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Title

Identification of women at risk of depression in pregnancy: Using women's accounts to understand the poor specificity of the Whooley and Arroll case finding questions in clinical practice

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Abstract

Purpose

Antenatal mental health assessment is increasingly common in high-income countries. Despite lacking evidence on validation or acceptability, the Whooley questions (modified PHQ-2) and Arroll 'help' question are used in the UK at booking (the first formal antenatal appointment) to identify possible cases of depression. This study investigated validation of the questions and women's views on assessment.

Methods

Women (n=191) booking at an inner-city hospital completed the Whooley and Arroll questions as part of their routine clinical care, then completed a research questionnaire containing the Edinburgh Postnatal Depression Scale (EPDS). A purposive sub-sample (n=22) were subsequently interviewed.

Results

The Whooley questions 'missed' half the possible cases identified using the EPDS (EPDS threshold ≥10: sensitivity 45.7%, specificity 92.1%; ≥13: sensitivity 47.8%, specificity 86.1%), worsening to nine in ten when adopting the Arroll item (EPDS ≥10: sensitivity 9.1%, specificity 98.2%; ≥13: sensitivity 9.5%, specificity 97.1%). Women's accounts indicated that under-disclosure relates to the context of assessment and perceived relevance of depression to maternity services.

Conclusion

Depression symptoms are under-identified in current local practice. Whilst validated tools are needed that can be readily applied in routine maternity care, psychometric properties will be influenced by the context of disclosure when implemented in practice.

Key words

mixed methods; perinatal mental health; pregnancy; screening; Whooley questions

Introduction

Perinatal mental health (PMH) encompasses new onset and pre-existing mental health illness that continues or recurs in the period spanning pregnancy, childbirth and the first postnatal year (Austin 2004; Matthey 2004). This includes severe mental illness (e.g. severe depression, schizophrenia, bipolar disorder, psychosis), which has been implicated in maternal death (Centre for Maternal and Child Enquiries 2011) and more common mild-moderate forms of depression and anxiety, estimated to affect 9-15% women at some stage during or after pregnancy (Bennett et al. 2008; Gavin et al. 2005; Robertson et al. 2004). Clinical guidelines in several countries recommend mental health assessment early in pregnancy to identify women who have or are at risk of having mental health problems (American College of Obstetricians and Gynecologists 2006; American College of Obstetricians and Gynecologists 2010; Austin et al. 2005; Carroll et al. 2005; National Collaborating Centre for Mental Health 2007; Scottish Intercollegiate Guidelines Network 2012). In the UK, Australia and New Zealand, this initial assessment is likely to be undertaken by the midwife as the lead healthcare professional providing maternity care to women. In other areas including North America, assessment is more likely to be considered the remit of medical doctors such as family doctors and obstetricians.

The Whooley questions (Whooley et al. 1997) have been introduced in England and Wales at booking (the first formal antenatal appointment) and postnatally as an initial "pre-screen" to identify possible cases of depression, based on current symptoms, that warrant further mental health review (National Collaborating Centre for Mental Health 2007). The questions are: During the past month, have you been bothered by: (i) feeling down, depressed or hopeless, (ii) having little interest or pleasure in doing things? (Whooley et al. 1997). Current National Institute for Health and Care Excellence (NICE) clinical guidelines (National Collaborating Centre for Mental Health 2007) advise additionally using the Arroll 'help' question (Arroll et al. 2003) to improve specificity, due to concerns that the Whooley questions may over-identify women, resulting in over-burdening of systems and unnecessary negative impact on women falsely identified as possible cases (i.e. false positives). The Arroll question is: Is this something you feel you need/want help with? (Arroll et al. 2003).

The Whooley questions are a modified version of the PHQ-2 (Kroenke et al. 2003), a two-item version of the PHQ-9 (Kroenke et al. 2001), which is based on the DSM-IV clinical interview. Although addressing the same symptoms, the Whooley questions differ from the PHQ-2 regarding timescale (past four weeks instead of past two weeks) and response format (dichotomous instead of ordinal four-point Likert scale). Published validation studies on the Whooley questions (and the original PHQ-2) are summarised in Table 1.

