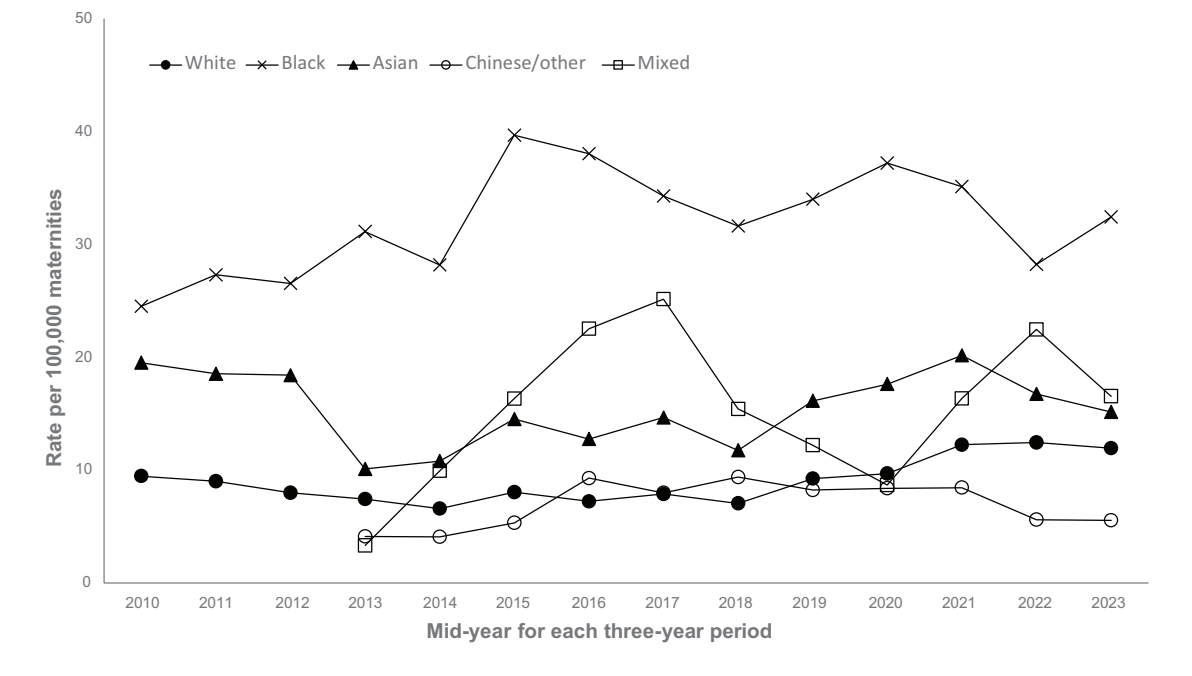
Figure 2.7: Maternal mortality rates per 100,00 maternities according to women's area of residence, England* 2009-24



*Data for England only due to availability of denominator data

After slight decreases in the previous two overlapping triennia, the mortality rate for women in England from Black ethnic backgrounds was non-statistically significantly increased in 2022-24 and comparable to earlier rates including 2019-21, the last complete triennium (RR 0.87, 95% CI 0.51-1.49, p=0.590) (Table 2.12 and Figure 2.8). In 2022-24, women from Black ethnic minority groups had a risk of maternal death that was nearly three times higher compared to White women (RR 2.72, 95% CI 1.80-4.00, p<0.001) (Table 2.12). The mortality rate for women in England from Asian ethnic backgrounds was similar in 2022-24 and 2021-23 (RR 0.90, 95% CI 0.56-1.47, p=0.668) and the risk of maternal death for Asian women in 2022-24 remained statistically non-significantly higher compared to White women (RR 1.27, 95% CI 0.86-1.84, p=0.202) (Table 2.12 and Figure 2.8).Maternal mortality rates amongst women from mixed ethnic backgrounds in England were non-statistically significantly decreased in 2022-24 compared to 2021-23, but rates remained two times higher than in 2019-21, the last complete triennium, and women from mixed ethnic backgrounds had a 39% increased risk of maternal mortality compared to White women (RR 1.39, 95% CI 0.55-2.93, p=0.395) (Table 2.12 and Figure 2.8). As noted in last year's report, low numbers of deaths of women from mixed ethnic backgrounds mean that this rate is subject to high levels of random variation.

Figure 2.8: Maternal mortality rates per 100,00 maternities amongst women from different ethnic groups, England* 2009-24



*Data for England only due to availability of denominator data

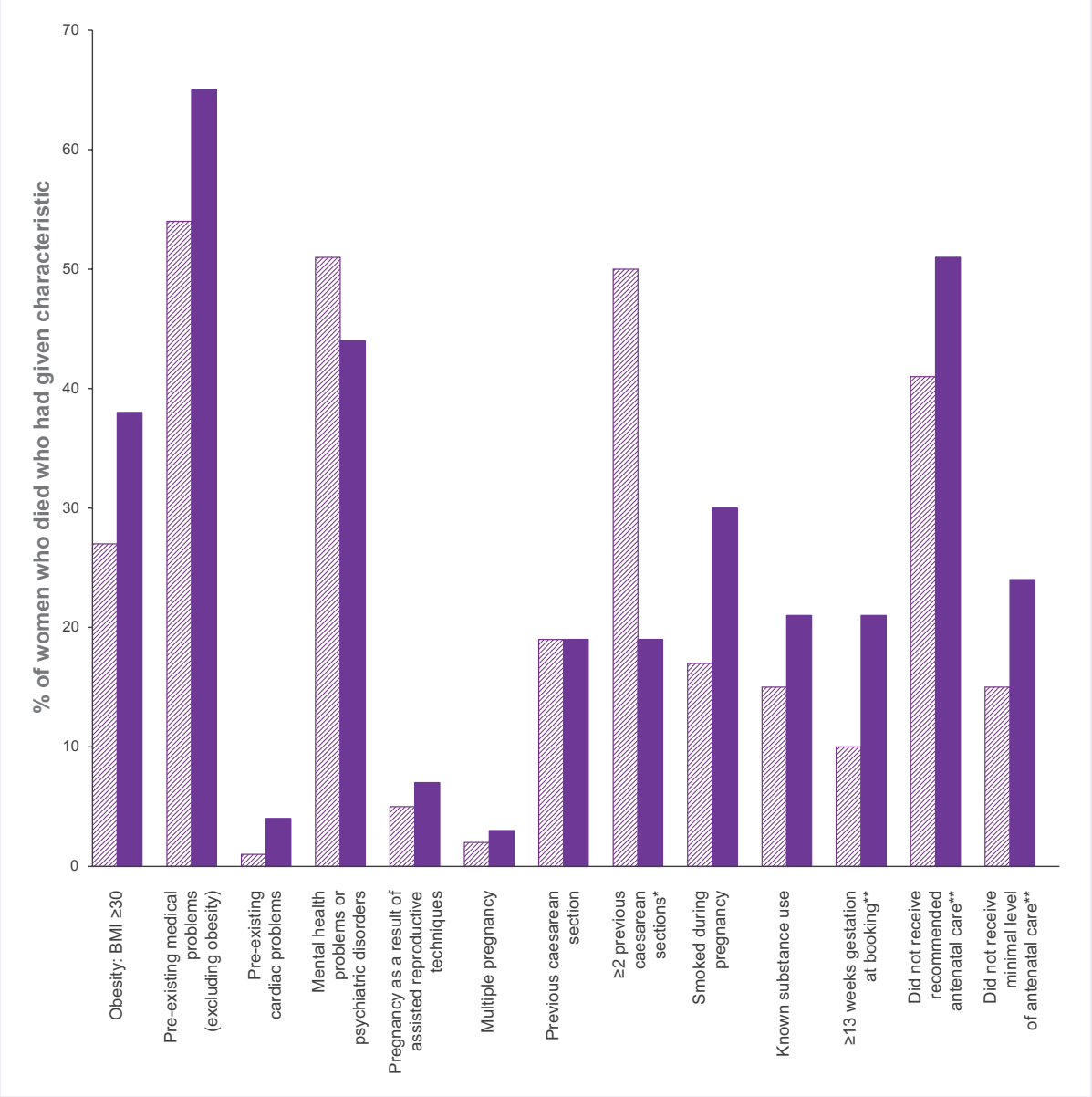
2.3.4 Medical and pregnancy-related characteristics

Studies have shown that 66% of the increased risk of maternal death in the UK can be attributed to medical comorbidities (Nair, Knight et al. 2016). The medical and pregnancy-related characteristics of the women who died in 2022-24 are shown in Tables 2.14-2.16 and Figure 2.9.

As has been demonstrated in previous MBRRACE-UK reports, women with medical complexities are increasingly overrepresented amongst the women who die during pregnancy or up to six weeks after pregnancy. Many of the women who died in 2022-24 were either overweight (BMI 25-29kg/m^2, n=70, 28%) or obese (BMI ≥ 30kg/m^2, n=83, 33%) and more than half (60%) were known to have pre-existing medical problems excluding obesity (Table 2.14). As the proportion of women with pre-existing medical conditions continued to increase in 2022-24, the significance of the lessons in Chapter 5 and 6 of this report are particularly pertinent. Women with known mental health problems are also increasingly prevalent amongst the women who die. In 2022-24, the proportion of women with known mental health problems rose to 47%, which is 10% higher than the proportion reported in 2019-21, the last complete triennium (Table 2.14).

In 2022-24, 15 women (6%) who died during or up to six weeks after pregnancy in the UK had a pregnancy as a result of an assisted conception procedure. This is twice the proportion than in last year's report. However, the proportion of women who died in 2022-24 with multiple pregnancies (2%) was the same as in 2021-23 (Table 2.15 and Figure 2.9).

Figure 2.9: Selected characteristics of women who died from direct or indirect causes, UK 2022-24



Hatched bars indicate direct causes of death, solid bars indicate indirect cause of death,

*Amongst women who had a previous caesarean birth

**NICE-recommended antenatal care: booked at 10 weeks or less and no antenatal visits missed. Minimum level of care: booked at less than 13 weeks and 3 or fewer antenatal visits missed.

2.3.5 Other characteristics of women who died

Inadequate utilisation of antenatal care services and substance use are associated with increased risk of maternal death in the UK (Nair, Knight et al. 2016, Nair, Kurinczuk et al. 2015). The prevalence of known substance use amongst women who died in 2022-24 did not differ from that noted in the previous reports, nor did the proportion of women who smoked. The proportion of women who died who received recommended levels of antenatal care was slightly lower than in 2021-23 and 2019-21; just under half (46%) of women who received antenatal care, received the recommended level of care according to NICE antenatal care guidelines (booking at 10 weeks or less and no routine antenatal visits missed) (National Institute for Health and Care Excellence 2019a) (Table 2.16 and Figure 2.9)

Table 2.14: Selected medical conditions and characteristics of women who died from direct and indirect causes, UK 2022-24 (illustrated in Figure 2.9)

Medical condition or characteristic	Direct (n=117) Frequency (%)	Indirect (n=135) Frequency (%)	Total (n=252) Frequency (%)
Body mass index (BMI kg/m^2)			
<18	2 (2)	5 (4)	7 (3)
18 – 24	33 (28)	36 (27)	69 (27)
25 – 29	40 (34)	30 (22)	70 (28)
≥ 30	32 (27)	51 (38)	83 (33)
Missing	10 (9)	13 (10)	23 (9)
Any pre-existing medical problem (excluding obesity)			
Yes	63 (54)	88 (65)	151 (60)
No	42 (36)	44 (33)	86 (34)
Missing	12 (10)	3 (2)	15 (6)
Pre-existing cardiac problems			
Yes	1 (1)	5 (4)	6 (2)
No	104 (89)	127 (94)	231 (92)
Missing	12 (10)	3 (2)	15 (6)
Mental health problems or psychiatric disorders			
Yes	60 (51)	59 (44)	119 (47)
No	45 (38)	72 (53)	117 (46)
Missing	12 (10)	4 (3)	16 (6)

Table 2.15: Pregnancy-related characteristics of women who died from direct and indirect causes, UK 2022-24 (illustrated in Figure 2.9)

Characteristics	Direct (n=117) Frequency (%)	Indirect (n=135) Frequency (%)	Total (n=252) Frequency (%)
Pregnancy known to be as a result of assisted reproductive techniques			
Yes	6 (5)	9 (7)	15 (6)
No	111 (95)	126 (93)	237 (94)
Multiple pregnancy			
Yes	2 (2)	4 (3)	6 (2)
No	115 (98)	131 (97)	246 (98)
Previous caesarean section			
Yes	22 (19)	26 (19)	48 (19)
No	88 (75)	100 (74)	188 (75)
Missing	7 (6)	9 (7)	16 (6)
Previous caesarean numbers (amongst women who had a previous caesarean section)			
1	11 (50)	21 (81)	32 (67)
≥2	11 (50)	5 (19)	16 (33)

Table 2.16: Other characteristics of women who died from direct and indirect causes, UK 2022-24 (illustrated in Figure 2.9)

Characteristics	Direct (n=117) Frequency (%)	Indirect (n=135) Frequency (%)	Total (n=252) Frequency (%)
Smoking			
Smoked during pregnancy	20 (17)	40 (30)	60 (24)
Non-smoker	78 (67)	88 (65)	166 (66)
Missing	19 (16)	7 (5)	26 (10)
Known substance use			
Yes	17 (15)	28 (21)	45 (18)
No	82 (70)	99 (73)	181 (72)
Missing	18 (15)	8 (6)	26 (10)
Received any antenatal care*			
Yes	80 (68)	114 (84)	194 (77)
No	37 (32)	21 (16)	58 (23)
Gestational age at booking in weeks (amongst women who received any antenatal care)			
≤10	61 (76)	76 (67)	137 (71)
11 – 12	10 (13)	12 (11)	22 (11)
≥13	8 (10)	24 (21)	32 (16)
Missing	1 (1)	2 (2)	3 (2)
Received *recommended* antenatal care† (amongst women who received any antenatal care)			
Yes	43 (54)	47 (41)	90 (46)
No	33 (41)	58 (51)	91 (47)
Missing	4 (5)	9 (8)	13 (7)
Received a *minimum* level of antenatal care† (among women who received any antenatal care)			
Yes	64 (80)	76 (67)	140 (72)
No	12 (15)	27 (24)	39 (20)
Missing	4 (5)	11 (10)	15 (8)

*includes 28 women who died in early pregnancy (≤10 weeks' gestational age)

†NICE-recommended antenatal care: booked at 10 weeks or less and no antenatal visits missed. Minimum level of care: booked at less than 13 weeks and 3 or fewer antenatal visits missed.

2.3.6 Classification of quality of care

This section includes information on women who died between 2022-24 and who are included in this year's confidential enquiry reports (including women who died between six weeks and a year after the end of pregnancy and women from the Republic of Ireland). Table 2.17 and Figure 2.10 show the classification of care as agreed by the assessors for 178 of the women who died and Table 2.17 and Figure 2.11 show the classification of care for the 33 women who were included in the morbidity confidential enquiry. Only the women whose case notes were available with sufficient information for an in-depth review are included.

Amongst the women who died, 16% were assessed to have received good care. For the majority of women (61%), assessors felt that improvements in care may have made a difference to their outcome. Opportunities to improve care were also identified for the majority of women requiring networked maternal medical care, though assessors felt that most of these improvements to care would not have made a difference to the woman's outcome (52%). For 30% of the women in the morbidity enquiry, assessors felt that the care they received was good.

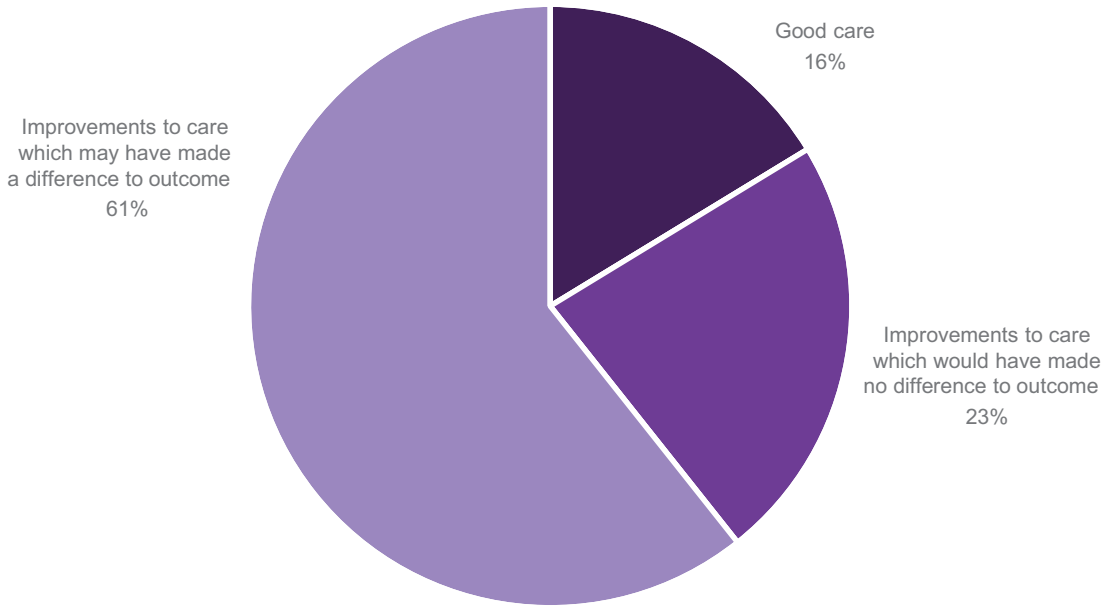
Table 2.17: Classification of care received by women who are included in the confidential enquiry chapters, UK and Ireland 2022-24 (illustrated in Figures 2.10 and 2.11)

Classification of care received	Women who died* (n=178) Frequency (%)	Women requiring networked maternal medical care** (n=33) Frequency (%)
Good care	29 (16)	10 (30)
Improvements to care which would have made no difference to outcome	41 (23)	17 (52)
Improvements to care which may have made a difference to outcome	108 (61)	6 (18)

*Includes only women whose case notes were available with sufficient information for an in-depth review

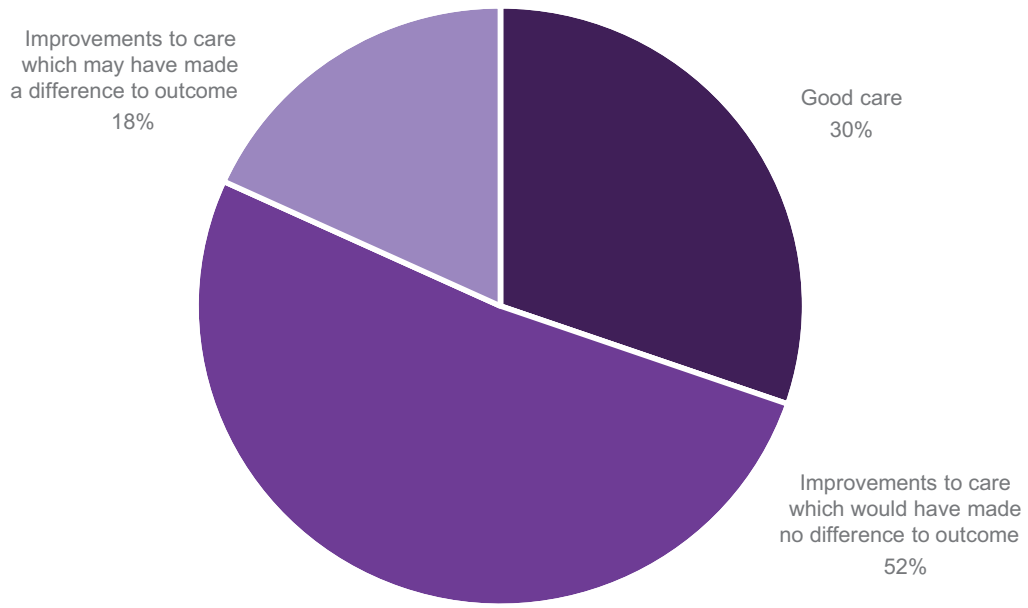
**Does not include women from the Republic of Ireland

Figure 2.10: Classification of care received by the women who died and who are included in the confidential enquiry chapters*, UK and Ireland 2022-24 (N=178)



*Includes only women whose case notes were available with sufficient information for an in-depth review

Figure 2.11: Classification of care received by the women who are included in the morbidity confidential enquiry into the care of women requiring networked maternal medical care, 2024 (N=33)



2.3.7 Local clinicians' reports

The proportion of reports received from local clinicians of those requested was 77% for the confidential enquiry chapters in this year's report (Table 2.18). Local clinicians' reports are absolutely essential to allow MBRRACE-UK assessors to fully take account of any local system factors impacting on care, and we are particularly grateful for the effort and commitment to the enquiry this represents. We urge clinicians to continue to return their reports in a timely manner and provide their personal reflections and lessons learned from women's care.

Table 2.18: Percentage of local clinicians' reports received for women whose care was examined for the confidential enquiry chapters, 2022-24

Specialty group	Percentage of reports requested that were received (%)
Obstetricians	71
Anaesthetists	81
Midwives	81
Critical Care Clinicians	69
Emergency Medicine Specialists	58
GPs	86
Physicians	76
Total	**77**

2.3.8 Post-mortem examination

A post-mortem examination was carried out for two thirds (67%) of all the women who died during or up to one year after pregnancy in the UK in 2022-24 (Table 2.19). Although the proportion of completed post-mortem examinations was relatively high for women who died during pregnancy or up to six weeks after pregnancy from direct (74%) or indirect causes (75%), only 46% of the women who died from coincidental causes had a post-mortem examination. Similarly, a lower proportion of women who died between six weeks and one year after the end of pregnancy had a post-mortem examination (62%). As noted in previous reports and in Chapter 9 of this report, establishing the cause of women's death with a high-quality autopsy is essential not only to improve future care, but to ensure any family counselling or testing is appropriate.

Table 2.19: Frequency of post-mortem examinations for maternal deaths, UK 2022-24

	Direct (n=117) Frequency (%)	Indirect (n=135) Frequency (%)	Coincidental (n=24) Frequency (%)	Late Deaths (n=322) Frequency (%)	Total (n=598) Frequency (%)
No post-mortem	30 (26)	33 (24)	13 (54)	121 (38)	197 (33)
Post-mortem completed	87 (74)	102 (76)	11 (46)	201 (62)	401 (67)

3. Lessons for care of women with haemorrhage or amniotic fluid embolism

Allison Felker, Issie Gardner and Marian Knight on behalf of the MBRRACE-UK haemorrhage and AFE chapter writing group

Chapter group members: Hilde Engjom, Allison Felker, Becky Ferneyhough, Issie Gardner, Kate Harding, Samantha Holden, Marian Knight, Nuala Lucas, Becky MacGregor, Upma Misra, Clare Mumby, Roshni Patel, Felicity Plaat, Nicola Vousden, Arlene Wise

3.1 Key messages

New recommendations

Review theatre and workforce capacity to manage the additional workload associated with changing trends in maternal characteristics and associated caesarean section rates **[ACTION: Departments of Health in each of the devolved nations]**

Ensure postnatal contraception can be prescribed and administered in maternity services for future pregnancy planning **[ACTION: Integrated Care Boards in England and commissioning bodies in the devolved nations]**

Existing guidance and recommendations requiring improved implementation

Haemorrhage (which might be concealed) should be considered when classic signs of hypovolaemia are present (tachycardia and/or agitation and the late sign of hypotension) even in the absence of revealed bleeding (Knight, Nair et al. 2017)

It is prudent to trigger the massive obstetric haemorrhage protocol in an undelivered woman at the timelines decision to proceed to peri-mortem caesarean section is made (Knight, Kenyon et al. 2014)

The elective delivery of women with placenta accreta spectrum should be managed by a multidisciplinary team, which should include senior anaesthetists, obstetricians and gynaecologists with appropriate experience in managing the condition and other surgical specialties if indicated. In an emergency, the most senior clinicians available should be involved (Royal College of Obstetricians and Gynaecologists 2018)

Uterus preserving surgical techniques should only be attempted by surgeons working in teams with appropriate expertise to manage such cases and after appropriate counselling regarding risks and with informed consent (Royal College of Obstetricians and Gynaecologists 2018)

In case of unsuspected placenta accreta spectrum diagnosed after the birth of the baby, the placenta should be left in situ and an emergency hysterectomy performed (Royal College of Obstetricians and Gynaecologists 2018)

Antenatal anaemia should be investigated and treated appropriately as this may reduce the morbidity associated with postpartum haemorrhage (PPH) (Royal College of Obstetricians and Gynaecologists 2016a)

Update guidance on the use of coagulation tests in the context of obstetric haemorrhage including the timelines for availability and how to interpret these, noting that women should not be inappropriately denied clotting products based on a single measure of coagulation in the face of ongoing haemorrhage (Knight, Bunch et al. 2023)

All staff involved in maternity care should receive training in the management of obstetric emergencies, including the management of PPH (Royal College of Obstetricians and Gynaecologists 2016a)

3.2 Background

Globally, obstetric haemorrhage is the leading cause of maternal mortality accounting for 27% of all maternal deaths, or around 70,000 women each year (Cresswell, Alexander et al. 2025). Mortality due to obstetric haemorrhage is rare in the UK, but morbidity is common (National Maternity and Perinatal Audit 2026). However, while rates of maternal death due to obstetric haemorrhage and amniotic fluid embolism have remained largely stable across MBRRACE-UK reporting, increasing proportions of caesarean births (Ambia, Alderdice et al. 2026) and pregnancy interventions, such as induction of labour, may impact future incidence, morbidity and mortality. The newly developed Maternal Care Bundle from NHS England (NHS England 2026b) recognises the significant contribution of obstetric haemorrhage to maternal outcomes, including severe maternal morbidity and intensive care admission, as well as the associated long-term psychological impacts. It outlines key interventions that can be enacted in all devolved nations to standardise the definition and management of obstetric haemorrhage (NHS England 2026b). The messages outlined in this chapter reflect this aim to reduce variation in care but also highlight some of the major system pressures identified within maternity services (National Maternity and Neonatal Investigation 2026), which must be considered in order to improve care and prevent future morbidity and mortality.

3.3 The women who died

In the UK and Ireland there were 11 women who died from obstetric haemorrhage during pregnancy or up to six weeks after the end of pregnancy in 2022-24 (Table 3.1). This represents a mortality rate of 0.52 per 100,000 maternities (95% CI 0.26–0.93). This rate is lower than in previous triennia but the decrease is not statistically significant compared to 2019-21 (RR 0.64, 95% CI 0.27-1.44) or 2016-18 (RR 0.89, 95% CI 0.37-2.12). Six women died from haemorrhage following a caesarean birth and one following an assisted vaginal birth. The remaining four women had spontaneous vaginal births.

Eight women died following an AFE, a rate of 0.38 per 100,000 maternities (95% CI 0.16-0.74). This is comparable to rates of AFE in both 2019-21 (RR 1.05, 95% CI 0.34-3.22) and 2016-18 (RR 1.13, 95% CI 0.37-3.47). All eight women died following a caesarean birth; two were scheduled caesarean births and six were emergency caesarean births due to maternal collapse. Of the emergency caesarean births, five were classified as a RH. Three women had an induction of labour and all the women died on the same day as giving birth.

Table 3.1: Direct deaths by type of obstetric haemorrhage, UK and Ireland 1994-2024

Time period	Placental abruption	Placenta praevia/ accreta	Postpartum haemorrhage		Uterine inversion	Total deaths from haemorrhage	Direct haemorrhage death rate per 100,000 maternities	
			Atony	Genital Tract Trauma			Rate	95% Confidence Interval (CI)
1994-96	4	3	5	5	0	17	0.77	0.45 - 1.24
1997-99	3	3	1	2	0	9	0.42	0.19 - 0.80
2000-02	3	4	10	1	0	18	0.90	0.53 - 1.42
2003-05	2	3	9	3	0	17	0.80	0.47 - 1.29
2006-08	2	2	4*	1*	1	9	0.39	0.18 - 0.75
2009-12†	2	1	7	7	0	17	0.49	0.29 - 0.78
2013-15†	3	9	9	1	0	22	0.88	0.55 - 1.33
2016-18†	3	3	2	4	2	14	0.58	0.32 - 0.97
2019-21†	4	6	4	4	0	18	0.80	0.48 - 1.27
2022-24†	0	2	4	5	0	11	0.52	0.26 - 0.93

*Includes one woman for whom both atony and genital tract trauma contributed to her haemorrhage

†Figures for UK and Ireland. All other figures are UK only

3.4 Overview of care and lessons to be learned

3.4.1 Caesarean section lists

A woman was considered very high-risk for uterine rupture. She had been advised to delay future pregnancies following complications at a previous caesarean birth requiring an extended incision. She became pregnant before the recommended time and a plan was made for a scheduled caesarean birth at 38 weeks' gestation. Her caesarean section was postponed twice, by eight days in total, due to theatre availability and workload capacity. Although her previous surgery and potential operative difficulty were acknowledged as part of caesarean list prioritisation, her obstetric risk was not considered. Early on the morning of her rescheduled operation, she went into spontaneous labour. On arrival, she was pale, clammy and tachycardic having fainted on the way to the hospital. She had a category 1 caesarean birth of a stillborn baby that was complicated by a massive obstetric haemorrhage and uterine rupture. She died a few days after giving birth.

The care of this woman demonstrates the challenge of managing growing caesarean section lists. National figures suggest that the number of caesarean births in England has markedly increased in the past five years, which is not reflective of trends in other Western European countries (Ambia, Alderdice et al. 2026). In 2025, 45% of all births were by caesarean section, compared with 33% of all births in 2020 (Ambia, Alderdice et al. 2026, NHS Digital 2025). Of these caesarean sections, half were scheduled operations (NHS Digital 2025) rising from 14% of all births in 2020 to 20% of all births in 2025 (Ambia, Alderdice et al. 2026). Within this report, six of the 11 women who died from obstetric haemorrhage had a caesarean birth; three of these births were scheduled caesarean sections. Assessors noted that the capacity for caesarean sections is becoming a patient safety issue. They felt that both this woman and her baby would have survived if she had had her caesarean section on either of the two rescheduled dates.

Safety message

Safety message: Service provision and acuity

Service provision must keep pace with increasing maternal complexity and clinical demand with regular review of capacity across emergency triage, staffing and operating theatres. Escalation pathways and flexible resource allocation are essential to ensure patient safety during periods of high acuity. Ongoing monitoring and support, including skills-based training, should be prioritised to reduce risk and provide safe, effective care.

The recent report from the Independent Investigation into Maternity and Neonatal Services in England noted capacity pressures as a factor potentially contributing to broader system pressures on the maternity and neonatal system (National Maternity and Neonatal Investigation 2026). This finding was also echoed in a recent recommendation from the National Maternity and Neonatal Audit (NMPA) regarding the impact of changes in maternal characteristics and mode of birth on resource allocation (National Maternity and Perinatal Audit 2026). Similar findings have also been reported in previous MBRRACE-UK enquiries where insufficient theatre capacity, simultaneous emergencies and the skill mix of available surgeons, contributed to postponements and delays in management of both scheduled and emergency caesarean births (Knight, Bunch et al. 2023).

For the women who died in 2022-24, assessors noted that there was little evidence of structured, risk-based processes for the prioritisation of scheduled caesarean births, including decisions around postponements or cancellations. The woman above had well known clinical risk factors, but surgical prioritisation focussed on logistical and workload considerations, such as the expected theatre time required and the perceived complexity of the surgery, rather than obstetric risk. There was also no documented re-assessment of the woman's clinical risk category at either postponement. Assessors noted opportunities for system-level learning regarding the management of planned caesarean sections. They highlighted that there is a difference between scheduled caesarean births in women who are low risk for complications and those who have planned caesarean birth as a risk-reduction intervention. In these high-risk women, cancellation or delay of a planned caesarean section should be treated as a clinical incident with senior input, clearly documented re-evaluation of the risks of delay and multidisciplinary agreement on a revised delivery plan. They suggested consideration of the use of a standardised proforma for risk-assessment to help guide management of scheduled caesarean lists.

NEW **National recommendations**

Review theatre and workforce capacity planning guidance to manage the additional workload associated with changing trends in maternal characteristics and associated caesarean section rates.

Clinical message

Clinical message: Prioritisation of scheduled caesarean births

Some caesarean births are planned as time-critical risk-reduction interventions. It is important to recognise the difference between these and other scheduled caesarean births when prioritising scheduled caesarean section lists.

3.4.2 Risk counselling

A high-risk woman had a complex medical, social and obstetric history. She had three previous caesarean births, the last of which was complicated by major obstetric haemorrhage requiring ICU admission. She had been advised on the risks of a fourth caesarean birth after this event. She booked early and received consultant-led, multidisciplinary care. She was admitted for a scheduled caesarean birth at 36 weeks' gestation. Precautions were taken in anticipation of possible haemorrhage and a consultant anaesthetist and obstetrician were present. There was minimal blood loss during surgery, but shortly after, while in recovery, she had a massive obstetric haemorrhage. There was a delay in return to theatre due to capacity restraints. Her estimated blood loss was close to 6L and she was increasingly acidotic with severe coagulopathy. She was transferred to the ICU where she died a few weeks after birth.

Assessors noted good examples of multidisciplinary care and proactive planning for the woman above. Her surgery was led by senior clinicians and when complications arose shortly after birth she was attended to quickly; however, despite the best efforts of the staff, she experienced delays in management due to obstetric theatre availability. While assessors felt that this delay was unlikely to have changed her outcome, they again noted the importance of appropriate service provision and planning for emergencies, including review of operating theatre capacity.

Of the three women who had a scheduled caesarean birth, two (the women described above) were considered high risk and had been advised about the risk of future pregnancy and repeat caesarean sections. However, it is unclear whether these women were provided with contraceptive advice or if the counselling they received effectively conveyed their risk. A newly developed toolkit aimed at improving postnatal care recommends the development of integrated pathways across hospital and community settings to ensure women have timely access to post-pregnancy contraception and advice (NHS England 2026a). It is important that maternity services are included in such plans to improve postnatal care so that women can be provided with appropriate methods of contraception before they are discharged from the service.

NEW **National recommendations**

Ensure postnatal contraception can be prescribed and administered in maternity services for future pregnancy planning.

Home births

Improvements in risk counselling were also noted for five women included in this year's enquiries who planned to give birth at home; all of whom were considered high risk. Assessors felt that discussions around birth plans would have benefited from more senior, multidisciplinary input to effectively communicate women's individual risks, including the limitations around treatment options and interventions and speed of transfer in the event of an emergency at home. They stressed that risk counselling must be trauma informed with recognition of how a woman's past obstetric history can influence decision-making.

Safety message

Safety message: Risk counselling

Counselling women about the possible risks of pregnancy, for themselves and their babies, must be trauma informed with consideration of prior adverse experiences and complex social, medical and obstetric histories. Information provided must be balanced to promote informed decision-making and clinicians should be prepared to hold these discussions, including signposting for further support or guidance if needed. Particular consideration is required for higher-risk situations including when women become pregnant or make other decisions against medical advice. In such situations, robust documentation, clear safety-netting procedures and the offer of follow-up discussions and support arrangements are essential to reduce risk.

