National Neonatal Audit Programme (NNAP) 2023 Data: Extended Analysis Report

The National Neonatal Audit Programme is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing, and National Voices. Its aim is to promote quality improvement in patient outcomes, and in particular, to increase the impact that clinical audit, outcome review programmes and registries have on healthcare quality in England, Wales, Scotland, and participating crown dependencies. HQIP holds the contract to commission, manage and develop the NCAPOP, comprising around 40 projects covering care provided to people with a wide range of medical, surgical and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual projects, other devolved administrations and crown dependencies (www.hqip.org.uk/national-programmes).

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Further details of the NNAP governance structure are available at:
https://www.rcpch.ac.uk/work-we-do/quality-improvement-patient-safety/national-neonatal-audit-programme/governance-delivery

1. Introduction

This document is a supplementary extended analysis report to accompany the National Neonatal Audit Programme (NNAP) Summary report on 2023 data. It provides results by NNAP measure at unit level (Special Care Unit (SCU), Local Neonatal Unit (LNU), Neonatal Intensive Care Unit (NICU)), by neonatal network, and for England, Scotland, Wales and the Isle of Man combined, grouped by theme, with a summary of key findings and suggestions for next steps for services seeking to make improvements and links to further resources and case studies.

The NNAP Summary report on 2023 data describes the key messages and recommendations by theme with links to further information about the audit provided within the report. It is available to download at: www.rcpch.ac.uk/nnap.

Full annual results at unit and network level, interactive reporting tools and unit posters are available on NNAP Online at: https://nnap.rcpch.ac.uk/.

Inclusion of Scottish data in 2023 NNAP reporting

Scottish Health Boards originally started participating in the NNAP in 2015, however due to a decision by the Scottish Government not to join the overarching contract for the delivery of the NNAP, Scottish services were not included in reporting in 2020 and 2021. The NNAP team at the RCPCH now has access to Scottish data relating to admissions from the 1st of April 2022, and therefore this report includes Scotland in analyses wherever possible.

Methodology and statistical analysis plan

A number of changes have been applied to the data flow and data cleaning processes applied to NNAP 2023 data, as well as to the derivation of the NNAP measures. This means that in some cases, caution should be applied when comparing this year's results to previous years, and when interpreting the longitudinal bar charts. Notes for interpretation are included with the charts and results for individual measures where relevant.

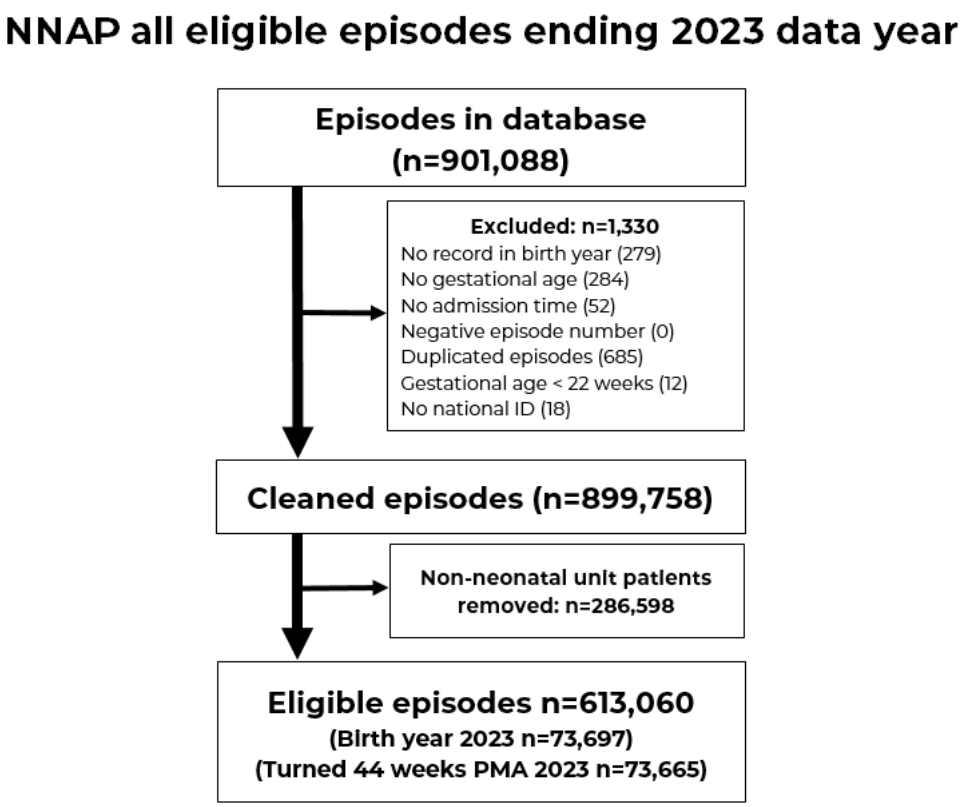
The overarching changes are as follows:

- The Intraventricular haemorrhage (IVH) analysis now describes the IVH outcomes based only on those taken within 28 days of birth, rather than including imaging from any eligible patient episode.

- The blood stream infection (BSI) measure has been updated to link screenings to the patient episode sharing a date and time with the screening. Previously, BSI screening data was linked to the episode within which it was recorded.
- The nurse staffing measure has been updated to account for associate nurses in the calculation that indicates if a shift was sufficiently staffed. Previously, associate nurses were not included in the calculation.
- Mortality to discharge in very preterm babies has been updated to 1 year epochs. Previously the NNAP reported three-year rolling epochs.
- Promoting normal temperature on admission. The upper gestational age cut-off has been increased from 32 weeks to 34 weeks, in line with MatNeoSIP measurement.
- For the analysis of 2023 data, the bronchopulmonary dysplasia (BPD) cohort changed from babies discharged within the calendar year of analysis to babies who turned 44 weeks PMA in the calendar year of analysis and moved from a three year cohort to a one year cohort.
- For the analysis of 2023 data, the cystic periventricular leukomalacia (cPVL) cohort changed from babies discharged within the calendar year of analysis to babies who turned 44 weeks PMA in the calendar year of analysis.
- The Parents on Ward Rounds measure has been updated to count days on which a ward round did not occur in the denominator. Previously, these days were excluded from the analysis.

Figure 1 describes the exclusions and episodes eligible for inclusion in analysis.

Figure 1. Flow diagram, episodes eligible for the NNAP, 2023 data year.



The full NNAP methodology and statistical analysis plan is available at: https://www.rcpch.ac.uk/nnap-data-flow-methodology

Future NNAP reporting

The RCPCH entered a new three-year contract for the delivery of the NNAP in April 2023. The new contract brings changes to the way NNAP reporting will be delivered, including the definition of 10 headline metrics, and the introduction of more frequent reporting in the public domain.

2023 NNAP measures

From 2023, NNAP reporting has been streamlined to 10 headline performance metrics, some of which are composite (or bundled) metrics, which support the NNAP's improvement strategy and improvement goals. Reporting of the component measures sitting behind these 10 performance metrics continues to enable and support local monitoring and quality improvement activity.

The metrics are summarised below.

1. Mortality until discharge
2. Optimal perinatal care composite metric
   (Component measures: antenatal steroids, antenatal magnesium sulphate, birth in a centre with a NICU, deferred cord clamping, normal temperature on admission, breastmilk feeding in the first 2 days of life)
3. Clinical outcomes composite metric
   (Component measures: bloodstream infection, BPD, NEC, preterm brain injury)
4. Parental consultation within 24 hours of every admission
5. Parental inclusion in consultant ward rounds
6. Breastmilk feeding composite metric
   (Component measures: breastmilk feeding at day 14, breastmilk feeding at discharge home)
7. Follow-up at two years
8. On-time screening for retinopathy of prematurity
9. Neonatal nurse staffing
10. Type and duration of respiratory support

Full details of the metrics and component measures, inclusion criteria, data sources and how they are derived in the 2023 measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Frequent reporting of NNAP results

- The NNAP public access dashboard (PAD) dashboard provides results for each of the 10 NNAP performance metrics, as annual rolling averages. Data is refreshed monthly. Results can be displayed for neonatal units, Integrated Care Systems, Health Boards (Wales and Scotland), and by neonatal network. The dashboard provides more timely access to the latest available results, facilitating earlier identification of the need for improvement and data to support improvement work.

- The NNAP restricted access dashboard (RAD) provides the underlying data for the NNAP performance measures to participants, visible only to neonatal units and networks. The data is refreshed monthly and presented in time series charts, tabular data, and an interactive patient list. The RAD allows units to understand temporal changes in the components of the composite metrics without deductive disclosure risks. is intended to be used by participating neonatal units and networks for quality improvement purposes and is a replacement for the former system of PDF reports and attendant excel patient lists.

Data for assurance and data for improvement

NNAP wishes to point out the distinction to be drawn between the data referred to in this report and that seen within the dashboards referenced above. The data published here has been subject to an NNAP data assurance window, and as such is published using data abstracted on the 2nd of April 2024. As part of the data assurance process, units were asked to review their data and specifically to offer assurance relating to necrotising enterocolitis, bloodstream infection and preterm brain injury. The results of this NNAP data assurance survey are represented in the specific sections of what follows and inform the graphical presentation of data as well as that shown online.

Annual results for 2023 and previous years continue to be available on NNAP online.

Outcomes of neonatal care

1.1. Mortality until discharge home

What proportion of very preterm babies die before discharge home, or 44 weeks post-menstrual age (whichever occurs sooner)?

The NNAP reports mortality until discharge, or 44 weeks post-menstrual age (whichever occurs sooner), for a one-year cohort of babies born at 24 to 31 weeks gestational age inclusive between 1st of January 2023 and the 31st of December 2023. Previously NNAP reported three year rolling epochs. Attribution by the unit of birth. When the place of birth is listed as home or transit, place of birth will be assigned to the Network related to the first unit of first admission.

This measure of mortality supplements other measures of mortality, such as that reported by Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries in the UK (MBRRACE-UK). The NNAP measure only includes very preterm babies because they experience higher mortality and is limited to babies born alive and admitted to neonatal units, describing mortality up to the point of hospital discharge. MBRRACE-UK report neonatal mortality, defined as that occurring before 28 days of age, by centre, for all gestational ages. There is evidence that notable numbers of babies die after 28 days.[1] MBRRACE-UK have published data showing national rates of infant mortality (death before a year of age for babies born before 27 weeks gestational age).[2]

The comparative mortality reporting in this report excludes admissions of babies born at 22 and 23 weeks gestation, consistent with previous years. This exclusion was agreed with partners based on evidence that rates of admission for attempted curative intensive care vary. Given high rates of mortality at the lowest gestations, the potential impact on mortality reporting is significant, although this decision will be kept under review. However, in addition to comparative mortality reporting of babies born at 24 to 31 gestational age, we report separately, the proportion of admitted babies born at 22 and 23 weeks gestational age who do not survive to 44 weeks PMA or discharge home.

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[1] Berrington J.B., *et al.* Deaths in Preterm Infants: Changing Pathology Over 2 Decades. *J Peds*;160(1):49-53. Available at: https://www.ncbi.nlm.nih.gov/pubmed/21868028.

[2] Smith, L., *et al.* on behalf of the MBRRACE-UK collaboration. *MBRRACE-UK Supplementary report on survival up to one year of age for babies born before 27 weeks gestational age*. 2019. Available at: https://www.npeu.ox.ac.uk/assets/downloads/mbrrace-uk/reports/MBRRACE-UK%20supplementary%20tables%20on%20births%20before%2027%20weeks%20gestation%202016.pdf

In reporting mortality, the NNAP describes the observed number of infants who died, and a "balanced proportion" which is the proportion of mortality in a matched group of babies with similar baseline characteristics to those in the network of interest. Comparing the balanced proportion to the observed proportion allows calculation of a "treatment effect". Treatment effect is the difference between the observed and balanced proportion. Therefore, a negative treatment effect suggests that the babies were more likely to survive in the network than elsewhere in the country, and a positive treatment effect suggests that the babies would have been more likely to survive had they been born and treated elsewhere.

The baseline characteristics used in the balancing analysis are mother's ethnicity, smoking status, mother's age, number of previous pregnancies, multiplicity, type of labour, problems in pregnancy, baby's sex, month and year of birth, weight, gestational age, and deprivation quintile.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

For a full description of the NNAP methodology and statistical analysis plan, see: https://www.rcpch.ac.uk/nnap-data-flow-methodology

Results

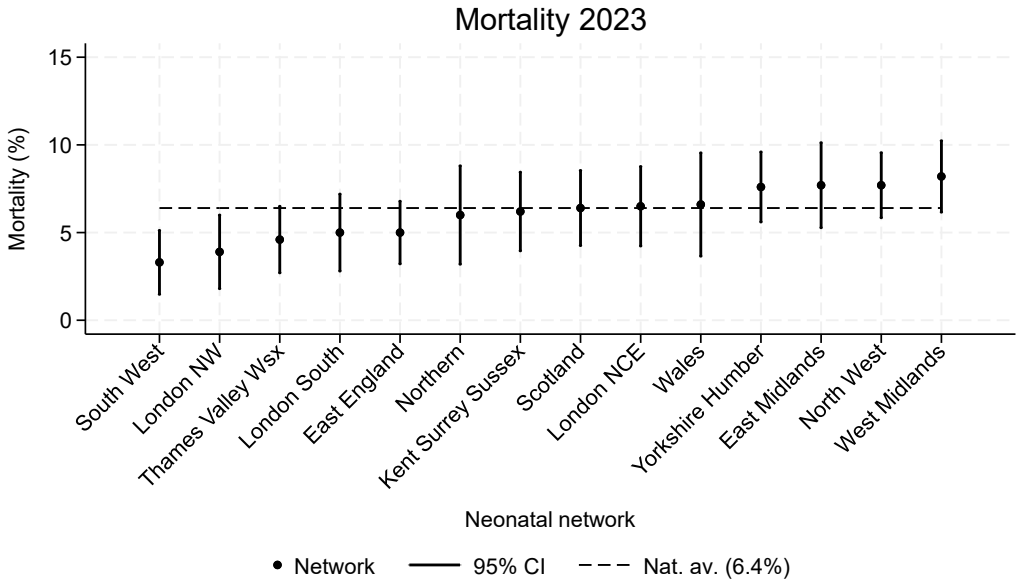
From the 2023 report forwards, NNAP will publish mortality data describing one year cohorts, in contrast to the 3 year rolling cohorts published previously. Understandably, this diminishes the statistical power of our treatment effect analysis to demonstrate differences between results obtained for larger cohorts using otherwise very similar methodology in previous years.

For 2023 data, NNAP clinical leads at participating neonatal units were not asked to provided assurance that all deaths meeting the inclusion criteria were entered onto BadgerNet due to neglibile numbers of babies with no final neonatal outcome recorded.

Full results are available on NNAP Online and more recent, unassured, data can be viewed in the NNAP Data Dashboard.

Figure 2. Caterpillar plot of observed proportion of mortality until discharge (or 44 weeks PMA) in babies born at less than 32 weeks (top) and mortality treatment effect (bottom), by neonatal network.

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.



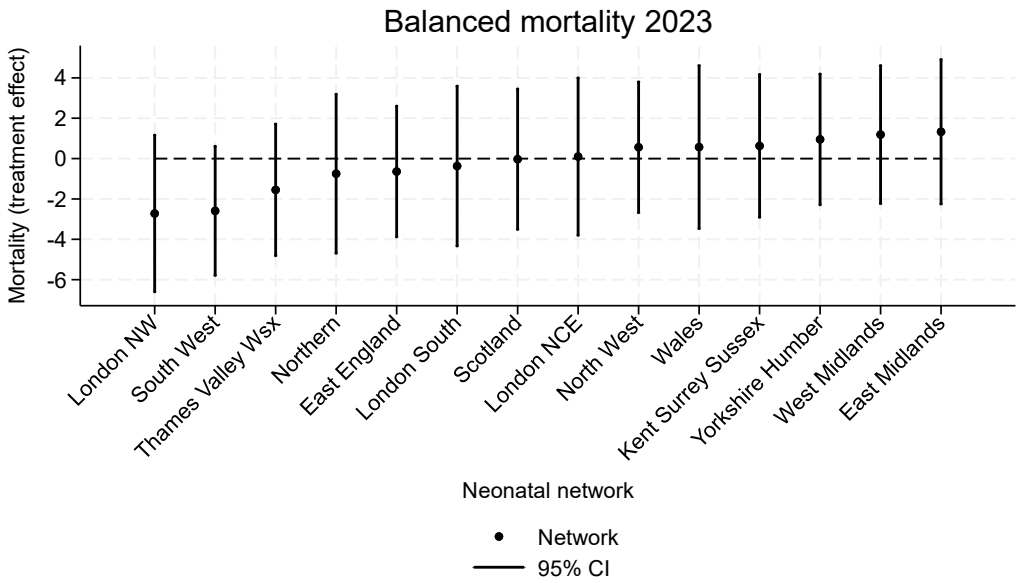
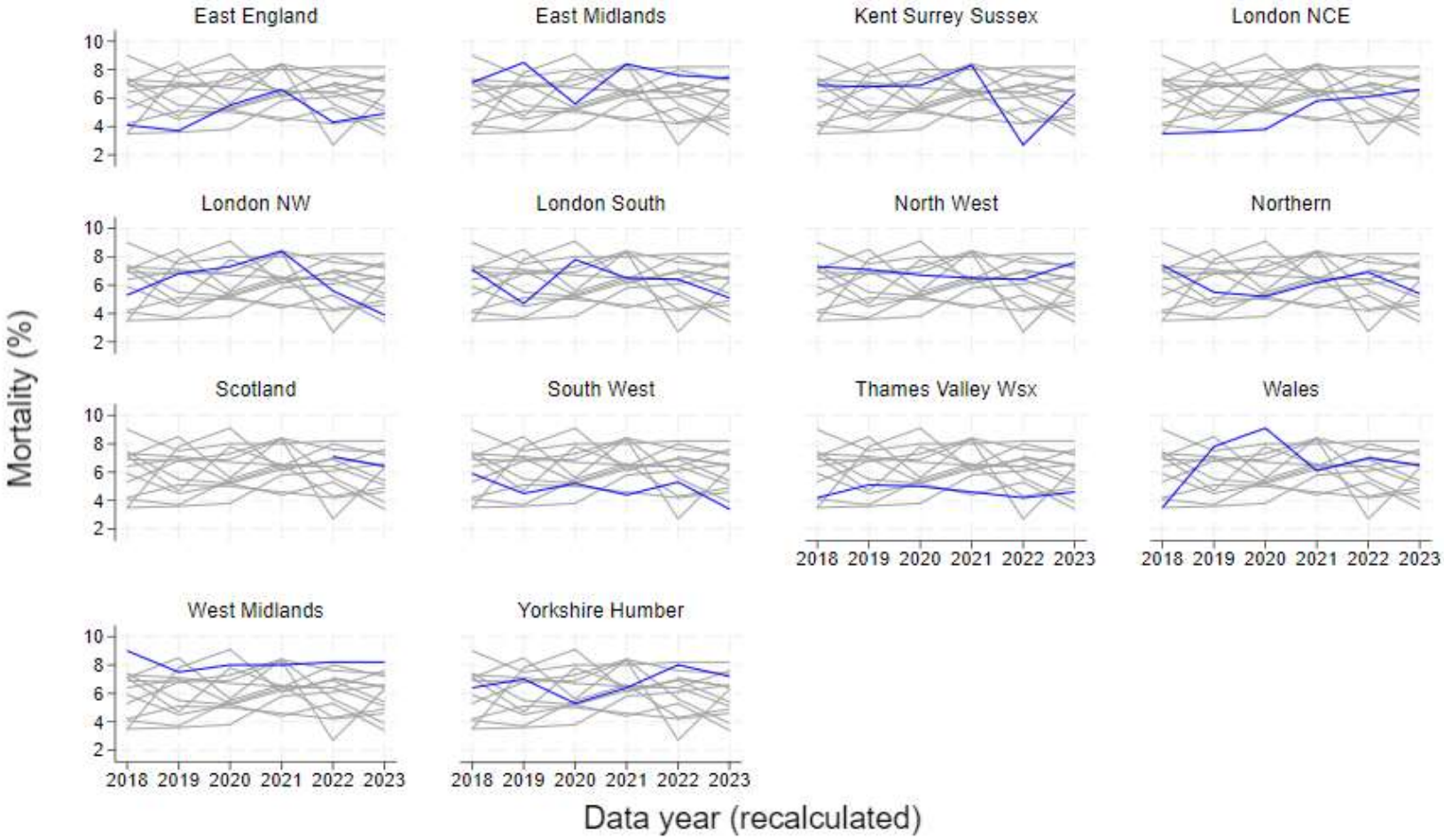


Figure 3. Observed proportion of mortality until discharge (or 44 weeks PMA) in babies born at less than 32 weeks by neonatal network.



Notes for interpretation: This year the NNAP has moved to reporting mortality until discharge, or 44 weeks post-menstrual age (whichever occurs sooner), for a one-year cohort of babies. The new methodology has been retrospectively applied to all previous years of data.

Table 1: Mortality until discharge (or 44 weeks PMA) in babies born at less than 32 weeks gestational age, by neonatal network.

Neonatal network	Eligible babies	With outcome	Survived	Died prior to discharge/44 weeks PMA	Missing	Treatment effect % (St. error)
East Midlands ODN	482	482	445	37 (7.7%)	0 (0%)	1.33 (1.79)
East of England Perinatal ODN	598	598	568	30 (5%)	0 (0%)	-0.64 (1.62)
Kent, Surrey, Sussex ODN	465	465	436	29 (6.2%)	0 (0%)	0.63 (1.77)
London ODN - North Central & East	475	475	444	31 (6.5%)	0 (0%)	0.1 (1.95)
London ODN - North West	337	337	324	13 (3.9%)	0 (0%)	-2.72 (1.94)
London ODN - South	397	397	377	20 (5%)	0 (0%)	-0.37 (1.98)
North West ODN	829	829	765	64 (7.7%)	0 (0%)	0.56 (1.62)
Northern ODN	285	285	268	17 (6%)	0 (0%)	-0.75 (1.97)
Scotland	520	519	486	33 (6.4%)	1 (0.2%)	-0.03 (1.74)
South West ODN	389	389	376	13 (3.3%)	0 (0%)	-2.59 (1.6)
Thames Valley & Wessex ODN	483	483	461	22 (4.6%)	0 (0%)	-1.55 (1.63)
Wales	286	286	267	19 (6.6%)	0 (0%)	0.57 (2.02)
West Midlands ODN	723	723	664	59 (8.2%)	0 (0%)	1.19 (1.71)
Yorkshire & Humber ODN	701	701	648	53 (7.6%)	0 (0%)	0.95 (1.62)
Other*	36	36	31	5 (13.9%)	0 (0%)	NA
National†	7,006	7,005	6,560	445 (6.4%)	1 (0%)	NA

*'Other' networks are those that are in locations not associated with an NNAP neonatal network or are unknown. Home and Transit locations are updated to match their first provider of care for all networks and for units at most place of birth measures.

†National' figures are calculated from participating neonatal units in England, Wales, Scotland, and the Isle of Man.

Figure 4. Caterpillar plot of observed proportion of mortality until discharge in babies born at less than 28 weeks gestational age (top) and mortality treatment effect (bottom), by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

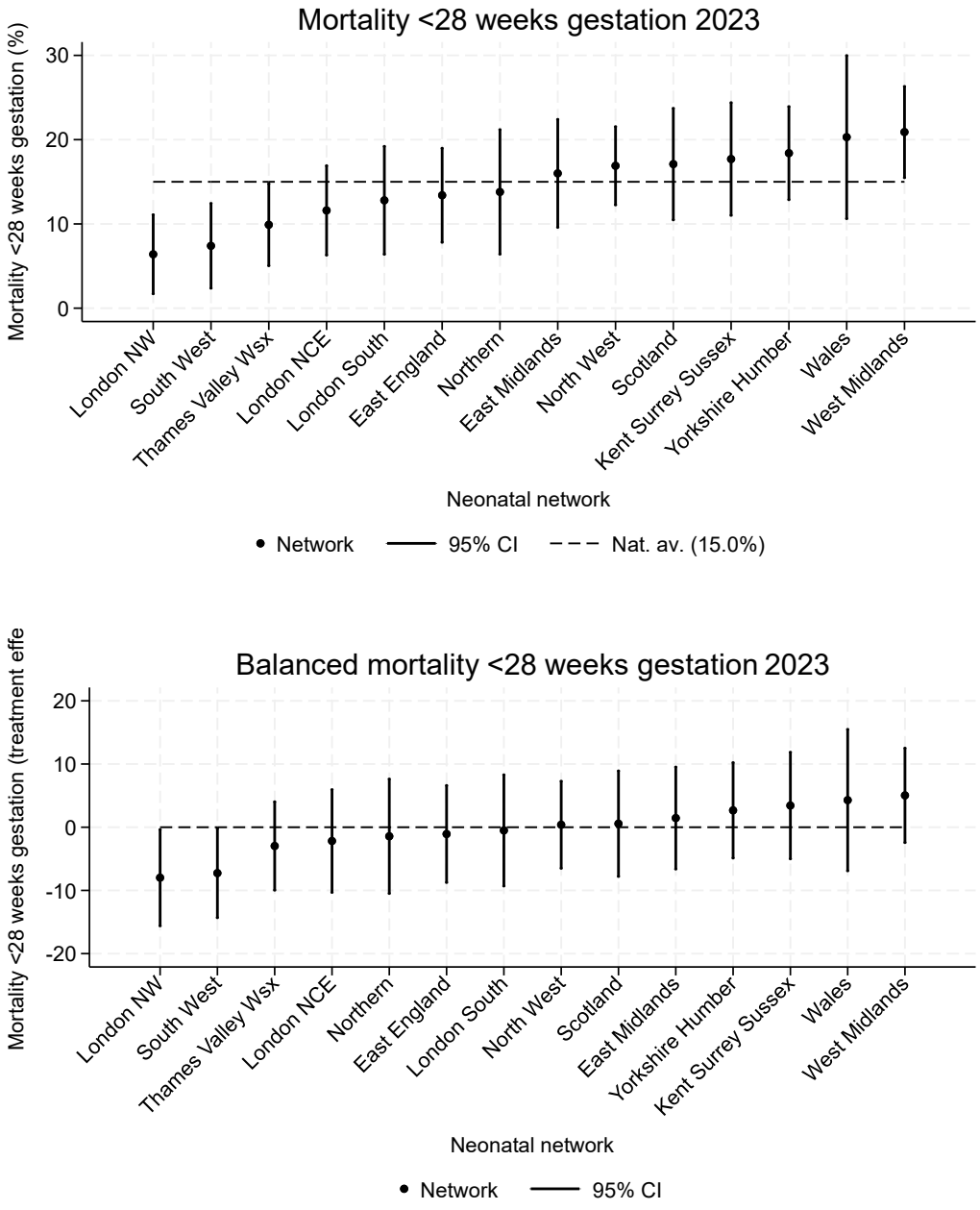


Table 2: Mortality until discharge (or 44 weeks PMA) in babies born at less than 28 weeks gestational age, by neonatal network.

Neonatal network	Eligible babies	With outcome	Survived	Died prior to discharge/44 weeks PMA	Missing	Treatment effect % (St. error)
East Midlands ODN	131	131	110	21 (16%)	0 (0%)	1.45
East of England Perinatal ODN	149	149	129	20 (13.4%)	0 (0%)	-1.07
Kent, Surrey, Sussex ODN	130	130	107	23 (17.7%)	0 (0%)	3.43
London ODN - North Central & East	146	146	129	17 (11.6%)	0 (0%)	-2.18
London ODN - North West	109	109	102	7 (6.4%)	0 (0%)	-7.99
London ODN - South	109	109	95	14 (12.8%)	0 (0%)	-0.51
North West ODN	260	260	216	44 (16.9%)	0 (0%)	0.39
Northern ODN	87	87	75	12 (13.8%)	0 (0%)	-1.43
Scotland	130	129	107	22 (17.1%)	1 (.8%)	0.56
South West ODN	108	108	100	8 (7.4%)	0 (0%)	-7.26
Thames Valley & Wessex ODN	151	151	136	15 (9.9%)	0 (0%)	-2.97
Wales	69	69	55	14 (20.3%)	0 (0%)	4.29
West Midlands ODN	225	225	178	47 (20.9%)	0 (0%)	5.04
Yorkshire & Humber ODN	196	196	160	36 (18.4%)	0 (0%)	2.67
Other*	8	8	7	1 (12.5%)	0 (0%)	NA
National†	2,008	2,007	1,706	301 (15%)	1 (0%)	NA

*'Other' networks are those that are in locations not associated with an NNAP neonatal network or are unknown. Home and Transit locations are updated to match their first provider of care for all networks and for units at most place of birth measures.

†'National' figures are calculated from participating neonatal units in England, Wales, Scotland, and the Isle of Man.

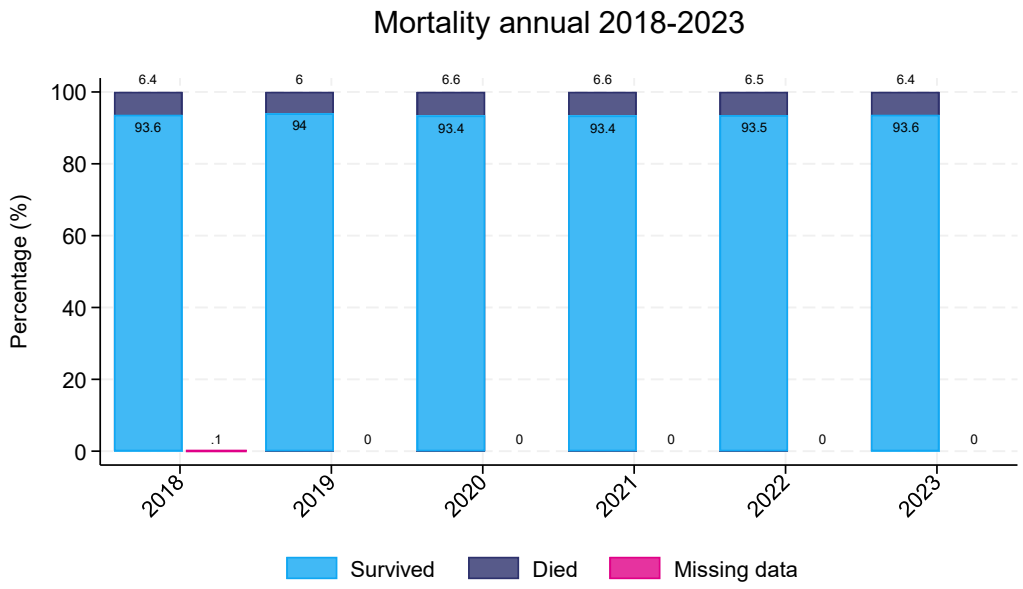
Table 3: Very preterm babies, observed mortality until discharge home from neonatal care.

Reporting period*	Babies	With data entered	Survived to 44 weeks PMA or discharge home	Died before 44 weeks PMA (%)	Missing data (%)
2018	7,311	7,303	6,833	470 (6.4%)	8 (0.11%)
2019	7,072	7,070	6,647	423 (6.0%)	2 (0.03%)
2020	6,907	6,904	6,450	454 (6.6%)	3 (0.04%)
2021	6,229	6,226	5,817	409 (6.6%)	3 (0.05%)
2022†	6,952	6,950	6,495	455 (6.5%)	2 (0.03%)
2023†	7,006	7,005	6,560	445 (6.4%)	1 (0.01%)

†*Includes Scotland.*

**All longitudinal data calculated using 1 year epochs.*

Figure 5. Observed mortality until discharge home from neonatal care.



Notes for interpretation:

- *All longitudinal data calculated using 1-year epochs.*
- *Years 2018 - 2021 do not include Scotland.*

Figure 6. Mortality by gestational age.

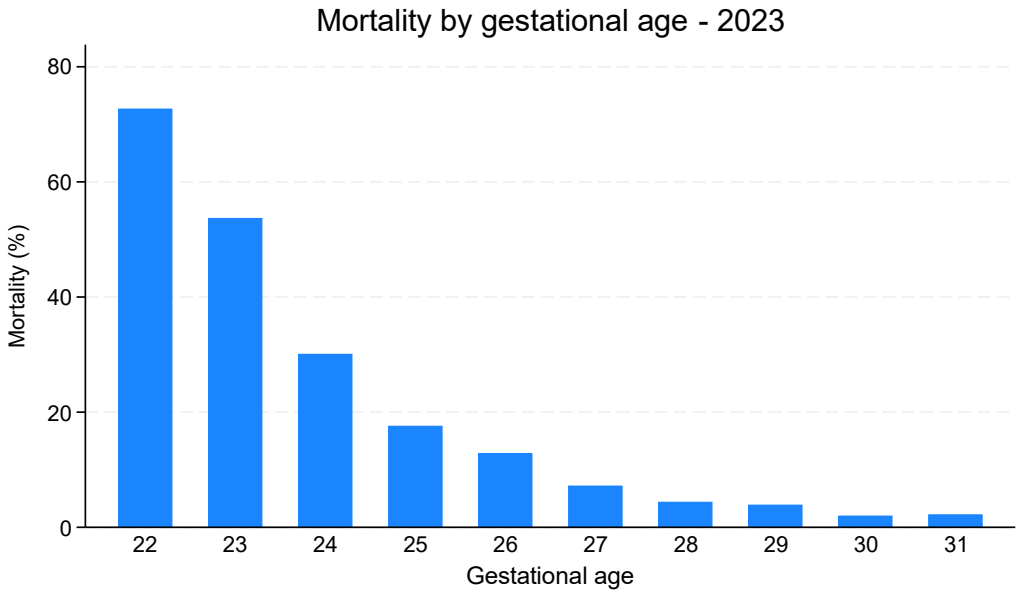


Table 4: Mortality by gestational age (2023).

Gestational Age	Number of babies	Deaths	Deaths (%)
22	110	80	72.7
23	244	131	53.7
24	356	107	30.1
25	409	72	17.6
26	576	74	12.8
27	666	48	7.2
28	913	40	4.4
29	1027	40	3.9
30	1256	25	2
31	1802	39	2.2

Table 5: Number and proportion of babies born at 22 and 23 weeks GA and admitted to neonatal care, and surviving to 44 weeks PMA, by year.

Reporting period (turned 44 Weeks PMA)	Number of babies admitted born at 23 weeks GA	Survived to 44 weeks PMA (%)*	Number of babies admitted born at 22 weeks GA	Survived to 44 weeks PMA (%)*
2018	239	110 (46%)	15	5 (33.3%)
2019	243	115 (47.3%)	13	3 (23.1%)
2020	257	126 (49%)	48	14 (29.2%)
2021	217	105 (48.4%)	75	21 (28%)
2022	286	139 (48.6%)	100	23 (23%)
2023	244	113 (46.3%)	110	30 (27.3%)
Overall	1,486	708 (47.6%)	361	96 (27.3%)

**Proportions should be interpreted with caution due to the increased variability associated with smaller denominators.*

Summary of findings

- The proportion of babies born between January 2023 and December 2023 at 24 to 31 weeks gestational age who died before discharge/44 weeks postmenstrual age (PMA) is 6.4% (445 of 7,005). In 2022, the proportion was 6.5% (455 of 6,950) (Figure 5).

- Across networks, the observed proportion ranges from 3.3% (South West ODN) to 8.2% (West Midlands ODN) (Figure 2). There remains wide variation in mortality between neonatal networks. It is clear that the difference between neonatal networks in the proportion of babies who do not survive has not yet decreased in the way that the NNAP hoped.

- Treatment effect ranges from -2.72% to 1.33%; indicating that the variation in mortality between networks is not fully explained by differences in case mix (Figure 2). The treatment effect results show that babies admitted to the network with the highest treatment effect might be at 4.05% additional risk of death compared to the network with the lowest treatment effect (London ODN - NW). Readers will note that NNAP is reporting mortality in shorter epochs than previously, and the wider confidence intervals that this leads to. This means the audit can less confidently identify differences in mortality treatment effect between neonatal networks. For babies born between 24 and 27 weeks' gestational age there remains wide variation in mortality between neonatal networks. At these gestations the overall mortality rate is 15%, ranging from 6.4% (London ODN – NW) to 20.9% (West Midlands ODN) across networks (Figure 4).

- The NNAP reports the number of babies born at 22 and 23 weeks gestational age that were admitted to neonatal care across England, Wales, Scotland and participating Crown Dependencies and the proportion of those babies who survive to 44 weeks post menstrual age (PMA) (Table 5).

- There has been a seven-fold increase in the number of babies born at 22 weeks gestational age and admitted to neonatal care between 2017 (15 babies) and 2023 (110 babies). The number of babies born at this gestational age and surviving to 44 weeks PMA has increased from 5 in 2018 to 30 in 2023 (Table 5). Between 2022 and 2023 there was a smaller increase in the number of babies born at 22 weeks gestation and admitted to neonatal intensive care (110 in 2023 compared to 100 in 2022).

- Guidance recommending active life sustaining treatment, based on a risk assessment, at the lower gestational ages was published by BAPM in October 2019[3]. The proportion of admitted babies currently surviving to 44 weeks is lower than may be anticipated by parents reading BAPM guidance.

[3] BAPM. Perinatal Management of Extreme Preterm Birth before 27 weeks of gestation: A Framework for Practice. October 2019. Available at: https://hubble-live-assets.s3.amazonaws.com/bapm/file_asset/file/30/Extreme_Preterm_28-11-19_FINAL.pdf

1.2. Bronchopulmonary dysplasia (BPD)

Does an admitted baby born at less than 32 weeks gestational age develop bronchopulmonary dysplasia (BPD)?

Babies born very preterm typically have incompletely developed lungs and typically need support with their breathing. Simply being born early can cause some ongoing breathing difficulty. Being on a ventilator can cause damage to the lungs, exacerbate breathing problems later in life and put babies at risk of chest infections. This condition is known as bronchopulmonary dysplasia (BPD) and is sometimes called chronic lung disease.

The NNAP reports on the proportion of babies born very preterm who are receiving help with their breathing or extra oxygen four weeks before their term due date. In 2023, the cohort changed from babies discharged within the calendar year of analysis to babies who turned 44 weeks PMA in the calendar year of analysis. From 2023, the NNAP reports BPD on 1-year epochs. Previously the NNAP reported three-year rolling epochs. Only babies who survive their early course can develop BPD, and therefore it is important that we consider rates of BPD alongside rates of death before 36 weeks postmenstrual age. For this reason, we report the combined outcome of 'BPD or death'.

Differing proportions of BPD or death between units and networks could be the result of differing treatments or might partially result from differences in the readiness of clinicians to administer oxygen to very preterm infants, although a recent paper shows no evidence of such a phenomenon[4].

In reporting BPD or death, the NNAP describes the observed number of infants who had BPD or died, and a 'balanced proportion', which is the proportion of BPD or death in a matched group of babies with similar baseline characteristics to those in the network of interest. Comparing the balanced proportion to the observed proportion allows calculation of a 'treatment effect'.

Treatment effect is the difference in the observed and balanced proportion. A negative treatment effect suggests that the babies fared better in the network than they would have done elsewhere in the country, and a positive treatment effect suggests that the babies would have fared better had they been treated elsewhere.

[4] Burgess-Shannon J, Briggs S, Oddie S, Mactier H. Variation in use of extended pulse oximetry testing to guide decisions around home oxygen provision for ex-preterm infants; A nationwide survey of UK neonatal units. Respir Med Res. 2023 Apr 7;83:101005. doi: 10.1016/j.resmer.2023.101005. Epub ahead of print. PMID: 37031570.

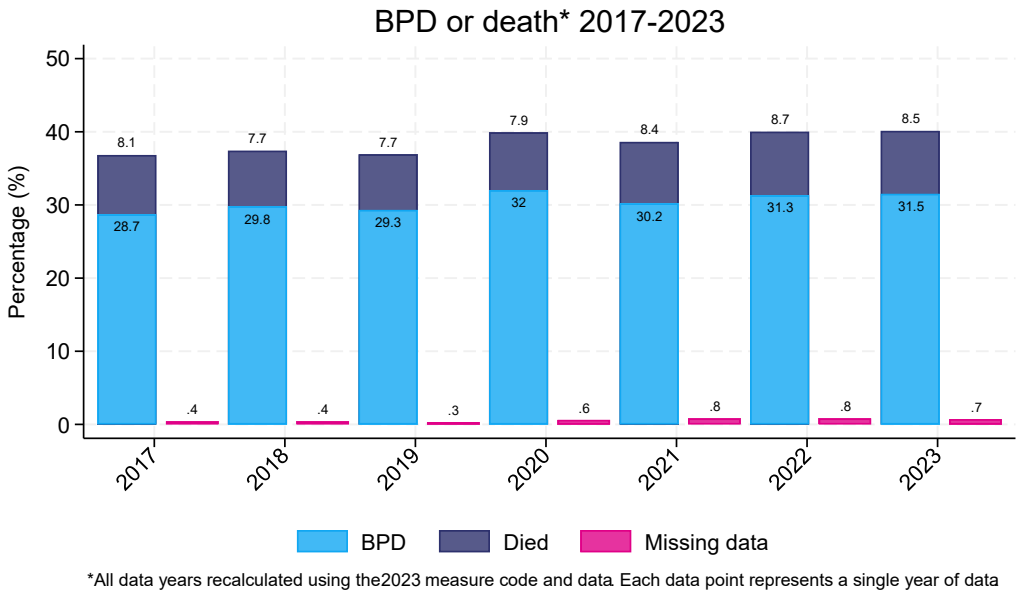
The baseline characteristics used in the balancing analysis are mother's ethnicity, smoking status, mother's age, number of previous pregnancies, multiplicity, type of labour, problems in pregnancy, baby's sex, month and year of birth, weight, gestational age, and deprivation quintile.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

For a full description of the NNAP methodology and statistical analysis plan, see: https://www.rcpch.ac.uk/nnap-data-flow-methodology.

Results

Figure 7. BPD and death, by NNAP reporting periods.



Notes for interpretation:

- *Years 2017 – 2021 do not include Scotland.*

Figure 8. Caterpillar plot of the proportions of BPD or death (2023) (top) and treatment effect (bottom), by neonatal network or operational delivery network (ODN) – all units.

