



UNIVERSITY OF
LEICESTER

www.le.ac.uk

FUNDED BY

NIHR

National Institute for
Health and Care Research

Preterm birth and paediatric intensive care:

*Using national data to examine
critical illness in early childhood*

Dr Tim van Hasselt

MBChB BMedSc MRCPCH PGCert FHEA PhD

NIHR Academic Clinical Lecturer, University of Leicester

Bliss
for babies born
premature or sick

40 years
of change
for babies



British Association of
Perinatal Medicine



Case Study

Baby Imogen* born at 22 weeks,
weighing 500g

- Long stay in NICU
- Complications of prematurity
- Eventually discharged from NICU
- Unexpected deterioration, admitted to PICU
- Significant trauma throughout for family

*name changed for confidentiality



Neonatal Care

- For preterm and sick babies after birth
- 195 neonatal units in the UK



Paediatric Intensive Care

- Intensive care for children of all ages
- 30 PICUs in the UK

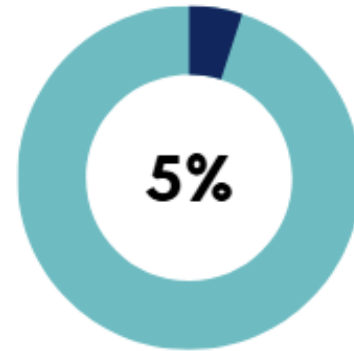
“[PICU is like being] thrown into a different environment”

“You don’t expect it’ll happen [PICU admission] when they go home [from neonatal unit]”

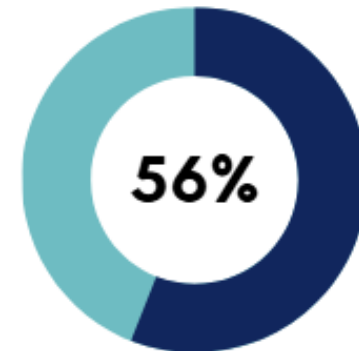


“[PICU is] 10 times more intense than neonatal”

Children born in England and Wales 2013-2018



Babies on neonatal units
admitted to PICU before
2 years of age



PICU admissions aged
under 2 years who had
neonatal admission



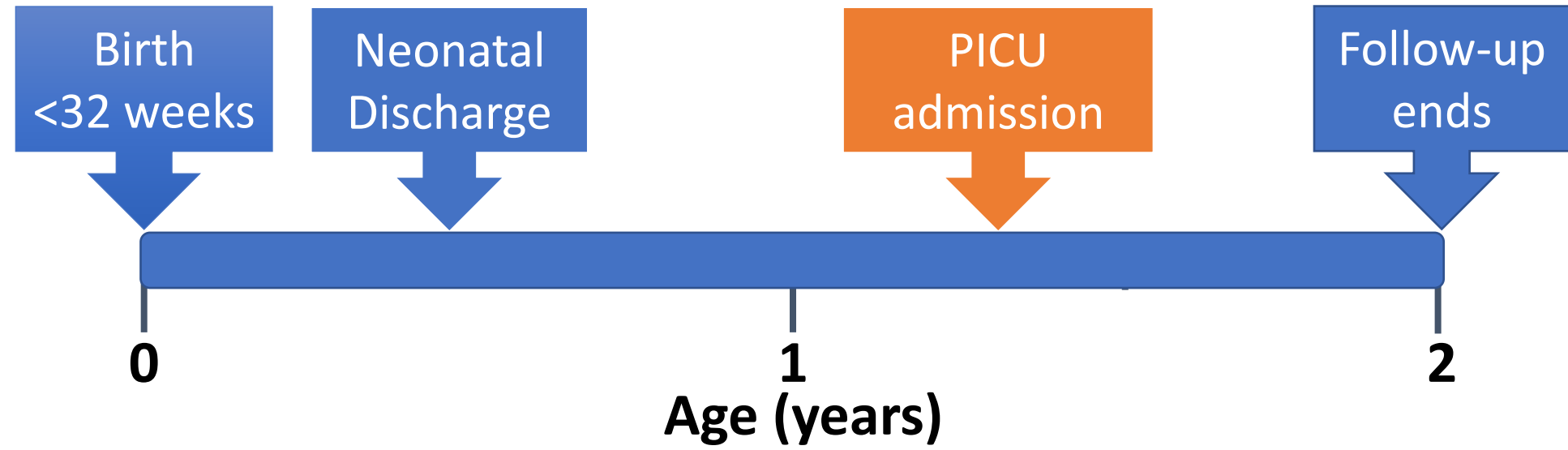
Research question:

When a preterm-born baby leaves neonatal care, what is the risk they will be admitted to PICU?



National Neonatal Research Database (NNRD)

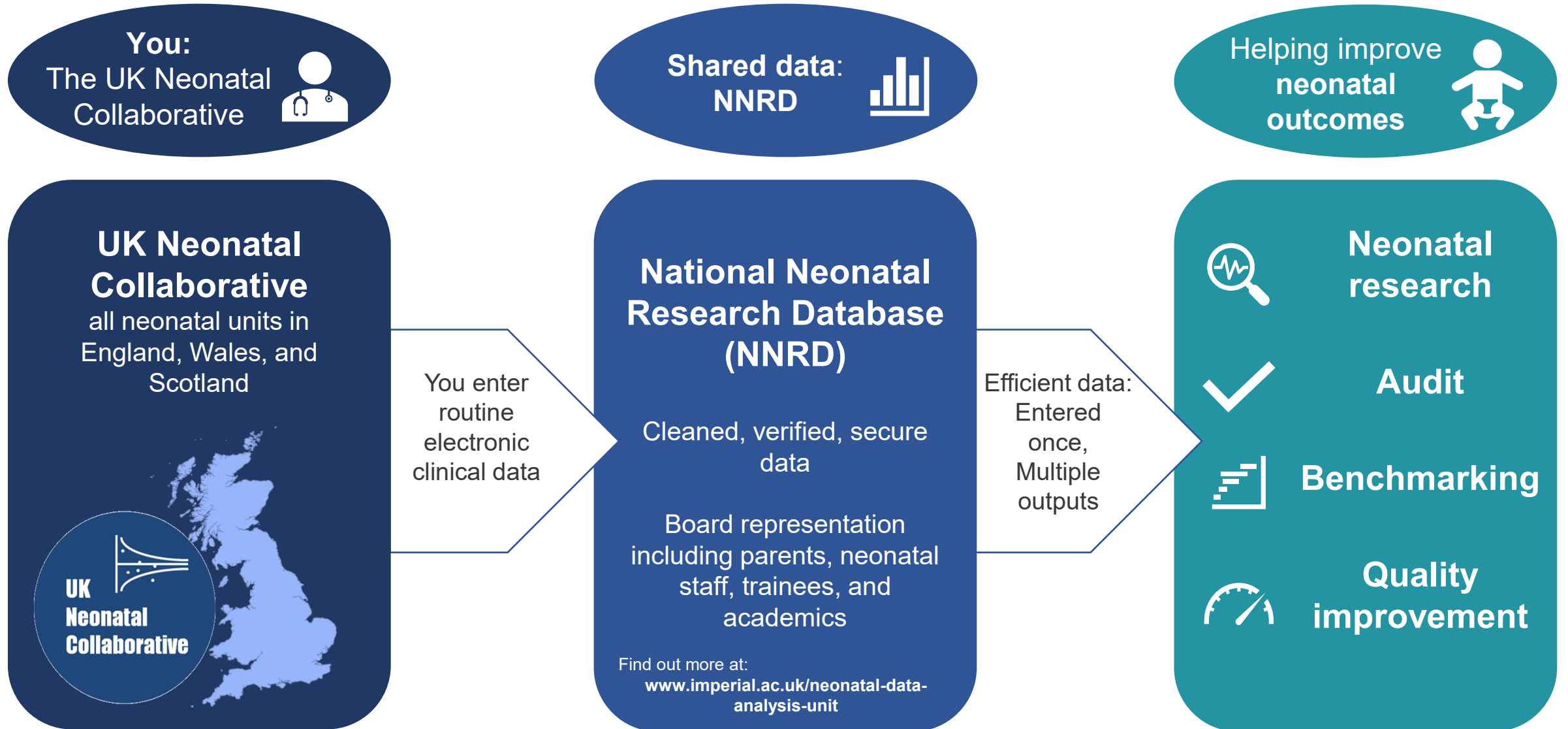
Paediatric Intensive Care Audit Network (PICANet)



National Neonatal Research Database (NNRD)

