Eighteen-year trajectories of depressive symptoms in mothers with a lifetime eating disorder: findings from the ALSPAC cohort

Yu Wei Chua, Gemma Lewis, Abigail Easter, Glyn Lewis and Francesca Solmi

Background
Two longitudinal studies have shown that depressive symptoms in women with eating disorders might improve in the antenatal and early postnatal periods. No study has followed up women beyond 8 months postnatal.

Aims
To investigate long-term trajectories of depressive symptoms in mothers with lifetime self-reported eating disorders.

Method
Using data from the Avon Longitudinal Study of Parents and Children and multilevel growth curves we modelled trajectories of depressive symptoms from the 18th week of pregnancy to 18 years postnatal in women with lifetime self-reported anorexia nervosa, bulimia nervosa or both anorexia and bulimia nervosa. As sensitivity analyses we also investigated these trajectories using quintiles of a continuous measure of body image in pregnancy.

Results
Of the 9276 women in our main sample, 126 (1.4%) reported a lifetime diagnosis of anorexia nervosa, 153 (1.6%) of bulimia nervosa and 60 (0.6%) of both anorexia and bulimia nervosa. Women with lifetime eating disorders had greater depressive symptoms scores than women with no eating disorders, before and after adjustment for confounders (anorexia nervosa: 2.10, 95% CI 1.36–2.83; bulimia nervosa: 2.28, 95% CI: 1.61–2.94, both anorexia and bulimia nervosa: 2.86, 95% CI 1.81–3.90). We also observed a dose-response association between greater body image and eating concerns in pregnancy and more severe trajectories of depressive symptoms, even after adjusting for lifetime eating disorders which also remained independently associated with greater depressive symptoms.

Conclusions
Women with eating disorders experience persistently greater depressive symptoms across the life-course. More training for practitioners and midwives on how to recognise eating disorders in pregnancy could help to identify depressive symptoms and reduce the long-term burden of disease resulting from this comorbidity.

Declaration of interest
None.

Keywords
ALSPAC; eating disorders; depression; parental mental health; perinatal mental health.

Copyright and usage
© The Royal College of Psychiatrists 2019. This is an Open Access article, distributed under the terms of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.

There is evidence that women with eating disorders, such as anorexia nervosa and bulimia nervosa, experience more postnatal (i.e. up to 12 months after pregnancy) depressive symptoms than the general population. Clinical studies have found that up to a third of women with eating disorders report postnatal depression1-3 and that, among women who experienced both anorexia nervosa and bulimia nervosa over the course of their lifetime, this proportion increased to two-thirds.2 Investigations of general population samples have shown that between 40% and 66% of women with a history of eating disorders had postnatal depression,1-6 compared with 5–13% (depending on severity of definition) in the general population.7 Existing evidence on postnatal depression in women with eating disorders has several limitations. First, many studies use clinical samples – some without a healthy comparison group1-3,7 – which can lead to selection bias and, potentially to an overestimation of this comorbidity. Second, most clinical and population-based studies use small samples, possibly with low statistical power.1-3,5,6 Third, studies have rarely investigated whether postnatal depressive symptoms vary by eating disorder diagnoses7 opting for broader definitions of current or past eating disorders1,5,8 or focusing on bulimia nervosa.2,3 Understanding whether these associations vary by eating disorder diagnoses can help to inform treatment approaches and shed light on shared or specific aetiological factors. Finally, the majority of studies used cross-sectional designs that do not allow study of how depressive symptoms develop over time.2,3,6

