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## Outcomes for births booked under an independent midwife and births in NHS maternity units: matched comparison study

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### ABSTRACT

**Objective** To compare clinical outcomes between women employing an independent midwife and comparable pregnant women using NHS services.

**Design** Anonymised matched cohort analysis. Cases from the database of the Independent Midwives' Association (IMA) matched up to 1:5 with Scottish National Health Service (NHS) records for age, parity, year of birth, and socioeconomic status. Multivariable logistic regression models used to explore the relation between explanatory variables and outcomes; analyses controlled for potential confounding factors and adjusted for stratification.

**Setting** UK databases 2002-5.

**Participants** Anonymised records for 8676 women (7214 NHS; 1462 IMA).

**Main outcome measures** Unassisted vertex delivery, live birth, perinatal death, onset of labour, gestation, use of analgesia, duration of labour, perineal trauma, Apgar scores, admission to neonatal intensive care, infant feeding.

**Results** IMA cohort mothers were significantly more likely to achieve an unassisted vertex delivery than NHS cohort mothers (77.9% (1139) v 54.3% (3918); odds ratio 3.49, 95% confidence interval 2.99 to 4.07) but also significantly more likely to experience a stillbirth or a neonatal death (1.7% (25) v 0.6% (46); 5.91, 3.27 to 10.7). All odds ratios are adjusted for confounding factors. Exclusion of "high risk" cases from both cohorts showed a non-significant difference (0.5% (5) v 0.3% (18); 2.73, 0.87 to 8.55); the "low risk" IMA perinatal mortality rate is comparable with other studies of low risk births. Women in the IMA cohort had a higher incidence of pre-existing medical conditions (1.5% (22) v 1.0% (72) in the NHS cohort) and previous obstetric complications (21.0% (307) v 17.8% (1284)). The incidence of twin pregnancy was also higher (3.4% (50) v 3.1% (224)). In the IMA cohort, 66.0% of mothers (965/1462) had home births, compared with only 0.4% of NHS cohort mothers (27/7214). Spontaneous onset of labour was more common in the IMA group (96.6% (1405) v 74.5% (5365); 10.43, 7.74 to 14.0), and fewer mothers used pharmacological analgesia (40.2% (588) v 60.6% (4370); 0.42, 0.38 to 0.47). Mothers in the IMA cohort were much

more likely to breast feed (88.0% (1286) v 64.0% (2759); 3.46, 2.84 to 4.20). Prematurity (4.3% (63) v 6.9% (498); 0.49, 0.35 to 0.69), low birth weight (4.0% (60) v 7.1% (523); 0.93, 0.62 to 1.38), and rate of admission to neonatal intensive care (4.4% (65) v 9.3% (667); 0.43, 0.32 to 0.59) were all higher in the NHS dataset.

**Conclusions** Healthcare policy tries to direct patient choice towards clinically appropriate and practicable options; nevertheless, pregnant women are free to make decisions about birth preferences, including place of delivery and staff in attendance. While clinical outcomes across a range of variables were significantly better for women accessing an independent midwife, the significantly higher perinatal mortality rates for high risk cases in this group indicate an urgent need for a review of these cases. The significantly higher prematurity and admission rates to intensive care in the NHS cohort also indicate an urgent need for review.

### INTRODUCTION

Patients' choice is a key aspect of government policy within the United Kingdom,<sup>1-3</sup> and maternity care has been a particular focus for the drive to empower service users.<sup>4,5</sup> This policy dates back at least as far as the Changing Childbirth report 15 years ago.<sup>6</sup> The process is aided in the case of pregnant women because in most cases they are physically well and because there is usually time to consider options before decisions have to be made.

The debate over home birth has been a polarising feature within obstetrics and midwifery in the past decade.<sup>7-11</sup> In 2003 a House of Commons committee urged more hospital trusts to support women who want to give birth at home,<sup>12</sup> and a joint statement by the Royal College of Obstetricians and Gynaecologists and the Royal College of Midwives<sup>13</sup> has supported this option for low risk women. Currently in the UK, some 2.5% of births occur in the home, most with NHS personnel in attendance.