3.4.3 Recognising and responding to haemorrhage

Recognition of deterioration

A woman had recently arrived in the UK and spoke little English. She booked for antenatal care in her second trimester upon her arrival in the country. She had a ventouse delivery at term with episiotomy. Fifteen minutes after birth, during suturing of the perineum, there was ongoing vaginal bleeding. A uterotonic was given. Ten minutes later, her heart rate was noted to be high and her oxygen saturation was less than 90%. Oxygen, fluids and oxytocin were given and an obstetric consultant was called. A further ten minutes passed and she was noted to be hypotensive and tachycardic. Assessment of blood loss was estimated at a little over 1L with clots in the uterus. A major obstetric haemorrhage call was made 45 minutes after birth and she was transferred to theatre where she went into cardiac arrest. The source of haemorrhage could not be identified and she died three hours after giving birth.

This woman's care demonstrates how rapid deterioration can be in instances of major obstetric haemorrhage. Changes in her vital signs were apparent shortly after birth but these changes were not immediately recognised or fully appreciated. Assessors noted that the severity and rapidness of her collapse was not proportionate to her estimated blood loss and felt that the clinical focus on repairing the perineum may have delayed recognition of changes in her vital signs. Similar delays in recognition due to a focus on other aspects of clinical management were observed for several other women. For one woman, a focus on auscultating the fetal heart rate delayed recognition of her own cardiovascular compromise and need for urgent transfer to theatre. A similar incident was noted for a woman who had a home birth where a focus on the care of her baby contributed to delays in recognition of her haemorrhage and transfer to hospital.

Clinical message

Clinical message: Remember the mother

Do not let your focus on the safety of the baby or other clinical management prevent you from caring for the mother. It is important that any concerns expressed by the mother are listened to and escalated appropriately.

Clinical message

Clinical message: Recognise rapid deterioration

Pregnant women tend to be young and fit and may compensate physiologically, despite significant illness or infection, before experiencing rapid decline.

Haemorrhage (which might be concealed) should be considered when classic signs of hypovolaemia are present (tachycardia and/or agitation and the late sign of hypotension) even in the absence of revealed bleeding (Knight, Nair et al. 2017)

Proactive management

For several women who died from haemorrhage, assessors felt that proactive planning and anticipation of complications may have changed their outcomes.

> A Black woman in her 40s developed gestational diabetes in her second trimester. At 37 weeks' gestation, she presented with reduced fetal movements and an intrauterine death was confirmed. She was given mifepristone and returned to hospital for misoprostol induction. Shortly after, she experienced increasing discomfort and collapsed during mobilisation. An anaesthetist and obstetrician were called. She went into cardiac arrest and an arrest call was put out. A resuscitative hysterotomy (RH) was performed, there was a return of spontaneous circulation and she was transferred to theatre. A major obstetric haemorrhage call was put out 15 minutes after the RH. Bedside testing showed profound coagulopathy. She received red cells, fresh frozen plasma, platelets and cryoprecipitate during the ongoing bleeding and resuscitation attempts. She arrested several times and resuscitation efforts were stopped three hours after her initial arrest. Post-mortem findings were in keeping with amniotic fluid embolism.

There was good multidisciplinary team working and communication during this woman's resuscitation and a systematic approach was taken to identify the cause of the arrest. There was also quick recourse to RH to aid in resuscitation efforts; however, activation of a major obstetric haemorrhage protocol was delayed until 15 minutes after the RH. Given this woman's severe coagulopathy, assessors felt that earlier initiation of the protocol was unlikely to have made a difference to her outcome but re-emphasised that pre-emptive planning such as this can help prevent delays in the availability of blood products.

It is prudent to trigger the massive obstetric haemorrhage protocol in an undelivered woman at the time the decision to proceed to peri-mortem caesarean section is made (Knight, Kenyon et al. 2014)

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Obstetric haemorrhage (NHS England 2026b)

Expert consensus recommendations

In line with RCOG Green-top guidelines, where there is concern of coagulopathy, abruption, fetal demise, suspicion of concealed bleeding, maternal cardiac arrest, suspicion of amniotic fluid embolus or PPH >1,000mL, it is recommended that services perform a coagulation test, including Clauss fibrinogen assay or TEG/ROTEM point-of-care testing, to guide replacement with cryoprecipitate or fibrinogen concentrate to maintain fibrinogen level above 2g/L

> A White woman in her late 30s had three previous caesarean births. In her fourth pregnancy she had increased surveillance due to concerns about fetal growth restriction, a low-lying placenta and possible placenta accreta. A caesarean section was planned for 35 weeks' gestation for fetal concerns. Pre-operatively, her haemoglobin was 82g/L and she received a 2-unit blood transfusion. Her caesarean birth was complicated by a partially adherent placenta and 1.5L blood loss. The placenta was left *in situ* and the uterus was closed. Surgical assistance was requested for ongoing bleeding but their arrival was delayed. Upon arrival, the gynaecologist removed the remaining placenta and a small section of the uterus. Total blood loss was nearly 5L with 2L of cell-salvaged blood returned. No clotting factors were given. Shortly after the surgery was completed, the woman went into cardiac arrest and could not resuscitated.

Although this woman's potential for placenta accreta was recognised, it did not appear to have been fully explored or followed-up. There was limited evidence of multidisciplinary planning for the birth including a robust pathway to manage placenta accreta if confirmed. Although senior gynaecological support was planned for the procedure, this person was not on site when the surgery was started. It was not clear if this was a consequence of capacity constraints or competing emergencies, but assessors felt that most planning decisions appeared to be focussed on the baby's

growth and health rather than the complete clinical picture. Although common, caesarean sections are major operations and should adhere to surgical safety standards as for any other surgery. This includes ensuring that all team members are available and present at the start of surgery (World Health Organisation 2009).

The elective delivery of women with placenta accreta spectrum should be managed by a multidisciplinary team, which should include senior anaesthetists, obstetricians and gynaecologists with appropriate experience in managing the condition and other surgical specialties if indicated. In an emergency, the most senior clinicians available should be involved.

RCOG Green-top guideline 27a (Royal College of Obstetricians and Gynaecologists 2018)

Clinical message

Clinical message: Care should be proactive, not reactive

Proper preparation and planning with multidisciplinary input and standard procedures can help avoid delays and support effective management.

Assessors also felt that the decision to partially remove the section of the uterus with the piece of adherent placenta, rather than convert to hysterectomy, was indicative of a need for improved planning. For women with placenta accreta or a low-lying placenta, the Royal College of Obstetricians and Gynaecologists (RCOG) guidelines recommend early recourse to hysterectomy and suggest a discussion with women and their partners about this possibility prior to birth (Royal College of Obstetricians and Gynaecologists 2018).

Uterus preserving surgical techniques should only be attempted by surgeons working in teams with appropriate expertise to manage such cases and after appropriate counselling regarding risks and with informed consent.

In case of unsuspected placenta accreta spectrum diagnosed after the birth of the baby, the placenta should be left in situ and an emergency hysterectomy performed.

RCOG Green-top guideline 27a (Royal College of Obstetricians and Gynaecologists 2018)

Basic management of obstetric haemorrhage

The care of the previous woman demonstrates several areas where assessors felt that basic management could have been improved. First, this woman required a pre-operative blood transfusion for management of anaemia. Assessors felt this could have been avoided if her anaemia had been recognised and managed earlier in pregnancy. There were several other women who died from haemorrhage and AFE who similarly had documented anaemia without appropriate management.

Antenatal anaemia should be investigated and treated appropriately as this may reduce the morbidity associated with postpartum haemorrhage (PPH).

RCOG Green-top guideline 52 (Royal College of Obstetricians and Gynaecologists 2016a)

Assessors also felt that her total blood loss was not fully appreciated in the operating theatre as her estimated blood loss was not proportional to the amount of fluid given, including the two units of blood that that had been transfused prior to surgery. They also noted the need for heightened awareness when cell salvage is used as it can make real-time measurement and communication of blood loss difficult. In all instances of obstetric haemorrhage, clear communication and accurate documentation of blood loss, blood products given, fluid resuscitation and fluid balance are essential. This must be updated and communicated regularly during ongoing haemorrhage. Situational awareness may be difficult when the focus is on haemorrhage management. Assessors re-emphasised the importance of having a senior clinician take a 'helicopter view' during major obstetric haemorrhage to coordinate all aspects of care (Knight, Bunch et al. 2023, Knight, Bunch et al. 2020b). An intervention from NHS England's Maternal Care Bundle recommends ensuring access to key resources to facilitate appropriate measurement of cumulative blood loss. Based on measured blood loss, it also outlines standard escalation pathways to improve decision-making and reduce treatment delays (NHS England 2026b).

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Obstetric haemorrhage (NHS England 2026b)

Intervention 5.1: Measure cumulative blood loss for all births in community and secondary care settings. This includes ensuring access to key resources including:

- scales – available at all births with swab weight chart to record and assess blood loss accurately
- under-buttock blood collection drapes for assisted vaginal births
- access to an obstetric haemorrhage emergency kit – that is, a trolley or grab bag for all births and post-natal settings
- documentation tool for individual patient records to be updated in real time

This woman was one of several who did not receive clotting factors when near patient testing was used. As highlighted in previous reports, this may be due to an over-reliance on a single point-of-care coagulation test (Knight, Bunch et al. 2023), or limited guidance on how to accurately interpret these tests.

Update guidance on the use of coagulation tests in the context of obstetric haemorrhage including the timelines for availability and how to interpret these, noting that women should not be inappropriately denied clotting products based on a single measure of coagulation in the face of ongoing haemorrhage (Knight, Bunch et al. 2023)

Finally, as outlined previously, this woman's care was affected by service constraints due to workforce capacity, which resulted in delayed management. For several other women who died from haemorrhage and AFE, as well those included in other chapters of this report, assessors highlighted specific local challenges that may have impacted care including delivery rooms without piped oxygen and broken emergency call systems. As discussed in Chapter 8 of this report, other women experienced delays in management, including resuscitation, due to challenges with appropriate intravascular access. The 2014 MBRRACE-UK report recommended that maternity units include guidance for achieving intravascular access, including the use of interosseous technology, as part of their major obstetric haemorrhage protocol (Knight, Kenyon et al. 2014).

Haemorrhage is an acute event that can progress extremely rapidly but proper planning and multidisciplinary team training can help ensure that key aspects of basic management are not missed during management of obstetric emergencies. Clinical incident reviews, as recommended for all women with significant obstetric haemorrhage (NHS England 2026b, Royal College of Obstetricians and Gynaecologists 2016a) can help identify areas for improvement including training needs and system constraints that contributed to delays in care.

All staff involved in maternity care should receive training in the management of obstetric emergencies, including the management of PPH.

RCOG Green-top guideline 52 (Royal College of Obstetricians and Gynaecologists 2016a)

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Obstetric haemorrhage (NHS England 2026b)

Intervention 5.3: Multidisciplinary team (MDT) case review should be undertaken for all women with significant bleeds (>2L) and all cases of cryoprecipitate and fibrinogen concentrate use within a month.

3.4.4 Amniotic fluid embolism (AFE)

Many of the messages for care described above are relevant to the care of the women who died from either haemorrhage or AFE. Two women died from AFE during scheduled caesarean births, both of whom were considered high risk. One woman's surgery was delayed due to staffing pressures, though assessors felt this did not impact her outcome. The other woman's surgery was performed by a resident doctor in a main theatre away from the labour suite. Assessors felt that this was inappropriate given the woman's risk factors and resulted in delayed arrival of senior obstetric staff to assist in resuscitation.

Three women who died from AFE collapsed shortly after induction of labour. One woman, described below, experienced hyperstimulation during the procedure. Two women had spontaneous rupture of membranes at term and one had preterm premature rupture of membranes.

> An Asian woman in her third pregnancy had a planned induction of labour at term for polyhydramnios. She experienced hyperstimulation and was transferred to the delivery suite due to concerns with the cardiotocography. One hour later her membranes spontaneously ruptured. She immediately became short of breath and collapsed. An emergency call was quickly put out and she was attended to by a senior, multidisciplinary team. A resuscitative hysterotomy was performed within 5 minutes of collapse and her baby was born in good condition. The woman could not be resuscitated.

> A Black woman presented with spontaneous rupture of membranes at term. She was reviewed by a doctor and not found to be in labour. She was sent home with a plan for induction in 24 hours if labour had not started. Shortly after she returned home, she collapsed. Paramedics arrived within ten minutes of the 999 call. An air ambulance arrived five minutes later with a clinician who performed a resuscitative hysterotomy. There was no return of circulation and the woman died half an hour after her collapse.

In almost all instances, assessors felt that the women who died from AFE received excellent multidisciplinary care during resuscitation, including timely recourse to RH by both hospital and pre-hospital staff. There were also good examples of support for staff who were affected by these women's deaths.

3.5 Conclusions

Many messages for care noted in this chapter, including the need to quickly recognise deterioration and appropriately assess blood loss, have been included in these reports before. However, assessors described important new messages that are reflective of the changing needs of the maternity population and the growing service pressures outlined in recent national investigations (National Maternity and Neonatal Investigation 2026). While these issues may seem challenging, assessors also noted many instances of good multidisciplinary care, especially during resuscitation attempts, and identified opportunities where the safety of care could be improved through basic management.

There was sufficient information to assess care for all eight women who died from AFE and nine of the women who died from haemorrhage. Improvements in care were noted for the majority of women. Assessors felt that improvements in care may have made a difference to outcome for two of the women who died from AFE (25%) and eight of the women who died from haemorrhage (89%).

Table 3.2: Classification of care received by the women who died from obstetric haemorrhage and amniotic fluid embolism (AFE), UK and Ireland 2022-24

Classification of care received	Women who died from obstetric haemorrhage* Number (%) N=9	Women who died from AFE Number (%) N=8
Good care	0 (0)	2 (25)
Improvements to care which would have made no difference to outcome	1 (11)	4 (50)
Improvements to care which may have made a difference to outcome	8 (89)	2 (25)

*includes only women whose case notes were available with sufficient information for an in-depth review

4. Messages for the prevention and treatment of infection

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4.1 Key messages

New recommendations

Ensure there is a mechanism for rapid access to antibiotics in all hospital-based care settings to allow for rapid management of sepsis at the point of care **[ACTION: Hospitals, trusts and health boards]**

Existing guidance and recommendations requiring improved implementation

'Think sepsis' at an early stage when presented with an unwell pregnant or recently pregnant woman, take all appropriate observations and act on them (Knight, Kenyon et al. 2014)

Take into account the factors that may increase the risk of developing sepsis or sepsis not being identified promptly. These include (National Institute for Health and Care Excellence 2025c):

- ethnicity: being from an ethnic minority background
- communication challenges
- drugs or alcohol misuse
- social, economic or environmental factors such as homelessness or living in deprived areas

Repeated presentation to the general practitioner or community midwife or alternatively repeated self-referral to the obstetric triage or day assessment unit should be considered a 'red flag' and warrant a thorough assessment of woman to investigate for signs of sepsis (Knight, Kenyon et al. 2014)

During a remote assessment, when deciding whether to offer a face-to-face assessment and, if so, on the urgency of it, identify indications of clinical concern such as new-onset abnormalities of behaviour, circulation or respiration (National Institute for Health and Care Excellence 2025c)

In the postnatal period health professionals must perform and record a full set of physiological vital signs, pulse, blood pressure, temperature and respiratory rate, in any woman with symptoms or signs of ill health (Knight, Bunch et al. 2020b)

Ensure the appropriate national Maternity Early Warning Score is used to monitor pregnant women wherever in the hospital she receives care (Knight, Bunch et al. 2022)

Monitoring of a woman with suspected sepsis should be performed using an early warning system modified for obstetrics, managed through a multidisciplinary approach with early escalation and senior input (Lissauer, Morgan et al. 2025)

Assess people who might have sepsis with extra care if there is difficulty in taking their history, for example people with English as a second language or people with communication challenges (such as those associated with learning disabilities or autism) (National Institute for Health and Care Excellence 2025c)

For [women] with suspected sepsis who are or have recently been pregnant, meet one or more high-risk criteria give a broad-spectrum antimicrobial without delay (within 1 hour of identifying that they meet any high-risk criteria), if antibiotics have not already been given for this episode of sepsis (National Institute for Health and Care Excellence 2025c)

If either the woman or the baby is infected with invasive Group A beta-haemolytic streptococcus (iGAS) disease in the postpartum period, both should be treated with antibiotics and full infection control precautions adopted, including barrier nursing as per local guidelines (Lissauer, Morgan et al. 2025)

Women should be strongly advised to take immediate steps towards delivery if there is sepsis, pre-eclampsia, placental abruption or membrane rupture (Royal College of Obstetricians and Gynaecologists 2010)

Review ambulance service algorithms for risk categorisation to ensure that 999 calls regarding women who are pregnant, recently pregnant or have the potential to be pregnant are appropriately managed, which may include early navigation and assessment. Ensure that repeated calls and calls made by minors are escalated to enable a rapid response by appropriately trained paramedics (Felker, Patel et al. 2024)

Ensure a prompt and brief assessment (triage) of the woman is undertaken by a midwife within 15 minutes of attendance, and the clinical urgency in which they need to be seen is determined in a standardised way, using a system that has been evaluated (e.g. BSOTS). This system should have minimal variation in the assessment of urgency between midwives, and include physiological assessment with use of a modified early obstetric/maternal early warning score (e.g. MEOWS or MEWS)(Royal College of Obstetricians and Gynaecologists 2023)

Ensure that pregnant and breastfeeding women are not excluded inappropriately from research, including new vaccine and treatment research, and ensure that messaging about benefits and risks of medication and vaccine use is clear and well informed with involvement of key opinion leaders and representatives of communities at risk from an early stage. Prepare a route to enable rapid dissemination of updated advice and data concerning new vaccines and treatments to both women and their clinicians in the future (Knight, Bunch et al. 2023)

4.2 Background

Maternal infection remains a significant contributor to maternal mortality in the UK and globally with the majority of deaths occurring in the early postpartum period (Cresswell, Alexander et al. 2025). Pregnant and recently pregnant women are at an increased risk of infection due to changes in their immune system and exposure to invasive procedures and surgery. While rates of direct maternal sepsis in the UK have remained relatively consistent in recent triennia, rates of indirect sepsis have fluctuated due to the emergence of novel pathogens, such as SARS-CoV-2, and pandemics, including both COVID-19 and influenza A/H1N1, previously. The period covered in this year's report (2022-24) marks the tail end of the COVID-19 pandemic, which is reflected in a significant decrease in the number of maternal deaths due to COVID-19. However, while this is an important milestone, women are still dying from COVID-19 and other preventable infectious causes during or shortly after pregnancy.

This chapter highlights some of the common themes emphasised in past reports including the need to 'think sepsis' and urgently manage infection using established pathways, such as Sepsis Six. These messages must be considered within the current challenges facing maternity services in the UK. Service pressures have been highlighted in past infection enquiries and remained evident in 2022-24. It was also clear that women's deterioration, which can be incredibly quick, was often missed due to the use of inappropriate scoring systems. In some instances, and similar to findings from other recent reviews (National Maternity and Neonatal Investigation 2026, Ockenden 2026), women's concerns were not listened to or escalated. This chapter examines recurring themes, identifies opportunities to improve the recognition and management of maternal infection, and highlights actions needed to prevent future maternal deaths.

4.3 The women who died

In 2022-24, 49 women died from infection in the UK and Ireland during or up to one year after the end of pregnancy. Of the 49 women who died from infection, 33 died during pregnancy or up to six weeks after pregnancy, a rate of 1.47 per 100,000 maternities (95% CI 1.01-2.07).

Genital tract and other direct causes of infection

Twenty women died from direct causes of infection. All but two of these women died during pregnancy or up to six weeks after pregnancy, a maternal mortality rate of 0.80 per 100,000 maternities (95% CI 0.48-1.27)(Figure 4.1). The majority of maternal deaths (75%) were due to three organisms: *Escherichia coli (E. coli)* (8/20, 40%), group B streptococcus (GBS)(4/20, 20%) and group A streptococcus (GAS)(3/20, 15%).

Eleven women died from genital tract sepsis. One woman died from GBS infection while still pregnant and two women died shortly after early pregnancy losses, one from GBS infection following a first trimester termination of pregnancy and the other from *E. coli* infection after a septic miscarriage. Three women died following chorioamnionitis at term, all due to GAS infection. The remaining five women died following preterm prelabour rupture of membranes (PPROM), all due to *E. coli* and all with associated intrauterine fetal death.

Two women died from urinary sepsis, both due to *E. coli* and three died following a caesarean birth, one due to infection with *Staphylococcus lugdunensis* and *Granulicatella adiacens*, one from *Morganella morganii* and one from an unknown organism. For the remaining four women, the primary causative organism was unknown.

Indirect causes of infection

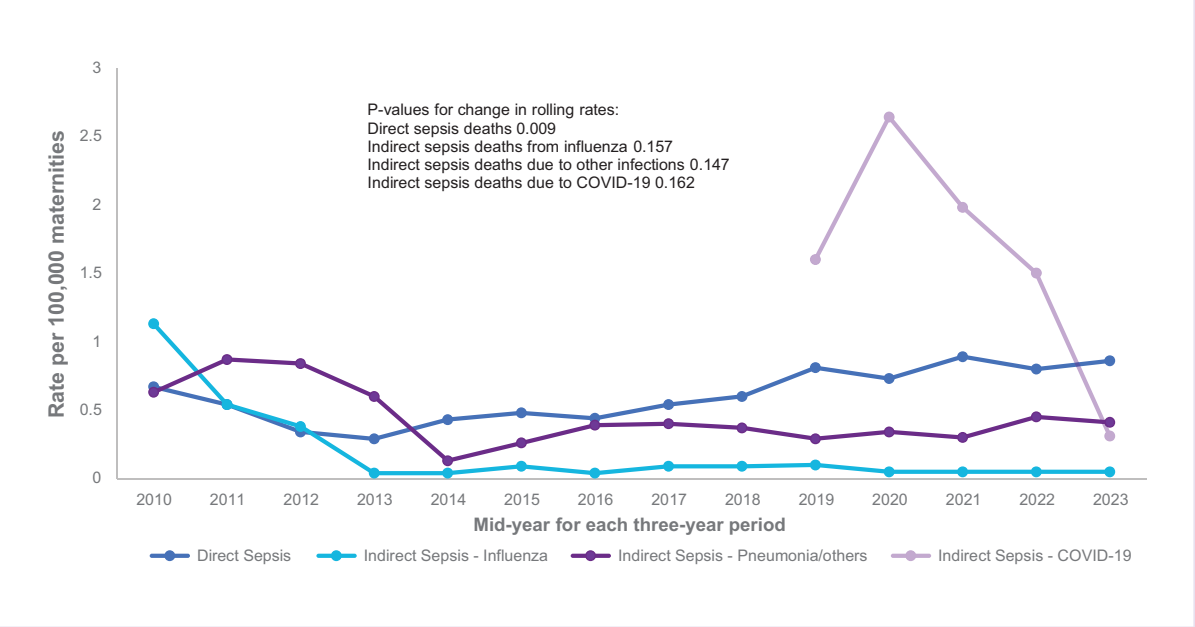
Twenty-nine women died from indirect causes of infection, 15 of whom died during pregnancy or up to six weeks after pregnancy, a rate of 0.67 per 100,000 maternities (95% CI 0.38-1.10)(Figure 4.1).

Two women died from influenza, one from influenza A on the day of RH and one from influenza B between six weeks and one year after the end of pregnancy. Neither woman had received an influenza vaccine in pregnancy.

Ten women died from COVID-19 in 2022-24; none died in 2024. Six women died during or up to six weeks after the end of pregnancy and a further four women died more than six weeks after the end of pregnancy, one of whom had contracted COVID-19 in the third trimester. The majority of the women who died from COVID-19 were unvaccinated (60%). Three women were fully vaccinated for SARS-CoV-2 prior to pregnancy but none received a booster vaccination in pregnancy. One further woman was partially vaccinated having received one dose of the vaccine one month prior to her illness. None of the women who died, and whose deaths are considered in this or any other chapter, had adverse outcomes following SARS-CoV-2 vaccination.

Seventeen women died from other indirect infections. Eight women died during or up to six weeks after the end of pregnancy: five from pneumonia; two from disseminated herpes simplex virus (HSV) infection, one from HSV-1 and the other HSV-2; and one from bacterial meningitis. Nine women died from other infectious causes between six weeks and one year after the end of pregnancy: three from pneumonia, one due to *Streptococcus pneumoniae* and the other two from unidentified organisms; and six from other causes of infection.

Figure 4.1: Maternal mortality rates from infectious causes per 100,000 maternities, during or up to six weeks after pregnancy, UK 2009-24



4.4 Overview of care and lessons to be learned

4.4.1 Recognition of sepsis

Think sepsis

As emphasised in previous reports (Knight, Bunch et al. 2023, Knight, Bunch et al. 2020b), early recognition and treatment of sepsis are vital. Clinicians are reminded to 'think sepsis' when presented with an unwell pregnant or recently pregnant woman (Knight, Kenyon et al. 2014).

A woman had been previously vaccinated for COVID-19 and received influenza and pertussis vaccines in pregnancy. Late in the third trimester she had shortness of breath when lying down. In the emergency department she was hypertensive with moderate proteinuria and 92% oxygen saturation. Maternity early warning score (MEWS) assessment was missing or incomplete. Pulmonary embolism and pre-eclampsia were considered separately by an emergency clinician and obstetric resident. She was given labetalol and discharged with low molecular weight heparin by a nurse practitioner. She went to see her midwife the next day and was noted to be wheezing with signs of respiratory distress. An ambulance was called and the emergency department was pre-alerted to her arrival. She went into cardiac arrest in the emergency department and a resuscitative hysterotomy was performed. She was transferred to the ICU where she died the next day. Viral pneumonitis was evident at post-mortem examination.

Assessors felt there were multiple missed opportunities to properly investigate this woman's symptoms and escalate her care. During her initial presentation she was moved between the emergency department and maternity triage without clear ownership of her care or senior review, including at discharge. She was separately treated for pulmonary embolism and hypertension by two different specialists. Sepsis was not considered and she was discharged by a nurse practitioner without confirmation of either working diagnosis. Even without a definitive diagnosis, assessors noted that either suspected pulmonary embolism or pre-eclampsia should have triggered admission for a woman in the third trimester of pregnancy. Although neither diagnosis was correct, admission would have allowed for continued observation and further investigation, which, in light of her rapid deterioration the following day, may have changed her outcome.

'Think sepsis' at an early stage when presented with an unwell pregnant or recently pregnant woman, take all appropriate observations and act on them (Knight, Kenyon et al. 2014)

Confirmation bias, or the dismissal of symptoms in favour of a simple explanation, is frequently observed in the reviews of the women who die (Felker, Patel et al. 2024, Knight, Bunch et al. 2023). A narrow clinical view without proper investigation, including senior review and accurate assessment of vital signs, can lead to misdiagnosis and delayed identification of sepsis. Obtaining a full, detailed history is essential for clinical investigation of any new, persistent or abnormal symptoms.

A White woman with mental health issues and known substance use died almost a year after giving birth. Her baby was removed from her care shortly after birth. She presented to the emergency department twice in the year postpartum. On the first occasion, five months after giving birth, she had a fever and her lactate was 3.3mmol/L. She was discharged with oral antibiotics. Months later, a few weeks before her death, she re-presented with nausea and pain her buttocks, back and thigh. She was diagnosed with sciatica and discharged. She died several weeks later and a large psoas abscess was noted at post-mortem.

This woman was a known substance user, but there appeared to be little appreciation of her social background when considering her symptoms and poor health, which had declined significantly since losing her child. A sepsis screen was not completed on either of her attendances in the emergency department. Infection was considered during her first presentation but there was no follow-up investigation to identify the source and she was discharged with oral antibiotics. On her second presentation, her symptoms were attributed to sciatica without considering other diagnoses or her risk factors, including intravenous drug use, which can increase the risk of sepsis (National Institute for Health and Care Excellence 2025c). Assessors questioned whether this woman's social circumstances affected her ability to advocate for herself or biased the care she received.

Take into account the factors that may increase the risk of developing sepsis or sepsis not being identified promptly. These include:

- **ethnicity: being from an ethnic minority background**
- **communication challenges**
- **drugs or alcohol misuse**
- **social, economic or environmental factors such as homelessness or living in deprived areas**

NICE NG255: Suspected sepsis in pregnant or recently pregnant [women]: recognition, diagnosis and early management (National Institute for Health and Care Excellence 2025c)

A multiparous woman had an elective caesarean birth at term. Her infant was colonised with group B streptococcus (GBS) postpartum. In the month after giving birth, she had two telephone consultations with her GP for shortness of breath, chest pain and fever. She was offered a face-to-face appointment but could not attend. Instead, she was prescribed oral antibiotics and given safety-netting advice. Shortly after, she presented to the emergency department with worsening symptoms and was diagnosed with GBS infective endocarditis. She died soon after valve replacement surgery.

At booking, this woman noted that she had GBS in a previous pregnancy, which was not documented in her antenatal notes. She requested GBS testing but was told she would have to have this done privately. Universal screening for GBS is not currently recommended for pregnant women in the UK. National guidance also indicates that maternal request is not an indication for screening (Hughes, Brocklehurst et al. 2017); however, assessors noted that there were local guidelines in place, which stated that, if requested, GBS screening should be offered. They felt that had this testing been offered in accordance with local guidelines, this woman's outcome may have been different.

The care of this woman, and the three others who died from GBS infection, demonstrates the need for heightened awareness of GBS as a potential cause of severe maternal sepsis, not just neonatal infection. Assessors felt there should be an equal focus on maternal as well as neonatal wellbeing when discussing risks of GBS infection and any updates to national guidance should reflect this risk.

If women are found to test positive for GBS, this should be appropriately documented in her records and transferred between healthcare systems so this information is available in subsequent pregnancies. There should also be robust follow-up for postpartum women with known or suspected GBS, particularly those with cardiac or respiratory symptoms. Careful auscultation of the heart is an important aspect of clinical assessment for women presenting with chest pain and fever. Assessors felt that face-to-face review of this woman may have expedited her diagnosis.

Repeated presentation to the general practitioner or community midwife or alternatively repeated self-referral to the obstetric triage or day assessment unit should be considered a 'red flag' and warrant a thorough assessment of woman to investigate for signs of sepsis (Knight, Kenyon et al. 2014)

During a remote assessment, when deciding whether to offer a face-to-face assessment and, if so, on the urgency of it, identify indications of clinical concern such as new-onset abnormalities of behaviour, circulation or respiration.

NICE NG255: Suspected sepsis in pregnant or recently pregnant [women]: recognition, diagnosis and early management (National Institute for Health and Care Excellence 2025c)

Maternal observations and maternity early warning scores (MEWS)

As has been a message in multiple MBRRACE-UK reports, pregnant and recently pregnant women are generally young and fit and tend to compensate physiologically, despite significant illness or infection, before rapid deterioration (Knight, Bunch et al. 2023). Assessors noted that postnatal visits within the first week after birth often focussed primarily on the well-being of the baby with very little detail about the mother's condition including clinical observations or wound assessment. Although postnatal care guidelines from the National Institute for Health and Care Excellence (NICE) recommend assessing woman for signs of infection, they do not specify the need to routinely record vital signs including blood pressure, heart rate or respiratory rate (National Institute for Health and Care Excellence 2021). A need to improve maternal observations was noted for many women who died from sepsis and has been emphasised in past MBRRACE-UK reports (Knight, Bunch et al. 2020b). This is especially true of changes in respiratory rate and oxygen saturations, which were the most inconsistently recognised and escalated abnormal observations, despite their importance in the course of a deteriorating illness. Assessors noted that respiratory rates in particular were often not recorded or not assessed properly.

In the postnatal period health professionals must perform and record a full set of physiological vital signs, pulse, blood pressure, temperature and respiratory rate, in any woman with symptoms or signs of ill health (Knight, Bunch et al. 2020b)

Most women who died from sepsis, or other causes, were not assessed using maternity early warning scores (MEWS). Other women did not have observations performed regularly, correctly or, in some instances, at all. Several MBRRACE-UK reports have recommended the use of MEWS for pregnant and recently pregnant women (Knight, Bunch et al. 2022). The Joint Royal Colleges Ambulance Liaison Committee's (JRCALC) Pre-hospital Maternity Decision Tool (Joint Royal Colleges Ambulance Liaison Committee (JRCALC) and Association of Ambulance Chief Executives (AACE) 2024) and NHS England's Maternal Care Bundle recommend the use of MEWS across all settings, including pre-hospital and acute care (NHS England 2026b). The RCOG guideline on maternal sepsis also recommends monitoring using an early warning system modified for obstetrics (Lissauer, Morgan et al. 2025); however, there must remain a continued focus on its digitisation and implementation in non-maternity settings. Although recent updates to guidance on the management of sepsis recommends the use of the National Early Warning Score (NEWS2) to assess people aged 16 or over who are not pregnant or recently pregnant (National Institute for Health and Care Excellence 2025b), corresponding updates to guidelines on suspected sepsis in pregnant or recently pregnant women do not specify the use of MEWS as an early warning score (National Institute for Health and Care Excellence 2025c).

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Pre-hospital and acute care (NHS England 2026b)

Interventions 2.1:

Implement the national maternity early warning score (MEWS) tool across all settings for women who are or have been pregnant in the past 4 weeks. This means ensuring timely obstetric team and/or obstetric physician review in line with the MEWS escalation timeframes, according to the total score identified and relevant additional concerns.

Clinical message

Clinical message: Record maternal observations using MEWS

Maternity early warning scores (MEWS) should be used for all pregnant or recently pregnant women in all settings, not just maternity.

Ensure the appropriate national Maternity Early Warning Score is used to monitor pregnant women wherever in the hospital she receives care (Knight, Bunch et al. 2022)

A non-English speaking Asian woman presented to the emergency department early in the second trimester with abdominal pain, vaginal bleeding and watery discharge. The emergency department was extremely busy and short staffed and she was not seen by triage until two hours after her arrival. Her pregnancy was noted at triage and she was found to be hypotensive with a lactate of 3.1mmol/L. She was not screened for sepsis. She had a National Early Warning Score (NEWS) of 7 and was seen by an emergency doctor 30 minutes later. She was given IV fluids and referred to gynaecology. Gynaecology advised transfer to a surgical assessment unit and initiation of antibiotics but neither was done. Five hours after her arrival in the emergency department she had a face-to-face review by a gynaecology registrar. She was diagnosed with a septic miscarriage and prescribed IV antibiotics. It was noted that she looked unwell but no observations were documented. Her condition deteriorated rapidly and she had a spontaneous abortion requiring transfer to theatre for retained products. She was increasingly unstable and died in the ICU shortly after the procedure. A family request to the coroner for a post-mortem examination was declined.

As highlighted throughout this report, this woman's care was impacted by extreme system pressures. On the day of this woman's attendance, the emergency department was at the highest level of acuity and the triage nurses were short staffed. While these capacity restraints may have contributed to delays in management, assessors highlighted significant improvements in care independent of these challenges. As previously noted, this woman was assessed using NEWS2, not MEWS when she presented to the emergency department. Appropriate use of MEWS would have prompted an increased frequency of observations, which may have resulted in quicker recognition of deterioration. However, assessors noted that her NEWS of 7 was significant and should have triggered an immediate response and transfer to a higher-dependency care area. This did not occur, which suggests a need for improved training on the importance of early warning scores, including which tool to use and when to escalate concerns.

Monitoring of a woman with suspected sepsis should be performed using an early warning system modified for obstetrics, managed through a multidisciplinary approach with early escalation and senior input.

