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Synopsis

Identifying acceptable and effective methods of assessing perinatal anxiety: the MAP study

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Abstract

Background: Anxiety is a common mental illness that can occur during and after pregnancy, which is associated with an increased risk of adverse outcomes for women and their infants. Despite this, there is no consensus on the best method of assessing anxiety.

Objectives: The methods of assessing perinatal anxiety (MAP) study aimed to identify the most acceptable, effective and feasible method for assessing anxiety in pregnancy and after birth.

Design and methods: The MAP study had four work packages: a qualitative and cognitive interview study (work package 1); a prospective longitudinal cohort study of women during pregnancy (early, mid- and late pregnancy) and post partum, with nested diagnostic interviews (work package 2) and implementation case studies (work package 3). Secondary analysis of cohort data was commissioned as an add-on project to examine the impact of socioeconomic deprivation on perinatal anxiety (work package 4). The MAP study evaluated four assessment measures based on clinical criteria and research evidence: the General Anxiety Disorder Questionnaire, 2-item, or 7-item version scale, Whooley questions, Stirling Antenatal Anxiety Scale and Clinical Outcomes in Routine Evaluation – 10 item version scale.

Setting and participants: Qualitative and cognitive interviews (work package 1) were conducted with 41 pregnant and postpartum women, recruited through patient and public involvement representative organisations and social media. The MAP cohort (work package 2) included 2243 women recruited through 12 National Health Service Trusts in England and 5 National Health Service Boards in Scotland. Diagnostic interviews were conducted with a consecutive subsample of 403 participants. Implementation case studies (work package 3) were conducted with two National Health Service sites in England and one in Scotland.

Results: Routine assessment of perinatal anxiety was acceptable to women and was viewed positively, although this was qualified by the extent to which the process was informed and personalised. Results from cognitive interviews found that all measures were acceptable and easy to use.

Diagnostic accuracy was greatest for the Stirling Antenatal Anxiety Scale and Clinical Outcomes in Routine Evaluation – 10 item version. Increased anxiety on all measures was associated with greater difficulties with daily living, poorer quality of life and participants wanting treatment. Early pregnancy (i.e. the first trimester) was the optimal time for identifying participants with anxiety disorders who wanted treatment.

Two measures met criteria for implementation: the Stirling Antenatal Anxiety Scale and the Clinical Outcomes in Routine Evaluation – 10 item version. The Stirling Antenatal Anxiety Scale was preferred by stakeholders (41

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women and 55 health professionals), so it was implemented. Acceptability to health professionals (*N* = 27) of routine assessment using the Stirling Antenatal Anxiety Scale was good. Potential barriers to conducting assessments informed the development of a guide to implementation.
The prevalence of anxiety disorders was 19.9% (confidence interval 16.1 to 24.1), with highest prevalence in early pregnancy (25.5%, confidence interval 17.4 to 35.1). A complex relationship was found between regional deprivation and perinatal anxiety, with regional differences in prevalence being explained by sociodemographic composition.
Limitations: The MAP cohort had a greater ethnic diversity than the general population, but participants were highly educated. The study evaluated four measures, so it could not determine whether other measures are more effective. The qualitative and observational research design means causality could not be inferred.
Conclusions: The MAP study found that routine assessment of perinatal anxiety is acceptable to women and is feasible to implement in National Health Service services. The Stirling Antenatal Anxiety Scale and Clinical Outcomes in Routine Evaluation – 10 item version were most effective at identifying women with perinatal anxiety disorders who wanted treatment.
Future work: Further research is needed to determine whether implementing routine assessment of perinatal anxiety results in improved outcomes for women and children.
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Introduction

Mental health problems that arise during the time from conception to 12-months postpartum (perinatal) affect one in five women and the total cost to the UK is estimated to be £8.1B for every annual cohort of women, with 72% of this cost attributable to the long-term impact on the child.[1] The most common disorders are depression and anxiety. Although depression has been extensively researched, research on anxiety has only recently been prioritised. Perinatal anxiety affects 15% of women[2] and is characterised by intense symptoms of anxiety and fear. Anxiety disorders may develop, which include generalised anxiety disorder (GAD), panic, phobias, social anxiety, obsessive–compulsive disorder (OCD) and post-traumatic stress disorder (PTSD).[3] Evidence of the impact of perinatal anxiety on women and their infants includes increased risk of preterm birth, postnatal depression and poorer developmental outcomes for the infant.[4,5] Evidence also shows that moderate symptoms which do not meet diagnostic thresholds can negatively impact women's lives, causing distress and functional impairment.[6]

Identifying perinatal anxiety is important for a number of reasons. In theory, the impact of perinatal anxiety on women's health could be reduced through early intervention, which could prevent short-term distress,[6] long-term chronic anxiety and improve the quality of life. Perinatal anxiety often co-occurs with depression, so identifying and treating anxiety early may also prevent depression. Early detection and treatment of anxiety could provide broader public health benefits by reducing the need for more intensive intervention longer term and supporting mothers to return to work. It may also reduce stigma through normalising perinatal anxiety, encouraging women to seek help and fostering community awareness and support for perinatal anxiety. Finally, it may improve the well-being of the infant[4,5] and wider family. However, research evidence in this area is sparse, so it is not known if screening and treatment programmes for perinatal anxiety are effective, in what way they are effective and how to maximise the effectiveness of such programmes.

As a first step, robust methods of assessing perinatal anxiety (MAP) are essential if services are to identify and treat women with perinatal anxiety, including those who do not meet clinical thresholds for mental health services. Assessment methods need to be acceptable to women and healthcare professionals (HCPs), feasible for services to use and effective at discriminating between women who need intervention and those experiencing normal anxiety associated with pregnancy and birth. However, the most effective method of assessing perinatal anxiety is not known and there is very little information on the acceptability of different assessment tools to women. A review of measures of perinatal anxiety found that very few self-report measures of anxiety had been validated for use with perinatal women.[7]

Thus, in most countries worldwide, universal screening is not in place for mental health in the perinatal period. A few countries, such as the UK and USA, have clinical guidelines with varying recommendations for perinatal depression and anxiety screening and assessment.[8,9] In the UK, the National Institute for Health and Care Excellence (NICE) clinical guidelines suggest HCPs ask two questions to identify anxiety [General Anxiety Disorder Questionnaire, 2-item

version (GAD-2[10])] and two questions to identify possible depression symptoms at appointments with perinatal women (Whooley questions).[9,11] Scottish Intercollegiate Guidelines Network guidelines suggest using the anxiety items from the Edinburgh Postnatal Depression Scale or another validated tool.[12] These guidelines also acknowledge the need to identify the most effective assessment tool for perinatal anxiety.[12]

This research therefore addressed a call by the National Institute for Health Research (NIHR) Health Services and Delivery Research Programme to 'produce rigorous and relevant evidence on […] robust methods of assessment that can be used by health and social care services, and are acceptable to potential service users, to identify those in need of intervention for perinatal mental health problems, including those who may not meet a clinical threshold for mental health services'.[13]

The MAP study aimed to determine the most effective, acceptable and feasible method of assessing perinatal anxiety. Research objectives were to:

1. determine the acceptability of different methods of assessment to women and understand women's experiences of routine assessment of perinatal anxiety
2. determine which assessment measures are most psychometrically robust
3. determine the most effective assessment measure to identify women with anxiety disorders
4. determine the optimal timing of assessment to identify women with anxiety disorders
5. determine the prevalence, risk factors and need for treatment for perinatal anxiety in regions identified as having a high or low prevalence of mental health conditions
6. determine the acceptability of assessment measures to health professionals and healthcare services
7. determine the feasibility of implementing assessment in different healthcare services in Scotland and England
8. develop a theoretically informed guide to implementation in NHS services in England and Scotland
9. disseminate the assessment tool and guide to implementation to key stakeholders in England and Scotland to facilitate implementation into clinical services.

Methods and results

Methods

The MAP study consisted of four work packages (WPs), as shown in *Figure 1*. These were: a qualitative and cognitive interview study (WP1); a prospective longitudinal cohort study with nested diagnostic interviews (WP2) and implementation case studies (WP3). Work package 4 (WP4) was a commissioned add-on secondary analysis[14] of WP2 cohort data, so it is reported under WP2.

Four assessment measures were evaluated: the UK clinically recommended measures for perinatal mental health assessment [the General Anxiety Disorder Questionnaire, 2- and 7-item versions (GAD-2/GAD-7)][10] for anxiety and the Whooley questions[11] for depression); a measure of psychological distress used in UK mental health services [Clinical Outcomes in Routine Evaluation – 10 item version (CORE-10)][15] and a measure of pregnancy-specific anxiety [Stirling Antenatal Anxiety Scale (SAAS)].[16] *Appendix 2*, *Table 4* depicts the details of these measures. The study protocol

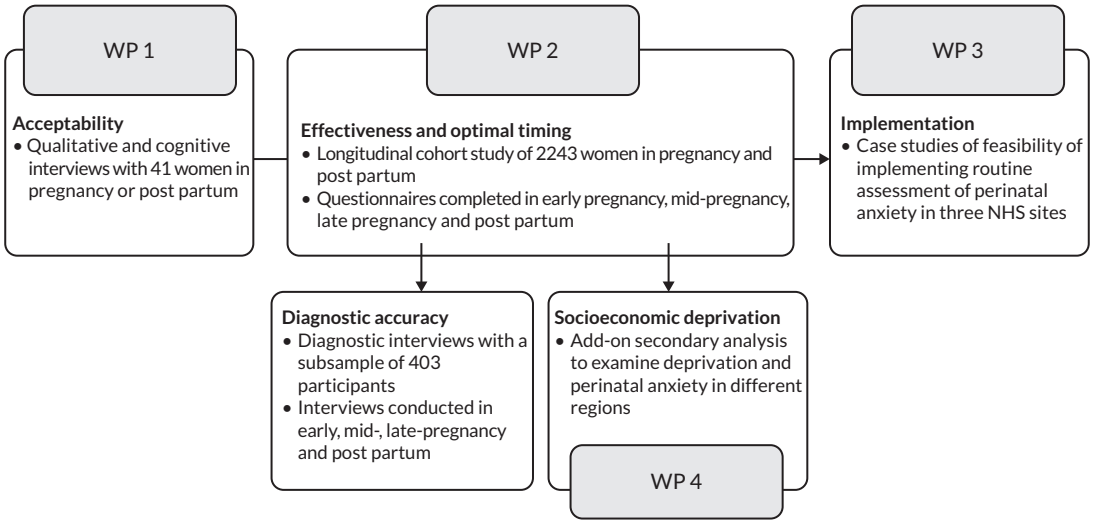

FIGURE 1 Overview of the MAP study.

V1.8_11012022 is available at https://njl-admin.nihr.ac.uk/document/download/2034506.

Work package 1: acceptability of measures of perinatal anxiety

In-depth qualitative and cognitive interviews were conducted to determine the acceptability and ease of use of different assessment measures and to understand women's experiences of assessment of perinatal mental health. WP1 registration is available online (Ayers *et al.* 2019).[21]

Sampling

Women were eligible if they were aged ≥ 16 years, pregnant or post partum and if they had adequate English language to complete and comment on the questionnaires. Participants were not excluded for reasons of literacy. The sample was purposively selected to achieve variation in the perinatal time point (early, mid-, late pregnancy and post partum) and mental health status (assessed by the GAD-2 and Whooley). See *Appendix 3*, *Table 5* for sample characteristics.

Data collection

Participants were recruited in person or online through social media, antenatal or baby events and antenatal education organisations. Women who expressed interest were contacted by researchers, given information about the study and informed consent was obtained. Participants completed initial assessment measures (Whooley questions and GAD-2) and provided sociodemographic, obstetric and mental health information. This information was used for purposive sampling to identify those were to be invited for interview.

Participants were interviewed in person or online within 3 weeks of recruitment. Interviews took approximately 1 hour (range 34–95 minutes, mean 65 minutes) and consisted of two parts. Part 1 used cognitive interviewing – a 'think-aloud' technique that asks participants to think aloud as they complete the questionnaire to highlight how they interpret and comprehend each item and come to formulate a response.[22] Cognitive interviewing is an evidence-based approach to survey development and evaluation, which is especially useful for evaluating sensitive or potentially intrusive questionnaires.[23] The interviewer probed any verbal or non-verbal occurrences of hesitation, reluctance, confusion or indecision. The order in which measures were presented was rotated to avoid order effects. Part 2 was a semistructured interview of participants' experiences and views on acceptability of different questionnaires, explored using a topic guide based on a theoretical framework of acceptability, including affective attitude, burden, perceived effectiveness, ethicality, intervention coherence, opportunity costs and self-efficacy.[24] Interviews were audio-recorded, transcribed and anonymised before analysis.

Data analysis

Data were analysed thematically on NVivo software (QSR International, Warrington, UK) [QSR International Pty Ltd. *NVivo* (version 12). 2018. URL: www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home (accessed 8 November 2024)]. Analysis used a combined deductive and inductive approach. Analysis of cognitive interviews used a framework based on the Tourangeau model of cognitive interviewing.[22] Inductive coding of themes was also done to ensure unexpected or emergent themes were captured. Transcripts were coded line by line with codes from the framework or new descriptive codes by three or four researchers. Coding was regularly discussed throughout the analysis phase to ensure reliability and credibility. To check the inter-rater reliability, another researcher checked 5% of the quotes and the inter-rater reliability was 82%. All disagreements were resolved by discussion.

For cognitive interview data, it was necessary to create a threshold above which items were classified as having positive or negative characteristics. It was decided that if 20% (i.e. one in five) or more participants reported diffculties with an item this was clinically and psychometrically meaningful in terms of: being a substantial proportion of the potential population; having significant implications for measurement at the individual and population level and being comparable to precedents in other areas that are defined as clinically significant, such as the prevalence of perinatal depression and anxiety. The threshold for items having negative or positive characteristics was therefore set at 20%.

For semistructured interviews, a combined deductive and inductive thematic analysis was conducted using a framework based on the theory of acceptability.[24] Guidelines for conducting and reporting qualitative research were adhered to O'Brien *et al.*[25] and Booth *et al.*[26]

Work package 2: effectiveness of measures of perinatal anxiety

A prospective longitudinal cohort study with nested diagnostic interviews on a subsample of participants. WP2 aimed to determine which assessment measures were most psychometrically robust, effective at identifying women in need of intervention and the optimal timing of assessment to identify women in need of treatment. WP2 registration is available online (Ayers *et al.* 2020).[27]

Sampling

The cohort sample was recruited through 12 NHS Trusts in England and 5 NHS Boards in Scotland between November 2020 and November 2021. Women were eligible if they were: aged ≥ 16 years; <15 weeks pregnant at the time of recruitment; able to provide written informed consent and had sufficient English to understand and complete the questionnaires. *Figure 2* shows the sample size at each time point. See *Appendix 4*, *Table 6* for sample characteristics.