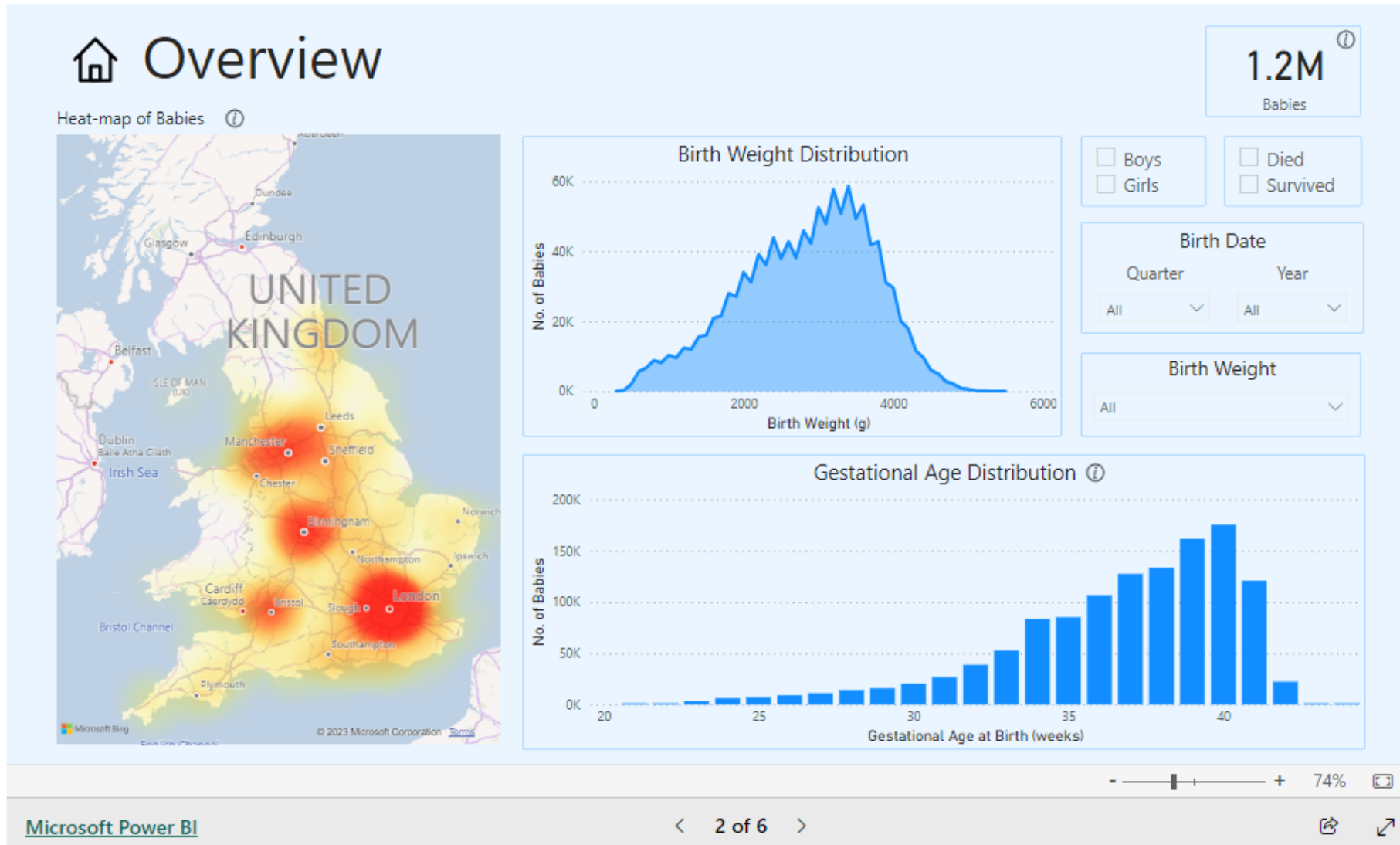
- Established in 2007 – complete data for England/Scotland/Wales since 2015
- Principle of “**enter high quality data once and use for multiple outputs**”
- Currently receives data from Neonatal BadgerNet (CleverMed)
- Run from the **Neonatal Data Analysis Unit (NDAU)** at Imperial College London
- **400+ data items** per baby all neonatal units
- Quality assurance and data cleaning
- **Over one million babies** and **10 million days of care** data in database; 100,000 new patients added each year
- NNRD access applications are through the [Health Data Research UK \(HDR-UK\) Innovation Gateway](#)

How neonatal data are improving care for our patients





NNRD Data Visualisation



Paediatric Intensive Care Audit Network




UNIVERSITY OF LEEDS

 UNIVERSITY OF
LEICESTER

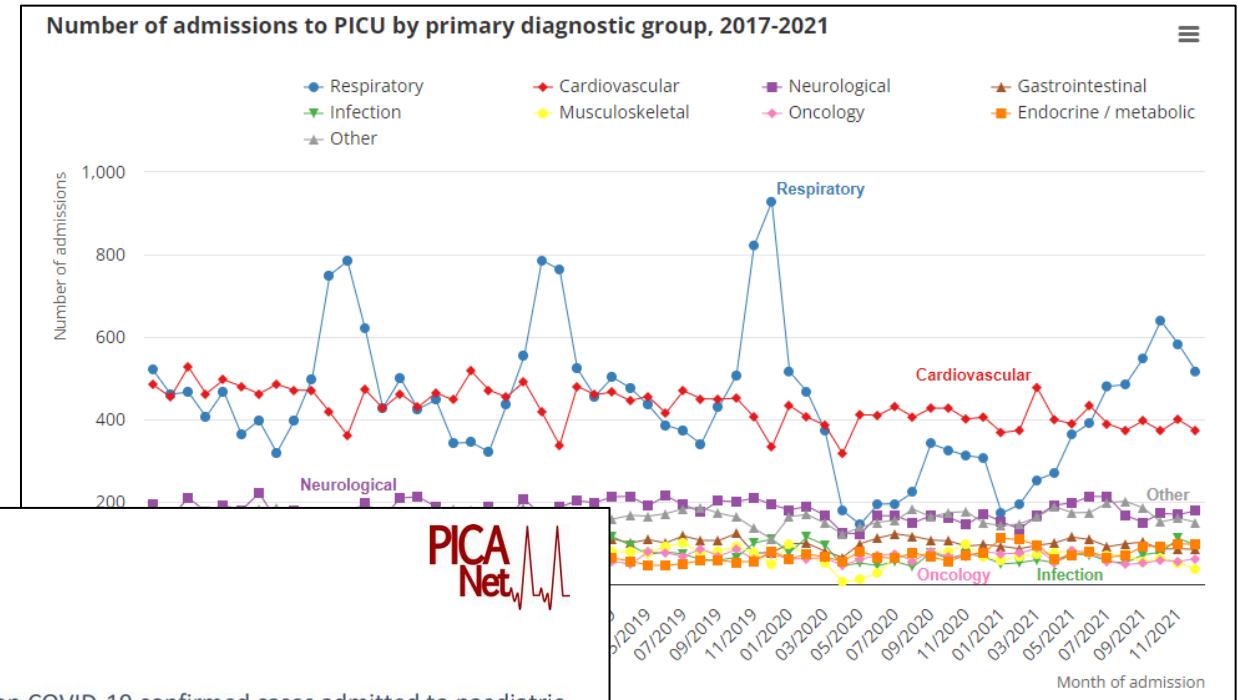
General Enquiries
picanet@leeds.ac.uk
0113 343 8125

- Established in 2002, full UK coverage since 2008, with the aims of:
 - Monitoring best practice and outcomes
 - Facilitate healthcare planning and quantify resource requirements
 - Study epidemiology of critical illness in children
- Includes all PICU admissions and transport episodes
- Data verification and cleaning
- Available through **Healthcare Quality Improvement Partnership (HQIP)** request process

PICANet Outputs



- Annual reports
- Audit
- Data Dashboards
- Research



Short report

Tracheostomy trends in paediatric intensive care

Jason Powell ,^{1,2} Hannah L Buckley,³ Rachel Agbeko ,⁴ Malcolm Brodlie,^{1,5} Steven Powell²

ABSTRACT
Paediatric tracheostomy is most commonly performed in children on the paediatric intensive care unit (PICU) to facilitate long-term ventilation. We sought to identify trends in UK tracheostomy practice in PICUs. Data were analysed from 250 261 admissions, including 4409 children tracheostomised between 2003 and 2017. The incidence of tracheostomy in 2017 was approximately half that in 2003 (incidence rate ratio=0.48, 95% CI 0.40 to 0.57). The percentage of patients tracheostomised during a PICU admission, as a proportion of all admissions, was 2.44% (n=319) in 2003 and reduced to 0.97% (n=180) in 2017. Nevertheless, we identified great variability in practice between different PICUs with tracheostomy rates between 0.0% and 4.0% of all admissions. Risk-adjusted PICU mortality was comparable between tracheostomised children and all admissions to PICU.

INTRODUCTION
Tracheostomy in children is most commonly performed to facilitate long-term ventilation.^{1, 2}

What is known on this topic?

- ▶ The most common indication for paediatric tracheostomy is to facilitate long-term ventilation in children on the intensive care unit.
- ▶ Performing paediatric tracheostomy and the subsequent care of children with tracheostomies requires specific training and resources.

What this study adds?

- ▶ Tracheostomy in children is becoming less common in paediatric intensive care units (PICUs) in the UK.
- ▶ The proportion of children tracheostomised during a PICU admission varies greatly between different institutions.
- ▶ In this large cohort we demonstrate comparable PICU mortality between tracheostomised children and all admissions to PICU.

Correspondence to
Jason Powell, Newcastle University Institute of Cellular Medicine, Newcastle upon Tyne, UK

8th July 2021

PICANet report on COVID-19 confirmed cases admitted to paediatric intensive care

Report date: 08 Jul 2021

Data cut off for inclusion in this report: 11 Jun 2021

Please use the following format when citing this report: Paediatric Intensive Care Audit Network report on COVID-19 confirmed cases in PICU (published 8th July 2021): Universities of Leeds and Leicester.

