Closing the Gap: Assessing Variation in Optimal Perinatal Care and the Impact on Preterm Babies

Sands & Tommy's Policy Unit

Working together to save babies' lives

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Summary

Prematurity is a key driver of mortality in neonatal care, with around three quarters of neonatal deaths among babies born before 37 weeks in the UK. The National Neonatal Audit Programme (NNAP) assesses whether preterm babies admitted to neonatal units in Great Britain receive high-quality care. This includes reporting on six optimal perinatal care measures that, if successfully implemented, it says are linked to key outcomes such as reduced mortality and brain injury. NNAP data shows that only 1 in 5 preterm babies receive all optimal care measures and there is unacceptable variation in their delivery across the country, between Trusts, neonatal units and babies' ethnicities. This briefing will examine the evidence behind each measure, analysing levels of adherence to understand why this variation exists, and to what extent variation has an impact on overall outcomes.

Our analysis found the administration of antenatal magnesium sulphate and ensuring that extremely preterm babies are born in a centre with a neonatal intensive care unit (NICU) onsite had the widest levels of variation, despite strong evidence of their impact on neonatal outcomes,

Key findings include:

- Whilst the administration of some of these measures rely on healthcare professionals accurately predicting preterm birth, the complex set of factors that influence the risk of preterm birth makes predicting and preventing it challenging.
- Antenatal care offers the greatest opportunity to identify those who may be at higher risk of preterm birth. However, women and birthing people from deprived areas or marginalised groups tend to have delayed access to, and low engagement with, antenatal care, which may reduce health care professionals' ability to predict preterm birth.
- Information on signs of labour is not routinely provided until the third trimester, which may be too late, and women and birthing people may not be given advice on what to do if they do go into preterm labour.
- A lack of knowledge amongst clinicians, especially amongst those with less experience dealing with extremely preterm babies, may make the delivery of optimal care for preterm babies less likely.
- Improved collaboration between maternity and neonatal teams is critical for perinatal optimisation, enabling colleagues to understand why certain interventions need to be prioritised.

- Disparities by ethnicity have been highlighted in the delivery of some measures, including babies from Black mothers being less likely to receive delayed cord clamping and have a normal temperature on admission.

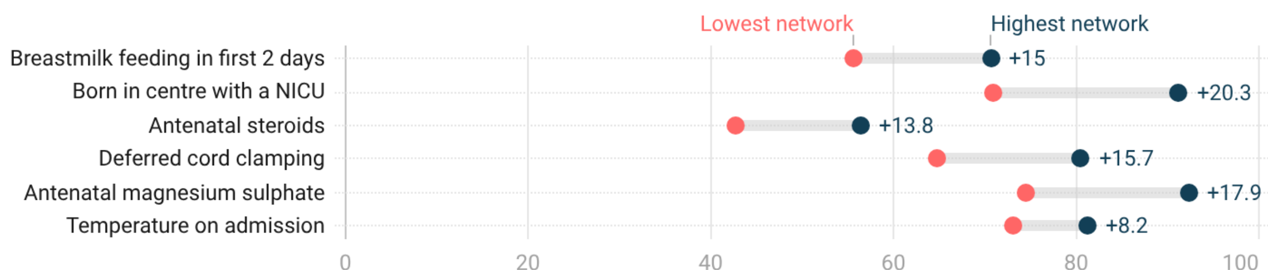
Suggestions to improve outcomes for preterm babies include supporting healthcare professionals with better access to tools that predict preterm birth, improved training and supervision on best practice across all measures, and a focus on improving access to antenatal care, especially for marginalised women and birthing people.

Background

Prematurity is a key driver of mortality in neonatal care, with around three quarters of neonatal deaths among babies born before 37 weeks in the UK. The National Neonatal Audit Programme (NNAP) assesses whether babies admitted to neonatal units in Great Britain receive high-quality care and identifies areas for improvement. NNAP reports on six optimal perinatal care measures that, if successfully implemented, it says are linked to key outcomes such as reduced mortality and brain injury. And yet, only 1 in 5 preterm neonates (21.9%) receive all the optimal care measures that they would be eligible for. Although this has increased three-fold since 2021 (7.7%), further improvements are still required.

Within each measure there is also unacceptable variation, with the highest variation seen for eligible babies being born in a centre with a neonatal intensive care unit (NICU) and eligible mothers receiving antenatal magnesium sulphate (see Figure 1).

There is unacceptable variation in the proportion of preterm babies receiving optimal care across neonatal networks in Great Britain in 2024



The inclusion criteria varies for each measure, for example the antenatal steroids measure relates to a mother who delivers a baby between 22 and 33 weeks' gestation, while the breastfeeding measure relates to babies born at less than 34 weeks' gestation. See NNAP for more detail. Data from England, Scotland and Wales in 2024.
View chart full screen

Chart: Sands & Tommy's Joint Policy Unit • Source: NNAP (2025) • Created with Datawrapper

Figure 1. *Proportion of preterm babies receiving optimal care measures*

This briefing will take a closer look at the six NNAP optimal perinatal care measures, delving into the evidence behind them and analysing levels of adherence to understand why variation in the implementation of these measures exists, and to what extent variation has an impact on overall outcomes.

1. Antenatal steroids

Does a mother who delivers a baby between 22 and 33 weeks' gestational age receive a full course of antenatal corticosteroids within 1 week prior to delivery?

Evidence

Described by the Royal College of Obstetricians and Gynaecologists as one of the most important interventions for neonatal outcomes in the short term, National Institute for Health and Care Excellence (NICE) guidelines recommend offering maternal corticosteroids to women at risk of preterm labour from 24 - 34 weeks. Preterm birth outcomes are improved as the administration of steroids accelerate fetal lung maturation which reduces the risk of respiratory distress syndrome in the first hour of life, as well as perinatal and neonatal death. A single course of antenatal corticosteroids has been found to reduce the risk of infant mortality and morbidity for preterm babies. For optimal use, the course should be administered within a week leading up to the birth.

Level of adherence

NNAP reports the proportion of mothers whose babies were born between 22-33 weeks' gestational age who received a full course (typically two injections 12 to 24 hour apart) of antenatal steroids within one week prior to delivery[1]. The latest data shows a small reduction in the proportion of eligible mothers receiving full course in 2024 (51.8%) when compared to the previous year (53%). Whilst the national uptake remains close to 50%, progress seems to have flattened since 2022 (see Figure 2) and NNAP notes that it is not possible to infer that improvement in measure adherence reflects real improvement in care.

