



## Costs and benefits of scaling psychosocial interventions during the perinatal period in England: A simulation modelling study

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### ABSTRACT

**Background:** Globally, guidance recommends the integration of mental health into maternal and child healthcare to address common maternal mental health problems during the perinatal period. However, implementing this in the real-world requires substantial resource allocations.

**Objective:** The aim of this study was to estimate the likely costs and consequences linked to scaling the delivery of treatment (in the form of psychosocial interventions) during the perinatal period.

**Design:** Simulation modelling.

**Setting(s):** England.

**Methods:** Costs and consequences were modelled for three scenarios of assumed provision of services, whereby one referred to the projected provision under current government plans, with no additional scaling up of treatment. The other two scenarios referred to additional scaling of treatment: in one scenario, this referred to the provision of treatment by midwives and health visitors trained in the routine enquiry about mental health and delivery of psychosocial interventions; in the other scenario this referred to an expanded provision by primary mental health services. For each scenario and in yearly intervals (covering a ten-year period, 2015 to 2024), unit costs and outcomes were assigned to the activities women were assumed to receive (routine enquiry, assessment, treatment, care coordination). All costs were in 2020 pounds sterling. Data sources for the modelling included: published findings from randomised controlled trials; national unit cost source; national statistics; and expert consultation.

**Results:** If the projected treatment gap was to be addressed, an estimated additional 111,154 (50,031) women would be accessing treatment in 2015 (2024). Estimated total costs (including cost offsets) in the scenario of projected provision under current government plans would be £73.5 million in 2015 and £95.2 million in 2024, whilst quality-adjusted life years gained would be 901 and 928 respectively. Addressing the treatment gap through provision by trained midwives and health visitors could mean additional costs of £7.3 million in 2015 but lower costs of £18.4 million in 2024. The additional quality-adjusted life years gained are estimated at 2096 in 2015 and 1418 in 2024. A scenario in which the treatment gap would be met by primary mental health services was likely to be more costly and delivered less health gains.

**Conclusions:** Findings from this modelling study suggest that scaling the integration of mental health care into routinely delivered care for women during the perinatal period might be economically viable.

**Registration:** N/A.

**Tweetable abstract:** Integrating mental health into maternal and child healthcare might generate economic benefits new study by @a\_annettemaria and @knappem @CPEC\_LSE finds #increasing access to treatment for women with perinatal mental health problems

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### What is already known

- Common perinatal mental health problems have detrimental adverse impacts on women and their children.
- Integrating mental health into maternal and child health services is recommended but has not been widely implemented.

- Maternal and child healthcare professionals (e.g. midwives and health visitors, in some countries known as public health or family nurses) can be trained to deliver treatment cost-effectively but there is no information on costs and likely pay-offs if treatment was scaled nationally.

### What this paper adds

- Findings from this economic modelling study suggest scaling treatment for common perinatal mental health problems can potentially lead to substantial quality of life improvement and some pay-offs, but leads to pay-offs and substantial quality of life improvements over a ten year period.
- Implications from the findings relate to a shift in policy, service planning and delivery to achieve parity of mental health care with physical health care.
- In the intergenerational mental health field, participatory economic modelling studies can potentially produce robust, relevant and acceptable economic evidence to decision makers.

## 1. Background

In many high-income countries there has been an increasing focus on investing in supporting women's mental health during the perinatal period (Howard and Khalifeh, 2020). England provides an example of a country in which the government has made perinatal mental health a policy priority and invested substantially in specialist perinatal mental health services (Cantwell, 2022). These specialist services, such as mother and baby units and community specialised community perinatal mental health teams, are funded to provide care for women with severe or complex mental health problems during the perinatal period. Although guidance and policies also cover the provision of treatment for women who experience mental health problems that do not meet the threshold for specialist services, including through stepped care models (NHS, 2016; NHS, 2019; Howard and Khalifeh, 2020), implementing those plans has been challenging (Smith et al., 2019; Millett et al., 2018). As a result, many women with common mental health problems are currently not identified or offered treatment during the perinatal period, a gap which became especially evident during the Covid-19 pandemic (MMHA, 2021).

The substantial burden linked to common mental health problems during the perinatal period is well-established and includes negative impacts on mothers and children, for example in health-related quality of life, productivity losses and service use (Da Costa et al., 2006; Epperson et al., 2020; Jacques et al., 2019). Adverse outcomes in the children include neonatal and birth outcomes (Jarde et al., 2016), development problems (Madigan et al., 2018; Rogers et al., 2020) and lower school performance (Law et al., 2021). In previous research, we estimated the lifetime costs of untreated maternal anxiety and depression during the perinatal period to be £6.6 billion in the United Kingdom, which included costs linked to many short- and long-term impacts on mothers and children (Bauer et al., 2016).

There is substantial, robust evidence that psychosocial interventions based on cognitive behavioural or interpersonal therapy approaches, provided alone or alongside drug treatments, are effective in preventing, reducing the risk of worsening and reducing the impact of common perinatal mental health problems (Dennis, 2014; Morrell et al., 2016). The evidence suggests that these interventions can also be cost-effective (Morrell et al., 2016; Camacho and Shields, 2018), with most studies showing that interventions fall below the £30,000 cost per quality-adjusted life year threshold used by the Health Technology Assessment Agency in England (the National Institute for Health and Care Excellence, NICE) (McCabe et al., 2008). These treatments can be effectively delivered in primary care or community settings (Stephens

et al., 2016). Several trials have shown that training general health professionals responsible for providing maternal and (early) child healthcare, such as midwives and health visitors (also known as public health or family nurses in some countries), to deliver those psychosocial interventions is feasible, effective and cost-effective (Morrell et al., 2016; Brugha et al., 2011; Brugha et al., 2016; Henderson et al., 2019).

Whilst bodies such as the World Health Organization clearly set out the role of healthcare professionals such as midwives and health visitors in integrating mental health treatment into their routine care (WHO, 2022; WHO, 2021), several challenges prevent professional groups from taking on these roles. Challenges include substantial staff shortages, high workloads, many competing priorities, a lack of mental health training as part of formal staff education (Higgins et al., 2018; Byatt et al., 2012), a historical bias in favour of physical health and the absence of any form of mental health trained professionals in the traditional multidisciplinary teams. Without additional resources it is unlikely that professionals will be willing and able take on the shifts in culture and practice required for identifying women with mental health problems and ensuring good and safe care. Evidence which provides information about required investments and potential returns might have an important role in informing the necessary resource allocation decisions.