Two longitudinal studies have explored the trajectory of postnatal depressive symptoms in mothers with eating disorders but only followed participants to 8 months postnatal.5,8 These studies show that, overall, women with current or past eating disorders experience a reduction in symptoms during pregnancy,5,8 but that for those with current eating disorders their symptoms might increase in the postnatal period.8 As far as we are aware, no study has investigated longer-term trajectories of depressive symptoms in mothers with lifetime eating disorders. This would provide important information on the longer-term mental healthcare needs of this population. We investigated trajectories of depressive symptoms in mothers who reported a history of anorexia nervosa, bulimia nervosa or both, from the 18th week of pregnancy up to when their child was 18 years of age. As sensitivity analyses, we also explored these trajectories in women with greater body image and eating concerns in pregnancy, adjusting for lifetime eating disorder disorder. This allowed us to test whether current body image and eating concerns and past self-reported diagnoses were independently associated with depression trajectories.
We assessed depressive symptoms using the Edinburgh Postnatal Depression Scale (EPDS), a 10-item self-report measure of depressive symptoms. The EPDS has been extensively used to measure parental depression in general population studies and has been validated beyond the postnatal period. Possible scores range from 0 to 30 with higher scores indicating greater depressive symptoms. Depressive symptoms were measured at nine time points: at 18 and 32 weeks’ gestation; at 8 weeks and 8 months postnatally; and when the children were approximately 2, 3, 5, 6, 8, 11 and 18 years of age.

Potential confounders of the association between eating disorders and postnatal depressive symptoms were identified as: age at delivery, maternal social class (non-manual/manual), highest educational qualification achieved (compulsory/non-compulsory), and whether at least one parent (of the mother) had a diagnosis of any mental disorder (yes/no). We further included history of sexual abuse as a potential confounder given its known associations with both eating disorders and depression. Other than age at delivery, these variables were assessed using self-report questionnaires at 32 weeks’ gestation.

Data analysis
We described our sample in relation to exposure, confounders and outcome distributions using cross-tabulations with proportions and means with standard deviations, testing for overall group differences with one-way χ² tests and ANOVAs, respectively. We investigated the correlation between depressive symptoms across follow-up times.

Using multilevel modelling with growth curves (repeated depression measurements nested within individuals) to investigate the association between lifetime eating disorder diagnoses and depressive symptom trajectories, using full information maximum likelihood estimation to include those with at least three outcome measurements. First, we modelled trajectories of depressive symptoms across time with a linear slope term (time) (model A). In model B, we further included a quadratic slope term (time²) and random effects for both time and time² as this provided a better fit for the data (see supplementary Table 1). Next, we fitted multivariable conditional models. In model C, all confounders were included as fixed effects. Lifetime eating disorder diagnoses were added as a fixed effect in model D. Finally, in model E, we included interaction terms between lifetime eating disorder diagnoses and linear time, and lifetime eating disorder diagnoses and quadratic time. This tested differences in the slope of depressive symptom trajectories over time. In all models child age was mean centred at 4.8 years. We chose 4.8 years as it represented the mean follow-up time point and hence we hypothesised it would provide an average estimate of group differences (i.e. model intercept) over time.

To explore the potential for missing data to bias our results, we ran our models on women with complete exposure data and at least three outcome measurements, and imputed missing confounder and outcome data. We imputed 50 data-sets using multiple imputation by chained equations with linear, logistic and multinomial logistic regression models. As recommended in the literature, our imputation models included all variables used in our main analyses, plus a number of auxiliary variables: parity, marital status and smoking during pregnancy. As a sensitivity check, we further ran our complete cases models (based on those women with complete exposure and confounder data) and at least one outcome measurement available in order to further explore whether any bias was introduced by restricting our analyses to women with more follow-up measurements.

In sensitivity analyses, we tested whether body image and eating concerns in pregnancy were higher in women with lifetime eating disorders and depression. Other than age at delivery, these variables were assessed using self-report questionnaires at 32 weeks’ gestation.
women in our complete case sample (74.7% of those with complete exposure, 80.0% of those with complete exposure and outcome).

As shown in Table 1, in our complete case participants 126 (1.4%) women had a history of anorexia nervosa, 153 (1.6%) of bulimia nervosa, and 60 (0.6%) of both anorexia and bulimia nervosa. Most women had non-manual occupations (81.0%) and had completed compulsory education (59.4%). The average age at delivery was 28.6 years (s.d. = 4.7 years). Less than 5% of women reported a history of parental mental disorder (4.4%) or sexual abuse (4.7%). Compared with women without a history of eating disorders, those with a lifetime diagnosis of anorexia nervosa, bulimia nervosa, or both had greater educational attainment, and were more likely to not be married and to have a history of parental mental health problems or sexual abuse (Table 1).

