



**QUEEN'S
UNIVERSITY
BELFAST**

Prevalence and factors associated with depression and depression-related healthcare access in mothers of 9-month old infants in the Republic of Ireland

Cruise, S. M., Layte, R., Stevenson, M., & O'Reilly, D. (2017). Prevalence and factors associated with depression and depression-related healthcare access in mothers of 9-month old infants in the Republic of Ireland. *Epidemiology and Psychiatric Sciences*. DOI: 10.1017/S2045796017000026

Published in:
Epidemiology and Psychiatric Sciences

Document Version:
Peer reviewed version

Queen's University Belfast - Research Portal:
[Link to publication record in Queen's University Belfast Research Portal](#)

Publisher rights

© Cambridge University Press 2017 .

This work is made available online in accordance with the publisher's policies. Please refer to any applicable terms of use of the publisher.

General rights

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact openaccess@qub.ac.uk.

Title: Prevalence and factors associated with depression and depression-related healthcare access in mothers of 9-month old infants in the Republic of Ireland

Short title: Depression and healthcare access in postpartum Irish mothers

S.M. Cruise^{1,2*}

R. Layte^{3,4}

M. Stevenson^{1,2}

D. O'Reilly^{1,2}

¹ Centre for Public Health, Queen's University Belfast, Belfast, Northern Ireland

² UKCRC Centre of Excellence for Public Health (NI), Centre for Public Health, Queen's University Belfast, Belfast, Northern Ireland

³ Department of Sociology, Trinity College Dublin, Dublin, Ireland

⁴ Economic and Social Research Institute, Dublin, Ireland

Word count: 4196

* Address correspondence to: Dr Sharon Cruise, Centre for Public Health, Institute of Clinical Sciences Block B, Queen's University Belfast, Royal Victoria Hospital, Grosvenor Road, Belfast, BT12 6BJ, Northern Ireland, United Kingdom. Email: s.cruise@qub.ac.uk

Prevalence and factors associated with depression and depression-related healthcare access in mothers of 9-month old infants in the Republic of Ireland

Abstract

Aims. Untreated maternal depression during the postpartum period can have a profound impact on the short- and long-term psychological and physical well-being of children. There is, therefore, an imperative for increased understanding of the determinants of depression and depression-related healthcare access during this period.

Methods. Respondents were 11,089 mothers of 9-month-old infants recruited to the Growing Up in Ireland study. Of this sample, 10,827 had complete data on all relevant variables. Respondents provided sociodemographic, socioeconomic and household information, and completed the Center for Epidemiologic Studies Depression Scale (CESD).

Results. 11.1% of mothers scored above the CESD threshold for depression. 10.0% of depressed mothers and 25.4% of depressed fathers had depressed partners. Among depressed mothers, 73.1% had not attended a healthcare professional for a mental health problem. In the adjusted model, the likelihood of depression was highest in mothers who: had lower educational levels (OR 1.26; 95% CIs 1.08,1.46); were unemployed (OR 1.27; 95% CIs 1.10,1.47); reported previous mental health problems (OR 6.55; 95% CIs 5.68,7.56); reported that the cohort child was the result of an unintended pregnancy (OR 1.43; 95% CIs 1.22,1.68), was preterm (OR 1.35; 95% CIs 1.07,1.70), or had health/developmental problems (OR 1.20; 95% CIs 1.04,1.39); had no partner in the household (OR 1.33; 95% CIs 1.04,1.70) or were living with a depressed partner (OR 2.66; 95% CIs 1.97,3.60); reported no family living nearby (OR 1.33; 95% CIs 1.16,1.54); were in the lowest income group (OR 1.60; 95% CIs 1.21,2.12).

The primary determinant of not seeking treatment for depression was being of non-white ethnicity (OR 2.21; 95% CIs 1.18,4.13).

Conclusions: Results highlight the prevalence of maternal depression in the later postpartum period, particularly for lower socioeconomic groups, those with previous mental health problems, and those with limited social support. The large proportion of unmet need in depressed mothers, particularly among ethnic minority groups, emphasises the need for a greater awareness of postpartum mental health problems and increased efforts by healthcare professionals to ensure that mothers can access the required services.

Introduction

It is well established that women have higher rates of depression than men, especially during the childbearing years (O'Hara & Swain, 1996; Almeida & Kessler, 1998; Evans *et al.* 2001; Kessler, 2006). Prevalence of maternal depression can range between 6.5% and 12.9% for major and minor depression at various times during the first year postpartum (Gaynes *et al.* 2005). Moreover, research demonstrates that nearly half of mothers who have depression in the early postpartum period will continue to experience depression at one year postpartum, and that half of that group of mothers will still be experiencing depression when the child is in kindergarten (Horwitz *et al.* 2009). Studies also indicate higher rates of postpartum depression among women who are immigrants, refugees, or asylum seekers compared to non-immigrant women (Ahmed *et al.* 2008; Falah-Hassani *et al.* 2015).

Impact of maternal depression on child outcomes

The National Institute of Clinical Excellence (NICE, 2014) guidelines highlight the impact of postpartum depression on child outcomes. For example, the parenting of depressed mothers is more likely to be emotionally distant, inconsistent, and punitive (Lovejoy *et al.* 2000; Hammen, 2002; Chung *et al.* 2004). Therefore, children of depressed mothers are less likely to be securely attached, and more likely to show patterns of avoidant and disorganised attachment (Van IJzendoorn *et al.* 1992; Martins & Gaffan, 2000), which in turn can be risk factors for higher levels of externalising behaviour problems (Renken *et al.* 1989; Lyons-Ruth *et al.* 1993; Moss *et al.* 2004; Fearon *et al.* 2010).

