National Learning Report
Maternal death: learning from maternal death investigations during the first wave of the COVID-19 pandemic

Independent report by the Healthcare Safety Investigation Branch I2020/017

February 2021
Providing feedback and comment on HSIB reports

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About HSIB

We conduct independent investigations of patient safety concerns in NHS-funded care across England. Most harm in healthcare results from problems within the systems and processes that determine how care is delivered. Our investigations identify the contributory factors that have led to harm or the potential for harm to patients. The safety recommendations we make aim to improve healthcare systems and processes, to reduce risk and improve safety.

We work closely with patients, families and healthcare staff affected by patient safety incidents, and we never attribute blame or liability.

Considerations in light of coronavirus (COVID-19)

We have adapted some of our national investigations, reports and processes to reflect the impact that COVID-19 has had on our organisation as well as the healthcare system across England. For this report, the way we engaged with staff and families was revised.

National learning reports

These reports offer insight and learning about recurrent patient safety risks in NHS healthcare that have been identified through our investigations. The reports present a digest of relevant, previously investigated events, highlight recurring themes and, where appropriate, make safety recommendations. National learning reports can be used by healthcare leaders, policymakers and the public to aid their knowledge of systemic patient safety risks and the underlying contributory factors, and to inform decision making to improve patient safety.
Our investigations

Our investigators and analysts have diverse experience of healthcare and other safety-critical industries and are trained in human factors and safety science. We consult widely in England and internationally to ensure that our work is informed by appropriate clinical and other relevant expertise.

We undertake patient safety investigations through two programmes:

National investigations

Concerns about patient safety in any area of NHS-funded healthcare in England can be referred to us by any person, group or organisation. We review these concerns against our investigation criteria to decide whether to conduct a national investigation. National investigation reports are published on our website and include safety recommendations for specific organisations. These organisations are requested to respond to our safety recommendations within 90 days, and we publish their responses on our website.

Maternity investigations

We investigate all incidents in NHS maternity services that meet:

• the criteria of the Royal College of Obstetricians and Gynaecologists’ Each Baby Counts programme, or

• our HSIB defined criteria for maternal deaths.

Incidents are referred to us by the NHS trust where the incident took place, and, where an incident meets the criteria, our investigation replaces the trust’s own local investigation. Our investigation report is shared with the family and trust, and the trust is responsible for carrying out any safety recommendations made in the report. In addition, we identify and examine recurring themes that arise from trust-level investigations in order to make safety recommendations to local and national organisations for system-level improvements in maternity services.

For full information on our national and maternity investigations please visit our website.
Executive Summary

Introduction

This national learning report reviews findings from HSIB investigations into maternal deaths (the death of women during pregnancy/childbirth or shortly after the end of a pregnancy) meeting our criteria that occurred between 1 March 2020 and 31 May 2020 (the first peak of the COVID-19 pandemic in England).

Specifically, this report aims to:

• inform understanding about the range of factors that contributed to harm at a local, regional, and national level

• support learning discussions within organisations

• influence the development of systems and processes to optimise patient safety particularly during further times of increased pressure on the healthcare service

• identify potential safety risks that merit further HSIB investigation.

Method

HSIB investigates maternal deaths that meet certain referral criteria. Between March and May 2020 there were 20 maternal deaths that met the criteria and were investigated by HSIB. Of these, 19 families gave permission to include their investigations in this review. Further information on the maternity investigation programme undertaken by HSIB, including the referral criteria, is available at www.hsib.org.uk/maternity.

This qualitative review used the Systems Engineering Initiative for Patient Safety (SEIPS 2.0) (Holden et al, 2013) framework for coding and analysis of the information within the 19 investigation reports.

Findings

Seven themes emerged from HSIB’s analysis of the investigations.

1 Unprecedented demand for telephone health advice caused delays in accessing health care

Several women, or their family members, attempted to contact NHS services by telephone. These included NHS 111, GPs and maternity helplines. Families described experiencing significant delays, making repeated attempts, and abandoning calls after waiting to connect with an operator.

2 Public messaging and ‘safety netting’ advice caused delays in seeking healthcare

The message from the UK government during March to May 2020 was to ‘Stay Home. Protect the NHS. Save Lives’ (Department of Health and Social Care, 2020a). HSIB investigations found that women and their families were
concerned about their health or the risk of exposing their unborn baby to COVID-19, and about the requirement to attend hospital without the support of their families. Because of these concerns they put off going to hospital for longer than they otherwise may have done.

3 Guidance changed rapidly

The effort to produce guidance to inform clinicians and the public about COVID-19 was unprecedented and the resultant wave of information being directed at staff on the frontline was considerable. It is evident from HSIB investigations that it was difficult for hospital trusts to keep staff apprised of updates to guidance.

4 Use of early warning scores did not always detect deterioration

HSIB investigations identified that early warning systems (clinical observations and tests used to check the state of a patient’s health) were not always used as intended. The issue of compliance in monitoring and recording clinical observations requires an understanding of working practices, and there are complexities in how scoring systems are embedded in practice. There is no nationally agreed maternity-specific early warning score in England, and investigations found examples where the National Early Warning Score (NEWS) 2 score, not designed for use in pregnant women, was used.

5 Personal protective equipment requirements changed due to COVID-19

The design of work processes and the environment did not adapt to account for the increase in time to don (put on) personal protective equipment (PPE). Environments were described as “noisy” with staff having to repeat requests and seek clarity of instructions. Clinicians’ voices were “muffled”, and staff reported “heightened stress levels” because of communication difficulties associated with wearing PPE.

6 Staff described feelings of stress and distress which can affect performance

Stress was aggravated for example by communication difficulties caused by PPE, redeployment to unfamiliar work areas, and reduced staffing levels. The report highlights areas where organisational resilience may be increased.

7 Difficulties in making a diagnosis and choosing treatment strategies

Several investigations highlighted diagnostic challenges which may have resulted in missed or delayed diagnosis. Diagnosis was impeded by lack of communication and face-to-face assessment, access to tests and concerns about infection prevention and control, as well as complexity caused by rapidly acquired knowledge of a new disease and the physiology of pregnancy.
Conclusion

This HSIB national learning report has identified changes in access to healthcare during the pandemic, barriers to effective work processes and pressures for staff. It describes seven themes which may inform decision making to improve patient safety in the months ahead.

HSIB makes the following safety observations

Safety observation O/2021/094:
It may be beneficial if further work is done to understand the increased risk of maternal death for women from Black, Asian and minority ethnic backgrounds and those with higher socio-economic deprivation.

Safety observation O/2021/095:
It may be beneficial if the NHS England and NHS Improvement communications toolkit for local maternity teams to improve communications with women from Black, Asian and minority ethnic backgrounds is implemented in all healthcare services for pregnant women.

Safety observation O/2021/096:
It may be beneficial if written safety netting advice is developed for pregnant and postpartum women about COVID-19 and other common conditions, incorporating the MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK) recommendations.

Related safety recommendation

This review adds weight to the safety recommendation (number R/2020/095) made in the HSIB report ‘COVID-19 transmission in hospitals: management of the risk – a prospective safety investigation’, that:

‘It is recommended that the Department of Health and Social Care, working with NHS England and NHS Improvement, Public Health England, and other partners as appropriate, develops a transparent process to co-ordinate the development, dissemination and implementation of national guidance across the healthcare system to minimise the risk of nosocomial transmission of COVID-19’.
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1 Introduction

1.1 Purpose

This report reviews findings from HSIB investigations into maternal deaths (the death of women during pregnancy/childbirth or shortly after the end of a pregnancy) that occurred during the early phase of the coronavirus pandemic, in order to identify themes and areas of learning which may improve safety in the healthcare system. The review includes maternal deaths that met HSIB’s referral criteria for investigation (see section 4) and where the families gave consent for their investigation to be included.

Specifically, this report aims to:

• inform understanding about the range of factors at a local, regional, and national level that contributed to harm

• support learning discussions within organisations

• influence the development of systems and processes to optimise patient safety particularly during further times of increased pressure on the healthcare service

• identify potential safety risks that merit further HSIB investigation.

This report complements other publications that have explored national learning following maternal deaths and other HSIB national investigations during the COVID-19 pandemic.

1.2 Scope

The maternal deaths reviewed in this report occurred between 1 March 2020 and 31 May 2020, the first peak of the COVID-19 pandemic in England. These investigations captured perceptions of events from families and staff in the context of the system in which the events took place. The investigations considered the organisational and environmental changes related to the COVID-19 pandemic.

HSIB recognises that in each of these cases decisions and actions were taken in a complex and dynamic healthcare system. The focus of this report is the interaction of multiple, interacting contributory factors within the healthcare system. It does not seek to examine specific national policies, guidelines or individual decision making.

Learning regarding specific medical conditions and cause of death are not the focus of this national learning report. HSIB worked with MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK) on ‘SARS-CoV-2 rapid review’ (Knight et al, 2020a), which includes exploration of the clinical aspects of individual mothers’ care. The HSIB cohort
of maternal deaths differs from that covered by the MBRRACE-UK rapid review and HSIB refers to MBRRACE-UK as the best source of information for the epidemiology and quantitative analysis of maternal deaths in the UK.

This review includes maternal deaths that were referred to HSIB, that met the HSIB criteria and where consent was given by the family. It is acknowledged that this does not include all the women who died during or after pregnancy in England during this time.

1.3 **A note of acknowledgement to families**

We would like to thank the families affected by maternal death whose experiences are described in this report. We are grateful to those who generously gave their time under such difficult circumstances.

Individual descriptions of the women’s care and experiences in relation to the clinical details of the case have not been described in this report, to protect the anonymity of the women and their families.

