

Indices of Multiple Deprivation predict breastfeeding duration in England and Wales

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Background: To investigate the association between breastfeeding duration and socio-economic status as measured by the English and Welsh Indices of Multiple Deprivation (IMD). **Methods:** Total 216 multiparous women whose youngest or only child was between 6 and 24 months completed a retrospective questionnaire study of infant feeding between birth and 26 weeks. Measurements included breastfeeding history; socio-economic demography and IMD. **Results:** Breastfeeding duration was associated with levels of multiple deprivation in both English and Welsh samples. Deprivation level and breastfeeding duration were associated with traditional indicators of socio-economic status. When considered in combination with other socio-economic indicators of breastfeeding duration, the deprivation level remained a strong predictor of breastfeeding duration over and above other socio-economic measures. **Conclusions:** Deprivation, as assessed by the IMD is predictive of breastfeeding duration. Postcode and thus deprivation level can be used as a non-intrusive way to identify women most at risk of low breastfeeding rates. Service provision can be targeted directly at women in areas recognized as being high in deprivation.

Keywords: breast-feeding, breast-feeding duration, formula-feeding, Index of Multiple Deprivation, socio-economic status.

Introduction

Breastfeeding has numerous health benefits for both mother and child. Breastfed infants have lower rates of gastrointestinal and respiratory disorders,¹ eczema,² obesity,³ otitis media⁴ and allergies,⁵ whilst women who have breast-fed have a reduced risk of reproductive cancers⁶ and osteoporosis.⁷ The World Health Organisation recommends that infants are breastfed exclusively for the first 6 months of life with continued breastfeeding up to the second year and beyond.⁸ In the UK, however, only 76% of mothers initiate breastfeeding at birth and by 6 months only 22% of mothers are giving any breast milk at all.⁹

Breastfeeding rates are not equal across socio-economic groups. Breastfeeding initiation and duration increase with maternal age, years in education, income and decrease with maternal smoking, body mass index and urban dwelling. Breastfeeding is also associated with employment and occupation. Both maternal and paternal employments in professional or skilled occupations are associated with increased breastfeeding duration, as is increased maternity leave. Home ownership, marriage or partnership is also linked to increased breastfeeding rates.^{10–21}

The majority of studies investigating the link between breastfeeding and socio-economic status focus on a number of single, direct indicators as predictors of breastfeeding duration. Recent research however has considered alternative approaches to measuring socio-economic status. Council tax band as an indicator of socio-economic status has shown an association with breastfeeding duration, with duration increasing as band rises.²² Further research in Scotland has produced collective measures of deprivation, which consider the impact of several socio-economic factors in combination upon breastfeeding rates. Lower breastfeeding rates have been associated with higher overall deprivation levels as measured

by the Scottish Index of Multiple Deprivation (IMD).²³ The Indices of Deprivation are a UK Government tool designed to identify the most disadvantaged areas in the UK. Deprivation and Poverty, although often used interchangeably are separate concepts. Whilst poverty is a lack of money and material goods, deprivation is a wider phenomenon and encompasses a lack of 'household, environmental, educational, working and social conditions, activities and facilities which are customary'.²⁴ The Indices of Deprivation aim to identify areas characterized as deprived on multiple levels relative to other areas. They combine specific forms of deprivation that individually impact on an individual's lifestyle (such as income, education, health, housing, services and environment) to form an overall measure. In the UK, Wales, England, Scotland and Northern Ireland have each produced their own IMD which although measuring similar domains are not directly comparable.^{25–28}

Here we investigate the association between breastfeeding duration and deprivation in both English and Welsh samples, using the English and Welsh IMDs.

Methods

Approval for this study was granted by the Swansea University Department of Psychology Research Ethics Committee. Two hundred and sixteen mothers with at least one child between 6 and 24 months of age (mean age 12.69 months) completed the questionnaire. For 72% of the mothers, this was their first child. Multiparous mothers were asked to complete the questionnaire in relation to their youngest child. Mean age of the infant at the time of the questionnaire did not differ significantly between primiparous and multiparous mothers (12.62 and 13.05 months, respectively). There was no significant difference in deprivation level between primiparous and multiparous mothers. Mean age of the respondents was 28.16 (SD 6.07) and mean number of years in education 13.50 (SD 2.81). Participants were recruited from day care centres, postnatal groups, Mother and baby groups and Community Centre's in Swansea and the surrounding area and online parenting forums based in the UK. The day care centres and groups came from various locations with varying degrees of social deprivation. No significant difference was seen in mean

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Table 1 Sample distribution by demographic factors for English and Welsh participants

	<i>N</i>	Mean deprivation score	% Aged ≤24 years	% Left school ≤16 years	% Below mean UK household income	% Professional and managerial (maternal)	% Professional and managerial (paternal)	% Married	% Home owner
English	142	22.25	34.5	36.5	48.2	25.4	35.3	60.8	55.4
Welsh	74	22.42	28.4	42.2	53.6	32.9	41.7	63.4	61.7

age, years in education or breastfeeding duration between mothers who participated online or through the different groups.

