Association between home birth and breast feeding outcomes: a cross-sectional study in 28 125 mother–infant pairs from Ireland and the UK

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ABSTRACT

Objectives: To examine the association between breast feeding outcomes and place of birth (home vs hospital birth).

Design: Population-based cross-sectional study.

Setting: Ireland and UK.

Participants: 10 604 mother–infant pairs from the Growing Up in Ireland study (GUI, 2008–2009) and 17 521 pairs from the UK Millennium Cohort Study (UKMCS, 2001–2002) at low risk of delivery complications were included in the study.

Primary and secondary outcome measures: Breast feeding initiation, exclusivity and duration.

Results: Home birth was found to be significantly associated with breast feeding at all examined time points, including at birth, 8 weeks, 6 months and breast feeding exclusively at 6 months. In GUI, adjusted OR was 1.90 (95% CI 1.19 to 3.02), 1.78 (1.18 to 2.69), 1.85 (1.23 to 2.77) and 2.77 (1.78 to 4.33), respectively, and in UKMCS it was 2.49 (1.84 to 3.44), 2.49 (1.92 to 3.26), 2.90 (2.25 to 3.73) and 2.24 (1.14 to 4.03).

Conclusions: Home birth was strongly associated with improved breast feeding outcomes in low-risk deliveries. While the association between home birth and breast feeding is unlikely to be directly causal, further research is needed to determine which factor(s) drive the observed differences, to facilitate development of perinatal care that supports breast feeding.

INTRODUCTION

Breast feeding is the optimal form of infant nutrition.1 2 It has been associated with short-term and long-term benefits for the infant and mother, including improved neurodevelopment, reduced incidence and severity of infections in childhood,3 and a protective effect against common adult-onset metabolic diseases for the breast fed individual later in life (eg, obesity, hypertension, dyslipidaemia, type 2 diabetes).4 and reduced incidence of gastrointestinal diseases (including inflammatory bowel disease and coeliac disease).3 The benefits for the breast feeding mother include reduced rates of breast and ovarian cancers later in life.5 6

Despite the well-established benefits of breast feeding, prevalence rates remain low in many developed countries. This is particularly true for Ireland, where the breast feeding initiation rates are low, at 56% in 2008–2009,7 8 compared with 81% reported in the UK in 2010.9 Apart from initiation, many recent government health policies, nationally and internationally, aim to maximise the 6-month exclusive breast feeding10 11 and continued breast feeding for a year or longer.3 However, data from many countries suggest that very few women and infants are receiving the benefits of breast feeding for the 6 months duration that is recommended by the WHO (2001).9 12

In Ireland, the National Home Birth Service provides for planned home birth in low-risk healthy women, under the care of a self-employed midwife on behalf of the

Strengths and limitations of this study

- Two large nationally representative cohorts comprising 28 125 mother–infant pairs were included in the analysis.
- These are the largest population cohorts studied until now that comprehensively examined the relationship between breast feeding and place of birth in low-risk pregnancies.
- Analysis was adjusted for multiple maternal, infant and household factors to minimise the effect of potential confounders; however, this is a cross-sectional study and the causality of the associations cannot be determined.
- Information was self-reported and eligibility for home birth was inferred from available data.
Health Service Executive (HSE). Similarly, in the UK, home birth is provided for women with low-risk pregnancies, and is supported by the Royal College of Midwives (RCM) and the Royal College of Obstetricians and Gynaecologists (RCOG). Recent guidance from the National Institute for Health and Care Excellence (NICE) encourages physicians and low-risk women to consider planned home birth, as for these mothers home birth is generally as safe or safer than hospital birth, particularly in the case of multiparous women.

Overall, home birth rates vary widely in developed countries; 2.5% of all births in England and Wales were planned home births in 2012, whereas this was reported to be only 0.3% in Northern Ireland, and 0.2% in the Republic of Ireland in the same year. These rates are determined by the demand, national policies and availability of the service, as well as by the means of measuring the home birth rate.

Studies looking into the outcomes of home birth have reported high rates of breast feeding, and it has been sporadically reported that place of birth may be associated with breast feeding outcomes; however, no study until now has focused on a comprehensive examination of this association at multiple time points. Examining the relationship between place of birth and breast feeding, and understanding which aspects of care have an impact on breast feeding outcomes, are essential for informing antenatal, perinatal and postnatal policies and procedures, equally in hospital and home settings.

Here, we explore the relationship between place of birth and breast feeding outcomes in mother–infant pairs at low risk of birth complications in two large population cohorts, to deliver the largest and most comprehensive study of the relationship between home birth and breast feeding until now.

**METHODS**

The Growing Up in Ireland (GUI) and UK Millennium Cohort Study (UKMCS) cohorts were included in this study. We chose to use two cohorts with complementary strengths and weaknesses to examine consistency of findings and increase statistical power.

