NMPA

National Maternity & Perinatal Audit

Induction of Labour Snapshot Audit

Based on births in NHS maternity services in England, Scotland and Wales during 2023

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LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE
RCPCH Royal College of Paediatrics and Child Health
Royal College of Midwives
Royal College of Obstetricians & Gynaecologists
HQIP Healthcare Quality Improvement Partnership

Introduction

Induction of labour (IOL) is the process of artificially starting labour by the softening and opening of the cervix and/or breaking the amniotic membranes.

This report uses data from births that occurred in NHS maternity services in 2023 to analyse the characteristics and outcomes of women and birthing people undergoing IOL in Great Britain. The report identifies factors that may influence mode of birth and 5-minute Apgar score following induction, and analyses variation in one of the most frequently used interventions to bring about labour and childbirth.

Contents

About Induction Of Labour

Induction of labour can be performed using one or more of the following methods:

- cervical balloon
- hormone pessaries, tablets and gels
- cervical dilating rods
- oxytocin infusion
- artificial rupture of the amniotic membranes

Further information about induction of labour can be found at ***NHS Inducing Labour***

Rates of IOL are rising across Great Britain and many high-income countries. NHS England have reported an increase in rates from 22% in 2011/12 to 33% in 2023/24. The National Maternity and Perinatal Audit (NMPA) have identified not only an increase in IOL rates but also a pattern of wide variation in rates between maternity care providers that persists across annual clinical reports between 2015–2019. In 2015/16, the average IOL rate was 29% and trust- and board-level rates varied from 20% to 46%. By 2023, the average rate had risen to 34% (trust- and board-level variation was 12–47%). This was despite adjusting for population-level factors such as maternal age, gestational age, parity, and previous caesarean birth. Such data patterns may not be explained by chance alone but may be influenced by local policies and practice, application of national guidance, and geographical location and proximity to maternity services for some women and birthing people. National guidelines that may contribute to decision-making, such as those published by National Institute for Health and Care Excellence (NICE) and NHS England's Saving Babies Lives Care Bundle version 3, offer guidance on where and when to offer an IOL.

The decision to opt for an IOL may be challenging for some women and birthing people. Evidence from a systematic review, meta-analysis and randomised trial demonstrates that IOL is associated with a decreased likelihood of a caesarean birth, and does not increase the chance of giving birth with the use of instruments. IOL may be more painful than a spontaneous labour, but does not restrict pain relief options. The induction process may take longer than spontaneous labour and may require additional interventions including multiple vaginal examinations. While some women and birthing people undergoing IOL may describe the experience as a positive one, others may report feelings of disappointment and dissatisfaction. These factors among others, may contribute to the decision-making process when a clinician offers an IOL. Some women and birthing people may choose instead to await spontaneous labour, or opt for a caesarean birth. Healthcare professionals supporting women and birthing people in their decision-making must ensure the information provided is clear and unbiased, and explains the options available based on each individual's personal circumstances.

Analysing data for those who experienced an induction of labour leads to a highly selective population, meaning this report is reflective of current practices and maternal preferences at the time the data was collected. As practices and preferences evolve over time, it can be expected the population experiencing an IOL may also change.

How to use this report

This report presents the key findings and recommendations of the snapshot audit. The following additional supporting documents can be found on our website:

» A **glossary** explaining the terminology and abbreviations used in our reports

» A **Methods and Results** document outlining how the analysis was carried out, as well as summary results tables and supplementary results

» Trust/board-level **data tables**

» A **Lay Summary**

» A **line-of-sight table** describing the evidence base for the recommendations in this report

» A **video** guide to interpreting funnel plots

About the data

This snapshot audit focuses on singleton pregnancies undergoing IOL where the labour is expected to result in the birth of a live baby. For a very small number of pregnancies, IOL may be recommended after confirming that an unborn baby's heartbeat has stopped. Under these circumstances, the rationale for offering an IOL is different (i.e., preventing infection, psychological welfare) and therefore, these births are not included in this report.

This report expands upon findings from the NMPA 2023 State of the Nation report using the same dataset. The IOL measure reported in the NMPA annual clinical report results includes singleton births between 37^{+0} and 42^{+6} weeks gestation, this report includes births from 24+0 weeks. General information about the development of this dataset can be found in the 2023 annual clinical report Methods and Measures Technical Specification documents.

Case-mix adjustment

Variation in care processes and outcomes can be used to highlight differences between trusts/boards. Factors such as clinical and demographic characteristics of women and birthing people can affect both the demands placed on the maternity service and the outcomes of care.

In order to make meaningful and fair comparisons between trusts/boards with different patient populations, we carry out a statistical adjustment called 'case-mix adjustment'. This process aims to take into account any factors which may have an effect on the results and are outwith the control of the maternity service, for example maternal age or previous obstetric history.