1. Data collection and caveats

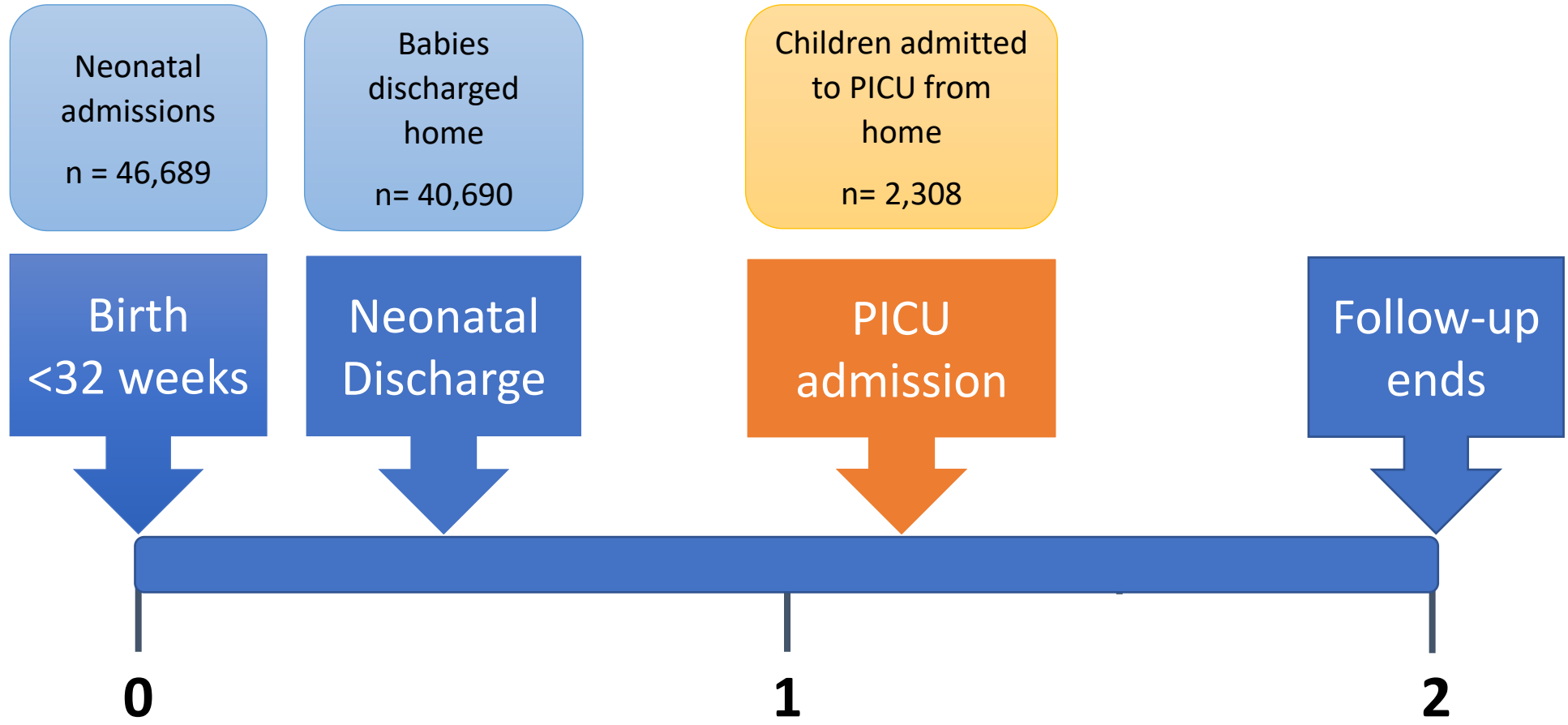
- This report presents data on children with a confirmed COVID-19 diagnosis treated in a paediatric intensive care unit (PICU) in the United Kingdom (UK) or Republic of Ireland (ROI). These children

Other Linkages of Datasets



- [neoWONDER: Neonatal whole population data linkage approach to improving long-term health and wellbeing of preterm and sick babies](#)
- Linking NNRD with education and health data
- *'Understanding the impact of preterm birth and neonatal care on childhood physical, mental health, and educational outcomes'*

Results



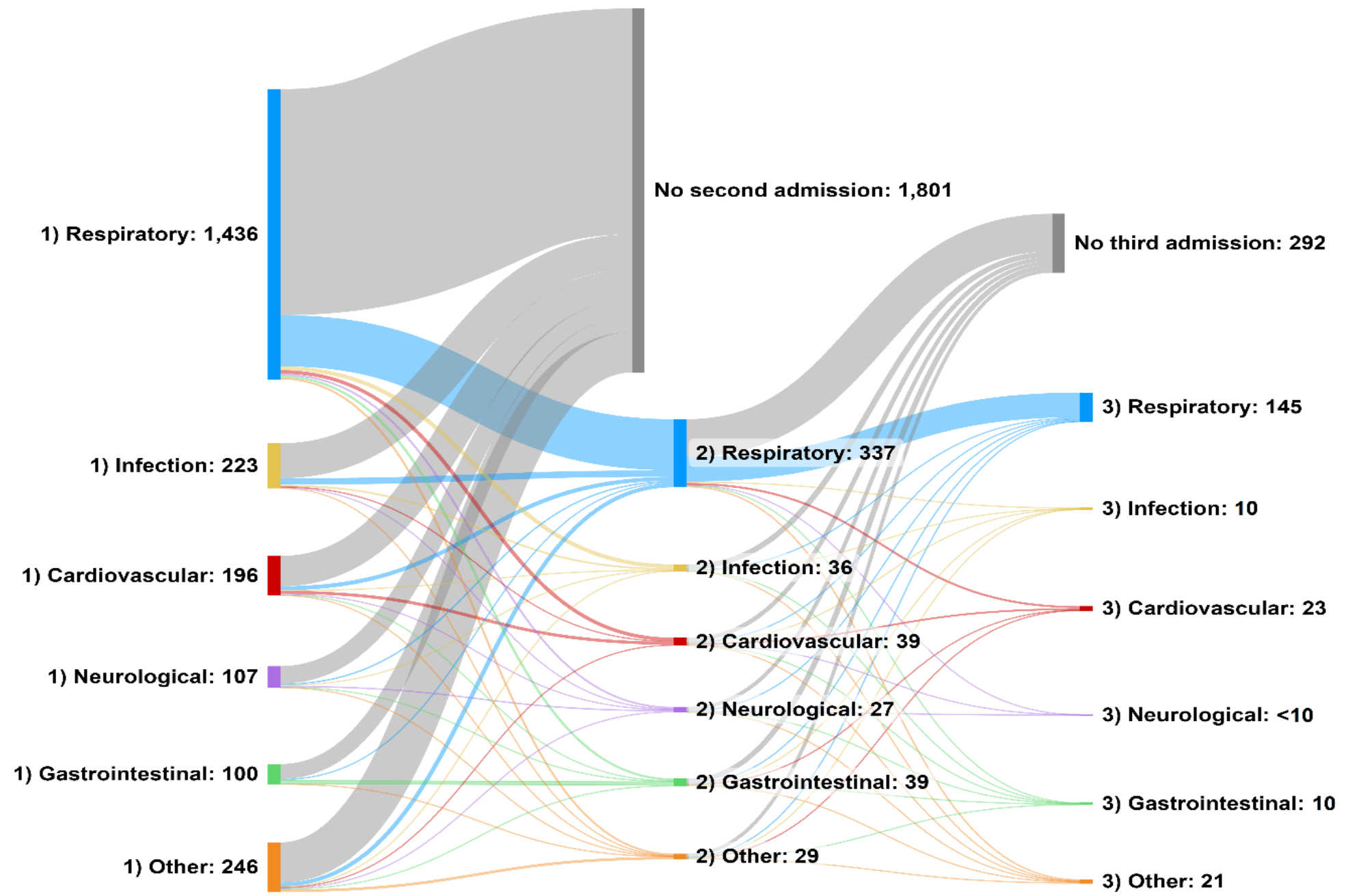
Excluded:
Admitted after day 1 (n=13)
Gestation <22 weeks (n=1)
Died in neonatal care (n=3,929)
Discharge elsewhere including wards/HDU/PICU (n=2,065)