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

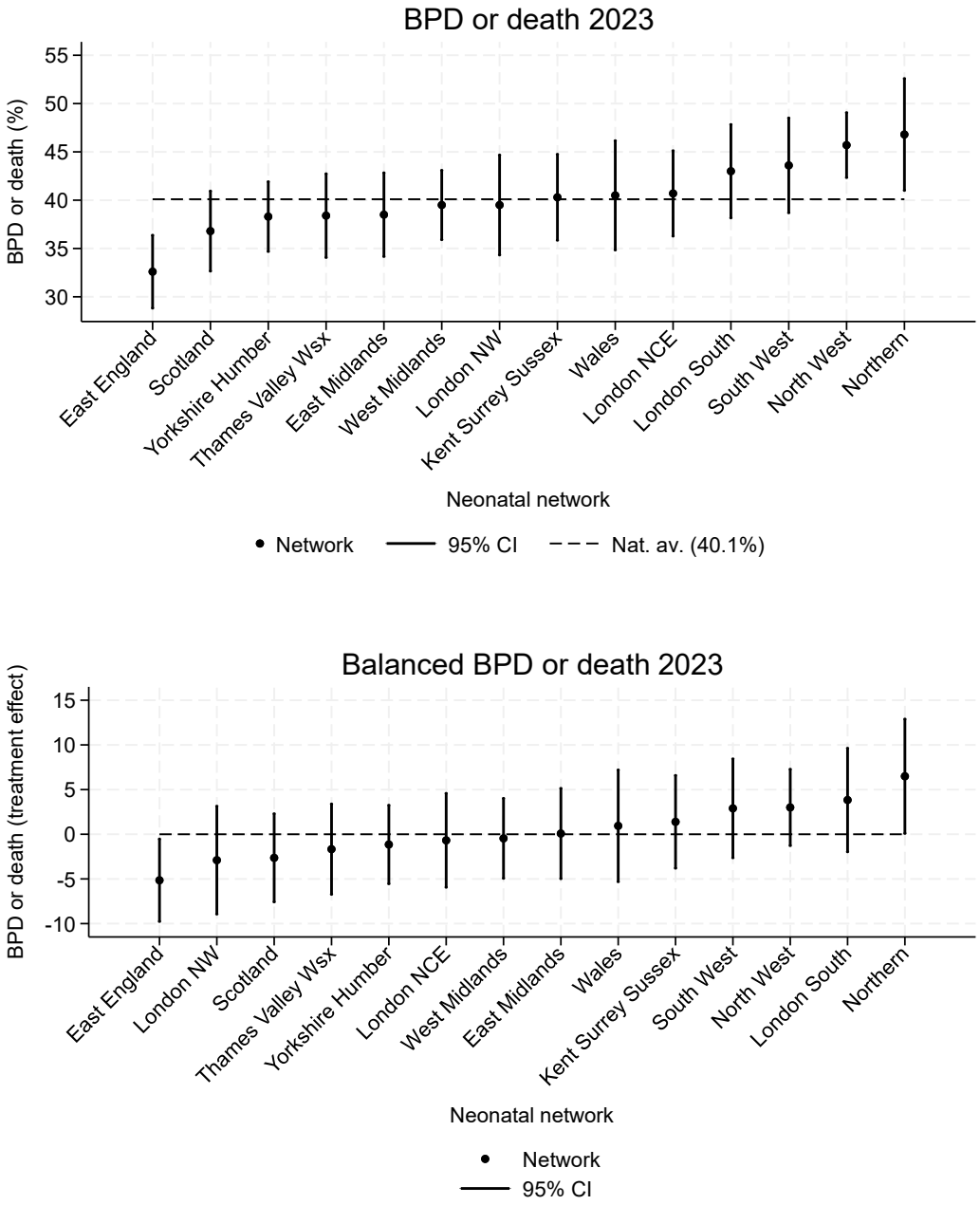
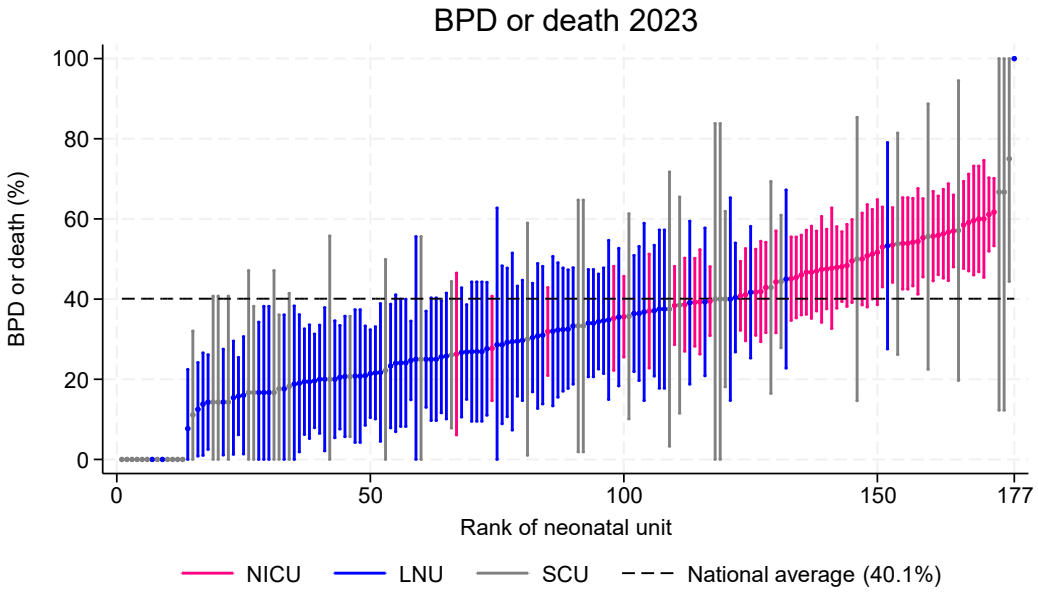


Figure 9. Caterpillar plot of observed proportion of BPD or death (2021-2023): neonatal units (top) and treatment effect (bottom).

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.



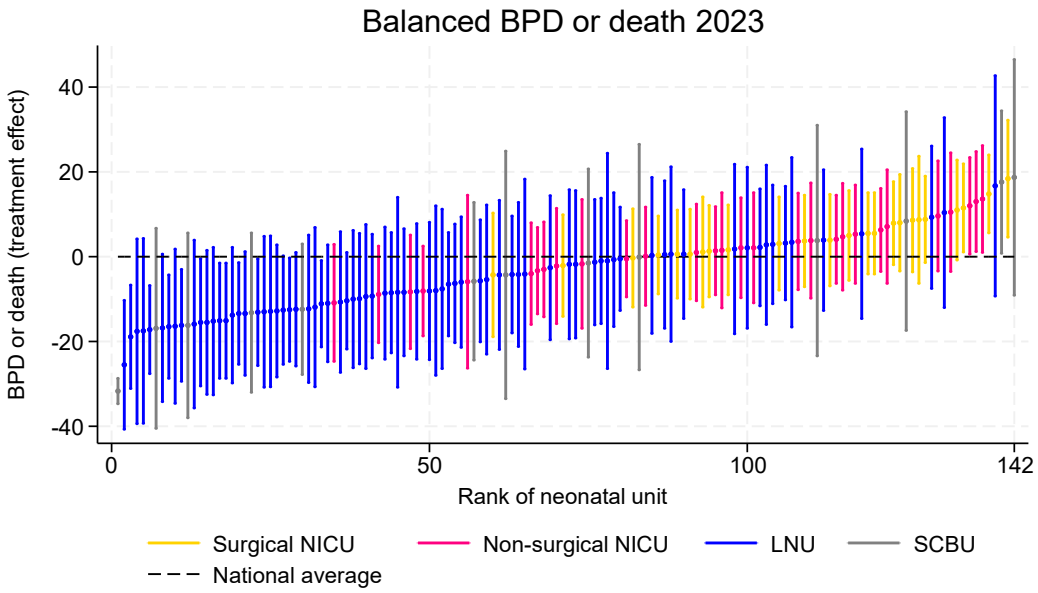


Table 6: BPD and death, by level of neonatal unit (2023)

Unit level	Eligible babies	With outcome	BPD	Died	BPD or death	Missing
Other*	119	118	31	25	56 (47.5%)	1 (.8%)
SCU	407	404	93	23	116 (28.7%)	3 (.7%)
LNU	2,500	2,482	530	140	670 (27%)	18 (.7%)
NICU	4,330	4,297	1,649	436	2,085 (48.5%)	33 (.8%)
National†	7,356	7,301	2,303	624	2,927 (40.1%)	55 (.7%)

**'Other' units are those that are hospital or healthcare locations not associated with an NNAP neonatal unit, NNAP units that have closed before the start of this audit year, or location records that are unknown.*

†'National' figures are calculated from participating neonatal units/ networks in England, Wales, Scotland, and the Isle of Man.

Table 7: BPD and death, by neonatal network (2023).

Network level	Eligible babies	With outcome	BPD	Died	BPD or death	Missing
East Midlands ODN	506	504	144	50	194 (38.5%)	2 (.4%)
East of England ODN	622	616	158	43	201 (32.6%)	6 (1%)
Kent, Surrey, Sussex ODN	491	486	153	43	196 (40.3%)	5 (1%)
London ODN - North C & E	500	494	163	38	201 (40.7%)	6 (1.2%)
London ODN - North West	358	357	117	24	141 (39.5%)	1 (.3%)
London ODN - South	425	419	143	37	180 (43%)	6 (1.4%)
North West ODN	881	877	309	92	401 (45.7%)	4 (.5%)
Northern ODN	297	297	116	23	139 (46.8%)	0 (0%)
Scotland	542	541	155	44	199 (36.8%)	1 (.2%)
South West ODN	409	408	156	22	178 (43.6%)	1 (.2%)
Thames V & Wessex ODN	505	503	162	31	193 (38.4%)	2 (.4%)
Wales	302	301	96	26	122 (40.5%)	1 (.3%)
West Midlands ODN	756	741	213	80	293 (39.5%)	15 (2%)
Yorkshire & Humber ODN	728	723	211	66	277 (38.3%)	5 (.7%)
Other*	34	34	7	5	12 (35.3%)	0 (0%)
National†	7,356	7,301	2,303	624	2,927 (40.1%)	55 (.7%)

**'Other' units are those that are hospital or healthcare locations not associated with an NNAP neonatal unit, NNAP units that have closed before the start of this audit year, or location records that are unknown.*

†'National' figures are calculated from participating neonatal units/ networks in England, Wales, Scotland, and the Isle of Man.

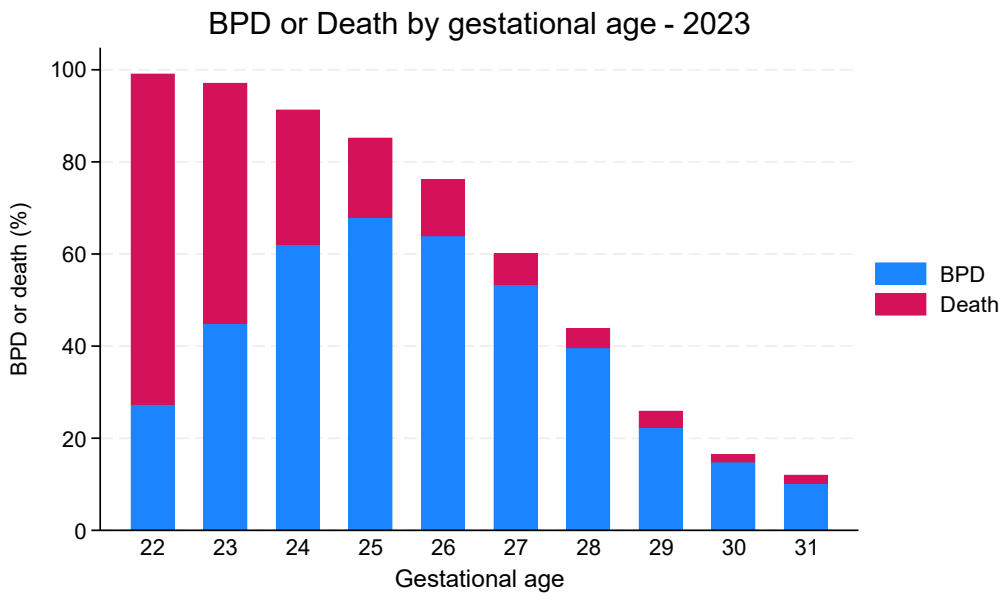
Table 8: BPD or death, proportion of very preterm babies in NNAP with BPD by year and gestational age group.

Year	BPD or Death % (24-31 GA)	BPD or Death % (22-31 GA)
2018	35.3%	37.4%
2019	34.7%	36.9%
2020	37.3%	39.9%
2021	35.9%	38.6%
2022	36.7%	40%
2023	37.1%	40.1%

Table 9: BPD or death by gestational age.

Gestational age	Number of babies	BPD or death	BPD or death (%)
22	110	109	99.1
23	245	238	97.1
24	355	324	91.3
25	406	346	85.2
26	570	434	76.1
27	659	396	60.1
28	908	398	43.8
29	1019	264	25.9
30	1248	206	16.5
31	1781	212	11.9

Figure 10. BPD and death by gestational age (2023).



Summary of findings

- The proportion of babies born between 1 January 2023 and 31 December 2023 at less than 32 weeks gestational age who had BPD or died was 40.1% (2,927 of 7,301) (Figure 7).
- Among networks, the observed proportion of babies with a combined outcome of BPD or death ranges from 32.6% (East of England ODN) to 46.8% (Northern ODN). Similar geographical variation in rates of the outcome of BPD or death are seen in 2023 data as have been seen in previous NNAP reports. This suggests that regional variation is not yet clearly decreasing over time. Treatment effect ranges from -5.15% to 6.49%. This indicates that variation between networks is probably not fully explained by differences in case mix and that opportunity may exist for a reduction in this adverse outcome of prematurity (Figure 8).
- Across neonatal units (SCUs, LNUs and NICUs), observed proportions of BPD or death range from 0% to 61.7% for units with at least 10 eligible babies. Treatment effect ranges from -31.7% to 18.7% (Figure 9). This suggests that variation in rates of BPD is probably not fully explained by differences in case mix and therefore unit level opportunities likely exist to reduce the overall incidence of BPD.
- Proportions of BPD (or death) differ with unit level designation; SCU – 28.7% (116 of 404), LNU – 26.7% (670 of 2,482), NICU – 48.1% (2,085 of 4,297). It is possible that the higher rates of BPD in babies born in units with an onsite SCU than an onsite LNU are explained by differing case characteristics of babies that are not described in the balancing analysis. This is because such deliveries at a unit with an onsite SCU are typically unplanned.
- There is a rise in the proportion of babies observed to have either BPD or died from 37.4% to 40.1% between 2018 and 2023. The rise in rates of BPD or death is not explained by an overall rise in the rate of death. Neither is the rise in the rate of BPD explained solely by the increase in admissions of the least mature babies (Table 8). We report a 1.8% increase in the proportion of babies in whom BPD is reported from 2018 to 2023. (29.3% increasing to 31.1%). The clinical interpretation is that the observed rise in rates of BPD may represent either an underlying deterioration in outcome for very preterm babies or an increased readiness to deploy treatments such as oxygen and non-invasive breathing support.

1.3. Necrotising enterocolitis (NEC)

Does an admitted baby born at less than 32 weeks gestational age meet the NNAP surveillance definition for necrotising enterocolitis (NEC) on one or more occasion?

Necrotising enterocolitis (NEC) is a serious condition which can follow preterm birth. Bowel inflammation prevents milk feeding and surgery may be needed. Babies who develop NEC tend to stay in hospital for a long time. Rates of mortality in babies with NEC are high, at over 20%[5]. Babies who survive NEC can have developmental as well as long-term feeding and bowel problems. Reporting of NEC is based on a surveillance definition, and cases are attributed to the unit at which the baby is nursed at 48 hours.

A balancing analysis has been conducted at neonatal network level which includes all units, regardless of whether they validated their data. This balancing analysis uses the full set of matching variables as described in the NNAP methodology and statistical analysis plan: https://www.rcpch.ac.uk/nnap-data-flow-methodology.

A balancing analysis has also been conducted for local neonatal units and neonatal intensive care units (surgical and non-surgical). This analysis only includes units which provided assurance of the accuracy of their NEC data. The methodology applied has changed slightly since 2022 with balancing applied solely for gestational age (previously it also included neonatal unit type). This means that all unit's caseloads are being compared to patients from all other units, regardless of unit type (SCBU, LNU, non-surgical NICU, surgical NICU). Balancing on gestational age is essential; the rate decreases with gestational age.

Only units providing assurance and for whom matching analysis is carried out are included in outlier identification.

The balanced proportion is the proportion of NEC in a set of babies in the dataset like those cared for by the network or unit. Treatment effect is the difference in the observed and balanced proportion; and therefore, a negative treatment effect indicates that the babies fared better in the unit or network than they would have done elsewhere in the country, and a positive treatment effect indicated that the babies would have fared better had they been treated elsewhere.

[5] Jones IH, Hall NJ. Contemporary Outcomes for Infants with Necrotizing Enterocolitis-A Systematic Review. J Pediatr. 2020 May;220:86-92.e3. doi: 10.1016/j.jpeds.2019.11.011. Epub 2020 Jan 22. PMID: 31982088. Available at: https://pubmed.ncbi.nlm.nih.gov/31982088/

The NEC outcome of a baby is determined by looking at the NEC data from all their episodes. In 2022, a methodological improvement was made to the way missing data are treated in the calculation of the proportion of NEC, so that if an episode has only missing and no NEC statuses across all episodes they will be classified as missing. In previous years these cases would have been classified as no NEC. This change has resulted in a small change in the proportion of babies reported as having NEC.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Results

NNAP clinical leads are asked to provide assurance of the accuracy of their NEC data. 87.6% of units gave assurance (in 2022 the proportion was 82.5%). NEC results are presented below based on all units' data and on data from those providing assurance. An indication of whether a unit provided assurance is given alongside unit level NEC results on NNAP Online. Units which did not assure their data are omitted from the treatment effect analysis. Data were missing for 3.4% of eligible cases – this varied by unit from 0 to 100%.

Table 10: Proportions of NEC by neonatal unit level - all units.

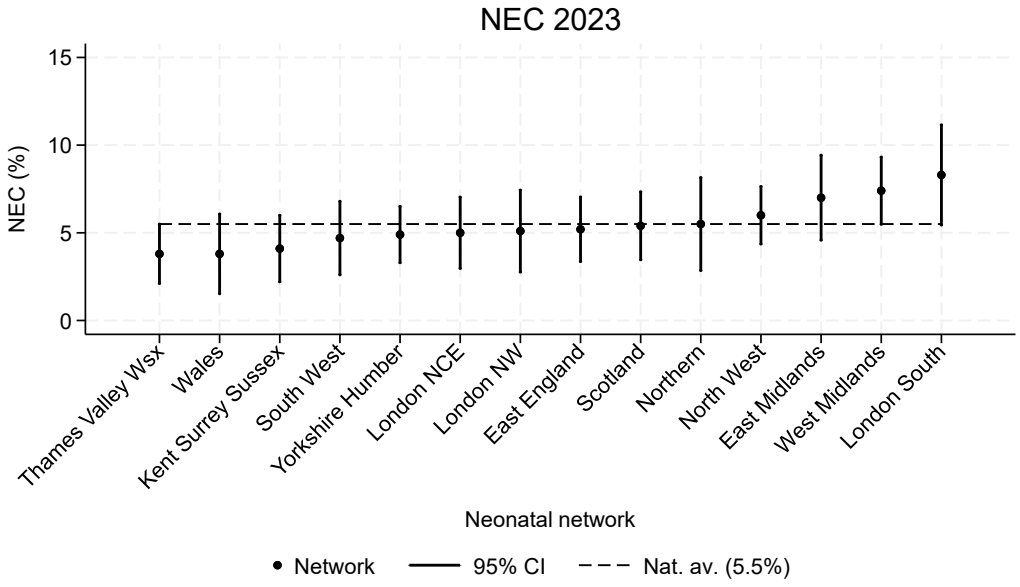
Unit level	Eligible babies	With outcome	NEC (%)	Missing (%)
SCU	122	118	1 (.8%)	4 (3.3%)
LNU	2145	2098	61 (2.9%)	47 (2.2%)
NICU	4946	4751	323 (6.8%)	195 (3.9%)
National*	7,213	6,967	**385 (5.5%)**	**246 (3.4%)**

Table 11: Proportions of NEC by neonatal unit level - units who have assured their NEC data only.

Unit level	Eligible babies	With outcome	NEC (%)	Missing (%)
SCU	102	99	0 (0%)	3 (2.9%)
LNU	2006	1961	55 (2.8%)	45 (2.2%)
NICU	4097	3971	251 (6.3%)	126 (3.1%)
National*	6,205	6,031	306 (5.1%)	174 (2.8%)

*'National' figures are calculated from participating neonatal units/ networks in England, Wales, Scotland, and the Isle of Man.

Figure 11: Caterpillar plot of proportions of NEC (top) and treatment effect (bottom), by neonatal network. *Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.*



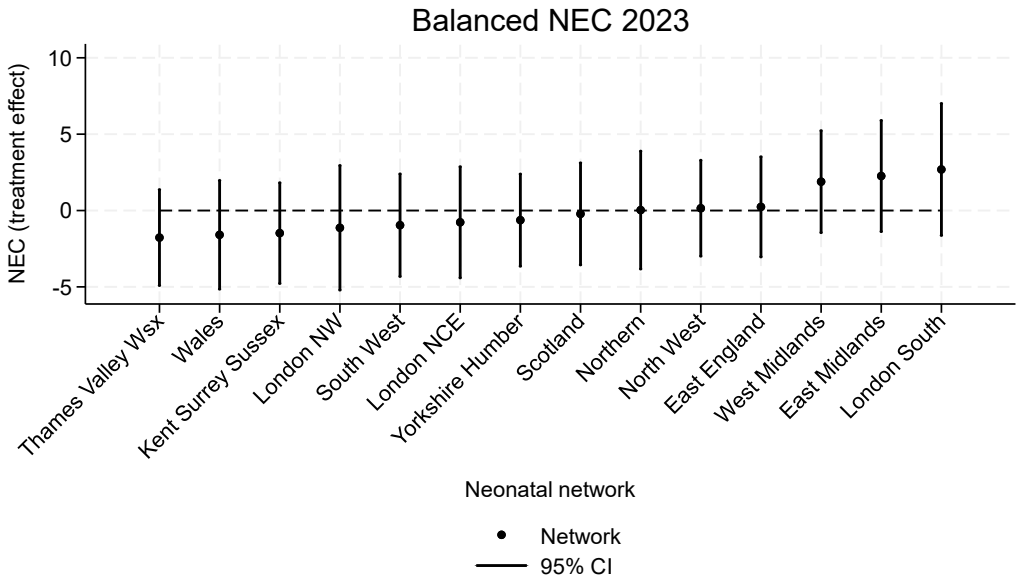
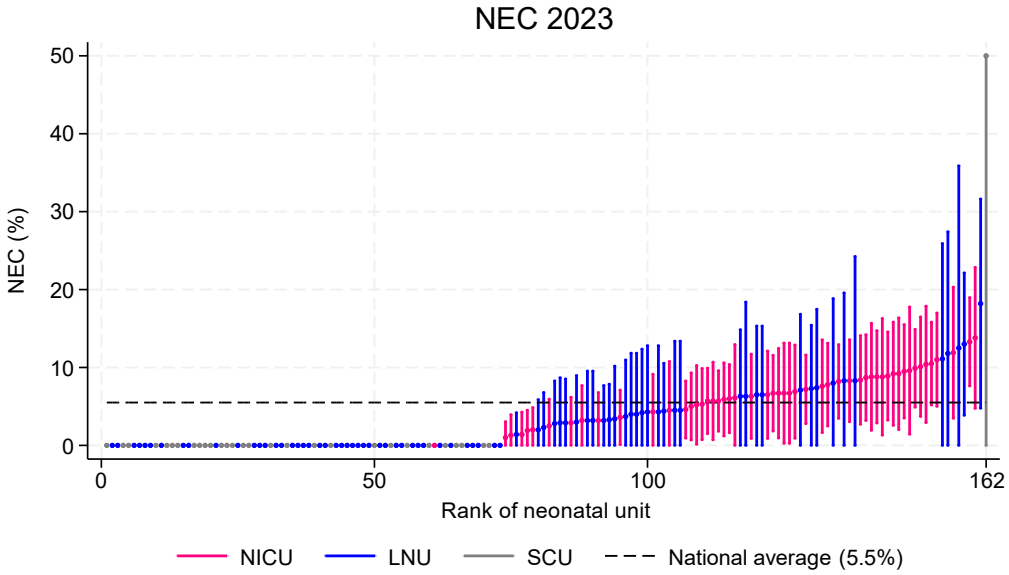


Figure 12. Caterpillar plot of proportions of NEC (top) and treatment effect (bottom), by LNU, surgical NICU and non-surgical NICU - units who provided assurance that their NEC diagnosis data was complete only.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online. Note that the balancing analysis used to determine treatment effect balances a neonatal unit within the sub-domain of unit level, and balancing is applied for gestational age. This means that neonatal units are only compared to similar units for the purposes of determining treatment effect and outlier identification.



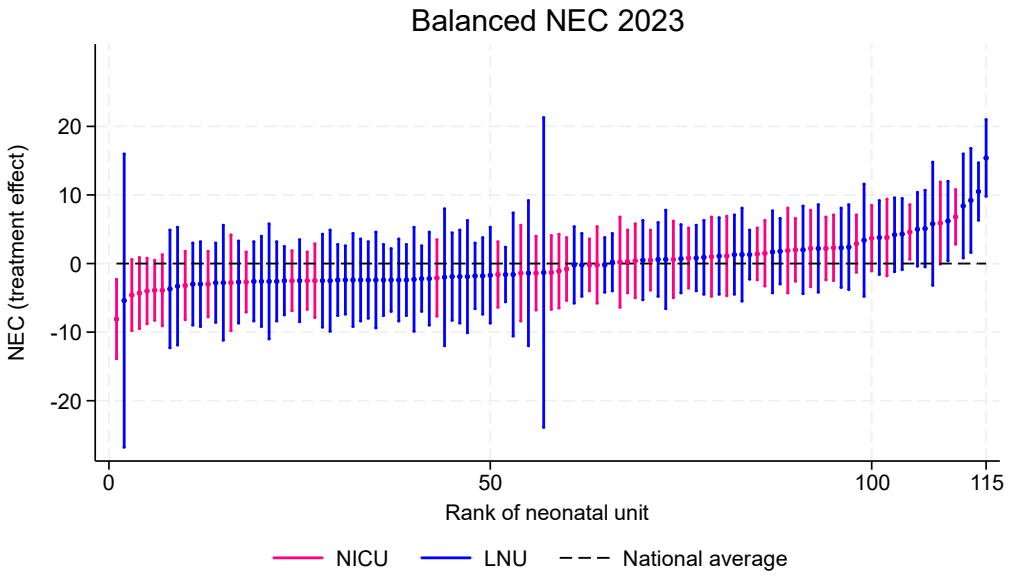
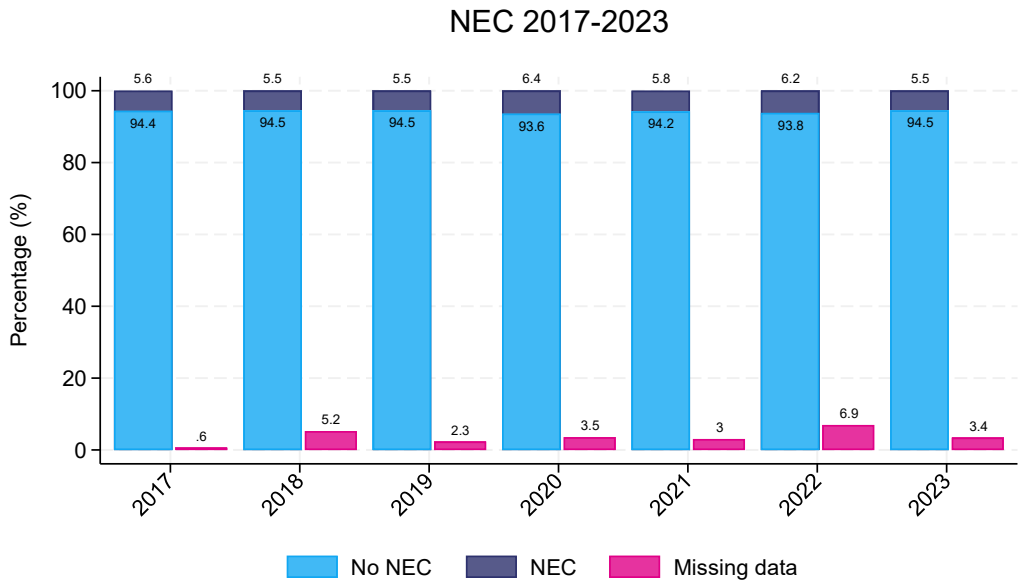


Figure 13: NEC status, according to the contemporaneous NNAP measurement criteria, by NNAP reporting year (2017-2023) – all units.



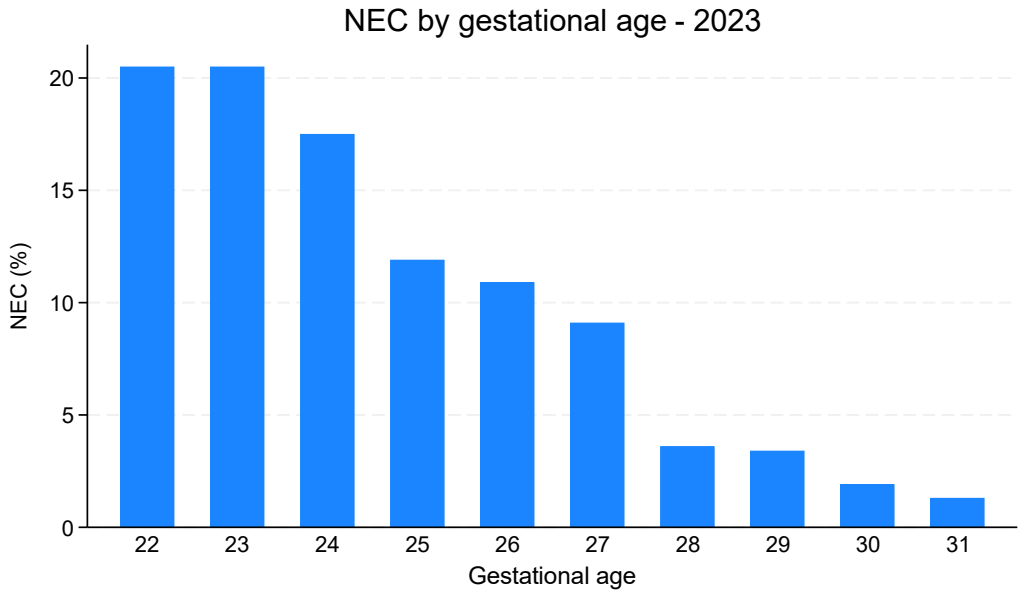
Notes for interpretation:

- *In 2022, categorisation priority ordering of neonatal episodes changed from NEC > No NEC > Missing, to NEC > Missing > No NEC. Prior to 2022, "No NEC" was prioritised over "Missing".*

Table 12: NEC by gestational age (2023).

Gestational age	Number of babies	Number of babies with NEC	Number of babies with NEC (%)
22	78	16	20.5
23	205	42	20.5
24	325	57	17.5
25	377	45	11.9
26	534	58	10.9
27	640	58	9.1
28	861	31	3.6
29	978	33	3.4
30	1228	23	1.9
31	1741	22	1.3

Figure 14. NEC by gestational age.



Summary of findings

- In 2023, 5.5% (385 of 6,967) of babies born at less than 32 weeks gestational age met the NNAP surveillance definition of NEC (Table 5). In 2022, the proportion was 6.2% (410 of 6,588) (Figure 13).
- Among the 87.6% of units who provided assurance of the accuracy of their NEC data, the proportion of babies with NEC was 5.1% (306 of 6,031) (Table 11). In 2022, the proportion of babies with NEC amongst units providing assurance was 6.2% (326 of 5,294).
- Considering units with validated data only, as expected on basis of case mix, the rate of NEC was highest in those babies cared for in NICUs (6.3%), compared to non LNUs (2.8%) and SCUs (0%) (Table 11). NEC occurred most commonly in babies of lower gestations but was also reported in babies at higher gestations (23 weeks gestation 20.5%, 31 weeks gestation 1.3%) (Table 12).
- Among networks (with results from all units included), the observed proportion of babies with NEC ranges from 3.8% to 8.3%. Treatment effect ranges from –1.77% to 2.69% (Figure 11). This suggests that the baseline characteristics of babies within different networks do not explain the variation in rates of NEC, and that network rates of NEC may be influenced by either the readiness to consider a clinical episode as representative of NEC, or perhaps that the rates of NEC are influenced by differing treatment received between networks.

- Among units with 3 or more eligible babies, the rates of NEC vary from 0% to 18.2% of very preterm babies. Using the matching analysis to account for the differing gestational age mix in units, it is clear that some of both LNUs and NICUs experience high rates, and low, rates of NEC. This suggests that either diagnostic precision, or the treatment influencing rates of NEC, could be improved.

1.4. Late onset bloodstream infection

Does an admitted baby who was born at less than 32 weeks gestational age, have one or more episodes of bloodstream infection, characterised by one or more positive blood cultures taken, after 72 hours of age?

Sick and premature babies are prone to infection by a variety of germs, including some that are normally harmless to healthy people. Infections increase the risk of death, can lengthen the stay in the neonatal unit and may worsen the long-term developmental outlook for babies[6].Neonatal unit staff and parents can reduce the risk of infection by following good infection prevention and control practice.

To look for infection in babies, neonatal staff usually take blood cultures to check whether bacteria or other organisms are present in their blood. Units are encouraged to report all positive blood cultures: that negative blood cultures are underreported is accepted as likely, or even inevitable. The NNAP reports the proportion of babies with one or more blood cultures positive for a pure growth of bacteria, fungi or yeasts.

In this report, we focus only on very preterm infants (those born at less than 32 weeks gestation) because these are the babies at highest risk of infection and because bloodstream infections in more mature babies may occur more in some units than others depending on the case mix of babies cared for.

A balancing analysis has been conducted at neonatal network level which includes all units, regardless of whether they validated their data. This balancing analysis uses the full set of matching variables as described in the NNAP methodology and statistical analysis plan: https://www.rcpch.ac.uk/nnap-data-flow-methodology.

A balancing analysis has also been conducted for local neonatal units and neonatal intensive care units (surgical and non-surgical). This analysis only includes units which provided assurance of the accuracy of their data. A neonatal unit is balanced within the sub-domain of unit level, and balancing is applied for gestational age. This means that neonatal units are only compared to similar units for the purposes of determining treatment effect and outlier identification. This simple method of balancing is used because many units have only a few (and some no) cases of blood stream infection (BSI).

[6] Stoll B.J., *et al*. Neurodevelopmental and Growth Impairment Among Extremely Low-Birth-Weight Infants With Neonatal Infection. *JAMA* 2004; 292(19): 2357–2365. doi:10.1001/jama.292.19.2357. Available at: https://www.ncbi.nlm.nih.gov/pubmed/15547163

Balancing on gestational age is essential; the proportion of babies with BSI decreases with gestational age and is higher in NICUs.

Only units providing assurance and for whom balancing analysis is carried out are included in outlier identification.

Treatment effect is the difference in the observed and balanced proportion. Therefore, a negative treatment effect indicates that the babies fared better in the network than they would have done elsewhere in the country, A positive treatment effect indicates that the babies would have fared better had they been treated elsewhere.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Results

Some organisms grown may either represent true bloodstream infection or contamination of the blood culture sample with skin organisms. For this reason, results for bloodstream infection are presented in two columns. One column presents the number of babies for whom any culture grew any organism. The other column presents the number of babies for whom one or more culture grew an organism of clear pathogenicity. Clearly pathogenic organisms were those of which a pure growth indicates a significant infection with or without the presence of clinical confirmation (a true infection). A list of such organisms is provided in section 10.

331 very preterm babies (less than 32 weeks gestation) had a pure growth of a clearly pathogenic organism. Babies contribute to the denominator for this measure for all units to which they were admitted, therefore babies can be counted twice in the analysis conducted for units and networks (if cared for in more than one unit or network). At an overall audit level, babies are only counted once.

NNAP clinical leads were asked to provide assurance that all their positive blood cultures had been entered. 85% (153/179) provided this validation of their infection data (78% in 2022).

Table 13: Positive blood cultures in babies born at less than 32 weeks, by assurance status.

Assurance status	No. units	Eligible babies	Number of babies with any positive blood culture	Number (%) of babies with growth of any clearly pathogenic organism*
All units	179	7,161	1,075	331 (4.6%)
Units confirming all positive blood cultures entered	153	6,120	969	298 (4.9%)

**Pure growth of organisms only*

Figure 15: Proportion of admitted babies (born at less than 32 weeks gestational age) who experienced one or more positive blood cultures with a clearly pathogenic organism, by NNAP reporting year (2019-2023).

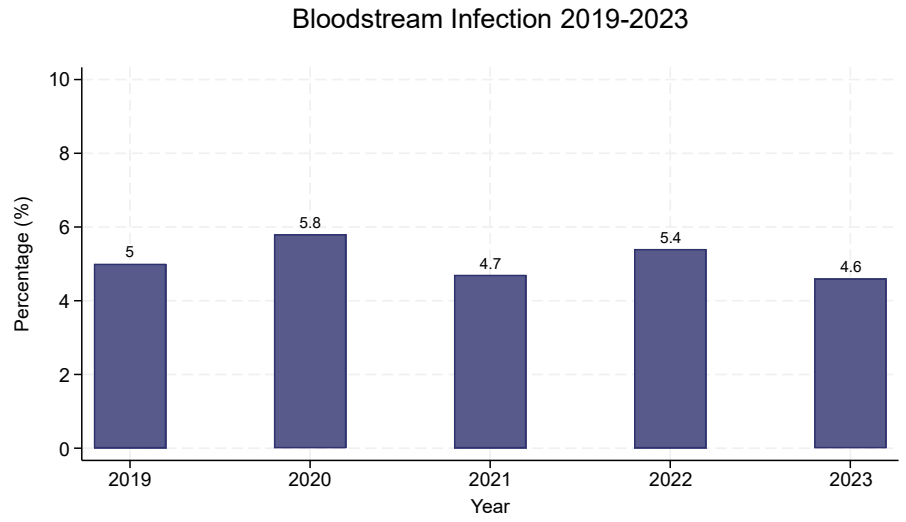


Table 14: Proportion of admitted babies (born at less than 32 weeks gestational age) who experienced one or more positive blood cultures with a clearly pathogenic organism by gestational age (2023).

Gestational age	Number of babies	Number of babies with BSI	Babies with BSI (%)
22	78	20	25.6
23	205	44	21.5
24	348	46	13.2
25	396	51	12.9
26	548	46	8.4
27	666	40	6.0
28	884	41	4.6
29	1011	20	2.0
30	1256	12	1.0
31	1769	11	0.6

Figure 16. Proportion of admitted babies (born at less than 32 weeks gestational age) who experienced one or more positive blood cultures with a clearly pathogenic organism by gestational age.

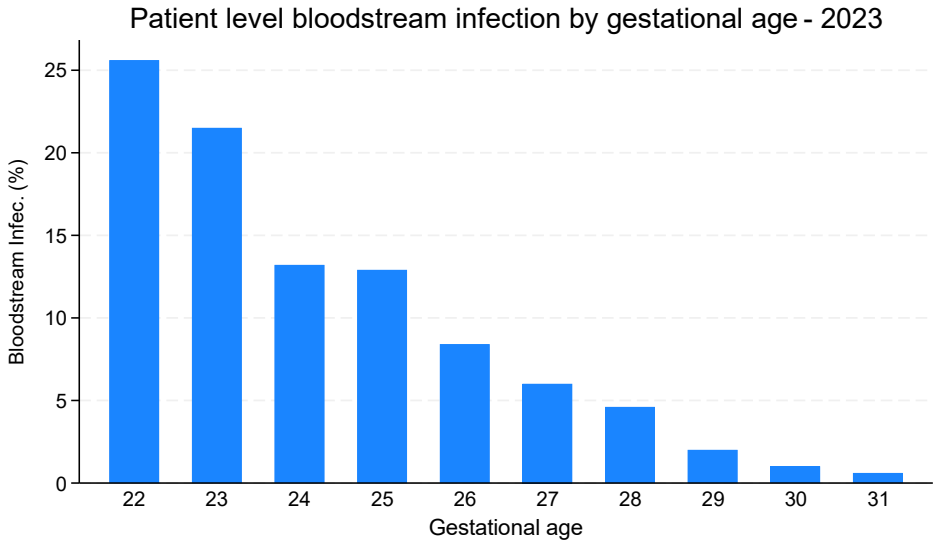
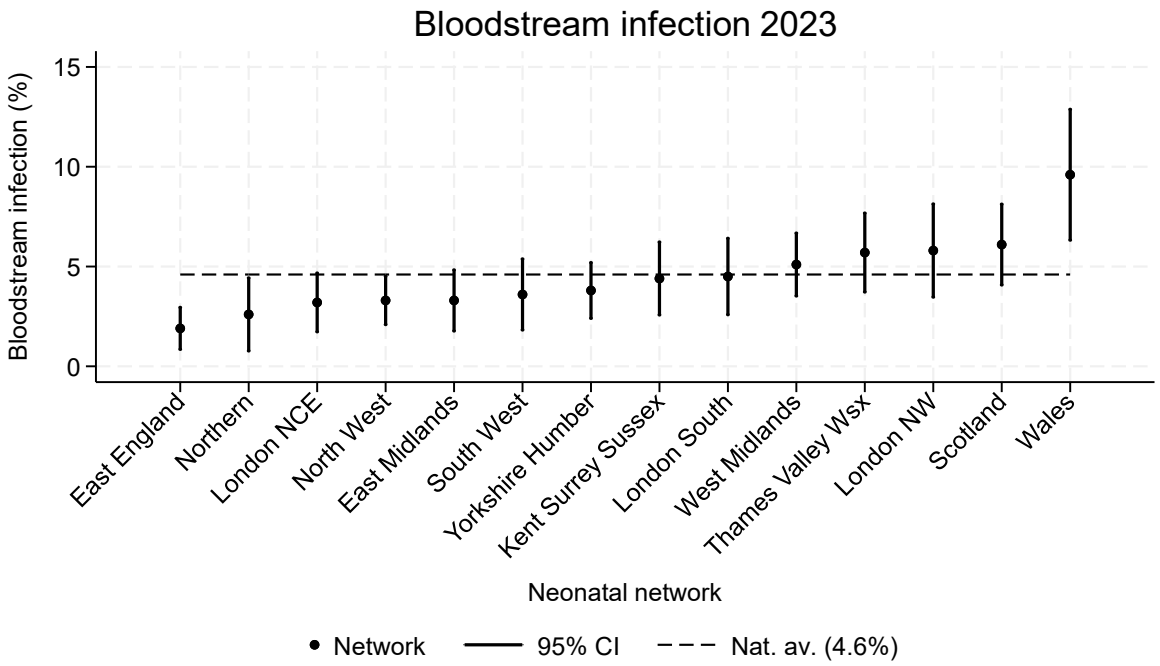


Figure 17: Caterpillar plot of proportion (TOP) and treatment effect (BOTTOM) of admitted babies (born at less than 32 weeks gestational age) who experienced one or more positive blood cultures with a clearly pathogenic organism, by neonatal network or operational delivery network.

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.