Data collection

Participants were recruited by midwives in person or remotely around the pregnancy booking appointment or first scan. Interested participants provided written informed consent and contact details. The research team sent the questionnaires to participants at four time points: early pregnancy [first trimester: mean gestation 11.4 weeks, standard deviation (SD) 2.0, range 5–16]; mid-pregnancy (second trimester: mean gestation 23.0, SD 1.3, range 21–27); late pregnancy (third trimester: mean gestation 31.9, SD 1.2, range 30–35) and postpartum (mean 7.9 weeks, SD 2.4, range 4–17).

Questionnaires comprised the four mental health assessment measures,[10,11,15,16] measures of quality of life [EuroQol-5 Dimensions, five-level version (EQ-5D-5L),[17] which includes daily functioning and physical health], whether participants wanted treatment, whether participants were receiving treatment and sociodemographic and obstetric information. Measures of factors likely to influence anxiety were also included, as follows: previous history of mental health problems, fear of birth (Fear of Birth Scale[18]), mother–infant bond (Prenatal Attachment Inventory – short version;[19] Maternal-to-Infant Bonding Scale[14]) and support from family and friends (Enhancing Recovery in Coronary Heart Disease social support instrument[20]). The postpartum questionnaire also included the type of birth, birth complications and satisfaction with birth (Birth Satisfaction Scale-Revised[28]). As the coronavirus disease (COVID) pandemic occurred during the MAP study, measures were added on COVID exposure, perceived risk of COVID, anxiety due to COVID-related changes and adherence to guidelines. Questionnaires were completed online or by post according to participants' preferences. The order of the mental health questionnaires was counterbalanced to prevent response bias.

To establish diagnostic accuracy, diagnostic interviews were conducted on a subsample of participants (N = 403) to establish whether they had an anxiety disorder according to formal diagnostic criteria.[29] Consecutive sampling was used to minimise bias, as recommended by guidelines for studies of diagnostic accuracy.[30] A 10 : 1 ratio of participants from England and Scotland was achieved (England n = 352; Scotland n = 51) to reflect the relative annual birth rates in these nations.

Participants were contacted after their questionnaires were returned to request participation in a diagnostic interview. Different participants were sampled at each time point, so participants were only interviewed at one time point. When the required number of participants were interviewed for each time point, recruitment stopped for this time point. Diagnostic interviews were conducted using the Mini International Neuropsychiatric Interview (MINI) version 7.0.2,[31] modules for panic disorder, agoraphobia, social anxiety disorder, OCD, PTSD, GAD, specific phobia and major depressive episode (current and past).

Diagnostic interviews were conducted by three clinically qualified members of the research team who were blind to the results of the questionnaires. Interviews were conducted by telephone within 28 days of participants completing their questionnaire assessment. Interviews

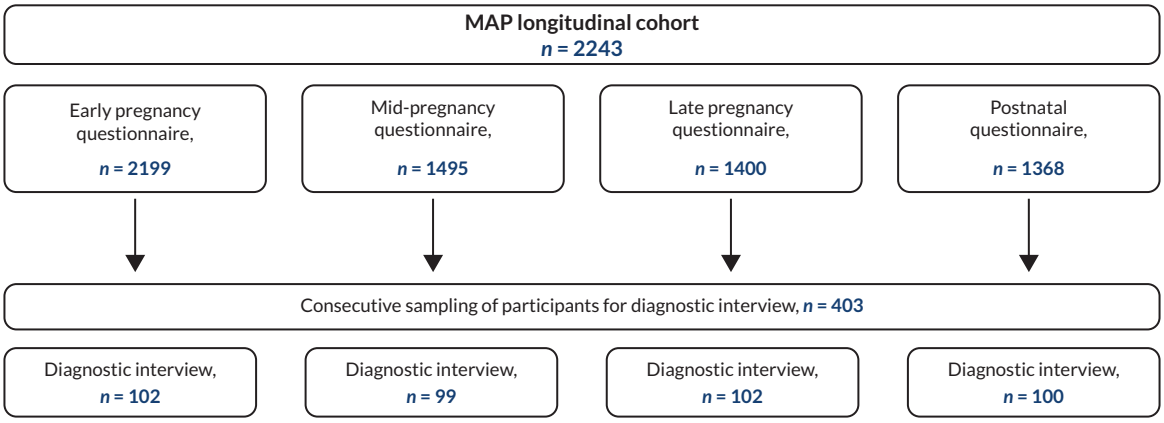

FIGURE 2 Methods of assessing perinatal anxiety cohort and diagnostic interview samples.

were audio-recorded to enable checks for fidelity and inter-rater reliability. Inter-rater reliability was examined for 5% of interviews and was high (96% agreement). Participants who met the criteria for a current anxiety or depressive disorder (n = 104) were advised to consult a HCP and were provided with information on available options, such as helplines and self-referral to specialist services. Safeguarding protocols were implemented in both the cohort and interview studies for participants who disclosed suicidal thoughts.

Data analysis

The statistical analysis plan was published on the Open Science Framework,[32] and the analyses were conducted in Stata® version 17 (StataCorp LP, College Station, TX, USA). Statistical analysis was used to examine the diagnostic accuracy, psychometric properties, optimal timing and associations with poor outcomes. Diagnostic accuracy was determined through comparison between questionnaire assessments and diagnostic interviews of the same participants at the same time point. Indicators examined included true positive rate (sensitivity), true negative rate (specificity), positive and negative likelihood ratio values, negative predictive value and Youden's index score. Area under the receiver operating characteristic (AUROC) was used to provide a single index of the overall diagnostic performance and to determine appropriate cut-off scores. A value of ≥ 0.80 is considered to be acceptable for the widespread application of a clinical screening tool. Optimal timing of screening was determined by comparing the AUROC curves for each of the questionnaires at the antenatal and postnatal time points and by evaluating which time point provided the highest diagnostic accuracy.

Psychometric properties included internal consistency using Cronbach's alpha (α), item-total and inter-item correlations. Factor analysis was used to determine the structure of each measure. Factor analysis looks at the correlation between the items in a measure to see whether all items tend to vary together or whether some groups of items cluster together. An exploratory factor analysis with oblimin rotation was used to explore the factor structure of measures with more than two items (i.e. GAD-7, CORE-10 and SAAS). The number of factors was determined based on visual inspection of the scree plot and an eigenvalue > 1. Sampling adequacy was assessed by the Kaiser–Meyer–Olkin test, which indicated that the sample size was adequate for factor analysis (GAD-7 0.88; CORE-10 0.88; SAAS 0.93).

Two sets of add-on analyses were conducted. The first was analysis of differences between regions in England in socioeconomic deprivation, diversity and perinatal anxiety (National Institute for Health Research. Call for additional work – Mental health. Deadline 30 September 2021, personal communication). The Index of Multiple Deprivation (IMD) was calculated and used to investigate the region-level deprivation of the sample based on participants' postcodes.[33] Differences between regions were tested using Chi Square test for categorical variables and independent samples t-test for continuous variables. The relationship between socioeconomic deprivation and health factors and perinatal anxiety was examined using generalised linear mixed models. Perinatal stage was included as a covariate with a random intercept at the individual participant level. The second add-on analysis was the evaluation of COVID and anxiety. Relationships between experiencing COVID infection, perceived likelihood of infection, perceived severity of infection and anxiety were assessed using a series of mixed-effects linear regression models, with total anxiety scores (measured by the SAAS) as the continuous dependent variable.

Guidelines for conducting and reporting diagnostic accuracy studies were adhered to.[34]

Work package 3: implementing perinatal anxiety assessment in routine care

The WP3 aimed to determine the feasibility and acceptability of implementing assessment in healthcare services and develop a theoretically informed guide to implementation. Case studies of implementing perinatal anxiety assessment using the SAAS were conducted using the Promoting Action on Research Implementation in Health Services (PARIHS) approach,[35] which aims to support the successful implementation of changes with active engagement of coparticipants. The study consisted of three stages: (1) pre-implementation (baseline) data collection and context mapping; (2) production of tailored implementation strategies followed by a 3–5-month phase of implementing perinatal anxiety assessment and (3) evaluation of implementation. Information collected at baseline was used to develop the implementation strategy and training for each site. WP3 registration is available online.[36]

Setting and participants

Two NHS Trusts in England (E1 and E2) and one Health Board in Scotland (S1) were selected to represent different maternity services and pathways of care and for pragmatic reasons, for example previous collaboration in MAP. Purposive sampling was used to recruit HCPs from a range of roles in maternity, primary care, psychological services and other relevant services and stakeholders (see *Appendix 5*, *Tables 7* and *8*).

Data collection

Recruitment was facilitated by a local principal investigator who identified HCPs and passed their contact details to a member of the research team. Semistructured interviews and focus groups were conducted with participants before implementation (baseline) and 3–5 months after implementation. Efforts were made to interview the same individuals at both stages. All interviews and focus groups were conducted remotely by three researchers.

Interview topic guides were based on the PARIHS framework.[35] The purpose of baseline data collection was to inform the development of training materials for the implementation of the SAAS and to create targeted implementation strategies for each site, so this is not reported here. The post-implementation interviews evaluated the acceptability of the new assessment to healthcare practitioners and the feasibility of implementing it into healthcare services. Feasibility of implementation was assessed with questions about HCPs' views and experiences of implementing the new perinatal anxiety assessment, barriers, facilitators and usefulness of the strategy, any recommended changes to the approach and views on sustainability. Evaluation of acceptability was based on the theoretical framework of acceptability.[24]

Data analysis

Data were analysed using framework analysis. A combined inductive–deductive approach was used, which enabled specific research questions to be addressed and allowed new themes relating to implementation to be identified. Analysis was conducted by two researchers with a third researcher checking for consistency on 10% of the data.

Guidelines for conducting and reporting qualitative research were adhered to.[25,26]

Results summary

Results of the MAP study are reported in detail in the research papers listed in *Table 1*.

Acceptability of measures of perinatal anxiety

Routine assessment of perinatal anxiety was viewed by our sample of 41 pregnant or postpartum women as positive and acceptable, although this was qualified by the extent to which the process was informed and personalised. Most participants thought that such an assessment was needed and that the benefits outweighed any potential negative impacts, such as unnecessary referrals to specialist services.

Results for the different dimensions of acceptability are shown in *Appendix 6*, *Table 9*. Three overarching themes were identified: (1) raising awareness and improving support; (2) surveillance and stratifying care and (3) personalising care and building trust. These covered how assessment was seen as a useful tool for raising awareness about mental health during the perinatal period and as a mechanism for normalising discussions about mental health more generally. However, views on questionnaire assessments of mental health were mixed, with some participants feeling that questionnaires could become an administrative 'tick box' exercise that depersonalised care and did not provide a space to discuss mental health problems. Approaches to assessment should therefore ideally be flexible, tailored across the perinatal period and embedded in the continuity of care.

TABLE 1 Overview of MAP study publications

WP	Research paper	Status
WP1	Women's experiences and views of routine assessment for anxiety in pregnancy and after birth: a qualitative study	*Br J Health Psychol* 2024;**29**(4):958–71
	Evaluation of perinatal anxiety assessment measures: a cognitive interview study	*BMC Pregnancy Childbirth* 2024;**24**(1):507
WP2	Assessment of perinatal anxiety: diagnostic accuracy of five measures	*Br J Psychiatry* 2024;**224**(4):132–8
	When is the best time to screen for perinatal anxiety? A longitudinal cohort study	*J Anxiety Disord* 2024;**103**:102841
	Socioeconomic deprivation and perinatal anxiety: an observational cohort study	*BMC Public Health* 2024;**24**(1):3183
	Prevalence and treatment of perinatal anxiety: a diagnostic interview study	*B J Psych Open* 2024;**11**(1):e5
	COVID-19 and anxiety in pregnancy and postpartum: a longitudinal survey	*BMC Public Health* 2025;**25**:1146
WP3	Implementing routine assessment of perinatal anxiety in healthcare services: qualitative case studies	*NIHR Journals*, 2025

COVID-19, coronavirus disease discovered in 2019.

Assessment experiences and their general acceptability were impacted by the structural and organisational aspects surrounding their delivery. This is reflected in what participants called 'gatekeeping' of support and care that is potentially produced by assessment during which the categorisation of anxiety 'severity' determines the clinical assumptions about its experience. This categorisation, in turn, stratifies women by their assumed experiences of anxiety, which might not reflect their actual experiences, and subsequently, governs their access to further support and care. In addition, women's experiences reflected how sociocultural barriers, such as stigma, shame and fear concerning mental health, continue to influence disclosure and subsequently impact assessment. Crucially, most participants did not know what would happen if they scored highly during an assessment for anxiety or if they would be referred to specialist services or support.

Results from cognitive interviews examining the characteristics of the different questionnaires evaluated found that all four questionnaires were acceptable to women and they were able to complete them easily. In general, questionnaires were considered as acceptable and relevant by participants, but items varied in whether they were viewed as positive or problematic in terms of comprehension, judgement, retrieval and responding. Overall, the SAAS and CORE-10 performed best, with the lowest mean number of problematic components. The Whooley questions also performed well. The GAD-2 and GAD-7 performed less well, with the greatest number of problematic components and, notably, the GAD-7 was also the measure with most items considered as not relevant to perinatal women. This poorer performance of the GAD is concerning, given it is currently the recommended screening tool for perinatal anxiety in the UK.[9]

A few further issues were noted. Some items were not thought to be as relevant to the perinatal period as other times in life (e.g. difficulties in sleeping). Two items were viewed as not acceptable by > 20% of participants. These were 'I did not feel worthy of being a mother' (SAAS) and 'I made plans to end my life' (CORE-10). However, views were mixed, with a greater proportion of participants commenting positively on the latter suicide item, saying they understood the value of this question even if it was only applicable to a few women.

For response scales, non-binary response options were preferred. Preferences for time frames (e.g. 1 week and 1 month) varied with no clear preferred time frame by participants in this sample.

Effectiveness of measures of perinatal anxiety

Diagnostic accuracy for perinatal anxiety disorders was greatest for the CORE-10 and SAAS (see *Appendix 7*, *Table 10*).[36] The CORE-10 showed a good sensitivity (64.6%) and an excellent specificity (82.3%) at a cut-off score of ≥ 9. The SAAS showed an excellent sensitivity (83.5%) and very good specificity (72.7%) at a cut-off score of ≥ 9. As per clinical guidelines,[9] a cut-off score of ≥ 1 for the Whooley was optimal with good sensitivity (58.7%) and very good (75.5%) specificity. The GAD-2 showed good sensitivity and specificity using a cut-off score of ≥ 2, not the recommended cut-off score of 3[9] which had poor sensitivity (38%). The GAD-7's optimal cut-off score was also lower than specified in guidelines,[9] with a cut-off score of 6 maximising both sensitivity and specificity (64.6% and 75.8%, respectively).