Impact of co-occurring parental depression on child outcomes

The impact on child health in the immediate and longer term is especially marked in households where *both* parents are depressed. For example, Joutsenniemi *et al.* (2013) found a twofold

increased risk of mental health problems in offspring who were raised in households where both parents were taking antidepressants. Children of depressed parents are also at increased risk of substance use and anxiety disorder (Lieb *et al.* 2002; Nomura *et al.* 2001).

Depression in the later postpartum period

The majority of studies have examined depression in the early postpartum period (e.g. 1 week to 6 months postpartum), often among small, non-representative samples, but there are a number of reasons why it is important to have a better understanding of depression in the later postpartum period. For example, recent research has demonstrated that whilst the rates of depression were highest in the first month postpartum and diminished at 2, 4, and 6 months, the prevalence at 9 months was double that shown at 6 months, and very similar to the prevalence at 0-1 month (i.e. 10.2% at 9 months; 12.5% at 0-1 month) (Gjerdingen *et al.* 2011). Moreover, from 9 months onwards is a peak period for infant language acquisition and more active and intentional social interaction between infant and caregivers, all of which are vital for the development of cognitive skills and healthy socio-emotional behaviour (e.g. Trevarthen & Hubley, 1978; Harris *et al.* 1983; Harris *et al.* 1995a; Harris *et al.* 1995b; Carpenter *et al.* 1998).

Healthcare access and unmet need in depressed mothers

Research indicates that mothers experiencing postpartum depression may be reluctant to seek professional help. Reasons for this include fears that they will be considered unfit mothers (Turner *et al.* 2008); reluctance to disclose depression when their children accompany them to general practitioner (GP) appointments (Zink *et al.* 2006); and an unwillingness to take antidepressants, with fears that this is the only type of treatment that will be offered to them (Dennis & Chung-Lee, 2006). Women from non-white ethnic groups may be particularly

vulnerable: Ahmed *et al.* (2008) found that immigrant, refugee, and asylum-seeking mothers with depression identified factors such as insufficient knowledge of what services were available, stigma and embarrassment associated with depression and help-seeking, language problems, or judgement from healthcare staff as being obstacles to seeking help. Financial constraints may also influence access to healthcare systems. For example, GP care in the Republic of Ireland is free at point of contact to only a minority of the population who are deemed eligible on account of low incomes, and previous studies have established reduced GP contact among those who have to pay for GP care (O'Reilly *et al.* 2007; Layte & Nolan, 2015).

The aims of the present study were threefold: i) to examine the prevalence of, and factors associated with depressive symptomatology among a large, nationally representative sample of mothers of 9-month-old infants in the Republic of Ireland, including the prevalence of co-occurring depressive symptoms within couples; ii) to examine the extent of unmet need in treatment of depression in mothers; and iii) to examine factors associated with healthcare access in mothers who exhibit depressive symptomatology.

Methods

Respondents

Respondents were 11,089 mothers of 9-month-old infants recruited to wave 1 of the Growing Up in Ireland (GUI) study, a nationally representative prospective cohort study commissioned by the Irish Government to examine factors associated with the health and well-being of children living in the Republic of Ireland (see <http://www.growingup.ie/index.php?id=9> and Thornton *et al.* 2013 for detailed information about the GUI study and study design). The sample response rate was 64.5% of all families who were approached to take part in the study (see Supplementary Files 1 and 2 for details of sampling and derivation of analytic sample).

Responses from 9,735 partners of mothers were also included in the present study, specifically in order to establish the number of depressed couples in the sample, and to examine associations between partners' and mothers' depression. Individual data for each respondent were collected during a single computer-assisted personal interview. Ethical approval was granted by an independent Research Ethics Committee that was organised by the Department of Health and Children (Dublin, Republic of Ireland).

Outcome variables

The primary outcome variable was the 8-item Center for Epidemiologic Studies Depression Scale (CESD; Melchior *et al.* 1993), which was designed to screen for depressive symptomatology among a population during the seven days preceding assessment. In the present study the CESD demonstrated satisfactory internal reliability among mothers ($\alpha=0.87$) and their partners ($\alpha=0.81$). Scores on the 8-item CESD can range from 0 to 24, with higher scores indicative of a higher incidence of both the presence and duration of symptoms. Melchior *et al.* (1993) recommend a 'caseness' threshold score of ≥ 7 on the total scale score in order to classify respondents as depressed.

Explanatory variables

Mothers provided demographic information about themselves, including age (16-24, 25-29 [ref], 30-34, 35-49), ethnicity (white [ref], non-white), educational level (higher education [ref], secondary education), employment status at time of interview (working [ref], not working), and region where they were living at time of interview (rural [ref], urban).

The models were also adjusted for mother's self-reported previous mental health problems (ever treated for clinical depression, anxiety, or 'nerves'; not treated [ref], treated), whether the

pregnancy of the cohort child had been an intended pregnancy (no [ref], yes, missing) (self-report), and the parity of the pregnancy with the cohort child (later born [ref], first born) (self-report).

Mothers provided information on their infant's characteristics, including gestational age (preterm [25-36 weeks], not preterm [37+ weeks; ref]), and general health, including developmental issues (healthy [ref], unhealthy).

Information on household characteristics was also collected from mothers, and included: whether there was a partner living in the household at time of interview (yes [ref], no); equivalised household income (0 [highest, ref] through 4 [lowest], missing); housing tenure (owner [ref], tenant); and whether the mother had any family living in the area at time of interview (yes [ref], no). The mental health status of the mother's partner (not depressed/depressed) was assessed using the 8-item CESD, and was scored in the same way as for the mothers. This variable was included in the regression model as an explanatory variable of mothers' depression.