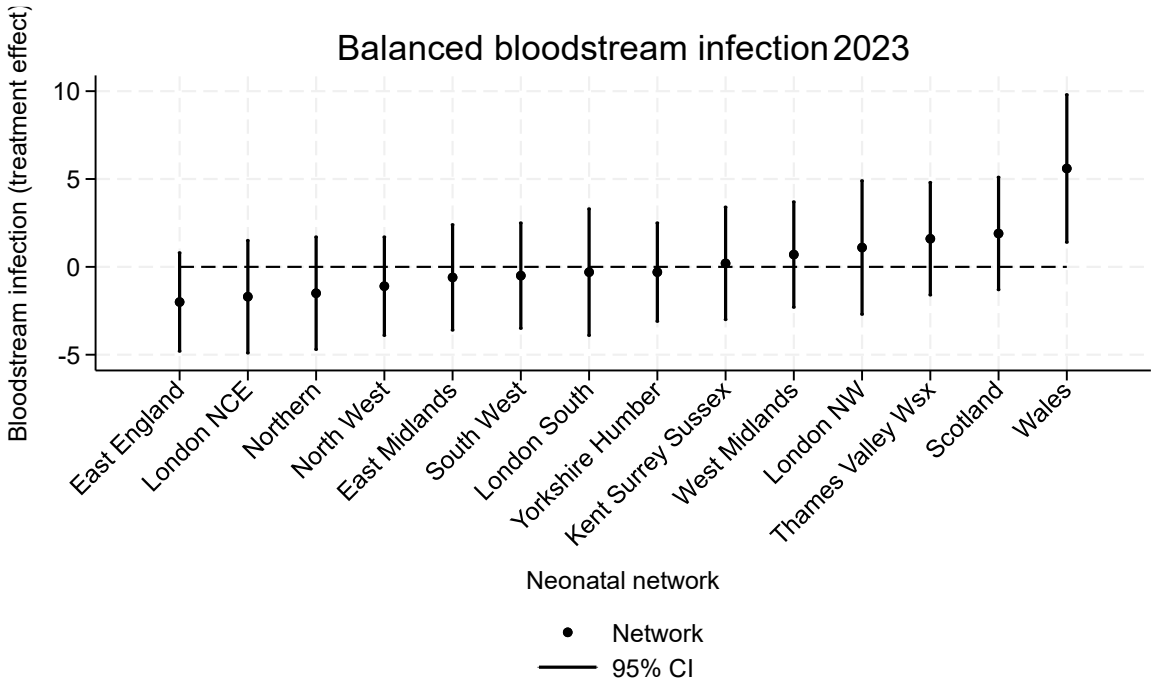
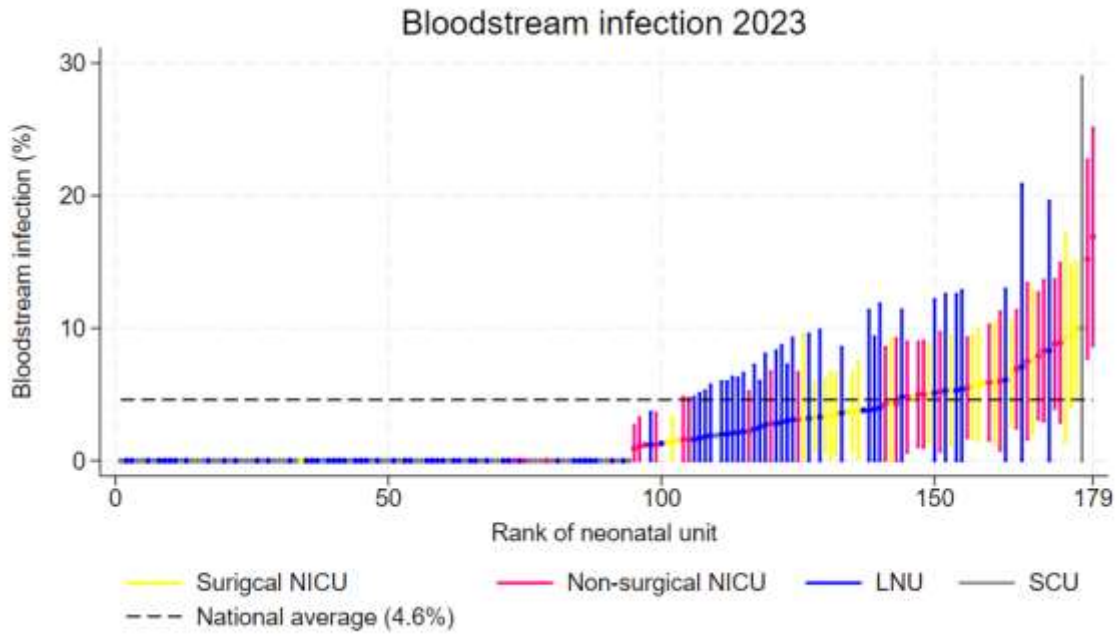
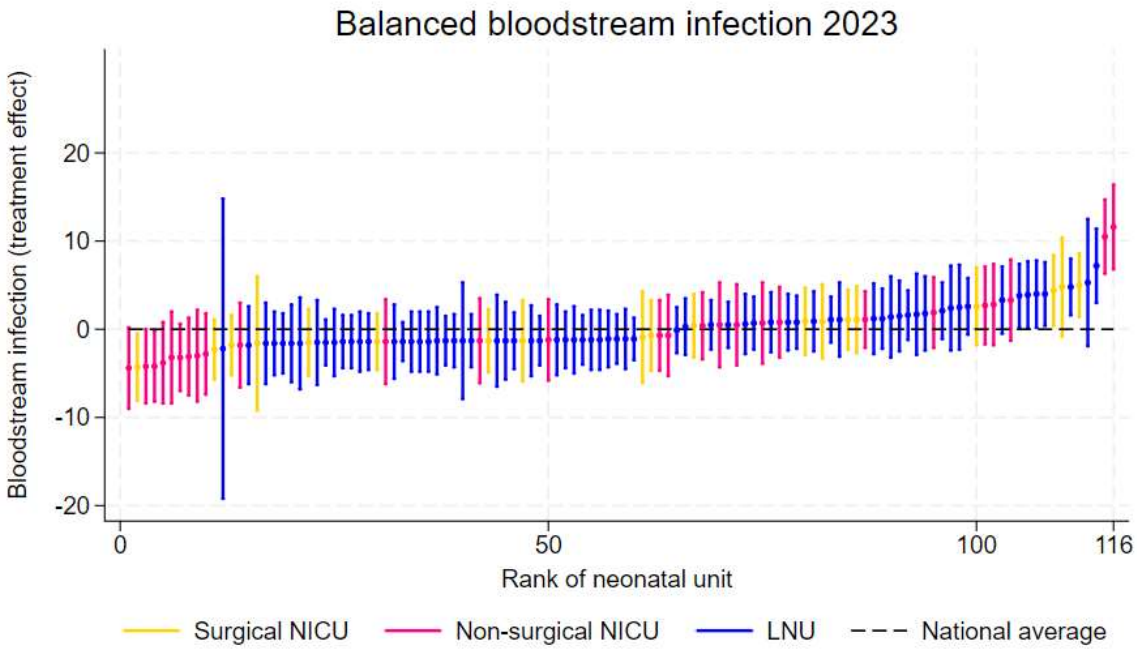


Figure 18. Caterpillar plot of proportion (top), and treatment effect (bottom), of admitted babies who experienced one or more positive blood cultures with a clearly pathogenic organism (born at <32 weeks gestational age), by LNU, surgical NICU and non-surgical NICU - units who provided assurance that all positive blood cultures were entered.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online. Note that the balancing analysis used to determine treatment effect balances a neonatal unit within the sub-domain of unit level, and balancing is applied for gestational age. This means that neonatal units are only compared to similar units for the purposes of determining treatment effect and outlier identification.





Summary of findings

- The proportion of babies born at less than 32 weeks gestational age with growth of any clearly pathogenic organism was 4.6% (331 of 7,159). Among the 85% of units that were able to provide assurance, the rate was marginally higher than in all units - 4.9% (299 of 6,095) (Table 13). In 2022, the proportion of babies with growth of any clearly pathogenic organism was 5.4% (379 of 7,041) for all units and 5.9% (320 of 5,462) amongst the 77.4% of units that were able to assure their data (Figure 15). The rate of bloodstream infection has therefore fallen between 2022 and 2023, to the lowest recently reported. However, there are important between year variations in rates of BSI and a trend has not yet been established.

- Across neonatal networks, the observed proportion of babies born at less than 32 weeks with growth of a clearly pathogenic organism ranges from 1.9% (East of England Perinatal ODN) to 9.6% (Wales) (Figure 17). This variation appears significant and suggests opportunities for quality improvement. Treatment effect (the difference between observed proportion and balanced proportion) ranges from –2% (East of England Perinatal ODN) to 5.6% (Wales); indicating that not all variation between networks is explained by differences in case mix.

- Considering only LNU and NICUs that have validated their data, observed proportions of bloodstream infection are higher in NICUs (5.9%, 256 of 4,352) than LNUs (1.5%, 45 of 3,002). Among NICUs, proportions of bloodstream infection vary in a way that is not explained by the gestational age mix of the admitted babies. This suggests that there may be opportunities to reduce proportions of infection through changes in practice.

1.5. Preterm brain injury

1. *Does a baby born at less than 32 weeks gestational age experience germinal matrix/ intraventricular haemorrhage (IVH)*
2. *Does a baby born at less than 32 weeks gestational age experience cystic periventricular leukomalacia (cPVL)*
3. *Does a baby born at less than 32 weeks gestational age experience post haemorrhagic ventricular dilatation (PVHD)*

The NNAP reports proportions of the more serious grades of intraventricular/ periventricular brain injury, proportions of cystic periventricular leukomalacia (cPVL) and the proportions of experience post haemorrhagic ventricular dilatation (PVHD).

Very preterm infants may experience brain injury, either from bleeding or consequent to cyctic periventricular leukomalacia. The consequences of such injury vary, in part depending on the severity of the injury. In the NNAP, we assess the proportion of babies in whom these types of brain injury occur. For intraventricular haemorrhage (IVH), we concentrate only on the more severe grades of injury. We appreciate that within these grade 3 and 4 haemorrhages the clinical sequallae may vary sigificantly depending on the laterality and size of injury. However, where the survelliance case definition, as set out in the NNAP measures guide, is consistently applied by neonatal units, we believe it will form the basis for appropriate comparisons of rates of adverse outcome between neonatal services.

The NNAP is also reporting proportions of cystic periventricular leukomalaicia (cPVL) based on the published surveillance case definition. Similarly to IVH, cases identified with cPVL will experience heterogenous outcome, but one that on average is much more likely to be characterised by disability than in babies without cPVL. It is not the case that all IVH or cPVL outcomes are known to be, or likely to be, preventable. However, these forms of brain injury are reasonably common and regarded as clinically important, with increased risk of adverse neurodevelopmental outcomes[7]. Care bundles targetting reduction in

[7] Rees et. Al., Preterm Brain Injury and Neurodevelopmental Outcomes: A Meta-analysis. *Pediatrics* December 2022; 150 (6): e2022057442. 10.1542/peds.2022-057442. Available at: https://doi.org/10.1542/peds.2022-057442.

their incidence are described, which may be of interest to units experiencing high rates of preterm brain injury[8],[9].

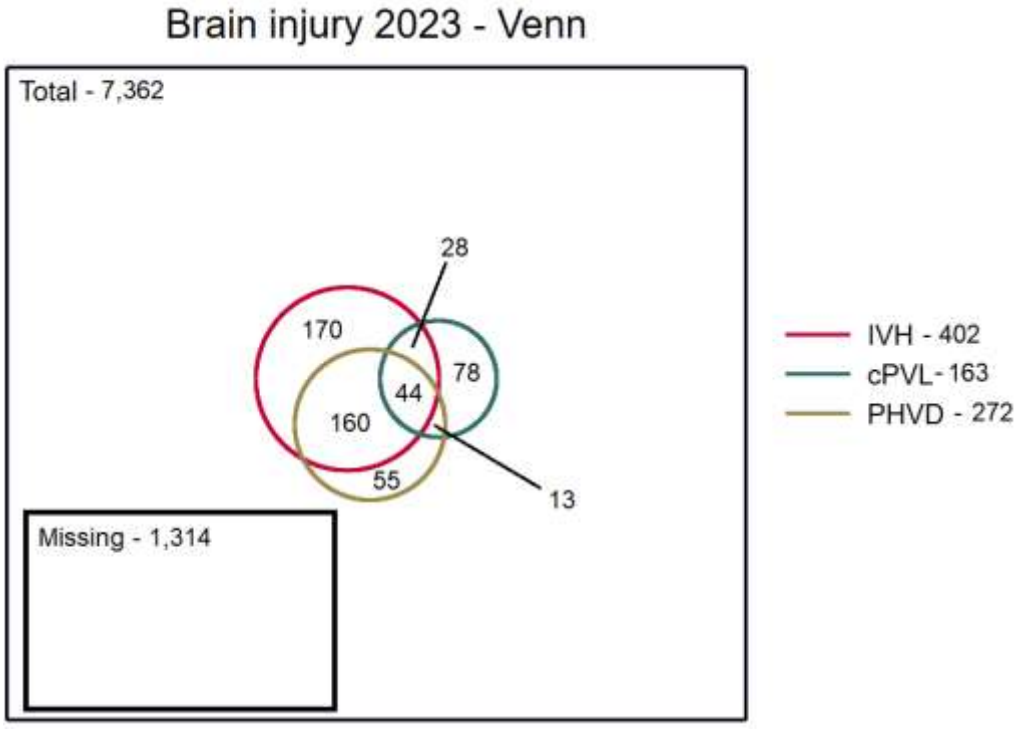
Full details of this measure can be found in the NNAP 2022 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Results

NNAP clinical leads were asked to provide assurance that all their scan data had been entered. 84.5% of units provided this validation of their preterm brain injury data; in 2022, 71.8% of units were able to do so.

The NNAP also collects data relating to post-haemorrhagic ventricular dilatation (PHVD), with an observed overall proportion of PHVD or death of 11.2% in 2023, however we do not yet present those results in detail, choosing initially to focus on improving the overall completeness of scan data and improving recorded diagnostic information relating to IVH 3 and 4 and cPVL.

Figure 19. Venn chart illustrating the relationship between the NNAP brain injury measures.



[8] Murthy et. Al., Neuroprotection Care Bundle Implementation to Decrease Acute Brain Injury in Preterm Infants. Pediatr Neurol. 2020 Sep;110:42-48. Available at: https://pubmed.ncbi.nlm.nih.gov/32473764/
[9] Gross et. Al., Evaluating the Effect of a Neonatal Care Bundle for the Prevention of Intraventricular Hemorrhage in Preterm Infants. Children (Basel). 2021 Mar 25;8(4):257. Available at: https://pubmed.ncbi.nlm.nih.gov/33806111/

Notes for interpretation: This diagram shows that of 7362 babies eligible for this measure, 402 babies experienced intraventricular haemorrhage grade 3 or 4 (IVH) of whom 72 also experienced cystic periventricular leukomalacia (cPVL) and 204 also had post haemorrhagic ventricular dilatation (PHVD). Data was missing for 1314 babies.

1. Intraventricular haemorrhage (IVH 3 and 4)

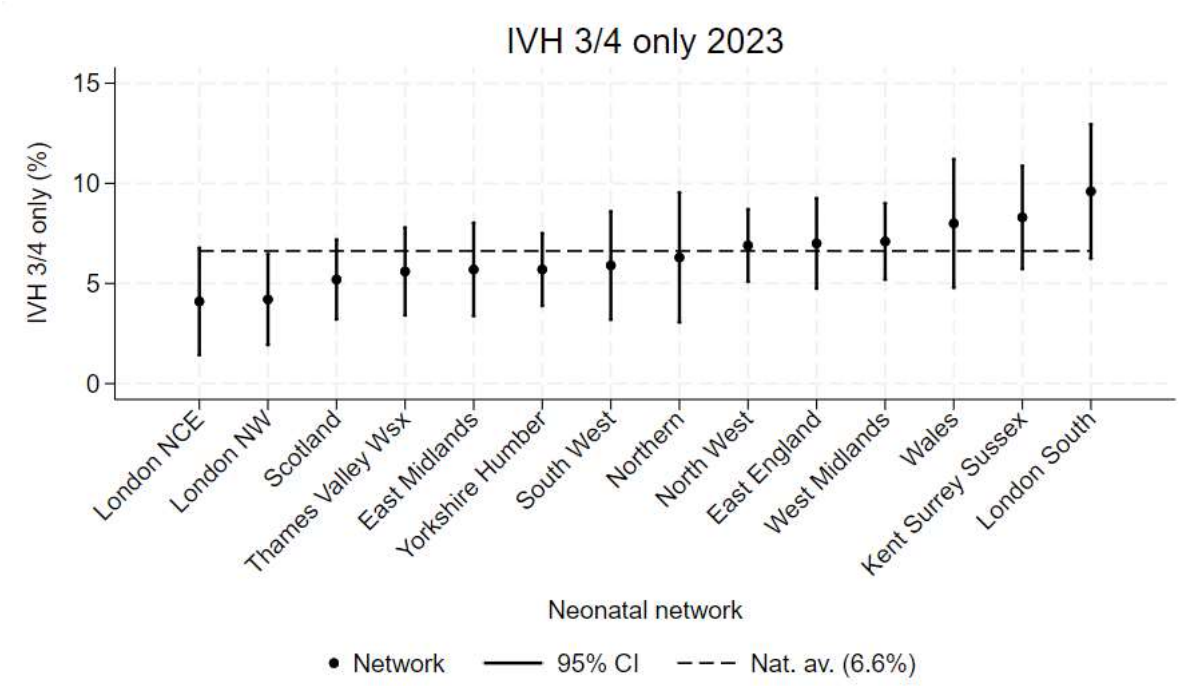
Table 15: Proportions of IVH 3 or 4, IVH 3 or 4 or death, and missing data, by network of birth.

Network of birth	Eligible babies	With IVH outcome	IVH 3 or 4 (%)	IVH 3 or 4, or death by discharge (%)	Missing data (%)
East Midlands ODN	506	412	25 (6.1%)	69 (16.7%)	94 (18.6%)
East of England Perinatal ODN	622	518	36 (6.9%)	64 (12.4%)	104 (16.7%)
Kent, Surrey, Sussex ODN	491	462	40 (8.7%)	67 (14.5%)	29 (5.9%)
London ODN - North Central & East	500	221	9 (4.1%)	29 (13.1%)	279 (55.8%)
London ODN - North West	358	312	13 (4.2%)	34 (10.9%)	46 (12.8%)
London ODN - South	425	311	30 (9.6%)	52 (16.7%)	114 (26.8%)
North West ODN	881	805	57 (7.1%)	138 (17.1%)	76 (8.6%)
Northern ODN	299	231	16 (6.9%)	32 (13.9%)	68 (22.7%)
Scotland	542	504	27 (5.4%)	62 (12.3%)	38 (7%)
South West ODN	409	307	18 (5.9%)	32 (10.4%)	102 (24.9%)
Thames Valley & Wessex ODN	505	451	26 (5.8%)	50 (11.1%)	54 (10.7%)
Wales	302	297	25 (8.4%)	48 (16.2%)	5 (1.7%)
West Midlands ODN	756	735	52 (7.1%)	105 (14.3%)	21 (2.8%)
Yorkshire & Humber ODN	728	663	38 (5.7%)	88 (13.3%)	65 (8.9%)
Other	38	22	2 (9.1%)	6 (27.3%)	16 (42.1%)
National	7,362	6,251	414 (6.6%)	876 (14%)	1,111 (15.1%)

*'Other' networks are those that are in locations not associated with an NNAP neonatal network or are unknown. Home and Transit locations are updated to match their first provider of care for all networks and for units at most place of birth measures.

Figure 20. Caterpillar plot of proportion of IVH 3 or 4 (TOP), and IVH 3 or 4 or death (BOTTOM), by neonatal network.

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.



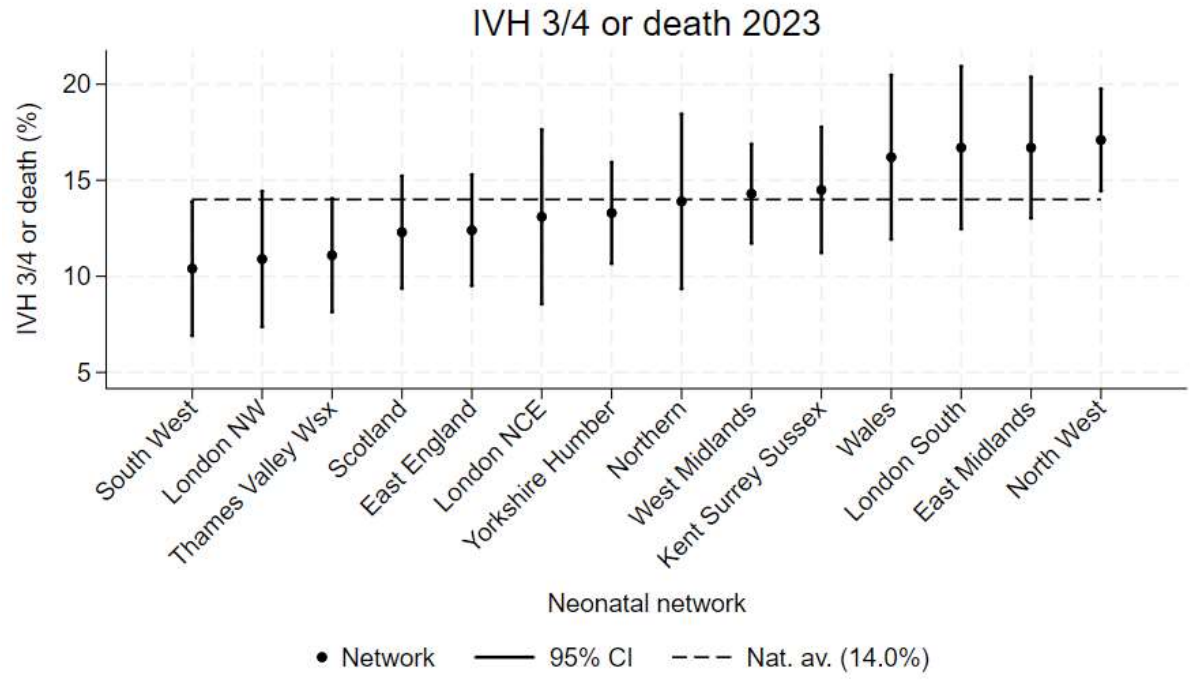


Figure 21. Caterpillar plot of proportion of intraventricular haemorrhage (IVH) 3 or 4 (TOP), and IVH 3 or 4 or death (BOTTOM), by neonatal unit.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.

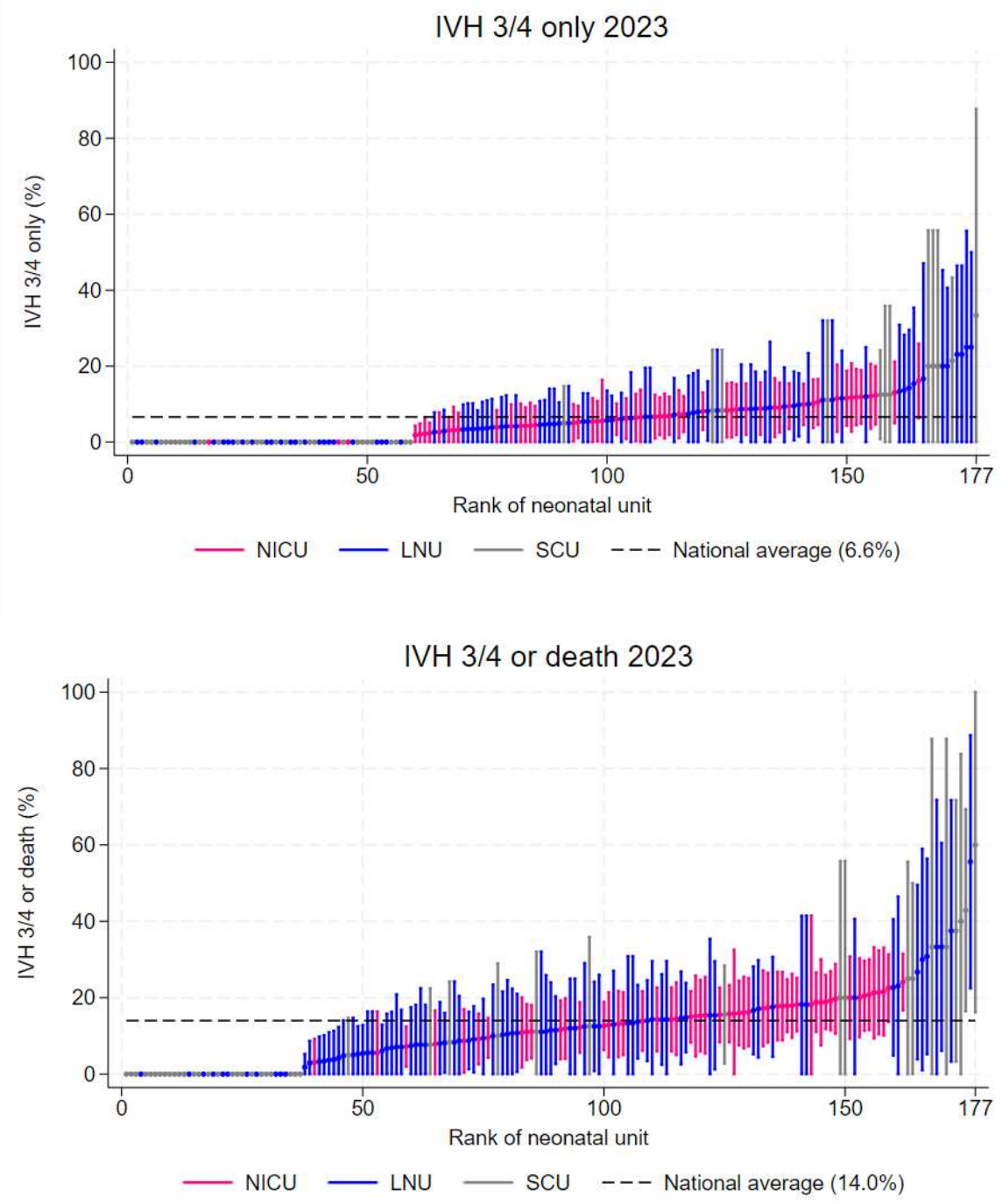


Figure 22. IVH or death by gestational age (2023).

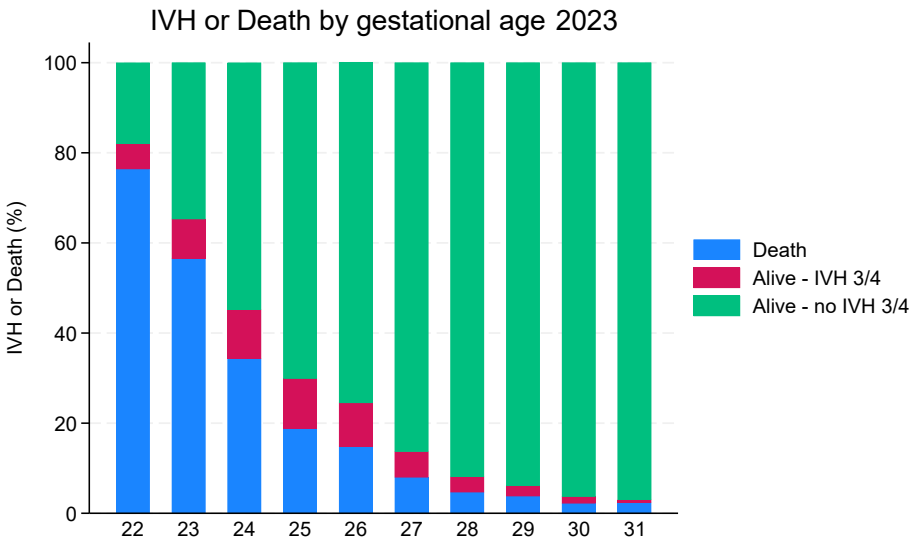


Table 16: IVH or death by gestational age (2023).

Gestational Age	Number of babies	Death (%)	Alive - IVH (%)	Alive – No IVH (%)
22	106	76.4	5.7	17.9
23	216	56.5	8.8	34.7
24	303	34.3	10.9	54.8
25	351	18.8	11.1	70.1
26	509	14.9	9.6	75.5
27	575	8	5.7	86.3
28	793	4.7	3.4	91.9
29	870	3.8	2.3	93.9
30	1046	2.2	1.5	96.3
31	1444	2.4	0.6	97

Summary of findings - IVH

- The proportion of babies born at less than 32 weeks gestational age with intraventricular haemorrhage grades 3 or 4 (IVH 3 or 4) was 6.7% (441 of 6,563) and the proportion with a combined outcome of IVH 3, 4 or death was 13.8% (903 of 6,563). In 2022, the proportion of babies with IVH3/4 was 7.5%, and the proportion with a combined outcome of IVH3/4 or death was 14.7%. Among the 84.5% of units who gave assurance that their scan data was complete, the proportion with a combined outcome of IVH 3,4 or death was 13.4% (752 of 5,608).

- Among networks the proportion of babies who experienced IVH 3/4 varied from 4.2%-9.8%. The proportion of babies experiencing either IVH 3/ 4 or death ranges from 10.2% (London ODN) to 16.9% (North-West ODN) (Figure 20).

- Overall, 10.9% (799 of 7,362) of eligible babies were missing data for IVH, with proportions of missing data ranging from 1.3% to 47.6% between networks (Table 15). Wales, have the lowest proportion of missing IVH data at 1.3%. The extent of missing data is sufficient to seriously compromise the ability of this audit to measure this outcome effectively. Further, initiatives such as the English Department of Health monitoring of the rates of brain injury will be significantly compromised by data incompleteness and inaccuracy[10].

- The proportions of missing data and variation in recorded outcomes observed in this analysis of 2023 data indicates that neonatal units, networks and LMNS (or their equivalent in devolved nations) should focus both on completeness and quality of data on proportions of brain injury using the NNAP consensus definition and other available resources such as the NNAP Restricted Access Dashboard and the BadgerNet clinical information system.

[10] Gale C et al; Brain Injuries expert working group. Neonatal brain injuries in England: population-based incidence derived from routinely recorded clinical data held in the National Neonatal Research Database. 2018.

2. Cystic periventricular leukomalacia (cPVL)

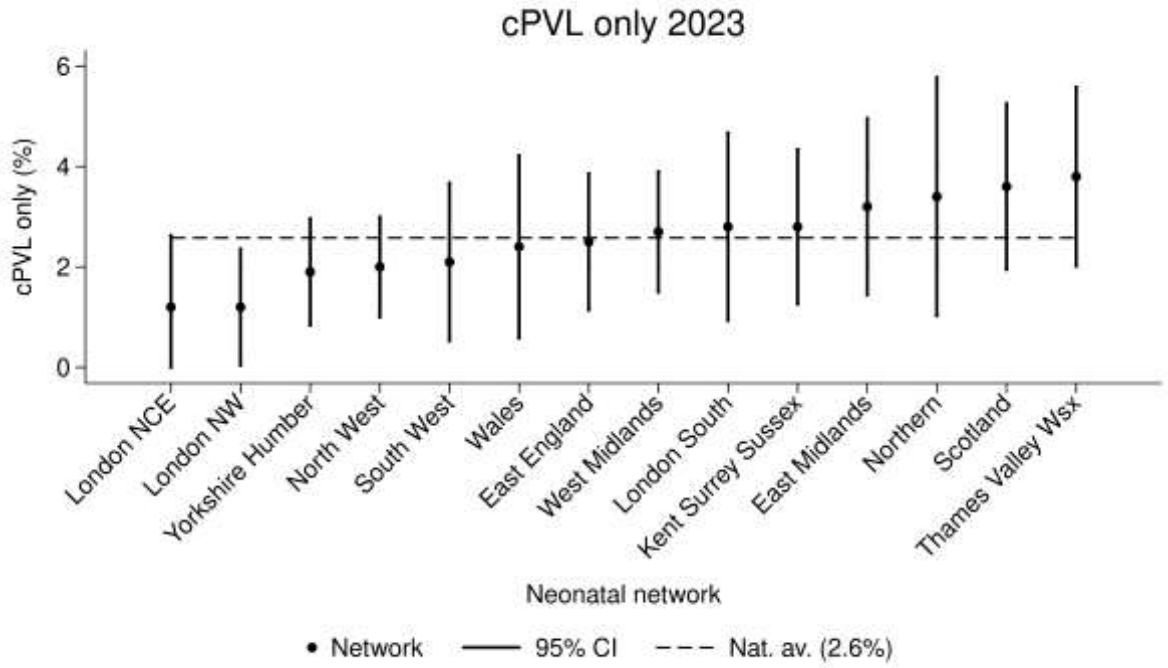
Table 17: Proportions of cPVL, cPVL or death, and missing data, by network of birth.

Network of birth	Eligible babies	With cPVL outcome	cPVL (%)	cPVL or death by discharge (%)	Missing data (%)
East Midlands ODN	506	413	14 (3.4%)	47 (11.4%)	93 (18.4%)
East of England Perinatal ODN	622	526	13 (2.5%)	44 (8.4%)	96 (15.4%)
Kent, Surrey, Sussex ODN	491	464	14 (3%)	54 (11.6%)	27 (5.5%)
London ODN - North C & E	500	242	3 (1.2%)	15 (6.2%)	258 (51.6%)
London ODN - North West	358	343	4 (1.2%)	28 (8.2%)	15 (4.2%)
London ODN - South	425	316	9 (2.8%)	37 (11.7%)	109 (25.6%)
North West ODN	881	804	16 (2%)	92 (11.4%)	77 (8.7%)
Northern ODN	299	241	9 (3.7%)	21 (8.7%)	58 (19.4%)
Scotland	542	509	18 (3.5%)	55 (10.8%)	33 (6.1%)
South West ODN	409	336	7 (2.1%)	17 (5.1%)	73 (17.8%)
Thames Valley & Wessex ODN	505	460	18 (3.9%)	42 (9.1%)	45 (8.9%)
Wales	302	297	7 (2.4%)	35 (11.8%)	5 (1.7%)
West Midlands ODN	756	737	20 (2.7%)	95 (12.9%)	19 (2.5%)
Yorkshire & Humber ODN	728	681	13 (1.9%)	67 (9.8%)	47 (6.5%)
Other*	38	29	0 (0%)	3 (10.3%)	9 (23.7%)
National	7,362	6,398	165 (2.6%)	652 (10.2%)	964 (13.1%)

*'Other' networks are those that are in locations not associated with an NNAP neonatal network or are unknown. Home and Transit locations are updated to match their first provider of care for all networks and for units at most place of birth measures.

Figure 23. Caterpillar plot of proportion of cPVL (TOP), and cPVL or death (BOTTOM), by neonatal network.

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.



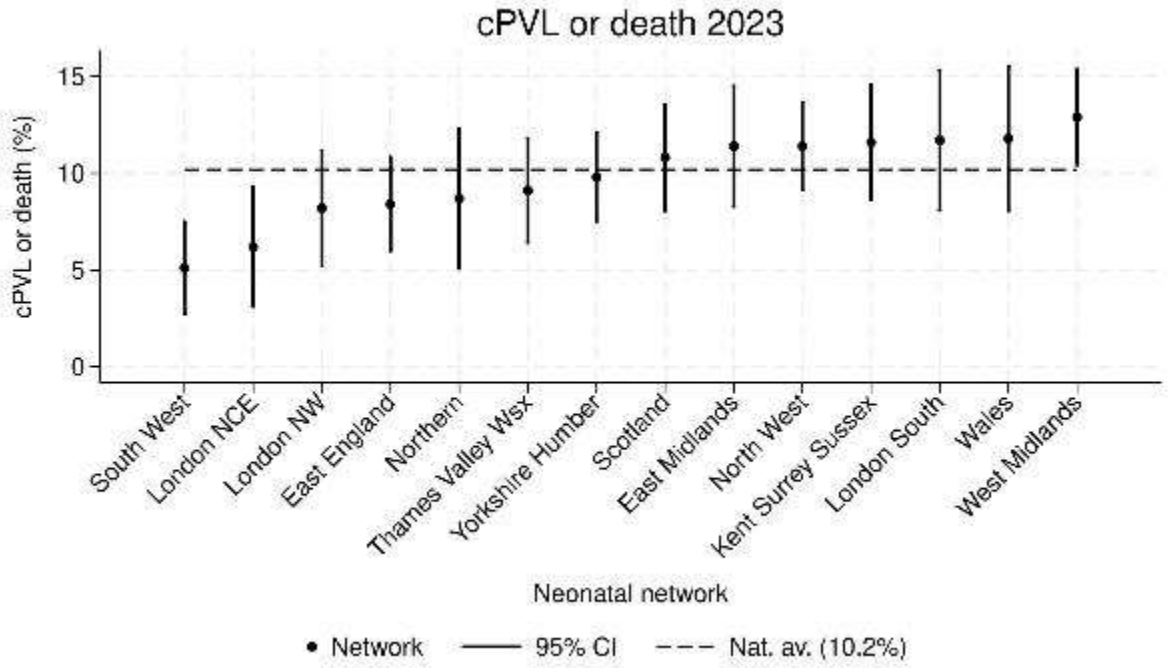


Figure 24. Caterpillar plot of proportion of cystic periventricular leukomalacia (cPVL) (TOP) and cPVL or death (BOTTOM), by neonatal unit.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online. Units with < 3 eligible babies with an outcome are not included.

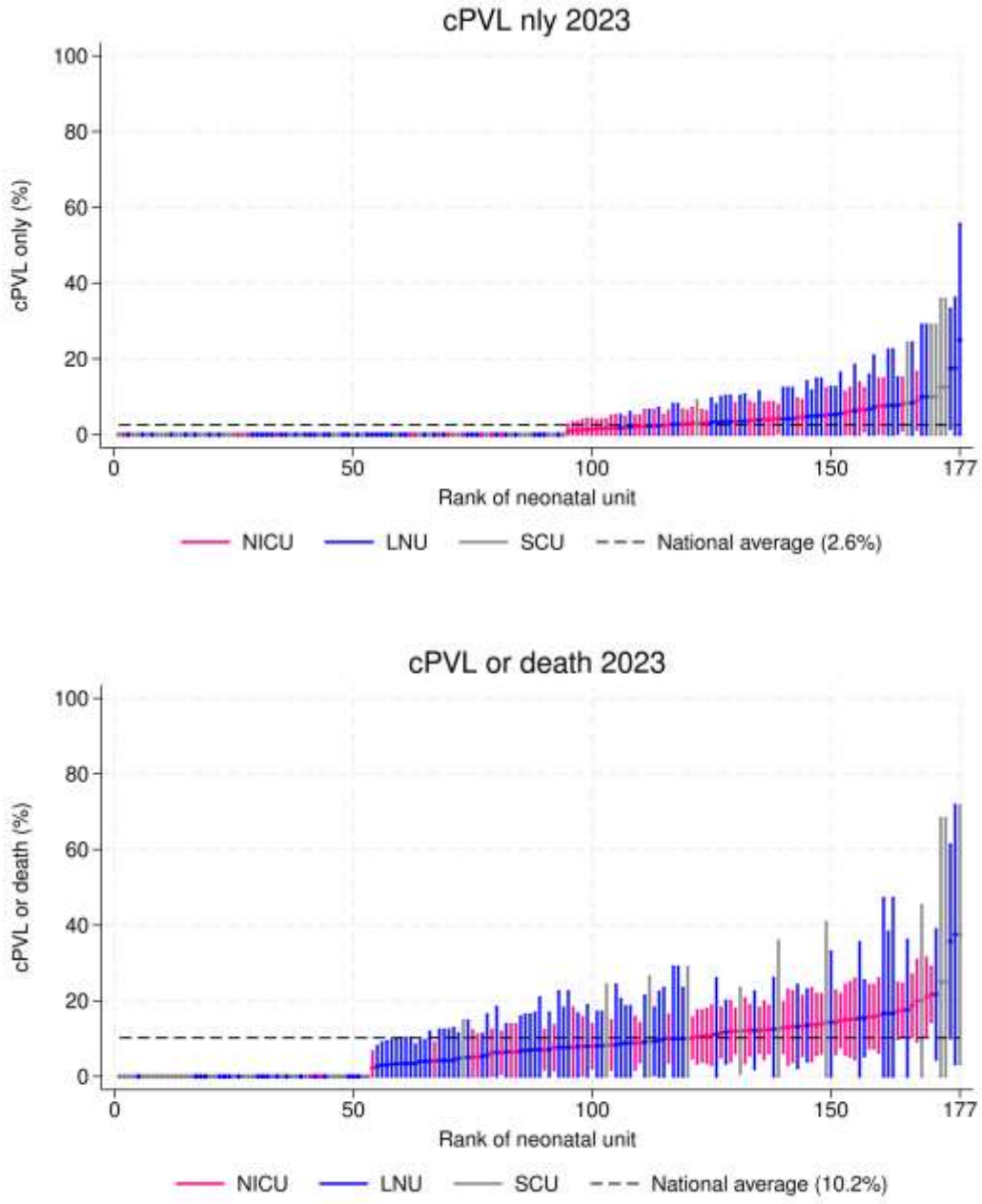


Figure 25. cPVL or death by gestational age (2023).

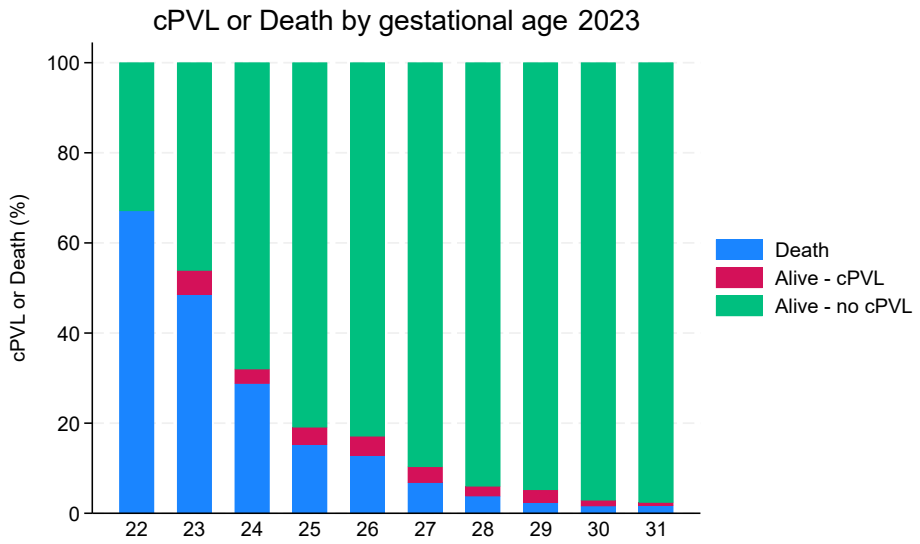


Table 18: cPVL or death by gestational age (2023).

Gestational Age	Number of babies	Death (%)	Alive - cPVL (%)	Alive – No cPVL (%)
22	85	67.1	0	32.9
23	204	48.5	5.4	46.1
24	313	28.8	3.2	68
25	365	15.3	3.8	80.9
26	532	12.8	4.3	82.9
27	600	6.8	3.5	89.7
28	815	3.8	2.2	94
29	889	2.4	2.8	94.8
30	1087	1.6	1.3	97.1
31	1508	1.7	0.7	97.6

Summary of findings - cPVL

- The proportion of babies born at less than 32 weeks gestational age with cystic periventricular leukomalacia (cPVL) was 2.6% (165 of 6,398) and the proportion with a combined outcome of cPVL or death was 10.2% (652 of 6,398). In 2022, the proportion of babies with cPVL was 2.6%, and the proportion with a combined outcome of cPVL or death was 10.1%.
- Among networks the proportion of babies with cPVL varies from 1.2% - 3.9%. Among networks, the proportion of cPVL or death ranges from 5.1% (South West ODN) to 12.9% (West Midlands ODN) (Figure 23).

- Overall, 13.1% (964 of 7,362) of eligible babies were missing data, with proportion of missing data ranging from 1.7% to 51.6% between neonatal networks.
- Among the 84.5% of units who gave assurance that their scan data was complete, the proportion with a combined outcome of cPVL or death was 10.1% (556 of 5,493).
- Taken together, the proportions of missing data and variation in recorded outcomes suggest that neonatal units, networks and LMNSs (or their equivalent in devolved nations) should focus both on completeness and quality of data on proportions of brain injury using the NNAP consensus definition and other available resources such as the NNAP Restricted Access Dashboard and the BadgerNet clinical information system.