RCOG Green-top guideline 64 (Lissauer, Morgan et al. 2025)

Safety message

Safety message: Service provision and acuity

Service provision must keep pace with increasing maternal complexity and clinical demand with regular review of capacity across emergency triage, staffing and operating theatres. Escalation pathways and flexible resource allocation are essential to ensure patient safety during periods of high acuity. Ongoing monitoring and support, including skills-based training, should be prioritised to reduce risk and provide safe, effective care.

Notably, although some NEWS2 charts were available for review by MBRRACE-UK assessors, most observations, including those taken at triage, were mentioned in the hospital review but not recorded in the woman's notes. Electronic recording of observations is essential to obtain a complete clinical picture and trigger escalation where required. There is significant work ongoing to integrate physiological parameters recorded in electronic patient records to NEWS2 in order to automatically calculate an aggregated score and generate an alert (National Institute for Health and Care Excellence 2020). The DREaMED (Defining, Recognising and Escalating Maternal Early Deterioration) programme is currently working on developing an electronic MEWS and escalation pathway to improve the detection of maternal deterioration and prevent adverse outcomes (Gerry, Bedford et al. 2024). However, this depends on integration of MEWS into electronic systems in a similar fashion to NEWS2, which is not the case for all systems. As such, many electronic systems do not currently allow for monitoring of trends in vital signs using MEWS parameters. Additionally, if an alert is issued when MEWS scores are abnormal, a response is not always required, which can delay or prevent escalation. Where electric alerts are used, there should be ongoing escalation until appropriate action is taken. Furthermore, for systems that are integrated with multiple early warning scores, it is vital that any alert generated from recorded physiological parameters is configured to MEWS, not NEWS2, for pregnant and recently pregnant women.

Safety message

Safety message: Electronic patient records

The use of different electronic patient record systems within or between different trusts or health boards, primary care and emergency services may lead to gaps in communication, underappreciation of deterioration, missed opportunities for intervention and diminished continuity of care. Improving the interoperability of systems and standardising key elements, including the ability to attach key pieces of correspondence and the integration of early warning scores, should be prioritised to support timely decision-making, minimise risk and enhance outcomes. The readability of outputs, including copies of records for use in review processes, must also be improved to facilitate learning from adverse events.

Sepsis Six pathway

One of the primary areas for improvement identified for the woman above was in the recognition of her sepsis, the clinical signs and severity of which did not seem to be appreciated until her acute deterioration. At triage, she had bloods and venous gas taken but no blood culture or septic screen. As such, the Sepsis Six pathway was not triggered and there was a significant delay in the provision of antibiotics. The Sepsis Six bundle (Box 4.1), developed by the UK Sepsis trust, is the recognised national standard for managing sepsis, including in pregnant and postnatal women (Lissauer, Morgan et al. 2025, UK Sepsis Trust 2024), and is widely embedded in maternity early warn-

ing pathways (UK Sepsis Trust 2024). National guidance recommends initiation of Sepsis Six, including provision of broad-spectrum antibiotics, within one hour of sepsis recognition (Lissauer, Morgan et al. 2025); however, the bundle is often not reliably delivered in practice (Abutheraa, Grant et al. 2021, Knight, Bunch et al. 2023, Knight, Kenyon et al. 2014).

Box 4.1: The Sepsis Six bundle should be delivered within one hour of suspected sepsis (UK Sepsis Trust 2024)

1. Ensure senior clinician attends
2. Give oxygen if required (start if saturations less than 92%)
3. Obtain intravenous access and take bloods (including blood cultures, glucose, lactate, FBC, U&Es, CRP, LFTs, clotting)
4. Give intravenous antibiotics
5. Give intravenous fluids
6. Monitor (use an appropriate early warning score and measure urine output)

Structural barriers to equitable care

There was evidence to suggest that this woman's ethnicity, culture and language may have affected the care she received. There was no indication that a professional interpreter was provided in the emergency department as she was with her partner who acted in this capacity. As highlighted in previous enquiries, family members should not be relied upon to act as interpreters, especially in acute or emergency situations (Felker, Patel et al. 2024, Kenyon, Gallimore et al. 2024). Assessors wondered whether her language difficulties affected her ability to fully convey the nature of her symptoms, and suggested that this may have led to an underestimation of the severity of her illness. There was also a question of whether her name was pronounced correctly when she was called for triage. Finally, it was documented that she 'looked well', despite abnormal vital signs, suggesting that her pallor may not have been recognised due to her skin colour

Assess people who might have sepsis with extra care if there is difficulty in taking their history, for example people with English as a second language or people with communication challenges (such as those associated with learning disabilities or autism).

NICE NG255: Suspected sepsis in pregnant or recently pregnant [women]: recognition, diagnosis and early management (National Institute for Health and Care Excellence 2025c)

This woman's experience is not an isolated event. The recent review of Nottingham University Hospitals NHS Trust similarly found that clinical deterioration was repeatedly missed amid systemic understaffing, and that women from ethnically diverse and deprived backgrounds were disproportionately affected, often facing barriers related to communication or culturally competent care (Ockenden 2026). Examples of overt, unintentional or structural racism and discrimination were also identified in this and previous enquiries, including microaggressions, such as ethnicity being recorded incorrectly (Draper, Gallimore et al. 2023) as well as clear instances of racism, such as a disregard for women's pain or symptoms due to racist stereotyping. The final report from the National Maternity and Neonatal Investigation clearly outlines challenges regarding racism and discrimination within maternity care, both for staff and the women they care for (National Maternity and Neonatal Investigation 2026). The report's recommendation to treat racism, discrimination and inequality as a critical maternity safety issue must be appropriately actioned nationwide to prevent future impacts on the quality of care and adverse events.

Martha's Rule

A woman felt increasingly unwell in the weeks after birth. She presented on several occasions with non-specific symptoms including bradycardia, shortness of breath, fever, rash and a C-reactive protein (CRP) over 80mg/L, which were attributed to other causes including her recent pregnancy. She did not have face-to-face obstetric review. Two weeks after birth she was admitted with sepsis but experienced delays with antibiotic administration and critical care review. While in the ICU she expressed concerns about her condition and felt she was not being listened to. She continued to deteriorate and died the day after admission.

A woman with multiple physical and mental health morbidities died six months after a stillbirth. Shortly before her death she was admitted to hospital with abdominal pain, constipation and weight loss. During admission she was found to be COVID-19 positive with increasing oxygen requirements and was transferred to the ICU. While in the ICU she was primarily cared for by resident doctors with limited senior review. On several occasions, nursing staff raised concerns about staffing levels and their ability to perform clinical observations. Despite maximum non-invasive ventilatory support, she continued to deteriorate and died shortly after admission.

Assessors felt that, had the concerns of the woman or staff been listened to and escalated accordingly, these women's outcomes may have been different. These two women died before the introduction of Martha's Rule, which ensures that the concerns of patients, families, carers and staff are listened to and acted upon to support earlier detection of deterioration (NHS England 2024). Implementation of this rule began in acute trusts in 2024 and, in response to a recommendation from a 2026 Ockenden review (Ockenden 2026), it was announced that Martha's Rule will be implemented in all maternity settings in England. Although its impact will require ongoing evaluation, consistent implementation of Martha's Rule has the potential to reduce future maternal deaths by improving the recognition of deterioration and escalation of care.

4.4.2 Management of suspected sepsis

Delays in antibiotic administration

A Black woman requiring interpreter support had an uncomplicated scheduled caesarean birth at term. She presented twice to the emergency department in the early postnatal period. On her first visit, maternal observations were incomplete and did not include temperature or respiratory rate. On her second visit, three days later, she had a had a maternity early warning score (MEWS) of 5 and the Sepsis Six pathway was commenced. She was admitted with suspected urinary sepsis and given IV antibiotics 1.5 hours after her initial MEWS was recorded. She was discharged with oral antibiotics after two days. She returned to hospital a few days later with a MEWS of 10 indicating critical deterioration. There was a three-hour delay in administration of antibiotics due to delays in transfer for HDU care and difficulties with prescribing due to new electronic systems. High acuity on the unit resulted in further delays in consultant review and anaesthetic involvement. She died the following day. Swabs grew *Enterobacter spp.* and *Morganella morganii*.

Recommendations from NICE, including previous (National Institute for Health and Care Excellence 2016) and newly published guidelines on the management of sepsis in pregnant or recently pregnant women (National Institute for Health and Care Excellence 2025c) recommend administration of broad-spectrum antibiotics within one hour of suspected sepsis. However, as in previous reports (Knight, Bunch et al. 2023, Knight, Kenyon et al. 2014), this woman faced delays in antibiotic administration on both her presentations to the emergency department, with the second delay being significant. Previous reports have emphasised that it is the responsibility of the prescriber to ensure antibiotics are given, even if this means they need to administer the antibiotics themselves (Knight, Kenyon et al. 2014). Assessors noted that the hospital caring for the woman above had introduced 'grab bags' to allow for rapid access to appropriate antibiotics; however, these were only available within the delivery suite. They felt that the decision to wait for transfer before giving antibiotics may not have been appropriate, especially as there were further delays on the delivery suite due to difficulties accessing electronic prescribing systems.

NEW National recommendations

Ensure there is a mechanism for rapid access to antibiotics in all hospital-based care settings to allow for rapid management of sepsis at the point of care.

For [women] with suspected sepsis who are or have recently been pregnant, meet one or more high-risk criteria give a broad-spectrum antimicrobial without delay (within 1 hour of identifying that they meet any high-risk criteria), if antibiotics have not already been given for this episode of sepsis.

NICE NG255: Suspected sepsis in pregnant or recently pregnant [women]: recognition, diagnosis and early management (National Institute for Health and Care Excellence 2025c)

Assessors also felt that service pressures on the unit and midwifery staffing below recommended levels may have affected the management of this woman's infection. She was reviewed by a consultant obstetrician only after the midwife raised concerns about the woman's condition and there was no anaesthetic involvement for over four hours. In situations such as this, assessors highlighted the importance of frequent monitoring and the use of MEWS so maternal deterioration is recognised and care is escalated appropriately.

Clinical message

Clinical message: Record maternal observations using MEWS

Maternity early warning scores (MEWS) should be used for all pregnant or recently pregnant women in all settings, not just maternity.

Penicillin allergies

A woman planning a home birth had a category 2 caesarean section for prolonged labour, which was complicated by a major obstetric haemorrhage. Due to a penicillin allergy, she was given teicoplanin and metronidazole pre-surgery with gentamicin after birth of the baby. Postnatally, there were limited maternal observations. One week after birth she collapsed at home and was transferred to hospital with suspected sepsis. Intravenous piperacillin/tazobactam (containing penicillin) and metronidazole were given on admission with no adverse reaction, but two further doses of piperacillin/tazobactam were missed due to confusion around her penicillin allergy. Despite antibiotic treatment, her condition continued to deteriorate rapidly and she died shortly afterwards.

This woman was one of five who died from sepsis who were noted to have a penicillin allergy. For all five women, assessors questioned whether their allergy impacted the effectiveness of the antibiotics they received and the timeliness of antibiotic administration. For this woman, assessors noted she may not have had sufficient antibiotic cover for gram-negative organisms before her caesarean section, though a single dose of gentamicin, with good gram-negative cover, was given post-birth. After her sepsis was recognised in hospital, she was initially treated with tazobactam and piperacillin which belongs to the penicillin class of antibiotics. This was subsequently stopped when her recorded penicillin allergy was noted. However, after it was determined that she did not have an anaphylactic reaction to the first dose, and in view of the severity of her condition, piperacillin/tazobactam was subsequently restarted. Assessors felt it was unlikely that this delay would have impacted the woman's outcome but noted that clarity around allergy severity is needed to distinguish severe anaphylactic allergies. De-labelling of penicillin (Savic, Ardern-Jones et al. 2022) or beta-lactam allergies should be considered for women thinking about becoming pregnant to help prevent unnecessary delays in care. For women with penicillin or other beta-lactam allergies, there should be a clear plan for an alternative regime that provides appropriate antibiotic cover.

Clinical message

Clinical message: Test and de-label penicillin allergies

Penicillin allergy testing and de-labelling, conducted before pregnancy and in accordance with ***published guidelines***, can help identify women at low risk of severe reactions and allow for safer, more effective antibiotic treatment of sepsis.

This woman's condition deteriorated quickly from the time of her first presentation with signs of sepsis. She had several risk factors for sepsis including prolonged labour, postpartum haemorrhage, a raised BMI and sepsis following a previous caesarean birth, but it is not clear if these were considered.

Clinical message

Clinical message: Recognise rapid deterioration

Pregnant women tend to be young and fit and may compensate physiologically, despite significant illness or infection, before experiencing rapid decline.

Follow-up and escalation

A Black woman experienced an early miscarriage in her second pregnancy. One week later she presented to the emergency department with a headache. She was triaged but left before being seen due to a long wait time. She went to her GP surgery the next day with a persistent headache and new onset vomiting. She was referred for an MRI and prescribed naproxen and omeprazole. The following day, she called 111 with confusion and dizziness. No one was available for advice so she attended the emergency department. Her headache was attributed to the combination of naproxen and omeprazole and she was discharged with advice. She died the following day. At post-mortem, there was evidence of herpes simplex encephalitis and jaundice.

This woman presented three times in three days with the same symptoms. Assessors felt that this should have merited further investigation including bloods and imaging, or prompted escalation including admission for observation and review. They also raised the possibility that her jaundice was missed due to her skin tone, which may have affected appreciation of her symptoms. However, it is not clear if details of her GP visit or 111 call could be accessed by the electronic systems in the emergency department. Neither the GP's request for an MRI nor her confusion during the 111 call was flagged by the emergency team, which meant that vital information on her history was missed. Reviews also noted that staff shortages meant that there was limited time to make detailed notes on her examination and service pressures resulted in two separate missed opportunities for earlier investigation and escalation.

Safety message

Safety message: Electronic patient records

The use of different electronic patient record systems within or between different trusts or health boards, primary care and emergency services may lead to gaps in communication, underappreciation of deterioration, missed opportunities for intervention and diminished continuity of care. Improving the interoperability of systems and standardising key elements, including the ability to attach key pieces of correspondence and the integration of early warning scores, should be prioritised to support timely decision making, minimise risk and enhance outcomes. The readability of outputs, including copies of records for use in review processes, must also be improved to facilitate learning from adverse events.

Safety message

Safety message: Service provision and acuity

Service provision must keep pace with increasing maternal complexity and clinical demand with regular review of capacity across emergency triage, staffing and operating theatres. Escalation pathways and flexible resource allocation are essential to ensure patient safety during periods of high acuity. Ongoing monitoring and support, including skills-based training, should be prioritised to reduce risk and provide safe, effective care.

A White woman in her 30s had a history of substance use, domestic abuse and significant mental health problems. In pregnancy she was cared for by a specialist midwife with multidisciplinary support. She initially engaged with care but missed several antenatal appointments after learning her baby would be taken into care. Early in the third trimester she reported vaginal discharge during an antenatal appointment. Two weeks later she attended triage for suspected premature rupture of membranes (PROM). Her cervix was closed on speculum examination but there was no bedside test for PROM. Vaginal discharge was noted and vaginal swabs were taken. She was also found to have a rash over her body and an ulcer on her foot. A swab was also taken of the foot ulcer and the women was discharged with instructions to return if she deteriorated. The vaginal swab had no growth but the swab from her foot grew group A streptococcus (GAS) and *Staphylococcus aureus*. These results were not followed up and she was not treated. She was found dead a few days later. At post-mortem, cultures from the uterine cavity and spleen grew GAS.

This woman was one of three who died from GAS infection. Pregnant women are at a 20 times greater risk of GAS infection than non-pregnant women and GAS infection is associated with a high risk of maternal sepsis and mortality (Lissauer, Morgan et al. 2025). Maternal deterioration from GAS infection can be extremely rapid, sometimes leading to death within hours of first presentation. As such, GAS should always be considered a pathogen with appropriate prescribing of antibiotics and follow-up to ensure the organism is cleared. This woman was discharged before her test results were available and was not provided with antibiotics. It was unclear when these results were available, who had access to these results or if attempts were made to contact this woman directly when GAS was detected. A week after the woman's presentation the positive test results were emailed to her specialist midwife who unsuccessfully attempted to contact the woman two days prior to her death.

It is vital that there are standard pathways in place for follow-up of test results requiring urgent treatment. It is also important that the entirety of women's circumstances, including social complexity and a history of non-engagement, are considered at hospital discharge and for anticipated follow-up. As noted in other chapters of this report, disengagement from care following the loss, or anticipated loss, of a child was common amongst the women who died. Assessors felt that this woman should have been offered admission in view of her extreme vulnerability. As it was, the safety-netting she received was not adequate and she could not be reached for treatment prior to her death.

If either the woman or the baby is infected with invasive group A beta-haemolytic streptococcus (iGAS) disease in the postpartum period, both should be treated with antibiotics and full infection control precautions adopted, including barrier nursing as per local guidelines.

RCOG Green-top guideline 64 (Lissauer, Morgan et al. 2025)

Clinical message

Clinical message: Incorporate safeguarding

Effective safeguarding should be incorporated into all aspects of maternity care, especially for women facing multiple disadvantages.

4.4.3 Preterm prelabour rupture of membranes (PPROM)

As noted in previous reports, PPROM carries a high risk of infection (Knight, Bunch et al. 2023, Knight, Bunch et al. 2020b). In 2022-24, five women died from sepsis following PPROM, all from *E. coli*. Four women had rupture of membrane at less than 22 weeks' gestation, with two at less than 20 weeks'. As emphasised in previous reports, there are challenging decisions around whether to continue a pregnancy with early rupture of membranes (Knight, Bunch et al. 2020b, Knight, Kenyon et al. 2014). Women need counselling that clearly details the baby's chances of survival and the risk of sepsis if the pregnancy continues; however, only two of the women who died from sepsis following PPROM had evidence of such discussions in their notes.

Two women had cervical sutures placed prior to membrane rupture; cerclage was attempted for a third but her membranes ruptured intra-operatively and no sutures were placed. Of the two women with cervical cerclage, both had an initial suture placed at 15+ weeks' gestation and both had a second suture placed weeks later. For one woman, the second suture was placed at a different clinic after the first was removed due to suspected PPROM. In both instances, assessors questioned whether cerclage was appropriate. Although there was no information avail-

able in the notes to determine the type of cervical sutures used, monofilament sutures are associated with a lower risk of infection than braided filaments (Hodgetts Morton, Toozs-Hobson et al. 2022) and should be considered in women at high risk of sepsis.

A woman had an obstetric history that included a second trimester miscarriage with associated preterm prelabour rupture of membranes (PPROM) and sepsis. In her current pregnancy she was identified as high risk but did not attend her consultant or preterm birth appointments. Her membranes ruptured at 19 weeks' gestation and she was admitted to maternity. She was counselled about the risks and offered termination of pregnancy. She requested antibiotics because of her previous loss and was given erythromycin. She was stable and discharged with advice on safety-netting and follow-up. Early the next morning, she presented with signs of sepsis and a maternity early warning score (MEWS) of 9. The Sepsis Six pathway was initiated but not followed appropriately; observations were inconsistent and antibiotics were delayed. Her condition deteriorated after she gave birth, requiring ICU transfer. She received appropriate treatment but died a few hours later. Chorioamnionitis was identified at post-mortem and placental and fetal swabs grew *E. coli*.

Preterm prelabour rupture of membranes (PPROM) is associated with a significant risk of ascending bacterial infection. Histological evidence of chorioamnionitis is apparent in 40-70% of PPROM pregnancies with 15-20% complicated by clinical chorioamnionitis (Ubom, Vatish et al. 2023). The use of antibiotics in women with confirmed PPROM can reduce complications, including chorioamnionitis, by 30-40% (Ubom, Vatish et al. 2023). The RCOG recommend providing erythromycin for 10 days following PPROM from 24 weeks' gestation (Thomson 2019) but there are no national or international guidelines on standard care, including provision of antibiotics, after PPROM before 23 weeks' gestation (Goodfellow, Care et al. 2024, Hall, Care et al. 2025). Oral erythromycin alone does not provide sufficient coverage to prevent or treat clinical chorioamnionitis or maternal sepsis. This is especially true of infection developing from gram-negative bacteria such as *E. coli*, which was the causative organism for all the women who died from sepsis following PPROM.

Early detection of infection and rapid management including intravenous broad-spectrum antibiotics are key to improved outcomes but there is insufficient evidence to support either hospital or outpatient monitoring for women with PPROM (Ubom, Vatish et al. 2023). Guidance suggests that, after 24 weeks' gestation, this decision should be made on an individual basis (Thomson 2019); however, given the significant risk of infection associated with PPROM, it is routine practice to admit women for observation for 72 hours prior to considering discharge and outpatient management. The risk of ascending infection is no less at earlier gestations (Goodfellow, Care et al. 2024) and a very low threshold for admission and observation should also be considered for these women (Hall, Care et al. 2025).

Early PPROM before 23 weeks' gestation carries a high risk of intrauterine death (Goodfellow, Care et al. 2024), as was the case for all of the women who died from sepsis following PPROM. Women at risk of sepsis still require rapid management of infection after fetal demise. This includes expedited delivery. However, it is important to recognise that the risk of maternal sepsis does not resolve with delivery and there must be ongoing robust management, including careful monitoring of possible deterioration, after delivery. This can be difficult after the loss of a baby. Staff should be aware of the risks and convey them to the woman and her family in a sensitive manner to facilitate effective management.

Women should be strongly advised to take immediate steps towards delivery if there is sepsis, pre-eclampsia, placental abruption or membrane rupture.

RCOG Green-top guideline 55 (Royal College of Obstetricians and Gynaecologists 2010)

4.4.4 Location of care

As demonstrated by the vignettes in this chapter, pregnant and recently pregnant women present across a variety of care settings including primary care, telephone triage services, emergency departments, acute medical units, and maternity services. As noted in previous enquiries and explored in Chapter 7 of this report, being pregnant or recently pregnant can convey a distinct disadvantage for women who are critically unwell (Knight, Bunch et al. 2023). Early referral to or review by obstetric and maternity triage teams should be considered regardless of where the woman first presents. Maternity teams are uniquely positioned to provide a comprehensive overview of a woman's pregnancy, delivery, and postpartum course, thereby facilitating continuity of care. However, many women who died from sepsis did not have senior obstetric oversight of their care.

A woman with a significant mental health history attended the maternity assessment unit on three occasions in the second trimester with abdominal pain and vaginal bleeding. She was discharged on the first two attendances but admitted on the third visit as she needed opiates for analgesia. She self-discharged after experiencing premature rupture of membranes and was re-admitted the following day with signs of sepsis. She was seen by an obstetric registrar who confirmed an intrauterine fetal death and started the Sepsis Six pathway. The woman had persistently high maternity early warning scores (MEWS) with signs of deterioration but senior review was delayed due to competing emergencies. She experienced further delays to caesarean section due to questions of where to perform the operation. She was moved to the maternity theatre ten hours after her initial presentation and then transferred to the ICU by ambulance after giving birth. She arrested shortly after her arrival and could not be resuscitated.

During this woman's final attendance and admission, her care was fragmented resulting in delays that may have impacted her outcome. Early review by senior clinicians is recommended for pregnant and recently pregnant women with suspected sepsis, abnormal physiological observations or evidence of clinical deterioration. Although the obstetric registrar who initially cared for her correctly identified her sepsis and initiated the Sepsis Six care bundle (Box 4.1), delayed senior input meant that her deteriorating MEWS parameters were not appropriately recognised or escalated.

This hospital had a standalone maternity unit which meant that ambulance transfer was required to reach the ICU and main theatre. As emphasised by the messages for critical care in Chapter 7, assessors felt that earlier senior review may have resulted in clearer ownership of her care and facilitated timelier transfer to the main site. As it was, her care was largely reactive without clear planning for her birth or ongoing management. She was not transferred until after her caesarean section by which time she was unstable and transfer was more difficult. To avoid unnecessary delays in management, there must be clear criteria for admission, escalation, and referral to critical care services for critically unwell pregnant women.

Clinical message

Clinical message: Plan for care outside of maternity wards

Defined management plans, including for assessment and triage in pre-hospital and emergency care settings, and clear communication between hospitals and specialities are important to ensure timely transfer and care in an appropriate setting that matches the woman's clinical needs.

4.4.5 Pre-hospital and emergency care

Triage

A multiparous woman had an uncomplicated antenatal course. She presented to hospital at term with regular contractions. She was examined and discharged. A few hours later she returned via ambulance in active labour. She gave birth shortly after arrival and was discharged the same day. Postnatally, her care was transferred to the community team at a different hospital. In the week after birth, she was feeling tired and week with some pains and vomiting. Her midwife advised her to rest, increase fluids and take analgesia. Her partner contacted maternity triage the following day who provided similar advice and told them to call 111 or 999 if her symptoms worsened. Ten minutes later her partner called 999 and reported that the woman was unconscious but breathing. The call was designated as a category 2 with advice to call again if there were more concerns. Less than 20 minutes later, the partner called 999 stating that the woman was not breathing. She was re-categorised as level 1 and the ambulance arrived within minutes but the woman could not be resuscitated. Post-mortem examination confirmed she died from sepsis secondary to group A streptococcus.

Assessors noted many instances where triage of pregnant and recently pregnant women could have been improved, both by ambulance services and in the emergency department. Similar to previous reports (Felker, Patel et al. 2024), the call triage system used by ambulance services did not appear to differentiate women who had recently been pregnant from non-pregnant women. Assessors felt that, had this woman's recent pregnancy been considered, she may have been classified as a category 1 call from the first contact. However, they noted that it was good practice to escalate her care when a repeat call was made.

It is crucial that the dispatch systems used in the UK incorporate appropriate questions to determine whether a woman has been pregnant within the last four weeks as standard procedure. This should also include pregnancies ending in termination or miscarriage, which carry associated risks such as the development of sepsis. In some instances, women were assessed using the Manchester Triage System, which is a standard risk-assessment tool for prioritisation in ambulance services and emergency departments. However, assessors noted that such national triage algorithms are not sensitive to perinatal physiology. It is crucial that any clinician providing remote advice to pregnant or recently pregnant women considers pregnancy-related pathology and uses perinatal observation parameters to guide decision-making. A previous RCOG good practice paper (Royal College of Obstetricians and Gynaecologists 2023), as well as NHS England's newly produced national maternity triage specifications (NHS England 2026c), recommend the use of the Birmingham Symptom-specific Obstetric Triage System (BSOTS) (Kenyon, Hewison et al. 2017) or an alternative evidence-based and clinically validated approach for maternity triage services. It is important that similar systems are implemented in other acute care settings.

Review ambulance service algorithms for risk categorisation to ensure that 999 calls regarding women who are pregnant, recently pregnant or have the potential to be pregnant are appropriately managed, which may include early navigation and assessment. Ensure that repeated calls and calls made by minors are escalated to enable a rapid response by appropriately trained paramedics (Felker, Patel et al. 2024)

Ensure a prompt and brief assessment (triage) of the woman is undertaken by a midwife within 15 minutes of attendance, and the clinical urgency in which they need to be seen is determined in a standardised way, using a system that has been evaluated (e.g. BSOTS). This system should have minimal variation in the assessment of urgency between midwives, and include physiological assessment with use of a modified early obstetric/maternal early warning score (e.g. MEOWS or MEWS).

RCOG Good Practice Paper 17 (Royal College of Obstetricians and Gynaecologists 2023)

There were several instances where 111 or maternity triage were contacted and women were provided advice over the phone without a proper assessment or escalation. This included women with 'red flag' symptoms who were sometimes provided with unhelpful advice such as 'drink more' or 'rest', or who were advised to contact their GP or 999 without consideration of the urgency of the symptoms.

A woman near the end of her second trimester had fever, vomiting and abdominal pain. Her partner contacted 999 and was advised to contact 111 or the woman's GP. They called 111 and were told a clinician would call back. The clinician called twice without reply and the call was terminated per policy. The following day, the partner contacted maternity triage on two separate occasions and was advised to attend. The woman was triaged using an appropriate obstetric triage system and admitted to the antenatal ward for a presumed urinary tract infection. She could not provide a urine sample. Her condition worsened and an intrauterine fetal death was confirmed. She continued to deteriorate rapidly and she died the same day as admission. Post-mortem examination found evidence of group A streptococcus infection.

This woman was appropriately assessed using an obstetric triage system when she presented to maternity triage but sepsis did not appear to be considered and her management was delayed. Delays were also identified due to the initial handling of the 999 and 111 calls. Assessors noted that it was not appropriate for the 999 call handler to de-escalate the call and advise the woman's partner to contact 111 or the GP. Upon contacting 111, there were two unanswered calls from the clinician; however, there was no mechanism for follow-up as no number was provided after either missed call.

Good care

Three months after the birth of her fourth child, a woman presented to her GP with painful ears. She was treated for an ear infection. Early the next morning she became acutely unwell with neck pain, headache, dizziness and discharge from her ear. An ambulance crew arrived promptly and found her unresponsive with a Glasgow Coma Score <8. They administered antibiotics and took her to the emergency department. Upon arrival she was given further antibiotics for presumed meningitis. She was admitted to ICU following a CT scan but remained unresponsive. She died the following day. Pneumococcus was detected in the cerebrospinal fluid.

There were many examples of good care for this woman. She was seen promptly in person by her GP but her condition deteriorated rapidly due aggressive pneumococcal meningitis. This diagnosis was considered by the ambulance team who administered IV antibiotics at her home before transferring her to the emergency department. She received rapid care in the emergency department that included a CT scan 30 minutes after arrival. Once admitted, treatment was rapid and included appropriate multidisciplinary discussions.

4.4.6 Risk counselling

Obesity and weight management

The prevalence of maternal obesity is increasing globally (Kent, McGirr et al. 2024) and, in the UK, approximately a quarter of the pregnant population are obese (Royal College of Physicians 2026). Of the 49 women who died from sepsis in 2022-24, 12 (24%) were considered overweight (BMI 25-29 kg/m^2) and 21 (43%) were obese (BMI ≥30 kg/m^2). Several studies have demonstrated an association between obesity in adulthood and an increased risk of severe infections (Muscogiuri, Pugliese et al. 2021, Nyberg, Frank et al. 2026). Maternal obesity remains a leading risk factor for adverse outcomes and the Royal College of Physicians have recently called for a coordinated approach to address maternal obesity as a key priority (Royal College of Physicians 2026). However, there have been no updates to the guidance on healthy weight gain in pregnancy since the initial recommendations from the Institute of Medicine in 2009 (Rasmussen and Yaktine 2009). These recommendations require updating to reflect the contemporary landscape of maternal health, including the increasing prevalence of obesity-associated comorbidities such as diabetes and cardiometabolic disease. Obesity prevention and weight management programmes must take a life course approach, including pre-pregnancy counselling, to prevent future mortality and morbidity related to infection or other associated causes (Royal College of Physicians 2026).

Clinical message

Clinical message: 'Get ready for pregnancy'

The period before conception, or between pregnancies, including after miscarriage, is an ideal time to counsel women about their health and address any physical or mental health conditions or social needs that may require management prior to becoming pregnant. Counselling should include, but is not limited to, optimisation of medications for chronic conditions, advice on weight management or smoking cessation and specialist referral to mental health or addiction services (Felker, Patel et al. 2025).

Vaccination

Neither woman who died from influenza received influenza vaccination during pregnancy.

The majority of women who died from COVID-19 in 2022-24 died in early 2022, towards the final phase of the pandemic when all would have been eligible for and could have received two doses of the vaccine before they died. Reflective of this, and in contrast to previous years, four of the ten of the women who died from COVID-19 had received SARS-CoV-2 vaccination, most of whom had been vaccinated prior to pregnancy and one of whom received a single dose of the vaccine postnatally, one month before her death. However, it was apparent that many women were still hesitant to accept SARS-CoV-2 vaccination during pregnancy. Of the three women who had received prior vaccinations, all declined booster doses in pregnancy, and six other women were not vaccinated at all. It is evident that messaging around vaccinations in pregnancy must remain a continued focus of public health initiatives.

A woman was advised on pertussis and influenza vaccination at her booking appointment and received both in the second trimester. She had not had any previous SARS-CoV-2 vaccination. There was no evidence that SARS-CoV-2 vaccination was discussed or recommended at any point during her pregnancy. She contracted COVID-19 in the third trimester and died shortly after.

A woman in her 20s expressed an interest in SARS-CoV-2 vaccination at her booking appointment but was advised against it. She received influenza and pertussis vaccinations in the second trimester but declined SARS-CoV-2. She contracted COVID-19 in the third trimester and died five weeks after giving birth.

Both these women were unvaccinated for COVID-19 at the time of their booking appointments. These appointments occurred after vaccine eligibility in the UK had expanded to the general adult population and both would have been eligible for at least one dose prior to becoming pregnant. Once they became pregnant, vaccination should have been offered in line with joint guidance from the RCOG, the Royal College of Midwives and other Royal Colleges (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2022).

Many of the women who were unvaccinated for COVID-19 accepted influenza and/or pertussis vaccines, which suggests that the safety of SARS-CoV-2 vaccination and the risks of COVID-19 were not fully explained or understood. In several instances, as for the second woman above, there was clear evidence of confused messaging resulting in vaccine hesitancy amongst both clinicians and women and their families. This woman had initially expressed an interest in SARS-CoV-2 vaccination at booking but it was evident that the staff were not confident discussing vaccination. As a consequence, she was advised against vaccination at booking and later declined vaccination when it was discussed and offered on two further occasions in pregnancy. Assessors noted that national guidance on COVID-19 had changed between her initial booking appointment and these later discussions but the staff had not been notified of these updates, which included an explicit recommendation to offer pregnant women vaccination (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2022).

As more vaccines are trialled and recommended in pregnancy, it remains imperative that any changes to national guidance are clearly and rapidly communicated to staff. Maternity staff must also be properly trained to discuss the safety of all vaccinations, including against SARS-CoV-2, so they can confidently counsel women to support informed decision-making. When a vaccine is declined, the discussion should gently be revisited at each subsequent visit as more information may be available or the woman may have changed her mind.

Consistent messaging around vaccine safety is essential to combat misinformation and promote vaccination as part of routine antenatal care. A broader public health focus is needed to promote vaccine confidence including a trauma-informed approach to target women from disadvantaged and ethnic minority backgrounds where vaccine hesitancy is well documented (Freeman, Loe et al. 2022, Mhereeg, Jones et al. 2022). Vaccination is integral to preventing maternal and neonatal illness. Serious vaccine complications are rare and there have been no maternal deaths attributable to SARS-CoV-2 vaccines or any other vaccination since MBRRACE-UK reporting began in 2009.

4.4.7 COVID-19

Most of the lessons learned from the review of the women who died from COVID-19 in 2022-24 are related to discussions and counselling on vaccination as noted in the previous section. Other messages identified are common across all chapters of this report including obstetric review outside of maternity settings, appropriate safety-netting at discharge from hospital, recognition of deterioration, escalation of care and senior review. Challenges were also noted due to electronic patient records and system pressures.