The AUROC analysis (see *Appendix 7*, *Figure 5*) also confirmed that the CORE-10 and SAAS were the most accurate diagnostic measures for perinatal anxiety. At the optimal cut-off score identified of ≥ 9, the SAAS had the highest sensitivity (probability of a questionnaire score indicating anxiety in someone who does have anxiety) and the CORE-10 had the highest specificity (probability of a questionnaire score indicating no anxiety in someone who does not have anxiety). The GAD-2 and GAD-7 did not perform as well as other measures and optimal cut-off scores were lower than recommended in clinical guidelines.[9]

Association with poor outcomes using mixed-effects models showed that increased scores on all measures of perinatal anxiety were associated with greater difficulties with activities of daily living [odds ratios (ORs) 11.88 GAD-2 to 16.48 SAAS], poorer quality of life (ORs −7.34 CORE-10 to −9.74 GAD-2) and participants reporting they wanted treatment (ORs 2.85 Whooley to 5.80 CORE-10) (see *Appendix 7*, *Table 11*). The SAAS had the strongest relationship with difficulties of daily living, with participants who scored ≥ 9 on the SAAS being 16 times more likely to experience difficulties [OR 16.48, confidence interval (CI) 13.49 to 20.13] compared to participants who scored < 9. Wanting treatment was greatest for those who scored ≥ 9 on the CORE-10 (OR 5.8, CI 3.36 to 10.01). However, CIs for all measures have a high degree of overlap, so these should be interpreted with caution.

Psychometric characteristics of all measures were good. They were psychometrically robust with good internal consistency, convergent validity and unidimensional factor structure in a perinatal population. Internal reliability was good for the CORE-10 (α= 0.84), GAD-7 (α = 0.89)

and SAAS (α= 0.91). It was not calculated for the GAD-2 or Whooley questions because they only include two items, so Cronbach's test was not appropriate. Item-total correlations showed that all measures were in the range of 0.54–0.93. Inter-item correlations revealed a range of moderate-to-moderately high inter-item correlations, which is desirable for items in a scale, with correlations all > 0.20 and < 0.80 (range 0.25–0.77). Inspection of response distributions showed that there were no floor or ceiling effects for items in the GAD-2, GAD-7, SAAS or Whooley scales. However, there was a floor effect for an item in the CORE-10, where all participants in the diagnostic interview subsample had answered 'not at all' to the item 'I have made plans to end my life'. The threshold for a floor or ceiling effect was where all respondents responded in the same way and there was no useful variation being elicited from the item.

Results of factor analysis showed that all three measures had a unidimensional structure as expected, with only one factor having an eigenvalue > 1. This suggests that all items on each scale are measuring the same latent construct. Convergent and discriminant validities were good. Significant, positive correlations were found between all measures, with coefficients suggesting strong positive relationships (coefficient range 0.50–0.86), indicating a good convergent validity. As expected, the smallest coefficients were between the Whooley and other scales (range 0.50–0.54) because the Whooley was developed to measure depression.

Optimal timing of assessment

Results suggested that early pregnancy was the optimal time to identify participants with anxiety disorders and participants who want treatment.[36] *Figure 3* shows the AUROC for measures at different time points to identify women with anxiety disorders at any time during pregnancy or postpartum. Tests of differences in accuracy showed that early pregnancy screening was significantly more accurate than postnatal screening for the Whooley (χ^2 = 8.13, p = 0.043). However, there were no significant differences in accuracy between time points for the other measures (GAD-2 χ^2 = 1.10, p = 0.776; GAD-7 χ^2 = 1.63, p = 0.652; SAAS χ^2 = 2.12, p = 0.549; CORE-10 χ^2 = 1.85, p = 0.604).

Early pregnancy was also the optimal time point to predict which participants wanted treatment by using a mixed-effects regression model (see *Appendix 8*, *Table 12*). Results showed that screening in early pregnancy had the greatest utility in predicting whether participants ever stated they wanted treatment. These findings were consistent across all five measures of anxiety and mental health.

Results were therefore consistent in finding that screening in early pregnancy was the most accurate at identifying participants with anxiety disorders and participants who wanted treatment.

Prevalence of anxiety disorders

The prevalence of anxiety disorders was 19.9% (CI 16.1 to 24.1), with highest prevalence in early pregnancy (25.5%, CI 17.4 to 35.1) and lowest prevalence in late pregnancy (15.7%, CI 9.2 to 24.2) (see *Appendix 9*, *Table 13*). The most prevalent disorders were OCD (8.2%, CI 5.7 to 11.3), major depressive disorder (6%, CI 3.8 to 8.7) and GAD (5.7%, CI 3.7 to 8.4). The least prevalent disorders were PTSD (2.5%, CI 1.2 to 4.5) and social anxiety (3.2%, CI 1.7 to 5. 5). Differences in prevalence by time point were only statistically significant for OCD and depression, where participants were significantly less likely to meet the criteria for OCD and depression in late pregnancy relative to early pregnancy (OCD: OR 0.26, CI 0.08 to 0.81, p = 0.020; depression: OR 0.17, CI 0.04 to 0.77, p = 0.021). There were no significant differences across time for other diagnoses.

In terms of comorbidity, most participants had anxiety disorders only (14.9%, CI 11.6 to 18.7), with 1% having depression only (CI 0.2 to 2.5) and 5% having comorbid anxiety and depression (CI 3.1 to 7.6). Anxiety, depression and comorbidity were highest in early pregnancy, and logistic regression showed that the odds of comorbidity were significantly lower in late pregnancy compared to early pregnancy (OR 0.10, CI 0.01 to 0.82, p = 0.032). Most participants with anxiety disorders had a history of mental health problems (64.6%).

Whether participants wanted treatment was measured by the question 'if you are currently experiencing psychological problems, is this something you would like professional help or treatment for?'. Most participants with anxiety disorders who wanted treatment (20.2%) were receiving treatment. However, most participants with anxiety disorders stated they did not want professional help or treatment (79.8%). Psychological symptoms were rated as 'not at all difficult' or 'somewhat difficult' by significantly more participants who were not receiving treatment (84.1%) compared to those currently receiving treatment (57.1%) (Fisher's exact test p = 0.03), suggesting those who perceived their symptoms as having less impact on their day to day life were less likely to want or receive treatment.

Social deprivation and perinatal anxiety

Secondary analysis of social deprivation and perinatal anxiety was conducted on 1882 participants from three

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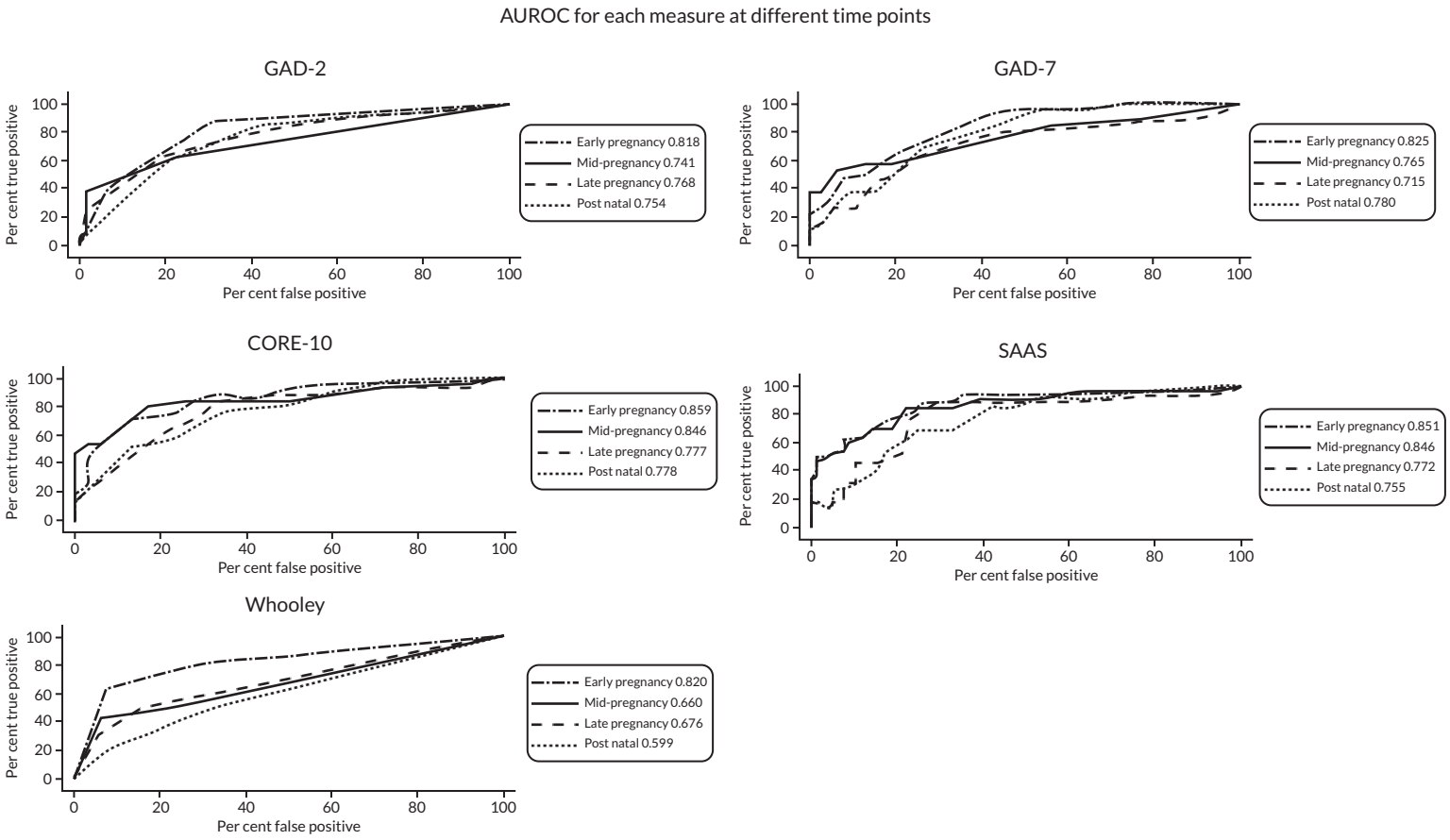

FIGURE 3 Area under the receiver operating characteristic for diagnostic accuracy of measures at different time points for diagnosis of any anxiety disorder (*N* = 403).

areas: two areas identified as having a probable higher mental illness prevalence (region 1, $n = 512$; region 2, $n = 665$), and one area with a probable lower mental illness prevalence (comparison region: $n = 705$).[32] Regions differed significantly in social deprivation, with 67.0% of participants in region 1 participants and 55.0% of region 2 participants being in the two most deprived quintiles of IMD, compared to 46.0% of the comparison region participants ($\chi^2 = 46.82$, $p < 0.001$). Participants in the three regions also differed significantly on ethnicity ($\chi^2 = 187.35$, $p < 0.001$), level of education ($\chi^2 = 87.3$, $p < 0.001$), mental health problems ($\chi^2 = 28.35$, $p < 0.001$) and physical health conditions ($\chi^2 = 46.57$, $p < 0.001$). The mean age of participants was 31.3 years (SD 5.2, range 16–50), and age did not differ across regions.

The prevalence of anxiety (defined by a score of ≥ 9 on the SAAS) differed between regions (*Figure 4*). Results showed that participants were less likely to have anxiety in region 1 (OR 0.63; 95% CI 0.45 to 0.89) and region 2 (OR 0.72; 95% CI 0.52 to 0.98) relative to the comparison region (adjusting for perinatal time point). The same pattern of prevalence was found in the subsample of participants who completed the diagnostic interview, with the highest prevalence for any anxiety diagnosis in the comparison region. This is unexpected, given the comparison region was previously identified as having lower prevalence of mental health problems in the general population.

Socioeconomic deprivation (IMD) was significantly associated with the prevalence of perinatal anxiety, and this differed by region (see *Appendix 10*, *Table 14*). In more affluent regions, living in a deprived neighbourhood had a greater impact on perinatal anxiety than living in a deprived neighbourhood in a deprived region.

Other sociodemographic risk factors for perinatal anxiety (controlling for assessment time point and IMD) were being from mixed or multiple ethnic groups (OR 3.33, CI 1.68 to 6.63), having physical health conditions (OR 3.16, CI 2.24 to 4.47) and previous mental health problems (OR 6.09, CI 4.43 to 8.38). Good quality of life was associated with reduced risk (OR 0.96, CI 0.95 to 0.97). Education, social support, quality of life and previous pregnancy loss were not significant in this model (see *Appendix 10*, *Table 15*).

Region was not associated with the proportion of participants who wanted treatment. A model on wanting treatment, adjusted for time point, region, ethnic group, education and category of IMD (low vs. high) showed only IMD was associated with wanting treatment. The adjusted odds for wanting treatment were higher [adjusted odds ratio (aOR) 2.30; 95% CI 1.14 to 4.62] in women living in neighbourhoods of higher deprivation as measured by the IMD.

Coronavirus disease and perinatal anxiety

The COVID measures were optional to complete at every time point, so were completed by 2122 participants.

Coronavirus disease had affected over one in three participants by the postpartum follow-up. Participants' exposure to COVID increased over time. The odds of having had COVID by the postpartum follow-up relative to early pregnancy were 7.64 (95% CI 5.40 to 10.82), with one in five participants (21.51%, 95% CI 19.51%

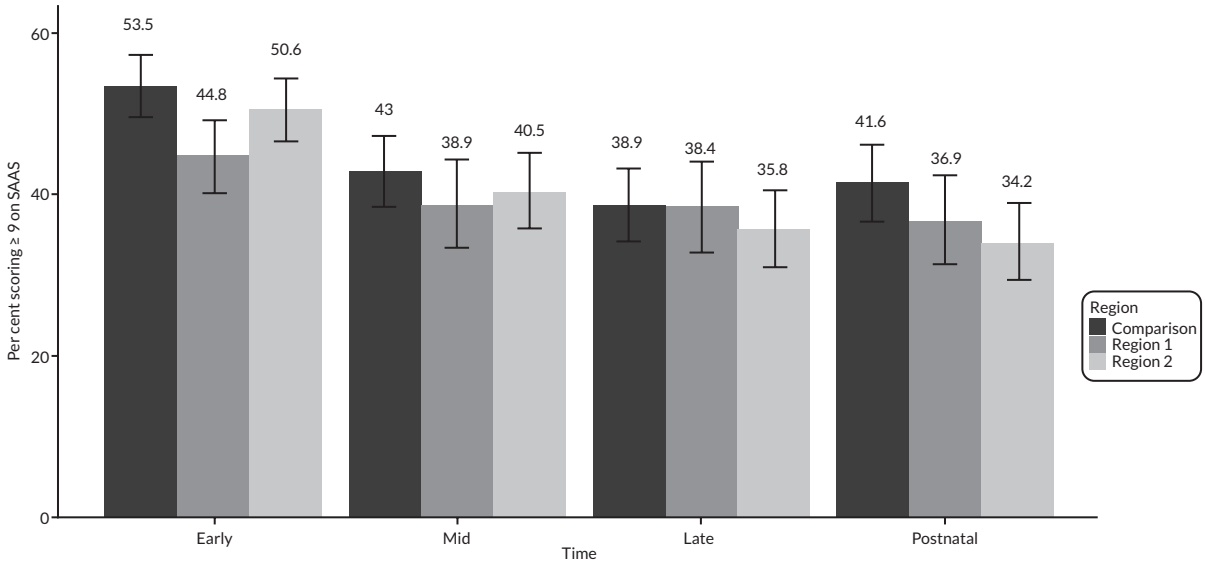

FIGURE 4 Prevalence of perinatal anxiety by region and time point ($N = 1849$).

to 23.62%) reporting ever having had COVID in early pregnancy and over one in three participants (38.41%, 95% CI 34.83% to 42.08%) reporting ever having had COVID postpartum. Very few participants reported having severe COVID: ranging from 1.51% in early pregnancy to 2.09% postpartum.