Data analysis plan

Weighted frequency analyses were conducted for the percentage of mothers who were classified as depressed (i.e. CESD score ≥ 7), and were crosstabulated with all explanatory variables included in the regression analyses.

Univariate and fully adjusted multivariate binary logistic regression models were conducted, with mothers' CESD caseness status as outcome variable. Explanatory variables were entered

in three blocks (1. Mother characteristics; 2. Infant characteristics; 3. Household characteristics), with the third block representing the fully adjusted multivariate model.

A further series of univariate and fully adjusted multivariate binary logistic regression models were conducted with the sample of mothers who had a CESD score of ≥ 7 . The outcome variable was whether or not the mother had seen a medical professional for depression/anxiety/nerves since the birth of the baby (yes [0]/no [1]). The explanatory variables for these analyses were the same as those included in the analysis examining odds of scoring ≥ 7 on the CESD, but with the addition of the mothers' healthcare access (GP cover [ref], hospital only cover, no healthcare cover), and the exclusion of 'pregnancy intention' (a priori, there was no reason to hypothesise that this variable would be associated with unmet need) and 'previous mental health problems' (as this represented an over-adjustment owing to the association between previous and current mental health problems). Variables were entered in three blocks (1. Mother characteristics; 2. Infant characteristics; 3. Household characteristics), with the third block representing the fully adjusted multivariate model.

Results

Descriptive statistics and factors associated with depression

From a total sample of 11,089 mothers, 10,895 had valid data on the CESD and 1,176 (11.1%) of these scored ≥ 7 on the CESD. There were large proportions of missing data for pregnancy intention, partner's current depression, and equivalised household income, therefore 'missing' categories were retained for these variables. Missing data for previous treatment for mental health, gestational age, and region were excluded as inclusion of 'missing' categories for these variables would have violated statistical disclosure control stipulations (i.e. no cell counts < 30 to be reported), thus leaving a sample of $N=10,827$ for regression models. The sample characteristics and results of logistic regression models are presented in Table 1.

< Insert Table 1 about here >

About two-thirds of the mothers were aged 30 or over, with one-third aged 35 or older. Depression prevalence was highest in younger mothers, and reduced linearly with age. However, in absolute terms most depressed mothers were aged over 30 owing to larger numbers of mothers in this age group. Younger mothers (16-24 years) comprised 11.4% of the cohort but had a higher prevalence of depression (19.1%) and also a higher prevalence of social and socio-demographic difficulties: almost half (47%) did not have a partner, two-thirds had only secondary-level education (compared to 31% overall), and 80% lived in rented accommodation, compared to 33% overall. Non-white mothers contributed 6.7% of the cohort and as expected, given the known distribution and characteristics of migrant populations, 70% were living in urban areas (compared to 42% for white mothers), 77% lived in rented accommodation (compared to 30% for white mothers), and 80% of non-white mothers had no family living in the area. The slightly higher prevalence of depression amongst non-white mothers (14% vs 11%) seems to be largely due to socioeconomic factors as their likelihood of depression was not significantly different from zero after adjustment for housing tenure and household income (OR 1.02; 95% CIs 0.81,1.28: models available on request). However, in the models adjusted for previous mental health problems their risk appears higher (Table 1: OR 1.23; 95% CIs 0.95,1.60).

Overall, 12% of mothers reported a previous diagnosis of mental health problems and there was a strong relationship between previous and current mental health problems, with 36% of those with a previous diagnosis scoring above the threshold on the current CESD (compared to 7.4% for the rest). The approximately 7-fold increased risk associated with previous mental

health problems remained after adjustment for all other factors. About 80% of mothers confirmed their pregnancy with the cohort child as intentional and in 40% of cases this was their first child. Unintended pregnancy was associated with twice the prevalence of depression (18% compared to 10%) and a higher risk of depression in the fully adjusted model (OR 1.43, 95% CIs 1.22,1.68).

Less than 7% of pregnancies were preterm, and 23% of infants had at least one of ten possible health problems (e.g. asthma, eczema, developmental delay). In the unadjusted models, preterm delivery and health issues (which included developmental problems) with the infant were associated with increased prevalence of maternal depression.

Most mothers (64%) had family living in the area, but those without had an elevated risk of depression (OR 1.33; 95% CIs 1.16,1.54). Over 12% of mothers were not living with a partner and 23% of these mothers were depressed. However, there was a strong relationship between partnership and disadvantage, therefore the risk of depression for mothers with no partner in the fully adjusted model was only modestly raised at 1.33 (95% CIs 1.04,1.70). However, the mental health of the partner was also important. Of the 9,735 fathers, 8,333 (85.6%) had valid data on the CESD and 318 (3.8%) of these scored ≥ 7 . Mothers with a depressed partner had a 2/3-fold increased likelihood of being depressed. While the number of depressed dyads was small (n=71), this equated to 10.0% of depressed mothers and 25.4% of depressed fathers who were living with a depressed partner.

There was a strong relationship between material disadvantage, as assessed by housing tenure and equivalised household income, and the prevalence of depression: tenants were almost twice as likely to be depressed as owner occupiers (OR 1.80; 95% CIs 1.59,2.03); and those in the

lowest income quintile were over three times as likely to be depressed as their more affluent peers (OR 3.53; 95% CIs 2.81,4.42). The likelihood of depression was also higher for mothers who had only secondary-level education or who were unemployed. There was no significant difference in the prevalence or likelihood of depression between urban and rural areas.

Factors associated with not seeking treatment for depression

A total of 1,176 mothers scored ≥ 7 on the CESD, thus meeting the threshold of caseness for depressive symptomatology, and of these 1,174 had valid data on whether or not they had been treated for mental health problems since the birth of the baby. Table 2 shows the characteristics of this sub-group of mothers, and results of analyses examining the likelihood of not attending a health professional for a postpartum mental health problem. These data are based on 1,169 cases with full data for all the variables included. The numbers are smaller than in the previous analysis and the confidence intervals are correspondingly wider.