**GUI:** All infants born between December 2007 and May 2008 in Ireland were eligible for inclusion. Families were selected randomly from the Child Benefit Register (which covers all children in Ireland) and invited to participate. Primary caregivers (typically the infant’s mother) who elected to take part (N=11 134) gave written informed consent. The interviews with families took place in 2008–2009, when the infants were 9 months old, and were carried out by trained interviewers using a detailed questionnaire. The GUI study has been described in detail elsewhere.

**UKMCS:** Families were identified from the UK Child Benefit System, which covers all children in the UK. The UKMCS was designed to achieve an over-representation of families from areas of high poverty and ethnic diversity. Trained interviewers carried out interviews with 18 552 families during home visits in 2001–2002 when the infants were ~9 months old (mean age 9.7 months). The design and composition of the UKMCS and data collection have been described in detail elsewhere and the study received ethics approval from the National Health Service Ethical Authority. The response rate was 58% in the GUI and 72% in the UKMCS.

**Breast feeding and home birth**

Participating mothers were asked about breast feeding history, including initiation, duration and exclusivity, and about the introduction times of non-breast milk and solids (see online supplementary appendix A for detail). In GUI, mothers were specifically asked ‘How old was the infant when (he or she) stopped being exclusively breast fed?’ There was no such question in UKMCS; therefore, exclusivity of feeding was derived from reported time of introduction of other milk and solids to the infant’s diet. Information was extracted on whether breast feeding was initiated, sustained at 8 weeks (any breast feeding), sustained at 6 months (any breast feeding) and whether the infant was exclusively breast fed at 6 months. These time points were chosen to facilitate the comparisons with previously published work.

Information on place of birth was collected differently in two cohorts: in GUI, mothers were asked whether it was a ‘planned home birth’; in UKMCS, mothers were asked if they gave birth at home or in the hospital (see online supplementary appendix B). We adopt the term ‘home birth’ for both cohorts unless otherwise stated. Further details collected about birth covered elective/planned or emergency caesarean section, vaginal breech delivery and suction (vacuum extraction) or forceps assisted delivery.

**Covariates**

We adjusted our model for a range of potential confounders that are typically considered in this context; these are listed and described below.

**Sociodemographic and lifestyle characteristics**

The mother’s age, partner status (alone or with a co-resident parent), socioeconomic status (derived from classification of occupation) and education were assessed. Stress, low mood and support were measured, with GUI assessing perceived support and UKMCS assessing maternal use of available supports. The body mass index (BMI) of the mother was derived from weight and height measured at time of interview in GUI. BMI was not available for all mothers in UKMCS (2316 missing) and was therefore not used in the adjusted analysis. Details of maternal alcohol consumption and smoking (smoker or non-smoker) were also recorded.

**Obstetric history, pregnancy and birth**

Parity (primiparity, multiparity), gestational age (in weeks), birth mode (spontaneous vaginal, breech (GUI...
only), assisted delivery or caesarean section), infant weight and gender, and maternal folic acid supplementation during pregnancy (yes/no, GUI only) were considered.

**Exclusions**

In the GUI and UKMCS cohorts, exclusion criteria included place of birth other than home or hospital, or risk factors that preclude planned home birth. These risk factors were informed by HSE and NICE criteria for advocacy of birth in an obstetric unit,13 15 and the final list constitutes a subset of factors that were absent in the home birth group: slow fetal growth, known fetal problems, non-singleton pregnancies, presence of maternal medical conditions and gestation under 31 weeks (for more detail, see online supplementary appendix C).

**Statistical analysis**

All statistical analyses were carried out with the statistics program R, V3.1.1 (R Version 3.1.1. Secondary R Version 3.1.1. 2014. http://www.r-project.org/). To test the association between place of birth and breast feeding at multiple time points, we first carried out an unadjusted analysis, and then proceeded with multivariable logistic regression adjusting for selected covariates. Covariates chosen for the fully adjusted model were: infant’s gender, birth weight, gestation, delivery mode, mother’s age, marital status, parity, BMI (in GUI), smoking, education, socioeconomic status, income, ethnicity, alcohol, stress, depression, return to work and support. Multicollinearity of covariates was assessed using variance inflation factors (function ‘vif’ implemented in package ‘usdm’ for R); values over 4 indicate the presence of multicollinearity.

While we report results from the full model to enable comparison, we used stepwise backwards regression removing the least significant covariate at the time, and we check consistency of findings between fully adjusted and reduced models. We repeat the analysis limited to mothers who breast fed at the immediately preceding time point (eg, only mothers who breast fed at birth were analysed for association of breast feeding with home birth at 8 weeks). This was done to assess continuation of breast feeding at later time points, and to ensure that associations at later time points were not driven by strong association at earlier time points. Analysis was also conducted after exclusions of all assisted deliveries, as birth interventions are known to be strongly negatively associated with breast feeding. Findings are reported as OR (95% CI) and, where appropriate, p value is also given. Since maternal characteristics and lifestyle may be the main confounders that affect both preference for home birth and breast feeding, we also examined the differences between the two groups of mothers.

