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Extended Research Article

Effectiveness and cost-effectiveness of community perinatal mental health services on access, experience, recovery/relapse and obstetric and neonate outcomes: the ESMI-II mixed-methods study

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Abstract

Background: Perinatal mental health disorders affect one in five mothers during pregnancy or within 2 years post childbirth. These disorders can lead to poor pregnancy and childbirth outcomes and maternal deaths. Additionally, they negatively affect a child's cognitive, social and emotional development. Stigma and a lack of specialised services have limited access to mental health care. National Health Service England invested £365M in community perinatal mental health teams, but their impact on women and infants' outcomes are not known.

Objectives:

1. Develop a taxonomy of community perinatal mental health teams (work package 1).
2. Compare and validate two assessments of quality of mother–infant interaction for use by community perinatal mental health teams (work package 2).
3. Evaluate the effectiveness and cost-effectiveness of community perinatal mental health teams (work packages 3 and 4).

Design: Mixed-methods study.

Setting: Community perinatal mental health teams in England.

Participants: Women who were pregnant or within 2 years postnatal.

Methods and outcome measures: Work package 1: Typology of community perinatal mental health teams in England.

Work package 2: Reliability and validity of two observational assessments of parent–infant interaction.

Work package 3: Realist evaluation interviews with women, partners/close others, and staff to determine effective community perinatal mental health team components.

Work package 4: Analysis of linked data:

- Association of community perinatal mental health teams with access to secondary care mental health services.
- Risk of acute relapse and improved obstetric and neonate outcomes for women with pre-existing severe disorders in areas with community perinatal mental health teams compared to generic services.
- Economic analysis of cost of community perinatal mental health teams.

Results:

- Objective 1: Community perinatal mental health team typologies revealed in 2020, 84% had basic staffing levels and 63% had more multi-professionals.
- Objective 2: The 'Parent Infant Interaction Observation Scale' and 'National Institute of Child Health and Human Development' assessments of mother–infant interaction were reliable and valid; the National Institute of Child Health and Human Development is more suitable for community perinatal mental health teams.
- Objective 3:
  - Work package 3: Interviews with 139 women, 55 partners/close others and 80 health workers highlighted the importance of specialist perinatal knowledge, responding in a warm and non-judgemental way, working closely with other healthcare providers, optimising medication, supporting mothers to reduce conflict and improve social support, helping mother–infant bonding, and teaching emotional management.
  - Work package 4: Analysis of linked health data revealed higher risks for obstetric and neonate problems in women with severe mental health disorders, particularly recent or very serious episodes.
  - Work package 4: Areas with community perinatal mental health teams saw increased mental health access among perinatal women and reduced need for acute care, albeit at a higher cost and with greater neonatal risks.

Limitations:

- High levels of missing data on diagnosis and mental health outcomes in existing health and service data.
- Lack of data on child outcomes.
- Evaluation occurred during community perinatal mental health team changes and the coronavirus disease discovered in 2019 pandemic limiting a full assessment of the impact of community perinatal mental health teams on maternal and child outcomes.

Conclusions: Community perinatal mental health teams can support perinatal women with complex, moderate/severe mental health disorders, but further attention to women's physical needs is essential. The use of observational assessments of parent–infant relationships will enhance the evaluation of community perinatal mental health teams' impact on infant outcomes.

Future work: Research should focus on prospective studies that gather mental health and child outcomes from community perinatal mental health teams and primary care mental health, to assess broader impacts of perinatal-specific treatment across care pathways.

Study registration: This study is registered on Research Registry as researchregistry5463.

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Contents

List of tables

List of figures

List of boxes

List of supplementary material

Report Supplementary Material 1

Supplementary material can be found on the NIHR Journals Library report page (https://doi.org/10.3310/RRAP0011).

Supplementary material has been provided by the authors to support the report and any files provided at submission will have been seen by peer reviewers, but not extensively reviewed. Any supplementary material provided at a later stage in the process may not have been peer reviewed.

List of abbreviations

AUC	area under the curve
BITSEA	Brief Infant-Toddler Social and Emotional Assessment
CBCL	Child Behavior Checklist
CBT	cognitive–behavioural therapy
CCG	Clinical Commissioning Group
CFT	compassion-focused therapy
CMOCs	context–mechanism–outcome configurations
CORE-10	Clinical Outcomes in Routine Evaluation – 10-item version
COSMIN	Consensus-based Standards for the selection of health Measurement Instruments
COVID	coronavirus disease
COVID-19	coronavirus disease discovered in 2019
CPMHT	community perinatal mental health team
CRT	crisis resolution team
DBT	dialectical behaviour therapy
EMDR	eye movement desensitisation and reprocessing
EMMOI	English Maternal Morbidity Outcome Indicator
ENAOI	English Neonatal Adverse Outcome Indicator
EUPD	emotionally unstable personality disorder
GLS	generalised least squares
GP	general practitioner
HES	Hospital Episode Statistics
HoNOS	Health of the Nation Outcome Scales
HSDR	Health and Social Care Delivery Research
ICC	intraclass correlation coefficient
ICD-10	*International Statistical Classification of Diseases and Related Health Problems*, Tenth Revision
IMD	Index of Multiple Deprivation
LTP	long-term plan
MBU	mother and baby unit
MHSDS	Mental Health Services Data Set
MMAOI	English Maternal Morbidity Outcome Indicator
NBO	newborn behavioural observation
NICE	National Institute for Health and Care Excellence
NICHD	National Institute of Child Health and Human Development
NICHD SECCYD	NICHD Study of Early Childcare and Youth Development
NIHR	National Institute for Health and Care Research
OCD	obsessive–compulsive disorder
PAG	Perinatal Advisory Group
PDS	Personal Demographic Service
PIIOS	Parent Infant Interaction Observation Scale
PMH	perinatal mental health
POEM	The Patient-rated Outcome and Experience Measure
PPI	patient and public involvement
PTSD	post-traumatic stress disorder
ROC	receiver operating curve
SGA	small for gestational age
SMI	serious mental illness
VIG	Video Interactive Guidance
WCHADS	The Wirral Child Health and Development Study
WP	work package
WTE	whole time equivalent

Plain language summary

We evaluated how well community perinatal mental health teams were working. The study had four work packages.

Work package 1 created community perinatal mental health team categories in England. In 2020, 84% had basic staffing, and 63% had more multi-professionals involved in mother and baby care.

Work package 2 evaluated two assessments of mother–baby interaction. 'Parent Infant Interaction Observation Scale' was better at predicting how babies would be developmentally at age 2, though is best used for babies 2–8 months old. 'National Institute of Child Health and Human Development-3' could be better for community perinatal mental health teams, because it can be used for babies 3–24 months old, is simpler to use and takes less staff training time.

Work package 3 used interviews to look at what aspects of community perinatal mental health team care helped women. We interviewed 139 women, 55 family members and 80 health workers in 10 community perinatal mental health teams throughout England. Good community perinatal mental health teams were comprehensive and had staff who were relational, approachable and non-judgemental. They understood what new mothers needed. Mothers and babies were greatly helped by:

1. community perinatal mental health teams working closely with other health providers
2. perinatal-specific medication advice
3. helping mothers connect with other mothers
4. supporting mothers to reduce conflict and get more support
5. helping mother–infant bonding
6. teaching mums how to manage their emotions.

Work package 4 evaluated National Health Service maternity and mental health data. We found women with serious mental health problems had a higher chance of having childbirth and newborn difficulties. The risk was greatest for women with very recent or serious mental health problems.

In areas with community perinatal mental health teams, more perinatal women accessed earlier help with their mental health, with fewer women having highest levels of care. Areas with community perinatal mental health teams cost more money and newborns had greater health risks.

Community perinatal mental health teams are good at helping perinatal women with mental health problems, but further work is needed to understand how to help their newborn baby's health.

Scientific summary

Background

Perinatal mental health (PMH) disorders (mental disorders occurring in pregnancy or 2 years after childbirth) are widely prevalent, affecting one in five mothers. Women with PMH have distressing symptoms and poor functioning that can affect their relationships with their families and infant. There is growing evidence that PMH disorders are associated with pregnancy complications, poor childbirth outcomes, maternal deaths in the first postnatal year and long-term negative effects on child cognitive, social and emotional development. Stigma, lack of specialist services and trained staff, and lack of clinically feasible assessments, particularly for the parent–infant relationship, have meant access to mental health care has been poor. In the 'Five Year Forward' and 'Long Term Plans', NHS England invested over £365M to improve access to community perinatal mental health teams (CPMHTs), but the effectiveness of these services on women and children's health and well-being is not known.

Objectives

1. Develop a taxonomy of variations characterising CPMHTs [work package (WP) 1].
2. Compare and validate two observational assessments of quality of mother–infant interaction for use by CPMHTs (WP2).
3. Evaluate the effectiveness and cost-effectiveness of CPMHTs (WPs 3 and 4).

- WP3: Which CPMHT components promote access to treatment and which components work, for whom, in what circumstances, how and why to reduce PMH problems?
- WP4: In women with pre-existing severe disorders are CPMHTs (compared with generic services) associated with:
  - higher levels of access to secondary care mental health services (generic and CPMHTs)?
  - lower risk of relapse?
  - improved birth outcomes?
  - greater cost-effectiveness?

Methods (2020–3)

Work package 1/RQ1

To characterise service variations [research questions (RQ1)], we created a taxonomy classifying CPMHT elements. Using published data, expert and patient consensus, we created a programme theory on optimal service provision. A programme theory explains how, when and why a programme is expected to work. We used service-level data gathered from CPMHT annual reports to NHS England (2020), NHS Benchmarking (2015–8), Royal College of Psychiatry Perinatal Quality Network, and National Maternity and Perinatal Audit (2017 and 2019) to develop the taxonomy relative to the programme theory.

Work package 2/RQ2

We assessed the reliability and predictive validity of two observational assessments of the parent–infant relationship. Observational assessments of the parent–infant relationship are considered superior to self-report, but there is a lack of consensus on which assessments have the best predictive validity to later child outcomes. We used video archive material from a prospective, longitudinal Medical Research Council-funded study from pregnancy to school age (The Wirral Child Health and Development Study) to evaluate the Parent–Infant Interaction Observation Scale (PIIOS; for use with infants 2–8 months) and the National Institute for Child Health and Human Development (NICHD; for use with infants) system. Using 250 mother–infant interactions recorded at 6–8 months of age, 2 research assistants coded 3-, 5- and 7-minute clips from the 7-minute recorded observation available using each system. Inter-rater reliability and intrarater reliability were assessed. Predictive validity was determined in relation to (1) attachment security from the

Strange-Situation Paradigm and (2) child internalising (emotional) and externalising (behavioural) problem scores from the Brief Infant Toddler Socio-Emotional Assessment (age 1 and 2) and Pre-school Child Behaviour Checklist at school entry. We tested whether we could identify a briefer reliable and valid form of either assessment for use in routine clinical practice.

Work package 3/RQ3

We carried out a realist evaluation assessing components of CPMHTs that promoted treatment access and perceived outcomes (RQ3). Using WP1 typology and programme theory, we selected 10 CPMHTs for variations on service components and configurations (e.g. level of mother–infant/psychological interventions, integration with other services). We employed a purposive sampling approach (with maximum variation in characteristics), to identify and interview at least 10 women, their (consenting) partners or close other (CO), and up to 10 staff from each service to help us refine and test aspects of our programme theory, which identified how programme activities were associated with outcomes. Women were eligible if they were near the end of their care with the CPMHT or had finished care within the past 2 years. Interviews, up to 60 minutes in duration, assessed domains from our programme theory (e.g. experiences/acceptability of care, service components they believed made a difference to their care and outcomes and how this made an impact on their mental health and functioning with their family, including their infant). Where individuals had 'less successful' outcomes, we asked them for their opinions on what might have helped. We asked partners/CO related questions about impact of care received and how/if the CPMHT involved the CO. We asked staff how teams operate, which service components improve mother and baby outcomes, and which populations CPMHTs work best for. We also gathered service-level data on monthly referral numbers, referral source, ethnicity of women on the service and staffing breakdown. A realist logic of analysis was used.

Work package 4/RQ4

We used linked NHS routinely collected data from the Maternity Services Data Set, the Mental Health Services Data Set and the Hospital Episode Statistics between 2016 and 2019. Using an initial data set from 2016, we firstly examined associations between women who had a history of severe and complex mental health problems and obstetric and neonatal outcomes. We investigated whether there was a relationship between severity, as indicated by an acute hospitalisation, and recency of the mental health problem and these outcomes.

For RQ4, we used data between 2016 and 2019 and we compared areas with a CPMHT to those without on women's access to secondary mental health care, acute post partum relapse (defined as admission to either inpatient or crisis team care), duration of admissions and associated costs. We also examined obstetric and neonatal outcomes (including birthweight, prematurity and infant death and stillbirth) for perinatal women with a history of severe and complex mental health problems in areas with CPMHTs compared to those without.

Results

Work package 1/RQ1

In 2020, there were 55 CPMHTs. This represented coverage across 94.8% of mental health trusts in the country. Using staff configurations that captured variations in service provision relative to the programme theory, we created a hierarchical taxonomy consisting of a basic, foundational classification of services based on presence of a psychiatrist, nurse and psychologist (84% of CPMHTs), and a secondary, comprehensive level with greater service differentiation in line with key domains in the long-term plan (63% of CPMHTs). These included the basic classification as well as occupational therapists and nursery nurses.

Work package 2/RQ2

We found evidence for the reliability and predictive validity of the total-score PIIOS and a three-item form of the NICHD (NICHD-3; parental sensitivity, intrusiveness and positive regard/warmth), and the total-score PIIOS. No shorter form of PIIOS was identified with sufficient predictive validity. Filming for a 5-minute period achieved optimal reliability and predictive (discriminative) validity to age 2 mental health outcomes for both NICHD-3 and PIIOS total score, although PIIOS had broader predictive validity to age 2 internalising and externalising mental health outcomes. Neither

observational tool predicted longer-term mental health outcomes at school entry, consistent with the high number of intervening events in this time period.

Work package 3/RQ3

Across 10 different CPMHTs, we interviewed 139 women, 55 partners/CO and 80 health and social care practitioners to determine effective CPMHT components. As predicted, comprehensive CPMHTs resulted in improvements in the experiences and mental health outcomes of women and infants, with some women stating CPMHTs were a 'transformative' experience. These improvements were grounded in the collaborative, integrative care provided between comprehensive CPMHTs and other health providers. Integration across care pathways was greatest with maternity, mother and baby hospitals, obstetrics, and crisis teams and was lowest with general practitioners and adult mental health.

Perinatal women with mental health disorders strongly preferred treatment from health professionals with specialist PMH knowledge as they felt these individuals were best placed to understand their complex family-related needs. Women described style of treatment delivery as critical to their perceived outcomes, including compassionate, open, non-judgemental care. These factors were associated with their perceptions that they got the 'right' treatments and their descriptions of their level of treatment engagement. The value of adaptable treatment catering to changing schedules and locations (home, clinic, remote, etc.) was emphasised.

A holistic approach, typically combining pharmacological and relational treatments, yielded positive perceived results. Women appreciated the CPMHTs' expertise optimising their medication by providing comprehensive, up-to-date information on the risks and benefits of medications during the perinatal period. This was especially important for women with severe mental illness (SMI). Women described how CPMHTs reduced isolation and stigma by improving social connectedness among parents, enhanced social support and reduced family conflicts, facilitated better bonding between mothers and their infants, and equipped women with emotional management skills while supporting their engagement in meaningful activities. Expansion of CPMHTs to meet the long-term plan was ongoing during the evaluation, with varying provision across different teams. While SMI care pathways were robust in most teams, disparities in referral pathways and interventions for other mental health problems were apparent. For example, some CPMHTs lacked psychological support, with negative effects on women with post-traumatic stress disorder, obsessive–compulsive disorder, anxiety and depression. Treatments that directly intervened with the parent–infant or couple's relationship were not yet widely available. This especially affected women who had experienced acute or complex trauma, and those who described experiencing problems bonding with their baby and/or heightened conflict in their relationships.

Numbers of ethnically diverse women seen in CPMHTs were lower than expected based on local prevalence estimates.

Work package 4/RQ4

We found that depending on definition, between 7% and 9% of women had histories of secondary mental healthcare contact, indicating presence of a severe and complex mental health disorder. We found a significant increased risk for negative obstetric and neonatal outcomes in women who had a history of severe and complex mental health disorders, as indicated by previous contact with secondary mental health care. These risks were greatest for women with the most severe mental health problems, as indicated by a history of hospitalisation, and those who had contact in the last year with secondary mental health care.

When comparing mental health treatment access and related costs in areas with and without CPMHTs (RQ4), we found greater access to higher overall use of community mental health treatment and lower risk of acute relapse (lower rates of hospitalisation or crisis resolution teams). When examining acute care components separately, there were more acute hospitalisations and longer durations of stay and less use of crisis resolution teams in areas with CPMHTs compared to those without. These differences resulted in overall higher costs in areas with CPMHTs [mean £651, standard deviation (SD) 4634] compared to areas without (mean £414, SD 4196) which were statistically significant [fully adjusted mean difference £111, 95% confidence interval (CI) £29 to £192, $p = 0.008$]. There were higher risks of neonatal death and stillbirth and the birth of a baby small for gestational age in areas with CPMHTs versus those without, but lower risks of premature births.

Conclusion

Between 7% and 9% of women had a history of serious and complex PMH problems and they were at increased risks for negative obstetric and neonatal outcomes.

The availability of CPMHTs, relative to areas without CPMHTs, increased overall use of specialist mental healthcare services and reduced postnatal risk of acute relapse. This was associated with overall higher costs in areas with CPMHTs. Our results also suggest the risks of stillbirth/neonatal death and babies born small for gestational age may increase with a CPMHT.

There was considerable variation in CPMHT configurations. Those with comprehensive provision provided greater access to a wider range of evidence-based care across mental health problems but many still lacked parent–infant and family treatment offers. CPMHTs were often not serving expected numbers from diverse communities.

Feasible parent–infant assessments are available and may help to highlight need and ensure parent–infant dyads get appropriate care. We found both the PIIOS and NICHD-3 were valid and reliable assessments of the parent–infant relationship, but the NICHD-3 may have greater clinical utility due to its brevity to train (2 days vs. 3 days) and code (~15 minutes vs. 20–30 minutes), its predictive validity to attachment security and externalising problems, and application from 3 to 24 months of age.

Implications for health care

- WP2 showed that the PIIOS mother–infant assessment had broader predictive validity to child outcomes at age 2 but should only be used with infants between 2 and 8 months. The NICHD-3 had good predictive validity, is shorter to train and code and can be used with a broader age range between 3 and 24 months, so may be more appropriate for CPMHTs.
- WP3 demonstrated CPMHT staff need perinatal specific training and supervision to ensure they have the perinatal specialist skills women want and benefit from.
- WP3 found staff's 'soft skills', being warm, non-judgemental, reliable and offering outreach, made a key difference to women's engagement and outcomes. Despite their importance, 'soft skills' often go unmeasured and undervalued in mental health services. A culture shift is needed to prioritise, support and value 'soft skills'. This should include training, job planning to include time for these skills, measurement, performance management and assessing staff attitudes.
- In WP3, women and COs benefitted when family was included in treatment (with woman's permission). Our results highlighted reducing conflict and improving support, approaches aligned with recommendations from NHS England's guide on good practices for partners and family members.
- WP4 showed CPMHTs are effective at improving access to needed and effective treatments, but pregnancy/neonate outcomes are an area of concern. Further research into the causes of this relationships is urgently needed, but several steps may help to promote positive outcomes. First, CPMHTs should encourage collaboration between mental health services and maternity/neonate services to ensure equitable attention to both health and mental health concerns. Second, treatment burden may affect women/birthing people (bp) ability to attend both health and mental health appointments. Colocated services and joint clinic sessions could reduce treatment burden. Lastly, training mental health practitioners on the physical health needs of women could support improved potential for timely communication with maternity for health concerns.

Research recommendations

- We need to know the biological, social and healthcare determinants of increased neonate risk in areas with CPMHTs.
- Routine mental health data have very high levels of missing data on diagnosis and mental health outcomes. CPMHTs have also had limited time to fully embed themselves into practice, making it difficult to retrospectively assess their impact on women and their babies. Prospective studies that recruit women from case identification and follow them

through the perinatal period and with longer-term follow-up assessing mental health, service use, health and linked child outcomes are needed to reliably assess the effectiveness and cost-effectiveness of CPMHTs.
- Research should focus on the development, evaluation and implementation of interventions tailored for underserved and diverse perinatal populations.
- WP4 data were based solely on secondary care data. A broader approach, using primary care data sets, data on talking therapies and aspects of different characteristics of CPMHTs could include women with a wider range of problems and severity and provide a better understanding of treatment components that work across the care pathway.
- Future research needs to evaluate the NICHD and PIIOS measures' sensitivity to change following parent–infant intervention.

Study registration

This study is registered on Research Registry as researchregistry5463.

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Chapter 1 Overview of perinatal mental health

Background

Perinatal mental health (PMH) problems, encompassing mental disorders occurring during pregnancy or up to 2 years after childbirth, are a significant public health concern. These conditions, marked by distressing symptoms and impaired functioning are a leading cause of maternal deaths.[1,2] The most common disorders are depression and anxiety disorders; they can predate conception, persist through the perinatal period, or emerge during pregnancy or the postnatal period. Common risk factors include psychosocial stressors related to childbirth, such as unplanned and unwanted pregnancy, lack of social support, domestic abuse, childhood trauma, financial hardship and young age. A history of prior mental health issues is the strongest predictor of mental health problems.[1] Moderate to severe depression affects around 4% of the maternity population,[1,3] with severe depression being the most common diagnosis associated with maternal suicide. Obsessive–compulsive disorder (OCD) is highly prevalent during the perinatal period, particularly postnatally, with an average prevalence of 7%.[4] The most common anxiety disorders are generalised anxiety disorder and social phobia (4–5% prevalence); while post-traumatic stress disorder (PTSD) occurs at 4%[5,6] and PTSD themes may focus on childbirth and infant loss trauma. Less common disorders include eating disorders, psychotic disorders, tokophobia (fear of childbirth) and personality disorders, each occurring in around 1–3%.[1,2] Psychotic disorders during pregnancy have a prevalence similar to that outside the perinatal period (around 1%), but the first few weeks after childbirth sees increased risk of psychosis, which may be particularly rapid in onset and severe, and is especially among those with a personal or family history of bipolar disorder.[2,7] Relapse rates are reported in a systematic review and meta-analysis to be around 20% and 35% for severe (psychotic) and episodes overall, respectively.[8] However, pregnancy-related relapse can also be problematic for women with severe disorders – for example, for those who may stop prophylactic medication due to their concerns about its impact on the baby.[2]

Perinatal mental health disorders not only affect the mother but are also linked to pregnancy complications like low birthweight and preterm birth and carry risks for long-term adverse effects on child's cognitive, social and emotional development.[9] These effects are thought to be mediated by prenatal cortisol exposure on the developing fetus leading to alterations in infant stress reactivity, and postnatal issues related to the quality of the mother–infant interaction.[6] Although some studies offer contradictory findings, recent research suggests that the children of mothers who have had effective treatment for maternal depression will not have developmental problems at age 2[10] (few studies have examined the impact of treatment of other disorders on child outcome). Child development issues are more likely with persistent and severe symptoms[11] or when the mother has additional personality difficulties.[12,13] Effective PMH services could mitigate the substantial economic burden of PMH disorders, which are estimated to cost the UK economy £8.1B per annual birth cohort in the UK (28% due to direct costs, 72% to the effect on the infant).[14]

The perinatal period is a critical period for maternal and infant mental health and long-term well-being. Women have frequent interactions with healthcare providers during pregnancy and postnatally, including midwives, health visitors and general practitioners (GPs), offering numerous opportunities to detect mental health issues and provide appropriate intervention. However, without integrated care across the care pathway that effectively identifies women with PMH needs and rapidly and effectively engages them with evidence-based care, few women (around 15%)[15] receive interventions, due to stigma, lack of training and a small workforce.[16] Before the National Health Service England perinatal programme only around 15% of trusts had comprehensive specialist community perinatal mental health teams (CPMHTs).

The 5 Year Forward perinatal transformation investment (£365M) by National Health Service England aimed to address this imbalance by expanding CPMHTs and delivering evidence-based perinatal care pathways.[17] These pathways included: (1) preconception advice to women with severe mental disorders; (2) identification and assessment by universal services, with referral for assessment and care by CPMHTs for women with moderate to severe and complex mental disorders and their partners who may also suffer from mental disorders; (3) emergency assessment for acute crises, carried out by psychiatric liaison or crisis teams, supported or led by the CPMHTs; (4) timely access to evidence-based psychological interventions, and co-ordination with primary care, maternity and secondary mental health services

on identifying, preventing and caring for mild to severe PMH problems; and (5) arranging admission/post-admission support. The long-term plan further extended PMH care to 24 months post delivery, expanded access to psychological therapies within CPMHTs, and offered fathers psychological assessment and signposting. The guidance emphasised the broader impact of well-functioning CPMHTs on the wider health system, ensuring comprehensive care for parents with PMH problems across universal services, NHS Talking Therapies (primary care psychology services), generic secondary mental health care, children and young people's care, and social care.

The recommended workforce composition of CPMHTs was outlined in the 2015 Royal College of Psychiatrists' report CR197[18] (updated in 2021 to CR232). However, limited evidence existed regarding optimal CPMHT service models and their impact on women and infants. A National Institute for Health and Care Excellence (NICE) scoping review and consultation did not identify any new studies on service models,[19] and there was considerable variation in team configuration and services provided, critical to consider as team composition affects the range and types of interventions offered. National Health Service England highlighted the range of diverse CPMHT approaches, including perinatal psychiatry and nursing-driven liaison, education, preconceptual counselling, care planning and medication optimisation and support. Other services built on this model to incorporate the skills of nursery nurses, social workers, clinical psychologists and occupational therapists. These expanded services offered psychological interventions, mother–infant interaction treatments, facilitated peer support, and support for partners and family relationships. 2018 National Health Service England benchmarking data showed that although use of other professions was limited, in some areas innovative approaches were being implemented. For example, specialist pharmacists were embedded in some CPMHTs, and additional psychological time was provided. Service configurations varied by trust type (acute vs. mental health), whether they were colocated within maternity hospitals or community secondary care [pre-coronavirus disease (pre-COVID)], where they employed in-person versus remote/home-based approaches or relied on outpatient/office-based visits, coworked with generic secondary care services versus care provided solely by CPMHTs, and whether they provided care across the perinatal period or for shorter periods.

Theoretical framework: As noted in the commissioning call (see *Report Supplementary Material 1*), despite the growing number of CPMHTs, there was a lack of data regarding how service-level variations or specific components impacted women and infants outcomes.[19] This was especially important to understand, because with the increased number of CPMHTs since the first wave of National Health Service England investment, NHS benchmarking data reported a 49% increase in the number of women seen by CPMHTs over 2015–7 (due to the availability of new teams), representing 0.9% of the maternity population in 2017.[20] Further expansion was expected, aiming for 5% of the maternity population by 2021, and 10% across the pathway. However, it was unclear whether women most in need were accessing CPMHTs, the extent of inequity of access across primary and secondary mental health care, and whether CPMHT access improved maternal and infant outcomes. We hypothesised that variations in service models and components influenced communication between CPMHTs and other healthcare professionals, as well as women's willingness and ability to access care. Therefore, it was critical to identify optimal models and components for identifying women, improving access, and improving outcomes for women and their infants. Following questions posed in the Health and Social Care Delivery Research (HSDR) commissioning brief, we aimed to provide evidence to establish:

1. *Which robust methods of assessment could be used by health and social care services, and are acceptable to potential service users, to identify those in need of intervention [2.1(i) of HSDR brief].*

Evidence on how best to assess important domains of mother–infant interaction quality (e.g. sensitivity, responsivity, withdrawn behaviours, intrusiveness, warmth or positive regard) within clinical services, known to impact adversely on child mental health or cognitive development, was acutely needed. Existing observation measures are training and time intensive (both to become a reliable observer/coder and to code a single mother–infant observation) and lacked evidence of predictive validity to child mental health outcomes or required a lengthy filmed observation period not commensurate with clinical practice. Assessment of mother–infant interaction quality required a validated, brief, clinically feasible observational measure of mother–infant interaction which could be used in routine clinical settings; we aimed to develop this in work package (WP) 2.

2. *Which interventions are attractive and acceptable to women, and clinically effective within/in conjunction with mainstream secondary mental health care, maternity and primary care [2.1.(ii) HSDR brief].*

There were major differences nationally in provision of interventions and it was not known which interventions were acceptable, appealing or what impact they had on women and their families when delivered by CPMHTs. For example, because services varied on the size of geographical area they cover (dense urban or expansive rural), the provision of therapies varied in their delivery (e.g. remote or group vs. home-based, 1 : 1 care). With the coronavirus disease discovered in 2019 (COVID-19) pandemic, many services moved to remote delivery only, but the acceptability and effectiveness of this model of delivery for perinatal women and their families were largely unknown. Care planning or psychological interventions might also not be as effective when delivered in the broader system (e.g. generic secondary care or NHS Talking Therapies) as they were generally not tailored for the perinatal period, and this may also vary by the mother's particular mental health problem or her sociodemographic characteristics. A range of psychological interventions and the ways in which they are delivered were therefore examined in WP3 informed by WP1 taxonomy.

3. *What service models are effective for mothers with PMH problems and their babies, and whether this varies according to mental health needs . . ., who delivers these interventions, with what skill mix and competencies, in what settings? [2.1.(iii) HSDR brief].*

It was not clear whether CPMHTs improved access to care and improved maternal, neonate and infant health outcomes, for whom and under what circumstances. This was examined in WPs 3 and 4.

Why this research is needed now: 35 National Health Service England PMH programme wave 2 sites were announced in May 2018 (20 wave 1 pilot sites were launched in 2017).[21] By the start of this proposal, most areas in England had recruited staff for their CPMHTs and were operational. It was therefore timely to evaluate these services to inform commissioning beyond the National Health Service England 5-year Forward View[22]and the NHS Long Term Plan.[23]

Aim: We aim to answer several inter-related questions from the HSDR call, using pre-existing data where possible, and primary data collection over four WPs. We aimed to produce high-quality evidence, examining which types of CPMHTs are most effective for which mothers and babies, in what circumstances.

1. Develop a taxonomy of CPMHTs across England (WP1) to inform sampling in subsequent WPs.
2. Validate a brief clinically feasible observational measure of mother–infant interaction (WP2).
3. Examine which CPMHT model worked, for whom, in what circumstances, how and why, identifying underlying mechanisms for effectiveness (WP3).
4. Investigate the effectiveness of CPMHTs in improving access to mental health care, improving birth outcomes, preventing relapse, and thus reducing cost, using national NHS data sets (WP4).

Chapter 2 Taxonomy of community perinatal mental health team provision in England

Background

In recognition of the unique treatment needs and heightened and complex risk factors in PMH, small CPMHTs consisting of at least a specialist consultant psychiatrist and mental health nurse, began in the 1980s. With growing awareness of the need and success of these teams, the 5 Year Forward Plan provided £365M to ensure CPMHTs were equitably provided across England.[22] Further investment in 2019 in the Long Term Plan supported the expansion of teams to provide a comprehensive mental health service delivered by multidisciplinary staff, with a particular aim to extend the treatment time period to 2 years postnatally and increase evidence-based psychological and parent–infant intervention provision.[23] In 2015, the Royal College of Psychiatrists published a report (CR-197) outlining a service and staffing model (per 10,000 deliveries) for CPMHTs.[18] The proposed multidisciplinary team structure incorporated the need for a range of psychiatric and psychological and relational interventions, with an emphasis on strong collaborative and integrative working with other health services. At the time of publication, it was estimated that 85% of localities did not have specialist PMH services to the level recommended in NICE guidelines.

The aim of this WP was to develop a taxonomy of CPMHTs across England which would inform sampling in subsequent WPs.

Methods

Developing a programme theory of change in community perinatal mental health teams

To develop the taxonomy, we first developed a programme theory describing proposed mechanisms in CPMHTs that support improving perinatal women's mental health and their relationships with their baby (*Figure 1*). The development of the programme theory followed the first two steps described by Pawson:[24] eliciting the implicit theories and formulate the initial middle-range theory. To elicit implicit programme theories, we undertook the following:

- Synthesised relevant policy documents on CPMHT structures, including the 5 Year Forward Plan,[22] the Long Term Plan,[23] Royal College of Psychiatry CR197,[18] 2014 NICE Antenatal and Postnatal Mental Health Guidelines,[19] Health Education England Perinatal Mental Health Competencies,[25] NICE Antenatal and Postnatal Quality Standards,[26] RC Psychiatry Perinatal Quality Network for Perinatal Mental Health Services *Standards for Community Perinatal Mental Health Services*, 4th edition,[27] British Psychological Society Position Paper 8, 'What does good perinatal mental health provision look like?'[28]
- Compiled information from systematic reviews about:
  - barriers and facilitators to PMH treatment
  - access to PMH treatment
  - effectiveness of PMH interventions.

- Conducted iterative stakeholder and patient and public involvement (PPI) discussions, including:
  - NHS England perinatal team members
  - NHS England Perinatal Strategic Network members
  - Health Education England
  - Members of:
    - Royal College of Psychiatry
    - British Psychological Society
    - Royal College of Midwifery
    - Royal College of Obstetrics
    - Institute of Health Visiting
  - Perinatal Mental Health Academics
  - Perinatal Advisory Group (PAG)

A preliminary list of components relevant to understanding what makes a good perinatal service was developed, discussed among the team and with our stakeholders and PAG group, and organised into a conceptual framework (see *Figure 1*).

Data collection

We aimed to characterise CPMHTs along the relevant dimensions outlined in the programme theory. With input from our Patient Advisory Group (PAG) we operationalised domains from the programme theory using system-related factors in CPMHTs and created a typology matrix (*Table 1*). We contacted the 55 CPMHTs in England asked them to complete the typology matrix. To supplement information we received from services, we also obtained data from NHS Benchmarking (2015–8), the Royal College of Psychiatry Perinatal Quality Network, the National Maternity and Perinatal Audit (2017 and 2019) and from the web pages of CPMHTs (e.g. service specifications). Data were collected between July 2019 and April 2020.

Data analysis

We conducted descriptive analyses on service area birth population, workforce and whole time equivalent (WTE) percentages to determine if services met CR197 staffing requirements, a component underpinning the programme theory. The following formula was used: Service area birth rate/10,000 × CR197 WTE.

Results

In 2020, there were 58 mental health trusts across England, and 55 of them had CPMHTs. We were able to obtain data from 33 of the 55 CPMHTs for the typology matrix. The data collected were characterised by a large amount of missing information and were largely descriptive and qualitative in nature, so we were unable to quantify and reliably compare information across services. The most consistently reported and quantifiable information was on workforce. We therefore used this information to develop typologies. Of note, at the time of data collection none of the services met full CR197 workforce WTE for a comprehensive CPMHT. We consequently characterised CPMHTs in terms of:

- offering a 'basic' service, consisting of the presence of a psychiatrist, psychologist and specialist community nurse
- offering a broader staff mix consistent with the aims of a 'comprehensive' service, defined as CPMHTs who had the presence of the following multidisciplinary staff members: psychiatrist, psychologist, specialist community nurse, nursery nurse and occupational therapist.