While improvements in care were noted for all the women who died from COVID-19, assessors also identified many areas of good care that should be highlighted. Compared to previous enquires where women were often not referred for consideration of extracorporeal membrane oxygenation (ECMO), all but two of the women who died in 2022-24 were referred for ECMO. While only a few women were deemed suitable based on their clinical condition, the care they received was appropriate and in line with national guidance (Camporota, Meadows et al. 2021, National Institute for Health and Care Excellence 2011, Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2022). Referrals for ECMO were often approached as multidisciplinary discussions including infectious disease and ECMO specialists as well as obstetrics. No referrals were declined on the basis of pregnancy or recent pregnancy. Similarly, many women with COVID-19 were appropriately treated with steroids and tocilizumab, the provision of which was noted to be highly variable in previous enquiries (Knight, Bunch et al. 2021a, Knight, Bunch et al. 2023).

It is important to recognise the progress that has been made in the equitable treatment of pregnant women with COVID-19, but also to acknowledge the work that remains to be done. National guidance on ECMO for respiratory failure in adults has not been updated to include specific information for pregnant or recently pregnant women, as previously recommended (Knight, Bunch et al. 2023) and barriers persist to the inclusion of pregnant and breastfeeding women in clinical trials (Medicines and Healthcare products Regulatory Agency 2026a), despite numerous calls for equity from the WHO and other organisations (British Pharmacological Society 2026, World Health Organisation 2025).

Ensure that pregnant and breastfeeding women are not excluded inappropriately from research, including new vaccine and treatment research, and ensure that messaging about benefits and risks of medication and vaccine use is clear and well informed with involvement of key opinion leaders and representatives of communities at risk from an early stage. Prepare a route to enable rapid dissemination of updated advice and data concerning new vaccines and treatments to both women and their clinicians in the future (Knight, Bunch et al. 2023)

4.5 Conclusions

While some of the messages from this year's confidential enquiry are different from those in previous, recent reports due to the significant decline in deaths attributable to COVID-19, many of the lessons remain the same. Comprehensive care with the woman at the centre is highlighted as a recurring theme. This requires a continued focus on listening to women's concerns, improving assessment and documentation of maternal observations using MEWS and prompt recognition of deterioration with early treatment and escalation. Multidisciplinary care with senior review is also key to improving outcomes, regardless of where the woman is cared for.

There was sufficient information to assess the care of 19 of the women who died from direct causes of infection. Assessors felt that different care may have made a difference to the outcome for almost all the women (n=17, 89%).

The care of all the women who died from indirect causes of infection was reviewed and assessors felt that improvements in care may have made a difference for 24 of the women (83%), including all of the women who died from influenza and COVID-19.

Table 4.2: Classification of care received by the women who died from infectious causes, UK and Ireland 2022-24

Classification of care received	Women who died from direct infectious causes* Number (%) N=19	Women who died from other indirect infectious causes Number (%) N=29
Good care	1 (5)	3 (10)
Improvements to care which would have made no difference to outcome	1 (5)	2 (7)
Improvements to care which may have made a difference to outcome	17 (89)	24 (83)

*includes only women whose case notes were available with sufficient information for an in-depth review

5. Learning from neurological complications

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5.1 Key messages

New recommendations

Implement processes for acute community or hospital-based prescribing of medications where an urgent initiation or change in medications is required **[ACTION: Hospitals, trusts and health boards]**

Existing guidance and recommendations requiring improved implementation

Develop clear standards of care for joint maternity and neurology services, which allow for: early referral in pregnancy, particularly if pregnancy is unplanned, to optimise anti-seizure drug regimens; rapid referral for neurology review if women have worsening epilepsy symptoms; pathways for immediate advice for junior staff out of hours; postnatal review to ensure anti-seizure drug doses are appropriately adjusted (Knight, Bunch et al. 2020b)

In the antenatal period, women with epilepsy should be regularly assessed for the following: risk factors for seizures, such as sleep deprivation and stress; adherence to anti-seizure drugs; and seizure type and frequency (Royal College of Obstetricians and Gynaecologists 2016b)

Develop guidance to ensure that SUDEP awareness, risk assessment and risk minimisation is standard care for women with epilepsy before, during and after pregnancy and ensure this is embedded in pathways of care. Clinicians need to talk to women and their partners or carers about the risk of SUDEP and how to minimise it (Knight, Bunch et al. 2020b)

When starting monitoring in women or girls planning pregnancy, obtain a baseline (pre-conception) concentration of antiseizure medications and check adherence to their medication (National Institute for Health and Care Excellence 2022)

Develop training resources concerning shared decision making and counselling regarding medication use in pregnancy and breastfeeding, including specific information on the benefits and risks of different medications and non-adherence (Knight, Bunch et al. 2023).

Ensure information about the care of women and girls during pregnancy is shared between the epilepsy specialist team, a specialist obstetric team and primary care (National Institute for Health and Care Excellence 2022)

Discharge summaries for primary care should clearly indicate in an initial summary box the key conditions that require ongoing support or management and a clear plan for postnatal care. Detailed information about medical, mental health and social complexities and ongoing medications, monitoring requirements or safeguarding concerns must be included to facilitate a clear plan for postnatal care (Felker, Patel et al. 2025)

Red flags in the history and examination of a pregnant patient presenting with headaches (Royal College of Physicians 2019):

- Sudden-onset headache / thunderclap or worst headache ever
- Headache that takes longer than usual to resolve or persists for more than 48 hours
- Has associated symptoms – fever, seizures, focal neurology, photophobia, diplopia
- Excessive use of opioids

Ensure the appropriate national Maternity Early Warning Score is used to monitor pregnant women wherever in the hospital she receives care (Knight, Bunch et al. 2022)

Ensure the digital maternity record includes details of language needs, including the use of formal interpreter services, to ensure that these are taken into consideration at all interactions, including in emergency situations (Felker, Patel et al. 2024)

5.2 The women who died

In total, 60 women died during or up to one year after pregnancy from neurological causes in the UK and Ireland in 2022-24. Thirty-three women died during or in the six weeks after pregnancy, a maternal mortality rate of 1.55 per 100,000 maternities (95% CI 1.07-2.18).

Fifteen of the women died from causes related to epilepsy, 13 from sudden unexpected death in epilepsy (SUDEP). Two further women had suspected SUDEP but did not have a formal epilepsy diagnosis at the time of their death. Thus, the maternal mortality rate for the 17 women who died from causes related to confirmed or probable epilepsy in 2022-24 is 0.80 per 100,000 maternities (95% CI 0.47-1.28). The mortality rate for the 13 women who died from SUDEP in 2022-24 is 0.61 per 100,000 maternities (95% CI 0.33-1.04). These rates are similar to those reported for 2016-18 and 2019-21. Two additional women who died had non-epileptic seizure disorders (or functional/dissociative seizures (FDS)); they are not included in the maternal mortality rates for epilepsy-associated deaths but are considered in overall mortality rates for neurological causes.

Twenty women died from stroke during or up to six weeks after pregnancy: twelve from intracerebral haemorrhage, seven from subarachnoid haemorrhage and one from ischaemic stroke. Twenty-one women died from stroke or other neurological causes between six weeks and one year after pregnancy: ten from subarachnoid haemorrhage, five from ischaemic stroke, four from intracerebral haemorrhage and two from other causes.

5.3 Caring for women with epilepsy

5.3.1 Background

In 2022-24, neurological conditions were the second leading cause of indirect maternal death and the fourth overall cause of death during or up to six weeks after the end of pregnancy. Epilepsy is the most common neurological disease in pregnancy and women with epilepsy are at a significantly higher risk of complications during pregnancy and the postnatal period. The significance of this is reflected within NHS England's Maternal Care Bundle (NHS England 2026b), which identified epilepsy in pregnancy as one of its core elements of focus for the establishment of best practice standards. The interventions identified as part of the care bundle's development echo common themes from past MBRRACE-UK reports including the need to ensure timely access to specialist care and improve multidisciplinary working for pregnant women with epilepsy. These themes are also reflected in recent updates to NHS England's national service specification for adult neurology services (NHS England 2025), which, in addition to multidisciplinary working, also emphasises pre-pregnancy counselling, in line with NICE guidelines (National Institute for Health and Care Excellence 2022), and regular medication monitoring that extends to the postnatal period. Although progress is being made in the care of pregnant and recently pregnant women with epilepsy, the lessons for care identified within this chapter remain important to ensure continued implementation of the interventions and prevent future deaths.

5.3.2 Overview of care and lessons to be learned

Multidisciplinary care

A vulnerable, young woman with a ten-year history of juvenile myoclonic epilepsy died early in the third trimester. This was her second pregnancy and was unplanned. She was taking levetiracetam and ethosuximide and was advised to continue this in pregnancy by her epilepsy specialist nurse (ESN). She was cared for by a community midwife and her ESN with a single obstetric appointment at 13 weeks' gestation. A consultant obstetrician was not present for this appointment. She had increasing seizure frequency from 20 weeks' gestation. Seizures were primarily nocturnal. This was noted by the maternity team on multiple occasions, but they were reassured by the fact that she was in contact with her epilepsy team. There was no evidence of joined-up care or communication between the maternity and epilepsy teams. Her epilepsy was considered well controlled and increased seizures were attributed to stress and lack of sleep. Her anti-seizure drug levels were not checked and no changes were made to her medications. She died from SUDEP at 32 weeks' gestation. Her levetiracetam level was found to be subtherapeutic at post-mortem.

The NHS England Maternal Care Bundle, launched in January 2026, provides best practice standards for women with epilepsy in England including referral to a maternal medicine network (MMN) and care provided by a local team consisting of, at minimum, an epilepsy specialist nurse (ESN) or neurologist, a maternal medicine obstetrician and an obstetric physician, if available locally (NHS England 2026b). The women included in this chapter died before the development of this care bundle; however, their care demonstrates the importance of this element and a need to ensure its implementation to prevent future deaths and severe morbidity. At the time of this woman's death there was no evidence of joined-up care between neurology and maternity services. Instead, care was provided by separate hospitals with no communication between the teams or senior involvement or input from a consultant obstetrician or neurologist. As a result, there appeared to be no awareness of the danger associated with nocturnal epilepsy, or sleep-onset seizures, and false reassurances about the woman's increasing seizure frequency and anti-seizure medication (ASM) dosage.

Clinical message

Clinical message: Provide joined-up care

Senior oversight and effective multidisciplinary working with clear documentation of all multidisciplinary discussions and decision-making can promote consistent management and prevent adverse outcomes that may result from gaps in communication.

Develop clear standards of care for joint maternity and neurology services, which allow for: early referral in pregnancy, particularly if pregnancy is unplanned, to optimise anti-seizure drug regimens; rapid referral for neurology review if women have worsening epilepsy symptoms; pathways for immediate advice for junior staff out of hours; postnatal review to ensure anti-seizure drug doses are appropriately adjusted (Knight, Bunch et al. 2020b)

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Epilepsy in pregnancy (NHS England 2026b)

Intervention 3.1:

Every pregnant woman with epilepsy has access to a local epilepsy in pregnancy team who will ordinarily lead the early pregnancy, intrapartum and postnatal care plans in line with the local maternal medicine network's (MMN) management and escalation protocol. The local team will consist of, at a minimum:

- epilepsy nurse specialist or neurologist
- maternal medicine obstetrician (see national service specification for maternal medicine networks)
- obstetric physician (subject to local availability)

Intervention 3.2:

Women requiring more complex epilepsy care should be referred by the local epilepsy in pregnancy team to a maternal medicine network (MMN) multidisciplinary team (MDT) who can oversee and – where necessary – lead the provision of care.

Senior oversight

A woman in her second pregnancy had a fifteen-year history of epilepsy. She was managed with lamotrigine and levetiracetam with seizures every other month. She booked at 8 weeks' gestation and was referred to a consultant obstetrician with an interest in epilepsy. She contacted her epilepsy specialist nurse (ESN) about a seizure a couple of weeks later and was advised on the importance of taking her medications but no adjustments were made. The ESN was previously unaware of her pregnancy. She had her first medical review in a joint clinic with a senior obstetric registrar and ESN at 16 weeks' gestation. She had another seizure a few weeks later resulting in an injury. She was attended to by ambulance but was not taken to hospital. The woman told her epilepsy team about this seizure and an increase in her medications was suggested. Following a third seizure two weeks later her levetiracetam was increased. Medications were provided by her GP not her epilepsy team. She had one further seizure before she died from SUDEP in the early third trimester.

Assessors felt that this woman would also have benefitted from the consensus recommendations laid out in the Maternal Care Bundle (NHS England 2026b). These state that women requiring complex epilepsy care should be reviewed and triaged by an epilepsy in pregnancy specialist within two weeks of a first contact with a positive pregnancy test. This should be followed by a medication review within a further two weeks (NHS England 2026b). Previous MBRRACE-UK reports have recommended similar urgent referral pathways to triage women with high-risk medical conditions, including epilepsy (Felker, Patel et al. 2025, Knight, Bunch et al. 2020b), which underpin the NHS England guidance. This woman was referred for specialist care at 8 weeks' gestation but this did not take place until 16 weeks' when she was seen by an ESN and senior obstetric registrar rather than the specialist consultant obstetrician as planned. Although this appointment took place in a joint clinic, assessors still felt that this woman would have benefited from better communication between teams and more senior oversight of her care.

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Epilepsy in pregnancy (NHS England 2026b)

Expert consensus recommendations

While local epilepsy pregnancy teams should provide care in line with agreed MMN protocols, the element 3 [epilepsy in pregnancy] working group recommends by expert consensus that services work to put in place local pathways so that every woman with epilepsy receives:

- a case review and triage by a member of the local epilepsy in pregnancy team within 2 weeks of first NHS care contact with a positive pregnancy test, and that highest risk women are then seen in person for medications review within a further 2 weeks (so 4 weeks from first care contact).
- a follow-up appointment (in person or virtual) with a member of the local epilepsy in pregnancy team within 14 days of the end of pregnancy, to review medications and discuss post-partum risks and contraceptive options. This plan should be communicated to primary care and the woman's neurology service.

Assessors felt that this woman's care should have been escalated for review by a consultant neurologist following her second seizure in pregnancy. This would have allowed for review of her medications and counselling about ASMs and potential side-effects, including how these may be affected by pregnancy-related changes to metabolism. Levels of lamotrigine are reported to fall by up to 70% in pregnancy (Royal College of Obstetricians and Gynaecologists 2016b) and levetiracetam levels can drop as early as the first trimester (Berlin, Barchel et al. 2019, Fallik, Trakhtenbroit et al. 2024). Demonstrating to this woman that her serum medication levels were subtherapeutic may have led her to accept an earlier increase in medication.

The care of this woman also demonstrates an important point about the availability of medications at the point of care. After it was agreed that the levetiracetam dose should be increased, a letter was sent to the woman's GP to prescribe the medication rather than the epilepsy team providing it themselves. This resulted in unnecessary delays, which may have impacted the woman's outcome.

NEW National recommendations

Implement processes for acute community or hospital-based prescribing of medications where an urgent change in medications is required.

Escalation of care and safeguarding

The care of the two women above demonstrates a common theme in the care of women with epilepsy where having intermittent seizures was treated as normal. Assessors noted that abnormal changes in blood pressure or blood glucose levels would not usually be dismissed in this manner. They emphasised the need to be proactive about seizure management, especially when there is increasing seizure frequency or a change in the type of seizures that women experience. Regular assessment is necessary to assess any changes in risk factors, ASMs or seizure activity.

In the antenatal period, women with epilepsy should be regularly assessed for the following: risk factors for seizures, such as sleep deprivation and stress; adherence to anti-seizure drugs; and seizure type and frequency

RCOG Green-top Guideline 68 (Royal College of Obstetricians and Gynaecologists 2016b)

A vulnerable woman in her third pregnancy had a previous diagnosis of non-epileptic seizure disorder. She had not experienced seizures for five years but, in the month prior to conception, she had two nocturnal seizures. Her GP referred her to neurology. She was not on any anti-seizure medications. She was awaiting review when she booked with maternity services at 9 weeks' gestation. Her seizure disorder was noted at booking and she experienced infrequent ongoing nocturnal seizures. Her referral to neurology was noted during an obstetric review at 16 weeks' gestation but was not escalated. In the late second trimester she was found unresponsive after falling asleep. She had experienced a short daytime seizure the day before.

This woman booked early for maternity care and was appropriately referred to mental health and social care services. Her history of a seizure disorder was also noted at booking but it is not apparent the significance of this was fully considered alongside her social complexities. At the time of her obstetric review at 16 weeks' gestation, nearly eight months had passed since her initial referral to neurology. Assessors felt that there was no sense of urgency for neurological review as no attempts were made to expedite the referral during pregnancy, despite her increased risk and the change in the nature and frequency of her seizures. They felt that, as described above, her previous diagnosis may have led clinicians to regard her seizure activity as consistent with her existing condition, thereby precluding consideration of an alternative diagnosis such as epilepsy. Had she been referred back to neurology or, given the complexities of her circumstances, to a MMN, her outcome may have been different.

Risk Counselling

Assessors noted that there did not appear to be a specific period of risk, in relation to pregnancy, for women who died from epilepsy and other seizure disorders. Of the 19 women who died, nine were undelivered at the time of their death, four of whom died at less than 20 weeks' gestation. Four women died in the early postnatal period and six more than six weeks after the end of pregnancy. This finding emphasises the need for early awareness and risk counselling as well as consistent provision of advice during the whole of pregnancy and postnatally.

Pre-pregnancy counselling is recommended by the RCOG for women with epilepsy (Royal College of Obstetricians and Gynaecologists 2016b) and is associated with improved medication adherence and disease quiescence during pregnancy (Nana, Stannard et al. 2023); however, the primary focus of this counselling relates to the risks of fetal exposure to ASMs with very little information in guidance documents about the risks to women of uncontrolled seizures. This is also the case in the national guidance on the use of sodium valproate (Medicines and Healthcare products Regulatory Agency 2025). It is unclear whether many of the women received pre-pregnancy counselling or if counselling they received at any point during their pregnancy properly conveyed the importance of ASMs or the risks of SUDEP, including risk mitigation strategies such as the use of sleep alarms or monitors for women sleeping alone.

Clinical message

Clinical message: Get ready for pregnancy

The period before conception, or between pregnancies, including after miscarriage, is an ideal time to counsel women about their health and address any physical or mental health conditions or social needs that may require management prior to becoming pregnant. Counselling should include, but is not limited to, optimisation of medications for chronic conditions, advice on weight management or smoking cessation and specialist referral to mental health or addiction services (Felker, Patel et al. 2025).

Develop guidance to ensure that SUDEP awareness, risk assessment and risk minimisation is standard care for women with epilepsy before, during and after pregnancy and ensure this is embedded in pathways of care. Clinicians need to talk to women and their partners or carers about the risk of SUDEP and how to minimise it (Knight, Bunch et al. 2020b)

Safety message

Safety message: Risk counselling

Counselling women about the possible risks of pregnancy, for themselves and their babies, must be trauma informed with consideration of prior adverse experiences and complex social, medical and obstetric histories. Information provided must be balanced to promote informed decision-making and clinicians should be prepared to hold these discussions, including signposting for further support or guidance if needed. Particular consideration is required for higher risk situations including when women become pregnant or make other decisions against medical advice. In such situations, robust documentation, clear safety-netting procedures and the offer of follow-up discussions and support arrangements are essential to reduce risk.

Medication monitoring

A young woman in her first pregnancy was treated with lamotrigine for her epilepsy. She had received pre-pregnancy counselling, which included the need for increasing doses of medication in pregnancy. SUDEP was not discussed. She booked early and was referred to consultant-led care. She experienced nausea and vomiting as well as ongoing seizures in the first and second trimester. She had several appointments with an epilepsy specialist nurse who increased her lamotrigine dose in the second trimester. No levels were taken at any appointment. She died at home a few weeks later. Lamotrigine levels were sub-therapeutic at post-mortem.

As noted in the previous section, although this woman received pre-pregnancy counselling it did not properly convey the risks of SUDEP in pregnancy. However, she was aware of the need to adhere to her medications and increase the dose as pregnancy progressed. As such, she expressed concern about her medication levels when she experienced nausea and vomiting. Despite this concern and increasing seizure frequency, her dose was only increased late in the second trimester and her levels were not tested to determine if the new dose was therapeutic.

Many of the women who died from causes related to epilepsy did not have their ASM levels monitored throughout pregnancy. In instances where monitoring was done, it was not always done appropriately. Often there were no pre-pregnancy baselines for comparison or monitoring was considered too late to allow for effective changes to medications. Assessors emphasised that the absence of a pre-pregnancy baseline should not prevent monitoring in pregnancy or preclude clinically-indicated adjustments to ASMs for seizure management or prophylaxis.

When starting monitoring in women or girls planning pregnancy, obtain a baseline (pre-conception) concentration of antiseizure medications and check adherence to their medication.

NICE NG217: Epilepsies in children, young people and adults (National Institute for Health and Care Excellence 2022)

Previous confidential enquiries identified concerns regarding adherence to ASMs (Knight, Bunch et al. 2023, Knight, Bunch et al. 2020b) and emphasised the importance of monitoring in such instances where non-adherence was suspected. However, as demonstrated by the care of this woman, who did appear to be taking her medications regularly as prescribed, medication monitoring is important in all instances. This is especially true for women on lamotrigine, as clearance of lamotrigine can vary substantially making fixed dose adjustments unreliable (Barry, French et al. 2023).

Good care

A woman with a history of epilepsy was booked for joint neurology and obstetric care in a maternal medicine clinic. She was on lamotrigine and her last seizure was seven years prior to pregnancy. Her medications were monitored throughout pregnancy and the results were clearly documented in communications between neurology and obstetrics. She did not experience any seizures in pregnancy. Postnatally, contraception was discussed and a plan was made for ongoing management of her epilepsy. She died from SUDEP five months after birth. Lamotrigine levels were in the therapeutic range at post-mortem.

This woman was assessed to have received good care. She was appropriately cared for in a joint maternal medical clinic with regular input from, and communication between, neurology specialists and her maternity team. Her ASM serum levels were regularly monitored and she did not experience any seizures in pregnancy or in the postpartum period prior to her death.

Choice of anti-seizure medications (ASMs)

Assessors noted that several of the women who died from epilepsy had been prescribed ASMs or combinations of ASMs that were not considered first line treatments.

The first woman described in section 5.3.2 of this chapter, was prescribed ethosuximide in addition to levetiracetam. Ethosuximide is a first-line ASM for childhood absence seizures (National Institute for Health and Care Excellence 2022). Unlike some other ASMs, ethosuximide controls only absence seizures and does not adequately treat focal seizures or generalised tonic-clonic seizures. As adults are more likely to have seizure types requiring broader-spec-

trum medications, assessors felt that its use was an indication that her ASMs had not been properly re-assessed when she transitioned out of paediatric services. Gaps in the transition from paediatric to adult neurology services have been noted in previous reports (Knight, Bunch et al. 2023, Knight, Bunch et al. 2020b). Recommendations were recently developed to help guide this transition (Association of British Neurologists and British Paediatric Neurology Association 2025) but this period must remain an important area of focus for pre-pregnancy counselling and ASM optimisation.

A woman with a history of epilepsy was prescribed lamotrigine and lacosamide. She had increased seizure activity around the time of early pregnancy that required emergency department admissions; however, at her booking appointment at 7 weeks' gestation she reported that her seizures were well controlled. She was appropriately referred for consultant-led care and was reviewed by a neurology team in early pregnancy. She was counselled on the importance of medication adherence and was told that there was a slight increase in the risk of SUDEP in pregnancy. A lamotrigine level was requested but was not processed. She told her midwife about ongoing seizures, but neurology services were not informed. She died from SUDEP in the second trimester of pregnancy. Lamotrigine levels were therapeutic at post-mortem, lacosamide was sub-therapeutic.

As for several other women described in this chapter, this woman's prescribed ASMs did not adequately control her seizures. This woman was prescribed lacosamide and lamotrigine, which are both sodium channel-blocking ASMs. Although this combination may be effective in some epilepsy syndromes, the use of lacosamide, in combination with other sodium channel-blocking ASMs, can lead to adverse neurotoxic effects including dizziness, diplopia and ataxia, which may affect tolerability and adherence (Novy, Patsalos et al. 2011). Careful clinical assessment for adverse effects, adherence and seizure control is therefore needed and individual serum levels of each ASM should be monitored regularly where indicated.

Develop training resources concerning shared decision making and counselling regarding medication use in pregnancy and breastfeeding, including specific information on the benefits and risks of different medications and non-adherence (Knight, Bunch et al. 2023).

Although a request was made to check this woman's serum levels, there appeared to be no urgency in processing the results, which were not available at the time of her death. She was also not re-reviewed by neurology when she told her midwife about ongoing seizures.

Ensure information about the care of women and girls during pregnancy is shared between the epilepsy specialist team, a specialist obstetric team and primary care.

NICE NG217: Epilepsies in children, young people and adults (National Institute for Health and Care Excellence 2022)

A woman with a family history of epilepsy had a nine-month history of recurrent seizure-like episodes characterised by choking, stiffness, shaking and loss of consciousness followed by confusion. She was seen by ear, nose and throat and neurology specialists. An EEG and MRI were normal. A letter from the neurologist to the GP suggested starting anti-seizure medications if seizures continued. The type and dose of medication were not specified. Following a further event, she was prescribed pregabalin, which she had been prescribed previously for back pain. During this time, she had been trying to conceive and visited her GP to discuss infertility having recently had two negative pregnancy tests. HCG levels were not tested. She died a few days after this appointment. At post-mortem she was found to be 18 weeks' pregnant.

Assessors felt that there were delays in escalation, initiation and titration of a first-line ASM for this woman. They highlighted a need for improved communication between secondary and primary care as she was constantly referred between neurology services and her GP without any clear ownership of her care or evidence of joined-up working. Information provided to the GP was incomplete and did not include clear information about the most appropriate ASM to prescribe or dose escalation. Pregabalin was recommended due to previous tolerance despite not being a first-line ASM. It is typically used, with caution, when first-line treatments are ineffective or not tolerated as it has

the potential to exacerbate certain types of seizures including generalised absence seizures, myoclonic jerks, tonic seizures, and atonic seizures (National Institute for Health and Care Excellence 2022). This woman's age at onset and seizure characteristics were suggestive of generalised epilepsy with tonic-clonic seizures. Therefore, assessors felt that pregabalin was an unusual treatment choice even if she had previously tolerated it for chronic pain.

A vulnerable young woman had a seven-year history of juvenile myoclonic epilepsy. She had tried several anti-seizure medications and found sodium valproate to be most effective. She was taking sodium valproate at the time she conceived her second child. Sodium valproate was stopped in early pregnancy and she was started on clonazepam. Her antenatal care was provided by different hospitals with input from multiple neurologists and epilepsy specialist nurses. She experienced recurrent tonic-clonic seizures with frequent hospital admissions throughout her pregnancy. She had an emergency caesarean birth at term and continued to experience persistent seizures. She was not re-started on sodium valproate postnatally. She died from SUDEP seven months after giving birth.

Sodium valproate is among the most effective ASMs for generalised epilepsy (Marson, Al-Kharusi et al. 2007); however, in *utero* exposure is associated with major congenital malformations and adverse neurodevelopmental outcomes. As such, the Medicines and Healthcare products Regulatory Agency have introduced stringent prescribing safeguards for women (and men) under age 55 (Medicines and Healthcare products Regulatory Agency 2025) in addition to a Pregnancy Prevention Programme for women on valproate (Medicines and Healthcare products Regulatory Agency 2018). Consequently, women are often switched from valproate to less effective therapies before or during pregnancy.

For the woman above, the switch from sodium valproate to clonazepam resulted in an unstable disease. During pregnancy, she had multiple risk factors for SUDEP (Box 5.1) including uncontrolled tonic-clonic seizures (Sveinsson, Andersson et al. 2020, Tomson, Andersson et al. 2025), but it is not clear if she received an individualised risk assessment (Knight, Bunch et al. 2020b) or risk-mitigation measures. This should have included a consideration to restart valproate in the postnatal period, alongside effective contraception and enrolment in the Pregnancy Prevention Programme (Medicines and Healthcare products Regulatory Agency 2018).

Box 5.1: Risk factors for SUDEP (National Institute for Health and Care Excellence 2022)

- non-adherence to medication
- alcohol and drug misuse
- having focal to bilateral tonic-clonic seizures or generalised tonic-clonic seizures
- having uncontrolled seizures
- living alone
- sleeping alone without supervision

Clinicians must 'remember the mother' when counselling women on the use of medications so that the safety of both mother and baby is appropriately considered. This should apply to all counselling provided before pregnancy, during pregnancy, including if any changes are made to medications, and after pregnancy, when it may be appropriate to reassess ongoing seizure frequency and re-start ASMs that were previously effective but which should be avoided in pregnancy.

Vulnerable women

A woman in her early 30s with a history of epilepsy had persistent seizures throughout pregnancy. She had complex social circumstances including substance use, domestic abuse, insecure housing and learning difficulties. Her obstetric history included multiple previous miscarriages and older children who were not in her care. She had a short inter-pregnancy interval with no evidence of pre-pregnancy counselling. Her neurology and maternity care were spread across different hospitals and teams changed late in the first trimester following an out of area move. There was minimal communication between any of the teams involved. A letter was sent from neurology to the woman's GP in the first trimester advising them to add lamotrigine to her levetiracetam. This letter was not received until a month later due to her move. Lamotrigine was not initiated until the second trimester when her new neurology team tested her anti-seizure medication levels. No further monitoring was performed for either medication. Her child was placed on a child protection plan at 15 weeks' gestation and the relationship with her partner broke down two months later. From this point, she had increasing seizure frequency and less engagement with care. She collapsed at 31 weeks' gestation and died a few days later.

This woman's complicated care pathway demonstrates many of the common themes identified in previous enquiries regarding women with multiple disadvantage (Felker, Patel et al. 2025) as well as other themes around pre-pregnancy counselling and medication monitoring outlined in this chapter. Her ability to engage with care was hampered by an out of area move and the involvement of multiple teams and services that did not effectively communicate with one another. Her first neurology team was unaware of her pregnancy and communications between safeguarding teams in different locations did not mention her epilepsy. Further to this, her GP did not receive important information regarding a change in medications, re-emphasising the new recommendation above.

NEW National recommendations

Implement processes for acute community or hospital-based prescribing of medications where an urgent change in medications is required.

As noted in previous enquiries (Felker, Patel et al. 2025) and other chapters of this report, the loss, or anticipated loss, of a child through social service proceedings can lead to deteriorating mental health and disengagement from care. Relationship breakdowns can have a similar effect (Felker, Patel et al. 2025), especially when compounded with other loss events as was the case for this woman. It is essential that mental health referrals are considered as part of routine safeguarding procedures in the event of loss and evident self-neglect.

Clinical message

Clinical message: Incorporate safeguarding

Effective safeguarding should be incorporated into all aspects of maternity care, especially for women facing multiple disadvantages.

This woman was one of several women who died from epilepsy in 2022-24 who had known learning difficulties or cognitive impairments. Guidance from NICE recommends more frequent monitoring reviews for women with learning disabilities (National Institute for Health and Care Excellence 2022). There is no evidence this was done for the women who died, and assessors questioned whether their capacity to adhere to medication regimes had been considered.

Non-epileptic seizure disorder (or functional/dissociative seizures)

Two women died in this triennium who had been previously diagnosed with non-epileptic seizure disorder and one further woman died who had been diagnosed with both epilepsy and a non-epileptic seizure disorder. The International League Against Epilepsy has recently suggested a new diagnostic label for this condition, which has numerous alternative terms. The proposed label of functional/dissociative seizures (FDS) reflects the types of seizures people with this condition frequently experience (Hingray, Popkirov et al. 2025). These seizures often occur in response to stress or trauma, and can closely mimic epilepsy. It is possible to have both epilepsy and FDS but, as the cause

of FDS is often psychological, typical ASMs used to control epilepsy will not be effective. Instead, seizure management for FDS is usually focussed on stress management, identification and avoidance of triggers and cognitive behavioural therapy.

A woman had experienced nocturnal seizures for several years after the birth of her first child. After a neurology assessment, including MRI and EEG, she was diagnosed with non-epileptic seizure disorder and discharged to primary care. Her seizures were thought to be associated with recurrent urinary tract infections (UTIs) and mirtazapine treatment for her anxiety. At booking for a planned second pregnancy, she was reported to have 'anxiety seizures' and was referred to a perinatal mental health team. In the early second trimester she presented to the emergency department with what was documented as a 'febrile seizure' secondary to a UTI. She reported recurrent nocturnal seizures in the subsequent weeks and her antibiotics were changed in response. She died following a seizure at 23 weeks' gestation. Although she did not have a formal epilepsy diagnosis, the cause of her death was attributed to SUDEP.

Assessors felt that this woman's care demonstrated a fundamental misunderstanding of non-epileptic seizure disorder/FDS. They noted that the attribution of her seizures to recurrent urinary tract infections (UTIs) should have been challenged as the biological mechanism for this was unclear and her urine cultures were often negative. They also remarked that, while fever or infection may lower seizure threshold, febrile seizures are rare in adults. They are usually a sign of an underlying medical issue that requires proper investigation and escalation, especially in a pregnant woman. However, the only response to this seizure activity was a change in prescribed antibiotics for her UTI without consideration of urgent neurological review or referral to a maternal medicine team. At post-mortem, her death was classified as SUDEP. As highlighted in Chapter 9, pathology reviewers felt this was inappropriate as she did not have a pre-mortem diagnosis of epilepsy. Assessors also felt that pre-pregnancy counselling would have been beneficial for this woman, and any other woman who experienced recurrent seizures, regardless of the cause.

Where there did seem to be an understanding of her condition was at booking when she was appropriately referred to the perinatal mental health team. However, she was not seen by mental health services prior to her death nearly three months later. It is also not clear if she was referred for mental health support after her previous pregnancy when her seizures started, or by her GP when she was discharged from neurology back to primary care. Assessors felt that an earlier mental health referral or more urgent response to her referral in pregnancy may have changed her outcome.

5.4 Caring for women with signs and symptoms of intracerebral disease

5.4.1 Overview of care and lessons to be learned

Blood pressure management

Eight of the 41 women who died from stroke (20%) had persistent hypertension; six had pre-existing chronic hypertension, three of whom had superimposed pre-eclampsia; and two women who had pre-eclampsia during pregnancy had chronically uncontrolled blood pressure postnatally. An additional four women had elevated blood pressure recordings in the intrapartum or early postnatal period, one of whom collapsed hours after giving birth.

A multiparous woman had a history of migraines and two previous pregnancies, both complicated by pre-eclampsia. Her risk factors were identified at booking and she was started on aspirin with regular blood pressure checks throughout pregnancy. She developed symptoms of pre-eclampsia near term and was started on labetalol before a caesarean birth. Postnatally, she was switched to enalapril for persistent hypertension with a plan for ongoing management by her GP. She was initially under the care of a community midwife and required regular increases to her enalapril to manage her blood pressure. On one occasion a blood pressure measurement was not possible due to telephone review. After 28 days, she was transitioned to GP-led care and advised to make an appointment in two weeks. She was not seen in person until six weeks later when her blood pressure was very high. The GP had not received a discharge letter or any information about her care in hospital. She was started on a four-week supply of labetalol and advised to make a follow-up appointment. She saw her GP shortly after for a different concern but her blood pressure was not measured and no further prescription was issued. She died three months after birth from a brain haemorrhage likely due to hypertension.