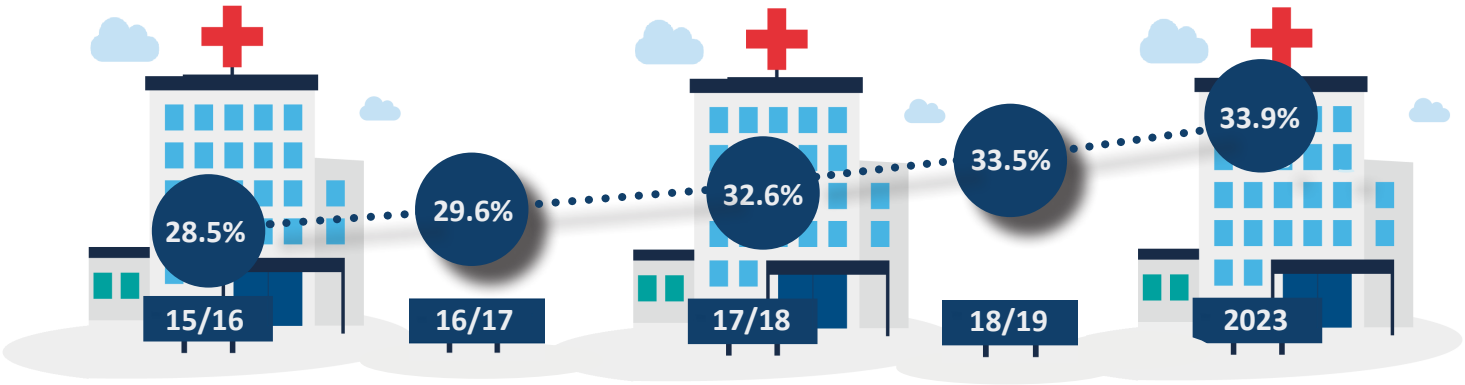
More information about case-mix adjustment can be found in the 2023 annual clinical report Methods and Measures Technical Specification documents online.

Results at a glance

The National Maternity and Perinatal Audit (NMPA) uses information collected routinely as part of NHS maternity care, combined with information collected when women and birthing people and their babies are admitted to hospital, to report on a range of care process and outcome measures.

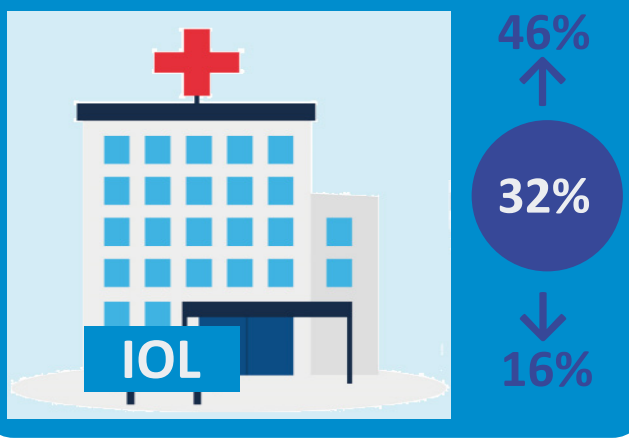
Summarised here are results for the 173 074 women and birthing people who underwent an induction of labour (IOL) in the NHS in 2023. Details of the methods, summary results table and supplementary results can be found in the Methods and Results document.

NMPA annual clinical reports show an increase in rates of IOL



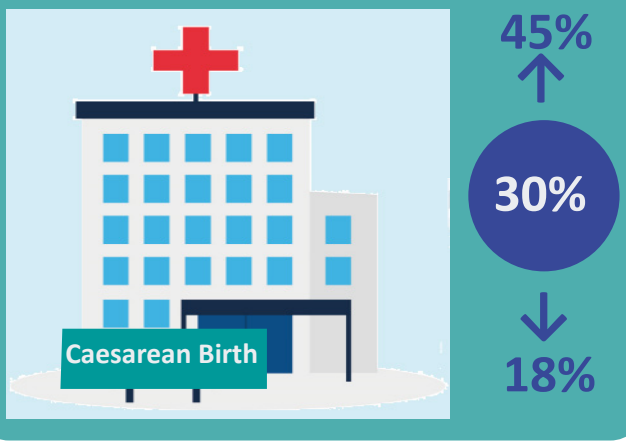
One in three women and birthing people had an induction of labour

IOL rates varied between trusts/boards



Of those who were induced, one in three gave birth by caesarean

Caesarean birth rates following IOL varied between trusts/boards



How maternal characteristics may influence outcomes are displayed as graphs for mode of birth (click **here** to view) and 5-minute Apgar score (click **here** to view).
The characteristics include:

- Maternal age
- Ethnic group
- Socioeconomic deprivation
- Pregnancy history
- Gestational age at birth
- Country

Of the babies born following IOL, **16 in 1000** were assigned an Apgar score of less than 7 at 5 minutes

Find out more at:
www.maternityaudit.org.uk

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Key Findings and Recommendations

Outcomes for mothers and babies

Key Finding 1: Just under one third (32%) of women and birthing people experienced an IOL; of those, 30% gave birth by caesarean.