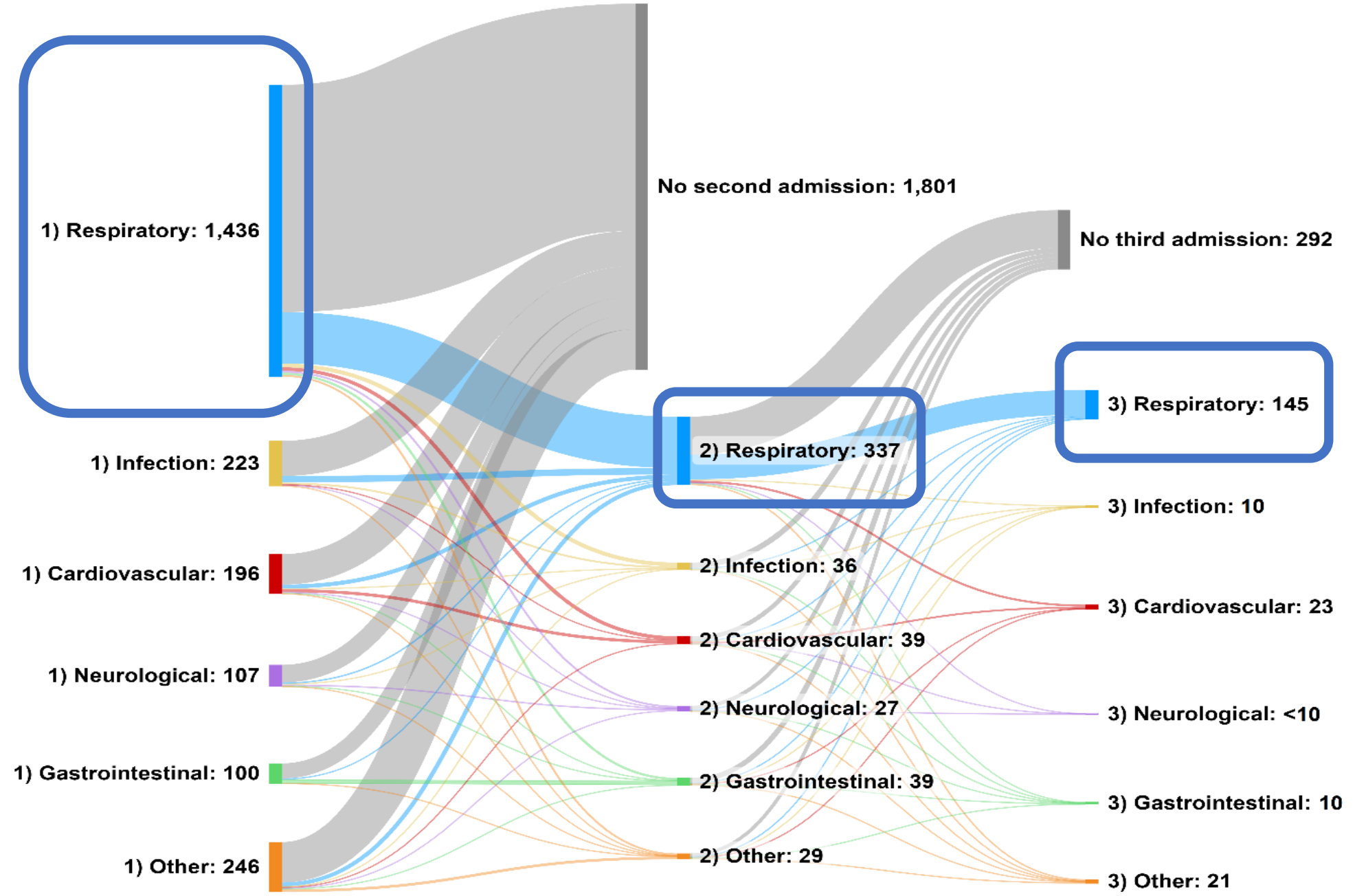
Age (years)

Results

Gestational age at birth (weeks)	Babies discharged home		PICU admissions from home	
	n	%	n	%
<24	529	13.6	72	13.6
24	1,416	12.4	175	12.4
25	2,034	10.1	205	10.1
26	2,804	9.0	252	9.0
27	3,733	6.3	236	6.3
28	5,103	5.6	287	5.6
29	6,121	5.1	312	5.1
30	8,129	4.5	369	4.5
31	10,821	3.7	400	3.7
Total	40,690	5.7	2308	5.7

van Hasselt TJ, *et al.* Paediatric intensive care admissions of preterm children born <32 weeks gestation: a national retrospective cohort study using data linkage. *Archives of Disease in Childhood - Fetal and Neonatal Edition* 2024;**109**:265-271.

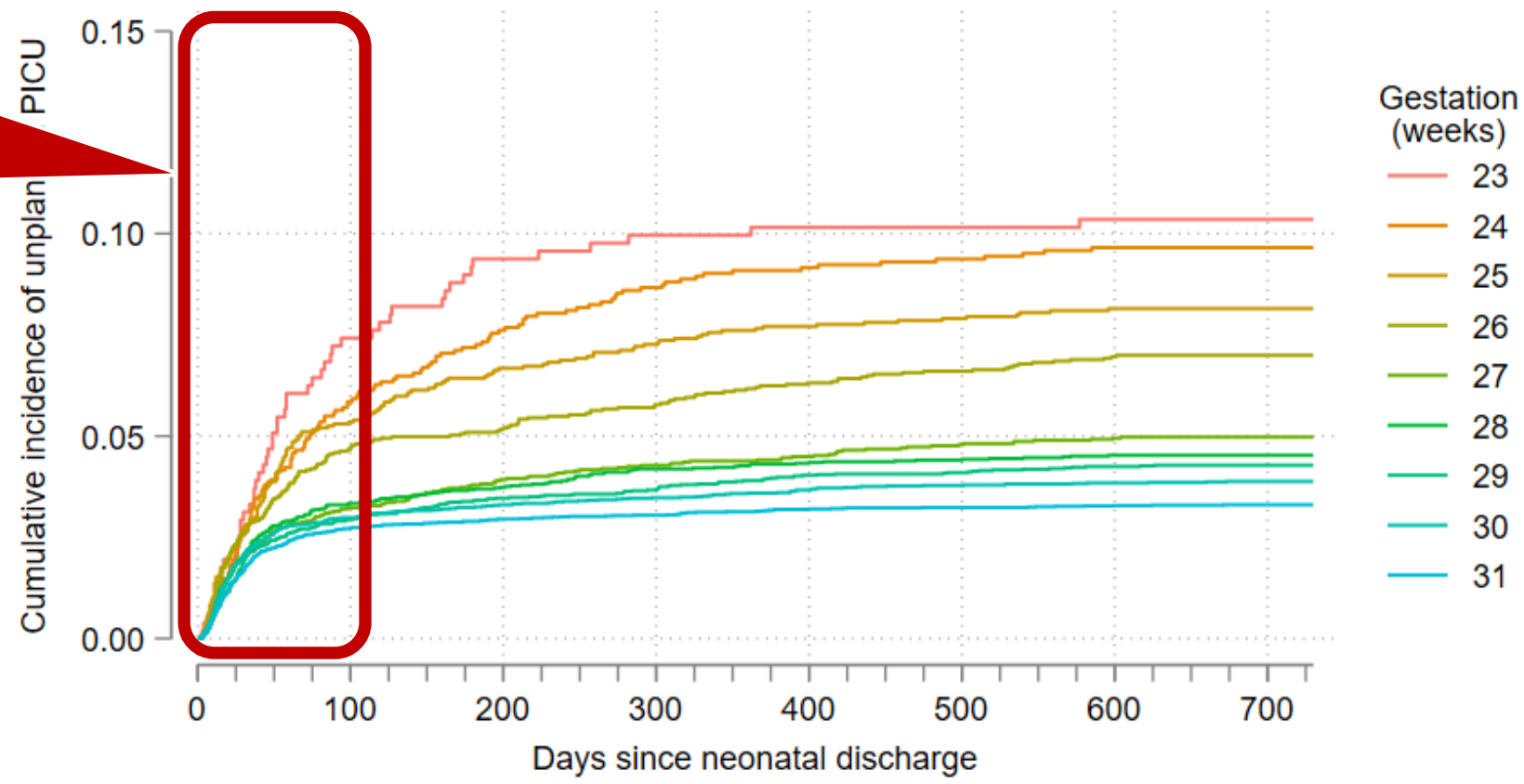




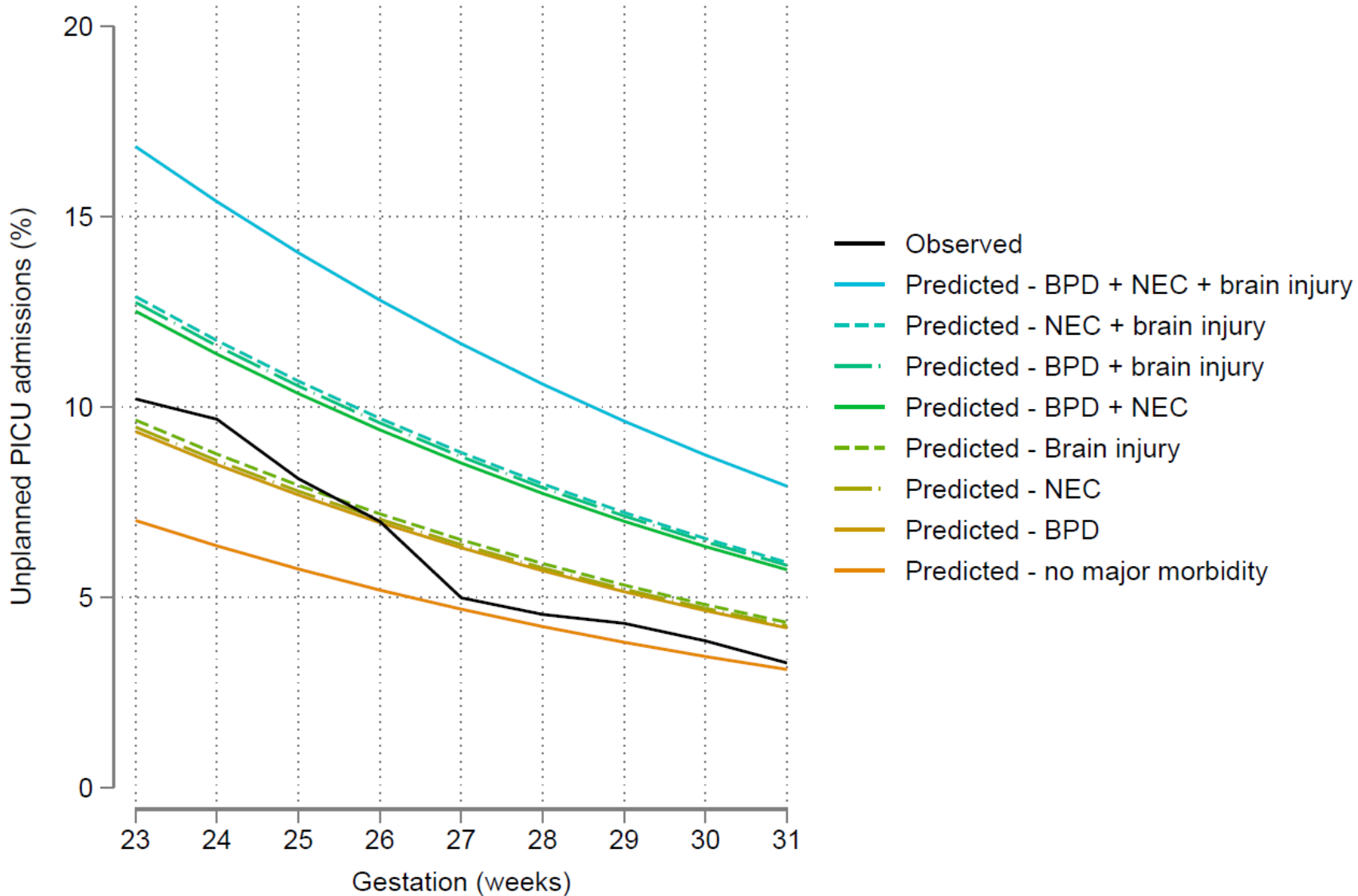
Gestational age at birth (weeks)	Babies discharged home	PICU admissions from home		Unplanned PICU admissions from home	
	n	n	%	n	%
<24	529	72	13.6	54	10.2
24	1,416	175	12.4	137	9.7
25	2,034	205	10.1	165	8.1
26	2,804	252	9.0	196	7.0
27	3,733	236	6.3	186	5.0
28	5,103	287	5.6	232	4.5
29	6,121	312	5.1	264	4.3
30	8,129	369	4.5	313	3.9
31	10,821	400	3.7	354	3.3
Total	40,690	2308	5.7	1901	4.7