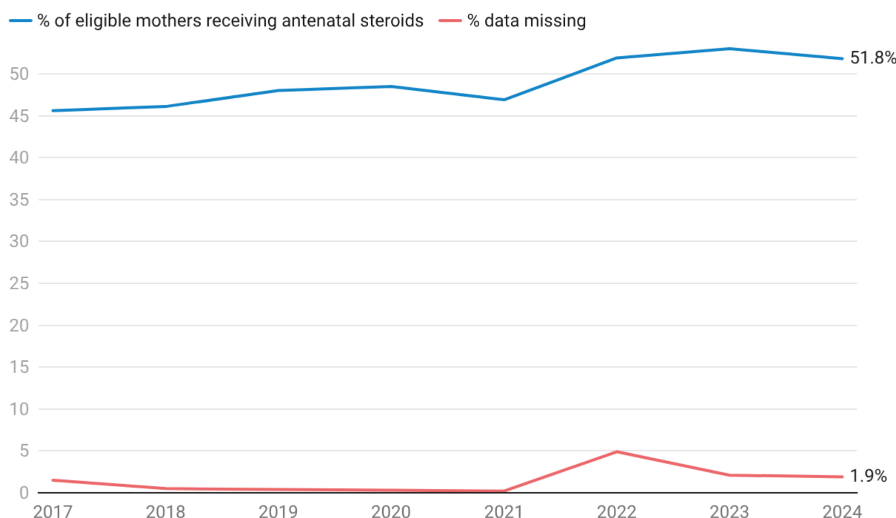


Figure 2. Proportion of eligible mothers receiving a full course of antenatal steroids

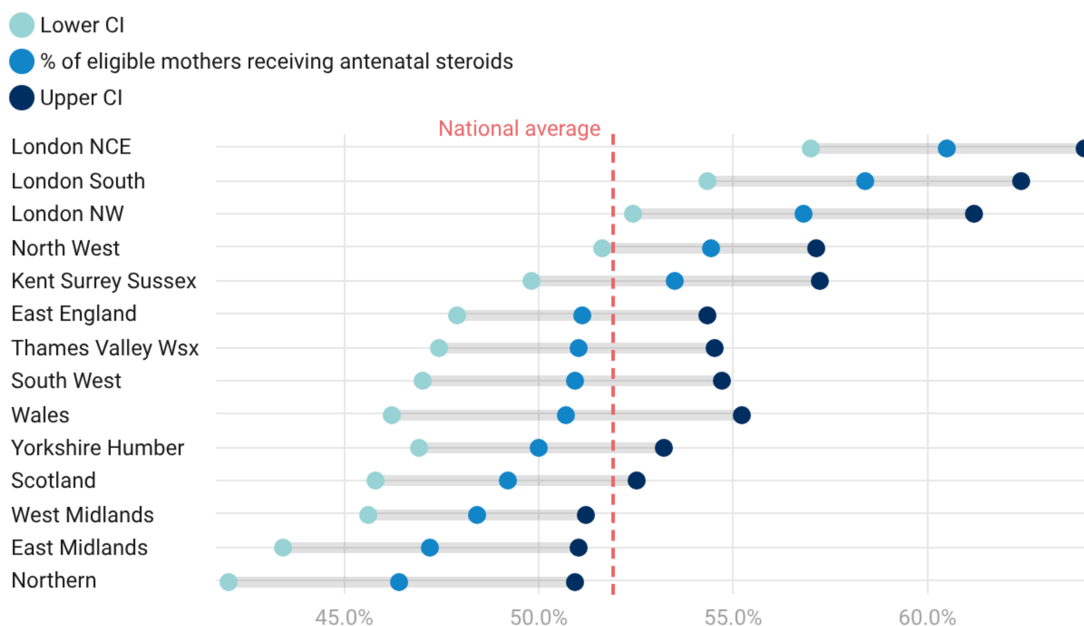
1 NNAP only reports on mothers whose babies were born between 22 and 33 weeks gestational age where there is complete data on antenatal steroid administration. Mothers whose babies were born outside of this gestational age are not included in the data.

Prior to 2022, NNAP measured the proportion of eligible mothers receiving at least one dose before delivery rather than a complete course. Compared to the current measure, previous reporting counted any steroid use, including those that were incomplete or poorly timed.

Shortened courses (a course duration less than 24 hours) are common, despite evidence that they may cause harm rather than leaving the recommended 24 hours between doses. This creates a risk that adherence to the target is rising without leading to the expected benefits. NNAP will measure dose intervals going forward to provide further insight.

Across Great Britain, neonatal networks with higher adherence are concentrated around London and the North West, with the proportion of administration lower across Northern England and the Midlands (see Figure 3). This variation between neonatal networks is also mirrored across unit types; Neonatal Intensive Care Units (NICUs) tended to perform better with an average rate of 54.5% compared to Special Care Units (SCUs) (42.1%) adherence and Local Neonatal Units (LNUs) (50.5%).

There is nearly 15% variation in the administration of antenatal steroids across neonatal networks



NNAP measures the proportion of eligible mothers with babies born between 23 and 33 weeks gestation receiving a full course of antenatal corticosteroids within one week prior to delivery.

Chart: Sands and Tommy's Joint Policy Unit • Source: NNAP (2025) • Created with Datawrapper

Figure 3. *The proportion of eligible mothers receiving a full course of antenatal steroids, by neonatal network*

Reasons for variation

Steroids should be administered antenatally up to one week before delivery, with 24 hours between doses for a full course. This requires staff to predict who may be at risk of preterm birth, when to decide if they are eligible for the intervention and when they should receive it. Administering a full course of steroids is more likely to be achievable when a preterm birth is planned or induced, although NNAP data does not provide this level of disaggregation.

Predicting spontaneous preterm birth is a challenge because there is no single cause and no reliable test that will identify all women and birthing people at risk. Administering antenatal steroids is inherently harder for spontaneous preterm births. When preterm birth is unexpected, labour may progress too quickly to administer steroids, or birth may take place prior to admission to a maternity unit. Clinical decision-making has also been identified as an issue, particularly among junior staff in triage. This may

be due to a lack of knowledge or experience but may also be influenced by uncertainty about when a preterm birth will occur, leading to concerns about administering steroids too early.

When comparing the administration of antenatal steroids with antenatal magnesium sulphate (see section 2), there are significantly higher levels of adherence for the latter despite both being administered by obstetric colleagues prior to birth. This may be linked emerging evidence that examines the potential risks, which may lead to caution in the administration of double doses of steroids. Further research is needed to explain this difference in uptake.

Solutions

Improving health care professionals' ability to predict preterm birth would help to identify eligible women and birthing people who should receive a full course of antenatal corticosteroids, improving overall adherence. New clinical tools are starting to help healthcare professionals to identify women and birthing people who may give birth within 7 days. The Quantitative Instrument for the Prediction of Preterm Birth (QUiPP) application is a promising decision support tool which uses medical history and cervical length to give an individualised score for the risk of having a spontaneous preterm birth. Further research is needed to fully optimise how these tools work in practice, as well as ensuring access to the tools required (one study referred to a national shortage of fFN Cassette Kits which impacted network adoption of the QUiPP app). There is ongoing research to improve the tool and improve how it works in practice. Staff must also have the knowledge about how to use tools to accurately predict preterm birth.

However, the benefits of prediction must be balanced with the chances of over-estimating the risk of preterm birth amongst women and birthing people who may not need treatment as there is some uncertainty about the longer-term impact of steroids on babies born near their due date.

In addition to predicting preterm births, a refreshment on the latest guidelines and best practice for optimal administration of antenatal steroids may support improvements. However, if a lack of expertise is currently an issue, it may be useful to encourage consultation with senior colleagues during the decision-making process. Improved teamwork between neonatal professionals, maternity and obstetric colleagues should also support improvements in administration.

2. Antenatal magnesium sulphate

Is a mother who delivers a baby below 30 weeks' gestational age given magnesium sulphate in the 24 hours prior to delivery?