Although this woman received excellent antenatal care with appropriate monitoring and management of her blood pressure, assessors felt that postnatal monitoring and management could have been improved. They highlighted that any complications or new issues that arise as a result of pregnancy must be specified in the discharge summary for primary care. However, as emphasised in previous reports (Felker, Patel et al. 2025), this woman's GP did not receive any discharge summary and was therefore unaware of information pertaining to her care in hospital or an ongoing management plan for her hypertension. Her risks were therefore not appreciated in the community and opportunities were missed to measure her blood pressure, review whether she was taking her medications and provide safety-netting advice regarding when to seek medical attention for headaches developing in the postnatal period. Telephone appointments may be appropriate and helpful in some instances, but they limit the ability to observe vital signs and recognise worrying symptoms.

Clinical message

Clinical message: 'FIGO pregnancy passport'

There are tools available to help inform women, and those caring for them, about their future health risks after pregnancy complications. The ***pregnancy passport*** designed by The International Federation of Gynaecology and Obstetrics (FIGO) was created for women with pre-pregnancy or pregnancy-induced risk factors for cardiometabolic diseases. It is designed to be provided to women after childbirth and before discharge from hospital to facilitate screening and management. It includes advice on recommended follow-up checks and information about potential risks on future health, and offers interventions to reduce such risks (Felker, Patel et al. 2025).

Discharge summaries for primary care should clearly indicate in an initial summary box the key conditions that require ongoing support or management and a clear plan for postnatal care. Detailed information about medical, mental health and social complexities and ongoing medications, monitoring requirements or safeguarding concerns must be included to facilitate a clear plan for postnatal care (Felker, Patel et al. 2025)

Symptom recognition

A woman in her second trimester experienced a sudden onset headache with accompanying seizure. Imaging revealed a subarachnoid haemorrhage (SAH) secondary to a middle cerebral artery (MCA) aneurysm, which was coiled with complete occlusion. Her obstetric team was not notified of her surgery and there was no further input from the neurosurgical team. An MRI was scheduled for six months later. She had ongoing headaches with worsening frequency but was reassured that they were normal. In the third trimester, her GP noted a raised blood pressure and prescribed oxycodone for pain. She collapsed at home at term with a repeat SAH and MCA aneurysm. She had an emergency caesarean birth and died five days later.

Assessors noted that this woman received good, multidisciplinary care when she presented to hospital with her second subarachnoid haemorrhage; however, they noted significant improvements to care in the weeks preceding this event. Following her initial diagnosis and surgery, this woman would have benefitted from a referral to the maternal medicine team where she would have received senior oversight and neurological input. As it was, there was little communication between the medical teams and limited support from the neurosurgical team after discharge from hospital. The woman was instructed to email the neurosurgical team about her headaches, but these emails went unanswered. Although headaches are common after intracranial procedures, assessors noted that it would have been appropriate for clinical follow-up and direct communication between the medical teams, including multidisciplinary planning for delivery. It was also noted that repeat imaging was postponed until after pregnancy, where it would normally be performed within one to two months. This could have been discussed and clarified had the maternal medical team been involved.

Clinical message

Clinical message: Provide joined-up care

Senior oversight and effective multidisciplinary working with, clear documentation of all multidisciplinary discussions and decision-making, can promote consistent management and prevent adverse outcomes that may result from gaps in communication.

The importance of the recognition of 'red flags' in pregnant women presenting with headaches is a common message in MBRRACE-UK reports (Knight, Bunch et al. 2023, Knight, Bunch et al. 2020b). This woman was incredibly high risk but her symptoms, including persistent headaches and the use of opioids for analgesia, did not appear to be appreciated in the context of her recent history.

Red flags in the history and examination of a pregnant patient presenting with headaches:

- **Sudden-onset headache / thunderclap or worst headache ever**
- **Headache that takes longer than usual to resolve or persists for more than 48 hours**
- **Has associated symptoms – fever, seizures, focal neurology, photophobia, diplopia**
- **Excessive use of opioids**

RCP Acute care toolkit 15 Managing acute medical problems in pregnancy (Royal College of Physicians 2019)

Several other women who died from intracerebral disease had a personal or family history associated with an increased risk of intracranial haemorrhage, which was not always recognised or appropriately acted upon. For most of these women, assessors felt that senior oversight may have improved care but may not have changed the outcome.

A young woman had a strong family history of a genetic neurological condition. She was awaiting the results of a genetic test to confirm her diagnosis when she became pregnant. The significance of the potential diagnosis was not recognised at booking. She collapsed from an intracerebral bleed a month after giving birth. An arteriovenous malformation was diagnosed by CT and she died shortly after.

A woman had a strong family history of intracranial aneurysms. Her risks were recognised and she received good care overall; however, there were challenges in communication between primary and secondary care, with hospital care records not being easily available to her GP. She died four months postpartum from a subarachnoid haemorrhage secondary to rupture of a berry aneurysm.

Based on their histories, both these women needed consultant-led, multidisciplinary care in a unit with on-site interventional radiology expertise that could provide emergency embolisation in the event of a bleed. Assessors felt that input from obstetric medicine may have improved assessment and safety-netting for the first woman. As it was, the risks of her condition in pregnancy were not communicated to her and she was not referred for pre-pregnancy counselling at the time of genetic testing, as is recommended (Faughnan, Mager et al. 2020).

A grand multiparous Asian woman had a caesarean birth at term. The baby had congenital anomalies and died soon after birth. The woman was prescribed bromocriptine to suppress lactation. One week after birth, she presented to the emergency department with a headache and raised blood pressure. No maternity early warning score (MEWS) was recorded and no antihypertensive medications were provided. The following day she was seen by a community midwife who recorded blood pressure of 170/110 mmHg and a MEWS of 6. She was referred for hospital admission and treated with labetalol and antibiotics. Her blood pressure remained elevated and she was given nifedipine. Her symptoms, including drowsiness and confusion, were attributed to her recent bereavement. A CT scan was requested but could not be done on site as it was out of hours. Transfer to another site was delayed during which time the woman became unresponsive. A subsequent CT scan showed an intracerebral bleed and she died a few days later.

As frequently observed in MBRRACE-UK reports (Felker, Patel et al. 2024, Felker, Patel et al. 2025, Knight, Bunch et al. 2023), this woman's symptoms were attributed to mental health issues without appropriate investigation. She had left several young children at home to present to the emergency department shortly after giving birth, but this did not appear to have been considered alongside her symptoms. Despite having a headache alongside new onset severe hypertension, no MEWS was recorded in the emergency department, and she was discharged without senior obstetric review. Although her care was appropriately escalated when she saw a midwife the following day, signs of confusion and drowsiness were attributed to grief during her hospital admission. As such there was no urgency in reaching a diagnosis and transfer for a CT scan was not expedited until she collapsed.

Clinical message

Clinical message: Record maternal observations using MEWS

Maternity early warning scores (MEWS) should be used for all pregnant or recently pregnant women in all settings, not just maternity.

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Pre-hospital and acute care (NHS England 2026b)

Intervention 2.1:

Implement the national maternity early warning score (MEWS) tool across all settings for women who are or have been pregnant in the past 4 weeks. This means ensuring timely obstetric team and/or obstetric physician review in line with the MEWS escalation timeframes, according to the total score identified and relevant additional concerns.

Ensure the appropriate national Maternity Early Warning Score is used to monitor pregnant women wherever in the hospital she receives care (Knight, Bunch et al. 2022)

Assessors also noted that this woman was prescribed bromocriptine, which is a second line treatment to cabergoline for lactation suppression (Royal College of Obstetricians and Gynaecologists 2010). Recent safety reviews concluded that bromocriptine use is contraindicated in women with hypertension or cardiovascular conditions and should not be prescribed without regular blood pressure monitoring (Medicines and Healthcare products Regulatory Agency 2024). Although bromocriptine treatment was stopped after the woman was admitted to hospital, it is not clear if this was considered as a potential differential cause of her symptoms, including persistent hypertension. Assessors noted that this woman deteriorated shortly after commencing bromocriptine.

Pre-hospital and emergency care

A White woman who did not speak English did not have an interpreter for most of her antenatal appointments, including at booking. Electronic records from a previous pregnancy, which was complicated by hypertension, were not available as she booked at a different hospital to her first pregnancy. As such, her obstetric history was not noted until a consultant appointment in the second trimester when an interpreter was present. From this point, she was started on aspirin prophylaxis with regular blood pressure monitoring. In her third trimester she experienced left-sided weakness. Her partner called 999 using a young family member as an interpreter. She was not documented as being pregnant and was incorrectly categorised due to communication difficulties. There were extreme pressures on the ambulance services and the family was advised to transfer the woman to the emergency department by car. She lost consciousness prior to transfer. Upon arrival in the emergency department, a CT scan showed a large intracerebral haemorrhage. One hour after admission, maternity staff were called to perform cardiotocography. Two hours later an obstetric consultant arrived and she had an emergency caesarean birth. After giving birth, she was admitted to ICU where she died a short time later.

This woman's care demonstrates the combined effect of multiple individual and system-level vulnerabilities on risk recognition and timely intervention. Her history of hypertension was not identified at booking due to language difficulties and issues with electronic patient records. It was also later revealed in GP notes that she had been diagnosed with a pulmonary embolus following a previous pregnancy and had a history of anxiety and depression, neither of which was documented in her hospital records. This illustrates a common theme identified in MBRRACE-UK enquiries (Felker, Patel et al. 2024, Kenyon, Gallimore et al. 2024) and recent investigations (National Maternity and Neonatal Investigation 2026) regarding the challenges women and families with language difficulties encounter when accessing care.

Safety message

Safety message: Electronic patient records

The use of different electronic patient record systems within or between different trusts or health boards, primary care and emergency services may lead to gaps in communication, underappreciation of deterioration, missed opportunities for intervention and diminished continuity of care. Improving the interoperability of systems and standardising key elements, including the ability to attach key pieces of correspondence and the integration of early warning scores, should be prioritised to support timely decision making, minimise risk and enhance outcomes. The readability of outputs, including copies of records for use in review processes, must also be improved to facilitate learning from adverse events.

Communication difficulties also affected this woman's care during the 999 call when the severity of her condition was not appropriately recognised and the call was not escalated. Assessors noted that interpretation services were available in the ambulance call centre, but were not activated. They re-emphasised that professional interpretation services must be used at every encounter, including during 999 call handling, regardless of whether a family member or friend is available for interpretation. This helps to ensure that questions are understood, the woman's status is adequately conveyed and optimal support and care can be provided.

Ensure the digital maternity record includes details of language needs, including the use of formal interpreter services, to ensure that these are taken into consideration at all interactions, including in emergency situations (Felker, Patel et al. 2024)

Ambulance service response times are affected by numerous factors such as staffing, major incidents and acuity within hospital emergency departments. Assessors noted exceptional operational pressures at the time of this woman's collapse, and were not certain if different categorisation would have resulted in earlier ambulance response for this woman. Emergency dispatch systems do not consistently account for pregnancy when triaging non-obstetric conditions such as stroke. As pregnancy can substantially alter the diagnosis, urgency and management of many emergency presentations, assessors suggested that women with suspected critical illness in pregnancy should be explicitly recognised within ambulance service clinical safety plans during periods of extreme demand. It was also proposed that dispatch systems incorporate pregnancy into prioritisation and escalation pathways, including for non-obstetric conditions, to identify pregnancy early and reduce the risk of inappropriate categorisation or delays for pregnant women with life-threatening conditions.

Safety message

Safety message: Service provision and acuity

Service provision must keep pace with increasing maternal complexity and clinical demand with regular review of capacity across emergency triage, staffing and operating theatres. Escalation pathways and flexible resource allocation are essential to ensure patient safety during periods of high acuity. Ongoing monitoring and support, including skills-based training, should be prioritised to reduce risk and provide safe, effective care.

The care of this woman also demonstrates the importance of communication and early multidisciplinary involvement when critically ill pregnant women present to hospital. When women are conveyed to hospital by ambulance, structured pre-alerts can help communicate pregnancy status, suspected diagnosis, physiological status and anticipated clinical needs before arrival. This enables emergency, maternity, anaesthetic and neonatal teams to prepare and facilitates coordinated decision-making, timely assessment and rapid access to definitive treatment (Chu, Johnston et al. 2020, Joint Royal Colleges Ambulance Liaison Committee (JRCALC) and Association of Ambulance Chief Executives (AACE) 2022). As this woman was not brought to hospital by ambulance, it was not possible to issue a pre-alert. Upon arrival, a general peri-arrest, not maternity arrest, call was made immediately but there were significant delays in the arrival of the maternity team including the senior obstetrician and obstetric anaesthetist. Assessors emphasised the importance of systems that ensure early recognition of pregnancy and prompt multidisciplinary escalation, regardless of the route by which women access emergency care.

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Pre-hospital and acute care (NHS England 2026b)

Intervention 2.2:

Implement a standardised pre-alert communication system between the ambulance service and labour ward and ensure adequate signage for all labour wards so that ambulance services can convey women with an obstetric emergency or red flags promptly and appropriately.

5.5 Conclusions

As in previous enquiries, multidisciplinary care and senior oversight were the core themes identified for women who died from neurological conditions in 2022-24. For women with epilepsy, this included joined-up care between neurology and obstetric services through a MMN or an appropriate equivalent. The care of these women re-emphasises the importance of this multidisciplinary insight for pre-pregnancy counselling and ongoing medication review and management, which remains important to assess non-adherence and make adjustments where needed. In the event that urgent changes to medication are indicated, a new lesson identified in this year's enquiry emphasises the importance of prescribing at the point of care to avoid unnecessary delays.

For women who died of stroke, multidisciplinary working and senior oversight were equally important for symptom recognition and the management of hypertension. Lessons for care were also identified for pre-hospital triage and obstetric review in the emergency department, which have previously been emphasised in MBRRACE-UK reports but require ongoing consideration.

The classification of care for women who died from neurological causes in the UK and Ireland in 2022-24 is shown in Table 5.1. The care of all 19 of women who died from epilepsy or who had non-epileptic disorders (or FDS) was reviewed and assessors felt that improvements in care would have made a difference for 15 of the women (79%). Information was sufficient to assess care for 38 of the 41 women who died from stroke and other neurological causes. Assessors felt that 11 of the women received good care (29%) but identified improvements to care that may have made a difference for 13 women (34%).

Table 5.1: Classification of care received by the women who died from neurological causes, UK and Ireland 2022-24

Classification of care received	Women who died from epilepsy or non-epileptic seizure disorders Number (%) N=19	Women who died from stroke and other neurological causes* Number (%) N=38
Good care	1 (5)	11 (29)
Improvements to care which would have made no difference to outcome	3 (16)	14 (37)
Improvements to care which may have made a difference to outcome	15 (79)	13 (34)

*includes only women whose case notes were available with sufficient information for an in-depth review

6. Messages for the care of women with general medical and surgical conditions

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6.1 Key messages

New recommendations

Ensure appropriate multidisciplinary care to enable consistency of advice for high-risk women with complex medical comorbidities regarding birth planning, medication adherence and monitoring and vaccination, including advice for the vaccination of infants exposed to biologic medications **[ACTION: Integrated Care Boards in England and commissioning bodies in the devolved nations]**

Ensure postnatal contraception can be prescribed and administered in maternity services for future pregnancy planning **[ACTION: Integrated Care Boards in England and commissioning bodies in the devolved nations]**

Existing guidance and recommendations requiring improved implementation

Services providing care to pregnant women should be able to offer all appropriate methods of contraception, including LARC (long-acting reversible contraceptive) to women before they are discharged from the service (The Faculty of Sexual and Reproductive Healthcare 2020)

Maternity services (including services providing antenatal, intrapartum and postpartum care) should give women opportunities to discuss their fertility intentions, contraception and preconception planning (The Faculty of Sexual and Reproductive Healthcare 2020)

High level actions are needed to ensure that it is seen as the responsibility of all health professionals to facilitate opportunistic counselling and appropriate framing of the advice when women attend any appointment, and that resources for pre- and post-pregnancy counselling are provided, together with open access to contraception services (Knight, Nair et al. 2017)

In pregnant or postpartum women with complex medical problems involving multiple specialties, the responsible consultant obstetrician or physician must show clear leadership and be responsible for coordinating care and liaising with anaesthetists, midwives, other physicians, and obstetricians and all other professionals who need to be involved in the care of these women (Knight, Nair et al. 2017)

Women with pre-existing medical conditions should have pre-pregnancy counselling by doctors with experience of managing their disorder in pregnancy (Knight, Kenyon et al. 2014)

Set up an urgent referral pathway in early pregnancy for women with high-risk medical conditions or complex social circumstances to ensure they receive early triage for senior or specialist consultation (Felker, Patel et al. 2025)

Discharge summaries for primary care should clearly indicate in an initial summary box the key conditions that require ongoing support or management and a clear plan for postnatal care. Detailed information about medical, mental health and social complexities and ongoing medications, monitoring requirements or safeguarding concerns must be included to facilitate a clear plan for postnatal care (Felker, Patel et al. 2025)

Women with long-standing diabetes mellitus are at increased risk of severe hypoglycaemia and diabetic ketoacidosis (Knight, Kenyon et al. 2014)

Ensure specialist perinatal mental health teams undertake a leadership role for the care of pregnant or recently pregnant women with mental health conditions even if women are not accepted for care under their services. This should include a risk assessment, provision of advice and guidance, oversight for joint care planning and support to ensure rapid onward referral into other appropriate mental health services (Felker, Patel et al. 2025)

Loss of a child, either by miscarriage, stillbirth and neonatal death, or by the child being taken into care increases vulnerability to mental illness for the mother and she should receive additional monitoring and support (Knight, Tuffnell et al. 2015)

Ensure that guidance on care for pregnant women with complex social factors is updated to include a role for networked medical care and postnatal follow-up to ensure that it is tailored to women's individual needs and that resources in particular target vulnerable women with medical and mental health comorbidities and social complexity (Knight, Bunch et al. 2023)

[Women] with asthma should have an asthma review during early pregnancy and in the postpartum period. Emphasise the importance and safety of maintaining good control of asthma during pregnancy and of continuing asthma medicines to avoid problems for themselves and their baby (National Institute for Health and Care Excellence 2024)

Check adherence, using prescription records, and inhaler technique at every asthma-related healthcare review (National Institute for Health and Care Excellence 2024)

6.2 Background

This chapter examines the care of women who died from connective tissue, endocrine, gastrointestinal, haematological and respiratory conditions as well as those who died from anaphylaxis and spontaneous intra-abdominal bleeding in 2022-24. This chapter also examines the care of women included in this year's morbidity enquiry into conditions requiring networked maternal medical care. General medical and surgical conditions are becoming more common amongst pregnant and recently pregnant women due to changing demographics within the maternity population. In 2022-24, 60% of the women who died during or up to six weeks after pregnancy had pre-existing conditions, not including obesity. As repeatedly highlighted in MBRRACE-UK reports, and as emphasised in the recent report from the National Maternity and Neonatal Investigation (National Maternity and Neonatal Investigation 2026), maternity care does not operate independently of other services. It remains important to disseminate the learning from this report, and other reports, beyond the maternity community to reach people caring for pregnant and recently pregnant women in all settings. Unless there is a clear reason, the standard of care for these women should not differ from that for non-pregnant women (Knight, Bunch et al. 2022).

6.3 The women who died

Between 2022-24, 27 women died in the UK and Ireland during pregnancy or up to six weeks after pregnancy from general medical and surgical conditions not considered elsewhere in these reports ('other indirect causes'). This represents a mortality rate of 1.27 per 100,000 maternities (95% CI 0.84-1.85). A further 30 women died from these causes between six weeks and one year after the end of pregnancy. The causes of the women's death are shown in Table 6.1 and Figure 6.1.

Fifteen women died from gastrointestinal disorders: ten from pancreatitis; two from bowel obstruction; and three from hepatic conditions. Ten of these women died between six weeks and one year after the end of pregnancy.

Eleven women died from endocrine causes: eight had diabetes, five of whom died from diabetic ketoacidosis (DKA), two from long-term complications of diabetes and one from hypoglycaemia; two women died from a phaeochromocytoma; and one from complications of Graves' disease. Seven women died while pregnant or within six weeks after the end of pregnancy.

Six women died from respiratory disorders: three from asthma, two from cystic fibrosis and one from pulmonary fibrosis. Half of the women died while pregnant or within six weeks after the end of pregnancy.

Six women died from connective tissue disorders: four from complications of systemic lupus erythematosus (SLE), one of whom had also been diagnosed with haemophagocytic lymphohistiocytosis (HLH) shortly before her death, and two from other disorders. Half of the women died while pregnant or within six weeks after the end of pregnancy.

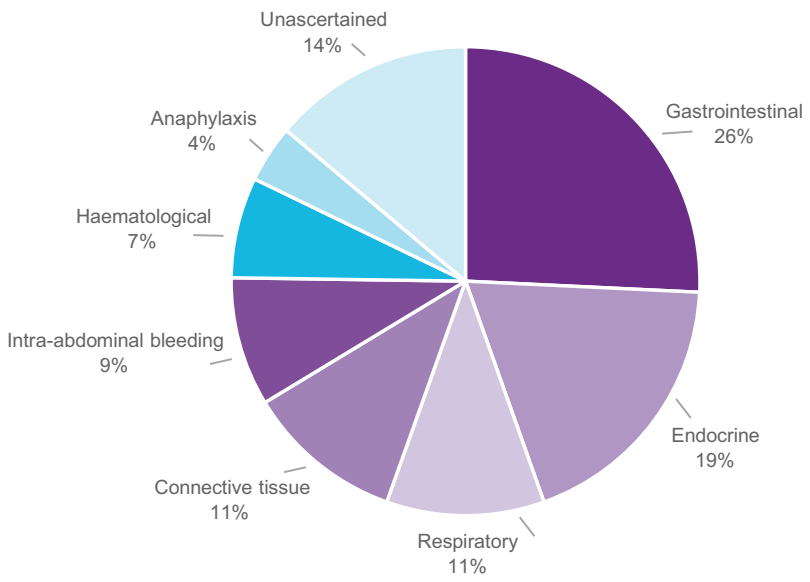
Five women died from non-obstetric spontaneous intra-abdominal bleeding, all but one of whom died while pregnant or within six weeks after the end of pregnancy. Four women died due to haematological causes, two due to HLH and two from other haematological conditions, and all between six weeks and one year after pregnancy.

Two women died from anaphylaxis to IV iron and antibiotics, respectively. The causes of death for eight other women were unascertained, largely due to absent or low-quality post-mortem examinations, but were felt most likely to be due to indirect causes. Half of the women with anaphylaxis or unascertained causes of death died while pregnant or within six weeks after the end of pregnancy.

Table 6.1: Causes of death for women who died from medical and surgical disorders during pregnancy or up to one year after pregnancy, UK and Ireland 2022-24

Cause of death	Number of women (%) N=57
Gastrointestinal	**15 (26)**
Pancreatitis	10
Bowel obstruction	2
Hepatic conditions	3
Endocrine	**11 (19)**
Diabetes	8
Other endocrine conditions	3
Respiratory	**6 (11)**
Asthma	3
Other respiratory conditions	3
Connective tissue disorders	**6 (11)**
Systemic lupus erythematosus (SLE)	4
Other connective tissue disorders	2
Non-obstetric intra-abdominal bleeding	**5 (9)**
Haematological	**4 (7)**
Haemophagocytic lymphohistiocytosis (HLH)	2
Other haematological conditions	2
Anaphylaxis	**2 (4)**
Unascertained indirect	**8 (14)**

Figure 6.1: Causes of death for women who died from medical and surgical disorders during pregnancy or up to one year after pregnancy, UK and Ireland 2022-24



6.4 The women whose care was reviewed for the morbidity enquiry

A sample of women was drawn from the UK Obstetric Surveillance System (UKOSS) study on the use of biological agents in pregnancy conducted from May 2022 to October 2024. Stratified sampling included 45 women spread across the UK nations with varied representation by age and ethnic group. Of the 45 women identified, records were received for 33 women. Twelve of the women whose care was reviewed had Crohn's disease, eight had ulcerative colitis, seven had inflammatory arthritis and six women had SLE.

6.5 Overview of care and lessons to be learned

6.5.1 Networked maternal medical care

Maternal medicine networks (MMNs) in England were launched in 2021 to support the care of women with complex health conditions before, during and after pregnancy. Specialised centres with maternal medicine expertise also exist across Wales, Scotland and Northern Ireland. Although the networks in England operate based on a national service specification (NHS England 2021), care is delivered regionally and so varies in the conditions women have which make them eligible for referral and the threshold for acceptance. The level of maternal medicine input can also differ on an individual basis; however, for the highest risk and most complex women, the expectation is that all care will be delivered within specialised centres.

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Pre-hospital and acute care (NHS England 2026b)

Intervention 2.3:

Establish acute referral pathways from local services to the maternal medicine centre (MMC) for acutely unwell pregnant or recently pregnant women presenting with symptoms or diagnostic uncertainty necessitating maternal medicine expertise. Maternity services and the maternity medicine network (MMN) should review these pathways annually.

A primiparous White woman had been diagnosed with Crohn's disease five years prior to her first pregnancy. Her disease was well controlled with her last flare three years prior to pregnancy. She had recently started taking vedolizumab and budesonide around the time she became pregnant. She booked at 11 weeks' gestation and antenatal care was provided by a community midwife with three obstetric appointments and one consultation with a separate inflammatory bowel clinic. She had a flare in the early third trimester due to a clerical prescribing error with her vedolizumab. She was induced at term and had a caesarean birth due to fetal concerns. Postnatally she contacted the inflammatory bowel disease (IBD) helpline to ask about contraception and live vaccines for her baby. No discussions were initiated by her care team. M

A primiparous Black woman had a nearly ten-year history of Crohn's disease. Her last flare was one year prior to pregnancy and she had no previous surgeries. Her condition was previously managed with adalimumab, which she stopped prior to becoming pregnant. She booked at 11 weeks' gestation and she was cared for by a local maternal medicine team in coordination with gastroenterology. She was counselled about starting biologics early in her pregnancy but was hesitant to do so; however, following a flare in the second trimester she was started on ustekinumab after discussion with her gastroenterology team. Advice was provided on avoiding live vaccinations for her baby in view of her ustekinumab use and a plan was made for a vaginal birth. She presented with spontaneous rupture of membranes at 39+2 weeks and had a caesarean birth due to fetal concerns. M

These two women were both in their first pregnancies and booked for antenatal care within similar timeframes. They had similar histories of Crohn's disease, which was well controlled by biological agents. Based on their medical history, both women should have received local care with review, advice and guidance provided by maternal medicine teams. However, although assessors felt that both women received good antenatal care, they recognised that, across all the reviews, there was a significant variation in the management of women with similar obstetric and medical histories.

The first woman above had care provided locally, but without local maternal medicine team or network input or support. Although there were clear pathways for escalation in the event of complications, she did not have any input from obstetric medicine specialists. She did have input from a gastrointestinal team on one occasion, but the appointment did not take place in a combined clinic. There was also no evidence that she was counselled about postnatal contraception or infant vaccination as she contacted the inflammatory bowel disease (IBD) helpline herself to ask

about this information. In contrast, the second woman described above was managed by a maternal medical team with coordinated input from gastroenterology. She was appropriately counselled on the use of biological agents, including which infant vaccinations to avoid, and had multidisciplinary discussions about her birth plan.

This difference in care was common amongst the women whose care was reviewed as part of the morbidity enquiry as well as those who died from neurological (Chapter 5) or other general medical conditions. While the anonymisation of records prevents awareness of regional service specifications and the availability of local services, all high-risk women who are eligible to receive care under or input from maternal medical centres should be provided with consistent advice regarding their pregnancy and postnatal health.

NEW **National recommendations**

Ensure appropriate multidisciplinary care to enable consistency of advice for high-risk women with complex medical comorbidities regarding birth planning, medication adherence and monitoring and vaccination, including advice for the vaccination of infants exposed to biologic medications.

6.5.2 Pre-pregnancy counselling and future pregnancy planning

The European Crohn's and Colitis Guidelines on Sexuality, Fertility, Pregnancy, and Lactation (Torres, Chaparro et al. 2023) suggest that all women of reproductive age with IBD should receive pre-pregnancy counselling, but it is unclear if this was the case for many of the women included in the morbidity enquiry. The first woman (in section 6.5.1 above) was using combined oral contraception but there were no discussions around the effectiveness of this form of contraception in the context of her Crohn's disease, which may impact absorption (Torres, Chaparro et al. 2023).

As in previous reports (Knight, Bunch et al. 2023, Knight, Kenyon et al. 2014, Knight, Nair et al. 2017), there was also limited evidence of pre-pregnancy counselling amongst the women who died who had multiple long-term conditions. Where there was evidence of counselling, it did not always convey the potential risks of pregnancy in a manner sufficient to make informed decisions. In some instances, it was not clear to assessors if women had received pre-pregnancy counselling as letters from external services are not always be visible in maternity electronic patient records. This also means that healthcare professionals utilising electronic patient records may not be aware of prior discussions and plans for management of pregnant women with pre-existing conditions.

Safety message

Safety message: Electronic patient records

The use of different electronic patient record systems within or between different trusts or health boards, primary care and emergency services may lead to gaps in communication, underappreciation of deterioration, missed opportunities for intervention and diminished continuity of care. Improving the interoperability of systems and standardising key elements, including the ability to attach key pieces of correspondence and the integration of early warning scores, should be prioritised to support timely decision making, minimise risk and enhance outcomes. The readability of outputs, including copies of records for use in review processes, must also be improved to facilitate learning from adverse events.

In addition to pre-pregnancy counselling, neither woman in section 6.5.1 above had clear documentation of postnatal contraception counselling or future pregnancy planning. This was a common theme across all chapters of this report. Assessors noted that it can be difficult to determine whose responsibility it is to hold these discussions, especially when care is shared across multiple teams or sites. However, the national service specifications for MMNs indicate that pre-pregnancy counselling and postnatal care plans, including contraception, should be coordinated by maternal medical centres (NHS England 2021). For many women, it was not clear whether they had access to post-pregnancy contraception and whether there were educational resources to equip professionals to deliver post-pregnancy contraception. This aligns with recommendations within NHS England's postnatal care toolkit, published in 2026 (NHS England 2026a) and a new recommendation from this year's report..

NEW **National recommendations**

Ensure postnatal contraception can be prescribed and administered in maternity services for future pregnancy planning.

Services providing care to pregnant women should be able to offer all appropriate methods of contraception, including LARC (long-acting reversible contraceptive), to women before they are discharged from the service.

Maternity services (including services providing antenatal, intrapartum and postpartum care) should give women opportunities to discuss their fertility intentions, contraception and preconception planning.

Faculty of Sexual and Reproductive Health guideline: Contraception after pregnancy (The Faculty of Sexual and Reproductive Healthcare 2020)

A woman had a history of type 1 diabetes and had recently transitioned from paediatric to adult diabetes services. Prior to pregnancy she had repeated emergency attendances for hyperglycaemia and one hospital admission with diabetic ketoacidosis (DKA). Although she told healthcare professionals that she was actively trying to conceive, there was no referral for pre-pregnancy counselling or documented discussion around stabilising her diabetes and the potential risk of becoming pregnant. Despite a rapid referral to endocrinology and obstetrics for review of her diabetes management, she died in early pregnancy from hypoglycaemia.

Assessors noted that there were numerous opportunities for pre-pregnancy counselling and support during this woman's multiple interactions with health services. As noted, it is sometimes difficult to determine whose responsibility it is to hold these discussions; however, interventions prior to, or between pregnancies, which aim to promote health can, and should, be delivered by a wide variety of services. A previous MBRRACE-UK report recommended that pre-pregnancy advice should be seen as the responsibility of all health professionals involved in the care of women of reproductive age with co-existing medical problems (Knight, Nair et al. 2017). The care of this woman suggests that this recommendation should be extended to include all health services, including emergency services and paediatrics. Improving pre-pregnancy care is one of the key actions of the Department of Health and Social Care's (DHSC) Renewed Women's Health Strategy for England (Department of Health and Social Care 2026) and is part of the core specification for Women's Health Hubs (Department of Health and Social Care 2024c), which required all integrated care boards in England to provide pre-pregnancy services by 2025. A pre-pregnancy toolkit was also recently developed to signpost healthcare providers to relevant and useful resources (Blundell, Schoenaker et al. 2025).

High level actions are needed to ensure that it is seen as the responsibility of all health professionals to facilitate opportunistic counselling and appropriate framing of the advice when women attend any appointment, and that resources for pre- and post-pregnancy counselling are provided, together with open access to contraception services (Knight, Nair et al. 2017)

6.5.3 Joined-up care

As noted in section 6.5.1, there was evidence of significant variation in the level of care provided to women with similar medical conditions including both those who died from general medical and surgical conditions and those women included in the morbidity enquiry who did not die but who also had complex pre-existing disorders. Variation in the delivery of care can be expected depending on the woman's location and unique characteristics; however, it is important that all care, regardless of how it is delivered, includes appropriate expertise with clear communication and pathways for escalation of care.

Specialist involvement

A multiparous Asian woman had a complex medical, social and obstetric history including systemic lupus erythematosus (SLE) and a stroke nine months after a previous pregnancy. There was no record of any discussion around contraception, pregnancy intentions or pre-pregnancy counselling following her stroke and she became pregnant again a few months after. There was no documented discussion of the risks of continuing pregnancy. Her antenatal care was spread across five centres with input from numerous specialists. There was limited coordination of her appointments and many were missed. During pregnancy, she had multiple neurological and cardiorespiratory complications from her SLE. She died from SLE-associated interstitial lung disease one month after an emergency caesarean birth.

A primiparous Asian woman had a history of multisystem systemic lupus erythematosus (SLE). She had a severe flare prior to pregnancy requiring extensive immunosuppression. She received pre-pregnancy counselling, including adjustment to her medications, and became pregnant shortly after. During pregnancy she was cared for in a maternal medicine centre with oversight by a senior specialist. She continued to have flares during pregnancy that were managed by a multidisciplinary team with escalation of immunosuppression when clinically indicated. She had an emergency caesarean birth and a postpartum complication of infective endometritis, from which she recovered. M

These two women shared many similarities, including high-risk medical conditions, but had very different experiences of care care as shown in Figures 6.2 and 6.3. For the first woman (Figure 6.2), assessors felt that her risks were not appropriately considered. She was not counselled after her stroke and had a very short interpregnancy interval. Once pregnant, she had appropriate referral to, and inclusion of, multiple different services and specialities but it was evident that there was no oversight or coordination of her care. Many specialities were not aware of the others' involvement and she was expected to attend multiple appointments in many different centres. Despite concerted efforts by some to coordinate appointments, her burden of care was very high. Assessors noted that there was a lot documented about her non-adherence to medications and missed appointments, but very little evidence of support or consideration of the impact of her recent stroke or social risks on her ability to engage with care.