The desire to provide healthcare choice is constrained by notions of safety and efficacy, and government documents refer to the concept of "clinically

**Table 1** | Characteristics of women by matched groups. Figures are percentages (numbers) of women

	IMA (n=1462)	NHS (n=7214)
Age (years):		
<20	0.5 (7)	0.5 (36)
20-29	17.6 (257)	17.6 (1270)
30-39	73.8 (1079)	73.8 (5324)
≥40	8.1 (118)	8.1 (584)
Fifth of deprivation:		
1 (least deprived)	33.8 (494)	33.8 (2438)
2	25.1 (367)	25.1 (1811)
3	17.9 (262)	17.9 (1291)
4	14.4 (211)	14.4 (1039)
5 (most deprived)	8.7 (127)	8.7 (628)
Existing medical condition	1.5 (22)	1.0 (72)
Previous obstetric complications	21.0 (307)	17.8 (1284)
Year of birth:		
2002	24.9 (364)	24.9 (1796)
2003	25.8 (377)	25.8 (1861)
2004	23.5 (344)	23.5 (1695)
2005	25.8 (377)	25.8 (1861)
Parity:		
0	38.3 (560)	38.3 (2763)
1	38.9 (569)	38.9 (2806)
2	16.6 (243)	16.6 (1198)
3	4.4 (64)	4.4 (317)
≥4	1.8 (26)	1.8 (130)
Multiple pregnancy	3.4 (50)	3.1 (224)
Breech presentation	4.4 (64)	5.3 (382)

IMA=Independent Midwives' Association.

appropriate” choices.<sup>1</sup> In childbirth, “safety” often relates to notions of risk status and of birth location.<sup>14</sup>

### Safety and efficacy

In comparisons of outcomes by place of birth, the preferred method internationally is to establish the intended place of birth at the initiation of labour. Studies examining this have consistently found lower perinatal mortality among low risk women giving birth at home or in a birth centre with a midwife<sup>10 15 16</sup>; this is similar to low risk hospital birth.<sup>10</sup> The UK studies on home birth have suggested favourable or at least comparable outcomes in terms of mortality and morbidity,<sup>17 18</sup> except for a recent study published in the *BJOG*,<sup>19</sup> which acknowledged that its findings had to be interpreted with caution because of inconsistencies in recorded data. In Australia, Bastian et al found that among low risk women, home birth compared favourably with hospital birth, but that for high risk women it was “inadvisable.”<sup>8</sup>

“Clinically appropriate choices” might refer to clinical risk factors or to the availability of health service personnel. While access to NHS maternity care is free, a small number of women opt to employ an independent midwife, often because they want a home birth.

### Medicolegal concerns

So that patients’ medicolegal interests can be safeguarded should clinical negligence proceedings arise, the UK government has indicated in a white paper<sup>20</sup> that indemnity insurance will be a requirement for those wishing to remain on a professional register. Perinatal litigation has for some time been the largest single factor in compensation payouts for clinical negligence.<sup>21-23</sup> Specific maternity standards have been introduced to address the relevant clinical and organisational issues.<sup>24</sup> Indemnity insurance for independent midwives, however, was withdrawn by the Royal College of Midwives in 1994, after the outcome of two legal claims. Since 2002 it has not been possible for this group to negotiate commercial insurance, though a mechanism of contracting into the NHS through a social enterprise is being explored.

### Independent midwifery

An independent midwife is a self employed qualified practitioner working outside the NHS. There are currently 118 full time members of the Independent Midwives’ Association (IMA) in the UK, compared with 31 064 midwives in the NHS ([www.ic.nhs.uk](http://www.ic.nhs.uk), [www.isdscotland.org](http://www.isdscotland.org), [www.statswales.wales.gov.uk](http://www.statswales.wales.gov.uk)). Cited reasons for choosing an independent midwife include the desire for continuity of care and carer and for a genuine partnership<sup>25</sup> and the wish to keep birth free from medical interventions.<sup>26</sup> Crucially, some women believe that these aspirations cannot be met within the NHS. Sometimes there is a reaction to a previous negative experience in the NHS or the desire for a home birth when this is deemed inappropriate by NHS staff.<sup>27</sup> An analysis of IMA records claimed that birth outcomes were comparable with those reported in midwifery caseload studies but acknowledged that women using independent midwives are not typical of the general population, many of them being older and better off socioeconomically.<sup>28</sup> We carried out a matched cohort study to assess whether birth outcomes for women using an independent midwife are the same as, better, or worse than outcomes for comparable women using NHS services.

### METHODS

We obtained an anonymised dataset (n=1462) from the UK IMA for births in 2002-5 in which the pregnant woman had employed an independent midwife. Participating independent midwives record intrapartum data after the birth; additional data, such as neonatal outcomes, are included later. The final data entry concerns breast feeding status at six weeks, at which time the infant’s progress is also confirmed. Completed forms are then sent to a coordinating centre for inclusion on an electronic database. Only three IMA database records were not usable because of incomplete data. Postcodes for the IMA dataset were independently allocated a deprivation score with the GeoConvert tool hosted by MIMAS at the University of Manchester (<http://geoconvert.mimas.ac.uk>), and thereafter allocated a deprivation fifth based on

population norms. The complete dataset was then sent to the Information and Statistics Division (ISD) of the NHS in Scotland for matching. The ISD has been collating national data for over 40 years and claims to have some of the best health service data in the world ([www.isdscotland.org](http://www.isdscotland.org)). Birth data are recorded by maternity unit staff and sent to the ISD using the Scottish Morbidity Record 02 (SMR02) form when the mother is discharged from the unit. This was augmented by the SMR linked dataset for deaths. The ISD dataset was complete for most variables, but notably deficient for analgesia (n=2175; 30.1%), perineal tears (n=2178; 30.2%), and feeding on discharge (n=2612; 36.2%).