Exposure and perceived severity of COVID changed over time, with more women infected with COVID and the perceived severity of COVID decreasing. Experiencing mild COVID was associated with reduced anxiety compared to participants who never had COVID (mean difference −0.72, 95% CI −1.38 to −0.07, $p = 0.030$). No significant differences were found for experiencing moderate or severe COVID (mean difference −0.55, 95% CI −1.29 to 0.20; and 0.65, 95% CI −1.22 to 2.51, respectively).

The perceived impact of COVID on mental health was low. Most participants (71.68% to 75.3%) said the pandemic had 'no' or a 'slight' impact on their mental health. A moderate or severe impact of COVID on mental health was reported by just over one in four women (e.g. 28.06% in early pregnancy). Very few women reported a severe impact (5.27% to 5.66%). These proportions remained stable through pregnancy and postpartum. A regression model indicated that, within individuals, the odds of reporting an impact of COVID on mental health declined over time points (OR 0.90, 95% CI 0.84 to 0.94).

Perinatal anxiety was predicted by participants believing that COVID would make them severely ill and reporting that COVID had impacted on their mental health (see *Appendix 11*, *Table 16*). Adjusted variables significantly associated with perinatal anxiety in this model were: having poor general health, being of Asian or mixed ethnicity and having previous mental health problems ($\chi^2 = 1095.8$, $p < 0.001$).

Pandemic-related restrictions to maternity care affected more participants, with around 40% reporting feeling very or extremely anxious about being separated from baby, their partner not being with them in labour or having to leave shortly after the birth (see *Appendix 11*, *Figure 6*).

Adherence to guidelines was variable, depending on the restrictions. Between 40% and 80% of participants adhered to government guidelines, depending on the specific guideline. There was some decrease in adherence over time. The guidelines that fewest participants (around 40%) adhered to were avoiding public gatherings, avoiding gatherings with friends and family, physical distancing and keeping in touch by phone or other remote methods.

Adherence to guidelines was not associated with levels of anxiety in participants, with one exception. Those who completely followed the guidance to avoid meeting or gathering with friends and family reported significantly more anxiety compared to those who did not follow this guidance (mean difference 1.02, 95% CI 0.21 to 1.83).

Non-adherence to guidance was associated with a greater likelihood that participants had had COVID. Greater likelihood of having had COVID was observed in participants who reported not avoiding public transport (aOR 5.15, 95% CI 1.62 to 16.34), not working from home (aOR 3.24, 95% CI 1.69 to 6.21), not using phone or other remote methods to keep in touch with friends and family (aOR 2.58, 95% CI 1.75 to 3.81), not avoiding social gatherings with family and friends (aOR 1.86, 95% CI 1.25 to 2.76) or not avoiding public gatherings (aOR 1.80, 95% CI 1.24 to 2.62) when comparing those who adhered to these completely versus not at all.

Implementing perinatal anxiety assessment in routine care

Two measures met criteria as acceptable and effective assessment tools for perinatal anxiety: the SAAS and the CORE-10. Consultations were therefore conducted with stakeholders (41 perinatal women and 55 health professionals) to decide which measure to implement in healthcare services. In both groups, the SAAS was the preferred choice, so this measure was implemented in WP3.

Two NHS Trusts in England and one NHS Health Board in Scotland implemented the SAAS assessment of perinatal anxiety into routine services. Twenty-seven participants involved in implementing the SAAS were interviewed for the evaluation. Participants included midwives, health visitors, clinical psychologists, mental health nurses and team leads (see *Appendix 5*, *Tables 7* and *8*). Evaluation findings were categorised into themes and subthemes shown in *Table 2*.

Experiences of the implementation were positive, with reports that the SAAS made it easier to initiate conversations about symptoms with women, and women were more likely to disclose symptoms when discussing their answers to questions in the questionnaire. This was found to be the case particularly when women completed the questionnaire as a self-report, as opposed to HCPs asking questions to women. Acceptability of the new assessment to HCPs was good, particularly for the dimensions of affective attitude, perceived effectiveness and opportunity costs. Recommendations to improve the implementation strategy included adding the SAAS to

TABLE 2 Implementation evaluation themes and subthemes

Themes	Subthemes
Experience of change in practice	• Experience of the implementation • SAAS facilitating conversations • SAAS identified pregnancy-related anxiety • Completing the SAAS (self-report vs. electronic records)
Barriers and facilitators to implementation	• Time available • Support from senior staff at early stages
Acceptability	• Affective attitude • Intervention coherence • Self-efficacy • Perceived effectiveness • Burden • Ethicality
Feasibility	• Knowledge and evidence to make this change in practice • Resources for implementation strategy • Impact on staff or services
Improvements	• Sustainability of change in practice

patients' electronic notes and getting wider buy-in from senior management.

Barriers to implementation were broadly in line with other research.[37] These included restricted time available in appointments to cover an additional assessment; the questionnaire being longer than previous tools in use and concerns that the questionnaire generated more discussion but not having the necessary time to have these discussions with women. For sites in England, women not having English as their first language was a notable barrier. Stigma about anxiety in some cultures, the presence of other people (e.g. partners and children) and the use of a translation service were also reported as potential barriers to women disclosing symptoms. These were used to inform the development of a guide to implementation for healthcare services.

Discussion

Overview of MAP study findings

The impact of perinatal mental health problems on women, and the associated cost to society, underpin the need for robust methods of assessment to identify women with anxiety and provide treatment where needed. The MAP study aimed to determine the most effective, acceptable and feasible method of assessing perinatal anxiety in healthcare services. This was achieved through a systematic, comprehensive programme of research using a range of methodologies. Results were consistent across methodologies, adding to the validity of the findings. Results contribute to the literature on the prevalence of perinatal anxiety in the UK, the acceptability and effectiveness of different assessment measures, the optimal timing of assessment, socioeconomic disparities, the impact of COVID restrictions on perinatal anxiety and implementation of routine assessment of perinatal mental health in healthcare services.

The MAP study found that self-report questionnaire measures of anxiety are acceptable and easy to use, although this was qualified by the extent to which the process was informed and personalised, that is not a 'tick box' exercise. Women thought the benefits of routine assessment of perinatal mental health outweighed any potential negative impacts. Screening in early pregnancy was most accurate at identifying women with anxiety disorders and those who wanted treatment. Of the measures evaluated, the SAAS and CORE-10 were most effective at identifying women who had anxiety disorders or developed anxiety disorders at a later time point.

The prevalence of anxiety disorders was around 20% (one in five women) during pregnancy and post partum combined, with the highest prevalence observed in early pregnancy at 25% (one in four women). The MAP study identified a complex relationship between regional deprivation and the risk for perinatal anxiety, with regional differences in prevalence being explained by sociodemographic composition.

COVID affected around one in three participants in the MAP study, but the perceived impact of this on mental

health was low. More women reported being anxious about the restrictions brought into maternity care during the pandemic, particularly the exclusion of partners and potential separation from the baby.

Implementing perinatal anxiety assessment in healthcare services was feasible and acceptable to health professionals involved. Experience of implementing the SAAS was broadly positive, with the measure facilitating disclosure and focused conversations with women about their anxiety symptoms. Potential barriers to conducting assessments were used to inform a guide to implementation.

Contribution to knowledge

These findings provide insights into the prevalence of anxiety disorders during pregnancy and postpartum, acceptability and effectiveness of different assessment questionnaires, optimal timing of assessment, socioeconomic disparities and impact of COVID on perinatal anxiety. Much of these findings are consistent with previous literature, which suggests that they are robust, or address gaps in knowledge.

Work package 1: acceptability of measures of perinatal anxiety

The qualitative research in WP1 is the first study to use cognitive interviewing to evaluate the ease of use, relevance and acceptability of measures used to assess perinatal anxiety. The findings that self-report measures are acceptable is consistent with previous research.[38] The MAP study extends this research by looking at acceptability across the perinatal period, including postpartum. Anxiety fluctuates throughout the perinatal period,[2] and there may be unique barriers to disclosing mental health difficulties after birth such as concerns of being seen as a 'bad mother'.[39,40] There are also barriers to women accessing support and treatment, such as insufficient staff time, workloads and lack of training among staff, unclear or complicated referral pathways and lack of funding for services.[40,41]

It is therefore important to ensure that the assessment measures are acceptable and relevant to women throughout this time. In addition, historically, the development of assessment tools has not used a collaborative approach with perinatal women. Evaluating acceptability is particularly important now, given the recognised importance of collaborative approaches in research, including patient and public involvement (PPI), co-production and the development of patient-derived outcome measures. Perinatal women are the lay experts in determining whether the tool captures all relevant aspects of perinatal anxiety and whether the tool is acceptable or not. The MAP findings ensure perinatal women have a voice in whether the tools used with them are relevant to them, as per best practice guidance in the development of outcome measures.[42]

The MAP study findings confirm that the measures evaluated are acceptable to women across the perinatal period but that some are more positively evaluated than others. Findings suggest the measure currently recommended by NICE[9] for the screening and assessment of perinatal anxiety in the UK, the GAD-2/GAD-7, may not be the most acceptable or easy to use. However, there was a lot of individual variation in how items were evaluated by women. This included variation in the perceived acceptability of items (e.g. the suicidal intent item), ease of use and preferences in relation to response options and time frame. It is perhaps unsurprising that what is acceptable and easy to use for one person is not necessarily the same for another. The sample for WP1 also did not have a lot of heterogeneity, with very few women from minority groups. This suggests the need for further research on perinatal anxiety assessment that consider variation in what is acceptable to women from different backgrounds.

Work package 2: effectiveness of measures of perinatal anxiety

The MAP study is the first to establish the diagnostic accuracy and effectiveness of measures of anxiety and associated disorders in a large non-clinical UK perinatal population. Results can therefore be used to inform clinical guidelines and research. Although all measures performed reasonably well at identifying anxiety or depressive disorders, the best diagnostic accuracy for anxiety was observed in the CORE-10 and SAAS. The best diagnostic accuracy for depression was observed in the CORE-10 and Whooley questions. Optimal cut-off scores for each measure were the same for identifying anxiety or depression, and measures were psychometrically robust.

This research has several implications. The UK National Screening Committee do not currently recommend universal screening for perinatal mental health disorders, partly because of the lack of evidence on the accuracy of available screening tests.[43] The MAP study shows most measures met criteria for good or excellent diagnostic accuracy, supporting the use of self-report measures in routine assessment of perinatal anxiety or depression. Interestingly, all measures also had a good or excellent diagnostic accuracy for depression despite the fact that most were developed to assess different constructs (i.e. anxiety or general distress). Two measures performed well at identifying both anxiety and depression: the CORE-10 and SAAS.

The optimal time to screen for perinatal anxiety and other mental health problems to maximise effectiveness is critical, but previously unknown. The MAP study shows that screening in early pregnancy is most accurate at identifying women who have anxiety disorders (at any time during pregnancy and postpartum) as well as those who want treatment (at any time during pregnancy and postpartum). These findings were robust in that they were consistent across all five questionnaire measures of anxiety and mental health used. However, it is important to note that this optimal time point is based on statistical diagnostic accuracy and predictive power for women self-reporting anxiety or wanting treatment. It is not based on clinical considerations such as how screening in early pregnancy fits into clinical care pathways, or the effectiveness of screening in terms of improving outcomes for women and their infants. In clinical practice, screening is an initial step which requires further action. Screening does not provide a diagnosis, so it should always be explored further and followed by a full clinical assessment and treatment where needed.[9,12]

The prevalence of perinatal anxiety in this sample was similar to that found in other studies.[2,44] This confirms that the prevalence in the UK is the same as that found elsewhere,[2,44] which adds to the validity of the findings and underscores the importance of early identification and treatment for perinatal anxiety. However, almost 80% of participants with anxiety disorders stated they did not want treatment. The reasons for this are unclear and might have been influenced by the wording of the question which was whether women wanted 'professional help or treatment'. It could be that women felt able to cope with anxiety symptoms by themselves or through other means, such as support from family and peers,[45] and therefore did not find the symptoms to be disabling. Alternatively, the pandemic may have meant women were reluctant to have contact with health services or professionals in case of infection. Multiple other barriers may also deter women from wanting to access professional help or treatment.[37] For example, stigma or lack of confidence in health services may mean women preferred non-medical support or private routes to treatment.

The prevalence of depression in this sample was lower than previous research at 6% (range 2–10.8%).[46] This is probably because we used clinical interviews to determine the prevalence of major depressive disorder rather than using a questionnaire measure of symptoms. Comorbid anxiety was present in most cases, with only 0–2% of participants having depression alone. This highlights the high comorbidity of anxiety with depression, with combined cases being more common than depression on its own. In contrast, 13.1–16.7% of participants had anxiety without depression, suggesting that anxiety screening is likely to identify more women with common affective disorders than screening for depression only.

In many countries mental health research is conducted in geographical locations which cluster around research institutions, with less activity in more deprived regions where mental illness may be more prevalent. National studies of adult psychiatric morbidity, such as the UK Adult Psychiatric Morbidity Survey, have not yet collected enough data on perinatal mental health in women from ethnic minority and deprived groups to enable analysis.[47] The MAP study therefore makes a valuable contribution to this literature, but findings do not support a straightforward relationship between regional deprivation and mental health burden,[32] or socioeconomic status and risk of antenatal anxiety and depression.[48] In fact, the area with the least women living in deprived neighbourhoods had the highest prevalence of anxiety. These findings show that the relationship is more complex and the effect of neighbourhood deprivation depends on context, with women living in deprived neighbourhoods in more affluent regions having a greater perinatal anxiety than those living in deprived neighbourhoods in deprived regions. Women of mixed or multiple ethnicities were also at a greater risk of perinatal anxiety. This implies that social factors, such as social norms, social comparisons and social isolation, are likely to be important.[49]

The COVID pandemic occurred during the MAP study and affected all aspects of peoples' lives during its peak period from 2020 to 2022. Restrictions imposed by the governments limited social contact and movement. Pressures on healthcare services and rapid changes to guidance, policy and protocols during this time not only impacted on the day-to-day running of maternity services but also impacted on women and families who used these services. Qualitative research suggests negative and positive impacts of pandemic-related changes on perinatal women and their families, such as isolation and despair about giving birth in a crisis, but families benefiting from more time at home together.[50]

There is substantial evidence that the pandemic and associated changes influenced women's mental health during pregnancy and after birth.[51–59] Reviews and meta-analyses find an increased postnatal depression, with prevalence from 17% to 24%.[51–59] The impact of the pandemic on anxiety is less clear. Reviews conclude that the pandemic increased anxiety,[53,55,57–59] did not increase anxiety[60] or that the evidence is inconsistent.[61]

The MAP findings confirm that, over time, more participants were infected with COVID and the perceived severity of COVID and its impact on mental health decreased. Pandemic-related restrictions to maternity care affected a greater proportion of participants' than COVID per se, with around 40% reporting feeling very or extremely anxious about their partner not being with them during labour, their partner having to leave shortly after the birth or being separated from baby when compared to 5.66% reporting that COVID had a severe impact on their mental health. The low impact of COVID on mental health in this sample may be because the prevalence of COVID infections (38.4%) was less than the prevalence in the general population at the same time (70.7% England and 51.5% Scotland).[62] It is not clear what underlies this. It is possible that being pregnant and having a newborn baby made women more motivated to avoid catching COVID.