The aim of this study was to develop a model that estimates the likely costs, cost consequences and health-related quality of life improvements linked to alternative plausible scenarios for scaling the delivery of psychosocial interventions for women with common mental health problems in England.

## 2. Method

Using a simulation modelling approach, we combine evidence on effectiveness and cost-effectiveness of interventions from previous studies with estimates of the number of women with untreated common mental health problems during the perinatal period for the period 2015 to 2024 (in yearly intervals) to project the costs, economic consequences (reduction in health and social care expenditure) and health-related quality of life improvements linked to addressing unmet needs. We included past years into the modelling, choosing 2015 as the starting year, which is the year in which substantial investment in specialist perinatal mental health services started. In our model, we estimate the number of women who are untreated through a detailed analysis of the number of women with mental health problems simulated (and projected) to access services and treatment in England, and apply two intervention scenarios aimed at addressing those unmet needs. All costs and economic consequences are in 2020-pounds sterling.

### 2.1. Scenarios

We compare costs and consequences (cost consequences and health-related quality of life improvements) between three scenarios. In all three scenarios the government plans for increased provision for women with severe and complex problems are assumed. The *first* (scenario 1) assumes no additional scaling-up of treatment for women with common mental health problems. In the second and third scenarios all women with common mental health problems who are eligible and accept treatment, receive it. The second and third scenarios differ from each other with regard to assumptions about who is providing treatment to address the unmet need. In the *second* scenario (scenario 2) it is assumed that healthcare professionals (such as midwives and health visitors and/or other professionals within the multidisciplinary team) who have received specific training as outlined in trials (Morrell et al., 2009; Brugha et al., 2011; Brugha et al., 2016) ask about and talk to women about their mental health as part of their routine visits and deliver low-intensity treatment to women where indicated. In the *third* scenario (scenario 3), it is assumed that practitioners in separate primary mental health services (clinical psychologists and wellbeing

practitioners) receiving referrals from healthcare professionals, provide clinical assessments and deliver low-intensity treatment.

## 2.2. Data sources and expert consultation

Data on (cost-)effectiveness of interventions were taken from trials or meta-analyses of trials which we analysed and extracted thoroughly; some of the evidence is provided in synthesised form in the guideline published by the National Institute for Health and Care Excellence (NICE, 2014), so this was used where possible. Unit costs for staff time were taken from the *Unit Costs for Health and Social Care* compendium (Curtis and Burns, 2020). Unit costs refer to direct face-to-face time and include various non-salary related costs, such as overhead costs and costs for training and supervision. Published national statistics and population projections were available for numbers of women giving birth in England; prevalence data were taken from a recent England-based source (Howard et al., 2018). Proportions of women accessing mental health services during the perinatal period were taken or derived from linked maternity service and mental health service data, and a South London study (Lee-Carbon et al., 2022). Experts were consulted at different stages throughout the study.

All parameters, values and data sources are presented in Table 1.

## 2.3. The 'interventions'

In the model, women can receive the following types of interventions in line with a stepped model of care (NICE, 2014): identification through routine enquiry for mental health problems; assessment (for women who screen positive); provision of low-intensity treatment (such as guided self-help) for women with mild to moderate symptoms and of high-intensity treatment (such as a full course of cognitive behavioural therapy) for women with moderate to severe symptoms; and care coordination for women with severe or complex needs. For each of the interventions, we present the evidence on costs and – if available – benefits that are then assigned to the number of women estimated to receive interventions (as outline under 'Target population').

### 2.3.1. Identification through routine enquiry

Evidence shows that training healthcare professionals (midwives and health visitors) in mental health, which includes the possible delivery of psychologically informed interventions where indicated, has preventative effects for women with no or subthreshold mental health problems (Henderson et al., 2019). This suggests that, as midwives and health visitors are applying their acquired learning to the way they are asking about and talking to women about their mental health and wellbeing during their visits, this is addressing relevant concerns, thus leading to small but significant improvements in women's health-related quality of life (adjusted mean difference in quality-adjusted life years of 0.002). In addition, findings from the same study suggest that, as midwives and health visitors are trained to better address mental health concerns, fewer or shorter visits are needed, which leads as well to reductions in health expenditure of £101 (Henderson et al., 2019). We apply those cost consequences and health-related quality of life benefits to women who are asked about their mental health by trained midwives and health visitors but do not meet the threshold for treatment.

Costs are established based on evidence about the number and duration of visits (in hours) and unit cost of the midwives and health visitors per hour, which is £98 if they have not been trained in mental health and £102 if they have been trained. Since, according to national guidance (NICE, 2014; PHE, 2016), women should be asked at every visit by a midwife or health visitor about their mental health, we multiplied the recommended average number of visits (10 in the antenatal period; 6 in the postnatal period) with the durations of the conversations (1 to 5 min) and the unit costs. (According to experts we consulted during the

study, the first conversation about mental health during the antenatal period could be reasonably assumed to take 5 min whereas subsequent ones 1 min; in the postnatal period, all conversations to ask about mental health are assumed to last 5 min each.)

### 2.3.2. Assessments

The costs of assessments by midwives and health visitors as well as by mental health professionals are included in the model; no benefits linked to assessments are included since we were unable to identify evidence for those.

As done for calculating the costs of routine enquiry, costs are calculated by multiplying the number and duration of assessments with the unit costs (which are as stated above for midwives and health visitors and £105 for mental health professional). In the model, all women who screen positive are assessed before receiving treatment, and the assessment is assumed to last 10 min if done by a midwife or health visitor and 12 min if done by a mental health professional.

### 2.3.3. Low-intensity treatment

Low-intensity treatment can refer to a range of psychologically informed interventions, typically referring to those that employ cognitive behavioural therapy or interpersonal therapy approaches or techniques. Since NICE recommends guided self-help for women with subthreshold, mild-to-moderate depression, evidence for this intervention is used, which shows that it reduces depressive symptoms, improves quality of life (adjusted mean difference in quality-adjusted life years of 0.01) (NICE, 2014), whilst also offsetting some of the intervention cost (£458) by £78 (Trevillion et al., 2020).

### 2.3.4. High-intensity treatment

Evidence on costs and benefits for high-intensity treatment is taken from trials, including those cited in NICE guidance, which shows a cost of £1514 and health-related quality improvements (adjusted mean difference in quality-adjusted life years) of 0.06 (NICE, 2014; Radhakrishnan et al., 2013; Burns et al., 2013). There is no evidence on possible cost-offsets.