No published studies have validated the tool as completed in clinical practice and an evidence synthesis concluded that there was insufficient evidence to justify its clinical use (Hewitt et al. 2009). The NICE guidelines have therefore been criticised (Martin and Redshaw 2009) for rejecting the most commonly used measure of perinatal depression, the Edinburgh Postnatal Depression Scale (EPDS) (Cox et al. 1987; Murray and Cox 1990), because of its sub-optimal positive predictive value and the lack of high-quality randomised controlled trials demonstrating reduction in morbidity accompanying introduction of routine screening, yet advocating an instrument that "probably would not meet the criteria either" of the National Screening Committee (p.117) (National Collaborating Centre for Mental Health 2007). Another criterion of the National

Screening Committee is that any procedure is considered acceptable to the population. The EPDS is recommended for routine clinical use in high-income countries including the US and Australia (American College of Obstetricians and Gynecologists 2010; Austin et al. 2011) and whereas an evidence base exists for acceptability of the EPDS, research on the Whooley questions is "urgently needed" given usage in current clinical practice in the UK (Brealey et al. 2010).

The objectives of this study were to: i) provide the first validation of the Whooley and Arroll questions completed at booking in UK clinical practice, and ii) explore women's views and experiences of antenatal mental health assessment that uses these questions.

[Table 1 (summary of literature) about here]

Materials and methods

The study used a mixed methods cohort design with sequential sampling (Teddlie and Yu 2007). In the quantitative component, women attending their booking at an inner-city hospital were invited to take part, regardless of any obstetric or other characteristics; the only exception being those unable to complete English-language questionnaires unassisted. Information about the research accompanied the appointment letter and was additionally provided by the researcher, who attended the antenatal clinic over a six-month period. Women self-completed the Whooley (Whooley et al. 1997) and Arroll (Arroll et al. 2003) questions as part of clinical care before completing a research questionnaire containing several measures, including the Edinburgh Postnatal Depression Scale (EPDS) (Cox et al. 1987). The EPDS is a 10-item self-report measure rating depressive symptoms in the last seven days (e.g. 'I have felt sad or miserable') using a 4-point Likert scale (0-3). Despite its name, the EPDS is also validated for use during pregnancy (Murray and Cox 1990). In the absence of a definitive threshold (Matthey et al. 2006) we used thresholds of $\geq$10 and $\geq$13, respectively indicative of 'possible' and 'probable' depression, and the more conservative threshold of $\geq$15 which is not commonly reported but has been suggested for antenatal use (Cox and Holden 2003; Matthey et al. 2006). Additional demographic and clinical data were abstracted from health records.

In the qualitative component, a purposive sub-sample of women were invited to take part in three serial in-depth interviews, on the basis of scoring above threshold on at least one of the measures of psychological distress (EPDS (Cox et al. 1987); State-Trait Anxiety Inventory state scale (Spielberger et al. 1987); GAD-2 (Kroenke et al. 2007)) or psychosocial risk factors for postnatal depression (Antenatal Risk Questionnaire (Austin 2003)). Topics included: women's experiences of maternal mental health and well-being; its recognition by health professionals, self and others; and available support. Discussion included women's views and experiences of mental health assessment during pregnancy and the postnatal period, including but not limited to the Whooley and Arroll questions. Interviews were audio-recorded and were conducted twice during pregnancy and once in the postnatal period, either at the participant's home or the hospital research suite, according to participant preference. Data were collected June 2010 – October 2011. Informed consent was gained prior to participation in each component of the study.

Agreement between the Whooley and Arroll questions and the EPDS were analysed using standard diagnostic performance measures: sensitivity (the proportion of true positives correctly identified by the test), specificity (the proportion of true negatives correctly identified by the test), positive predictive value (PPV; the proportion of patients with positive test results who are correctly identified) and negative predictive value (NPV; the proportion of patients with negative test results who are correctly identified) (Altman and Bland 1994a; Altman and Bland 1994b). Here, the EPDS was treated as the gold standard against which the 'test' was compared; firstly using a positive response to either Whooley item as the criterion for possible caseness and secondly using the Arroll 'help' item as the criterion. The EPDS was treated as a 'gold standard' because the alternative to using the Whooley questions would be a different self-report measure, not clinical interview.

Qualitative data were transcribed verbatim and analysed using Framework Analysis, as described by Ritchie and colleagues (Ritchie and Spencer 1994). Rigour was promoted through strategies such as member checking with participants and searching for alternative explanations with the supervisory team (Lincoln and Guba 1985). Although the quantitative and qualitative components were primarily designed to answer different research questions, findings were integrated in the analysis stage, with women's accounts offering insights into the quantitative findings.