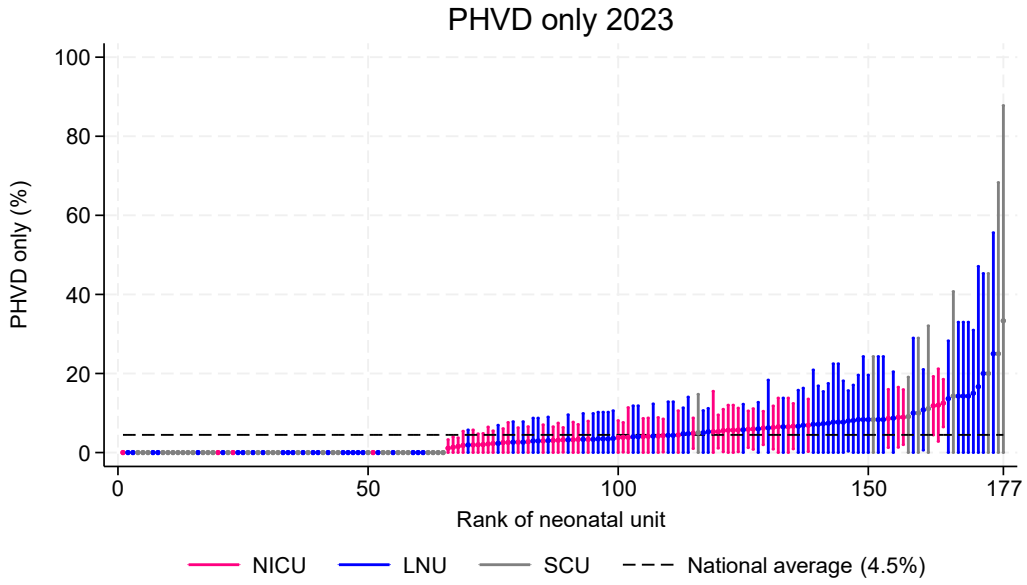
3. Posthaemorrhagic ventricular dilatation (PHVD)

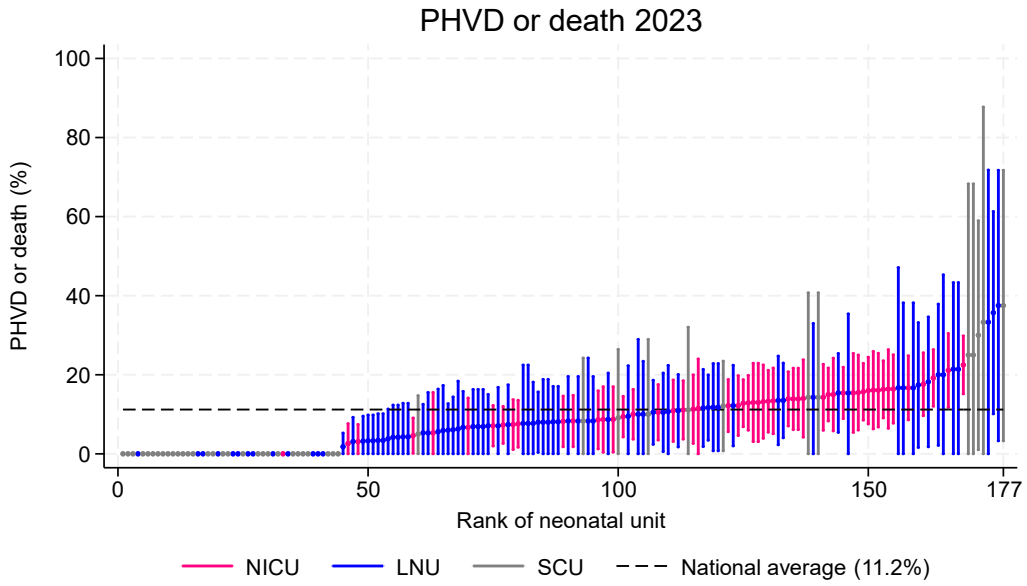
Table 19: Proportions of PHVD, PHVD or death, and missing data, by network of birth.

Network of birth	Eligible babies	With PHVD outcome	PHVD (%)	PHVD or death by discharge (%)	Missing data (%)
East Midlands ODN	506	412	15 (3.6%)	47 (11.4%)	94 (18.6%)
East of England Perinatal ODN	622	523	24 (4.6%)	54 (10.3%)	99 (15.9%)
Kent, Surrey, Sussex ODN	491	464	29 (6.3%)	62 (13.4%)	27 (5.5%)
London ODN - North C & E	500	242	8 (3.3%)	19 (7.9%)	258 (51.6%)
London ODN - North West	358	343	14 (4.1%)	33 (9.6%)	15 (4.2%)
London ODN - South	425	315	14 (4.4%)	38 (12.1%)	110 (25.9%)
North West ODN	881	805	37 (4.6%)	105 (13%)	76 (8.6%)
Northern ODN	299	241	10 (4.1%)	21 (8.7%)	58 (19.4%)
Scotland	542	507	18 (3.6%)	52 (10.3%)	35 (6.5%)
South West ODN	409	336	12 (3.6%)	22 (6.5%)	73 (17.8%)
Thames Valley & Wessex ODN	505	461	16 (3.5%)	41 (8.9%)	44 (8.7%)
Wales	302	297	14 (4.7%)	40 (13.5%)	5 (1.7%)
West Midlands ODN	756	737	45 (6.1%)	105 (14.2%)	19 (2.5%)
Yorkshire & Humber ODN	728	681	27 (4%)	75 (11%)	47 (6.5%)
Other*	38	29	3 (10.3%)	5 (17.2%)	9 (23.7%)
National	7,362	6,393	286 (4.5%)	719 (11.2%)	969 (13.2%)

Figure 26. Caterpillar plot of proportion of post-haemorrhagic ventricular dilatation (PVHD) (TOP) and PHVD or death (BOTTOM), by neonatal unit.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.





Summary of findings - PHVD

- The proportion of babies born at less than 32 weeks gestational age with post-haemorrhagic ventricular dilatation (PVHD) was 4.5% (286 of 6,393) and the proportion with a combined outcome of PHVD or death was 11.2% (719 of 6,393).
- Of the 272 babies reported to have PHVD, 68 (25%) were reported not to have had IVH grade 3 or 4. This may either reflect the clinical picture, diagnostic imprecision, poor data entry or missing data for the IVH outcome.
- Among networks the proportion of babies with PHVD varies from 3.3% - 6.3%. Among networks, the proportion of PHVD or death ranges from 6.5% (South West ODN) to 14.2% (West Midlands ODN) (Table 19).
- Across NICU's, the proportion of babies with PHVD or death ranges from 0% - 22.5%. This significant variation may reflect differences in case ascertainment or imprecision in the data feeding the case definition.
- Overall, 13.2% (969 of 6,393) of eligible babies were missing data, with proportion of missing data ranging from 1.7% to 51.6% between neonatal networks.

1.6. Key messages, recommendations and actions for improvement from the NNAP State of the Nation Report on 2023 data

- Neonatal unit mortality in very preterm infants in England, Scotland, Wales, and participating Crown Dependencies is:
    - Not improving. The one-year cohorts, shown for this report, demonstrate a relatively stable mortality trend between 2018 and 2023.
    - Similar to that seen in Australia, New Zealand[11] and Canada[12]. Neonatal unit mortality is known to vary within Europe[13].
    - Dynamic. From 2018 to 2023, the mortality trend in several neonatal networks varied by over 2%, whereas others showed relative stability.
    - Up to twice as high in some neonatal networks compared to others in a way that is not explained by case mix and with the differences undiminished over time.
- The NNAP Healthcare Improvement Strategy (2022-2025)[14] introduced an improvement goal with the stated aim of "reducing the difference between the networks with the most negative and most positive treatment effect for mortality until discharge home by 0.3% per year". No reduction has been seen. In 2023, the difference in mortality treatment effect was 3.9%, compared to 3.8% in 2022 and 2021.
- The overall rate of admission and survival for babies at 23 weeks gestation remained relatively unchanged (46.3% of 244 admitted babies survived in 2023, compared to 48.6% of 286 admitted babies in 2022). Compared to changes in previous years, there was only a small rise in the number of babies born and admitted for neonatal intensive care at 22 weeks gestion (110 in 2023 compared to 100 in 2022).
- The rates of complications relating to preterm birth and the management of preterm infants have not improved. This is clearest in the commonly occurring complication of bronchopulmonary dysplasia (BPD), which continues to rise despite recent clinical

[11] Report of the Australian and New Zealand Neonatal Network 2021. Available at: https://www.anznn.net/Portals/0/AnnualReports/Report%20of%20the%20Australian%20and%20New%20Zealand%20Neonatal%20Network%202021%20amended2.pdf
[12] The Canadian Neonatal Network (CNN) Annual Report 2022. Available at: https://www.canadianneonatalnetwork.org/portal/Portals/0/Annual%20Reports/2022%20CNN%20Annual%20Report.pdf
[13] Shah, Prakesh S et al. The International Network for Evaluating Outcomes of very low birth weight, very preterm neonates (iNeo): a protocol for collaborative comparisons of international health services for quality improvement in neonatal care. 2014. BMC paediatrics vol. 14 110.
[14] NNAP Healthcare Improvement Strategy 2022-2025. Available at: https://www.rcpch.ac.uk/sites/default/files/2023-06/nnap_healthcare_improvement_strategy_22-25_final_070623.pdf

initiatives[15]. An example of such treatments is the use of non-invasive breathing support, which varies strikingly between neonatal units of the same type. The observed increase in the rate of BPD cannot be attributed to falling mortality or an increase in the number of the least preterm infants. The increase in rates of BPD is not seen in the babies affected by the most serious forms of BPD such as ventilation at term equivalent. Very striking variations in rates of BPD continue to be observed between units and neonatal networks.

- Serious preterm brain injury was identified in 9.0% of very preterm babies nationally (572 of 6,390). Research indicates that preterm brain injury represents 40% of the total number of serious brain injuries recorded in infancy[16], itself part of a wider government ambition to reduce all avoidable harm by 50%[17]. Despite the existence of an agreed surveillance definition and established reporting mechanisms, rates of data completeness remain a serious concern (for example five neonatal networks had missing data rates that ranged from 15% to 48% for IVH). A high proportion of missing data, wide inter-unit variation in the rates of missing data and the fact that overall, the data suggests that one in ten babies did not receive relevant imaging within a week of birth, implies that measurement of progress towards the national ambition may be seriously undermined by data quality issues.
- Rates of necrotising enterocolitis (NEC) are not yet falling in a sustained and credible way. 88% of units provided assurance that their 2023 data were accurate, but as with preterm brain injury measurement of this serious complication of preterm birth is compromised by poor data quality.
- Rates of bloodstream infection in very preterm infants show tentative signs of an overall decrease (2023 - 4.3%, 2022 - 5.4%). The rigour of such a finding will be enhanced by forthcoming data linkage projects.

In addition to previous recommendations, NNAP makes the following national recommendations:

1. National Health Service England and health departments in the Devolved Governments should:
    - Ensure that Neonatal Networks with low rates of survival review their mortality data and develop locally prioritised improvement plans. Quality improvement activity should focus on best practices identified from Neonatal Networks exhibiting low mortality with particular attention given to differences in network structure, staffing, clinical governance, and clinical practices.

[15] BAPM. Antenatal Optimisation for Preterm Infants less than 34 weeks. A Quality Improvement Toolkit. October 2020. Available at: https://hubble-live-assets.s3.amazonaws.com/bapm/redactor2_assets/files/843/AO_Toolkit_FULLTOOLKIT_11-2-21.docx.pdf
[16] Gale C *et al*; Brain Injuries expert working group. Neonatal brain injuries in England: population-based incidence derived from routinely recorded clinical data held in the National Neonatal Research Database. 2018.
[17] Health Do. New ambition to halve rate of stillbirths and infant deaths. 2015. Available at: https://www.gov.uk/government/news/new-ambition-to-halve-rate-of-stillbirths-and-infant-deaths

- Review survival rates in very preterm infants and work with The National Institute for Health and Care Research (NIHR) to support future research investigating the reasons for the observed geographical variation in mortality.

2. National Health Service England and health departments in the Devolved Governments should ensure that Neonatal Networks work with their constituent units and are:
    - Regularly reviewing and addressing their rates of missing data for preterm brain injury (intraventricular haemorrhage, cystic periventricular leukomalacia, and post haemorrhagic ventricular dilatation) and necrotising enterocolitis.
    - Utilising the NNAP restricted access dashboard to validate these data in order that units and networks can develop quality improvement plans based on babies' outcomes.

Actions for local quality improvement

- Neonatal units without assured data entry for outcomes such as NEC, bloodstream infection and preterm brain injury should develop plans, in time for the final deadline for the submission of NNAP 2024 data, to deliver enhanced completeness and quality of data. Neonatal units should use the following resources to support this work:
    - NNAP 2023 audit measures guide
    - NNAP Restricted Access Dashboard
    - NNAP webinar: Checking and validating your NNAP data: What you need to know
    - Gale, C. et. Al. Brain injury occurring during or soon after birth: a report for the national maternity ambition commissioned by the Dept. of Health.
    - Case study: *Snuggle and PEEP – increasing use of non-invasive respiratory support and reducing BPD rates.* Bolton Hospital NHS FT
    - Case study: *Implementing a care bundle to reduce the incidence of severe intraventricular haemorrhages in a UK tertiary neonatal intensive care unit.* University College London Hospitals NHS FT
- Neonatal units should ensure there is a named lead for serious incident review with designated time to liaise closely with obstetric and maternity colleagues, in line with the recommendation made in the UK Neonatal Partnership Board report - National Reviews of Maternity and Neonatal Care: Supporting the perinatal team to implement recommendations. This is to ensure that timely and transparent incident investigations occur and result in shared learning.

2. Optimal perinatal care

2.1. Birth in a centre with a neonatal intensive care unit (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 NICU?

Babies who are born at less than 27 weeks gestational age are at high risk of death, serious illness, and brain injury. National recommendations in England[18],[19] state that neonatal networks should aim to configure and deliver services to increase the proportion of babies at this gestational age being delivered in a hospital with a neonatal intensive care unit (NICU) on site. This is because there is evidence that outcomes improve if such premature babies are cared for in a NICU from birth. Eighty-five percent (85%) of babies born at less than 27 weeks gestational age, weighing less than 800 grams, or born as a multiple at less than 28 weeks gestational age should be delivered in a maternity service on the same site as a NICU. Prior to 2022, the measure only considered babies born at less than 27 weeks gestational age.

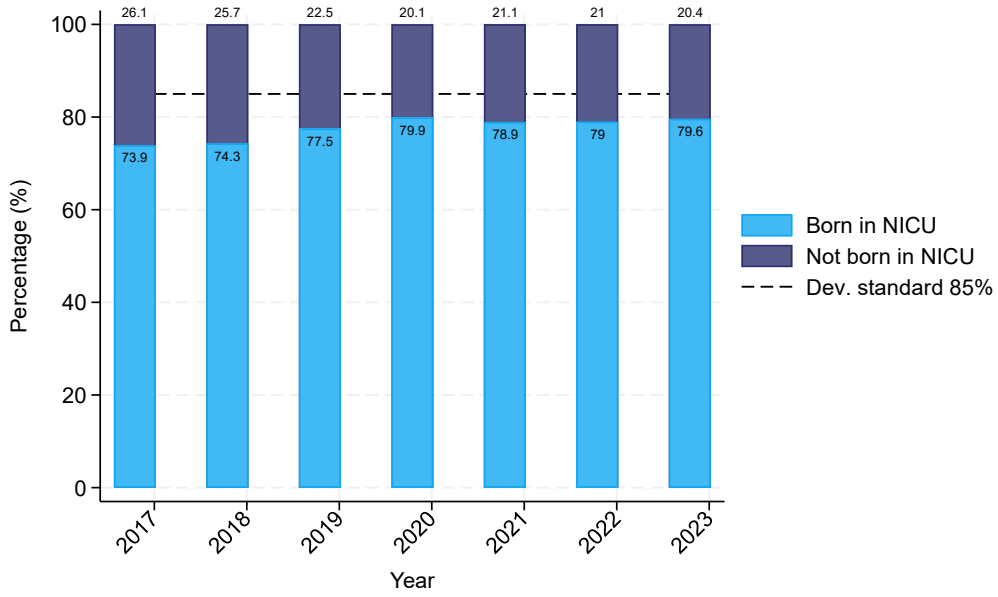
Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

[18] NHS England. *Neonatal Critical Care Service Specification*. 2016. Available from https://www.england.nhs.uk/commissioning/spec-services/npc-crg/group-e/e08/.

[19] NHS England. *Implementing Better Births: Integrating Neonatal Care into Local Maternity System Transformation Plans*. 2017.

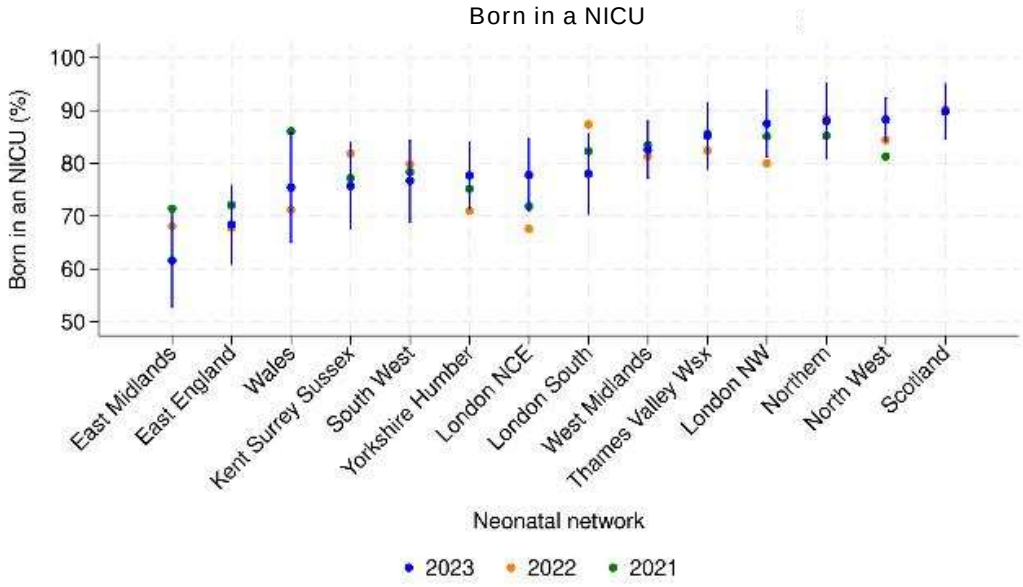
Results

Figure 27: Birth in a centre with a NICU, according to the contemporaneous NNAP measurement criteria, by NNAP reporting year, 2017-2023.



Notes for interpretation: Years 2020 and 2021 do not include Scotland.

Figure 28. Caterpillar plot of the proportions of birth in a centre with a NICU, by neonatal network or operational delivery network (ODN). *Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.*



Note for interpretation: Results for 2021 and 2022 have been re-analysed using the latest available data and the 2023 measure criteria.

Summary of findings

- In 2023 79.6% (1,551 of 1,948) of babies of less than 27 week' gestational age, weighing less than 800 grams or multiples of less than 28 weeks' gestational age were born in a maternity unit with a neonatal intensive care unit. In 2022, the proportion was 79% (1,576 of 1,995).
- Among networks, the proportion ranges from 61.6% (East Midlands ODN) to 89.8% (Scotland). Figure 28 compares network results for 2020, 2021, and 2022, using the most recent measure criteria and the latest available data. It the indicates that 5 of the 14 have seen a reduction in the proportion of babies born in an appropriate setting compared to the data from 2022. Further temporal comparisons can be made by reviewing the NNAP restricted access dashboard.

2.2. Antenatal steroids

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

Babies born at less than 34 weeks' gestational age sometimes have breathing difficulties in the first few days after they are born. Antenatal steroids are a powerful health intervention, given to mothers by obstetricians and midwives before delivery of a preterm baby. Antenatal steroids help reduce mortality and make other serious complications, such as bleeding into the brain, less likely. The NICE quality standard *Preterm Labour and Birth*[20] details recommendations on the use of antenatal corticosteroids prior to suspected preterm birth.

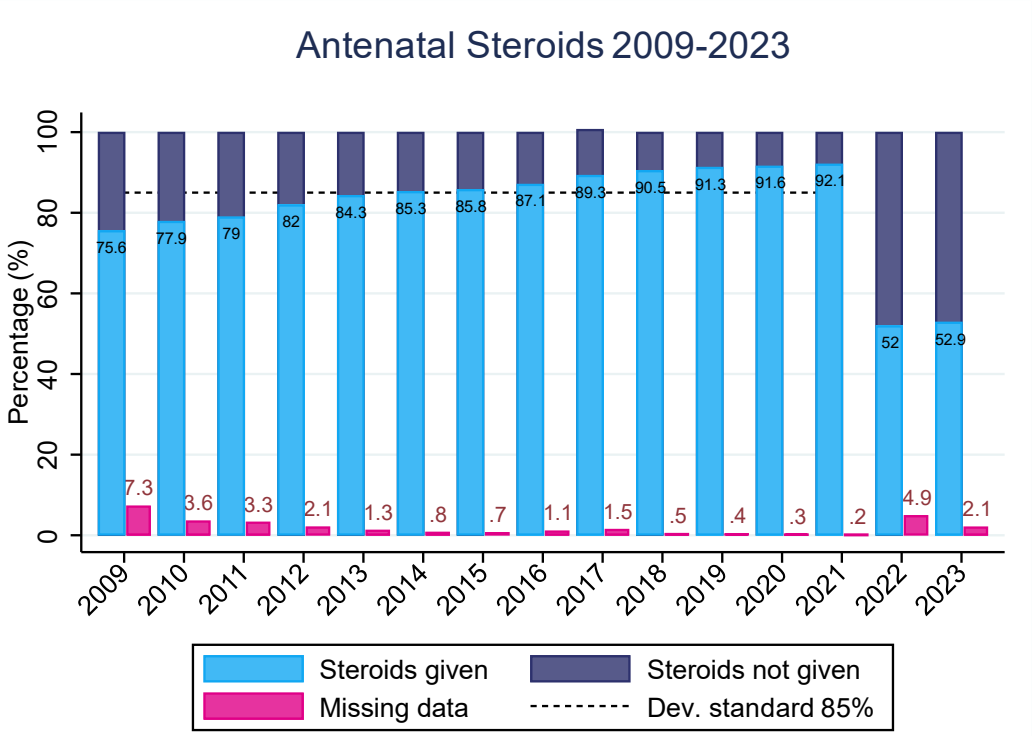
For the first time this year, the NNAP reports the proportion of eligible mothers who received a full course of antenatal corticosteroids within one week of delivery. Previously, the NNAP reported the proportion receiving at least one dose before delivery. On time delivery of a full course of antenatal corticosteroids is challenging to achieve, due to the complexities of accurately predicting preterm birth. This intervention is likely to be more achievable in some groups of mothers and babies, such as planned deliveries due to preeclampsia, compared to others such as delivery for placental abruption.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

[20] NICE guideline [NG25]. Preterm labour and birth. Last updated: 10 June 2022. Available at: https://www.nice.org.uk/guidance/ng25

Results

Figure 29. Administration of antenatal steroids, according to the contemporaneous NNAP measurement criteria, by NNAP reporting year (2009 to 2023).



Notes for interpretation:

- *Results for years 2010-2016 are recalculated so that missing data is excluded from the denominator (with outcome), therefore results vary from published results. Otherwise, all results use contemporaneous definitions.*
- *Years 2010-2014, 2020 and 2021 do not include Scotland.*
- *The gestational age inclusion criteria changed in 2018 from 24 to 34 weeks inclusive to 23 to 33 weeks inclusive.*
- *In 2022:*
    - *the measure question changed to consider whether a mother received a full course of corticosteroids in the week prior to delivery. Prior to 2021, it looked at whether a mother received at least one dose at any time in the pregnancy.*
    - *the lower gestational age cut-off has been extended to included babies born from 22 weeks gestational age, in line with the overall NNAP inclusion criteria.*
    - *babies born at home or in transit are attributed to first unit of care.*
    - *the cohort changed from babies discharged in the calendar year, to babies first admitted in the calendar year.*

Figure 30. Caterpillar plot of the proportions of administration of antenatal steroids, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

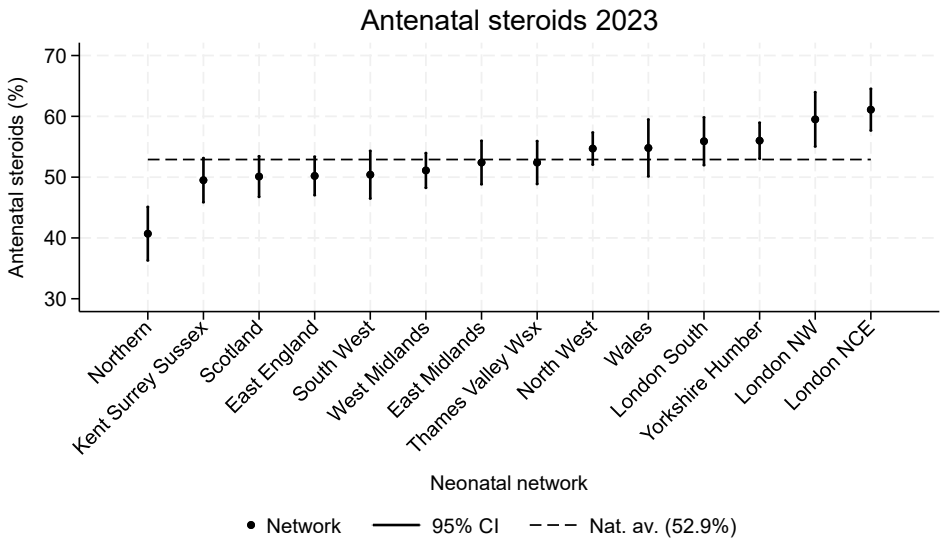


Figure 31. Caterpillar plot of the proportions of administration of antenatal steroids: neonatal units.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.

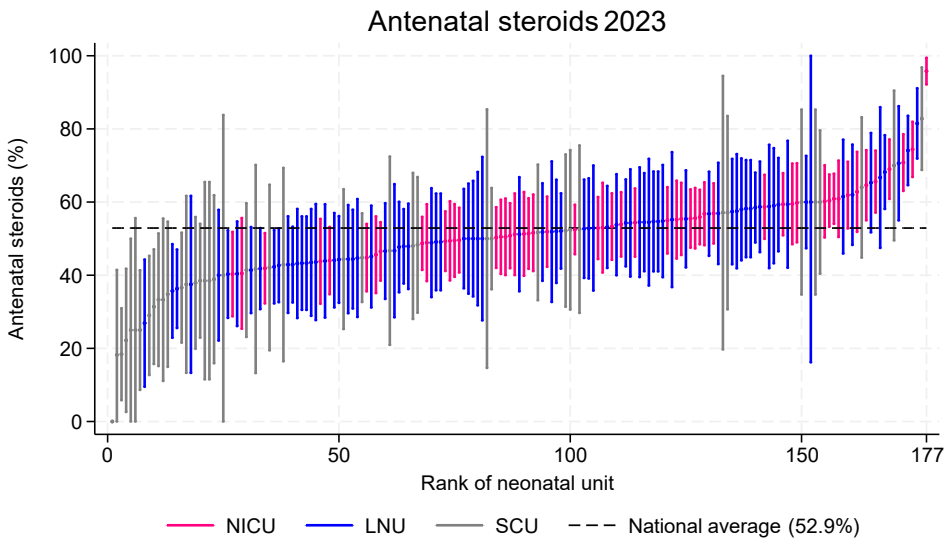


Table 20: Administration of antenatal steroids, by unit level

Unit level	Eligible mothers	With outcome	Antenatal steroids given (%)	Missing (%)
Other*	42	38	13 (34.2%)	4 (9.5%)
SCU	1,024	967	417 (43.1%)	57 (5.6%)
LNU	4,439	4,310	2,216 (51.4%)	129 (2.9%)
NICU	6,263	6,203	3,444 (55.5%)	60 (1%)
National	11,768	11,518	6,090 (52.9%)	250 (2.1%)

**'Other' units are those that are hospital or healthcare locations not associated with an NNAP neonatal unit, NNAP units that have closed before the start of this audit year, or location records that are unknown.*

Summary of findings

- In 2023, 52.9% (6,090 of 11,518) of mothers who delivered a baby between 23 and 33 weeks gestational age received a full course of antenatal steroids within one week prior to delivery. Across units, the proportion ranges from 0% to 95.8%.

- Achievement is higher in NICUs at 55.5% (3,444 of 6,203), compared to LNUs – 51.4% (2,216 of 4,4310, and SCUs – 43.1% (417 of 967). These differences are expected because fewer preterm deliveries are planned in SCUs and LNUs. Network achievement ranges from 40.7% (Northern ODN) to 61.1% (London ODN – North Central & East) (Figure 30). There is a clear opportunity for improvement towards the level of administration seen in the highest performing networks.

- NNAP are aware that there may be some use of antenatal steroids with inappropriately shortened dosage intervals, where antenatal steroids are given at a dose interval of 12 hours, rather than 24 hours, which does not confer clinical advantage. The NNAPs reporting of antenatal steroid use with this measure should not be taken as an endorsement of the practice shortened dosing intervals. NNAP hope to be able to provide data describing the prevalence of shortened dosing intervals in 2025, following the 2024 revision to the antenatal steroid data entry.

2.3. 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?

Giving magnesium sulphate to women who are at risk of delivering a preterm baby reduces the chance that their baby will develop cerebral palsy by 32%.[21] The NICE quality standard *Preterm Labour and Birth* recommends that all women who may deliver their baby at less than 30 weeks gestational age are offered magnesium sulphate where possible.[22] The NNAP developmental standard is that ninety percent (90%) of eligible mothers should receive antenatal magnesium sulphate.

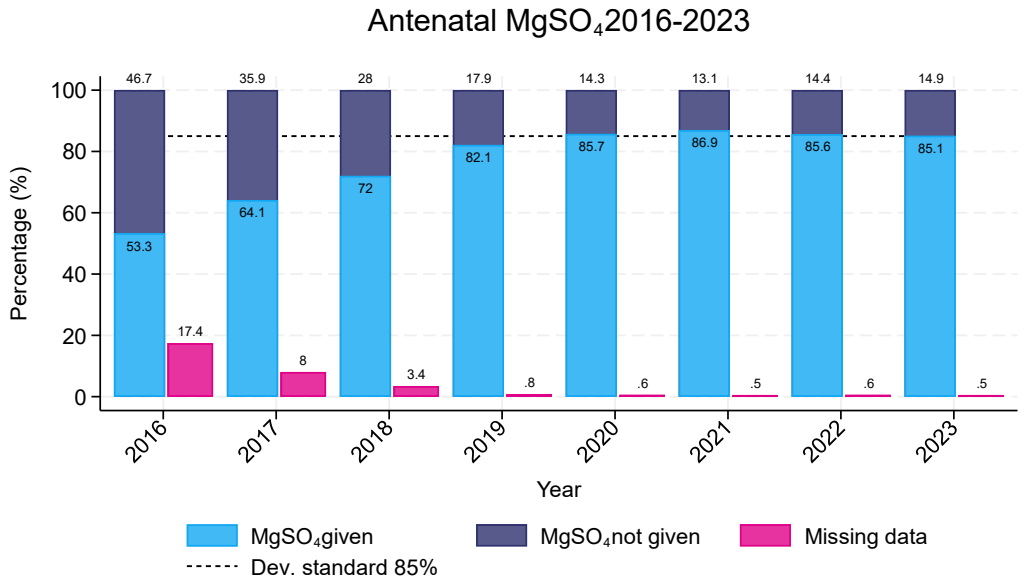
Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

[21] Oddie S., Tuffnell D. J., McGuire W. Antenatal magnesium sulfate: Neuro-protection for preterm infants. *Archives of Disease in Childhood - Fetal and Neonatal Edition* 2015; 100: F553-F557. Available at: https://fn.bmj.com/content/100/6/F553

[22] National Institute for Health and Care Excellence. *Preterm labour and birth. NICE guideline (NG25)* 2015. Available from: https://www.nice.org.uk/guidance/NG25

Results

Figure 32. Administration of magnesium sulphate, according to the contemporaneous NNAP measurement criteria, by reporting year (2016-2023).



Notes for interpretation:

- *Results for 2016 are recalculated so that missing data is excluded from the denominator (with outcome), therefore results vary from published results. Otherwise all results use contemporaneous definitions.*
- *Years 2020 and 2021 do not include Scotland.*
- *From 2022:*
    - *babies born at home or in transit are now attributed to first unit of care.*
    - *the cohort changed from babies discharged in the calendar year, to babies first admitted in the calendar year.*

Figure 33. Caterpillar plot of the proportions of administration of magnesium sulphate, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

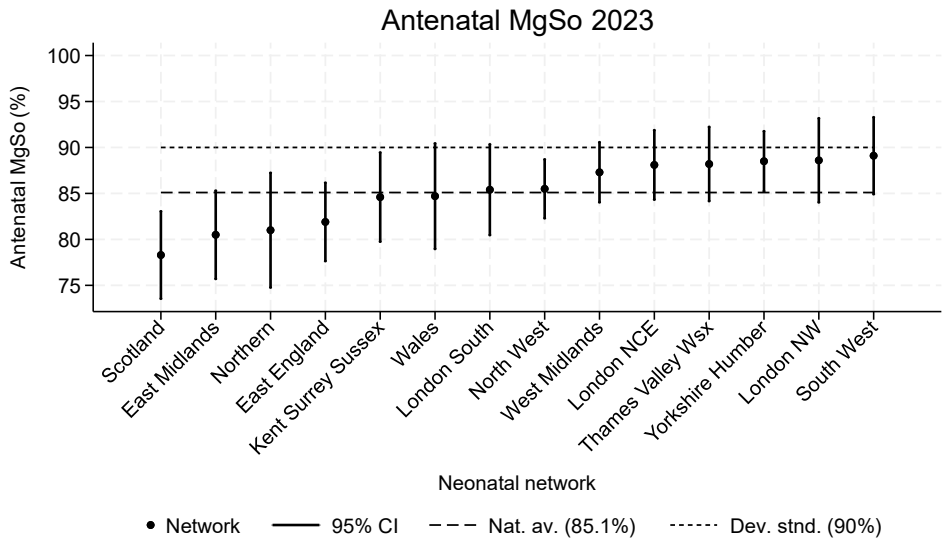


Figure 34. Caterpillar plot of the proportions of administration of magnesium sulphate: neonatal units.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.

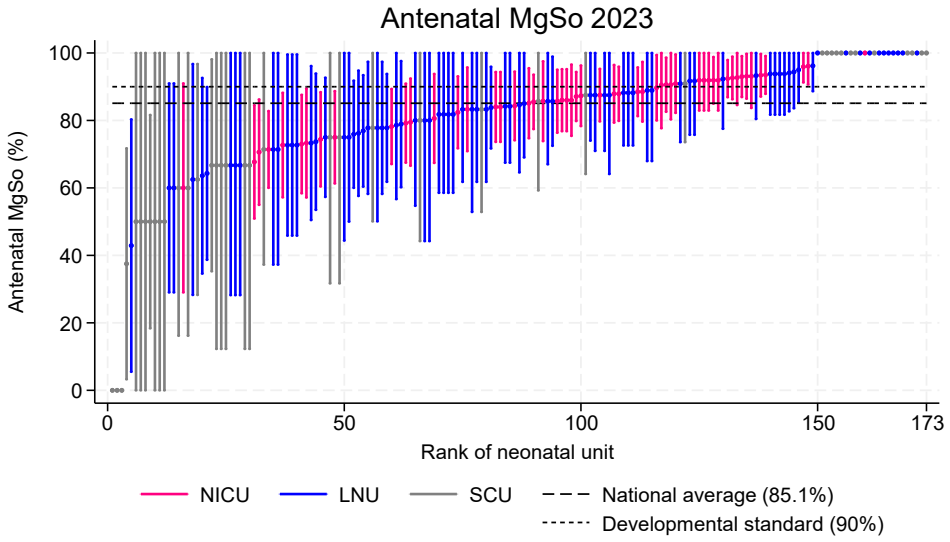


Table 21: Administration of antenatal magnesium sulphate, by unit level

Unit level	Eligible mothers	With outcome	Proportion	Missing
Other*	16	14	6 (42.9%)	2 (12.5%)
SCU	167	165	118 (71.5%)	2 (1.2%)
LNU	1091	1081	906 (83.8%)	10 (.9%)
NICU	2641	2637	2287 (86.7%)	4 (.2%)
National	3915	3897	3317 (85.1%)	18 (.5%)

**'Other' units are those that are hospital or healthcare locations not associated with an NNAP neonatal unit, NNAP units that have closed before the start of this audit year, or location records that are unknown.*

Summary of findings

- In 2023, 85.1% (3,317 of 3,897) of mothers who delivered a baby at less than 30 weeks gestational age received antenatal magnesium sulphate. In 2022, the proportion was 85.6% (3,349 of 3,913).
- Across networks, administration of antenatal magnesium sulphate ranges from 78.3% (Scotland) to 89.1% (South West ODN) (Figure 33).
- Across units, administration of antenatal magnesium sulphate varies widely; however, 96% (168/175) of units administer magnesium sulphate to half or more eligible women, and 32.6% (57/175) meet the NNAP developmental standard of 90% (Figure 34).
- Achievement of magnesium sulphate administration is higher in NICUs at 86.7% (2,387 of 2,637), compared to LNUs – 83.8% (906 of 1,081), and SCUs – 71.5% (118 of 165). The data suggest that important improvements to rates of antenatal magnesium administration can be achieved in some neonatal units and networks.

2.4. Deferred cord clamping

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

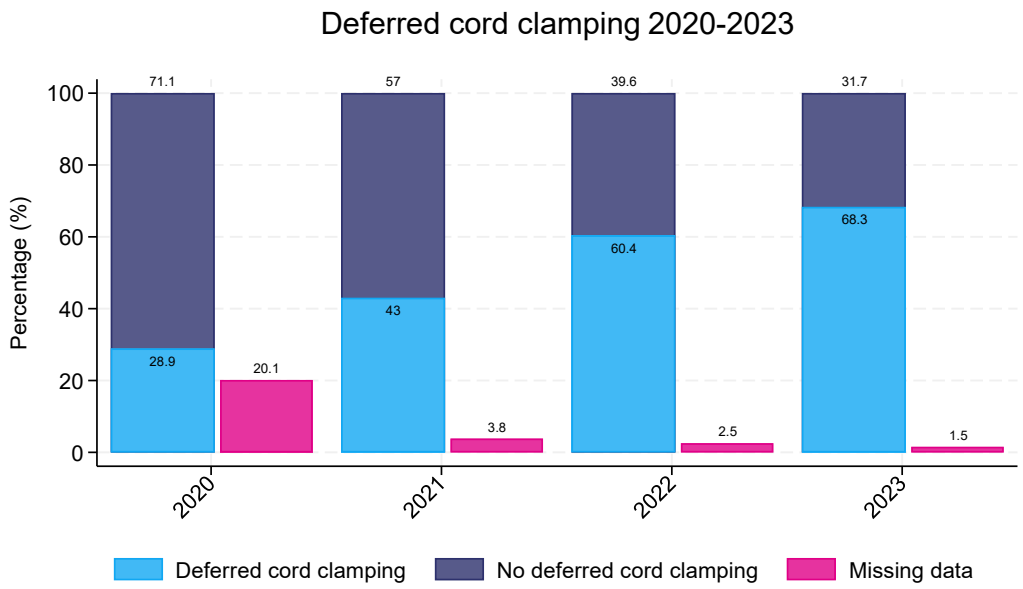
Evidence shows that avoiding immediate cord clamping reduces death in preterm babies by nearly a third.[23] Deferred cord clamping has been shown to be incompletely implemented in the UK and is one of the key perinatal care interventions identified by MatNeoSIP.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

[23] Fogarty, M. et al. Delayed vs early umbilical cord clamping for preterm infants: a systematic review and meta-analysis. *Am J Obstet Gynecol.* 2018 Jan;218(1):1-18. doi: 10.1016/j.ajog.2017.10.231. Available at: https://pubmed.ncbi.nlm.nih.gov/29097178/

Results

Figure 35: Deferred cord clamping, according to the contemporaneous NNAP measurement criteria, by NNAP reporting year (2020 to 2023).



Notes for interpretation:

- *In 2021, there was a change to the interpretation of missing data. Prior to 2021, a patient with a completed seconds field but with nothing entered in the minutes field would have been counted as missing.*
- *Years 2020 and 2021 do not include Scotland.*
- *In 2022,*
    - *the upper gestational age limit increased to include babies born at less than 34 weeks gestational age. Prior to 2022, the upper limit was less than 32 weeks gestational age.*
    - *babies born at home or in transit are attributed to first unit of care.*
    - *the cohort changed from babies discharged in the calendar year, to babies first admitted in the calendar year.*

Figure 36: Caterpillar plot of the proportions of deferred cord clamping at less than 34 weeks gestational age; by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

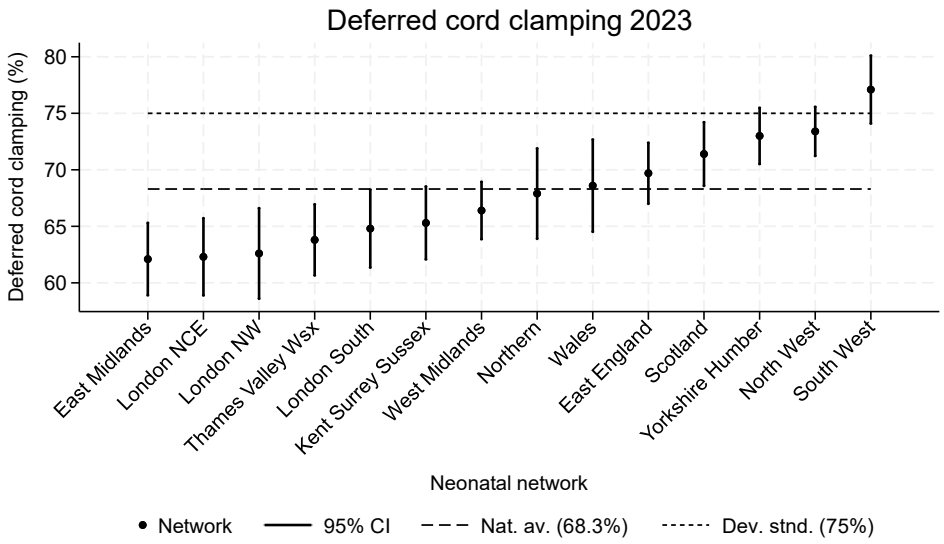


Figure 37: Caterpillar plot of the proportions of deferred cord clamping at less than 34 weeks gestational age; neonatal units.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.

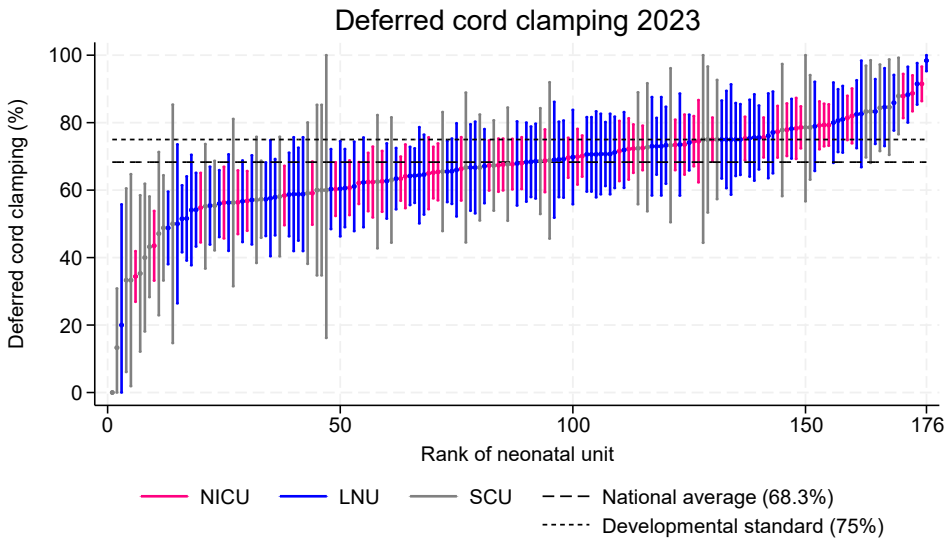


Table 22: Deferred cord clamping at less than 34 weeks gestational age, by neonatal unit level.