Each case in the IMA 2002-5 dataset was individually matched with up to five NHS records on four variables: age, parity, year of birth, and socioeconomic status (as measured by fifth of deprivation). The statistics division matched individual IMA records initially using the SMR02 (so capturing all intrapartum data), then checked for neonatal and late neonatal deaths up to six weeks in linked mortality databases. Table 1 shows the proportions in each variable subgroup.

All but 21 of the 1462 IMA records were matched 1:5 (there were fewer available matches for older mothers with high parity, for example); the total combined dataset amounted to 8676 records. The 7214 NHS births represent 3.8% of the total births in Scotland in 2002-5 (n=213 228). Data included clinical outcomes and background data on each mother, including the presence or absence of medical conditions (one or more of pre-existing hypertension, renal disease, cardiac disease, insulin dependent diabetes) and previous obstetric complications (one or more of caesarean section, preterm birth, postpartum haemorrhage, third or fourth degree tear, stillbirth, neonatal death).

Our primary outcome was rate of unassisted vertex delivery. Secondary outcomes were live birth, perinatal death, onset of labour (spontaneous/induced), gestation, use of pharmacological analgesia, duration of labour, perineal trauma (none *v* any; incidence of third or fourth degree tear), Apgar scores <7, admission to a neonatal intensive care unit, and infant feeding. We also wanted to compare augmentation of labour, third stage management, and blood loss, but these data were not available from the ISD dataset.

#### Statistical methods

We calculated descriptive statistics and expressed outcomes in binary form. We used odds ratios and 95% confidence intervals to investigate the magnitude of the association between each explanatory variable and the outcome of interest. Multivariable logistic regression models were then fitted to explore the relation between explanatory variables and outcomes adjusted for potential confounding factors.<sup>29,30</sup> Potential confounders included previous obstetric complications, previous conditions, gestation, presentation, induction, pharmacological analgesia, low birth weight, twin births, and Apgar score <7. In addition, all analyses were stratified by parity, age group, year, and fifth of

deprivation to account for the matching.<sup>29</sup> Explanatory variables with  $P \leq 0.05$  or of potential clinical importance were selected for inclusion into the multivariable regression models. The data were stored in Microsoft Excel and analysed in SAS (version 9.1). SAS was used to perform formal selection models in the regression.

#### Ethical issues

Advice from the local medical research ethics committee confirmed that we did not require formal ethics committee approval because all the data sent to us by the IMA and ISD were anonymised. The Privacy Advisory Committee of the ISD also considered the ethical aspects of the study, and authorised the ISD to release anonymised data.

#### RESULTS

Mothers in the IMA cohort had a higher incidence of pre-existing medical conditions (1.5% *v* 1.0%; adjusted odds ratio 1.52, 95% confidence interval 0.94 to 2.46) and a higher incidence of previous obstetric complications (21.0% *v* 17.8%; 1.24, 1.07 to 1.45).

Of the women booking under the NHS system, only 27 (0.4%) had a home birth (table 2). The ISD data do not indicate how many women originally planned to have a home birth but did not achieve this. All but a few of the births in the NHS cohort occurred in an NHS hospital (an obstetric unit with or without a midwife led unit on the same site; the ISD birth code does not distinguish between the two). A small number gave birth in "stand alone" midwife led units or general practitioner units.

In the IMA cohort, 10.2% (n=149) planned to have a hospital birth (reasons included fear, safety, high risk, partner's preference, and request for repeat caesarean) and 87.1% (n=1275) wanted a home birth (the 38 remaining were either undecided or their data were missing). In the event, 965 (66.0%) gave birth at home.

In terms of the main outcome, mothers in the IMA cohort were more likely to achieve an unassisted vertex delivery (77.9% *v* 54.3%; 3.49, 2.99 to 4.07). However, they were also significantly more likely to experience a stillbirth or a neonatal death (1.7% *v* 0.6%; 5.91, 3.27 to 10.7). When we compared only low risk mothers, however, the difference was not significant (0.5% *v* 0.3%; 2.73, 0.87 to 8.55).