Evidence

Administering magnesium sulphate for women and birthing people at risk of preterm birth has been found to reduces the risk of cerebral palsy, and death or cerebral palsy in children up to two years' corrected age, and possible reduction in intraventricular haemorrhage in infants. Despite maternal side effects (including nausea, vomiting and blurred vision) that were sometimes found to be severe enough to stop treatment, these are generally deemed manageable, with the benefits of administration outweighing the potential harms.

Current guidance suggests administration of magnesium sulphate should be done 24 hours prior to birth for women between 24 – 30 weeks of pregnancy. Ideally this should be administered at least four hours before birth, but it is still likely to be of benefit if it is given later.

Level of adherence

Despite a relatively high proportion of eligible mothers receiving antenatal magnesium sulphate, adherence remains below the developmental standard of 90%. With a national average of 86.7% in 2024 compared to 66.5% in 2017, progress seems to have plateaued since 2020, with only a 1.5% increase from 2023 – 2024 (see Figure 4).

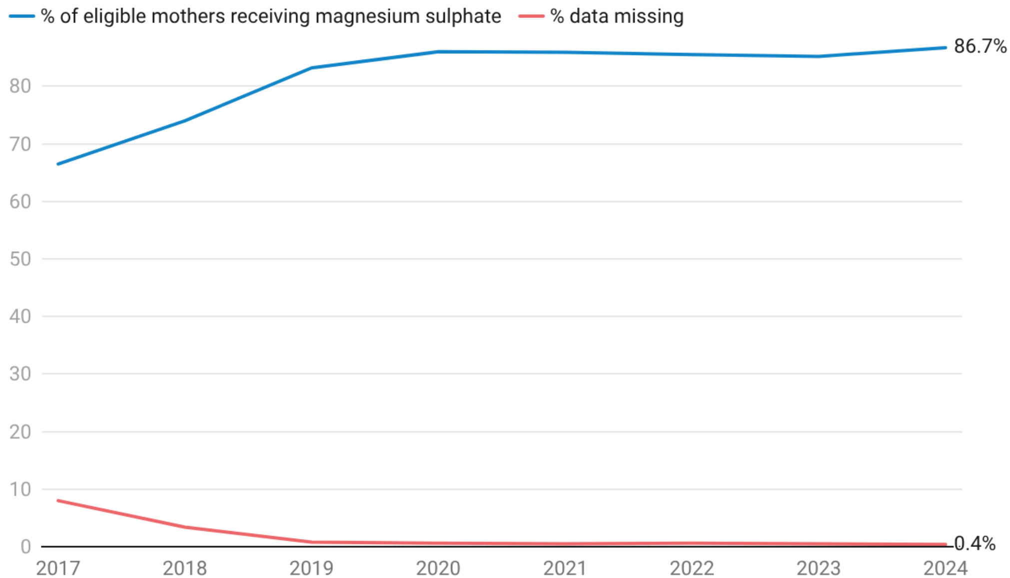
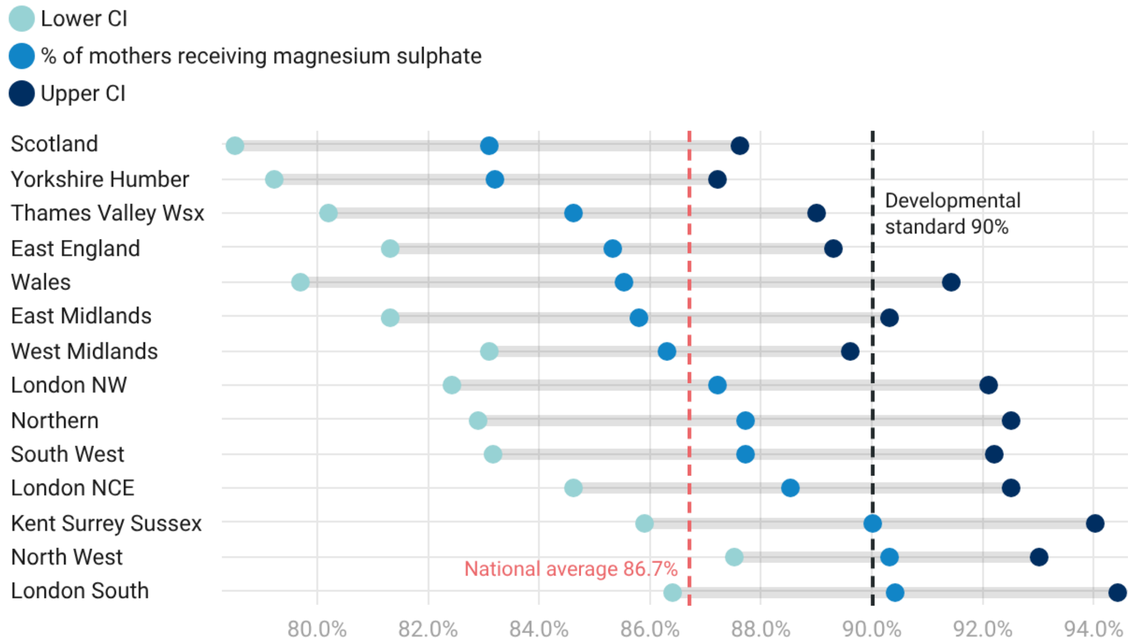


Figure 4. *Proportion of eligible mothers receiving a full course of antenatal magnesium sulphate*

Across neonatal networks there was relatively low geographical variation, with the lowest adherence in Scotland (83.3%) and the highest in London South (90.4%) (see Figure 5). A small number of neonatal networks, including London South, Northwest, and Kent, Surrey and Sussex achieved or exceeded the benchmark. In comparison, networks such as Scotland, Thames Valley and Wessex, and Yorkshire and Humber had lower levels of administration, below the national average. Taking the best and worst performing networks, London South had a 31.4% increase in the uptake of antenatal magnesium sulphate from 2017 (68.8%), whilst adherence in Scotland increased by 28.8%.

Although average compliance is over 85%, only three neonatal networks meet the NNAP target for magnesium sulphate



NNAP measures the proportion of eligible mothers delivering a baby below 30 weeks gestational age given magnesium sulphate in the 24 hours prior to delivery. This graph uses 2024 data, definitions, and methodology.

Chart: Sands and Tommy's Joint Policy Unit • Source: NNAP (2025) • Created with Datawrapper

Figure 5. *Administration of antenatal magnesium sulphate by neonatal network*

NICUs performed better in the administration of magnesium sulphate (88.6%), with poorer adherence and wider variation within SCUs (80% on average but ranging from 100% to 0%[2]) and LNUs (83.3% on average but ranging from 100% to 40%) (see Figure 6).

The delivery of antenatal magnesium sulphate is higher in units with a NICU

NNAP measure the administration of antenatal magnesium sulphate, provided to eligible mothers delivering a baby below 30 weeks gestation in the 24 hours prior to delivery, by unit level. 'Other' units are those that are hospital or healthcare locations not associated with NNAP neonatal unit. This chart uses 2024 data, definitions and methodology.

Chart: Sands and Tommy's Joint Policy Unit • Source: NNAP (2025) • Created with Datawrapper

Figure 6. *Administration of antenatal magnesium sulphate, by unit level.*

2 The SCU with the lowest adherence in 2024 only had two eligible mothers recorded, with 50% missing data.

Reasons for variation

Out of 2,811 eligible mothers, most were treated in NICUs (93.1%) compared to SCUs (5.8%). Where preterm birth is anticipated, mothers should be transferred to a centre with a NICU (see section 3), meaning that extremely preterm babies born in SCUs and LNUs are likely to have been unexpected, making administration of antenatal magnesium more challenging. Staff working in NICUs are also likely to be more familiar with best practice recommendations for the administration of magnesium sulphate, which may explain the higher adherence.