### 2.3.5. Care coordination

Some (10 %) of women with mental health problems require care coordination because of the severity of illness or complexity of their needs. The cost of participation in care coordination is included in the model, whilst it is assumed that there are no benefits linked to care coordination since we were unable to identify evidence. Costs of involvement in care coordination are calculated based on a duration of 20 min and unit costs for midwives and health visitors as stated above.

## 2.4. Target population

To derive the number of women with untreated common mental health problems who would be accessing or receiving the above interventions or activities, we estimate the number of women giving birth, the number of women with mental health problems (27 %), and the number of women estimated to access any mental health services and the number receiving (evidence-based) low- or high-intensity treatment. Mental health services are distinguished into primary, secondary and specialist perinatal mental health services.

The number of women accessing specialist perinatal or secondary mental health services is estimated based on the number of women giving birth and proportions of women recorded in national datasets as having accessed these services in the years of 2018 and 2019 during the perinatal period and assuming an adjustment in this proportion based on national targets applied to the other years. These calculations are possible because relevant datasets in England (i.e., those documenting numbers accessing maternity services and mental health services) were linked as part of a pilot project in 2018 and 2019. In addition, national government targets have set out the increase of

**Table 1**  
Parameter values and data sources for the modelling.

Parameter	Value	Data source
<i>Cohort of women with mental health problems during perinatal period &amp; proportion accessing services and treatment</i>		
[a] Number of women giving birth in England	2015: 664,399 2016: 663,157 2017: 646,794 2018: 625,651 2019: 610,505 2020: 621,132 2021: 618,343 2022: 614,768 2023: 612,859 2024: 612, 847	ONS (2018), ONS (no date)
[b] Probability that women during the perinatal period develop mental health problems	27 %	Estimated; Howard et al. (2018); refers to antenatal period
[c] Probability that women giving birth access different types of mental health services during the perinatal period	Secondary mental health services: 2015 to 2018: 4.3 % 2019 to 2024: 18 % Specialist perinatal mental health services 2015: 0 %; 2016: 0.4 %; 2017: 0.9 %; 2018: 1.3 %; 2019: 2.1 %; 2020: 3.7 %; 2021: 5.3 %; 2022: 6.8 %; 2023: 8.4; 2024: 10 % Primary mental health services 2015 to 2018: 14 % 2019 to 2024: 16 %	Estimated; NHS Digital (2020) → for <i>specialist perinatal mental health service</i> proportions available for 2018 and 2019; and target of 10 % for 2024; linear decrease/increase assumed starting from 0 % in 2025
[d] Probability that women with mental health problems access different types of mental health services during the perinatal period	Secondary mental health services 2015 to 2018: 16 % 2019 to 2024: 18 % Specialist perinatal mental health services 2015: 0 %; 2016: 2 %; 2017: 3 %; 2018: 5 %; 2019: 8 %; 2020: 14 %; 2021: 19 %; 2022: 25 %; 2023: 31 %; 2024: 37 % Primary mental health services: 2015 to 2018: 5.4 % 2019 to 2024: 6 %	Derived from [a], [b], [c]
[e] Probability that women using different mental health services during the perinatal period access high- or low-intensity (psychosocial) treatment	Secondary mental health services (high intensity only): 23.1 % Specialist perinatal mental health services (high intensity only): 23.1 % Primary mental health services (high intensity): 20 %; low intensity 3.6 %	Lee-Carbon et al. (2022)
[f] Probability that women giving birth access low- and high intensity (psychosocial) treatment in different types of mental health services	Secondary mental health services (high intensity only): 2015 to 2018: 1 %; 2019 to 2024: 1.1 % Specialist perinatal mental health services (high intensity only): 2015: 0 %; 2016: 0.1 %; 2017: 0.2 %; 2018: 0.3 %; 2019: 0.5 %; 2020: 0.9 %; 2021: 1.2 %; 2022: 1.6 %; 2023; 1.9 %; 2024: 2.3 % Primary mental health services: (High intensity) 2015 to 2018: 1.2 %; 2019 to 2024: 1.4 % (Low intensity) 2015 to 2024: 0.2 %	Derived from [a] to [e]
Number of screenings for mental health problems during perinatal period		
Antenatal (incl. early postnatal)	10	NICE (2014)
Postnatal (incl. late antenatal)	6	PHE (2016)
<i>Duration of screenings, assessments, care coordination for mental health problems during perinatal period</i>		
Duration of screenings, antenatal (incl. early postnatal period)	1st 5 min; subsequent 8: 1 min	Expert consultation
Duration of screenings, postnatal (incl. late antenatal period)	5 min	Expert consultation
Duration of assessment by universal healthcare professionals	10 min	Expert consultation; refers to direct face-to-face time in addition to direct face-to-face time for screening
Duration of clinical assessment	12 min	NICE (2014)
Duration of involvement in care coordination	20 min	Expert consultation; refers to direct face-to-face time in addition to direct face-to-face time for screening and assessment
Cost consequences linked to interventions (in 2020 prices)		
Screening by universal healthcare staff trained in mental health	−£101	Henderson et al. (2019), refers to reduction in staff time
Low-intensity treatment	−£78	Trevillion et al. (2020), Morrell et al. (2016); refers to reduction in staff time

Table 1 (continued)

Parameter	Value	Data source
<i>Quality adjusted life year (QALY) gains linked to interventions</i>		
Screening by universal healthcare professionals trained in mental health	0.002	Henderson et al. (2019)
Low-intensity treatment	0.01	NICE (2014)
High-intensity treatment	0.06	NICE (2014)
<i>Unit costs (in 2020 prices)</i>		
Universal healthcare professional, direct face-to-face time, per hour	Without training in mental health: £98; with training in mental health: £102	Curtis and Burns (2020); refers to Band 6 health professional
Mental health professional, direct face-to-face time, per hour	£105	Curtis and Burns (2020); refers to midpoint Band 6 to 7 community nurse
Low-intensity treatment, per course	Provided by mental health practitioner: £458 Provided by health visitor trained in mental health: £543	Curtis and Burns (2020), Trevillion et al. (2020), Morrell et al. (2009, 2016); refers to 9 sessions; 30 min per session; Band 5 for mental health practitioner and Band 6 for health visitor
High-intensity treatment, per course	£1514	Burns et al. (2013), Table 4; Radhakrishnan et al. (2013); refers to average as provided in practice; typically refers to 12 to 16 sessions; 55 min per session; delivered by mental health professionals (Bands 5 to 7)

specialist perinatal mental health services over a ten-year period to reach 10 % of all women giving birth with mental health problems by 2024 (since investment happened in 2015, it was assumed that provision was zero in 2015). The proportion of women accessing other secondary mental health services is assumed to remain constant. The proportion of women accessing primary mental health services is derived by applying data on the relationship between primary and secondary mental health services from a study that evaluated access to services for this population (Lee-Carbon et al., 2022).