**Table 2 | Place of birth in NHS and IMA (Independent Midwives' Association) cohorts. Figures are numbers (percentages) of women**

Place of birth	IMA	NHS
NHS hospital (consultant obstetric unit, with or without onsite midwife led unit)	474 (32.4)	7048 (97.7)
Stand alone midwife led unit	14 (1.0)	85 (1.2)
GP unit	4 (0.3)	50 (0.7)
Home	965 (66.0)	27 (0.4)
Other (special health board/private hospital/hotel)	5 (0.3)	4 (0.1)

**Table 3** | Clinical outcomes, adjusted for strata as defined in methods, for pregnancies in NHS and IMA (Independent Midwives' Association) cohorts. Figures are numbers\* (percentages) of women and crude and adjusted odds ratios and 95% confidence intervals

Variable	IMA	NHS	Odds ratio† (95% CI)	
			Crude	Adjusted‡
Unassisted vertex delivery:				
No	323 (22.1)	3296 (45.7)	3.21 (2.80 to 3.68)	3.49 (2.99 to 4.07)
Yes	1139 (77.9)	3918 (54.3)		
Spontaneous onset of labour:				
No	50 (3.4)	1839 (25.5)	9.77 (7.31 to 13.1)	10.43 (7.74 to 14.0)
Yes	1405 (96.6)	5365 (74.5)		
Use of pharmacological analgesia:				
No	874 (59.8)	2844 (39.4)	0.44 (0.39 to 0.49)	0.42 (0.38 to 0.47)
Yes	588 (40.2)	4370 (60.6)		
Duration of labour (hours):				
<7	771 (52.7)	4286 (59.4)	1.33 (1.18 to 1.50)	1.37 (1.20 to 1.55)
>7	691 (47.3)	2928 (40.6)		
Stillbirth§ (singleton births):				
No	1406 (99.3)	7029 (99.5)	1.48 (0.65 to 3.08)	4.22 (1.72 to 10.3)
Yes	10 (0.7)	33 (0.5)		
Stillbirth§ (singletons and twins):				
No	1493 (99.0)	7330 (99.5)	1.84 (0.89 to 3.57)	5.15 (2.34 to 11.4)
Yes	14 (1.0)	35 (0.5)		
Stillbirth or neonatal death§ (singleton births):				
No	1398 (98.7)	7020 (99.4)	2.07 (1.19 to 3.61)	5.20 (2.57 to 10.5)
Yes	18 (1.3)	43 (0.6)		
Stillbirth or neonatal death§ (singletons and twins):				
No	1483 (98.3)	7320 (99.4)	2.66 (1.63 to 4.35)	5.91 (3.27 to 10.7)
Yes	25 (1.7)	46 (0.6)		
Preterm <37 weeks:				
No	1399 (95.7)	6716 (93.1)	0.58 (0.45 to 0.76)	0.49 (0.35 to 0.69)
Yes	63 (4.3)	498 (6.9)		
Low birth weight <2500 g:				
No	1402 (96.0)	6539 (92.9)	0.70 (0.55 to 0.90)	0.93 (0.62 to 1.38)
Yes	60 (4.0)	523 (7.1)		
Twin pregnancy:				
No	1413 (96.6)	6910 (96.9)	0.86 (0.58 to 1.28)	1.51 (0.83 to 2.73)
Yes	49 (3.4)	152 (3.1)		
Perineal trauma (any):				
No	773 (52.9)	2331 (47.6)	0.80 (0.71 to 0.90)	0.55 (0.48 to 0.64)
Yes	688 (47.1)	2565 (52.4)		
Apgar score:				
<7	54 (3.7)	282 (3.9)	1.05 (0.78 to 1.41)	0.83 (0.60 to 1.14)
≥7	1391 (96.3)	6949 (96.1)		
Breast feeding:				
No	176 (12.0)	1555 (36.0)	4.14 (3.48 to 4.92)	3.46 (2.84 to 4.20)
Yes	1286 (88.0)	2759 (64.0)		
Admission to neonatal intensive care unit:				
No	1397 (95.6)	6465 (90.7)	0.47 (0.36 to 0.60)	0.43 (0.32 to 0.59)
Yes	65 (4.4)	667 (9.3)		

\*Occasional missing values, not all totals add up to final number of births.

†Odds ratio &gt;1.0 indicates association with IMA mothers; &lt;1.0 indicates association with NHS mothers.

‡All non-mortality outcomes adjusted for previous conditions, previous obstetric complications, gestation, presentation, induction, pharmacological analgesia, duration of labour, low birth weight, Apgar score &lt;7, twin births.

§Mortality outcomes adjusted for previous conditions, previous obstetric complications, gestation, presentation, induction, pharmacological analgesia.

IMA cohort mothers were much more likely to start labour spontaneously (96.6% *v* 74.5%; 10.43, 7.74 to 14.0) and less likely to use pharmacological analgesia (40.2% *v* 60.6%; 0.42, 0.38 to 0.47). Non-pharmacological analgesia included water therapy and transcutaneous electrical nerve stimulation (TENS).