Results

Characteristics for the full sample of women returning the research questionnaire (n=191) and the sub-sample interviewed (n=22) are presented in Table 2. These 191 women represented 16.5% of the women booked in the study timeframe, with reasons for non-approach presented in Figure 1. Comparison with local maternity data for the study period provided by the hospital found that White British women and older women were over-represented in the research sample whereas parity was comparable. The full sample and sub-sample did not vary on any characteristics.

[Table 2 (sample characteristics) about here]

Validation of the Whooley and Arroll questions

Responses to the Whooley and Arroll questions were only available via the handheld maternity notes (n=167; see Figure 1) and were uncompleted in five instances. Thirty women (18.5%) endorsed at least one Whooley item; the Arroll 'help' item was endorsed by six of these and uncompleted by three.

Using either Whooley item as the criterion for possible caseness (Table 3) had strong specificity (i.e. most women identified as non-cases using the EPDS are identified as non-cases using the Whooley questions) but identified only half the women identified using the commonly adopted EPDS thresholds (EPDS ≥10: sensitivity 45.7%, specificity 92.1%; EPDS ≥13: sensitivity 47.8%, specificity 86.1%). Agreement with the EPDS was

greater for the Whooley item concerning low mood than the item concerning anhedonia, with the latter leading to more false positives, possibly reflecting somatic aspects of pregnancy.

Using the Arroll 'help' question as the test criterion (Table 4) improved specificity but substantially compromised sensitivity, missing nine in ten possible cases (EPDS ≥10: sensitivity 9.1%, specificity 98.2%; EPDS ≥13: sensitivity 9.5%, specificity 97.1%). Of the six women endorsing the Arroll item, four were identified by the EPDS at the lower of the common thresholds. Details in health records indicated that the responses of the remaining two women reflected somatic aspects (sickness and backache) rather than psychological distress per se, suggesting that these were not possible cases 'missed' by the EPDS.

Regardless of test criterion, agreement was greatest at the more conservative EPDS threshold of ≥15, but not substantially so (Whooley as criterion: sensitivity 57.1%, specificity 84.9%; Arroll as criterion: sensitivity 16.7%, specificity 97.2%) and, due to the positive predictive value being linked to the prevalence of possible cases in the population, performance was best at the lowest EPDS threshold.

[Table 3 (Whooley vs EPDS) around here]

[Table 4 (Arroll vs EPDS) around here]

Analysis of women's views and experiences

Several themes emerged from the analysis; the theme context of disclosure is presented here to inform understanding the validation findings and limited disclosure in a clinical context.

Women's accounts illustrated that disclosure required women to 'admit' symptoms of distress, both to themselves and to others; and that this was influenced by women's views on the relevance of mental health to maternity services. Such views were shaped by women's individual understandings of maternal mental health, the context of the appointment and the perceived purpose of assessment.

Remit of maternity services

Perceived relevance was shaped by perceiving that the emphasis of maternity care was "98% medical physical thing and 2% emotional" (Lena, time 1). Thus, questions such as "How are you?" were interpreted as concerning physical aspects to do with the pregnancy, rather than emotional aspects to do with the woman:

> "They're more interested in you medically … they're asking you, "How are you? How are you feeling?" but it's more, "Have you got any lumps and bumps and pains?" … they're not asking you emotionally." (Anne, time 1)

Some women felt that their psychological distress was "just personal circumstances" (Jess, time 1), and therefore not a legitimate concern for midwives:

> "I don't feel I can turn round and go "Yeah, but there's this that's gone on and that that's gone on" and actually it's unrelated to the pregnancy. I feel like, for them, they need to concentrate on the pregnancy side of things really." (Emily, time 2)

Context of maternity appointments

The context of appointments, both in terms of the nature of busy clinics and in relation to interactions with health professionals, influenced women's views on relevance of mental health to maternity services. Comments about appointments referred both to the booking appointments, which in this sample took place in a hospital antenatal clinic, and subsequent antenatal appointments either in the community or the hospital; all of which involved consultations with midwives.