The proportion of women found to be accessing low- and high-intensity treatments in different service settings (e.g., 23 % for high-intensity treatment in specialist perinatal mental health services) as taken from Lee-Carbon et al. (2022) is applied to the number estimated to be accessing those services. The unmet need with regard to common mental health problems is then assumed to be the gap between the number of women estimated to have mental health problems and those estimated to access treatment. For simplicity, it is assumed that the treatment gap only refers to women with mild or moderate symptoms (i.e., common mental health problems), whilst women with moderate to severe symptoms are assumed to receive care under current and projected specialist provision. Furthermore, we assume that the treatment gap for this group is addressed with low-intensity treatment. Conservatively, based on expert views, it is assumed that, of women who need or potentially benefit from low-intensity treatment, 20 % for various reasons do not engage in such treatment.

The number of women receiving assessments (after being identified with a mental health problem) is calculated based on the following assumptions: all women who access mental health services as calculated above will have received an (initial) assessment by a midwife or health visitor and an assessment by a mental health professional.

As mentioned, across all three scenarios, 10 % of women with mental health problems are assumed to require care coordination involving midwives or health visitors.

### 2.5. Costs, cost consequences, and health-related quality of life

Costs are aggregated across different categories for each of the scenarios. This includes the costs of routine enquiry, assessments, and delivery of low- and high-intensity treatment. Cost consequences refer to potential savings or offsets due to reductions in health and social care expenditure linked to asking women about their mental health and wellbeing (as done by trained midwives and health visitors) as well as those receiving low-intensity treatment. Health-related quality of life improvements refer to trained midwives and health visitors asking about mental health and wellbeing during routine perinatal visits and to women receiving low- or high-intensity treatment.

## 3. Results

### 3.1. Target population

Between 2015 and 2024, the number of women with all mental health problems during the perinatal period in England was projected to slightly decline from 179,399 to 165,469 based on predicted reductions in the number of births, with an assumption that the proportion of women experiencing all mental health problems remained constant. It was estimated that the number of women receiving either treatment increased from 16,240 in 2015 to 30,879 in 2024 (i.e., increase in specialist perinatal mental health services to reach 10 % of women with problems that meet the threshold of a mental disorder). If the estimated treatment gap would have been addressed as much as possible, as projected in scenarios 2 and 3, an additional 111,154 women would be accessing treatment in 2015. The estimated treatment gap closes over time (in line with current government plans) and is 50,031 in 2024.

### 3.2. Costs and quality-adjusted life years

Table 2 presents the annual costs (including cost consequences, i.e., cost offsets in health and social care) and health-related quality of life improvements (shown in the form of quality-adjusted life years) for the provision under current government plans (scenario 1) and if treatment gaps were closed (scenarios 2 and 3) for the years 2015 to 2024.

Costs linked to routine enquiries, assessments and care coordination are estimated to be the lowest in the scenario reflecting project provision under current government plans (scenario 1) since a higher proportion of women are not receiving those activities. Costs are estimated to be highest in the scenario where the treatment gap is met by primary mental health services since a higher proportion of women receive interventions by more expensive staff compared with a scenario where health visitors and midwives provide interventions, and assessments are duplicated. Total costs in scenario 1 would amount to £72.8 million in 2015 and £93.5 million in 2024. Total costs would be highest for scenario 3, which are estimated to be around £120.2 million in 2015 and £114.8 million in 2024, whereas costs for scenario 2 are estimated at £80.1 million in 2015 and £74.7 million in 2024. Costs in scenario 2 are estimated to be lower than in scenario 3 because some of the interventions (e.g. assessments) per woman are cheaper since they are provided by less expensive staff and because of additional cost-offsets linked to routine enquiry by trained midwives and health visitors (i.e. the preventative effects).

Estimated annual quality-adjusted life year gains are the highest in scenario 2 and lowest in scenario 1 across all years. For example, in

**Table 2**  
Projections of costs and quality adjusted life years (QALYs) for scenarios 1 to 3.

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
<i>Projections under current government plans (scenario 1)</i>										
Costs routine enquiries, assessment & care coordination (£, 000)	49,844	49,858	48,733	47,241	46,441	47,616	47,767	47,853	47,066	48,427
Net costs linked to low-/high intensity treatment (£, 000)	22,922	23,884	24,275	24,429	27,995	31,915	35,188	38,382	41,649	45,035
Total costs (£, 000)	72,766	73,742	73,007	71,670	75,325	79,530	82,954	86,235	89,715	93,461
QALY gain	901	899	877	848	924	940	936	931	928	928
Cost per QALY	80,761	82,027	83,246	84,517	81,521	84,606	88,626	92,626	96,676	100,713
<i>Projections if treatment gap is addressed by trained midwives and health visitors (scenario 2)</i>										
Costs routine enquiries, assessment & care coordination (£, 000)	54,206	54,165	52,887	51,215	50,169	51,249	51,223	51,131	51,176	51,378
Net costs linked to low-/high intensity treatment (£, 000)	25,844	25,731	25,034	24,155	24,700	24,911	24,582	24,223	23,932	23,716
Total costs (£, 000)	80,050	79,896	77,486	75,770	75,486	75,770	75,417	74,970	74,724	74,710
QALY gain	2997	2969	2873	2757	2723	2692	2602	2509	2424	2346
Cost per QALY	26,710	26,910	26,970	27,483	27,722	28,146	28,984	29,880	30,827	31,846
<i>Projections if treatment gap is addressed by primary mental health services (scenario 3)</i>										
Costs routine enquiries, assessment & care coordination (£, 000)	55,031	54,928	53,573	51,822	50,567	51,447	51,217	50,920	50,762	50,825
Net costs linked to low-/high intensity treatment (£, 000)	65,160	65,170	63,690	61,732	61,909	63,435	63,597	63,674	63,919	64,361
Total costs (£, 000)	120,191	120,098	117,263	113,553	112,163	114,565	114,497	114,279	114,367	114,807
QALY gain	2027	2000	1929	1844	1832	1785	1699	1611	1529	1451
Cost per QALY	59,295	60,049	60,790	61,580	61,224	64,182	67,391	70,937	74,799	79,123

QALYs = quality adjusted life years.