Despite the higher incidence of preterm birth in the NHS group (IMA 4.3% *v* NHS 6.9%; 0.49, 0.35 to 0.69), average gestational age was similar (IMA 39.6 (SD 1.76) weeks *v* NHS 39.3 (SD 2.86) weeks; median 40 weeks for both groups, interquartile range 39-41). Mothers in the IMA cohort were more likely to have twins (3.4% *v* 3.1%; 1.51, 0.83 to 2.73) and to have an intact perineum (52.9% *v* 47.6%; 0.55, 0.48 to 0.64). The incidence of third or fourth degree tears was similar (1.0% *v* 0.8%), as were Apgar scores. Birth weights in the IMA cohort, however, were significantly higher (3573 g *v* 3417 g;  $t=9.42$ ;  $P<0.001$ ), partly accounted for by a higher incidence of low birth weight in the NHS group (4.0% *v* 7.1%; 0.93, 0.62 to 1.38). Babies in the NHS group were more likely to be admitted to intensive care (4.4% *v* 9.3%; 0.43, 0.32 to 0.59). IMA mothers were more likely to breast feed fully (88.0% *v* 64.0%; 3.46, 2.84 to 4.20), even allowing for the significant difference in time estimation (six weeks for IMA *v* time of discharge from hospital, usually between one and three days, for NHS).

Table 3 shows the comparison of clinical outcome data and table 4 the comparison of perinatal mortality outcomes from the two cohorts, with crude and adjusted odds ratios.

Fifteen out of the 25 IMA babies who did not survive were born in hospital (table 5). None of the babies born at home in the NHS cohort died.

**Table 4** Perinatal mortality outcomes, adjusted for strata as defined in methods, for low and high risk pregnancies in NHS and IMA (Independent Midwives' Association) cohorts. Figures are numbers (percentages) of women and crude and adjusted odds ratios and 95% confidence intervals

Variable	IMA	NHS	Odds ratio* (95% CI)	
			Crude	Adjusted†
<b>Low risk</b>				
Stillbirth (singleton births):				
No	1044 (99.7)	5370 (99.8)	1.14 (0.32 to 4.01)	3.65 (0.82 to 16.2)
Yes	3 (0.3)	13 (0.2)		
Stillbirth or neonatal death (singleton births):				
No	1045 (99.5)	5365 (99.7)	1.37 (0.51 to 3.71)	2.73 (0.87 to 8.55)
Yes	5 (0.5)	18 (0.3)		
<b>High risk</b>				
Stillbirth (singleton births):				
No	359 (98.1)	1659 (98.8)	1.56 (0.65 to 3.77)	9.45 (2.26 to 39.6)
Yes	7 (1.9)	20 (1.2)		
Stillbirth (singletons and twins):				
No	446 (97.6)	1960 (98.9)	2.21 (1.05 to 4.64)	8.47 (2.95 to 24.3)
Yes	11 (2.4)	22 (1.1)		
Stillbirth or neonatal death (singleton births):				
No	353 (96.5)	1654 (98.5)	2.51 (1.25 to 5.03)	20.2 (5.72 to 71.2)
Yes	13 (3.6)	25 (1.5)		
Stillbirth or neonatal death (singletons and twins):				
No	434 (95.6)	1956 (98.6)	3.36 (1.86 to 6.12)	13.8 (5.75 to 33.3)
Yes	20 (4.4)	28 (1.4)		

\*Odds ratio >1.0 indicates association with IMA mothers.

†Mortality outcomes adjusted for previous conditions, previous obstetric complications, gestation, presentation, induction, pharmacological analgesia.

Table 6 lists particular risk factors associated with perinatal deaths in both cohorts and the planned and actual place of birth for the IMA cohort. Exclusion of the "high risk" cases (as in table 6) leaves an incidence of perinatal death of 5/1050 (4.8/1000) in the IMA cohort and 18/5383 (3.3/1000) in the ISD cohort.

## DISCUSSION

Though many outcomes are significantly better for women who book an independent midwife, the perinatal mortality rate is also significantly higher. Government documents have stressed that pregnant women can exercise choice.<sup>1-3</sup> This policy relates specifically to accessing maternity care and place of birth and of postnatal care. Women are entitled to know the risks and benefits of each option. We matched women who used an independent midwife with women using the NHS, according to age, parity, year of birth, and socioeconomic status. By matching 1:5, our analysis was powerful and the matching increased efficiency. Differences in birth outcomes because of socioeconomic status<sup>4,28</sup> are therefore unlikely.

### Strengths of study

This is the largest study to examine clinical outcomes over a period of years for women using an independent midwife. The IMA database covers most births in which an independent midwife is involved. We were able to match NHS births using anonymised NHS records on four variables, pre-empting the criticism that outcomes cannot be compared because women who employ an independent midwife are atypical. This relates in particular to socioeconomic status. In addition, our analysis adjusted for non-matched confounders such as previous medical and obstetric history.