Women's accounts highlighted a sense that there are too many tasks for the time available, with appointments consequently feeling rushed and potentially limiting disclosure without the "time and space to actually go through those things" (Charlotte, time1):

> "It's just like a conveyor belt. You're in and you're out. They're just: blood pressure, check your water, check the heartbeat, and then off. There's no real conversation of how are you? So because I wasn't really asked, I didn't speak about it." (Louise, time 1)

Alongside the pace of appointments, it was the manner in which they were asked that mattered to women and some felt that factors such as trust and confidence were more important for disclosures concerning mental health and well-being than discussions of physical aspects of health. Although continuity was valued, this was considered less important than skills such as "really listening" (Abbie, time 1) which were contrasted with interactions that felt "a little bit false" (Abbie, time 2), as though they "were going through the motions of it" (Charlotte, time 1) with "bullet type things that they have to ask" (Helen, time 2). Some women also described feeling that staff seemed to lack confidence and felt uncomfortable in discussing mental health.

Understandings of maternal mental health

Disclosure of symptoms were also influenced by women's personal understandings of maternal mental health and several described struggling to determine whether their feelings were "normal" (Louise, time 2); here, some women felt that screening questions helped them to recognise to themselves that they were struggling. Women could however feel deterred from seeking support because assessing symptoms and severity was "so subjective" (Katie, time 1) but also because women needed themselves to be "at the stage where you've thought about, "yeah, I could really do with some support" " (Hannah, time 1).

Purpose of assessment and implications of disclosure

Admitting to self and others was influenced by the implications of disclosure. This extended beyond stigma (indicated by terms such as "loony bin", "bonkers", "crazy", "bring branded") and was more concerned with the perceived purpose of assessment. Women's accounts suggested great uncertainty around implications:

> "If I tick yes [to the Arroll item], what does that mean, what's going to happen?" (Emily, time 1)

Some women held concerns about possible treatment options, both pharmacological and psychological, that could deter them from seeking help. Several women felt that maternity services could, theoretically, be in a position to help with early intervention, most felt that, in reality, the purpose of assessment was to identify risk of harm:

> "The only question that she [health visitor] was more worried about is, would I self-harm or hurt the baby. I went "no". That's all she was more worried about, not dealing with the fact that, why am I upset?" (Rebecca, time 1)

> "Unless you've been suffering from sort of psychosis, you're not gonna get any real, you know, service or support from anywhere anyway. It's always like "worst case scenario then we will help you". (Michelle, time 1)"

Women were sometimes therefore either wary of potential social services involvement or simply cynical about health professionals' ability to do anything to help them address their underlying causes of distress (Abbie, time 3; Katie, time 2).

Discussion

This is the first study to offer validation of Whooley questions and Arroll 'help' item in UK clinical practice. Contrary to concerns that clinical use of the Whooley questions may unnecessarily over-burden systems through high rates of false positives, they were found to identify only half of women identified by the EPDS completed in a research context. Sensitivity substantially worsened by reliance on the Arroll 'help' item, missing nine in ten possible cases identified using the EPDS.

Performance was far poorer in the current study than reported elsewhere (Bennett et al. 2008; Mann and Gilbody 2011; Smith et al. 2010). The EPDS does not offer diagnosis and is itself therefore vulnerable to issues of sensitivity and specificity; however, this does not explain the poor sensitivity because stronger performance has been found both for validation against diagnostic clinical interview (Mann and Gilbody 2011; Smith et al. 2010) and against the EPDS (Bennett et al. 2008). Our finding is also unlikely to be due to gestational age at assessment, as the mean age is similar in the current study and the study by Bennett et al. (2008), as is the percentage of women scoring above threshold (respectively 14.4% and 17.4%, using a threshold of ≥13).

Analysis of women's accounts indicates that a likely explanation for the poor sensitivity found is that women under-disclosed when completing the Whooley and Arroll questions and primarily because of the context of disclosure; which could similarly inhibit disclosure if the EPDS were completed in this manner. In our study the Whooley and Arroll questions were self-completed as part of routine clinical care; the EPDS was also self-completed, but as part of a research study. In contrast, both measures were completed with a physician or nurse in the IMPLICIT network study (Bennett et al. 2008) and both were completed in a research context for the other studies (Mann and Gilbody 2011; Smith et al. 2010).