Kaplan-Meier – cumulative incidence of unplanned PICU admission

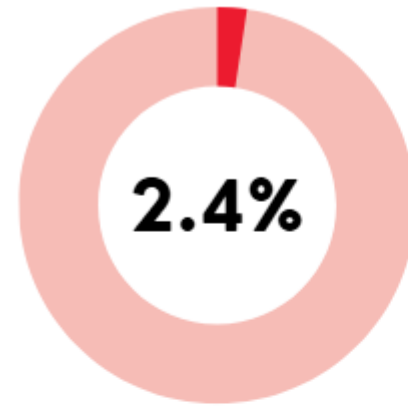
72% within 100 days of discharge



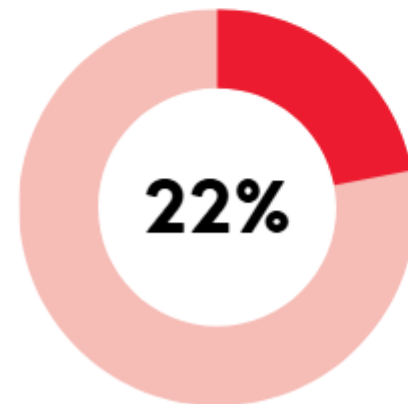
Unplanned PICU admission, by morbidity



Outcomes in PICU



Mortality

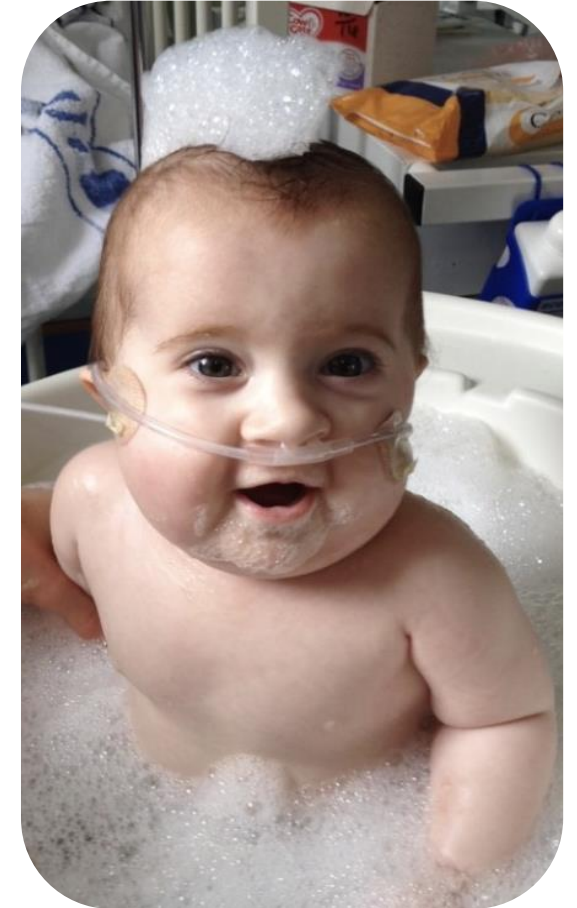


Readmission
to PICU
before 2nd
birthday



Conclusions

- Over 1 in 20 children born <32 weeks require PICU admission after neonatal discharge, most of these unplanned
- Higher-risk babies (over 1 in 10 chance) may be identifiable on neonatal discharge planning
- Unplanned PICU admissions occur shortly after neonatal discharge
- Collaboration with families required to communicate this risk



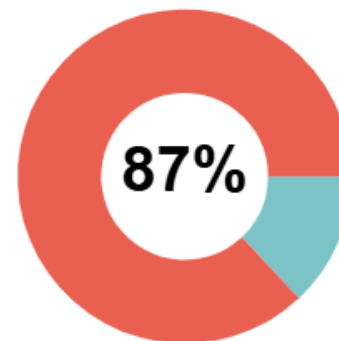
Some children may need PICU (Paediatric Intensive Care Unit) after going home

For children born at

Hospital admissions of very preterm children

Some children get sick and need admission to hospital after going home from the neonatal unit

For children born before 24 weeks...



87 out of 100 children do need hospital admission

13 out of 100 children do not need hospital admission

On average children born before 24 weeks spend **8 days** in hospital between neonatal discharge and their 2nd birthday

Most hospital admissions are for **chest infections**. The risk is higher in **autumn** and **winter**, and for children with long-term health conditions.

For **more information** about your baby's health, and avoiding viral illnesses, go to:
www.bliss.org.uk/parents/going-home-from-the-neonatal-unit



90 out of 100 children do not need admission to PICU

10 out of 100 children need admission to PICU

Ask your neonatal team if you want to know more about the PICU in your area

Admissions are for **chest infections**, **summer** and **winter**, and for children with long-term health conditions.

To find out your baby's long-term health conditions, go to:

www.bliss.org.uk/parents/going-home-from-the-neonatal-unit



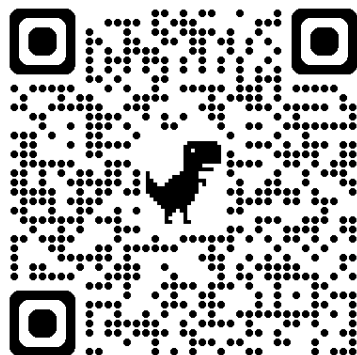
Source: unplanned PICU admissions before 2 years of age. Paper available online: van Hasselt et al. Archives.

Outputs

Infographics

- Co-designed with families and neonatal healthcare professionals
- For use in neonatal units to aid discussions around risk

<https://timms.le.ac.uk/preterm-birth-and-paediatric-intensive-care/>



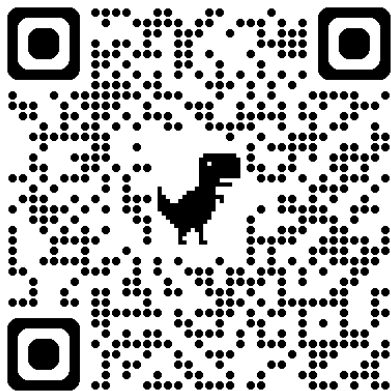


Outputs

Preterm outcome dashboard

- Online dashboard
- Collaboration with the University of Nottingham

<https://premoutcome.github.io/>



Unplanned PICU admission in infants born <32 weeks gestation

Gestation at birth*

23 weeks	24 weeks	25 weeks
26 weeks	27 weeks	28 weeks
29 weeks	30 weeks	31 weeks

Sex

Female Male

Birthweight centile

≤9	9 - 25	25 - 50
50 - 75	75 - 91	>91

Centile conversion calculator

Select morbidity present

BPD No Yes

Severe NEC (Surgical) No Yes

Brain injury No Yes

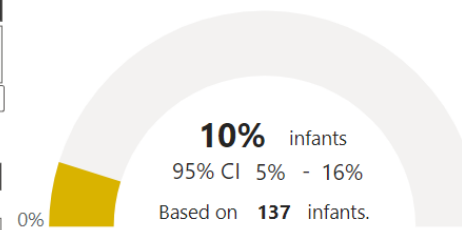
[Click for NICU mortality & respiratory outcomes](#)

Select the desired infant characteristics on the left.

