

# Explaining the increase in breastfeeding at hospital discharge in Ireland, 2004–2010

A. Brick · A. Nolan

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## Abstract

**Background** Despite a steady increase in the rate of breastfeeding in Ireland over the period 2004–2010 (from 46.8 % in 2004 to 55.7 % in 2010), Irish rates of breastfeeding are still low by international standards. Over this period, the characteristics of mothers and babies changed, with mothers increasingly older, having fewer children and increasingly born outside the Republic of Ireland.

**Aims** The purpose of this paper is to understand the extent to which changing maternal and birth characteristics explained the increase in the breastfeeding rate in Ireland over the period 2004–2010.

**Methods** We apply non-linear decomposition techniques to micro-data from the 2004–2010 Irish National Perinatal Reporting System to examine this issue. The technique allows us to quantify the extent to which the increase in the breastfeeding rate over the period 2004–2010 is due to changing maternal and birth characteristics.

**Results** We find that between 55 and 74 % of the increase over the period can be explained by changing characteristics, with the increasing share of mothers from Eastern Europe, and increasing maternal age the most important contributors.

**Conclusions** These findings suggest that the existing policy initiatives have been relatively ineffective in increasing breastfeeding rates in Ireland, i.e. most of the observed increase occurred simply because the characteristics of mothers were changing in ways that made them increasingly likely to breastfeed.

**Keywords** Breastfeeding · Ireland · Decomposition · Culture · Attitudes

## Introduction

The benefits of breastfeeding for babies, mothers and society have been demonstrated in a large scientific literature [1]. Reflecting the proven benefits, the WHO recommends that babies should be exclusively breastfed for the first 6 months and that some breastfeeding should continue up to 2 years old and beyond [2]. Despite this recommendation, breastfeeding initiation and duration rates remain varied across developed countries.

Cross-country comparisons of breastfeeding rates are complicated by a lack of comparable data. Despite the variety of definitions, data sources and collection methods employed, the available data show rates of breastfeeding in Ireland that are considerably lower than other in other European countries. In 2010, Ireland had the lowest ‘any’ breastfeeding rate of 14 European countries, measured both at birth and 48 h postpartum (‘any’ breastfeeding refers to both exclusive breastfeeding and breastfeeding combined with artificial feeding methods) [3]. While the rate in Ireland has been increasing, it remains below national targets [4, 5].

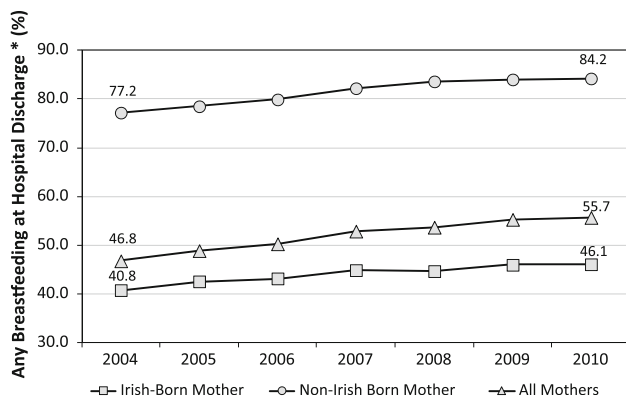
As well as the breastfeeding rate being much lower in Ireland than in other countries there are distinct patterns

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A. Brick  
Health Research and Information Division, Economic and Social  
Research Institute, Whitaker Square, Dublin 2, Ireland

A. Brick · A. Nolan  
Department of Economics, Trinity College, Dublin, Ireland

A. Nolan (✉)  
Social Research Division, Economic and Social Research  
Institute, Whitaker Square, Dublin 2, Ireland  
e-mail: anne.nolan@esri.ie



**Fig. 1** Percentage of mothers breastfeeding at discharge from Hospital by Maternal Country of Birth, 2004–2010. \*Any breastfeeding includes exclusive breastfeeding and breastfeeding combined with artificial feeding. Sample derived from the National Perinatal Reporting System—see “Methods” for description

within Ireland by maternal country of birth. As illustrated in Fig. 1, 46.1 % of Irish-born mothers were breastfeeding at hospital discharge in 2010, in contrast to 84.2 % of non-Irish-born mothers. In addition, the overall breastfeeding at hospital discharge rate was increasing over the period 2004–2010. However, the share of non-Irish-born mothers also increased considerably (from 16.4 % in 2004 to 25.1 % in 2010), and given the much higher rates of breastfeeding among non-Irish-born mothers, it is important to understand the extent to which this compositional change contributed to the overall increase over the period.