### Missing data
Among women with complete exposure data, 812 (6.5%) had fewer than three follow-up EPDS measurements. As shown in supplementary Table 1, women with a history of anorexia nervosa, who were younger, unmarried, with a manual occupation, and who had only completed compulsory education and smoked in pregnancy were more likely to have missing outcome data.

### Lifetime eating disorders and depressive symptoms
As shown in supplementary Table 2, in the complete case participants, mean depressive symptoms scores ranged, across time points, between 5.2 (s.d. = 4.5) at 8 months’ postnatal to 7.4 (s.d. = 5.4) at 18 years of age of the offspring. On average women had greater depressive symptoms during pregnancy (18 weeks’ gestation mean 6.7 (s.d. = 4.7), 32 weeks’ gestation mean: 6.8 (s.d. = 4.9)) and at the offspring’s 18th year of age (mean 7.4, s.d. = 5.4). Depressive symptoms were moderately to highly correlated between each time point, and more strongly correlated for measurements made closer in time, as we would expect in repeated measures designs (supplementary Table 3). At all time points, women with lifetime eating disorders had greater depressive symptoms supplementary Table 2).

### Growth curve models
In supplementary Table 4 we report our model-building approach for unconditional models A and B and conditional model C, and in Table 2, results of models D and E. In model D, we found evidence that women with lifetime anorexia nervosa, bulimia nervosa, and both anorexia and bulimia nervosa all had greater depressive symptoms (anorexia nervosa coefficient: 1.88, 95% CI 1.24–2.51; bulimia nervosa coefficient: 1.72, 95% CI 1.15–2.30; both anorexia and bulimia nervosa coefficient: 2.68, 95% CI 1.77–3.60). The overlapping 95% CIs suggest that these differences did not vary by group. In model E, where we included two interaction terms between eating disorders and time and eating disorders and time2, results were largely unchanged with self-reported eating disorder still reporting greater depressive symptoms, regardless of diagnosis, as can be seen in Fig. 1 plotting the model estimates. When we relaxed our assumptions on outcome missingness and extended the sample to women with at least one outcome measurement available results were comparable (see supplementary Table 5).

### Multiple imputation
We also re-ran models A–E in the those women (n = 11 590) with complete exposure data and three or more depression measurements, and imputed missing confounders and outcome. As can be seen in supplementary Table 6, results did not change substantially in these models. Women with a lifetime eating disorder still had greater postnatal depressive symptoms in models D and E and, although coefficients were larger in the imputed sample, 95% CIs largely overlapped with those of our main analytical samples.

### Sensitivity analyses
A total of 8722 women had complete data on body image and eating concerns in pregnancy, at least three outcome measurements, and all confounders including maternal self-reported eating disorder diagnosis. Of these, 2316 (26.6%), 1823 (20.9%), 1524 (17.5%), 1569 (18.0%), and 1490 (17.0%) were in the first, second, third, fourth and fifth quintile of body image and eating concerns, respectively. Compared with those in the bottom quintile, more women in the top quintile reported a history of sexual abuse (3.6% v. 7.7%) and parental mental health problems (3.7% v. 5.6%). Women in the top quintile were also younger (28.4 v. 28.7 years) (data available from the authors on request). Women with lifetime self-reported eating disorder reported greater body image dissatisfaction and eating concerns in pregnancy (adjusted coefficients for anorexia nervosa: 1.07, 95% CI 0.30–1.94; bulimia nervosa: 2.83, 95% CI 2.14–3.51, both anorexia and bulimia nervosa: 2.89, 95% CI 1.80–2.98, see supplementary Table 7).