< Insert Table 2 about here >

Overall, 854 (73%) of these mothers had not attended a health professional for mental health problems since the birth of the cohort child. Although the number of non-white mothers with depression was small it is evident that very few (18.1%) were receiving treatment, and in fully adjusted models they were more than twice as likely not to be under treatment (OR 2.21; 95% CIs 1.18,4.13). There is also some evidence that single mothers, mothers with lower educational levels, and those who were unemployed were more likely to be under medical management for their depression. There is little evidence that access to health insurance or levels of income were a significant deterrent to accessing appropriate healthcare.

Discussion

Results indicated that 11% of mothers and 3.8% of fathers scored above the established CESD threshold for depression. The point prevalence for mothers was at the upper end of the range cited in a systematic review of 28 international studies (in developed countries) between 1980 and 2004 (Gavin *et al.* 2005) and comparable with the 9-month rates reported by Gjerdingen *et al.* (2011), but higher than rates shown in studies among women in the later postpartum period in the Gavin *et al.* (2005) review, possibly on account of their exclusion of any studies that relied on self-reported depression. Depression among ethnic minority mothers was higher (14.1% vs 11.0% for white mothers – see Table 1), but within the range of those identified in a recent systematic review and meta-analysis of postpartum depression in immigrant mothers (Falah-Hassani *et al.* 2015). Father/partner depression prevalence was substantially less than Paulson and Bazemore's (2010) 10.4% meta-estimate; however, they highlighted considerable heterogeneity in paternal depression rates, and an apparent peak period in paternal depression rates from 3-6 months postpartum.

We have also shown evidence of co-occurring parental depression: though the overall number of depressed dyads was small (<1% of the overall sample with valid CESD data), perhaps as a result of the relatively low prevalence of paternal depression, the proportions were notable, with 10% of depressed mothers and 25.4% of depressed fathers having depressed partners. Given the risk of the intergenerational transmission of mental health problems in children being raised by two depressed parents (see Joutsenniemi *et al.* 2013; Lieb *et al.* 2002; Nomura *et al.* 2001), there is an imperative to identify at-risk families and intervene at an early stage. Greater exploration of the associations between paternal depression and the mental health and well-being of both mother and child were beyond the scope of the present study but merit further investigation.

Results of the initial regression analyses highlighted that mothers with lower levels of education, who were unemployed, and who had lower household incomes were all at higher risk of depression, which is consistent with previous research (e.g. O'Hara & Swain, 1996; Beck, 2001). The association between depression and compromised social support (i.e. no partner in the household or a depressed partner, no family living in the area) is also consistent with previous research (e.g. Brugha *et al.* 1998; O'Hara & Swain, 1996). The data did not allow us to examine to what extent (or how) family living in the area enhances the mother's mental health; however, recent research suggests that poor health behaviours relating to being a parent of a young child (e.g. lack of sleep and exercise; poor diet) may mediate the association between lack of support and psychological well-being in the postpartum period (e.g. Beck *et al.* 2011).

Of particular concern was the fact that over 73% of mothers who scored above the CESD caseness threshold reported that they had not received any treatment for depression since the birth of the cohort child. Although this represents a substantial proportion of unmet need within this sample, the prevalence is on a par with similar studies. For example, Huang *et al.* (2007) found that 74% of depressed mothers (9 months postpartum) had not consulted a healthcare professional for depression during the previous year. Similarly, Flynn *et al.* (2004) found that 78% of mothers of young children had untreated depression. Regressions examining determinants of healthcare access among depressed mothers indicated that the characteristics associated with increased likelihood of depression (i.e. lower educational and income levels; unemployment) were paradoxically associated with *an increased likelihood* of accessing healthcare. A possible explanation is the inherent vulnerability of these mothers, meaning they have more contact with healthcare professionals and therefore are more likely to receive

diagnosis and treatment. There was no indication that mothers in depressed dyads were less likely to access healthcare for their depression which suggests an increased awareness of mental health and the need for treatment among depressed dyads, and that either they are already in contact with healthcare professionals for their mental health issues, or that the depressed partner of a depressed mother will recognise and be aware of her vulnerability and encourage her to seek help.

Depressed ethnic minority women in our study had a more than twofold likelihood of not seeking medical help compared with their depressed white counterparts. Such findings highlight the need for awareness among those providing maternity care to ensure that mothers from ethnic minority groups are supported and are given the means to access the appropriate healthcare. Healthcare professionals also need to be aware that ethnic minority mothers may not have the same levels of social support as they would experience in their own countries, therefore pregnancy, childbirth, and child-rearing in their new host country may represent a particular challenge (Teng *et al.* 2007). Conversely, those ethnic minority mothers who have family living nearby may be reluctant to access healthcare because of cultural differences in the perception of depression and help-seeking outside of the immediate family (Templeton, 2003).

Qualitative research indicates many reasons why mothers (including those from minority ethnic groups) either cannot or do not seek help for postpartum depression (see Ahmed *et al.* 2008; Dennis & Chung-Lee, 2006; Turner *et al.* 2008; Zink *et al.* 2006). However, the design of the present study did not allow us to expand upon these findings. Interestingly, Huang *et al.* (2007) found that nearly 60% of their sample of depressed postpartum mothers reported that they did not believe that they *needed* to seek help, which suggests a necessity to promote awareness of

the symptoms of postpartum depression, and the importance of maintaining good psychological health.