Differences in breastfeeding rates by maternal country of birth/race/ethnicity are not unique to Ireland, although the scale of the differential between Irish-born and non-Irish-born mothers is particularly distinctive [6, 7]. The existence of racial/ethnic differences in breastfeeding rates is highlighted by a large body of literature from the US and the UK [8–13]. Much of the previous research in Ireland has focussed on the determinants of breastfeeding initiation and duration, using information collected from small samples [7, 14, 15]. With the exception of the few studies that have noted the discrepancy in breastfeeding behaviour between Irish- and non-Irish-born/nationals/ethnic groups [6, 7, 16], more detailed analysis of the differences, and the change in breastfeeding behaviour over time, is absent. This is partly due to a lack of data [the National Perinatal Reporting System (NPRS), the only source of micro-data on all births in Ireland, first collected information on maternal country of birth in 2004]. Using data from the NPRS, the purpose of this paper is to examine the extent to which the increase in the breastfeeding at hospital discharge rate between 2004 and 2010 is due to changes in maternal characteristics over the period.

## Methods

### Data source

In this paper, we use the NPRS which reports data on all births over 500 g in the Republic of Ireland (ROI). Over the period 2004–2010, 489,170 live and stillborn births were recorded. Non-hospital births (2,967), births in private hospitals (15,171), and births from one hospital where breastfeeding was underreported (34,905) are excluded. In common with other studies, stillbirths and early neonatal deaths (3,481) and multiple births (15,674) are excluded. In the absence of detailed clinical data we include only healthy babies by excluding babies of <37 weeks gestation (29,258), <2.5 kg (26,433) and where the discharge date of mother and baby are different (21,381). After excluding a further 4,164 observations with missing values on key variables, the final data-set contains 385,549 births, which represents 78.8 % of all births in the ROI between 1 January 2004 and 31 December 2010.

The dependent variable indicates whether the mother was engaged in ‘any’ breastfeeding upon hospital discharge. No data are available on breastfeeding duration. The main independent variable of interest is maternal country of birth, disaggregated into seven mutually exclusive categories: ROI, UK, EU-15 (excluding ROI and UK), EU-27 Accession States (excluding ROI, UK, and EU-15—referred to as EU-27 for the remainder of the paper), Africa, Asia, and other. Information on race/ethnicity or length of time since migration is not available. The data reveal a steady decrease in the proportion of births in this sample to Irish-born mothers, from 83.6 % in 2004 to 74.9 % in 2010.

Other independent variables include those familiar from previous research on breastfeeding determinants [17], such as maternal age, marital status, social class and parity. Variables describing the child’s sex, birthweight, gestation length, type of delivery, postpartum length of stay (LOS) and hospital designation as ‘baby friendly’ under the WHO/UNICEF Baby Friendly Hospital Initiative (BFHI) are also included.

### Summary statistics

Table 1 presents the proportion of mothers in the sample who were engaged in ‘any’ breastfeeding at hospital discharge in 2010 by various characteristics (data for 2004–2009 are available from the authors). Mothers that were non-Irish-born, older, married, in higher social classes, with fewer previous children and with a longer postpartum LOS had higher rates of breastfeeding. Mothers of low birthweight babies, those of shorter gestational age and those born via Caesarean section had lower rates. In a

**Table 1** Any breastfeeding at hospital discharge by maternal and birth characteristics, 2010 (%)

Total	55.7
Maternal age at delivery (years)	
<20	24.5
20–29	51.2
30–34	59.5
35+	59.5
Maternal marital status	
Married	61.6
Not married <sup>a</sup>	44.4
Maternal social class	
Professional/managerial	69.4
Clerical	49.6
Skilled/semi-skilled	63.5
Unskilled	51.8
Unemployed	40.1
Home duties	47.1
Other <sup>b</sup>	53.3
Maternal country of birth	
ROI	46.1
UK	62.3
EU-15 (excl ROI and UK)	87.3
EU-27 (excl ROI, UK and EU-15) <sup>c</sup>	88.3
Africa	85.6
Asia	83.6
Other <sup>d</sup>	87.9
Parity	
Primiparous	61.6
Multiparous	51.5
Gestational age at delivery (weeks)	
37–38	53.6
39–41	55.8
42+	60.7
Method of delivery	
Spontaneous	55.7
Caesarean	53.2
Other	59.1
Birthweight (g)	
2,500–2,999	50.9
3,000–3,499	55.1
3,500–3,999	56.9
4,000+	56.7
Sex of baby	
Male	55.6
Female	55.7
Maternal postpartum LOS (days)	
0–1	50.6
2	55.1
3–5	58.5