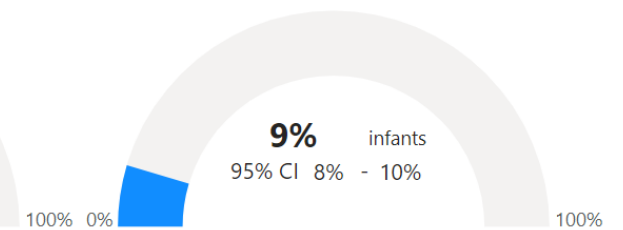
- . BPD = respiratory support requirement at 36 weeks corrected gestational age or discharge.
- . Severe NEC = NEC requiring surgery
- . Brain injury = Grade III/IV intraventricular haemorrhage, periventricular leukomalacia, hypoxic ischaemic encephalopathy, meningitis or seizures after excluding congenital / inherited causes.

Unplanned PICU admission between neonatal discharge and 2 years old

Observed incidence (Gestation only)



Predicted risk (Gestation & morbidity)



Data Source ⓘ
40,690 infants born between 22-31 weeks of gestation in England and Wales from 2013-2018 & **alive at neonatal discharge**.

Print summary data
Click to print summary data for the infant characteristics selected.



[Feedback](#)
[Disclaimer](#)

Outputs

BAPM Working Group

[About](#)[Membership](#)[News](#)[Events](#)[Awards](#)[Professionals](#)[Resources](#)[Transport](#)[National Updates](#)[Data](#)[Research](#)[Safety](#)[NEWTT 2](#)[Quality](#)[COVID-19](#)[Log in](#)

BAPM Member Needed to Chair Working Group on Transition to Paediatrics

Chair a new BAPM Working Group

📅 15 Apr 2024



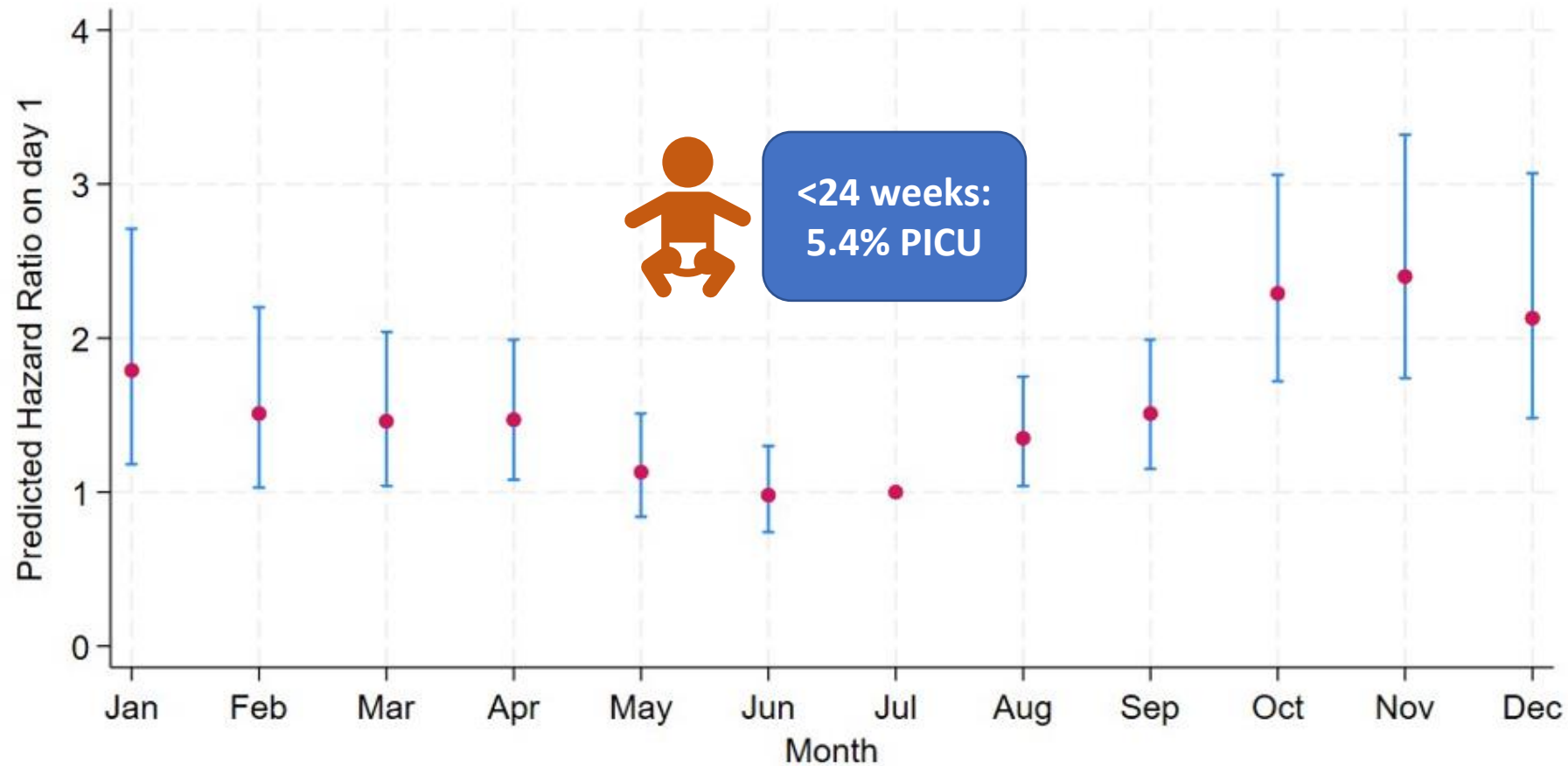
BAPM is seeking a member to chair a working group to develop a Framework for Practice on transition to paediatrics for neonatal patients.



Does going home from
neonatal care in winter
instead of summer make
a difference?

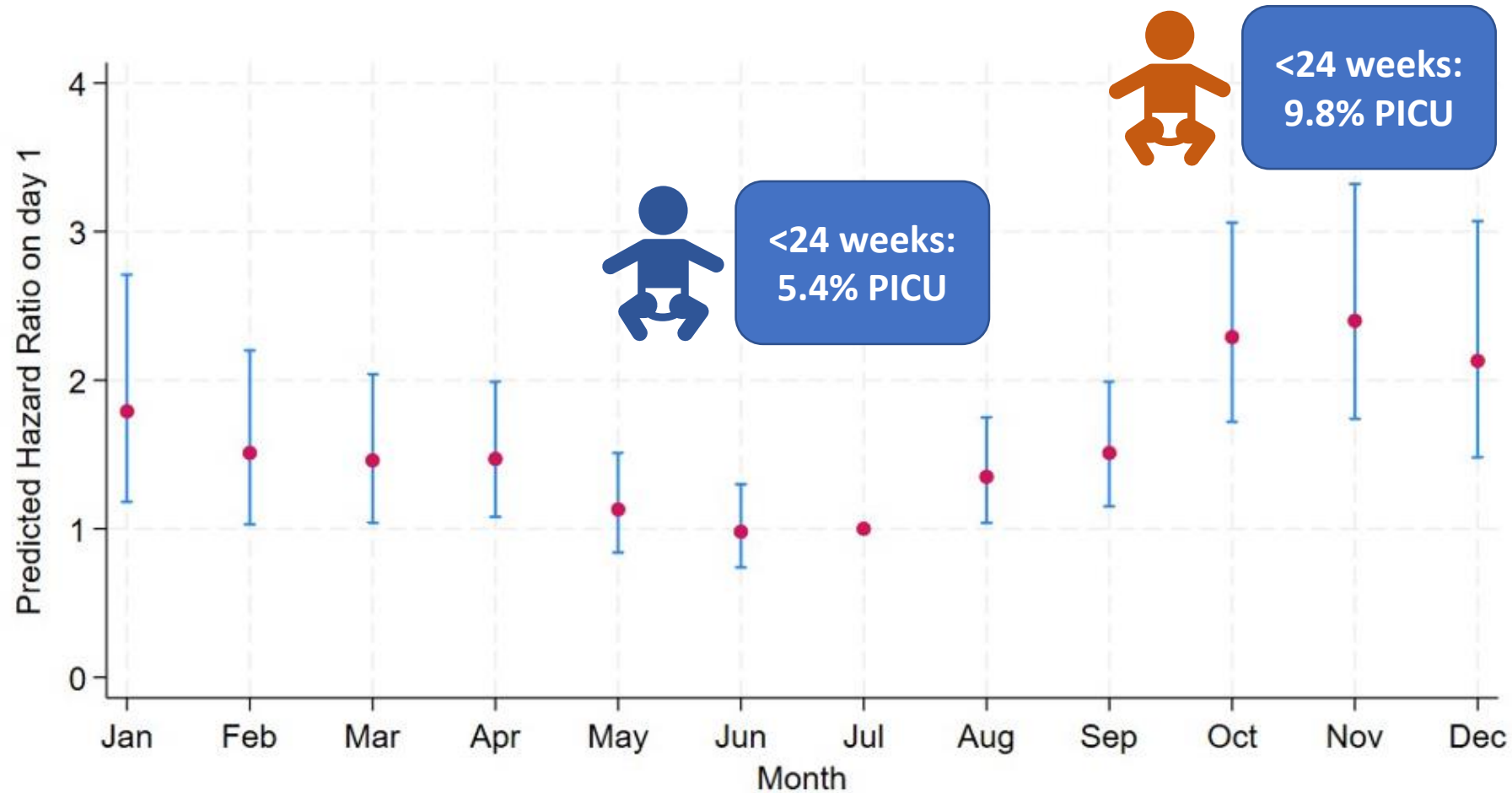


Hazard ratios for unplanned PICU admissions from home by month of neonatal discharge