Participants provided demographic information; age at childbirth, years in education, maternal and paternal occupation, household income, home ownership and marital status (table 1). Occupations were coded according to the National Statistics Socio-Economic Classification self-coded method (NS-SEC).²⁹ Occupations were ranked in order of professional or skilled status from professional (ranked one) to unskilled (ranked six). Home post code was provided to determine IMD. Participants provided details retrospectively about breastfeeding duration.

Indices of deprivation

The English and Welsh IMDs are based on geographical location categorized by Super Output Areas (SOAs). These are based on aggregates of census output areas each having roughly the same population (~1500). Each consists of three levels decreasing in size (upper, middle and lower layers). The smallest area (the lower layer) is used to categorize an areas deprivation level. Post code is used to identify SOA. Each larger region has SOAs that vary in terms of deprivation. In England there are 32 482 lower layer SOA's and in Wales 1896. SOAs are ranked in order of deprivation with the most deprived ranking at 1.^{25,26}

Separate IMDs exist for Wales and England. The latest Indices of Deprivation for England were produced in 2007.²⁷ They are based on seven domains: Income deprivation, Employment deprivation, Health deprivation and disability, Education, skills and training deprivation, Barriers to housing and services, Living environment deprivation and Crime. Each domain is calculated by considering a number of different indicators which measure key features of that domain. Usually there are between two and six indicators for each domain. For example in relation to the domain of 'barriers to housing and services' four indicators were considered; distance to GP premises, distance to supermarket or convenience store, distance to a primary school and distance to a post office.

As the scoring system is different for each domain, the scores were then converted to *z*-scores and the domain-scores then combined to give a score out of 100 (one is equal to least deprived). Each domain is weighted differently to reflect the greater impact certain domains have upon deprivation level, e.g. income and employment are weighted more highly. The scores, although indicative of increasing deprivation level are not uniformly distributed. Approximately 10% of SOAs are scored between 50 and 100 and indicate the most deprived areas.²⁶

The Welsh IMDs were revised in 2008.²⁶ They consist of seven domains: income, employment, health, education, housing, access to services and environment. Each SOA is scored on each individual domain. They are computed through a similar process as described above for the English Index.^{25,26}

Although the methodology used to produce the indices is broadly similar, subtle differences do occur making it

inadvisable to compare them on anything other than a hypothetical level. For example the two indices measure similar concepts, but in different combinations or forms. The English scale, e.g. considers 'barriers to housing and services' whereas the Welsh scale considers housing as a stand alone measure, identifying access to services alongside environmental concerns. Furthermore, minor differences occur in the weighting given to each domain for the two Indices. For example, the English Index assigns income a weighting of 22.5, whereas the Welsh Index employs a weighting of 25. Moreover, the two countries use different numbers of indicators to compute each domain. Finally, the two indices were not constructed during the same time periods. This has a particular impact if considering concepts such as income or employment which are susceptible to economic climate. In summary, although the indices measure very similar concepts due to their computation they cannot be treated as one index.^{25,26} Welsh and English participants were therefore treated as two separate groups. This however served as a measure of reliability in relating IMDs to breastfeeding duration.

Measuring IMD

To measure IMD, participants provided their home postcode. From this SOA was traced using the GiGateway postcode search facility³⁰ and then entered into the English or Welsh Indices of Deprivation database to assign deprivation level.^{31,32} One hundred and forty-two participants lived in England and 74 participants in Wales. Indices of deprivation ranged from 1.68 to 69.23 (mean 22.45, SD 15.40) in the English sample and from 2.50 to 88.60 for the Welsh sample (mean 22.42, SD 16.54). A total of 9.5% of the Welsh and 8.5% of the English samples lived in the most deprived 10% of the areas of the respective countries (deprivation level between 50 and 100).

Infant feeding method

Participants provided information stating whether they initiated breast-feeding at birth and if applicable duration of breastfeeding, which was measured in weeks. Participants who breastfed for a very short period of time often recalled breastfeeding duration in days rather than weeks. For consistency, this was treated as a fraction of a week e.g. 3 days = 0.4. Due to the retrospective nature of report, it is possible memory error could have occurred in recalling breastfeeding duration. However no significant association was found between age of infant at time of survey and reported duration of breastfeeding.