Of the 33 services, the following met criteria (*Figure 2*):

- basic 28/33 (84.8%)
- comprehensive 21/33 (63.6%).

We used the 'basic' definition to characterise the presence of at least minimal CPMHT services for WP4. For WP3, we also used the qualitative, descriptive data to purposively sample services for variation on domains from our programme theory that we hypothesised were related to women and babies' outcomes (e.g. provision of parent–infant, collaborative care) (*Table 2*).

Overall, the data suggested there was still considerable variability among CPMHT offer (*Table 3*). In relation to the domains we specified in the programme theory, the following trends emerged:

- Collaborative working: there were higher rates of collaborative working with statutory health providers compared to social care and the voluntary care sector.
- Delivery: there were high rates of providing care in women's homes and children's centres, some CPMHTs were also delivering joint maternity clinics. Few, pre-COVID, were using remote delivery.
- Psychological and parent–infant interventions (see *Appendix 1*, *Tables 21* and *22* for training in treatment): We only received data on these areas from 57% of services. Of these, most (41%) offered between three and five types of psychological interventions, but it is notable that 26% only offered up to two. The most common psychological

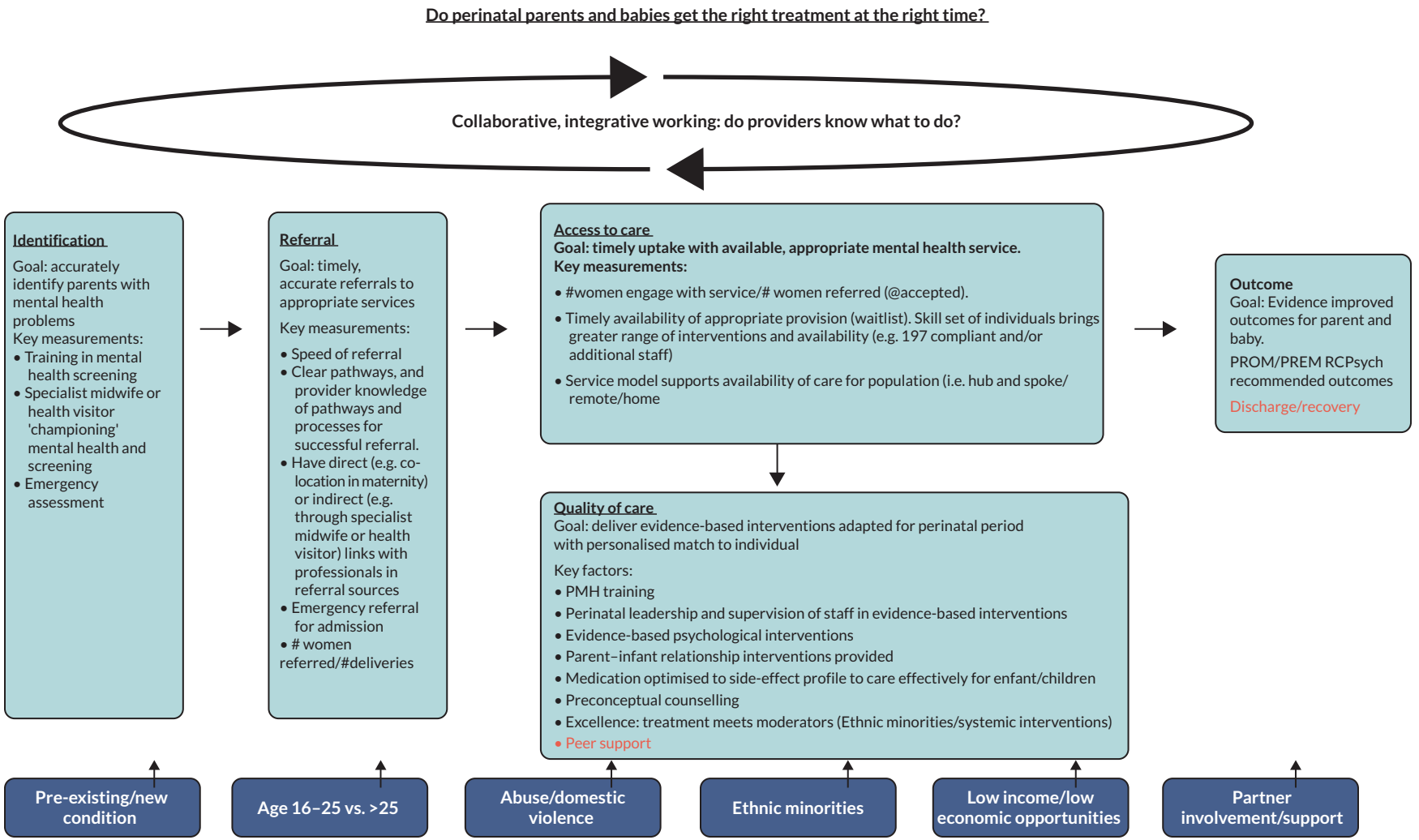


FIGURE 1 ESMI-II programme theory. PREM, patient reported experience measure.

TABLE 1 Typology matrix with components of care

Collaboration and coworking with maternity services (co-location)	• Evidence of links across the perinatal care pathway (e.g. obstetric-liaison clinics, outreach specialist PMH provision, in-reach/out-reach service to mother and baby unit, GP education/liaison, specialist health visiting links). • Where the service is located (i.e. within maternity services, within community)? • Evidence of relationships with other services (e.g. third sector, specialist services). • Training across the different services on PMH. • Time set aside for teamwork and building collaborative relationships.
Provision (home/remote)	• Where appointments are offered – for example at home, over phone, at a clinic – appropriate for the geographic spread of the patient population.
Psychological intervention	• What type of psychological interventions are offered? • Are the interventions offered evidence based? • Who (i.e. which staff member) provides the interventions?
Mother–infant intervention	• What mother–infant interventions are offered and who delivers them? • Evidence of training of staff on mother–infant interventions.
Skill mix of team	• Workforce type and %WTE – as covered by CR197. • Additional workforce that are employed on the service that is above and beyond CR197.
Customer service	• Friends and family question. • Patient experience questionnaires. • Communication between staff and patients.
Preconceptual care	• The numbers of mothers provided with preconceptual care advice and by whom
Access/retention	• Pathways of referrals and knowledge of pathways. • Evidence of timely referrals and acceptances (wait time). • Engagement of women to the service (i.e. DNA rates post first appointment) – retention.
Skills and support (competency)	• Training and supervision within the PMH team – who is trained in what. • What supervision is provided to the staff trained in the psychological interventions.

TABLE 2 Typology of selected sites for realist evaluation study

	Service									
Typology characterisation	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Collaboration and coworking with maternity services (co-location)	X	X	X	X	X	X	X	X	X	X
Provision (home/remote)	X	X		X	X		X	X		
Psychological intervention		X				X		X	X	
Mother–infant intervention	X		X						X	
Skill mix of team				X	X	X		X	X	
Customer service						X	X	X	X	X
Preconceptual care	X		X	X			X			
Access/retention						X	X		X	
Skills and support (competency)		X				X	X		X	X

TABLE 3 Typology matrix of 33 CPMHTs across England

Collaboration and coworking with maternity services (colocation)	• Secondary healthcare services: maternity, midwifery, psychiatry (78.8%) • Primary care: GPs, health visiting (66.7%) • Community care: social care, children's centres (27.3%) • Third sector: charity organisations (27.3%)
Provision (home/remote)	Provision of care (pre-COVID) was highly variable across services. Twenty-four services provided information on the settings women were seen in which included: ◦ Maternity (joint clinics) – 44% ◦ Mother and baby unit – 4.2% ◦ Community: Children's centres, local charities, supermarkets, libraries – 70.8% ◦ Woman's home – 91.2%
Psychological intervention	Nineteen (57%) of services provided data on the type of psychological interventions offered within their service. Services varied with how many interventions were offered: • 0–2 interventions offered: 5 services (26.3%) • 3–5 interventions offered: 8 services (42.1%) • 6 and more interventions offered: 6 services (31.6%) CBT-based treatments • CBT: 13 services (68.4%) • Behavioural activation: 3 services (15.8%) • Dialectical behaviour therapy: 9 services (47.4%) • Acceptance and commitment therapy: 1 service (5.2%) • Compassion-focused therapy: 5 services (26.3%) Trauma-based interventions • EMDR: 7 services (36.8%) • Cognitive analytic therapy: 4 services (21.1%) Attachment-based interventions • Circle of security therapy: 1 service (5.2%) Interpersonal-based interventions • Interpersonal therapy: 1 service (5.2%) • Dynamic interpersonal therapy: 1 service (5.2%) Family-orientated therapy • Systemic family therapy: 3 services (15.8%) • Couple therapy: 4 services (21.1%)
Mother–infant intervention	Parent–infant assessments and interventions (19 services provided data) Assessments • Brazelton – Newborn Observation: 8 services (42.1%) • Parent–Infant Interaction Observation Scale: 4 services (21.1%)

TABLE 3 Typology matrix of 33 CPMHTs across England (*continued*)

	Interventions • VIG: 12 services (63.2%) • Watch, wait and wonder: 1 service (5.2%) • Here's looking at you baby: 3 services (15.8%) • Dynamic maturation therapy: 1 service (5.2%) • Mentalisation-based therapy: 1 service (5.2%) Baby-oriented psychoeducation or generic interactions • Gro-Brain: 1 service (5.2%) • 5 to Thrive: 1 service (5.2%) • Play-based group sessions: 1 service (5.2%) • Seeing is believing: 1 service (5.2%)
Skill mix of team	• Basic (psychiatry, psychology and nursing) WTE met: 27/33 (81.8%) • Comprehensive (basic plus occupational therapy, nursery nursing) WTE met: 20/33 (60.6%)
Customer service	Twenty-two (67%) services discussed using a variety of patient reported experience measures, patient reported outcome measures and clinician reported outcome measures including: • HoNOS (n = 5) • POEM (*n* = 11) at the initial assessment and upon discharge • Friends and Family (*n* = 7) test upon discharge. • CORE-10 (*n* = 5) • Clinical Outcomes in Routine Evaluation – Outcome Measure (*n* = 2) • Post partum bonding questionnaire (*n* = 1) • Parent–Infant Mothers' Object Relations Scale (*n* = 1) • Clinical Global Impression Scale (*n* = 1) • HYS (*n* = 1) • Parent–Infant Interaction Observation Scale (*n* = 2) • Alarm Distress Baby Scale (*n* = 2) • Peer support and co-production (*n* = 13)
Preconceptual care	Fifteen services provided preconceptual care (45.5%)
Access/retention	Twenty-three services mentioned accepting referrals from all pathways from GPs, midwives to heath visitors, midwives, specialist midwives and NHS Talking Therapies. Wait times from referral to assessment varied: • 4/11 reported < 2-week wait for assessment. • 6/11 reported a 4- to 6-week wait for assessment. • 1/11 reported a 7- to 11-week wait for assessment or treatment
Skills and support (competency)	Twenty-six out of 33 services provided information around training and supervision of staff (see *Appendix 1*).

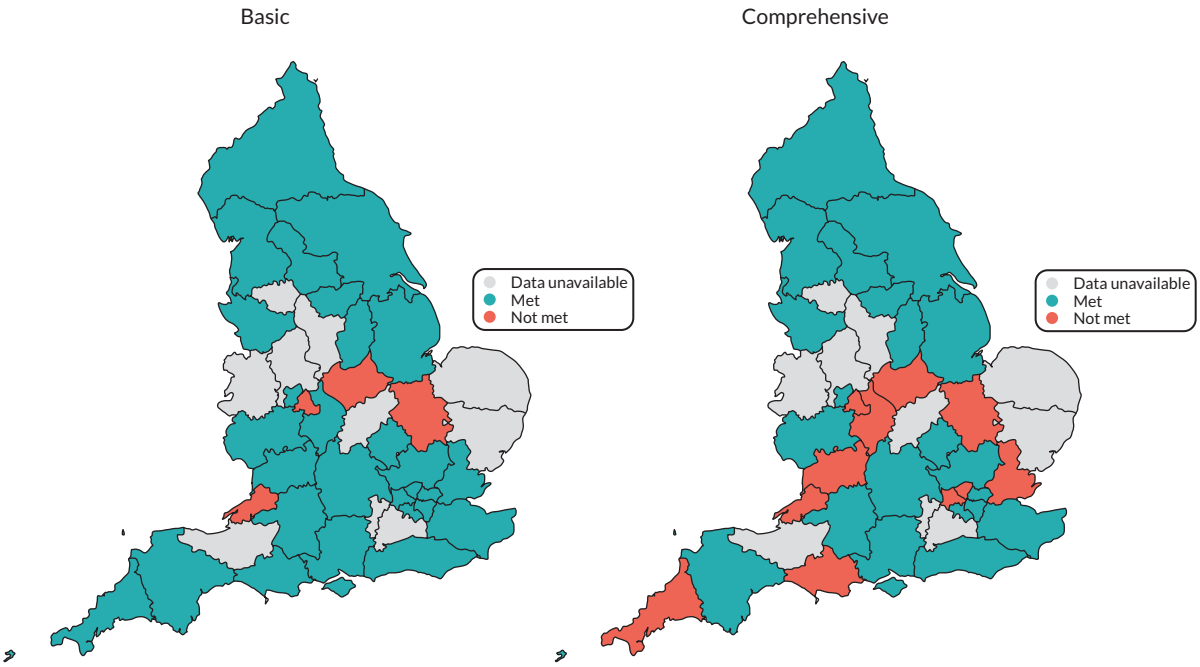


FIGURE 2 Maps of basic and comprehensive CPMHTs within England.

interventions were cognitive–behavioural therapy (CBT), dialectical behaviour therapy, and eye movement and desensitisation and reprocessing (EMDR). Parent–infant interventions were rarely offered, although 63% provided Video Interaction Guidance (VIG).

- Outcome measures. There was wide variability in what was used. The Health of the Nation Outcome Scales (HoNOS), Patient-rated Outcome and Experience Measure (POEM) and Clinical Outcomes in Routine Evaluation – 10-item version (CORE-10) are recommended as a minimum set of measures for CPMHTs.[29] Of the reporting CPMHTs, 22% used the HONOS and CORE-10 and 50% used the POEM.
- Preconceptual Care: Only 46% of CPMHTs were offering preconceptual care.
- Wait times: Wait times for assessment from referral varied between CPMHTs, ranging from < 2 to 11 weeks.

Strengths and limitations

We had excellent engagement and responses from CPMHT services across the UK. The Maternal Mental Health Alliance also generally supported our data collection efforts. However, the quality and missingness of data across services and the mode of reporting were widely variable, limiting our ability to make reliable comparisons across services. We therefore adopted a conservative estimating approach, using consistently reported staffing data to discern service provision across the country.

Conclusion

The provision of perinatal care across England has grown substantially with transformational funding from only 10 services operational in 2013 to all Clinical Commissioning Groups (CCGs) providing the basic level of care by 2020. By 2020, none of the 33 services in our study met full CR197 criteria for staffing levels, and only 60% of the services had sufficient psychiatry, psychology, nursing and occupational therapy care in place. Workforce time did not meet CR197 standards, suggesting that, in many circumstances, provision performed by some staffing types was still minimal. The organisation, composition and delivery of community PMH services in England varied considerably. The categories used to map out service provision included nine areas and there was variation across services in all aspects apart from collaboration and coworking with maternity. Greatest uniformity existed across reported collaboration with other statutory services, though even this varied considerably, with few examples of joint clinics held with maternity, for example. There were notable gaps in collaborative working with social care and voluntary sector organisations, but best practice existed in some places. For example, some services provided examples of good collaboration between organisations through joint clinical meetings, assessments and/or clinics being run within the community through children centres or other public services (e.g. local libraries), and educational sessions provided to organisations.

Chapter 3 Work package 2: assessing validity of parent-interaction observational tools

What is the most reliable, valid and clinically feasible observational measure for routinely assessing parent–infant interaction quality in PMH services?

Background

Specialist PMH services require guidance as to how to meaningfully assess, target and evaluate perinatal interventions that aim to improve the quality of parent–infant interactions (e.g. maternal sensitivity, intrusiveness, withdrawn behaviours, warmth/positive regard). These early parent–infant interactions are important mediators or moderators of PMH on child mental health outcomes, and also represent important early modifiable risk factors for poor child outcomes in their own right. Observational measures are considered the 'gold standard' index of parenting quality, superior to and generating different information from parental self-report. However, the recent Royal College of Psychiatrists working group on outcome measures were unable to recommend an observational tool for this purpose[31] because existing measures either are too training and time intensive, lack evidence for their predictive validity to later child mental health outcomes or require a lengthy filmed observation period not commensurate with routine clinical practice. In this WP, we aimed to evaluate the psychometric properties of two parent–infant interaction observational coding schemes, selected from the research and clinical literature, using video archive material from a prospective, longitudinal Medical Research Council-funded study with follow-up from pregnancy to school age [The Wirral Child Health and Development Study (WCHADS)[32]].

The two measures we selected are described briefly below, along with the reason for their selection:

1. The Parent–Infant Interaction Observation Scale (PIIOS).[33,34] Developed as a clinical screening tool for coding 3- to 4-minute parent–infant interactions between age 2 and 8 months, its concurrent validity has been established against the maternal sensitivity subscale of a detailed measure of mother–infant interaction (the CARE-Index). Training has been rolled out in specialist PMH teams in England on the basis of this, but it is not yet routinely used. However, predictive validity for the PIIOS had not yet been established to later meaningful child outcomes like attachment security or child mental health indices.
2. The revised 'Qualitative Ratings for Parent–Child Interaction'.[35] Adapted from the NICHD Study of Early Childcare and Youth Development (SECCYD) system,[36] this system has been widely used internationally in research for infants age 3–15 months. This coding system has established predictive validity to attachment security and later child psychopathology using 10–15 minutes of mother–infant observation.[37,38] However, the reliability and predictive validity from a shorter observation period with 'clinical utility' are not known and perinatal clinicians view a 10- to 15-minute observation period as too lengthy in the context of parents experiencing moderate to severe mental health problems.

We therefore tested the inter-rater reliability and predictive validity of both the NICHD system and PIIOS system. In the original plan, child outcomes were attachment security and disorganisation (age 14 months) and child externalising and internalising problems at school entry using Pre-school Child Behavior Checklist (CBCL)[39] (age 4–5 years). However, we completed additional work during the course of WP2 in which we also examined predictive validity to child mental health outcomes assessed using Brief Infant-Toddler Social and Emotional Assessment (BITSEA)[40] at age 1 and 2, also available within the WCHADS data set. In order to further inform clinical practice, we also tested whether brief forms of each tool (subsets of items) could be identified that retained acceptable psychometric properties, and whether the reliability and validity of the measures varied depending on length of observation on which ratings were based.

The full NICHD-SECCYD and PIIOS systems are similar, in that they each involve coding multiple dimensions of parent–infant interaction and both aim to capture parental sensitive-responsiveness. Researchers have typically previously used the NICHD system in a hypothesis-driven manner to examine specificity of prediction from specific parenting dimensions to later child outcomes of interest. Internationally, some research groups have used a single coding dimension (e.g. global sensitivity or sensitivity to distress) and others have used subsets of codes. Commonly a three-item composite has been used to yield a broader 'sensitivity' composite, using sensitivity to non-distress or global sensitivity (which includes non-distress and distress episodes during play), positive regard (also known as warmth) and intrusiveness (reverse coded) examining prediction to later child mental health or attachment-related outcomes.[41–45] In contrast, for PIIOS, there is a limited research literature with only one publication describing the development of the measure.[4] The manual[5] recommends calculation of a total score across 13 parent–infant interaction dimensions to index overall sensitive-responsiveness and then conversion of this score into three categorical domains (no concern, some concern, significant concern), designed to drive clinical decision-making and intervention level (e.g. Universal, Universal Plus and Universal Partnership as part of the UK Department of Health's Healthy Child Programme).[46,47] To our knowledge, no previous research has been conducted to examine whether or not the whole scale or a subset of codes within PIIOS has validity in the prediction of later future child outcomes.

In summary, in order to determine which measure or combination of codes within each scale had optimum predictive validity and brevity, and thus clinical utility, we examined whole scale performance and item-subset performance, determined a priori from the research literature or guidance manual for the tool, or from factor analytic or machine learning analyses conducted within this study. Since parents with moderate to severe mental health problems may not tolerate lengthy observation, we further tested whether 3-, 5- or 7-minute observation periods incrementally improved inter-rater reliability and predictive validity to child outcomes or not.

Original aims

1. To derive indices of clinical utility
   a. Time to train staff*
   b. Costs to train staff*
   c. Length of reliable observation period

2. To test the comparative predictive validity of the two coding schemes over varying observation periods (3, 5, 7 minutes) to gold-standard measures of attachment security at age 1 and total child mental health symptoms (internalising and externalising) at school entry (age 4–5 years).

Additional aim addressed during course of work

3. To use the same study sample and methodology to test the comparative predictive validity of the two coding schemes over varying observation periods (3, 5, 7 minutes) to shorter-term mental health outcomes (total internalising and externalising problems) at age 1 and 2 years.

*Note: time and costs to train staff were linked to our original bid proposal which included a new cohort study in which multiple staff were to be trained in order to generate reliable estimates of time taken for a range of multidisciplinary healthcare staff. Since this element of the original proposal was not funded, we are not able to report here on time and costs to train clinical staff.

Findings related to Aim 1 length of reliable observation period, Aim 2 predictive validity in relation to attachment outcomes and Aim 3 to the shorter-term mental health outcomes are reported in detail in Sharp *et al.*[30] Here we report a brief summary of these findings, and we report on the findings in relation to Aim 2 prediction of school entry mental health outcomes (age 4–5 years).

Methods

Overall design

Data were drawn from a longitudinal data set in which film footage was gathered of parent–infant interaction in a play-based task at 6–8 months of age and follow-up outcome data were gathered from cohort members at age 1, age 2 and age 4–5 years (see detailed methods in Sharp *et al.*[30])

Sample size and estimated power

The Consensus-based Standards for the selection of health Measurement Instruments (COSMIN)[48] recommendation is for a sample size of at least 50 for internal consistency (using Cronbach's alpha),[49] which is sufficient also for inter-rater reliability [agreement coefficients, such as the intraclass correlation coefficient (ICC)].

Power analysis

For the mental health problem score, we will report univariate measures of association (for which we will have 90% power for explaining 4% of behaviour variance) and test for a difference in predictive power of the two ratings (for which Stata powerreg calculates 80% power is for a difference in explained variance of just 2%).

Sample

A stratified high-risk community sample of 250 mother–infant dyads from UK WCHADS completed a 7-minute play-based interaction at 6–8 months. The stratification variable, interpartner psychological abuse reported by a larger sample of women[50] in pregnancy, was chosen for its known association with a variety of risk factors for early child development. The intensive sample comprised a higher risk community sample of first-time mothers in which 53% and 47% represented high- and low-risk strata, respectively. The stratification variable was effective in generating a higher-risk perinatal sample, as by the fact that the mean prenatal Edinburgh Postnatal Depression Scale scores[51] in the low- versus high-risk strata were 6.67 [standard deviation (SD) 3.97] versus 9.86 (SD 4.80), Cohen's $d = 0.68$, $p < 0.001$.

Of these 250 dyads, 231 completed the attachment assessment at mean age 14 months. Parents reported child mental health outcomes at ages 1 year ($N = 231$), 2 years ($N = 219$) and age 4–5 years ($N = 225$). Socioeconomic conditions on the Wirral range between the deprived inner city and affluent suburbs, but with very low numbers from ethnic minorities. The demographic characteristics of the sample are given in *Table 4*. Just under 40% of the sample were living in socioeconomic conditions equivalent to the bottom quintile of UK neighbourhoods[52] and just 3.6% were from non-White British ethnicities which is representative of the local area from which participants were drawn.

TABLE 4 United Kingdom WCHADS demographic characteristics

	Total *N*	Mean (SD)	Range
Maternal age (years)	250	27.69 (6.14)	18–51
Phase 8 age of child (months)	231	14.12 (1.68)	11–20
Phase 9 age of child (months)	219	30.86 (2.32)	27–42
Phase 11 age of child (months)	225	57.56 (2.93)	52–73
		***N* (%)**	
Child sex at birth	250		
Male		127 (50.8)	
Female		123 (49.2)	
Marital status	249		
Married/cohabiting		190 (76.4)	

continued

TABLE 4 United Kingdom WCHADS demographic characteristics (*continued*)

	Total *N*	Mean (SD)	Range
Single/divorced/separated/partner living elsewhere		59 (23.6)	
Ethnicity	250		
White British		241 (96.4)	
Other		9 (3.6)	
Maternal education			
< 18 years		86 (34.4)	
≥ 18 years		164 (65.6)	
Socioeconomic status	250		
IMD 1 most deprived		94 (37.6)	
IMD 2		51 (20.4)	
IMD 3		66 (26.4)	
IMD 4		16 (6.4)	
IMD 5 least deprived		23 (9.2)	
Sample stratifier	250		
Low risk		118 (47.2%)	
High risk		132 (52.8%)	

a Socioeconomic status derived from postcodes using Indices of Multiple Deprivation.[52]

Measures

Mother–infant observation

The Wirral Child Health and Development Study video archive material of 7-minute play-based mother–infant interaction recorded at 6–8 months of age was coded using the PIIOS[33,34] and the revised NICHD-SECCYD[6] system. The procedure for the observation of mother–infant interaction followed the manual from NICHD-SECCYD research network.[53]

The NICHD coding scheme

The revised manual for The Qualitative Ratings for Parent–Child Interaction for 3–15 Months of Age,[35] which uses 5-point global ratings adapted from the 4-point NICHD-SECCYD system,[36] was used. This yielded ratings for nine maternal and four infant-focused scales and one dyadic scale. Each is rated on a global 5-point scale, ranging from 1 (not at all characteristic) to 5 (highly characteristic). Two 'a priori' summary indices were also created for the analysis which combine NICHD dimensions, namely the three-item composite score (NICHD-3) and the NICHD total score ($NICHD_{total}$). These were guided by previous empirical research using the NICHD system. The NICHD-3 score (range 3–15) was created by summing 3 codes: global sensitivity, intrusiveness (reversed) and positive regard. The $NICHD_{total}$ score was the sum scale of all seven maternal codes plus the one dyadic code: global sensitivity, intrusiveness (reversed), detachment (reversed), positive regard, negative regard (reversed), animation, stimulation and dyadic mutuality (range 8–40). High scores indicated more optimal interaction. The internal consistency in the current study for $NICHD_{total}$ was high at $\alpha = 0.84$ and for NICHD-3 it was acceptable given the scale consists of only three items, $\alpha = 0.67$.

Reliability and validity analyses first included examination of individual codes within the NICHD system and the two summary indices described above. The *Data analysis* section describes further analytic approaches taken to examine whether there might be other more optimal approaches to combining codes to maximise predictive validity of the tool.

The PIIOS coding scheme

The PIIOS[34] manual was used to record the interactions and maternal responses on 13 dimensions which together represent overall sensitive-responsiveness according to the authors. The coder rated the interaction based on descriptors given for allocation to a 3-point categorical scale, assigning a score of 0 (no concern), 2 (some concern) or 4 (significant concern) for each dimension, with the lowest score indicating the most optimal interaction and the highest, the least optimal. Once all dimensions were assigned a score, a total score was calculated, hereafter referred to as the $PIIOS_{total}$. The total score was then used to create the PIIOS domain score $PIIOS_{domain}$, which indicates which category the dyad's quality of interaction should be allocated to overall according to the manual; no concerns ($PIIOS_{total}$ scores between 0 and 17), some concerns ($PIIOS_{total}$ scores between 18 and 25) or significant concerns ($PIIOS_{total}$ scores of 26+). The internal consistency in this study for the $PIIOS_{total}$ was high, $\alpha = 0.82$.

Reliability and validity analyses first included examination of individual codes within the PIIOS system, and the two summary indices described above, total score and domain of concern. The *Data analysis* section describes further analytic approaches taken to examine whether there might be other more optimal approaches to combining PIIOS codes to maximise predictive validity of the tool.

Outcome measures

Outcomes were:

- infant attachment security and disorganisation (Strange Situation[54]) at 14 months
- maternal report of internalising and externalising child mental health symptoms (BITSEA[40]) at 14 and 30 months
- internalising and externalising child mental health symptoms (Pre-School Child Behaviour Checklist[39]) at age 4–5 years.

For details of all attachment and mental health outcome measures at age 1 and 2, please see Sharp *et al.* 2024.[30] In the absence of UK norms for the BITSEA and CBCL to define clinical level symptoms, we used a cut-point of being in the top decile range for total subscale scores (1) versus below (0) to indicate mental health outcome in receiver operating curve (ROC) analyses.

Covariates

- Socioeconomic status, which was derived from post code data using the English Index of Multiple Deprivation (IMD[52]) and converted to quintile categories with a binary variable (1 = most deprived, 0 = all 4 other quintiles), was used for analysis.
- Mother's age, education beyond school and marital status were recorded at consent.
- Child sex was recorded at birth.

Procedure

An incremental approach was taken to coding each video. Each rater coded the 3, then 5, then 7-minute interaction clip for the same dyad to enable examination of any incremental improvement afforded in reliability or predictive validity by increasing the observational period. Rating each interaction in this incremental manner using the full NICHD coding scheme took approximately 30–45 minutes and took 20–30 minutes using the full PIIOS coding scheme.

Inter-rater reliability between each naïve rater and a gold standard rater was calculated for the study data set for 40 randomly selected filmed interactions using PIIOS and 40 using the NICHD system (see Sharp *et al.* 2024[30] for additional details of training procedure and main study rating procedure).

Data analysis

We evaluated the psychometric properties of the two mother–infant interaction measures based on COSMIN[48] and contemporary psychometric guidelines.[55]

Reliability

Agreement coefficients were used to evaluate the agreement between the raters (inter-rater reliability) and subsequently agreement of ratings within rater for different observation duration (stability). Raters were Rater 1 (R_1), Rater 2 (R_2) and a golden criterion rater. Data from all three raters were used. As the PIIOS and NICHD codes are rated in skewed three and five points scales respectively, we used the nonparametric Psi coefficient [R package (The R Foundation for Statistical Computing, Vienna, Austria) nopaco[56]], which can be transformed to the ICC.[57] For completeness, we also present the percentage of agreement and Cohen's weighted kappa coefficient[58] where appropriate. Guidelines[59] were followed for interpreting the results (values < 0 no agreement; 0–0.20 slight agreement; 0.21–0.40 fair agreement; 0.41–0.60 moderate agreement; 0.61–0.80 substantial agreement; and 0.81–1 almost perfect agreement).

Exploratory factor analysis

Exploratory factor analysis was carried out to assess the latent constructs of the NICHD and PIIOS, for ordered categorical items, using the weighted least squares mean and variance adjusted estimator.[60] Measures of relative and absolute fit were used to assess the goodness of fit of the emerged structures (see Sharp *et al.*[30] for detail). Latent variable analysis was conducted using the M*plus* (Muthén & Muthén, Los Angeles, CA, USA) software.[61] This data-driven approach was taken to determine if coding dimensions might form factors or subscales for each measure. Any such subscales might then be examined for their predictive validity in relation to the outcomes of interest in this study, alongside those selected on an a priori basis from the literature or original scoring in the manual (e.g. NICHD-3, $NICHD_{total}$, $PIIOS_{total}$ and $PIIOS_{domain}$).

Predictive validity

We first examined the predictive validity of the two tools in relation to attachment outcomes using logistic regression. Analysis tested the predictive validity at individual code level, as well as subscale or summary level (NICHD-3, $NICHD_{total}$, $PIIOS_{domain}$ and $PIIOS_{total}$).

We next created ROC[33] to test the discriminant validity of NICHD-3, $NICHD_{total}$, $PIIOS_{domain}$ and $PIIOS_{total}$ in the prediction of attachment outcomes and top decile scores on each mental health outcome at different durations of observation. We further tested the discriminant validity of factor scores derived from the exploratory factor analysis above for PIIOS and NICHD systems in relation to top decile mental health outcomes. Discriminative validity was evaluated by the area under the curve (AUC) where values 0.9–1 indicate very good validity, 0.8–0.9 good, 0.7–0.8 fair, 0.6–0.7 poor validity and 0.5–0.6 failed to provide evidence for validity. We also tested the ways in which demographic covariates might affect the ROC curves. First, we tested if a covariate (child's sex, maternal age and level of deprivation) affects the ability of the measure to discriminate between cases and controls. Second, we tested if the ROC curve is biased by the levels of the covariate. We used the ROC regression (*rocreg*) process for the testing of significant covariates.

Finally, we used regularised methods (Lasso regression) and cross-validation (machine learning) methods to examine the prediction of attachment classification and symptom outcomes. Both the NICHD and PIIOS coding schemes provide ratings of a range of behaviours, some principally of the mother, some of the child and some that are intrinsically dyadic in nature. It is possible that there are particular coding dimensions and combinations of those dimensions that might be of particular salience for later development of secure attachment and behaviour problems. Such a search requires choosing from among a large number of potential prediction models and requires special attention being paid to the problems of overfitting. Overfitting leads to coefficient estimates being upwardly biased in magnitude, and an exaggerated assessment of prediction success. We applied lasso and split-sample cross-validation methods to reduce the extent of these biases. We compared the performance of the two coding schemes using several sets of predictors in each case.

A priori 8: The first was the single item (appropriately signed) sum score from each scale. There being no model selection, this used regular logistic regression informed by the literature. In the case of the PIIOS, the total score was used ($PIIOS_{total}$) as the instrument was developed with the intention of a total score being derived to reflect overall quality of interaction. In the case of NICHD, the literature has typically focused on ratings derived from combinations of the seven adult scales [global sensitivity, detachment (reversed), intrusiveness (reversed), animation, stimulation, positive regard, negative regard (reversed) AND one dyadic scale (dyadic mutuality)] to predict child development

outcomes such as behavioural problems. Accordingly, we selected to examine prediction to total internalising and externalising problems at age 1 and 2 from (1) a total score ($NICHD_{total}$) representing all eight NICHD dimensions of adult behaviour including dyadic mutuality and (2) a commonly used trio of codes (NICHD-3); global sensitivity, intrusiveness (reversed) and positive regard, identified below as the minimum set.

A priori 3

The set of three NICHD items (NICHD-3), global sensitivity, intrusiveness and positive regard most commonly identified in the literature. There is no equivalent evidence base for PIIOS.

Main

This set included all the individual item scores as main effects and likely freely available demographics (maternal age, child sex, IMD deprivation quintile associated with postcode, maternal education beyond school, marital status).