2020 estimated quality-adjusted life year gains in scenario 1 are 940, whilst they amount to 2692 in scenario 2 and 1785 in scenario 3.

### 3.3. Incremental costs and quality-adjusted life years between scenarios

Incremental cost effectiveness ratios are the difference in costs between two alternative uses of resources divided by the difference in their benefits (= effects), thus showing a ratio of extra cost per extra unit of health. Typically, the alternatives are an innovative way of providing care versus standard provision of care. Since scenario 1 is a projected provision of care under current government plans, it can be thought of as standard care (or the ‘doing nothing’ alternative). For decision makers, taking the incremental values of costs and effects between a possible new way of investment and the current standard care is relevant to the decision of whether investing is a good idea (since disinvesting is not considered a rational option). Since in terms of both costs and benefits, scenario 2 is superior to scenario 3, the latter is excluded as alternative.

Compared with projected provision under government plans, addressing the treatment gap through provision by trained midwives and health visitors would mean additional estimated costs of £7.3 million in 2015 but lower estimated costs of £18.6 million in 2024 (Table 3). The additional quality-adjusted life years gained would be 2096 in 2015 and 1418 in 2024. Table 3 shows that the incremental cost effectiveness ratio between scenarios 2 and 1 is estimated at £3475 per quality-adjusted life year in 2015 and is projected to decrease noticeably over time suggesting scenario 2 becomes even more economically viable over time. In 2020, the incremental costs would become negative, i.e., presenting potential savings. In this situation the incremental cost effectiveness ratio would no longer be a suitable indicator since the new alternative is estimated to be cheaper and achieve more units of health.

**Table 3**  
Incremental costs (£, 000) and effects (in quality-adjusted life years (QALYs)) between scenario under current government plans (scenario 1) and investment into training universal health professionals in mental health (scenario 2).

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Incremental costs, scenario 2 – 1 (£, 000)	7284	6154	4479	4100	161	-3760	-7,537	-11,265	-14,991	-18,751
Incremental effects, scenario 2 – 1, in QALYs	2096	2069	1996	1909	1799	1752	1666	1578	1496	1418
Incremental cost-effectiveness ratio	3475	2973	2244	2148	89	/	/	/	/	/
						Cost saving	Cost saving	Cost saving	Cost saving	Cost saving

QALYs = quality adjusted life years.

## 4. Discussion

We modelled the costs, including cost-offsets, and health-related quality of life improvements linked to different scenarios of scaling treatment for women with common mental health problems in England over a ten-year period. Our findings suggest that training health staff already in contact with women during the perinatal period to ask about mental health and provide psychologically informed interventions where indicated, is potentially cost-effective. The comparisons included three alternative scenarios: a scenario in which no additional intervention is put in place for the estimated number of women with common mental health problems in the current system who do not receive treatment (‘treatment as usual’); secondly a scenario in which those women receive care from midwives and health visitors, and finally a scenario in which they receive interventions from primary mental health services. Our findings suggest that, in addition to achieving potentially substantial health-related quality of life improvements, investing in identification and treatment by midwives and health visitors might generate cost savings over time, compared with treatment as usual. For example, over the period from 2015 to 2024, estimated savings amounted to about £26.6 million. Savings referred to cost-offsets through a reduction in some health services, suggesting a more efficient use of resources when midwives and health visitors are trained in mental health, and when low-intensity treatment is provided. Furthermore, our findings suggest that, if currently unmet needs were addressed through separately organised mental health services, this would be more costly and achieve fewer health benefits than integrating this care into enhanced maternity and health visiting services.

To our knowledge, this is the first return-on-investment analysis that estimates costs and benefits of scaling treatment for women with common mental health problems during the perinatal period. Data from this paper originate from research we conducted to inform

government policy in the United Kingdom (Bauer et al., 2022). Evidence on costs and effects is drawn from robust randomised controlled trials.

To ensure that implications of these findings are as relevant as possible to decision makers in the 'real world', we have deliberately followed a conservative approach in our modelling to avoid overestimating economic consequences: for example, health benefits and cost-offsets are only assumed to last for the period over which they are evaluated in the study, which referred to a few weeks or months. We have also developed a model that seeks to reflect system realities as much as possible. First, we use conservative estimates for the number of women accepting treatment, which is a known barrier (Millett et al., 2018). Second, the model utilises recently published national data on women accessing different types of services and treatments during the perinatal period. As more data become available from national surveys and administrative systems, our model can and should be updated. Third, our model distinguishes between access to services and access to treatment, since in current systems of care, only a proportion of women who access services also access treatment. Fourth, costs included in the model not only refer to those linked to delivering treatment but also to activity that is required to implement treatment in the system, including routine enquiry, assessments, and care coordination (e.g., referrals to other services).

#### 4.1. Limitations

Whilst our model is the best currently available, it has several limitations. Our treatment gaps are estimated based on several assumptions, including that all women with severe mental health problems access (specialist) mental health services. In addition, our model does not include the proportion of women who currently access treatment and support outside of mental health services, such as support offered by general practitioners, voluntary and community sector organisations. In many localities, these services offer essential support for women's mental health but currently no data are routinely collected on them.

Another limitation relates to the scenarios we developed. Whilst they were informed by national and international policy, plans and recommendations by bodies like the National Institute for Health and Care Excellence and World Health Organization, it is possible that other scenarios might be considered more relevant by those who fund services. In our model we assume that delivering treatment at scale can achieve the same results as found in trials of psychologically informed interventions. Whether and how these results can be replicated in actual practice are currently unknown, and training and supervision in line with the one provided in the studies are likely to be a key factor in influencing costs and impacts. This study does not consider capacity and capability limitations and assumes that substantial system change is feasible. Because most professional roles and education of midwives and health visitors have traditionally focused on physical health, organisational and professional culture changes would need to be substantial.

The model is currently limited to evidence from studies of interventions that address only women's mental health rather than social determinants of mental health. The importance of complex interventions that address a range of factors such as those related to poverty, family and child adversities has been highlighted (Howard and Khalifeh, 2020). We found some parameters to be difficult to estimate, such as the number of visits by health staff (e.g., midwives and health visitors, general practitioners), as there are gaps between what should happen according to good practice and what happens in actual practice due to resource or system constraints. Again, the routine collection of such data is urgently recommended to estimate resource requirements more accurately.