The national PReCePT programme was rolled out across England in 2018, with an aim to increase the use of antenatal magnesium sulphate for neuroprotection in very preterm births. An evaluation into the effectiveness of the programme found that the most common reason for non-administration was due to imminent or rapid delivery which limited the clinician's ability to offer or administer treatment. However, the percentage of those not offered treatment has significantly decreased overtime, falling from around 7% to 1% across Great Britain.

Solutions

Improved administration of antenatal magnesium sulphate relies on accurately predicting preterm birth to deliver the treatment in an optimal way (see section 1 for improving preterm birth prediction). This includes improving education and guidance on its benefits and best practice on administration. The evaluation of the national PReCePT programme found that offering clinical guidance and resources was associated with a 5.8% improvement in uptake, with improvement also maintained over four years, suggesting that a structured national approach supported embedding the practice and improved adherence. Whilst Scotland and Wales implemented their own improvement initiatives; MCQIC Preterm Perinatal Wellbeing Package, PERIPrem Cymru, progress seemed to be slower than England. In England, adherence has remained relatively unchanged with the most significant gains seen in the first two years after implementation. Whilst adherence hasn't dropped, performance seems to have plateaued when it approached higher levels suggesting that whilst early implementation strategies were effective, they may need to be adapted to drive further improvement at higher levels of adherence.

The data from NNAP suggest that slower implementation of guidance is leading to inconsistencies across units, with some adopting the intervention at a quicker pace than others. Addressing the reasons behind unit level variation, which may include improving clinical judgement (especially in LNUs and SCUs) will not only to drive more equitable and consistent application but should increase the national average to the desired standard.

3. Born in a centre with a NICU

Is a baby born at less than 27 weeks' gestational age, or less than 800 grams at birth, or born as a multiple at less than 28 weeks' gestational age, delivered in a maternity service on the same site as a designated neonatal intensive care unit (NICU)?

Evidence

Babies born extremely prematurely, before 27 weeks' gestation, have an increased risk of mortality and serious illnesses. While improvements in neonatal care have increased survival rates, babies born in hospitals with an on-site NICU have better outcomes through immediate access to specialist care, increasing chances of survival and improving outcomes. Being transferred to a hospital with a NICU after birth is associated with an increased risk of brain injury, whilst staying in a hospital without a specialist unit was associated with increased risk of death for extremely premature babies.

Level of adherence

The NNAP development standard states that at least 85% of extremely preterm babies should be delivered in a maternity service with a NICU. Adherence to this measure has steadily increased, from

72.5% in 2017 to a record adherence of 80.4% in 2024, although this was only a small increase from the previous year (79.6%), and remains below the expected standard.

There was significant regional variation across neonatal networks, with the lowest performing network in the East Midlands at 10% below the national average of 71%, whilst the highest performing networks met or exceeded the standard of 85%, with the Northern network achieving over 91.3% adherence (see Figure 7).

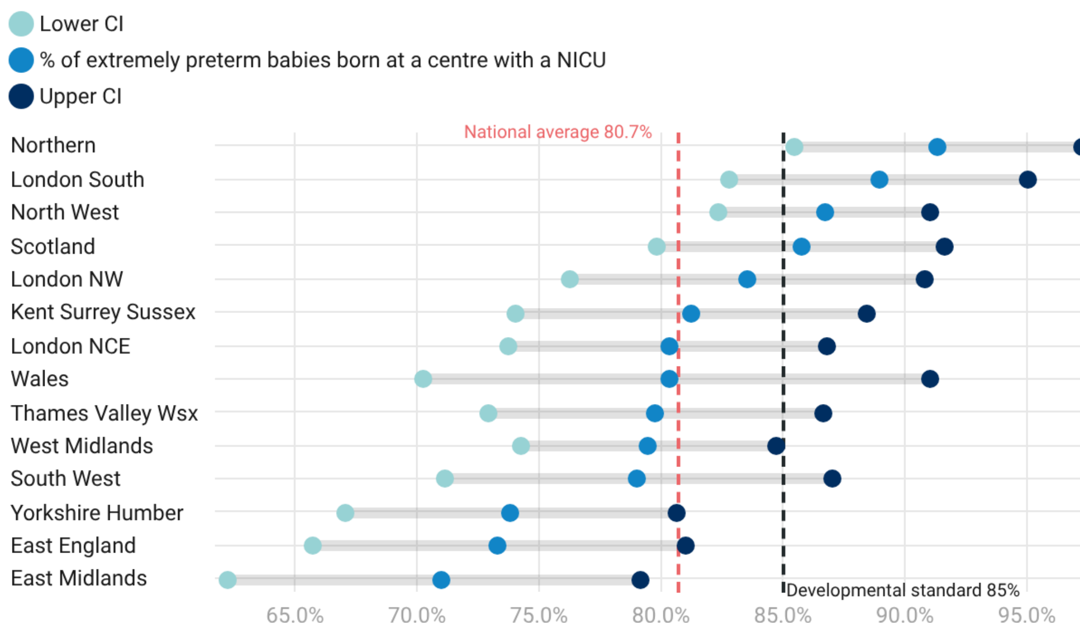


Figure 7. *Proportion of extremely preterm babies born in a centre with a NICU, by neonatal network.*

Most networks have gradually improved their adherence since 2017, except for Wales where adherence was lower than most networks before a sharp increase in 2021.This was followed by a short dip in 2022, but since then adherence has gradually increased year on year.

Babies from White mothers were less likely to be born in a centre with a NICU (77.8%) compared to babies from Black (82.9%), Asian (82.6%) and Mixed/Other (83.2%) mothers (see Figure 8).

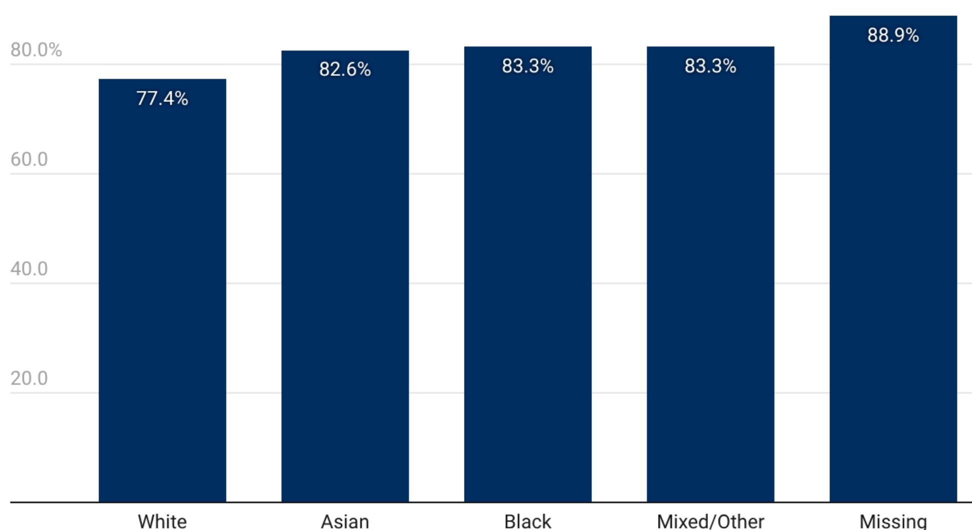


Figure 8. *Proportion of extremely preterm babies born in a centre with a NICU, by ethnicity.*