Results of model A–C are reported in supplementary Table 8. Table 3, shows the results of models D and E. In both models, we observed a dose–response association between increasing levels of body image dissatisfaction and eating concerns and depressive symptoms (see also supplementary Fig. 1). For women in the top quintile of body image and eating concerns, depressive symptoms appeared to decrease at a higher pace in the antenatal and postnatal periods, although remaining the most symptomatic group over the

### Table 1 Participants characteristics

| Lifetime eating disorder, n (%) | Participants, total | No eating disorder | Anorexia nervosa | Bulimia nervosa | Anorexia nervosa + bulimia nervosa |
|-------------------------------|---------------------|--------------------|-----------------|-----------------|-----------------------------------|
| Social class, n (%)           |                     |                    |                 |                 | P                                 |
| Manual                        | 1763 (19.0)         | 1692 (18.9)        | 25 (19.8)       | 33 (21.6)       | 13 (21.7)                         |
| Non-manual                    | 7513 (81.0)         | 7245 (81.1)        | 101 (80.2)      | 120 (78.4)      | 47 (78.3)                         |
| Education, n (%)              |                     |                    |                 |                 | 0.80                              |
| Compulsory                    | 5513 (59.4)         | 5348 (59.8)        | 59 (46.8)       | 82 (53.6)       | 24 (40.0)                         |
| A level or degree             | 3763 (40.6)         | 3589 (40.2)        | 67 (53.2)       | 71 (44.4)       | 36 (60.0)                         |
| Parental mental disorder, n (%)|                     |                    |                 |                 | <0.001                            |
| No                            | 8866 (95.6)         | 8562 (95.8)        | 114 (90.5)      | 138 (90.2)      | 52 (86.7)                         |
| Yes                           | 410 (4.4)           | 375 (4.2)          | 12 (9.5)        | 15 (9.8)        | 8 (13.3)                          |
| History of sexual abuse, n (%)|                     |                    |                 |                 | <0.001                            |
| No                            | 8844 (95.3)         | 8547 (95.6)        | 113 (89.7)      | 137 (89.5)      | 47 (78.3)                         |
| Yes                           | 432 (4.7)           | 390 (4.4)          | 13 (10.3)       | 16 (10.5)       | 13 (21.7)                         |
| Age at delivery, years: mean (s.d.) | 28.6 (4.7) | 28.6 (4.7) | 29.4 (5.1) | 28.2 (4.5) | 29.3 (3.9) | 0.11 |
entire follow-up period. Lifetime eating disorder remained very strongly associated with greater depressive symptoms independently of current symptoms with coefficients comparable with those observed in the main analyses.

Discussion

In this large longitudinal general population cohort, we found that women with an eating disorder at some point in their lives had greater depressive symptoms in the perinatal period and that these symptoms persisted over an 18-year follow-up. We also found that women with greater body image and eating concerns in pregnancy had higher depressive symptoms across the life-course, after accounting for self-reported lifetime eating disorder, which was still independently associated with the outcome.

Strengths and limitations

To our knowledge, this is the first study to explore long-term (i.e. from pregnancy until age 18 of their study child) trajectories of depressive symptoms among mothers with lifetime eating disorders and current eating disorder symptoms. This study had a number of strengths. We used data from a large general population cohort of mothers, which allowed us to avoid biases associated with clinical samples and investigate symptom presentations that might be common in the general population. Owing to the large size of our sample we could also investigate differences in patterns of depressive symptoms across eating disorder diagnoses, which have not been explored in previous literature. Finally, our multilevel analytical approach allowed us to make efficient use of the longitudinal nature of our sample and minimise the impact of losses to follow-up.

Our study also had a number of limitations. First, our main exposure variable was based on a self-reported measure of lifetime eating disorder.
eating disorder, which could have resulted in some degree of misclassification or recall bias. However, a number of studies have used this definition as there is evidence that this approach yields acceptable levels of sensitivity and specificity in community samples. Our prevalence estimates are also in line with those published online by Cambridge University Press.

Comparison with previous literature

Our findings are largely consistent with those of previous investigations using a trajectory-based modelling approach, finding that women with current or lifetime history of eating disorders have greater depressive symptoms compared with the general population. These studies, however, also showed that depressive symptoms in women with eating disorders decrease over the antenatal and perinatal period.