Strengths and weaknesses

The present study has a number of strengths including: the size and representativeness of the sample; a rich data source which allowed us to examine the co-occurrence of depression among couples and unmet need in mothers with depression, and to include a large number of covariates in our analyses; adjustment for previous treatment for psychological problems; and the inclusion of partner's depression. However, the cross-sectional design did not allow us to determine direction of associations between mother and partner depression, and while most of the covariates were current at the time of interview (e.g. current age, employment, income, family in the area), there were other covariates that were more distal to the outcome variable (e.g. educational level, pregnancy intention, child health and development).

There have been suggestions (e.g. Matthay, 2010) that prevalence rates of depression in the perinatal period have been over-estimated, especially when assessed using self-report instruments such as the CESD, and that repeat testing plus diagnostic interviews would provide a more realistic estimate of persistent depressive symptoms as opposed to transient depressive episodes. We acknowledge that we were unable to establish the severity of depression in the present study owing to the absence of a clinical diagnosis of depression in either mothers or fathers. Nonetheless, the CESD provides an estimate of the individual's mental state over the previous week, and as such presents a meaningful approximation of those parents who are experiencing some degree of psychological difficulty. Furthermore, (NICE, 2014) stress the importance of considering sub-threshold levels of postpartum depression, especially if prolonged.

Additionally, our findings in relation to unmet need may not extrapolate to populations of postpartum women who have no restrictions on healthcare access. Although the second regression model (i.e. Table 2) was adjusted for a range of socioeconomic factors and the respondent's level of healthcare access, this may not be sufficient to ensure the generalisability of our findings to other populations.

Implications

A recent systematic review (Gaynes *et al.* 2005) found that point prevalence rates for postpartum depression in the studies included were not significantly different to those in the general population of non-childbearing women and therefore may not be considered any more a public health problem than depression in the general population. However, what makes this a public health concern is the fact that maternal depression is detrimental to the child's emotional, psychological, and physical development, especially in the first year, and when there are recurrent depressive episodes during the early years. Mothers have more opportunity than fathers/partners to engage with healthcare professionals, especially in the first year postpartum, and as such there are greater possibilities for screening and where necessary, referrals for diagnosis and treatment. In cases where a mother is identified as experiencing depression, fathers/partners (where appropriate/applicable) should be routinely screened. Even if partners of depressed mothers are not themselves depressed, this provides an opportunity for healthcare professionals to advise on how to provide appropriate support to their partner. A recent qualitative study in the Republic of Ireland (Higgins *et al.* 2016) has recommended investment into additional specialist perinatal mental health services, with increased training and education for healthcare professionals working within maternity services, and enhanced

connection between maternity units and mental health services. It is hoped that such specialist services will consider the family as a unit and incorporate support for partners where necessary.

Acknowledgements

We acknowledge the Central Statistics Office (Ireland), the Department of Health and Children (Ireland), and the Economic and Social Research Institute (ESRI) (Ireland) for facilitating data access.

Financial Support

This study forms part of a larger project funded by the Health Research Board, Ireland (grant reference number HRA_PHS/2010/26). The GUI data is funded by the Government of Ireland through the Office of the Minister for Children and Youth Affairs, and have been collected under the Statistics Act, 1993, of the Central Statistics Office. The GUI project has been designed and implemented by the joint ESRI-TCD GUI Study Team.

Conflict of Interest

None.

Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Availability of Data and Materials

The current study involved secondary data analysis of Wave 1 GUI infant cohort study data, and used data from the Anonymised Microdata File (AMF) and the Researcher Microdata File (RMF). Information about accessing GUI study data is available at:

<http://www.growingup.ie/index.php?id=223>

References

- Ahmed A, Stewart DE, Teng L, Wahoush O, Gagnon AJ** (2008). Experiences of immigrant new mothers with symptoms of depression. *Archives of Women's Mental Health* **11**, 295-303.
- Almeida DM, Kessler RC** (1998). Everyday stressors and gender differences in daily distress. *Journal of Personality and Social Psychology* **75**, 670-680.
- Beck CT** (2001). Predictors of postpartum depression: an update. *Nursing Research* **50**, 275-285.
- Beck CT, Gable RK, Sakala C, Declercq ER** (2011). Postpartum depressive symptomatology: results from a two-stage US national survey. *Journal of Midwifery and Women's Health* **56**, 427-435.
- Brugha TS, Sharp HM, Cooper S-A, et al.** (1998). The Leicester 500 Project. Social support and the development of postnatal depressive symptoms, a prospective cohort survey. *Psychological Medicine* **28**, 63-79.
- Carpenter M, Nagell K, Tomasello M, Butterworth G, Moore C** (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development* **63**, 1-174.

Chew-Graham CA, Sharp D, Chamberlain E, Folkes L, Turner KM (2009). Disclosure of symptoms of postnatal depression, the perspectives of health professionals and women: a qualitative study. *BMC Family Practice* **10**, 7. doi:10.1186/1471-2296-10-7

Chung EK, McCollum KF, Elo IT, Lee, HJ, Culhane JF (2004). Maternal depressive symptoms and infant health practices among low-income women. *Pediatrics* **113**, e523-529.

Dennis CL, Chung-Lee L (2006). Postpartum depression help-seeking barriers and maternal treatment preferences: a qualitative systematic review. *Birth* **33**, 323-331.

Evans J, Heron J, Francomb H, Oke S, Golding J, Team on behalf of the Avon Longitudinal Study of Parents and Children Study Team (2001). Cohort study of depressed mood during pregnancy and after childbirth. *British Medical Journal* **323**, 257-260.

Falah-Hassani K, Shiri R, Vigod S, Dennis C-L (2015). Prevalence of postpartum depression among immigrant women: A systematic review and meta-analysis. *Journal of Psychiatric Research*. doi: 10.1016/j.jpsychires.2015.08.010.