Unit level	Eligible babies	With outcome	Deferred cord clamping (%)	Missing (%)
Other*	47	31	21 (67.7%)	15 (34%)
SCU	1135	1065	671 (63%)	31 (6.2%)
LNU	5142	5080	3465 (68.2%)	25 (1.2%)
NICU	7107	7051	4874 (69.1%)	31 (0.8%)
National	13431	13227	9031 (68.3%)	102 (1.5%)

**'Other' units are those that are hospital or healthcare locations not associated with an NNAP neonatal unit, NNAP units that have closed before the start of this audit year, or location records that are unknown.*

Summary of findings

- In 2023, 68.3% (9,031 of 13,227) of babies born at less than 34 weeks' gestation had deferred cord clamping. In 2022, the proportion was 60.4% indicating a 7.9% improvement in the delivery of deferred cord clamping over the past year.
- In comparison to the 2022 data there is less variation in the achievement of deferred cord clamping across networks, from 62.1% (East Midlands ODN) to 77.1% (South West ODN) (Figure 36).
- Across neonatal units, we report a wide range of achievement of deferred cord clamping. Proportions of babies receiving deferred cord clamping range from 0% to 98.4%, with missing data ranging from 0% to 24.3% (Figure 37). This suggests that further important improvements in the delivery of deferred cord clamping can be achieved at unit level.
- Achievement of deferred cord clamping is higher in NICUs at 69.1% (4,874 of 7,051), compared to LNUs – 68.2% (3,465 of 5,080), and SCUs – 63% (671 of 1,065) (Table 22).
- Overall, the variation in rates of DCC, and the types of units affected suggest that many units could achieve significantly higher rates of DCC by comparing practices to those of other units, and use of relevant national guidance[24]. Such increases in the practice of deferred cord clamping might reasonably be expected to result in reduced mortality[25].

[24] British Association of Perinatal Medicine. Service Standards for Hospitals Providing Neonatal Care (3rd edition). 2010. Available at: https://www.bapm.org/resources/32-service-standards-for-hospitals-providing-neonatal-care-3rd-edition-2010

[25] Fogarty et al. Delayed vs early umbilical cord clamping for preterm infants: a systematic review and meta-analysis. Am J Obstet Gynecol. 2018 Jan;218(1):1-18. doi: 10.1016/j.ajog.2017.10.231. Epub 2017 Oct 30. PMID: 29097178.

2.5. Normal temperature on admission

Does an admitted baby born at less than 32 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?

Low admission temperature is associated with an increased risk of illness and death in preterm babies. Low temperature (or hypothermia) is a preventable condition in vulnerable newborn babies.

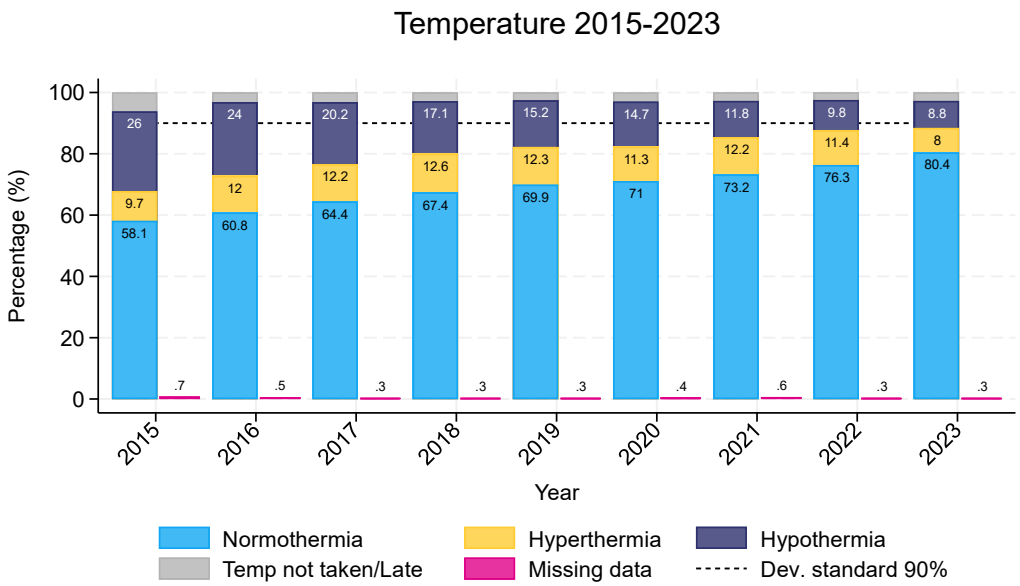
This NNAP measure looks at how successful neonatal units are at achieving a normal first temperature (between 36.5 and 37.5°C) within an hour of birth in very preterm babies. The NNAP developmental standard is that at least 90% of babies should have an admission temperature taken within an hour of birth and measuring within the normal range.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

From 2023, the cohort for this measure will include babies born at 32 and 33 weeks gestational age, in line with MatNeoSIP measurement.

Results

Figure 38. Temperature on time and within normal range, according to the contemporaneous NNAP measurement criteria, by NNAP reporting year (2015-2023).



Notes for interpretation:

- *Results for 2015 and 2016 are recalculated so that missing data is excluded from the denominator (with outcome), therefore results vary from published results. Otherwise, all results use contemporaneous definitions.*
- *Years 2020 and 2021 do not include Scotland.*
- *In 2022,*
    - *babies born at home or in transit are now attributed to first unit of care.*
    - *the cohort changed from babies discharged in the calendar year, to babies first admitted in the calendar year.*

Figure 39. Caterpillar plot of the proportions of temperature taken on time and within normal range, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

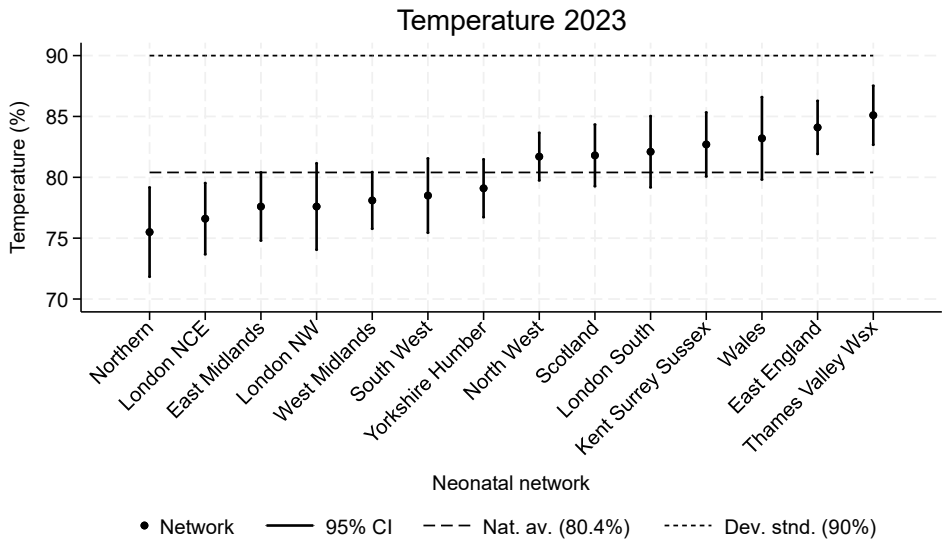


Figure 40. Caterpillar plot of the proportions of temperature taken on time and within normal range: neonatal units.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.

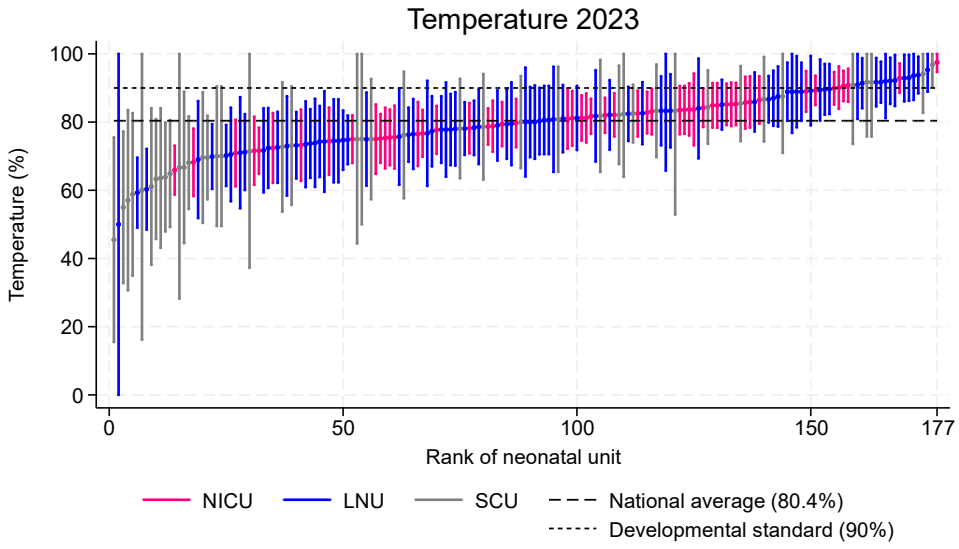


Table 23: Temperature on time and within normal range, by neonatal unit level

Unit level	Eligible babies	With outcome	Temperature measurement							
			On time					After hour	Not taken	Missing data (%)
			< 32°C	32 to 35.9°C	36 to 36.4°C	36.5 to 37.5°C	> 37.5°C			
Other*	18	18	0 (0%)	1 (5.56%)	3 (16.7%)	10 (55.6%)	1 (5.6%)	3	0	0 (0%)
SCU	1,046	1,039	0 (0%)	13 (1.25%)	106 (10.2%)	786 (75.6%)	71 (6.8%)	63	0	7 (0.7%)
LNU	4,814	4,797	1 (0%)	51 (1.06%)	381 (7.9%)	3,843 (80.1%)	419 (8.7%)	100	2	17 (0.4%)
NICU	6,604	6,587	2 (0%)	73 (1.11%)	458 (7%)	5,361 (81.4%)	506 (7.7%)	187	0	17 (0.3%)
National	12,482	12,441	3 (0%)	138 (1.11%)	948 (7.6%)	10,000 (80.4%)	997 (8%)	353	2	41 (0.3%)

**'Other' units are those that are hospital or healthcare locations not associated with an NNAP neonatal unit, NNAP units that have closed before the start of this audit year, or location records that are unknown.*

Summary of findings

- In 2023, 80.4% of babies had a temperature measured on time and within the normal range. There has been a sustained year on year improvement in the proportion of babies admitted with a normal temperature, from 58.1% in 2015 (Figure 38).
- Across networks, acheivement of normal temperature on admission ranges from 75.5% (Northern ODN) to 85.1% (Thames Valley & Wessex ODN). Most neonatal units, and none of the neonatal networks, are yet achieving the NNAP developmental standard of 90% of eligible babies with a temperature measured on time and within the normal range (Figure 39).
- Across units, achievement of normal temperature on admission ranges from 45.5% to 97.5%, with 12.4% (22/177) of units achieving the NNAP developmental standard of 90% of eligible babies with a temperature measured on time and within the normal range (Figure 40).
- Achievement remains higher in NICUs at 81.4% (5,361 of 6,587), compared to LNUs – 80.1% (3,843 of 4797), and SCUs – 75.6% (786 of 1,039) (Table 23). It should be noted that the overall rate observed in SCUs has improved by 7.1% over the last year, 75.6% (786 of 1,039) in 2023 and 68.5% (272 of 397) in 2022.

2.6. Key messages, recommendations and actions for improvement from the NNAP State of the Nation Report on 2023 data

- Over three quarters of babies born at less than 34 Weeks' gestation did not receive an optimal care journey. Whilst there is encouraging improvement in this metric across most regions there remains significant variation between neonatal units and networks.
- 68.3% (9,031 of 13,227) of babies born at less than 34 weeks' gestation had deferred cord clamping (DCC). In 2022, the proportion was 60.4%, indicating a striking 7.9% improvement over the past year. Many neonatal units are now delivering DCC at or above the levels observed in the clinical trials that demonstrated reduced neonatal mortality after preterm birth. In contrast to practice in some of the trials, less than 7% of babies had DCC of more than two minutes, likely reflecting a literal adoption of published guidance. A small number of neonatal units can be identified as low outliers in the proportion of babies who get DCC (alarm threshold). These and other units may perceive barriers to wider use of DCC that are not appreciated in higher use units.
- 52.9% (6,090 of 11,518) of mothers who delivered a baby between 23 and 33 weeks gestational age received a full course of antenatal steroids within one week prior to delivery. Antenatal steroids are acknowledged to be the most powerful influence on the survival and wellbeing of preterm infants. Changes in their use are difficult to interpret reliably from the 2023 NNAP data. This is in part due to the lack of balancing measures and in part due to concerns that any apparent improvement in adherence to the existing measure may simply reflect a measurement driven trend to administer antenatal steroids with a shorter than recommended dosage interval. The NNAP has developed a dataflow to address the latter problem.
- 85.1% (3,317 of 3,897) of mothers who delivered a baby at less than 30 weeks gestational age received antenatal magnesium sulphate. This represents a small decrease from 2022 data (0.5%) and remains below the new developmental standard (90%). It is not likely that all eligible women can receive magnesium sulphate, due to the emergency nature some preterm labour. However, further increases in aggregate usage can likely be achieved by examining and learning from cases where administration did not occur, particularly in centres with below average adherence.
- 80.4% (10,000 of 12,441) of babies had a temperature measured on time and within the normal range. This data represents a continuation of the trend of year-on-year improvement in the proportion of babies admitted with a normal temperature and may be attributable to national perinatal improvement programmes.

- There has not been any significant improvement in the proportion of the most premature babies delivered in the most appropriate hospitals (2023 - 79.6%, 2022 - 79.0%). As with timely administration of antenatal steroids and administration of magnesium sulphate, early recognition of symptoms and signs of preterm labour will be central in facilitating further improvement.

The NNAP makes the following national recommendations:

3. In order for perinatal teams to identify and implement the necessary perinatal interventions at the earliest opportunity, the Departments of Health in England, Wales, Scotland, and the Isle of Man should:
    - Commission public health campaigns aimed at raising public and professional awareness of the nature and importance of the signs and symptoms of preterm labour and the effectiveness of clinical interventions.
    - Work with relevant manufacturers and distributors to address supply chain challenges in the delivery of quantitative fetal fibronectin testing kits.
4. Neonatal Networks should ensure that their constituent units are using the NNAP restricted access dashboard to review their rates of optimal perinatal care delivery, identifying instances of non-adherence, and implementing quality improvement activities in response to them.

Actions for local quality improvement

- Preterm birth lead teams should use new NNAP frequent reporting tools and quality improvement methodology to understand the proportion of babies receiving perinatal care interventions in their service and network, to identify opportunities for improvement to maximise quality of care, and the delivery of interventions identified by national improvement initiatives.
- Perinatal teams should use the following resources to strengthen their multi-disciplinary team working and improve the proportion of babies receiving perinatal care interventions:
    - BAPM toolkits and resources:
        - Building Successful Perinatal Optimisation Teams Toolkit
        - Antenatal Optimisation for Preterm Infants less than 34 weeks: A QI Toolkit
        - Maternal Breastmilk Toolkit
        - Normothermia Toolkit
        - Optimal Cord Management Toolkit
        - Perinatal Optimisation Pathway Resources (BAPM and BICS)

- West of England Academic Health Sciences Network, PERIPrem
- The QUiPP App Toolkit
- Maternity Transformation Programme, Perinatal Culture and Leadership Programme (England only), further information available via login at: https://future.nhs.uk/.
- The Scottish Patient Safety Programme (SPSP) Maternity and Children Quality Improvement Collaborative (MCQIC) Preterm Perinatal Wellbeing Package
- Case study: *Optimal Timing of Antenatal Corticosteroids to improve outcomes in preterm birth*. Thames Valley & Oxford Academic Health Sciences Network

4. Parental partnership in care

4.1 Breastmilk feeding in the first two 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?

The NNAP is delivering measurement of breastmilk in the first two days of life because currently data describing breastmilk use within 24 hours of birth are insufficiently complete to usefully describe early breastmilk use. Expert opinion suggests that very early breastmilk use is both clinically beneficial and also that high rates of usage in a unit are an indication that early postnatal support to the mothers of preterm babies in expressing breastmilk is successful.

This measure was first introduced in 2022 and will be amended if other data flows become available to better describe the care pathway that is intended to maximise use of maternal breastmilk for feeding of preterm infants.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Results

Figure 41: Caterpillar plot of proportions of any breastmilk feeding in the first two days of life, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

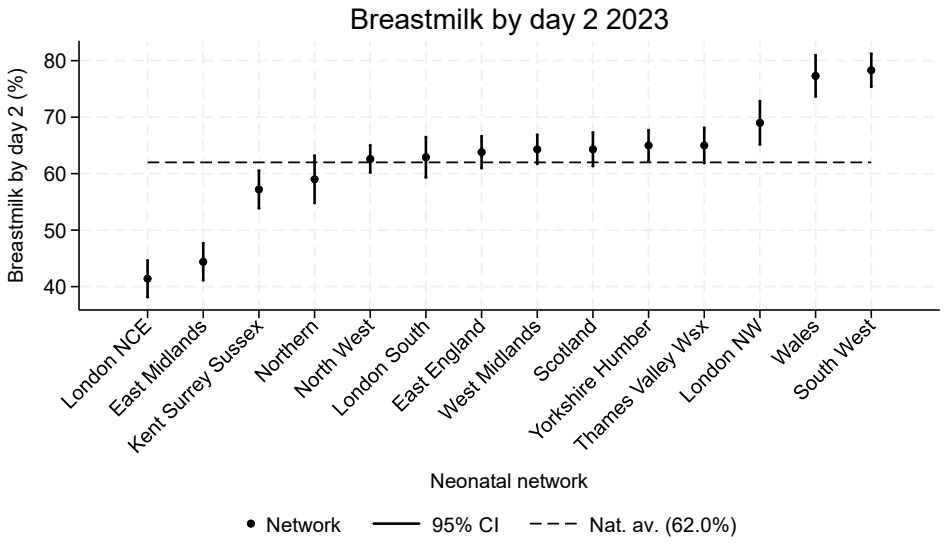


Figure 42: Caterpillar plot of proportions of any breastmilk feeding in the first two days of life, by neonatal unit.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online. Units with < 3 eligible babies with an outcome are not included.

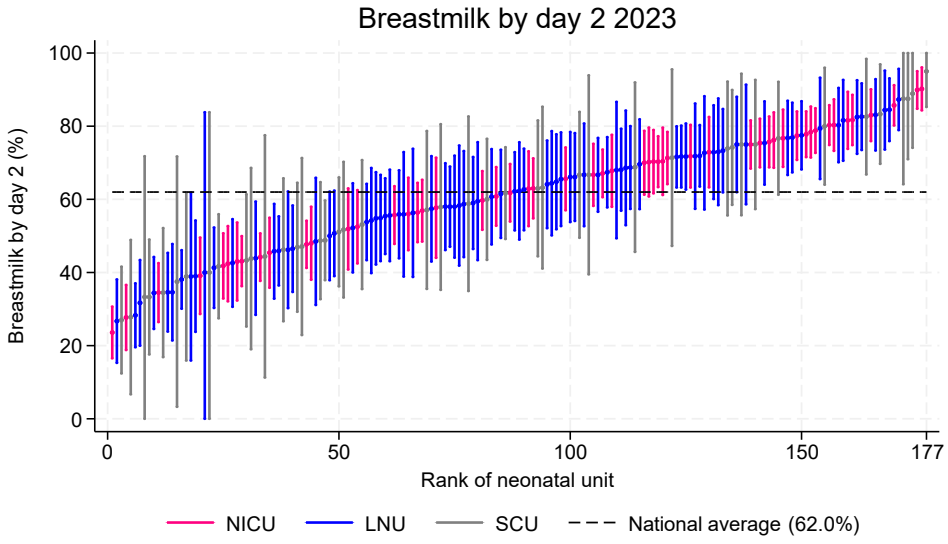


Table 24: Feeding by day 2 of life, by neonatal network.

Network	Eligible babies	With Outcome	Mothers milk only (%)	Mixed feeding (%)	Any mothers milk (%)	Other (%)	Nil by mouth (%)	Missing (%)
East Midlands ODN	923	908	286 (31.5%)	117 (12.9%)	403 (44.4%)	211 (23.2%)	294 (32.4%)	15 (1.6%)
East of England Perinatal ODN	1147	1145	427 (37.3%)	304 (26.6%)	731 (63.8%)	264 (23.1%)	150 (13.1%)	2 (0.2%)
Kent, Surrey, Sussex ODN	873	872	246 (28.2%)	253 (29%)	499 (57.2%)	266 (30.5%)	107 (12.3%)	1 (0.1%)
London ODN - North C & E	939	912	274 (30%)	104 (11.4%)	378 (41.4%)	178 (19.5%)	356 (39%)	27 (2.9%)
London ODN - North West	577	577	177 (30.7%)	221 (38.3%)	398 (69%)	144 (25%)	35 (6.1%)	0 (0%)
London ODN - South	751	728	280 (38.5%)	178 (24.5%)	458 (62.9%)	151 (20.7%)	118 (16.2%)	23 (3.1%)
North West ODN	1616	1604	779 (48.6%)	225 (14%)	1004 (62.6%)	279 (17.4%)	321 (20%)	12 (0.7%)
Northern ODN	550	547	235 (43%)	88 (16.1%)	323 (59%)	113 (20.7%)	111 (20.3%)	3 (0.5%)
Scotland	1031	1025	372 (36.3%)	287 (28%)	659 (64.3%)	267 (26%)	99 (9.7%)	6 (0.6%)
South West ODN	795	792	439 (55.4%)	181 (22.9%)	620 (78.3%)	109 (13.8%)	63 (8%)	3 (0.4%)
Thames Valley & Wessex ODN	930	928	360 (38.8%)	243 (26.2%)	603 (65%)	194 (20.9%)	131 (14.1%)	2 (0.2%)
Wales	525	520	301 (57.9%)	101 (19.4%)	402 (77.3%)	82 (15.8%)	36 (6.9%)	5 (1%)
West Midlands ODN	1378	1368	706 (51.6%)	174 (12.7%)	880 (64.3%)	238 (17.4%)	249 (18.2%)	10 (0.7%)
Yorkshire & Humber ODN	1264	1261	618 (49%)	202 (16%)	820 (65%)	216 (17.1%)	225 (17.8%)	3 (0.2%)
National*	13,304	13,192	5,501 (41.7%)	2,679 (20.3%)	8,180 (62%)	2,713 (20.6%)	2,297 (17.4%)	112 (0.8%)

Table 25: Feeding by day 2 of life, by neonatal unit level.

Unit level	Count	With outcome	Mothers milk only (%)	Mixed feeding (%)	Any Mothers milk (%)	Other (%)	Nil By Mouth (%)	Missing (%)
SCU	1111	1102	361 (32.8%)	269 (24.4%)	630 (57.2%)	289 (26.2%)	183 (16.6%)	9 (0.8%)
LNU	5062	5033	1908 (37.9%)	1125 (22.4%)	3033 (60.3%)	1127 (22.4%)	873 (17.3%)	29 (0.6%)
NICU	7131	7057	3232 (45.8%)	1285 (18.2%)	4517 (64%)	1297 (18.4%)	1241 (17.6%)	74 (1%)
National	13,304	13,192	5,501 (41.7%)	2,679 (20.3%)	8,180 (62%)	2,713 (20.6%)	2,297 (17.4%)	112 (0.8%)

Summary of findings

- In 2023 the proportion of babies born at less than 34 weeks gestational age who receive any of their own mother's milk in the first two days of life was 62% (8,180 of 13,192) with a low level of missing data 0.8% (112 of 13,192). In 2022, the proportion was 49% (6,293 of 12,837).
- This represents a 13% improvement in the proportion of babies less than 34 weeks who have received breastmilk within the first two days of life from 2022 to 2023. The inclusion within this measure of buccal administration of breastmilk from 2023 may explain part of this dramatic improvement. However, longitudinal measurement of early breastmilk use on the NNAP Restricted Access Dashboard (RAD) suggests there is overall improvement in breastmilk use in this patient group since late 2021.
- Across networks, proportions of breastmilk feeding in the first two days of life range from 41.4% (London ODN - North Central & East) to 78.3% (South West ODN) (Figure 41).
- Among neonatal units, proportions of breastmilk feeding in the first two days of life vary greatly (Figure 42). For example, proportions of breastmilk feeding in NICUs range from 9.3% to 77.6%, a finding which is most unlikely to be explained by case mix, and which almost certainly represents an opportunity for at least some units to evolve their practice based on that of other units.
- Achievement is higher in NICUs at 64% (4,517 of 7,057) compared to LNUs – 60.3% (3,033 of 5,033), and SCUs – 57.2% (630 of 1,102) (Table 25).

4.2 Breastmilk feeding at day 14

Does a baby born at less than 34 weeks gestational age receive any of their own mother's milk on day 14 of age?

For babies to benefit from both early and long term benefits of breastmilk, mothers of very preterm babies have to be successful in establishing expression, and to sustain this expression and intent to breastmilk feed over a long period. This measure is designed to assess the success of initiation of breastmilk expression, to support comparison between units, and quality improvement activities based on this.

For 2022 reporting of breastmilk feeding at day 14 of life, the upper gestational age limit was increased to include babies born at 32 and 33 weeks gestational age. This change was made to increase the relevance and utility of this measure for units caring for fewer babies born at lower gestational ages, and to align with the MatNeoSIP measurement strategy in England.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Results

Figure 43: Caterpillar plot of proportions of any breastmilk feeding on day 14 of life, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

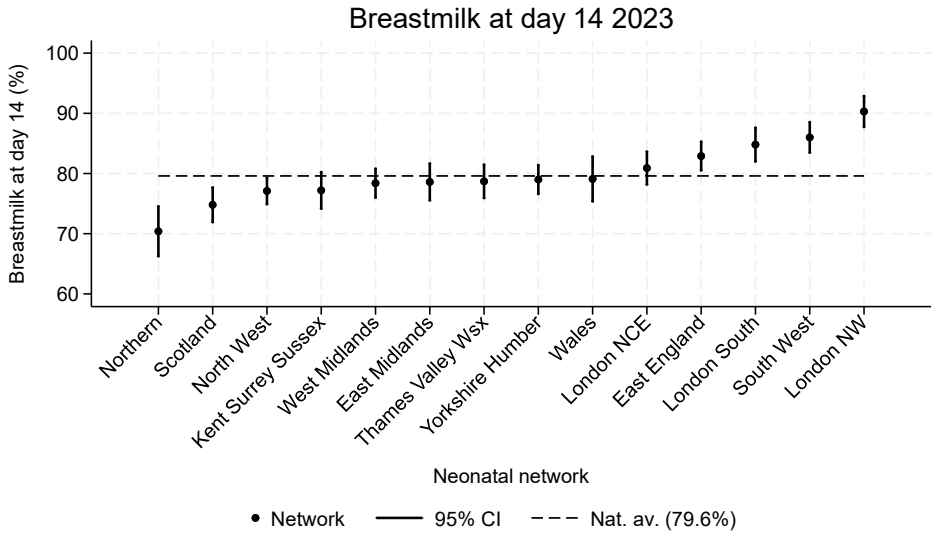


Figure 44: Caterpillar plot of proportions of any breastmilk feeding on day 14 of life, by neonatal unit.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online. Units with < 3 eligible babies with an outcome are not included.

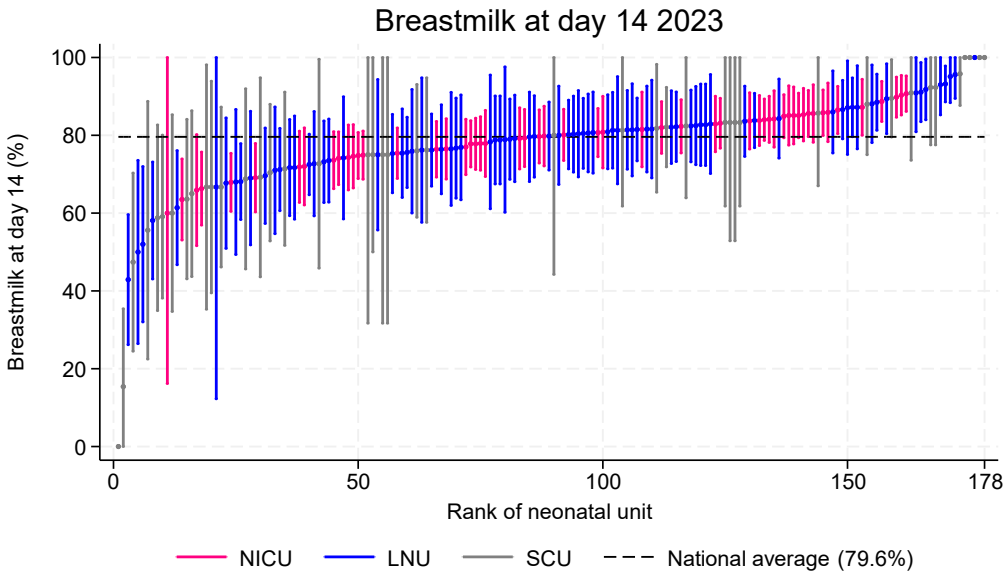


Table 26: Feeding at day 14 of life, by neonatal network.

Network	Eligible babies	With Outcome	Mothers milk only (%)	Mixed feeding (%)	Any mothers milk (%)	Other (%)	Missing (%)
East Midlands ODN	721	718	170 (23.7%)	394 (54.9%)	564 (78.6%)	154 (21.4%)	3 (0.4%)
East of England Perinatal ODN	1000	996	305 (30.6%)	521 (52.3%)	826 (82.9%)	170 (17.1%)	4 (0.4%)
Kent, Surrey, Sussex ODN	760	759	244 (32.1%)	342 (45.1%)	586 (77.2%)	173 (22.8%)	1 (0.1%)
London ODN - North C & E	832	822	134 (16.3%)	531 (64.6%)	665 (80.9%)	157 (19.1%)	10 (1.2%)
London ODN - North West	530	526	198 (37.6%)	277 (52.7%)	475 (90.3%)	51 (9.7%)	4 (0.8%)
London ODN - South	660	656	175 (26.7%)	381 (58.1%)	556 (84.8%)	100 (15.2%)	4 (.6%)
North West ODN	1446	1444	441 (30.5%)	672 (46.5%)	1113 (77.1%)	331 (22.9%)	2 (0.1%)
Northern ODN	485	483	147 (30.4%)	193 (40%)	340 (70.4%)	143 (29.6%)	2 (0.4%)
Scotland	905	903	275 (30.5%)	400 (44.3%)	675 (74.8%)	228 (25.2%)	2 (0.2%)
South West ODN	750	749	179 (23.9%)	465 (62.1%)	644 (86%)	105 (14%)	1 (0.1%)
Thames Valley & Wessex ODN	866	865	184 (21.3%)	497 (57.5%)	681 (78.7%)	184 (21.3%)	1 (0.1%)
Wales	477	474	95 (20%)	280 (59.1%)	375 (79.1%)	99 (20.9%)	3 (.6%)
West Midlands ODN	1176	1168	284 (24.3%)	632 (54.1%)	916 (78.4%)	252 (21.6%)	8(.7%)
Yorkshire & Humber ODN	1153	1152	284 (24.7%)	626 (54.3%)	910 (79%)	242 (21%)	1 (0.1%)
National	11,764	11,718	3,115 (26.6%)	6,213 (53%)	9,328 (79.6%)	2,390 (20.4%)	46 (0.4%)

Table 27: Feeding at day 14 of life, by neonatal unit level.

Unit level	Eligible babies	With outcome	Mothers milk only (%)	Mixed feeding (%)	Any mothers milk (%)	Other (%)	Missing (%)
SCU	649	648	116 (17.9%)	372 (57.4%)	488 (75.3%)	160 (24.7%)	1 (0.2%)
LNU	4343	4328	899 (20.8%)	2545 (58.8%)	3444 (79.6%)	884 (20.4%)	15 (0.3%)
NICU	6772	6742	2100 (31.1%)	3296 (48.9%)	5396 (80%)	1346 (20%)	30 (0.4%)
National	11,764	11,718	3,115 (26.6%)	6,213 (53%)	9,328 (79.6%)	2,390 (20.4%)	46 (0.4%)

Summary of findings

- The overall proportion of babies receiving breastmilk feeding at 14 days of life is 79.6% (9,328 of 11,718). In 2022, the proportion for England and Wales was 79% indicating some modest improvement in promoting maternal milk use for premature babies.
- Across neonatal networks, proportions range from 70.4% (Northern ODN) to 90.3% (London ODN – North West) (Figure 43). Notably the difference in use of breastmilk at day 14 is much less marked than the difference on day 1 or 2.
- Among neonatal units with thirteen or more eligible babies, proportions range from 15.4% to 100%.
- Achievement is slightly higher in NICUs (80% - 5, 396 of 6,742) and LNUs (79.6% - 3,444 of 4,328), than SCUs (75.3% - 488 of 648) (Table 27).

4.3 Breastmilk feeding at discharge home

Does a baby born at less than 34 weeks gestational age receive any of their own mother's milk at discharge to home from a neonatal unit?

For babies to benefit from both early risk modification (e.g. reduction in NEC) and long term benefits of breastmilk, mothers of very preterm babies have to be successful in establishing expression, and to sustain this expression and intent to breastmilk feed over a long period. This measure of the prevalence of any breastmilk feeding at discharge home assesses establishment of expression and its continuation to such a point where a baby can be discharged breastmilk feeding.

For 2022 reporting of breastmilk feeding at discharge home, the upper gestational age limit was increased to include babies born at 32 and 33 weeks gestational age. This change was made to increase the relevance and utility of this measure for units caring for fewer babies born at lower gestational ages, and to align with the MatNeoSIP measurement strategy in England. Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Results

Figure 45: Breastmilk feeding at discharge home, by NNAP reporting year (2013 to 2023).

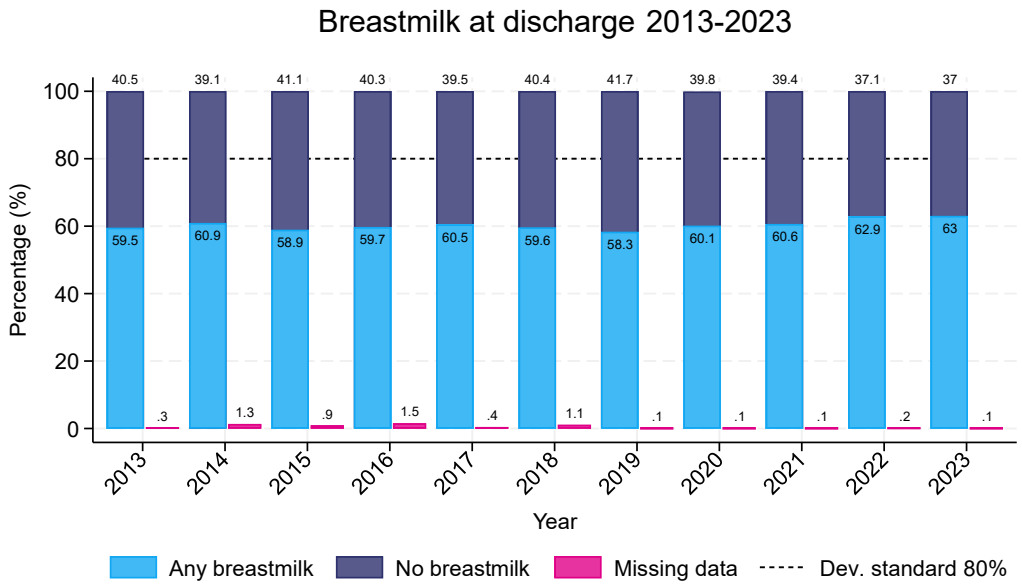


Figure 46: Caterpillar plot of any breastmilk feeding at discharge home, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

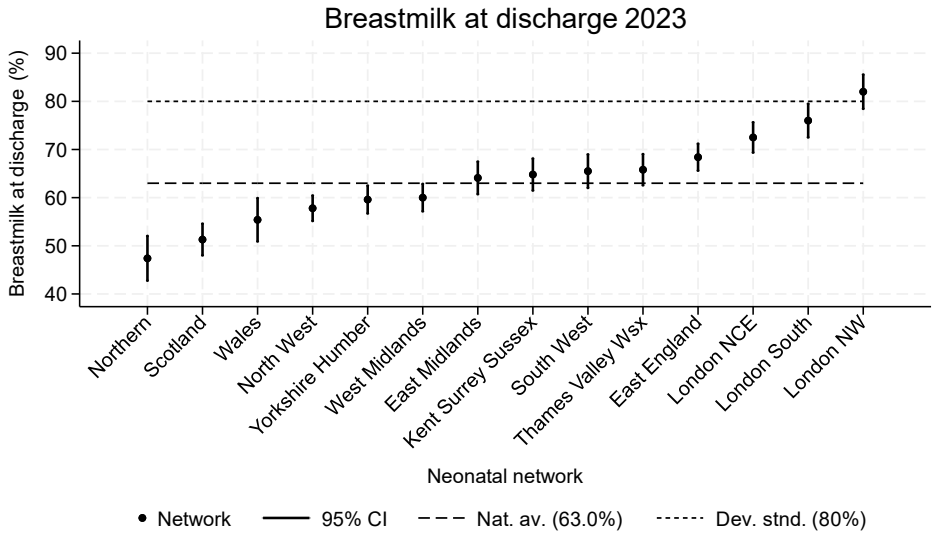


Figure 47: Caterpillar plot of exclusive maternal breastmilk feeding at discharge home, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot.

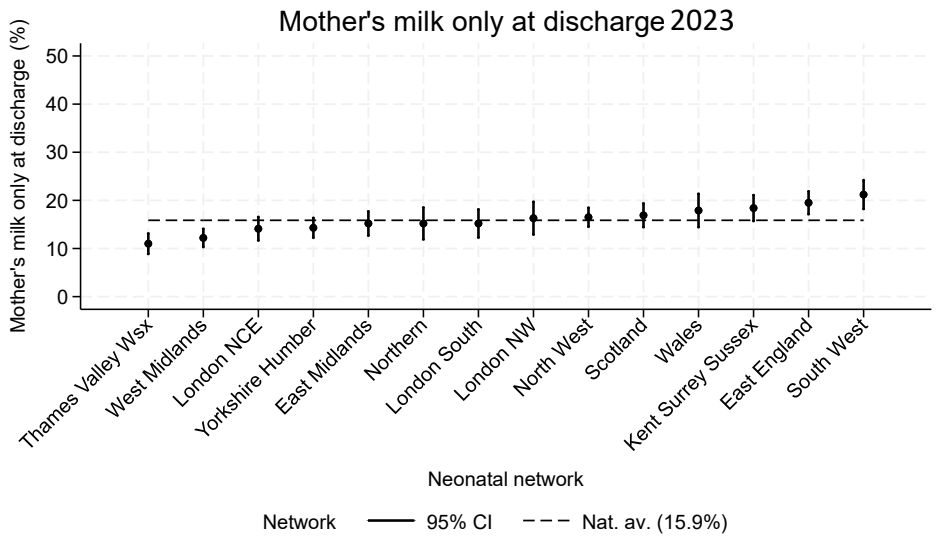


Figure 48: Caterpillar plot of any proportions of breastmilk feeding at discharge home, by neonatal unit.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online. Units with < 3 eligible babies with an outcome are not included.

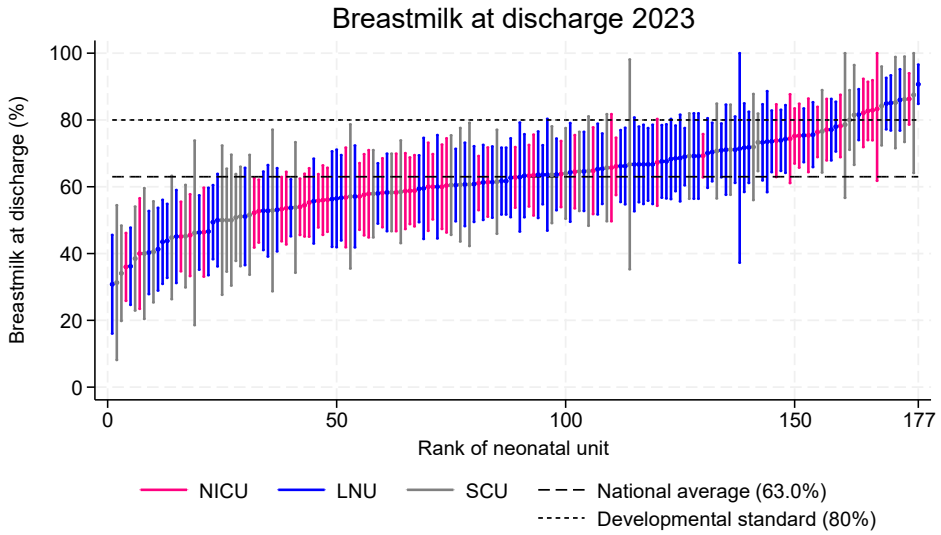


Figure 49: Caterpillar plot of exclusive maternal breastmilk feeding at discharge home, by neonatal unit.

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Units with < 3 eligible babies with an outcome are not included.

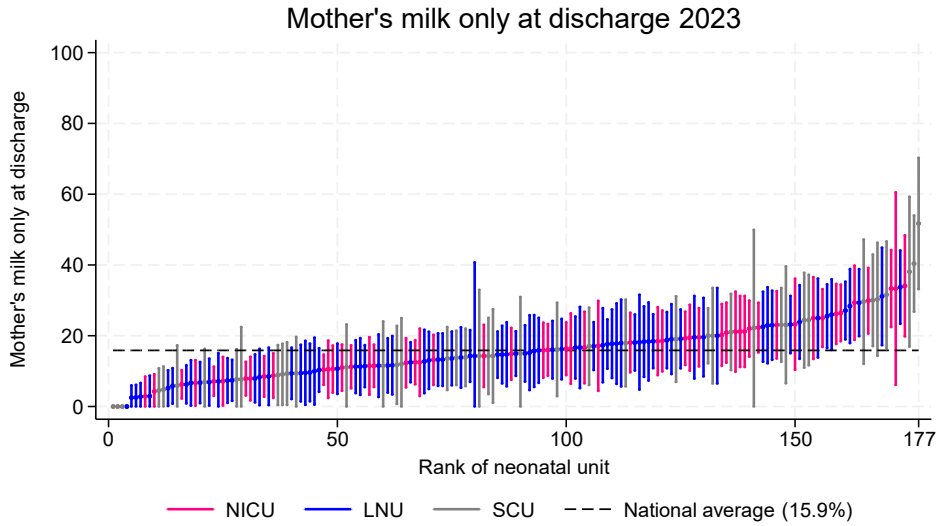


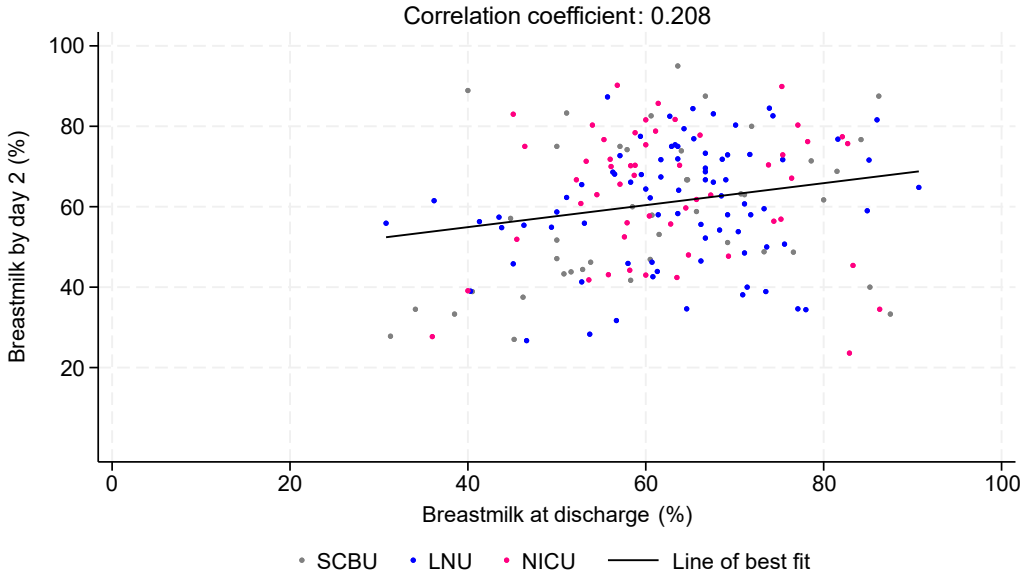
Table 28: Feeding at discharge home, by neonatal network.