### Limitations

This was a retrospective study and subject to the usual constraints. Although the IMA believed the database sent to the research team to be nearly complete for all participating midwives, about 20% of independent midwives do not belong to the IMA and not all IMA members participated in the database project. Compared with more experienced independent midwives, some who were new to independent practice and who were starting to build up their caseload also did not participate.<sup>28</sup> The IMA believe that data concerning over 70% of births involving independent midwife care were included in the database. Within a small group, where experiences are shared, the IMA thought it unlikely that a death would be not be reported.

While the IMA dataset had few missing variables, the ISD dataset was incomplete for certain variables, including analgesia, perineal tears, and breast feeding, and this compromised the power of the analysis for these outcomes. The data were complete for the primary outcome. As noted above, we also wanted to compare blood loss, augmentation of labour, and third stage management, but these data were not available from the ISD dataset.

**Table 5** | Location of birth in cases of perinatal death in NHS and IMA (Independent Midwives' Association) cohorts. Figures are numbers (percentages) of deaths

	IMA	NHS
Singleton:		
Hospital	12/467 (2.6)	42/7035 (0.6)
Home	6/949 (0.6)	0/27
Twin:		
Hospital	3/60 (5.0)	3/303 (1.0)
Home	4/31 (12.9)	0/0
All babies:		
Hospital	15/527 (2.8)	45/7338 (0.6)
Home	10/980 (1.0)	0/27
All locations	25/1507 (1.7)	45/7365 (0.6)

Different models of care (for example, affecting continuity rates) might help to explain different outcomes, but we were not able to establish these for women in different units within the NHS—for example, “alongside midwife led unit,” “stand alone midwife led unit,” and obstetric unit.

Matching by deprivation fifths relies on postcode analysis, which does not measure individual socioeconomic status. Differences within the UK might also apply—for example, it is possible that someone in the fourth of the five categories of deprivation in Scotland is even more disadvantaged than someone in the same category in England (ISD, personal communication).

Perceptions of risk might simply be different for women who opt for certain choices.<sup>31</sup> Given the lack of an objective and widely accepted tool for scoring obstetric risk, it would be extremely problematic to incorporate this factor when matching two cohorts.

We were not able to assess outcomes by ethnicity, as these data were not available from ISD. Scotland is less ethnically diverse than many other parts of the UK, the white population accounting for 98%. Of all the IMA mothers, 94% were classified as white.

#### Normality of birth

Our results are mixed. IMA cohort mothers were significantly more likely to have an unassisted vaginal birth (having started labour spontaneously) and to avoid pharmacological analgesia, including Entonox (nitrous oxide and oxygen). They were also more likely to avoid perineal trauma and to breast feed successfully. The 54.3% rate of unassisted vertex delivery for the NHS cohort is considerably lower than the average Scottish rate of 63.4%,<sup>32</sup> suggesting that the mothers in this study are not representative of all mothers. Indeed, this was the point of carrying out a matched control study.

The mean gestational age at birth was almost identical in the two groups (despite the rates of prematurity and induction of labour being significantly higher in the NHS group), and there were no significant differences in Apgar scores. Admission to neonatal intensive care (another measure of neonatal morbidity) was far lower in the IMA group. This might be partly

explained by the location of birth: babies born in hospital will be subject to unit protocols, some of which, for example, might require admission to intensive care for hypoglycaemia. Independent midwives at home births would not be obliged to follow NHS unit protocols. The cost of the number of preterm births and the apparently high number of NHS admissions in economic terms alone might be significant; this warrants further investigation.

Some of the outcomes might be linked. Induction of labour and certain forms of analgesia, for example, are associated with a higher incidence of instrumental or operative delivery.<sup>33</sup> The average length of labour was significantly longer in the IMA cohort, which might be accounted for by different philosophies of intervention. Data on augmentation were not available for the NHS cohort, and national data are not published. The augmentation rate for IMA mothers, at 3.1%, however, seems to be low and certainly lower than the 19.7% cited in an Australian study.<sup>34</sup>

Breast feeding is the preferred method of infant feeding, and its promotion is a key government target.<sup>35 36</sup> Breastfeeding rates at birth in the UK have increased in the past few years from 69% to 76%.<sup>37</sup> It is recognised, however, that breast feeding declines after hospital discharge, and the latest government figures give the six week rate as 49%.<sup>35</sup> At discharge, the NHS group in this study had a breastfeeding rate of 64%; the rate in the IMA group was significantly higher, even six weeks later, at 88%.