Finally, as the case with all models, the study only includes economic consequences for which relevant evidence exists. It is therefore likely to underestimate benefits. First, whilst negative impacts of mental health on productivity and employment are well established (Knapp and Wong, 2020) and included in return-on-investment analysis in other areas of mental health (Chisholm et al., 2016), there is an urgent need to establish those for this population. For example, evidence from the

United States suggests that perinatal mental health problems can slow women's return to work but also suggests the importance of considering factors related to socio-economic status (e.g., pregnancy intention), on employment and mental health during this time (Dagher et al., 2014). Second, the impact of increasing access to treatment on women's out-of-pocket expenditure is currently not known. Third, even though evidence on the potential benefits of treatment on children exists (Milgrom et al., 2019; Stein et al., 2018; Holt et al., 2021), it is currently inconsistent and cannot be reliably synthesised. Fourth, likely benefits on fathers or other family members are yet to be investigated quantitatively. Fifth, the model is reliant on health-related quality of life benefits established in randomised controlled trials using generic measures of health such as the Short-Form Health Survey which have been criticised for lacking sensitivity to reflect the real impact of mental health problems on quality of life (Brazier et al., 2014), again leading to an underestimation of benefits of treatment.

#### 4.2. Implications

National and international guidance sets out that women with common mental health problems should be receiving evidence-based psychological interventions during the perinatal period (NICE, 2014) and that mental health should be integrated into maternal and child health services (WHO, 2022). Healthcare professionals in contact with women during the perinatal period have an important role in ensuring that women are receiving parity of care for their mental health and wellbeing as for their physical health. Training these professionals in the knowledge and skills required for this and for providing low-intensity treatment (or supplementing their multi-disciplinary teams with staff who provide such treatments) is likely to contribute importantly not only to women's health but also to the health and development of their children and partners (Stein et al., 2018, Holt et al., 2021).

Questions remain on how to realise service models for this kind of provision in practice. Research is currently conducted in the United States on cost-effectively scaling access to psychological treatment provided by non-specialist health professionals for women during the perinatal period, through the use of telemedicine (Singla et al., 2023). The many challenges of integrating mental and physical health in affordable ways, as well as possible solutions to make models of integration work, are well documented (Joo and Platt, 2018). In the context of recruitment and retention challenges amongst healthcare professionals, additional staff trained in low-intensity treatment might need to be brought in and integrated into the multidisciplinary maternity and health visiting services to provide elements of this care. To realise some of the estimated cost savings, further exploration is needed of the active ingredients of treatment and related activities and how those might be implemented efficiently and affordably through integration into routine provision. As data systems are improving and better data are becoming available, models like the one presented here should be updated. However, generating relevant economic evidence will always require making assumptions about how evidence from trials applies to the real world. Therefore, the systematic involvement of experts and stakeholders in this kind of economic research that seeks to reflect complex system realities is therefore essential. We need to develop a better understanding of how to tap into the potential for participatory economic modelling to inform decision-making processes (Kumar et al., 2023; Wilson et al., 2021; Staniszewska et al., 2021).

#### 5. Conclusions

In England, much progress has been made in recent years in investing in specialist perinatal mental health services, and a strong primary mental health service is available through National Health Service Talking Therapies (formerly Increasing Access to Psychological Therapies), but there are still important gaps (MMHA, 2023). Findings from this modelling study suggest that integration of mental health care into routinely delivered care for women during the perinatal period is

likely to be economically viable. This would require a shift not only in policy but in service planning, structure, and delivery, and most importantly in organisational and professional culture. Governments are increasingly committed to parity of mental health care with physical health care. This study seeks to inform steps to make this vision a reality in maternity and postnatal care.

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Maternal Mental Health Alliance, United Kingdom.

## CRedit authorship contribution statement

**Annette Bauer:** Writing – review & editing, Writing – original draft, Validation, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Alain Gregoire:** Writing – review & editing, Validation, Resources, Project administration, Conceptualization. **Michela Tinelli:** Writing – review & editing, Project administration, Investigation, Conceptualization. **Martin Knapp:** Writing – review & editing, Supervision, Resources, Project administration, Funding acquisition, Conceptualization.

## Data availability

The authors confirm that the data supporting the findings of this study are available within the article.

## Declaration of Competing Interest

Dr Alain Gregoire is founder and honorary president of the Maternal Mental Health Alliance, which funded the research. He was not involved in decisions concerning the funding of the research. The other authors have no conflict of interest to declare.

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## References<sup>1</sup>

- Bauer, A., Knapp, M., Parsonage, M., 2016. Lifetime costs of perinatal anxiety and depression. *J. Affect. Disord.* 192, 83–90.
- Bauer, A., Tinelli, M., Knapp, M., 2022. The economic case for increasing access to treatment for women with common mental health problems during the perinatal period. London School of Economics and Political Science <https://www.lse.ac.uk/cpec/assets/documents/CPEC-Perinatal-Economics-2022.pdf>.