Table 3 Results of multilevel models D and E showing the association between quintiles of maternal body image and eating concerns in pregnancy and trajectories of depressive symptoms in complete case participants (n = 8722)\textsuperscript{a}

| Quintiles of eating disorder cognitions | Model D, coefficient (95%CI) | Model E, coefficient (95%CI) |
|----------------------------------------|-----------------------------|-----------------------------|
| 1st (lowest)                           | Reference                   | Reference                   |
| 2nd                                    | 0.75 (0.55 to 0.97)**       | 0.68 (0.43 to 0.92)**       |
| 3rd                                    | 1.20 (0.98 to 1.42)**       | 1.15 (0.89 to 1.41)**       |
| 4th                                    | 1.94 (1.72 to 2.15)**       | 1.78 (1.52 to 2.04)**       |
| 5th (highest)                          | 3.23 (3.01 to 3.46)**       | 2.98 (2.62 to 3.14)**       |
| Quintiles of eating disorder cognitions × time |                          |                             |
| 1st (lowest)                           | Reference                   | Reference                   |
| 2nd                                    | –                           | Reference                   |
| 3rd                                    | –                           | –                           |
| 4th                                    | –                           | –                           |
| 5th (highest)                          | –                           | –                           |
| Quintiles of eating disorder cognitions × time\textsuperscript{2} |                          |                             |
| 1st (lowest)                           | Reference                   | Reference                   |
| 2nd                                    | –                           | –                           |
| 3rd                                    | –                           | 0.0002 (0.00001 to 0.0003)   |
| 4th                                    | –                           | 0.0001 (0.00001 to 0.0003)   |
| 5th (highest)                          | –                           | 0.0002 (0.00001 to 0.0003)   |
| Lifetime eating disorder               | Reference                   | Reference                   |
| No eating disorder                     | Reference                   | Reference                   |
| Anorexia nervosa                       | 1.50 (0.86 to 2.13)**       | 1.49 (0.85 to 2.13)**       |
| Bulimia nervosa                        | 1.16 (0.59 to 1.73)**       | 1.16 (0.59 to 1.73)**       |
| Anorexia nervosa + bulimia nervosa     | 1.84 (0.94 to 2.74)**       | 1.84 (0.94 to 2.74)**       |

\textsuperscript{a}Model D: adjusting for maternal age, education, social class, history of sexual abuse, parental mental health and maternal self-reported lifetime eating disorder. Model E: adjusting for model D + interactions between maternal body image and eating concerns in pregnancy and both time and time square.

*0.05 < p < 0.01; **p < 0.0001.
Second, we did not group eating disorders according to presence or absence of self-reported lifetime diagnosis of ‘severe depression’. Given the retrospective nature of the questions included in ALSPAC, we would not have been able to exclude that depression was a consequence of eating disorders. Hence, stratifying for depression could have masked the effect of the exposure on the outcome. Nevertheless, future studies should further explore mechanisms that explain these patterns of comorbidity, as they could provide important insights on the aetiology of these conditions across the life-course.

Interpretation of findings

The finding that mothers with a lifetime history of eating disorders – regardless of their diagnosis – continue to experience greater depressive symptoms up to 18 years after pregnancy could indicate that a considerable number of women might not fully recover from eating disorders, since these are highly comorbid with depression. It is known that, among women treated for eating disorders, around a third do not fully recover.26 A study by Bardone-Cone and colleagues found that women who achieve only partial recovery from eating disorders scored similarly to women with active eating disorders on a number of eating disorder, body image and psychopathology scales (including depression and anxiety) with greater scores compared with healthy controls and women who had achieved full recovery.27

However, we also found that lifetime eating disorders were still associated with greater depressive symptoms, regardless of body image and eating concerns in pregnancy. This association is consistent with the hypothesis that depressive symptoms might be a risk factors for onset of eating disorders and persist after recovery. Supporting this hypothesis, a study of adolescents who had achieved a 3-year recovery from anorexia nervosa (defined as weight restoration, stable periods, and absence of eating disorder symptoms) found that the latter, compared with healthy controls, still reported greater obsessive–compulsive, anxious and depressive traits.28