**RESULTS**

In total, we analysed 10 604 mother–infant pairs from the GUI cohort and 17 521 pairs from the UKMCS cohort. In GUI, 61% (n=6427) of mothers initiated breast feeding, 22% (n=2292) continued to breast feed for at least 6 months, and 9% (n=968) breast fed exclusively for 6 months (figure 1A). In UKMCS, 67% (n=11 774) initiated breast feeding, 22% (n=3768) continued to breast feed for at least 6 months and 1% (n=226) breast fed exclusively for 6 months (figure 1B). In GUI, there were 10 447 hospital births, and 157 planned home births, 1% of the total number of births (table 1). In UKMCS, there were 17 181 hospital births, and 340 home births, 2% of the total number of births (table 2).

**Association between home birth and breast feeding in GUI and UKMCS**

Home birth was positively associated with initiation of breast feeding and with sustained breast feeding at all time points, in the unadjusted analysis and after adjustment for relevant confounders, at all time points in the GUI and UKMCS cohorts (table 3). In multivariable adjusted analysis, associations with initiation at birth, sustained breast feeding at 8 weeks and 6 months, and exclusive breast feeding at 6 months in GUI were: OR=1.90 (95% CI 1.19 to 3.02; p=0.0001), 1.78 (1.18 to 2.69; p=0.003), 1.85 (1.23 to 2.77; p=0.006) and 2.77 (1.78 to 4.33; p=0.007), respectively, and in UKMCS were: OR=2.49 (1.84 to 3.44; p=0.011), 2.49 (1.92 to 3.26; p<0.0001), 2.90 (2.25 to 3.73; p<0.0001) and 2.24 (1.14 to 4.03; p<0.0001), respectively. Only minor differences were observed between fully adjusted and reduced models. Results were largely consistent (although attenuated) when the analysis was restricted to infants who were breast fed at a previous time point only; results were consistent when births which involved interventions were excluded, or in UKMCS when restricted to a subset of participants for whom BMI was available (see online supplementary appendix D). Support in GUI was found to be inversely associated with breast feeding, and in UKMCS no association was found with uses of available supports (see online supplementary appendix E).

The covariates which showed a consistent association with home birth in GUI and UKMCS were higher education level or professional qualification (GUI: OR=3.62 (1.50 to 8.74); UKMCS: OR=2.26 (1.16 to 4.38)) and gestational age (per week): GUI: OR=1.15 (1.03 to 1.30); UKMCS: OR=1.13 (1.05 to 1.22; see online supplementary appendix F).

**DISCUSSION**

Home birthed infants were overall twice as likely to be breast fed and sustained breast feeding was consistently associated with home birth at various time points. Our findings are consistent with previously published reports.16 20–22 29–33

The home birth rate observed in the GUI study (1.48%) was more than seven times the rate reported in...
the Irish government-published data (0.2%). The government data may report a lower rate as it includes only planned home births that were attended to by an independent midwife, and excludes home births that took place as part of hospital-administered home birth schemes.

Among developed countries, home birth rates are highest in the Netherlands (30%), where care for pregnant women is divided into primary care for low-risk women (who may choose home birth), and secondary care for women at risk of complications. Moreover, the demand for home birth in the Netherlands is high, with 34–63% of low-risk women intending to give birth at home rather than in hospital or a birth centre. In Ireland, only 9.5% reported that they would consider home birth in a subsequent pregnancy in 2000.

Breast feeding in the UKMCS cohort was lower than previously reported UK rates, with initiation of breast feeding at 67%, compared with 81% reported in 2010. This may be due to over-representation of deprived populations in this cohort. There was also a sharper drop-off of exclusive breast feeding seen in UKMCS compared with GUI, with the rate in UKMCS falling sharply after 4 months. This may be related to a change in the WHO infant feeding recommendations: prior to 2001, exclusive breast feeding was recommended for 4–6 months (when the UKMCS data collection took place); however, in 2001, the WHO published new guidelines that recommend a 6-month exclusive breast feeding period (in effect when GUI was conducted).

It is presently unclear what underlies the observed association between sustained breast feeding and home birth. Some potential factors are discussed. First, the type and level of support from health professionals that the mother receives may differ: care is typically midwife-led in the case of home birth, and physician-led in case of the hospital birth. Interestingly, a recent study among low-risk women who intended to breast feed their baby from the Netherlands did not show statistically significant differences in the breast feeding success rate between home-led and midwife-led hospital births.