**Table 1** continued

Total	55.7
6+	62.4
BFHI designation	
Yes	56.9
No	55.1

Source: Sample derived from the National Perinatal Reporting System—see “Methods” for description

- <sup>a</sup> Includes divorced, separated, and widowed
- <sup>b</sup> Includes farmers and farm managers, other agricultural occupations and fisheries workers, and not classifiable
- <sup>c</sup> Accession State—Bulgaria and Romania are included from 2004
- <sup>d</sup> Includes the Rest of Europe, the Americas, Australia, New Zealand (inc. Oceania), multi-nationality, non-Irish, and no nationality

multivariate analysis (results of which are available on request from the authors), all of these factors were statistically significant, with the effects for maternal country of birth particularly large and significant.

The main objective of this research is to examine the extent to which the increase in the breastfeeding at hospital discharge rate between 2004 and 2010 can be explained by changing maternal characteristics over the period. In general, over the period, the change in characteristics of mothers is predictive of higher breastfeeding rates over time (e.g. increasing age, social class, non-Irish, falling parity), although there are some exceptions (e.g. declining postpartum LOS, increasing rate of Caesarean section) (Table 2).

#### Decomposition of the Increase in breastfeeding at hospital discharge rate 2004–2010

To determine the extent to which the increase in the breastfeeding at hospital discharge rate between 2004 and 2010 can be explained by changing maternal characteristics, we use a non-linear decomposition technique [18]. The average difference in the breastfeeding at hospital discharge rate between 2004 and 2010 may be expressed as:

$$\bar{Y}^A - \bar{Y}^B = \left[ \sum_{i=1}^{N^A} \frac{F(X_i^A \hat{\beta}^A)}{N^A} - \sum_{i=1}^{N^B} \frac{F(X_i^B \hat{\beta}^A)}{N^B} \right] + \left[ \sum_{i=1}^{N^B} \frac{F(X_i^B \hat{\beta}^A)}{N^B} - \sum_{i=1}^{N^B} \frac{F(X_i^B \hat{\beta}^B)}{N^B} \right] \quad (1)$$

where  $\bar{Y}^J$  is the average probability of breastfeeding at hospital discharge for group J (J = A, B),  $X_i^J$  is the vector of independent variables of observation  $i$  in group J,  $\hat{\beta}^J$  is the vector of coefficients. In this case, group A is the

**Table 2** Maternal and birth characteristics, 2004–2010 (% of sample)

	2004	2005	2006	2007	2008	2009	2010
<b>Maternal country of birth</b>							
Ireland	83.6	82.6	80.6	78.5	76.9	75.6	74.9
UK	3.3	3.6	3.6	3.1	2.8	2.7	2.8
EU-15 (excl IRE and UK)	1.1	1.3	1.4	1.3	1.4	1.5	1.5
EU-27 (excl IRE, UK and EU-15) <sup>a</sup>	1.7	2.8	5.0	7.5	9.5	10.6	11.7
Africa	5.7	4.6	4.1	3.6	3.4	3.4	3.0
Asia	2.7	3.0	3.2	3.8	3.8	4.1	3.9
Other <sup>b</sup>	1.8	2.1	2.2	2.1	2.1	2.0	2.1
<b>Maternal age at delivery (years)</b>							
<20	4.1	4.0	3.6	3.5	3.1	3.0	2.7
20–29	38.1	36.3	37.2	36.8	36.9	36.6	35.1
30–34	34.4	35.1	33.9	34.2	34.0	33.8	35.0
35+	23.4	24.6	25.3	25.4	25.9	26.6	27.2
<b>Maternal marital status</b>							
Married	66.9	66.8	65.8	66.1	65.9	65.9	65.6
Not married <sup>c</sup>	33.1	33.2	34.2	33.9	34.1	34.1	34.4
<b>Maternal social class</b>							
Professional/managerial	23.8	24.4	25.8	27.0	28.1	28.6	29.2
Clerical	25.4	24.7	24.7	24.6	24.7	24.1	23.2
Skilled/semi-skilled	5.2	5.2	5.4	5.3	5.2	5.2	5.0
Unskilled	11.1	12.9	12.3	12.8	13.0	13.6	13.4
Unemployed	3.8	3.9	3.8	2.9	2.7	2.6	3.9
Home duties	26.4	24.9	23.5	23.5	22.2	21.8	20.8
Other <sup>d</sup>	4.4	4.1	4.5	4.0	4.1	4.1	4.5
<b>Parity</b>							
Primiparous	39.7	40.1	40.9	41.6	41.8	41.7	41.3
Multiparous	60.3	59.9	59.1	58.4	58.2	58.3	58.7
<b>Gestational age at delivery (weeks)</b>							
37–38	14.9	14.3	14.3	14.6	15.1	15.2	15.3
39–41	79.5	80.5	81.1	81.2	80.5	80.7	81.0
42+	5.6	5.1	4.5	4.1	4.4	4.1	3.8
<b>Method of delivery</b>							
Spontaneous	62.0	62.0	61.8	59.7	58.8	58.1	58.3
Caesarean	22.0	22.4	22.0	23.3	23.9	24.4	24.5
Other	15.9	15.6	16.2	17.0	17.3	17.5	17.2
<b>Birthweight (g)</b>							
2,500–2,999	10.2	10.4	10.0	9.9	10.0	10.1	10.0
3,000–3,499	33.9	33.9	34.1	34.7	34.1	34.4	34.3
3,500–3,999	37.1	37.2	37.6	37.3	37.8	37.6	37.5
4,000+	18.7	18.4	18.3	18.1	18.1	17.9	18.1
<b>Sex of baby</b>							
Male	51.5	51.2	51.3	51.2	51.4	51.2	50.9
Female	48.5	48.8	48.7	48.8	48.6	48.8	49.1
<b>Maternal postpartum LOS</b>							
0–1	14.8	16.1	17.4	19.4	21.4	22.7	25.1
2	29.4	29.7	30.2	31.3	31.6	32.3	32.3
3–5	41.1	40.4	40.2	39.0	38.2	37.8	36.5
6+	14.7	13.9	12.3	10.2	8.8	7.2	6.2