Interaction

This set included both main effects included in *Main* but also all pairwise (two-way) interactions, for example allowing for the possibility that maternal intrusiveness in a context of low maternal warmth might be of particular concern.

All analyses were conducted in Stata Version 16 (StataCorp. Stata treatment-effects reference manual. College Station, TX, USA: StataCorp LLC; 2017) unless otherwise stated.

Results

Psychometric evaluation

The descriptive indices of the measuring tools (BITSEA, NICHD and PIIOS) are presented in *Table 5*.

TABLE 5 Descriptive indices for predictors and outcome measures

Outcome variable	*N*	Frequency, *N* (%)	
Attachment security	231	108 (46.8) secure	123 (53.2) insecure
Attachment disorganisation	231	156 (67.5) organised	75 (32.5) disorganised
	N	Mean (SD)	Median (min–max)
BITSEA externalising – age 1	219	1.8 (1.7)	1 (0–11)
BITSEA internalising – age 1	219	1.3 (1.2)	1 (0–6)
BITSEA externalising – age 2	219	2.0 (1.9)	1 (0–10)
BITSEA internalising – age 2	219	1.7 (1.5)	2 (0–9)
CBCL externalising – age 4–5	225	9.9 (7.6)	9 (0–44)
CBCL internalising – age 4–5	225	7.5 (5.9)	6 (0–36)
Predictor variable	*N*	Mean (SD)	Median (min–max)
$NICHD_{total}$ (3 minutes)	250	30.1 (4.8)	31 (16–39)
$NICHD_{total}$ (5 minutes)	250	30.1 (5.2)	30 (17–40)
$NICHD_{total}$ (7 minutes)	250	29.9 (5.4)	30 (16–40)
$NICHD_{Composite}$ (3 minutes)	250	11.4 (2.1)	12 (6–15)
$NICHD_{Composite}$ (5 minutes)	250	11.4 (2.2)	11 (5–15)
$NICHD_{Composite}$ (7 minutes)	250	11.3 (2.4)	11 (5–15)

continued

TABLE 5 Descriptive indices for predictors and outcome measures (*continued*)

Outcome variable	*N*	Frequency, *N* (%)	
$PIIOS_{total}$ (3 minutes)	250	11.5 (7.6)	10 (0–38)
$PIIOS_{total}$ (5 minutes)	250	13.3 (8.1)	12 (0–40)
$PIIOS_{total}$ (7 minutes)	250	14.2 (8.7)	14 (0–38)
		Category of concern, *N* (%)	
$PIIOS_{domain}$ (3 minutes)	250	no: 189 (75.6%), some: 49 (19.6%), sign.: 12 (4.8%)	
$PIIOS_{domain}$ (5 minutes)	250	no: 166 (66.4%), some: 66 (26.4%), sign.: 18 (7.2%)	
$PIIOS_{domain}$ (7 minutes)	250	no: 157 (62.8%), some: 66 (26.4%), sign.: 27 (10.8%)	

BITSEA, Brief Infant Toddler Social-Emotional Scale; NICHD, National Institute of Child Health and Human Development coding scheme – higher scores represent optimal parenting; PIIOS, Parent–Infant Interaction Observation Scale – lower scores represent optimal parenting; PIIOS domains, no concern, some concern, significant concern.

Length of reliable observation period

Inter-rater agreement

For all NICHD individual codes, the two raters had excellent inter-rater agreement with the golden rater, regardless of the length of observation. The percentage of agreement across codes was at least 84%, the PSI coefficient varied between 0.72 and 0.94, leading to an ICC coefficient of at least 0.83 (excellent agreement).

For all PIIOS individual codes there was high inter-rater agreement between the two raters and the golden rater for all observation periods, across all codes. The percentage of agreement was at least 84%, the PSI coefficient varied between 0.71 and 0.96, leading to ICC coefficients of at least 0.83 (excellent agreement).

Intra-rater agreement (stability of ratings)

Table 6 shows the agreement coefficients between ratings for different observation periods. For the $NICHD_{total}$, the ICC between 3 and 5 minutes, 5 and 7 minutes, and 3 and 7 minutes observation, agreement was excellent for all comparisons though highest between 5 and 7 minutes. Similar results were found for the composite NICHD-3.

For the $PIIOS_{total}$, the ICC between 3 and 5 minutes and the ICC between 5 and 7 minutes showed excellent agreement, while the ICC between 3 and 7 minutes was lower at 0.69. These results indicate that adding the first 2 minutes makes a small difference in the reliability scores, but adding the second 2 minutes does not actually make a difference in the scores. With respect to the $PIIOS_{domain}$ score, as expected, the agreement was lower (due to the categorical classification). Using weighted kappa, the agreement coefficients indicated that the observations at 5 and 7 minutes were in highest agreement. See Sharp *et al.*[30] for coefficients of agreement for different scenarios.

Five minutes observation was optimal to achieve an excellent level of stability in mother–infant interaction ratings.

TABLE 6 Stability of ratings for NICHD and PIIOS indices between different observation periods expressed as ICCs

Within-rater comparison for	$NICHD_{total}$	NICHD-3	$PIIOS_{total}$	$PIIOS_{domain}$ [a]
3 and 5 minutes	0.91	0.88	0.82	0.51
5 and 7 minutes	0.97	0.94	0.91	0.78
3 and 7 minutes	0.87	0.84	0.69	0.44

a Weighted kappa used for categorical data.

Exploratory factor analysis

For detailed information, see Sharp *et al.*[30]

Factor analysis for categorical data was performed for PIIOS and NICHD systems separately to establish whether or not a new combination of parenting codes might prove reliable and predict later outcomes. Factor analysis led to a two-factor model in each case. The factors derived for each measure were of good or satisfactory internal consistency and content validity. However, when ROC analyses were conducted to assess predictive validity to attachment and mental health outcomes, factor scores had poor discriminant validity in the case of prediction to each mental health outcome at age 1, 2 and 5 and attachment outcome at age 1 (AUC < 0.70).

We concluded that the predictive validity was not increased if the information from NICHD or PIIOS was summarised using a different clustering of the codes, to that proposed a priori in the *Measures* section above, for either tool. See Sharp *et al.*[30] for more detail.

Predictive validity to attachment outcome at age 1

Although logistic regression analyses showed multiple individual codes and the summary indices in both measures significantly predicted later attachment security, and for NICHD some codes also predicted attachment disorganisation, ROC analyses revealed neither the $NICHD_{total}$, NICHD-3 nor the $PIIOS_{total}$, $PIIOS_{domain}$ predicted attachment outcomes at the level required for a screening tool (AUC > 0.70). For more detailed information, see Sharp *et al.*[30]

Predictive validity to mental health outcomes

For 5 minutes observation using NICHD-3, ROC curve analysis demonstrated fair discriminant validity to later BITSEA externalising problems (threshold – top 10%) at age 1 and 2 (AUCs = 0.74), but values were < 0.70 threshold for prediction of internalising problems and age 4–5 CBCL outcomes. Values of AUC from $NICHD_{total}$ fell < 0.70 threshold for outcomes at age 2, indicating use of brief NICHD-3 is optimal for the NICHD-SECCYD system.

For 5 minutes observation using $PIIOS_{total}$, AUCs ranged from 0.72 to 0.82 indicating fair to good discriminant validity in the prediction BITSEA internalising and externalising problems, respectively, at age 2, but values were < 0.70 threshold in relation to age 1 BITSEA and age 4–5 CBCL outcomes. For $PIIOS_{domain}$, AUC was 0.77 indicating fair discriminant validity in the prediction of age 2 BITSEA externalising problems only, but values were also < 0.70 threshold in relation to age 1 BITSEA and age 4–5 CBCL outcomes, indicating use of $PIIOS_{total,}$ rather than the domain-based scoring system, is optimal for this tool.

In ROC regression analyses, ROC curves at specific values of the covariates were not implemented, as no covariates (maternal age, gender, IMD quintile) were identified as having a significant effect on the discriminatory ability of either measure. Adjustment for significant covariates (maternal age for NICHD and all three covariates for PIIOS) resulted only in a marginal fall in AUC.

Predictive validity in relation to length of observation

For both NICHD-3 and $PIIOS_{total}$, optimal prediction to age 2 mental health outcomes was reached at 5 minutes observation, with values of AUC falling below threshold for the shorter 3 minutes of observation in the case of NICHD-3 in relation to age 2 externalising problems, and in the case of $PIIOS_{domain}$ and $PIIOS_{total}$ in relation to age 2 internalising problems.

Derivation of cut-points from receiver operating curve analyses for use in clinical practice

Using data from 5 minutes observation for NICHD-3, a score of 11 or below had 92.8% sensitivity and 52.2% specificity to detect membership of the top decile at age 1, correctly classifying 54%. A score of 10 or below had 72.7% sensitivity and 66.3% specificity to detect membership of the top decile for externalising problems at age 2, with correct classification of 67%.

Using data from 5 minutes observation for $PIIOS_{total}$, a score of 20 or above had 81.8% sensitivity and 74.5% specificity to detect membership of the top decile for externalising problems, with 75% correctly classified, and had 66.7%

sensitivity and 73.3% specificity (73% correctly classified) to detect membership of the top decile for internalising problems at age 2.

Prevalence and characteristics of high-risk dyads

Using the cut-points for sensitivity and specificity derived above identified 28.3% of dyads as at risk according to $PIIOS_{total}$ and 24% dyads as high risk on NICHD-3 in our higher-risk community sample. Although the overall agreement level in classification of dyads as high or low risk was 73% so a dyad that was rated high risk on PIIOS was four times more likely to be rated as high risk on NICHD [odds ratio (OR) = 4.0, $p < 0.001$], the two scales also appeared to detect slightly different forms of risk.

Logistic regression revealed that those dyads identified using NICHD-3 were at raised risk of insecure attachment (OR = 2.7, $p = 0.004$) and top decile level externalising problems at age 2 (OR = 1.9, $p = 0.14$) which suggests the threshold for externalising problems derived above can be used to identify dyads at risk for attachment insecurity, whereas dyads identified using PIIOS were at raised risk for externalising (OR = 3.75, $p = 0.002$) and internalising problems at age 2 (OR = 2.16, $p = 0.073$) but not so clearly for insecure attachment (OR = 1.5, $p = 0.15$, ns). However, these results need to be considered with caution. ORs are best used as the index of effect size here since the small sample size constrained our power to detecting moderate effects as significant.

We did calculate the comparative likelihood of being classified as insecure based on above/below threshold status on $PIIOS_{total}$ and NICHD-3. *Table 7* shows that the odds of being insecure are threefold higher for dyads scoring above threshold on both tools, compared to dyads scoring as low risk on both measures. However, the raised risk for attachment insecurity is driven by the NICHD-3 rating as we can see that the risk of insecure attachment is not raised in those dyads who only score high on the PIIOS are those low risk on both measures [Chi (3) = 9.08, $p < 0.05$].

Predictive validity: Lasso regression using scales and scale items from 5-minute ratings and background/demographic variables

Regularised methods (Lasso regression) and cross-validation (machine learning) were used to examine the prediction of attachment classification and mental health symptom outcomes. Both the NICHD and PIIOS coding schemes provide ratings of a range of behaviours, some principally of the mother, some of the child and some that are intrinsically dyadic in nature. We considered the possibility that there might be coding dimensions and combinations of those dimensions within each measure, including interactions between codes, that have not yet been identified in the literature, which might be of salience for later development of secure attachment and mental health problems at age 1, 2 and 4–5 years. However, in almost all cases, analyses revealed that the a priori assumed scores ($PIIOS_{total}$, $NICHD_{total}$ and NIICHD-3) performed better than any other new combination of codes. The results of these analyses are given in Sharp *et al.* 2024.[30]

Discussion and conclusions

- Using film footage recorded at 6–8 months of age in a high-risk community sample, we provide evidence for the reliability and predictive validity of two observational tools which we conclude are suitable for routine use in perinatal clinical practice to identify parent–infant dyads who may benefit substantially from interventions designed to improve interaction quality.

TABLE 7 Cross-tabulation of prediction from high-risk status on PIIOS and/or NICHD-3 to attachment status as insecure

Outcome	Chi square	OR	*p*-value
Attachment group	Low both (NICHD-3 and $PIIOS_{total}$) – reference category		
Insecure (vs. secure)	High NICHD-3/low both	2.2	0.088
	High $PIIOS_{total}$/low both	1.1	0.780
	High NICHD-3 and $PIIOS_{total}$/low both	3.3	0.010

- These measures comprise (1) a short form of the NICHD coding system, namely the NICHD-3, or (2) the PIIOS in its full form using the total score ($PIIOS_{total}$). No shorter form of PIIOS was identified with sufficient predictive validity.
- Optimal reliability (stability of ratings) and predictive (discriminative) validity to age 2 mental health outcomes were achieved by using 5 minutes observation for both NICHD-3 and $PIIOS_{total}$. In clinical practice we therefore advise filming for a 5-minute period, rather than shorter or longer periods which confer, respectively, disadvantage or no advantage in terms of predictive validity.
- Neither observational tool predicted longer-term mental health outcomes at school entry, but this is not surprising if one considers the many intervening events or circumstances in children's lives that might influence outcomes between 6 and 8 months of age when parenting was assessed and school entry at age 4–5 years.
- While PIIOS had broader predictive validity to age 2 internalising (emotional) and externalising (behavioural) mental health outcomes, it was developed for use with infants between 2 and 8 months which limits application in services with a broader age range of infants. The full system needs to be used as we found no short form. Training takes 3 days, plus time to practise and complete the reliability set of observations. Once trained, coding a 5-minute interaction takes 20–30 minutes depending on complexity.
- The NICHD-3 which focuses only on parental sensitivity, intrusiveness and positive regard (warmth) may have greater clinical utility due to its comparative brevity, its predictive validity to both attachment security and externalising problems and application from 3 to 24 months of age which matches the broader needs of specialist PMH services. We estimate the time to train to reliability will require 2 days, rather than 3 days for the full system, plus time to practise and complete the reliability set of observations. Once trained, coding a 5-minute interaction takes 15–20 minutes, rather than 30–45 minutes for the full system.
- Services who have already invested in staff training on these observational tools can use them with confidence *for the infants who are within the age ranges that each respective tool has been validated on.*
- Future research needs to establish the sensitivity to change following intervention for each tool.
- Our findings used a higher-risk community sample drawn from a population sample of consecutively registered mothers for antenatal care on Wirral and, as such, represented the local population well, with higher levels of socioeconomic deprivation than the national population of England. However, few families were non-White British and so the findings reported here are limited in this respect in terms of generalisation to more diverse populations.

Chapter 4 Realist evaluation of community perinatal mental health teams

Introduction

The perinatal period is a critical time for maternal and infant mental health and the long-term well-being of family members.[1] While women see many health providers through pregnancy and after birth (including midwives, health visitors, GPs), until 2015 there was a lack of integrated care across the care pathway that effectively identified and treated women with more severe and complex PMH needs and the mother–infant dyad. The 5 Year Forward plan included a £365M investment to transform PMH and provide CPMHTs equitably across England.[17,22,23] In the Long Term Plan (LTP) there was further investment in CPMHTs that included increasing the numbers of women seen and offering a wider skill set in teams, with particular focus on strengthening psychological treatment and parent–infant offers and providing partners with assessment and signposting. With these changes, there were key questions about whether CPMHTs effectively improved access, particularly to women most in need of support, what factors promoted their successful engagement and ongoing adherence with mental health treatment, and if the increase in staff skill mix and treatment offers effectively improved maternal and infant outcomes.

In the midst of the PMH transformation, the COVID-19 pandemic occurred. The first lockdown coincided with the week we were due to begin recruitment in WP3, and we moved to recruit and interview online only. Research findings from the pandemic have demonstrated that it had a number of impacts on perinatal women and infants, including in England there were significant changes in maternity appointments, in that they moved primarily to remote only and were sometimes reduced in number. In the beginning of the pandemic, women laboured alone, as family were not permitted to accompany them for fear of COVID contagion. Late in the pandemic, one family member might join for the delivery, but had to leave immediately thereafter. These changes were associated with increases in reports of perceived traumatic childbirths.[63] Following childbirth, women reported a decrease in access to regular universal provision, including fewer health contacts for mother or baby, and a lack of ability to attend parent and baby groups, affecting socialisation.[64] These changes resulted in increases in parental perceived isolation and loneliness. New families were also isolated from their wider family supports, with mixed consequences. This benefitted some families, particularly when there was conflict with extended families.[65] Other families suffered from lack of support.[66] There were also reports of increases in domestic violence to women.[67] Overall, the prevalence of maternal mental health worsened during the pandemic,[68–70] with CPMHTs reporting that women often were referred to them later in pregnancy and had more severe symptoms and complex needs when they reached the CPMHT.

Therefore, to better understand which factors ensure CPMHT successfully deliver care, the following questions were considered in this chapter:

1. *What service models are effective for mothers with PMH problems and their babies? Does this vary by mental health need, who delivers the intervention, the skill mix and competencies of the service and the settings in which the services are provided?*
2. *Which interventions are attractive and acceptable to women, and clinically effective within/in conjunction with mainstream secondary mental health care, maternity and primary care?*

Because of the timing in which we recruited and in which women had received services allowed us to examine service provision before, during and after COVID lockdowns, we were able to include the impact of COVID-related changes on service provision, their integration with other health providers, and manner of delivery on women and infant's

outcomes. We received extension funding for this project to answer additional questions specific to the impact of COVID on services, and to examine barriers and facilitators to care in women from ethnically diverse background who have PMH problems but do not access statutory mental health services. The additional questions were:

1. *What has been the impact of COVID-19 on how women experience service delivery and their overall well-being?*
2. *What factors make PMH services resilient to public health emergencies?*
3. *What barriers and facilitators do women with diverse background encounter regarding access to CPMHS?*

Methods

We sampled from 10 CPMHTs across England. CPMHTs were purposefully selected for variations in different components and configurations including: level of mother–infant and/or psychological interventions, collaborative care (e.g. integrated with universal and adjunctive services), quality of integration (e.g. communication, mental health colocated with maternity care), delivering perinatally tailored care, including care co-ordination versus coworking with generic mental health teams, and meeting women's needs (flexible, remote/in home, family-centred). Three services were in the SouthWest, four were in the London/SouthEast and three were in the Midlands/NorthWest.[5] The study received ethical approval by the Southwest – Central Bristol Research Ethics Committee (Reference: 19/SW/0218). The study was also registered on Research Registry (ID number 5463).

Recruitment took place between April 2020 and June 2021 and included those who experienced CPMHT care prior to and during the COVID 19 pandemic. Recruitment methods for participants are outlined below:

- Mothers: Recruited via a purposive sampling approach (with maximum variation in characteristics) that identified women with different types of mental health problems, that is serious mental illness (SMI) (psychosis, schizoaffective disorder, bipolar I), personality disorder, trauma/PTSD, depression and anxiety. A member of the direct care team approached potential participants via phone or e-mail and gave a brief overview of the study and an opt-out option. Participants were interviewed towards the end of their treatment or up to 2 years after they had completed their treatment, to avoid Hawthorne effects.
- Significant sources of support: Women were asked during their interview to identify their significant sources of support and for permission to contact them. Once contact details were obtained, the research team contacted significant sources of support to inform and consent them into the study.
- Staff: The perinatal service champion, identified at the start of the study, was asked to disseminate study information sheets to key members of staff within each professional group. Staff either came forward to be interviewed or were contacted by the research team to take part in the study. Staff members included: PMH nurses, nursery nurses, psychologists, psychiatrists, pharmacists, occupational therapists, team leaders, managers and administrative staff.

Data collection

Semistructured interviews lasting approximately 60–90 minutes, and consistent with COVID-19 related changes, were conducted via telephone or videoconference only (no in-person interviews). Interviews followed a guide that followed domains from the programme theory and was developed in collaboration with clinicians, policy-makers and persons with lived experience. Interview topics included:

- Mothers: Experiences of care including their mental health history; access to service; which service components made a difference to their access, engagement and adherence with treatment; and the impact (if any) on their mental health/well-being, functioning and their relationship with their family, including their infant.
- Significant sources of support: Perceptions of care received; the impact (if any) on the mother's mental health/well-being and functioning; how the care received affected the mother's relationships with their partner/family, including their infant.
- Staff: How services operate; which service components improve outcomes for mothers and babies; and which populations/presenting problems these services work for.

Data analysis

We followed RAMESES reporting guidelines.[71] Interviews were audio-recorded, transcribed verbatim and analysed using NVivo 12 software (QSR International, Warrington, UK). Analysis followed a realist logic of analysis with the goal of using the collected data to develop and refine the initial programme theory into a more refined realist programme theory. Data coding was deductive (informed by our initial programme theory; see *Figure 1*), inductive (from the data within transcripts) and retroductive (where inferences were made based on interpretations of the data within sources about underlying causal processes, i.e. mechanisms). Data to inform our interpretation of the relationships between contexts, mechanisms and outcomes were sought across interviews (e.g. mechanisms inferred from one interview could help explain the way contexts influenced outcomes in a different interview). Synthesising data from different interviews was often necessary to compile context–mechanism–outcome configurations (CMOCs), since not all parts of the configurations were always articulated in a single interview. During data collection and analysis, we moved iteratively between the analysis of particular examples, refinement of programme theory and further data collection to test particular theories. Mechanisms and refinement of programme theory were discussed iteratively with service users and stakeholders.

Results

Across 10 different CPMHTs, we interviewed 139 women who were nearing the end of their care with the CPMHT or had finished their care within the past 2 years. We also spoke to 55 significant sources of support and 80 health and social care practitioners (*Table 8*).

TABLE 8 Work package 3 demographic details of mothers, type of significant source of support and staff roles

	N	%
Age (n = 139; mean = 32.2; SD = 5.20; range 20–45)		
≤ 25	12	8.63
26–30	38	27.33
31–35	53	38.13
36–40	26	18.71
41–45	10	7.53
Ethnicity (n = 139)		
White	110	79.14
South Asian	9	6.47
Black	10	7.19
Mixed	6	4.32
Other stated	4	2.88
Diagnosis category (n = 136)		
SMI	23	16.9
Personality disorder	16	11.8
PTSD and OCD	22	16.2
Depression and/or anxiety	75	55.1
Socioeconomic deprivation (n = 135)		
Least deprived = quintile 1	17	12.59

TABLE 8 Work package 3 demographic details of mothers, type of significant source of support and staff roles (*continued*)

	N	%
Quintile 2	29	21.48
Quintile 3	30	22.22
Quintile 4	34	25.19
Most deprived = quintile 5	25	18.52
Employment status (n = 137)		
Employed (including full-time, part-time, self-employed and furloughed)	69	50.36
Unemployed (including recently redundant)	30	21.90
Stay at home mum	14	10.22
In education	1	0.73
Long term sick	5	3.65
Maternity leave	18	13.14
Relationship status (n = 138)		
Married	74	53.62
Cohabiting	38	27.54
Single	19	13.77
Divorced	2	1.45
Living separately from partner	5	3.62
Number of children		
Currently pregnant	4	2.90
One child	72	52.17
Two children	45	32.61
Three children	8	5.80
More than three children	9	6.52
Significant sources of support (N = 55)		
Partner	38	69.09
Parent/family member	13	23.64
Friend	2	3.64
Ex-partner/father of child(ren)	2	3.64
Staff (n = 81)		
Psychiatrists	9	11.11
Psychologists	13	16.05
Psychotherapists	6	7.41
Specialist doctor/junior doctor	2	2.47
Mental health nurses	11	13.58
Nursery nurse	8	9.88

continued

TABLE 8 Work package 3 demographic details of mothers, type of significant source of support and staff roles (*continued*)

	N	%
Occupational therapists	7	8.64
Pharmacists	4	4.94
Team leaders	12	14.81
Administrative staff	1	1.23
Peer support workers	2	2.47
Care co-ordinators	2	2.47
Perinatal practitioners	4	4.94

Most women described their experiences of CPMHTs as positive and helpful to their and their baby's well-being. This was particularly pronounced in women who had previous negative experiences of other mental health services.

Question 1: What service models are effective for mothers with perinatal mental health problems and their babies? Does this vary by mental health need, who delivers the intervention, the skill mix and competencies of the service and the settings in which the services are provided?

Effective CPMHT service models had the following components:

- integrated, co-ordinated care between CPMHTs and health providers (e.g. maternity, GPs, health visiting)
- flexible, de-stigmatising, needs-based delivery approaches
- a family-centred, approach that is engaging and acceptable to women and their families.

Integrated, co-ordinated care

Community perinatal mental health team integration with relevant health providers varied across sites. When CPMHTs had higher levels of integration with health and mental health providers, women reported greater ease of access to the CPMHT, higher perceived quality of care, better outcomes and more acceptable discharge procedures.

Good levels of CPMHT integration with other health/mental health services were evidenced when the following were in place (see *Box 1* for supporting quotes):

- clear referral and discharge pathways into and from CPMHTs
- joint, co-operative models of roles and responsibilities
- ongoing sharing of knowledge and working (i.e. multidisciplinary meetings, trainings, joint clinics/meetings, colocation of PMH staff within health settings).

BOX 1 Quotes on examples of good levels of CPMHT integration

Previously, the perception among the referrers was – anybody pregnant and having a mental health issue should be referred to the perinatal team, it [didn't] matter whether, you know, they have the severe end of mental illness or mild or moderate. It took a lot of work to tailor down and us receiving appropriate referrals to make the best use of the service. So, working with the midwives and GPs has been really helpful to ensure we get the right referrals.

OS5 – psychiatrist

So, we work really closely with [midwives] . . . and really close with the safeguarding teams, the recovery teams, and the intensive team. We don't really have the professional team working issues that other patches have, [Service name] seems to gel quite well.

BS2 – mental health nurse

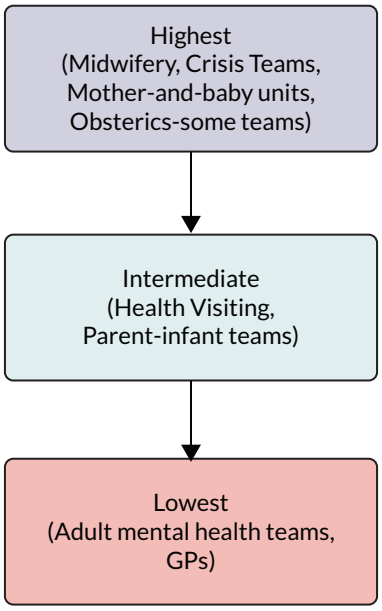
They come along to the team meetings, the specialist midwives, so that they can flag up anyone in the day that they've got any concerns with or who are on their caseload and to make sure that we're both talking to each other. Specialist midwives will be invited

to birth planning, or the midwives anyway, get invited to their mental health birth planning sessions. And I've done a few of them, depending how – if I've been involved a lot antenatally, I'll be part of that as well.

DS1 – nursery nurse

I've been quite poorly, and I've been in and out of hospital, and [the health visitor] gets notified of that each time and each time she texts me and says are you okay? What happened? Do you need me? So, yeah . . . [CPMHT and health visitor] obviously, they liaise between themselves, which meant I didn't need to explain myself over again. They knew what was going on with me.

EX-SUM7 –OCD



Barriers to integrated care included (see *Box 2* for supporting evidence):

- local underinvestment in CPMHT and related health and mental health services (e.g. 0–5 mental health, health visiting)
- high levels of staff turnover and therefore loss of shared knowledge and working relationships (e.g. CPMHT, maternity, health visiting)
- structural/organisational factors leading to misconceptions about the roles of CPMHTs and referral cut-offs.

BOX 2 Quotes around barriers to integrated care

I think we do need more different kinds of staff . . . [we have] no infant mental health workers . . . I think that's a gap in our service.

EX-BS11 – parent/infant psychotherapist

There have been huge [staff] turnovers, and I think it's a very stressful job. It can be quite triggering to people, and people aren't always aware of what perinatal is before they come in. They think sort of mums and babies and, sort of, how lovely, you know, it will be lovely working with that, but actually, it can be pretty high-end stuff . . . it can be quite triggering . . . [the work] can be quite hard.

EX-DS3 – clinical team leader

Flexible, de-stigmatising, needs-based delivery approaches

Flexible delivery approaches that adapted to maternal and family needs and risk levels were highly valued by women and promoted service engagement. Delivery modalities ranged from in-person (clinic, maternity, hospital, children's centre) and in-home appointments, to remote videoconferencing (particularly during the COVID pandemic). Women's preferences for how treatments were delivered varied, both between individuals and by the contexts/situations/stigma they were in at the time (*Box 3*). Factors determining preferences included:

In person/clinic: preferred when:

- women wanted a private, neutral, safe location
- women wanted to be able to speak freely about difficult content (trauma work, domestic violence, family conflict) outside of home context or away from family.

In home: preferred when:

- there were difficulties with infant schedules
- multiple children and/or transportation issues (or videoconferencing)
- woman needed practical/functional support with activities of daily living (including parenting support).

Remote/videoconferencing: preferred when:

- woman was socially anxious
- woman had worries about stigma and wanted to uphold their privacy from the public eye
- woman wanted ease of access and convenience, particularly in remote areas and areas with difficult and/or expensive transportation
- home felt like safe place for woman in which to discuss difficult topics.

BOX 3 Quotes to support women's preference of treatment delivery theme

> *I was in a really low place then, I was at my worst was when I wasn't able to talk, my mind was just so jumbled, I couldn't form sentences or yeah, I just couldn't, all I could do really, was nod and shake my head, which was why face-to-face was just so important really. Phone contact was just impossible by this point.*
>
> DM18 – post partum psychosis
>
> *Even when I was in my pyjamas and I just didn't want visitors . . . she'd be like 'oh come on, come to the door' because she just knew I was trying to hide away through it all.*
>
> LV-CM5 – post partum psychosis, OCD, depression
>
> *[Remote appointments were] really great, I think that's something that should continue after Covid to be honest because it worked so much easier around the schedule and you don't have to like get ready, get the kids ready, get out of the house, it's twenty, thirty minutes away it's another drive, you know, husband's waiting in the car or with the other kid. I think this is a great way to just be able to have the service and like I think it helps with everybody's time.*
>
> BM22 – bipolar 2

Staff highlighted moderating factors affecting mode of delivery preferences. They stressed the importance of home, or at least in-person, visits when there were worries about:

- symptoms were severe and functioning poor such that women were unable to make in-clinic appointments and needed in-person assessment and support (e.g. detecting suicidality, supporting with significant parenting/bonding issues, psychosis)
- significant deterioration in mental health including suicidality and functioning
- 'Getting eyes on baby'/assessing the well-being of baby and the parent–infant interaction
- assessing the context in which women lived
- assessing for domestic abuse.

Staff also worked to adapt appointments to fit with women's needs, for example, scheduling in-person appointments around times women had a midwifery or hospital appointment, and/or baby's schedule. In preventative cases (where women were being monitored due to a history of psychosis), staff were flexible with women, empowering them to initiate contact as needed (*Box 4*).

BOX 4 Quotes to support staff adaptations made in treatment delivery

> *The lack of face-to-face work . . . it's difficult to assess risk, you know, and just kind of seeing their mum-baby interaction is really hard, I think, to kind of assess over the video.*
>
> KC-HS2 – occupational therapist/team leader
>
> *Some women, especially women who presented in very precarious home situations, preferred to use the phone, because it gave them more privacy. But in terms of the work, the parent–infant work, we lost sight of the baby, which meant that we were concerned about not being able to set eyes on babies who may have been in safeguarding plans or who needed to have safeguarding support.*
>
> KC-NES5 – clinical lead/psychotherapist
>
> *If you're with somebody . . . if they're really depressed and hopeless, if you're in somebody's house, you can notice a photo or notice an object and start a conversation that would hopefully lead you and them to remember when times were more hopeful, or a trip that they've enjoyed or a hobby that they obviously do . . . it changes all the dynamics.*
>
> EX-DS4 – care co-ordinator

Family-centred, acceptable, engaging community perinatal mental health teams

We found four key pillars underpinned the effectiveness of CPMHT service models. These were:

1. perceived perinatal competence (having the appropriate skills to understand and meet the needs of the mother *and* the infant and wider family)
2. honest and trusting relationships
3. accurate and knowledgeable reassurance (especially around fears and worries about childbirth/parenting/bonding/safeguarding concerns/medication)
4. staff/service reliability and consistency.

The way these perinatal competencies were relayed to women were fundamental; a non-judgemental and compassionate stance was a critical interactional style that determined whether women engaged fully with services. Together with the four foundational pillars, these interactional elements created a successful CPMHT service model (see Fisher *et al.* 2024). The extent to which these factors affected women's engagement and outcomes varied by their context and personal characteristics (*Box 5*).

- for whom?
  - Women with emotionally unstable personality disorder (EUPD) and young mothers sometimes described feeling patronised and/or judged by staff and withdrawing from interactions with the service as a result.
  - Women with SMI were able to build close, trusting relationships with staff, who were sometimes the first to identity early signs of escalating mental health issues, and then provided timely support/interventions.
  - Women experiencing mental health problems for the first time described being treated with warmth, kindness and not feeling judged, and were reassured and supported in how to navigate their symptoms.

BOX 5 Quotes supporting interactional elements impacting on engagement with CPMHTs

> *They were reassuring . . . I felt like my parents would disown me; my husband would leave me . . . I just felt like I was going to go into a mental home, a mental asylum or something, I thought I was completely crazy, and they just brought me back down to earth and like no, this happens to a lot of people and these feelings are very normal.*
>
> EX-BM14 – postnatal depression
>
> *I saw the same person throughout, and that was absolutely brilliant . . . there's something to say about continuity of care and she didn't drop the ball once, not at all. And that really, really helped . . . there were open lines of communication throughout, and it was just – you felt supported.*
>
> EX-DM12 – psychosis

Before my pregnancy I really didn't trust medical professionals at all, I've had some quite negative experiences with them and [perinatal nurse] has completely turned my view on medical professionals around, she was amazing . . . I felt like I could trust her, which in the past I didn't feel like I could trust medical professionals . . . but I felt safe around [perinatal nurse], she would say how it was, she wouldn't fill me with rubbish or false hope, and she was very realistic, but also very positive.

EX-DM5 – psychosis and CPTSD

I'd had a psychiatrist before . . . who I just felt had a very different manner . . . [the perinatal psychiatrist], he was the first psychiatrist I'd spoken to who wasn't talking to me like a person who has a, you know, has an illness, like a sort of ill person.

KC-OM1 – bipolar 1

Supporting discharge and ongoing recovery

Women's experiences in services affected their readiness for discharge and where they were discharged to.

Women's readiness for discharge was variable and was contingent on:

- Confidence in their improvements.
- Fear of independence in recovery without CPMHT support.
- Worries about ongoing mental health problems.
- Tapering of care towards the end of time with CPMHT.

Where were women discharged to?

- Primary care (most).
  - For whom?
    - Some had been referred via primary care.
    - Some had been referred via Adult Mental Health Care.
  - Contextual factors:
    - In COVID, decrease in universal community parenting support equalled a 'cliff edge'. Some CPMHTs held onto women longer to bridge this gap.