In Ireland, a self-employed community midwife is the primary carer for the mother and home birthed infant until the infant is 14 days old. As a result, the mother receives support and consistent advice from a single midwife. In contrast, multiple health professionals are involved in care following hospital birth, potentially providing unpredictable and inconsistent input. There is also a difference in the level of training related to

Figure 1  Breast feeding rates in: (A) the Growing Up in Ireland (GUI) cohort (n=10 604) and (B) the UK Millennium Cohort Study (UKMCS; n=17 521). The proportion of infants who were breast fed in the first 6 months of life is shown, including the proportion (%) of any breast feeding and of exclusive breast feeding, for deliveries at home and in the hospital.
Table 1  Pregnancy, maternal and household characteristics for the GUI cohort (n=10 604)

| Variables                          | GUI: total | BF initiated | BF≥8 weeks | BF at 6 months | EBF at 6 months |
|------------------------------------|------------|--------------|------------|----------------|----------------|
|                                    | n          | Per cent     | n          | Per cent       | n          | Per cent |
| Total                              | 10 604     | 100          | 6402       | 60             | 4896       | 46        | 2282     | 22        | 963       | 9         |
| Place of birth                     |            |              |            |                |            |            |          |           |           |           |
| Planned home birth                 | 157        | 1            | 121        | 2 (77†)        | 103        | 2 (66†)   | 59        | 3 (38†)   | 35        | 4 (22†)   |
| Hospital birth                     | 10 447     | 99           | 6281       | 98 (60†)       | 4793       | 98 (46†)  | 2223      | 97 (21†)  | 928       | 96 (9†)   |
| Maternal age                       |            |              |            |                |            |            |          |           |           |           |
| <30                                | 3453       | 33           | 1827       | 29             | 1288       | 26        | 531       | 23        | 215       | 22        |
| 30–35                              | 3662       | 35           | 2334       | 36             | 1807       | 37        | 854       | 37        | 341       | 35        |
| ≥35                                | 3489       | 33           | 2241       | 35             | 1801       | 37        | 897       | 39        | 407       | 42        |
| Marital status                     |            |              |            |                |            |            |          |           |           |           |
| Single parent                      | 1272       | 12           | 520        | 8              | 340        | 7         | 133       | 6         | 44        | 5         |
| Parity                             |            |              |            |                |            |            |          |           |           |           |
| Primiparous                        | 4312       | 41           | 2911       | 45             | 2158       | 44        | 954       | 42        | 375       | 39        |
| Multiparous                        | 6292       | 59           | 3491       | 55             | 2739       | 56        | 1328      | 58        | 588       | 61        |
| Education                          |            |              |            |                |            |            |          |           |           |           |
| ≤Lower second.                     | 1236       | 12           | 362        | 6              | 241        | 5         | 92        | 4         | 31        | 3         |
| Upper second.                      | 3467       | 33           | 1736       | 27             | 1220       | 25        | 493       | 22        | 205       | 21        |
| No degree                          | 2038       | 19           | 1269       | 20             | 896        | 18        | 386       | 17        | 154       | 16        |
| Degree                             | 3854       | 36           | 3054       | 48             | 2534       | 52        | 1307      | 57        | 569       | 59        |
| Socioeconomic status               |            |              |            |                |            |            |          |           |           |           |
| Never worked                       | 1193       | 11           | 472        | 7              | 343        | 7         | 170       | 7         | 58        | 6         |
| Unskilled                          | 971        | 9            | 557        | 9              | 423        | 9         | 198       | 9         | 78        | 8         |
| Semiskilled                        | 3213       | 30           | 1700       | 27             | 1224       | 25        | 540       | 24        | 230       | 24        |
| Manager/Prof.                      | 5172       | 49           | 3635       | 57             | 2875       | 59        | 1360      | 60        | 593       | 62        |
| Otherwise emp.                     | 55         | 1            | 38         | 1              | 31         | 1         | 14        | 1         | 4         | 0.4       |
| Ethnicity                          |            |              |            |                |            |            |          |           |           |           |
| Irish                              | 8736       | 78           | 4422       | 69             | 3158       | 65        | 1279      | 56        | 558       | 58        |
| Other white                        | 1471       | 13           | 1309       | 20             | 1104       | 23        | 586       | 26        | 275       | 29        |
| Black                              | 361        | 3            | 339        | 5              | 317        | 6         | 209       | 9         | 47        | 5         |
| Asian                              | 301        | 3            | 274        | 4              | 245        | 5         | 164       | 7         | 62        | 6         |
| Other                              | 52         | 0            | 47         | 1              | 44         | 1         | 25        | 1         | 11        | 1         |
| Smoking                            |            |              |            |                |            |            |          |           |           |           |
| Current smoker                     | 2559       | 24           | 1127       | 18             | 772        | 16        | 219       | 10        | 80        | 8         |
| Alcohol use                        |            |              |            |                |            |            |          |           |           |           |
| Rare/never                         | 1893       | 18           | 1274       | 20             | 1052       | 21        | 663       | 29        | 282       | 29        |
| Alcohol consumption                |            |              |            |                |            |            |          |           |           |           |
| <7 U/week                          | 8109       | 76           | 4949       | 77             | 3829       | 78        | 1889      | 83        | 818       | 85        |
| 7–14 U/week                        | 1760       | 17           | 1055       | 16             | 785        | 16        | 301       | 13        | 112       | 12        |
| ≥14 U/week                         | 727        | 7            | 390        | 6              | 274        | 6         | 88        | 4         | 32        | 3         |
| BMI                                |            |              |            |                |            |            |          |           |           |           |
| <25                                | 5496       | 52           | 3485       | 54             | 2720       | 56        | 1319      | 58        | 570       | 59        |
| 25–30                              | 2967       | 28           | 1759       | 27             | 1318       | 27        | 579       | 25        | 242       | 25        |
| ≥30                                | 1634       | 15           | 855        | 13             | 621        | 13        | 269       | 12        | 100       | 10        |
| Missing                            | 534        | 5            | 303        | 5              | 237        | 5         | 115       | 5         | 51        | 5         |
| Infant gender                      |            |              |            |                |            |            |          |           |           |           |
| Female                             | 5180       | 49           | 3210       | 50             | 2468       | 50        | 1170      | 51        | 522       | 54        |
| Gestational age (weeks)            |            |              |            |                |            |            |          |           |           |           |
| <37                                | 627        | 6            | 341        | 5              | 270        | 6         | 86        | 4         | 36        | 4         |
| ≥37                                | 9940       | 94           | 6055       | 95             | 4600       | 94        | 2186      | 96        | 924       | 96        |
| Mode of delivery                   |            |              |            |                |            |            |          |           |           |           |
| SVD                                | 6350       | 60           | 3913       | 61             | 3038       | 62        | 1519      | 67        | 652       | 68        |
| Breech                             | 38         | 0.4          | 24         | 0              | 20         | 0.4       | 5         | 0.2       | 1         | 0         |
| Assisted                           | 1527       | 14           | 971        | 15             | 698        | 14        | 306       | 13        | 129       | 13        |
| Caesarean                          | 2687       | 25           | 1517       | 24             | 1138       | 23        | 452       | 20        | 181       | 19        |