To preserve anonymity, individuals are referred to as the woman or family member. We use the term ‘woman’ or ‘women’ to include women, or mothers, who died during pregnancy or within 42 days of the end of a pregnancy.

1.4 **A note of acknowledgement to members of staff**

We would also like to thank the healthcare providers and staff who participated in the investigations included in this review and shared their perceptions of the incidents and the healthcare service with us, as well as expressing their empathy for the families involved.

1.5 **A note to pregnant women or those planning pregnancy**

We would like to acknowledge that reading this report may be concerning for women who are currently pregnant, those planning a pregnancy or their families. Maternal death is rare in England, and this report is focused on the important learning from these devastating outcomes. It is important to acknowledge that during the time covered by the report thousands of mothers and babies experienced a safe pregnancy, labour and birth.
2 Background

2.1 Definition and categorisation of maternal deaths

The World Health Organization (WHO) defines maternal death as:

‘The death of a woman while pregnant or within 42 days of the end of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.’

(World Health Organization, 2004)

The WHO further categorises maternal deaths into those that are direct, indirect, or coincidental.

• Direct deaths

Direct maternal deaths are:

‘… those resulting from obstetric complications of the pregnancy state (pregnancy, labour and the period of six weeks after childbirth during which the woman’s reproductive organs return to their pre-pregnancy condition), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.’

(World Health Organization, 2012)

• Indirect deaths

Deaths ‘resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by physiologic effects of pregnancy’ are defined as indirect deaths (World Health Organization, 2012).

• Coincidental deaths

Coincidental deaths cover deaths such as some caused by cancers or due to accidents. While these deaths occur in pregnancy, childbirth, or the period following pregnancy, they are not considered maternal deaths (World Health Organization, 2012).

Maternal deaths are rare in the UK, occurring in fewer than 10 per 100,000 pregnancies (Knight et al, 2019).

2.2 Changes to healthcare in England during March to May 2020

COVID-19 pandemic


Most people with COVID-19 experience mild to moderate respiratory illness and recover without requiring special treatment (World Health Organization, 2020c). A small proportion of people may develop serious illness or die. Older
people, men, those from Black, Asian, and other ethnic minority backgrounds, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease or cancer, are more likely to develop serious illness.

The first confirmed case of COVID-19 in the UK occurred on 30 January 2020 and the first confirmed death was on 2 March 2020 (Public Health England, 2020a; Office for National Statistics, 2020a).

New policies and directions for healthcare providers

On 17 March 2020, the NHS Chief Executive and NHS Chief Operating Officer mandated change in NHS services to prepare for large numbers of patients with COVID-19, many requiring respiratory support (NHS England and NHS Improvement, 2020a). All non-urgent elective (planned) work was postponed from 15 April 2020. Maternity services remained operational.

Changes in practice included the following:

- Increased use of remote consultations (NHS England and NHS Improvement, 2020b).
- Restricting family visits to reduce the risk of transmission of the virus (NHS England and NHS Improvement, 2020c).
- Some services were reduced, such as ultrasound scans (NHS England and NHS Improvement, 2020d).
- Services and patient pathways were reconfigured to separate patients with and without symptoms suggesting COVID-19.
- Staff were redeployed to other areas of hospitals (NHS England and NHS Improvement, 2020a).
- Critical care services were expanded, and additional equipment sourced (NHS England and NHS Improvement, 2020e).
- Staff who developed symptoms of COVID-19 were asked to self-isolate, and to stay away from work for 14 days (Public Health England, 2020c).
- Staff received risk-assessments, and some were redeployed to non patient-facing roles (Health and Safety Executive, 2020).
- Temporary reorganisation guidance for intrapartum maternity care (care during labour and immediately after birth) was published on 9 April 2020 (NHS England and NHS Improvement, 2020f).
- The requirements for death certification changed (Coronavirus Act, 2020).
- Guidance for coroners allowed for increased use of other sources of evidence to reduce post-mortem examination numbers (Lucraft, 2020).
Dec 2019
COVID-19 is initially detected in China

30 Jan 2020
First confirmed case of COVID-19 in the UK

02 Mar 2020
First confirmed death in the UK

09 Mar 2020
Royal College of Obstetricians and Gynaecologists (RCOG) on 9 March 2020 advised pregnant women, based on advice from Public Health England and the Government, that ‘they should not visit their GP practice or attend A&E in person’ regarding COVID-19 symptoms and should contact NHS 111

11 Mar 2020
The World Health Organisation declares the COVID-19 outbreak a pandemic

16 Mar 2020
Pregnant women were added to the ‘clinically vulnerable’ group and specific advice for women above 28 weeks’ gestation about social distancing was added on 21 March 2020

17 Mar 2020
NHS Chief Executive and NHS Chief Operating Officer mandated change in NHS services: changes included; increased use of personal protective equipment, increased use of remote consultations, restricting family visits to reduce the risk of transmission of the virus, some services were reduced, such as ultrasound scans, staff were redeployed to other areas of hospitals

23 Mar 2020
First national stay at home advice in England was announced by the UK Prime Minister

09 Apr 2020
Temporary reorganisation guidance for intrapartum maternity care was published

15 Apr 2020
All non-urgent elective work in the NHS was suspended. Maternity services remained operational

29 Apr 2020
Maternity services were recommended to make regular contact with women under their care to explain access to services

11 May 2020
The UK Obstetric Surveillance System released a pre-print publication describing outcomes for 427 pregnant women and their babies admitted to hospital with COVID-19. This study found that 55% of pregnant women admitted to hospital with COVID-19 were from a Black, Asian, or other ethnic minority backgrounds, an over-representation of women from these groups.

13 May 2020
Stay at home restrictions started to be eased in certain areas of England
Stay at home advice

On 23 March 2020, the UK Prime Minister announced that people should only leave their homes for essential reasons (Prime Minister’s Office, 2020). ‘Stay at home’ restrictions started to be eased from 13 May 2020; at the time of publication, restrictions continue.

Further directions for healthcare providers

From 29 April 2020, maternity services were recommended to make regular contact with women under their care to explain access to services (NHS England and NHS Improvement, 2020g).

Rapid service changes

HSIB recognises the extraordinary efforts of NHS staff at all levels to provide safe services to pregnant women despite the pressures of the pandemic. In the cases described in this report, HSIB saw evidence of good care in general despite the outcomes.

It is evident from HSIB maternity investigations that the healthcare system acted rapidly and implemented changes quickly:

‘The investigation found that a divisional governance day … had been used for planning and preparation, with guidelines allocated to individual clinical staff to review.’

‘All elective surgical lists were suspended two weeks prior … [which] allowed anaesthetists to support the ITU [intensive therapy unit] team.’

Investigations described rapid reconfiguration of departments and processes in preparation for the predicted increased number of patients with COVID-19:

‘The ED [emergency department] had doubled its footprint, taking over the ‘medical hub’ in order to accommodate the large influx of patients.’

Examples of excellent leadership were evident across HSIB investigations including where teams were led compassionately and inclusively during the extraordinary time covered in this report.

‘The investigation learned that clinicians were able to identify a leader during the resuscitation efforts … ongoing dialogue within the team continued to ensure there was shared understanding of the decisions being made and ongoing treatment provided.’

2.3 Changes for pregnant women due to COVID-19

Contact with the NHS for women with symptoms

On 9 March 2020 the Royal College of Obstetricians and Gynaecologists (RCOG) advised pregnant women, based on
advice from Public Health England and the Government, that ‘they should not visit their GP practice or attend A&E in person’ regarding COVID-19 symptoms and should contact NHS 111 (Royal College of Obstetricians and Gynaecologists, 2020a).

Later guidance published on 18 March 2020 urged pregnant women to contact their ‘maternity care team or NHS 111 straight away for further information and advice’ (Royal College of Obstetricians and Gynaecologists, 2020b).

**Vulnerable group status**

Pregnant women were added to the ‘clinically vulnerable’ group on 16 March 2020 (Public Health England, 2020c) and specific advice for women above 28 weeks’ gestation about social distancing was given on 21 March 2020 (Royal College of Obstetricians and Gynaecologists, 2020c).

**Self-isolation**

Self-isolation was required for those with symptoms of COVID-19 or who had a positive test (NHS, 2020). For pregnant women, initial advice was to self-isolate, to ‘stay indoors and avoid contact with others for 14 days’ (Royal College of Obstetricians and Gynaecologists, 2020a), later changed to 7 days (Royal College of Obstetricians and Gynaecologists, 2020d), and subsequently 10 days (Public Health England, 2020e).

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**2.4 Pregnancy and COVID-19 risk factors**

On 11 May 2020, the UK Obstetric Surveillance System released a pre-print publication describing outcomes for 427 pregnant women and their babies admitted to hospital with COVID-19 (Knight et al, 2020b). This study found that 55% of pregnant women admitted to hospital with COVID-19 were from a Black, Asian, or other ethnic minority background, an over-representation of women from these groups.

Guidance issued by the RCOG was updated to reflect these increased risks on 13 May 2020.

‘Women of Black, Asian or other ethnic minority backgrounds should be advised that they may be at higher risk of complications of COVID-19 and encouraged to seek advice without delay if they are concerned about their health. Clinicians should be aware of this increased risk, and have a lower threshold to review, admit and consider multidisciplinary escalation of symptoms in women of Black, Asian, or other ethnic minority backgrounds.’ (Royal College of Obstetricians and Gynaecologists, 2020e)

Other factors associated with an increased chance of hospital admission were older maternal age, raised body mass index (BMI) and pre-existing health...
conditions such as asthma, type 2 diabetes, or hypertension (high blood pressure). Most women who were hospitalised had COVID-19 symptoms in the third trimester of pregnancy (that is, they were between 28 and 40 weeks pregnant) or peripartum (the time shortly before, during, and shortly after childbirth), had good outcomes, and transmission of SARS-CoV-2 to infants was uncommon (Knight et al, 2020b).