Knowledge about the impact of pandemics and associated restrictions is important for future policy and practice during pandemics and other crises that affect healthcare services. This study suggests pandemic-related restrictions caused anxiety for more women than COVID itself. However, these restrictions played an important part in reducing infections and deaths. Based on the results of this and other studies,[63] we recommend that restrictions that cause high levels of anxiety (i.e. preventing partners' attendance at labour/birth and being separated from the baby) should be carefully considered in future pandemics and only implemented if absolutely necessary.

Work package 3: implementing perinatal anxiety assessment in routine care

The MAP study is the first to look at the acceptability and feasibility of using the SAAS in clinical practice for routine screening of perinatal anxiety. Overall, HCPs indicated that their experiences of the SAAS were positive. The new scale made it easier to initiate conversations about anxiety symptoms with women and facilitated disclosure of symptoms. The SAAS was useful for pinpointing specific problematic symptoms which, in turn, informed HCPs' decisions about the appropriate service to refer women to. However, the meaning of SAAS scores was not always clear and HCPs were sometimes unsure about appropriate referral pathways.

Uncertainty about existing referral pathways was not specific to the SAAS but to mental health assessment more broadly. This aligns with the UK National Screening Committee findings that most women are asked about their mental health and that HCPs are confident about asking, but actions to address anxiety through onward referral are inconsistent across services.[64] To improve the onward process, roles such as specialist midwives in perinatal mental health, or access to other mental health specialists, may be beneficial in supporting HCPs with decisions about symptom management and referral pathways.[64] It is therefore important that HCPs know about NHS and other mental health support services available in their area. Having score ranges for the SAAS (e.g. mild/moderate/severe) would also be beneficial in supporting decisions on management strategies and referrals.

Strengths and weaknesses

The qualitative research in WP1 is the first study to use cognitive interviewing to evaluate the ease of use, relevance and acceptability of measures used to assess perinatal anxiety. Study limitations include that most of the sample were highly educated, employed and white. The sampling strategy meant that there was a high prevalence of self-reported depression and anxiety in our sample compared to the perinatal population. It is therefore important that future research looks at the acceptability and ease of use of these measures in population-based samples as well as diverse groups.

The cohort study with nested diagnostic interviews in WP2 is the first to establish diagnostic accuracy and effectiveness anxiety measures in a non-clinical perinatal population and to examine the optimal time to screen for perinatal anxiety in a large UK cohort. It is also the first to directly examine whether women with anxiety disorders want or receive treatment. The consistency of results across all assessment measures and outcomes of anxiety and wanting treatment adds to the strength of the findings. The sample was more diverse or representative of the general population in terms of ethnicity, age and relationship status, but more highly educated. Rates of anxiety disorders were similar in this sample when compared to other research,[2,65] although previous mental health problems were slightly higher in the subsample that took part in the diagnostic interviews compared to the cohort.

Data were collected during the pandemic, which may have influenced anxiety, although the findings suggest COVID did not affect mental health as much as the restrictions to maternity care. Increased anxiety due to the pandemic or restrictions is unlikely to influence the associations between anxiety symptoms and other variables. However, it may have increased the prevalence of anxiety disorders, particularly disorders such as OCD, which can involve fear of contagion and obsessive behaviours around cleanliness. The pandemic and related restrictions also evolved and changed over time, as did

the availability of vaccines, all of which would have influenced women's responses.

The MAP study evaluated four assessment measures, so it is possible that other measures could perform as well or better than those evaluated. The recommended measures are therefore likely to be acceptable and effective, but they are not necessarily superior to other measures not evaluated here.

The implementation case studies in WP3 are the first to look at the feasibility of using the SAAS for routine assessment of perinatal anxiety and the acceptability of this to HCPs. However, there was variability in implementing the SAAS across sites. HCPs did not always use the scale with women due to a number of factors such as perceived language difficulties with English. HCPs suggested it would be helpful to see the number of cases identified using the SAAS and the referrals made to services. However, this was challenging to obtain, especially in the case of self-referrals to services such as NHS Talking Therapies [previously, Improving Access to Psychological Therapies (IAPT)]. Future research could capture these data to understand more about the referral rates and the appropriateness of referral routes.

Summary

In summary, this study showed that the assessment of perinatal anxiety during pregnancy and after birth is acceptable to women. Two measures were identified that were particularly effective at identifying women with anxiety and those who want treatment. The preferred measure (SAAS) was implemented in three NHS services. Evaluation showed that implementation is feasible and acceptable to health professionals. A guide to implementation was developed to assist NHS services to implement perinatal anxiety assessment more widely.

Patient and public involvement

The MAP study aimed for PPI representatives and researchers to work collaboratively on the development, conduct, interpretation and dissemination of MAP research.

Patient and public involvement structure

The PPI representative organisations in MAP were the National Childbirth Trust (NCT) in England, Maternal Mental Health Change Agents (MMHCA) in Scotland, and the Research Advisory Group (RAG) at the Centre for Maternal and Child Health Research at City, University of London. Members of the research team had collaborated with the NCT, MMHCA and RAG for several years prior to the project, so had established and valued relationships.

The NCT is a UK national charity with 332 branches and 1200 NCT practitioners who provide information, education and advice for women and their partners during pregnancy and after birth. The NCT campaigns as a voice for parents on the issues they care about, and it represents parents on relevant research projects across the UK. The Director of Research and Knowledge at the NCT was a co-applicant on MAP, and three representatives from the NCT worked consecutively on the project to ensure PPI input throughout.

The MMHCA are a group of people with lived experience of perinatal mental illness who work in Scotland to challenge stigma and campaign for better services. They also work in partnership with the Scottish Government to improve awareness of perinatal mental ill health and have won awards in recognition of this work. A member of the MMHCA was a key advocate in the MAP study, providing advice on research design, procedures, materials and dissemination. Sadly, this advocate left halfway through the MAP study to take up another position and the MMHCA did not have capacity to provide another representative.

The RAG is a group of women with experience of pregnancy and birth who advise on research in the Centre for Maternal and Child Health Research at City, University of London. The RAG meets on an ad hoc basis and offers one-to-one specialist feedback or group feedback on research projects. They provide advice on any aspect of research proposals or current projects. Members of the RAG reviewed the MAP research proposal and application. During the project, they reviewed participant-facing materials, for example recruitment materials and patient information sheets.

Patient and public involvement methods

The NCT, MMHCA and RAG were part of the MAP study team as follows:

- Representatives from the NCT and MMHCA were part of the MAP core research team that met every one to two weeks throughout the project and the Programme Management Group that met three to six times a year.
- The research proposal, application and plain language summary were developed with one-to-one advice and reviews from four PPI representatives from the NCT, RAG and London Research Design Service.
- Advice was provided by members of the NCT, MMHCA and RAG on specific aspects of research design and materials, for example recruitment, consent and safe-guarding procedures.

- The NCT and MMHCA assisted recruitment for WP1.
- The NCT facilitated a stakeholder consultation to determine which measure to implement in the NHS services.
- The NCT and MMHCA disseminated the project to the public, suggesting innovative dissemination strategies, e.g., the 2019 Baby Show, the NCT webpage on MAP, NCT Matters publication and activities for World Maternal Mental Health Week.

Outcomes

The PPI members of the team were influential in many actions and outcomes throughout the project. This was particularly valuable in areas where sensitivity to participants was paramount. For example, the MMHCA representative helped develop safeguarding policies for participants who expressed suicidal intent. Wording of risk assessments was reviewed by the MMHCA representative and modified to ensure that questions were supportive, clear and would not trigger participants with trauma histories. PPI representatives also suggested providing resources for MAP participants on the MAP website.

Reflection

The MAP study ran over four years, so it was difficult to maintain continuity over this length of time. This had advantages and disadvantages. Advantages were that the project gained from the different perspectives offered by the various PPI leads over this time. Disadvantages were that it took time to develop the same relationship and engagement with new PPI leads that we had with original PPI leads. Therefore, when a follow-on project was funded (the MAP ALLIANCE project), we set up a dedicated PPI group of participants in the MAP cohort to provide strong PPI input from participants who continue to be part of the study (see www.mapstudy.org/ppi).

Equality, diversity and inclusion

Equality, diversity and inclusion in the MAP study were addressed in five main ways:

1. PPI work
2. recruitment to our study cohort
3. adding a WP to examine the impact of socioeconomic deprivation
4. diversity in the research team
5. opportunities for students and early career researchers.

Through our PPI work, we endeavoured to include the voices of women who are often marginalised within healthcare, whether this is through their status as women experiencing mental health problems or through socioeconomic deprivation or ethnicity status. We worked with organisations who represent many women (NCT, MMHCA and RAG) to ensure we could reach as many minority groups as possible. The MMHCA is particularly concerned with representing and engaging women from diverse socioeconomic backgrounds. The inputs of PPI members on how we communicated with women from different backgrounds were particularly important and contributed to our successful recruitment and retention, especially of those from minority ethnic or deprived socioeconomic backgrounds.

The sample for WP1 lacked diversity, so recruitment to our study cohort was modified to include multiple regions across England and Scotland and to ensure we included women from diverse ethnic and socioeconomic circumstances. This was successful, and the cohort had higher levels of diversity and representation from different ethnic groups than in the general population,[66] as shown in *Table 3*.

We were not able to offer multiple language versions of questionnaires in this study, and this was one of the recommendations from HCPs in WP3 for future implementation. The lack of questionnaires in different languages does not seem to have affected our ability to recruit from diverse ethnic populations, but it may limit implementation of the questionnaires in areas with a high proportion of non-English speaking women. In terms of gender, all participants were women, so we have referred to women throughout.

Adding a WP to examine socioeconomic deprivation enabled us to conduct a secondary analysis of the MAP cohort data to examine perinatal anxiety in areas that reflect higher levels of socioeconomic deprivation and under-researched communities. This led to the award of additional funding to undertake these analyses (WP4).

Diversity in the research team: Our research team included a mix of people in relation to gender, age, ethnicity, disabilities, caring responsibilities and geographical location. We did not collect information in relation to team members' religious beliefs, gender identity, neurodiversity or socioeconomic background. Our team and wider collaborators represented a wide variety of disciplines: healthcare professions (midwifery, general practice, psychology, psychiatry and obstetrics), sociology, anthropology, statistics, epidemiology and public health.

Throughout the project, we provided opportunities for students and early career researchers by sharing learning

TABLE 3 Ethnicity in the MAP cohort sample

Ethnicity	*N*	%
White British	1337	66.5
Black (African/Caribbean/other)	89	4.4
Asian (Bangladeshi/Indian/Chinese/Pakistani/other)	259	12.9
Mixed/multiple ethnicity	91	4.5
Other ethnic background (white)	214	10.6
Other ethnic background (Arab/other)	21	1.0

of research methods, leadership of WPs, opportunities to present at academic conferences and leading on specific publications. We also supported five postgraduate students to gain work experience and knowledge of working on a large multidisciplinary project. Students were included as coauthors in publications that their work contributed to.

Implications for decision-makers

This study directly contributed to the gaps in evidence for screening of perinatal anxiety through identifying the most acceptable and effective tools for assessing perinatal anxiety as well as providing practical guidance for implementing this in routine healthcare practice. We can therefore provide a clear guidance for decision-makers and clinicians regarding screening for perinatal anxiety.

De-implementing currently recommended measures

The tools currently recommended by NICE guidelines to screen for perinatal anxiety[9] (the GAD-2 and GAD-7) did not perform as well as other measures, and optimal cut-offs on these measures were lower than the currently recommended cut-offs. We therefore recommend use of the GAD-2 and GAD-7 is de-implemented, and clinical guidelines are revised in light of the findings from MAP and other studies.[65] Although it was not a primary objective, results showed that the CORE-10 and Whooley were effective for assessing depression. Thus, findings support current NICE recommendations to use the Whooley questions to assess perinatal depression.[9]

Implementing new assessment measures

The MAP findings suggest the CORE-10 or SAAS offer more acceptable and effective assessments of perinatal anxiety than the currently recommended tool. In our consultation, the SAAS was preferred by women and HCPs, as well as being one of the most acceptable and effective measures. However, before implementing the routine assessment of perinatal anxiety, it is important that health services are adequately resourced to provide appropriate referral pathways and treatments. Research is needed to ensure that screening and treatment pathways are effective at improving outcomes for women as well as being cost-effective.

If new measures are implemented, the choice of measure will partly depend on how the measure is utilised. For example, if a service wants to assess anxiety and depression separately, they might employ the SAAS and Whooley, or SAAS and CORE-10, respectively. If a service prefers a general, one-off screening tool to identify women with anxiety or depression, they might employ the CORE-10 and then follow-up the women who score over the cut-off scores with a more detailed assessment. Decisions about which measure to use will be influenced by local practice, service constraints and preferences about the length of the scale, ease of use, patient burden, etc.

Decisions about assessment also need to consider the balance between sensitivity and specificity at different points in the care pathway. For initial screening, it is important that a measure has high sensitivity (i.e. picks up most women who have potential anxiety) to minimise false negatives, which might result in women with anxiety being missed. Once women at risk of anxiety disorders are identified, subsequent assessment might prioritise specificity (i.e. identifying people with the disorder) to minimise false positives, which might result in those without a disorder being referred to specialist services.

However, prior to introducing a new national assessment measure, further research is needed to determine its effectiveness in facilitating access to appropriate treatments and improving outcomes for women and children.

Recommended timing of assessment

The MAP study suggests that early pregnancy is the optimal time to screen for perinatal anxiety. These results have clear implications for clinical practice, policy and research. The consistency of findings across all the questionnaires suggests that screening in early pregnancy may be optimal, regardless of the questionnaire used. This makes it simpler to implement in policy and practice, as it reduces the need to standardise the screening tool used beforehand. Healthcare services that already screen for perinatal anxiety could continue to use existing screening tools and ensure screening is conducted in early pregnancy. In this study, early pregnancy questionnaires were completed around 11 weeks' gestation, which coincides with maternity care appointments in many countries, such as pregnancy booking or scan appointments, so results support continued mental health screening at this time.

In this study, receiving treatment was most strongly associated with anxiety screening in late pregnancy or postpartum. This could be due to multiple factors. It may be that anxiety in early pregnancy is normalised, so referrals are not made until later in pregnancy when it is clear that anxiety is chronic. Delays in referrals mean women are more likely to access treatment in late pregnancy or postpartum.[67] This highlights the importance of not normalising results of screening and referring earlier where needed. Alternatively, the association between anxiety screening in late pregnancy/postpartum and treatment might reflect delays in women accessing treatment after they have been referred. Referrals were not measured in this study, so it is difficult to know whether this is the case.