Activity

Positive discharge experiences were linked to receiving CPMHT resources, support and individualised planning about how to manage mental health problems, family support needs and parenting during recovery (*Box 6*).

Outcomes

Support and information helped women:

- build a sense of efficacy about recovery
- understand what 'safety net' supports were available should they experience future problems
- knowledge they could access the CPMHT again if they had a future pregnancy and mental health problems.

BOX 6 Quotes on discharge experiences

I didn't realise, you know, now that he's had his birthday that that means I'm going to be discharged and that's – I definitely feel as though I've taken quite a few steps backwards. I've – they would have done, but I said to the lady that I've been dealing with – what with Christmas being quite a tough time for me, anxiety-wise, and the dialectical behaviour therapy course coming to an end pretty much at the same time as them wanting to discharge me. I just said that I was really, really frightened. And she has said that she will give me one last appointment in January, just to soften the blow and see, you know, how I'm doing post-Christmas and things.

SUM3 – postnatal depression and anxiety

Yeah, but it went on a little longer, not majorly, hopefully because I think the nurse, she was saying to me you know, sometimes in exceptional circumstances they could push it forward, la, la, la, la, la. But from [name of nursery nurse]'s point of view and from [name of OT]'s point of view, they knew me and knew that I had asked for help and if it had come sooner, they would have been with

> *me sooner. So, they weren't in any hurry to decide, yeah, sorry, your son's one, off you go. No, they saw it as, actually, detrimental to me to do that, and I really, really appreciated it. Because I was panicking, I was like 'He's going to be one in six weeks, what are we going to do?' and between the two of them, they did what they had to and I really appreciate that . . .*
>
> SLM1 – postnatal depression

Question 2: Which interventions are attractive and acceptable to women, and clinically effective within/in conjunction with mainstream secondary mental health care, maternity and primary care?

Community perinatal mental health teams offer a range of interventions that can be categorised as:

- *Psychiatric medical interventions*
  - specialised medication management
  - nursing mental health support
  - preconceptual counselling
- *Practical*
  - occupational therapy interventions focused on implementation of practical strategies
- *Relational/psychological*
  - parent–infant interventions that included parenting psychoeducation
  - interventions directly targeting the parent–infant relationship
  - psychoeducational and supportive groups
  - psychological interventions
  - peer-led support

Across women's descriptions of the interventions that were attractive, acceptable and clinically effective, elements of what staff did, and the impact of these actions coalesced into key mechanisms supporting their improved well-being (*Figures 3–7*). These mechanisms, which were important across specific intervention types and staffing roles, were:

- support that improves women's sense of social belonging
- family-centred approaches
  - partner/supportive other interventions
  - parent–infant interventions
- interventions that helped women to develop/apply skills
- perinatally specific expert medication advice and support.

We refined the overall programme theory to reflect these processes. The updated programme theory is presented by the domains that were impacted in the figures below.

Support that improved women's sense of social belonging

Figure 2 provides an overview of the relationship between context, mechanism and outcomes in relation to women's sense of social belonging, with *Box 7* presenting the CMOC statements.

BOX 7 Context–mechanism–outcome configuration statements for women's sense of social belonging

- When women are helped by staff to engage with supportive others who have shared experiences (C), they feel less isolated (O) because they feel a sense of social belonging (M)
- When women are helped by staff to engage with supportive others who have shared experiences (C), they have improved trust in their ability to interact securely with other parents (O), because they learn how to do this (M)
- When staff provide practical outreach to women who do not think they are entitled to care (C), they feel valued and deserving of care (O) because they develop a better understanding of their needs and entitlement (M)

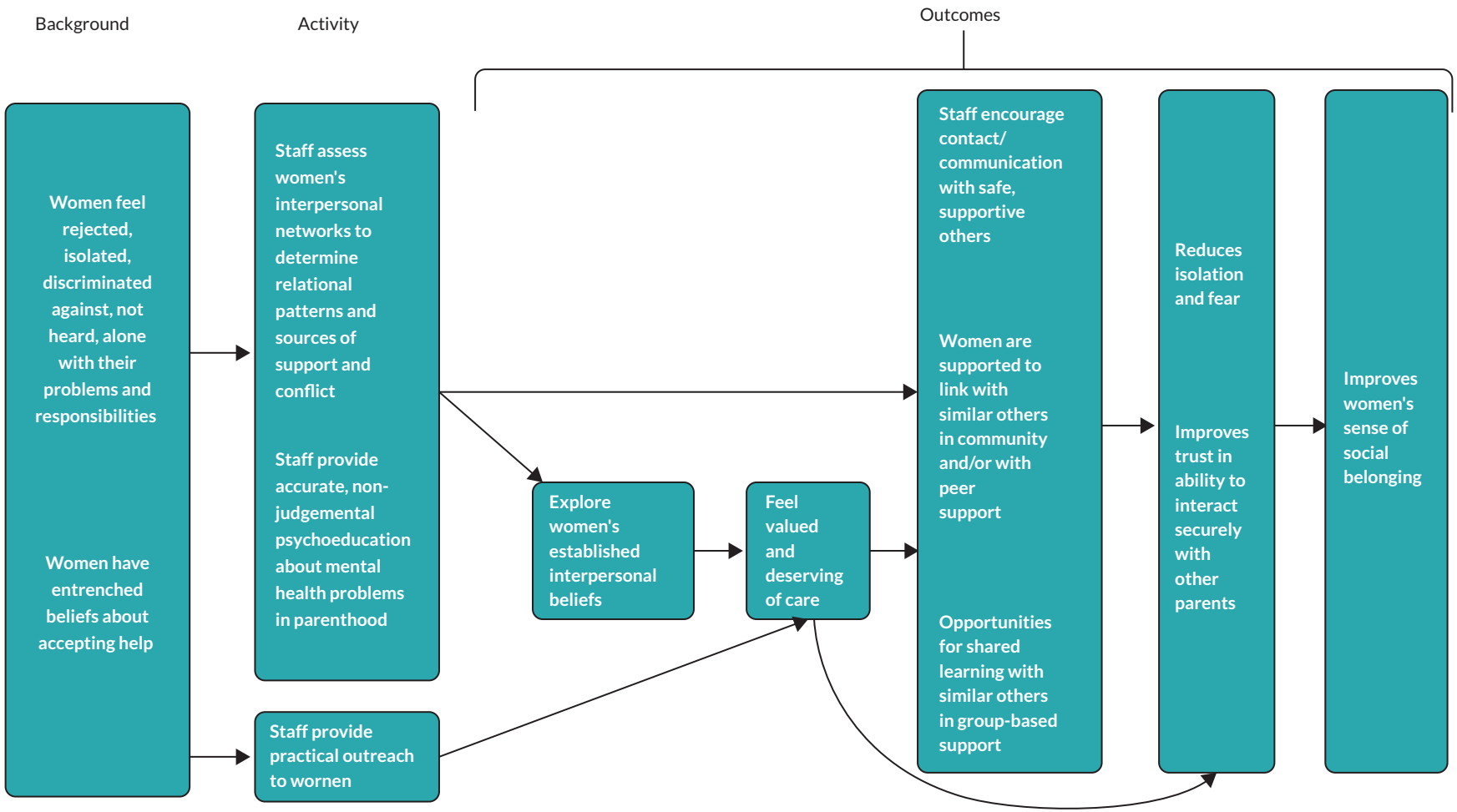


FIGURE 3 Context–mechanism–outcome configurations for women's sense of social belonging.

Background

Most women reported feeling dismayed about having mental health problems during the perinatal period, keenly aware that their experiences of motherhood were different from other mothers' experiences. Some described feeling rejected or 'othered' when they tried to join with other mothers because their own experiences were different. Mothers' feelings of isolation were associated with:

- experiences of poor support from others in their support network (i.e. partners, family, friends)
- sense of rejection from other mothers
- entrenched negative beliefs:
  - 'I am unworthy of asking for help'
  - 'Good mothers should be able to parent without support'.

Activity

Community perinatal mental health team's practical and relational psychological interventions helped women to build their social networks and the quality of their social support. This included:

- providing women with skills to communicate with safe others
- directly linking with other perinatal parents in the community or providing opportunities for shared learning in CPMHT group-based treatment sessions, [e.g. dialectical behaviour therapy (DBT) and compassion-focused therapy (CFT)]
- connecting mothers with similar women, especially useful in overcoming stigma and feared rejection from wider community groups and building lasting sources of perceived validation and support
  - For whom?
    - mothers with longer-term mental health problems (e.g. SMI, mental health problems associated with histories of complex trauma).

Women commented on the active role staff (i.e. mental health nurse, nursery nurse, occupational therapist) took in developing their 'mummy network', appreciating the flexibility and extra support in helping them take the first steps in joining group interventions or building contacts with community groups of parents outside CPMHT. Many noted they would have been unlikely to have joined had they not had this additional support.

Outcomes

Practical and relational psychological interventions that helped women to build connection with supportive others and develop their social and parenting networks resulted in noticeable improvements in women's feelings of trust in their ability to interact securely with other parents (see *Box 8* for quotes). This led to:

- improved sense of efficacy
- positive transformations in feelings of isolation and social fear
- sense of parental social belonging
- positive parenting identity
- better well-being.

BOX 8 Quotes supporting women's sense of social belonging

> *I think I just, I should be enjoying it all, but I wasn't at the time, and I felt guilty because of that. I felt that I wasn't able to be, I wasn't good enough at being a mum.*
>
> EX-BM14 – postnatal depression
>
> *I made a really good friend through [the CPMHT mindfulness group] . . . once you've been in that system like perinatal, you can't go to an ordinary mums [group] who have their life together and say 'I was under the psychiatrist for so many months' because they look at you like you're nuts and you don't have that community. But a friend who has gone through perinatal I can say to her 'I'm having a really bad day today, this happened, I know it sounds stupid' and she'll say 'oh, you know, this happened to me last week'. And you don't feel that judgement.*
>
> LV-SWM11 – bipolar I

I had my worst time in my pregnancy and obviously [the Psychologist] come through that journey with me and she thought that this CFT group would be great but didn't realise how much . . . I didn't need the help after the CFT group because I got so much out of that, and I'd got that support network.

NWM8 – White British mother with bipolar

We were doing [CFT] groups, and it was really, really good . . . there wasn't very many of us there and like we'd formed like a good friendship . . . we went on holiday together in a caravan and stuff like that which was really, really nice.

LV-NWM2 – D&A

I just didn't want to go [Mum and Bump group] but she [staff] said oh, I think it will be really good for you, you know and the fact that she went as well it kind of made it easier.

LV-SWM6 – depression

They had . . . walk and talk therapy – you go up to the park with your baby in the buggy you meet other mums you have a walk around the park you get some exercise you have a coffee and a chat as you're going so you don't feel so alone and the occupational therapist is the one's that area organising all these events just so that the mums don't feel so alone which is really nice.

SLM2 – Black British mother with postnatal depression

Family-centred approaches

Couples/supportive others

Figure 4 provides an overview of the relationship between context, mechanism and outcomes in relation to family-centred approaches taken by staff within CPMHTs in relation to couples and supportive others, with *Box 9* presenting the CMOC statements.

Background

Many women talked about how their mental health problems were interlinked with their personal relationships. They highlighted how the following were strong contributors to their mental health problems and left them feeling judged, let-down and taken advantage:

- lack of support
- conflict
- domestic violence
  - *For whom?*
    - EUPD. Though conflict and domestic violence could affect women across diagnostic problem, those with EUPD were especially likely to report high interpersonal conflict. Women described wanting help with managing their anger and the effects of previous complex trauma on their relationships.

Others believed their relationships were built on strong foundations but described how the struggles of having a baby and mental health problems added extra pressure on communication and family support.

Partners and close others described feeling:

- scared
  - for whom?
    - post partum psychosis
    - OCD
    - severe depression
- de-skilled
- hopeless
- lost
- pushed aside and dismissed by staff in maternity, contributing to own feelings of helplessness as a parent and partner.

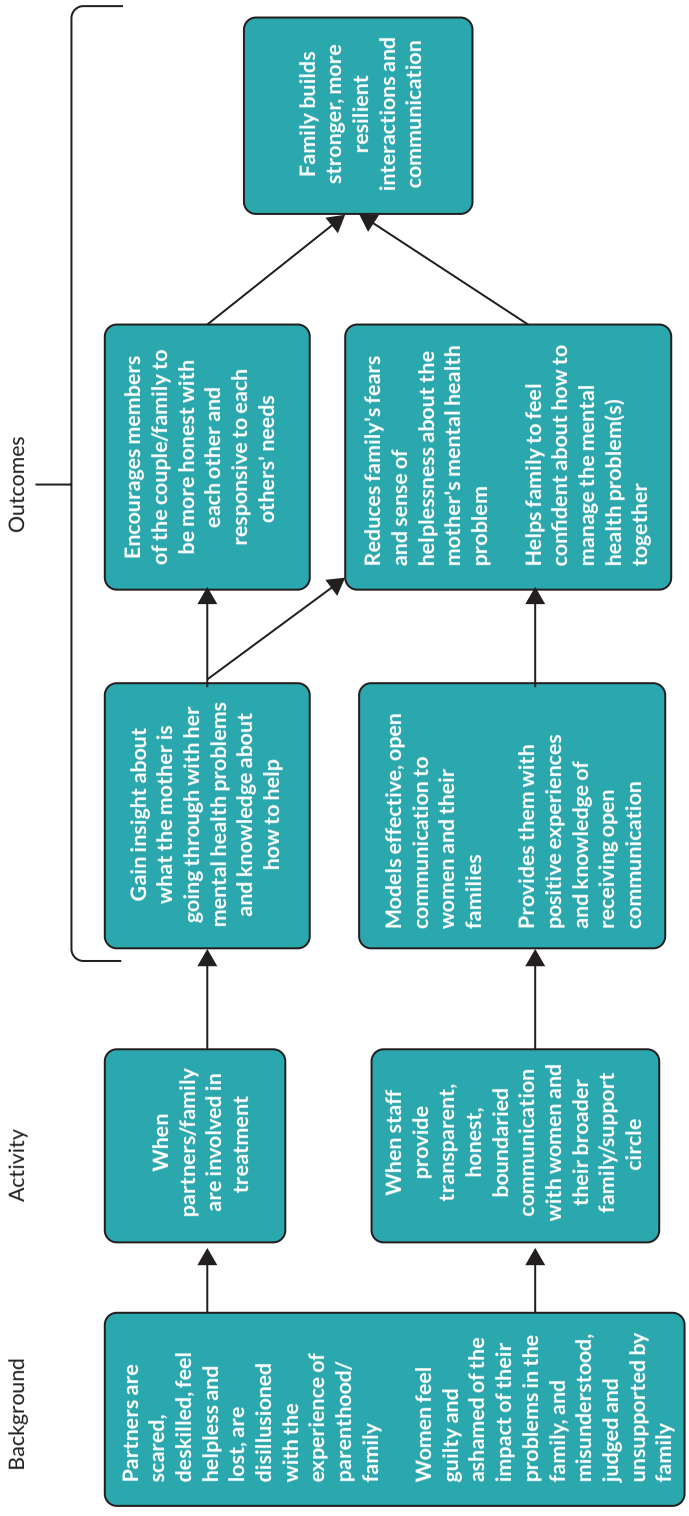


FIGURE 4 Context–mechanism–outcome configurations for family-centred approaches focusing on couples/supportive others.

Activity

Women and partners/close family described how the whole family approach taken by CPMHTs made a critical difference to their recoveries and well-being (*Box 10*). Staff helped them to:

- gain insight into each other's perspectives and experiences
- speak more honest, openly and safely with each other
- be more appropriately responsive to each other's needs.

However, they noted that this support was often informal and there was a lack of availability of couples and family interventions and often poor assessment of and support for domestic violence in many of the services.

Partners and close others commented on how staff helped them understand the impact of mental health problems on the woman and ways they could effectively support them; this involved:

- providing models of effective, boundaried communication
- guidance about when and how to turn to CPMHT staff and other healthcare providers
- couples and/or family therapy (see *Figure 3*).

BOX 9 Context–mechanism–outcome configuration statements for family-centred approaches focusing on couples/supportive others

- When a woman's partner/family have better knowledge and understanding of what the mother is going through with her mental health problems (C), they are more likely to be more honest and responsive to each other's needs (O) because they have the confidence to do so (M)
- When women with mental health problems and their partners/ family are more honest and responsive to each other's needs (C), they are more likely to build stronger, more resilient interactions and communication (O) because they are less judgemental? (M)
- When staff model and provide practical communication skills to partners or family members who have challenges adjusting to parenthood/familyhood in a woman's treatment (C), they have a better understanding of what the mother is going through with her mental health problems (O) because of their greater insight (M)
- When staff model and provide practical communication skills to partners or family members who have challenges adjusting to parenthood/familyhood in a woman's treatment (C), they have knowledge about how to help (O) because they have the opportunity to learn (M)
- When a woman's partner/family have better knowledge and understanding of what the mother is going through with her mental health problems (C), they have reduced fears and sense of helplessness about the mother's mental health problem (O) because they know how they might be able to help her (M)
- When women with mental health problems who are finding their relationship with their partner/family challenging are actively supported by staff (C), they are more likely to build stronger, more resilient interactions and communication (O) because they develop the skills and the confidence to do so (M)

Outcomes

As families began to face the woman's mental health problems together, they felt less afraid and helpless, and more confident about jointly managing future challenges.

BOX 10 Quotes supporting family-centred approaches

[Both of us understanding] how he unwittingly but inevitably had been part of this thing that had happened, this wasn't just something that happened to me in isolation this was something that happened to me in the context of our new baby and our relationship and our home environment. I found [the sessions] hugely useful because I think sometimes you know when it's just the two of you, things can become very heated or very emotional.

DM19 – psychosis

I think the perinatal team are the only people that have actually really helped . . . every other experience I've had with any mental health team or anything like that, it's always been me, it's just me, but with the perinatal [team] . . . it's me and my family and that is a big thing. Because the fact that a lot of my mental health issues are to do with my family and prior to this nothing's been – they've never been included.

KC-NEM1 – postnatal depression

I didn't know, probably, myself, what I could possibly do to support her with her issues, you know, 'cos she wasn't able to talk to me properly about her issues, you know.

NEP1 – partner

I was given a number of the CPN and there's a few occasions when [the mum] was . . . having problems that I had to call her . . . not just for her help but for my help as well.

BP1 – partner

[My partner] didn't realise how to help me, which, I was shocked at I think, because . . . he's always been so supportive . . . I felt like we were at breaking point. And [perinatal nurse] really helped us. . . . we kind of gained perspective on where we were going wrong and letting each other talk and finish without over-talking each other.

LV-SWM10 – depression

Parenting

Figure 5 provides an overview of the relationship between context, mechanism and outcomes in relation to parenting, while *Box 11* outlines the CMOC statements.

Background

Women described how parenting difficulties were frequently a key motivator for treatment and reason for referral into the CPMHT because they worried about the impact of their symptoms on their baby. A number of women, who had not been referred because of parenting concerns, noted they still would have benefitted from parenting-related interventions. They discussed how worries and feelings of being deskilled affected their parenting confidence, and how this fed into their mental health problems.

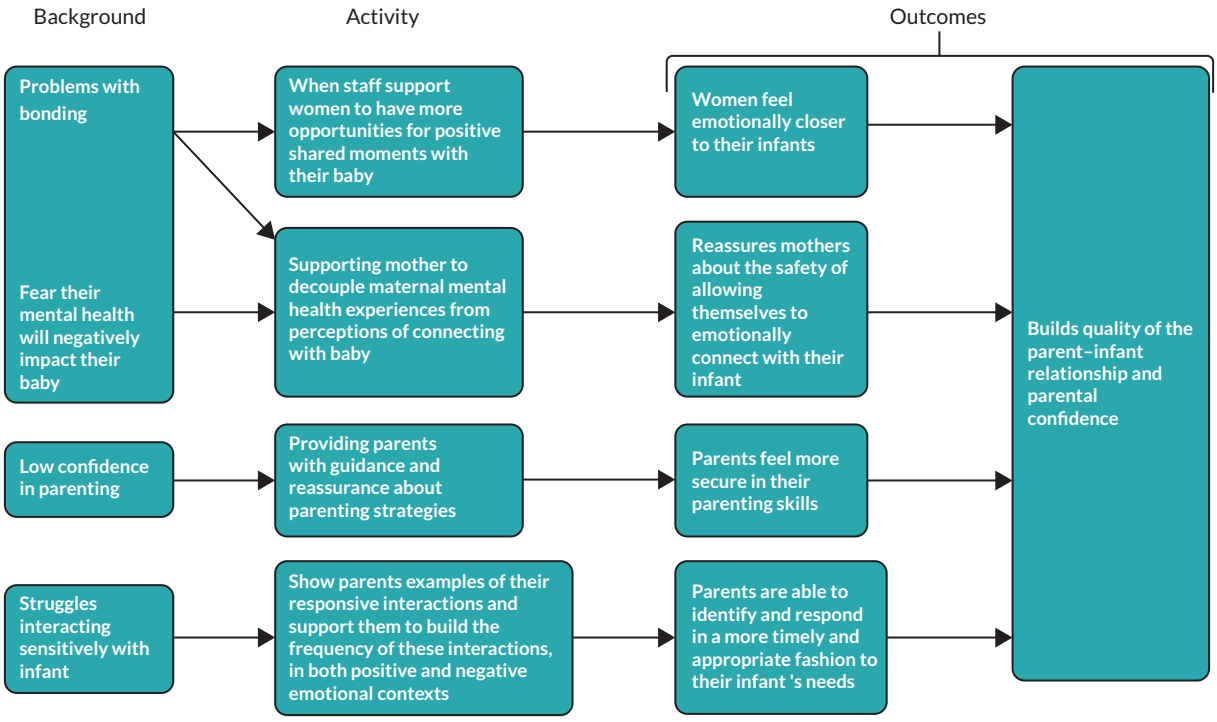


FIGURE 5 Context–mechanism–outcome configurations for parenting.

Parenting CPMHT referral reasons included:

- Women expressed difficulties connecting with their infant
  - For whom?
    - Traumatic delivery
    - Problems breastfeeding
    - Previous histories of childhood maltreatment

BOX 11 Context–mechanism–outcome configuration statements for parenting

- When women with bonding problems are supported by staff to have more opportunities for positive shared moments with their baby (C), they build quality of the parent–infant relationship and parental confidence (O) because mothers feel emotionally closer to their infant (M).
- When women with bonding problems fear their mental health will negatively impact their baby are supported by staff to decouple maternal mental health experiences from perceptions of connecting with baby (C), they build quality of the parent–infant relationship and parental confidence (O) because mothers feel reassured about the safety of allowing themselves to emotionally connect with their infant (M).
- When staff provide guidance and reassurance about parenting strategies to parents with low confidence of their parenting skills (C), they build quality of the parent–infant relationship and parental confidence (O) because parents feel more secure in their parenting skills (M).
- When staff show parents who are struggling with interacting sensitively with infant examples of their responsive interactions and support them to build the frequency of these interactions, in both positive and negative emotional contexts (C), they build quality of the parent–infant relationship and parental confidence (O) because parents learn how to identify and respond in a more timely and appropriate fashion to their infant's needs (M).

Activity

Many women reported they valued interventions that:

- helped them to recognise and build on positive moments of interaction with their infant
- learn to identify when their fears about their infant were driven by their mental health symptoms, enabling them to relax and feel closer to their babies
- provided guidance, support and reassurance on concrete parenting approaches
- directed them to skills to improve interactions with infant.

Outcomes

Women reported that this support helped them to bond with baby and feel more secure in their parenting skills. Women described how having staff on the CPMHT who could seamlessly address both their needs and those of their baby was a key factor in supporting their recovery, though staff noted that the availability of more formalised parent–infant treatments offered by clinically trained staff was often limited (see *Box 12* for quotes).

BOX 12 Quotes supporting parenting CMOC

The nursery nurses . . . came in when I was struggling to feed my baby properly, I was struggling to breastfeed, and they are the best people you will ever meet. They are so calm, unflappable, they love babies so if you have a crisis which I did once or twice, and they will just take your baby, and you can leave the room and make a cup of tea.

BM9 – White British mother with OCD

[The nursery nurse] came in, she spoke to me about what I can do and how to look after [baby son], basically, but she just talked to me, talked to me like a human being, she related to me, that was the biggest thing . . . she was just giving me confidence.

BM4 – White British mother with anxiety

That was really good and before [name of baby] was born we just had some telephone conversations about getting ready for the baby and I'd quite often talk to her [nursery nurse] about [name of first child], my toddler as well and how she was doing, and we'd talk about preparing her for the new arrival and getting ready for baby and stuff. So, yeah, it was really good.

DM10 – D&A

> *[The nursery nurse] did various things around [baby's] development and good toys and things like that that would be good for her development. A real focus on bonding with her, you know, creating bonding experiences.*
>
> HM7 – White British mother with post partum psychosis

Support that helps women to develop/apply skills

Figure 6 provides an overview of the relationship between the context, mechanism and outcomes in relation to the support provided by CPMHT which helped women to develop and apply practical skills. *Box 13* provides the CMOC statements in relation to this.

Background

Women frequently described mental health difficulties during the perinatal period as detrimental to their confidence as a person, parent and partner. Having a baby often meant juggling valued work, social and family activities with pregnancy and postnatal physical complications and infant caretaking needs, and women frequently described feeling lost and overwhelmed in their daily lives with mental health problems a significant barrier to their ability to undertake tasks. For many, managing pregnancy and parenting an infant while struggling with mental health difficulties felt insurmountable, and women expressed wanting and needing specific skills to help them both with their mental health and their lives as parents.

Activity

Psychological/relational interventions included:

- Psychoeducation
  - helped women get a grasp of their situation
  - understand how their symptoms can affect:
    - their thoughts about parenthood
    - themselves as mothers
    - their ability to engage in parenting, family and self-oriented activities.

- Therapy groups
  - provided women with specific skills to:

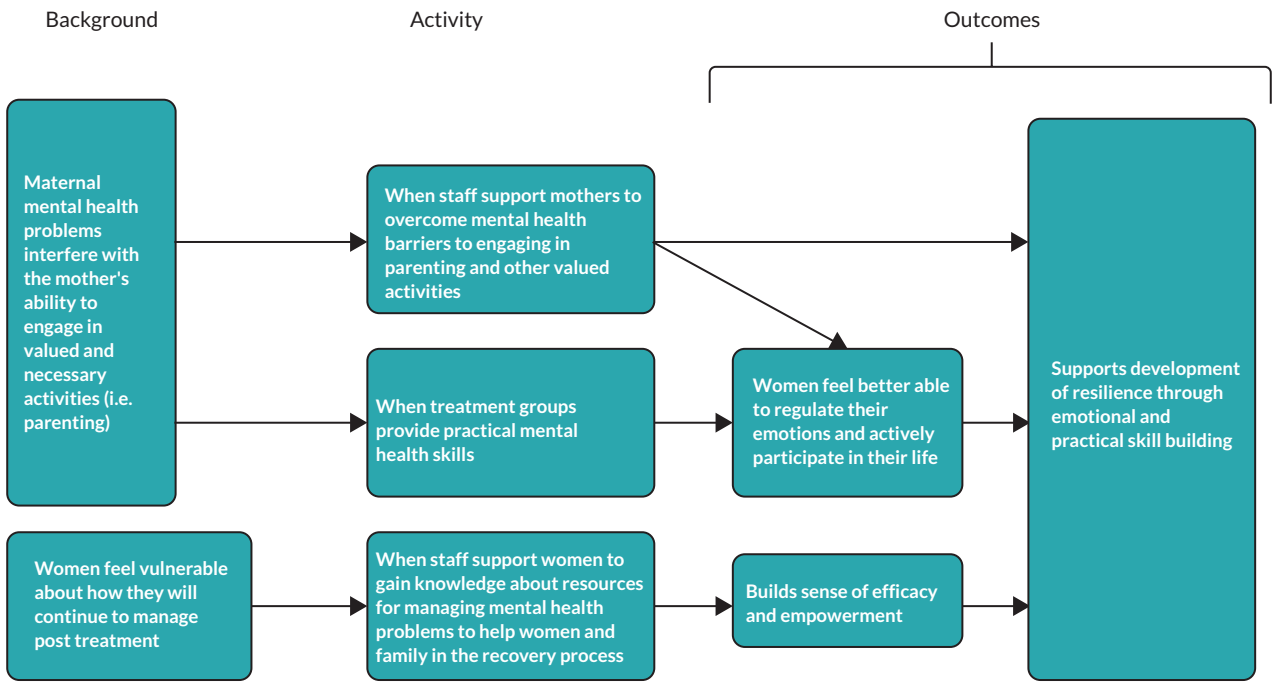


FIGURE 6 Context–mechanism–outcome configuration for support that helps women to develop/apply skills.

    - manage their emotions
    - cope with challenging interpersonal situations
    - understand the ups and downs in recovery

- *For whom?*
    - Women with PTSD and EUPD reported a lack of interventions that directly targeted processing their trauma(s).
    - Women with SMI reported regular, frequent contact with psychiatrists, rather than being offered specific interventions, such as CBT.
    - Women who were experiencing mental health issues for the first time described talking therapies as transformative.

Practical interventions led by CPMHT staff (i.e. occupational therapists, mental health nurses) included:

- cooking/preparing meals
- leaving the house
- identifying and liaising with community parenting groups
- supporting women to form local peer support contacts.

BOX 13 Context–mechanism–outcome configuration statements for support that helps women to develop or apply practical skills

- When staff regularly and consistently support mothers to overcome mental health barriers to engaging in parenting and other valued activities through emotional and practical skill building (C), mothers develop resilience (O) because they feel better able to regulate their emotions and actively participate in their life (M).
- When staff support women to gain knowledge about resources for managing mental health problems to women and their partners or family who feel vulnerable about how they will continue to manage post treatment (C), they develop resilience and a better understanding of how they will continue to manage post treatment (O) because they build a sense of efficacy and empowerment (M).

Outcomes

Together, mothers described how these interventions helped them overcome struggles related to mental health symptoms that interfered with their ability to function day-to-day as a parent and family member. Many reported they were fundamental for their recovery and developing longer-term resilience. Opportunities for support were missed when there was high staff turnover, sometimes resulting in women being discharged before new staff were hired (*Box 14*).

BOX 14 Quotes providing evidence for support that helps women to develop or apply practical skills

[The mental health nurse] said 'right, I want you to leave the house, you must go for a walk, and [your husband] is going to text me once you've achieved this' . . . she was almost quite strict, but she also had a real, like, soft, kind side to her as well. I think she really invested in us as a family.

EX-DM18 – psychosis

The occupational therapist started coming round and cooking with me . . . that really got me over a hump, because up to that point I wouldn't really even make a cup of tea for anyone, I was that frightened.

HM3 – White British mother with OCD

I was referred to group therapy, DBT, that was really very helpful. I really liked how it doesn't try and convince you that there's no problem, it just tells you, you can deal with the problem, which I found very helpful. It's very helpful to me to have practical solutions rather than try and mull on what the problems are.

BM9 – White British mother with depression and anxiety

The ECS [emotional coping skills] had really connected with me and they'd really started to take effect . . . one of my biggest struggles was not allowing myself a bad day, feeling like everything I had achieved had been lost just because I had a bad day, so

> *being reassured that bad days were OK and it was OK to slip back and just know that one step back is not all the way back. . . I felt very secure.*
>
> HM5 – White British mother with EUPD and PTSD

Perinatally specific expert medication advice and support

Figure 7 outlines the relationship between the context, mechanism and outcomes for perinatally specific expert medication advice and support given by CPMHTs. *Box 15* summarises the CMOC statements for this theme.

Background

Almost all the women under the care of the CPMHTs had been prescribed medication while they were pregnant and/or post partum, and many had significant concerns about the possible side effects of taking medication (*Box 16*). Before accessing the specialised support offered by CPMHT, women struggled with:

- finding reassurance and accurate and reliable advice
- struggling to know if they should take the medication and preserve their mental health with uncertain side effects for their baby or stop medication and risk deteriorating mental health.

Activity

Perinatal psychiatrists and pharmacists:

- provided expert perinatal knowledge about medications
- helped women weigh up fears, risks and benefits
- support women with preconceptual counselling; however, we found this was rarely offered (*n* = 11)

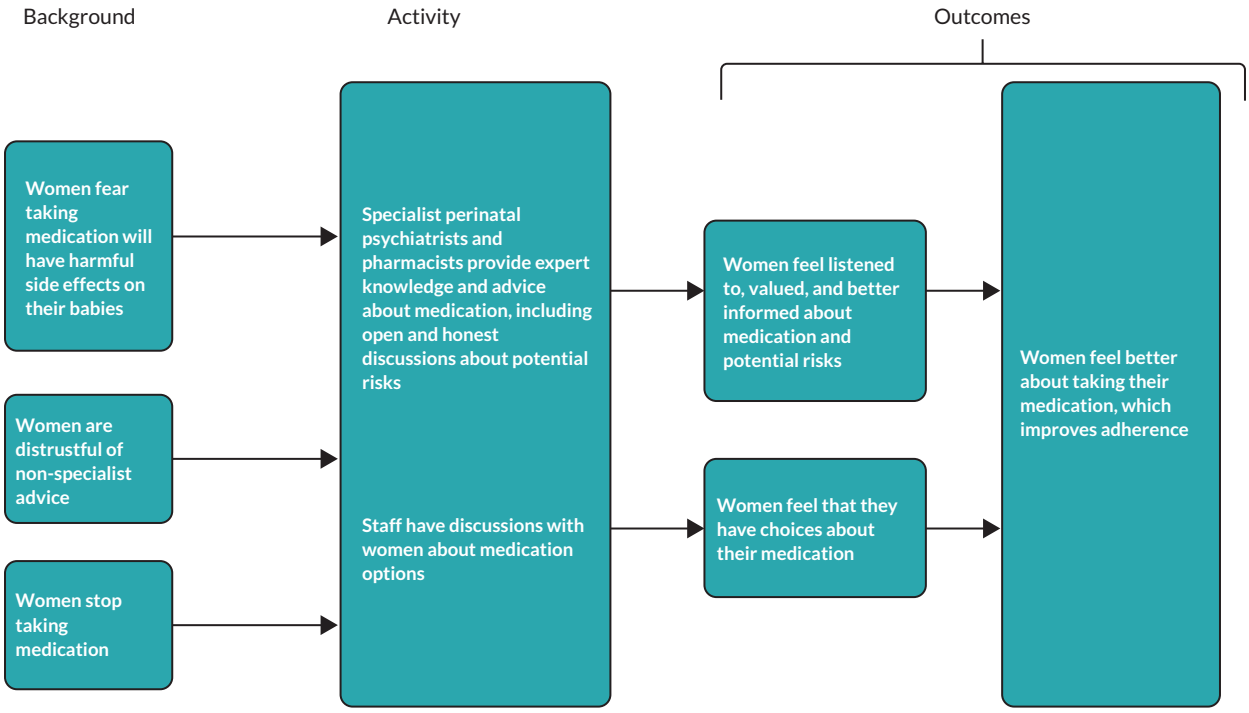


FIGURE 7 Context–mechanism–outcome configuration for perinatally specific medication advice and support

BOX 15 Context–mechanism–outcome configuration statements for perinatally specific expert medication advice and support

- When women who have concerns about whether the medication they are taking (or may have to take) are provided with advice in an open and honest way about potential risks by specialist perinatal psychiatrists and/or pharmacists with expert knowledge about the medication (C), they are more likely to feel better about ticking the medication (O) or carry on taking it [if they are already on the medication (O), because they feel listened to (M) and better informed (M)].
- When women who are distrustful about medication advice from non-specialists are provided with advice in an open and honest way about potential risks by specialist perinatal psychiatrists and/or pharmacists with expert knowledge about the medication (C), they are more likely to feel better about ticking the medication (O) or carry on taking it [if they are already on the medication (O), because they feel the advice is more credible (M)].
- When staff take the time to openly and honestly share medication options with women who have stopped taking their medication (C), women are more likely to reconsider their decision (O) because they feel they choices about their medication (M).