#### Perinatal mortality

Our overall findings show that women using an independent midwife fared better across a range of clinical outcomes. However, their babies were more likely to be stillborn or to die in the neonatal period. The stillbirth rate (singletons and twins) in the IMA cohort was twice that in the NHS cohort (1.0% *v* 0.5%). The rate for England, Wales, and Northern Ireland in 2005 was reported to be 0.55%<sup>38</sup> and in Scotland it was 0.53%.<sup>39</sup> While the unadjusted odds ratio among singletons was not significantly greater, the difference was significant when we included neonatal death.

#### Factors influencing mortality rates

Several factors could explain the higher perinatal mortality rate in the IMA cohort. Statistical artefact is a possibility: the incidence of perinatal deaths in the IMA database for 2006-8 is reported to be 10 (personal communication). After careful checking, we found only one death between 7 and 28 days in the NHS cohort (in addition to the 45 that occurred at birth or up to day seven); given the intense scrutiny surrounding perinatal deaths, under-reporting in the ISD cohort is unlikely. However, the analysis is based on small numbers, and resulting large confidence intervals.

In several cases multiple factors were involved (such as twin pregnancy and vaginal breech birth). Of the 25 perinatal deaths in the IMA cohort in 2002-5, seven babies (28%) were born at gestational ages ranging from 25-32 weeks. An even greater proportion of the

babies who died in the NHS cohort, however, were born at or below 32 weeks (15/45; 33%). Only limited data were available about circumstances regarding transfer to hospital in the IMA cohort. While independent midwives' observations of the reception by hospital staff on transfer were mostly positive, these also included "indifferent," "unsupportive," and "hostile." It is possible that the anticipation of such a welcome might delay prompt transfer.<sup>40</sup>

Seven of the 25 IMA perinatal deaths occurred to a twin, of which three were vaginal breech births; there were three further vaginal breech births. As noted above, the IMA cohort mothers had a higher incidence of existing medical conditions and previous obstetric complications. Of those whose babies did not survive, one mother had an existing renal condition; another already had a child with cerebral palsy; and two had had a previous caesarean section. One of these, and another mother with a twin pregnancy and breech presentation, planned to have their babies in hospital (and did so).

Most of the IMA cohort births occurred at home, which some consider a risk factor in itself, although home birth studies in low risk women have found that their outcomes are no worse than for low risk women in hospital.<sup>10 18</sup> All but one of the very preterm births noted in table 6 occurred in hospital. Indeed, most of the stillbirths in the IMA cohort (10/14) occurred in hospital. In eight of the 14 cases the fetal death had occurred before labour. While clinical mismanagement cannot be ruled out, it seems likely that other factors might be implicated. Five of the seven second twins in the IMA cohort who died were presenting by the breech.

When we excluded "high risk" cases (regardless of survival) from the entire IMA dataset, the perinatal mortality rate, at 4.8/1000, is comparable with the national rate. The conclusion might therefore be drawn that it is the additional "high risk" cases (such as preterm birth, twin pregnancy, and attempted vaginal breech birth, especially when combined) that account for the overall higher perinatal mortality rate. We cannot say with certainty that pregnant women who currently employ an independent midwife would use NHS services if the independent midwife option were not available. Some might choose to give birth without any assistance—known as "freebirthing"<sup>41</sup>—raising the possibility of even worse clinical outcomes.<sup>42</sup>

The IMA dataset contained information unavailable from the ISD. All of the IMA perinatal deaths occurred in cases where the mother was classified as white, so minority ethnic group status is clearly not an explanatory factor. In two of the perinatal deaths, the independent midwife noted life threatening birth defects (both were in twin pregnancies); in another, serious defects were reported pending postmortem examination. It is not known to what extent similar explanations might apply to the NHS cohort.

Twenty nine (3.3%) of the IMA cohort mothers had conceived by assisted means (in vitro fertilisation, intracytoplasmic sperm injection, etc). This is considerably higher than the national average, which is around one in 80 babies (1.4%).<sup>43</sup> None of the babies in this category in the IMA cohort, however, was still-born or died in the neonatal period. The IMA database also informed us that 19 mothers were considered to have had poor nutritional status; a further 250 (17.1%)

**Table 6** | Risk factors and planned and actual place of birth in IMA (Independent Midwives' Association) cohort perinatal deaths; risk factors in NHS cohort perinatal deaths

Risk factor(s)*	IMA planned home births				IMA planned hospital births	IMA total	NHS total
	Home birth	Hospital birth					
		Antenatal transfer	Intrapartum transfer				
<34 weeks	0	4	1	1	6	9	
<34 weeks and breech	0	0	0	0	0	7	
<34 weeks and twin and vaginal breech	1	0	0	0	1	1	
<34 weeks and previous obstetric complication	0	0	0	0	0	2	
Vaginal breech	3	0	0	0	3	3	
Vaginal breech and twin	2	0	0	0	2	0	
Breech (operative)	0	0	1	0	1	0	
Breech (operative) and twin	0	0	1	1	2	0	
Twins	1	1	0	0	2†	2	
Previous obstetric complication	0	0	1	1	2	2	
Existing medical condition	0	0	1	0	1	1	
Previous obstetric complication and medical condition	0	0	0	0	0	1	
Subtotal: births among higher risk women	7	5	5	3	20	28	
Subtotal: births among women without identified risk factors	3	0	2	0	5	18	
Total	10	5	7	3	25	46	

\*Each row is mutually exclusive.