- Brazier, J., Connell, J., Papaioannou, D., Mukuria, C., Mulhern, B., Peasgood, T., Jones, M.L., Paisley, S., O'cathain, A., Barkham, M., Knapp, M., Byford, S., Gilbody, S., Parry, G., 2014. A systematic review, psychometric analysis and qualitative assessment of generic preference-based measures of health in mental health populations and the estimation of mapping functions from widely used specific measures. *Health Technol. Assess.* 18, vii–viii, xiii–xxv, 1–188.
- Brugha, T.S., Morrell, C.J., Slade, P., Walters, S.J., 2011. Universal prevention of depression in women postnatally: cluster randomized trial evidence in primary care. *Psychol. Med.* 41, 739–748.
- Brugha, T.S., Smith, J., Austin, J., Bankart, J., Patterson, M., Lovett, C., Morgan, Z., Morrell, C. J., Slade, P., 2016. Can community midwives prevent antenatal depression? An external pilot study to test the feasibility of a cluster randomized controlled universal prevention trial. *Psychol. Med.* 46, 345–356.
- Burns, A., O'Mahen, H., Baxter, H., Bennert, K., Wiles, N., Ramchandani, P., Turner, K., Sharp, D., Thorn, J., Noble, S., Evans, J., 2013. A pilot randomised controlled trial of cognitive behavioural therapy for antenatal depression. *BMC Psychiatry* 13, 33.
- Byatt, N., Biebel, K., Lundquist, R.S., Moore Simas, T.A., Debordes-Jackson, G., Allison, J., Ziedonis, D., 2012. Patient, provider, and system-level barriers and facilitators to addressing perinatal depression. *J. Reprod. Infant Psychol.* 30, 436–449.
- Camacho, E.M., Shields, G.E., 2018. Cost-effectiveness of interventions for perinatal anxiety and/or depression: a systematic review. *BMJ Open* 8, e022022.
- Cantwell, R., 2022. Perinatal mental health service development across the UK – many achievements, growing challenges. *Ir. J. Psychol. Med.* 1–4.
- Chisholm, D., Sweeney, K., Sheehan, P., Rasmussen, B., Smit, F., Cuijpers, P., Saxena, S., 2016. Scaling-up treatment of depression and anxiety: a global return on investment analysis. *Lancet Psychiatry* 3, 415–424.
- Curtis, L., Burns, A., 2020. Unit Costs of Health and Social Care 2020 University of Kent. Personal Social Services Research Unit, Kent.
- Da Costa, D., Dritsa, M., Rippen, N., Lowensteyn, I., Khalifé, S., 2006. Health-related quality of life in postpartum depressed women. *Arch. Womens Ment. Health* 9, 95–102.
- Dagher, R.K., Hofferth, S.L., Lee, Y., 2014. Maternal depression, pregnancy intention, and return to paid work after childbirth. *Womens Health Issues* 24, e297–e303.
- Dennis, C.L., 2014. Psychosocial interventions for the treatment of perinatal depression. *Best Pract. Res. Clin. Obstet. Gynaecol.* 28, 97–111.
- Epperson, C.N., Huang, M.Y., Cook, K., Gupta, D., Chawla, A., Greenberg, P.E., Eldar-Lissai, A., 2020. Healthcare resource utilization and costs associated with postpartum depression among commercially insured households. *Curr. Med. Res. Opin.* 36, 1707–1716.
- Henderson, C., Dixon, S., Bauer, A., Knapp, M., Morrell, C.J., Slade, P., Walters, S.J., BRUGHA, T., 2019. Cost-effectiveness of PoNDER health visitor training for mothers at lower risk of depression: findings on prevention of postnatal depression from a cluster-randomised controlled trial. *Psychol. Med.* 49, 1324–1334.
- Higgins, A., Downes, C., Monahan, M., Gill, A., Lamb, S.A., Carroll, M., 2018. Barriers to midwives and nurses addressing mental health issues with women during the perinatal period: the Mind Mothers study. *J. Clin. Nurs.* 27, 1872–1883.
- Holt, C., Gentileau, C., Gemmill, A.W., Milgrom, J., 2021. Improving the mother-infant relationship following postnatal depression: a randomised controlled trial of a brief intervention (HUGS). *Arch. Womens Mental Health* 24, 913–923.
- Howard, L.M., Khalifeh, H., 2020. Perinatal mental health: a review of progress and challenges. *World Psychiatry* 19, 313–327.
- Howard, L.M., Ryan, E.G., Trevillion, K., Anderson, F., Bick, D., Bye, A., Byford, S., O'Connor, S., Sands, P., Demilew, J., Milgrom, J., Pickles, A., 2018. Accuracy of the Whooley questions and the Edinburgh Postnatal Depression Scale in identifying depression and other mental disorders in early pregnancy. *Br. J. Psychiatry* 212, 50–56.
- Jacques, N., De Mola, C.L., Joseph, G., Mesenburg, M.A., Da Silveira, M.F., 2019. Prenatal and postnatal maternal depression and infant hospitalization and mortality in the first year of life: a systematic review and meta-analysis. *J. Affect. Disord.* 243, 201–208.
- Jarde, A., Morais, M., Kingston, D., Giallo, R., Macqueen, G.M., Giglia, L., Beyene, J., Wang, Y., McDonald, S.D., 2016. Neonatal outcomes in women with untreated antenatal depression compared with women without depression: a systematic review and meta-analysis. *JAMA Psychiatry* 73, 826–837.
- Joo, J.H., Platt, R., 2018. The promise and challenges of integrating mental and physical health. *Int. Rev. Psychiatry* 30, 155–156.
- Knapp, M., Wong, G., 2020. Economics and mental health: the current scenario. *World Psychiatry* 19, 3–14.
- Kumar, M.B., Roder-Dewan, S., Nyondo-Mipando, A.L., Mirzoev, T., Marston, C., 2023. Participatory economic approaches in global health evaluations. *Lancet Glob. Health* 11, e1001–e1002.
- Law, E.C., Aishworiya, R., Cai, S., Bouvette-Turcot, A.A., Broekman, B.F.P., Chen, H., Daniel, L. M., Gluckman, P.D., Shek, L.P.C., Tay, S.K.H., Chong, Y.S., Koh, G.C., Meaney, M.J., 2021. Income disparity in school readiness and the mediating role of perinatal maternal mental health: a longitudinal birth cohort study. *Epidemiol. Psychiatr. Sci.* 30, e6.
- Lee-Carbon, L., Nath, S., Trevillion, K., Byford, S., Howard, L.M., Challacombe, F.L., Heslin, M., 2022. Mental health service use among pregnant and early postpartum women. *Soc. Psychiatry Psychiatr. Epidemiol.* 57, 2229–2240.
- Madigan, S., Oatley, H., Racine, N., Fearon, R.M.P., Schumacher, L., Akbari, E., Cooke, J.E., Tarabulsky, G.M., 2018. A meta-analysis of maternal prenatal depression and anxiety on child socioemotional development. *J. Am. Acad. Child Adolesc. Psychiatry* 57, 645–657.e8.
- McCabe, C., Claxton, K., Culyer, A.J., 2008. The NICE cost-effectiveness threshold: what it is and what that means. *Pharmacoeconomics* 26, 733–744.
- Milgrom, J., Holt, C.J., Bleker, L.S., Holt, C., Ross, J., Ericksen, J., Glover, V., O'Donnell, K.J., De Rooij, S.R., Gemmill, A.W., 2019. Maternal antenatal mood and child development: an exploratory study of treatment effects on child outcomes up to 5 years. *J. Dev. Orig. Health Dis.* 10, 221–231.

<sup>1</sup> Additional references from Table 1: ONS (2018), ONS (n.d.), NHS (2020), and PHE (2016).