Data analysis

The data analysis was carried out using SPSS v13, SPSS UK Ltd. English and Welsh data was treated separately due to the non-comparable nature of the deprivation scales. Correlations were performed between established indicators of socio-economic status (e.g. age, education) and the English and Welsh Indices of Deprivation. Breastfeeding duration was also correlated with these measures. Finally, a stepwise

Table 2 Association between English and Welsh IMDs and other measures of socio-economic status

	Age	Education	Marital status	Home ownership	Maternal SES	Paternal SES	Income
EIMD	-0.357*	-0.162*	0.206*	-0.179*	0.181*	0.201*	-0.285**
WIMD	-0.127*	-0.215**	0.143*	-0.429*	0.402**	0.543**	-0.445**

* $P < 0.05$; ** $P < 0.01$ **Table 3** Association between breastfeeding duration in weeks (formula feeding = 0) and socio-economic indicators for English and Welsh Samples

	N	Age	Education	Marital status	Home ownership	Maternal SES	Paternal SES	Income	Deprivation score
English	142	0.350**	0.477**	0.352**	0.309**	-0.45**	-0.39**	0.46**	-0.44**
Welsh	74	0.221**	0.224**	0.261**	0.315**	-0.263**	-0.302**	0.436**	-0.43**

* $P < 0.05$; ** $P < 0.01$

multivariate linear regression analysis was performed to identify socio-economic factors independently predictive of breastfeeding duration.

Results

IMD and socio-economic indicators

No significant difference was seen in deprivation levels for primiparous and multiparous mothers. They were therefore treated as one cohort. Deprivation scores were associated with other single measures of socio-economic status. Both the English and Welsh deprivation indices were significantly inversely associated with age, years in education and income. Mothers, who were older, had more years in education and a greater household income lived in areas of lower deprivation. Positive significant associations with deprivation level were found for both samples for both maternal and paternal SES. Those who worked in routine and unskilled occupations were more likely to live in areas of higher deprivation. Mothers, who owned their own home and were married, lived in areas of significantly lower deprivation (table 2).

Breastfeeding duration

Of the 216 women who completed the questionnaire, 17.6% chose to formula-feed from birth. One hundred and seventy eight women initiated breast-feeding, of whom 30.9% discontinued within 1 week post-partum and a further 31.5% discontinued by 6 weeks post-partum. Fifty nine (27.3%) women continued breast-feeding until at least 26 weeks. A total of 84.5% of the English sample and 78.4% of the Welsh sample initiated breastfeeding at birth. No significant difference was found between the Welsh and English samples for initiation or duration of breastfeeding.

Duration of breastfeeding and socio-economic factors

Breastfeeding duration was examined in relation to established single indicators of socio-economic status separately for both the Welsh and English sample. In both samples, breastfeeding duration in weeks (formula feeding = 0) was inversely associated with measures of low socio-economic status (table 3). Mothers who breastfed for an increased duration were significantly more likely to be older, have more years in education and to have a greater income. Mothers who were married, owned their own home, and were themselves and their partner employed in managerial or professional occupations breastfed for a significantly longer duration (all

Table 4 Socio-economic predictors of breastfeeding duration: the unstandardized and standardized regression coefficients for the variables included in the model

Subgroup	Variable	B	SE B	β
English	Education	21.09	6.04	0.28
	IMD	-1.33	0.39	-0.26
	Marital Status	36.6	13.20	0.22
	Maternal occupation	7.84	3.10	0.20
Welsh	IMD	-1.37	0.62	-0.27*
	Age	3.39	1.55	0.23*
	Income	0.01	0.00	0.25*

* $P < 0.05$

at $P < 0.05$). Moreover, both the English and Welsh Indices of Deprivation were inversely associated with breastfeeding duration. Mothers who breastfed for a greater period of time lived in areas of lower deprivation (table 3).

In order to establish which indicators independently influenced breastfeeding duration, multiple regressions were performed for both the English and Welsh samples. Each significant indicator of breastfeeding duration was placed in a forward stepwise linear regression analysis with breastfeeding duration as the outcome measure (table 4).

For the English sample, the model explained 36.6% of the variance $F(4, 111) = 17.04, P < 0.001$. Years in education, IMD, marital status and maternal occupation predicted breastfeeding duration. Age, paternal occupation, income and home ownership were no longer predictive.

For the Welsh sample, a significant model emerged explaining 27.7% of the variance $F(3, 66) = 9.431, P < 0.001$. IMD, age and income predicted breastfeeding duration. Education, maternal and paternal professional or managerial occupation and home ownership were no longer predictive.

Discussion

Inequalities in breastfeeding duration associated with measures of socio-economic status are well documented.¹⁰⁻²⁴ This study adds further support to the evidence that considering a woman's socio-economic background when targeting breastfeeding support can play a useful role. This study establishes for the first time (as far as known by the authors) that increased deprivation, as measured by the Welsh and English IMDs, is associated with shorter duration of breastfeeding. It supports previous findings that highlight combined measures of Deprivation (as measured by the Scottish IMD)²³ as an important indicator of breastfeeding duration. The finding

that breastfeeding duration was related to deprivation in both the Welsh and English samples adds further reliability to the finding.