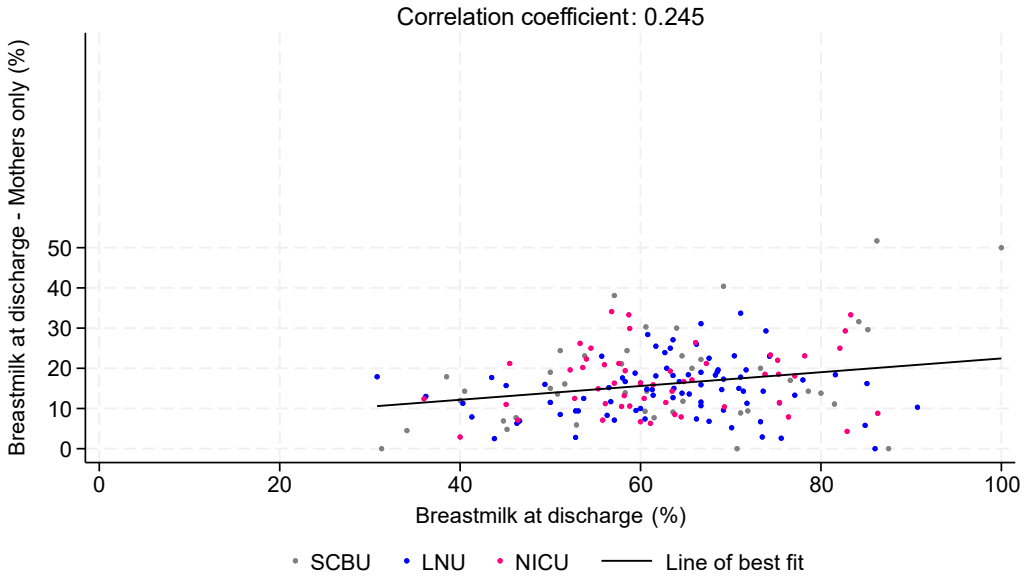
Provider ODN	Eligible babies	With outcome	Mothers milk only (%)	Mixed feeding (%)	Any mothers milk (%)	Other (%)	Missing (%)
East Midlands ODN	805	805	122 (15.2%)	394 (48.9%)	516 (64.1%)	289 (35.9%)	0 (0%)
East of England Perinatal ODN	1103	1103	215 (19.5%)	539 (48.9%)	754 (68.4%)	349 (31.6%)	0 (0%)
Kent, Surrey, Sussex ODN	826	826	152 (18.4%)	383 (46.4%)	535 (64.8%)	291 (35.2%)	0 (0%)
London ODN - North C & E	806	803	113 (14.1%)	469 (58.4%)	582 (72.5%)	221 (27.5%)	3 (0.4%)
London ODN - North West	467	467	76 (16.3%)	307 (65.7%)	383 (82%)	84 (18%)	0 (0%)
London ODN - South	598	597	91 (15.2%)	363 (60.8%)	454 (76%)	143 (24%)	1 (0.2%)
North West ODN	1392	1392	229 (16.5%)	575 (41.3%)	804 (57.8%)	588 (42.2%)	0 (0%)
Northern ODN	462	462	70 (15.2%)	149 (32.3%)	219 (47.4%)	243 (52.6%)	0 (0%)
Scotland	925	917	155 (16.9%)	315 (34.4%)	470 (51.3%)	447 (48.7%)	8 (0.9%)
South West ODN	744	744	158 (21.2%)	329 (44.2%)	487 (65.5%)	257 (34.5%)	0 (0%)
Thames Valley & Wessex ODN	855	855	94 (11%)	469 (54.9%)	563 (65.8%)	292 (34.2%)	0 (0%)
Wales	487	487	87 (17.9%)	183 (37.6%)	270 (55.4%)	217 (44.6%)	0 (0%)
West Midlands ODN	1185	1184	144 (12.2%)	566 (47.8%)	710 (60%)	474 (40%)	1 (0.1%)
Yorkshire & Humber ODN	1152	1152	165 (14.3%)	522 (45.3%)	687 (59.6%)	465 (40.4%)	0 (0%)
National	11,814	11,801	1,872 (15.9%)	5,567 (47.2%)	7,439 (63%)	4,362 (37%)	13 (0.1%)

Table 29: Feeding at discharge home, by neonatal unit level.

Unit level	Eligible babies	With outcome	Mothers milk only (%)	Mixed feeding (%)	Any mothers milk (%)	Other (%)	Missing (%)
SCU	1642	1636	286 (17.5%)	722 (44.1%)	1008 (61.6%)	628 (38.5%)	6 (0%)
LNU	5699	5697	859 (15.1%)	2799 (49.1%)	3658 (64.2%)	2039 (35.8%)	2 (0%)
NICU	4473	4468	727 (16.3%)	2046 (45.8%)	2773 (62.1%)	1695 (37.9%)	5 (0.1%)
National	11,814	11,801	1,872 (15.9%)	5,567 (47.2%)	7,439 (63%)	4,362 (37%)	13 (0.1%)

Figure 50: The proportion of babies receiving any breastmilk by day 2 compared to the proportion receiving any breastmilk at discharge and the proportion of babies receiving **mothers' milk at discharge** compared to the proportion receiving any breastmilk at discharge, by neonatal unit.





Summary of findings

- The overall proportion of babies receiving breastmilk feeding at discharge home is 63% (7,439 of 11,801). In 2022, the proportion was 62.9%.
- Across neonatal networks, proportions range from 47.4% (Northern ODN) to 82% (London ODN – North West). London ODN – North West was the only network achieving the NNAP developmental standard of 80% (Figure 46). In 2022, the range

was 48.6% (Northern ODN) to 79.3% (London ODN – South). The differences between networks in proportions of breastmilk feeding are comparable, but much larger in scale, at discharge compared to at day 14. It may be that small differences in proportions of feeding at day 14 become amplified by the interplay between family, professional and cultural influences, resulting in the much wider range of the proportion of babies fed at least some maternal breastmilk by the time of discharge.

- Achievement is marginally higher in LNUs (64.2% - 3,658 of 5,697), than SCUs (61.5% - 1,004 of 1,632) and NICUs (62.1% - 2,773 of 4,468) (Table 29).

- There is very little relationship between the proportion of babies receiving breastmilk on the first or second day of life in a unit and the proportion of babies fed at least some maternal milk on discharge (Figure 49). This shows that early breastmilk expression and use is only one among the factors that need to be optimised in order to maximise the proportion of preterm infants fed breastmilk at discharge.

- The proportion of babies fed exclusively maternal breastmilk at discharge is 15.9% - significantly lower than the proportion of babies fed any maternal milk (63%) reflecting that formula supplementation of preterm babies by the time of discharge is common (Table 28).

- At unit level (Figure 49) there is considerable variation in the proportion of babies discharged on exclusive maternal breastmilk feeding. Only a very poor correlation exists between the proportion of babies discharged on exclusive and non-exclusive maternal milk feeding – some units with low rates of non-exclusive breastmilk feeding have high rates of exclusive breastmilk feeding, and correspondingly some units with low rates of non-exclusive breastmilk feeding have relatively high rates of exclusive breastmilk feeding.

- There is a striking discrepancy between networks with high proportions of 'any maternal milk' and those with high proportions of exclusive maternal milk feeding (Table 28). This means that networks with high rates of any breastmilk feeding are not much, if at all, more successful in establishing babies on exclusive breastmilk feeding than networks where breastmilk use at discharge is lower. This is important given that exclusive breastmilk feeding at discharge is commonly the aim for families and is more likely than mixed feeding to result in long term exclusive breastfeeding.

4.4 Breastmilk feeding through the neonatal admission

These plots describe the number of very preterm babies receiving their mother's milk as inpatients. The plots show the number of babies (on the vertical axis) who were fed with breastmilk, and alternatives, for each day of life (on the horizontal axis). The timing of discharge is denoted by a solid black curved line separating the green colour segments. The purpose of these plots is to illustrate how practice varies between ODNs and units, and to stimulate focussed quality improvement activity. An example plot is given in Figure 51 based on the feeding journey from admission to day 90 in a unit with 100 babies and achieving the NNAP developmental standard of 80% of babies receiving any of their mother's own milk at discharge home from the neonatal unit.

Figure 51. Breastmilk feeding from admission to day 90, example neonatal unit plot

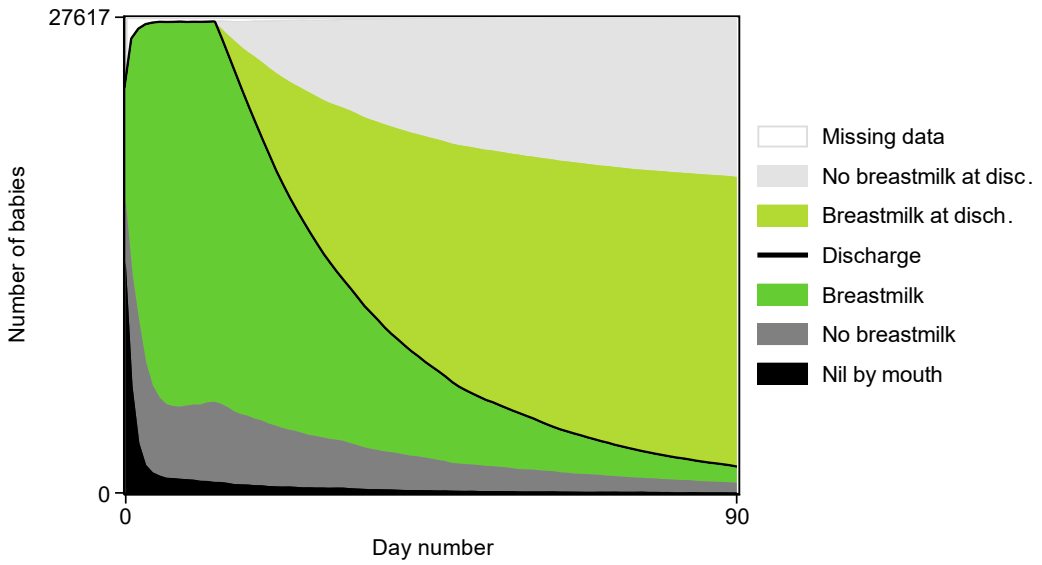
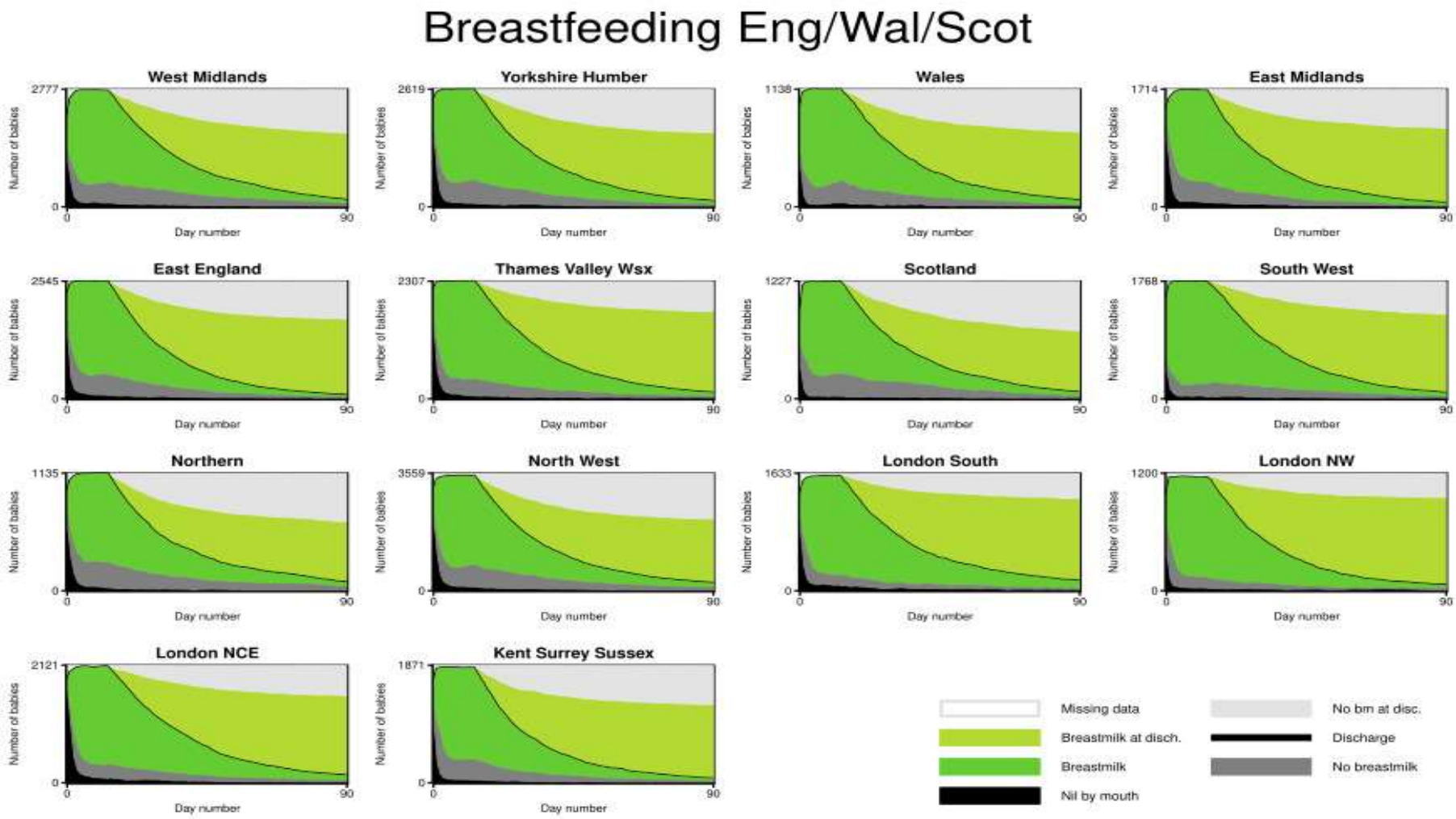


Figure 51 shows examples of plots which describe rates of maternal milk feeding for very preterm babies as inpatients, and how they vary by network. Unit plots are available on NNAP Online.

Figure 52. Breastmilk feeding proportions from admission to day 90, by neonatal network (2023).



4.5 Parental consultation within 24 hours of admission

Is there a documented consultation with parents by a senior member of the neonatal team within 24 hours of a baby's admission?*[26,27,28]

**Consultant or middle grade doctor, or a nurse practitioner acting in such a role.*

It is important that neonatal teams explain to parents the care provided to babies admitted to neonatal unit. If families are well informed, they will be more able to be fully involved in decision making for their baby. This first consultation provides an opportunity for the senior staff member to meet the parents, listen to their concerns, explain how their baby is being cared for and respond to any questions. This measure of care looks at whether parents have had a consultation with a senior member of the neonatal team within the first 24 hours of their baby being admitted. It applies for all babies who require care on a neonatal unit. A consultation should take place within 24 hours of admission for every baby, for every admission.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

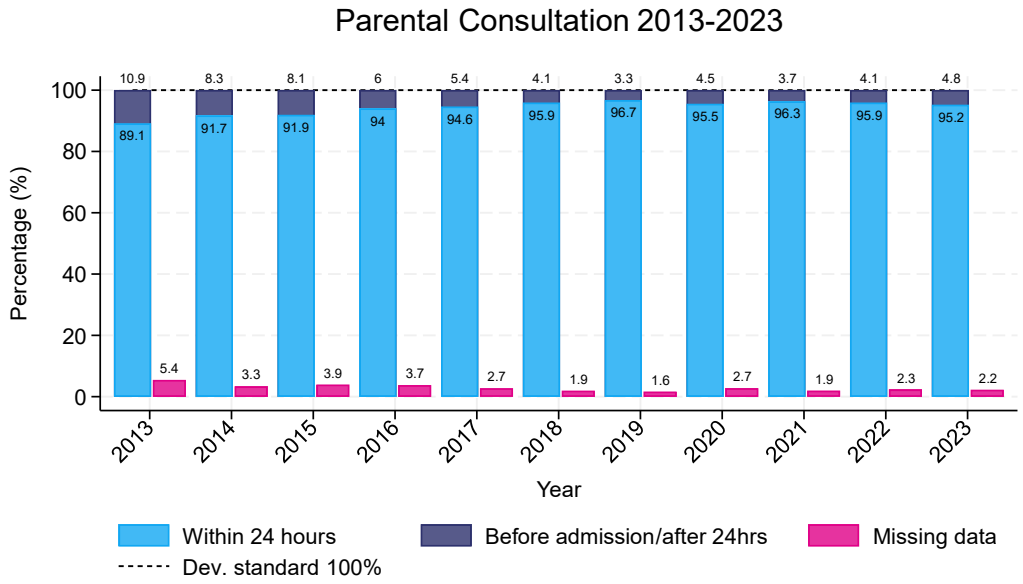
[26] Scottish Government. *Neonatal Care in Scotland: A Quality Framework*. 2013. Available from http://www.gov.scot/Resource/0041/00415230.pdf.

[27] Welsh Health Specialised Services Committee, NHS Wales. *All Wales Neonatal Standards - 2nd Edition*. 2013. Available from http://www.wales.nhs.uk/document/219405.

[28] Department of Health. *Toolkit for high quality neonatal services*. 2009. Available from https://webarchive.nationalarchives.gov.uk/ukgwa/20100604134939/http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_107845

Results

Figure 53: Time of first consultation, according to the contemporaneous NNAP measurement criteria, by NNAP reporting year (2013 to 2023).



Notes for interpretation:

- *Results for 2013-2016 are recalculated so that missing data is excluded from the denominator (with outcome), therefore results vary from published results. Otherwise, all results use contemporaneous definitions.*
- *Years 2013, 2014, 2020 and 2021 do not include Scotland.*
- *The 2020 data year was the first in which all admissions, rather than just first episodes, were included in this measure.*
- *In 2022, the cohort changed from babies discharged in the calendar year, to babies first admitted in the calendar year.*

Figure 54: Caterpillar plot of the proportions of first consultation within 24 hours of admission, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

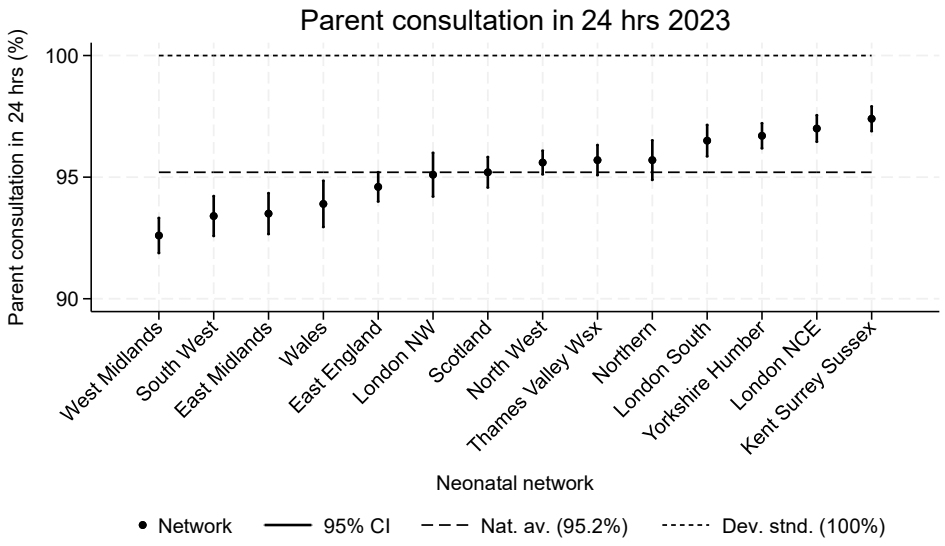


Figure 55. Caterpillar plot of the proportions of first consultation within 24 hours of admission: neonatal units.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.

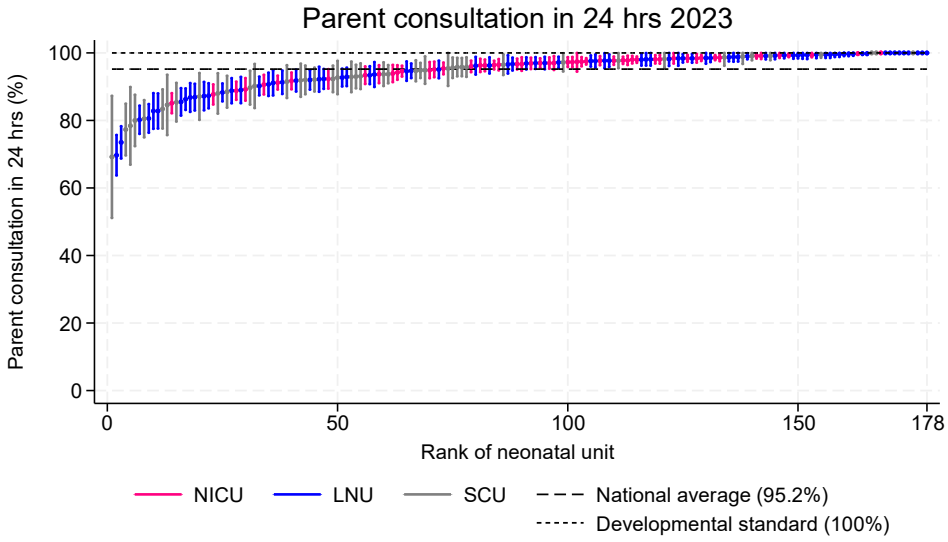


Table 30: First consultation within 24 hours of every admission, by neonatal unit level.

Unit Level	Eligible admissions	With outcome	Within 24 hours	Before admission	After 24 hours	No consultation	Unknown (%)
SCU	6,955	6,713	6,246 (93%)	199	196	72	242 (3.5%)
LNU	23,939	23,530	22,265 (94.6%)	653	384	228	409 (1.7%)
NICU	27,555	26,940	25927 (96.2%)	324	498	191	615 (2.2%)
National	58,449	57,183	54,438 (95.2%)	1,176	1,078	491	1,266 (2.2%)

Summary of findings

- The proportion of admissions where a consultation took place between parents and a senior member of the neonatal team within 24 hours is 95.2% (54,438 of 57,183). The proportion of neonatal admissions where a consultation with parents took place took place within 24 hours of admission has fallen slightly from the proportions recorded in 2021 (96.3%) and 2022 (95.9%) (Figure 53).
- Across neonatal networks, the proportion ranges from 92.6% (West Midlands ODN) to 97.4% (Kent, Surrey, Sussex ODN) (Figure 54).
- Neonatal units range in their achievement of this measure from 69.2% to 100%, with 13 units achieving the NNAP developmental standard of 100% (Figure 55). Overall, 1 in 20 families do not seem to have met a senior clinician within 24 hours of their babies' admission.

4.6 Parental inclusion in consultant ward rounds

What proportion of baby care days had a consultant-led ward round with at least one parent included?

**Consultant ward round refers to any ward round where a consultant is in attendance, at any time of the day.*

Professionals, parents' advocates, and parents agree that including parents in consultant ward rounds supports parental partnership in care. Consultant ward rounds occur regularly (usually daily, or more often) on neonatal units. This measure looks at the proportion of baby care days that had a consultant-led ward round with at least one parent included. Prior to 2022, we focussed on the proportion of admissions where parents were present on a consultant ward round on at least one occasion during a baby's stay.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Results

Figure 56: Caterpillar plot of proportions of baby care days that had a consultant-led ward round with at least one parent included, by neonatal network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online. Confidence intervals in the figure are smaller than other caterpillar plots because the unit of analysis is baby days rather than babies or episodes.

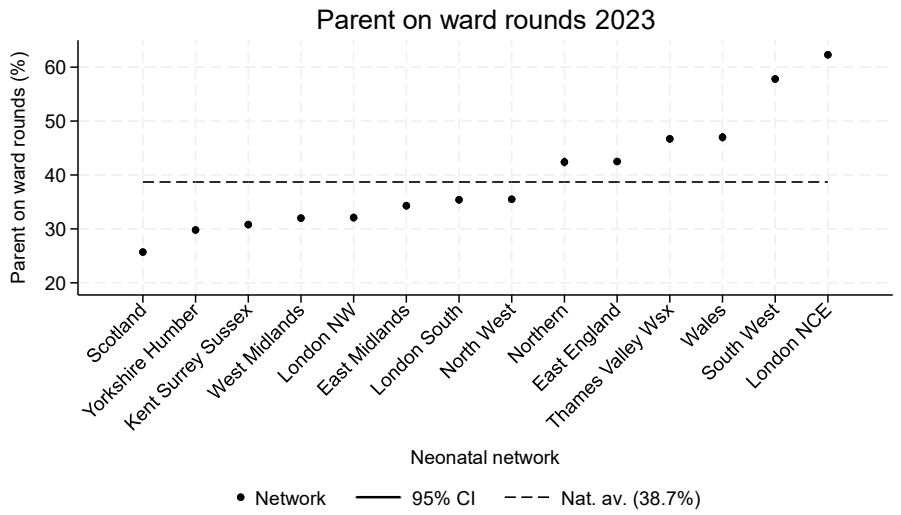


Figure 57: Caterpillar plot of proportions of baby care days that had a consultant-led ward round with at least one parent included, by neonatal unit.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online. Confidence intervals in the figure are smaller than other caterpillar plots because the unit of analysis is baby days rather than babies or episodes.

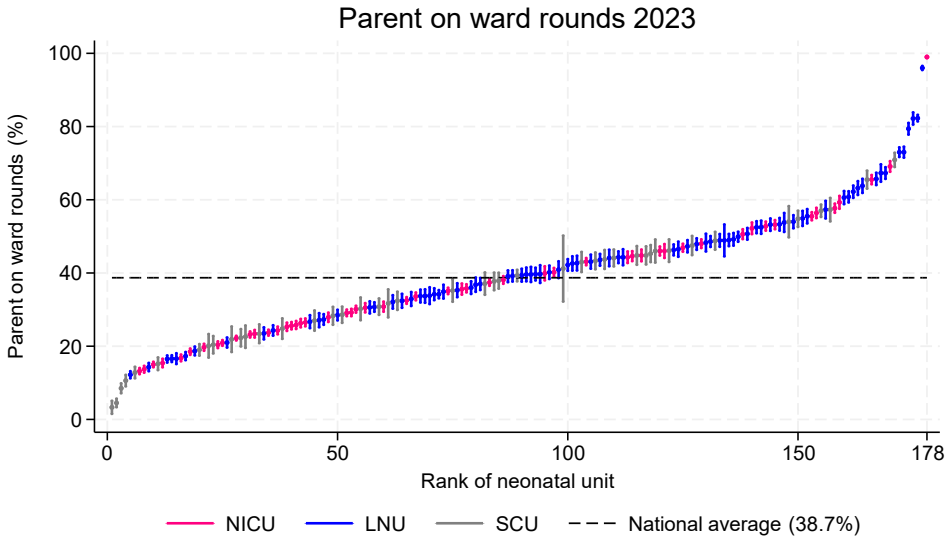


Table 31: Baby care days with at least one parent included on a consultant ward round, by length of stay

Length of stay	Eligible ward rounds	With data entered	Ward rounds		Missing data (%)
			Ward rounds with no parent included	Ward rounds with a parent included (%)	
≤7	53010	47956	23611	24345 (50.8%)	5054 (9.5%)
8-14	95013	85022	47023	37999 (44.7%)	9991 (10.5%)
15-21	94365	84594	51183	33411 (39.5%)	9771 (10.4%)
22-28	84042	74919	46881	28038 (37.4%)	9123 (10.9%)
>28 days	449803	391226	250195	141031 (36%)	58577 (13%)
National	776,233	683,717	418,893	264,824 (38.7%)	92,516 (11.9%)

Table 32: Baby care days with at least one parent included on a consultant ward round, by neonatal unit level

Unit level	Eligible ward rounds	With data entered	Ward rounds		Missing data (%)
			Parent not included	Ward rounds with a parent included (%)	
SCU	67,234	61,667	39,127	22,540 (36.6%)	5567 (8.3%)
LNU	281,042	257422	145,056	112,366 (43.7%)	23620 (8.4%)
NICU	427,957	364,628	234,710	129,918 (35.6%)	63329 (14.8%)
National	776,233	683,717	418,893	264,824 (38.7%)	9,2516 (11.9%)

Summary of findings

- NNAP reporting of parental inclusion in consultant ward rounds reports the proportion of baby care days where a parent was included on the consultant ward round.
- Data was missing for 92,516 (11.9%) baby care days (Table 31) a significant improvement from 2022 where data was missing for 198,121 (23.2%) baby care days.
- In 2023 parents were included in ward rounds on 264,824 days of a possible 683,717 days (38.7%). The denominator for this measure has expanded this year and now includes days on which a ward round did not occur. In 2022 we reported figures relating solely to days on which a ward round occurred with parents included on 269,706 days of a possible 571,415 days (47.2%).
- This measure of parental partnership in care is the single NNAP measure in which most variation is observed. Network adherence varies from 26.5 to 68.6% of baby care days in which a parent was included in a consultant ward round. Unit level adherence varies still more strikingly, from 3.3% to 99%.
- NNAP considers that there may be differential interpretation or implementation of this measure in neonatal units, potentially diminishing its value as a direct quality measure. However, the existing measure to some extent likely reflects both varying enthusiasm for, and success in delivery of, parental inclusion in consultant ward rounds.
- The proportion of baby care days where parents were involved in ward rounds is higher for shorter durations of stay. Early in a neonatal stay, more – and more significant - clinical decisions and diagnoses are made and parents may therefore be more likely to involve themselves in ward round care planning.

4.7 Key messages, recommendations and actions for improvement from the NNAP State of the Nation Report on 2023 data

- There has been a rise in the proportion of babies less than 34 weeks' gestation who received at least some maternal breastmilk within the first two days of life from 49% in 2022 to 62% in 2023. This may reflect increased recording of small amounts of milk administered to babies as 'mouth care'. However, a temporal change can be seen in data collected since 2021, meaning that this factor does not explain all the observed change. There remains a large variation by region (41.4% - 78.3%) in the proportion of babies receiving breastmilk within 2 days of life. This may reflect differences in clinical preference or the availability of breastmilk. Striking regional variation in rates of breastmilk feeding later on in babies' stays and at discharge remains evident.
- The proportion of babies receiving breastmilk feeding at 14 days of life (79.6% - 9,328 of 11,718) shows some modest improvement in promoting maternal milk use for premature babies. There has been no change in the proportion of babies receiving breastmilk feeding at discharge home (2023 – 63%, 2022 – 62.9%).
- For more than one neonatal unit admission in twenty, there is no record of parents being seen by a senior member of staff with 24 hours. This poor adherence represents a small decline (0.3%) since this measure was last subject to outlier identification in 2020. This highlights the known challenges in maintaining improved quality and further suggests that outlier identification may support efforts to maintain adherence, which has implications for this audit and perinatal quality improvement generally.
- 38.7% of baby care days had a consultant-led ward round with at least one parent included (264,824 days of a possible 683,717 days). There is wide variation in the proportion of consultant ward rounds with parental involvement. Adherence at neonatal network level ranged from 26.5% to 68.6% and even more strikingly unit level adherence ranged from 3.3% to 99%. There may however be differential interpretation or implementation of this measure in neonatal units.

In addition to previous recommendations, The NNAP makes the following national recommendation:

5. Neonatal Networks should work with their constituent units and encourage them to use the monthly data available in the NNAP restricted access dashboard to identify

cases where optimal parental partnership in care did not occur. These data will support neonatal units to enhance their delivery of family centred care.

Actions for local quality improvement

- Neonatal units and neonatal networks with low rates of breastmilk feeding (within 2 days, at 14 days and at discharge), should:
    - Ensure they have a dedicated neonatal unit-based lead for infant feeding
    - Ensure that there is immediate availability of high-quality breast pumps in all neonatal settings.

- Neonatal units and neonatal networks with low rates of breastmilk feeding (within 2 days, at 14 days and at discharge), should identify opportunities to improve, and use existing quality improvement programmes and resources to support their improvement work, such as:
    - The UNICEF UK Baby Friendly Initiative
    - BAPM toolkits and resources:
        - Optimising Early Maternal Breast Milk for Preterm Infants: A QI Toolkit
        - Optimising Maternal Breastmilk for Preterm Infants Part 2 – To discharge and beyond: A QI Toolkit
        - Perinatal Optimisation Passports
    - Bliss resources:
        - Information for parents about feeding and related aspects of neonatal care
        - Emotional and practical support from Bliss
        - Bliss Baby Charter
    - West of England Academic Health Sciences Network, Perinatal Excellence to Reduce Injury in Premature Birth (PERIPrem)
    - PERIPrem Cymru
    - The Scottish Patient Safety Programme (SPSP) Maternity and Children Quality Improvement Collaborative (MCQIC) Preterm Perinatal Wellbeing Package
    - UK Neonatal Partnership Board report - National Reviews of Maternity and Neonatal Care: Supporting the perinatal team to implement recommendations.

- Neonatal units with low rates of breastmilk feeding at discharge should consider developing quality improvement projects involving the multidisciplinary care team and informed by the perspectives of parents with diverse neonatal experiences, to

ensure high quality support before and at the time of discharge for the continuation of breastmilk feeding after discharge.

- Neonatal units and neonatal networks with low proportions of parent involvement in ward rounds and with high proportions of missing data, should address their data incompleteness, and seek to engage in activities to improve their parent partnership in care, such as:
    - Co-designing quality improvement activities and projects with parents with both diverse backgrounds and experiences of neonatal care, and actively seek feedback to understand the barriers to involvement in consultant ward rounds and other aspects of their baby's care.
    - Seeking to learn from other units and networks who have successfully implemented family integrated and centred care within their services.
    - Using quality improvement methodologies and programmes to support their work, such as:
        - BAPM, Family Integrated Care: A Framework for Practice
        - Bliss resources:
            - Information for parents about feeding and related aspects of neonatal care
            - Emotional and practical support from Bliss
            - Bliss Baby Charter
            - Training and learning to support family integrated care and partnership
        - FiCare – The Family Integrated Care model

6. Neonatal nurse staffing

6.1 Nurse staffing on neonatal units

What proportion of nursing shifts are numerically staffed according to guidelines and service specification? [29,30,31]

Recommended nurse staffing levels are defined in the Neonatal Critical Care Service Specification, Toolkit for High Quality Neonatal Services[30] and the BAPM Service Standards for Hospitals Providing Neonatal Care[31] according to the level of care being provided. The NNAP looks at the total nurses required per shift and reports the proportion of shifts with sufficient nurses to meet the requirements of the Service Specification and Standards.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

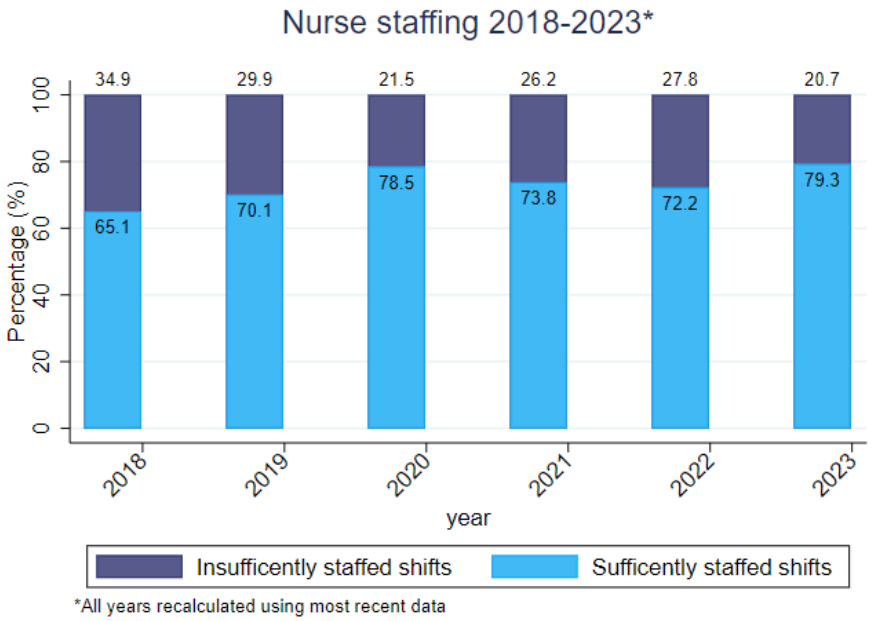
[29] NHS England. *Neonatal Critical Care Service Specification*. 2016. Available from https://www.england.nhs.uk/commissioning/spec-services/npc-crg/group-e/e08/.

[30] Department of Health. *Toolkit for high quality neonatal services*. 2009. Available from https://webarchive.nationalarchives.gov.uk/ukgwa/20100604134939/http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_107845

[31] British Association of Perinatal Medicine. *Service Standards for Hospitals Providing Neonatal Care (3rd edition)*. 2010. Available at: https://www.bapm.org/resources/32-service-standards-for-hospitals-providing-neonatal-care-3rd-edition-2010

Results

Figure 58: Proportion nurse shift sufficiently staffed, according to the contemporaneous NNAP measurement criteria, by NNAP reporting year 2018-2023



Notes for interpretation:

- *Years 2020 and 2021 do not include Scotland.*

Figure 59: Proportion of nurse shifts sufficiently staffed, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online. Confidence intervals in the figure are smaller than other caterpillar plots because the unit of analysis is nursing shifts rather than babies or episodes.

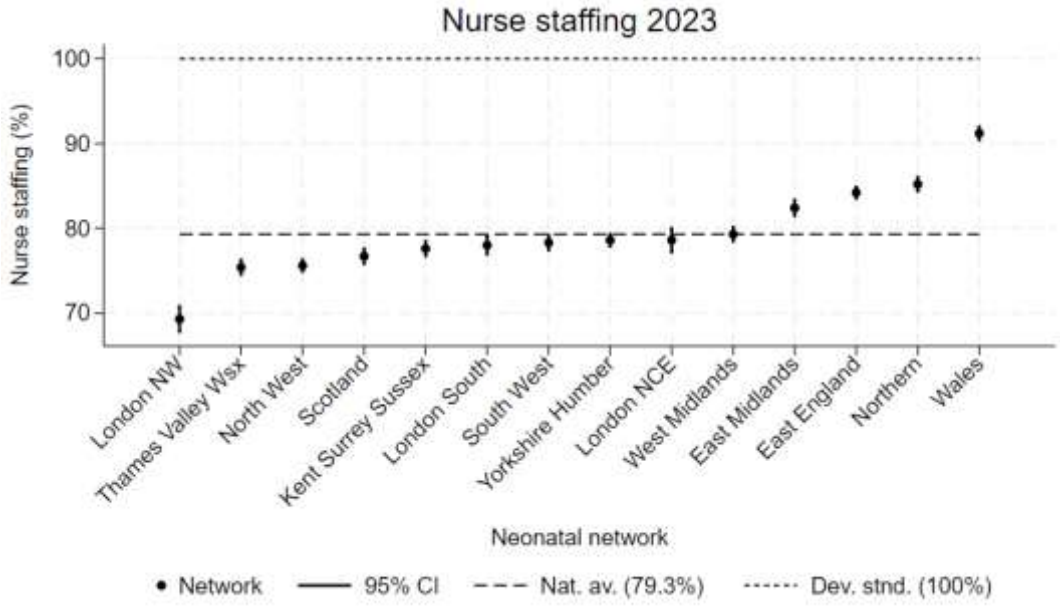


Figure 60: Proportion of nurse shifts sufficiently staffed, by neonatal unit

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online. Confidence intervals in the figure are smaller than other caterpillar plots because the unit of analysis is nursing shifts rather than babies or episodes.

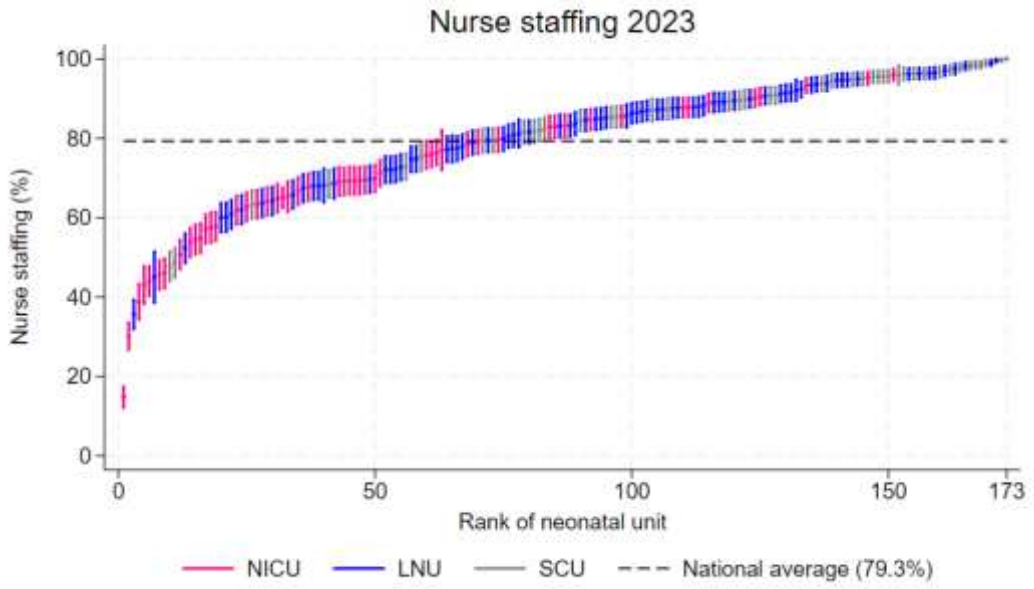


Figure 61: Adherence to recommended nurse staffing levels. Neonatal units in 2023.

The number of nurse shifts required to deliver adequate staffing according to the guidelines for all 2023 shifts, based on the babies present on each shift, is shown on the horizontal axis as "unit annual workload". For example, a unit that required four nurses to care for its babies for every one of its 730 shifts had an annual workload of 4 x 730 = 2920. The vertical axis shows the proportion of these nurse shifts reported to be staffed according to guidelines.