About 10% of pregnant women admitted with COVID-19 infection required admission to a critical care setting for respiratory support (help with their breathing), which was a similar percentage to the general population requiring hospital admission.
3 Methods used in the review of maternal death investigation reports

3.1 Inclusion criteria

This report includes maternal deaths that occurred in England between 1 March 2020 and 31 May 2020 which were referred to HSIB between 6 March 2020 and 3 June 2020 and met the following HSIB maternity investigation referral criteria:

- direct or indirect maternal deaths (as defined in section 3)
- deaths of women while pregnant, or
- deaths of women within 42 days of the end of pregnancy.

HSIB directions (the remit of HSIB as set out by the Secretary of State for Health and Social Care) exclude the investigation of cases where homicide or suicide was the cause of death and investigations do not proceed if there is no family consent. Further information on the maternity investigation programme undertaken by HSIB is available at www.hsib.org.uk/maternity.

Twenty maternal deaths met HSIB’s criteria between March and May and proceeded to investigation; 19 families gave permission to include their investigations in this review.

3.2 Approach

The individual maternal death investigations were conducted in accordance with HSIB’s investigation process and supported using the Systems Engineering Initiative for Patient Safety (SEIPS 2.0) (Holden et al, 2013). SEIPS is a framework for studying and improving health and healthcare. The information contained in the individual investigation reports was derived from interviews with families, staff, clinical notes, post-mortem examinations, and the wider context of the healthcare system and the environment.

This qualitative review of the 19 investigation reports also used SEIPS for semi-structured coding and data analysis. Further information about this analysis method is described in HSIB’s national learning report ‘Never Events: analysis of HSIB’s national investigations’ (Healthcare Safety Investigation Branch, 2021).

Themes that were identified in two or more of the investigations were considered for inclusion in this report. All data and final themes were reviewed and agreed by HSIB’s multidisciplinary panel which includes investigators, clinicians, safety scientists and analysts.

This report includes quotes and excerpts from HSIB maternity investigation reports; where this is not possible, the report has described the findings in a narrative format.
the case, no citation or reference is given as these reports are not externally published.

3.3 Limitations

The individual maternal death investigations were conducted during a period when social distancing measures were in place. This resulted in changes to HSIB’s investigation process; for example, interviews with staff and family were conducted remotely rather than face to face. The analysts who undertook this review had access only to the investigation reports themselves and not the interviews or documents on which they were based.

These methods provide a narrative review of the investigations’ findings. HSIB has not set out to make statistical comparisons or findings of causation, but to describe the circumstances and pathways of care for the women involved. A quantitative approach is available in the report by MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK) which covers a similar time period (Knight et al, 2020b).
4 Characteristics and circumstances of maternal deaths

To preserve anonymity, the report has reduced statistical descriptions where there are fewer than three women in a category; some categories are therefore merged.

4.1 Cause of death

Cause of death is an official determination of conditions resulting in death, and is made by a doctor, medical examiner, or coroner. The Medical Certificate of Cause of Death (MCCD) records a sequence of conditions including the immediate cause of death, underlying cause of death (disease or condition) and other significant diseases. The leading causes of death for the 19 women whose cases are included in this report are shown in figure 2, using post-mortem reports where available and following clinical review. They are classified using the International Classification of Diseases, Maternal Mortality (ICD-MM) (World Health Organization, 2012).

In its report, ‘Saving lives, improving women’s care’ (Knight et al, 2020c) MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK) notes that the rate of direct maternal deaths from any cause did not change significantly between the periods 2013 to 2015 and 2016 to 2018. Thrombosis and thromboembolism (blood clots) are significant causes of direct maternal death.

<table>
<thead>
<tr>
<th>Direct cause of maternal death</th>
<th>Indirect cause of maternal death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood clot in the lung</td>
<td>Disorder of blood pressure in pregnancy</td>
</tr>
<tr>
<td>Disorder of the brain or nervous system</td>
<td>Disorder of the heart or blood vessels</td>
</tr>
<tr>
<td>Excessive bleeding around the time of birth</td>
<td>Severe infection (not COVID-19)</td>
</tr>
<tr>
<td>Severe infection (not COVID-19)</td>
<td>Severe infection (COVID-19)</td>
</tr>
</tbody>
</table>

Fig 2 Cause of maternal death, separated into direct cause (pregnancy related) and indirect cause
clots) were the leading cause of direct maternal death; death by suicide and death from obstetric haemorrhage were the joint second largest causes. Cardiac (heart) disease was the largest cause of indirect maternal death, followed by neurological causes (for example, stroke or epilepsy).

This report shows a similar pattern of causes of death, with the addition of COVID-19. The leading indirect cause of death was severe infection with COVID-19, followed by disorders of the heart or blood vessels (cardiac disease). As in the MBRRACE-UK report, the leading direct cause of death was blood clots.

- **COVID-19**

COVID-19 was listed on the MCCD for six women. This includes women who tested positive for the virus and women who did not receive a COVID-19 swab test – see figure 3.

Eleven of the 19 women had recognised COVID-19 symptoms of high temperature, new continuous cough and/or loss or change to the sense of smell or taste.

An additional five women had symptoms recognised as potential features of COVID-19 such as breathlessness, fatigue, or limb/joint pain.

**Fig 3** Any potential COVID-19 symptoms, whether testing was undertaken and if COVID-19 was listed as a cause of death
Six of the women whose families gave consent for inclusion in this report also had their care reviewed as part of the ‘Rapid report: learning from SARS-CoV-2-related and associated maternal deaths in the UK’ (Knight et al, 2020a).

Thirteen women received a COVID-19 test, of whom six tested positive; five of these had COVID-19 listed on the MCCD. One woman tested positive for COVID-19 but this was not included on the MCCD following post-mortem examination. Six women were not tested, in accordance with changes in testing policy during this time (Department of Health and Social Care, 2020b). Tests may have false negative and false positive results (Surkova et al, 2020).

At the time these women were receiving care, there were no specific treatments or vaccines for COVID-19 and care was based on supportive strategies, such as supplementary oxygen and continuous positive airway pressure support for breathing (Beeching et al, 2020). None of the women whose cases were reviewed in this report participated in clinical trials.

- **Blood clots in the lungs**

A pulmonary embolism (PE) occurs when one or more emboli (a detached blood clot or other material) travels through the blood stream and gets lodged in and obstructs the pulmonary arteries (blood vessels in the lungs). The most common source of a PE is a blood clot in the veins of the leg, known as a deep venous thrombosis (DVT). Thrombosis may affect other parts of the body, including the upper limbs, brain or gut (National Institute for Health and Care Excellence, 2020a; Di Nisio et al, 2016; Royal College of Obstetricians and Gynaecologists, 2015). A PE can cause severe breathing problems, low blood pressure or collapse, which might progress to shock (when the organs and tissues do not receive an adequate flow of blood), acute right-sided heart failure or sudden death. The estimated mortality rates of significant PE are 18% to 65% overall and 20% following treatment (Bĕlohlávek et al, 2013).

Three of the women died from a PE, all of whom had been diagnosed with or had symptoms consistent with an infection in the weeks leading up to their death. Of those tested, none were positive for COVID-19. Infection increases the risk of a PE (Bĕlohlávek et al, 2013) and symptoms may overlap with other medical conditions, such as pain or shortness of breath. This is explored in the ‘difficulties making a diagnosis’ section below. Findings from these investigations have prompted an HSIB national investigation to review prevention and identification of venous thrombo-embolic disease in pregnant
women, which will be published later in 2021 (Healthcare Safety Investigation Branch, 2020e).

- **Timing of illness and death**

  The stage of pregnancy when the women became unwell and subsequently died is described in figure 4. Fourteen of the women became unwell during their pregnancy, and five after pregnancy ended. A typical pregnancy lasts 40 weeks and is divided into three trimesters:

  - first trimester (between 0 to 12 weeks’ gestation)
  - second trimester (between 13 to 27 weeks).
  - third trimester (between 28 to 42 weeks).

  Pregnancy may end by giving birth, miscarriage, or termination of pregnancy (Knight et al, 2019).

  All the women who were in the third trimester when they became unwell delivered their babies prior to their death, with four undergoing a peri-mortem caesarean section (a caesarean undertaken at or near the time of death).

  Ten of the women died within one week of the end of their pregnancy, including seven within the first 24 hours. The other maternal deaths occurred between eight days and 39 days following the end of pregnancy. Six women had a pregnancy loss before 24 weeks. Eleven babies were born alive; two were stillborn.

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**Fig 4 The stages of pregnancy when the women became unwell and subsequently died**

<table>
<thead>
<tr>
<th>Stage of pregnancy when the women became unwell</th>
<th>Stage of pregnancy when the women died</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Trimester (2)</td>
<td>1st Trimester (1)</td>
</tr>
<tr>
<td>2nd Trimester (2)</td>
<td>2nd Trimester (1)</td>
</tr>
<tr>
<td>3rd Trimester (10)</td>
<td>Following the end of pregnancy (17)</td>
</tr>
<tr>
<td>Following the end of pregnancy (5)</td>
<td></td>
</tr>
</tbody>
</table>
4.2 Use of healthcare services

In the 14 days prior to their death, the 19 women had contact with multiple healthcare services including:

- NHS 111
- general practices
- ambulance services
- community-based services, including health visitors and community midwifery
- hospital services including:
  - emergency departments
  - maternity wards
  - medical wards
  - operating theatres
  - critical care (high-dependency units and intensive care units).