Reasons for variation

Inequality in the access to a NICU when delivering may be based on regional availability and depends on an individual's ability to easily access a centre with a NICU in their local area. This may be due to a higher proportion of minoritised ethnic populations living in urban areas where NICUs tend to be located. A study on the reconfiguration of neonatal services highlighted the tensions shaped by geography, with the centralisation of care increasing the travel burden in larger, dispersed population. In 2022 the HSJ reported that more than 1,000 referrals to admit very sick premature babies were rejected due to a lack of beds, with families having to travel long distances from home to receive sufficient care. Whilst centralisation of services may result in fewer centres within a region, it is viewed as a necessary trade-off for improved outcomes for the sickest babies. Some of this variation, including the changes recorded in Wales, may reflect networks becoming more established or changes to both the structure and capacity within a unit. Poor performance in the East Midlands may be as a result of documented capacity issues. Analysis of 2025 data from NNAP should demonstrate whether increasing the footprint and cot capacity through the opening of a combined NICU in Nottingham has improved adherence to this measure.

A lack of antenatal education on what to do if there are signs of premature labour may result in women and birthing people not being immediately aware they are in labour or where they should seek care. Certain groups may also be more likely to only engage with health services once in labour, such as refugee and asylum-seeking women and birthing people due to fears that they may be reported to the Home Office, financial constraints or a lack of understanding of the healthcare system. When women and birthing people report to maternity services without intensive care facilities in established labour, safe transfer in utero may not be possible.

Despite being more likely to be born in a centre with a NICU, babies born to mothers of Black ethnicity continue to have the highest mortality rates within neonatal units; with 81% higher odds of mortality compared with babies of White ethnicity. Babies of Asian mothers had 48% higher odds of mortality than those of White mothers, with suggestions that care practices within units that are rooted in racism

may be driving these inequalities. This shows that location of birth alone may not improve outcomes for all mothers and babies; the quality of care in those centres must also be improved.

Solutions

Commissioners considering regional plans for neonatal system reconfigurations should prioritise providing an appropriate level of care nearest to home.

Once the risk of preterm birth is predicted, parents should be aware of what to do if there are possible signs of premature labour such as seeking care in a centre with a NICU. Developing a standardised leaflet across all nations, as has been developed in Scotland, may support improving antenatal awareness and prevent delayed diagnosis. As the guidance was developed in December 2025, analysis of future NNAP data should consider whether adherence to this measure has increased since the introduction of the guidance to understand how effective it has been.

4. Deferred cord clamping

Does a baby born at less than 34 weeks' gestational age have their cord clamped at or after one minute?

Evidence

Deferred cord clamping, the practice of waiting for a period before clamping the umbilical cord after birth, has been proven to reduce death before discharge in preterm infants when compared to immediate cord clamping. Whilst early cord clamping enables the quick transfer of infants to neonatal care, if required; stopping the continued blood flow between mother and baby leads to a sudden drop in blood pressure with the movement of blood into the lungs. Defined as waiting until at least one minute after birth or when cord pulsation has ceased, optimal timing remains unclear as the amount of blood left in the placenta can vary between individuals. Allowing enough time for the baby to adjust to life outside the womb must be prioritised.

Level of adherence

Since NNAP began reporting deferred cord clamping in 2020, adherence has doubled from 36% to 73.5% in 2024 (see Figure 9), close to the NNAP development standard of 75%[3]. There is a significant increase in uptake when compared to other measures and may be linked to a national effort to improve optimal cord clamping for preterm babies.

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3 From 2022, the upper gestational age cut off was amended from 32 weeks to less than 34 weeks to reflect the MatNeoSip measurement.

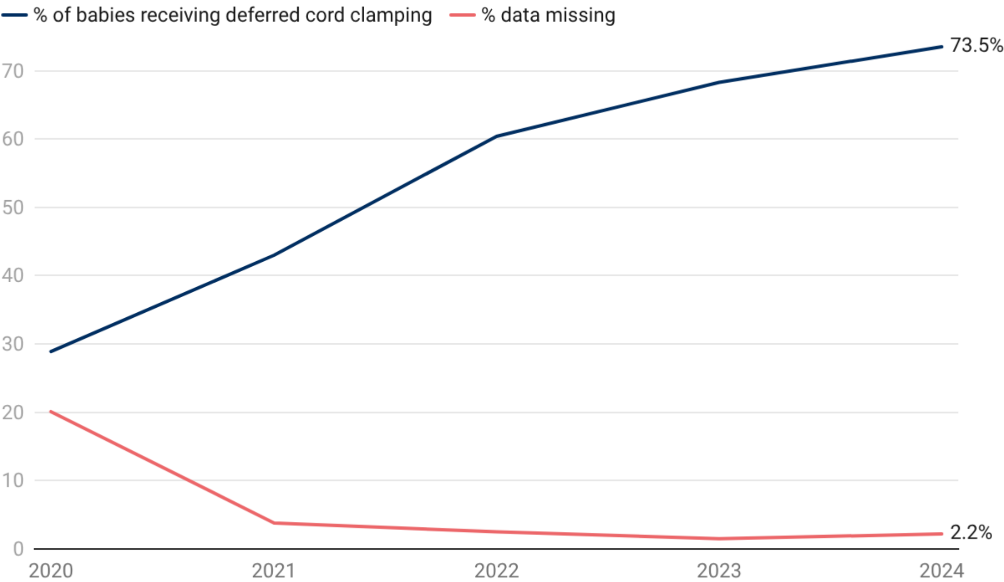

Figure 9. *Proportion of preterm babies receiving deferred cord clamping.*

Despite the overall improvement, only five networks achieved the development standard in 2024. There is moderate regional variation, with the lowest performing network reporting 66.8% adherence (London South) compared to 80.4% in the highest performing (South West). However, this variation seems to be narrowing over time with universal improvements seen across all networks; compared to 2020 where East Midlands has the lowest levels of adherence (20.8%), whilst South West achieved the highest adherence (60.6%) (see Figure 10).