Fearon RP, Bakermans-Kranenburg MJ, Van IJzendoorn MH, Lapsley A, Roisman GI (2010). The significance of insecure attachment and disorganization in the development of children's externalizing behavior: a meta-analytic study. *Child Development* **81**, 435-356.

Flynn HA, Davis M, Marcus SM, Cunningham R, Blow FC (2004). Rates of maternal depression in pediatric emergency department and relationship to child service utilization. *General Hospital Psychiatry* **26**, 316-322.

Gavin NI, Gaynes BN, Lohr KN, Meltzer-Brody S, Gartlehner G, Swinson T (2005).

Perinatal depression: a systematic review of prevalence and incidence. *Obstetrics and Gynecology* **106**, 1071-1083.

Gaynes BN, Gavin N, Meltzer-Brody S, Lohr KN, Swinson T, Gartlehner G, Brody S,

Miller WC (2005). Perinatal depression: prevalence, screening accuracy, and screening outcomes. *Summary, Evidence Report/Technology Assessment* **119**, 1-8.

Gjerdingen D, Crow S, McGovern P, Miner M, Center B (2011). Changes in depressive symptoms over 0–9 months postpartum. *Journal of Women's Health* **20**, 381-386.

Hammen C (2002). Context of stress in families of children with depressed parents. In SH Goodman SH, IH Gotlib (eds.), *Children of Depressed Parents: Mechanisms of Risk and Implications for Treatment* (pp. 175-199). Washington, DC, US: American Psychological Association.

Harris M, Jones D, Grant J (1983). The nonverbal context of mothers' speech to infants.

First Language **4**, 21-30.

Harris M, Barlow-Brown F, Chasin J (1995). The emergence of referential understanding:

pointing and the comprehension of object names. *First Language* **15**, 19-34.

Harris M, Yeeles C, Chasin J, Oakley Y (1995). Symmetries and asymmetries in early

lexical comprehension and production. *Journal of Child Language* **22**, 1-18.

Higgins A, Tuohy T, Murphy R, Begley C (2016). Mothers with mental health problems: contrasting experiences of support within maternity services in the Republic of Ireland.

Midwifery **36**, 28-34.

Horwitz SM, Briggs-Gowan MJ, Storfer-Isser A, Carter AS (2009). Persistence of maternal depressive symptoms throughout the early years of childhood. *Journal of Women's Health* **18**, 637-645.

Huang ZJ, Wong FY, Ronzio CR, Yu SM (2007). Depressive symptomatology and mental health help-seeking patterns of U.S.- and foreign-born mothers. *Maternal and Child Health Journal* **11**, 257-267.

Joutsenniemi K, Moustgaard H, Martikainen P (2013). Parental use of antidepressant medication and family type in the risk for incident psychiatric morbidity in offspring. *Journal of Epidemiology and Community Health* **67**, 703-705.

Kahn RS, Wise PH, Finkelstein JA, Bernstein HH, Lowe JA, Homer CJ (1999). The scope of unmet maternal health needs in pediatric settings. *Pediatrics* **103**, 576-581.

Keller MB, Lavori PW, Mueller TI, Endicott J, Coryell W, et al. (1992). Time to recovery, chronicity, and levels of psychopathology in major depression: a 5-year prospective follow-up of 431 subjects. *Archives of General Psychiatry* **49**, 809-816.

Kessler RC (2006). The epidemiology of depression among women. In *Women and Depression: A Handbook for the Social, Behavior, and Biomedical Sciences*, ed. CLM Keyes, SH Goodman, pp. 22-40. New York: Cambridge Univ. Press.

Layte R, Nolan A (2015). Eligibility for free GP care and the utilisation of GP services by children in Ireland. *International Journal of Health Economics and Management* **15**, 3-27.

Lieb R, Isensee B, Höfler M, Pfister H, Wittchen H-U (2002). Parental major depression and the risk of depression and other mental disorders in offspring: a prospective-longitudinal community study. *Archives of General Psychiatry* **59**, 365-374.

Lovejoy MC, Graczyk PA, O'Hare E, Neuman G (2000). Maternal depression and parenting behavior: a meta-analytic review. *Clinical Psychology Review* **20**, 561-592.

Lyons-Ruth K, Alpern L, Repacholi B (1993). Disorganized infant attachment classification and maternal psychosocial problems as predictors of hostile-aggressive behaviour in the preschool classroom. *Child Development* **64**, 572-585.

Martins C, Gaffan E (2000). Effects of early maternal depression on patterns of infant-mother attachment: a meta-analytic investigation. *Journal of Child Psychology and Psychiatry* **41**, 737-746.

Matthay S (2010). Are we overpathologising motherhood? *Journal of Affective Disorders* **120**, 263-266.

Melchior LA, Huba GJ, Brown VB, Reback CJ (1993). A short depression index for women. *Educational and Psychological Measurement* **53**, 1117-1125.

Moss E, Cyr C, Dubois-Comtois K (2004). Attachment at early school age and developmental risk: examining family contexts and behavior problems of controlling caregiving, controlling-punitive, and behaviorally disorganized children. *Developmental Psychology* **40**, 519-532.

National Institute for Health and Clinical Excellence (NICE) (2014). *Antenatal and Postnatal Mental Health. Clinical Management and Service Guidance*. London: National Institute for Health and Clinical Excellence.

Nomura Y, Warner V, Wickramaratne P (2001). Parents concordant for major depressive disorder and the effect of psychopathology in offspring. *Psychological Medicine* **31**, 1211-1222.

O'Hara MW, Swain AM (1996). Rates and risk of postpartum depression – a meta-analysis. *International Review of Psychiatry* **8**, 37-54.