Women's accounts conveyed that the manner in which mental health was discussed was considered more important than the exact phrasing used to ask the depression questions, illustrating the need to provide an enabling environment to ensure the process is both acceptable to the population and effective. Thus, rather than endorsing routine use of the EPDS in preference to the Whooley and Arroll questions, this study speaks to the significance of the context of disclosure for mental health assessment which is relevant regardless of the measure used, the setting or healthcare professional involved. The need for enabling environments and challenges around implementation echo those raised when routine enquiry for domestic abuse was introduced (Taket et al. 2003). Ensuring an enabling environment includes addressing consultation-level factors such as time limitations and work pressures that impact patient-centredness (Mead and Bower 2000) and can influence women's help seeking for depression in various maternity settings (Bennett et al. 2009). It is unsurprising that we found parallels with the literature on acceptability of the EPDS. Authors of a review on EPDS acceptability concluded that although the EPDS was "generally acceptable" there could be issues around its administration and they considered the clinic setting "too distracting and uncomfortable for women", instead recommending completion at home, affording more privacy and time (Brealey et al. 2010).

Alongside consultation-level factors, staff need the appropriate training and skills in psychological assessment. Low staff confidence in handling perinatal mental health has been reported amongst midwives in the UK (King et al. 2012); similarly, in Australia where mental health assessment is also carried out at booking by midwives, training needs have been identified, including knowledge of perinatal mental health and resources available to women and staff (McCauley et al. 2011). Some women in the current study picked up on staff discomfort and lack of confidence, linked to the perception that mental health is not the remit of maternity services. These findings resonate with a North American study that reported women perceived a lack of mental health expertise amongst obstetricians (i.e. those healthcare professionals who would be expected to undertake mental health assessment during the perinatal period) and that this acted as a potential barrier to depression help seeking (Bennett et al. 2009).

Perceived relevance also included the purpose of assessment. Women's concerns around implications of disclosure, including others' views of parenting ability and potential involvement of social services, have been raised in relation to the EPDS and women's ability to answer depression screening questions honestly (Brealey et al. 2010). However, unlike the EPDS, the Arroll approach asks women directly about wanting or needing help and our study demonstrated concerns and uncertainty amongst some women about possible implications of reporting this to a healthcare professional; here, a midwife. This is consistent with our quantitative data indicating extremely poor sensitivity of the Arroll question. The finding that reliance on the Arroll 'help' item

may risk false negatives is consistent with the findings of Mann and Gilbody (2011), but is considerably more marked in our study. Such findings suggest that, whereas concerns over high false positive rates are consistently raised in respect of ultra-brief screening tools (Mitchell and Coyne 2007) and national screening programmes for postnatal depression have been advised against mainly due to the costs of false positives (Hewitt et al. 2009), of equal concern may be high rates of false negatives and the potential for delayed access to interventions (Martin and Redshaw 2009). The guidelines for England and Wales (National Collaborating Centre for Mental Health 2007) position the Whooley and Arroll items as the first assessment stage, to be followed up further assessment. Such two-stage processes require strong sensitivity in the first step to avoid 'missing' potential cases (Bennett et al. 2008; Gjerdingden et al. 2009), yet this is compromised by the use of the 'help' item in its current format and women's uncertainty around the purpose of assessment.

The validation component of this study had two main methodological limitations: i) threats to internal validity by lacking comparison with diagnostic interviews and ii) threats to external validity due to sampling constraints. Analysing the validation data alongside women's accounts offered alternative perspectives and richer understandings through considering the context of disclosure, illustrating the potential benefit of integrating mixed methods in the analysis stage to provide an end product greater than the constituent parts (Bryman 2007; Moran-Ellis et al. 2006). Although qualitative research does not have the same need for representativeness, it is important to acknowledge the views that are being represented. Interviews were limited to those with high levels of maternal stress as defined by the chosen measures and acceptability may be different in those below and above threshold. In addition, the findings are taken from one local unit and, within the sample, White British women and older women were over-represented; care must therefore be taken in extending the findings beyond the study.

Conclusion

Contrary to concerns about the numbers of false positives encountered when using ultra-brief mental health assessment, this study suggests that the greater concern when administering the Whooley and Arroll questions in antenatal care is the number of false negatives. A mixed methods approach illustrated the significance of context of disclosure for psychometric properties when measures developed in research settings are adopted in clinical practice. Further research is needed to validate the use of this approach in maternity care and to determine the optimal approach to identifying possible depression in pregnancy; this extends beyond the instrument of choice to include enabling environments and subsequent management. Meanwhile, health professionals and policy makers should be aware that while the Whooley questions offer a simple and quick means of identifying women who need support, they fail to identify a substantial proportion of women.