Key Finding 2: Increasing maternal age was strongly associated with increasing likelihood of giving birth by caesarean following IOL, and those giving birth at or after 41 weeks of gestation and from ethnic minority groups had a higher likelihood of giving birth by caesarean.

Key Finding 3: Babies born to women and birthing people from Black ethnic groups were more likely, and babies born to women and birthing people from Asian, Mixed or 'Other' ethnic groups were less likely, to be assigned an Apgar score of less than 7 at 5 minutes following IOL than babies born to white women and birthing people.

Recommendation 1: Maternity care commissioners and maternity networks* should ensure that their constituent units use their local data and national data on variation in IOL practice and disparities in outcomes to inform the planning of service provision, and in the counselling of women and birthing people accessing their services.

*English local maternity and neonatal systems (LMNS), the Scottish Perinatal Network, and the Wales Maternity and Neonatal Network

Trust/board variation

Key Finding 4: Unexplained variation in IOL rates extended to the mode of birth and 5-minute Apgar score experienced by women and birthing people and their babies following induction of labour.

Key Finding 5: There was wide variation between trusts and boards in the proportion of caesarean births following IOL, 40% had rates that were higher or lower than the expected range.

Recommendation 2: Maternity care commissioners should undertake a structured review to identify the drivers of practice variation in IOL care within their networks, such as clinical culture, local policies and protocols and clinical leadership, to target a reduction in unwarranted variation in IOL care processes and outcomes.

Data quality and capture

Key Finding 6: IOL was recorded as unsuccessful for 6% of women and birthing people. However, this may have been influenced by a lack of a standardised definition, along with concerns about coding accuracy and data completeness.

Key Finding 7: A number of key data items relating to IOL are not included or are incomplete in the national maternity datasets, these include the method, indication for and duration of induction.

Recommendation 3: Digital teams in the Government health departments should work with maternity data controllers and software developers to incorporate processes and systems into the next version update of each dataset that support maternity care providers to record data items, such as gestational age at induction, maternal decision-making, the indication, method(s) and duration of induction.

Recommendation 4: The Royal College of Obstetricians and Gynaecologists (RCOG) should work collaboratively with stakeholders to develop a standardised definition for the diagnosis and reporting of 'unsuccessful induction of labour'.

IOL rates and maternal characteristics

NMPA maternity data contains records of 93% of births that occurred in Great Britain in 2023. This report focuses on data for births that took place in 114 English Trusts, 11 Scottish Boards and 5 Welsh Health Boards; capturing 533 503 births (NMPA population), of which 173 074 experienced an induction of labour.

Table 1 shows unadjusted IOL rates and trust/board-level variation. In 2023, 32.4% of women and birthing people experienced IOL, with similar proportions seen across England (32.2%), Scotland (34.6%) and Wales (34.2%). These numbers and rates closely mirror those of the State of the Nation report, which describes singleton births undergoing IOL at or after 37^{+0} weeks of gestation; differences in the cohort construction for this report are described in the Methods and Results document. The extent of variation in trust/board IOL rates across Great Britain is shown in the relevant funnel plot produced as part of the NMPA's annual clinical reporting.

Table 1: Unadjusted induction of labour rates, by country

	Births (n)	Induction of labour (n)	IOL rate	Interquartile range	Trust/Board min	Trust/Board max
England	470 484	151 345	32.2%	28.1–37.5%	15.7%	46.4%
Scotland	42 724	14 792	34.6%	30.8–38.6%	27.5%	40.8%
Wales	20 295	6 937	34.2%	29.4–38.1%	28.4%	39.0%
Great Britain	533 503	173 074	32.4%	28.6–37.9%	15.7%	46.4%

Table 2 in the Methods and Results document shows characteristics of the women and birthing people who were induced compared to the NMPA population. Those who were induced were more likely to be aged under 30 years, and were more likely to give birth between 37^{+0}–38^{+6} weeks of gestation or at or after 41^{+0} weeks. Across England, Scotland and Wales the proportion of those who were induced was higher for white women and birthing people, whereas the proportion was lower for those from all other ethnic groups. A greater proportion of those who were induced were giving birth for the first time and almost half were from the more deprived Index of Multiple Deprivation (IMD) quintiles (Q4 and Q5).