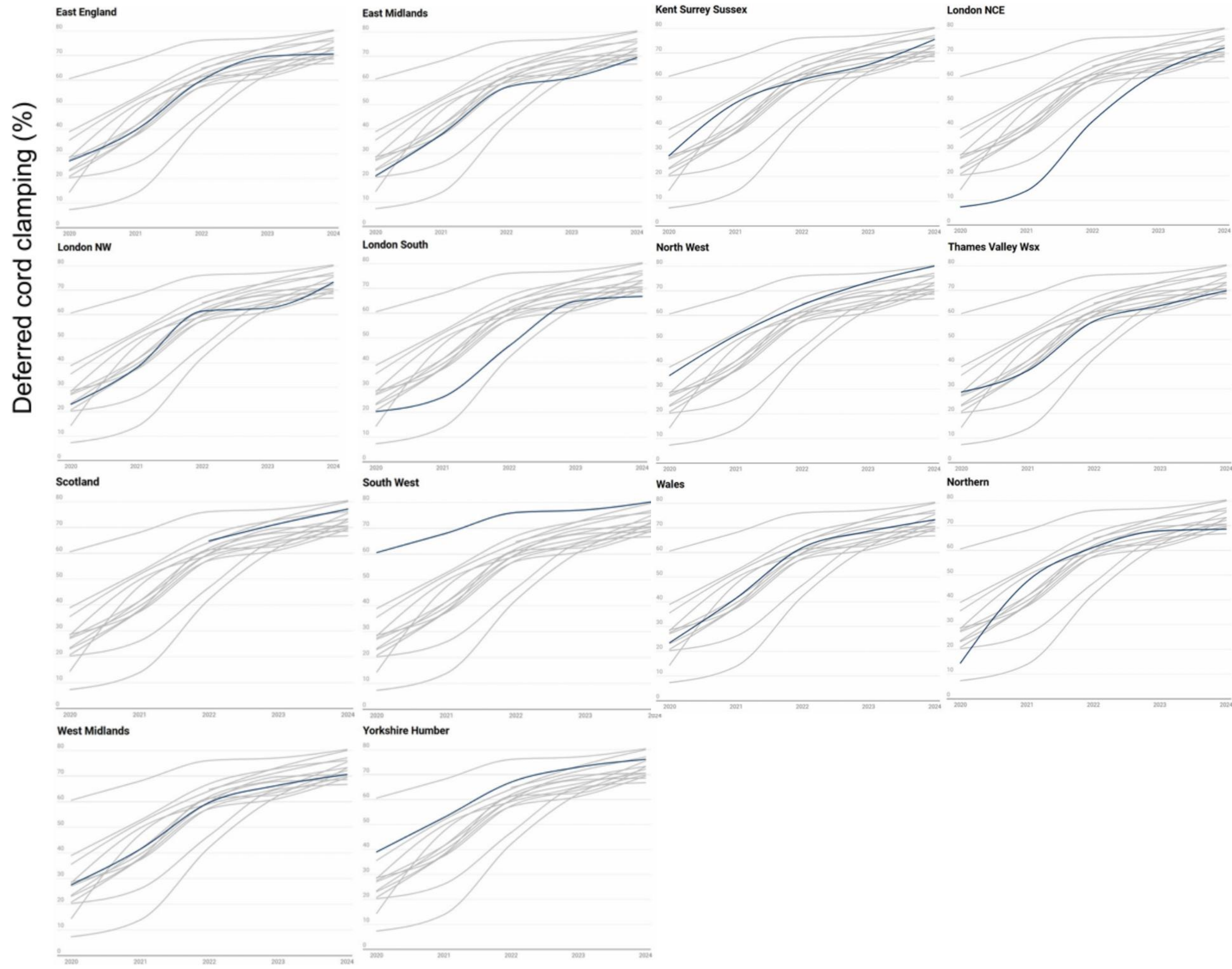

Figure 10. *Deferred cord clamping by neonatal networks from 2017 – 2024*

However, amongst individual units, variation is much higher, with some with as low as 20% adherence in 2024. SCUs are found to have the greatest spread of variation, with most of their units having low levels of adherence. On the other hand, NICUs have the highest and most consistent adherence, with many achieving 85 – 100%.

When comparing data across ethnicities, babies from Black mothers had the lowest proportion of deferred cord clamping (68.5%), whereas rates were higher among White (74.1%), Asian (75.5%) and Mixed/Other (70.2%) mothers (see Figure 11).

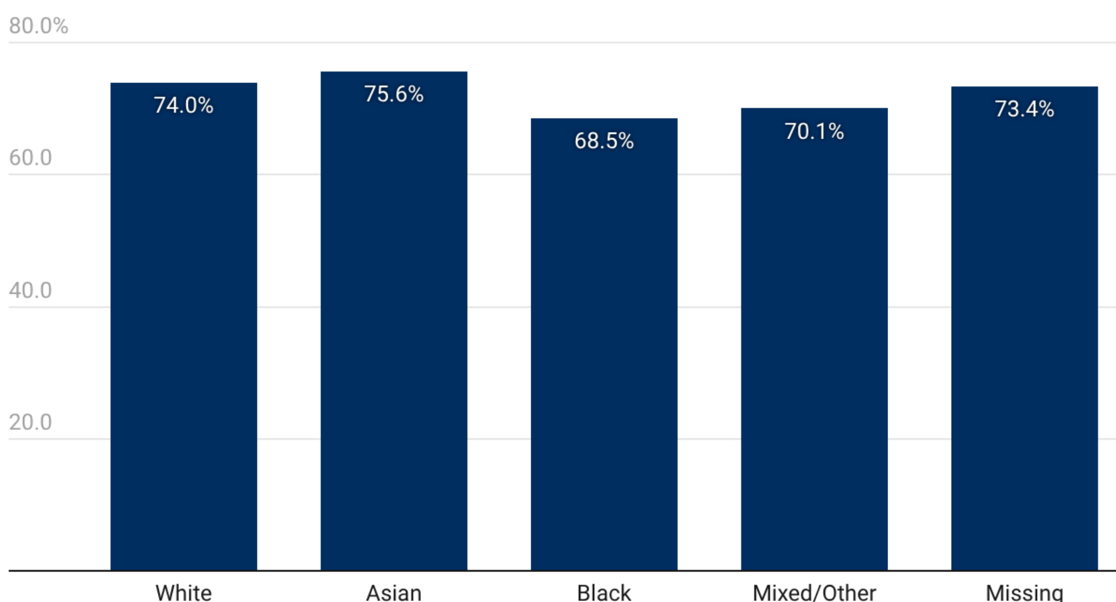

Figure 11. *Proportion of preterm babies receiving deferred cord clamping, by ethnicity.*

Reasons for variation

Across three quality improvement projects in NHS Trusts, reasons for variation included a combination of organisational and behavioural factors:

- **Lack of understanding of the practice and its benefits,** leading to inconsistent recognition of when a baby qualified for the practice and it being underused.
- **Absence of standardised programmes** resulted in variations in the approach between clinicians and departments, with variation further exacerbated by poor multi-disciplinary communication during delivery.
- **Lack of clarity on roles**, especially during urgent or complex deliveries led to missed opportunities, with some staff also lacking confidence to follow the guidance when the baby appears unwell, reverting to immediate clamping when unsure.
- **Insufficient training on equipment** due to time constraints, such as the LifeStart trolley (bedside resuscitation unit), impacted staff confidence and reduced its use in facilitating deferred cord clamping.

Variation by ethnicity may be a result of explicit or implicit biases from clinicians, including subjective visual assessments on skin colour to determine if the baby is well enough to receive deferred cord clamping. Analysis within the report notes that these results are currently unexplained, but urgent improvement is needed to understand what is driving these outcomes.

Solutions

Developing and embedding standardised guidelines within Trusts, which align with national guidance, would help to reduce ambiguity and reduce variation between clinicians. In such cases, regional care bundles were found to support the implementation of national guidance, whilst acknowledging local needs. Strengthened training, including mandatory training for new staff, and regular simulations and practice sessions will help to normalise the practice of deferred cord clamping, building confidence in the familiarity of equipment, and the process. Improved collaboration, teamwork and communication between maternity and neonatal colleagues would enhance understanding on the importance of the intervention, leading to improved implementation of best practice.