— Lower 95% CI/Upper 95% CI
● Predicted Hazard Ratio

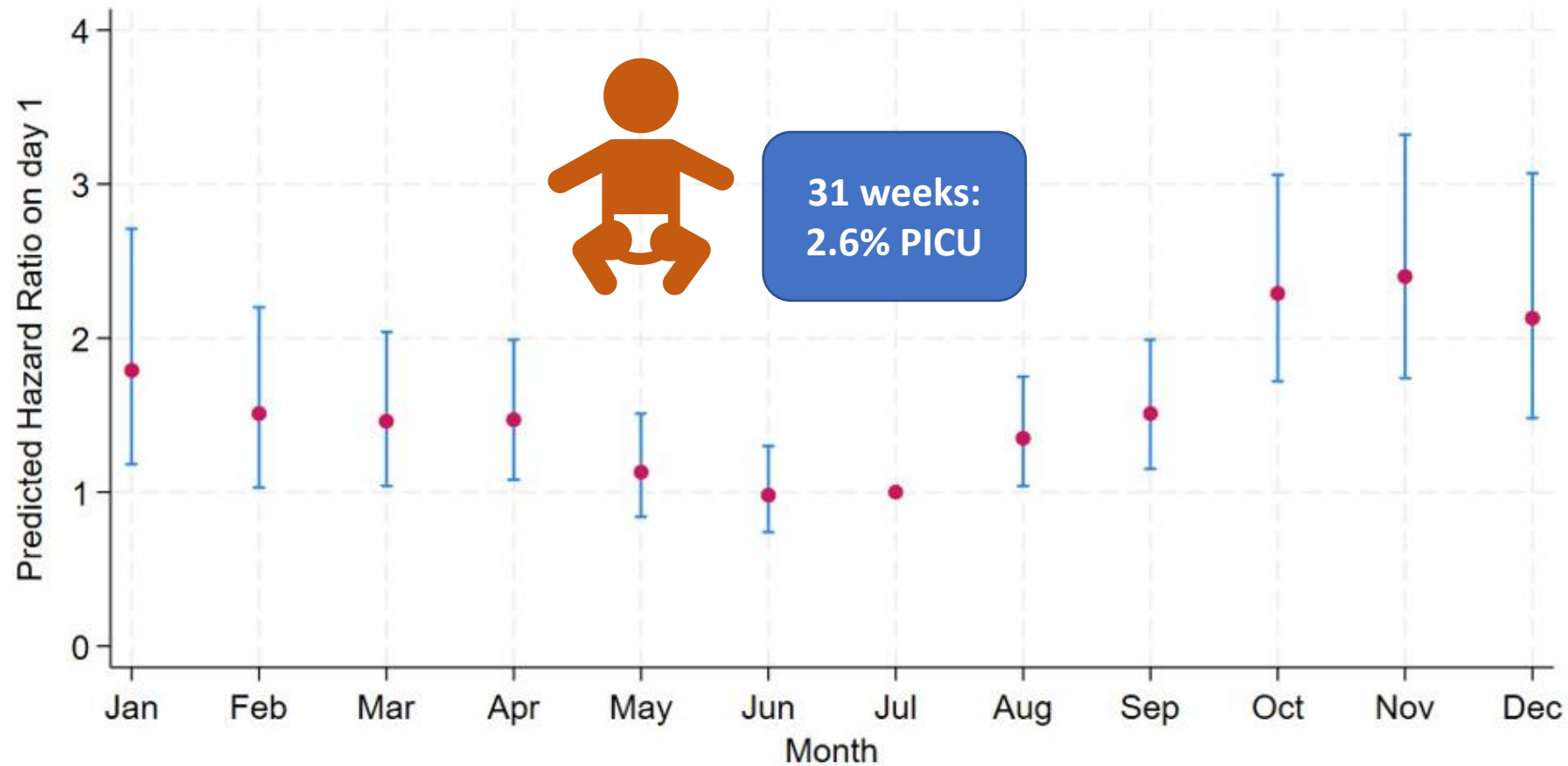
Hazard ratios for unplanned PICU admissions from home by month of neonatal discharge



— Lower 95% CI/Upper 95% CI
● Predicted Hazard Ratio

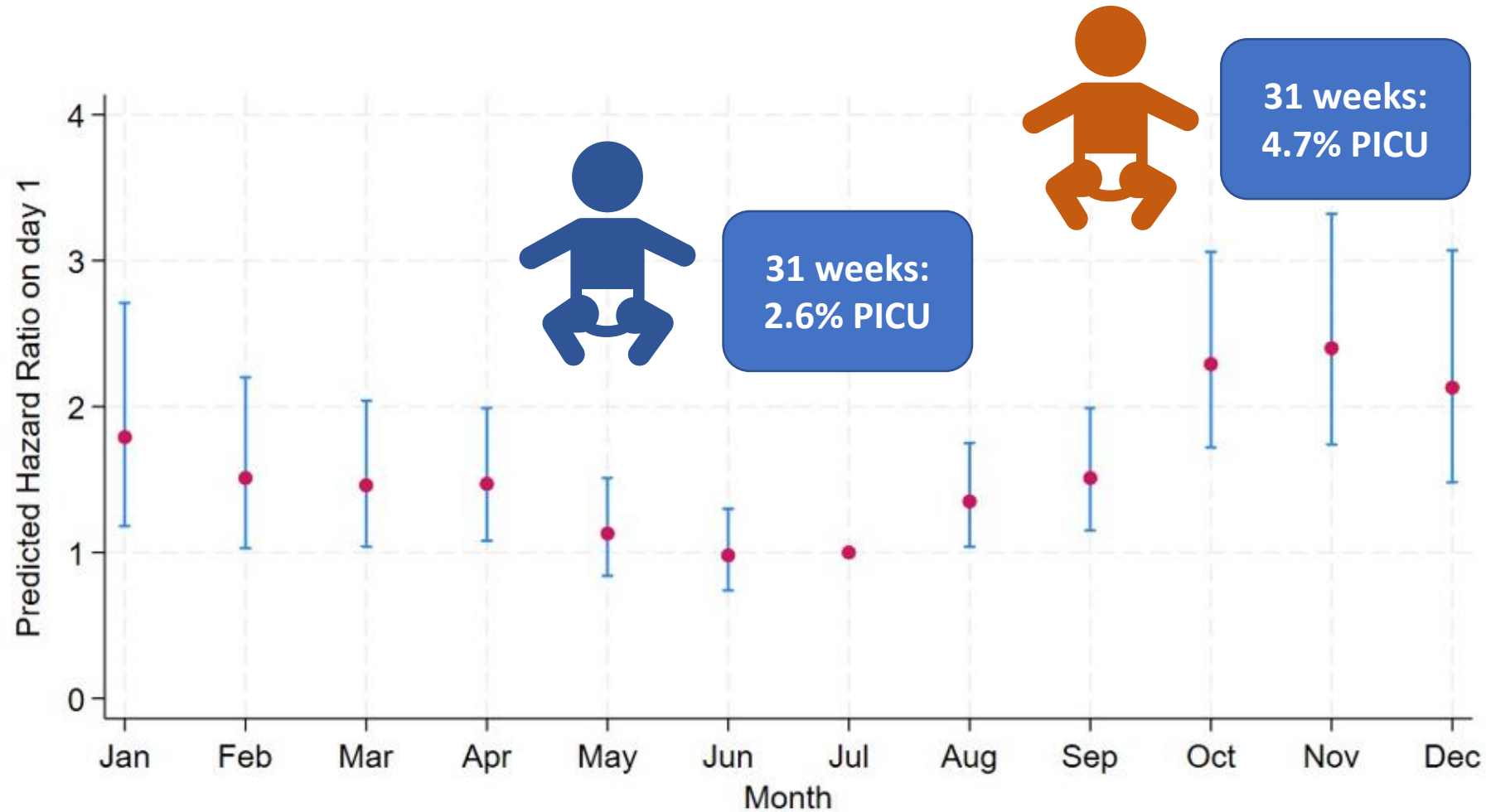
van Hasselt TJ, et al. Timing of Neonatal Discharge and Unplanned Readmission to PICUs Among Infants Born Preterm. JAMA Netw Open. 2024 Nov 4;7(11):e2444909.

