

Introduction

The care that maternity services provide to women giving birth needs to be finely balanced between supporting the physiological process of birth and intervening when required. Wide variations in clinical care are seen within and between settings and countries [1]. In the UK, there is substantial variation between maternity units in the rate of key interventions including induction of labour and caesarean birth [2]. Targets to lower caesarean section rates have recently been identified as a possible safety concern [3].

We investigated the association of the rates of induction of labour and emergency caesarean section in each hospital in England with the risks of key neonatal outcomes. These interventions can be considered measures of a hospital's "practice style", with the induction of labour rate reflecting how hospitals provide proactive care for women with term pregnancies and the emergency caesarean section rate reflecting how hospitals respond to acute situations that may need immediate preventive action or rescue.

Methods

The National Maternity and Perinatal Audit (NMPA) dataset was linked to the National Neonatal Research Dataset (NNRD), which contains information on admissions to neonatal care.¹⁰ Information was available on births between 1st April 2015 and 31st March 2017.

This study examined the association between hospital-level rates of induction of labour and emergency caesarean section and the patient-level risk of adverse perinatal outcomes in singleton pregnancies at term. The adverse perinatal outcome measures were stillbirth, according to the NMPA dataset, and admission to a neonatal unit at term, and mechanical ventilation of the baby, according to the NNRD. Information about maternity interventions was available from the NMPA dataset.

First, we determined for each hospital the rate of induction of labour and emergency caesarean section. In a second step, we included these hospital-level induction of labour and emergency caesarean section rates as risk factors in multilevel regression models, adjusted for individual maternal characteristics.. These models were used to test whether differences in the hospital-level intervention rates were associated with the risk of an adverse outcome using odds ratios.