Continued
lactation among carers, with midwives typically receiving more education in this area. The default national hospital birth model of care involves shared care between the obstetrician and general practitioner, followed by a statutory universal visit from a public health nurse (PHN). This is important because intervention in the early postpartum period has been shown to improve maternal and infant outcomes. PHNs in Ireland are population-based generalist nurses, whose postnatal visit should take place within 48 hours of discharge, however, the percentage of first visits actually achieved during this period varies significantly (57–85%), and the service has been found to fall short of meeting postnatal breast feeding support needs.

Second, psychological factors are likely to have an important role in the success of breast feeding. The physiological experience of giving birth at home in a familiar environment may lead to reduced stress, and a reduction in stress could contribute to an intervention-free birth, and may consequentially influence breast feeding outcomes. Moreover, postpartum circumstances of home birth that enable immediate and prolonged skin-to-skin contact can facilitate homoeostasis of the infant, mother–infant bonding and play a role in the cascade of events that promote lactogenesis.

Stress in the perinatal period has been linked to delayed breast feeding. Intrapartum interventions are stress-provoking and they have been negatively associated with breast feeding. However, it is difficult to isolate birth circumstances, at home or in hospital, as directly causative of increased stress: women who report psychosocial stress during pregnancy are more likely to experience birth complications themselves, and may also be less likely to breast feed as a result of background levels of stress, thereby confounding a direct relationship between birth circumstances-related hypothalamic-pituitary-adrenal axis activation and subsequent breast feeding. Apart from interventions, analgesia during labour is also common in hospital birth but rare in home birth. This is relevant because analgesia has been shown to cause lethargy in the infant and to delay milk production, thereby interfering with breast feeding initiation.

With regard to partner support, in GUI we found no association between breast feeding and a living-in partner, while in UKMCS an association was found, but was not consistent across the time points. In other measures of support, in the UKMCS the presence of a partner, or usage of supports was not found to be associated with breast feeding at all assessed time points; however, surprisingly, a consistent inverse association was observed in GUI of perception of support with breast feeding and home birth. Some responses, on questioning on levels of support perceived, may have been an indirect measurement of maternal sociodemographic or personality traits, such as resilience and self-reliance. Further studies aimed at addressing all elements of professional and partner/community support, including non-perceived support, are needed.

Additional psychological factors that have been known to affect breast feeding include anxiety, adaptability, mother’s priorities and mothering self-efficacy, breast feeding self-efficacy, dispositional optimism, faith in breast milk, breast feeding expectations, planned duration of breast feeding and the time of the infant feeding decision and other; unfortunately, we were unable to study these.

Third, we hypothesise that the mothers who deliver at home may differ in unmeasured and/or unmeasurable characteristics, such as in personality, beliefs, lifestyle choices or in their attitudes towards birth and infant feeding. Many of these potential factors are difficult to capture or even define clearly. In our analysis of home versus hospital birth, we found sustained differences between the home and hospital birth mothers: the former were more educated, the infant’s gestational age was greater and they reported low levels of support. There are other differences which are unmeasured in study cohorts, including factors which may preclude birth at home, such as distance to the hospital and the facilities available in the home. However, we consistently observe the association between home birth and improved breast feeding outcomes, even after adjustment for multiple maternal sociodemographic,
Table 2  Pregnancy, maternal and household characteristics for the UKMCS cohort (n=17 521)