In line with a report into the assessment of neonatal practices for Black, Asian and minoritised ethnic newborns, any guidance for healthcare professionals must be suitable and recognise changes in clinical need across all skin tones. This includes investing in more diversified training materials, as current imagery and mannequins used for training predominantly depict babies with lighter skin tones.

5. Breastmilk feeding in first 2 days of life

Does a baby born at less than 34 weeks' gestational age receive any of their own mother's milk in the first two days of life?

Evidence

There is limited evidence on the optimal way to feed preterm babies to meet all their nutritional needs, and it is less clear why this has been included as one of the key NNAP metrics. Many of the improved outcomes may be explained by other characteristics of women and birthing people who breastfeed, including ethnicity, education, and household income. However, we recognise that breastmilk has been associated with reduced incidence of necrotizing enterocolitis which is a key motivator in clinicians encouraging breastmilk feeding if possible. Breastfeeding is a mother's choice, and some may choose not to or may not be able to. Instead, the focus should be on supporting mothers if they choose to breastfeed.

Level of adherence

The proportion of babies born at less than 34 weeks' gestational age receiving any of their own mother's milk in the first two days of life has increased from 52.4% in 2022 to 66.8% in 2024, whilst the proportion of babies receiving exclusive breastmilk rose from 33.7% in 2022 to 45.1% in 2024. The data do not tell us how many of the remaining women and birthing people wanted to breastfeed but did not.

Similarly, while there is wide variation between the poorest performing network, 45.8% in the East Midlands, compared to 82.8% in South West ODN, it is not clear whether this is driven by women and birthing people's preferences or by unmet need for breastfeeding support.

The variation reported by ethnicity, with a lower proportion of babies born to Black (62.2%) and Asian (65.5%) mothers receiving any of their mother's milk in the first two days of life compared to babies born from White (67.5%) or Mixed/Other (70.9%), does suggest some unmet need for early support as NNAP reports that babies from minoritised ethnic groups were more likely to receive breastmilk on day 14 and at discharge.

Reasons for variation

Prematurity creates barriers to breastfeeding preterm infants, either because of the separation of mother and baby in hospital settings resulting in low milk supply, immature feeding abilities from the baby, or medical interventions such as respiratory support interfering with breastfeeding. There are also general healthcare related barriers to breastfeeding, including insufficient counselling or lactation support. Whilst support may vary across regions, NICUs are more likely to have better access to overnight accommodation can help to reduce separation and the stress associated with it. Socio-cultural influences such as stigma, misinformation, and lack of partner or family support may also play a role.

Solutions

Healthcare professionals and neonatal services should focus on supporting women and birthing people to breastfeed, if they choose to and ensuring equitable access to support. Further analysis is required to identify unmet need for breastfeeding support, to inform future interventions.

6. Temperature on admission

Does an admitted baby born between 22 and 33 weeks' gestational age have a first temperature on admission which is both between 36.5-37.5°C and measured within one hour of birth?

Evidence

Newborn babies lose body heat rapidly after birth as they move from a warmer environment in the womb to cooler room temperatures. Preterm babies are especially vulnerable due to their underdeveloped skin, minimal insulating fat, and having a larger surface area relative to their body mass, which limits their ability to conserve heat. Abnormal temperature in preterm babies is associated with increased morbidity and mortality, requiring a combination of interventions to maintain a normal temperature. Nearly one-third (29.0%) of reviews completed with the Perinatal Mortality Review Tool (PMRT) in 2024 found issues with thermal management at any stage of care, which has increased from 25% in 2022.

Often without the presence of a qualified midwife or obstetrician and not in a controlled environment, babies born unexpectedly outside of hospital are at increased risk of hypothermia. Issues related to thermal management during transfer to another unit was the fifth most identified issue with neonatal care in PMRT reviews in 2024, identified in 17% of reviews overall.

Level of adherence

NNAP measures the proportion of babies born at less than 33 weeks' gestational age with a normal first temperature (between 36.5 and 37.5°C) within an hour of birth[4]. The target is for at least 90% of babies to have had an admission temperature taken within an hour of birth and measuring within the normal range. There has been a gradual increase in the average proportion of babies with a normal temperature on admission, rising from 64.5% in 2017 to 77.6% in 2024 (see Figure 14).

4 The measurement includes a small number of babies who were admitted to neonatal care after the first hour of life to prevent unintentionally encouraging clinicians to delay admitting babies who were already too cold to improve reported performance results.

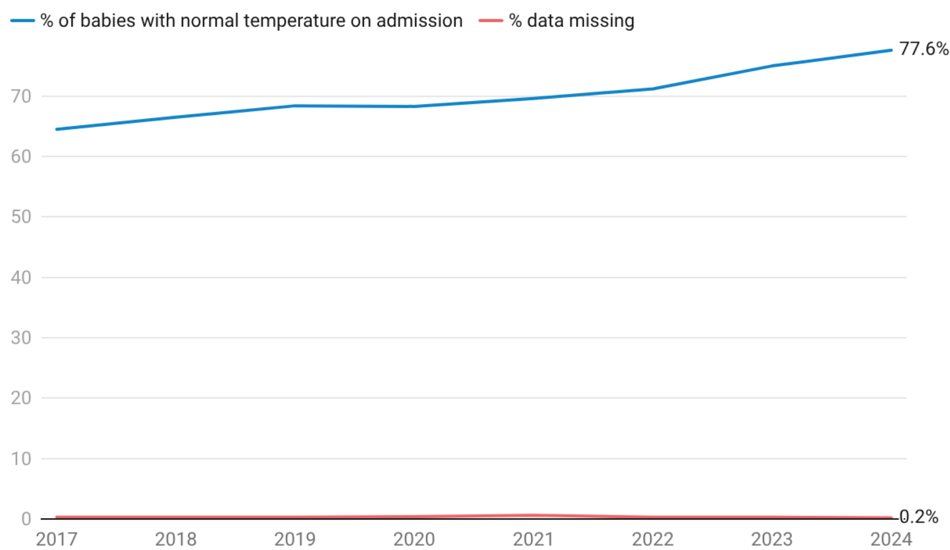

Figure 14. *Proportion of preterm babies with a normal temperature on admission.*

Variation between networks is relatively low, ranging from 69.1% in London South to 82.2% in East of England, with all the networks showing improvement over time. Adherence is high across all neonatal unit types, the LNUs reporting the highest levels (78.6%), which is slightly above the national average. Whilst there is only a small difference in the averages across unit level types, there are significant outliers, such as Princess Royal Hospital LNU (31.8%) and Evelina NICU (33.1%) in London South, which pulls the national average down.

Despite 18 units meeting the 90% developmental standard, most units sit below the standard, with a national average of 77.6%.

The data show that babies born to Black mothers had the lowest proportion of normal temperature on admission (73.1%) compared to White (78.2%), Asian (77.5%) or Mixed/Other (76.0%) (see Figure 15).