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Conflict of interest

The authors declare that they have no conflict of interest.

Ethical standards

The study received favourable ethical opinion from the Greater Manchester East Research Ethics Committee (10/H1013/12) and relevant governance approval from the hospital, and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

References

Altman DG, Bland M (1994a) Diagnostic tests 1: sensitivity and specificity. British Medical Journal 308:1552

Altman DG, Bland M (1994b) Diagnostic tests 2: predictive values. British Medical Journal 309:102

American College of Obstetricians and Gynecologists (2006) Psychosocial risk factors: Perinatal screening and intervention. ACOG Committee Opinion Number 343. Obstetrics and Gynecology 108:469-477

American College of Obstetricians and Gynecologists (2010) Screening for depression during and after pregnancy. Committee Opinion No. 453. Obstetrics and Gynecology 115:394-395

Arroll B, Khin N, Kerse N (2003) Screening for depression in primary care with two verbally asked questions: cross sectional study. British Medical Journal 327:1144-1146

Austin MP (2003) Psychosocial assessment and management of depression and anxiety in pregnancy: Key aspects of antenatal care for general practice. Australian Family Physician 32:119-126

Austin MP (2004) Antenatal screening and early intervention for "perinatal" distress, depression and anxiety: Where to from here? Archives of Women's Mental Health 7:1-6

Austin MP, Hadzi-Pavlovic D, Saint K, Parker G (2005) Antenatal screening for the prediction of postnatal depression: validation of a psychosocial Pregnancy Risk Questionnaire. Acta Psychiatrica Scandinavica 112:310-317

Austin MP, Highet N, the Guideline Expert Advisory Committee (2011) The beyondblue clinical practice guidelines for depression and related disorders, anxiety, bipolar disorder and puerperal psychosis in the perinatal period. A guideline for primary care health professionals providing care in the perinatal period. Beyond Blue: The National Depression Initiative, Melbourne

Bennett I et al. (2008) Efficiency of a two-item pre-screen to reduce the burden of depression screening in pregnancy and postpartum: an IMPLICIT Network study. Journal of the American Board of Family Medicine 21:317-325

Bennett IM et al. (2009) "One end has nothing to do with the other:" Patient attitudes regarding help seeking intention for depression in gynecologic and obstetric settings. Archives of Women's Mental Health 12:301-308

Brealey SD, Hewitt C, Green JM, Morrell J, Gilbody S (2010) Screening for postnatal depression - is it acceptable to women and healthcare professionals? A systematic review and meta-synthesis Journal of Reproductive and Infant Psychology 28:328-344 doi:10.1080/02646838.2010.513045

Bryman A (2007) Barriers to integrating quantitative and qualitative research. Journal of Mixed Methods Research 1:8-22

Carroll JC et al. (2005) Effectiveness of the antenatal psychosocial health assessment (ALPHA) form in detecting psychosocial concerns: A randomized controlled trial Canadian Medical Association Journal 173:253-259

Centre for Maternal and Child Enquiries (2011) Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer: 2006–08. The Eighth Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. British Journal of Obstetrics and Gynaecology 118 (Supplement 1):1-203

Cox J, Holden J (2003) Perinatal mental health: a guide to the Edinburgh Postnatal Depression Scale (EPDS). Gaskell, London

Cox J, Holden J, Sagovsky R (1987) Detection of postnatal depression: Development of a 10-item Edinburgh Postnatal Depression Scale. British Journal of Psychiatry 150:782-786

Darwin Z (2012) Assessing and Responding to Maternal Stress (ARMS): Antenatal Psychosocial Assessment in Research and Practice., University of Manchester

Gavin NI, Gaynes BN, Meltzer-Brody S, Gartlehner G (2005) Perinatal depression: A systematic review of prevalence and incidence. Obstetrics and Gynecology 106:1071-1083

Gjerdingden D, Crow S, McGovern P, Miner M, Center B (2009) Postpartum depression screening at well-child visits: Validity of a 2-question screen and the PHQ-9 Annals of Family Medicine 7:63-70

Hewitt CE et al. (2009) Methods to identify postnatal depression in primary care: An integrated evidence synthesis and value of information analysis. Health Technology Assessment 13

King L, Pestell S, Farrar S, North N, Brunt C (2012) Screening for antenatal psychological distress. British Journal of Midwifery 20:396-401