Hazard ratios for unplanned PICU admissions from home by month of neonatal discharge



— Lower 95% CI/Upper 95% CI
● Predicted Hazard Ratio

Hazard ratios for unplanned PICU admissions from home by month of neonatal discharge

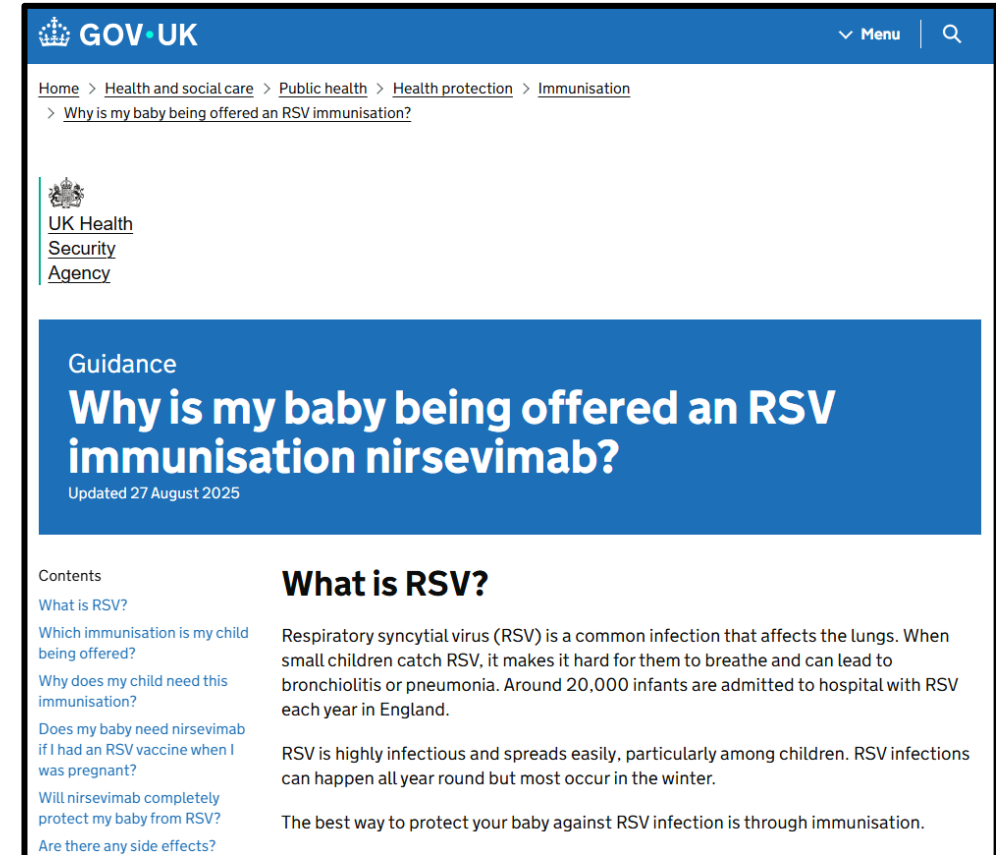


— Lower 95% CI/Upper 95% CI
● Predicted Hazard Ratio

van Hasselt TJ, et al. Timing of Neonatal Discharge and Unplanned Readmission to PICUs Among Infants Born Preterm. JAMA Netw Open. 2024 Nov 4;7(11):e2444909.

Conclusions

- Most very preterm babies have at least 1 hospital admission after going home from neonatal care
- Discharge in autumn and winter carries the highest risk of PICU and hospital admission
- New **Nirsevimab** programme for very preterm babies should reduce this risk



The screenshot shows a GOV.UK webpage with a blue header. The breadcrumb trail is: Home > Health and social care > Public health > Health protection > Immunisation > Why is my baby being offered an RSV immunisation?. The page is from the UK Health Security Agency. The main heading is 'Guidance: Why is my baby being offered an RSV immunisation nirsevimab?' with a sub-heading 'Updated 27 August 2025'. A 'Contents' section lists: 'What is RSV?', 'Which immunisation is my child being offered?', 'Why does my child need this immunisation?', 'Does my baby need nirsevimab if I had an RSV vaccine when I was pregnant?', 'Will nirsevimab completely protect my baby from RSV?', and 'Are there any side effects?'. The 'What is RSV?' section explains that RSV is a common lung infection that can lead to bronchiolitis or pneumonia, with around 20,000 hospital admissions in England each year. It notes that RSV is highly infectious and spreads easily, especially among children, and can occur year-round but is most common in winter. The best protection is through immunisation.



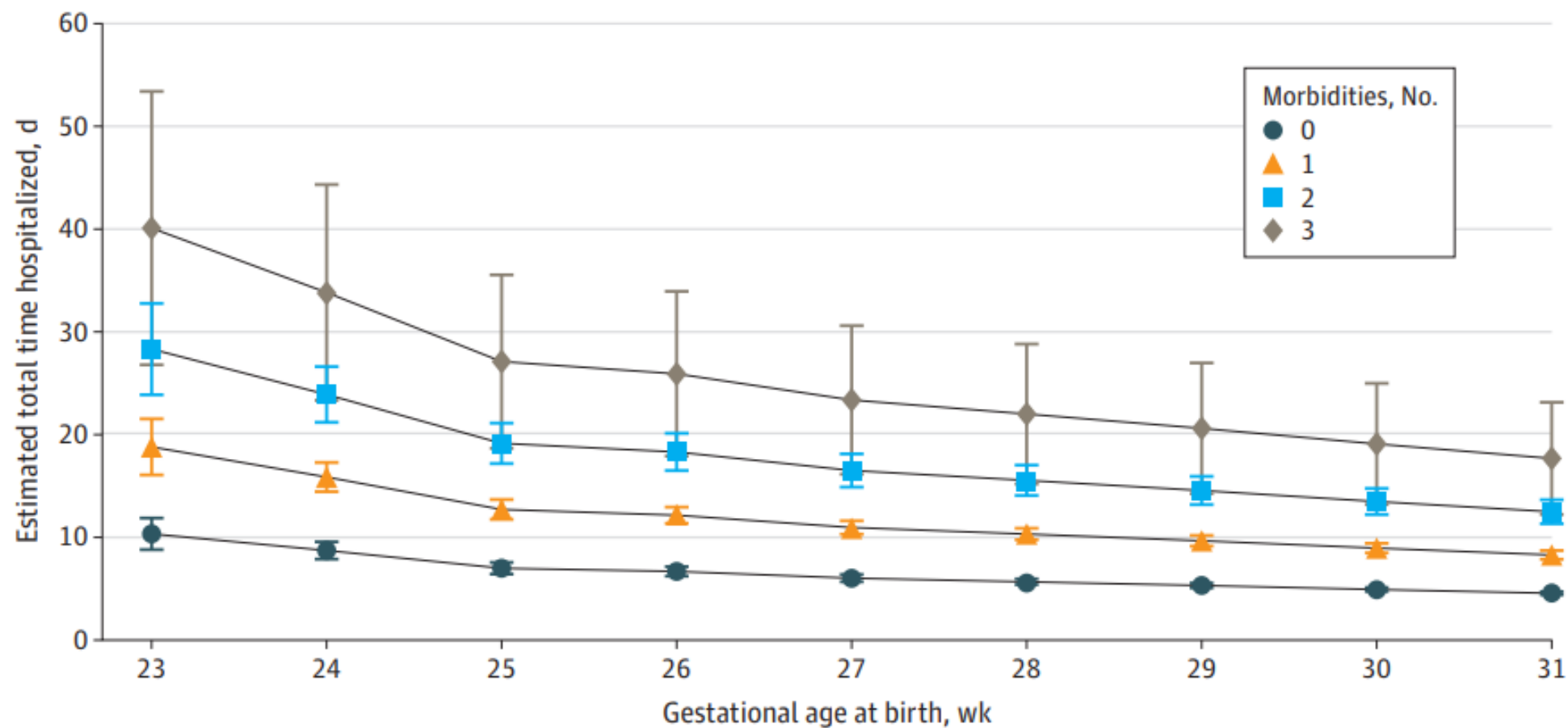
What about hospital
admissions, not just
PICU?



Results – HES data for hospital admissions

Gestational age at birth (weeks)	Any hospital admission	Any unplanned hospital admission	Any admission for respiratory problems
	%	%	%
<24	87	81	63
24	85	81	63
25	81	73	54
26	79	72	52
27	75	68	46
28	71	64	43
29	65	59	39
30	62	56	35
31	59	54	31
Total	67	61	40

Figure 2. Estimates of Expected Number of Total Calendar Days of Hospitalization After Neonatal Discharge Until 2 Years of Age, by Gestational Age and Count of Neonatal Morbidities



Conclusions

- Majority of very preterm children will have at least 1 hospital admission before their 2nd birthday
- Most of these will be unplanned, most for respiratory reasons, and mostly short duration (1-3 days)
- The most preterm children with long-term morbidity may have much longer admissions





Further work: 2025-2027

MAPS: Multiple Long Term Conditions and Prematurity Study

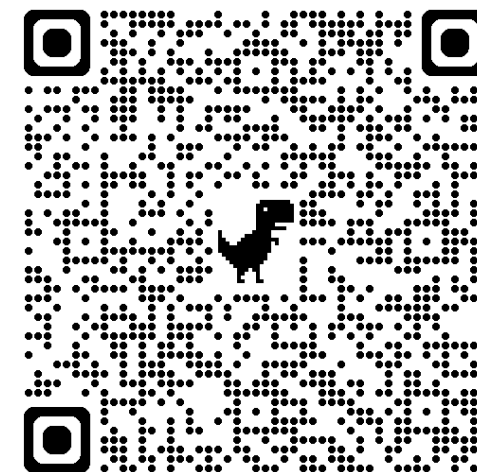
- Consensus definition for paediatric MLTC, input from families and healthcare professionals
- CPRD primary care data linked to hospital and pregnancy/baby data (20% coverage for England)
- Epidemiology of MLTC in preterm vs term children 0-10yrs



Further work: 2027-2032

***E-CHAMPIONS:** Examining Childhood Health and education for those with MultiPle long-term conditions*

- What is the epidemiology of MLTCs in children in England and Wales?
- What is the impact of MLTCs on health and education in childhood?
- Are there groups of children with similar MLTCs, who use similar outpatient services that could be combined into “one-stop” clinics?



Many thanks to:

My supervisors

NIHR

Bliss

BAPM

PICANet team and PICU staff

Paediatric Critical Care Society Study Group

NNRD team and UK Neonatal Collaborative

Clinical advisory group

Parental advisory panel, especially Ava's mum and Joshua's mum

Thank you for listening,
any questions?

tvh3@leicester.ac.uk / [@tim-van-hasselt.bsky.social](https://www.bsky.social/@tim-van-hasselt)



40 years
of change
for babies