**Table 2** continued

	2004	2005	2006	2007	2008	2009	2010
BFHI designation							
Yes	8.2	8.5	28.6	31.6	34.5	30.0	29.7
No	91.8	91.5	71.4	68.4	65.5	70.0	70.3

Source: Sample derived from the National Perinatal Reporting System—see “Methods” for description

Percentages columns subject to rounding

<sup>a</sup> Accession State—Bulgaria and Romania are included from 2004

<sup>b</sup> Includes the Rest of Europe, the Americas, Australia, New Zealand (inc. Oceania), multi-nationality, non-Irish, and no nationality

<sup>c</sup> Includes divorced, separated, and widowed

<sup>d</sup> Includes farmers and farm managers, other agricultural occupations and fisheries workers, and not classifiable

sample of 2010 mothers, group B is the sample of 2004 mothers, and the reference group is group A. We also undertake the decomposition using the estimated group B and pooled coefficients as the reference, to provide a range of estimates [19]. We use the ‘Fairlie’ decomposition command in STATA 12.1 [20].

The first term on the right hand side of Eq. (1) measures the amount of the breastfeeding gap that is due to differences in the characteristics of the two groups. The second term captures the degree to which mothers giving birth in the 2 years, but with similar observable characteristics, breastfeed at different rates. The first part may be further decomposed into the relative contributions of each of the independent variables (e.g. we can quantify the extent to which the breastfeeding differential between 2004 and 2010 is due to differences in maternal age, social class, country of birth, etc.).

### Robustness checks

A unique health identifier is not available in NPRS; while it is unlikely that the same woman could give birth twice in one year, it is possible that the same woman could give birth more than once over the period 2004–2010. To test whether our results are dependent on this assumption, we also estimate the models on the sample of primiparous women. There is a larger, albeit still small (3.2 %), proportion of missing observations on maternal country of birth for 2004. We also run the model using 2005 as the start year (results from all robustness checks are available from the authors).

### Results

Table 3 presents the results of the decomposition of the change in the breastfeeding at hospital discharge rate between 2004 and 2010, using the 2010 coefficients as the reference. The raw difference in breastfeeding between

2004 and 2010 was 8.8 percentage points. Of that, 4.9 percentage points (or 55.5 %) may be explained by changing maternal characteristics over the period, i.e. on average, characteristics in 2010 were predictive of higher breastfeeding rates. Using the 2004 and pooled coefficients as the reference results in explained components of 61.4 and 73.8 %, respectively.

Decomposing the contributions of each of the independent variables in Table 3 reveals that increasing maternal age explains 13.5 % of the increase in the rate between 2004 and 2010, while the increasing share of EU-27 mothers explains 36.8 %. Other variables make much smaller contributions, although it is important to note that the breastfeeding at hospital discharge rate would have actually *fallen* between 2004 and 2010 if mothers in 2004 had the same postpartum LOS as mothers in 2010, holding all else constant.