Outcomes

- Relief
  - For whom?
    - Women with SMI, 'finally found someone who truly understands my needs'

- Felt heard and felt their individual circumstances and preferences were considered
- Trust in CPMHT
- Efficacy in making medication decisions
- Improved mental health

BOX 16 Quotes supporting perinatally specific expert medication advice and support

I was pregnant, I really didn't want to take any medication, 'cos obviously of the effects on the baby and stuff like that, and also I wanted to breastfeed.

LV-NMW2 – D&A

I just knew that I just wanted to have a specialist psychiatrist. That was the main thing for me, to be under a psychiatrist that knew about using Lithium in pregnancy.

LV-CM13 – bipolar I

They were very good at finding medication because also I was breastfeeding, so they were very good at finding a solution for which medications I could take and couldn't take . . . every month they would check in on how was I finding the medication, what were my side effects, did I like it . . . they were very good in keeping me informed on what I could and couldn't take, it wasn't just 'here's your pills, bye'.

KC-SLM2 – D&A

I got to speak to a [specialist perinatal] pharmacist, who was absolutely brilliant . . . I've got a big chunk of paperwork which he sent me, so I could read through it, you know, as and when I pleased, to see if actually I do want to go on something, it was very, very useful . . . he was just really thorough . . . the way he explained, it had never been explained to me in that way before, and it took the fear out of it.

EX-DM12 – psychosis

They suggested [medication], but I was quite reluctant . . . when I said I didn't want to take it they were very supportive of that, which was really nice. I felt that my opinions were really considered . . . not like 'if you don't take this, sod you' sort of thing.

KC-SLM11 – OCD, anxiety

Additional research questions

1. What has been the impact of COVID-19 on how women experience service delivery and their overall well-being?
2. What factors make perinatal mental health services resilient to public health emergencies?
3. What barriers and facilitators do women with diverse background encounter regarding access to CPMHS?

COVID-19

Results

Factors important to women during COVID-19 and their overall well-being

Background

The COVID-19 pandemic resulted in a number of changes for perinatal families that affected their well-being, including:

- Significant alternations in maternity provision (reduction in appointments, remote-only provision, partners for some parts of the COVID pandemic not allowed to accompany women in delivery or asked to leave hospital immediately thereafter, lack of postnatal support from medical professionals and from community sector support, e.g. parent and baby groups).
- Reductions in family and social network contact and support due to social distancing, affecting women's access to practical support.
- For those in socially deprived circumstances:
  - Report increased levels of conflict and stress associated with living in cramped spaces with little access to outdoor space.
  - Struggle with digital poverty and lack of access to information, healthcare providers and digital links with family and friends.
  - Work in poorly paid 'essential worker' categories (e.g. food delivery, waste removal work, and domestic services) with increased risk of being exposed to the COVID-19 virus.

- Changes in conflict and/or support
  - Families with pre-existing conflict reported increases in conflict, and, in some cases, domestic violence.
  - Families with less conflict reported increases in positive family time and mothers reported an increase in practical support from non-birthing partners.

Women we interviewed who experienced care from the CPMHT during the COVID-19 pandemic discussed the following service-related factors related to what they perceived to be 'good' care that impacted positively on their well-being:

- Clear lines of communication throughout their care, from accessing services through to discharge was seen as especially important during a period that otherwise had high levels of uncertainty.
- Having a clear link and supported referral to another service where available (NHS or voluntary sector) was appreciated and seen as especially helpful.

Box 17 provides quotes from women of their experience of communication from CPMHTs and links between services.

BOX 17 Quotes on communication and CPMHT links with other services

Communication from PMH team

> *[I]t was hard because obviously we've never had a pandemic before, and, but yeah, they didn't really tell me much.*
>
> Woman DM7 – bipolar I

> *So, a few times during those seven weeks, she did say, oh, shall I call you tomorrow and I would say yes please and then I would never get a call and I'd be home waiting, and I'd arranged for someone to look after the baby so I could speak to her and I would just have nothing.*
>
> Woman DM8 – psychosis

Clear links between services

[I]t meant that I was without support (after Mother and Baby Unit discharge) for a really long period of time, and it's my kind of belief that I feel like they shouldn't discharge you until you've got an appointment with another team . . . I was discharged before my daughter was one . . . So, I kind of just feel like where's the continuity of care there? They did so much and my care during my pregnancy and during that initial period was fantastic, and I just feel like it ended on a bad note.

Woman NEM6 – bipolar and postnatal OCD

Continuing treatment offer versus narrowing treatment offer to serious mental illness business

I think that I'm aware now that . . . about how they've really tightened up all the criteria because of lockdown. And it almost feels, like I said earlier, like they've used that as an excuse . . . but it's looks like they're only seeing, it's almost they're just a crisis team now . . . you wouldn't get in if you have OCD or depression or anxiety, no one is seen now . . . I think also, because I'm aware that people might not look very complex on paper, but that doesn't mean that they're not suicidal or really struggling.

Woman DM6 – bipolar 2

The transition to digital forms of care was rapid in many, though not all, mental health care trusts. Some women experienced telephone-only care, while others were in CPMHTs that delivered care via videoconferencing. *Box 18* provides quotes on the types of communications women experienced from CPMHTs. Although responses varied, as women grew accustomed to digital delivery, they typically reported a preference for a blended approach that combined in-person with digital forms of contact. The diagram below outlines women and staff's accounts of how different components of digital delivery worked:

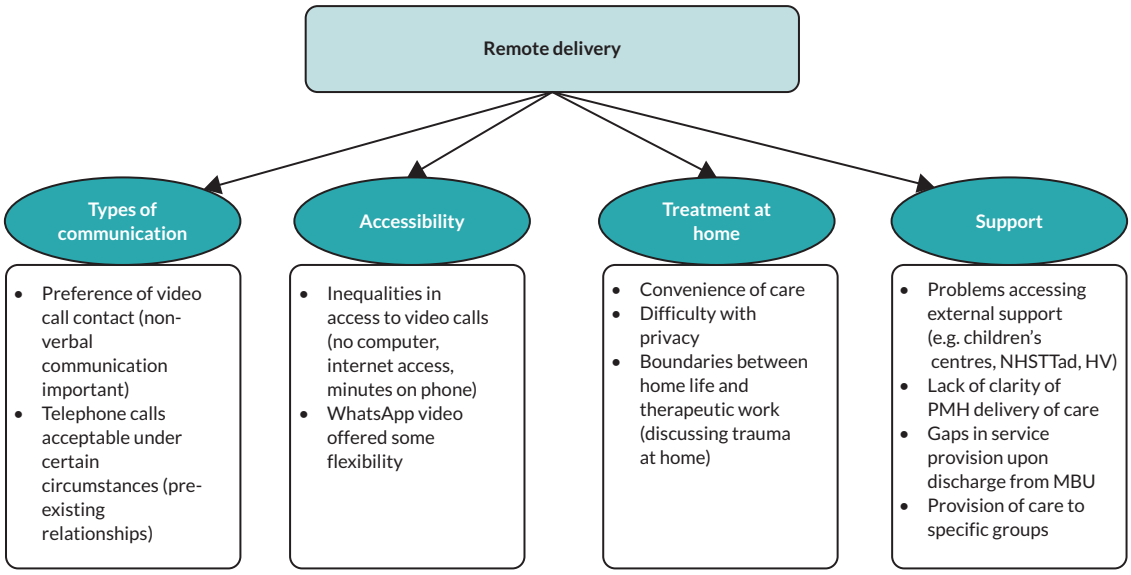


FIGURE 8 Components of successful remote delivery. HIV, health visitor; NHSTTad, NHS Talking Therapies for anxiety and depression.

BOX 18 Quotes on types of communication – telephone vs. teleconferencing

It was actually quite difficult to open up over the telephone, because you sort of put the telephone façade on.

DM12 – psychosis

I think in terms of the therapy it would have been lovely to have had some face-to-face, but we did videocalls every single time, doing the CBT. And I really really liked that aspect of it, because it was just really nice to talk to someone face-to-face in a sense.

Postnatal depression and anxiety

I would have like to have tried that (video call) because I found it's quite difficult to see how to describe how he (baby) feeds. It might have been better if she (staff member) could have seen it.

KC-NEM3 – anxiety disorder

I got offered a nursery nurse, but because of COVID it was going to be over the phone and I just felt it was a bit pointless.

EUPD OCD – anxiety and moderate depression

Boxes 19 and *20* provide quotes on the benefits and drawbacks of remote delivery and challenges in signposting during COVID.

BOX 19 Quotes on accessibility

Greater reach to larger groups of individuals

[T]hings feel less scary maybe because you're not having to go to hospital and be in that environment.

Woman – postnatal depression

For a couple of ladies, they've got older children, and had it been in the community, our community group, face-to-face, we would say – if you've got children over one, they can't come to the group. But because it's in their own home, you know, their children have been at home, and it's been OK.

Staff

[P]ractically there are lots of challenges with setting up groups when you've got an area as big as [name of county] because it's enormous and getting, you know, a group together on a day when people can manage . . . has been a challenge, but actually online it's . . . provided an opportunity to do it.

Staff

Inequalities in access to digital technology/service using unfamiliar technologies

The software [AttendAnywhere] wasn't working great, overall, I had one and a half (sessions) . . . By the third one it worked.

Woman – OCD

I wanted to go to a sensory group and – it's on video but, obviously, I haven't got a laptop.

Woman – bipolar

BOX 20 Quotes on treatment at home and support

Treatment at home

I find it [videoconference] more difficult because I'm not in a private setting . . . you haven't got the privacy.

Woman – PTSD – who didn't want to discuss her trauma experiences in her home

. . . when you're there in the room having an appointment it's your time it's your space it's and then you leave it in that room and you go for it. Whereas, at the moment . . . it's in my home, I would prefer it you can walk away from.

Woman – EUPD and OCD

Support

And then quite often what we'll do is . . . signpost them. and link them with a local children's centre . . . In pre-Covid, we would probably go along with them, for a first time, just to . . . introduce them to . . . one of the family workers at the children's centres.

SLS3 – staff

Additional research question

What factors make PMH services resilient to public health emergencies?

Additional research question 2

What factors make PMH services resilient to public health emergencies?

Background

The COVID-19 pandemic provided a natural test of health and social care, with some established practice suspended, and in other cases, new care provision rapidly adapted and implemented. PMH services experienced challenges in team working with staff feeling isolated and disjointed in their practice, with a lack of access to normal services and resources. This proved to be a difficult situation which led to either clients and services accepting the situation for what it was or not resulting in adaptations being made or keeping to rigid structures that were in place. Those services and staff who accepted the challenging situation COVID presented adapted and used alternative ways of working which meet the needs of their women. Other services which adhered to rigid structures resulted in a reduced offering in their service.

Results

Table 9 outlines the themes explaining resilience of services from the qualitative data.

Client and service acceptance of situation

There was an element of acceptance from both women and services on what type of care could be delivered. *Box 21* presents quotes on how staff adapted to and accepted changes in service delivery during COVID. Women understood the difficulties services were experiencing and were appreciative of whatever care they could get. Services adapted from providing face-to-face contact to initially telephone contacts and eventually video calls. It was apparent that the types of contact used to deliver care was important for both families and the types of healthcare professionals. While telephone calls were useful for checking in with women, they were not appropriate for providing advice on mother–infant bonding or feeding. Video calls were increasingly used as the pandemic progressed, particularly when delivering a psychological intervention or conducting a medication review. However, not all healthcare trusts were adaptable to the needs of the service or the population they served in terms of the variability of the platforms that could be used.

TABLE 9 Factors associated with understanding resilience of services

Themes	Subthemes
Acceptance of situation	
Adaptations	
	Adaptable communication methods to meet women's need
	Delivery of intervention (content, frequency, method)
Opportunities to have a positive impact	
	Understanding of situation and gratitude of receiving a service
	Keep in the service to reduce mental health deterioration
	Care above and beyond
Non-acceptance of situation	
Rigid structures/processes	
	Barriers to varied communication platforms
Fear of punishment and negative harm	
	Management of risk
	Increased threshold
	Early discharge
	Reduced intervention offers
	Mothers feeling of abandonment

Services found that better platform choices were associated with ease of use, familiarity to both the client and staff members, security and ability to use for no cost (e.g. WhatsApp, Menlo Park, CA, USA). Services that were open to using platforms that better suited their clients adapted and used whatever was both confidential and acceptable to clients to maintain care for their clients. This provided an opportunity for services to provide a good level of care during these challenging times, resulting in positive outcomes for clients and their families (more connectedness, access to interventions).

BOX 21 Quotes on adaptability and acceptance of the pandemic

I think, actually, we've been reasonably stable, everything's remained the same, it's just been virtual. There was some sort of jigging about in terms of how you manage duty and the duty phone, but we've continued to have weekly team meetings, I've continued to do all of my visits.

Staff member 4

We got it all set up and then really from lockdown we've all been agile working from home and [name], our manager, is trying to negotiate to get us places where we can see people where we think it's important, face to face, but that's not organised yet.

Staff NE1

Some of the women that we think needed face to face we still offer face to face but we had the full PPE kits so we had the PPE kits provided for us so you can see those women that needed to be seen.

Staff SE4

[W]e're going to find out what parents want from groups and design our group programme about, around what's what people would like. We've got a few ideas continues the Walk and Play. We're thinking maybe of a virtual cooking/weaning group. A creative group possibly that could incorporate art, writing, music, yeah, so we're working on that.

Staff member SE7

Maybe I've been not discharging people as much, just aware how isolated people are, because they can't go to children's centre groups, less groups are running, they're maybe not seeing their friends and family as much, so yeah, maybe, I haven't been aware of that, but maybe I have been keeping people on and not discharging as soon.

Staff member SW4

Client and service not accepting of the situation

Services that were rigid in their approach to provision of care during the pandemic did not adapt to the needs of their client, resulting in a reduction of their offer. *Box 22* presents quotes on how staff found it difficult to accept the situation they were in during the pandemic. Women reported reduced range of psychological interventions being offered and staff felt limited in the types of interventions they could offer remotely. For example, trauma-based interventions delivered over video call in a woman's home were in some cases not acceptable, as home was a safe space for them. However, alternatives were not suggested by staff in these situations (e.g. in the car) as services at times overweighed the risks of treatment versus the risk of non-delivery to pregnant women. Some services increased their threshold for access, only accepting women of higher needs and more serious mental health issues.

BOX 22 Quotes related to services not accepting the pandemic situation

Yeah, definitely. We're not going one to one, that's straight off, we've not been doing anywhere near as many home visits and one to one anything as we would usually do. I would usually use a lot of CBT, and I find that almost impossible to do any other way but face to face, and that may well be that's my skills deficit because I know that it can be done electronically but I don't find it easy to do it that way.

Staff member d1

> *I think because obviously we've had to adapt our criteria, so, we're not seeing that perhaps low level, and we are looking at mental illness, people that are, you know, in the community and high end. So, people have got – people were looked at, you know, if there's some work that needs to be done to tidy it up or, you know, looking at discharging client load to free up caseloads and work, to work more intensively with those that are our new referral criteria, so that was a big change.*
>
> Staff member s3
>
> *There's obviously some things that we can't do so much, so I used to do, when Covid started I was doing Exposure, Response, Prevention with a lady with OCD, in her home. And that became very difficult to do online, so there's definitely some things that you can't really do online.*
>
> Staff member 7

Additional research question 3

What barriers and facilitators do women with diverse backgrounds encounter regarding access to CPMHT?

Aim of study:

- qualitatively explore ethnic minority women's perceptions of barriers and facilitators to accessing specialist community PMH.

Methods

Participants

- *n = 28 ethnic minority women in England*
- *Inclusion criteria:*
  - gave birth within the past 4 years
  - experienced self-defined mental health problems during pregnancy or the 2 years following childbirth
  - did not receive statuary PMH support.

Procedures

- Semistructured interview guide developed study team and the study's PAG.
  - Questions included:
    - women's views of their community's perception of PMH and motherhood
    - perceived barriers to PMH support
    - their PMH experiences and interactions with health professionals
    - their recommendations for improving access.

Data analysis

Interviews were audio-recorded and transcribed verbatim. Thematic analysis was used to analyse the data.

Results

Participant characteristics are described in *Table 10*. Themes of women's views of PMH are presented in *Figure 9*.

Cultural beliefs and expectations

- Beliefs and perceptions of PMH.
  - Awareness of PMH was generally high across different ethnic groups.
  - Stigma about PMH within communities was high.
    - Black women reported mental health problems were sometimes perceived as a 'normal part of life' that people 'have to go through'.
    - In Black communities, physical health was emphasised over mental health.

TABLE 10 Participant characteristics

	n (%)
Ethnicity	
Black/Black British	7 (24.8)
Asian	13 (46.3)
Mixed ethnicities	2 (7.1)
Other ethnicities	6 (21.4)
Age (mean = 32, range 25–44)	
25–29	7 (25.0)
30–39	19 (67.8)
40–44	2 (7.1)
Employment status	
Employed (including self-employed)	19 (77.9)
Unemployed	9 (32.1)
Length of stay in the UK	
UK born	16 (57.1)
1–5 years	6 (21.4)
5–10 years	3 (10.7)
10 + years	3 (10.6)

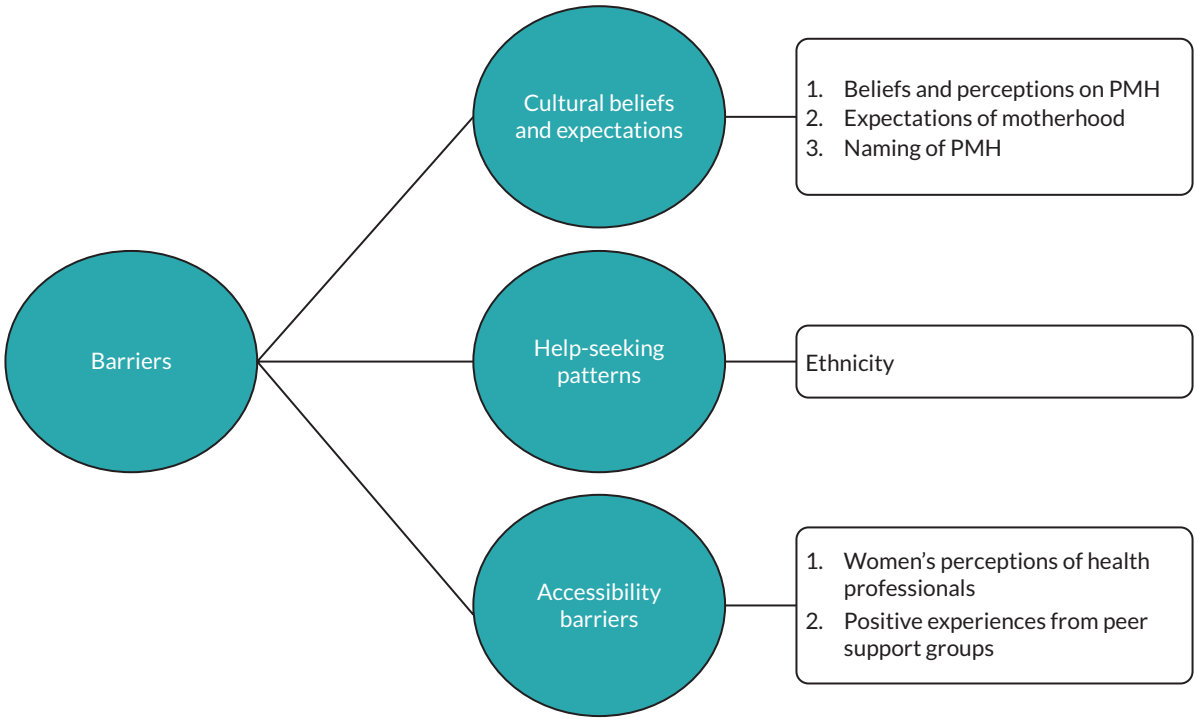


FIGURE 9 Themes of women's views of PMH and support.

        - Women in Asian communities reported a subtle difference, 'mental health isn't important. You're a mum now. You have to get on with things'.
        - Women from other ethnicities reported that 'mental health is not something you discuss'.

- Expectations of motherhood.
    - Balancing compound expectations: mainstream motherhood expectations, expectations of the wider ethnic (e.g. Black) community, and expectations of motherhood within their specific community.
        - For example, being a 'strong Black woman' and not letting community or self down with mental health problems.
        - Feeling pressure to uphold religious values and behaviours as a mother that do not seem to be valued by mainstream British culture (e.g. Muslim, South Asian women).
        - 'Giving it all' as a mother and giving up self in the process. In Italian culture, this being based in ideals of the Virgin Mary, in South Asian culture, ideal mother seen as the one who does and gives all.

- Naming PMH.
    - Language: Lack of labels for PMH within own culture.
        - Could not label the problem for themselves as these words were lacking in their own culture.
        - Fifty per cent of participants were first-generation immigrants who flagged language as a barrier to speaking to healthcare professionals.

Help-seeking patterns

- Ethnicity.
    - Black and 'other' ethnicities would first seek help informally from their own families and communities.
    - South Asian women were wary about seeking informal help because of high community stigma and lack of confidentiality within community. Lack of individuals in their community who might act as 'cues to action' but more willingness to accept support outside community if it is confidential.

Accessibility barriers

- Women's perceptions of health professionals.
    - Women's willingness to seek professional help significantly impacted by their negative previous experiences of healthcare interactions.

        - Both personal and community accounts of healthcare discrimination were high.
        - Accounts of perceived discrimination in maternity particularly prevalent.
        - When women experienced discrimination in maternity, they expressed worries about then receiving mental health care from professionals.

- Positive experiences from peers.
    - In the face of perceived discrimination and stigma, women expressed desire to be 'understood'.
    - Peer support provided a safe place where women felt a shared and common history that provided unspoken validation.

Discussion

As expected, the comprehensive CPMHT model yielded substantial improvements in the experiences and mental health outcomes of women and infants. These improvements were facilitated by a range of processes grounded in the integrated and reciprocal relationships between the CPMHT and other mental health providers.

Benefits to a comprehensive CPMHT included:

- Improved access through streamlined referral processes, particularly within maternity care, because the CPMHT provided PMH education and improved linkage.
- Expanded capacity to deliver acceptable, evidence-based interventions for complex, serious PMH problems (e.g. PTSD, OCD, EUPD) with a strong emphasis on a family-centred approach. Noteworthy domains highlighted in our revised programme theory contributed to improved mental health: specialised medication advice, bolstering social belonging and close social relationships and enhancing mental health management skills.
- Improvement in women's outcomes and experiences with the CPMHT increasing health provider confidence in referring to the team.

Women often described their experiences with the CPMHT as transformative, particularly among those with previous experiences of secondary mental health. The CPMHT was viewed as a nurturing service, treating them as mothers rather than as a person with a mental health problem. The pivotal role of staff 'soft skills' was highlighted, and included consistent, non-judgemental and compassionate care, which fostered engagement and openness in women and helped ensured they were able to get the treatments they needed. These results are consistent with a broader literature highlighting the importance of 'soft skills' across mental health treatment, but especially in reaching and engaging people with complex social and emotional needs,[72] the target population for CPMHTs.

Community perinatal mental health teams were still undergoing rapid expansion during the evaluation. Provision within the teams we sampled varied. The COVID-19 pandemic revealed how reductions in universal maternity and voluntary sector care and a move to remote provision affected women and infants. CPMHTs struggled with an increasingly complex caseload, and at times were wary about discharging women as there was little existing support in the community. Remote provision was successful in some cases, and less acceptable in others, especially when this was marked by slow transitions, use of technology that was not familiar to women, staff who were also unfamiliar with or worried with using technology and disclosed this to women and did not help them with becoming familiar with how to use the technology. Busy pregnant women, those living in circumstances where they could find privacy, and women living in remote areas had more favourable opinions of remote provision. Socially isolated women, those with higher risk profiles and women struggling with bonding benefitted from in-person contact. While teams adapted to COVID-19 changes, care remained inconsistent across many CPMHTs. Although care pathways and support for severe mental illness were robust in most teams, disparities in referral pathways and intervention availability for other mental health problems were apparent. For example, psychological support was lacking in some CPMHTs, impacting women with PTSD, OCD, anxiety and depression. Co-ordination between CPMHTs and adult mental health care was limited for women with EUPD and complex trauma. Although some services began offering parent–infant support, direct intervention was generally lacking. Though many services have enhanced their provision since we conducted our interviews, not all CPMHTs have achieved the full flexible aims of the LTP.

Moreover, it became evident that CPMHTs were not effectively reaching women from diverse ethnic backgrounds, which is concerning given their heightened risk for adverse obstetric and neonatal outcomes. To fully understand the needs of ethnically diverse populations, additional research using different recruitment approaches is needed. Further, addressing historical discrimination and mistrust in mental healthcare engagement is essential to rectifying this gap.

Strengths and limitations

This is one of the largest and most comprehensive qualitative studies of perinatal treatment engagement and outcomes. We sampled a range of CPMHTs across England and a broad range of women with different mental health problems. By taking a realist approach, this study extended previous literature in this domain by examining causal factors underlying women's engagement with PMH services, examining what worked for whom and when.

Although the sample here is based on women who were referred to the service and opted to attend at least an initial appointment, we did have accounts from women who initially engaged well, but then disengaged, and women who did not initially engage well with the service but returned at a later date. These women's accounts helped us to distinguish between what worked and what did not work for women once they started with CPMHS, though this was qualified by

high levels of missing quantitative data and variation in types of data collected from services, which meant a mixed-methods analysis was not possible.

In conclusion, comprehensive CPMHTs hold substantial promise for women facing complex and serious mental health challenges, benefiting both them and their families. The model's warm, inclusive approach presents an opportunity to address disparities in PMH care delivery, but this necessitates collaborative efforts between services and communities.

Chapter 5 Obstetric and neonatal outcomes in pregnant women with and without a history of specialist mental health care: a national population-based cohort study using linked routinely collected data in England

Background

Pregnant women with pre-existing mental illness have an increased risk of adverse birth outcomes, including preterm birth and a baby being small for gestational age (SGA). The risk appears greatest in women with a more severe mental illness.[74]

The evidence of an increased risk of stillbirth and neonatal death is less consistent, potentially due to the lack of statistical power of previous studies that examine these outcomes in women with less common complex of severe mental illnesses. A further issue is the lack of recording, or inconsistent recording, of the severity of symptoms in routinely collected mental healthcare data sets.[75]

Aim

The aim of this study was to compare the risks of adverse pregnancy outcomes between women with and without a history of mental illness. The outcomes we considered included fetal and neonatal death, preterm birth, and the baby born SGA as well as composite indicators for neonatal adverse outcomes and maternal morbidity. We compared women with and without a history of mental illness, defined as a care episode with pre-pregnancy specialist mental healthcare services.[76,77]

Methods

Data sources and linkage

This study used three consecutive versions of the national data set of specialist mental health care provided by the NHS in England, which together include mental healthcare episodes from April 2006, linked at the patient level to the Hospital Episode Statistics (HES), the administrative database of all care episodes in general NHS hospitals[78,79] and the birth notifications of Personal Demographic Service (PDS).[80] Records on mental healthcare episodes provided between December 2015 and March 2016 were not available for technical reasons.

Hospital Episode Statistics records include patient demographics, admission dates, diagnoses according to *International Statistical Classification of Diseases and Related Health Problems*, Tenth Revision (ICD-10) codes[81] and procedures coded according to OPCS-4 codes.[82] HES records of maternity episodes include additional information in the 'HES maternity tail'.[83] HES and PDS records of women giving birth were linked to HES records of their babies. PDS birth records contained additional information on stillbirth, gestational age and birthweight that was used if HES data were missing.

Cohort selection, comparison groups and risk adjustment

Maternity episodes for women, aged 18 and above, with a recorded gestation of at least 24 completed weeks, who had a singleton birth between April 2014 and March 2018 in the English NHS were identified from HES and PDS birth notifications (see *Report Supplementary Material 1*). Women who gave birth before 24 weeks were not included because there is no legal requirement to register babies born before 24 weeks of gestation without signs of life in the UK.[84] Women who had a multiple birth were not included because their risk of adverse pregnancy outcomes are inherently increased.[85]

We considered that a woman had a pre-existing mental illness if there was evidence in the mental healthcare data sets that she had had a contact with specialist mental health care within 7 years before pregnancy. These specialist care contacts typically need a referral from a GP or they are part of urgent or emergency care.[86] To determine the onset of pregnancy, we subtracted the gestational age at birth minus 2 weeks (or 38 weeks if gestational age was not available) from the date of birth.

We categorised the specialist mental healthcare contacts according to their highest level of care:

- an admission to a psychiatric ward, including generic psychiatric wards, MBUs or secure wards ('hospital admission'; highest level)
- involvement of a specialist mental health crisis resolution team providing intensive treatment at home ('CRT'; next highest level)
- and other care contacts with specialist mental health care, including day care and outpatient or community-based care ('community care'; lowest level).

We grouped the timing of the most recent mental healthcare contacts (of any type) as:

- more than 5 years
- between 1 and 5 years
- less than 1 year before of pregnancy.

Hospital Episode Statistics records provided data on maternal age, parity, and previous caesarean section, ethnicity, pre-existing hypertension, pre-existing diabetes mellitus, pre-eclampsia/eclampsia and gestational diabetes (see *Report Supplementary Material 1*). Socioeconomic deprivation was derived from quintiles of the national ranking of the IMD 2019 of the women's area of residence.[83]

Outcomes

Study outcomes across analyses were:

- stillbirth or neonatal death within 7 days of birth
- preterm birth (birth before 37 completed weeks of gestation)
- birth of a baby born SGA (birthweight less than the 10th centile using the UK-WHO gestationally corrected growth charts)[87]
- and two composite adverse outcome indicators that capture neonatal and maternal morbidity.
  - The English Neonatal Adverse Outcome Indicator (ENAOI) for liveborn babies is derived from the presence of 15 ICD-10 diagnoses and 7 OPCS-4 procedures present in the babies' HES records before inpatient discharge after birth (see *Report Supplementary Material 1*).[76]
  - The English Maternal Morbidity Outcome Indicator (EMMOI) is derived from 17 ICD-10 diagnoses (including acute psychosis, but no other mental illness diagnosis, suicide, or substance misuse) and 9 OPCS-5 procedures, in HES records of the maternity episode (see *Report Supplementary Material 1*).[77]

For the purpose of this study, acute psychosis was not included.

Data analysis

All obstetric and neonatal outcomes follow accepted definitions. The definition of the comparison groups according to severity and timing of the pre-pregnancy mental healthcare contacts was guided by creating clinically relevant groups

as much as possible equal in size. ORs adjusted for all maternal characteristics described above (adjORs) and their 95% confidence intervals (CI) were estimated with logistic regression with robust standard errors to account for clustering of outcomes within hospitals. We also tested the differences according to the severity and the timing of these contacts using joint Wald tests.

For regression analyses, missing values for outcomes and risk factors were imputed using chained equations to generate 10 data sets.[88] Stata 17 was used for all analyses. A *p*-value of < 0.05 was considered to represent statistical significance. Where we adjusted for related factors, the covariates were: maternal age, parity and previous caesarean section, maternal ethnicity, socioeconomic deprivation, pre-existing diabetes mellitus and pre-existing hypertension, gestational diabetes and pre-eclampsia/eclampsia.

Results

Of the 2,081,043 women who were identified in the administrative hospital or birth registrations data with a singleton birth, 151,770 (7.3%) had at least 1 pre-pregnancy face-to-face contact with specialist mental health care within 7 years before pregnancy: 7247 (0.3%) had at least 1 admission to a psychiatric hospital, 29,770 (1.4%) had at least 1 CRT contact (and no hospital admission) and 114,753 (5.5%) had at least 1 specialist community contact (and no hospital admission or CRT contact).[10]

Table 11 shows the characteristics of the women according to the level and timing of their pre-pregnancy mental healthcare contact.

Table 12 shows that the risk of stillbirth or neonatal death within 7 days was 0.45% in women without and 0.49% in women with a pre-pregnancy specialist mental healthcare contact, but this increase was not statistically significant (adjOR 1.11, 95% CI 0.99 to 1.24, $p = 0.078$). When we used a model that included both the level and timing of the pre-pregnancy contacts, we did not find statistically significant evidence that risks were increased in women who had a community care contact more than 5 years before the pregnancy compared to women without a pre-pregnancy contact ($p = 0.229$). Neither did we find that the risks differed according to the level (overall $p = 0.145$) or timing (overall $p = 0.267$) of the pre-pregnancy contact. There was no statistically significant interaction between the level and timing of the pre-pregnancy contacts ($p = 0.203$).

Table 13 shows that the risk of preterm birth was 6.5% in women without and 9.8% in women with a pre-pregnancy specialist mental healthcare contact (adjOR 1.53, 95% CI 1.35 to 1.73, $p < 0.001$). This risk gradually increased according to the highest level of mental healthcare contact from 9.2% in women who had a community care contact only (adjOR 1.44, 95% CI 1.25 to 1.66), 11.0% in women who had a CRT contact (adjOR 1.73, 95% CI 1.57 to 1.90), to 13.4% in women with a psychiatric hospital admission (adjOR 2.11, 95% CI 1.96 to 2.28, overall $p < 0.001$). We also found a gradual increase according to the timing of the most recent contact from 8.5% in women with a contact more than 5 years before pregnancy (adjOR 1.33, 95% CI 1.15 to 1.54), 9.3% in women with a contact between 1 and 5 years before pregnancy (adjOR 1.46, 95% CI 1.28 to 1.66), to 11.3% in women with a contact less than 1 year before pregnancy (adjOR 1.77 95% CI 1.58 to 1.97; overall $p = 0.001$). This overall pattern of results was consistent with that seen when we analysed the risk of preterm birth using a model that included both the level and timing of the pre-pregnancy mental healthcare contacts. There was no evidence of a statistical interaction between the level and timing of the pre-pregnancy contacts ($p = 0.554$).