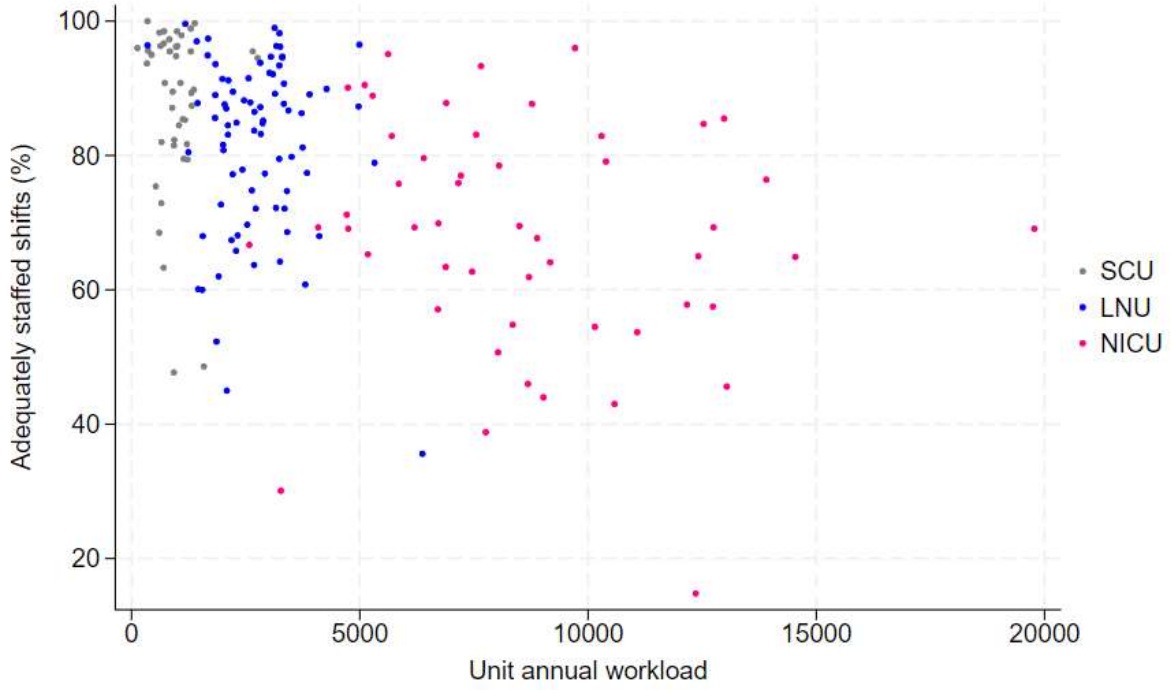


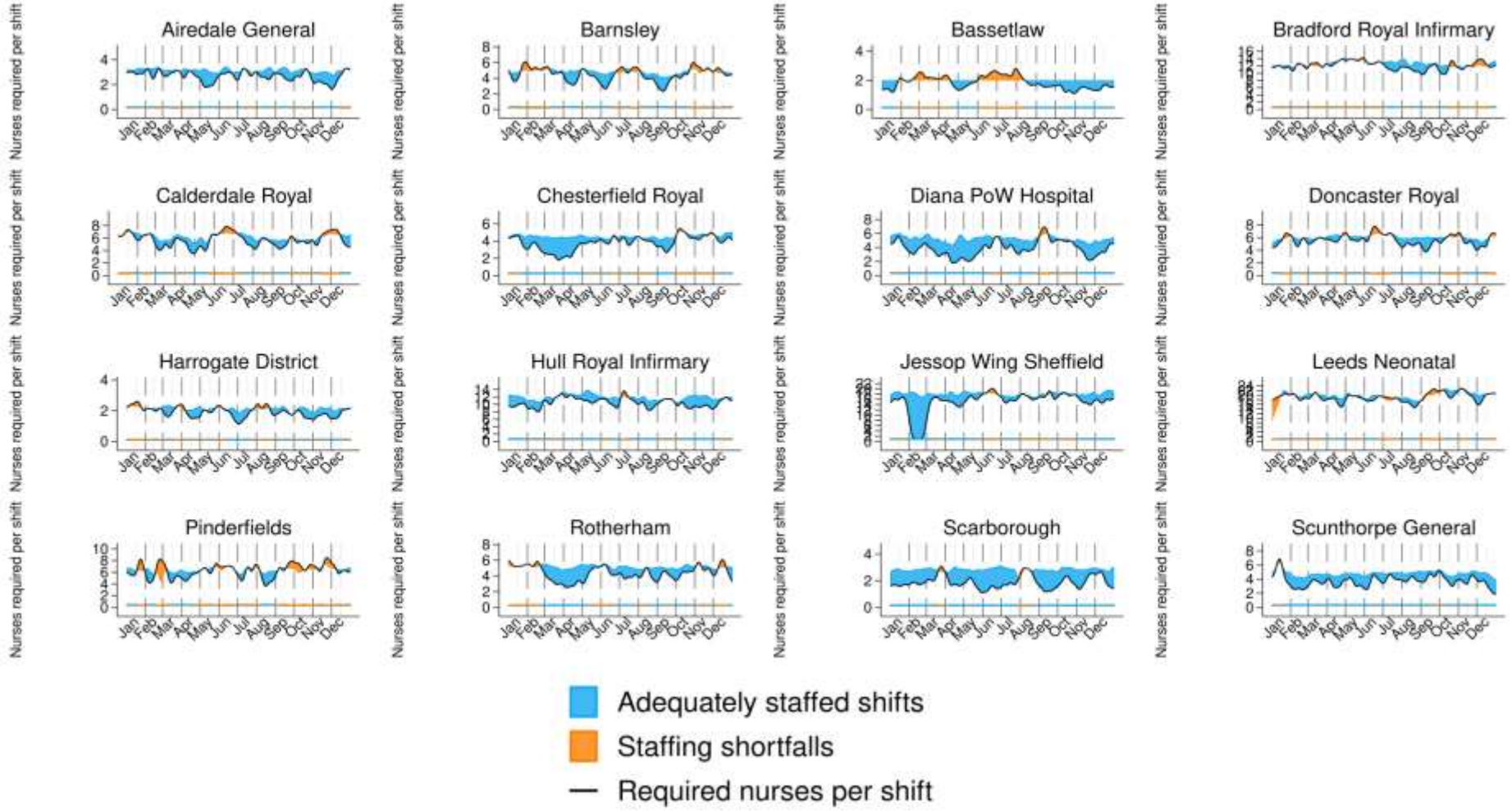
Table 33: Proportion of nurse shifts sufficiently staffed, by neonatal unit level.

Unit level	Total eligible shifts	Sufficiently staffed shifts
SCU	29,672	25,977 (87.5%)
LNU	54,937	45,044 (82%)
NNU	36,337	24,872 (68.4%)
National	120,946	95,893 (79.3%)

Figure 62. Nurse staffing summaries by month, Yorkshire & Humber Network (example)

Figure 62 is an example of nurse staffing summary plots designed to make this data useful to Trusts/Health Boards and Neonatal Networks. The horizontal axis show time in months for the year of interest. The vertical axis indicates the number of nurses. The solid black line represents the number of nurses that would be needed to care for the babies present in the unit, with some smoothing. The blue shading describes nurse surplus to minimum requirement, and the orange shading shows where there is a staffing shortfall. These plots are available for all neonatal units on NNAP Online. minimum requirement, and the orange shading shows where there is a staffing shortfall. These plots are available for all neonatal units on NNAP Online.

Yorkshire Humber



Summary of findings

- The proportion of neonatal nurse shifts staffed according to recommended levels in 2023 is 79.3%, an improvement from last year (2022 – 71.1%). It is important to note however that the measure has been updated this year to account for associate nurses in the calculation. Separate data entry for associate nurses was recently facilitated in the BadgerNet system, and not revised in our measure code, which meant that associate nurses were not previously included in the nurse staffing figures for the NNAP. This revised measurement has already been enacted on the NNAP dashboards. The revision is known to affect some neonatal units more than others.

- This evidently explains a small proportion of the uplift in the percentage of shifts staffed according to recommendations. The NNAP believe it likely that a much larger share of the improvement in nurse staffing seen reflects the increased investment in nursing posts as a result of the Neonatal Critical Care Review[32] . Among networks, the proportion of shifts staffed according to recommended levels ranges from 68.1% (London ODN - North West) to 91% (Wales) (Figure 59). Neonatal unit staffing levels range from 14.5% to 99.7% (Figure 60).

- Levels of nurse staffing are higher in SCUs at 87.1% (25,834 of 29,672), compared to LNUs – 80.1% (44,015 of 54,937), and NICUs – 66.5% (24,157 of 36,337) (Table 33). To some extent this is explained by the structure of smaller units who need fewer staff on each shift (Figure 60). Such units need to have some staff capacity to be able to manage sudden increases in workload. In contrast, larger units may appear to have too few staff if only a small relative proportional deficit exists on any given shift. Therefore, it is expected that smaller units more commonly staff their units with sufficient staff to match recommendations. The nurse staffing summaries by month should help contextualise staffing for planning purposes (see example Figure 62).

- NNAP remain cognisant that there is a widely held perception that there are insufficient nurses working in neonatal care who have the relevant professional qualification but is not able to measure this proportion at present.

- It is notable that units of all sizes and levels experience very good, and very concerning, levels of staffing (Figure 60). This variation should be addressed as a

[32] NHS England and NHS Improvement. Implementing the Recommendations of the Neonatal Critical Care Transformation Review. Available online at the following address: https://www.england.nhs.uk/wp-content/uploads/2019/12/Implementing-the-Recommendations-of-the-Neonatal-Critical-Care-Transformation-Review-FINAL.pdf

matter of urgency, given the association between neonatal nurse staffing and mortality in neonatal care.

6.2 Key messages, recommendations and actions for improvement from the NNAP State of Nation Report on 2023 data

- The proportion of neonatal nurse shifts staffed according to recommended levels in 2023 is 79.3% (95,893 of 120,946), an improvement from last year (2022 – 71.1%). This increase in the proportion of appropriately staffed shifts is encouraging and likely reflects increased funding for nurses specified by Implementing the Recommendations of the Neonatal Critical Care Transformation Review (NCCR).

Useful resources

- Case study: *Using the NNAP measure for neonatal nurse staffing to support benchmarking, oversight of safe staffing and quality improvement across the Herts and West Essex Local Maternity and Neonatal System*.

7. Care processes

7.1 On-time screening for retinopathy of prematurity (ROP)

Does a baby born at less than 31 weeks gestational age, or weighing less than 1501g at birth undergo the first ROP screening according to the guideline?[33]

Retinopathy of prematurity (ROP) is a complication of prematurity which is largely treatable. If left undetected and untreated, severe disease can result in visual impairment. Babies at risk of developing severe ROP should be screened according to the UK screening of retinopathy of prematurity guideline.[34][33]

Prior to 2022, the NNAP reported against the previous guideline, and described screening within an extended window of a week either side of the then target week as adherent.

The updated guideline was published by the RCPCH in March 2022, and the NNAP measure was updated in line with the guideline. The NNAP now reports whether the time of first examination recommendation is met:

- For infants born before 31+0 weeks' GA, the first ROP examination should be performed between 31+0 and 31+6 weeks' postmenstrual age (PMA), or at 4 completed weeks' postnatal age (PNA) (28 – 34 days), whichever is later.
- For infants born from 31+0 weeks' GA, the first ROP examination should be performed at 36 weeks' PMA or 4 completed weeks' PNA (28 – 34 days), whichever is sooner.

Therefore, it is fully expected that the overall proportion of babies receiving "on time" screening will be reduced in the subsequent years. This is not reflective of a reduction in the quality of care, but both a tightening of the audit criteria and the revised clinical guidance. The audit criterion in the new guideline is that the proportion of babies screened in accordance with the guideline should be reported. Previously, the NNAP had chosen to report adherence to an extended 'window' encompassing a week either side of the then target week.

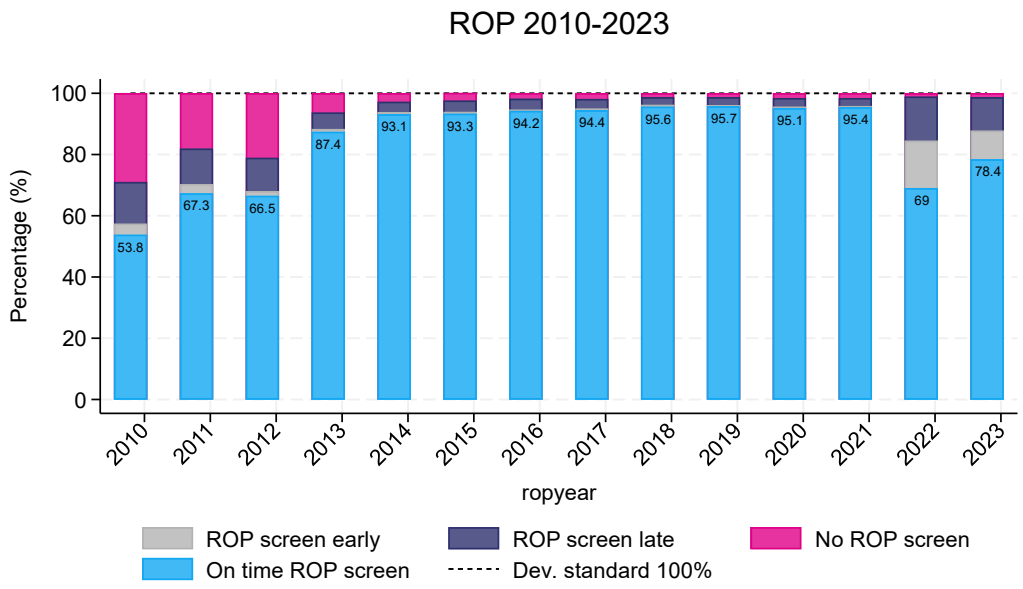
[34] Royal College of Paediatrics and Child Health. UK Screening of Retinopathy of Prematurity Guideline. Available at: https://www.rcpch.ac.uk/resources/screening-retinopathy-prematurity-rop-clinical-guideline

Due to the publication of the new guideline in March 2022, NNAP reporting for 2022 started from 1 April 2022. Significant changes to guideline adherence can be seen on NNAP dashboard, as well as in this report.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Results

Figure 63. Timing of ROP screening, according to the contemporaneous NNAP measurement criteria, by NNAP reporting year (2010-2023).



Notes for interpretation:

- *Years 2013, 2014, 2020 and 2021 do not include Scotland.*
- *In 2010-2012, on time screens after discharge were not counted as adherent, results have been recalculated to include those as adherent, so results will vary from those originally published.*
- *In 2022, the eligible population and the ROP screening window were changed in line with the updated screening guideline, published March 2022. Only babies admitted after 1 April 2022 are included in 2022 reporting.*

Figure 64. Caterpillar plot of the proportions of on-time ROP screening, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

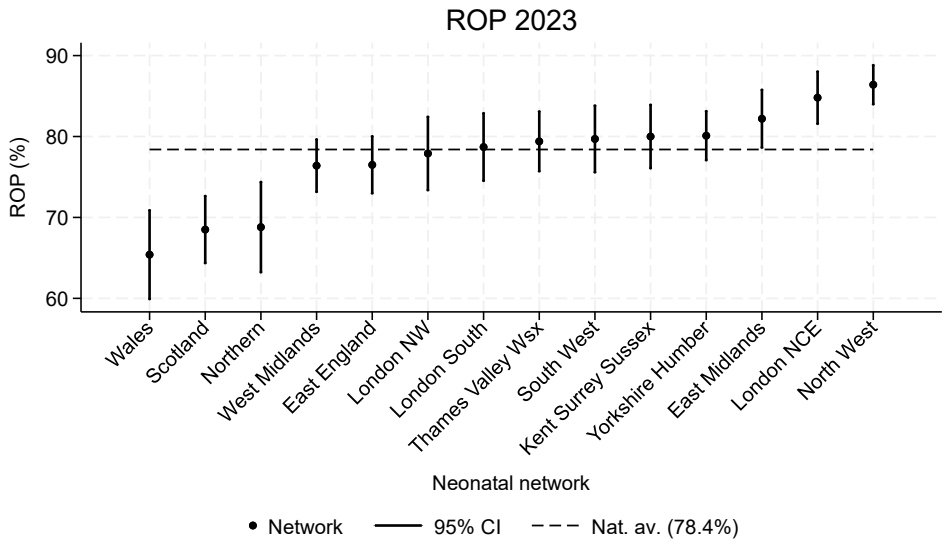


Figure 65. Caterpillar plot of the proportions of on-time ROP screening: neonatal units.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.

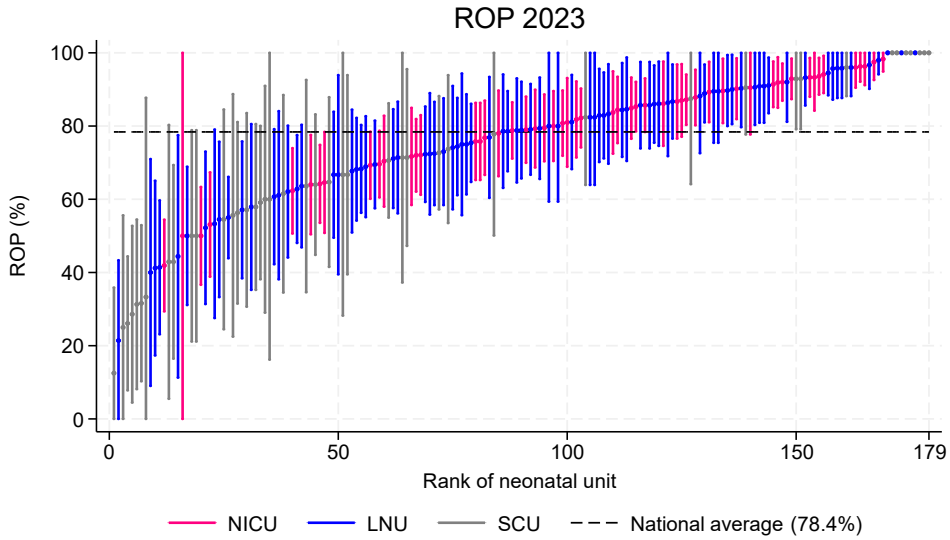


Table 34: Proportions of on-time ROP screening, by neonatal unit level

Unit level	Count	Any screen	Screened on time			Screened early	Screened late	No screen
			Total (%)	During care	After discharge			
SCU	603	581	397 (65.8%)	361	36	79	105	22
LNU	2,637	2611	2,047 (77.6%)	1,921	126	256	308	26
NICU	3,559	3522	2,889 (81.2%)	2,764	125	302	331	37
National	6,799	6,714	5,333 (78.4%)	5,046	287	637	744	85

Summary of findings

- The NNAP reports adherence to the updated UK screening for retinopathy of prematurity guideline. Overall, 78.4% (5,333 of 6,799) of eligible babies are screened according to the guideline. This represents a 9.4% increase from 2022 (69% - 3,509 of 5,083). Adherence to the guideline is higher in NICUs at 81.2% (2,889 of 3,559), compared to LNUs – 77.6% (2,047 of 2,637), and SCUs – 65.8% (396 of 602) (Table 34).
- Network proportions range from 65.4% (Wales) to 86.4% (North West ODN) (Figure 64). Although reduced from the 2022, data variation between neonatal networks in on-time screening persists despite the introduction of new guidance and is a matter of some concern. The variance between networks is extremely unlikely to be attributable to the case mix of patients.
- Across neonatal units, proportions range from 12.5% to 100% (Figure 65).

7.2 Follow-up at two years of age

Does a baby born at less than 30 weeks gestational age receive medical follow-up at two years corrected age (18-30 months gestationally corrected age)?

The NICE guideline on the developmental follow-up of children and young people born preterm[35] recommends that all children born at less than 30 weeks gestational age should receive a developmental assessment at two years (corrected age), with follow up also required at high gestational ages where there are additional risk factors. A developmental assessment is also recommended at four years for babies born before 28 weeks gestation.

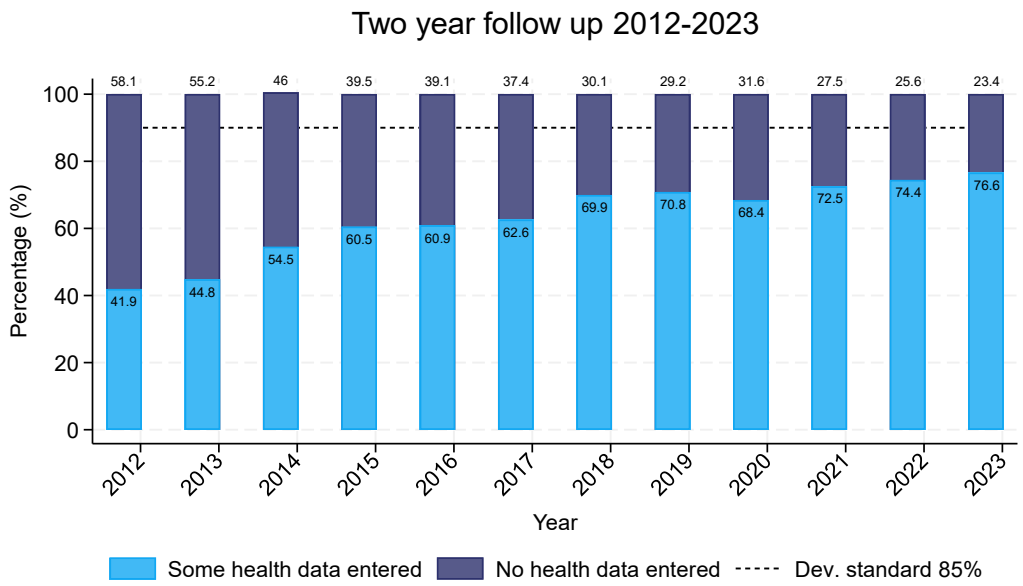
The NNAP measure currently focusses on whether a follow-up developmental assessment took place at two years of age. The long-term intention of the NNAP is to report the outcomes of this assessment, and the NICE guideline recommends the recording of the results of the assessment for audit purposes.

Full details of this measure can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

[35] NICE guideline [NG72]. Developmental follow-up of children and young people born preterm. 2017. Available at: https://www.nice.org.uk/guidance/ng72

Results

Figure 66. Two-year follow-up proportions, according to the contemporaneous NNAP measurement criteria, by NNAP reporting year (2012-2023).



Notes for interpretation:

- *Years 2013, 2014, 2015, 2020 and 2021 do not include Scotland.*
- *In years 2012-2015, babies died post discharge have been included as "health data entered" as per latest methodology, therefore results differ from previously published results, where these babies are included in no health data entered.*

Figure 67. Caterpillar plot of the proportions of two-year follow-up assessment, by neonatal network or operational delivery network (ODN).

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.

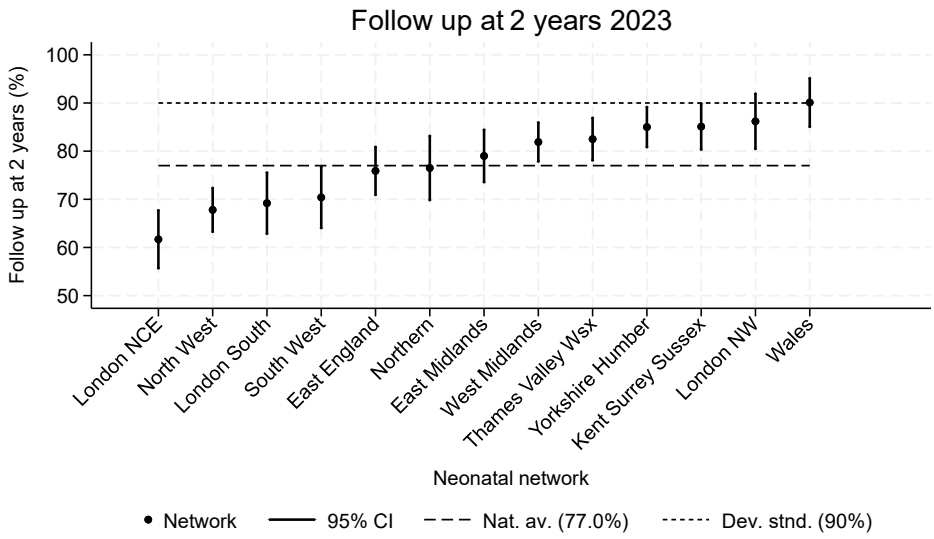


Figure 68: Caterpillar plot of the proportions of two-year follow-up assessment: neonatal units.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.

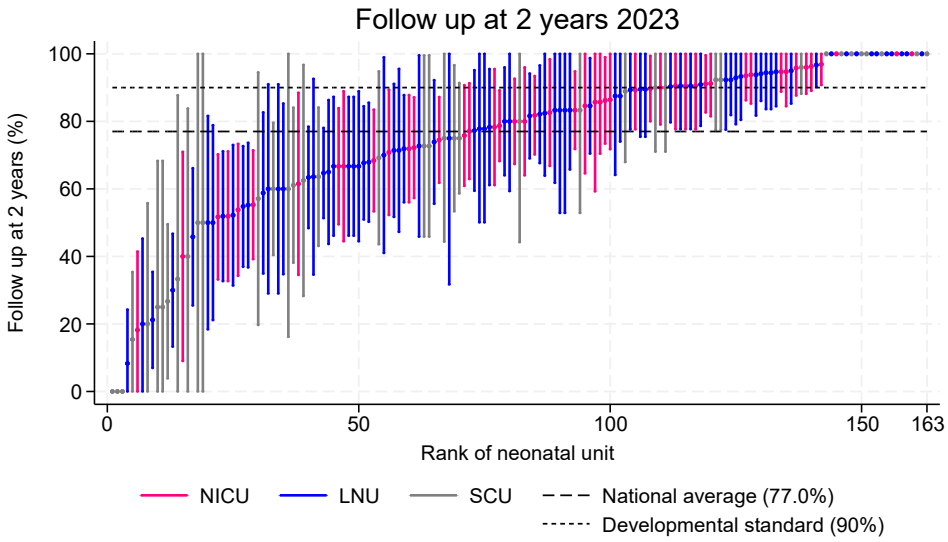


Table 35: Two-year follow up assessment, by neonatal unit level.

Unit level	Eligible babies	Some two-year follow up health data entered (%)	Two-year follow up completed outside of range	No health data entered		
				Lost to follow-up	Not assessed for other reason	No data entered at all
SCU	401	277 (69.1%)	29	6	36	1
LNU	1479	1114 (75.3%)	82	17	133	5
NICU	1360	1103 (81.1%)	41	22	139	7
National	3,240	2,494 (77%)	152	45	308	13

Summary of findings

- The proportion of babies born at less than 30 weeks gestation receiving a two-year follow-up assessment within the appropriate time window is 77% (2,494 of 3,240). This is a 2.6 percentage point increase since 2022, when 74.4% (2,711 of 3,642) of eligible babies received a two-year follow up (Figure 66).
- Network delivery of two-year follow up ranges from 61.7% (London ODN - North Central & East) to 90.1% (Wales) (Figure 67).
- Among neonatal units, proportions range from 0% to 100%, with 33.7% (55 of 163) achieving the NNAP developmental standard of 90% (Figure 68).
- Achievement is higher in NICUs (81.1% - 1,103 of 1,360) than LNUs (75.8% - 1,114 of 1,479) and SCUs (69.1% - 277 of 401) (Table 35).

7.3 Non-invasive breathing support

What proportion of babies born at less than 32 weeks gestational age only receive non-invasive breathing support during the first week of life?*

**Invasive respiratory support is defined as that delivered through an endotracheal tube.*

Bronchopulmonary Dysplasia (BPD) is the most common form of chronic lung disease in infancy associated with preterm birth. Despite the advances in perinatal care such as administration of antenatal corticosteroids, surfactant and gentler ventilation strategies, the proportion of babies with BPD has remained constant. However, there is substantial variation in the proportions of BPD among neonatal networks even after comparing the proportions with a matched group of babies with very similar case mix.

One the contributing factors to BPD is the type and duration of respiratory support provided to the babies. Provision of non-invasive respiratory support, to avoid mechanical ventilation through endotracheal tube, and early extubation of very preterm infants onto non-invasive support have been shown to reduce the risk of BPD[36]. Variations in respiratory care practices (the type and duration of respiratory support) may contribute to these variations in proportions of BPD.

The NICE guidance (NG 124) recommends provision of non-invasive respiratory support through nasal CPAP or high flow humidified oxygen therapy as primary mode of respiratory support for preterm infants[37]. Through the identification of variation in the extent of adoption of NICE guidance between neonatal networks, and units of a similar designation, the NNAP can support quality improvement.

Full details can be found in the NNAP 2023 audit measures guide: https://www.rcpch.ac.uk/work-we-do/clinical-audits/nnap/measures.

Unit and network results for this measure are balanced on gestational age. Balancing is a process that compares the outcome or exposure of babies at a unit to a sample of babies from the national population whose gestational ages are comparable to those of the unit of comparison. The weighted national result (referred to as the "balanced proportion") is then compared to the unit's result (referred to the "observed proportion"), with the difference between their proportions referred to as the "treatment effect". A positive

[36] Jensen EA. Prevention of bronchopulmonary dysplasia: A summary of evidence-based strategies. NeoReviews 2019;20:e189-e201

[37] National Institute for Health and Care Excellence (NICE). Specialist neonatal respiratory care for babies born preterm. NICE guideline [NG124]. April 2019. Available at: https://www.nice.org.uk/guidance/ng124

treatment effect indicates that babies at the unit would have been more likely to receive only non-invasive respiratory support had they been treated elsewhere, and a negative treatment effect indicates that they would have been less likely to receive only non-invasive respiratory support elsewhere.

For a full description of the NNAP methodology and statistical analysis plan, see: https://www.rcpch.ac.uk/nnap-data-flow-methodology.

Results

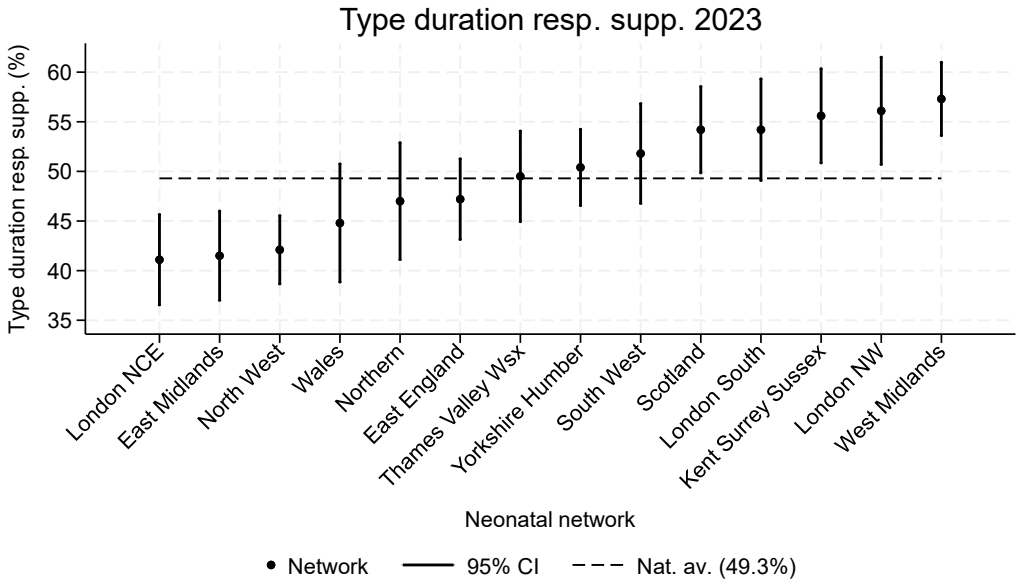
Table 36: Observed proportion of babies receiving only non-invasive respiratory support in the first 7 days of life, by neonatal level.

Unit level	Eligible babies	With outcome	Non-invasive respiratory support (%)	Missing (%)
Other*	83	80	37 (46.3%)	3 (3.6%)
SCU	386	379	179 (47.2%)	7 (1.8%)
LNU	2345	2324	1298 (55.9%)	21 (0.9%)
NICU	4169	4111	1888 (45.9%)	58 (1.4%)
National	6,983	6,894	**3,402 (49.3%)**	**89 (1.3%)**

**'Other' units are those that are hospital or healthcare locations not associated with an NNAP neonatal unit, NNAP units that have closed before the start of this audit year, or location records that are unknown.*

Figure 69: Caterpillar plot of the observed proportion of babies receiving only non-invasive respiratory support in the first 7 days of life (TOP) and treatment effect (BOTTOM), by neonatal network.

Network proportions are represented by dots. The 95% confidence intervals for a network are shown by a vertical line with each dot. Full results are available on NNAP Online.



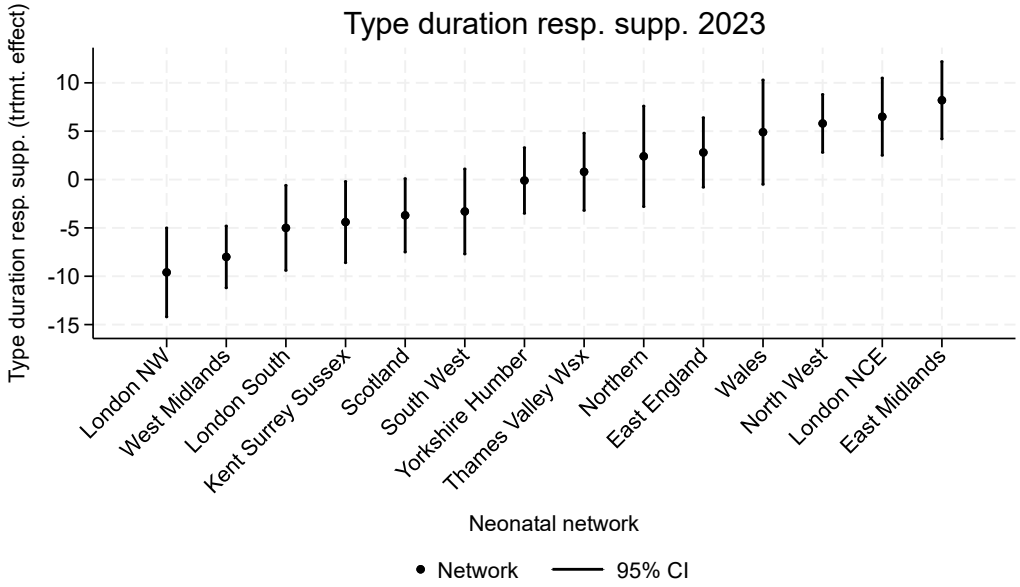
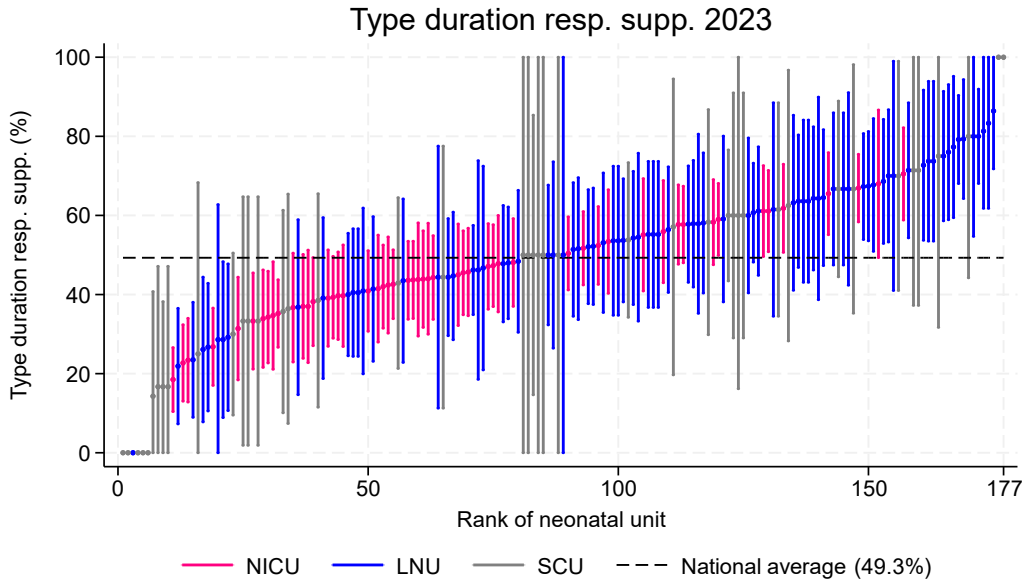


Figure 70: Caterpillar plot of the observed proportion of babies receiving only non-invasive respiratory support in the first 7 days of life (TOP) and treatment effect (BOTTOM), by neonatal unit.

Unit proportions are represented by dots. The 95% confidence intervals for a unit are shown by a vertical line with each dot. Neonatal units can be identified on NNAP Online.



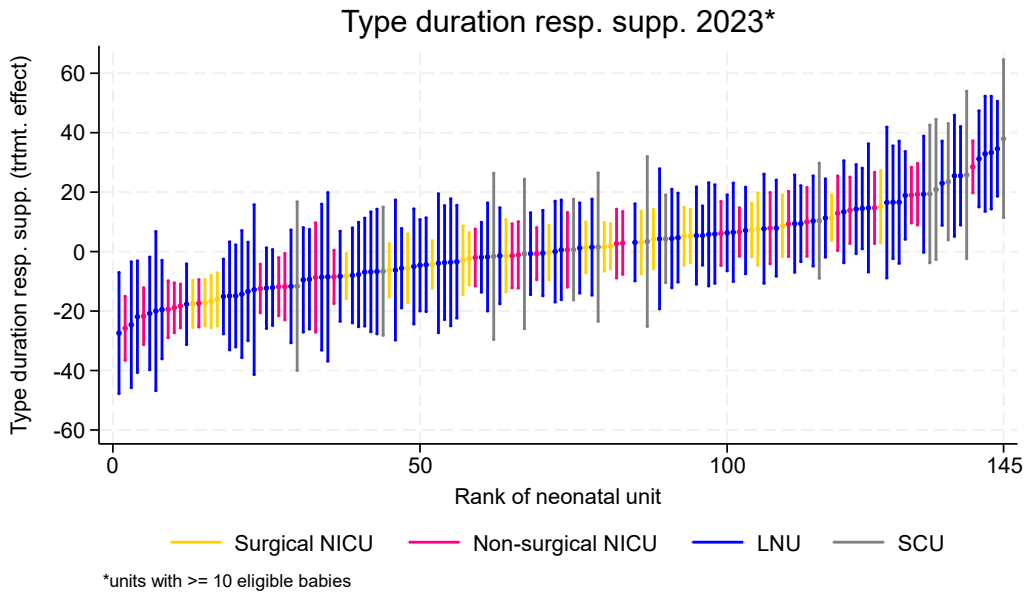
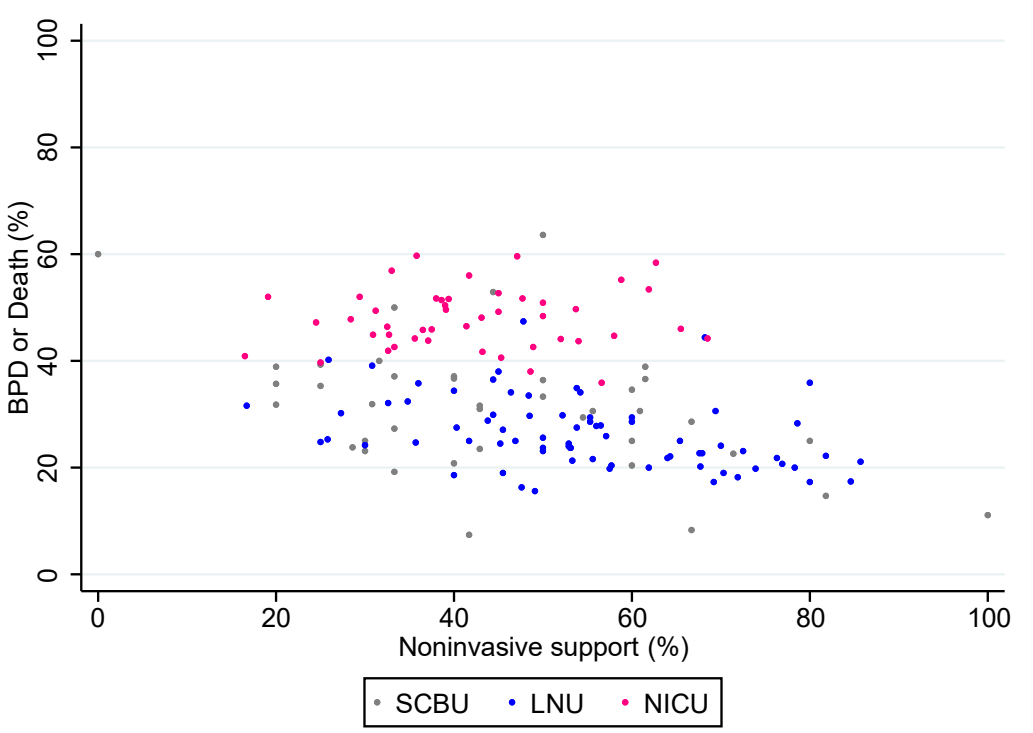


Figure 71: Proportion of babies with BPD, compared to proportion receiving only non-invasive breathing support in the first 7 days, by neonatal unit.



Summary of findings

- Overall, 49.3% (3,402 of 6,894) of babies born at less than 32 weeks gestational age received only non-invasive respiratory support in the first seven days of life.
- Among neonatal networks, observed proportions of non-invasive respiratory support range from 41.1% (London ODN - North Central & East) to 57.3% (West Midlands ODN). The high variance observed between neonatal networks is not explained by gestational age differences in the babies cared for by the network – this is shown in the treatment effect analysis (Figure 69). Whether a baby is cared for in a one network or another seems to lead to major differences in successful adherence to NICE guidance on use of non-invasive ventilation.
- At unit level still more striking differences are observed in the proportion of babies who are managed solely with non-invasive ventilation. The proportion of babies in NICUs receiving only non-invasive breathing support in the first 7 days varies from 18.5% to 70.5%. Even when baseline characteristics are taken into account, the unit of care changes the chance of a very preterm baby being cared for in this (treatment effect ranges from -25.8% to 28.5% between NICUs (Figure 70).

- There is some limited evidence of an association between proportions of exclusive non-invasive breathing support and proportions of BPD. Figure 71 shows that units with higher rates of the composite outcome of BPD or death are, on average slightly less likely to have a high proportion of babies cared for using non-invasive breathing support alone. This correlation is only weak – considerable variation in the rates of BPD or death exists between units with similar usage of non-invasive ventilation. Further, it is important to note that association may not imply causation. Additional factors and underlying mechanisms may be responsible for the observed correlation and therefore further analysis is required to account for other potentially confounding factors, and to consider the association for NICU level only.

7.4 Key messages, recommendations and actions for improvement from the NNAP State of Nation Report on 2023 data

- Overall, 49.3% (3,402 of 6,894) of babies born at less than 32 weeks gestational age received only non-invasive respiratory support in the first seven days of life, which is recommended by NICE for support of the most premature infants. The proportion of babies in NICUs receiving only non-invasive breathing support in the first 7 days varies from 18.5% to 70.5%. The high variance observed is not explained by gestational age differences in the babies cared for by the NICU.
- National adherence to the UK screening for retinopathy of prematurity (ROP) guideline has improved markedly. In 2023, 78.4% (5,333 of 6,799) of eligible babies are screened according to the guideline which represents a 9.4% increase from 2022 (69% - 3,509 of 5,083). This improvement can be observed in more detail through the quarterly trend data available on the NNAP Online Dashboard. There are however three neonatal networks where improvement in adherence lags behind that of most others.
- There was only a small increase (2.6%) in the proportion of babies born at less than 30 weeks gestation who received a two-year follow-up assessment within the appropriate time window (77% - 2,494 of 3,240).