Mode of birth and 5-minute Apgar score

Mode of birth

There is a chance of experiencing a caesarean birth with all pregnancies however, when opting for an induction of labour, most women and birthing people do so with the aim of achieving an uncomplicated vaginal birth. Once the induction process has started, a caesarean birth may be advised for a number of reasons including maternal request or where there are concerns about the health of the mother or baby. Of those who were induced, mode of birth was available for 173 000, 29.7% gave birth by caesarean. Unadjusted caesarean birth rates were similar for England (29.6%), Scotland (30.8%), and Wales (29.2%) (Table 2). The funnel plot in Figure 1 demonstrates trust/board-level variation in caesarean birth rates that have been adjusted for maternal age, parity, previous caesarean birth, and gestation at birth. Interpreting funnel plots is explained in this video.

Table 2: Unadjusted rates of caesarean birth following IOL, by country

	IOL (n)	Caesarean birth following IOL (n)	Caesarean birth rate following IOL	Interquartile range	Trust/Board min	Trust/Board max
England	151 277	44 783	29.6%	25.6–34.1%	17.8%	45.2%
Scotland	14 789	4 561	30.8%	27.6–31.3%	23.4%	40.0%
Wales	6 934	2 024	29.2%	27.5–29.6%	26.2%	32.5%
Great Britain	173 000	51 368	29.7%	26.0–33.4%	17.8%	45.2%

By chance alone, we might expect only 1 in 20 trusts/boards to have a rate beyond the inner (95%) funnel limits and only 1 in 500 trusts/boards to have a rate beyond the outer (99.8%) funnel limits. There was unexplained variation in rates of caesarean birth following IOL for approximately one third of trusts/boards. For some trusts and boards, around 20% of women and birthing people who were induced gave birth by a caesarean, whereas for others the rate was almost 40%. Explaining this pattern is challenging; factors may include (but are not limited to) local trust/board culture, processes and practice, differing methods used for induction, intrapartum states such as sepsis or slow labour progress, maternal choice or the characteristics of the individual woman or birthing person undergoing induction.

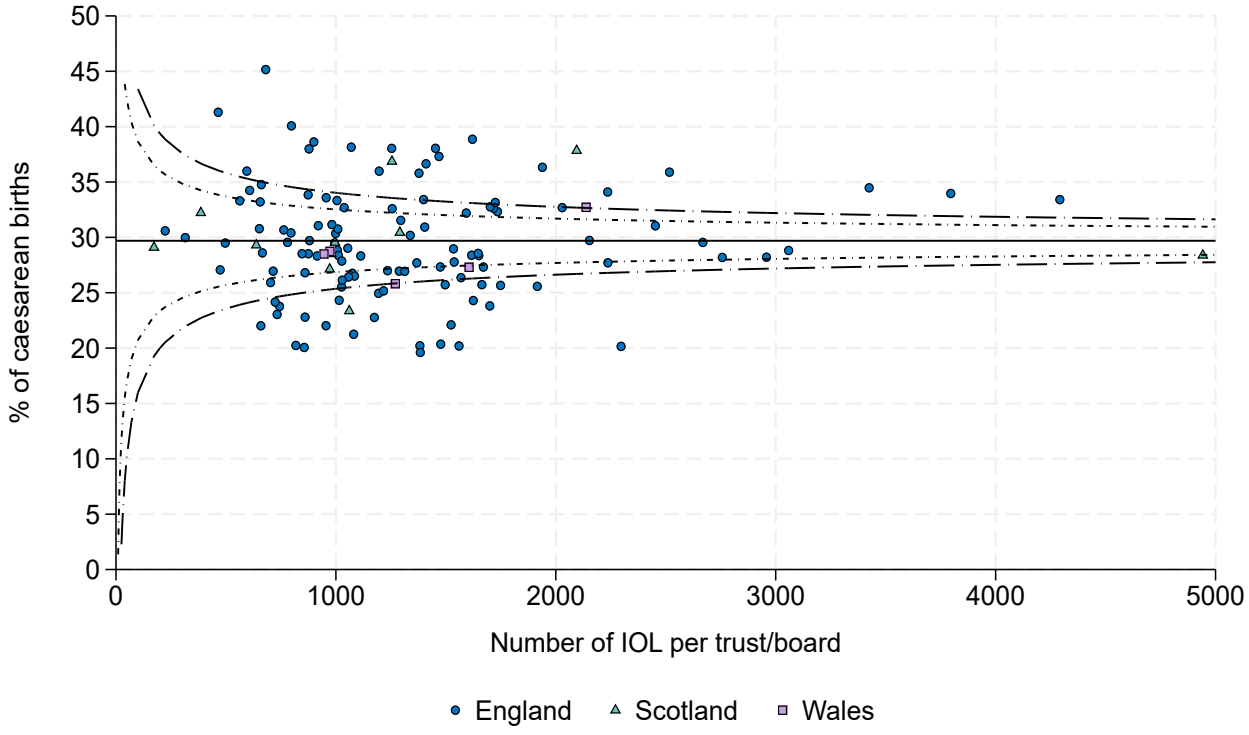

Figure 1: Funnel plot showing case-mix adjusted caesarean birth rates following IOL

Effect of maternal characteristics on mode of birth

To assess how the characteristics of women and birthing people experiencing IOL may impact their likelihood of giving birth vaginally or giving birth by caesarean, statistical modelling has been used while controlling for other factors. These results are summarised in a margins plot (Figure 2). Detailed model results can be found in Table 5 in the Methods and Results document.