Kroenke K, Spitzer RL, Williams JBW (2001) The PHQ-9: validity of a brief depression severity measure. Journal of General Internal Medicine 16:606-613

Kroenke K, Spitzer RL, Williams JBW (2003) The Patient Health Questionnaire-2: Validity of a two-item depression screener. Medical Care 41:1284-1292

Kroenke K, Spitzer RL, Williams JBW, Monahan PO, Lowe B (2007) Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. Annals of Internal Medicine 146:317-325

Lincoln Y, Guba E (1985) Naturalistic inquiry. Sage, Thousand Oaks, CA

Mann R, Gilbody S (2011) Validity of two case finding questions to detect postnatal depression: A review of diagnostic test accuracy. Journal of Affective Disorders 133:388-397

Martin CR, Redshaw M (2009) Carry on screening Journal of Reproductive and Infant Psychology 27:327-329

Matthey S (2004) Detection and treatment of postnatal depression (perinatal depression or anxiety). Current Opinion in Psychiatry 17:21-29

Matthey S, Henshaw C, Elliott S, Barnett B (2006) Variability in use of cut-off scores and formats on the Edinburgh Postnatal Depression Scale - implications for clinical and research practice. Archives of Women's Mental Health 9:309-315

McCauley K, Elsom S, Muir-Cochrane E, Lyneham J (2011) Midwives and assessment of perinatal mental health. Journal of Psychiatric and Mental Health Nursing 18:786-795

Mead N, Bower P (2000) Patient centredness: a conceptual framework and review of the empirical literature. Social Science and Medicine 51:1087-1110

Mitchell AJ, Coyne JC (2007) Do ultra-short screening instruments accurately detect depression in primary care? A pooled analysis and meta-analysis of 22 studies. British Journal of General Practice 57:144-151

Moran-Ellis J, Alexander VD, Cronin A, Dickinson M, Fielding J, Sleney J, Thomas H (2006) Triangulation and integration: Processes, claims and implications. Qualitative Research 6:45-59

Murray D, Cox JL (1990) Screening for depression during pregnancy with the Edinburgh Depression Scale (EPDS). Journal of Reproductive and Infant Psychology 8:99-107

National Collaborating Centre for Mental Health (2007) Antenatal and postnatal mental health. The NICE guideline on clinical management and service guidance. The British Psychological Society and The Royal College of Psychiatrists, Leicester

Ritchie J, Spencer L (1994) Qualitative data analysis for applied policy research. In: Bryman A, Burgess R (eds) Analysing qualitative data. Routledge, London, pp 173-194

Robertson E, Grace S, Wallington T, Stewart DE (2004) Antenatal risk factors for postpartum depression: A synthesis of recent literature. General Hospital Psychiatry and Clinical Neurosciences 26:289-295

Scottish Intercollegiate Guidelines Network (2012) Management of perinatal mood disorders. Scottish Intercollegiate Guidelines Network, Edinburgh

Smith MV, Gotman N, Lin H, Yonkers KA (2010) Do the PHQ-8 and the PHQ-2 accurately screen for depressive disorders in a sample of pregnant women? General Hospital Psychiatry 32:544-548

Spielberger CD, Gorusch RL, Lushene RE (1987) The State-Trait Anxiety Inventory: Test Manual. Consulting Psychological Press, Palo Alto

Taket A et al. (2003) Routinely asking women about domestic violence in health settings. British Medical Journal 327:673-676

Teddlie C, Yu F (2007) Mixed methods sampling: A typology with examples. Journal of Mixed Methods Research 1:77-100

Whooley MA, Avins AL, Miranda J (1997) Case-finding instruments for depression. Two questions are as good as many. Journal of General Internal Medicine 12:439-445

494 **Tables and Figures**

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496 **Figure 1 Participant recruitment and data available**