- Millett, L., Taylor, B.L., Howard, L.M., Bick, D., Stanley, N., Johnson, S., 2018. Experiences of improving access to psychological therapy services for perinatal mental health difficulties: a qualitative study of women's and therapists' views. *Behav. Cogn. Psychother.* 46, 421–436.
- MMHA, 2021. Maternal mental health during a pandemic: a rapid evidence review of Covid-19's impact. Maternal Mental Health Alliance <https://maternalmentalhealthalliance.org/mmhpanemic/>.
- MMHA, 2023. Improving access to specialist perinatal mental health services. Available: Maternal Mental Health Alliance <https://maternalmentalhealthalliance.org/campaign/maps/>. (Accessed 20 May 2023) (Online).
- Morrell, C.J., Slade, P., Warner, R., Paley, G., Dixon, S., Walters, S.J., Brugha, T., Barkham, M., Parry, G.J., Nicholl, J., 2009. Clinical effectiveness of health visitor training in psychologically informed approaches for depression in postnatal women: pragmatic cluster randomised trial in primary care. *BMJ* 338, a3045.
- Morrell, C.J., Sutcliffe, P., Booth, A., Stevens, J., Scope, A., Stevenson, M., Harvey, R., Bessey, A., Cantrell, A., Dennis, C.L., Ren, S., Ragonesi, M., Barkham, M., Churchill, D., Henshaw, C., Newstead, J., Slade, P., Spiby, H., Stewart-Brown, S., 2016. A systematic review, evidence synthesis and meta-analysis of quantitative and qualitative studies evaluating the clinical effectiveness, the cost-effectiveness, safety and acceptability of interventions to prevent postnatal depression. *Health Technol. Assess.* 20, 1–414.
- NHS, 2016. Implementing the five year forward view for mental health. <https://www.england.nhs.uk/publication/implementing-the-fyfv-for-mental-health/>.
- NHS, 2019. NHS Mental Health Implementation Plan 2019/20–2023/24. <https://www.longtermplan.nhs.uk/wp-content/uploads/2019/07/nhs-mental-health-implementation-plan-2019-20-2023-24.pdf>.
- NHS, 2020. Mental Health Services Monthly Statistics. <http://digital.nhs.uk/pubs/mhsfindec19provjan20>.
- NICE, 2014. Antenatal and postnatal mental health: clinical management and service guidance. Clinical guideline GC192. National Institute for Health and Care Excellence <https://www.nice.org.uk/guidance/cg192>.
- ONS, 2018. Conceptions in England and Wales. Office for National Statistics <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/conceptionandfertilityrates/bulletins/conceptionstatistics/2018>.
- ONS, d. Population projections. Office for National Statistics [https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections\(n.d.\)](https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections(n.d.)).
- PHE, 2016. Guidance Healthy Child Programme 0 to 19: health visitor and school nurse commissioning. Public Health England <https://www.gov.uk/government/publications/healthy-child-programme-0-to-19-health-visitor-and-school-nurse-commissioning>.
- Radhakrishnan, M., Hammond, G., Jones, P.B., Watson, A., Mcmillan-Shields, F., Lafortune, L., 2013. Cost of improving Access to Psychological Therapies (IAPT) programme: an analysis of cost of session, treatment and recovery in selected Primary Care Trusts in the East of England region. *Behav. Res. Ther.* 51, 37–45.
- Rogers, A., Obst, S., Teague, S.J., Rossen, L., Spry, E.A., Macdonald, J.A., Sunderland, M., Olsson, C.A., Youssef, G., Hutchinson, D., 2020. Association between maternal perinatal depression and anxiety and child and adolescent development: a meta-analysis. *JAMA Pediatr.* 174, 1082–1092.
- Singla, D.R., De Oliveira, C., Murphy, S.M., Patel, V., Charlebois, J., Davis, W.N., Dennis, C.-L., Kim, J.J., Kurdyak, P., Lawson, A., Meltzer-Brody, S., Mulsant, B.H., Schoueri-Mychasiw, N., Silver, R.K., Tschritter, D., Vigod, S.N., Byford, S., 2023. Protocol for an economic evaluation of scalable strategies to improve mental health among perinatal women: non-specialist care delivered via telemedicine vs. specialist care delivered in-person. *BMC Psychiatry* 23, 817.
- Smith, M.S., Lawrence, V., Sadler, E., Easter, A., 2019. Barriers to accessing mental health services for women with perinatal mental illness: systematic review and meta-synthesis of qualitative studies in the UK. *BMJ Open* 9, e024803.
- Staniszewska, S., Hill, E.M., Grant, R., Grove, P., Porter, J., Shiri, T., Tulip, S., Whitehurst, J., Wright, C., Datta, S., Petrou, S., Keeling, M., 2021. Developing a framework for public involvement in mathematical and economic modelling: bringing new dynamism to vaccination policy recommendations. *Patient* 14, 435–445.
- Stein, A., Netsi, E., Lawrence, P.J., Granger, C., Kempton, C., Craske, M.G., Nickless, A., Mollison, J., Stewart, D.A., Rapa, E., West, V., Scerif, G., Cooper, P.J., Murray, L., 2018. Mitigating the effect of persistent postnatal depression on child outcomes through an intervention to treat depression and improve parenting: a randomised controlled trial. *Lancet Psychiatry* 5, 134–144.
- Stephens, S., Ford, E., Paudyal, P., Smith, H., 2016. Effectiveness of psychological interventions for postnatal depression in primary care: a meta-analysis. *Ann. Fam. Med.* 14, 463–472.
- Trevillion, K., Ryan, E.G., Pickles, A., Heslin, M., Byford, S., Nath, S., Bick, D., Milgrom, J., Mycroft, R., Domoney, J., Pariante, C., Hunter, M.S., Howard, L.M., 2020. An exploratory parallel-group randomised controlled trial of antenatal Guided Self-Help (plus usual care) versus usual care alone for pregnant women with depression: DAWN trial. *J. Affect. Disord.* 261, 187–197. <https://doi.org/10.1016/j.jad.2019.10.013> Jan 15; Epub 2019 Oct 12. PMID: 31634678.
- WHO, 2021. Comprehensive Mental Health Action Plan 2013–2030. World Health Organization, Geneva.
- WHO, 2022. Guide for Integration of Perinatal Mental Health in Maternal and Child Health Services. World Health Organization, Geneva.
- Wilson, M., Thavorn, K., Hawrysh, T., Graham, I.D., Atkins, H., Kekre, N., Coyle, D., Lalu, M. M., Fergusson, D.A., Chan, K.K., Ollendorf, D.A., Presseau, J., 2021. Stakeholder engagement in economic evaluation: protocol for using the nominal group technique to elicit patient, healthcare provider, and health system stakeholder input in the development of an early economic evaluation model of chimeric antigen receptor T-cell therapy. *BMJ Open* 11, e046707.