Figure 6.2: Visual representation of care received before, during and after pregnancy for a woman who died from complications of systemic lupus erythematosus*

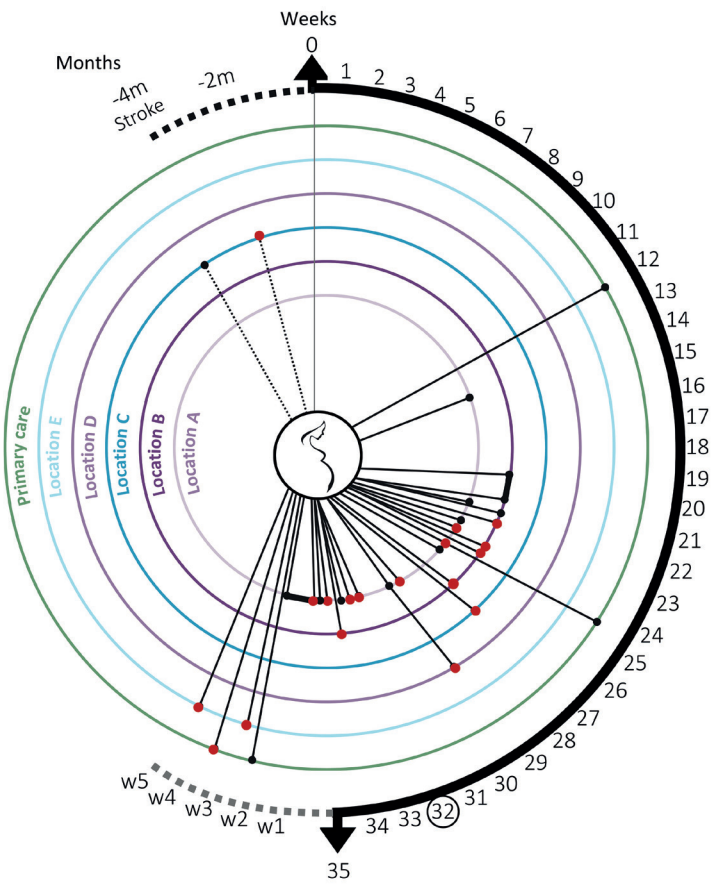


Figure adapted from an original design by Kaat De Backer

* The pre-pregnancy period is presented as the number of months prior to pregnancy (-4m and -2m) and marked by a black dashed line. Pregnancy is presented by gestational week and marked by an external arrow from conception to birth (0-35). Circled gestational weeks indicate that the woman was discussed at a multidisciplinary team meeting. The postnatal period is presented as the number of weeks after birth until the woman's death (w1-w5) and marked by a grey dashed line. Different locations of care are denoted by separately coloured concentric circles. Appointments attended are indicated by a black dot and appointments missed by a red dot. Sections with a black continuous line between appointments represent inpatient admissions.

In comparison, the second woman (Figure 6.3) received pre-pregnancy counselling following a severe SLE flare and her medications were adjusted to pregnancy-safe alternatives. Once pregnant, she received proactive, networked care under the leadership of a named specialist. She also experienced medical complications of her SLE throughout pregnancy, which were monitored and managed appropriately. The difference in these women's outcomes demonstrates the importance of coordinated multidisciplinary working for women with medical and obstetric complexities. When multiple specialities are involved in care, it is essential that there is clinical oversight to provide a helicopter view and ensure pertinent information is shared with all healthcare providers.

Figure 6.3: Visual representation of care received before, during and after pregnancy for a woman with systemic lupus erythematosus who did not die*

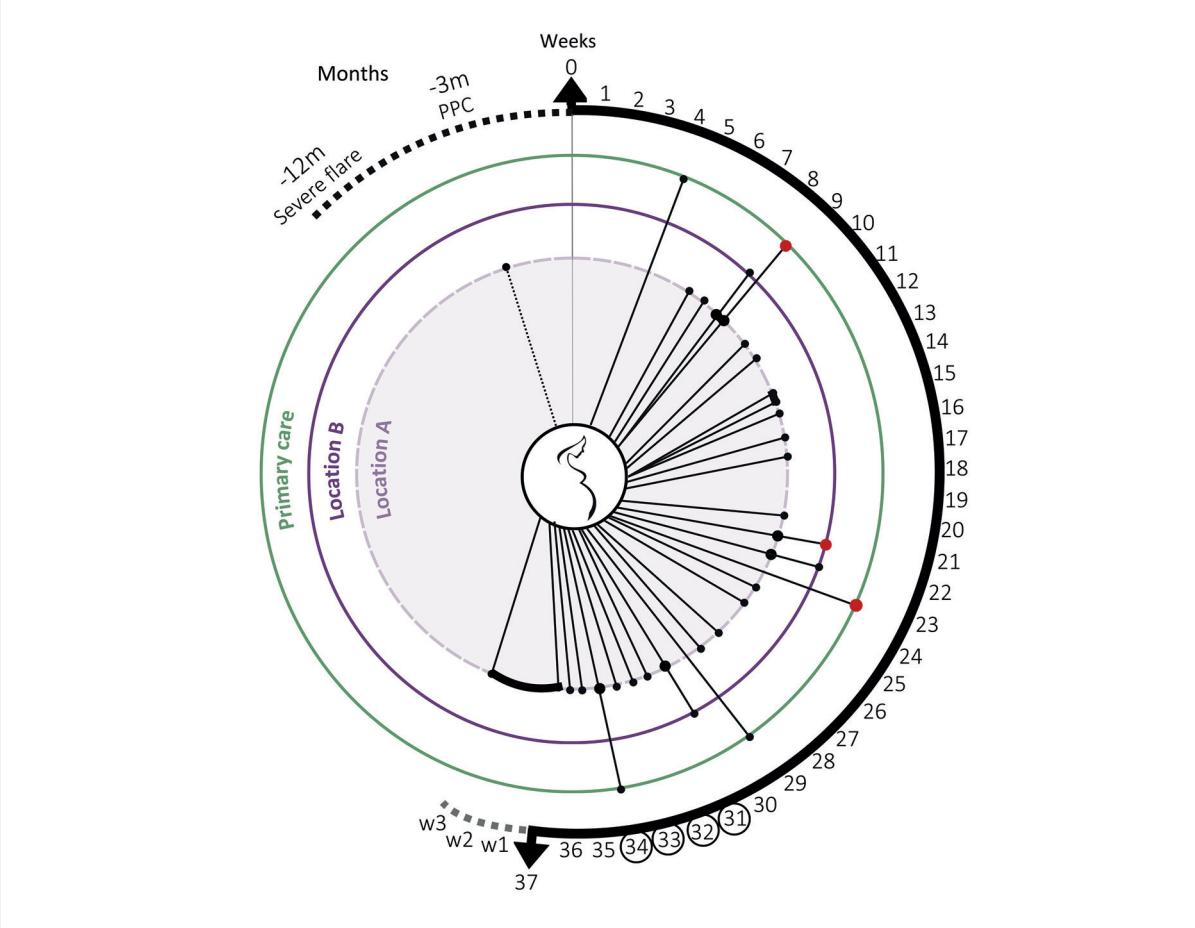


Figure adapted from an original design by Kaat De Backer

* The pre-pregnancy period is presented as the number of months prior to pregnancy (-12m and -3m) and marked by a black dashed line. Pregnancy is presented by gestational week and marked by an external arrow from conception to birth (0-37). Circled gestational weeks indicate that the woman was discussed at a multidisciplinary team meeting. The postnatal period is presented as the number of weeks after birth until the woman's discharge from hospital (w1-w3) and marked by a grey dashed line. Different locations of care are denoted by separately coloured concentric circles; care provided in a maternal medical centre is indicated by a shaded purple circle (Location A). Appointments attended are indicated by a black dot and appointments missed by a red dot. Sections with a black continuous line between appointments represent inpatient admissions. PPC: pre-pregnancy counselling

Clinical message

Clinical message: Provide joined-up care

Senior oversight and effective multidisciplinary working with clear documentation of all multidisciplinary discussions and decision-making can promote consistent management and prevent adverse outcomes that may result from gaps in communication.

In pregnant or postpartum women with complex medical problems involving multiple specialties, the responsible consultant obstetrician or physician must show clear leadership and be responsible for coordinating care and liaising with anaesthetists, midwives, other physicians, and obstetricians and all other professionals who need to be involved in the care of these women (Knight, Nair et al. 2017)

Multidisciplinary working

A woman with idiopathic juvenile arthritis received pre-pregnancy counselling from her rheumatologist, which included a plan to change her medication from tocilizumab to certolizumab at the start of pregnancy. She was recommended to receive care in a maternal medicine centre during pregnancy and was appropriately referred when she became pregnant. Her maternal medicine consultant advised her on the safety of medications during pregnancy and breastfeeding; however, this advice was contradicted by her rheumatology team. M

This woman received counselling from her rheumatologist on several occasions, including before she became pregnant; however, assessors felt that, while this demonstrated good care, she would have benefited from more multidisciplinary discussions between maternal medicine and specialist teams. Tocilizumab can be used safely in pregnancy and while breastfeeding provided that the baby does not receive live vaccines for the first six months after birth (UK Teratology Information Service 2026). In view of this, assessors felt that the decision to switch this woman to certolizumab was not appropriate. While continuity of care with a trusted specialist may be beneficial, it is essential that there is clear communication with obstetric teams or the involvement of an obstetric physician who can provide accurate advice on pregnancy-specific management.

Women with pre-existing medical conditions should have pre-pregnancy counselling by doctors with experience of managing their disorder in pregnancy (Knight, Kenyon et al. 2014)

Assessors noted that this woman did not appear to have been discussed as part of a multidisciplinary team meeting within the maternal medical centre. This was also the case for several other women whose care was reviewed as part of the morbidity enquiry. In instances where meetings were held, these were not always attended by members of the maternal medicine team. Therefore, even when multidisciplinary working was evident, decisions regarding the choice of therapies or the mode and timing of delivery were not always informed by full consideration of the risks and benefits to the mother and her baby. Assessors noted that multidisciplinary team meetings should be properly documented, including who was present and what discussions were held. They also emphasised that members of the team should be able to speak up and challenge one another so that any consensus reached is evidence-based and considers the best interests of both the mother and her baby. Patient advocacy is an important role for all healthcare professionals. Having a nominated lead can help ensure the women's voice is included in any care discussions.

Surgical consultations

A woman in her 40s had social complexities but no medical history of note. She had two previous caesarean sections with uterine adhesions noted during surgery. In this pregnancy she presented on multiple occasions with constipation, abdominal pain and vomiting. It is unclear if these admissions included obstetric review. On her final admission in the early third trimester, a bowel obstruction was confirmed by MRI after some delays in imaging and reporting of results. There was extensive discussion between the maternity and surgical teams around which unit was the most appropriate location of care. She was managed conservatively before rapidly deteriorating less than a week after admission. She had an emergency caesarean birth and laparotomy. The obstruction, secondary to dense adhesions to the uterus, was resolved but she continued to deteriorate and died shortly after the operation.

Assessors felt that improved multidisciplinary working between obstetrics and general surgery may have changed the outcome for this woman. In pregnant women, bowel obstruction secondary to adhesions from abdominal surgery, including caesarean section, should be considered in the differential diagnosis of abdominal pain with new gastro-intestinal symptoms. Assessors felt that multidisciplinary oversight of the woman's repeat symptoms may have prompted investigation and earlier diagnosis. Once admitted, there was a delay in MRI imaging due to concerns around safety for the fetus. While these concerns were discussed between the surgical and radiology teams, it is unclear if multidisciplinary discussions were held with the maternal medical team.

As highlighted in the critical care chapter (Chapter 7) of this report, delays also occurred due to extensive discussions on the appropriate location of care. Assessors noted that neither maternity nor surgical teams felt confident caring for this woman in their units. She was initially cared for on an understaffed labour ward after a referral to general surgery was denied. Her care was then escalated to a surgical unit following repeated referrals from senior staff, by which point her condition had deteriorated. Assessors emphasised that there is a need for a stronger interface between surgery and obstetrics, including multidisciplinary discussions and clear escalation criteria for pregnant women requiring surgical interventions. They also noted that the availability of specialist skills required to care for acutely unwell pregnant women needs to be considered when deciding on the appropriate location of care.

Clinical message

Clinical message: Plan for care outside of maternity wards

Defined management plans, including for assessment and triage in pre-hospital and emergency care settings, and clear communication between hospitals and specialities are important to ensure timely transfer and care in an appropriate setting that matches the woman's clinical needs.

Senior review and oversight

A young woman with cystic fibrosis (CF) died shortly after giving birth. She had one previous pregnancy that was complicated by multiple infective exacerbations of her CF and had been advised not to get pregnant again. She was noted to be pregnant during a hospital attendance for respiratory symptoms. She was seen by a midwife in hospital but was not booked for antenatal care until six weeks later, early in her second trimester. She was not seen by an obstetrician in person but had a telephone appointment with a joint obstetric CF clinic at 23 weeks' gestation. She had multiple admissions in pregnancy and had an emergency caesarean birth early in the third trimester following a severe chest infection that she did not recover from.

This woman had received advice to avoid subsequent pregnancies but it is not clear if this counselling appropriately conveyed her risks or if she was adequately safety-netted when she did become pregnant. Assessors felt there was a missed opportunity to book this woman for antenatal care when she was first admitted to hospital, which may have facilitated earlier referral to specialist care. She was not seen by the joint obstetrics and cystic fibrosis (CF) team until late in her second trimester and this team did not appear to have ownership of her care. They were not informed of multiple missed antenatal appointments and were not always involved in her care when she was admitted to hospital. Assessors felt that earlier and more consistent involvement of her CF team may have improved risk counselling and permitted more informed decision-making.

Safety message

Safety message: Risk counselling

Counselling women about the possible risks of pregnancy, for themselves and their babies, must be trauma informed with consideration of prior adverse experiences and complex social, medical and obstetric histories. Information provided must be balanced to promote informed decision-making and clinicians should be prepared to hold these discussions, including signposting for further support or guidance if needed. Particular consideration is required for higher-risk situations including when women become pregnant or make other decisions against medical advice. In such situations, robust documentation, clear safety-netting procedures and the offer of follow-up discussions and support arrangements are essential to reduce risk.

Set up an urgent referral pathway in early pregnancy for women with high-risk medical conditions or complex social circumstances to ensure they receive early triage for senior or specialist consultation (Felker, Patel et al. 2025)

Good postnatal management

A woman with a history of Crohn's disease and partial small bowel resection was in her second pregnancy. She was booked early for consultant-led care with specialist input. Her Crohn's disease remained stable throughout pregnancy and she had an uncomplicated repeat caesarean birth at term. She had postnatal follow-up from her GP and specialist who discussed restarting her biologic. M

Assessors noted that this woman received good, coordinated care throughout pregnancy and postnatally. There was evidence of clear communication between the maternity team, specialists and GP from the time of booking and also at hospital discharge after birth. Previous enquiries have emphasised the importance of clear discharge summaries for women with complex conditions requiring ongoing management (Felker, Patel et al. 2025). It is essential that any specialist care that was provided before or during pregnancy continues postnatally. This must also include clear clinical oversight to clarify roles and responsibilities required for ongoing support.

Discharge summaries for primary care should clearly indicate in an initial summary box the key conditions that require ongoing support or management and a clear plan for postnatal care. Detailed information about medical, mental health and social complexities and ongoing medications, monitoring requirements or safeguarding concerns must be included to facilitate a clear plan for postnatal care (Felker, Patel et al. 2025)

6.5.4 Gastrointestinal disorders

Pancreatitis

A young woman died from necrotising pancreatitis ten months after a vaginal birth. She had a BMI over 30 kg/m^2 and was considered vulnerable with a history of social service involvement, domestic abuse and mental health problems. She had an uneventful pregnancy with input from a perinatal mental health team and social care. Five months postpartum, she attended the emergency department with severe abdominal pain and vomiting. Her bloods were normal apart from a mildly raised ALT. It is not clear if amylase and lipase were measured. She was discharged with a diagnosis of gastritis and a plan for the GP to repeat her liver function tests in a month. It is not clear if this happened. She presented again three months later with similar symptoms and was admitted for pancreatitis. Scans showed multiple gallstones with necrotising pancreatitis affecting half the pancreas. She was admitted to the ICU but was unable to be resuscitated after a cardiac arrest.

Assessors commented on the number of maternal deaths due to pancreatitis in 2022-24. During this period, ten women died from pancreatitis in the UK and Ireland. This is more than twice the number of women who died from pancreatitis in 2019-21 and five times higher compared to the number of deaths in 2013-15. Of the women who died from pancreatitis in 2022-24, seven had gallstones and all were overweight or obese. Pancreatitis is associated with high rates of mortality, even with good care. It should be considered in the differential diagnosis when women present with abdominal pain and vomiting, especially if they have a raised BMI or have a history or risk of gallstones (Box 6.1). However, for many of the women who died from pancreatitis, there was evidence of delayed diagnosis as clinicians did not seem to appreciate the relevance of a known history of gallstones or of the increased risk of gallstones and cholecystitis in pregnant women. Rather, abdominal pain was often attributed to other causes without proper investigation, including serum amylase testing.

Box 6.1: Risk factors for gallstones

- Female sex
- High oestrogen levels (including pregnancy)
- Age over 40 years
- BMI over 30 mg/kg^2
- Rapid weight loss or prolonged fasting
- A family history of gallstones
- Medical conditions including diabetes, Crohn's disease, cirrhosis and infections
- Diets that are high in refined sugars or fats and low in fibre

As noted, 70% of the women who died from pancreatitis in 2022-24 were obese and the remaining 30% were overweight. Although not commonly available at the time these women died, glucagon like peptide (GLP-1) receptor antagonists are increasingly used to aid weight loss in women of reproductive age. These drugs are associated with rare instances of necrotising and fatal pancreatitis (Medicines and Healthcare products Regulatory Agency 2026b). Although contraindicated in pregnancy, clinicians should be aware of this rare but serious side effect as it could present in pregnancy or the postpartum period.

Escalation of care

A woman in her 40s died from acute pancreatitis six months after birth. She had presented with abdominal pain and bloating at the end of her first trimester and gallstones were confirmed by ultrasound. She was referred for surgical follow-up but did not attend. She was diagnosed with gestational diabetes in the second trimester and had an uncomplicated caesarean birth at 37 weeks' gestation for macrosomia. Six months after giving birth she presented to the emergency department with a three-day history of abdominal pain. A CT scan showed acute mild pancreatitis with gallstones. She was admitted to a surgical ward where she became increasingly acidotic and oliguric over the following two days with worsening pain and raised inflammatory markers. She was reviewed by members of the critical care outreach team and given IV fluids. Following several discussions between the critical care outreach consultant and surgical team, the woman was referred to the ICU but there were further delays in transfer. She continued to deteriorate and died five days after her initial presentation.

The care of this woman demonstrates another common theme across the care of women who died from pancreatitis. In many instances, the severity of women's illness was underappreciated, including the significance of worsening lactic acidosis, evidence of acute kidney injury and raised white cell counts. This woman's condition deteriorated quickly from when she first presented with acute mild pancreatitis. Clinical concern was expressed at several points by the surgical team; however, it is unclear if the critical care outreach team appreciated the severity of her condition. There were multiple requests for urgent review and referral by the surgical team before the woman was finally accepted for transfer to ICU. Service pressures, including bed availability, further delayed transfer and appropriate management. Assessors felt that, had the severity of this woman's condition been appreciated and escalated earlier, including rescheduling of her missed surgical appointment in pregnancy, she may have had a different outcome. The importance of multidisciplinary working, including critical care outreach, and the appropriate location of care are themes explored more in the critical care chapter (Chapter 7) of this report.

Safety message

Safety message: Service provision and acuity

Service provision must keep pace with increasing maternal complexity and clinical demand with regular review of capacity across emergency triage, staffing and operating theatres. Escalation pathways and flexible resource allocation are essential to ensure patient safety during periods of high acuity. Ongoing monitoring and support, including skills-based training, should be prioritised to reduce risk and provide safe, effective care.

6.5.5 Endocrine disorders

Phaeochromocytoma and neurofibromatosis

In 2022-24, two women died from phaeochromocytomas, both discovered at post-mortem examination, and both associated with neurofibromatosis. Phaeochromocytomas in pregnancy are rare, affecting 1 in 15,000 - 300,000 pregnancies, but they carry a high risk of maternal mortality if undiagnosed. They are often difficult to diagnose in pregnancy as their symptoms, particularly hypertension, often mirror those of pre-eclampsia. Screening is recommended for pregnant women who have new, unexplained hypertension before 20 weeks' gestation, or if they experience hypertension without oedema or hyperuricemia (Clifton-Bligh 2023).

One woman who died had early onset hypertension that was attributed to pre-eclampsia in view of a family history of the disorder but without appropriate consideration of her neurofibromatosis. The incidence of phaeochromocytoma in neurofibromatosis is around 0.1-5.7% but screening is recommended only if hypertension is present (Ferreira, Manso et al. 2021). In view of the diagnostic bias towards pre-eclampsia or gestational hypertension in pregnant women, assessors felt that women with known neurofibromatosis should be considered for screening for phaeochromocytoma, particularly if they develop hypertension or have other symptoms such as headache, sweating or tachycardia (Clifton-Bligh 2023).

Diabetes

Diabetic ketoacidosis (DKA)

A vulnerable woman had a history of insulin-treated type 2 diabetes. She booked early in pregnancy and was under the care of a diabetes team. However, distance and financial difficulties made it hard to attend appointments and she did not attend any diabetes clinic appointments in pregnancy. This information was not shared with her GP, with whom she was in routine contact. An ambulance crew attended her home in the third trimester after she experienced shortness of breath. Her initial initial National Early Warning Score (NEWS) was 6 and her blood glucose was elevated. Blood and urine ketones were not tested. Her symptoms were attributed to anxiety and she was not transferred to hospital. She died the next day from diabetic ketoacidosis.

Assessors reinforced that it is possible to develop DKA during pregnancy even if blood glucose levels are only mildly elevated or within normal ranges. This woman had a blood glucose level of 16 mmol, which is well outside the normal range, but this did not appear to be appreciated by the ambulance crew. Ketoacidosis should be considered in any unwell person with diabetes, especially if they present with breathlessness, as ketoacidosis is often associated with tachypnoea. In all instances, blood ketones should be measured and the risk of DKA considered.

Women with long-standing diabetes mellitus are at increased risk of severe hypoglycaemia and diabetic ketoacidosis (Knight, Kenyon et al. 2014)

Clinical message

Clinical message: Record maternal observations using MEWS

Maternity early warning scores (MEWS) should be used for all pregnant or recently pregnant women in all settings, not just maternity.

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Pre-hospital and acute care (NHS England 2026b)

Intervention 2.1:

Implement the national maternity early warning score (MEWS) tool across all settings for women who are or have been pregnant in the past 4 weeks. This means ensuring timely obstetric team and/or obstetric physician review in line with the MEWS escalation timeframes, according to the total score identified and relevant additional concerns.

Assessors emphasised that it is particularly important to recognise the risk of DKA in vulnerable women who may require more support to manage their condition. This woman was a known diabetic but had not attended any appointments at the diabetes clinic during pregnancy. Her non-attendance was recorded, but it is not clear if it was followed-up appropriately or if her GP received this information. Had communication from the diabetes team with her GP been improved, assessors felt that there may have been opportunities to better engage her in care and manage her diabetes.

Clinical message

Clinical message: Provide joined-up care

Senior oversight and effective multidisciplinary working with clear documentation of all multidisciplinary discussions and decision-making can promote consistent management and prevent adverse outcomes that may result from gaps in communication.

The importance of relationships

A vulnerable woman with insulin-dependent type 1 diabetes had a history of mental health problems including self-harm and previous suicide attempts. During pregnancy, her blood sugar was difficult to control and she had multiple admissions for diabetic ketoacidosis (DKA). In the second trimester, her baby was found to have a congenital cardiac anomaly and died shortly after birth. It is unclear if she received perinatal mental health support after the death of her child. Postnatally, her diabetes control deteriorated and she died from DKA three months after giving birth. She had not taken her insulin for over 48 hours.

The care of these two women who died from DKA demonstrates a common theme across this and past MBRRACE-UK reports. Many of the women who died were vulnerable, including six of the eight women with diabetes (75%), and most had periods of disengagement from maternity care. This was particularly apparent in the postnatal period when the supports provided during pregnancy fell away. For women who experienced the loss of a child, including through bereavement or social service involvement, disengagement from care was often associated with deteriorating physical health. While past reports have emphasised the need to consider declining mental health following loss events (Felker, Patel et al. 2025), it is also important to recognise that mental health problems may manifest as inattention to physical health needs.

Ensure specialist perinatal mental health teams undertake a leadership role for the care of pregnant or recently pregnant women with mental health conditions even if women are not accepted for care under their services. This should include a risk assessment, provision of advice and guidance, oversight for joint care planning and support to ensure rapid onward referral into other appropriate mental health services (Felker, Patel et al. 2025)

Loss of a child, either by miscarriage, stillbirth and neonatal death, or by the child being taken into care increases vulnerability to mental illness for the mother and she should receive additional monitoring and support (Knight, Tuffnell et al. 2015)

Ensure that guidance on care for pregnant women with complex social factors is updated to include a role for networked medical care and postnatal follow-up to ensure that it is tailored to women's individual needs and that resources in particular target vulnerable women with medical and mental health comorbidities and social complexity (Knight, Bunch et al. 2023)

Clinical message

Clinical message: Incorporate safeguarding

Effective safeguarding should be incorporated into all aspects of maternity care, especially for women facing multiple disadvantages.

6.5.6 Respiratory disorders

Asthma

A young woman in her first pregnancy had a known history of asthma. She was under the care of her GP having been discharged by the hospital respiratory team after one non-attendance. In the two years preceding pregnancy, she had multiple overnight admissions requiring nebulisers. It is not clear what medication she was using for self-management of her asthma. She had an acute asthma exacerbation at 10 weeks' gestation and was triaged to a GP-led urgent treatment centre. No maternity early warning score (MEWS) or Peak Expiratory Flow Rate (PEFR) were recorded. She was given some nebulised bronchodilators and prescribed antibiotics, steroids and an inhaler but went home before the prescription was issued. Shortly after returning home her symptoms worsened and her family called 999. The ambulance arrived quickly and an obstetric pre-alert was made to the emergency department. She was admitted to critical care but died a week later.

Three womendied from asthma in 2022-24, one of whom, the woman above, was pregnant at the time of her death. The two other women died within the year following pregnancy; both had a history of severe asthma and both had experienced exacerbations during pregnancy. For all three women, assessors noted areas for improvements in asthma management. It is not clear what medications the woman above was using to self-manage her asthma and assessors felt that management of her acute exacerbation in the urgent treatment centre could have been improved.

Asthma management has evolved in recent years, with a shift from short-acting beta-2 agonists alone, to combination treatments with inhaled corticosteroids (Global Intiative for Asthma 2026, National Institute for Health and Care Excellence 2024). For many individuals, this has resulted in better control and long-term stability. However, the care of this woman demonstrates that medication adherence and appropriate management cannot be assumed. The severity of asthma, particularly during pregnancy, should not be underestimated.

[Women] with asthma should have an asthma review during early pregnancy and in the postpartum period. Emphasise the importance and safety of maintaining good control of asthma during pregnancy and of continuing asthma medicines to avoid problems for themselves and their baby.

Check adherence, using prescription records, and inhaler technique at every asthma-related healthcare review.

NICE NG245: Asthma: diagnosis, monitoring and chronic asthma management (BTS, NICE, SIGN) (National Institute for Health and Care Excellence 2024)

6.5.7 Electronic systems

As noted in multiple locations in this chapter and other chapters in this report, the use of disparate electronic record systems in different care settings is becoming a patient safety issue.

> A vulnerable woman in her first pregnancy presented to the emergency department in her second trimester. She was confirmed to be pregnant but this was not communicated to the consultant. The obstetric team was not called and maternity early warning scores (MEWS) were not used. She was diagnosed with diabetic ketoacidosis and managed accordingly. She collapsed a couple hours after her admission and the obstetric team was called for a possible resuscitative hysterotomy (RH). It was noted that the woman's maternity notes were on a different electronic system that could not be accessed in the emergency department. A RH was performed but the woman could not be resuscitated.

There was evidence of service pressures in the care of this woman. She booked late as there were no available appointments and high acuity in the emergency department meant that elements of her care, namely her obstetric care, were overlooked. However, once the obstetric team was involved, it became apparent that relevant electronic patient records were not available in every department of the hospital, which resulted in delays to RH.

> A woman with well-controlled ulcerative colitis moved midway through her pregnancy. This resulted in a transfer of care from a networked tertiary centre to a local maternity unit. It is unclear if all her obstetric records were transferred. She also received input from her regular gastroenterologist who was located in her previous area. There were many communications between the gastroenterologist and the woman and her GP, but not maternity services. M

This woman's care was not joined up but assessors felt it was appropriate in the absence of flares and her desire to stay with her regular gastroenterologist, who was familiar with her condition. However, after her move, her gastroenterologist was located in a different region, which meant it was not possible to share electronic patient records. Instead, communication was via letters addressed to the woman and her GP. While these letters were detailed and included forward planning for after pregnancy, assessors felt that this indirect communication may not have been sufficient if the woman had experienced a flare or another complication during pregnancy. They noted that there needs to be consistency in electronic patient records, either nationally, or simply within trusts or regions so key information is widely available and specialist care is not isolated.

Safety message

Safety message: Electronic patient records

The use of different electronic patient record systems within or between different trusts or health boards, primary care and emergency services may lead to gaps in communication, underappreciation of deterioration, missed opportunities for intervention and diminished continuity of care. Improving the interoperability of systems and standardising key elements, including the ability to attach key pieces of correspondence and the integration of early warning scores, should be prioritised to support timely decision-making, minimise risk and enhance outcomes. The readability of outputs, including copies of records for use in review processes, must also be improved to facilitate learning from adverse events.

6.6 Conclusions

Many of the women in this chapter had multiple, complex medical disorders, which, in most instances, were further complicated by their social circumstances or elements of disadvantage. While many of the messages for care are repeated from previous reports and echoed across other chapters in this report, assessors re-emphasised a need to improve pre- and interpregnancy counselling, networked maternal medical care and joined-up working to support and manage an obstetric population with increasing medical, surgical, mental health and social care needs. However, it was also noted that, in order to support the increasing complexity of the maternity population, health services must be better equipped. This includes a need for improved interoperability of electronic patient record systems so that every service a woman interacts with is aware of her unique history and needs.

Information was sufficient to assess the care of all but three of the women who died from general medical and surgical conditions. Of the 54 women whose care could be reviewed, assessors felt that 19% received good care; however, for the majority of women (n=29, 54%), they noted improvements in care that may have made a difference to the outcome (Table 6.2).

The records of 33 women were available for review for this year's morbidity enquiry of women with networked medical care. Assessors felt that nearly a third of these women received good care (n=10, 30%) and just over half had improvements in care noted but that would not have changed their outcome (n=17, 52%) (Table 6.3).

Table 6.2: Classification of care received by the women who died from general medical and surgical conditions, UK and Ireland 2022-24

Classification of care received	Women who died from general medical or surgical disorders* Number (%) N=54
Good care	10 (19)
Improvements to care which would have made no difference to outcome	15 (28)
Improvements to care which may have made a difference to outcome	29 (54)

*Includes only women whose case notes were available with sufficient information for an in-depth review

Table 6.3: Classification of care received by the women who are included in the morbidity confidential enquiry into the care of women requiring networked maternal medical care, UK 2024

Classification of care received	Women included in the morbidity enquiry Number (%) N=33
Good care	10 (30)
Improvements to care which would have made no difference to outcome	17 (52)
Improvements to care which may have made a difference to outcome	6 (18)

7. Lessons for critical care

Katie Cranfield, Steve Cantellow, Debbie Horner, Marian Knight and Allison Felker on behalf of the MBRRACE-UK critical care chapter writing group

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7.1 Key messages

Existing guidance and recommendations requiring improved implementation

Ensure the appropriate national Maternity Early Warning Score is used to monitor pregnant women wherever in the hospital she receives care (Knight, Bunch et al. 2022)

Consultants in intensive care should have an active role in multidisciplinary discussions and meetings concerning the pre-conception, antenatal, peripartum and post-partum care of patients with significant pathology, especially those likely to require ICU admission (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

Intensive care services must establish a clearly defined 24/7 escalation route for maternity patients to access intensive care, including from enhanced maternal care units when they have separate oversight (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

The transfer of critically ill maternity patients should follow the specific guidance for this patient group (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

Women with pre-existing medical conditions should have pre-pregnancy counselling by doctors with experience of managing their disorder in pregnancy (Knight, Kenyon et al. 2014)

All intensive care services (including outreach) caring for maternity patients must appoint a named lead clinician and a lead nurse for maternal critical care (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

All maternity patients admitted to intensive care must have evidence of a clearly documented, multidisciplinary, intensive care, obstetric and anaesthetic consultant-led review at least once every 24 hours (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

Local measures must be in place to promote and facilitate breastfeeding, including milk expression, and to ensure routine contact between the patient and their newborn whilst receiving intensive care (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

A general clinical assessment should be performed to assess nutrition in the ICU, until a specific tool has been validated. General clinical assessment could include anamnesis, report of unintentional weight loss or decrease in physical performance before ICU admission, physical examination, general assessment of body composition, and muscle mass and strength, if possible (Singer, Blaser et al. 2023)

Every critically ill patient staying for more than 48 h in the ICU should be considered at risk for malnutrition (Singer, Blaser et al. 2023)

You must make sure that formal records of your work (including patients' records) are clear, accurate, contemporaneous and legible (General Medical Council 2024)

Following discussions and meetings with the partner and family members, it is important to keep records of all conversations and what the partner and family have been told regarding the circumstances surrounding the death and eventually the cause of death (Royal College of Obstetricians and Gynaecologists 2024a)

Data relating to enhanced maternal care and maternal critical care should be routinely collected and reviewed to enable benchmarking and improve outcomes, with insights disseminated to the wider multidisciplinary team (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

Although a serious incident investigation may not be necessary, it is best practice to review the whole pathway of the woman's care to consider if there were any patient safety issues, and other aspects of care earlier in the woman's journey, which affected the quality of her care and the outcome, and to improve care for future women with the same condition (Royal College of Obstetricians and Gynaecologists 2024a)

7.2 Background

The last chapter dedicated to lessons for critical care appeared in the MBRRACE-UK report covering 2018-20. Since then, new national guidance relevant to maternal critical care has been published across several key areas. Updated guidance on the provision of intensive care services includes specifics related to the care of critically ill pregnant (or recently pregnant) women within the ICU (Faculty of Intensive Care Medicine and Intensive Care Society 2026), Enhanced Maternal Care (EMC) guidance with more specific information on the development and implementation of EMC units (Intensive Care Society 2023) and a supplementary resource for the transfer of critically ill maternity patients (Intensive Care Society 2026). These guidance documents help clarify the needs of critically ill pregnant or recently pregnant women regardless of their care location and emphasise the importance of multidisciplinary working as highlighted in past reports (Knight, Bunch et al. 2022). Further to changes in guidance, service specifications for MMNs across England highlight the contribution of critical care specialists to the management of women with medical conditions before pregnancy, during pregnancy and in the peri- and postpartum periods (NHS England 2021) and updates to the maternal critical care competencies for critical care nurses (Witton, Clegg et al. 2024) reflect increasing clinical engagement in improving care for this group of women.