4.3 Location of death

Figure 5 shows the settings where the women died. Three women died at home. Sixteen women died in hospital, including 11 women who were admitted to an intensive care unit.

Fig 5 The settings where the women died

- Hospital 84%
- Home 16%
- Emergency department 5%
- Maternity ward 11%
- Maternity operating theatre 11%
- Intensive care unit 58%
4.4 Demographic and clinical characteristics

A summary of demographic and clinical details of the 19 women is provided below. Full details are provided in appendix 1.

- Thirteen were aged between 25 and 34 years.
- Eight had a body mass index (BMI) of greater than 30 kg/m².
- Eight women were from Black, Asian, or other ethnic minority backgrounds and 11 were from a white background (see ethnicity section below).
- Sixteen had been pregnant before and had other children.
- Fifteen had a pre-existing medical condition, including diabetes, high blood pressure, heart conditions, hypothyroidism (where the thyroid does not produce enough hormone), or epilepsy.

4.5 Ethnicity

To protect the confidentiality of the women and their families, because of small numbers, this report groups together women from different heritages including Asian or Asian British Indian, Asian or Asian British Pakistani, Black British, Black African or Black Caribbean, and Mixed Ethnicity, as defined by the Office for National Statistics (2017).

Eight (42%) of the 19 women included in this report were from Black, Asian or other minority ethnic backgrounds, compared to 13.9% of the UK population (Office for National Statistics, 2020b).

The disparity in maternal deaths according to ethnicity has been observed previously. MBRRACE-UK (Knight et al, 2019) found that Black women are five times more likely to die in pregnancy, childbirth or in the period after giving birth (the postpartum period), compared to white women, and Asian women are twice as likely to die, compared to white women. The report did not determine the causes of this disparity and concluded that further research was needed.

HSIB investigations did not identify specific aspects of the healthcare system which could explain this disparity.

All six women who died from complications of COVID-19 infection were from a Black, Asian, or other ethnic minority background.

4.6 Index of Multiple Deprivation

People who live in the most deprived areas of England and Wales are around twice as likely to die if they contract COVID-19 (O’Dowd, 2020).

HSIB uses the Index of Multiple Deprivation (IMD) to measure deprivation. The IMD is based
on seven domains including income deprivation, crime, and education, giving a combined score where 1 is most deprived and 10 least deprived (Ministry of Housing, Communities and Local Government, 2019).

The areas of residence for all women from Black, Asian, and other ethnic minority backgrounds included in this report were rated between 1 and 5 using IMD – that is, the most deprived areas (see figure 6). Seven of the women from white backgrounds were from the five most deprived areas and four from the five least deprived areas.

4.7 Policy and proposed research following these maternal deaths

Since the deaths of these women, the government announced a programme of work focusing on health inequalities and COVID-19 (HM Government, 2020) and tackling racial disparity in maternal mortality (Government Equalities Office, 2020). A key focus for future research will be the racial health inequalities in maternity care (Ford, 2021).

On 27 June 2020, NHS England (2020) wrote to maternity care providers to advise they take the following specific actions to improve care:

- increase support for at-risk women and have a lower threshold to admit pregnant women from a Black, Asian or other ethnic minority background
- tailor communications to women
- discuss vitamin supplements and nutrition with women, including vitamin D
ensure providers record risk factors to identify those most at risk of poorer outcomes.

A toolkit for local maternity teams to improve communications with women from Black, Asian and other ethnic minority backgrounds was produced by NHS England in January 2021 (NHS England, 2021).

HSIB makes the following safety observations

Safety observation O/2021/094:
It may be beneficial if further work is done to understand the increased risk of maternal death for women from Black, Asian and minority ethnic backgrounds and those with higher socio-economic deprivation.

Safety observation O/2021/095:
It may be beneficial if the NHS England and NHS Improvement communications toolkit for local maternity teams to improve communications with women from Black, Asian and minority ethnic backgrounds is implemented in all healthcare services for pregnant women.
5 Family perspective

HSIB acknowledges that this report will be unable to describe the full circumstances of each woman’s death or the impact these events have had on those involved. This includes the effect on partners, families, children, and the babies born to the women.

This HSIB review has identified four themes relating to concerns expressed by families:

5.1 Experience of maternal collapse at home has a significant impact

Fourteen women suddenly became unwell or collapsed at home. Of these, three died at home despite the efforts of the attending healthcare professionals. Sixteen of the 19 women whose cases are included in this report died in hospital.

The individual investigations describe circumstances where family members were asked to assist healthcare professionals at home, including assistance with resuscitation of their relative and with use of equipment. Although there was a clear time-critical imperative for this, and it occurs outside the pandemic, HSIB investigations noted the impact such involvement had on family members.

5.2 Visiting restrictions

National and local policies were implemented to restrict the attendance of partners and families at hospitals (NHS England and NHS Improvement, 2020c) to reduce the transmission of COVID-19 to patients, families, and the public.

These policies meant that women were alone when attending hospital appointments, emergency departments, assessment units, ultrasound scans and on admission to hospital, including in maternity settings and intensive care units.

Partners were permitted to be on labour wards only when the woman was in labour and were asked to return home hours after the baby was born. This contributed to decisions to delay attendance at hospital or to self-discharge. Several fathers told the investigations that they were unable to be present for the birth of their child.

Families are an important source of support for women who are feeling unwell, in pain, receiving bad news or making difficult decisions (Rance et al, 2020; Manias, 2013).

The investigations found variation in local implementation of national guidance. For example, HSIB identified instances where partners could accompany...
the woman in the emergency department whereas in other places they could not.

5.3 **Families’ ability to advocate or support**

Many of the women were admitted to hospital and received medical care over several days prior to their death. As described above, the visiting restrictions at the time meant the women were unable to be with family members during their admissions.

The investigations saw examples where staff regularly communicated with family members to give them updates. There were occasions where staff anticipated the death of the woman and contacted family members promptly to ensure they had the opportunity to be with the woman before she died.

Investigations noted other instances when families did not have the opportunity to visit the woman prior to her death. Visiting restrictions, coupled with the sudden and, at times, unanticipated deterioration of the women’s clinical condition, added to the families’ distress.

In complex situations families can advocate on behalf of their relative and bring knowledge of the individual woman’s personal circumstances, medical history, and preferences. This may be particularly important where there are cultural or language differences.

Concern expressed by families is highlighted in the following excerpt from an HSIB maternity investigation report:

‘The woman was admitted alone due to the COVID-19 pandemic ... This has caused the family great concern as they were unable to be with the woman when she collapsed and died. The family felt that if they had been with her, they would have been able to advocate for her ...’

5.4 **Families want to understand more about why their relative died**

Some of the families wanted to understand more about why their relative died and felt that information from a post-mortem examination (PME) would have helped. Nine of the women did not receive a PME, with the coroner deciding on cause of death based on other factors such as computed tomography (CT) scans or symptoms.

The decision by professionals regarding whether to undertake a PME during the pandemic was challenging and complex.
It required balancing multiple factors, underpinned by the change in legislation for death notification introduced due to the pandemic (Department of Health and Social Care, 2020c; Coronavirus Act, 2020) and acknowledging the MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK) recommendations which underline the importance of a PME in maternal death (Knight et al, 2020a).
6 Themes from maternal death investigations

HSIB identified seven themes from the maternal death investigations:

1. Unprecedented demand for telephone health advice caused delays in accessing health care
2. Public messaging and safety netting advice caused delays in presentation
3. Guidance changed rapidly
4. Use of early warning scores did not always detect deterioration
5. Personal protective equipment requirements changed due to COVID-19
6. Staff described feelings of stress and distress which can affect performance
7. Difficulties in making a diagnosis and choosing treatment strategies.

Where learning was identified within individual HSIB maternity investigations, recommendations have been provided to individual health care providers. These individual recommendations have been drawn upon and summarised to support this national learning report.

6.1 Unprecedented demand for telephone health advice caused delays in accessing health care

During March and April 2020, as COVID-19 cases increased in England, there was an unprecedented demand for health advice using telephone health services, including NHS 111 (see figure 7).

Fig 7 NHS 111: calls received and total calls answered (Vestesson and Gardner, 2020)
NHS 111 service levels were affected by contact relating to COVID-19 from the middle of February 2020 (NHS England and NHS Improvement, 2020h). This resulted in a sharp increase in the volume of telephone calls received in March 2020, the time taken to answer those calls, and the number of abandoned calls.

There were 2,962,751 calls to NHS 111 in England in March 2020, an average of 95,600 calls per day – double the number of calls during the same month the previous year. Of the calls made to NHS 111 in March 2020, the proportion abandoned after waiting longer than 30 seconds was 38.7%, compared to 2.4% in March 2019.

The HSIB maternity investigations showed that women were given several contact numbers for healthcare services. Several of the women, or their family members, attempted to contact NHS 111. Six experienced delays or were unsuccessful when attempting to access advice, some trying repeatedly through multiple contact numbers.

HSIB heard evidence of calls being abandoned after waiting up to 30 minutes to connect with an operator, and significant delays while waiting to receive a call back from a clinical advisor.

One example is described below:

‘The investigation discovered that in one of the regional NHS 111 services the volume of calls significantly increased the average time taken to answer a call to 21 minutes and 43 seconds, in March 2020, whereas the average time taken to answer a call in February 2020 had been 17 seconds.’

Other services also appeared to be less accessible during this period. Three of the investigations described women as unable to contact their GP: one stated that the telephone was “not answered”, another obtained an appointment for three days later and another disconnected the call on hearing that she was 27th in the queue to be answered. A family member recalled telephoning the local maternity helpline at night on “four or five occasions, and that each of these calls went to answerphone”.