Actions for local quality improvement

- Neonatal services with low adherence to recommended clinical practices such as non-invasive breathing support and ROP screening should:
  - use NNAP Online to identify comparable services with better adherence to identify opportunities for shared learning.
  - use quality improvement methodology and available resources to develop and deliver an action plan to improve adherence in their hospitals. For example,
    - NICE Quality Standard [QS193]. Specialist neonatal respiratory care for babies born preterm.
    - Royal College of Paediatrics and Child Health. UK Screening of Retinopathy of Prematurity Guideline
    - NNAP ROP screening calculator

- BAPM, Minimising the burden of bronchopulmonary dysplasia - A BAPM Quality Improvement Toolkit (expected publication Autumn 2023)
- Case study: *More than meets the eye: understanding the impact of guideline changes on retinopathy of prematurity screening performance*. Bradford Teaching Hospitals NHS Foundation Trust
- Case study: *Use of non-synchronised non-invasive positive pressure ventilation (NS-NIPPV) to reduce extubation failure in preterm infants*. Lancashire Women & Newborn Centre

8. Audit questions, standards and associated guidelines

NNAP question	Start year	Cohort	Measure type	Developmental standard	Associated guidelines
Mortality until discharge home Does a baby born at 24 to 31 weeks gestational age inclusive die before discharge home, or 44 weeks post-menstrual age (whichever occurs sooner)?		Jan 2023 to Dec 2023	Outcome	No developmental standard.	
Bronchopulmonary dysplasia (BPD) Does an admitted baby born at less than 32 weeks' gestational age develop bronchopulmonary dysplasia (BPD) or die?		Final discharge in 2023	Outcome	No developmental standard.	
Necrotising enterocolitis (NEC) Does an admitted baby born at less than 32 weeks' gestational age meet the NNAP surveillance definition for necrotising enterocolitis (NEC) on one or more occasion?		Final discharge in 2023	Outcome	No developmental standard.	
Late onset bloodstream infection Does an admitted baby have one or more episodes of bloodstream infection, characterised by one or more positive blood cultures taken, after 72 hours of age?		Final discharge in 2023	Outcome	No developmental standard.	
Neonatal preterm brain injury Does a baby born at less than 32 weeks' gestational age experience any of the following forms of brain injury? • Germinal matrix/ intraventricular haemorrhage • Post haemorrhagic ventricular dilatation • Cystic periventricular leukomalacia		Final discharge in 2023	Outcome	No developmental standard.	
Birth 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		First admission in 2023	Process	Eighty-five (85%) of babies born at less than 27 weeks gestational age should be delivered in a maternity service on the same site as a NICU.	British Association for Perinatal Medicine. Perinatal Management of Extreme Preterm Birth before 27 weeks of gestation A Framework for Practice NHS England, Neonatal Critical Care Service Specification

delivered in a maternity service on the same site as a designated NICU?					
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?		First admission in 2023	Process	No developmental standard.	NICE guideline [NG25], Preterm Labour and Birth
Antenatal magnesium sulphate Does a mother who delivers a baby below 30 weeks' gestational age receive magnesium sulphate in the 24 hours prior to delivery?		First admission in 2023	Process	Ninety percent (90%) of eligible mothers should receive antenatal magnesium sulphate.	NICE guideline [NG25], Preterm Labour and Birth
Deferred cord clamping Does a baby born at less than 34 weeks' gestational age have their cord clamped at or after one minute?		First admission in 2023	Process	Sixty percent (60%) of babies born at less than 34 weeks' should have deferred cord clamping.	NICE guideline [NG25], Preterm Labour and Birth
Normal temperature on admission Does a baby born at less than 32 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?		First admission in 2023	Process	Timeliness and normal temperature should be met for at least ninety percent (90%) of babies.	NHS England, Neonatal Critical Care Service Specification
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 2 days of life?	2022	First admission in 2023	Process	No developmental standard.	UNICEF UK. The Baby Friendly Initiative
Breastmilk feeding at day 14 Does a baby born at less than 34 weeks' gestational age receive any of their own mother's milk at day 14 of life?		Final discharge in 2023	Process	No developmental standard.	UNICEF UK. The Baby Friendly Initiative
Breastmilk feeding at discharge home Does a baby born at less than 34 weeks' gestational age receive any of their own mother's milk at discharge to home from a neonatal unit?		Final discharge in 2023	Process	Eighty percent (80%) of babies born at less than 34 weeks' gestational age should receive at least some of their mother's milk at discharge home from the neonatal unit.	UNICEF UK. The Baby Friendly Initiative
Parental consultation within 24 hours of admission Is there a documented consultation with parents by a senior member of the neonatal team*, within 24 hours of admission? **By senior member of the neonatal team, NNAP means a consultant or middle grade doctor, or a nurse practitioner acting in such a role.*		First admission in 2023	Process	A consultation should take place within 24 hours of admission for every baby (100%).	Scottish Government, Neonatal Care in Scotland: A Quality Framework NHS Wales. All Wales Neonatal Standards – 3rd Edition. Department of Health. Toolkit for high quality neonatal services
Parental inclusion in consultant ward rounds What proportion of baby care days had a consultant-led ward round* with at least one parent included?		Final discharge in 2023	Process	No developmental standard.	UNICEF UK. The Baby Friendly Initiative. Scottish Government, Neonatal Care in Scotland: A Quality Framework

**Consultant ward round refers to any ward round where a consultant is in attendance, at any time of the day.*					Bliss Baby Charter
Nurse staffing on neonatal units What proportion of nursing shifts are numerically staffed according to guidelines and service specification?		Shifts in 2023	Structure	100% of shifts staffed according to guidelines and service specification.	NHS Wales. All Wales Neonatal Standards – 3rd Edition. NHS England. Neonatal Critical Care Service Specification BAPM. Service Standards for Hospitals Providing Neonatal Care
On-time screening for retinopathy of prematurity (ROP) Does a baby born at less than 31 weeks gestational age, or weighing less than 1501g at birth undergo the first ROP screening according to the guideline?		Final discharge in 2023	Process	All (100%) of eligible babies should receive ROP screening within the recommended time windows for first screening.	Royal College of Paediatrics and Child Health. UK screening of retinopathy of prematurity guideline: Summary of recommendations, March 2022.
Follow-up at two years of age Does a baby born at less than 30 weeks gestational age receive medical follow-up at two years gestationally corrected age (18-30 months' gestationally corrected acceptable age range)?		Born July 2020 to June 2021	Process	Ninety percent (90%) of babies with two-year follow-up data entered.	NICE guideline [NG72], Developmental follow-up of children and young people born preterm.
Type and duration of respiratory support What proportion of babies born at less than 32 weeks' gestation only receive non-invasive respiratory support during the first week of life?	2022	First admission in 2023	Process	No developmental standard.	NICE Quality standard [QS193] Specialist neonatal respiratory care for babies born preterm

9. Unit participation

Table A: NNAP participating neonatal units

*HD days – Total number of high dependency days delivered by the neonatal unit in the calendar year. High dependency days are those recorded as HRG 2[38].

**IC days – Total number of intensive care days delivered by the neonatal unit in the calendar year. Intensive care days are those recorded as HRG 1[38].

Unit name	Trust/Health Board	Unit level	IC days**	HD days*	HD & IC days*
East Midlands ODN					
Leicester Neonatal Service$_1$	University Hospitals Leicester NHS Trust	NICU†	2978	2524	5502
Nottingham City Hospital	Nottingham University Hospitals NHS Trust	NICU†	1511	1550	3061
Nottingham University Hospital (QMC)	Nottingham University Hospitals NHS Trust	NICU	2044	1293	3337
Kettering General Hospital	Kettering General Hospital NHS Foundation Trust	LNU	226	692	918
King's Mill Hospital	Sherwood Forest Hospitals NHS Foundation Trust	LNU	260	1018	1278
Lincoln County Hospital	United Lincolnshire Hospitals NHS Trust	LNU	295	920	1215
Northampton General Hospital	Northampton General Hospital NHS Trust	LNU	335	1260	1595
Royal Derby Hospital	University Hospitals Derby and Burton NHS Foundation Trust	LNU	570	1510	2080
Pilgrim General Hospital	United Lincolnshire Hospitals NHS Trust	SCU	27	73	100
Queen's Hospital, Burton on Trent	University Hospitals Derby and Burton NHS Foundation Trust	SCU	63	82	145
East of England Perinatal ODN					
Norfolk & Norwich University Hospital	Norfolk and Norwich University Hospitals NHS Foundation Trust	NICU†	2235	2692	4927
Rosie Maternity Hospital, Addenbrookes	Cambridge University Hospitals NHS Foundation Trust	NICU†	3494	3924	7418
Luton and Dunstable University Hospital	Bedfordshire Hospitals NHS Foundation Trust	NICU	2096	3223	5319
Basildon University Hospital	Mid and South Essex NHS Foundation Trust	LNU	439	1486	1925
Broomfield Hospital, Chelmsford	Mid and South Essex NHS Foundation Trust	LNU	265	887	1152

[38] NHS England. Service specification E08/S/a: Neonatal Critical Care. Available at: https://www.england.nhs.uk/commissioning/wp-content/uploads/sites/12/2015/01/e08-serv-spec-neonatal-critical.pdf

Colchester General Hospital	East Suffolk and North Essex NHS Foundation Trust	LNU	209	793	1002
Ipswich Hospital	East Suffolk and North Essex NHS Foundation Trust	LNU	235	812	1047
Lister Hospital	East and North Hertfordshire NHS Trust	LNU	232	1067	1299
Peterborough City Hospital	North West Anglia NHS Foundation Trust	LNU	364	1023	1387
Princess Alexandra Hospital	The Princess Alexandra Hospital NHS Trust	LNU	346	1053	1399
Queen Elizabeth Hospital, King's Lynn	The Queen Elizabeth Hospital, King's Lynn, NHS Foundation Trust	LNU	150	552	702
Southend Hospital	Mid and South Essex NHS Foundation Trust	LNU	136	718	854
Watford General Hospital	West Hertfordshire Teaching Hospitals NHS Trust	LNU	108	802	910
Bedford Hospital	Bedfordshire Hospitals NHS Foundation Trust	SCU	71	358	429
Hinchingbrooke Hospital	North West Anglia NHS Foundation Trust	SCU	32	291	323
James Paget Hospital	James Paget University Hospitals NHS Foundation Trust	SCU	95	376	471
West Suffolk Hospital	West Suffolk NHS Foundation Trust	SCU	62	444	506
Kent, Surrey, Sussex ODN					
Royal Sussex County Hospital	University Hospitals Sussex NHS Foundation Trust	NICU†	1933	2158	4091
Medway Maritime Hospital	Medway NHS Foundation Trust	NICU	1142	2885	4027
St Peter's Hospital	Ashford and St Peter's Hospitals NHS Foundation Trust	NICU	1361	1393	2754
William Harvey Hospital	East Kent Hospitals University NHS Foundation Trust	NICU	1099	1566	2665
East Surrey Hospital	Surrey and Sussex Healthcare NHS Trust	LNU	353	948	1301
Frimley Park Hospital	Frimley Health NHS Foundation Trust	LNU	283	787	1070
Tunbridge Wells Hospital	Maidstone and Tunbridge Wells NHS Trust	LNU	389	1804	2193
Conquest Hospital	East Sussex Healthcare NHS Trust	SCU	18	323	341
Darent Valley Hospital	Dartford and Gravesham NHS Trust	SCU	61	854	915
Princess Royal Hospital, Haywards Heath	University Hospitals Sussex NHS Foundation Trust	SCU	16	277	293
Queen Elizabeth The Queen Mother Hospital	East Kent Hospitals University NHS Foundation Trust	SCU	28	236	264
Royal Surrey County Hospital	Royal Surrey County Hospital NHS Foundation Trust	SCU	30	211	241
Worthing Hospital	University Hospitals Sussex NHS Foundation Trust	SCU	16	275	291
London ODN - North Central & East					
The Royal London Hospital	Barts Health NHS Trust	NICU†	4116	4126	8242
University College London Hospital	University College London Hospitals NHS Foundation Trust	NICU†	2093	2717	4810
Homerton University Hospital	Homerton Healthcare NHS Foundation Trust	NICU	3093	4067	7160

Barnet Hospital	Royal Free London NHS Foundation Trust	LNU	550	2230	2780
Newham University Hospital	Barts Health NHS Trust	LNU	425	993	1418
North Middlesex University Hospital	North Middlesex University Hospital NHS Trust	LNU	384	1415	1799
Queen's Hospital, Romford	Barking, Havering and Redbridge University Hospitals NHS Trust	LNU	524	1722	2246
Whipps Cross University Hospital	Barts Health NHS Trust	LNU	177	698	875
Whittington Hospital	Whittington Health NHS Trust	LNU	454	1772	2226
Royal Free Hospital	Royal Free London NHS Foundation Trust	SCU	22	205	227
London ODN - North West					
Chelsea & Westminster Hospital	Chelsea and Westminster Hospital NHS Foundation Trust	NICU†	3474	3705	7179
Queen Charlotte and Chelsea Hospital	Imperial College Healthcare NHS Trust	NICU	1938	3111	5049
Hillingdon Hospital	The Hillingdon Hospitals NHS Foundation Trust	LNU	360	1521	1881
Northwick Park Hospital	London North West University Healthcare NHS Trust	LNU	194	1121	1315
St Mary's Hospital, London	Imperial College Healthcare NHS Trust	LNU	340	1149	1489
West Middlesex University Hospital	Chelsea and Westminster Hospital NHS Foundation Trust	SCU	101	927	1028
London ODN - South					
Evelina London Children's Hospital	Guy's and St Thomas' NHS Foundation Trust	NICU†	4659	3472	8131
King's College Hospital	King's College Hospital NHS Foundation Trust	NICU†	3547	2636	6183
St George's Hospital	St George's University Hospitals NHS Foundation Trust	NICU†	3254	4172	7426
Croydon University Hospital	Croydon Health Services NHS Trust	LNU	310	1066	1376
Kingston Hospital	Kingston Hospital NHS Foundation Trust	LNU	357	847	1204
Princess Royal University Hospital, Farnborough	King's College Hospital NHS Foundation Trust	LNU	104	549	653
Queen Elizabeth Hospital, Woolwich	Lewisham and Greenwich NHS Trust	LNU	261	950	1211
St Helier Hospital	Epsom and St Helier University Hospitals NHS Trust	LNU	112	561	673
University Hospital Lewisham	Lewisham and Greenwich NHS Trust	LNU	316	1125	1441
Epsom General Hospital	Epsom and St Helier University Hospitals NHS Trust	SCU	5	42	47
Isle of Man					
Noble's Hospital	Manx Care	LNU	7	44	51
North West ODN					
Alder Hey Children's Hospital	Alder Hey Children's NHS Foundation Trust	NICU†	683	1488	2171
Liverpool Women's Hospital	Liverpool Women's NHS Foundation Trust	NICU†	3795	2953	6748

St Mary's Hospital, Manchester	Manchester University NHS Foundation Trust	NICU†	5495	5976	11471
Arrowe Park Hospital	Wirral University Teaching Hospital NHS Foundation Trust	NICU	983	1820	2803
Lancashire Women and Newborn Centre	East Lancashire Hospitals NHS Trust	NICU	2095	2833	4928
Royal Bolton Hospital	Bolton NHS Foundation Trust	NICU	1583	3419	5002
Royal Oldham Hospital	Northern Care Alliance NHS Foundation Trust	NICU	1830	3199	5029
Royal Preston Hospital	Lancashire Teaching Hospitals NHS Foundation Trust	NICU	1181	1738	2919
Countess of Chester Hospital	Countess Of Chester Hospital NHS Foundation Trust	LNU	57	248	305
Leighton Hospital	Mid Cheshire Hospitals NHS Foundation Trust	LNU	169	668	837
North Manchester General Hospital	Manchester University NHS Foundation Trust	LNU	107	686	793
Ormskirk District General Hospital	Mersey And West Lancashire Teaching Hospitals NHS Trust	LNU	69	504	573
Royal Albert Edward Infirmary	Wrightington, Wigan and Leigh NHS Foundation Trust	LNU	148	699	847
Royal Lancaster Infirmary	University Hospitals Morecambe Bay NHS Foundation Trust	LNU	96	431	527
Stepping Hill Hospital	Stockport NHS Foundation Trust	LNU	159	678	837
Tameside General Hospital	Tameside and Glossop Integrated Care NHS Foundation Trust	LNU	162	602	764
Victoria Hospital, Blackpool	Blackpool Teaching Hospitals NHS Foundation Trust	LNU	163	705	868
Warrington Hospital	Warrington and Halton Teaching Hospitals NHS Foundation Trust	LNU	278	647	925
Whiston Hospital	Mersey And West Lancashire Teaching Hospitals NHS Trust	LNU	220	707	927
Wythenshawe Hospital	Manchester University NHS Foundation Trust	LNU	252	978	1230
Furness General Hospital	University Hospitals Morecambe Bay NHS Foundation Trust	SCU	17	30	47
Northern ODN					
Royal Victoria Infirmary	The Newcastle Upon Tyne Hospitals NHS Foundation Trust	NICU†	2630	3097	5727
Sunderland Royal Hospital	South Tyneside and Sunderland NHS Foundation Trust	NICU	864	1120	1984
The James Cook University Hospital	South Tees Hospitals NHS Foundation Trust	NICU	1265	2699	3964
Cumberland Infirmary	North Cumbria Integrated Care NHS Foundation Trust	SCU	31	149	180
Darlington Memorial Hospital	County Durham and Darlington NHS Foundation Trust	SCU	13	139	152
Northumbria Specialist Emergency Care Hospital	Northumbria Healthcare NHS Foundation Trust	SCU	30	194	224
Queen Elizabeth Hospital, Gateshead	Gateshead Health NHS Foundation Trust	SCU	3	125	128
University Hospital of North Durham	County Durham and Darlington NHS Foundation Trust	SCU	33	154	187
University Hospital of North Tees	North Tees and Hartlepool NHS Foundation Trust	SCU	25	198	223
West Cumberland Hospital	North Cumbria Integrated Care NHS Foundation Trust	SCU	18	50	68

Scotland					
Aberdeen Maternity Hospital	NHS Grampian	NICU†	1128	2096	3224
Royal Hospital for Children, Glasgow	NHS Greater Glasgow & Clyde	NICU†	3806	4195	8001
Simpson Centre for Reproductive Health, Edinburgh	NHS Lothian	NICU†	1955	2878	4833
Ninewells Hospital, Dundee	NHS Tayside	NICU	858	1419	2277
Princess Royal Maternity Hospital, Glasgow	NHS Greater Glasgow and Clyde	NICU	911	1973	2884
Victoria Hospital, Kirkcaldy	NHS Fife	NICU	216	1276	1492
Wishaw General Hospital	NHS Lanarkshire	NICU	1087	1831	2918
Ayrshire Maternity Unit, Crosshouse	NHS Ayrshire & Arran	LNU	398	1006	1404
Forth Valley Royal Hospital	NHS Forth Valley	LNU	208	659	867
Raigmore Hospital, Inverness	NHS Highland	LNU	210	593	803
Royal Alexandra Hospital, Paisley	NHS Greater Glasgow and Clyde	LNU	174	847	1021
Borders General Hospital, Melrose	NHS Borders	SCU	10	88	98
Dumfries & Galloway Royal Infirmary	NHS Dumfries and Galloway	SCU	9	92	101
St John's Hospital, Livingston	NHS Lothian	SCU	41	339	380
South West ODN					
St Michael's Hospital	University Hospitals Bristol and Weston NHS Foundation Trust	NICU†	3360	2506	5866
Derriford Hospital	University Hospitals Plymouth NHS Trust	NICU	1260	1583	2843
Southmead Hospital	North Bristol NHS Trust	NICU	1980	2569	4549
Gloucestershire Royal Hospital	Gloucestershire Hospitals NHS Foundation Trust	LNU	515	1762	2277
Great Western Hospital	Great Western Hospitals NHS Foundation Trust	LNU	261	1078	1339
Musgrove Park Hospital	Somerset NHS Foundation Trust	LNU	262	879	1141
Royal Cornwall Hospital	Royal Cornwall Hospitals NHS Trust	LNU	257	1212	1469
Royal Devon & Exeter Hospital	Royal Devon University Healthcare NHS Foundation Trust	LNU	265	1163	1428
Royal United Hospital	Royal United Hospitals Bath NHS Foundation Trust	LNU	193	1036	1229
North Devon District Hospital	Royal Devon University Healthcare NHS Foundation Trust	SCU	31	162	193
Torbay Hospital	Torbay and South Devon NHS Foundation Trust	SCU	32	200	232
Yeovil District Hospital	Somerset NHS Foundation Trust	SCU	21	101	122
Thames Valley & Wessex ODN					
John Radcliffe Hospital	Oxford University Hospitals NHS Foundation Trust	NICU†	4035	3778	7813

Princess Anne Hospital	University Hospital Southampton NHS Foundation Trust	NICU†	3214	2588	5802
Queen Alexandra Hospital	Portsmouth Hospitals University National Health Service Trust	NICU	2398	1573	3971
Basingstoke & North Hampshire Hospital	Hampshire Hospitals NHS Foundation Trust	LNU	172	602	774
Milton Keynes University Hospital	Milton Keynes University Hospital NHS Foundation Trust	LNU	353	1265	1618
Poole General Hospital	University Hospitals Dorset NHS Foundation Trust	LNU	253	1437	1690
Royal Berkshire Hospital	Royal Berkshire NHS Foundation Trust	LNU	249	1273	1522
Royal Hampshire County Hospital	Hampshire Hospitals NHS Foundation Trust	LNU	188	416	604
Salisbury District Hospital	Salisbury NHS Foundation Trust	LNU	75	653	728
St Richard's Hospital	University Hospitals Sussex NHS Foundation Trust	LNU	30	339	369
Stoke Mandeville Hospital	Buckinghamshire Healthcare NHS Trust	LNU	255	1070	1325
Wexham Park Hospital	Frimley Health NHS Foundation Trust	LNU	195	808	1003
Dorset County Hospital	Dorset County Hospital NHS Foundation Trust	SCU	18	238	256
St Mary's Hospital, Isle of Wight	Isle Of Wight NHS Trust	SCU	11	69	80
Wales					
Singleton Hospital	Swansea Bay University LHB	NICU	1767	2351	4118
The Grange University Hospital	Aneurin Bevan University LHB	NICU	1668	2119	3787
University Hospital of Wales	Cardiff & Vale University LHB	NICU	2587	3056	5643
Glan Clwyd Hospital	Betsi Cadwaladr University LHB	LNU	570	939	1509
Prince Charles Hospital	Cwm Taf Morgannwg University LHB	LNU	82	593	675
Glangwili General Hospital	Hywel Dda University LHB	SCU	33	494	527
Princess of Wales Hospital, Bridgend	Swansea Bay University LHB	SCU	89	491	580
Wrexham Maelor Hospital	Betsi Cadwaladr University LHB	SCU	21	204	225
Ysbyty Gwynedd	Betsi Cadwaladr University LHB	SCU	63	194	257
West Midlands ODN					
Birmingham Women's Hospital	Birmingham Women's and Children's NHS Foundation Trust	NICU†	3313	3090	6403
Birmingham Heartlands Hospital	University Hospitals Birmingham NHS Foundation Trust	NICU	1534	2000	3534
New Cross Hospital	The Royal Wolverhampton NHS Trust	NICU	1779	2402	4181
Royal Stoke University Hospital	University Hospitals of North Midlands NHS Trust	NICU	1397	1618	3015
University Hospital Coventry	University Hospitals Coventry and Warwickshire NHS Trust	NICU	1727	2294	4021
Birmingham City Hospital	Sandwell and West Birmingham Hospitals NHS Trust	LNU	540	2155	2695

Manor Hospital	Walsall Healthcare NHS Trust	LNU	292	1058	1350
Princess Royal Hospital, Telford	The Shrewsbury and Telford Hospital NHS Trust	LNU	355	944	1299
Russell's Hall Hospital	The Dudley Group NHS Foundation Trust	LNU	345	1093	1438
Worcestershire Royal Hospital	Worcestershire Acute Hospitals NHS Trust	LNU	294	868	1162
George Eliot Hospital	George Eliot Hospital NHS Trust	SCU	30	91	121
Good Hope Hospital	University Hospitals Birmingham NHS Foundation Trust	SCU	20	117	137
Hereford County Hospital	Wye Valley NHS Trust	SCU	41	176	217
Warwick Hospital	South Warwickshire University NHS Foundation Trust	SCU	24	91	115
Yorkshire & Humber ODN					
Hull Royal Infirmary	Hull University Teaching Hospitals NHS Trust	NICU†	1565	2180	3745
Jessop Wing, Sheffield	Sheffield Teaching Hospitals NHS Foundation Trust	NICU†	2832	2705	5537
Leeds Neonatal Service[2]	Leeds Teaching Hospitals NHS Trust	NICU†	3180	3349	6529
Bradford Royal Infirmary	Bradford Teaching Hospitals NHS Foundation Trust	NICU	1760	2106	3866
Barnsley District General Hospital	Barnsley Hospital NHS Foundation Trust	LNU	371	581	952
Calderdale Royal Hospital	Calderdale and Huddersfield NHS Foundation Trust	LNU	395	697	1092
Chesterfield Royal Hospital	Chesterfield Royal Hospital NHS Foundation Trust	LNU	149	609	758
Diana Princess of Wales Hospital	Northern Lincolnshire and Goole NHS Foundation Trust	LNU	367	661	1028
Doncaster Royal Infirmary	Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust	LNU	438	1008	1446
Pinderfields General Infirmary (Pontefract)	Mid Yorkshire Teaching NHS Trust	LNU	556	1006	1562
Rotherham District General Hospital	The Rotherham NHS Foundation Trust	LNU	221	683	904
Scunthorpe General Hospital	Northern Lincolnshire and Goole NHS Foundation Trust	LNU	197	617	814
York District Hospital	York And Scarborough Teaching Hospitals NHS Foundation Trust	LNU	158	653	811
Airedale General Hospital	Airedale NHS Foundation Trust	SCU	24	140	164
Bassetlaw District General Hospital	Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust	SCU	14	52	66
Harrogate District Hospital	Harrogate and District NHS Foundation Trust	SCU	14	54	68
Scarborough General Hospital	York And Scarborough Teaching Hospitals NHS Foundation Trust	SCU	25	60	85

1. Includes Leicester Royal Infirmary and Leicester General Hospital. 2. Includes Leeds General Infirmary and St James's Hospital.

†Neonatal intensive care units providing surgery.

10. Pathogens: bloodstream infection reporting

Bacterial, fungal and yeast positive blood cultures reported to the NNAP in 2022 for the late onset bloodstream infection measure have been classified as shown below into organisms whose growth would be regarded as indicative of a bloodstream infection without further clinical evidence of infection (clearly pathogenic), and into a list of other organisms. This list of organisms included for NNAP reporting is available below. The NNAP are grateful to Dr Jim Gray, Consultant Microbiologist at Birmingham Women's and Children's NHS Foundation Trust, who kindly reviewed organisms reportedly cultured in blood, and helped classify them into 'clearly pathogenic' and 'other' organisms.

For more information, see Fraser C, Muller-Pebody B, Blackburn R, Gray J, Oddie SJ, Gilbert RE, Harron K. Linking surveillance and clinical data for evaluating trends in bloodstream infection rates in neonatal units in England. PLoS One. 2019 Dec 12;14(12):e0226040. doi: 10.1371/journal.pone.0226040.eCollection 2019.

Clearly pathogenic organisms		
Acinetobacter Baumannii	Enterobacter Sakazakii	Salmonella Apapa
Aeromonas Caviae	Enterobacter Sp.	Salmonella Arizonae
Aeromonas Hydrophila	Enterococcus Avium	Salmonella Brandenburg
Aeromonas Salmonicida	Enterococcus Casseliflavus	Salmonella Colindale
Aeromonas Sobria	Enterococcus Durans	Salmonella Cotham
Aeromonas Sp	Enterococcus Faecalis	Salmonella Cubana
Anaerococcus Prevotii	Enterococcus Faecium	Salmonella Djugu
Aspergillus	Enterococcus Gallinarum	Salmonella Dublin
Aspergillus Fumigatus	Enterococcus Hirae	Salmonella Enteritidis
Aspergillus Niger	Enterococcus Raffinosus	Salmonella Gold-Coast
Aspergillus Sp	Enterococcus Sp.	Salmonella Hadar
B Haemolytic Streptococci	Escherichia	Salmonella Heidelberg
Bacteroides Capillosus	Escherichia Coli	Salmonella Hofit
Bacteroides Distasonis	Escherichia Hermannii	Salmonella Hull
Bacteroides Fragilis	Escherichia Sp	Salmonella Infantis
Bacteroides Ovatus	Escherichia Vulneris	Salmonella Kedougou
Bacteroides Sp	Fusobacterium Necrophorum	Salmonella Kiambu
Bacteroides Uniformis	Fusobacterium Nucleatum	Salmonella Kibusi
Bacteroides Vulgatus	Fusobacterium Sp	Salmonella Kintambo
C. Koseri	Gardnerella	Salmonella Kisarawe
Campylobacter Fetus	Gardnerella Vaginalis	Salmonella Matopeni
Campylobacter Jejuni	Group B Streptococcus	Salmonella Mississippi
Campylobacter Sp	Group G Streptococcus	Salmonella Monschaui

Campylobacter Ureolyticus	Haemophilus Influenzae	Salmonella Montevideo
Candida	Hafnia Alvei	Salmonella Muenchen
Candida Albicans	Hansenula Sp	Salmonella Muenster
Candida Ciferrii	Klebsiella	Salmonella Newport
Candida Dubliniensis	Klebsiella Aerogenes	Salmonella Oranienburg
Candida Fabianii	Klebsiella Ornithnolytica	Salmonella Poona
Candida Famata	Klebsiella Oxytoca	Salmonella Reading
Candida Glabrata	Klebsiella Planticola	Salmonella Saphra
Candida Guilliermondii	Klebsiella Pneumoniae	Salmonella Senftenberg
Candida Haemulonis	Klebsiella Pneumoniae Subsp Ozenae	Salmonella Sinstorf
Candida Krusei	Klebsiella Sp.	Salmonella Sp.
Candida Lusitaniae	Kluyvera Sp	Salmonella Stanley
Candida Parapsilosis	Leclercia Adecarboxylata	Salmonella Tel-El-Kebir
Candida Sp.	Listeria Monocytogenes	Salmonella Typhi And Paratyphi
Candida Tropicalis	Listeria Sp	Salmonella Typhimurium
Cedecea Lapagei	Malassezia Furfur	Salmonella Unnamed
Citrobacter	Malassezia Pachydermatis	Salmonella Virchow
Citrobacter Amalonaticus	Malassezia Sp	Salmonella Vitkin
Citrobacter Braakii	Morganella Morganii	Salmonella Wichita
Citrobacter Diversus	Mrsa	Serratia Liquefaciens
Citrobacter Farmeri	Neisseria Meningitidis	Serratia Marcescens
Citrobacter Freundii	Pantoea Agglomerans	Serratia Odorifera
Citrobacter Koseri	Pantoea Septica	Serratia Plymuthica
Citrobacter Sp.	Pantoea Sp	Serratia Proteamaculas
Clostridium Beijerinckii	Pasteurella	Serratia Rubidaea
Clostridium Bifermentans	Pasteurella Haemolytica	Serratia Sp.
Clostridium Butyricum	Pasteurella Multocida	Shigella Flexneri
Clostridium Paraputrificum	Pasteurella Pneumotropica	Shigella Sonnei
Clostridium Perfringens	Pasteurella Sp.	Staphylococcus Aureus
Clostridium Septicum	Peptostreptococcus	Stellatoidea
Clostridium Sordelli	Peptostreptococcus Asaccharolyticus	Streptococcus Agalactiae
Clostridium Sp.	Peptostreptococcus Magnus	Streptococcus Anaerobic
Clostridium Sporogenes	Prevotella Bivia	Streptococcus Anginosus
Clostridium Tertium	Prevotella Buccalis	Streptococcus Bovis
Coccidioides Sp.	Prevotella Oralis	Streptococcus Constellatus
Coliform	Proteus Mirabilis	Streptococcus Faecalis
Cryptococcus Albidus	Proteus Penneri	Streptococcus Group A Stem
Cryptococcus Sp.	Proteus Sp.	Streptococcus Group B Stem
E.Coli	Proteus Vulgaris	Streptococcus Group C Stem
Enterobacter	Providencia Alcalifaciens	Streptococcus Group D Stem
Enterobacter Aerogenes	Providencia Stuartii	Streptococcus Group G Stem
Enterobacter Agglomerans	Pseudomonas Aeruginosa	Streptococcus Milleri
Enterobacter Agglomerans	Raoultella Planticola	Streptococcus Milleri Group
Enterobacter Amnigenus	Raoultella Sp	Streptococcus Pneumoniae
Enterobacter Asburiae	Raoultella Terrigena	Streptococcus Pyogenes
Enterobacter Cloacae	Rhodotorula	Veillonella Atypica

Enterobacter Cloacae Complex	Rhodotorula Rubra	Veillonella Named
Enterobacter Gergoviae	Rhodotorula Sp	Yeasts
Enterobacter Hormaechei	S. Aureus	Yeasts (Other)
Enterobacter Intermedium	Salmonella Aba	Yersinia Enterocolitica
Enterobacter Intermedius	Salmonella Agama	Yersinia Sp.
Enterobacter Kobei	Salmonella Ajiobo	

Other organisms		
Abiotrophia	Corynebacterium Xerosis	Paenibacillus Glucanolyticus
Abiotrophia Adiacens	Coryneform Bacilli	Paenibacillus Pabuli
Abiotrophia Defectiva	Delftia Acidovorans	Paenibacillus Sp
Achromobacter Sp	Dermabacter Hominis	Parabacteroides Distasonis
Achromobacter Xylosoxidans	Dermacoccus Sp	Paracoccus Sp
Acidovorax Temperans	Diphtheroids	Paracoccus Yeeii
Acinetobacter Anitratus	Eggerthella Lenta	Pediococcus Acidilactici
Acinetobacter Calcoaceticus	Eikenella Corrodens	Penicillium Sp
Acinetobacter Haemolyticus	Elizabethkingia Miricola	Peptococcus Sp
Acinetobacter Johnsonii	Elizabethkingia Sp	Phialophora
Acinetobacter Junii	Eubacterium Lentum	Propionibacterium Acnes
Acinetobacter Lwoffii	Exophiala Sp.	Propionibacterium Freudenreichii
Acinetobacter Parvus	Flavimonas Oryzihabitans	Propionibacterium Sp
Acinetobacter Radioresistens	Flavobacterium Sp.	Proprionebacterium Acnes
Acinetobacter Sp.	Gemella Haemolysans	Pseudoclavibacter Sp
Acinetobacter Ursingii	Gemella Morbillorum	Pseudomonas Alcaligenes
Actinomyces	Geotrichum Sp	Pseudomonas Fluorescens
Actinomyces Bovis	Globicatella Sanguis	Pseudomonas Luteola
Actinomyces Cardiffensis	Gordonia Bronchialis	Pseudomonas Oleovorans
Actinomyces Naeslundii	Gordonia Sp	Pseudomonas Oryzihabitans
Actinomyces Neuii	Gram Negative Bacilli	Pseudomonas Paucimobilis
Actinomyces Odontolyticus	Granulicatella Adiacens	Pseudomonas Putida
Actinomyces Oris	Granulicatella Elegans	Pseudomonas Sp.
Actinomyces Sp.	Haematobacter Sp	Pseudomonas Stutzeri
Actinomyces Viscosus	Haemophilus	Pseudoxanthomonas Kaohsiungensis
Aerococcus Sp	Haemophilus Aphrophilus	Psychrobacter Phenylpyruvicus
Aerococcus Urinae	Haemophilus Haemolyticus	Rahnella Named
Aerococcus Viridans	Haemophilus Parahaemolyticus	Rahnella Sp
Agrobacterium Tumefaciens	Haemophilus Parainfluenzae	Ralstonia Pickettii
Alcaligenes Faecalis	Haemophilus Paraphrohaemolyticus	Ralstonia Sp.
Alcaligenes Sp	Haemophilus Sp.	Rhizobium Radiobacter
Alpha Haemolytic Streptococcus	Kingella Denitrificans	Rhodococcus
Alternaria Sp.	Kingella Kingae	Rhodococcus Bronchialis
Anaerobes (Not Specified)	Kingella Sp	Rhodococcus Sp
Anitratus	Kocuria Kristinae	Roseomonas Gilardii
Arcanobacterium Haemolyticum	Kocuria Rhizophila	Roseomonas Mucosa

Arthrobacter Sp	Kocuria Rosea	Roseomonas Sp
Aurantimonas Altamirensis	Kocuria Sp	Rothia Aeria
Bacillus	Kocuria Species	Rothia Dentocariosia
Bacillus Cereus	Kocuria Varians	Rothia Sp
Bacillus Circulans	Kytococcus Schroeteri	Rothia Spp
Bacillus Licheniformis	Lactobacillus	Ruminococcus Gnavus
Bacillus Pumilus	Lactobacillus Crispatus	Scopulariopsis Brevicaulis
Bacillus Silvestris	Lactobacillus Fermentum	Sphingobacterium Multivorum
Bacillus Sp.	Lactobacillus Gasseri	Sphingomonas
Bacillus Subtilis	Lactobacillus Jensenii	Sphingomonas Paucimobilis
Bifidobacterium	Lactobacillus Lactis	Sphingomonas Sp
Bifidobacterium Adolescentis	Lactobacillus Paracasei	Staph Saprophyticus
Bifidobacterium Breve	Lactobacillus Rhamnosus	Staphylococcus Capitis
Bifidobacterium Catenulatum	Lactobacillus Sp.	Staphylococcus Coagulase Negative
Bifidobacterium Longum	Lactococcus Cremoris	Staphylococcus Epidermidis
Bifidobacterium Sp	Lactococcus Garvieae	Staphylococcus Haemolyticus
Brevibacillus Parabrevis	Lactococcus Lactis	Staphylococcus Hominis
Brevibacterium	Lactococcus Sp.	Staphylococcus Lugdunensis
Brevibacterium Casei	Leuconostoc Sp	Staphylococcus Pettenkoferi
Brevibacterium Sp	Lysinibacillus Sp	Staphylococcus Simulans
Brevundimonas Diminuta	Mallassezia Furfur	Staphylococcus Sp.
Brevundimonas Sp	Massilia Timonae	Staphylococcus Vitulinus
Brevundimonas Vesicularis	Methylobacterium Sp	Staphylococcus Warneri
Burkholderia Capecia	Microbacterium Aurum	Stenotrophomonas Acidaminiphila
Burkholderia Cepacia	Microbacterium Paraoxydans	Stenotrophomonas Maltophilia
Burkholderia Gladioli	Microbacterium Sp	Stenotrophomonas Sp
Capnocytophaga	Micrococcus	Stephanoascus Ciferrii
Chryseobacterium Indologenes	Micrococcus Luteus	Steptococcus Mutans
Chryseobacterium Meningosepticum	Micrococcus Lylae	Stomatococcus Mucilaginosus
Chryseobacterium Sp.	Micrococcus Sp.	Stomatococcus Sp
Chryseomonas Indologenes	Micrococcus Varians	Streptococcus Alactolyticus
Collinsella Aerofaciens	Microsporum Sp	Streptococcus Alpha And Non-Haemolytic
Comamonas Acidovorans	Mixed Growth	Streptococcus Cristatus
Comamonas Testosteroni	Moraxella Catarrhalis	Streptococcus Gordonii
Cons	Moraxella Lacunata	Streptococcus Infantarius Subsp Nov
Cons (Mixed)	Moraxella Nonliquefaciens	Streptococcus Infantis
Corynebacterium	Moraxella Osloensis	Streptococcus Intermedius Group
Corynebacterium Afermentans	Moraxella Sp.	Streptococcus Lutetiensis
Corynebacterium Amycolatum	Mycobacterium Sp.	Streptococcus Mitis
Corynebacterium Aurimucosum	Neisseria Cinerea	Streptococcus Oralis
Corynebacterium Auris	Neisseria Flavescens	Streptococcus Other Group
Corynebacterium Coyleae	Neisseria Lactamica	Streptococcus Parasinguinis
Corynebacterium Diphtheriae	Neisseria Mucosa	Streptococcus Peroris
Corynebacterium Imitans	Neisseria Perflava	Streptococcus Pseudoporcinus

Corynebacterium Jeikeium	Neisseria Polysacchareae	Streptococcus Salivarius
Corynebacterium Minutissimum	Neisseria Sicca	Streptococcus Sanguis
Corynebacterium Mucifaciens	Neisseria Sp	Streptococcus Sobrinus
Corynebacterium Propinquum	Neisseria Subflava	Streptococcus Sp.
Corynebacterium Pseudodiphtheriticum	Oceanobacillus Profundus	Streptococcus Thermophilus
Corynebacterium Simulans	Ochrobactrum Anthropi	Streptococcus Vestibularis
Corynebacterium Sp.	Ochrobactrum Sp	Streptococcus Viridans
Corynebacterium Striatum	Paenibacillus Amylolyticus	

11. Glossary of terms

BAPM	The British Association for Perinatal Medicine improves standards of perinatal care by supporting all those involved in perinatal care to optimise their skills and knowledge, promote high quality, safe and innovative practice, encourage research, and speak out for the needs of babies and their families. https://www.bapm.org/
BPD	Bronchopulmonary dysplasia
Bliss	Bliss is a national charity for babies born premature or sick. It exists to give every baby born premature or sick in the UK the best chance of survival and quality of life. Bliss supports families, campaigns for change, and supports professionals, and enables life-changing research. https://www.bliss.org.uk
cPVL	Cystic periventricular leukomalacia
DCC	Deferred cord clamping
GIRFT	Getting It Right First Time (GIRFT) is a national programme designed to improve the treatment and care of patients through in-depth review of services, benchmarking, and presenting a data-driven evidence base to support change.
HQIP	The Healthcare Quality Improvement Partnership (HQIP) aims to promote quality improvement in patient outcomes, and in particular, to increase the impact that clinical audit, outcome review programmes and registries have on healthcare quality in England and Wales. HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. https://www.hqip.org.uk/
HRG	Healthcare resource group: Standard groupings of clinically similar treatments which use common levels of healthcare resource.
Hyperthermia	A body temperature more than 37.5°C
Hypothermia	A body temperature less than 36.5°C
IVH	Intraventricular haemorrhage
LNU	Local neonatal units (LNUs) provide neonatal care for their own catchment population, except for the sickest babies. They provide all categories of

	neonatal care, but they transfer babies who require complex or longer-term intensive care to a NICU, as they are not staffed to provide longer-term intensive care. Most babies over 27 weeks gestational age will usually receive their full care, including short periods of intensive care, within their LNU. Some networks have agreed variations on this policy, due to local requirements. Some LNUs provide high dependency care and short periods of intensive care for their network population. LNUs may receive transfers from other neonatal services in the network if these fall within their agreed work pattern[39].
MatNeoSIP	The Maternity and Neonatal Safety Improvement Programme (MatNeoSIP), formerly known as the Maternal and Neonatal Health Safety Collaborative, is the programme supporting improvement in the quality and safety of maternity and neonatal units across England. https://www.england.nhs.uk/mat-transformation/maternal-and-neonatal-safety-collaborative/
MBRRACE-UK	Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK. https://www.npeu.ox.ac.uk/mbrrace-uk
NCAPOP	National Clinical Audit and Patient Outcomes Programme
NEC	Necrotising enterocolitis
NHSE	NHS England
NICE	National Institute for Health and Care Excellence
NICU	Neonatal intensive care units (NICUs) are sited alongside specialist obstetric and feto-maternal medicine services and provide the whole range of medical neonatal care for their local population, along with additional care for babies and their families referred from the neonatal network. Many NICUs are co-located with neonatal surgery services and other specialised services. Medical staff in a NICU should have no clinical responsibilities outside the neonatal and maternity services[39].
NMPA	The National Maternity and Perinatal Audit is a national clinical audit of NHS maternity services in England, Scotland and Wales. The audit, commissioned by HQIP, is led by the Royal College of Obstetricians and

[39] Department of Health. *Toolkit for high quality neonatal services*. 2009. Available from https://webarchive.nationalarchives.gov.uk/ukgwa/20100604134939/http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_107845

	Gynaecologists in partnership with the Royal College of Midwives (RCM, the Royal College of Paediatrics and Child Health (RCPCH) and the London School of Hygiene and Tropical Medicine (LSHTM). www.maternityaudit.org.uk
NNAP	National Neonatal Audit Programme
Normothermia	A body temperature between 36.5°C and 37.5°C
ODN	Operational delivery network: In England, managed clinical networks for the coordination of neonatal critical care.
Outlier	A result that is statistically above or below expected performance. The NNAP defines outliers in four categories: • outstanding: three or more standard deviations above expected performance • excellent: between two and three standard deviations above expected performance • alert: between two and three standard deviations below expected performance • alarm: three or more standard deviations below expected performance.
PERIPrem	Perinatal Excellence to Reduce Injury in Premature Birth https://www.weahsn.net/our-work/transforming-services-and-systems/periprem/
PReCePT	The Prevention of Cerebral Palsy in PreTerm Labour. https://www.weahsn.net/our-work/transforming-services-and-systems/precept/
Preterm	Preterm is defined by the World Health Organisation as a baby born alive before 37 weeks of pregnancy are completed. This definition is sub-categorised by gestational age: • extremely preterm (less than 28 weeks) • very preterm (28 to 32 weeks) • moderate to late preterm (32 to 37 weeks).
QI	Quality improvement
RCPCH	The Royal College of Paediatrics and Child Health (RCPCH) was founded in 1996 and now has over 17,000 members across the world. The RCPCH plays

	a major role in postgraduate medical education, professional standards, research and policy. https://www.rcpch.ac.uk
RCOphth	Royal College of Ophthalmologists
ROP	Retinopathy of prematurity
SCU	Special care units (SCUs) provide special care for their own local population. Depending on arrangements within their neonatal network, they may also provide some high dependency services. In addition, SCUs provide a stabilisation facility for babies who need to be transferred to a neonatal intensive care unit (NICU) for intensive or high dependency care, and they also receive transfers from other network units for continuing special care[39].