Table 14 shows that the risk of a baby born SGA was 6.2% in women without and 7.5% in women with a pre-pregnancy specialist mental healthcare contact (adjOR 1.34, 95% CI 1.30 to 1.37, $p < 0.001$). We found a gradual increase in risk according to the highest level of the mental healthcare contact from 7.3% in women with a community care contact (adjOR 1.30, 95% CI 1.26 to 1.34), 8.0% in women with a CRT contact (adjOR 1.39, 95% CI 1.32 to 1.46), to 9.5% in women who had a hospital admission (adjOR 1.64, 95%CI 1.51 to 1.79, overall $p < 0.001$). We also found a gradual increase according to the timing of the most recent contact from 6.4% in women with a contact more than 5 years before pregnancy (adjOR 1.21, 95% CI 1.14 to 1.28), 7.3% in women who had a contact between 1 and 5 years before pregnancy (adjOR 1.31, 95% CI 1.27 to 1.35), to 8.5% in women with a contact less than 1 year before pregnancy

(adjOR 1.45, 95% CI 1.39 to 1.51, overall $p < 0.001$). Again, this pattern of results was consistent with that seen when we modelled the risk of a baby born SGA, including both the level and timing of the pre-pregnancy contacts (see Langham *et al.* 2023, table 4).[73] There was no evidence of a statistical interaction between the level and timing of the pre-pregnancy contacts ($p = 0.179$).

The risk of neonatal adverse outcomes, defined using the composite neonatal outcome indicator, was 6.4% without and 8.4% with a pre-pregnancy specialist mental healthcare contact (adjOR 1.37, 95% CI 1.21 to 1.55, $p < 0.001$). The pattern of results according to the level and timing of the mental healthcare contacts followed that observed for the risk of preterm birth and babies born SGA (see *Report Supplementary Material 1*).

The risk of maternal morbidity (*Table 15*), defined using the composite maternal outcome indicator, was 0.9% without and 1.0% with a pre-pregnancy specialist mental healthcare contact (adjOR 1.18, 95% CI 1.12 to 1.25, $p < 0.001$). We also found evidence of an increase in this risk according to the highest level of the mental healthcare contact (overall $p < 0.001$) or according to the timing of the most recent contact (overall $p < 0.001$). The pattern of results was less clear if we included both the level and timing of the pre-pregnancy contacts in the same model (see *Report Supplementary Material 1*).

Discussion

This study of about 2 million women who gave birth to a singleton baby in the English NHS between 2014 and 2018. Of these women, 7.3% had at least one face-to-face contact with specialist mental health care in the 7 years before their pregnancy.

We used the highest level of specialist mental health care as a proxy for the severity of the disorders and the timing of the most recent pre-pregnancy specialist mental healthcare contact to distinguish pregnant women's mental healthcare histories.

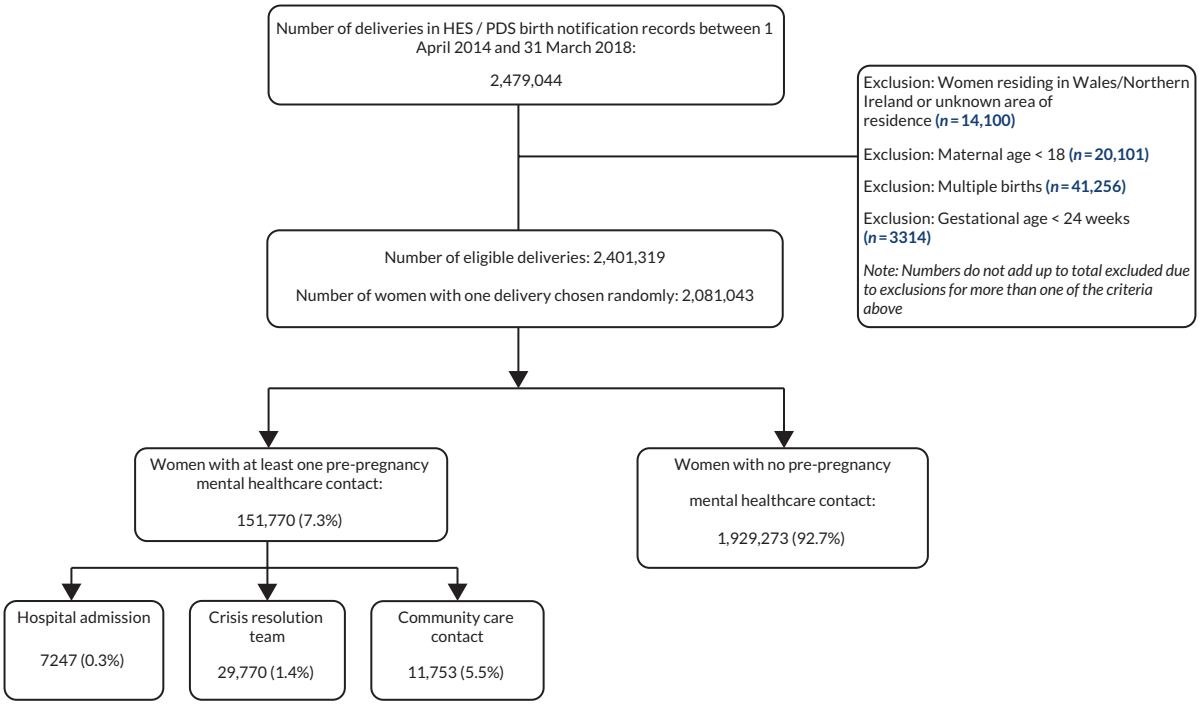


FIGURE 10 Flow diagram indicating number of women with and without pre-pregnancy mental healthcare contact, by type of contact.

TABLE 11 Maternal characteristics at time of birth and pre-pregnancy specialist mental healthcare contact

		Presence of contact		By type of contact			By timing of contact		
	All women	No contact	At least one	Community care contact	CRT	Hospital admission	> 5 years	1–5 years	< 1 year
	2,081,043	1,929,273	151,770	114,753	29,770	7247	22,007	85,097	44,666
Maternal age (missing n = 28, < 0.01%)									
18–24	365,554 (17.6)	323,329 (16.8)	42,225 (27.8)	30,640 (26.7)	9715 (32.6)	1870 (25.8)	2722 (12.4)	22,627 (26.6)	16,876 (37.8)
25–34	1,250,692 (60.1)	1,167,627 (60.5)	83,065 (54.7)	63,574 (55.4)	15,552 (52.2)	3939 (54.4)	14,542 (66.1)	47,174 (55.4)	21,349 (47.8)
35–39	374,489 (18.0)	353,674 (18.3)	20,815 (13.7)	16,225 (14.1)	3477 (11.7)	1113 (15.4)	3703 (16.8)	12,063 (14.2)	5049 (11.3)
40 ≤	90,280 (4.3)	84,619 (4.4)	5661 (3.7)	4312 (3.8)	1024 (3.4)	325 (4.5)	1039 (4.7)	3232 (3.8)	1390 (3.1)
Parity (missing n = 91,523, 4.4%)									
Nulliparous	870,661 (43.8)	816,530 (44.3)	54,131 (37.3)	40,284 (36.8)	11,226 (39.4)	2621 (38.0)	7067 (33.7)	29,081 (35.8)	17,983 (42.1)
Multiparous, no previous cesearean section	931,397 (46.8)	85,6325 (46.4)	75,072 (51.8)	57,113 (52.1)	14,396 (50.5)	3563 (51.7)	11,370 (54.2)	42,743 (52.6)	20,959 (49.0)
Multiparous, with previous caesarean section	187,462 (9.4)	171,720 (9.3)	15,742 (10.9)	12,137 (11.1)	2895 (10.2)	710 (10.3)	2523 (12.0)	9413 (11.6)	3806 (8.9)
Ethnicity (missing n = 292,757, 14.1%)									
White	1,388,951 (77.7)	1,268,938 (76.8)	120,013 (88.1)	91,285 (88.8)	23,510 (87.1)	5218 (80.8)	17,237 (87.8)	67,270 (88.1)	35,506 (88.3)
South Asian	204,298 (11.4)	197,302 (11.9)	6996 (5.1)	5199 (5.1)	1403 (5.2)	394 (6.1)	1038 (5.3)	4084 (5.3)	1874 (4.7)
Black	84,198 (4.7)	80,238 (4.9)	3960 (2.9)	2607 (2.5)	886 (3.3)	467 (7.2)	601 (3.1)	2126 (2.8)	1233 (3.1)
Mixed	31,957 (1.8)	29,213 (1.8)	2744 (2.0)	1930 (1.9)	618 (2.3)	196 (3.0)	398 (2.0)	1481 (1.9)	865 (2.2)
Other stated	78,882 (4.4)	76,399 (4.6)	2483 (1.8)	1724 (1.7)	573 (2.1)	186 (2.9)	353 (1.8)	1407 (1.8)	723 (1.8)

continued

TABLE 11 Maternal characteristics at time of birth and pre-pregnancy specialist mental healthcare contact (*continued*)

		Presence of contact		By type of contact			By timing of contact		
	All women	No contact	At least one	Community care contact	CRT	Hospital admission	> 5 years	1–5 years	< 1 year
Socioeconomic deprivation (missing n = 35, < 0.01%)									
Least deprived = quintile 1	313,034 (15.0)	297,314 (15.4)	15,720 (10.4)	12,662 (11.0)	2527 (8.5)	531 (7.3)	2829 (12.9)	9108 (10.7)	3783 (8.5)
Quintile 2	352,242 (16.9)	331,487 (17.2)	20,755 (13.7)	16,348 (14.2)	3624 (12.2)	783 (10.8)	3416 (15.5)	12,009 (14.1)	5330 (11.9)
Quintile 3	402,454 (19.3)	375,299 (19.5)	27,155 (17.9)	20,776 (18.1)	5185 (17.4)	1194 (16.5)	4097 (18.6)	15,436 (18.1)	7622 (17.1)
Quintile 4	471,646 (22.7)	435,640 (22.6)	36,006 (23.7)	26,834 (23.4)	7231 (24.3)	1941 (26.8)	5134 (23.3)	19,923 (23.4)	10,949 (24.5)
Most deprived = quintile 5	541,632 (26.0)	489,510 (25.4)	52,122 (34.3)	38,124 (33.2)	11,201 (37.6)	2797 (38.6)	6531 (29.7)	28,615 (33.6)	16,976 (38.0)
Pregnancy risk factors (missing = 91,523, 4.4%)									
Pre-existing diabetes	16,786 (0.8)	14,839 (0.8)	1947 (1.3)	1395 (1.3)	430 (1.5)	122 (1.8)	278 (1.3)	1045 (1.3)	624 (1.5)
Pre-existing hypertensive conditions	12,467 (0.6)	11,504 (0.6)	963 (0.7)	738 (0.7)	172 (0.6)	53 (0.8)	158 (0.8)	545 (0.7)	260 (0.6)
Gestational diabetes	112,043 (5.4)	104,021 (5.6)	8022 (5.5)	5891 (5.4)	1630 (5.7)	501 (7.3)	1208 (5.8)	4415 (5.4)	2399 (5.6)
Pre-/eclampsia	42,680 (2.1)	39,618 (2.1)	3062 (2.1)	2279 (2.1)	628 (2.2)	155 (2.2)	417 (2.0)	1666 (2.1)	979 (2.3)

TABLE 12 Risk of stillbirth and neonatal mortality according to the highest level and the timing of the most recent pre-pregnancy mental healthcare contact

	Numerator/denominator	Rate (%)	Unadjusted OR (95% CI)	*p*-value	Adjusted[a] OR (95% CI)	*p*-value
All women	9121/2,021,289	0.45				
According to any previous specialist mental healthcare contact						
	8396/1,873,823	0.45	Reference		Reference	
	725/147,466	0.49	1.10 (0.98 to 1.24)	0.119	1.11 (0.99 to 1.24)	0.078
According to type and timing						
No contact			Reference		Reference	
Community care contact > 5 years			1.09 (0.92 to 1.30)	0.301	1.12 (0.93 to 1.35)	0.229
TYPE (reference: community care contact > 5 years)						
CRT			1.11 (0.94 to 1.31)	0.094[b]	1.10 (0.93 to 1.30)	0.145[b]
Hospital admission			1.34 (1.02 to 1.77)		1.32 (1.00 to 1.75)	
TIMING (reference: community care contact > 5 years)						
1–5 years			0.92 (0.76 to 1.11)	0.210[b]	0.91 (0.76 to 1.09)	0.267[b]
< 1 year			1.04 (0.83 to 1.30)		1.02 (0.83 to 1.25)	
Interaction TYPE × TIMING				0.200		0.203

a Adjusted for maternal age, parity and previous caesarean section, maternal ethnicity, socioeconomic deprivation, pre-existing diabetes mellitus and pre-existing hypertension, gestational diabetes and pre-eclampsia/eclampsia.
b *p*-value of joint test that ORs are equal to 1.

TABLE 13 Risk of preterm birth according to the highest level and the timing of the most recent pre-pregnancy mental healthcare contact

	Numerator/ denominator	Rate (%)	Unadjusted OR (95% CI)	*p*-value	Adjusted[a] OR (95% CI)	*p*-value
All women	136,899/2,039,580	6.7				
According to any previous specialist mental healthcare contact						
No contact	122,343/1,890,694	6.5	**Reference**		**Reference**	
At least one previous contact	14,556/148,886	9.8	1.57 (1.36 to 1.81)	< 0.001	1.53 (1.35 to 1.73)	< 0.001
According to type and timing						
No contact			**Reference**		**Reference**	
Community care contact; > 5 years			1.32 (1.11 to 1.56)	0.001	1.31 (1.12 to 1.52)	0.001
TYPE (reference: community care contact; > 5 years)						
CRT			1.18 (1.11 to 1.26)	< 0.001[b]	1.16 (1.09 to 1.24)	< 0.001[b]
Hospital admission			1.41 (1.25 to 1.59)		1.38 (1.22 to 1.55)	
TIMING (reference: community care contact; > 5 years)						
1–5 years			1.08 (1.02 to 1.15)	< 0.001[b]	1.07 (1.01 to 1.13)	< 0.001[b]
< 1 year			1.28 (1.21 to 1.37)		1.26 (1.18 to 1.33)	
Interaction TYPE × TIMING				0.746		0.554

a Adjusted for maternal age, parity and previous caesarean section, maternal ethnicity, socioeconomic deprivation, pre-existing diabetes mellitus and pre-existing hypertension, gestational diabetes and pre-eclampsia/eclampsia.
b *p*-value of joint test that ORs are equal to 1.

TABLE 14 Risk of SGA birth according to the highest level and the timing of the most recent pre-pregnancy mental healthcare contact

	Numerator/ denominator	Rate (%)	Unadjusted OR (95% CI)	*p*-value	Adjusted[a] OR (95% CI)	*p*-value
All women	127,968/2,030,048	6.3				
According to any previous specialist mental healthcare contact						
No contact	116,829/1,882,019	6.2	**Reference**		**Reference**	
At least one previous contact	11,139/148,029	7.5	1.23 (1.19 to 1.27)	< 0.001	1.34 (1.30 to 1.37)	< 0.001
According to type and timing						
No contact			**Reference**		**Reference**	
Community care contact; > 5 years			1.03 (0.97 to 1.09)	0.349	1.20 (1.13 to 1.27)	< 0.001
TYPE (reference: community care contact; > 5 years)						
CRT			1.08 (1.03 to 1.14)	< 0.001[b]	1.05 (1.00 to 1.10)	< 0.001[b]
Hospital admission			1.25 (1.15 to 1.37)		1.22 (1.12 to 1.33)	

TABLE 14 Risk of SGA birth according to the highest level and the timing of the most recent pre-pregnancy mental healthcare contact (*continued*)

	Numerator/ denominator	Rate (%)	Unadjusted OR (95% CI)	*p*-value	Adjusted[a] OR (95% CI)	*p*-value
TIMING (reference: community care contact; > 5 years)						
1–5 years			1.13 (1.06 to 1.20)	< 0.001[b]	1.07 (1.01 to 1.14)	< 0.001[b]
< 1 year			1.31 (1.22 to 1.41)		1.17 (1.09 to 1.26)	
Interaction TYPE × TIMING				0.065		0.179

a Adjusted for maternal age, parity and previous caesarean section, maternal ethnicity, socioeconomic deprivation, pre-existing diabetes mellitus and pre-existing hypertension, gestational diabetes and pre-eclampsia/eclampsia
b *p*-value of joint test that ORs are equal to 1.

TABLE 15 Risk of maternal morbidity according to the highest level and the timing of the most recent pre-pregnancy mental health care

	Numerator/ denominator	Rate (%)	Unadjusted OR (95% CI)	*p*-value	Adjusted[a] OR (95% CI)	*p*-value
All women	17,968/1,989,520	0.9				
According to any previous specialist mental healthcare contact						
No contact	16,528/1,844,575	0.9	**Reference**		**Reference**	
At least one previous contact	1440/144,945	1.0	1.11 (1.05 to 1.17)	< 0.001	1.18 (1.12 to 1.25)	< 0.001
According to type and timing						
No contact			**Reference**		**Reference**	
Community care contact; > 5 years			1.00 (0.87 to 1.15)	0.976	1.07 (0.94 to 1.23)	0.312
TYPE (reference: community care contact; > 5 years)						
CRT			0.92 (0.81 to 1.06)	0.374[b]	0.90 (0.79 to 1.03)	0.294[b]
Hospital admission			1.09 (0.86 to 1.38)		1.01 (0.79 to 1.28)	
TIMING (reference: community care contact; > 5 years)						
1–5 years			1.11 (0.95 to 1.29)	0.033[b]	1.11 (0.96 to 1.29)	0.046[b]
< 1 year			1.21 (1.04 to 1.42)		1.21 (1.02 to 1.41)	
Interaction TYPE × TIMING				0.429		0.253

a Adjusted for maternal age, parity and previous caesarean section, maternal ethnicity, socioeconomic deprivation, pre-existing diabetes mellitus and pre-existing hypertension, gestational diabetes and pre-eclampsia/eclampsia.
b *p*-value of joint test that ORs are equal to 1.

We found that about 1 in 14 women had at least one pre-pregnancy specialist mental healthcare contact and that in these women; the risk of adverse obstetric and neonatal outcomes was increased, even if they only had specialist mental health care in a community setting more than 5 years before the pregnancy. Risks were higher in women with a pre-pregnancy specialist healthcare contact that reflects a more severe mental illness (a psychiatric hospital admission or involvement of a CRT), and in women who had a more recent pre-pregnancy specialist mental healthcare contact. The risk of maternal morbidity was only slightly increased in women who had a pre-pregnancy specialist mental healthcare contact.

Strengths and limitations

The major strength of this study is that we could use linked national data sets of care provided by the English NHS. We could trace face-to-face contacts with specialist mental health services for all women up to 7 years before their pregnancy, but this look-back period was shorter in younger women because we did not have access to adolescent mental health records.

A limitation of our study includes that because of technical issues experienced by the national data provider we did not have access to records of specialist mental healthcare episodes for a 4-month period between December 2015 and March 2016. Therefore, we will have misclassified a proportion of women whose highest level of specialist mental healthcare contact occurred during that period. It is unlikely that this period without access to mental healthcare records will have had a major impact, given that the number of women whose mental healthcare history in the year immediately before pregnancy is affected is relatively low, the duration for those whose mental health history between 1 and 5 years before the onset for the pregnancy is affected is relatively short, and most women with pre-pregnancy mental illness will have had multiple contacts.

Previous studies have described the prevalence of common and severe mental illness during pregnancy and the year after birth,[9,74] but there is little systematic evidence on the prevalence of mental illness before the onset of pregnancy. Other new key findings are that the risks of preterm birth and a baby born SGA were increased for all women who had a pre-pregnancy contact with specialist mental health care, even if they had only experienced a community contact more than 5 years before the pregnancy.

A recent meta-analysis of 28 studies reported increases of 40–50% in the risk of stillbirth and neonatal mortality, irrespective of the type of mental disorder that was studied and the perinatal outcomes considered, but with considerable heterogeneity between studies.[89] We did not find an overall increase in the risk of stillbirth and neonatal mortality considering all women with a pre-pregnancy specialist mental healthcare contact, but the overall increases in the risk of other adverse outcomes, including preterm and SGA birth, were found to be in a similar range as reported in the meta-analysis.

Implications for practice and research

Our results suggest adding questions about whether women who are planning a pregnancy or who have recently learnt they are pregnant have ever had contact with specialist mental healthcare services to the initial obstetric risk assessment, which already includes questions about current medication, smoking, alcohol, illicit drug use and other adverse conditions. Of note, questions about the highest level of the mental health care and the timing of the most recent contact provide an opportunity to identify women at the highest risk.

The results described in this chapter underpin the urgency of an impact of the specialist CPMHTs not only on mental outcomes during and the year after pregnancy but also on obstetric and neonatal outcomes. In many countries, new maternity care models, such as the midwifery caseload model, have been introduced that strengthen continuity of carer, especially for women with complex medical and social needs, which present opportunities for risk assessment and referral, for example through pregnancy smoking cessation services.[90–92] However, to guide the prevention of adverse obstetric and neonatal outcomes, we need a detailed causal mediation analysis to gain a better understanding of the complex pathways that explain the increases in the risks in the women who had a specialist mental healthcare contact before the onset of pregnancy.[9]

Chapter 6 Community perinatal mental health teams and associations with perinatal mental health and obstetric and neonatal outcomes in pregnant women with a history of specialist mental health care in England: a national population-based cohort study

Background

In 2014, a guideline for the NHS in England recommended that women with pre-existing complex and severe mental illness should be referred to specialist mental health services during pregnancy and postnatal period, preferably set up as a CPMHT for timely assessment and treatment treatment.[16,19]

The NHS in England announced in the 2016 5 Year Forward Plan an investment of £365M to be spent over a 5-year period in order to improve overall access to PMH maternity services equitably across England, and to improve the treatment of women with new mental health problems and to reduce the risk of relapse of women with pre-existing mental health problems, particularly women at risk of severe acute relapses needing hospitalisation or the input of a specialist mental health CRT which provides intensive support in the community input. Before 2016, there had only been a few CPMHTs in England, but there has been a gradual increase in their coverage following this investment.

Aim

The primary aim of this study was to:

- test the hypothesis that the gradual implementation of CPMHTs was associated with an *increase* in the overall use of 'specialist mental healthcare services', defined as any contact with CPMHTs and other type of specialist (secondary) mental healthcare services (including day care, outpatient visits, and community-based care) in the perinatal period (i.e. pregnancy and the year after birth)
- and a *reduction* in the risk of 'acute relapse' in the postnatal period (i.e. the year after birth), defined as an admission to a psychiatric ward or psychiatric MBU or the involvement of a CRT.

In this chapter, we report that the risk of adverse obstetric and neonatal outcomes was increased in women with at least one pre-pregnancy contact with specialist mental health care. We showed that the risk of adverse outcomes was higher in women with mental healthcare contacts related to more severe mental illness and in those with more recent mental healthcare contacts. Therefore, we include as a secondary aim to evaluate the association of the implementation of CPMHTs with the risk of adverse obstetric and neonatal outcomes.

Subgroup analyses

In the first subgroup analysis, we only included women who had received pre-pregnancy mental healthcare contacts that reflect a more severe pre-existing mental disorder. In the second subgroup analysis, we only included women who

had received more recent pre-pregnancy mental healthcare contacts. These subgroups were chosen as they define women who are thought to be at an increased risk of a relapse in the postnatal period.

Methods

Data sources and linkage

The data sources described for this study are already described earlier in this chapter.

Cohort selection and comparison groups

Maternity episodes for women, aged 18 and above, with a recorded gestation of at least 24 completed weeks, with an onset of pregnancy after 1 April 2016 and a singleton birth before 31 March 2018 in the English NHS were identified from HES records and PDS birth notifications (see *Report Supplementary Material 1*) because for these women the mental health outcomes were captured in the most recent version of the specialist mental healthcare data set.

Women were considered to have a pre-existing mental disorder if they had a record of a contact with any form of specialist (secondary) mental health care within 10 years before the onset pregnancy. Please note that in this chapter, we could use a 'look-back period' to detect a pre-existing mental disorder of only 7 years. (See *Chapter 5* for a description of how we managed multiple maternity episodes, onset of pregnancy and identification of pre-existing mental disorder, and distinguished levels of specialist mental health care.)

Chapter 2 explained how we collected information on the regional presence of CPMHTs at the level of the CCGs. In this study, we define the regions according to the 207 CCGs present in July 2017. Typically, these regions cover areas with a population of 250,000 people. Women were considered to have had access to a CPMHT if the date of CCG implementation in their region was before the onset of pregnancy.

Study outcomes

The primary mental health outcome was 'acute relapse' ('psychiatric hospital admission' or a 'CRT contact') in the *postnatal* period (i.e. in the first year after birth). The secondary mental health outcome was 'any specialist care contact' defined as at least one specialist mental healthcare contact during the *perinatal* period (i.e. during the pregnancy and the first year after birth), also including a specialist community mental healthcare contact.

The obstetric and neonatal outcomes are described in this chapter in the *Study outcomes* section.

Statistical analysis

The analysis approach follows the approach described in this chapter.

Results

The flow of data and description of participants is demonstrated in *Figure 10*. *Figure 11* demonstrates that we identified 780,026 eligible women with a singleton birth and that 70,323 (9.0%) women with a pre-existing mental disorder were included.

Figure 12 shows that in April 2016 a CPMHT was available in 81 of the 207 CCG regions (39.1%). The number of regions with a CPMHT increased to 130 (62.8%) in June 2017, just before the onset of pregnancy of women who gave birth in March 2018, the most recent month of our cohort (more information can be found in *Chapter 2*).

Of the 70,323 included women, 31,276 (44.5%) gave birth when a CPMHT was available in their region at the onset of pregnancy and 39,047 (55.5%) when a CPMHT was not available. The characteristics of women with and without a CPMHT available were broadly similar (*Table 16*), with a lower proportion of white women in regions with a CPMHT than in regions without.

Acute relapse

Of the 70,323 included women, 2862 (4.1%) had an acute care relapse (a psychiatric hospital or CRT contact) in the *postnatal* period (the year after birth). The risk of acute relapse varied according to regional CPMHT availability (*Table 17*). Of the 31,276 women who gave birth when a CPMHT available at the onset of pregnancy, 1117 (3.6%) had an acute relapse in the year after birth compared to 1745 (4.5%) of the 39,047 women who gave birth CPMHT when was not available (adjOR 0.77, 95% CI 0.64 to 0.92; *p*-value = 0.004).

There was no association between the regional availability of a CPMHT and acute relapse during *pregnancy*. Seven hundred and fifty-seven (2.4%) of 31,276 women with a CPMHT available had an acute relapse during pregnancy compared to 1013 (2.6%) of the 39,047 women who gave birth without CPMHT available (adjOR 0.89, 95% CI 0.73 to 1.08; *p*-value = 0.248).

Any specialist mental healthcare contact

Of the 70,323 included women, 19,921 (28.3%) had any type of specialist mental healthcare contact in the *perinatal* period (during pregnancy and in the year after birth). The percentage of women having any specialist mental healthcare contact in the perinatal period varied according to CPMHT availability (see *Table 17*). Of the 31,276 women who gave birth when a CPMHT was available, 9888 (31.6%) had a specialist mental healthcare contact in the perinatal period compared to 10,033 women (25.7%) of the women who gave birth when a CPMHT was not available (adjOR 1.35, 95% CI 1.23 to 1.49; *p*-value < 0.001). Higher percentages of women having any mental healthcare contact in regions with a CPMHT available were observed both during pregnancy and in the first year after birth.

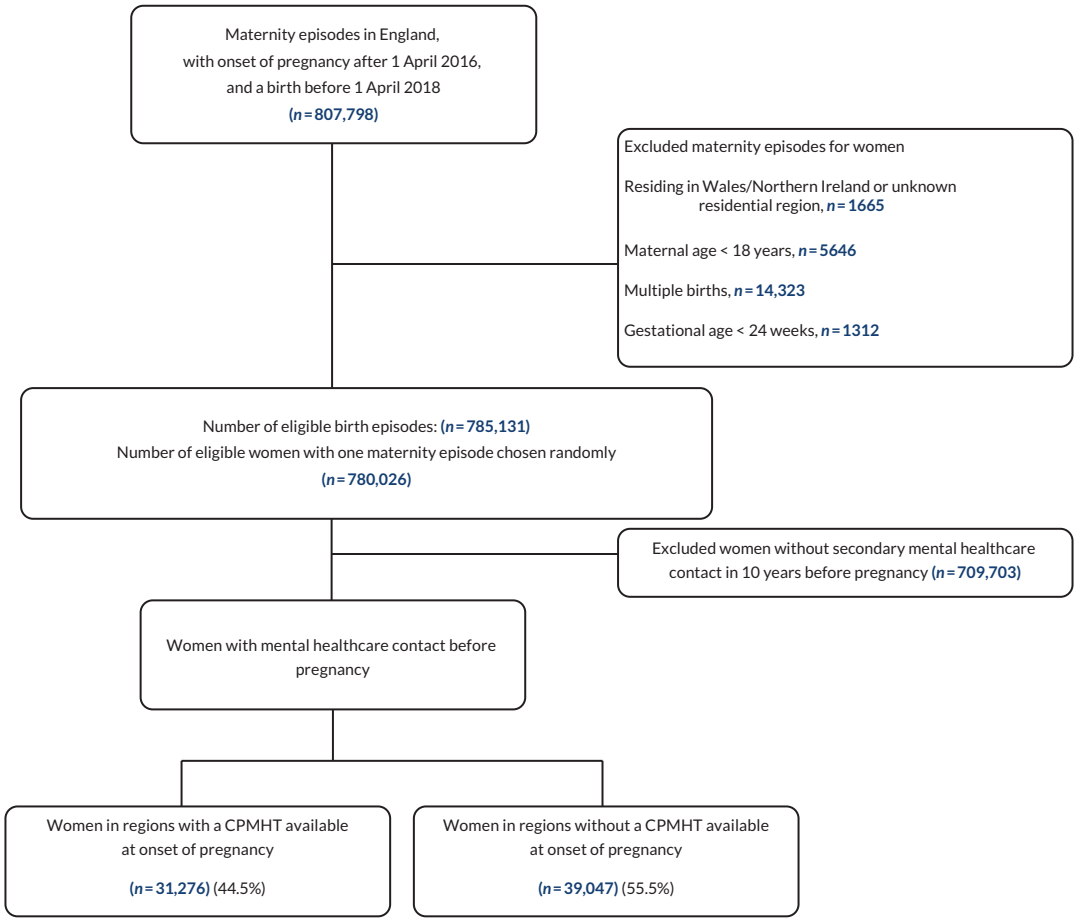
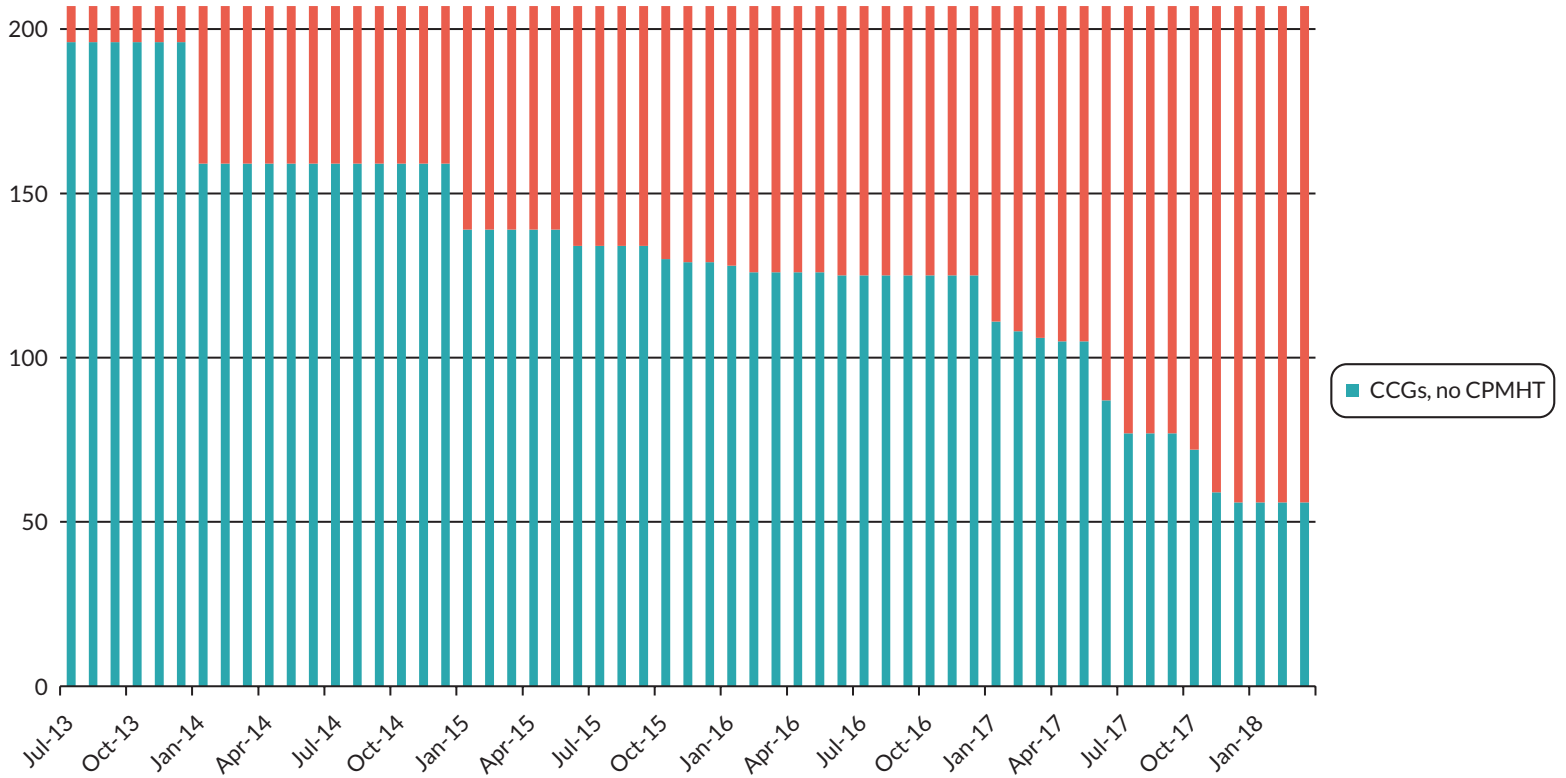


FIGURE 11 Flow diagram (CPMHT).



	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	July-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	July-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	July-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	July-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
CCGs, with CPMHT	11	11	11	11	11	11	48	48	48	48	48	48	48	48	48	48	48	48	68	68	68	68	68	73	73	73	73	77	78	78	79	81	81	81	81	82	82	82	82	82	82	82	96	99	101	102	102	120	130	130	130	135	148	151	151	151	151
CCGs, no CPMHT	196	196	196	196	196	196	159	159	159	159	159	159	159	159	159	159	159	159	139	139	139	139	139	134	134	134	134	130	129	129	128	126	126	126	126	125	125	125	125	125	125	125	111	108	106	105	105	87	77	77	77	72	59	56	56	56	56

FIGURE 12 Availability of CPMHTs as present in July 2017 in 207 regions defined according to areas covered by NHS CCGs (orange: CPMHT available; blue CPMHT not available).