Implementing assessment

Despite the high prevalence of perinatal mental health problems in UK, it is estimated that fewer than half of women with problems are identified during routine maternity care appointments.[68,69] This would indicate that despite clinical guidelines and recommendations, there is an issue with implementing such guidance in routine clinical care. The acceptability and use of screening among HCPs require more focus.

The MAP study showed that HCPs' experience of using the SAAS during the implementation was positive. There was general agreement that the benefits of using the SAAS outweighed any opportunity costs. Among the barriers mentioned, time was the most frequent. However, after the SAAS was implemented, HCPs concluded that if the SAAS replaced the current GAD-2/GAD-7 assessment, time would not be a significant issue. A key recommendation was to include the SAAS in patients' electronic notes as one of the standard screening measures for perinatal mental health problems, as this would limit the administrative time required to transfer scores from the paper version of the scale (although having paper copies was also seen as facilitating 'ease of use'). This was also seen as important for long-term sustainability of changes to screening and assessment.

Using self-report questionnaire measures in maternity and other healthcare services has the following advantages: they can be administered to large numbers of women at low cost and they are quick and provide standardised assessment. However, barriers such as stigma and fear of consequences may determine whether women are prepared to disclose difficulties and accept treatment.[41] Reducing barriers therefore has to be considered by services to facilitate wider implementation.

Other recommendations to facilitate implementation are that the key figures at sites (e.g. specialist midwives in perinatal mental health) have a proactive approach to ensure consistent implementation of the SAAS. At a management level, enablers to implementation included buy-in from the senior management and awareness of the SAAS among all services and HCPs who might receive referrals based on use of the scale.

Implementing assessment of perinatal anxiety needs to be integrated into existing or new care pathways so that referral options are clear for health professionals. Treatment of perinatal anxiety in the UK can involve maternity services, primary care and community hubs, community mental health teams, Talking Therapies (previously IAPT) and specialist perinatal mental health services. MAP findings confirm that one in five women meet the diagnostic criteria for anxiety disorders, so may require referral to mental health services, although some of these women might not want referrals. Research is needed to understand more about why some women with anxiety disorders do want referrals and whether routine screening impacts on this. For current practice, these findings highlight the importance of relationship-based care where individual needs and contextual barriers to treatment can be explored, so appropriate action is taken.

Implementation guide

An implementation guide for services to facilitate uptake of the SAAS in clinical practice was developed (see *Report Supplementary Material 1*). Key recommendations for successful implementation include: (1) buy-in from senior management regarding the use of a new scale, as this has a

direct impact on the HCPs' attitude towards the scale and increases motivation; (2) ensuring all HCPs using the SAAS have attended information sessions on its use; and (3) ensuring that all services where women may be referred to are aware of the scale and have some basic knowledge of it.

Research recommendations

The MAP study provides rigorous evidence on important aspects of screening for perinatal anxiety, including acceptability, diagnostic accuracy and optimal timing, and it has explored the implementation of the optimal screening tool (SAAS) into clinical practice. We recommend the following four priority areas for future research.

Evaluating wider implementation of the Stirling Antenatal Anxiety Scale

The MAP study provided evidence that implementing the SAAS into clinical practice in three NHS sites was feasible and acceptable, and an implementation guide for NHS services has been produced. However, bringing about sustained changes in clinical practice on a large scale is challenging and complex. Research informed by implementation science approaches is required to confirm the most effective methods of wider implementation, especially in the context of pressures on HCPs and services as well as the difficulty of onward referrals if treatment services are not available.

Determining the effectiveness of screening for improving outcomes for women and their infants

The MAP study established the diagnostic accuracy and optimal cut-off scores for measures of anxiety in a large non-clinical UK population of women in pregnancy and after birth. The study also enabled comparison between measures to identify which are most effective at the screening and assessment of perinatal anxiety. However, the effectiveness of screening and treatment programmes is unknown. A randomised controlled trial is therefore required to determine whether antenatal screening for perinatal anxiety is effective in improving health outcomes for women and their infants by using screening tools like the SAAS that have robust evidence for diagnostic accuracy and acceptability as well as initial evidence of feasibility. A phase III trial of effectiveness in clinical settings is now required to determine whether screening for anxiety in early pregnancy as part of a clinical care pathway is effective at improving anxiety and other related health outcomes for women and infants in the short and long term.

Understanding the impact of deprivation and ethnicity on perinatal mental health

The MAP findings indicated a complex relationship between regional deprivation and risk for perinatal anxiety. The relationship between regional deprivation and risk of antenatal anxiety and depression was not straightforward. Regional differences in the prevalence of perinatal anxiety were explained by the sociodemographic context, that is in terms of neighbourhood deprivation and ethnic composition. Further research is needed to explore this further and understand the mechanisms underlying the interplay between socioeconomic deprivation and perinatal mental health in populations from different backgrounds and ethnicities.

Understanding and overcoming barriers to mental health treatment

There may be multiple reasons why a woman might not want or access treatment. These will depend on the woman, her symptoms, circumstances and the context in which screening is offered. Further research is needed to better determine the proportion of women with anxiety who are referred and access treatment, why women with anxiety might not want professional help or treatment and how these barriers may be overcome.

Conclusions

The significant impact of perinatal anxiety on women and society underpins the need for robust methods of assessment to identify and treat women with perinatal anxiety. The MAP study was an ambitious programme of research which aimed to determine the most effective, acceptable and feasible method of assessing perinatal anxiety. The study's findings covered the acceptability and effectiveness of different assessment measures, the optimal timing of assessment, prevalence of anxiety disorders, socioeconomic disparities, the impact of COVID on perinatal anxiety and the feasibility of implementing assessment in healthcare services. This report also outlines the involvement of PPI representatives in the MAP study, emphasis on equality, diversity and inclusion as well as implications for healthcare practice.

Results show that routine assessment of perinatal anxiety is acceptable to women, effective and feasible to implement in NHS services. Diagnostic accuracy for perinatal anxiety was greatest for the SAAS and CORE-10, and the GAD-2/GAD-7 performed least well. Although two measures met criteria for implementation, the SAAS was preferred by stakeholders. Implementation case studies showed the SAAS was feasible to implement and

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acceptable to health professionals. Potential barriers to conducting assessments were used to inform a guide to implementation for NHS services.

The prevalence of anxiety disorders was around 20%, with highest rates in early pregnancy at 25%. Early pregnancy was the optimal time for identifying participants with anxiety disorders and/or who wanted treatment. Increased anxiety on all measures was associated with greater difficulties with daily living, poorer quality of life and participants wanting treatment. However, most women with anxiety disorders did not want professional support or treatment. A complex relationship was found between regional deprivation and perinatal anxiety, with regional differences in prevalence being explained by sociodemographic composition.

The MAP findings have various implications for practice and policy. Routine assessment of anxiety in pregnancy and after birth is feasible and should be rolled out more widely in NHS services. We recommend screening is conducted in early pregnancy using the SAAS or CORE-10. We do not recommend using the GAD-2, which is currently recommended by UK clinical guidelines.[9] Results support clinical guidelines to use the Whooley questions to screen for perinatal depression. Barriers to women wanting and accessing treatment need to be considered by healthcare services and should be explored further by research. The MAP implementation guide provides recommendations on how to minimise key barriers. These findings provide evidence to support the routine assessment of perinatal mental health, so can inform national and international guidelines on screening,[43,70] but it is important that the effectiveness of screening at improving outcomes for women is evaluated alongside any wider implementation.

Additional information

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Data-sharing statement

Individual participant-level data are not available, but authors can provide research materials, analytic codes and sample-level data and information upon reasonable request to the corresponding author. The study protocol is available at https://njl-admin.nihr.ac.uk/document/download/2034506.

Ethics statement

All participants gave their written informed consent to participate. Ethical approval for the MAP study was obtained for each WP as follows. WP1: City, University of London School of Health Sciences Ethics Committee (ETH1819-0689, 23 April 2019). WP2: NHS Research Ethics Committee (20/WS/0065, 30 April 2020); City, University of London School of Health Sciences Ethics Committee (ETH1920-0572, 8 May 2020); Health Research Authority (IRAS 274901, 15 May 2020). WP3: City, University of London School of Health Sciences Ethics Committee (ETH2223-1651, 8 March 2023); Health Research Authority (22/HRA/5484, IRAS 321790, 30 January 2023).

Information governance statement

The MAP study adhered to the principles of information governance outlined by the UK Data Protection Act (2018) and the General Data Protection Regulation (GDPR) (2016/679). City, University of London was the data controller. We are committed to ensuring the confidentiality, integrity and availability of research data, protecting the privacy rights of participants and complying with ethical standards and regulatory requirements.

Confidentiality and anonymity

All information collected during the MAP study was treated with strict confidentiality. Data were anonymised and held under unique participant identifiers. All data were stored in accordance with data protection laws. Personal information was held in password-protected electronic databases on secure servers at City, University of London. Paper records with personally identifying information were held securely at the University or by University staff (during the pandemic) and were destroyed after they were recorded electronically or at the end of the project. Only authorised members of the research team had access to the data. Published results did not include any identifiable information about individual participants.

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/RRHD1124.

Primary conflicts of interest: Andrea Sinesi, Helen Cheyne and Margaret Maxwell developed and published one of the measures evaluated by the MAP study (the SAAS). Susan Ayers, Rose Meades, Andrea Sinesi, Helen Cheyne, Margaret Maxwell, Catherine Best and Judy Shakespeare are part of a follow-on project funded by the NIHR, MAP ALLIANCE (NIHR133727). All other authors declare no competing interests.

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This synopsis was published based on current knowledge at the time and date of publication. NIHR is committed to being inclusive and will continually monitor best practice and guidance in relation to terminology and language to ensure that we remain relevant to our stakeholders.

Publications

Williams LR. *The Clarity, Acceptability and Relevance of Self-Report Scales to Screen for* Perinatal *Anxiety*. Annual Conference of the Society for Reproductive and Infant Psychology, Online, 2021.

Meades R. *Acceptability of Screening for Suicidal Ideation during the* Perinatal *Period: Preliminary Findings from Cognitive and In-Depth Qualitative Interviews*. Annual Conference of the Society for Reproductive and Infant Psychology, Online, 2021.

Sinesi A. *The Relevance, Acceptability and Clarity of Self-Report Scales to Screen for* Perinatal *Anxiety*. International Marce Society Conference, London, UK, 2022.

Meades R. *Diagnostic Accuracy and Psychometric Properties of Measures of Affective Disorders in Pregnancy and Postpartum*. Annual Conference of the Society for Reproductive and Infant Psychology, Lausanne, Switzerland, 2023.

Andrea Sinesi. *Methods of Assessing* Perinatal *Anxiety (MAP): Diagnostic Accuracy of Self-Report Measures*. NRS Mental Health Network Annual Scientific Meeting. Strathclyde, UK, n.d.

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List of abbreviations

aOR	adjusted odds ratio
AUROC	area under the receiver operating characteristic
CI	confidence interval
CORE-10	Clinical Outcomes in Routine Evaluation – 10 item version
COVID	coronavirus disease
COVID-19	coronavirus disease discovered in 2019
EQ-5D-5L	EuroQol-5 Dimensions, five-level version
GAD	generalised anxiety disorder
GAD-2/GAD-7	General Anxiety Disorder Questionnaire, 2-item, or 7-item version
HCP	healthcare professional
IAPT	Improving Access to Psychological Therapies
IMD	Index of Multiple Deprivation
MAP	Methods of Assessing Perinatal anxiety
MINI	Mini International Neuropsychiatric Interview
MMHCA	Maternal Mental Health Change Agents
NCT	National Childbirth Trust
NICE	National Institute for Health and Care Excellence
NIHR	National Institute for Health Research
OCD	obsessive–compulsive disorder
OR	odds ratio
PARIHS	Promoting Action on Research Implementation in Health Services
Perinatal	time from conception to 12-month post partum
PPI	patient and public involvement
PTSD	post-traumatic stress disorder
RAG	Research Advisory Group
SAAS	Stirling Antenatal Anxiety Scale
SD	standard deviation
SSC	Study Steering Committee
WP	work package
WP1	work package 1
WP2	work package 2
WP3	work package 3
WP4	work package 4

List of supplementary material

Report Supplementary Material 1
Implementation guide

Supplementary material can be found on the NIHR Journals Library report page (https://doi.org/10.3310/RRHD1124).

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.

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Appendix 2 Perinatal anxiety measures evaluated by the methods of assessing perinatal anxiety study

TABLE 4 Measures of perinatal anxiety evaluated by the MAP study

Questionnaire	GAD-2/GAD-7[a]	Whooley questions[b]	CORE-10[c]	SAAS[d]
Description	Two questions taken from the original 7-item version. If a woman scores ≥ 3 on the GAD-2, the GAD-7 can be used for further assessment and referral	Two questions widely used in maternity services to assess depression	A 10-item measure of psychological distress, which covers a range of symptoms of distress and associated functioning, including anxiety	A clinically derived 10-item measure that includes both general and pregnancy-specific anxiety symptoms
Responses	Not at all/several days/more than half the days/nearly every day	Yes/no	Not at all/only occasionally/sometimes/often/most or all of the time	Never/rarely/sometimes/often/always
Rationale for inclusion in study	Acceptable validity and reliability of the GAD-7 have been reported in perinatal women[17] The Royal College of Psychiatrists, NICE Guidelines and NHS England recommend the GAD-2/GAD-7 as one of a few measures to use with perinatal women.[8,18] However, the current evidence for use of the GAD-2/GAD-7 with UK perinatal women is limited with some evidence that the GAD-2 is inappropriate for screening for anxiety in pregnancy[12]	High sensitivity and variable specificity in identifying perinatal depression has been reported.[19] Whooley Questions may also be appropriate to assess perinatal anxiety and other mental disorders.[11] Potential suitability to assess perinatal anxiety and mental disorders is based on its widespread clinical use and indication that it identifies other mental disorders. However, current evidence for the Whooley questions to assess perinatal anxiety is limited	Derived from the larger clinical outcomes in routine evaluation-outcome measure, a well-established measure used in counselling and clinical psychology services in the UK.[14] The CORE-10 is a preferred outcome measure for the NHS Talking Therapies services in England.[20] It is recommended as one of a few measures to use with perinatal women.[18] Good psychometric properties with perinatal women have been reported, but current evidence is limited[13]	Developed from a systematic review of existing anxiety scales; interviews with women who experienced antenatal anxiety; and a Delphi study with clinicians with expertise in perinatal mental health. The SAAS has excellent sensitivity, good specificity and showed superior performance compared to the GAD-2 and GAD-7. It was also considered acceptable to pregnant women. It includes both general and pregnancy-specific anxiety items. However, the evidence on the accuracy and acceptability of the SAAS is limited to one study[15]

a Spitzer *et al.*[10]
b Whooley *et al.*[11]
c Barkham *et al.*[15]
d Sinesi *et al.*[16]