Understanding a margins plot

A margins plot shows the statistical model's estimated value, or likelihood, for the outcome of interest for each characteristic. The point shows the model's estimate and the bars adjacent to the point are the confidence interval – the shorter the bar, the greater the precision.
The vertical line represents the GB average.

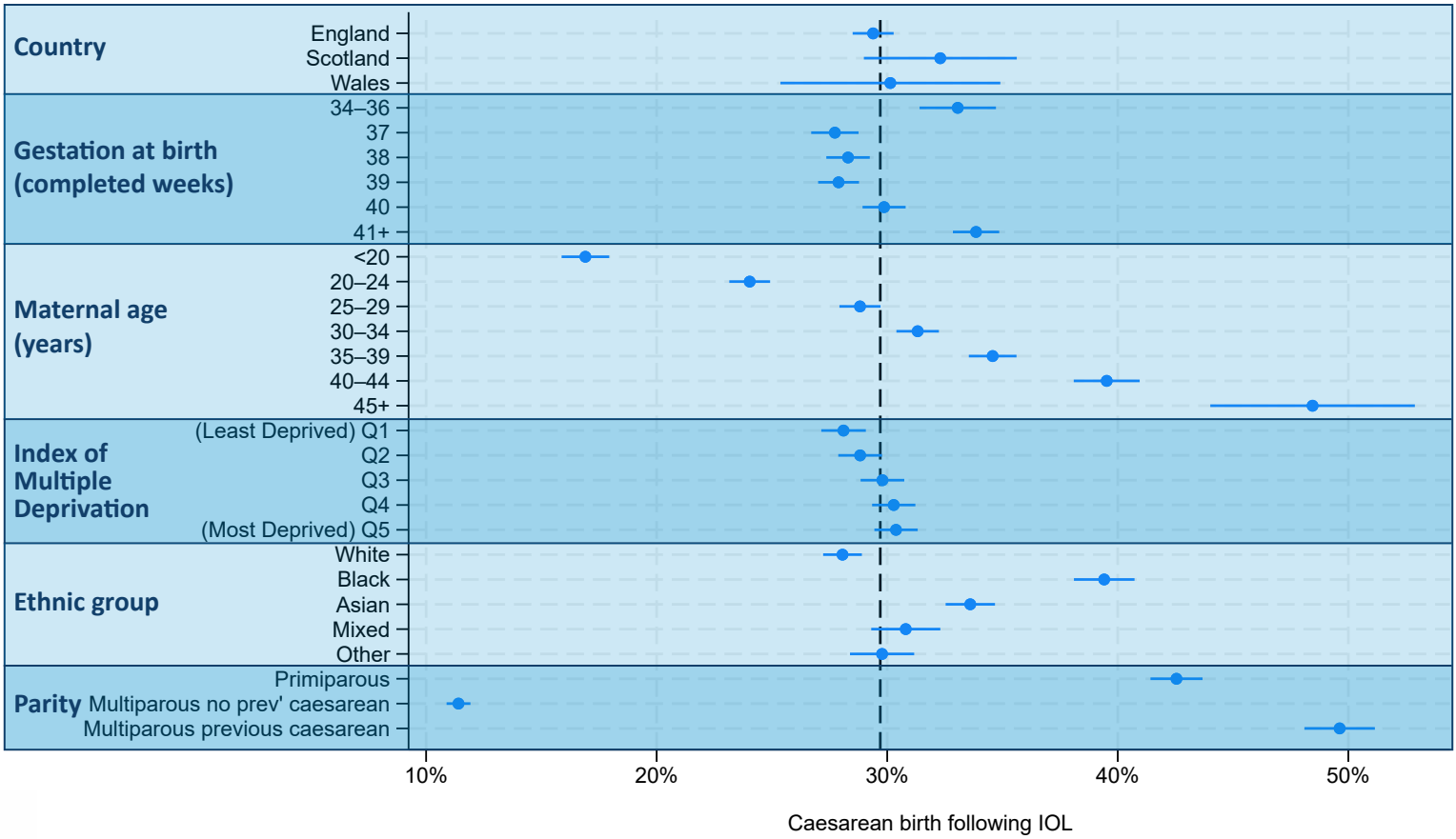

Figure 2: Margins plot showing the estimated likelihood of caesarean birth following IOL by maternal characteristics