In response to the issues identified in this national learning report and other sources, HSIB has recently started an investigation into the NHS 111 response to the coronavirus pandemic which will be published later in 2021.

6.2 Public messaging and safety netting advice caused delays in presentation

The message from the government (and healthcare organisations) during March to May 2020 was ‘Stay Home. Protect the NHS. Save Lives’ (Department of Health and Social Care, 2020a).

The HSIB maternity investigations found that women and their families were concerned and feared for their health and the risk
of exposing their unborn baby to COVID-19. There were examples of women staying away from hospitals for as long as they could. This was found both in women who died due to COVID-19 and those who died of other causes.

Trusts reported a decrease in the number of both emergency department attendances and emergency department admissions during this time (Hughes et al, 2020). The public messaging may have been reinforced by women’s earlier visits to the hospital for appointments, where impressions were that there “was nobody in the hospital and the rooms were bare”, suggesting that other members of the public were adhering to advice to stay at home.

As described above, families told us that the new hospital visiting policies influenced the decisions of women to delay attendance, or to discharge themselves against medical advice. Some women had previously been informed that they did not need to be in hospital.

On 25 April 2020, the Chief Executive of NHS England and NHS Improvement launched a campaign encouraging people to seek help for urgent health needs and reassuring people that they should continue to use other services, such as maternity care. The campaign was supported by government messaging on television (NHS England and NHS Improvement, 2020i). This aligned with statements from the Royal College of Obstetricians and Gynaecologists (RCOG) on 3 April 2020. Many professional bodies, including the RCOG and the Royal College of Midwives, reinforced this message through their websites and public messages (Royal College of Obstetricians and Gynaecologists, 2020f). Most of the women whose cases are included in this report died prior to this campaign.

From October 2020 the ‘Help-Us-Help-You’ campaign produced resources to support the message of encouragement to access health care for serious or urgent problems (Public Health England, 2020).

Safety netting

HSIB’s investigations found that several women received advice to ‘stay at home’ or were sent home by healthcare staff, in accordance with national guidance at the time. Some women were advised to stay at home when reporting fever and/or cough, or were sent home from an emergency department, without evidence of clear individualised advice about when to return.

The term ‘safety netting’ (or discharge advice) refers to tailored advice provided at the end of a healthcare contact. Providing safety netting advice can increase patient safety (Almond et al, 2009).
HSIB’s investigations found that safety netting advice often did not contain all the recommended elements. The uncertainty of the diagnosis, other potential conditions, potential warning symptoms or the likely course of the illness were not conveyed.

HSIB investigations found that women were advised to contact healthcare services again if they “felt worse” or had concerns; such advice was given when attending hospitals or when calling ambulance services. As women already felt acutely unwell with symptoms, families told HSIB there was uncertainty about what else would prompt the need to call back or to re-attend hospital. Previous research has shown that when patients contacted healthcare providers earlier in the course of their illness and were advised to come back if their ‘symptoms got worse’, this led to delay in the patient re-contacting the healthcare provider and led to missed opportunities for earlier treatment (Neill, 2020).

Women often visited healthcare services alone, meaning there was no one else with them to clarify which symptoms should prompt a return to the hospital or attendance at the GP. Written information was not always given to reinforce advice or to describe what was meant by worsening symptoms.

HSIB investigations saw barriers to effective communication including time demands, lack of continuity of care, noise, lack of privacy, and the stressful nature of the visit. A previous study demonstrated that 79% of patients discharged from emergency departments had an incomplete understanding of discharge instructions (Engel et al, 2009). This may be further compounded if English is a second language (Ngo-Metzger et al, 2007).

Jones et al (2019) proposed that to increase patient safety, safety netting advice should include:

- advice on potential alarming or warning symptoms
- a discussion with the patient on the problem of uncertainty, inherent in all diagnoses particularly in the absence of definitive diagnostic tests
- the likely time course of the illness and when to re-present to healthcare services
- advice on accessing further medical care
- follow-up, and the management of any tests ordered.

MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK) recommends that healthcare providers offer ‘specific advice to pregnant and post-partum women with COVID-19 infection about the risk of deterioration and when to seek urgent medical attention or go to the hospital. This should be
communicated via an interpreter if necessary’ (Knight et al, 2020a). MBRRACE-UK recommends that national advice should be developed by the COVID-19 guideline development group of the RCOG, the Royal College of Midwives and the Obstetric Anaesthetists Association, and HSIB recommends in addition that this advice should contain specific local information with maternity unit contact details. Considering the MBRRACE-UK recommendation, HSIB has identified the following safety observation.

**HSIB makes the following safety observation**

**Safety observation O/2021/096:**
It may be beneficial if written safety netting advice is developed for pregnant and postpartum women about COVID-19 and other common conditions, incorporating the MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK) recommendations.

### 6.3 Guidance changed rapidly

The effort to produce guidance to inform clinicians and the public about COVID-19 was unprecedented and the resultant wave of information directed at staff on the frontline was considerable. National guidance and updates were a necessary and a welcome response, both in England and internationally, to the evolving knowledge and evidence.

For the unwell pregnant woman attending a healthcare provider in various settings, and seen by a variety of professional disciplines, multiple guidance from multiple sources was applicable.

HSIB investigations heard that it was difficult for healthcare providers to keep staff apprised of updates to guidance, in addition to pre-existing policies. Guidance was provided in different formats and on different website platforms, such as national bodies (NHS England and NHS Improvement, National Institute for Health and Care Excellence, Public Health England) and various professional bodies (RCOG, Royal College of Anaesthetists, Royal College of Physicians, Royal College of General Practitioners).

Public Health England (PHE) (2020f) published initial COVID-19 guidance on infection prevention and control on 10 January 2020. Between 1 March and 31 May, this was updated 21 times, while personal protective equipment (PPE) advice was updated 6 times in the same period.

The RCOG produced the first version of its COVID-19 advice for healthcare professionals on 9 March (Royal College of Obstetricians and Gynaecologists, 2020a). It went on to produce 11 further updates and publications in March, 12 in April and 6 in May. On 9 April, NHS England and NHS Improvement published the first version of a clinical guide for the temporary

For example, the RCOG (2020a) recommendations for hourly oxygen saturations (checks of how much oxygen was in the bloodstream) and hourly respiration monitoring for women in labour were not followed as not all staff were aware of them. There was no formal local dissemination process to staff in several trusts, and the investigations heard examples of services such as primary care and emergency departments having difficulty keeping abreast of updated guidelines from many different specialties, and of local guidelines contradicting the national specialty guidance.

In another example, one investigation found a local standard operating procedure was still being developed and had not been shared with staff, as further national guidance was emerging. The clinical staff were aware of the RCOG guidance, which had changed, and were using this to support their clinical decision making in practice while the local guideline was being developed.

Organisations had to modify their methods for passing on information about the changes to care pathways and standard operating procedures. Usual forums, such as huddles or skills training, were not available because of reduction in staff meeting in groups, new shift patterns, sickness absence and part-time working. One investigation described that because of the new roster pattern, ambulance crews did not all start their shifts at the same time. There was ‘no opportunity for an update as a team and crews often self-briefed from a notice board’. Some trusts used a variety of means including shift handovers, email, face-to-face conversation and private social media pages.

The recent HSIB investigation ‘COVID-19 transmission in hospitals: management of the risk – a prospective safety investigation’ identified how challenging it has been for organisations in the NHS to develop, interpret and implement local guidance due to the ‘volume of guidance disseminated and the speed at which guidance updates have been required’ (Healthcare Safety Investigation Branch, 2020a).

Related safety recommendation

This review adds weight to the safety recommendation (number R/2020/095) made in the HSIB report ‘COVID-19 transmission in hospitals: management of the risk – a prospective safety investigation’, that:
‘It is recommended that the Department of Health and Social Care, working with NHS England and NHS Improvement, Public Health England, and other partners as appropriate, develops a transparent process to co-ordinate the development, dissemination and implementation of national guidance across the healthcare system to minimise the risk of nosocomial transmission of COVID-19’.

6.4 Use of early warning scores did not always detect deterioration

Early warning scoring systems in pregnancy

Early warning scoring (EWS) systems (also called ‘track and trigger’ systems) are used in healthcare, along with clinical observation, to help identify when a patient’s condition is deteriorating and action needs to be taken (NHS England and NHS Improvement, 2019a; Royal College of Physicians, 2012). A EWS system requires regular monitoring of the patient’s condition, and incorporates observations such as respiratory rate, oxygen saturation, temperature, heart rate, blood pressure and assessment of urine. The tool produces a score that can be used to support escalation of care but does not replace clinical judgement. The commonest tool used in the English NHS is the NEWS2 (National Early Warning Score 2) (Royal College of Physicians, 2017).

NEWS2 has not been validated for the assessment and monitoring of pregnant women and there are concerns that physiological changes of pregnancy may alter its efficacy (Royal College of Physicians, 2020). The UK Confidential Enquiry into Maternal Deaths, published in 2007, recommended the introduction of the Modified Early Obstetric Warning System (MEOWS) for all admissions during pregnancy (Lewis, 2007; Cole, 2015). HSIB investigations found use of NEWS2 rather than MEOWS in the assessment and monitoring of pregnant women in settings such as pre-hospital care, the emergency department and medical wards, where there can be limited access to the MEOWS tool and healthcare professionals are more familiar with NEWS2.

An EWS tool for pregnancy such as MEOWS uses parameters appropriate to pregnancy and may include scores for additional factors specifically relating to pregnancy as well as an overall assessment of whether the woman appears well.