The care of critically ill pregnant and recently pregnant women sits at the interface of obstetrics and intensive care. Safe practice therefore depends on clinicians in both specialties understanding when and how to involve one another and work together effectively. However, despite the recent updates to national guidance, critical care assessors highlighted that current training structures do not reliably support this cross-speciality collaboration. Neither the RCOG nor the Faculty of Intensive Care Medicine (FICM, now the College of Intensive Care Medicine (CICM)) curricula mandate defined placement in the other's setting (Faculty of Intensive Care Medicine 2021, Royal College of Obstetricians and Gynaecologists 2024b). This means that obstetricians may not have familiarity with organ support or invasive monitoring and intensivists may not be aware of maternal physiology or the management of obstetric emergencies. Compounding this issue, the proportion of intensive care medicine residents entering from anaesthesia, which has historically provided obstetric exposure, is falling, and recent changes to anaesthetic training have reduced obstetric requirements (Royal College of Anaesthetists 2021). Cross-speciality exposure is considered essential for safe practice in other General Medical Council approved curricula. For instance, FICM requires placements in paediatric and cardiothoracic intensive care. Assessors felt that the same principle should apply to obstetric critical care and structural biases in medical training should be amended so that clinicians are aware of the unique care needs of pregnant and recently pregnant women and are able to provide equitable treatment. Maternal critical care admission is associated with an increased risk of adverse short- and long-term maternal, pregnancy and neonatal outcomes (Masterson, Adamestam et al. 2024). The care of the women reviewed in this chapter highlights several important learning points to support ongoing efforts to reduce these risks.

7.3 The women who died

During the four-year period (2021-24) since the last MBRRACE-UK report that featured lessons for critical care, there were 144 women who were admitted to ICU prior to their death. Sepsis was the most frequent cause of death amongst these women (Table 7.1), including four women who died from COVID-19 in 2021-24. Neurological and other general medical and surgical disorders were the next most frequent causes of death.

Table 7.1: Causes of death amongst women who required critical care admission, UK and Ireland 2021-24

Cause of death	Number of women (%) N=144
Sepsis	28 (19)
Neurological	25 (17)
Other indirect deaths	25 (17)
Thrombosis and thromboembolism	14 (10)
Deaths from psychiatric cause	13 (9)
Cardiac disease	13 (9)
Pre-eclampsia and eclampsia	5 (4)
Obstetric haemorrhage	5 (4)
Amniotic fluid embolism	4 (3)
Early pregnancy death	4 (3)
Malignancy	4 (3)
Accidental	2 (1)
Unascertained	2 (1)

7.4 Overview of care and lessons to be learned

7.4.1 Identification of critical illness

Recurring themes highlighted in this report and other MBRRACE-UK reports include the need to recognise women who are unwell or deteriorating and respond promptly and appropriately to abnormal physiological parameters, including escalation of care when needed. As noted in Chapters 4 (Infection), 5 (Neurology) and 6 (Other indirect deaths) of this report, although MEWS are now widely embedded within maternity services, there is a persistent gap in their use outside maternity settings, including in acute care. Evidence suggests that urgent and emergency services are disproportionately accessed by women living in more deprived areas (Office for National Statistics 2023). Standardising care in these settings can help improve outcomes for pregnant and recently pregnant women facing barriers in accessing care through other routes. NHS England's Maternal Care Bundle aims to support the implementation of the MEWS tool across all healthcare settings that may be accessed by pregnant or recently pregnant women (NHS England 2026b) and MEWS parameters are embedded in the national pre-hospital Maternity Decision Tool (Joint Royal Colleges Ambulance Liaison Committee (JRCALC) and Association of Ambulance Chief Executives (AACE) 2024). In the devolved nations and Republic of Ireland, alternative national MEWS tools have been similarly developed and supported for implementation across all relevant care settings (Health Improvement Scotland 2021, Intensive Care Society 2023, Rose 2025).

NHS England's Maternal Care Bundle

***NHS England's Maternal Care Bundle*:** Pre-hospital and acute care (NHS England 2026b)

Intervention 2.1:

Implement the national maternity early warning score (MEWS) tool across all settings for women who are or have been pregnant in the past 4 weeks. This means ensuring timely obstetric team and/or obstetric physician review in line with the MEWS escalation timeframes, according to the total score identified and relevant additional concerns.

Clinical message

Clinical message: Record maternal observations using MEWS

Maternity early warning scores (MEWS) should be used for all pregnant or recently pregnant women in all settings, not just maternity.

Ensure the appropriate national Maternity Early Warning Score is used to monitor pregnant women wherever in the hospital she receives care (Knight, Bunch et al. 2022)

7.4.2 Multidisciplinary working

A woman in her 20s had an induction of labour at term for prolonged rupture of membranes. Shortly after induction, she deteriorated rapidly and became unresponsive and hypotensive. She was urgently transferred to theatre for an emergency caesarean birth but arrested shortly after initiation of anaesthesia. Senior critical care and haematology staff attended within a few minutes. Multidisciplinary discussions were held regarding acute investigations and management. Despite extensive resuscitation efforts the woman died shortly after giving birth. Following post-mortem and clinical review, the cause of death was considered to be amniotic fluid embolism.

Multidisciplinary working is a common theme across all MBRRACE-UK reports and can be particularly complicated when caring for pregnant or recently pregnant women who are critically ill. Previous reports have emphasised that critical care should be regarded as a treatment approach rather than a specific location of care (Knight, Bunch et al. 2022), especially as no single care setting or team is typically equipped to manage all of a woman's complex needs (Cranfield, Horner et al. 2023, Knight, Bunch et al. 2022). Therefore, effective care relies on a collaborative, multidisciplinary approach, with relevant services attending the woman's location, as was the case for the woman above.

Previous enquiries into critical care have demonstrated the unique challenges that arise when speciality teams who may have no experience working together engage in coordinated clinical decision making, particularly in acute situations (Knight, Bunch et al. 2022). While some acute events are not predictable, advance planning is essential when risks of deterioration are identified. It is important that multidisciplinary management plans are developed proactively to prepare for emergencies and are adaptable to changing maternal condition (Faculty of Intensive Care Medicine and Intensive Care Society 2026).

Consultants in intensive care should have an active role in multidisciplinary discussions and meetings concerning the pre-conception, antenatal, peripartum and post-partum care of patients with significant pathology, especially those likely to require ICU admission.

Guidelines for the Provision of Intensive Care Services (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

7.4.3 Escalation of care

Updated guidance on Enhanced Maternal Care (EMC) units recognises potential variations in local resources and service pressures and acknowledges that 'one size fits all' models of care are likely to be impractical or inappropriate across all units (Intensive Care Society 2023). Rather, models of care must be tailored at a local level to meet the needs of women requiring enhanced maternal support. A similar principle should be applied to the provision of maternal critical care, including clearly defined pathways for escalation to critical care services (Faculty of Intensive Care Medicine and Intensive Care Society 2026). These pathways should be developed collaboratively and include multidisciplinary team input (including maternal medicine services where relevant) to support timely and coordinated patient-centred care.

A woman presented to hospital with acute chest pain, shortness of breath and bradycardia. Pulmonary embolism was considered but excluded after a CT pulmonary angiogram. She was discharged home with a planned follow-up appointment with outpatient cardiology. She had ongoing symptoms and re-presented to the emergency department where she was treated for presumed sepsis. She was admitted to the acute medical unit where observations recorded on a National Early Warning Score (NEWS2) chart showed worsening hypotension and tachypnoea. In view of her deterioration, critical care outreach was called. They reviewed the woman's electronic record remotely and advised IV fluids. Over the next four hours the woman deteriorated further before a face-to-face ICU review was arranged. She was admitted to critical care later that day by which point she required emergency intubation and rapidly developed multi-organ dysfunction. In spite of ongoing critical care treatment, she died the day after admission. *E. coli* was detected in her urine at post-mortem.

Assessors noted that this woman's care was not in keeping with national 'track and trigger' escalation guidelines. They felt that, in view of her suspected sepsis and postpartum state, she should have had urgent review when she became hypotensive. Escalation pathways should mandate the use of appropriate monitoring and escalation for all women who are pregnant or who have been pregnant in the past four weeks, in line with national MEWS guidance (Faculty of Intensive Care Medicine and Intensive Care Society 2026, NHS England 2026b), to ensure that deterioration is recognised and acted on early. It was unclear from the reviews whether her postpartum state was communicated to the ICU. Assessors felt that, had her recent pregnancy been taken into account, including appropriate use of MEWS, her care may have been escalated sooner.

As it was, this woman did not have a face-to-face review by either critical care outreach or the ICU medical team until she had already significantly deteriorated. The national standard of care for critically ill patients requires a structured bedside ward round led by a consultant (Intensive Care Society and Faculty of Intensive Care Medicine 2026). It is not sufficient to rely on remote review of electronic records as they may include physiological observations that are incomplete or outdated. If immediate transfer to ICU is not possible, staff with the necessary expertise need to be able to provide care at the woman's location until transfer is available (Faculty of Intensive Care Medicine and Intensive Care Society 2026, Knight, Bunch et al. 2022).

Intensive care services must establish a clearly defined 24/7 escalation route for maternity patients to access intensive care, including from enhanced maternal care units when they have separate oversight.

Guidelines for the Provision of Intensive Care Services (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

7.4.4 Transfers

An important consequence of specialised services and split-site working is the potential need for both intra- and inter-hospital transfers of critically unwell women. Thus, while it is recognised that acutely unwell women should have immediate access to critical care services, this can be challenging in situations where critical care facilities are geographically separate from obstetric services (Banerjee and Cantellow 2021, Royal College of Anaesthetists 2018).

In such instances, early involvement of senior multidisciplinary teams is vital to support decision-making regarding the most appropriate location of care. These decisions should consider local service configuration and available resources (Faculty of Intensive Care Medicine and Intensive Care Society 2026, Royal College of Anaesthetists 2018).

A woman became unresponsive at home late in her third trimester. She had abnormal limb movements before going into cardiac arrest. A pre-hospital team attended and achieved return of spontaneous circulation. Multidisciplinary team discussions were held on site between senior clinicians and a Helicopter Emergency Medical Service consultant regarding the most appropriate care location. A decision was made to bypass the local emergency department and transfer the woman directly to a neurosurgical unit. The woman was transferred by air by a specialist pre-hospital transfer team. The neurosurgical unit was pre-alerted and consultants from the emergency department, critical care, anaesthesia, obstetric and neonatal teams were waiting upon arrival. Her baby had already died by the time of arrival in hospital, where a resuscitative hysterotomy was performed. A maternal CT scan showed evidence of a massive subarachnoid haemorrhage. No surgical intervention could be offered and the woman was transferred to the ICU. Following a multidisciplinary team discussion and consultation with the woman's family, care was withdrawn and the woman died.

Assessors felt that the decisions made for this woman demonstrated many points of good care. They specifically highlighted the multidisciplinary working and clear communication, including a pre-hospital alert, which permitted rapid involvement from senior clinicians. However, as demonstrated by the care of this woman, decisions around transfer and the most appropriate location of care often require complex and finely balanced decisions made within an acute, time-pressured environment. The pre-hospital team caring for this woman suspected an intracranial pathology and made the decision to bypass the emergency department and transfer her to a neurosurgical unit to prioritise her health. Although there are currently no nationally agreed bypass criteria for maternal cardiac arrest, assessors noted that this decision was outside of local guidance for transfer. They questioned whether this decision delayed definitive management for the mother and whether transfer to the nearest emergency department may have changed the baby's outcome.

Where transfer is required, it should be undertaken in line with national guidance developed specifically to support the safe care of obstetric patients (Intensive Care Society 2026). Although this guidance does not cover primary conveyance, including transfer by air, its principles may be applied pragmatically when a critically ill pregnant or recently pregnant woman is transported by ambulance.

The transfer of critically ill maternity patients should follow the specific guidance for this patient group.

Guidelines for the Provision of Intensive Care Services (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

7.4.5 Routine ICU care

Admission to critical care during pregnancy and the peripartum period is relatively uncommon in the UK. A recent cohort study of women giving birth in Scottish hospitals found that 0.18% of women were admitted to the ICU (Masterson, Adamestam et al. 2024). As a result, critical care staff may have limited exposure to this group. Clear communication and multidisciplinary working, including regular obstetric review, are vital to deliver optimal care.

Pregnancy testing

A young woman with a history of substance use had an associated medical condition that caused chronic pain. She had multiple presentations in primary and emergency care services in a short time period with increasing abdominal pain and weight loss. A pregnancy test was not performed on any occasion. On her final presentation, she was in extremis with urinary sepsis and pyelonephritis. A CT scan showed a gravid uterus with evidence of a missed miscarriage at approximately 14 weeks' gestation. She developed multiorgan failure secondary to sepsis and died shortly after admission.

Critical care clinicians caring for acutely unwell women of reproductive age should be aware of the potential of pregnancy in women who present with new or non-specific symptoms. As emphasised in past reports and recommended by NICE guidance, pregnancy should not be excluded from the differential diagnosis until a pregnancy test has been offered and confirmed to be negative (Felker, Patel et al. 2024, National Institute for Health and Care Excellence 2019b).

Even when a pregnancy test is negative, critical care teams may often care for women with chronic medical conditions or social complexities. As such, they are well placed to identify women who may benefit from pre-pregnancy counselling and support. Even if pregnancy is not currently being planned, clinicians should consider signposting women to local or regional pre-pregnancy services following recovery and discharge to support informed discussions about the potential risks associated with an unplanned pregnancy in the context of their health, and to consider appropriate contraceptive options where desired.

Women with pre-existing medical conditions should have pre-pregnancy counselling by doctors with experience of managing their disorder in pregnancy (Knight, Kenyon et al. 2014)

Obstetric management in critical care

A young woman developed a facial rash shortly before her first pregnancy. She had multiple appointments with her GP in early pregnancy and was treated with topical steroids and antibiotics. A diagnosis of systemic lupus erythematosus (SLE) was considered following an appointment with a consultant dermatologist at 13 weeks' gestation. Less than a month later, she was admitted to a different hospital's ICU with a rash over nearly half her body. She had dermatology and rheumatology advice while on the ICU but did not have obstetric involvement. She was discharged after five days and re-presented to the same emergency department less than a week later where she waited over 40 hours before being admitted to the ICU. Haemophagocytic lymphohistiocytosis (HLH) was considered and she had a bone marrow biopsy. She deteriorated rapidly and an extracorporeal membrane oxygenation (ECMO) referral was made three days after her admission. This was declined and she died the next day, in her second trimester.

Assessors identified areas where improvements in communication between hospitals and between specialities in each hospital may have changed this woman's outcome. There was evidence of siloed working in the care she received from dermatology and rheumatology while on the ICU. These appointments were not combined resulting in unnecessary re-investigation of her SLE and inaccurate interpretation of her history, including when her rash first developed in relation to steroid use. Many women will present with more than one complex medical condition. Effective communication and collaboration are essential to prevent the duplication of efforts and avoid unnecessary delays in management. If multidisciplinary team meetings are held to discuss women's care, they should include all relevant specialities, including obstetrics, with clear documentation of who was present and what was discussed.

Clinical message

Clinical message: Provide joined-up care

Senior oversight and effective multidisciplinary working with clear documentation of all multidisciplinary discussions and decision-making can promote consistent management and prevent adverse outcomes that may result from gaps in communication.

This woman had very limited obstetric involvement during her admission to the ICU; she was reviewed by a senior obstetric registrar on her second admission who decided that she did not need daily obstetric review due to an upcoming antenatal appointment. Guidelines for the Provision of Intensive Care Services specify daily obstetric review as a minimum standard of care for maternity patients admitted to the ICU. For women under 20 weeks' gestation, this may be substituted by gynaecology review depending on local arrangements. These guidelines also recommend named leads for maternal critical care who can provide oversight and coordinate multidisciplinary care (Faculty of Intensive Care Medicine and Intensive Care Society 2026).

All intensive care services (including outreach) caring for maternity patients must appoint a named lead clinician and a lead nurse for maternal critical care.

All maternity patients admitted to intensive care must have evidence of a clearly documented, multidisciplinary, intensive care, obstetric and anaesthetic consultant-led review at least once every 24 hours.

Guidelines for the Provision of Intensive Care Services (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

Obstetric involvement in the care of critically ill maternity patients is crucial to ensure that care is appropriate and equitable. This may involve providing advice on the safety of medications, treatments and imaging modalities in pregnancy or risk counselling so that the woman can make informed decisions about her own care and the care of her baby. This woman developed an infection during her admission and was counselled about the potential risks of antibiotic use for her baby by a critical care physician. She chose not to go home with antibiotics and instead was given safety-netting advice for signs of sepsis. Assessors felt that she would have benefited from obstetric input that more clearly outlined the significant risk of sepsis for the woman versus limited risks of *in utero* antibiotic exposure for the baby. They also felt that risk counselling and safety-netting advice at hospital discharge needs to consider other potential barriers in access, including system pressures and long wait times in emergency departments.

Safety message

Safety message: Risk counselling

Counselling women about the possible risks of pregnancy, for themselves and their babies, must be trauma informed with consideration of prior adverse experiences and complex social, medical and obstetric histories. Information provided must be balanced to promote informed decision-making and clinicians should be prepared to hold these discussions, including signposting for further support or guidance if needed. Particular consideration is required for higher-risk situations including when women become pregnant or make other decisions against medical advice. In such situations, robust documentation, clear safety-netting procedures and the offer of follow-up discussions and support arrangements are essential to reduce risk

Improving obstetric critical care

Although the appointment of a named lead and daily obstetric review is regarded as a minimum standard, this is dependent on staff capacity and the availability of services. Hospitals differ in their configuration of care for women who are critically ill during pregnancy. Regardless of the care setting, whether it is the labour ward, medical ward or ICU, it is important that hospitals recognise potential pitfalls in the configuration of services and facilitate ways of providing appropriate, multidisciplinary care regardless of the location. This should include clear escalation pathways that recognise the dynamic nature of staffing workload and ward capacity.

Clinical message

Clinical message: Plan for care outside of maternity wards

Defined management plans, including for assessment and triage in pre-hospital and emergency care settings, and clear communication between hospitals and specialities are important to ensure timely transfer and care in an appropriate setting that matches the woman's clinical needs.

Critical care units that admit obstetric patients should be supported to develop local policies and guidance to facilitate safe and effective care delivery (Faculty of Intensive Care Medicine and Intensive Care Society 2026). The use of structured tools, such as checklists or care bundles, may help to promote consistency and support the delivery of high-quality care (Horner and Bellamy 2012). Efforts to enhance staff knowledge and confidence, including maternal critical care competencies for nurses and midwives (Royal College of Anaesthetists 2018, Witton, Clegg et al. 2024) and national recommendations for multidisciplinary learning related to obstetric critical care (Intensive Care Society and Faculty of Intensive Care Medicine 2026) are essential. However, education alone will not fully address the challenges associated with infrequent exposure to critically ill pregnant or recently pregnant women. Regular rehearsal and simulation for the management of deteriorating obstetric patients is also recommended in the European Resuscitation Council Guidelines on special circumstances (Lott, Karageorgos et al. 2025).

Safety message

Safety message: Service provision and acuity

Service provision must keep pace with increasing maternal complexity and clinical demand with regular review of capacity across emergency triage, staffing and operating theatres. Escalation pathways and flexible resource allocation are essential to ensure patient safety during periods of high acuity. Ongoing monitoring and support, including skills-based training, should be prioritised to reduce risk and provide safe, effective care.

Good multidisciplinary care

An older woman was admitted to critical care due to shortness of breath two weeks after giving birth. Chest imaging was consistent with bilateral pneumonitis and she had multiorgan dysfunction. She had a prolonged critical care admission with multidisciplinary review and specialist input from respirology, microbiology, extracorporeal membrane oxygenation (ECMO) services and a maternal medicine team. Maternal observations were recorded using maternity early warning scores (MEWS) and she was appropriately treated with steroids and referred for ECMO. Her family were informed of and included in all decisions and she was supported to see her baby while on the ICU. Despite extensive efforts, she died one month after admission.

As demonstrated by the care of this woman, a multidisciplinary approach can improve the quality of routine care, while also strengthening shared decision-making and wider supports, such as facilitating contact between the mother and baby. Such contact, alongside appropriate support for breastfeeding, enables women to engage in their role as mothers and aims to help their recovery.

Local measures must be in place to promote and facilitate breastfeeding, including milk expression, and to ensure routine contact between the patient and their newborn whilst receiving intensive care.

Guidelines for the Provision of Intensive Care Services (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

Nutritional requirements

As highlighted in a previous critical care report (Knight, Bunch et al. 2022), there were several learning points identified in this year's enquiry around pregnancy-specific aspects of supportive care, including awareness of nutritional requirements during pregnancy.

A woman had a complex medical history including systemic lupus erythematosus (SLE). She had a BMI <20 kg/m^2 at booking and had significant weight loss in early pregnancy. In the second trimester she presented with recurrent seizures and was intubated and ventilated in the emergency department. She was also noted to be hypoglycaemic and febrile. She was transferred to ICU and was acidotic on arrival but her ketones were not checked. Starvation ketosis was not considered and she was not reviewed by a dietician. She was stabilised and discharged and subsequently died from complications of SLE shortly after giving birth.

Assessors suspected that this woman had starvation ketosis, but this could not be confirmed as her ketones were not checked. They felt that review by a dietician with specific obstetric and critical care experience would have been helpful given her hypoglycaemic state, low BMI and significant weight loss in early pregnancy. Such a review may have ensured that she had supplementary nutrition or adequate micronutrient supplementation for pregnancy while in critical care.

During pregnancy, women have a higher basal metabolic rate compared to their non-pregnant baseline and are more susceptible to the effects of reduced caloric intake. As a result, ketosis may develop after relatively short periods of limited oral intake, especially in the third trimester (Mohan and Banerjee 2021). A low threshold for starvation ketosis should be considered in pregnant women alongside appropriate measurement of blood ketones. Nutritional support and supplementation should also be prioritised for pregnant women in line with national guidance (National Institute for Health and Care Excellence 2025a), which recommends:

- Folic acid: 400 micrograms daily during pregnancy, with higher-dose folic acid (5 mg a day) for women at increased risk of neural tube defects (including those with relevant medical conditions, raised BMI, or medication exposures)
- Vitamin D: 10 micrograms daily during pregnancy

Women with poor nutritional reserves, such as those with low BMI or restrictive diets may require extra vitamin or micronutrient supplementation. Additional care, including early support from dieticians, can help assess and manage support for these women, including in situations where they become critically unwell.

A general clinical assessment should be performed to assess nutrition in the ICU, until a specific tool has been validated. General clinical assessment could include anamnesis, report of unintentional weight loss or decrease in physical performance before ICU admission, physical examination, general assessment of body composition, and muscle mass and strength, if possible.

Every critically ill patient staying for more than 48 h in the ICU should be considered at risk for malnutrition.

ESPEN guideline on clinical nutrition in the intensive care unit (Singer, Blaser et al. 2023)

7.4.6 Equity of care

Neuroprognostication

A woman had persistent hypertension after giving birth. Four months postpartum, she had an out-of-hospital cardiac arrest. She was transferred to critical care where she received post-cardiac arrest care including targeted temperature management. There were no facilities for on-site supplementary investigations. A week after her cardiac arrest, there were ongoing concerns regarding her neurological recovery and she was transferred to a regional neurocritical care unit for ongoing management and specialist prognostication. CT and MRI imaging suggested hypoxic brain injury and she developed seizures. The family were consulted and treatment shifted to palliation. The family was provided with bereavement support and the woman died several days later.

There were many women whose care was reviewed as part of this chapter who required critical care input following cardiac arrest. The Resuscitation Council UK recently published updated guidance on neuroprognostication in the comatose adult patient as part of their guidelines on post-resuscitation care (Nolan, Charlton-Webb et al. 2025). However, there was evidence from the reviews included in this chapter of ongoing disparities in the provision of care between units for pregnant and recently pregnant women. For the woman described above, UK guidance on neuroprognostication was not followed. She did not have an EEG or other ancillary investigations and there was no clear documentation of recognised predictors of poor neurological outcome. Whilst the reasons for this were not clear, it serves as a reminder that pregnant and recently pregnant women should receive the same standard of care as the non-pregnant population, unless there is a clear clinical justification not to do so.

Best interest decisions and devastating brain injury

A woman presented to the emergency department in the first trimester with a severe headache, vomiting and subsequent collapse. She had a history of epilepsy and a previously clipped cerebral artery aneurysm. A scan showed a subarachnoid haemorrhage secondary to the aneurysm that was not amenable to surgical intervention. She developed fixed dilated pupils and concerns were raised about possible brainstem death. An extensive multidisciplinary team meeting was held with senior clinicians, ethics committee members, organ donation leads and legal advisors who agreed that continuation of life-sustaining treatment to reach fetal viability was not appropriate. The family were counselled regarding brainstem death, including the testing process and informed of the low likelihood of supporting an ongoing pregnancy. Organ donation was discussed with the family, but was declined. The family were supported throughout the woman's death and afterwards.

Within critical care, clinicians are experienced in providing care for individuals who may not have decision-making capacity; however, this woman's care highlights some of the ethical and legal challenges faced when managing a pregnant woman who does not have capacity. In such instances, there is a need for excellent multidisciplinary teamworking and communication at all stages, including with the family. Previous MBRRACE-UK reports have highlighted delays or alterations to standard clinical practice arising from 'fetal fixation', where concern for the baby takes precedence over the investigation or treatment of the mother's illness (Chu, Johnston et al. 2020, Felker, Patel et al. 2024, Knight, Bunch et al. 2021b). Clinicians caring for pregnant women should use standard capacity assessments and refer to local and national guidance, seeking legal advice where appropriate, to support decisions about what treatment is in the woman's best interest. The same principles as for non-pregnant women should be applied.

A multidisciplinary approach, alongside early engagement with legal services, where needed, can help ensure that decisions are carefully considered, lawful, and centred on the woman's best interests in line with the standard of care and established legal and ethical frameworks. Where no formal legal authority exists, such as a Lasting Power of Attorney for health and welfare, family members are not able to provide consent on behalf of the woman (Intensive Care Society 2019, UK Public General Acts 2005). However, their insights remain an important part of understanding the woman's values, wishes and preferences.

Instances of brain-death in pregnancy are inevitably difficult for all involved, including the woman's family and the staff caring for her. However, the legal challenges regarding such complex circumstances, including discontinuation of maternal support after brain death, are largely untested in the UK (Warren, Kelly et al. 2021).

In 2025, the Academy of Medical Royal Colleges published an update to the Code of Practice for the diagnosis and confirmation of death (Academy of Medical Royal Colleges 2025). While the women included in this report died before this update was published, it is important to highlight that the principle of equitable care for pregnant women must also apply to the diagnosis and confirmation of death. This is particularly relevant when considering the diagnosis of death using neurological criteria, which are used when death is suspected to have occurred following a devastating brain injury. It is applicable to individuals who remain deeply comatose (Glasgow Coma Scale score 3), have no observed brainstem reflexes and are apnoeic with their lungs being mechanically ventilated, but in whom circulation and other bodily functions persist (Academy of Medical Royal Colleges 2025). Typically, such an individual will be cared for on the ICU where death cannot be diagnosed using circulatory criteria because mechanical ventilation (or more rarely, ECMO), maintains oxygenation and prevents circulatory arrest.

7.4.7 End-of-life care

End-of-life care for pregnant or recently pregnant women should involve early and effective multidisciplinary working between senior clinicians and legal and ethical representatives where appropriate. As highlighted above, this is especially important for women who may not have capacity to make informed decisions about their own health and care. Although multidisciplinary discussions around end-of-life care were noted for some women, documentation of these discussions, including who participated, what was discussed and any agreed outcomes or plans, often did not meet the standards of good medical practice (General Medical Council 2024). These standards must be applied across all areas of clinical care, including discussions with families, as they may be important at later stages of care or during subsequent reviews.

You must make sure that formal records of your work (including patients' records) are clear, accurate, contemporaneous and legible (General Medical Council 2024)

A woman in her 30s had a significant intraventricular haemorrhage at 18 weeks' gestation that resulted in a devastating brain injury. She was transferred to critical care and several multidisciplinary discussions were held with the family and clinicians regarding ongoing care. These discussions included legal and ethical advisors to advise on continuation of care to prolong the pregnancy. Specialist nurses for organ donation were also contacted. Several days after admission, the woman developed multiorgan dysfunction and experienced a miscarriage. Following a discussion with the family, care shifted to palliation and withdrawal of life-sustaining treatment. The family were supported throughout this process including provision of a cold cot to enable the baby to spend time with the mother before her death.

Assessors identified many examples of excellent, compassionate end-of-life care for this woman. Previous MBRRACE-UK reports have emphasised the importance of involving families, and where possible the woman herself, in shared decision-making to support compassionate, high-quality end-of-life care (Felker, Patel et al. 2024, Knight, Bunch et al. 2022). National guidance supports these principles (Academy of Medical Royal Colleges 2025, Faculty of Intensive Care Medicine 2019, National Institute for Health and Care Excellence 2019c).

Assessors felt that the family were well supported in their initial decision to continue care and appropriately re-advised after she experienced a miscarriage. The family was also consulted on the woman's wishes for organ donation. Although an 'opt-out' system for organ donation operates across the UK, families remain central to the consent process and should be supported in these decisions (UK Donation Ethics Committee 2016). Guidance on organ donation in pregnancy recognises that these situations are rare and require an individualised, case-by-case approach with senior and, where appropriate, regional or supra-regional input (NHS Blood and Transplant 2022). While it is important that women are not denied equitable care or the opportunity to become organ donors, it is equally important to minimise distress for grieving families. Organ donation should be discussed only once it is established that it is clinically, legally and ethically feasible, and that eligibility criteria are met (NHS Blood and Transplant 2022).

7.4.8 Care after a maternal death

A maternal death is a devastating outcome of pregnancy. Although staff working within critical care may be familiar with the logistical and supportive processes that follow a death, maternal deaths are rare and staff may be unfamiliar with the specific processes that must be followed in these circumstances. Guidance from the RCOG on managing a maternal death highlights the legal and logistical processes as well as the importance of pastoral care for both family and staff. The use of checklists, such as the one outlined in the RCOG guidance, can help ensure that key actions are completed (Royal College of Obstetricians and Gynaecologists 2024a).

As highlighted in the 2025 MBRRACE-UK report, changes to the death certification process were introduced in England and Wales in September 2024 (Felker, Patel et al. 2025). The updated Medical Certificate of Cause of Death (MCCD) now includes specific questions on pregnancy status, and all deaths not referred to the coroner must be reviewed by an independent medical examiner (Department of Health and Social Care 2024a). Similar processes were already in place in the devolved nations. Referral to the coroner (or a procurator fiscal in Scotland) remains mandatory for all women who are pregnant or within 42 days of the end of pregnancy (including delivery, miscarriage or termination); however, the new MCCD and medical examiner process are particularly relevant to late maternal deaths (Department of Health and Social Care 2024a, Royal College of Obstetricians and Gynaecologists 2024a), which, as highlighted in Chapter 9 of this report, often do not have an autopsy.

Support for families

For several women whose care was reviewed, there was no documented evidence of discussions, communication or support for bereaved families; however, this does not mean this support was not provided. Professional standards continue to apply after death. It is essential to maintain clear, contemporaneous records of all discussions with family members, including what has been explained about the circumstances and cause of death (General Medical Council 2024, Royal College of Obstetricians and Gynaecologists 2024a). Best practice guidance recommends that meetings with families are followed up in writing with correspondence also shared with the GP. Clear records of communication with the family should also be made available to teams involved in any subsequent review or investigation (Royal College of Obstetricians and Gynaecologists 2024a).

Following discussions and meetings with the partner and family members, it is important to keep records of all conversations and what the partner and family have been told regarding the circumstances surrounding the death and eventually the cause of death.

RCOG Good practice paper 18 (Royal College of Obstetricians and Gynaecologists 2024a)

Although RCOG guidance emphasises that investigations should consider the woman's entire care pathway, assessors noted that many reviews treated critical care as the endpoint of care, rather than the beginning of a care journey in which outcomes may still be influenced by the quality of treatment provided. Multidisciplinary team working should extend beyond a woman's death, with all relevant teams, including critical care, engaged in review processes and the dissemination of learning to improve future care (Faculty of Intensive Care Medicine and Intensive Care Society 2026).

Data relating to enhanced maternal care and maternal critical care should be routinely collected and reviewed to enable benchmarking and improve outcomes, with insights disseminated to the wider multidisciplinary team.

Guidelines for the Provision of Intensive Care Services (Faculty of Intensive Care Medicine and Intensive Care Society 2026)

Although a serious incident investigation may not be necessary, it is best practice to review the whole pathway of the woman's care to consider if there were any patient safety issues, and other aspects of care earlier in the woman's journey, which affected the quality of her care and the outcome, and to improve care for future women with the same condition.

RCOG Good practice paper 18 (Royal College of Obstetricians and Gynaecologists 2024a)

Support for staff

It is increasingly recognised that involvement in traumatic events, such as a maternal death, can have a significant impact on staff both personally and professionally. National guidance emphasises the importance of providing appropriate pastoral support, including access to psychological support, for all those involved (Faculty of Intensive Care Medicine and Intensive Care Society 2026, Royal College of Obstetricians and Gynaecologists 2024a). As for families, the support provided to staff should be available in the immediate aftermath of the event and also extend for a sustained period following the death, including throughout any subsequent serious incident investigations. Providing support is important for staff wellbeing and also contributes to maintaining a safe and supportive environment for the ongoing care of other women.

7.5 Conclusions

Reports from MBRRACE-UK have consistently highlighted the importance of effective multidisciplinary teamwork in delivering high-quality care. This is reinforced again by care of women reviewed in this chapter, particularly in relation to the expanding role of critical care clinicians beyond critical care units.

Early and sustained involvement of critical care clinicians within the multidisciplinary team caring for acutely unwell pregnant and recently pregnant women helps support earlier recognition, escalation, and management of clinical deterioration. Strategies to support multidisciplinary working include ensuring critical care involvement in incident reviews, investigations and learning, improving the quality of documentation for multidisciplinary discussions, and increasing exposure of resident doctors across acute specialties to the care of acutely unwell obstetric patients. Together, these approaches may help to improve the quality of care provided to women in the future.

8. Improving anaesthetic care

Nuala Lucas, Katie Cranfield, Issie Gardner, Arlene Wise, Marian Knight and Allison Felker

8.1 Key messages

New recommendations

Review theatre and workforce capacity planning guidance to manage the additional workload associated with changing trends in maternal characteristics and associated caesarean section rates **[ACTION: Departments of Health in each of the devolved nations]**

Existing guidance and recommendations requiring improved implementation

Maternity units should have as part of their major obstetric haemorrhage protocol guidance for achieving intravascular access when access is particularly difficult. The use of intraosseous technology and appropriate staff training should be considered (Knight, Kenyon, et al 2014)

Pregnant women with complex needs or a complex medical history should have timely antenatal multidisciplinary planning, and an experienced obstetric anaesthetist should contribute to the planning (Knight, Nair et al. 2017)

Update guidance to make certain that category 4 caesarean section lists are managed separately from more urgent caesarean sections to ensure these operations are not delayed to late in the day (Knight, Bunch 2023)

All units are required to have escalation policies for periods of high activity. These policies should include a plan to obtain more and senior obstetric and anaesthetic assistance as well as considering midwifery staffing and diverting activity (Knight, Nair et al. 2017)

8.2 Background and summary of the key findings 2022-24

This triennium marks a significant milestone in obstetric anaesthesia in the UK. For the first time since MBRRACE-UK reporting began, there were no women in the UK and Ireland who died from complications of anaesthesia in 2022-24. This remarkable achievement is a reflection of significant advances made by the specialty since the early 1980s when anaesthesia was the third leading cause of direct maternal deaths. Since then, decades of progress in training, equipment, multidisciplinary working, the organisation of obstetric anaesthetic services and the development of clear clinical standards and national guidelines have contributed to steadily declining rates of maternal deaths due to anaesthesia.