Women and birthing people experiencing IOL in Scotland had a greater likelihood of giving birth by caesarean than those in England and Wales, although this was not statistically significant. Between 37–39 completed weeks of gestation there was no difference in the likelihood of a vaginal or caesarean birth, but the likelihood of a caesarean birth was highest for preterm births and births at or after 40 weeks of gestation. There was a strong gradient between increasing maternal age and increasing likelihood of a caesarean birth. Those aged 40 years or above were at least twice as likely to give birth by caesarean compared to those aged less than 20 years. The relationship between IMD and mode of birth was less strong, although there was an increase in likelihood of caesarean birth for women and birthing people from the most deprived quintiles (Q4 and Q5). Compared to white women and birthing people, those from all other ethnic groups were more likely to have a caesarean birth; the rate was significantly higher for those from Black and Asian ethnic groups.

Compared to those giving birth for the first time, women and birthing people who had previously given birth vaginally were more likely to give birth vaginally; the likelihood of a birth by caesarean was higher for those who had previously given birth by caesarean.

5-minute Apgar score

An induction of labour most frequently results in a vaginal birth. However, labours that are induced may have more complications and a caesarean birth may occur for a number of reasons including maternal request or concerns about the health of mother or baby. Depending on the condition of the baby during labour, a caesarean birth may be recommended as the safest mode of birth for mother and baby. It is therefore important to consider the outcomes for the baby, not just the mode of birth.

The Apgar score is a tool widely used to assess the condition of a baby at time intervals following birth, typically at 1 minute, 5 minutes and 10 minutes. A score of less than 7 at 5 minutes is suggestive of a baby requiring additional support. Babies born preterm (before 37 completed weeks of gestation) may have lower Apgar scores due to their gestation at birth.

Table 3: Unadjusted rates of Apgar score less than 7 at 5 minutes following IOL, by country

	IOL (n)	Apgar <7 at 5 minutes (n)	Rate	Interquartile range	Trust/board min	Trust/board max
England	143 521	2 126	1.48%	0.99–1.69%	0.16%	3.97%
Scotland	14 676	371	2.53%	2.09–3.35%	1.95%	3.96%
Wales	6 936	132	1.90%	1.10–2.24%	1.03%	2.81%
Great Britain	165 133	2 629	1.59%	1.08–1.97%	0.16%	3.97%

Apgar scores at 5 minutes were reviewed for 165 133 babies. Overall, 1.59% of babies were assigned an Apgar score of less than 7 at 5 minutes (Table 3). This rate compares to the rate of 1.45% reported in the 2023 State of the Nation. Average rates of an Apgar score of less than 7 at 5 minutes following IOL were higher in Scotland (2.53%) than in England (1.48%) and Wales (1.90%). This pattern mirrors both the 2023 State of the Nation population and previous annual clinical reports. The rate of babies assigned an Apgar score of less than 7 at 5 minutes following adjustment for maternal age, parity, previous caesarean birth, and gestation at birth was within the funnel limits for the majority of trusts and boards (Figure 3).