| Variables                        | UKMCS: total | BF initiated | BF ≥ 8 weeks | BF at 6 months | EBF at 6 months |
|----------------------------------|--------------|--------------|--------------|----------------|-----------------|
|                                  | n            | Per cent     | n            | Per cent       | n              |
| Total                            | 17 521       | 100          | 11 774       | 67             | 7630           |
| Place of birth                   |              |              |              | 44             | 3768           |
| Home birth                       | 340 (2%)     |              | 280 (2.6%)   | 228 (3.6%)     | 159 (4.7%)     |
| Hospital birth                   | 17 181 (98%) |              | 11 494 (96%)| 7402 (97.4%)   | 3609 (96.2%)   |
| Maternal age                     |              |              |              | 44             | 22 (6.9%)      |
| <30                              | 9762 (56%)   |              | 5915 (50%)   | 3307 (47%)     | 1425 (38.7%)   |
| 30–35                            | 5042 (27%)   |              | 3733 (32%)   | 2684 (36%)     | 1387 (37.8%)   |
| >35                              | 2764 (16%)   |              | 2124 (18%)  | 1638 (22%)     | 956 (25.6%)    |
| Marital status                   |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| Single parent                    | 7121 (41%)   |              | 3904 (33%)  | 2185 (29%)     | 907 (24%)      |
| Parity                           |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| Multiparous                      | 8596 (49%)   |              | 5573 (47%)  | 3876 (51%)     | 2077 (76%)     |
| Primiparous                      | 8975 (51%)   |              | 6201 (53%)  | 3754 (49%)     | 1691 (24%)     |
| Maternal education               |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| NVQ 1–3                          | 9039 (52%)   |              | 5537 (47%)  | 3196 (42%)     | 1329 (35%)     |
| NVQ 4–5                          | 5093 (29%)   |              | 4408 (38%)  | 3377 (44%)     | 1904 (51%)     |
| Foreign Qual.                    | 542 (3%)     |              | 404 (3%)    | 299 (4%)       | 173 (5%)       |
| No Qual.                         | 2846 (17%)   |              | 1405 (12%)  | 743 (10%)      | 354 (9%)       |
| SES                              |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| Never worked                     | 2114 (12%)   |              | 1308 (11%)  | 817 (11%)      | 1904 (11%)     |
| Lower                            | 948 (5%)     |              | 587 (5%)    | 353 (5%)       | 127 (3%)       |
| Intermediate                     | 2929 (17%)   |              | 2064 (18%)  | 1299 (17%)     | 629 (17%)      |
| Routine                          | 6400 (36%)   |              | 3461 (29%)  | 1886 (25%)     | 815 (22%)      |
| Employer                         | 624 (4%)     |              | 482 (4%)    | 360 (5%)       | 193 (5%)       |
| Manag./Prof.                     | 4556 (26%)   |              | 3852 (33%)  | 2915 (38%)     | 1575 (42%)     |
| Ethnicity                        |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| White                            | 14 677 (84%) |              | 9317 (79%)  | 5884 (77%)     | 2838 (75%)     |
| Black                            | 644 (4%)     |              | 600 (5%)    | 482 (6%)       | 269 (7%)       |
| Asian‡                          | 1691 (9%)    |              | 1379 (12%)  | 894 (12%)      | 440 (12%)      |
| Other                            | 511 (3%)     |              | 457 (4%)    | 355 (5%)       | 213 (6%)       |
| Smoking status                   |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| Smoker                           | 5274 (30%)   |              | 2659 (23%)  | 1320 (17%)     | 454 (12%)      |
| Maternal alcohol consumption§    |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| Every day                        | 372 (2%)     |              | 293 (2%)    | 210 (3%)       | 112 (3%)       |
| 5–6×/week                       | 353 (2%)     |              | 304 (3%)    | 244 (3%)       | 124 (3%)       |
| <2×/week                         | 5597 (32%)   |              | 3910 (33%)  | 2690 (35%)     | 1345 (36%)     |
| ≤2×/month                        | 6945 (40%)   |              | 4290 (37%)  | 2575 (34%)     | 1140 (30%)     |
| Never                            | 4281 (24%)   |              | 2975 (25%)  | 1931 (25%)     | 1047 (28%)     |
| Maternal BMI                     |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| <18                              | 612 (3%)     |              | 386 (3%)    | 236 (3%)       | 125 (3%)       |
| 18–25                            | 8691 (50%)   |              | 5898 (50%)  | 4043 (53%)     | 2094 (56%)     |
| 25–30                            | 3920 (22%)   |              | 2625 (22%)  | 1645 (22%)     | 777 (21%)      |
| >30                              | 1982 (11%)   |              | 1316 (11%)  | 753 (10%)      | 355 (9%)       |
| Missing                          | 2316 (13%)   |              | 1549 (13%)  | 953 (12%)      | 417 (11%)      |
| Infant gender                    |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| Female                           | 8523 (49%)   |              | 5704 (48%)  | 3749 (49%)     | 1894 (50%)     |
| Gestational age (weeks)          |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| <37                              | 1055 (6%)    |              | 703 (6%)    | 395 (5%)       | 169 (5%)       |
| ≥37                              | 16 274 (94%) |              | 10 954 (94%)| 7158 (95%)     | 2859 (95%)     |
| Mode of delivery                 |              |              |              | 22 (6.9%)      | 22 (6.9%)      |
| SVD                              | 12 168 (69%) |              | 8044 (68%)  | 5311 (70%)     | 2663 (71%)     |
| Assisted                         | 1685 (10%)   |              | 1196 (10%)  | 751 (10%)      | 340 (9%)       |
| Caesarean                        | 3665 (21%)   |              | 2533 (22%)  | 1568 (20%)     | 765 (20%)      |