Appendix 3 Work package 1 sample characteristics

TABLE 5 Work package 1 sample characteristics

	Total sample *N* = 41 *n* (%)
Age (years)	
23	1 (2.4)
25–29	10 (24.4)
30–34	11 (26.8)
35–40	19 (46.3)
Recruitment site	
England	4 (58.5)
Scotland	17 (41.5)
Ethnic background	
White Caucasian	38 (92.7)
Asian	1 (2.4)
Multiple ethnic groups/mixed	2 (4.8)
Education	
A level/other level 3 qualification	6 (14.6)
Degree/other level 4 qualification	11 (26.8)
Higher degree/level 5+ qualification	24 (58.5)
Employment status	
Employed	38 (92.7)
Unemployed	2 (4.8)
Other (student)	1 (2.4)
Pregnancy/postpartum stage	
12 weeks	6 (14.6)
22 weeks	6 (14.6)
31 weeks	13 (31.7)
6 weeks post partum	16 (39.0)
Probable depression or anxiety	
Depression	17 (41.5)
Anxiety	7 (17.1)

Appendix 4 Work package 2 sample characteristics

TABLE 6 Work package 2 sample characteristics

		Cohort sample, *N* = 2243, *n* (%)[a]	Diagnostic interview sample, *N* = 403, *n* (%)[b]
Relationship status	In a relationship but not cohabitating	164 (8.2)	14 (3.7)
	Cohabitating	682 (34.2)	128 (34.1)
	Married/civil partnership	1072 (53.7)	223 (59.5)
	Separated/divorced/single	79 (3.9)	10 (2.7)
Education	None	49 (2.4)	3 (0.8)
	Secondary education	193 (9.6)	19 (5.0)
	Postsecondary education	284 (14.1)	49 (13.0)
	Vocational qualification	246 (12.2)	35 (9.3)
	Degree or equivalent	819 (40.7)	165 (43.8)
	Postgraduate degree or equivalent	364 (18.1)	87 (23.1)
	Doctorate	56 (2.8)	19 (5.0)
Ethnicity	White British	1337 (66.5)	274 (72.5)
	Black (African/Caribbean/other)	89 (4.4)	13 (3.4)
	Asian (Bangladeshi/Indian/Chinese/Pakistani/other)	259 (12.9)	31 (8.2)
	Mixed/multiple ethnicity	91 (4.5)	13 (3.5)
	Other ethnic background (white)	214 (10.6)	44 (11.6)
	Other ethnic background (Arab/other)	21 (1.0)	3 (0.8)
Previous pregnancy		1363 (62.1)	236 (60.1)
Previous mental health disorder		742 (34.5)	149 (39.9)
Anxiety disorders (MINI)			80 (19.9)

a Missing values mean *n* ranges from 2022 to 2196.
b Missing values mean *n* ranges from 373 to 403.

Appendix 5 Work package 3 site and sample characteristics

TABLE 7 Work package 3 NHS implementation sites

Site E1	Site E2	Site S1
England site (E1) is a secondary care NHS trust which serves London. Community midwives typically carry out perinatal mental health screening at antenatal booking appointments. Midwives are supported by specialist perinatal mental health midwives who can advise on the best pathways for care. Depending on the severity of anxiety and depression symptoms, referrals may be to the GP, local NHS Talking Therapies services or specialist perinatal mental health service through a dedicated team	England site (E2) is an NHS Community Healthcare trust which serves a population across London. The health visiting team (family nurses) carry out perinatal mental health screening at antenatal appointments, the new birth contact, and 6–8 weeks postpartum review	Scotland site (S1) is an NHS Health Board. Perinatal mental health screening is conducted by community midwives. If women have anxiety, an advanced specialist midwife in Perinatal Mental Health Team supports decisions regarding the appropriate pathways of care. Referral options include referral to GPs and provision of online cognitive behavioural therapy. Specialist services include the Maternity and Neonatal Psychological Interventions service and the Perinatal Mental Health Team

GP, general practitioner.

TABLE 8 Work package 3 sample characteristics (post implementation)

	n (%)
Job role	
Midwife	12 (44)
Community midwife	4 (15)
Specialist perinatal mental health midwife	3 (11)
Health visitor	2 (7)
Clinical psychologist	2 (7)
Team lead/service manager	2 (7)
Obstetrician	2 (7)
Participating site	
E1	10 (37)
E2	2 (7)
S1	15 (55)

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Appendix 6 Acceptability findings

TABLE 9 Acceptability results mapped onto a theoretical framework of acceptability[22]

Indicator of acceptability	Explanation	Example quotes
Affective attitude	Participants reported either a lack of or no assessment during their antenatal and postnatal care Most found assessment to be beneficial and positive and expressed a desire for more assessment, particularly during pregnancy	*I think that was really useful so felt very knowledgeable about it. So if it was going to happen I would happily answer these questionnaires and hold my hands up and say I needed some help.* EP10 *I think it's really positive. I hope it would pick up things or issues that need, people that need the help, and I'm all for it.* EP13 *I suppose it is important to ask at the start, there's no harm in asking every time, but I think women need to be aware of the circumstances around how they're asking and not make it feel like it is just a tick box.* SP09
Burden	No significant burdens reported, though potential barriers were identified Participants had a range of views about the preferred place and method (online vs. paper) for completing a questionnaire assessment	*I think screening is a good thing, I think that it needs to be robust enough … I don't think anything would make me drop out on this occasion, because I know that I need the help. If I wasn't as confident and comfortable in saying that, if it takes too long, if it seems too arduous a task, if it involves phone calls, online forms, setting up registration details that you don't have. To me it seems much easier to just be a piece of paper that you can tick.* EP24 *Me personally I would answer it as many times as I got it, but is that because I feel quite confident in my answers and I feel fine answering them? Do I want to be reminded how depressed I am every time I answer it if I'm on the other side? I think it would depend on where that person is.* EP18 *After the birth, it has to be at home because the stress to the mother of trying to get the baby out and meet a deadline on time, it's just added unnecessary stress.* EP13
Ethicality	Some spoke about the implications of assessment and records about mental health, mostly the fear of social services becoming involved and separating them from their children. They highlighted this as key reason why it is important to inform people about the nature of the questions being asked	*The doctor might think it's a casual tick box exercise and you're sitting there thinking, 'they're going to take this baby away', because that's how they show it on telly.* EP05 *The reason that I would worry about answering those sorts of things honestly, is because I'd be thinking, 'do people think I'm a danger to my family or to my child? Or is something going to happen now, which means they're worried about safety, from the Social Services point of view?' That shouldn't be a reason not to answer it accurately, because you would hope that if that was a genuine fear or concern, that you would be supported through that rather than removed from your child.* EP06 *From my own opinion I think it's great, it's more knowledge, more information. Some people might find it's quite intrusive if they're quite private and if they want it to just be about their physical health.* SP03
Intervention coherence	The majority of participants interviewed did not know what would happen after an assessment, particularly if they scored highly on a questionnaire	*I assume you do these sort of tick boxes and then it gets put into a computer somewhere and then an algorithm spits out high alert, medium, low and then the professional contacts you if you're over a certain threshold, is that right?* EP21 *I would imagine there would be a referral, won't there? Someone that would then get involved, but I don't know who that would be, or what would happen.* SP02

TABLE 9 Acceptability results mapped onto a theoretical framework of acceptability[17] (*continued*)

Indicator of acceptability	Explanation	Example quotes
Opportunity costs	Most participants thought the benefits of assessment outweighed the costs	*I think it saves money in the long run, if you invest at the beginning. If someone was having anxiety issues at the beginning, you could put some sort of coping strategies in to begin with, you're less likely to find someone who ends up in a full mother and baby unit, due to lack of coping later on. If people are more open about their mental health and how they're feeling, you're going to save money in the other end of the pressures of Health Visiting, the amount of visits that will be needed to follow up ….* SP07 *I don't find it annoying because I know that it's important for the people that are struggling and I think to have however many people maybe annoyed along the way is a decent enough payoff for catching people who are really, really struggling.* SP08
Perceived effectiveness	Most participants viewed questionnaires as better than a general 'How are you feeling?' question, which was viewed as indicative of superficial support Emphasis was placed on assessment being to connected to a further conversation with a HCP and support	*Actually give it the time it really deserves, because I don't think people give it the time it deserves, it's always seen as a tick box exercise, that's kind of just added on … I think it'd make people more honest, because if you feel like you've just gone in and you've mentioned things and nothing's happened, then you just think well there's no point. What's the point next time I mention anything, because nothing's going to happen anyway.* SP07 *Scales can be quite useful – if someone ticks a certain box, you can then say to them more about that. It opens up conversation. I do struggle with scales used just to input a number on a computer, which I think is how they're often used in mental health services, but I think it can be a useful tool and maybe using them across time as well to see if there's any change.* SP09
Self-efficacy	Most felt they could complete the questionnaires but identified potential deterrents from completing questionnaires honestly, especially if it was perceived to be a 'tick box' exercise	*You're just exposing yourself to someone, you've just got to be happy to be vulnerable, which some people are and some people aren't.* EP13 *[M]aybe the fear of disclosure of some questions probably I would not necessarily answer all of them, but to drop out completely I can't think of a reason why I would do that.* EP09 *I think [screening] should be for everyone, but only because I think we've not normalised it, and until we normalise it, people won't be honest about things.* SP07

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Appendix 7 Diagnostic accuracy analyses

TABLE 10 Sensitivity, specificity, likelihood ratios and negative predictive values of measures for anxiety diagnosis

	Sensitivity (95% CI)	Specificity (95% CI)	LR+	LR−	NPV	Youden's Index
GAD-2 cut-off scores						
≥ 2	**70.89 (66 to 75)**	**76.16 (72 to 80)**	**2.97**	**0.38**	**0.91**	**0.47**
≥ 3	37.97 (33 to 43)	92.57 (90 to 95)	5.11	0.67	0.86	0.31
≥ 4	29.11 (25 to 34)	95.98 (94 to 98)	7.23	0.74	0.85	0.25
GAD-7 cut-off scores						
≥ 6	**64.56 (60 to 69)**	**75.78 (72 to 80)**	**2.67**	**0.47**	**0.90**	**0.40**
≥ 7	55.70 (51 to 61)	82.92 (79 to 87)	3.26	0.53	0.88	0.39
≥ 8	45.57 (41 to 50)	88.20 (85 to 91)	3.86	0.62	0.87	0.34
≥ 9	41.77 (37 to 47)	90.68 (88 to 94)	4.48	0.64	0.86	0.32
CORE-10 cut-off scores						
≥ 9	**69.62 (65 to 74)**	**78.95 (75 to 83)**	**3.31**	**0.38**	**0.91**	**0.49**
≥ 10	64.56 (60 to 69)	82.35 (79 to 86)	3.66	0.43	0.90	0.47
≥ 11	59.49 (55 to 64)	86.69 (83 to 90)	4.47	0.47	0.90	0.46
≥ 12	56.96 (52 to 62)	88.85 (86 to 92)	5.11	0.48	0.89	0.46
SAAS cut-off scores						
≥ 9	**83.54 (80 to 87)**	**72.76 (68 to 77)**	**3.07**	**0.23**	**0.95**	**0.56**
≥ 10	77.22 (73 to 81)	74.61 (70 to 79)	3.04	0.31	0.93	0.52
≥ 11	68.35 (64 to 73)	76.16 (72 to 80)	2.87	0.42	0.91	0.44
≥ 12	65.82 (61 to 70)	79.26 (75 to 83)	3.17	0.43	0.90	0.45
Whooley cut-off scores						
≥ 1	**58.75 (54 to 64)**	**75.54 (71 to 80)**	**2.40**	**0.55**	**0.88**	**0.34**
≥ 2	42.50 (38 to 57)	92.88 (90 to 95)	5.97	0.62	0.87	0.35

LR, likelihood ratio; NPV, negative predictive value.

Note
Values in bold indicate optimal cut-off scores.

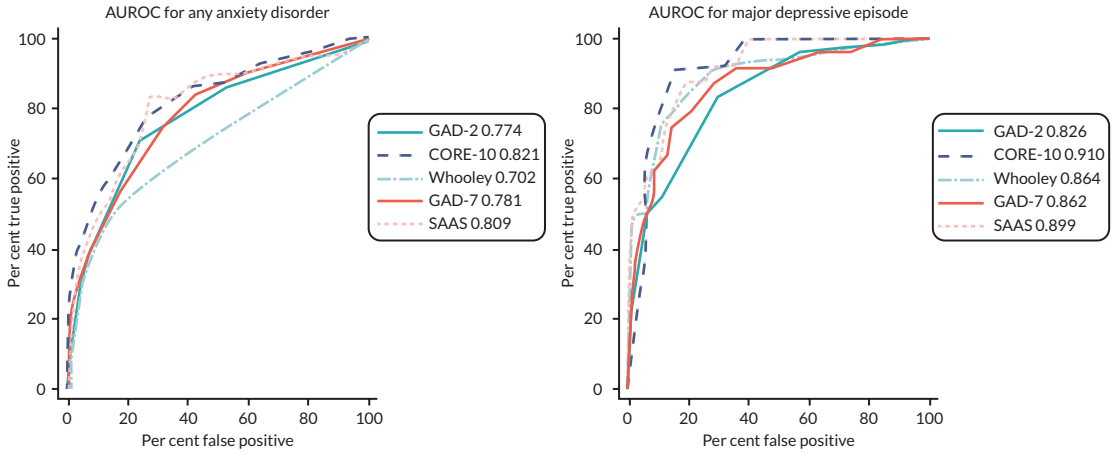

FIGURE 5 Area under the receiver operating curve for diagnostic accuracy of measures (*N* = 403).

TABLE 11 Association between perinatal anxiety measures and poor outcomes

	Difficulties in daily activities OR (95% CI) *N* = 5294[a]	HRQoL mean difference (95% CI) *N* = 5121[a]	Want treatment OR (95% CI) *N* = 1337[b]
GAD-2	11.88 (9.46 to 14.90)	−9.74 (−10.97 to −8.50)	5.03 (3.07 to 8.25)
GAD-7	13.70 (11.36 to 16.52)	−8.04 (−8.99 to −7.08)	4.27 (2.63 to 6.94)
CORE-10	13.43 (11.14 to 16.19)	−7.34 (−8.24 to −6.45)	5.80 (3.36 to 10.01)
SAAS	16.48 (13.49 to 20.13)	−7.91 (−8.83 to −6.98)	5.52 (3.16 to 9.65)
Whooley	14.13 (11.69 to 17.09)	−7.78 (−8.69 to −6.86)	2.85 (1.87 to 4.35)

a Scores on measures were combined across all four time points.
b participants only answered the question on whether they wanted treatment if they identified as currently experiencing psychological problems, so *N* is smaller.

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Appendix 8 Optimal time to assess anxiety to identify women who want treatment

TABLE 12 Optimal time to assess anxiety to identify women who want treatment

	GAD-2		GAD-7		CORE-10		SAAS		Whooley	
	OR	*z*	OR	*z*	OR	*z*	OR	*z*	OR	*z*
Early pregnancy	1.35***	4.76	1.13***	5.24	1.16**	7.13	1.11***	5.66	2.02***	5.68
Mid-pregnancy	1.11	1.41	1.03	1.1	1.00	0.15	0.99	-0.71	1.38*	2.33
Late pregnancy	1.33***	3.34	1.07*	2.27	1.05	1.8	1.07*	3.01	1.58**	3.28
Postpartum	1.27***	3.79	1.07**	3.16	1.07***	3.68	1.04**	2.72	1.50**	3.25
N	1016		1007		1000		1010		1020	
Log-likelihood	−350.39538		−346.25403		−311.97684		−332.62361		−344.8805	
BIC	735.4089		727.08171		658.49245		699.83575		724.3988	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
BIC, Bayesian information criterion.