Other countries have developed a standardised MEOWS tool (Healthcare Improvement Scotland, 2018; Institute of Obstetricians and Gynaecologists, 2014) but there is currently no standardised MEOWS tool used in England. Additionally, there is no guidance on which observations should be included or what the
expected ‘trigger’ thresholds for those observations should be (Carle et al, 2013). NHS England and NHS Improvement’s maternity and neonatal safety improvement programme (MatNeoSIP) is working with key stakeholders to develop a nationally agreed maternity early warning scoring system and a national pathway to manage maternal and neonatal deterioration.

HSIB investigations identified that EWS systems are not always used as intended

HSIB saw that local MEOWS charts sometimes used a scoring range rather than a single number for the pain score. This meant it could not be determined if a woman’s pain had improved or not during her admission, as the MEOWS range for her pain remained the same. The use of a single number pain score with an associated MEOWS score would allow identification of change in pain and the need for escalation.

HSIB investigations also noted occasions where MEOWS charts were incomplete, without all parameters being assessed, and where the total score was inaccurately added up.

HSIB identified variation in trigger thresholds on MEOWS charts

In other investigations HSIB found that trigger thresholds on MEOWS charts, specifying what was to be considered a concerning physiological sign, varied. For example, the threshold for heart rate on some MEOWS charts had a trigger point of greater than 100 beats per minute (bpm) and on others greater than 120 bpm. This led to a variation in escalation in different maternity units for women with the same physiological signs.

Interpretation of EWS in the context of COVID-19

HSIB maternal death investigations identified examples where women had an elevated respiratory rate for a prolonged period prior to death. Local guidance did not prompt escalation of care for the respiratory rate at this level in pregnancy and causes other than COVID-19 were not considered. During this time, the women maintained oxygen saturations within the expected range, which falsely reassured staff.

EWS should be used alongside clinical judgement to help identify the severity of a patient’s illness and the risk of their condition deteriorating. An HSIB national investigation (Healthcare Safety Investigation Branch, 2019) found that EWS may give false reassurance to staff working in busy and complex environments.

Actions to improve safety of EWS use

NHS England and NHS Improvement’s maternity and neonatal safety improvement programme (MatNeoSIP) has been tasked with producing an evidence-based, standardised obstetric early warning scoring system. HSIB is supporting this work.

The Royal College of Physicians (RCP) released a statement with revised guidance on the use of NEWS2 for adult COVID-19 inpatients. The RCP suggests that all staff should be aware that any increase in oxygen requirements should be an indicator of clinical deterioration as the EWS might not significantly increase. This guidance did not refer to pregnant women.

6.5 Personal protective equipment (PPE) requirements changed due to COVID-19

Changing PPE guidance

PPE guidance was updated or added 22 times in the time covered by this report, in response to increased understanding of transmission of COVID-19. By comparison, in the same period last year guidance was updated once (Public Health England, 2020b; Public Health England, 2020g; NHS England and NHS Improvement, 2019b). Rapid changes meant that guidance could change between individual clinicians’ shifts.

Prior to COVID-19, healthcare workers were directed to wear PPE for a small range of specific tasks and infectious diseases (The Personal Protective Equipment (Enforcement) Regulations, 2018; Department of Health, 2015).

Public Health England (2020b) notes that ‘the transmission of COVID-19 is thought to occur mainly through respiratory droplets generated by coughing and sneezing, and through contact with contaminated surfaces ... The provision and use of personal protective equipment (PPE), will protect staff, patients and visitors’.

Work processes and environment

HSIB has learned through its investigations that the design of work processes and the environment did not adapt to account for the increased use of PPE, which created difficulties particularly in emergencies such as cardiac arrest (when a person’s heart stops beating), emergency caesarean section, or when rapid access to a woman’s house was needed.

The investigations found that healthcare workers were trained in the donning of PPE to help reduce delays. Additional resources for healthcare professionals have been provided for use in training, such as simulation videos of donning and doffing (putting on taking off)PPE in an obstetric (childbirth-related) emergency (PROMPT, 2020).
Training is only one aspect of a socio-technical system and relies on the memory of an individual who is under pressure to respond.

In some cases, the location of PPE was not designed to promote rapid donning. Research by Herlihey et al (2017) has shown that the design of the environment influences the ease for healthcare workers donning and doffing PPE.

HSIB also found that processes were not adapted to account for the additional donning time to ensure staff could respond quickly when required. HSIB investigations highlighted instances where an intervention was delayed or it took longer to obtain results because of the increase in the number of recommended PPE items to be worn, the built environment, and the design of work processes. For example:

- commencing urgent (category 1) caesarean section was delayed while staff donned PPE
- delays due to the additional infection prevention control requirements, including donning and doffing PPE multiple times as a clinician moved between areas to obtain test results from equipment located on another ward during resuscitation
- donning PPE prior to an ambulance crew entering a woman’s home, adding time before resuscitation could commence.

Known risks associated with wearing PPE were not sufficiently accounted for

The impact of wearing PPE on staff was described in literature prior to the COVID-19 pandemic. For example, Herlihey et al (2016) have shown that:

- overheating is common, even after wearing PPE for a short period of time
- face coverings can restrict a healthcare worker’s field of view, particularly when looking downwards, leading to a tendency to adjust face coverings to compensate which risks contamination
- face/head coverings such as safety goggles and visors can fog, further reducing visibility
- wearing PPE can hinder communication between healthcare workers and with patients.

Hignett et al (2020) confirmed that during the COVID-19 pandemic these issues were widespread throughout the UK with clinicians reporting issues with the fit of PPE, vision and hearing difficulties, and completion of tasks.

Healthcare workers were required to wear additional PPE, including items such as face masks and visors that cover large areas of the face. HSIB investigations noted that staff expressed difficulty
with hearing and identifying staff and their respective roles. Environments were described as “noisy” with staff having to repeat requests and seek clarification of instructions. Difficulty was reported with the use of some masks, with clinicians’ voices being described as “muffled”. One investigation described teams providing verbal updates “through the door” to enable infection control precautions to be maintained.

The findings described in this report regarding PPE are also reflected in HSIB’s report ‘COVID-19 transmission in hospitals: management of the risk – a prospective safety investigation’ (Healthcare Safety Investigation Branch, 2020a). This maternal death review adds further weight to the report’s recommendations to consider system design and risk controls.

6.6 Staff described feelings of stress and distress which can affect performance

Stress is an emotional state of heightened arousal (Eysenck and Keane, 2020). Stress is not always negative; in some circumstances it may improve performance. Prolonged or intense levels of stress can impair performance, and, if severe enough, can have negative consequences for health in the form of burnout (Wickens et al, 2013). Although an individual’s response to stress is complex, impaired human performance is generally marked by the following:

- Attentional narrowing: a reduction in the amount of information that is processed. In most circumstances, this is adaptive by focusing attention on tasks of greatest importance. Narrowing can lead to undesirable outcomes when important information is filtered and ignored.

- Distraction: stressors, including time pressure, serve as a distraction and may divert attention away from processing relevant information.

- Memory loss: stressors, including anxiety, can divert attention away from rehearsing information in memory and as such can impact on learning.

- Perseveration: high levels of stress may cause people to continue with a given action despite changing circumstances, and fail to consider alternative approaches. This is demonstrated in the well-known case of Elaine Bromiley, who died during a routine operation (Laerdal Medical, 2011).

The impact of stressors can be modulated by several factors including the design of the healthcare system in which people work and individual factors such as skill and personality variables.
Communication difficulties when wearing PPE “heightened stress levels”. There are many other examples from the HSIB investigations where the staff interviewed expressed fear, increased stress, anxiety and distress over this period and the events that occurred.

Staff from several specialties told HSIB investigators that making decisions with limited information, particularly about COVID-19, increased levels of anxiety. One staff member commented that “tensions were very high as this was the first time that the team were treating a patient they thought may have COVID-19”.

One investigation report highlighted that the redeployment of staff to unfamiliar working environments was a trigger for increased anxiety:

‘Staff who were deployed from other areas to work in the ITU [intensive therapy unit] felt vulnerable and there was not always a sense of teamwork ... The investigation learned that team working improved with time.’

In addition, reports described emotional distress and that staff were “deeply affected” by the deaths. Although HSIB observed examples of good support for staff, there were many examples where proactive support or debriefs were not offered and staff were required to continue their shifts.

‘The investigation learned that staff who were present at the time of the woman’s surgery were not offered formal support following the woman’s death. A whole team debrief for all of those involved in the care of the woman, and present during her surgery did not take place, as required by Trust policy.’

Understanding the effect of stress and emotional distress on human performance can support the design of more stress-tolerant systems.

While the workforce must continually adjust and adapt to new demands, understanding the ability of staff to achieve this safely requires an understanding of organisational resilience. Organisational resilience is the ability of a healthcare system (for example a clinic, ward or hospital) to adjust its functioning prior to, during, or following events (changes, disturbances), and thereby sustain required services under both expected and unexpected conditions (Wears et al, 2015).

There were many examples where the system successfully increased specific services to accommodate the anticipated increased demand. However, there were examples when the system did not or could not raise staffing levels sufficiently to support reconfiguration, sickness and additional tasks, such as donning and doffing PPE, as described in the reports below:
‘At the time of the incident, when the woman attended the hospital and was discharged home ... there were a large number of staff on sick leave and also a proportion of staff who were unable to work in the suspected COVID-19 areas. This reduced staffing levels and increased workload...’

‘Another consultant had to do an extra shift, on top of their normal rota, to cover an ED [emergency department] that was now double its usual size but the department had not doubled the workforce.’