*The proportion of mothers (%) who had home birth and were still BF at the specified BF time point, of the total number of mothers who had home birth.
†The proportion of mothers (%) who had hospital birth and were still BF at the specified BF time point, of the total number of mothers who had hospital birth.
‡Indian, Bangladeshi or Pakistani nationality.
§Alcohol consumption: the reported figures are frequency of alcohol consumption (not units of alcohol consumption).
BF, breast feeding; BMI, body mass index (maternal, measured postdelivery, available for n=15 205, 87%); EBF, exclusive breast feeding; Manag., managerial; n, number of participants; Prof., professional; education level is classified according to National Vocation Qualification (NVQ) level, NVQ level 3 corresponds to a qualification of A-levels standard (school leaving examinations at 18 years of age) and level 4 is at certificate level, a qualification immediately above leaving-school level; SES: socioeconomic status: maternal employment is classified according to the National Statistics, Socio-Economic Classification,34 a five-part classification system; SVD, spontaneous vaginal delivery; UKMCS, UK Millennium Cohort Study; Qual., qualification.

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Table 3  The association between place of birth (home birth vs hospital birth) and breast feeding in GUI (n=10 604) and UKMCS (n=17 521) cohorts

| Breast feeding time point | Study population | Unadjusted analysis | Adjusted analysis |
|---------------------------|------------------|---------------------|------------------|
|                           |                  | OR  | 95% CI      | p Value         | OR  | 95% CI      | p Value         |
| Initiation                | GUI              | 2.23| 1.53 to 3.24 | <0.0001         | 1.9 | 1.19 to 3.02 | <0.0001         |
| Initiation                | UKMCS            | 2.31| 1.74 to 3.05 | <0.0001         | 2.49| 1.84 to 3.44 | 0.011           |
| 8 weeks                   | GUI              | 2.25| 1.61 to 3.13 | <0.0001         | 1.78| 1.18 to 2.69 | 0.0029          |
| 8 weeks                   | UKMCS            | 2.69| 2.14 to 3.38 | <0.0001         | 2.49| 1.92 to 3.26 | <0.0001         |
| 6 months                  | GUI              | 2.23| 1.61 to 3.09 | <0.0001         | 1.85| 1.23 to 2.77 | 0.0058          |
| 6 months                  | UKMCS            | 3.3 | 2.66 to 4.10 | <0.0001         | 2.9 | 2.25 to 3.73 | <0.0001         |
| 6 months: exclusive       | GUI              | 2.94| 2.01 to 4.31 | <0.0001         | 2.77| 1.78 to 4.33 | 0.0073          |
| 6 months: exclusive       | UKMCS            | 3.17| 1.79 to 5.60 | <0.0001         | 2.24| 1.14 to 4.03 | <0.0001         |

The ORs and corresponding 95% CIs are shown for any breast feeding at birth, 8 weeks and 6 months, and exclusive breast feeding for 6 months, according to place of birth (home vs hospital birth).

The strongest association in GUI is with exclusive breast feeding for 6 months, adjusted OR=2.77 (1.78 to 4.33), and in UKMCS it is with breast feeding for 6 months, 2.90 (2.25 to 3.73); the weakest association in GUI is with breast feeding for 8 weeks, 1.78 (1.18 to 2.69), and in UKMCS it is with breast feeding exclusively for 6 months, 2.24 (1.14 to 4.03).

Other covariates which were associated with breast feeding initiation and at all assessed time points included maternal factors: older maternal age and perception of low support (GUI); birth factors: later gestational age and heavier birth weight; and socioeconomic factors: higher education level, higher household income and later timing of return to work. Negatively associated covariates included maternal factors: Irish or British ethnicity, higher parity, smoking status: smoker, higher alcohol consumption and higher BMI; socioeconomic factors: long-term unemployment; birth characteristics: caesarean mode of delivery and infant characteristics: male infant.

BMI, body mass index; GUI, Growing Up in Ireland; UKMCS, UK Millennium Cohort Study.

psychosocial, lifestyle and obstetric factors, including education and gestational age; some of these covariates are likely to in part capture unmeasured confounders.