Appendix 9 Prevalence of anxiety disorders

TABLE 13 Prevalence of anxiety disorders over time

	Early pregnancy *N* = 102 % (95% CI)	Mid-pregnancy *N* = 99 % (95% CI)	Late pregnancy *N* = 102 % (95% CI)	Postpartum *N* = 100 % (95% CI)	Total *N* = 403 % (95% CI)
Anxiety disorders					
All anxiety disorders	25.5 (17.4 to 3.1)	19.2 (12.0 to 28.3)	15.7 (9.2 to 24.2)	19.0 (11.8 to 28.1)	19.9 (16.1 to 24.1)
GAD	5.9 (2.2 to 12.4)	6.1 (2.3 to 12.7)	4.9 (1.6 to 11.1)	6.0 (2.2 to 12.6)	5.7 (3.7 to 8.4)
Panic disorder	4.9 (1.6 to 11.1)	4.0 (1.1 to 10.0)	4.9 (1.6 to 11.1)	2.0 (0.0 to 7.0)	4.0 (2.3 to 6.4)
Agoraphobia	6.9 (2.8 to 13.6)	2.0 (2.5 to 7.1)	4.9 (1.6 to 11.1)	5.0 (1.6 to 11.3)	4.7 (2.9 to 7.3)
Specific phobia	4.9 (1.6 to 11.1)	1.0 (0.0 to 5.5)	4.9 (1.6 to 11.1)	3.0 (0.6 to 8.5)	3.5 (1.9 to 5.8)
Social anxiety	2.9 (0.6 to 8.4)	3.0 (0.60 to 8.60)	3.9 (1.1 to 9.7)	3.0 (0.6 to 8.5)	3.2 (1.7 to 5.5)
OCD	13.7 (7.7 to 22.0)	9.1 (4.2 to 16. 6)	3.9 (1.1 to 9.7)	6.0 (2.2 to 12.6)	8.2 (5.7 to 11.3)
PTSD	2.9 (0.6 to 8.4)	1.01 (0.0 to 5.5)	5.9 (2.2 to 12.4)	0 (0 to 3.6)	2.5 (1.2 to 4.5)
Major depressive disorder	10.8 (5.5 to 18.5)	6.1 (2.3 to 12.7)	2.0 (0.2 to 6.9)	2.0 (1.6 to 11.3)	6.0 (3.8 to 8.7)
Comorbid anxiety and depression					
No diagnosis	72.5 (62.8 to 80.9)	80.8 (71.7 to 88.0)	83.3 (74.7 to 89.9)	80.0 (70.8 to 87.3)	79.2 (74.8 to 83.0)
Anxiety only	16.7 (10.0 to 25.3)	13.1 (7.2 to 21.4)	14.7 (8.5 to 23.1)	15.0 (8.6 to 23.5)	14.9 (11.6 to 18.7)
Depression only	2.0 (0 to 6.9)	0.0 (0 to 3.7)	1.0 (0 to 5.3)	1.0 (0 to 5.4)	1.0 (0.2 to 2.5)
Anxiety and depression	8.8 (4.1 to 16.1)	6.1 (2.3 to 12.7)	1.0 (0 to 5.3)	4.0 (1.1 to 9.9)	5.0 (3.1 to 7.6)

This synopsis should be referenced as follows: Ayers S, Meades R, Sinesi A, Cheyne H, Maxwell M, Best C, *et al.* Identifying acceptable and effective methods of assessing perinatal anxiety: the MAP study. *Health Soc Care Deliv Res* 2025;**13**(32):1–44. https://doi.org/10.3310/RRHD1124

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Appendix 10 Socioeconomic deprivation and perinatal anxiety

TABLE 14 Effect of socioeconomic deprivation (IMD) in each region on perinatal anxiety

	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Comparison	Ref	Ref	Ref
Region 1	0.678* (0.476 to 0.966)	0.656* (0.458 to 0.939)	0.858 (0.495 to 1.487)
Region 2	0.664* (0.472 to 0.935)	0.654* (0.464 to 0.921)	0.891 (0.551 to 1.442)
Early pregnancy	Ref	Ref	Ref
Mid pregnancy	0.517*** (0.415 to 0.644)	0.518*** (0.416 to 0.646)	0.519*** (0.416 to 0.647)
Late pregnancy	0.415*** (0.331 to 0.522)	0.417*** (0.331 to 0.524)	0.418*** (0.333 to 0.525)
Postpartum	0.396*** (0.314 to 0.499)	0.397*** (0.316 to 0.501)	0.398*** (0.316 to 0.502)
Low deprivation		Ref	Ref
High deprivation		1.170 (0.874 to 1.566)	1.659* (1.049 to 2.624)
Comparison # low deprivation			Ref
Comparison # high deprivation			Ref
Region 1 # low deprivation			Ref
Region 1 # high deprivation			0.592 (0.286 to 1.227)
Region 2 # low deprivation			Ref
Region 2 # high deprivation			0.531 (0.268 to 1.050)
Variance of the random effect	193.144***	189.853***	185.115***
Observations	4661	4661	4661
BIC	5551.731	5559.100	5572.290

*$p < 0.05$, ***$p < 0.001$.

TABLE 15 Adjusted model of other sociodemographic risk factors for perinatal anxiety (adjusting for perinatal time point, region and IMD)

	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Early pregnancy	Ref	Ref	Ref
Mid-pregnancy	0.523*** (0.417 to 0.656)	0.473*** (0.370 to 0.605)	0.479*** (0.373 to 0.615)
Late pregnancy	0.421*** (0.332 to 0.533)	0.383*** (0.296 to 0.494)	0.383*** (0.294 to 0.499)
Postpartum	0.395*** (0.311 to 0.502)	0.355*** (0.273 to 0.463)	0.352*** (0.269 to 0.461)
Comparison	Ref	Ref	Ref
Region 1	0.874 (0.495 to 1.544)	0.874 (0.593 to 1.289)	0.898 (0.625 to 1.291)
Region 2	0.923 (0.557 to 1.528)	0.904 (0.625 to 1.308)	0.856 (0.609 to 1.202)
Low deprivation	Ref	Ref	Ref
High deprivation	1.704* (1.036 to 2.803)	1.108 (0.808 to 1.520)	0.920 (0.685 to 1.235)
Region 1 # high deprivation	0.613 (0.285 to 1.318)		
Region 2 # high deprivation	0.514 (0.251 to 1.051)		
White	Ref	Ref	Ref
Mixed/multiple ethnic groups	2.658** (1.305 to 5.412)	2.117* (1.016 to 4.410)	3.332*** (1.676 to 6.625)
Asian/Asian British	1.018 (0.630 to 1.646)	0.953 (0.588 to 1.546)	1.361 (0.860 to 2.153)
Black/African/Caribbean/Black British	0.852 (0.418 to 1.735)	0.414* (0.195 to 0.878)	0.873 (0.433 to 1.759)
Other ethnic groups	0.343 (0.087 to 1.346)	0.298 (0.072 to 1.229)	0.420 (0.106 to 1.659)
Education degree	1.050 (0.759 to 1.452)	1.395* (1.003 to 1.940)	1.000 (1.000 to 1.000)
Social support		0.769*** (0.740 to 0.799)	1.189 (0.875 to 1.615)
Any health condition		3.164*** (2.241 to 4.466)	
EQ-5D-5L VAS			0.960*** (0.953 to 0.967)
Ever experienced psychological/mental health problems			6.092*** (4.432 to 8.375)
Previous pregnancy loss			1.330 (0.980 to 1.806)
Variance of random effect	176.997***	97.375***	26.562***
Observations	4342	3965	3800
BIC	5213.114	4522.798	4086.821

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
VAS, visual analogue scale.

Note
Exponentiated coefficients; 95% CIs in brackets.

This synopsis should be referenced as follows: Ayers S, Meades R, Sinesi A, Cheyne H, Maxwell M, Best C, *et al.* Identifying acceptable and effective methods of assessing perinatal anxiety: the MAP study. *Health Soc Care Deliv Res* 2025;**13**(32):1–44. https://doi.org/10.3310/RRHD1124

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Appendix 11 The COVID and perinatal anxiety

TABLE 16 Adjusted model of the association between COVID variables and perinatal anxiety symptoms (*N* = 2122)

	Coefficient	SE	*t*-value	*p*-value	95% CI		Sig
Ethnicity							
White	0	–	–	–	–	–	
Asian/British Asian	1.497	0.453	3.31	0.001	0.609	2.384	***
Black/African/Caribbean	0.598	0.786	0.76	0.447	−0.943	2.138	
Mixed/multiple ethnicity	1.901	0.688	2.76	0.006	0.553	3.249	***
Other	0.295	1.587	0.19	0.853	−2.815	3.404	
Previous mental health problems	3.6	0.282	12.75	0	3.047	4.153	***
General health	−0.1	0.006	−16.67	0	−0.112	−0.088	***
COVID exposure							
No COVID	0	–	–	–	–	–	
Mild COVID	−0.243	0.266	−0.91	0.362	−0.764	0.279	
Moderate COVID	−0.389	0.312	−1.24	0.213	−1.001	0.224	
Severe COVID	−0.723	0.771	−0.94	0.348	−2.233	0.787	
Perceived risk of them, their baby or someone close to them getting COVID							
Unlikely	−0.408	0.425	−0.96	0.337	−1.241	0.425	
Uncertain	−0.345	0.413	−0.83	0.404	−1.154	0.465	
Likely	−0.71	0.428	−1.66	0.097	−1.549	0.129	
Very likely	−0.593	0.465	−1.28	0.202	−1.505	0.318	
Perceived risk of them, their baby or someone close to them being severely ill with COVID							
Unlikely	0.194	0.324	0.60	0.548	−0.441	0.829	
Uncertain	0.647	0.34	1.90	0.057	−0.019	1.314	
Likely	1.572	0.441	3.57	0	0.708	2.437	***
Very likely	1.235	0.65	1.90	0.058	−0.04	2.509	

TABLE 16 Adjusted model of the association between COVID variables and perinatal anxiety symptoms (N = 2122) (*continued*)

	Coefficient	SE	*t*-value	*p*-value	95% CI		Sig
Impact of COVID on their mental health							
Slight impact	1.343	0.259	5.20	0	0.836	1.85	***
Moderate impact	3.576	0.319	11.21	0	2.951	4.201	***
Severe impact	5.68	0.475	11.96	0	4.75	6.611	***

***$p < 0.01$.
SE, standard error.

Note
Adjusted for relationship status, ethnicity, age, general health and previous mental health problems. Information for adjusted variables that were significant is included in the table.

This synopsis should be referenced as follows: Ayers S, Meades R, Sinesi A, Cheyne H, Maxwell M, Best C, *et al.* Identifying acceptable and effective methods of assessing perinatal anxiety: the MAP study. *Health Soc Care Deliv Res* 2025;**13**(32):1–44. https://doi.org/10.3310/RRHD1124

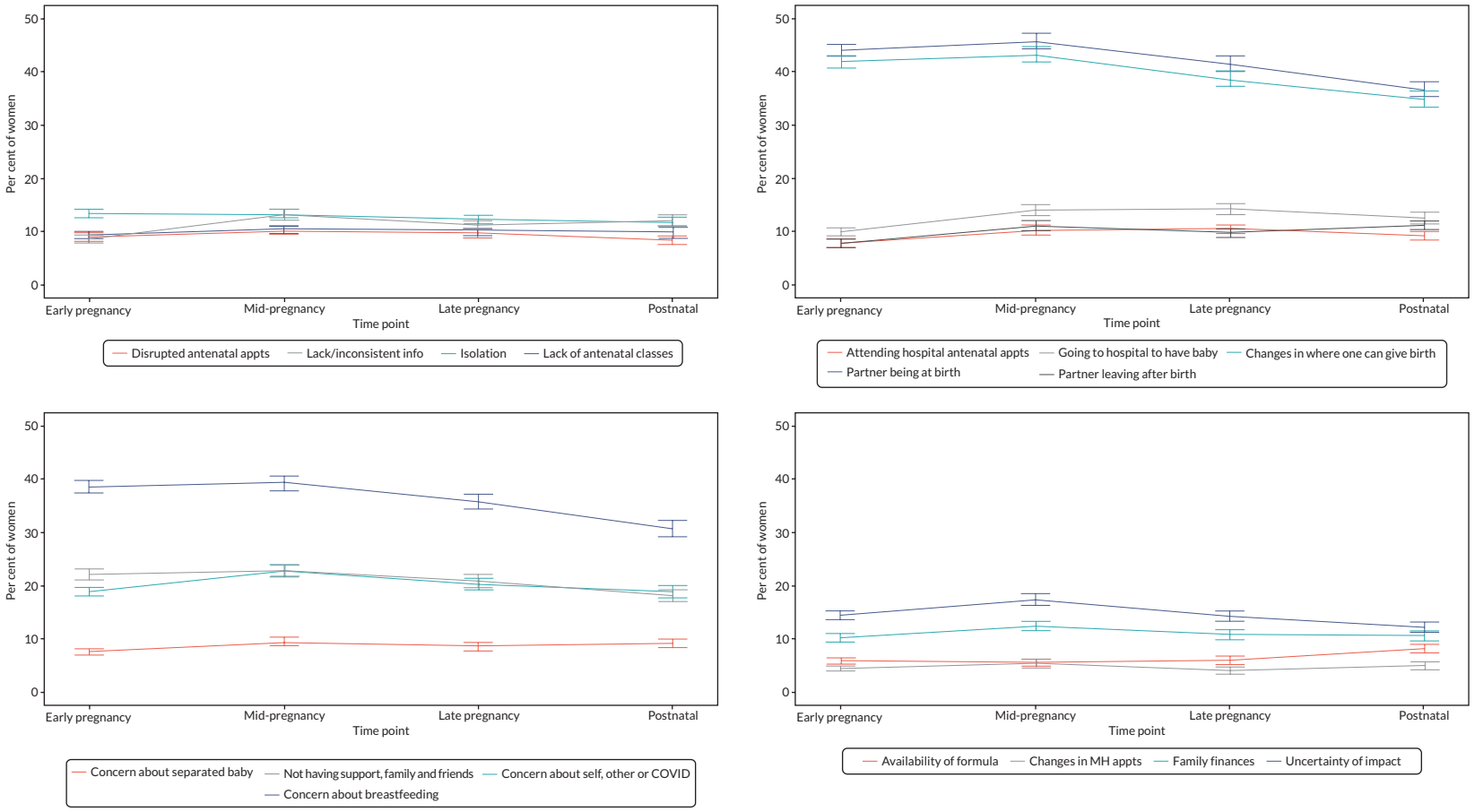

FIGURE 6 Proportion of sample who were 'very' or 'extremely' anxiety about COVID-related restrictions.