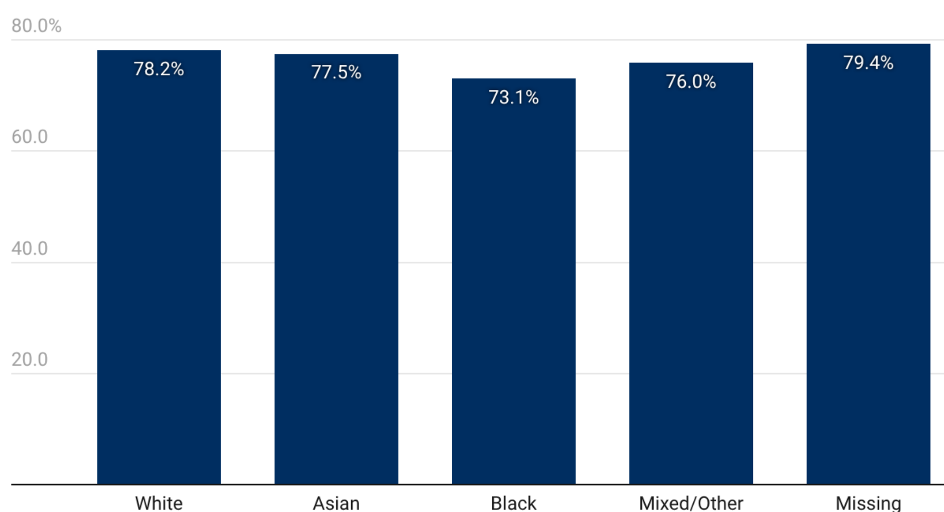

Figure 15. *Proportion of preterm babies with normal temperature on admission, by ethnicity.*

Reasons for variation

Having a normal temperature on admission suggests a baby has been properly stabilised and kept warm after birth. However, from birth to admission onto neonatal units, temperature management can be compromised during deferred cord clamping, resuscitation, skin-skin care, or during transport.

Poor environmental control such as the inconsistent management of delivery room temperatures, with windows and doors left open and equipment showing inaccurate temperature readings have been found to impact appropriate temperature management.

When considering preterm births which occur outside of hospital (known as Birth Before Arrival[5]) and require postnatal transfer to a neonatal unit, several factors may affect the recording and management of a baby's temperature. In the absence of a healthcare professional, effective thermal care may be limited if 999 call handlers do not provide specific advice. Personal circumstances can also be a barrier, with some families finding it difficult to maintain a warm environment for their baby due to the increased costs of heating homes.

During the transfer to a neonatal unit, paramedics may not be familiar with thermal management processes due to a lack of exposure to births or lack of training. Other barriers include unavailable or unsuitable equipment for temperature monitoring and management, as well as prioritising other clinical needs.

Variation in admission temperatures remains unexplained. Limited access to appropriate guidance, particularly for out-of-hospital births where language barriers may exist, could be a contributing factor. Further research is needed to understand these differences

5 These refer to births that happen unexpectedly, whether at home, in a public place, or in a car or ambulance while the mother is on the way to the hospital. It does not include planned home births.

Solutions

Ensuring preterm babies have a normal temperature on admission requires a system approach that is continually audited and reviewed to encourage improvements in practice.

This includes a standardised thermal care pathway that provides staff with clear, evidence-based steps for stabilisation. Targeted education and training on safe thermal care practices, including regular teaching sessions and simulations can also help to reinforce the correct practice.

A supportive learning culture, with shared multidisciplinary responsibility and regular communication of good practice, has been found to sustain engagement and continuous improvement. Clear accountability through a designated lead for thermal care during stabilisation can further ensure temperature management remains a priority.

For Birth Before Arrival, updated scripts and training for 999 call handlers should enable them to provide the caller with specific advice related to managing the baby's temperature and check whether advice has been followed. During transfer, paramedics require training and access to equipment to monitor and manage the baby's temperature.

Common themes and policy implications

Higher adherence in specialised units

Adherence to many of the measures is higher in NICUs compared to SCUs and LNUs. When extremely premature birth is expected, it should take place in a maternity service with a NICU onsite, with the right expertise and facilities that may not be available at local units. This may mean that preterm babies born at SCU and LNU units were to mothers not identified as at risk of preterm birth, making the administration of some of the measures more challenging.

However, some of the variation may also be due to staff working in a centre with a NICU being more likely to be familiar with the latest guidance or best practice. **Despite better adherence in NICUs, the latest data from MBRRACE-UK points to wide variation in neonatal deaths within NICU. Whilst the report notes that it may not reflect quality of care and must be considered with an understanding of population type and service organisation, i.e. high rates reflecting units having to care for the sickest babies, a more in-depth analysis of what is causing this variation is needed.**

Accurately predicting preterm birth

Some of the measures, such as steroids and magnesium sulphate, should be administered up to one week prior to a preterm birth. Timely administration, therefore, requires health care professionals to accurately identify women and birthing people at risk of preterm birth. The risk of preterm birth can be influenced by a complex set of factors which makes predicting and preventing it challenging. **Further research is required to understand the underlying causes of preterm birth, identify those who are at greatest risk, and which interventions would most effectively support prevention. This should include a focus on addressing inequalities to reduce the disproportionate burden of preterm births among the most deprived and minoritised ethnic groups.**

Importance of antenatal care

Antenatal care offers important touchpoints with women and birthing people to identify those who may be at higher risk of preterm birth. The Saving Babies' Lives Care Bundle Version 3 (SBLCBv3) recommends assessing all women at booking appointment for their risk of preterm birth and to provide any additional intervention or support, such as prescription of aspirin, if required. However, women and birthing people from deprived areas or marginalised groups tend to have delayed access to, and low engagement with, antenatal care, which may reduce health care professionals' ability to predict preterm

birth among certain groups. **Removing barriers to accessing antenatal care, either by strengthening translation or interpreting services or addressing reasons for mistrust in services through targeted interventions is paramount.**

SBLCBv3 also emphasises the importance of antenatal education for women and birthing people at risk of preterm birth, so that they are aware of the signs and symptoms of preterm labour and are encouraged to attend their local maternity unit early if these occur. **Better antenatal education may be required for all pregnant women and birthing people to predict preterm birth accurately, with further research on the impact on reducing preterm births and improving outcomes for preterm babies.**

Training and education

A lack of education amongst clinicians, especially amongst those with less experience dealing with extremely preterm babies was commonly cited. The NHS Core Competency Framework mandates training to be in alignment with the BAPM/MatNeoSIP pathway for optimal perinatal care for preterm infants. The lack of training may therefore be related to a lack of protected time to undertake the necessary training. **Training on preterm birth must be prioritised to ensure staff to feel more confident in administering the necessary interventions. Staff need to have protected time for training and simulations to ensure they have the skills to respond to preterm births. This is especially true when considering prehospital management of babies born extremely preterm, with out of hospital births recognised as rare but high-risk events even for the most experienced paramedics.**

Importance of collaborative working

Effective multidisciplinary teamwork enables the timely identification of maternal risk factors which improves the delivery of antenatal interventions, whilst ensuring the baby receives appropriate and timely neonatal support. **Improved collaboration between maternity and neonatal teams is therefore critical to optimising perinatal outcomes, with the shared commitment to improving neonatal outcomes encouraging better communication and more joint up care**.

Inequalities and racism

Disparities by ethnicity have been highlighted in the delivery of some measures, including babies from Black mothers being less likely to receive delayed cord clamping, or have a normal temperature on admission. Whilst the reasons behind these disparities are not yet fully understood, the impact of racial bias on neonatal practices in the UK cannot be underestimated. Some of this may be influenced by structural racism, as marginalised families are more likely to receive fragmented care, delayed engagement with services (see antenatal care section) or implicit bias in clinical decision making. **Further research is needed to understand what is causing variation of some perinatal care measures by ethnicity.**

Acknowledgements

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