The potential persistence of depressive symptoms in mothers after eating disorder recovery is of note, as the former have been associated with negative outcomes in the offspring. A previous study has shown that children of women with eating disorders had greater odds of mental health difficulties in early childhood and that these associations were largely mediated by the presence of depression and anxiety in pregnancy.29 Although little is known about the long-term psychopathological outcomes of children of mothers with eating disorders, postnatal depression has consistently been associated with offspring developmental delays,30 higher rates of psychopathology31 and obesity.32 A recent study has also shown that children of mothers with more severe and persistent maternal depression,33 have adverse long-term outcomes, including greater depression and poorer academic achievement. This evidence suggests that children of women eating disorders could be at greater risk of a number of adverse outcomes by way of the latter experiencing greater and more persistent depressive symptoms. Future studies should explore these associations.

Finally, it is worth noting that for all women, regardless of eating disorder diagnosis, depressive symptoms increased when their offspring was 18 years of age. Recent nationwide UK data from the 2014 Adult Psychiatry Morbidity Survey found that the prevalence of depression was highest in women aged 16–24 years, decreased between 25 and 44 and then increased again between the ages of 45 and 54.34 The reasons for the increase in depression between the ages of 45 and 54 years are poorly understood, but they likely involve a complex interplay of social, psychological and biological factors. The menopause, for example, occurs between the ages of 44 and 55 years, with an average age in the UK of 51 years. Depressive symptoms have been found to increase during the menopausal transition (around 3 years prior to the menopause).28 More research on risk factors for midlife depression in women are thus warranted.

To conclude, from a public health point of view, identifying pregnant women who have had an eating disorder in the past or might be experiencing concerns with their body image in pregnancy could help to also detect women at risk for depression. This might help to reduce the burden of postnatal depression, with benefits for both women and, potentially, their offspring. High levels of stigma perceived by people with eating disorders and difficulties in identifying eating disorders in general practice represent known barriers to treatment access, particularly in pregnancy.29 A recent systematic review suggests that presence of mental health comorbidity is perceived by people with eating disorders as facilitating help-seeking.30 In the UK, current guidelines from the National Institute for Health and Care Excellence (NICE) recommend using the EPDS or the Whooley questionnaire as part of a general discussion about woman’s mental health and well-being during pregnancy and in the early postnatal period.33 As recent evidence confirms, women who disclosed depressive symptoms using these measures were also more likely to report other comorbid mental health disorders, including eating disorders.32 Hence, identifying depression in women with current or past eating disorders could provide them with a gateway to accessing more intensive perinatal care, as recommended by NICE.33 This could also help to prevent postnatal relapse of the eating disorder and long-term depressive symptoms identified in this study.

It is of critical importance to increase awareness of eating disorders in pregnancy and to train clinicians and midwives to recognise and support women with eating disorders in this crucial phase of their lives. The antenatal and early postnatal periods can be a time when eating disorder symptoms temporarily improve34 and women might be more open to change, hence they could be a key moment for the identification of these conditions with long-term benefits for these women.

Yu Wei Chua, MSc, PhD candidate in Education, Laboratory for Innovation in Autism, University of Strathclyde, UK; Gemma Lewis, PhD, Research Associate in Psychiatric Epidemiology, Division of Psychiatry, University College London, UK; Abigail Easter, PhD, Senior Postdoctoral Research Fellow, Centre for Implementation Science, Institute of Psychiatry, Psychology and Neuroscience, King’s College London, UK; Glyn Lewis, PhD, Professor of Epidemiological Psychiatry, Division of Psychiatry, University College London, UK; Francesca Solmi, PhD, Sir Henry Wellcome Post-doctoral Fellow, Division of Psychiatry, University College London, UK

Correspondence: Francesca Solmi, UCL Division of Psychiatry, 6th Floor, Wing B, Maple House, 189 Tottenham Court Road, London W1T 2NF, UK, Email: francesca.solmi@ucl.ac.uk