†Both had lethal anomalies.

**WHAT IS ALREADY KNOWN ON THIS TOPIC**

Patients' choice is a key driver in government health policy

Independent midwives provide a service for a minority of pregnant women, many of whom are believed to be unrepresentative of the general maternity care population, thus making comparisons problematic

**WHAT THIS STUDY ADDS**

Clinical outcomes concerning normal birth, spontaneous labour, use of pharmacological analgesia, perineal trauma, and breast feeding were significantly better in the IMA cohort

There was a significantly higher perinatal mortality rate among the higher risk births (breech presentations and twin pregnancies) in the IMA group

For low risk women perinatal mortality rates were not significantly different between the NHS and IMA datasets

Significantly higher rates of premature birth and admission to neonatal intensive care were found for the NHS births

had either a vegan, ovo-lacto-vegetarian, or macrobiotic diet. None of these factors was associated with perinatal death. No such data were available for the NHS cohort.

Thirty eight (2.6%) women in the IMA cohort reported having smoked during the pregnancy. Two of these experienced a perinatal death (one had smoked 30 cigarettes a day while pregnant). A further 534 (37%) stated they had drunk alcohol while pregnant, although none admitted drinking more than six units a week. In six cases the baby was either stillborn or died in the neonatal period. No comparable data were available for the NHS cohort, nor are national figures obtainable. Government advice, published in 2006, was not to drink more than one or two units of alcohol once or twice a week.<sup>44</sup> This has been revised to a position of advising complete abstinence.<sup>45</sup>

**Future research**

We considered various potential explanations for the higher perinatal death rate in the IMA cohort and identified possible predisposing reasons, including twin pregnancy and breech presentation. These factors usually preclude eligibility for home birth under NHS clinical protocols.

Identifying precisely what occurred in the instances described here is a necessary next step. We were told that clients of independent midwives are more likely to decline aggressive treatments or interventions, which might have affected clinical outcome. In addition, two mothers chose to give birth at home, knowing there had been an intrauterine death (IMA, personal communication). We have secured funding for a senior academic to review the case notes to identify the factors that might have contributed to the higher perinatal mortality rate. All the perinatal deaths recounted in this study would have been reported to the Confidential Enquiry into Maternal and Child Health. Their reports covering stillbirth and neonatal death since 2000 have examined home births in detail and have not identified independent midwifery as a risk

factor.<sup>38 46-48</sup> In the event of a perinatal death, an independent midwife would also be obliged to report this to her or his supervisor of midwives, who would scrutinise practice.

The significantly higher incidence of preterm birth and low birth weight in the NHS group are matters of concern. There is some evidence that targeted antenatal care is associated with a lower incidence of preterm birth, even in high risk populations<sup>49</sup>; the effectiveness of different models of care requires further research. This was a UK study, and while the theme of home birth might be applied in other contexts, the circumstances of independent midwifery in the UK at present make extrapolations difficult. As Bastian et al note, home and hospital birth do not have standard care characteristics.<sup>8</sup>

**Conclusion**

Women are being advised that they can exercise choice in determining patterns of care. While the decision to opt for non-NHS care or home birth, or both, in the presence of identifiable risk factors might be difficult for some practitioners to accept, women's perspectives on risk and safety in birth do not always accord with biomedical viewpoints.<sup>50</sup> There is, in addition, clear legal justification for a mentally competent woman to choose an option that seems irrational or wrong to clinicians, even if the consequences are potentially fatal.<sup>51</sup> Better communication regarding care options, which might include reviewing previous experiences or offering counselling or debriefing, might provide women with greater confidence in the NHS.

Evidence based decisions can be made only if appropriate information is available. While clinical outcomes across a range of variables are much better for women using an independent midwife, the significantly higher perinatal mortality rate, particularly in higher risk women, indicates the need for a full review of case notes to identify possible causative factors. Adequate plans need to be in place to manage clinical emergencies and to expedite transfer to a suitable facility when serious problems arise. A full review of these cases could help to explain the higher perinatal mortality rate in higher risk women and thereby provide women with further evidence on which to base their decisions about pregnancy care and delivery.

Gill Libby, of Community Health Sciences, University of Dundee, was involved in the conception and design of the study.

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