O'Reilly D, O'Dowd T, Galway KJ, Murphy AW, O'Neill C, Shryane E, Steele K, Bury G, Gilliland A, Kelly A (2007). Consultation charges in Ireland deter a large proportion of patients from seeing the GP: Results of a cross-sectional survey. *European Journal of General Practice* **13**, 231-236.

Paulson JF, Bazemore SD (2010). Prenatal and postpartum depression in fathers and its association with maternal depression. *JAMA* **303**, 1961-1969.

Renken B, Egeland B, Marvinney D, Mangelsdorf S, et al. (1989). Early childhood antecedents of aggression and passive-withdrawal in early elementary school. *Journal of Personality* **57**, 257-281.

Templeton L, Velleman R, Persaud A, Milner P (2003). The experiences of postnatal depression in women from black and minority ethnic communities in Wiltshire, UK. *Ethnicity and Health* **8**, 207-221.

Teng L, Robertson Blackmore E, Stewart DE (2007). Healthcare worker's perceptions of barriers to care by immigrant women with postpartum depression: an exploratory qualitative study. *Archive of Women's Mental Health* **10**, 93-101.

Thornton M, Williams J, McCrory C, Murray A, Quail A (2013). *Growing Up in Ireland National Longitudinal Study of Children: Design, Instrumentation and Procedures for the Infant Cohort at Wave One (9 Months), Technical Report Number 2*. Dublin, Ireland: Department of Children and Youth Affairs. (accessed at http://www.growingup.ie/fileadmin/user_upload/documents/Technical_Reports/9_month_instrumentation_report_final_18.12.13.pdf) (last accessed 30th September 2016)

Trevarthen C, Hubley P (1978). Secondary intersubjectivity: confidence, confiding and acts of meaning in the first year. In *Action, Gesture, and Symbol: The Emergence of Language*, ed. A Lock, pp. 183-230. New York: Academic.

Turner KM, Sharp D, Folkes L, Chew-Graham C (2008). Women's views and experiences of antidepressants as a treatment for postnatal depression: a qualitative study. *Family Practice* **25**, 450-455.

Van IJzendoorn MH, Goldberg S, Kroonenberg PM, Frenkel OJ (1992). The relative effects of maternal and child problems on the quality of attachment: a meta-analysis of attachment in clinical samples. *Child Development* **63**, 840-858.

Zink T, Levin L, Wollan P, Putnam F (2006). Mother's comfort with screening questions about sensitive issues, including domestic violence. *American Board of Family Medicine* **19**, 358-367.

Table 1. Results of unadjusted and fully adjusted logistic regressions examining odds of scoring ≥ 7 on the CESD in mothers of 9-month-old infants in Ireland

			N	n (wt %)	Unadjusted		Fully adjusted	
					OR	95% CIs	OR	95% CIs
Mother's characteristics	Age	16-24	1245	231 (19.1)	1.71	1.42, 2.08***	1.22	0.97, 1.52
		25-29	2284	268 (12.8)	1.00		1.00	
		30-34	3775	362 (9.7)	0.80	0.67, 0.94**	0.95	0.79, 1.14
		35-49	3591	315 (8.7)	0.72	0.61, 0.86***	0.82	0.67, 1.00*
	Ethnicity	White	10165	1078 (11.0)	1.00		1.00	
		Non-white	730	98 (14.1)	1.31	1.05, 1.63*	1.23	0.95, 1.60
	Education	Higher	7545	650 (8.1)	1.00		1.00	
		Secondary	3350	526 (15.2)	1.98	1.75, 2.23***	1.26	1.08, 1.46**
	Work	Working	4929	381 (8.2)	1.00		1.00	
		Not working	5966	795 (13.4)	1.84	1.61, 2.09***	1.27	1.10, 1.47**
	Previous MH probs	No	9547	699 (7.4)	1.00		1.00	
		Yes	1343	475 (36.0)	6.93	6.05, 7.93***	6.55	5.68, 7.56***
	Pregnancy intention	Intended	8701	793 (9.5)	1.00		1.00	
		Unintended	1995	349 (17.5)	2.11	1.84, 2.42***	1.43	1.22, 1.68***
Missing		199	34 (18.8)	2.05	1.41, 2.99***	1.87	1.25, 2.80**	
Parity	Later-born	6479	713 (11.4)	1.00		1.00		
	First-born	4416	463 (10.7)	0.95	0.84, 1.07	0.96	0.83, 1.12	
Infant characteristics	Gestational age	Not preterm	10154	1063 (10.8)	1.00		1.00	
		Preterm	715	109 (16.3)	1.54	1.24, 1.90***	1.35	1.07, 1.70*
	Health	Healthy	8278	843 (10.7)	1.00		1.00	
Unhealthy		2617	333 (12.4)	1.29	1.12, 1.47***	1.20	1.04, 1.39*	
Household characteristics	Partner in household	Yes	9569	871 (9.1)	1.00		1.00	
		No	1326	305 (22.9)	2.98	2.58, 3.45***	1.33	1.04, 1.70*
	Partner's current depression	Not depressed	8015	656 (8.2)	1.00		1.00	
		Depressed	318	71 (25.4)	3.22	2.45, 4.25***	2.66	1.97, 3.60***
		Missing	2562	449 (18.0)	2.38	2.09, 2.71***	1.43	1.17, 1.76***
	Family in the area	Yes	6923	700 (10.4)	1.00		1.00	
		No/unknown	3972	476 (12.5)	1.21	1.07, 1.37**	1.33	1.16, 1.54***
	Equivalent household income	Highest	1940	106 (5.9)	1.00		1.00	
		2	2175	170 (7.6)	1.47	1.14, 1.88**	1.27	0.98, 1.65
		3	1938	210 (10.9)	2.10	1.65, 2.68***	1.45	1.11, 1.88**
		4	1883	232 (13.1)	2.43	1.91, 3.09***	1.36	1.04, 1.79*
		Lowest	2138	362 (18.0)	3.53	2.81, 4.42***	1.60	1.21, 2.12***
		Missing	821	96 (11.8)	2.29	1.72, 3.06***	1.42	1.03, 1.96*
	Housing tenure	Owner	7367	652 (9.1)	1.00		1.00	
Tenant		3528	524 (16.9)	1.80	1.59, 2.03***	0.96	0.81, 1.15	
Region	Rural	6048	624 (10.3)	1.00		1.00		
	Urban	4807	547 (12.1)	1.12	0.99, 1.26	0.97	0.85, 1.12	