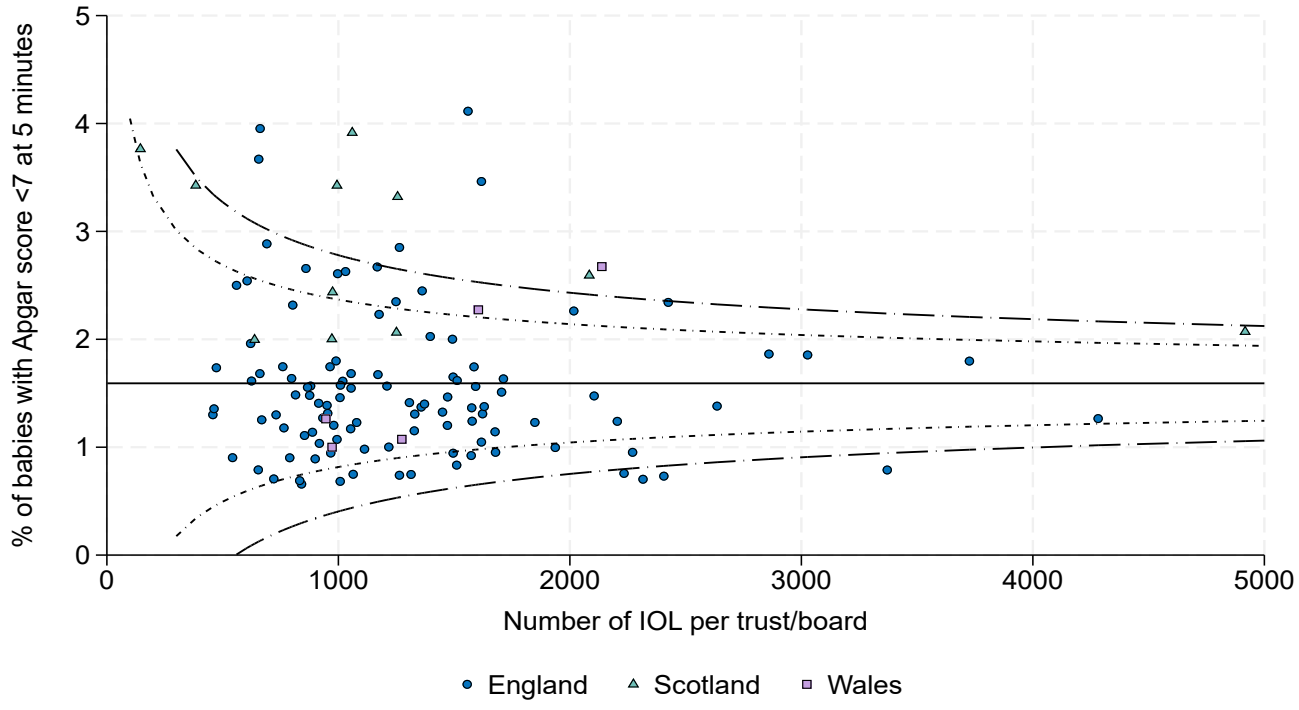

Figure 3: Funnel plot showing case-mix adjusted rates of Apgar score of less than 7 at 5 minutes following IOL

Effect of maternal characteristics on 5-minute Apgar score

The characteristics of women and birthing people experiencing IOL may have an impact on their baby's 5-minute Apgar score. Statistical modelling has been used to explore the maternal characteristics that may influence the Apgar score of the baby, while controlling for other factors. These results are summarised in a margins plot (Figure 4). Detailed model results can be found in Table 6 in the Methods and Results document.