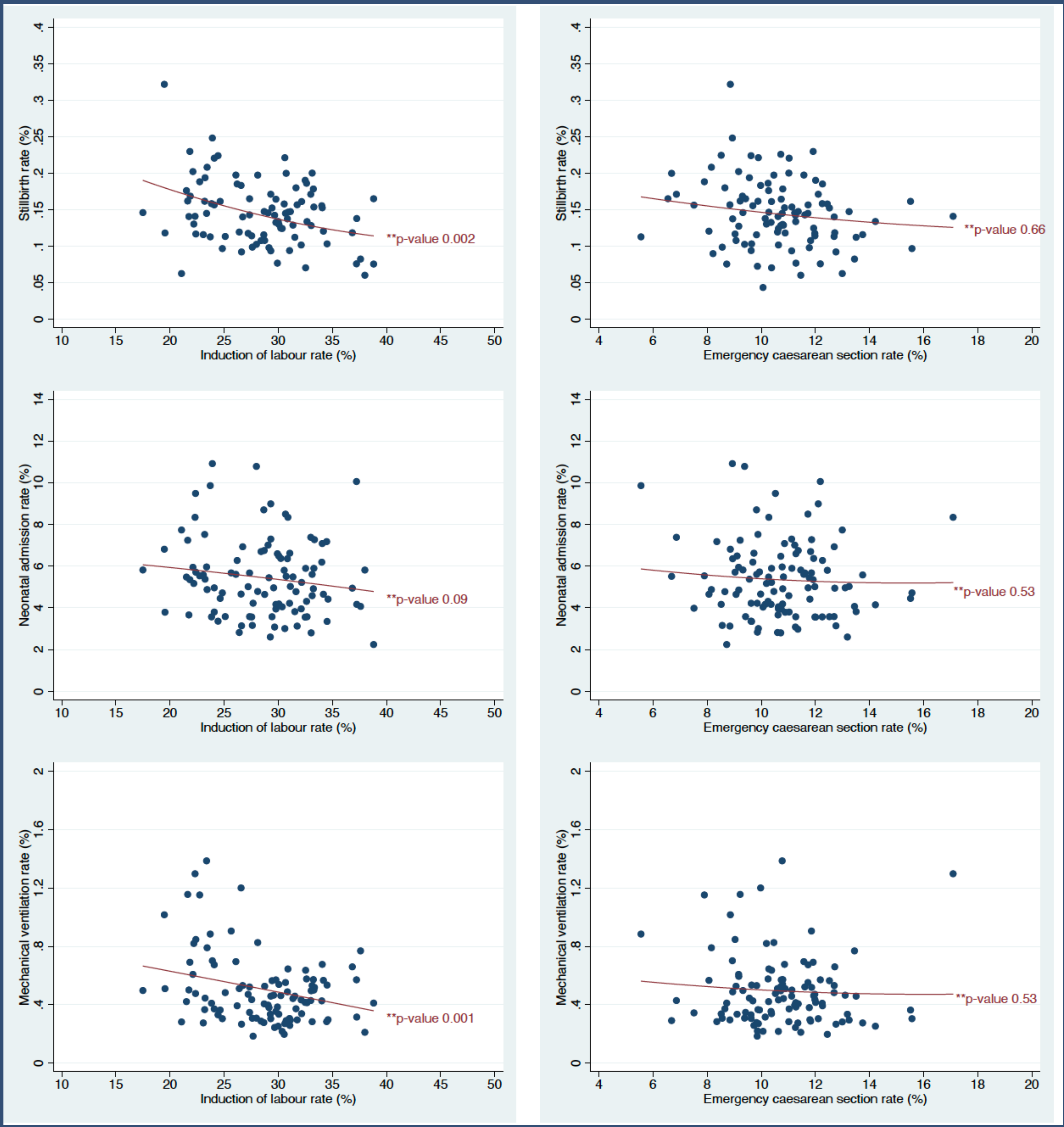
Results

Figure 1 show the between-hospital variation in the induction of labour rate (minimum 17.5%, maximum 40.7%, and interquartile range 24.6% and 32.1%) and in the emergency caesarean section rate (minimum 5.6%, maximum 17.1%, and interquartile range 9.4% and 11.8%).

Figure 1 also demonstrates that the risk of adverse perinatal outcomes tends to be lower in hospitals with higher intervention rates, but only the associations between the induction of labour rate and stillbirth and mechanical ventilation rate were statistically significant (p = 0.002 and p = 0.001, respectively).

Table 1 demonstrates a similar pattern of results with adjustment for maternal characteristics. These results show that a 5%-point increase in a hospital's induction of labour rate was associated with a 9%-reduction (95% CI 3% to 15%) in the risk of stillbirth in term pregnancies and a 14%-reduction (95% CI 6% to 21%) in the risk of a baby requiring mechanical ventilation. No corresponding association was found between rates of emergency caesarean section and risk of stillbirth, neonatal admission or mechanical ventilation of the baby.

Figure 1. Risks observed in hospitals (dots) and predicted* risks (line) of the three perinatal outcomes according to the hospitals' induction of labour and emergency caesarean section rates.



A full description of this study and its results are available at

<https://doi.org/10.1111/1471-0528.17193>

Table 1. Odds ratios corresponding to a 5%-point increase in the induction of labour or in the emergency caesarean section rate.

	Induction of labour	Emergency caesarean section
Stillbirth		
Number of hospitals	92	99
Number of births	842,737	905,081
Odds ratio (95% CI); p-value	0.89 (0.83 – 0.94); p<0.001	0.86 (0.73 – 1.01); p=0.07
Adjusted odds ratio (95% CI); p-value	0.91 (0.85 – 0.97); p=0.002	0.96 (0.82 – 1.13); p=0.66
Neonatal admission rate		
Number of hospitals	101	109
Number of births	839,754	964,353
Odds ratio (95% CI); p-value	0.94 (0.88 – 1.01); p=0.11	0.94 (0.79 – 1.13); p=0.52
Adjusted odds ratio (95% CI); p-value	0.94 (0.87 – 1.01); p=0.09	0.94 (0.79 – 1.13); p=0.53
Mechanical ventilation rate		
Number of hospitals	101	109
Number of births	839,754	964,353
Odds ratio (95% CI); p-value	0.87 (0.80 – 0.94); p=0.001	0.92 (0.74 – 1.15); p=0.47
Adjusted odds ratio (95% CI); p-value	0.86 (0.79 - 0.94); p=0.001	0.93 (0.74 – 1.17); p=0.53

Strengths and Limitations

The key strengths of our study are its size and design. This study reported on births in the majority of English hospitals and data completeness in the hospitals included in the analyses was high.

A first limitation is that we did not have information about the indications for the interventions which limits the exploration of the reasons for the observed variation. Second, a higher induction of labour rate may be linked to other differences in the care delivered to women with pregnancies beyond 37 weeks.

Conclusion

There was considerable between-hospital variation in the use of induction of labour and emergency caesarean section in singleton term births. Hospitals with a higher induction rate had a lower risk of adverse birth outcomes but a similar association was not found for emergency caesarean section. This suggests that a more proactive practice style with an increased use of induction of labour, rather than an increased use of caesarean section in emergency situations, seems to be linked to safer childbirth at term. Our results also demonstrate that independent reviews investigating concerns about safety of maternity services in a specific hospital might benefit from being nested in larger epidemiological studies.