Strengthening organisational resilience involves understanding how the system can effectively learn, monitor, anticipate and respond (Hollnagel et al, 2006). This contrasts with individual resilience that focuses on the ability of an individual to withstand and adapt to unexpected circumstances or pressures, and to recover to a state of mental wellbeing by using effective coping strategies (Robertson et al, 2015). Individual resilience is often improved through training; organisation resilience is improved through system change.

The Chartered Institute of Ergonomics and Human Factors (2020) recently published a paper titled ‘Achieving sustainable change: capturing lessons from COVID-19’. The document outlines an approach to strengthening organisational resilience through designing learning mechanisms across the healthcare system. In the document, organisational learning is described as a social process that involves taking a step back, collectively making sense of experiences, and reflecting on and challenging assumptions to trigger change and improvement.

This approach enables the organisation to understand the pressures that staff are facing. This understanding allows for the identification of key work processes and how these can be better designed so that the system has the adaptive capacity to meet demand. This report has highlighted several areas that may increase organisational resilience.

HSIB has contributed to the Health and Social Care Committee’s current inquiry examining workforce burnout and resilience in the NHS and social care.

HSIB has published a national learning report on support for staff involved in patient safety incidents which may be useful for trusts planning support programmes (Healthcare Safety Investigation Branch, 2021).

6.7 Difficulties in making a diagnosis

Making a diagnosis requires the gathering of information, interpretation, consideration of a range of potential causes of the symptoms, and prioritising
information based upon that which might be more life-threatening or more likely. This is often not a simple linear sequence (National Academies of Sciences, Engineering, and Medicine, 2015). It occurs within a complex system, with numerous interdependent steps across multidisciplinary teams, which can be challenging (Healthcare Safety Investigation Branch, 2020). Furthermore, the correct diagnosis may only be apparent in retrospect (Williams et al, 2019).

The clinicians looking after the women whose cases were included in this review faced two additional challenges. The first was that COVID-19 was new and therefore not understood. The second was the impact of pregnancy, which itself can alter the way in which a woman is affected by a medical condition.

The process of making a diagnosis can be divided into the following four steps which are discussed below:

1. **Taking a clinical history and examining the patient**
2. **Diagnostic testing**
3. **Multidisciplinary consultation**
4. **Formulating a diagnosis.**

### 6.7.1 Taking a clinical history and examining the patient

All clinical services and the women themselves had to balance judgements about the risk of individuals being exposed to infection by attending healthcare facilities in person, against the benefits of a full assessment incorporating non-verbal cues and tailored clinical examination. HSIB investigations heard concerns of women and healthcare professionals about the risk of attending healthcare settings.

‘During the call, the woman described her breathlessness ... due to the recent outbreak of COVID-19 the medical staff had to assess the potential risk to the woman of a face-to-face review posed when she was shielding’.

Investigations found local policies recommended reduced hospital and home visits, including community midwife and health visitor appointments. Investigations noted usual measurements or interventions such as blood pressure recording, which were not done, or at least not recorded, in these unfamiliar circumstances.

Communication during telephone appointments was more difficult for those whose first language was not English or when wearing PPE. Handover communication between healthcare settings, verbal and documented, was also affected.

### 6.7.2 Diagnostic testing

**Diagnostic equipment not available**

There were examples where specific diagnostic equipment could not be located. One
investigation found a device to undertake point-of-care testing for urine was missing.

Another example involved a blood ketone testing machine (used to measure the substance produced by the body if cells do not get enough glucose).

‘On admission to the Emergency Department the woman was identified as experiencing a metabolic acidosis [a build-up of acid in the body] from her blood gas results. The presence of blood ketones was considered as the cause, however ... the blood ketones machine in the ED could not be located ... as the woman was moved from one clinical setting to another, this test was not completed.’

Reduced access to tests because of risk of COVID-19 transmission

Infection prevention and control measures implemented due to COVID-19 affected test availability.

‘The HSIB investigation team learnt that a computerised tomography pulmonary angiogram was not carried out ... due to them needing to be carried out in a non-COVID-19 area.’

HSIB investigations found some diagnostic tests were deliberately avoided because they posed an added risk of virus transmission. For example, transoesophageal echocardiography, which collects real-time pictures of a patient’s heart via an ultrasound probe passed down the oesophagus, generates an aerosol (a suspension of respiratory droplets or particles in the air). This can increase the chance of SARS-CoV-2 transmission, and the procedure was recommended to be done only where a patient’s condition was life threatening.

Choice of test and scoring systems affected by pregnancy

Pregnancy itself may have influenced clinicians’ choice of investigation, particularly those not working in maternity teams. Traditionally there is concern about using ionising radiation in tests such as X-rays for pregnant women for fear of injury to the developing baby, although advice is clear from the RCOG (Royal College of Obstetricians and Gynaecologists, 2020g). Obstetric advice was not always obtained to support decision making. As in any clinical situation, using ionising radiation when making a clinical decision, such as making a diagnosis of a life-threatening condition requires a balance of risks and benefits, regardless of pregnancy.

‘The investigation learnt a chest X-ray would have been performed if the woman was not pregnant. It was not performed as the emergency department team wanted to avoid any radiological examinations of the woman as they considered that this may
have an adverse effect on the pregnancy.’

On 18 March 2020, the RCOG amended its COVID-19 guidance to emphasise:

‘Chest imaging, especially CT chest, is essential for the evaluation of the unwell patient with COVID-19 and should be performed when indicated and not delayed due to fetal concerns.’ (Royal College of Obstetricians and Gynaecologists, 2020b)

HSIB investigations identified in some cases the use of scoring systems that are not validated in pregnancy, for example the NEWS2 score as described above, and the Wells score which is used to assess risk of venous thrombo-embolic disease.

These dilemmas existed before the pandemic but became particularly important in the context of an unfamiliar disease presenting with respiratory symptoms.

**COVID-19 testing**

Reliable identification of patients with infection requires tests that are available, accurate and timely. There was a changing picture during the period of this report. Early on, there was limited availability of tests and laboratory capacity and therefore restrictive policies on their use. Understanding of false positive and false negative test rates has also changed during the pandemic.

In the cases included in this review, several women had contacted or visited healthcare providers previously with COVID-19 symptoms and were not tested, in line with the policy at the time.

‘Guidance from the Trust’s infection control team was to test patients admitted to hospital only … This was in line with government guidance … This meant there was no result available to assist with diagnosis … For those admitted patients who were tested, a result took 72 hours or more to report.’

Limited ability to confirm a diagnosis with a test can lead to over- and under-diagnosis. The investigations found the gap between testing and receiving results in the earlier part of the pandemic caused delays in isolating people with infection and impeded diagnosis. It also affected staffing levels as healthcare professionals were required to isolate for several days following symptoms.

Improvements in test availability and performance continue to be made.

6.7.3 **Multidisciplinary consultation**

Many staff were working in unfamiliar settings, with unfamiliar patient groups. To minimise cross-contamination, staff were instructed to reduce “unnecessary” staff contact with patients. HSIB’s investigations saw examples where the emergency physician discussed a woman’s medical condition with the obstetric team by telephone.
rather than the more usual face-to-face visit, meaning that obstetric assessment was limited.

Multidisciplinary team review for complex cases is essential (Knight et al, 2019). It was more difficult to arrange where there were staff shortages, staff were redeployed, staff had their own concerns about contracting or spreading COVID-19, there were physical changes to the environment and additional barriers existed such as use of PPE or segregated pathways for patients.

6.7.4 Formulating a diagnosis

Following information gathering and interpretation the clinician formulates a diagnosis. A diagnosis is made within a dynamic, complex healthcare system over a limited timeframe and with the information available (National Academies of Sciences, Engineering, and Medicine, 2015).

HSIB found that symptoms were sometimes mistakenly attributed to pregnancy and COVID-19 presented a new additional challenge to clinicians. A person’s physical symptoms can be mis-attributed to an existing psychological or physiological condition (Shefer et al, 2014). This can occur when clinicians who do not work in obstetrics review a pregnant woman’s case.

COVID-19 is a novel disease which was unknown before December 2019 (World Health Organization, 2020a). Understanding of its symptoms and time course developed during the period of these investigations (Public Health England, 2020h). There were changes in case definition of COVID-19 and recommendations for management. Loss of sense of smell was only added as a criterion for diagnosis in May 2020, for example. In the period these investigations took place, clinicians were seeing some features of COVID-19 for the first time:

‘The changes in the lungs and the heart are consistent with the changes now recognised as part of the coronavirus disease-2019 (COVID-19) … these changes are very similar to those seen [by the healthcare professional] in two previous cases of COVID-19.’

During the pandemic hospitals changed the usual routes of admission for patients to keep those suspected of being infected with COVID-19 separate from those without infection, to reduce the risk of transmission of disease. Women were therefore already ‘framed’ to clinicians as likely or unlikely to have COVID-19 before assessments were made. HSIB heard in one staff interview that:

“As far as the management of patients was concerned, everyone [here] had COVID-19 unless proven otherwise.”

As described above, of the 19 maternal deaths reviewed in this report, 11 women had a high temperature or cough. These
symptoms are identified as specific symptoms associated with COVID-19. Other symptoms have been associated with COVID-19 in the research literature and 16 out of the 19 women whose cases are included in this report had at least one of the following: high temperature, cough, shortness of breath, or muscle aches.

Patients with COVID-19 may appear generally well. Symptoms can be variable and mimic other conditions (National Institute for Health and Care Excellence, 2020b). For example, shortness of breath, fatigue, pain, high temperature, or cough may also be associated with bacterial infection, COVID-19, other viral infections, pulmonary embolism (PE), or rare inflammatory conditions.