This progress has been achieved despite increasing complexity in the population of women receiving maternity care. Maternal age, obesity and medical comorbidities continue to rise, alongside increasing rates of operative birth, particularly caesarean sections. Anaesthetists are therefore caring for greater numbers of women with increasingly complex physiological and medical needs, often in time-critical situations.

Although there are no direct anaesthetic deaths in this triennium, there are still important lessons to be learned about anaesthetic management from the women who died from other causes. Notably, these lessons are less about the technical delivery of anaesthesia and more about the wider contribution of anaesthetists to safe maternity care. This evolution reflects the changing role of the obstetric anaesthetist and their importance as part of a multidisciplinary team to help anticipate deterioration, lead physiological resuscitation, coordinate multidisciplinary care, maintain situational awareness and ensure the availability of appropriate staffing, theatre capacity and critical care resources.

While excellence in technical anaesthesia remains fundamental, the specialty's greatest contribution to maternal safety increasingly sits in the support of resilient systems of care and provision of clinical leadership for women with complex and evolving illness.

8.3 Overview of care and lessons to be learned

8.3.1 Basic anaesthetic management

A woman had recognised risk factors for difficult intravenous access but did not have an antenatal anaesthetic assessment. Last minute changes to her planned mode of birth resulted in an emergency caesarean birth under general anaesthesia. During the surgery, she had a major obstetric haemorrhage. Difficulties with intravenous access delayed management and she died shortly after her baby was born.

Reliable intravenous access is fundamental to safe obstetric care. It was anticipated that this woman would have difficult intravenous access, but this did not appear to be appropriately planned for and management was largely reactionary. Severe bleeding and major obstetric haemorrhage may occur unexpectedly in any pregnancy, regardless of known risk factors. Adequate vascular access should therefore be considered proactively as part of routine obstetric and anaesthetic planning. This woman did not have an anaesthetic assessment prior to birth and assessors noted that there was a missed opportunity to place a central line before her deterioration, which would have aided in fluid replacement.

The appropriate size and number of intravenous cannulae should be determined by the anticipated clinical scenario rather than by what is easiest to insert. Women with recognised or anticipated difficult intravenous access should be identified antenatally wherever possible, with a documented plan developed by the multidisciplinary team. Where major haemorrhage or emergency operative birth is anticipated, vascular access should be appropriate for the clinical risk, recognising that larger-bore cannulae (>16 gauge) allow for substantially quicker administration of fluids and blood products than smaller cannulae. If peripheral access cannot be established promptly in a critically unwell woman, early consideration should be given to alternative techniques, including intraosseous access. Early use of ultrasound guidance may improve the success of peripheral intravenous cannulation in women with difficult vascular access and reduce repeated unsuccessful attempts.

Maternity units should have as part of their major obstetric haemorrhage protocol guidance for achieving intravascular access when access is particularly difficult. The use of intraosseous technology and appropriate staff training should be considered (Knight, Kenyon, et al 2014)

8.3.2 Clinical vigilance, situational awareness and proactive care

Diagnostic curiosity

A woman had recurrent episodes of severe hypertension from early pregnancy, which required progressive escalation of antihypertensive treatment. Although pre-eclampsia was considered on several occasions, repeated investigations were unremarkable and the pattern of hypertension, associated symptoms and response to treatment was atypical. Early in the third trimester she had an obstetric emergency requiring urgent delivery. Despite extensive multidisciplinary resuscitation, she died shortly after giving birth. Post-mortem examination identified an underlying phaeochromocytoma that had not been recognised prior to her death.

The care of this woman highlights a common theme across MBRRACE-UK reports regarding the importance of maintaining diagnostic curiosity when the clinical course does not fit the expected pattern. Assessors felt that fixation on suspected pre-eclampsia, despite atypical symptoms and limited response to treatment, may have precluded consideration of an alternative diagnoses and earlier specialist input.

Situational awareness

As highlighted in other chapters of this report, maternal deterioration is often preceded by subtle physiological changes or evolving clinical features, which may be overlooked when women are assessed using inappropriate early warning scores or attention is focused on immediate clinical tasks. Maintaining situational awareness requires clinicians to continually re-assess the woman's overall condition rather than concentrating solely on individual procedures or single measurements or observations. For the obstetric anaesthetist, this 'helicopter view' is a core component of

safe care. Rather than relying on a presumed diagnosis or estimated blood loss alone, clinicians should consider and interpret the woman's overall physiology, recognise concealed deterioration and escalate concerns whenever the clinical picture is inconsistent with the expected course.

Anticipation and proactive management

The report also reinforces the importance of proactive rather than reactive management. This includes anticipating major haemorrhage before cardiovascular instability develops, activating major haemorrhage protocols early, mobilising the multidisciplinary team promptly, and ensuring appropriate personnel, equipment and blood products are available before further deterioration occurs. Anaesthetists frequently play a central role in these anticipatory processes through continuous physiological assessment, forward planning and coordination of multidisciplinary care.

Clinical message

Clinical message: Care should be proactive, not reactive

Proper preparation and planning with multidisciplinary input and standard procedures can help avoid delays and support effective management.

8.3.3 Anaesthetic leadership in multidisciplinary planning

The importance of early multidisciplinary planning for women with complex obstetric or medical conditions is highlighted throughout this report. Examples can be found in Chapter 3, in relation to women with placenta accreta spectrum, a history of major obstetric haemorrhage or previous uterine surgery associated with an increased risk of rupture, and in Chapters 5 and 6 concerning women with significant medical comorbidity.

Regardless of the clinical scenario, the role of the obstetric anaesthetist extends beyond providing anaesthesia. There are common themes around the early recognition of risk, coordinated multidisciplinary planning and continuity of care. The involvement of consultant obstetric and anaesthetic teams before delivery enables shared decision-making, anticipates and plans for potential complications and ensures that appropriate expertise and resources are available where and when they are required.

These findings closely align with the recommendations from previous MBRRACE-UK reports (Knight, Bunch et al. 2023) and the recent Ockenden report into Nottingham University Hospitals NHS Trust (Ockenden 2026), which emphasised early risk recognition, continuity of care, robust information sharing and timely senior multidisciplinary review for women with additional complexities. However, delivering this level of multidisciplinary care requires adequate anaesthetic workforce and organisational support. A national survey of UK obstetric anaesthetic services undertaken in 2021 demonstrated considerable variation in consultant staffing, multidisciplinary ward rounds, antenatal anaesthetic clinics and support for scheduled caesarean section services (Bamber, Lucas et al. 2023). Findings from this year's MBRRACE-UK report as well as recent national reviews (National Maternity and Neonatal Investigation 2026) suggest that these problems persist and many units are not sufficiently resourced to consistently deliver these recommendations.

Pregnant women with complex needs or a complex medical history should have timely antenatal multidisciplinary planning, and an experienced obstetric anaesthetist should contribute to the planning (Knight, Nair et al. 2017)

8.3.4 Anaesthetic services and system resilience

A recurring theme throughout this report is the interaction between increasing maternal complexity, and limitations in maternity infrastructure. These factors are closely interdependent and have important implications for the organisation of obstetric anaesthetic services. The Royal College of Anaesthetists' Seventh National Audit Project (Royal College of Anaesthetists 2023) highlighted increasing demands placed on obstetric anaesthetic services, particularly outside normal working hours, and emphasised the importance of ensuring that workforce and infrastructure keep pace with the changing complexity of maternity care. This is demonstrated by findings from the recent Ockenden report, which reported a high standard of anaesthetic care in 91% of the cases reviewed at Nottingham University Hospitals NHS Trust. This quality of care was attributed, in part, to appropriate levels of consultant anaesthetists on labour wards and dedicated on-call rotas (Ockenden 2026).

As rates of operative birth, especially caesarean sections, continue to increase (Ambia, Alderdice et al. 2026, National Maternity and Perinatal Audit 2026), anaesthetic workforce and theatre capacity must expand proportionately to maintain safe care. Consideration should therefore extend beyond staffing numbers to also include recovery provision, timely access to emergency theatres and the availability of appropriately experienced anaesthetic staff, recognising that these elements together contribute to the resilience of the maternity service.

As demonstrated in Chapter 3 of this report, elective obstetric theatres should be viewed as a critical component of the maternity pathway, which support timely access to emergency care in addition to scheduled operating lists. For caesarean sections where complications are reasonably anticipated, the location of theatres for elective caesarean lists should be considered in relation to emergency theatres and critical care units.

NEW **National recommendations**

Review theatre and workforce capacity planning guidance to manage the additional workload associated with changing trends in maternal characteristics and associated caesarean section rates.

Clinical message

Clinical message: Prioritisation of scheduled caesarean births

Some caesarean births are planned as time-critical risk-reduction interventions. It is important to recognise the difference between these and other scheduled caesarean births when prioritising scheduled caesarean section lists.

Update guidance to make certain that category 4 caesarean section lists are managed separately from more urgent caesarean sections to ensure these operations are not delayed to late in the day (Knight, Bunch 2023)

All units are required to have escalation policies for periods of high activity. These policies should include a plan to obtain more and senior obstetric and anaesthetic assistance as well as considering midwifery staffing and diverting activity (Knight, Nair et al. 2017)

8.4 Conclusions

No anaesthetic-related deaths were reported since the last triennial review by MBRRACE-UK but many of the messages identified for anaesthetic care remain the same. Although obstetric anaesthetists are increasingly included in specifications for multidisciplinary care teams, including in maternal medicine centres (NHS England 2021) and case reviews for major obstetric haemorrhage (NHS England 2026b), there is a continued need for inclusion of the obstetric anaesthetist as part of routine care and proactive planning for emergencies. In order to accomplish this, workforce capacity must keep pace with the changing complexity of maternity care and anaesthetic training curricula (Royal College of Anaesthetists 2021) must maintain a sufficient level of obstetric exposure to ensure the availability of appropriately skilled clinicians outside of maternity services.

9. Messages for pathologists

Samantha Holden, Esther Youd, Anna Green, Lucy Green, Lisa Barker, Marian Knight and Allison Felker

9.1 Key messages

Existing guidance and recommendations requiring improved implementation

Full autopsy, including the examination of the cranial cavity, with the pathologist present at the evisceration; weight, height, BMI and ethnicity should be documented in the report (Royal College of Pathologists 2024)

The diagnosis of amniotic fluid embolism requires careful correlation with the clinical scenario (Royal College of Pathologists 2024)

Consider taking other samples for microbiology/virology: high vaginal swab, sample of the uterine content for microbiology (after sterilising the surface of the uterus), viral respiratory panel nasopharyngeal swab, lung viral swabs/pieces for microbiology and myocardium for the viral myocarditis panel (Royal College of Pathologists 2024)

In the following scenarios, SUDEP is excluded: Death during or following a provoked seizure (where there is not an epilepsy diagnosis) (Royal College of Pathologists 2019)

The pathologist should produce a formal report that will detail (Royal College of Pathologists 2025):

- the source(s) of information the pathologist received or reviewed in advance of the post-mortem. While some authorities do not allow such information to be transcribed directly into the report, the sources used should still be cited and at least a summary of such information included in the report
- conclusions and the reasoning that supports them, detailing all material referenced, such as pertinent literature. Where unusual features are found but are concluded not to be relevant, the pathologist should explain why the finding has been discounted
- the reasoning underlying why, where findings are open to alternative explanations, 1 explanation is favoured

9.2 Background

Last year's MBRRACE-UK report highlighted changes to the MCCD in England and Wales (Department of Health and Social Care 2024a), which now includes questions specific to maternal deaths; similar processes have been in place in Scotland for several years. Since the publication of last year's report, the Office for National Statistics (ONS) has published provisional data on death certificate reform. These data show that 61 deaths occurred during pregnancy or within a year of the end of pregnancy in England and Wales between 9 September 2024 and 30 June 2025 (Office for National Statistics 2025). Although MBRRACE-UK data for maternal deaths in 2025 are not yet available, 2023-2024 data for the same time frame includes more than twice this number of deaths. This is to be expected given MBRRACE-UK's enhanced case ascertainment process (Knight, Bunch et al. 2023), but emphasises that caution must be used when interpreting these routine statistics, especially for deaths occurring between six weeks and one year after pregnancy, where the largest differences were noted.

These initial data from ONS also suggest that improvements are needed in the completeness and quality of pregnancy-specific questions on MCCDs. Although false positives for maternal deaths were rare (<1% of deaths), there were approximately 4,000 deaths (18% of all eligible deaths) where the pregnancy status was unknown and, of the 61 deaths that were determined to have occurred during or in the year after pregnancy, it was unknown if pregnancy contributed to 16 deaths (26%) (Office for National Statistics 2025). These findings reinforce the need for continued MBRRACE-UK surveillance and confidential enquiries to identify and capture the learning from the care of all women who die during or in the year after pregnancy.

Guidance from the Royal College of Pathologists (RCPath) recommends that medical examiners ensure they have tried to ascertain whether a woman may have had a pregnancy around the time of their death (Royal College of Pathologists 2024). If it is not possible to complete the MCCD accurately, or if the cause of the death is unnatural, violent or unknown, the death may be referred to a coroner (or procurator fiscal in Scotland) to instruct an autopsy (Department of Health and Social Care 2024a). Most maternal deaths fulfil these criteria for referral. As such, the UK has historically had one of the highest rates of autopsy amongst high-income countries (Lucas 2019). A high-quality autopsy is essential to establish or confirm the cause of death and improve the quality of maternal mortality data.

While maternal deaths are rare in the UK, pathologists should be prepared if they do encounter one. This chapter outlines some of the key messages for pathologists learned from the review of women who died in in the UK and Ireland in 2022-24 from haemorrhage, AFE, infection, general medical and surgical conditions, epilepsy, stroke and other neurological causes.

9.3 General messages

9.3.1 Rates of post-mortem examination in the UK

The proportion of women who had a post-mortem examination in the UK in 2022-24 is relatively stable compared to past triennia, with a post-mortem examination performed in around two-thirds of the women who died (Table 9.1). As in previous triennia (Felker, Patel et al. 2025), the vast majority were performed under coronial or procurator fiscal authority (Table 9.1) and most women who did not have a post-mortem examination died between six weeks and one year after the end of pregnancy.

Table 9.2: Frequency of post-mortem examination amongst women who died during or up to one year after pregnancy, by overlapping triennia, UK 2016-24

Post-mortem type	2016-18 (n=547) Frequency (%)	2017-19 (n=495) Frequency (%)	2018-20 (n=536) Frequency (%)	2019-21 (n=573) Frequency (%)	2020-22 (n=626) Frequency (%)	2021-23 (n=611) Frequency (%)	2022-24 (n=598) Frequency (%)
No post-mortem	139 (25)	137 (28)	169 (32)	188 (33)	216 (35)	203 (33)	192 (32)
Hospital	33 (6)	38 (8)	32 (6)	19 (3)	11 (2)	10 (2)	9 (2)
Coroner/ procurator fiscal	335 (61)	303 (61)	335 (63)	366 (64)	399 (64)	398 (65)	397 (66)
Records not available	40 (7)	17 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

As in last year's report, there were some post-mortem reports that did not contain factors considered to be a minimal standard. These include the woman's weight and height, all organ weights, comment on all organs and appropriate statements discussing the findings, supporting reasoning and clinicopathological correlation (Felker, Patel et al. 2025, Royal College of Pathologists 2024).

Full autopsy, including the examination of the cranial cavity, with the pathologist present at the evisceration; weight, height, BMI and ethnicity should be documented in the report.

RCPath G100 Guidelines on autopsy practice: Maternal deaths (Royal College of Pathologists 2024)

9.4 Specific messages for maternal deaths included in the 2022-24 confidential enquiries

9.4.1 Obstetric haemorrhage

There were 11 women who died from obstetric haemorrhage in the UK and Ireland in 2022-24. Eight of the 11 women who died from obstetric haemorrhage had post-mortem examination. Of the three women who did not, two woman's records were not available and assessors felt it was appropriate that the other did not have a post-mortem. The post-mortem examinations that were available for review were generally of appropriate standard; however, one woman's body weight was not included, one woman's brain was not examined and for another woman, the site of suspected haemorrhage was not sampled for histology. In many cases of haemorrhage, a hysterectomy may be performed with or without the placenta left *in situ*. In such instances, it is important to obtain histological specimen of the placenta and uterus from the local histopathology department for examination (Royal College of Pathologists 2024).

One woman whose death was considered to be due to obstetric haemorrhage was initially thought to have died from AFE. Amniotic fluid embolism can cause disseminated intravascular coagulation and subsequent massive obstetric haemorrhage. It is important to differentiate between instances where the woman's collapse occurs prior to the onset of haemorrhage (consistent with AFE) and those where primary haemorrhage occurs followed by secondary collapse due to blood loss.

9.4.2 Amniotic fluid embolism (AFE)

The diagnosis of AFE is recognised to be difficult. Amniotic fluid embolism is caused by amniotic fluid entering the circulation. As such, the detection of fetal squamous cells (squames) in the maternal circulation is a key part of the diagnosis; however, this finding can also be observed in women without other evidence of AFE, especially if the woman had attempted resuscitation. The diagnosis of AFE, therefore, requires careful review of the woman's history, appropriate clinicopathological correlation and a full post-mortem examination, including lung histology and use of appropriate special stains (such as cytokeratins) to confirm the presence of fetal squames in the maternal circulation (Royal College of Pathologists 2024) .

The diagnosis of amniotic fluid embolism requires careful correlation with the clinical scenario.

RCPath G100 Guidelines on autopsy practice: Maternal deaths (Royal College of Pathologists 2024)

The deaths of 12 women were initially attributed to amniotic fluid embolism. All had a post-mortem examination performed, which is appropriate in such instances. Upon review of the post-mortem reports and other medical records, assessors felt that AFE was the correct cause of death for six women and likely to be correct cause for a further two women. The remaining four women's deaths were re-classified after review: one woman's death was attributed to obstetric haemorrhage, as indicated in the previous section; two women's deaths were thought to be due to other indirect causes, one due to an anaphylactic reaction and the other from intra-abdominal haemorrhage; and the final woman's death was determined to be unascertained on the basis of the information available.

9.4.3 Infection

Direct causes of infection

Twenty women died from direct causes of infection, of whom 15 had a post-mortem examination.

Of the women who did not have an autopsy, there was one woman whose family requested a post-mortem. The woman's death was referred to the coroner who opened an inquest but did not request an autopsy; the hospital was unable to provide a consented autopsy.

Upon review of the available post-mortem reports, assessors noted that one woman had an incomplete autopsy report. Her cause of death was attributed to sepsis-induced cardiomyopathy but the cause of sepsis was not stated. Review of her medical records determined the likely cause of death was sepsis due to a urinary tract infection. Another woman's death was initially attributed to uterine infection, but on review, was considered to be a sudden cardiac death due to thyrotoxicosis in the context of Graves' disease. The inflammation described in the uterine histology was determined to be within normal variation rather than due to infection.

A woman died of invasive group B streptococcal (GBS) infection in the second trimester. The autopsy was performed to a very high standard, including microbiology sampling. A swab taken of the spleen identified the causative organism.

Assessors noted that this woman's autopsy was performed according to RCPath guidelines and deemed it to be of a very high standard. The swab from the spleen identified GBS as the causative organism, likely ascending from the genital tract. This was highlighted to be particularly good practice as a diagnosis would not have been possible without this sample.

Assessors noted that, for some women, there was little evidence of sampling for microbiology and/or virology testing at autopsy. As demonstrated by the vignette above, such sampling can help establish the cause of death and should be considered whenever infection is suspected or if an autopsy does not identify a cause of death (Royal College of Pathologists 2024).

Consider taking other samples for microbiology/virology: high vaginal swab, sample of the uterine content for microbiology (after sterilising the surface of the uterus), viral respiratory panel nasopharyngeal swab, lung viral swabs/pieces for microbiology and myocardium for the viral myocarditis panel.

RCPath G100 Guidelines on autopsy practice: Maternal deaths (Royal College of Pathologists 2024)

Indirect causes of infection

There was an autopsy performed for 17 of the 29 women who died due to indirect causes of infection. Assessors felt that an autopsy would have been helpful to confirm the diagnosis in several women who did not have a post-mortem examination.

Two women's deaths, one attributed to influenza A and the other to a lower respiratory tract infection were regarded by the reviewers as unascertained due to the quality of the autopsy reports.

> A woman had presented to the emergency department with shortness of breath, cough and fever three months after giving birth. She had a history of repeated chest pain and had presented to the emergency department on three prior occasions. At her final presentation, she was found to have influenza A. She was given IV antibiotics and collapsed shortly after administration. She could not be resuscitated. The autopsy described macroscopic myocardial fibrosis with normal histology, and platelet thrombi in the pulmonary vasculature. The cause of death was given as pulmonary microvascular thrombosis due to influenza A.

Assessors felt that the cause of death given for this woman was not accurate. On review, they considered several possible causes of death including anaphylaxis, sepsis and sudden cardiac death; however, due to the limitations of the autopsy, there was no consensus on the cause of death, which was re-classified as an unascertained indirect cause.

9.4.4 Neurology

Epilepsy

Fifteen women died from a cause related to epilepsy in the UK and Ireland in 2022-24; all had a post-mortem examination. Thirteen women's cause of death was given as SUDEP. Of the other two woman, one's death was thought likely to be attributable to epilepsy but it was also noted that she had an enlarged heart, likely related to substance use. The other woman died from drowning in a bathtub; her history of epilepsy was considered significant in relation to her death.

There were two further women who did not have a formal epilepsy diagnosis at the time of their death, but whom assessors felt likely died from SUDEP. One woman's cause of death was stated as SUDEP in the absence of a formal diagnosis. For the other woman, no cause of death was identified. SUDEP was considered and discussed in the post-mortem comment but felt not to be appropriate without a diagnosis, which is in line with guidance on autopsy practice in individuals with epilepsy (Royal College of Pathologists 2019).

Two women who died had a history of non-epileptiform seizures. One woman was given a cause of death of SUDEP by the initial pathologist.

In the following scenarios, SUDEP is excluded: Death during or following a provoked seizure (where there is not an epilepsy diagnosis).

RCPath G175 Guidelines on autopsy practice: Deaths in patients with epilepsy including sudden deaths (Royal College of Pathologists 2019)

The quality of the post-mortem examination was considered to be good for seven women. Assessors felt that histology and genetic testing could have been improved for the remaining eight women and noted that three did not receive neuropathological referral as is recommended (Royal College of Pathologists 2019).

Intracranial haemorrhage or stroke

Forty-one women died from intracranial hemorrhage, stroke or other neurological causes. The majority of women (n=28) did not have a post-mortem examination performed and not all post-mortems were available for review by assessors. Of the eight post-mortems available for review, assessors felt that six were of good standard and two would have benefited from more extensive sampling for histology and clearer clinicopathological correlation.

For most women who did not have a post-mortem, assessors felt that this was appropriate as there was no need for a medicolegal examination. However, for some women, offering a consented post-mortem examination may have revealed additional information of relevance for the family, such as identification of underlying pathology (e.g. an aneurysm), which may have had genetic implications for other family members. Also, a very small number of women who died had a previous intracranial surgery. In such instances, a post-mortem examination can help determine if there were any complications arising from the original surgery that were relevant to the death.

9.4.5 General medical and surgical conditions

General medical and surgical conditions fall under the classification of 'other indirect' causes of death. This category includes a range of largely medical deaths, including diabetes mellitus, liver, renal or lung disease and gastrointestinal pathology. By nature of the condition, some of these deaths involve complex pathophysiology requiring comprehensive, high-quality autopsy; however, assessors noted the highest number of autopsies requiring improvements amongst this group of women. Examples of common themes across these post-mortem examinations included evidence of limited understanding of pathological processes, incomplete or missing sampling for further investigations and inadequate final reports. Improvements were noted for around half of the 28 autopsies reviewed.

Endocrine

Eleven women died from endocrine causes. Eight women's deaths were related to diabetes mellitus. Five women had confirmed DKA and assessors felt that DKA may have been the cause of death for one further woman, but this was not considered or tested. Of the women with confirmed or presumed DKA, post-mortem examination for three women did not include sampling of vitreous humour for glucose testing to confirm the diagnosis.

One woman's death was attributed to hypoglycaemia with known type 1 diabetes mellitus but assessors felt that this could not be confirmed on the basis of the autopsy itself and that other causes of death should have been explored. Despite a negative autopsy, there was limited histology sampling and only the heart was examined. Other organs were either not sampled or not examined and the glucose level could not be measured as the vitreous sample was sent to a toxicology laboratory rather than a biochemistry laboratory.

> A woman had a history of type 1 diabetes mellitus associated with long-term health problems including renal disease. She died three months after giving birth. The cause of death provided by the autopsy was end-stage renal failure due to diabetes and hypertension. Her heart was significantly enlarged, which was attributed to hypertensive heart disease. Hypertension had not been diagnosed clinically. There was no histology and diabetic ketoacidosis (DKA) was not considered or tested for.

This woman's death was attributed to chronic renal disease associated with diabetes but assessors felt that improvements to the autopsy report were need to confirm this cause of death. Her autopsy did not include basic testing, such as toxicology, vitreous glucose testing or biochemistry testing for beta-hydroxybutyrate. There was also no histology, including from the heart or kidney. Assessors also noted improvements in the clinicopathological correlation as systemic hypertension was thought to be contributory to her death without any history of chronic hypertension.

There were two women who died from phaeochromocytoma. One woman's cause of death was not given on the autopsy report but was reported to MBRRACE-UK as a death due to obstetric haemorrhage. Upon review, assessors noted that the woman had a clinical history of hypertension with associated neurofibromatosis and that the post-mortem report described a large phaeochromocytoma.

Gastrointestinal

Fifteen women died from gastrointestinal causes, most of whom (n=10) died from complications of pancreatitis. Of the women with pancreatitis, only two had an autopsy. In one autopsy, the cause of death was given as haemorrhage into a pancreatic pseudocyst with underlying chronic pancreatitis; however, assessors noted that the detail in the autopsy report made it difficult to reach that conclusion. There was no description of macroscopic findings in the pancreas or consideration of the pathophysiology. For the remaining women without an autopsy, the diagnosis was well established during a period of care in hospital and assessors felt it was appropriate not to conduct an autopsy.

Liver disease

There were six deaths attributed to liver disease. One woman had autoimmune hepatitis, two had liver disease related to alcohol consumption, two had underlying haematological conditions and one had an idiopathic acute liver injury.

Two women had an autopsy, including the woman who died from idiopathic acute liver injury. For this woman, assessors noted that the autopsy report demonstrated insufficient understanding of the findings and their significance in addition to limited sampling and incomplete conclusions. Therefore, they felt the cause of this woman's death should be regarded as unascertained.

For the remaining women who did not have an autopsy, the diagnosis was well established during a period of care in hospital, and reviewers felt that it was mostly appropriate not to conduct an autopsy. However, there was one woman who assessors felt would have benefited from an autopsy. She had acute liver failure of unknown aetiology. Her

clinical team felt that her liver would show necrosis and that a post-mortem examination would not yield a diagnosis. While it can be challenging to identify the cause of acute liver failure by autopsy examination, it is possible, and assessors felt that this woman should have been referred for an autopsy to try and determine the underlying aetiology.

One further woman's death was attributed to non-obstetric haemorrhage due to a bleeding gastric ulcer but assessors noted that the formulation of the cause of death did not make sense and did not consider her chronic liver disease.

> A woman with a history of chronic liver disease, died eight months after giving birth. The autopsy was brief and the cause of death was given as 1a. Bleeding gastric ulcer 1b. Pneumonia. There was no histology or microbiology investigation. Splenomegaly was described but not further investigated. Her liver was enlarged and fatty but her chronic liver disease was not considered.

Assessors noted that pneumonia is not the cause of ulcers. As both a bleeding gastric ulcer and pneumonia are acute conditions, they felt that a more accurate formation of death for this woman would be 1a. Bleeding gastric ulcer and pneumonia or 1a. Bleeding gastric ulcer 2. Pneumonia. Overall, assessors noted that this woman's autopsy did not meet the standard for autopsies in non-suspicious deaths outlined by RCPath's best practice recommendations (Royal College of Pathologists 2025). It was very brief with no information about the circumstances of the death or the woman's history, including chronic liver disease. It also included incomplete investigations of the pneumonia and splenomegaly.

The pathologist should produce a formal report that will detail:

- **the source(s) of information the pathologist received or reviewed in advance of the post-mortem. While some authorities do not allow such information to be transcribed directly into the report, the sources used should still be cited and at least a summary of such information included in the report**
- **conclusions and the reasoning that supports them, detailing all material referenced, such as pertinent literature. Where unusual features are found but are concluded not to be relevant, the pathologist should explain why the finding has been discounted**
- **the reasoning underlying why, where findings are open to alternative explanations, 1 explanation is favoured**

RCPath G136 Best practice recommendations: Standards for autopsy pathologists in post-mortem examinations of deaths that appear not to be suspicious (Royal College of Pathologists 2025)

Connective tissue disorders

> A woman died following laparoscopic cholecystectomy with subsequent bleeding from the liver and abdominal sepsis. The autopsy report contained a thorough history but had limited or absent descriptions. There was no description of the peritoneal cavity, liver laceration or abdominal infection. Despite a clinical suspicion of vascular Ehlers-Danlos syndrome, there was no histology or sample taken for genetic testing.

This woman had significant vascular pathology with a family history of Ehlers-Danlos syndrome. Her own diagnosis was confirmed after her death, but there was no consideration of preserving a sample for genetic testing. As noted in previous reports in relation to aortic dissection, genetic material should be retained for any women with suspected or confirmed inheritable connective tissue disorders to permit potential genetic testing (Felker, Patel et al. 2025, Knight, Bunch et al. 2022).

There was one woman who died from an unclassified connective tissue disorder who did not have a post-mortem examination. Four further women's deaths were attributed to SLE; all but one of these women had a post-mortem and all were deemed to be a good standard.

Intra-abdominal haemorrhage

There were five deaths that were attributed to non-obstetric, intra-abdominal haemorrhage, chiefly in the peritoneal cavity. All the women who died from haemorrhage had an autopsy; however, improvements were noted for all the autopsies. One woman's death was originally attributed to AFE based on clinical interpretation but, as only two blocks of lung histology were taken at post-mortem, this could not be confirmed. The most likely cause of her death was thought to be peritoneal haemorrhage from splenic tears; however, she was one of two women where pathology assessors questioned whether the peritoneal haemorrhage was a result of injuries sustained during CPR rather than

the true cause of death. The other woman's death was attributed to 'spontaneous rupture of the liver' which is vanishingly rare. In her autopsy there was no investigation of histology or toxicology, and despite the CPR attempts, there was no description of the musculoskeletal system and presence or absence of rib fractures. After review, assessors agreed the liver injury was likely due to CPR and, as the underlying cause was therefore not established, her cause of death was determined to be unascertained. Pathologists are reminded to recognise the extent of injuries that can be encountered following CPR. These injuries should not preclude investigation of the actual underlying cause of death.

> A woman died in early in her third trimester following a collapse at home. The autopsy was negative. Limited samples were taken for histology and no samples were taken for toxicology testing. Cardiac pathology was not considered and no samples were retained for potential genetic testing. After releasing the initial autopsy report, the pathologist discovered that four litres of blood had been found in the abdomen at caesarean section.

This woman was determined to have died from 'spontaneous intraperitoneal bleeding', which was the only conclusion that could be determined on the basis of the autopsy and clinical information available. Her history was not understood before the initial autopsy was performed and the report had to be modified retrospectively. The initial conclusion was that it was a negative autopsy, but sampling for histology, toxicology and genetic testing was largely incomplete. Once the haemorrhage was discovered, a second autopsy was conducted by a forensic pathologist by which time it was too late to determine the source of the bleeding.

Respiratory

There were six women's deaths attributed to respiratory disease: three due to acute asthma, two from cystic fibrosis and one from pulmonary fibrosis. Only one woman had an autopsy. Two further women who died from SLE were noted to have respiratory complications that contributed to their deaths. One had diffuse alveolar damage and the other had SLE-associated interstitial lung disease. Both had autopsies.

There was one further woman whose cause of death was given as multi-organ failure due to acute alveolar damage, the cause of which was not considered by the pathologist. Assessors noted that the description of the lung histology was that of organising pneumonia and determined that her death was due to infection rather than an underlying respiratory condition.

Haemophagocytic lymphohistiocytic (HLH) syndrome

There were three women who died who had haemophagocytic lymphohistiocytic (HLH) syndrome. HLH has a high mortality rate if untreated and is diagnosed by a number of criteria (Fardet, Galicier et al. 2014, Henter, Horne et al. 2007). One of the criterion, haemophagocytosis, can be assessed at autopsy by CD68 immunohistochemical staining of the bone marrow, spleen, liver or lymph nodes. However, it is important to note that haemophagocytosis is not specific, or required, for a diagnosis of HLH and should be considered alongside other clinical criteria and blood parameters (Fardet, Galicier et al. 2014, Henter, Horne et al. 2007).

HLH is a clinical syndrome of severe hyperinflammation and can be either primary (inherited) or secondary to an underlying pathology including autoimmune or auto-inflammatory disease, malignancy (most frequently haematological), infection or certain medications or treatments. In most instances of maternal death, HLH will be secondary. Therefore, determining the underlying cause is important to fully understand the cause of death.

Of the three women who died who had HLH, one woman's death was attributed to comorbid SLE, one died from a fungal infection and one died from cerebellar haemorrhage secondary to low platelets and abnormal liver function due to HLH. One woman had an autopsy, which was performed to an excellent standard.

9.4.6 Unascertained

In total, there were ten women who had unascertained causes of deaths in the UK and Ireland in 2022-24. Two women's deaths were thought to be the result of a direct cause of death and eight related to an indirect cause of death.

One woman's death was given as 1a. Unascertained at post-mortem examination. Assessors felt her post-mortem was performed to a good standard. Appropriate testing, including genetic testing, was undertaken, although the results of this testing were not available for review.

The cause of death for the nine other women was determined to be unascertained after review of the autopsy and case notes. Four of these women are noted in various sections above and three others were also reviewed as part of the 2022-24 confidential enquiries included in this report. The final two women were reviewed as part of last year's confidential enquiries into cardiac disease. Both of these women had a cause of death of sudden arrhythmic death

syndrome (SADS) but post-mortem examination was limited to examination of the torso with heart histology only. For one woman, the possibility of infection was not considered despite a clinical diagnosis of sepsis in the hospital notes, which were not reviewed.

9.5 Conclusions

While the proportion of maternal deaths that undergo a post-mortem examination is high in the UK, there are still lessons to learn. As demonstrated by the examples in this chapter, the cause of maternal death is not always obvious and it is imperative that any autopsy conducted is complete and of high quality.

Pathologists are reminded to:

- Consider the possibility of diabetic ketoacidosis (DKA) in women with diabetes mellitus - take a sample of vitreous humor to test for glucose (in a biochemistry laboratory) and beta-hydroxybutyrate (which may be done by a biochemistry laboratory or toxicology laboratory)
- Conduct additional investigations when an initial autopsy is negative, including histology and toxicology as a minimum, with consideration of microbiology, biochemistry, genetics and other testing as appropriate
- Be aware of the possible extent of injuries that can occur due to attempts at resuscitation and take care not to over-interpret these findings as pathological

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