First received 27 Jul 2018, final revision 18 Nov 2018, accepted 17 Mar 2019

Funding

F.S. is supported by a Sir Henry Wellcome Fellowship funded by the Wellcome Trust (grant no. 209196/Z/17/Z). This work is also supported by the UCLH NIHR Biomedical Research Centre. The UK Medical Research Council and Wellcome (Grant ref. T022152/2/17/2) and the University of Bristol provide core support for ALSPAC. A.E. is supported by a King’s Improvement Science Fellowship. King’s Improvement Science is part of the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care South London (CLAHRC South London) and comprises a specialist team of improve- ment scientists and senior researchers based at King’s College London. Its work is funded by King’s Health Partners (Guy’s and St Thomas’ NHS Foundation Trust, King’s College Hospital NHS Foundation Trust, King’s College London and South London and Maudsley NHS Foundation Trust), Guy’s and St Thomas’ Charity, the Maudsley Charity and the Health Foundation. This research was supported by the NIHR CLAHRC South London at King’s College Hospital NHS Foundation Trust. The views expressed in this article are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.
Acknowledgements

We are extremely grateful to all the families who took part in this study, the midwives for their help in recruiting them, and the whole ALSPAC team, which includes interviewers, computer and laboratory technicians, clerical workers, research scientists, volunteers, managers, receptionists and nurses.

Supplementary material

Supplementary material is available online at https://doi.org/10.1192/bjp.2019.89.