HSIB investigations showed examples of the difficulty of distinguishing causes for such symptoms, including:

- chest pain and the woman’s behaviour being attributed to labour
- difficulty diagnosing PE rather than COVID-19 from symptoms
- chest pain being attributed to PE rather than aortic dissection (a tear in the wall of the aorta, the main blood vessel that takes blood away from the heart)
- bacterial sepsis (when the body’s immune response overreacts to infection and attacks its own tissue and organs) not distinguished from COVID-19
- pain attributed to infection rather than blood clots.

This influenced subsequent management of the women’s condition, any treatment provided, and advice given, including whether to return to hospital or remain at home.

HSIB investigations found challenges at every step of the diagnostic process, including taking a clinical history and examining the woman, selecting, and accessing diagnostic tests, and accessing multidisciplinary advice. These challenges limited the amount of information available and affected the formulation of the final diagnosis. This was compounded by the interaction of additional factors described previously in this report:

- guidance changed rapidly with no formal dissemination process
- the use of early warning scores did not always identify deterioration
- staff experienced difficulties wearing PPE including heat, visibility, and communication
- staff experienced stress and emotional distress
- the system did not account for additional staffing levels to support reconfiguration of services, self-isolation, or sickness
- families were not able to advocate for their relative.
7 Conclusion and safety observations

This national learning report reviews findings from HSIB investigations into maternal deaths that occurred between 1 March and 31 May 2020. This timeline coincides with the first peak in deaths from COVID-19 in England.

The aim of this report is to support the healthcare system to continue to provide safe maternity care to women.

The report has identified pressures that staff experienced and barriers to effective work processes and describes seven themes based on this learning. By describing these themes HSIB aims to inform decision making to improve patient safety in the months ahead.

The themes are:

1 **Unprecedented demand for telephone health advice caused delays in accessing health care.** This applied to NHS 111, GP services and maternity unit helplines.

2 **Public messaging and safety netting advice caused delays in presentation.** Women were concerned about risk to themselves and their unborn child, and about the requirement to attend hospital appointments and be admitted to hospital without the support of their families.

3 **Guidance changed rapidly** in response to changing information and policy. Communication of these changes to frontline staff was compounded by the changes in staff meetings and rosters. There are no formal means of managing guidance updates.

4 **The use of early warning scores did not always detect deterioration in women’s health.** There is no nationally agreed maternity-specific early warning score in England, and HSIB saw examples where the NEWS2 score, which is not designed for use in pregnant women, was used. Maternity-specific MEOWS scores were not always used as intended or interpreted appropriately and were not embedded in non-maternity services.

5 **Personal protective equipment (PPE) requirements changed due to COVID-19.** There were difficulties providing adequate environments for donning and doffing PPE, delays in undertaking urgent procedures caused by donning PPE, and staff experienced difficulties including heat, visibility, and communication.

6 **Staff described feelings of stress and distress which can affect performance.** Stress was aggravated for example by communication difficulties caused by PPE, redeployment to unfamiliar work areas, and reduced staffing levels. The report highlights areas where organisational resilience may be increased.

7 **Difficulties in making a diagnosis and choosing treatment strategies.** Diagnosis was impeded by lack of communication and
face-to-face assessment, access to tests and concerns about infection prevention and control, as well as complexity caused by rapidly acquired knowledge of a new disease and the physiology of pregnancy. Management strategies were complicated by altered layout of hospitals and difficulties with liaising between teams.

This review has shown that factors affecting safety in this situation can be identified at a healthcare system level. HSIB maternity investigations have made recommendations directly to local providers and HSIB national investigations have made recommendations to national bodies and regulators for system change.

Throughout this report HSIB has noted a number of improvements and changes made subsequent to the period under review, but to date some of the issues identified have not been successfully addressed.

HSIB investigations of maternal deaths during the first wave of the COVID-19 pandemic in England have identified patient safety risks arising from the disease itself, from behaviour changes relating to patient and staff appreciation of risk, changes in patient pathways and access to services, obstacles to care caused by additional safety precautions such as PPE, and reduced availability of staff. Effective interventions are most likely to be successful at the system level.

HSIB has initiated national investigations in two areas identified from this review, namely the capacity of NHS 111 to respond to an unprecedented increase in demand and the detection of venous thromboembolic disease in pregnancy.

HSIB has also published several reports that address aspects identified in this report:

- **National learning report – ‘Support for staff following patient safety incidents’** (Healthcare Safety Investigation Branch, 2021)


- **National intelligence report – ‘Early warning score tools to detect deterioration in COVID-19 patients** (Healthcare Safety Investigation Branch, 2020)


- **National learning report – ‘Delays to intrapartum intervention once fetal compromise is suspected’** (Healthcare Safety Investigation Branch, 2020)

Alterations to usual ways of working caused by COVID-19, such as changes in access to services, increased use of PPE, reduced staffing levels and increased stress for staff, need to be considered in service planning.

Systemic disruption has affected every level of the interaction between the patient and the healthcare system: access to health services; assessment; access to diagnostics; communication; support from family and carers; service capacity; decision making; and hospital layout. Business continuity planning for any other major disruption should take these factors into account.

HSIB makes the following safety observations

Safety observation O/2021/094:
It may be beneficial if further work is done to understand the increased risk of maternal death for women from Black, Asian and minority ethnic backgrounds and those with higher socio-economic deprivation.

Safety observation O/2021/095:
It may be beneficial if the NHS England and NHS Improvement communications toolkit for local maternity teams to improve communications with women from Black, Asian and minority ethnic backgrounds is implemented in all healthcare services for pregnant women.

Safety observation O/2021/096:
It may be beneficial if written safety netting advice is developed for pregnant and postpartum women about COVID-19 and other common conditions, incorporating the MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK) recommendations.

Related safety recommendation

This review adds weight to the safety recommendation (number R/2020/095) made in the HSIB report ‘COVID-19 transmission in hospitals: management of the risk – a prospective safety investigation’, that:

‘It is recommended that the Department of Health and Social Care, working with NHS England and NHS Improvement, Public Health England, and other partners as appropriate, develops a transparent process to co-ordinate the development, dissemination and implementation of national guidance across the healthcare system to minimise the risk of nosocomial transmission of COVID-19’.
8 References


Neill, S. (2020) Before Arrival at Hospital (BeArH). Factors affecting timing of admission to hospital for children with serious infectious illness project. A collaboration between the University of Northampton, Meningitis Now, Mother’s Instinct Support Group, the University of Leicester, Edge Hill University, the University of Liverpool, the University of Plymouth, Kettering General Hospital NHS Foundation.


9 Appendix 1: Additional information

The following table provides more information about the 19 women whose cases were included in the review of HSIB maternal death investigations.

<table>
<thead>
<tr>
<th>Age bracket</th>
<th>20-29</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30-39</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>40 or over</td>
<td>2</td>
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</table>

<table>
<thead>
<tr>
<th>Body mass index (BMI)</th>
<th>under 25</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>25-29</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>30 or over</td>
<td>8</td>
</tr>
</tbody>
</table>

| Asian or Asian British Indian, Asian or Asian British Pakistani, Black British, Black African or Black Caribbean, Mixed Ethnicity or Other Ethnic backgrounds | 8 |
| White British or any other White background | 11 |

| Number of women with pre-existing medical condition | Yes | 12 |
|                                                      | No  | 7  |

| Deprivation score (1 = most deprived 10 = least deprived) | 1-2 | 7 |
|                                                           | 3-4 | 4 |
|                                                           | 5-6 | 5 |
|                                                           | 7-8 | 0 |
|                                                           | 9-10 | 3 |

<p>| First pregnancy (no previous births) at start of this pregnancy | Yes | 3 |
|                                                               | No  | 16 |</p>
<table>
<thead>
<tr>
<th>Did the woman become unwell before delivery of baby or pregnancy loss prior to 24 weeks?</th>
<th>Yes</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Did the woman become unwell before delivery of baby or pregnancy loss prior to 24 weeks?</th>
<th>Yes</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>5</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode of delivery for all maternal deaths</th>
<th>Caesarean section</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peri-mortem caesarean section</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Vaginal delivery, spontaneous or assisted</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pregnancy loss prior to 24 weeks</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Died while still pregnant</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Was there a post-mortem examination?</th>
<th>Yes</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Severe infection (COVID-19)</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood clot in the lung (pulmonary embolism)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Bacterial infection or sepsis (not COVID-19)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Excessive bleeding around the time of birth</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Disorder of high blood pressure in pregnancy (pre-eclampsia)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Disorder of the brain or nervous system (epilepsy, stroke)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Disorder of heart or blood vessels</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>11</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Number of women who were in an intensive care unit prior to death</td>
<td>No</td>
<td>8</td>
</tr>
<tr>
<td>COVID-19 symptoms: temperature, cough or anosmia</td>
<td>Yes</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>14</td>
</tr>
<tr>
<td>Any potential COVID-19 symptoms</td>
<td>Yes</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>4</td>
</tr>
<tr>
<td>Number of women who had a COVID-19 swab test</td>
<td>Yes</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>7</td>
</tr>
<tr>
<td>Number of women who received a positive COVID-19 swab test</td>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>13</td>
</tr>
<tr>
<td>Number of women where COVID-19 was recorded on the death certificate</td>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>13</td>
</tr>
<tr>
<td>Healthcare settings contacted or attended in 14 days prior to death</td>
<td>GP, NHS 111, emergency services, maternal assessment units, labour ward, accident and emergency, medical wards, high-dependency units, intensive care units, community healthcare services such as health visitors and midwifery appointments</td>
<td></td>
</tr>
</tbody>
</table>
Further information

More information about HSIB – including its team, investigations and history – is available at www.hsib.org.uk

If you would like to request an investigation then please read our guidance before contacting us.

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