### Discussion

The benefits of breastfeeding for mothers, babies and society have been demonstrated in a large scientific literature. Irish rates of breastfeeding are very low by international standards, despite a steadily increasing rate in recent years. There has been no attempt to analyse the reasons for the recent increase in the breastfeeding rate in Ireland, and in particular, to examine the possibility that an increasing proportion of non-Irish-born mothers may have driven much of the observed increase. The availability of detailed micro-data on the full census of births over the period 2004–2010 allowed us to examine this issue in greater detail than before.

Despite the size of the data-set, there are inevitably some limitations. First, our indicator of breastfeeding refers to ‘any’ breastfeeding at hospital discharge. Information on breastfeeding initiation at birth or on the duration of breastfeeding is not available. Second, detailed clinical information is not available, although we have attempted to

**Table 3** Decomposition of the differential in breastfeeding rates between 2004 and 2010

	% point difference	% of $\bar{Y}^A - \bar{Y}^B$	z-statistic
$\bar{Y}^A - \bar{Y}^B$	0.088		
Explained <sup>a</sup>	0.049	55.5	
Unexplained <sup>b</sup>	0.039	44.5	
<i>Detailed contributions</i>			
Maternal age at delivery			
Age (years)	0.012	13.5	31.0
Maternal marital status			
Married	0.000	-0.5	-6.0
Not married <sup>c</sup>	Ref	Ref	Ref
Maternal social class			
Professional/managerial	Ref	Ref	Ref
Clerical	0.006	7.4	25.4
Skilled/semi-skilled	0.001	1.2	13.6
Unskilled	-0.002	-2.7	-17.2
Unemployed	0.000	-0.3	-3.7
Home duties	0.009	10.1	26.5
Other <sup>d</sup>	0.000	-0.2	-3.3
Maternal country of birth			
ROI	Ref	Ref	Ref
UK	0.000	-0.2	-3.4
EU-15 (excl ROI and UK)	0.001	1.7	17.1
EU-27 (excl ROI, UK and EU-15) <sup>e</sup>	0.032	36.8	82.5
Africa	-0.005	-5.2	-18.5
Asia	0.004	5.1	26.9
Other <sup>f</sup>	0.002	1.8	14.2
Parity			
Parity	0.003	2.9	15.2
Gestational age at delivery			
Gestational age (weeks)	0.000	-0.6	-5.3
Method of delivery			
Spontaneous	Ref	Ref	Ref
Caesarean	-0.003	-3.1	-18.5
Other	0.000	-0.4	-5.6
Birthweight			
Birthweight (kg)	0.000	-0.1	-3.8
Sex of baby			
Male	0.000	0.0	0.7
Female	Ref	Ref	Ref
Maternal postpartum LOS			
Length of stay (days)	-0.011	-12.9	-14.1
BFHI designation			
Yes	0.001	1.3	1.4
No	Ref	Ref	Ref

Source: Sample derived from the National Perinatal Reporting System—see “Methods” for description

Using the group A (i.e. 2010) coefficients as the reference. Using the 2004 coefficients as the reference, the explained component is 61.4 %, while using the pooled coefficients results in an explained component of 73.8 % (full results available on request from the authors)

<sup>a</sup> The differential that is estimated based on differences in observed characteristics (i.e. the first term in Eq. 1)

<sup>b</sup> The differential that is estimated based on differences in group-specific attitudes, cultural norms, or other omitted variables (i.e. the second term in Eq. 1)

<sup>c</sup> Includes never married, divorced, separated, and widowed

<sup>d</sup> Includes farmers and farm managers, other agricultural occupations and fisheries workers, and not classifiable

<sup>e</sup> Accession States—Bulgaria and Romania are included from 2004

<sup>f</sup> Includes the rest of Europe, the Americas, Australia, New Zealand (inc. Oceania), multi-nationality, non-Irish, and no nationality

control for this by excluding low birthweight babies, those born early, and those where the discharge data of mother and baby are different. Third, information on race/ethnicity and/or 'length of time since migration' is not available. Finally, there are a number of potentially important variables for which information is not available from NPRS (e.g. smoking status, antenatal intention to breastfeed, etc.).

The results show that between 55 and 74 % of the increase in the breastfeeding rate over the period 2004–2010 was due to changing maternal characteristics. Further decomposition confirms that the majority of the increase over the period is accounted for by the increasing share of EU-27 mothers, and by increasing maternal age. This suggests that existing policy initiatives have been relatively ineffective in increasing breastfeeding rates in Ireland. Much of the increase in the breastfeeding rate in Ireland occurred simply because, over the period 2004–2010, the characteristics of mothers were changing in ways that made them increasingly likely to breastfeed.

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**Conflict of interest** None.

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