TABLE 16 Characteristics of women, by exposure

	All women	No CPMHT at onset of pregnancy	CPMHT at onset of pregnancy
	70,323	39,047 (55.5)	31,276 (44.5)
Maternal age missing n = 6; 0.01%			
18–24	17,463 (24.8)	9971 (25.5)	7492 (24.0)
25–34	40,031 (56.9)	22,219 (56.9)	17,812 (57)
35–39	10,216 (14.5)	5489 (14.1)	4727 (15.1)
40 ≤	2607 (3.7)	1364 (3.5)	1243 (4.0)
Obstetric history missing n = 3589; 5.1%			
Nulliparous	22,665 (34.0)	12,749 (34.5)	9916 (33.4)
Multiparous, no previous cs	35,423 (53.1)	19,558 (52.8)	15,865 (53.4)
Multiparous, with previous cs	8646 (13.0)	4700 (12.7)	3946 (13.3)
Ethnicity missing n = 7843; 11.2%			
White	54,965 (88.0)	31,199 (89.9)	23,766 (85.5)
South Asian	3244 (5.2)	1622 (4.7)	1622 (5.8)
Black	1779 (2.8)	692 (2.0)	1087 (3.9)
Mixed	1332 (2.1)	661 (1.9)	671 (2.4)
Other stated	1160 (1.9)	525 (1.5)	635 (2.3)
Socioeconomic deprivation missing n = 3, < 0.01%			
Least deprived = quintile 1	7373 (10.5)	4268 (10.9)	3105 (9.9)
Quintile 2	9765 (13.9)	5528 (14.2)	4237 (13.5)
Quintile 3	12,560 (17.9)	6820 (17.5)	5740 (18.4)
Quintile 4	16,522 (23.5)	8492 (21.7)	8030 (25.7)
Most deprived = quintile 5	24,100 (34.3)	13,937 (35.7)	10,163 (32.5)
Pregnancy risk factors missing n = 3589; 5.1%			
Pre-existing diabetes	1021 (1.5)	502 (1.4)	519 (1.7)
Pre-existing hypertensive conditions	488 (0.7)	250 (0.7)	238 (0.8)
Gestational diabetes	4294 (6.4)	2263 (6.1)	2031 (6.8)
Pre-/eclampsia	1442 (2.2)	779 (2.1)	663 (2.2)
Highest level of pre-pregnancy contact			
Community care contact	53,098 (75.5)	28,880 (74.0)	24,218 (77.4)
CRT	13,832 (19.7)	8242 (21.1)	5590 (17.9)
Hospital admission	3393 (4.8)	1925 (4.9)	1468 (4.7)
Timing of most recent pre-pregnancy contact			
> 5 years	18,302 (26.0)	10,219 (26.2)	8083 (25.8)
1–5 years	34,672 (49.3)	19,770 (50.6)	14,902 (47.7)
< 1 years	17,349 (24.7)	9053 (23.2)	8291 (26.5)

TABLE 17 Mental healthcare outcomes

Primary outcomes	*n* (%)	No CPMHT at onset of pregnancy	CPMHT at onset of pregnancy	Unadjusted OR (95% CI) for CPMHT	*p*-value	Adjusted, with time trends only adjOR (95% CI) for CPMHT	*p*-value	Adjusted, with time trends and maternal characteristics. adjOR (95% CI) for CPMHT	*p*-value
Acute care contact (CRT/Hosp)									
Perinatal	3932 (5.6)	2310 (5.9)	1622 (5.2)	0.87 (0.74 to 1.02)	0.095	0.87 (0.73 to 1.02)	0.095	0.84 (0.71 to 0.99)	0.041
Postnatal	2862 (4.1)	1745 (4.5)	1117 (3.6)	0.79 (0.66 to 0.95)	0.011	0.79 (0.66 to 0.94)	0.009	0.77 (0.64 to 0.92)	0.004
Pregnancy	1788 (2.5)	1031 (2.6)	757 (2.4)	0.91 (0.75 to 1.11)	0.373	0.92 (0.76 to 1.12)	0.428	0.89 (0.73 to 1.08)	0.248
Any care contact (other/CRT/Hosp)									
Perinatal[a]	19,921 (28.3)	10,033 (25.7)	9888 (31.6)	1.33 (1.22 to 1.47)	< 0.001	1.32 (1.20 to 1.46)	< 0.001	1.35 (1.23 to 1.49)	< 0.001
Pregnancy	14,555 (20.7)	7001 (17.9)	7554 (24.2)	1.46 (1.31 to 1.63)	< 0.001	1.44 (1.29 to 1.62)	< 0.001	1.50 (1.34 to 1.68)	< 0.001
Postnatal	15,366 (21.9)	7866 (20.1)	7500 (24)	1.25 (1.14 to 1.37)	< 0.001	1.24 (1.13 to 1.36)	< 0.001	1.23 (1.13 to 1.36)	< 0.001

TABLE 18 Pregnancy outcomes

	n (%)	No CPMHT	CPMHT	Unadjusted OR (95% CI) for CPMHT	*p*-value	Adjusted, with time trends only adjOR (95% CI) for CPMHT	*p*-value	Adjusted, with time trends and maternal characteristics. adjOR (95% CI) for CPMHT	*p*-value
Perinatal death	316 (0.4)	151 (0.4)	165 (0.5)	1.37 (1.10 to 1.68)	0.003	1.31 (1.06 to 1.62)	0.011	1.34 (1.09 to 1.66)	0.006
Preterm birth	7508 (10.7)	4341 (11.1)	3167 (10.1)	0.90 (0.79 to 1.04)	0.146	0.87 (0.76 to 1.00)	0.049	0.86 (0.74 to 0.99)	0.032
SGA	4769 (6.8)	2542 (6.6)	2227 (7.2)	1.10 (1.01 to 1.20)	0.022	1.11 (1.02 to 1.20)	0.021	1.10 (1.02 to 1.20)	0.016
ENAOI for live births	6191 (9.1)	3599 (9.5)	2592 (8.6)	0.90 (0.76 to 1.05)	0.187	0.87 (0.74 to 1.03)	0.109	0.86 (0.72 to 1.02)	0.086
MMAOI	758 (1.1)	418 (1.1)	340 (1.1)	1.01 (0.85 to 1.21)	0.898	0.98 (0.82 to 1.18)	0.862	0.93 (0.78 to 1.11)	0.433

Obstetric and neonatal outcomes

Table 18 shows that the overall risk of stillbirth and neonatal death in the first 7 days after birth was 0.4%, the risk of preterm birth 10.7%, and the risk of a birth of a SGA baby 6.8% in the 70,323 women with a pre-existing mental disorder. A maternal adverse outcome according to the English Maternal Morbidity Outcome Indicator (MMAOI) occurred in 1.1% of women. In the 70,096 women who had a liveborn baby, an adverse neonatal outcome according to the ENAOI occurred in 9.1%.

The risk of stillbirth and neonatal death was higher when a CPMHT was available at the onset of pregnancy. Of the 31,276 women who gave birth when a CPMHT was available, 165 (0.5%) had a stillbirth or a baby who died in the first 7 days after birth, compared to 151 (0.4%) of the 39,047 women who gave birth when a CPMHT was not available (adjOR 1.34, 95% CI 1.09 to 1.66; *p*-value = 0.006).

The risk of preterm birth was lower when a CPMHT was available (10.1%, compared to 11.1%, fully adjusted OR 0.86, 95% CI 0.74, 0.99; *p*-value = 0.032), whereas the risk of a SGA birth was increased (7.2%, compared to 6.6%, adjOR 1.10, 95% CI 1.02 to 1.20; *p*-value = 0.016). There were no statistical differences in the risk of adverse neonatal outcomes according to the ENAOI or maternal adverse outcomes according to the MMAOI between women with and without a CPMHT available at the onset of pregnancy.

Subgroup analyses

The first subgroups analyses included only women who had a pre-pregnancy psychiatric hospital admission or CRT, and the second subgroup analyses included only women who had a specialist mental healthcare contact in the year immediately before the pre-pregnancy. The pattern of results in both subgroup analyses were similar to those observed in the main analyses (see *Report Supplementary Material 1*; *p*-values for interaction always > 0.05).

Discussion

Our study of 70,000 with a pre-existing mental health disorder found that 9% of these women who gave birth in an English NHS hospital had a specialist (secondary) mental healthcare contact in the 10 years before the pregnancy, suggesting a pre-existing mental disorder. We found evidence supporting our hypotheses that the implementation of CPMHTs improves access to specialist (secondary) mental health services in the perinatal period and that in turn it reduces the risk of an acute relapse in women with pre-existing mental health disorders. This supports policies that ensure that comprehensive and high-quality PMH services are available for all women with pre-existing mental disorders in the perinatal period.[16,19]

The observation that the risks of stillbirth, neonatal death and the birth of a SGA baby were increased in regions where a CPMHT was available is a serious concern that needs further follow-up. The interpretation of this pattern of opposing associations is not straightforward and may be due to chance. However, based on this evidence, CPMHTs should ensure that they have close links with other health and social care professionals to minimise the risk that more intensive psychiatric support negatively affects the midwifery and obstetric support for women with severe mental disorders get during pregnancy and childbirth.

Strengths and limitations

Using national, linked data we assigned women to two groups according to the availability of a CPMHT in their region, rather than whether individual women did actually receive CMHPT support. This regional approach has two key implications. First, it eliminates the problem of bias by clinical indication because there is no direct link between the individual women's characteristics and whether or not they receive support.[94] However, regions with a population with higher baseline risks of adverse mental health or obstetric and neonatal outcomes may have implemented CPMHTs earlier and quicker which may not have been fully captured in our risk adjustment models. Second, the regional approach may have reduced the observed effect size of CPMHT perinatal mental health care, because even if women gave birth in a region where CPMHT support was available, not all women will have received it.

The observed effect size of CPMHTs may have been further reduced because we used a single date to distinguish whether or not a CPMHT was available in a particular region, without allowing an implementation period or a lag time

for its effects to become apparent. However, *Figure 8* demonstrates that only 70 regions changed from not having to having a CMPHT during the study period which limits the extent to which this underestimates the effect size.

As explained in this chapter, we did not have access to records of specialist mental healthcare episodes for a 4-month period (between December 2015 and March 2016).

Interpretation of the results and implications for practice

Our results suggest that in women with pre-existing mental disorders, the regional availability of CPMHTs providing tailored PMH support increased the use of mental health care during pregnancy and in the year after birth and that it reduced the risk of acute relapse in the year after birth.

However, the interpretation of the study's pattern of obstetric results is less straightforward given that we found higher risk of stillbirth, neonatal death and birth of a SGA baby alongside a lower risk of preterm birth when a CPMHT was available. A possible explanation for the increases in obstetric and neonatal risks is that the primary focus of the CPMHTs to reduce psychiatric risks may 'overshadow' recognising and addressing modifiable behavioural and obstetric risk factors, such as motivating women to stop smoking, encouraging a healthy lifestyle and identifying other physical risk factors.[95,96] Another unintended negative aspect of CPMHT involvement could be that care by CPMHTs during pregnancy highlights mental health needs, and may lead to experiencing discrimination when physical health care is needed.[97]

The increases in the risk of stillbirth and birth should not be overinterpreted at this stage, as it is possible that they may represent false-positive results.[73] However, they do suggest that CPMHTs should work very closely with maternity and obstetric services, GPs in primary care, and generic specialist secondary care mental health service and communicate directly with health visitors and social workers.[17]

Chapter 7 Economic analysis of areas with community perinatal mental health teams compared to those without

Aim

The economic component of this study aimed to explore changes in patterns of service use and associated costs following implementation of CPMHTs in England, and to consider costs and outcomes in a cost–consequences framework.

We hypothesised that areas with CPMHTs would be associated with lower rates of acute care in the perinatal period, shorter duration of admissions, lower rates of Mental Health Act detentions, and lower costs than areas without CPMHTs.

Methods

Study design and population

As described in this chapter, the study used a longitudinal cohort design. The economic perspective was limited to secondary mental health services, and the time horizon was the perinatal period (from estimated start of pregnancy to 1-year post birth). The economic analyses used the same population as described in this chapter all women residing and giving birth in England between 1 April 2016 and 31 March 2018 with pre-existing mental illness, defined as having used secondary mental healthcare services in the 10 years before onset of pregnancy.

Intervention

As described in this chapter, the intervention was access versus no access to a CPMHT, determined by the woman's place of residence at pregnancy start date.

Resource use measurement and valuation

The Mental Health Services Data Set (MHSDS) provided patient-level data on contacts with secondary mental health service use, including acute care contacts (psychiatric inpatient stays and CRT contacts) and other community mental healthcare contacts ('community care'). Unit costs were in Great British pounds at 2018–9 prices. Inpatient costing was conducted within a mental health cluster framework which firstly involved combining the number of admitted days with unit costs for mental healthcare cluster assignment inpatient days[99,100] provided in the NHS Reference Costs.[101] Unit costs for CRTs and other community care contacts were taken from Curtis and Burns (2017)[102] and inflated to 2018–9 prices.

Outcomes

Outcomes were those included in the clinical analysis *Chapter 6* and in this chapter: perinatal mortality, preterm birth, SGA, ENAOI and EMMOI, plus we explored formal detentions under the Mental Health Act.

Analyses

Number and percentage of women using each service type (inpatient, CRT, community care) were reported as well as the mean and SD for number of contacts and costs of contacts. Generalised least squares (GLS) regression models were used to estimate the mean difference in mental health resource use costs associated with individuals in areas with

and without CPMHTs. To account for the skewed nature of healthcare costs, non-parametric bootstrapping with 5000 estimates was used to generate the standard errors and 95% CIs around the cost differences.[103] Models were estimated with random effects at the CCG level, and the final model included a binary exposure variable, a time variable and adjustments for sociodemographic characteristics (maternal age, ethnicity, socioeconomic deprivation), highest level of pre-pregnancy care contact (inpatient, CRT or community care), timing of most recent pre-pregnancy care contact (< 1 year, 1–5 years and > 5 years) and maternal risk factors (parity, pre-existing hypertension, pre-existing diabetes mellitus, pre-eclampsia and gestational diabetes).

Results

Complete economic data were available for 70,082 women (99.7% of the total cohort). *Table 19* reports service use and cost summary statistics. In the perinatal period, those in CPMHT areas were less likely to use acute care services than those without CPMHTs (4.94% vs. 5.58%), but more likely to use community care (30.96% vs. 24.72%). When acute care was broken down into its two components, use of inpatient care was higher for the CPMHT group (1.43% vs. 1.13%), while use of CRTs was lower (4.41% vs. 5.23%). The CPMHT group had higher numbers of acute care contacts than the no CPMHT group (mean 1.11 vs. 0.87), longer inpatient stays (mean 0.85 vs. 0.55 days), fewer CRT contacts (mean 0.27 vs. 0.32) and higher community care contacts (mean 4.31 vs. 3.26). This translated into higher total costs over the perinatal period in the CPMHT group compared with no CPMHT (mean £651 vs. £414).

TABLE 19 Service use and cost summary statistics

Service	No CPMHT (*n* = 38,901)	CPMHT (*n* = 31,181)
Number using each service n (%)		
Total acute care	2171 (5.58)	1540 (4.94)
Psychiatric admission	441 (1.13)	445 (1.43)
CRT	2035 (5.23)	1375 (4.41)
Community care	9615 (24.72)	9653 (30.96)
Number of days/contacts mean (SD); range		
Total acute care	0.87 (9.39); 0–461	1.11 (11.53); 0–446
Psychiatric admitted days	0.55 (8.49); 0–455	0.85 (10.62); 0–446
CRT contacts	0.32 (2.16); 0–100	0.27 (2.04); 0–107
Community care contacts	3.26 (10.75); 0–202	4.31 (12.14); 0–241
Costs mean (SD); range		
Total acute care	£282 (3615); 0–210,024	£387 (4421); 0–177,702
Psychiatric admission	£218 (3459); 0–208,813	£332 (4245); 0–176,254
CRT	£64 (437); 0–20,187	£54 (412); 0–20,187
Community care	£132 (434); 0–8153	£174 (490); 0–9727
Total	£414 (3807); 0–213,455	£651 (4634); 0–182,506

The GLS model (*Table 20*) found costs to be significantly higher in the CPMHT group compared with no CPMHT for psychiatric inpatient stays (adjusted mean difference £90, 95% CI £18 to £163; $p = 0.015$), total acute care (adjusted mean difference £80, 95% CI £4 to £157; $p = 0.040$), community care (adjusted mean difference £22, 95% CI £10 to £34; $p < 0.001$) and total costs (adjusted mean difference £111, 95% CI £29 to £192; $p = 0.008$). Multiple imputation of missing data produced similar results (see https://link.springer.com/article/10.1186/s12913-024-10553-8).

Maternal and neonatal outcomes are reported in full in this chapter. For formal detentions under the Mental Health Act, the odds of a detention for CPMHT versus no CPMHT was not statistically different (adjusted OR 0.926, 95% CI 0.760 to 1.130; $p = 0.444$). A summary of costs and consequences is provided in *Table 21* which shows that that there is no clear pattern; total costs are significantly higher in the CPMHT group and outcomes vary, with some being poorer in CPMHT areas (perinatal mortality and SGA), some better (preterm birth) and the remainder not significantly different (EMMOI, ENAOI and detentions).

Discussion

The results of the economic analysis suggest that the implementation of CPMHTs has successfully supported increased access to secondary mental healthcare services, particularly community mental health care. However, no corresponding reduction in use or cost of psychiatric inpatient admissions was identified. These findings may reflect better identification and admission of more severely unwell women requiring intensive support, with better support being provided in the community for women less severely unwell. It may also reflect greater access in CPMHT regions to MBUs where admissions are typically longer than for traditional psychiatric wards.[104] Length of admissions is influenced by many factors, but a key factor in PMH populations is whether women are together with or separated from their baby. In traditional psychiatric wards, there is likely to be a greater sense of urgency to discharge women so they can be returned to their baby.

TABLE 20 Generalised least squares regression model for differences in cost for CPMHT vs. no CPMHT

Service	Cost difference £ (SE)	95% CI	*p*-value
Total acute care	80 (39)	4 to 157	0.040
Psychiatric admissions	90 (37)	18 to 163	0.015
CRT	−11 (6)	−22 to 0	0.058
Community care	22 (6)	10 to 34	0.000
Total	111 (42)	29 to 192	0.008

SE, standard error.

TABLE 21 Cost–consequences analysis

Costs/outcomes	Summary of results
Total costs	CPMHT > no CPMHT
Perinatal mortality	CPMHT > no CPMHT
SGA	CPMHT > no CPMHT
Preterm birth	CPMHT < no CPMHT
ENAOI	CPMHT = no CPMHT
EMMOI	CPMHT = no CPMHT
Formal detentions	CPMHT = no CPMHT

Increased access to CPMHTs resulted in significantly higher costs and mixed results in terms of maternal and neonatal outcomes. However, CPMHTs are primarily focused on improving mental health outcomes, which this study was unable to examine, with the exception of formal detentions. Nor were we able to consider quality of life or measures preferred for economic evaluation, such as quality-adjusted life-years. We were also unable to measure any potential reduction in other costs that may have been impacted by access to CPMHTs, such as social care or non-mental health service costs or the longer-term impacts on costs and outcomes. These are important omissions and while regions with CPMHTs may incur higher costs in the perinatal period, the benefits in terms of potential increases in quality of life and potential reductions in broader societal costs may offset this increased cost.

Chapter 8 Conclusions

Our aim was to provide high-quality evidence of the effectiveness of CPMHTs, in terms of increased treatment use and the impact of CPMHTs on women children and families. We also sought to examine the reliability and predictive validity of two observational measures assessing the quality of parent–infant interactions. We aimed to test whether brief forms of each tool might be identified with sufficient predictive validity, even over short observation periods, enhancing their suitability for routine clinical use.

The research spanned four distinct WPs, using a multi-method approach.

- Work package 1: What service variations are found in CPMHTs and their links to the wider system of universal services, primary care and generic secondary care?
- Work package 2: What is the most reliable, valid and clinically feasible observational measure for routinely assessing parent–infant interaction quality in PMH services?
- Work package 3: Which CPMHT components promote access to treatment and which components work, for whom, in what circumstances, how and why to reduce PMH problems?
- Work package 4: Are CPMHTs associated with higher levels of access to secondary care mental health services (generic and CPMHTs), and in women with pre-existing severe disorders, lower risk of relapse and improved birth outcomes compared with generic services?

Are CPMHTs effective and do they make a difference to maternal and neonate outcomes?

Extending previous research that has found a link in maternal mental health problems and negative maternal and neonate outcomes, in our linked data set analyses (WP4), we found that among the 9% of women who had a previous history of a specialist mental health contact those with more severe histories (had at least one hospitalisation) or those who had contact within the past year were at the highest risks of having negative obstetric, maternal and neonatal outcomes. These findings provide support for the argument for CPMHT, which seek to provide treatment for women with moderate to severe and complex mental health disorders; those at greatest risk of negative outcomes.

Analysing data from linked data sets, we found greater use of any specialist mental health service and lower use of acute care (psychiatric inpatient and crisis teams) in perinatal women in areas that had CPMHTs relative to areas without CPMHTs, suggesting that CPMHTs are effective in improving access to mental health care for perinatal women and their babies and likewise reducing acute care usage. However, this reduction in overall acute care was driven by lower use of crisis teams, with a higher proportion of women in CPMHT areas being admitted to hospital and having longer lengths of stay, on average, compared to areas without CPMHTs. As a result, our economic analysis found total secondary mental healthcare costs over the perinatal period to be significantly higher for areas with CPMHTs. This may be due to greater access to MBUs in CPMHT areas, with MBUs being associated with longer lengths of stay compared with traditional psychiatric wards. Notably, MBUs are for two individuals, the mother and the baby, and treat the mother and the relationship with the baby. Likewise, although there was a decrease in preterm births in areas with CPMHTs, there were higher rates of stillbirth, neonatal death and premature delivery.

Our findings provide support for investment in CPMHT. Without CPMHTs, treatment use rates among perinatal women are low, and previous economic modelling has demonstrated significant downstream costs associated with both maternal and negative child outcomes. Because the systematic and widespread implementation of CPMHT in England are still early, it is not yet possible to examine their longer-term clinical and economic impacts. So, although the upfront costs of CPMHTs are greater, they provide important opportunities to change longer-term outcomes, and to change broader clinical and economic impacts than it was possible to measure in the current study. However, our findings regarding neonate outcomes temper these results. Although they may be due to chance, it is essential to replicate these findings, investigate the ‘black box’ explaining mechanisms underlying this link, and improve co-ordinated work between mental health and health providers in order to ensure women with mental health needs receive health care tailored to these needs.

What service models are effective for mothers with PMH problems and their babies, and does this vary according to mental health needs? (i.e. who delivers these interventions, with what skill mix and competencies, in what settings?) Which interventions are attractive and acceptable to women, and clinically effective within/in conjunction with mainstream secondary mental health care, maternity and primary care?

- In our taxonomy work (WP1), we evidenced wide variations in CPMHT structures between 2019 and 2020. Notably, none of the CPMHTs met the staff mix and WTE for a comprehensive service as suggested by the Royal College of Psychiatry's CR197 guidance.[18] Using simplified models of CPMHT structures defined by staff mix alone (not WTE), we found that 85% met criteria for a 'Basic' service (psychiatrist, nurse, psychologist) and 64% met criteria for a modified 'comprehensive' service (Basic + nursery nurse and occupational therapist). Service provision among our programme theory domains was also variable. Greatest uniformity existed across reported collaboration with other statutory services, though even this varied considerably, with few examples of joint clinics held with maternity, for example. There were notable gaps in collaborative working with social care and voluntary sector organisations, but best practice existed in some places. Some services provided example of good collaboration between organisation through join clinical meetings, assessments and/or clinics run through community children centres or other public services (e.g. local libraries) In contrast, other components of CPMHT care were widely variable, with only 57% of services reporting any data on psychological interventions for maternal mental health and the parent–infant relationship, for example. Of those we received data from, only 41% of services between 3 and 5 types of psychological provision, and most of these were focused on maternal mental health. Few services using the core recommended outcome measures.[31] Delivery of care was typically limited to clinics or in home, though some services delivered care in children's centres. Pre-COVID, few services used remote delivery formats. Wait times likewise varied, with some services meeting wait times in < 2 weeks, but other services struggling to see clients within 11 weeks of referrals.
- In our realist evaluation (WP3), we used our taxonomy, plus the descriptive data we gathered in WP1 to purposively select 10 CPMHTs on their service component offers as highlighted from our programme theory on the effectiveness of treatment for PMH. We asked what CPMHTs were effective, for whom, and how?

As we had anticipated, the importance of co-ordinated, integrated care between CPMHTs and other relevant health providers emerged as critical for women. The presence of comprehensive CPMHTs, as compared to basic CPMHTs, facilitated integrated, co-ordinated care, leading to timely and appropriate CPMHT referrals and improved outcomes across different settings, pointing to the importance of mixed staff skill sets. This holistic approach played a pivotal role in ensuring the well-being of women, children and families, although results from WP4 suggest that additionally enhanced sharing of knowledge between health and mental health professionals is important to ensure women receive timely health interventions when needed.

Perinatal women with mental health problems expressed a strong preference for treatment that was family centred and delivered by health professionals with perinatal competence – an understanding of the complex needs they and their families faced. The manner in which treatment was delivered played a crucial role, with compassionate, open and consistent non-judgemental care leading to improved perceived relevance of treatments offered and overall higher treatment engagement. Many women commented on how CPMHTs provided them with transformative experiences of mental health treatment, interacting with women as individuals and mothers, rather than 'labels'. A holistic approach, which typically combined pharmacological and relational/psychological treatments, proved beneficial. Particular strengths of the CPMHT were around optimising women's medication by providing them with comprehensive specialist up-to-date information on risks and benefits of medication in the perinatal period, improving their sense of social belonging with other parents, building their social support and reducing conflict with family, helping them to build their relationships with their infant(s), and providing them with emotional management skills and supporting them to engage in valued activities. Women described how a flexible treatment approach, tailored to the distinct needs of their families and with the capacity for schedule and location adjustments (home, clinic, remote, etc.), played a pivotal role in sustaining their engagement with treatment.

For whom? Women with SMI described a notable appreciation for how the CPMHT effectively facilitated accurate medication optimisation, a crucial factor in improving their treatment outcomes which significantly contributed to their willingness and ability to adhere to or start their medication. Women with both acute and complex trauma experiences

shared their concerns regarding the lack of psychological interventions targeting their trauma-related issues. They were also especially likely to report difficulties in bonding and often experienced heightened conflict in their relationships. Women with SMI and/or with histories of complex trauma consistently emphasised the value of receiving support from staff to connect with similar mothers, both within the CPMHT and in community motherhood groups.

What is the most reliable, valid and clinically feasible observational measure for routinely assessing parent–infant interaction quality in PMH services?

In WP2, we used film footage recorded at 6–8 months of age in a high-risk community sample and found evidence for the reliability and predictive validity of two observational tools suitable for routine use in perinatal clinical practice to identify parent–infant dyads who may benefit substantially from interventions designed to improve interaction quality. These measures comprise (1) a short form of the NICHD coding system, namely the NICHD-3, or (2) the PIIOS in its full form using the total score. No shorter form of PIIOS was identified with sufficient predictive validity. Optimal reliability (stability of ratings) and predictive (discriminative) validity to age 2 mental health outcomes was achieved by using 5 minutes observation for both NICHD-3 and PIIOS total score. In clinical practice, we therefore recommend filming for a 5-minute period, rather than shorter or longer periods which confer, respectively, disadvantage or no advantage in terms of predictive validity. Neither observational tool predicted longer-term mental health outcomes at school entry, but this is not surprising if one considers the many intervening events or circumstances in children's lives that might influence outcomes between 6 and 8 months of age when parenting was assessed and school entry at age 4–5 years.

While PIIOS had broader predictive validity to age 2 internalising (emotional) and externalising (behavioural) mental health outcomes, it was developed for use with infants between 2 and 8 months which limits application in services with a broader age range of infants. The NICHD-3 which focuses on parental sensitivity, intrusiveness and positive regard (warmth) may have greater clinical utility due to its comparative brevity to train (~2 days) and code (~15 minutes), its predictive validity to both attachment security and externalising problems and application from 3 to 24 months of age which matches the broader needs of specialist PMH services. Services who have already invested in staff training on these observational tools can use them with confidence for the infants within scope developmentally at the time of assessment.

Patient and public involvement

We had strong lived experience and stakeholder representation on the grant in the form of the team, the project oversight group (two lived experience members) and our PAG, which was comprised of 12 women individuals with lived experience of PMH problems and 3 male partners. We had PPI input embedded in ESMI-II from the design and writing of the grant to supporting the development of the interview guide in WP3 to feeding back on the interpretation of findings and dissemination of the findings, including input to the content of our policy briefs and participation in our discussion panels on our stakeholder days.

The PAG met routinely four times a year, and members were available via e-mail in-between meetings. We provided costings for a service user researcher, Clare Dolman, to manage and run the PPI group (2 hours/week). Clare presented updates from the PAG at each project management meeting.

Both during the grant planning phase and in early meetings on the grant, the PAG prioritised the following areas:

- Focus on which aspects of CPMHTs work well and help women the most, highlighting improvement in symptoms and quality of life were of primary importance.
- Examine whether care plans were collaborative and were implemented.
- Examine support for fathers/wider family and assessment of their needs.
- Examine support around medication choices including preconception advice, liaison with GPs and suggested resources for women not needing specialist care.
- Examine long-term support for women following acute illnesses (e.g. post admission to MBU) and integrated recovery support.
- Examine integration of services that facilitate consistent messages and education/training of health professionals in the broader care pathway.

We also sought advice from the PAG when recruitment from individuals from diverse ethnic backgrounds was slow. Based on their advice, we updated our recruitment strategy to include social media and third-sector organisations.

Equality, diversity and inclusion

Our team, although primarily White English and female, was comprised of three individuals from 'white, other' backgrounds, two from East/South Asian backgrounds, and one from a Black African background. Four of these individuals were first-generation immigrants to England. At the analysis and dissemination stage, we sought to enhance input from diverse voices and brought in additional PPI from diverse backgrounds to input into our understanding of our findings. The strong interaction between our project team and our PAG has helped to ensure the meaningfulness of the findings to women, families, services and policy-makers, for example with 'tweets' from our stakeholder day reaching over 4500 individuals and reports from clinicians that they have been drawing on ESMI-II results in their service designs and business plans.

Our data, however, were ultimately reliant on the representativeness of the data sets from which we drew, or as in our realist evaluation, on the individuals who were in CPMHTs. Where possible, in WP3 we oversampled participants from diverse and underserved populations. Over 20.8% of our sample was from diverse background, compared to 16.7% in services, with the data from WP4 suggesting that CPMHTs are failing to adequately engage diverse populations. In WP2, we used longitudinal data from the Medical Research Council funded WCHADS. No other cohort in the UK has filmed footage of early mother–infant interactions and infant attachment and mental health outcomes in the pre-school period. The community sample was stratified for psychosocial risk by design and was also drawn from a geographic location spanning affluent to deprived neighbourhoods. The sample represented the local population well, with higher levels of socioeconomic deprivation than the national population of England (~40% in bottom quintile of UK neighbourhoods). However, only 3% families were non-White British, which although representative of the local population, means that findings reported here may not be generalisable to more ethnically diverse populations.

Impact and learning

We had excellent recruitment to the study, despite starting during the first COVID lockdown. Key factors contributing to success included the swift responsiveness of the NIHR and streamlined NHS ethics, allowing a seamless shift to fully remote recruitment and interviews in WP3.

Our focus on recruiting women who either were concluding their time with the CPMHT or had received care in the past year enabled us to compare women's experiences before, during and after the pandemic-driven shift to remote treatment provision. This evaluation revealed both positive and negative unintended consequences resulting from COVID's impact on service delivery, which we highlighted in rapid response briefs to the House of Lords and NHS England.

On the negative side, rapid service expansion coupled with the sudden shift to remote treatment led to significant changes in how the NHS LTP was implemented, at times slowing progress in some areas. On the positive side, the forced adoption of remote treatment delivery, although not universally appropriate, effectively overcame transportation and time barriers for some women and infants, leading to more efficient outreach.

Both before and after COVID-19, we found that CPMHTs performed optimally when they were able to deliver on the LTP aims, but there was wide variability in the extent to which services were able to incorporate these and this was often linked to CPMHTs receiving promised levels of investment at the local level.

During WP4, we encountered substantial challenges when attempting to obtain linked data from NHS Digital. From the initial data request to its actual receipt took over 24 months. These delays were partly exacerbated by the prioritisation of COVID-related linked data requests.

The quality of the data we eventually received posed some challenges that necessitated an intensive 6-month effort by our team to transform the data into a usable format. This meant that even with the original 3-year grant time frame we were left with limited time for data analysis, leading to requests for no-cost extensions and additional funding for the

WP4 statistical team. These delays and extensions created intense work periods with tight deadlines, which would have been avoidable with timely data receipt.

Despite these challenges, the data ultimately proved valuable, offering critical insights for policy-makers on CPMHT access and maternal/neonate outcomes. However, we could not analyse CPMHT impact on clinical outcomes across specific PMH issues due to significant missing data on diagnosis, clinical severity and functioning at the start and end of care. This issue, which is driven by both poor recording of data in the NHS and by problems between data systems and uploading data to MHSDS, is prevalent across mental health services, and critically hampers the examination of clinical effectiveness.

While efforts are ongoing in adult mental health to define core outcome measures and incentivise regular recording of these measures, without making them mandatory, regular completion is unlikely, affecting quality-improvement and investment in all mental health services in the NHS.

We held two stakeholder events, one remote in 2021 with 69 attendees from 35 NHS and third-sector organisations and in April 2023, we presented ESMI results at a London hybrid stakeholder event. Attendees included 120 PPI, service users, CPMHT service leads, clinicians, commissioners, perinatal researchers, and policy-makers from National Health Service England and DHSC, representing over 60 organisations. The event involved presentations from the research team on the various WPs followed by panel discussions involving PPI, NHS policy-makers and clinicians. Feedback was excellent, 'I wanted to say [the ESMI-II event] . . . was the most interesting conference-style event I have been to. The panel discussions really brought it all to life . . . [especially] the focus on barriers to access. The work itself is so impressive and needed – I am looking forward to seeing more of the results!' [DHSC government policy lead]. Visual briefings for teams and policy-makers, plus social media distribution, have been prepared, and we are consulting with National Health Service England's perinatal policy team on ESMI-II results.

Implications for decision-makers

We found that 9–10% of perinatal women had histories of complex and severe mental health problems – a significant proportion of birthing individuals. Our results demonstrate that CPMHTs are effective at improving access to needed and effective treatments, but pregnancy/neonate outcomes are still an area of concern. Staff training on comorbid health/mental health conditions is needed in both CPMHTs and medical settings. Collaborative working between mental health and health settings to adequately address issues of multimorbidity is critical.