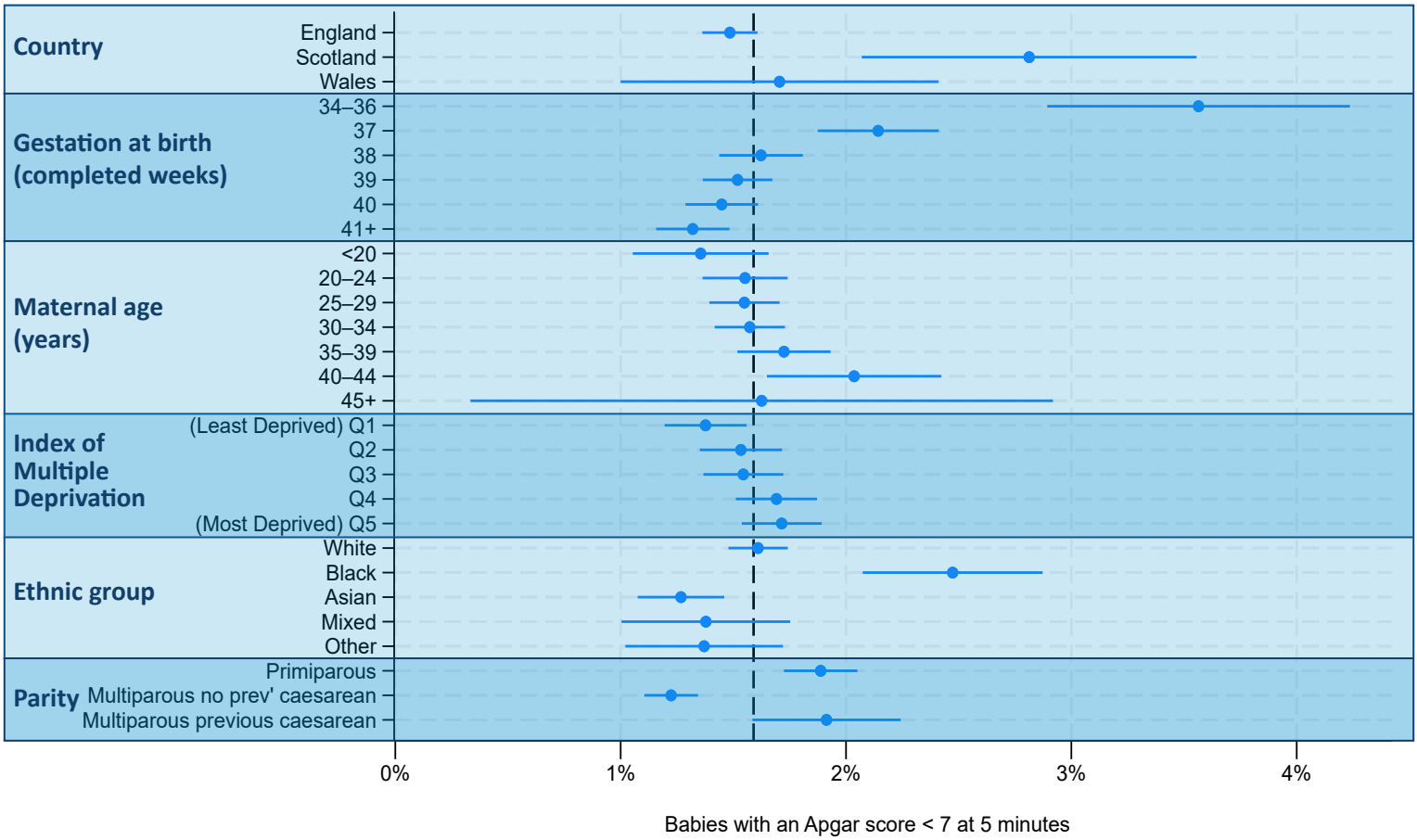

Figure 4: Margins plot showing the estimated likelihood of an Apgar score of less than 7 at 5 minutes following IOL

Babies born to women and birthing people in Scotland and Wales had a higher likelihood of being assigned an Apgar score less than 7 at 5 minutes following IOL compared to those born in England. No association was found between maternal age and likelihood of an Apgar score of less than 7 at 5 minutes after birth. Babies born to women and birthing people from the most deprived IMD quintiles (Q4 and Q5) were more likely to have an Apgar score of less than 7 at 5 minutes compared to those from the least deprived quintile (Q1). Babies born to women and birthing people from Black ethnic groups were more likely to have an Apgar score of less than 7 at 5 minutes and babies born to those from Asian and the 'Other' ethnic groups were less likely, compared to babies born to white women and birthing people. A similar pattern between 5-minute Apgar score and maternal ethnic group was reported for the whole maternity population in the 2021 NMPA report *Ethnic and Socio-economic Inequalities in NHS Maternity and Perinatal Care for Women and their Babies*.

Babies born to women and birthing people giving birth for the first time, and to those who had previously given birth by caesarean had a higher likelihood of being assigned an Apgar score of less than 7 at 5 minutes, compared to those who had previously given birth vaginally.

Several of the maternal characteristics that were examined for a relationship between IOL and caesarean birth or 5-minute Apgar score are the same characteristics which may directly or indirectly influence clinical decision-making regarding whether an induction should be offered. Body Mass Index (BMI) and pre-pregnancy conditions such as diabetes and hypertension were not included in the model due to insufficient data completeness.

Unanswered questions about IOL

While national maternity data has been able to offer some insights into the mode of birth and 5-minute Apgar score following IOL, there are a number of questions that remain unanswered. This is either due to key data variables being suboptimally designed, data being recorded with poor completeness, or data not being readily available in specific freestanding variables.

These questions include:

- How often do women and birthing people decline IOL?
- What are the most common indications for induction of labour?
- Which methods of induction are most frequently used?
- What is the average duration from commencing induction to being transferred to a labour suite?
- What proportion of IOL are unsuccessful?

The quality and completeness of the data that may answer some of these questions differs. For example, diagnostic codes for an unsuccessful induction of labour were identified for 6% of all inductions. However when examined at a trust/board level, these rates varied from 0% to 20%, raising concerns about the validity and accuracy of the coding for this finding.

An unsuccessful IOL may be considered as one which does not progress sufficiently to the point of 'established labour', defined as regular contractions and progressive dilation of the cervix from 4cm; when this occurs many women and birthing people may consider a caesarean birth. Interpretation of this finding is further complicated by a lack of consensus definition for unsuccessful IOL. While the literature agrees that concluding an IOL has been unsuccessful should not occur before oxytocin is administered, different definitions have been proposed with varying duration of oxytocin administration. In clinical practice, IOL is sometimes declared/recorded as unsuccessful before oxytocin is administered. It is also possible for an IOL to successfully start labour but the woman or birthing person still experiences a caesarean in later labour; however, this would not be considered an unsuccessful induction.

Research Priorities

Commissioners of research including the National Institute for Health and Care Research (NIHR) and UK Research and Innovation (UKRI) alongside the Royal Colleges, researchers and other stakeholders should prioritise induction of labour research addressing the following questions:

- Is it possible to predict mode of birth following IOL?
- Which methods/regimens of induction are most likely to result in successful labour onset?
- How can the birth experience around IOL be improved?
- How do outcomes compare between induced and spontaneous labour?
- Does the duration of the induction process influence the outcomes?
- What is the rate of maternal adverse outcomes following IOL?
- How does IOL influence birth experiences in future pregnancies?
- How do women and birthing people describe their experiences during and following induction?
- What are the outcomes (e.g. neonatal unit admission, adverse outcomes, use of antibiotics) for babies following induction?
- How do the social determinants of health impact IOL care and outcomes?

Acknowledgements

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For further information and resources please visit the NMPA website, where you can also subscribe to the email newsletter for regular audit updates:

www.maternityaudit.org.uk

Alternatively you can contact us at: nmpa@rcog.org.uk

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