The findings suggest that deprivation level may be a stronger indicator of socio-economic influences upon breastfeeding duration than other well established indicators. When placed in the regression analyses, IMD remained a significant predictor of breastfeeding duration for both the English and Welsh samples. Indeed for the Welsh sample it was the primary indicator (from three measures that remained significant) and second for the English sample (from four measures). IMD was the sole indicator of socioeconomic status, which remained predictive for both the English and Welsh samples when placed in the logistic regression analysis. This challenges previous findings in the area that suggested multiple deprivation (as measured by a local deprivation score, not IMD) is not a direct indicator of breastfeeding duration.³³

Using the IMD to predict breastfeeding duration (and thus to identify women at risk of short breastfeeding duration) is a useful tool for a number of reasons. First, it is easily accessible, because the vast majority of women booking with a midwife during pregnancy provide their addresses. It allows support to be targeted in a non-intrusive manner without in-depth questioning: indeed it can be accessed remotely. The IMD allows comparison across areas in the country quickly and easily. This is both time saving for service providers and less invasive for the mother. Additionally, as IMD remained the sole socioeconomic measure factor which was predictive in the regression analysis for both the English and Welsh sample, this suggests that it is perhaps a more stable indicator than others such as age. Finally, we argue that it is a more objective measure and less prone to bias or falsification.

The IMD are found to be a strong measure of socio-economic status (and thus breastfeeding duration) most likely as they take into account a variety of different measures of an individual's social and economic experience rather than focusing upon a single measure. They therefore present an overall illustration of deprivation reducing individual variations within socio-economic measures. Although the indices are specific to their countries of origin, their construction is detailed in documentation^{25,26} and the key messages easily adapted and incorporated by other countries. Indeed, as internationally there is likely to be variation in concepts and influences upon deprivation, the Indices could serve as a model to highlight the importance and predictive power of considering multiple and non-traditional measures of social and economic deprivation.

One limitation of this study that could be addressed in future research is the self selecting nature of the sample. As the questionnaire was completed retrospectively and participants were self selecting, there may have been an outlying influence determining completion. The sample is also relatively small. However the demographics of the sample were similar in comparison to much larger studies such as the Infant Feeding Survey.⁹ Also, the spread of the sample in terms of deprivation level was representative; 9.5% of the Welsh and 8.5% of the English samples lived in the most deprived 10% of the areas of the respective countries. Moreover, age of infant at time of completion of the questionnaire was not associated with responses open to memory bias such as recalled breastfeeding duration. Limitations aside, the findings do highlight the strength of the IMD in predicting breastfeeding duration and potentially allowing resources and support to be targeted.

Future research should aim to establish why deprivation level is associated with decreased breastfeeding duration. Deprivation level itself does not directly influence breastfeeding duration. Instead it is likely that it places mothers in

an environment where access to the information, support and encouragement needed to initiate, establish and continue breastfeeding is low. Moreover, it is likely that certain attitudes and influences which are associated with breastfeeding duration may be clustered within areas high in deprivation thus mediating the relationship between deprivation and breastfeeding duration. For example, mothers from low income backgrounds describe feeling part of 'a formula feeding culture' where others have little knowledge, experience or understanding of breastfeeding.^{34,35} Where however mothers from these backgrounds are given the information and support they need to breastfeed successfully, socio-economic background does not hinder breastfeeding initiation and continuation.³⁶ Indeed, many studies show that measures of socio-economic status fail to directly predict breastfeeding duration when considered alongside attitudes of others. Factors such as father's attitude, familial and peer influence and professional support mediate this relationship.^{36,37}

In sum, it is felt that the use of the IMD to highlight areas of probable need is a useful and quick tool. Attitudes and influences are not as accessible as an index that can be used remotely. Areas at risk can be identified quickly and easily using the index, then support could be targeted on a more individual basis in the areas identified. Identification of factors that predict breastfeeding duration is essential due to the well established benefits of breastfeeding for infant and maternal health alongside the low levels of breastfeeding in the UK. Using the IMD to predict breastfeeding duration can help to target interventions at those areas most likely to be in need.

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Key points

- Breast-feeding duration is associated with deprivation level as measured by the IMD in both English and Welsh samples.
- The IMD appears to be a strong predictor of breastfeeding duration perhaps over and above traditional measures of socioeconomic status.
- The IMD allows quick, easy and remote access to information that can be predictive of breastfeeding duration. It is time saving for the service provider and non-intrusive for the mother.
- As the IMD is based upon smaller areas than other measures such as ward or council tax band professional support and resources can be locally targeted.
- Although the individual Indices are specific to their countries of origin, the concept of multiple influences upon deprivation can be adopted by others both nationally and internationally.

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