Qualitative results point to the importance of perinatal competencies in staff. CPMHT staff need perinatal specific training and supervision in parental mental health, couples approaches and, critically, parent–infant interventions.

Staff's 'soft skills' – being genuine, warm, non-judgemental, reliable, and providing outreach to women underpinned women's initial and ongoing engagement with treatment. These skills were especially important to women with more complex problems and those from under-represented groups. Staff 'soft skills' are often unmeasured and undervalued in mental health services relative to 'knowledge' and direct intervention skills, despite being critical to women's outcomes and the success of the service. Our findings point to the need for a culture change in services where 'soft skills' are valued as equally important to high-quality care. All parts of systems across care pathways should signal and support this to be the norm, through:

- training and education
- staffing/workloads (prioritise providing staff with time to engage in 'soft skills' and outreach, as this is often the first to go when services are busy)
- measurement of 'soft skills' and outreach
- performance management
- staff attitudes (both mental health and health providers).

Care pathways and treatment provision in pregnancy, for women who have had recent contact with secondary mental health care and for women with SMI, are strong and well-developed. There was less pathway/treatment development and greater variability in women's experiences where problems developed postnatally, women had not had previous or

recent contact with secondary mental health care, and where women struggled with PTSD, depression, anxiety, OCD and EUPD. We found CPMHTs with well-developed comprehensive teams with full investment from commissioners had stronger strategic leadership and greater clarity on treatment pathways within their teams, providing access to higher-quality evidence-based treatment for women.

Parent–infant treatment within teams was largely underdeveloped in most CPMHTs at the time of our evaluation. Provision was provided primarily by nursery nurses in most services, and evidence-based parent–infant interventions were rarely available. When parent–infant support was available, women and families reported notably improved experiences of their time with the CPMHT. Since our evaluation, more teams have expanded to meet the LTP flexible aim for expansion to 24 months and have invested in training some staff in parent–infant interventions, though there is still considerable variability among services. For CPMHTs to achieve the economic and health promises of preventing negative child outcomes, our findings suggest it is important to realise the full implementation of parent–infant provision in services. A critical component to ensuring appropriate recognition of parent–infant problems and treatment is having feasible outcomes tools. In WP2, we demonstrated the clinical validity and feasibility of two observational tools of the parent–infant relationship. Though the PIIOS showed good predictive ability, it currently can only be used on a narrow infant age cohort. The NICHD-3 measure is brief, easier to train and administer in busy clinical settings and is valid for use in infants up to age 2, making it more widely appropriate for specialist PMH teams and parent–infant services. Its extensive use as a research tool internationally makes it highly appropriate for future evaluations of the effectiveness and cost-effectiveness of interventions and mental health services.

Women and families both reported that women's treatment experiences were improved when, with the woman's consent, couples and families were involved in their treatment. Though staff described they sometimes felt unsure about how to engage families, our results highlighted a number of mechanisms through which to do this, consistent with recommendations from NHS England's partners and family members' good practice guide.

Recommendations for policy-makers, commissioners and service leads:

- Perinatal parents and their infants are at high risk and are less likely to access mental health services than at other periods of life. Perinatal-specific services increase access to timely, evidence-based treatment but require investment to deliver on their aims.
- CPMHT and health staff require training and close collaborative working with perinatal women with multimorbidities to reduce negative childbirth, obstetric and neonate outcomes.
- To ensure perinatal competences in CPMHT staff, ongoing perinatal-specific training and supervision is required.
- Paired measurement of parental and child-infant outcomes is critical for demonstrating the effectiveness and cost-effectiveness of services both in the short and longer term. Our study showed the NICHD-3 is a feasible and valid observational tool for assessing the parent–infant relationship.
- Family involvement in treatment improved treatment engagement and perceived outcomes.
- Diverse ethnic groups are less likely to access mental health treatment in statutory settings. Lack of trust and a history of discrimination are critical factors to overcome and require dedicated outreach from services into communities to (re)build trust.

Research recommendations

1. We found increases in neonate risk in areas with CPMHTs. We do not know the biological, social and healthcare determinants of these effects.
2. Mental health outcomes and diagnostic data are largely unavailable in existing mental health data sets. Mandatory reporting of this (and other important contextual factors such as domestic and sexual abuse) would significantly improve the quality of data. CPMHTs have also had limited time to fully embed themselves into practice, making it difficult to retrospectively assess their impact on women and their babies. Prospective studies that recruit women from case identification and follow them through the perinatal period and with longer-term follow-up assessing mental health, health and child outcomes are needed to reliably assess the effectiveness and cost-effectiveness of CPMHTs.

3. There is a growing research base about barriers and facilitators to mental health care and treatment preferences in underserved and diverse parents. Research could now focus on the development of feasible and effective interventions tailored for underserved and diverse perinatal populations and how best to implement them within community specialist PMH teams.
4. Two specific groups require further study. From this project, we do not know what happens to women who have PMH problems but do not reach the threshold of being seen by CPMHTs. Further, complex trauma and loss presentations are common in PMH, though often are not identified because of concerns about stigma associated with this presentation. CPMHTs struggled with decision-making about what treatments to provide within their relatively short treatment windows (pregnancy to 24 months postnatal). Research is needed on women who have moderate to severe but non-complex mental health problems (and would be eligible to be seen in primary care mental health) and examining the effects of models of care incorporating briefer perinatally focused interventions administered alongside co-ordinated care in community mental health teams on parental emotion regulation, interpersonal conflict and parenting outcomes will give services critical information about how to provide best care to perinatal parents with complex trauma and loss.
5. We have established that both NICHD-3 and PIIOS are reliable and valid tools to identify parent–infant dyads who require parent–infant focused interventions in order to improve infant mental health outcomes. Future research needs to evaluate the measures' sensitivity to change following intervention.

Additional information

CRediT contribution statement

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Patient data statement

This work uses data provided by patients and collected by the NHS as part of their care and support. Using patient data is vital to improve health and care for everyone. There is huge potential to make better use of information from people's patient records, to understand more about disease, develop new treatments, monitor safety, and plan NHS services. Patient data should be kept safe and secure, to protect everyone's privacy, and it's important that there are safeguards to make sure that they are stored and used responsibly. Everyone should be able to find out about how patient data are used. #datasaveslives You can find out more about the background to this citation here: https://understandingpatientdata.org.uk/data-citation

Data-sharing statement

The data used in *Chapters 6* and *7* have been provided by patients as part of their care and support. The data are collated, maintained and quality assured by NHS Digital, now part of NHS England. Requests for access to these data should be directed to the Data Access Request Service, which is part of NHS England (https://digital.nhs.uk/services/data-access-request-service-dars).

Ethics statement

The work conducted in *Chapter 5* was reviewed by NHS ethics and received ethical approval by the Southwest – Central Bristol Research Ethics Committee (Reference: 19/SW/0218).

Information governance statement

Universities of Exeter, King's College London and Liverpool are committed to handling all personal information in line with the UK Data Protection Act (2018) and the General Data Protection Regulation (EU GDPR) 2016/679. Universities of Exeter, King's College London and Liverpool are the Data Processors; the Devon Partnership Trust is the Data Controller, and we process personal data in accordance with their instructions. You can find out more about how we handle personal data, including how to exercise your individual rights and the contact details for the University of Exeter Data Protection Officer: www.exeter.ac.uk/about/oursite/dataprotection/.

Disclosure of interests

Full disclosure of interests: Completed ICMJE forms for all authors, including all related interests, are available in the toolkit on the NIHR Journals Library report publication page at https://doi.org/10.3310/RRAP0011

References

1. 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.
2. Jones I, Chandra PS, Dazzan P, Howard LM. Bipolar disorder, affective psychosis, and schizophrenia in pregnancy and the post-partum period. *Lancet* 2014;**384**:1789–99.
3. Howard LM, Ryan EG, Trevillion K, Anderson F, Bick D, Bye A, *et al*. Accuracy of the Whooley questions and the Edinburgh Postnatal Depression Scale in identifying depression and other mental disorders in early pregnancy. *Br J Psychiatry* 2018;**212**:50–6. URL: https://pubmed.ncbi.nlm.nih.gov/29433610/ (accessed 30 August 2023).
4. Fairbrother N, Collardeau F, Albert AYK, Challacombe FL, Thordarson DS, Woody SR, Janssen PA. High prevalence and incidence of obsessive–compulsive disorder among women across pregnancy and the postpartum. *J Clin Psychiatry* 2021;**82**:20m13398.
5. Yildiz PD, Ayers S, Phillips L. The prevalence of posttraumatic stress disorder in pregnancy and after birth: a systematic review and meta-analysis. *J Affect Disord* 2017;**208**:634–45.
6. Nath S, Busuulwa P, Ryan EG, Challacombe FL, Howard LM. The characteristics and prevalence of phobias in pregnancy. *Midwifery* 2020;**82**:102590.
7. Jones I, Smith S. Puerperal psychosis: identifying and caring for women at risk. *Adv Psychiatr Treat* 2009;**15**:411–8.
8. Wesseloo R, Kamperman AM, Munk-Olsen T, Pop VJM, Kushner SA, Bergink V. Risk of postpartum relapse in bipolar disorder and postpartum psychosis: a systematic review and meta-analysis. *Am J Psychiatry* 2016;**173**:117–27.
9. Stein A, Pearson RM, Goodman SH, Rapa E, Rahman A, McCallum M, *et al*. Effects of perinatal mental disorders on the fetus and child. *Lancet* 2014;**384**:1800–19.
10. Stein A, Netsi E, Lawrence PJ, Granger C, Kempton C, Craske MG, *et al*. 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* 2018;**5**:134–44.
11. Netsi 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.
12. Pearson RM, Campbell A, Howard LM, Bornstein MH, O'Mahen H, Mars B, Moran P. Impact of dysfunctional maternal personality traits on risk of offspring depression, anxiety and self-harm at age 18 years: a population-based longitudinal study. *Psychol Med* 2018;**48**:50–60.
13. Nath S, Pearson RM, Moran P, Pawlby S, Molyneaux E, Howard LM. Maternal personality traits, antenatal depressive symptoms and the postpartum mother–infant relationship: a prospective observational study. *Soc Psychiatry Psychiatr Epidemiol* 2020 May;**55**:621–34. https://doi.org/10.1007/s00127-019-01790-y
14. Bauer A, Parsonage M, Knapp M, Iemmi V, Adelaja B. *Costs of Perinatal Mental Health Problems*. Centre for Mental Health; 2014. URL: www.centreformentalhealth.org.uk/publications/costs-perinatal-mental-health-problems (accessed 30 August 2023)
15. Cox EQ, Sowa NA, Meltzer-Brody SE, Gaynes BN. The perinatal depression treatment cascade: baby steps toward improving outcomes. *J Clin Psychiatry* 2016;**77**:1189–200.
16. Howard LM, Megnin-Viggars O, Symington I, Pilling S; Guideline Development Group. Antenatal and postnatal mental health: summary of updated NICE guidance. *BMJ* 2014;**349**:g7394.
17. NHS England. *The Perinatal Mental Health Care Pathways*. 2018. URL: www.england.nhs.uk/publication/the-perinatal-mental-health-care-pathways/ (accessed 1 October 2022).

18. Royal College of Psychiatrists. *Perinatal Mental Health Services*: *Recommendations for the Provision of Services for Childbearing Women*. 2015. URL: www.rcpsych.ac.uk/publications/ (accessed 25 June 2022).
19. National Institute for Health and Care Excellence. *Overview Antenatal and Postnatal Mental Health: Clinical Management and Service Guidance NICE*. London, UK: NICE; 2019.
20. NHS Digital. *Mental Health Services Monthly Statistics: Final July, Provisional August 2017*. 2017. URL: https://digital.nhs.uk/data-and-information/publications/statistical/mental-health-services-monthly-statistics/mental-health-services-monthly-statistics-final-july-provisional-august-2017 (accessed 7 May 2022).
21. NHS England. *Perinatal Mental Health Community Services Development Fund: Application Guidance*. 2016. URL: www.england.nhs.uk/mentalhealth/wp-content/uploads/sites/29/2016/08/perinatal-mh-csdf-guid.pdf (accessed 21 May 2022).
22. NHS England. *Five Year Forward Review*. 2014. URL: www.england.nhs.uk/wp-content/uploads/2014/10/5y-fv-web.pdf (accessed 2 April 2022).
23. NHS England. *The NHS Long Term Plan*. Vol. 1.2. NHS England; 2019. URL: www.longtermplan.nhs.uk/wp-content/uploads/2019/08/nhs-long-term-plan-version-1.2.pdf (accessed 15 May 2022).
24. Pawson R, Tilley N. *Realistic Evaluation*. London: SAGE Publications Ltd; 1997.
25. Health Education England. *Competency Framework for Perinatal Mental Health*. 2018. URL: www.hee.nhs.uk/our-work/mental-health/perinatal-mental-health/competency-framework-perinatal-mental-health (accessed 5 May 2022).
26. National Institute for Health and Care Excellence. *Antenatal and Postnatal Mental Health: Quality Standard [QS115]*. 2016. URL: www.nice.org.uk/guidance/qs115 (accessed 24 March 2018).
27. Royal College of Psychiatrists. *Standard for Community Perinatal Mental Health Services*. 4th edn. London, UK; 2007. URL: www.rcpsych.ac.uk/docs/default-source/improving-care/ccqi/quality-networks/perinatal/pqn-standards-for-community-perinatal-mental-health-services-4th-edition.pdf?sfvrsn=f31a205a_4 (accessed 23 May 2022).
28. British Psychological Society. *What Does Good Perinatal Clinical Psychology Provision Look Like?*. 2019. URL: https://explore.bps.org.uk/content/report-guideline/bpsrep.2019.pp19/chapter/bpsrep.2019.pp19.4 (accessed 23 May 2022).
29. Marriott S, Sleed M, Dalzell K. *Implementing Routine Outcome Monitoring in Specialist Perinatal Mental Health Services*. London; 2019. URL: www.england.nhs.uk/publication/implementing-routine-outcome-monitoring-in-specialist-mental-health-services/ (accessed 23 May 2022).
30. Sharp H, Vitoratou S, O'Mahen H, Bozicevic L, Refberg M, Hayes C, *et al*. Identification of vulnerable mother-infant dyads in the perinatal period: a psychometric evaluation of two observational coding systems using varying interaction periods. *Front Psychol* 2024;**15**:1399841.
31. Manning C, Sharp H, Seneviratne G. *FROM-Perinatal Framework for Routine Outcome Measures in Perinatal Psychiatry*. London: Royal College of Psychiatry; 2018.
32. Medical Research Council. *MRC Cohort Directory: Wirral Child Health and Development Study*. 2023. URL: www.ukri.org/councils/mrc/facilities-and-resources/find-an-mrc-facility-or-resource/cohort-directory/ (accessed 29 August 2023).
33. Svanberg PO, Barlow J, Tigbe W. The Parent-Infant Interaction Observation Scale: reliability and validity of a screening tool. *J Reprod Infant Psychol* 2013;**31**:5.
34. Svanberg PO. *The Parent-Infant Observation Scale Manual*. 2009.
35. Cox M, Crnic K. *Qualitative ratings for parent-child interaction at 3–15 months*. Unpublished coding manual. Chapel Hill: Center for Developmental Science, University of North Carolina; 2003.

36. Owen MT. *The NICHD Study of Early Child Care Mother–Infant Interaction Scales*. Unpublished manuscript, Dallas, TX: Timberlawn Psychiatric Research Foundation; 1992.
37. Leerkes EM, Nayena Blankson A, O'brien M. Differential effects of maternal sensitivity to infant distress and nondistress on social-emotional functioning. *Child Dev* 2009;**80**:762–75.
38. McElwain NL, Booth-Laforce C. Maternal sensitivity to infant distress and nondistress as predictors of infant-mother attachment security. *J Fam Psychol* 2006;**20**:247–55.
39. Achenbach T, Rescorla L. *Manual for the ASEBA Preschool Forms and Profiles*. Vermont: Burlington; 2000.
40. Briggs-Gowan MJ, Carter AS, Irwin JR, Wachtel K, Cicchetti DV. The brief infant-toddler social and emotional assessment: screening for social-emotional problems and delays in competence. *J Pediatr Psychol* 2004;**29**:143–55.
41. NICHD Early Child Care Research Network. The effects of infant child care on infant-mother attachment security: results of the NICHD study of early child care. *Child Dev* 1997;**68**:860–79.
42. Birmingham RS, Bub KL, Vaughn BE. Parenting in infancy and self-regulation in preschool: an investigation of the role of attachment history. *Attach Hum Dev* 2017;**19**:107–29.
43. Campbell SB, Brownell CA, Hungerford A, Spieker SJ, Mohan R, Blessing JS. The course of maternal depressive symptoms and maternal sensitivity as predictors of attachment security at 36 months. *Dev Psychopathol* 2004;**16**:231–52.
44. Mills-Koonce WR, Gariépy JL, Propper C, Sutton K, Calkins S, Moore G, Cox M. Infant and parent factors associated with early maternal sensitivity: a caregiver-attachment systems approach. *Infant Behav Dev* 2007;**30**:114–26.
45. Bakermans-Kranenburg MJ, van IJzendoorn MH, Kroonenberg PM. Differences in attachment security between African-American and white children: ethnicity or socio-economic status? *Infant Behav Dev* 2004;**27**:417–33.
46. Shribman S, Billingham K. *Healthy child programme: Pregnancy and the first five years of life*. London: Department of Health; 2009.
47. Shribman S, Billingham K. *Health Visitor Implementation Plan – A Call to Action*. London: Department of Health; 2011.
48. Mokkink LB, Prinsen CAC, Patrick DL, Alonso J, Bouter LM, De Vet HCW, *et al*. COSMIN methodology for systematic reviews of Patient – Reported Outcome Measures (PROMs). User Manual. *Qual Life Res* 2018.
49. Cronbach LJ, Warrington WG. Coefficient alpha and the internal structure of tests. *Psychometrika* 1951;**16**:167–88.
50. Moffitt TE, Caspi A, Krueger RF, Magdol L, Margolin G, Silva PA, *et al*. Do partners agree about abuse in their relationship? A psychometric evaluation of interpartner agreement. *Psychol Assess* 1997;**9**:47–56.
51. 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.
52. Noble M, Wright G, Dibben C, Smith GAN, McLennan D, Anttila C, *et al*. *The English indices of deprivation 2004*. London: Office of the Deputy Prime Minister; 2004. p. 180.
53. NICHD Early Child Care Research Network. Child care and mother-child interaction in the first 3 years of life. NICHD early child care research network. *Dev Psychol* 1999;**35**:1399–413.
54. Ainsworth MDS, Blehar MC, Waters E, Wall SN. *Patterns of Attachment: A Psychological Study of the Strange Situation*. Hillsdale, NJ: Lawrence Erlbaum; 2015.
55. Vitoratou S, Uglik-Marucha N, Hayes C, Pickles A. *A Comprehensive Guide for Assessing Measurement Tool Quality: The Contemporary Psychometrics (ConPsy) Checklist*. 2023. https://doi.org/10.31234/osf.io/t2pbj

56. Kuiper R, Hoogenboezem R. *Nopaco: A Non-parametric Concordance Coefficient, Version 1.0.5*. 2019. URL: https://cran.r-project.org/package=nopaco (accessed 29 August 2023).
57. Shrout PE, Fleiss JL. Intraclass correlations: uses in assessing rater reliability. *Psychol Bull* 1979;**86**:420–8.
58. Cohen J. Weighted kappa: nominal scale agreement provision for scaled disagreement or partial credit. *Psychol Bull* 1968;**70**:213–20.
59. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977;**33**:363–74.
60. Muthen BO, du Toit SHC, Spisic D. *Robust Inference Using Weighted Least Squares and Quadratic Estimating Equations in Latent Variable Modelling with Categorical and Continuous Outcomes*. 1997. URL: www.statmodel.com/download/Article_075.pdf (accessed 22 May 2022).
61. Muthen LK, Muthen BO. *Mplus User's Guide*. 8th edn. Los Angeles, CA: Muthén & Muthén; 2017.
62. Fisher L, Davey A, Wong G, Morgan-Trimmer S, Sharp H, Atmore KH, *et al*. Women's engagement with community perinatal mental health services: a realist evaluation. *BMC Psychiatry* 2024;**24**:492. https://doi.org/10.1186/s12888-024-05804-1
63. Silverio SA, De Backer K, Easter A, von Dadelszen P, Magee LA, Sandall J. Women's experiences of maternity service reconfiguration during the COVID-19 pandemic: a qualitative investigation. *Midwifery* 2021;**102**:103116.
64. Farewell CV, Jewell J, Walls J, Leiferman JA. A mixed-methods pilot study of perinatal risk and resilience during COVID-19. *J Prim Care Community Health* 2020;**11**:2150132720944074.
65. Moyer CA, Compton SD, Kaselitz E, Muzik M. Pregnancy-related anxiety during COVID-19: a nationwide survey of 2740 pregnant women. *Arch Womens Ment Health* 2020;**23**:757–65.
66. Lebel C, MacKinnon A, Bagshawe M, Tomfohr-Madsen L, Giesbrecht G. Elevated depression and anxiety symptoms among pregnant individuals during the COVID-19 pandemic. *J Affect Disord* 2020;**277**:5–13.
67. Caparros-Gonzalez RA, Alderdice F. The COVID-19 pandemic and perinatal mental health. *J Reprod Infant Psychol* 2020;**38**:223–5. https://doi.org/10.1080/02646838.2020.1786910
68. Sánchez OR, Vale DB, Rodrigues L, Surita FG. Violence against women during the COVID-19 pandemic: an integrative review. *Int J Gynaecol Obstet* 2020;**151**:180–7.
69. Iyengar U, Jaiprakash B, Haitsuka H, Kim S. One year into the pandemic: a systematic review of perinatal mental health outcomes during COVID-19. *Front Psychiatry* 2021;**12**:674194.
70. Wilson DM, Darko EM, Kusi-Appiah E, Roh SJ, Ramic A, Na Errasti-Ibarrondo B. What exactly is 'complicated' grief? A scoping research literature review to understand its risk factors and prevalence. *Omega (Westport)* 2022;**86**:471–87.
71. Wong G, Westhorp G, Manzano A, Greenhalgh J, Jagosh J, Greenhalgh T. RAMESES II reporting standards for realist evaluations. *BMC Med* 2016;**14**:96. https://doi.org/10.1186/s12916-016-0643-1
72. Brown AF, Ma GX, Miranda J, Eng E, Castille D, Brockie T, *et al*. Structural interventions to reduce and eliminate health disparities. *Am J Public Health* 2019;**109**:S72–8.
73. Langham J, Gurol-Urganci I, Muller P, Webster K, Tassie E, Heslin M, *et al*. Obstetric and neonatal outcomes in pregnant women with and without a history of specialist mental health care: a national population-based cohort study using linked routinely collected data in England. *Lancet Psychiatry* 2023;**10**:748–59. URL: https://pubmed.ncbi.nlm.nih.gov/37591294/ (accessed 30 August 2023).
74. Howard LM, Khalifeh H. Perinatal mental health: a review of progress and challenges. *World Psychiatry* 2020;**19**:313–27.
75. Lora A, Lesage A, Pathare S, Levav I. Information for mental health systems: an instrument for policy-making and system service quality. *Epidemiol Psychiatr Sci* 2017;**26**:383–94.

76. Knight HE, Oddie SJ, Harron KL, Aughey HK, Van Der Meulen JH, Gurol-Urganci I, Cromwell DA. Establishing a composite neonatal adverse outcome indicator using English hospital administrative data. *Arch Dis Child Fetal Neonatal Ed* 2019;**104**:F502–9.

77. Nair M, Kurinczuk JJ, Knight M. Establishing a national maternal morbidity outcome indicator in England: a population-based study using routine hospital data. *PLOS ONE* 2016;**11**:e0153370.

78. Herbert A, Wijlaars L, Zylbersztejn A, Cromwell D, Hardelid P. Data resource profile: hospital episode statistics admitted patient care (HES APC). *Int J Epidemiol* 2017;**46**:1093–1093i.

79. NHS Digital. *Mental Health Services Data Set (MHSDS) – NHS Digital Data Specification*. 2021. URL: https://digital.nhs.uk/data-and-information/data-collections-and-data-sets/data-sets/mental-health-services-data-set/tools-and-guidance (accessed 22 May 2022).

80. NHS Digital. *Personal Demographics Service*. 2022. URL: https://digital.nhs.uk/services/personal-demographics-service#an-nhs-record-starting-at-birth (accessed 22 May 2022).

81. World Health Organisation. *International Statistical Classification of Diseases and Related Health Problems*. 10th revision. 2010. URL: https://icd.who.int/browse10/2019/en

82. NHS Digital. *OPCS Classifications of Interventions and Procedures Version 4.4*. 2007. URL: http://systems.digital.nhs.uk/data/clinicalcoding/codingstandards/opcs4 (accessed 21 May 2022).

83. Department of Communities and Local Government. *The English Indices of Deprivation 2015 Statistical Release*. 2015. URL: www.gov.uk/government/statistics/english-indices-of-deprivation-2015 (accessed 21 May 2022).

84. Office for National Statistics. *Birth Characteristics in England and Wales: 2020. Annual Live Births in England and Wales by Sex, Birthweight, Gestational Age, Ethnicity and Month, Maternities by Place of Birth and With Multiple Births, and Stillbirths by Age of Parents and Calendar Quarter*. 2022. URL: www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/bulletins/birthcharacteristicsinenglandandwales/2020#place-of-birth (accessed 22 May 2023).

85. Ralph S, National Maternity and Perinatal Audit Project Team. *NHS Maternity Care for Women with Multiple Births and Their Babies*. 2020. URL: https://maternityaudit.org.uk/FilesUploaded/NMPA Multiple Births Report 2020.pdf (accessed 2 July 2023).

86. NHS Digital. *The Healthcare Ecosystem*. 2022. URL: https://digital.nhs.uk/developer/guides-and-documentation/introduction-to-healthcare-technology/the-healthcare-ecosystem#secondary-care (accessed 2 May 2023).

87. Cole TJ, Williams AF, Wright CM. Revised birth centiles for weight, length and head circumference in the UK-WHO growth charts. *Ann Hum Biol* 2011;**38**:241–241.

88. White IR, Royston P, Wood AM. Multiple imputation using chained equations: issues and guidance for practice. *Stat Med* 2011;**30**:377–99.

89. Adane AA, Bailey HD, Morgan VA, Galbally M, Farrant BM, Marriott R, *et al*. The impact of maternal prenatal mental health disorders on stillbirth and infant mortality: a systematic review and meta-analysis. *Arch Womens Ment Health* 2021;**24**:543–55. URL: https://link.springer.com/article/10.1007/s00737-020-01099-9 (accessed 31 August 2023).

90. McLachlan HL, Forster DA, Davey MA, Farrell T, Gold L, Biro MA, *et al*. Effects of continuity of care by a primary midwife (caseload midwifery) on caesarean section rates in women of low obstetric risk: the COSMOS randomised controlled trial. *BJOG* 2012;**119**:1483–92. URL: https://onlinelibrary.wiley.com/doi/full/10.1111/j.1471-0528.2012.03446.x (accessed 31 August 2023).

91. Cummins A, Baird K, Melov SJ, Melhem L, Hilsabeck C, Hook M, *et al*. Does midwifery continuity of care make a difference to women with perinatal mental health conditions: a cohort study, from Australia. *Women Birth* 2023;**36**:e270–5. URL: https://pubmed.ncbi.nlm.nih.gov/35941058/ (accessed 31 August 2023).

92. Vigod SN, Fung K, Amartey A, Bartsch E, Felemban R, Saunders N, *et al*. Maternal schizophrenia and adverse birth outcomes: what mediates the risk? *Soc Psychiatry Psychiatr Epidemiol* 2020;**55**:561–70. URL: https://link.springer.com/article/10.1007/s00127-019-01814-7 (accessed 31 August 2023).

93. Gurol-Urganci I, Langham J, Tassie E, Heslin M, Byford S, Davey A, *et al*. Community perinatal mental health teams and associations with perinatal mental health and obstetric and neonatal outcomes in pregnant women with a history of secondary mental health care in England: a national population-based cohort study. *Lancet Psychiatry* 2024;**11**:174–82. https://doi.org/10.1016/S2215-0366(23)00409-1

94. Rothman KJ, Greenland S, Lash TL. *Modern Epidemiology*. 3rd edn. Philadelphia: Wolters Kluwer Lippencott Williams and Wilkins; 2008.

95. Howard LM, Bekele D, Rowe M, Demilew J, Bewley S, Marteau TM. Smoking cessation in pregnant women with mental disorders: a cohort and nested qualitative study. *BJOG* 2013;**120**:362–70. URL: https://pmc.ncbi.nlm.nih.gov/articles/PMC3638317/ (accessed 31 August 2023).

96. Shefer G, Henderson C, Howard LM, Murray J, Thornicroft G. Diagnostic overshadowing and other challenges involved in the diagnostic process of patients with mental illness who present in emergency departments with physical symptoms – a qualitative study. *PLOS ONE* 2014;**9**:e111682. URL: https://pubmed.ncbi.nlm.nih.gov/25369130/ (accessed 31 August 2023).

97. Farrelly S, Clement S, Gabbidon J, Jeffery D, Dockery L, Lassman F, *et al*.; MIRIAD study group. Anticipated and experienced discrimination amongst people with schizophrenia, bipolar disorder and major depressive disorder: a cross sectional study. *BMC Psychiatry* 2014;**14**:157. URL: https://pubmed.ncbi.nlm.nih.gov/24885144/ (accessed 31 August 2023).

98. Langham J, Gurol-Urganci I, Van der Meulen J, Howard LM, Pasupathy D, *et al*. An exploration of service use pattern changes and cost analysis following implementation of community perinatal mental health teams in pregnant women with a history of specialist mental healthcare in England: a national population-based cohort study. *BMC Health Serv Res* 2024;**24**:359. https://doi.org/10.1186/s12913-024-10553-8

99. NHS England and NHS Improvement. *2019/20 National Tariff Payment System – A consultation notice: Annex DtE, Technical guidance for mental health clusters*. 2019.

100. Jacobs R, Chalkley M, Böhnke JR, Clark M, Moran V, Aragón MJ. Measuring the activity of mental health services in England: variation in categorising activity for payment purposes. *Adm Policy Ment Health* 2019;**46**:847–57.

101. NHS England. *2018/19 National Cost Collection Data Publication*. 2019. URL: www.england.nhs.uk/publication/2018-19-national-cost-collection-data-publication/ (accessed 18 August 2023).

102. Curtis L, Burns A. *Unit Costs of Health and Social Care 2017*. Canterbury: Personal Social Services Research Unit; 2017.

103. Thompson SG, Barber JA. How should cost data in pragmatic randomised trials be analysed? *BMJ* 2000;**320**:1197–200.

104. Howard LM, Trevillion K, Potts L, Heslin M, Pickles A, Byford S, *et al*. Effectiveness and cost-effectiveness of psychiatric mother and baby units: quasi-experimental study. *Br J Psychiatry* 2022;**221**:628–36.

Appendix 1 Types of training received by professions and delivered by staff

TABLE 22 Training received by each profession within CPMHTs

Psychologists	Nursery nurses	CPNs	Team managers	Psychiatrist	Occupational therapy
Circle of security	VIG	ITSIEY training at the Anna Freud Centre	ITSIEY training at the Anna Freud Centre	Masterclass for consultant perinatal psychiatrists (National Health Service England/HEE)	Interpersonal therapy
EMDR	NBO	Perinatal training for community and inpatient perinatal MH practitioners	Perinatal team managers training; perinatal community services workshop	Royal College of Psych Perinatal: Perinatal psychiatry 3 day training course	AMPS training
NBO	Mellow Bumps	Anna Freud Centre on risk assessment and report writing	EMDR	King's Fund leadership training	Sensory integration training
VIPP	Infant Massage	Perinatal champion training	Mellow Bumps	Preconception counselling and risk assessment in early pregnancy	Winchester course
DBT	AVIGuk Practitioner training	DBT	Winchester course		
University of Exeter/ Liverpool clinical psychology perinatal CPD programme		CBT diploma and CBT introductory course from local university	Tavistock and Portman (Course 1 perinatal training for community and inpatient perinatal MH team managers/ leaders)		
VIG		Perinatal training course at a local university	Winchester leadership course		
Tavistock and Portman courses		Family work for psychosis			
AVIGuk practitioner training		Winchester course			
Winchester leadership course		VIG			
Parent–infant psychotherapy training at Anna Freud		NBO			
Perinatal psychology workforce training event		Interpersonal therapy 2-day course			

continued

TABLE 22 Training received by each profession within CPMHTs (*continued*)

Psychologists	Nursery nurses	CPNs	Team managers	Psychiatrist	Occupational therapy
Care Index Course		Mellow Bumps			
		Behavioural family therapy			
		EMDR			
		Parental mental health training			
		Suicide prevention training			

AMPS, Assessment of Motor and Process Skills; CPD, continuing professional development; CPN, clinical practice nurse; HEE, Health Education England; ITSIEY, International Training School for Infancy and Early Years; MH, mental health; VIPP, Video Interaction for Positive Parenting.

TABLE 23 Training delivered to all staff within CPMHTs or not specified which profession

All staff	Non-specified professionals
Working with mothers and babies in the community in the perinatal period	Anna Freud centre on introduction to PiP work and mentalisation and the baby work
Simulation training	Simulation training
PIIOS training	Safeguarding supervision
Bespoke Tavistock and Portman training	Brazleton (NBO) training
E-Learning for health-perinatal mental health	Winchester perinatal training
VIG introductory training course with InVIGorate	GRASPPIT training (Global recognition and assessment of the sick perinatal patient and initial treatment)
DBT	Watch wait and wonder training – (parent–infant interaction re. play)
Warwick University infant mental health online course	Behavioural family therapy training course
'Winchester course' PIMH training	CBT
Compassion focused Therapy	Interpersonal psychotherapy training
Solihull Approach – Core Foundation Training (Antenatal 2DF)	Cognitive analytic therapy
Tavistock and Portman Course 3 – Working with acutely unwell women in the perinatal period	EMDR
Care Index overview and stabilisation	University perinatal mental health module
SCM	IMHOL – Infant mental health online course (University of Warwick)
Here's Looking at Your Baby	IHV perinatal and infant mental health champions training
Behavioural activation	Emergency services perinatal awareness training
PIIOS	Assisted reproduction and sexual health – Margaret Pyke Trust
	PIIOS accredited training – University of Warwick
	Risk Assessment and risk management – Tavistock and Portman
	VIG training and supervision
	Bebe scale
	Solihull Foundation 2 day
	Baby Mind mindedness
	Warwick infant mental health training

IHV, Institute of Health Visiting; PIMH, parent-infant mental health; PiP, parent infant psychotherapy; SCM, structured clinical management.

EME
HSDR
HTA
PGfAR
PHR

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