 * $p < 0.05$; ** $p < 0.01$; *** $p \leq 0.001$

Table 2. Results of unadjusted and fully adjusted logistic regressions examining likelihood of not attending a health professional for mental health problems since the birth of the cohort child in mothers who scored ≥ 7 on the CESD at 9 months postpartum

					Unadjusted		Fully adjusted	
			N	n (wtd %)	OR	95% CIs	OR	95% CIs
Mother's Characteristics	Age	16-24	230	171 (72.3)	1.10	0.74, 1.64	1.30	0.84, 2.01
		25-29	265	192 (71.8)	1.00		1.00	
		30-34	361	259 (67.3)	0.97	0.68, 1.38	0.97	0.67, 1.42
		35-49	313	232 (72.4)	1.08	0.75, 1.56	1.09	0.73, 1.64
	Ethnicity	White	1071	770 (69.8)	1.00		1.00	
		Non-white	98	84 (81.9)	2.38	1.33, 4.26**	2.21	1.18, 4.13*
	Education	Higher	647	492 (74.1)	1.00		1.00	
		Secondary	522	362 (68.1)	0.71	0.55, 0.92**	0.70	0.52, 0.94*
	Work	Employed	379	290 (77.5)	1.00		1.00	
		Unemployed	790	564 (67.3)	0.77	0.58, 1.02	0.75	0.55, 1.02
Parity	Later-born	708	508 (69.0)	1.00		1.00		
	First-born	461	346 (73.2)	1.18	0.91, 1.54	1.13	0.83, 1.53	
Infant characteristics	Gestational age	Not preterm	1060	779 (71.1)	1.00		1.00	
		Preterm	109	75 (65.8)	0.81	0.53, 1.24	0.82	0.52, 1.28
	Health	Healthy	839	620 (72.1)	1.00		1.00	
Unhealthy		330	234 (67.0)	0.87	0.66, 1.15	0.90	0.67, 1.20	
Household characteristics	Partner in household	Yes	864	635 (70.0)	1.00		1.00	
		No	305	219 (72.1)	0.94	0.70, 1.26	0.60	0.36, 1.00*
	Partner's current depression (CESD)	Not depressed	650	468 (68.8)	1.00		1.00	
		Depressed	71	53 (67.6)	1.18	0.67, 2.06	1.13	0.63, 2.01
		Missing	448	333 (73.4)	1.16	0.88, 1.52	1.61	1.02, 2.55*
	Family in the area	Yes	698	491 (69.1)	1.00		1.00	
		No	471	363 (73.1)	1.37	1.05, 1.79*	1.27	0.95, 1.69
	Equivalised household income	Highest	105	85 (78.2)	1.00		1.00	
		2	170	122 (66.7)	0.63	0.35, 1.13	0.61	0.33, 1.11
		3	205	144 (67.0)	0.55	0.31, 0.96*	0.58	0.32, 1.05
		4	232	160 (67.3)	0.55	0.32, 0.95*	0.64	0.35, 1.17
		Lowest	361	273 (75.7)	0.77	0.45, 1.31	0.88	0.47, 1.64
		Missing	96	70 (67.7)	0.67	0.35, 1.28	0.65	0.32, 1.32
Healthcare access	GP cover	751	545 (69.8)	1.00		1.00		
	Hospital only	193	147 (75.2)	1.19	0.83, 1.72	1.29	0.87, 1.93	
	None	225	162 (69.1)	0.95	0.68, 1.32	1.00	0.71, 1.42	
Housing tenure	Owner	647	465 (69.5)	1.00		1.00		
	Tenant	522	389 (72.3)	1.16	0.90, 1.51	1.15	0.81, 1.63	
Region	Rural	622	451 (70.9)	1.00		1.00		
	Urban	547	400 (70.5)	1.03	0.80, 1.34	0.96	0.73, 1.26	

* $p \leq 0.05$; ** $p < 0.01$

Supplementary File 1

Sampling

Infants and their families were randomly selected from the population of infants who were recorded on the Child Benefit Register during the period 1st December 2007 to 30th June 2008. On registration of a child's birth in Ireland, the Department of Social Protection automatically begins a Child Benefit claim for the child; therefore the Child Benefit Register is an appropriate sampling frame. Of 73,662 infants registered for Child Benefits in the 2008 calendar year, 41,185 infants were determined to be the correct age (i.e. 9 months) at time of interview during the data collection period (data for the wave 1 infant cohort was collected between September 2008 and April 2009) and therefore eligible to take part. Of 17,264 families who were approached, 11,134 primary caregivers agreed to take part (response rate of 64.5%). As the focus of our study was postpartum depression, we excluded any primary caregivers who were not the biological female parent of the cohort child (i.e. we excluded non-biological parents, or non-parental caregivers such as grandmothers, aunts, etc.) which resulted in a sample of 11,089. A flowchart showing further details of the derivation of the analytic samples for the present study are shown in Figure 1 in the accompanying supplementary file.

Supplementary file 2

Figure 1. Growing Up in Ireland study sampling frame and derivation of analytic samples