A retrospective cohort study (n=225) conducted in a small ethno-religious community in rural Canada, the Old Order Mennonites, also reported a significant association between home birth and breast feeding outcomes. The unique traditional lifestyle setting of the Mennonites, a homogeneous community which generally eschews the use of technological advances and modern conveniences, maintains an agricultural way of life and for whom community traditions are of great importance, presents a setting in which mothers may be of similar beliefs and disposition, including a tendency towards breast feeding over other ‘less natural’ means of infant nutrition. Despite this unique setting, home birth in this community continued to independently predict exclusive breast feeding for 6 months, OR=2.83 (1.14 to 7.06). This further suggests that the association observed may not be wholly due to pre-existing differences in world view in those mothers who choose home birth. Unfortunately, no information on treatment of high-risk births was given in the paper, so it cannot be excluded that the association is partially driven by higher risk deliveries taking place in a hospital.

A woman’s decision to give birth at home is often embedded in a refutation of a public narrative (the medical model of childbirth) and a challenge to obstetric models of care; hence, they implicitly challenge the reliance on technology and more medicalised approaches to childbirth. It could be suggested that this perspective on birth is more likely to lead women towards the adoption of natural methods of infant feeding and hence favour breast feeding. These mothers are more likely to reject the notion of breast feeding as a challenging skill, and anticipate a positive breast feeding experience. Midwives providing home birth services have also suggested that the sense of empowerment and satisfaction that many women express after a home birth forms the foundation of empowered parenting and successful breast feeding.

Finally, it has been shown that formula supplementation in the early postnatal period reduces the likelihood of subsequent exclusive breast feeding, and also reduces the overall duration of breast feeding. All 19 maternity units in Ireland participate in the Baby Friendly Health Initiative, step 6 of which states that newborn infants should receive no food or drink other than breast milk, unless medically indicated. However, hospital births have been associated with formula supplementation which may be based on clinical findings, or may be encouraged due to the busy clinical routine or inadequate staffing, where formula feeding is a more convenient solution to feeding problems than diagnosis and treatment of breast feeding issues. A further barrier to supporting breast feeding may be the lack of a lactation consultant and/or staff training in breast feeding needs. Economically, both breast feeding and the ability to give birth at home have a potential to significantly lower the cost of care.

Strengths and limitations
Research question was addressed in two very large cohort studies that together comprised 28 125 mother–infant pairs. Detailed information was collected in both cohorts, and enabled us to adjust the analysis for a range of factors. One limitation of the study is the inconsistent response option with respect to place of birth in study.
questionnaires: GUI focused on planned home birth (unplanned home births were coded as ‘other’ and excluded from the analysis) and UKMC on any home birth (both planned and unplanned home births). However, the consistency of results in the two cohorts and with previously published findings suggests that the difference in measurement (home birth vs planned home birth) may not be all that important or that misclassification is low, maybe because most home births are planned in the developed world. Together, this supports the association between home birth and breast feeding outcomes. Limitations also include maternal reporting of the information and consequential risk of recall bias as a longer breast feeding duration may have been reported due to social desirability; however, there is no reason to expect differential reporting according to place of birth. Similarly, participants could self-select through opting out from the study, and therefore under-representation of lower socioeconomic groups may have occurred. Questionnaires had limited ability to capture support for the mother; we used the presence of a live-in partner in the analysis, which does not necessarily correspond to getting support. Only a small proportion of home births occurred in our study cohorts, and we did not have information on breast feeding intent or previous success. Apart from increased risk of complications, some other factors may have necessitated opting for hospital birth (such as having inadequate facilities at home, or the home being too far from the midwife or maternity hospital), but these were not assessed in GUI and UKMCs, as these were population-based studies. The findings should be interpreted with caution in regions with a substantially different provision of maternity health service.

Policy changes to increase breast feeding could include altering current models of perinatal care for mothers, and addressing a possible diminished sense of self-reliance in mothers who choose hospital birth, relative to those who undergo home birth. Standards of perinatal care may be altered by increasing the availability and accessibility of home birth for low-risk mothers, and midwife-led care could also be increased as it is economical in low-risk mothers, but underused in Ireland, compared with other countries, for example, the Netherlands where midwife-led care is the default model for low-risk women. Upscaling midwifery services has been predicted to reduce maternal and infant mortality, and the need for such upscaling has been highlighted recently in Ireland. The question of differential maternal confidence in breast feeding ability between home and hospital birth mothers requires further investigation, as this may also be a target for improvement. The association of improved breast feeding and home birth is most likely due to a range of factors, but aspects of home versus hospital birth care, including maternal autonomy, and the environment of the birth place, and midwife delivered perinatal care, could inform further efforts to improve breast feeding rates.

CONCLUSIONS

Currently breast feeding rates fall short of the WHO recommendations in Ireland and the UK. This is particularly true for the rate of breast feeding exclusively for 6 months, which occurred in <10% of infants in this study. Results presented in this study showed that improved breast feeding is twice as likely in home versus hospital birth. Further studies are needed to determine which elements of perinatal care could be altered to improve breast feeding outcomes.

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