References

1. Franko DL, Blais MA, Becker AE, Delinsky SS, Greenwood DN, Flores AT, et al. Pregnancy complications and neonatal outcomes in women with eating disorders. Am J Psychiatry 2001; 158: 1461–6.
2. Morgan JF, Lacey JH, Sedgwick PM. Impact of pregnancy on bulimia nervosa. Br J Psychiatry 1999; 174: 135.
3. Morgan JF, Lacey JH, Chung E. Risk of postnatal depression, miscarriage, and perterm birth in bulimia nervosa: retrospective controlled study. Psychosom Med 2006; 68: 487–92.
4. Micali N, Simonoff E, Stahl D, Treasure J. Maternal eating disorders and infant feeding difficulties: maternal and child mediators in a longitudinal general population study. J Child Psychol Psychiatry 2011; 52: 800–7.
5. Easter A, Solmi F, Bye A, Taborelli E, Corfield F, Schmidt U, et al. Antenatal and postnatal psychopathology among women with current and past eating disorders: longitudinal patterns. Eur Eat Disord Rev 2014; 23: 19–27.
6. Mazzeo SE, Landt M, Jones I, Mitchell K, Kendall KS, Neale MC, et al. Associations among postpartum depression, eating disorders, and perfectionism in a population-based sample of adult women. Int J Eat Disord 2006; 39: 202–11.
7. Howard LM, Molyneaux E, Dennis CL, Rochat T, Stein A, Milgrom J. Non-psychotic mental disorders in the perinatal period. Lancet 2014; 384: 1775–88.
8. Micali N, Simonoff E, Treasure J. Pregnancy and post-partum depression and anxiety in a longitudinal general population cohort: the effect of eating disorders and past depression. J Affect Disord 2011; 131: 150–7.
9. Boyd A, Golding J, Macleod J, Lawlor DA, Fraser A, Henderson J, et al. Cohort profile: the Avon longitudinal study of parents and children: ALSPAC mothers cohort. Int J Epidemiol 2013; 42: 97–110.
10. Golding J, Pembrey M, Jones R. ALSPAC—the Avon longitudinal study of parents and children. I. Study methodology. Paediatr Perinat Epidemiol 2001; 15: 74–87.
11. Kothari R, Solmi F, Treasure J, Micali N. The neuropsychological profile of children at high risk of developing an eating disorder. Psychol Med 2012; 1–12.
12. Keski-Rahkonen A, Sithola E, Raevuori A, Kaukoranta J, Bulik CM, Hoek HW, et al. Reliability of self-reported eating disorders: optimizing population screening. Int J Eat Disord 2006; 39: 754–62.
13. Pearson RM, Evans J, Kouali D, Lewis G, Heron J, Ramchandani PG, et al. Maternal depression during pregnancy and the postnatal period risks and possible mechanisms for offspring depression at age 18 years. JAMA Psychiatry 2013; 70: 1312–9.
14. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale. Br J Psychiatry 1987; 150: 782–6.
15. Royston P, White IR. Multiple imputation by chained equations (MICE): implementation in Stata. J Stat Softw 2011; 45.
16. Sterne JAC, White IR, Carlin JB, Spratt M, Royston P, Kenward MG, et al. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. BMJ 2009; 338: b2393.
17. Nicholls DE, Viner RM, Doll H, Davies B, O’Connor M, Sullivan P. Childhood risk factors for lifetime anorexia nervosa by age 30 years in a national birth cohort. J Am Acad Child Adolesc Psychiatry 2009; 48: 791–9.
18. Smitk FRE, Van Hoeeken D, Hoek HW. Epidemiology of eating disorders: incidence, prevalence and mortality rates. Curr Psychiatry Rep 2012; 14: 406–14.
19. Keel PK, Brown TA. Update on course and outcome in eating disorders. Int J Eat Disord 2010; 43: 195–204.
20. Bardone-Cone AM, Harney MB, Maldonado CR, Lawson MA, Robinson DP, Smith R, et al. Defining recovery from an eating disorder: conceptualization, validation, and examination of psychosocial functioning and psychiatric comorbidity. Behav Res Ther 2010; 48: 194–202.
21. Holthamp K, Muller B, Heussen N, Remschmidt H, Herpertz-Dahlmann B. Depression, anxiety, and obsessiveness in long-term recovered patients with adolescent-onset anorexia nervosa. Eur Child Adolesc Psychiatry 2005; 14: 106–10.
22. Micali N, Stahl D, Treasure J, Simonoff E. Childhood psychopathology in children of women with eating disorders: understanding risk mechanisms. J Child Psychol Psychiatry 2014; 53: 124–34.
23. Deave T, Heron J, Evans J, Emond A. The impact of maternal depression in pregnancy on early child development. BJOG 2008; 115: 1043–51.
24. Foulir E, Ruddy A, Midobuah E. Maternal depression and trajectories of child internalizing and externalizing problems: the roles of child decision making and working memory. Psychol Med 2017; 47: 1138–48.
25. Lampard AM, Frankel RR, Davison KK. Maternal depression and childhood obesity: a systematic review. Prev Med (Baltim) 2014; 59: 60–7.
26. Nests E, Pearson RM, Murray L, Cooper P, Craske MG, Stein A. Association of persistent and severe postnatal depression with child outcomes. JAMA Psychiatry 2018; 75: 247–53.
27. NHS Digital. Mental Health and Wellbeing in England Adult Psychiatric Morbidity Survey 2014. NHS, 2016.
28. Freeman EW, Sammel MD, Boorman DW, Zhang R. Longitudinal pattern of depressive symptoms around natural menopause. JAMA Psychiatry 2014; 71: 36–43.
29. Bye A, Shaw J, Bick D, Easter A, Kush-McDonald M, Micali N. Barriers to identifying eating disorders in pregnancy and in the postnatal period: a qualitative approach. BMC Pregnancy Childbirth 2018; 18: 114.
30. Ali K, Farrer L, Fassnacht DB, Gulliver A, Bauer S, Griffiths KM. Perceived barriers and facilitators towards help-seeking for eating disorders: a systematic review. Int J Eat Disord 2017; 50: 9–21.
31. National Institute for Health and Care Excellence. Antenatal and Postnatal Mental Health Guidelines. Clinical Guidelines CG192. NICE, 2014.
32. Howard LM, Ryan EG, Trevillion K, Anderson F, Bick D, Bye A, et al. Accuracy of identifying depression and other mental disorders in early pregnancy. Br J Psychiatry 2018; 212: 50–6.
33. National Institute for Health and Care Excellence. Eating Disorders: Recognition and Treatment. Appendix P: Economic Evidence – Evidence Tables. NICE, 2017.
34. Taborelli E, Easter A, Keefe R, Schmidt U, Treasure J, Micali N. Transition to motherhood in women with eating disorders: a qualitative study. Psychother Practioner Theory Res Pract 2016; 89: 308–23.