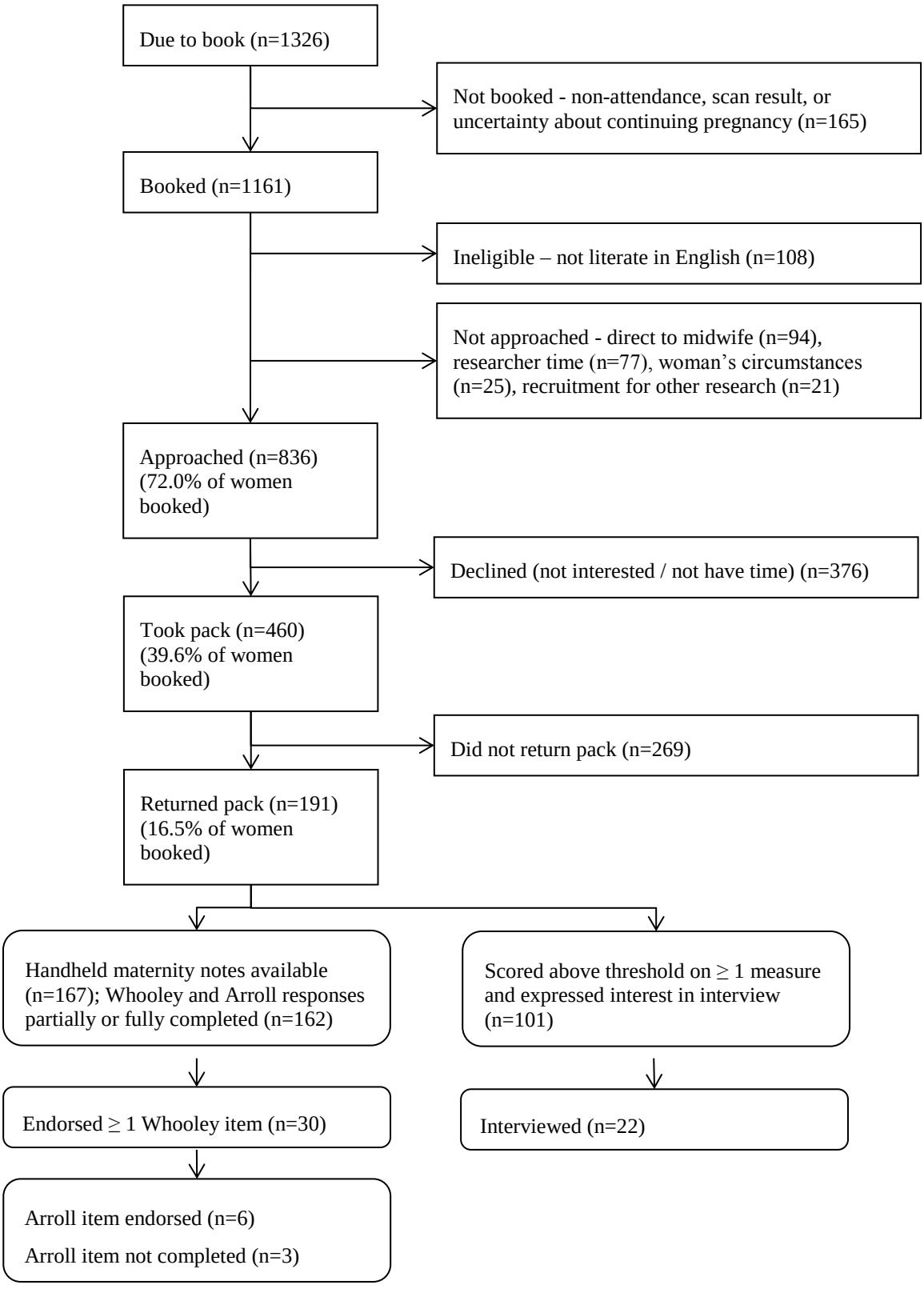

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Table 1 Summary of published literature on validation of the Whooley questions and original PHQ-2 in antenatal populations

Study - Author - Country	Details - Whooley 'test' criterion - 'gold standard' comparison - gestational age - sample size	Measures of performance			
		sensitivity	specificity	PPV	NPV
Bennett et al 2008 USA	Whooley (yes to either item) EPDS ≥13 15 weeks n=414	93	75	44	98
Bennett et al 2008 USA	Whooley (yes to either item) EPDS ≥13 30 weeks n=334	82	80	24	91
Smith et al 2010 USA	PHQ-2 (≥3) Diagnostic interview Before 17 weeks n=214	59	77	n/r	n/r
Smith et al 2010 USA	PHQ-2 (≥4) Diagnostic interview Before 17 weeks n=214	62	79	n/r	n/r
Mann et al 2012 UK	Whooley (yes to either item) Diagnostic interview 26-28 weeks n=126	100	68	33	99
Mann et al 2012 UK	Arroll (yes) Diagnostic interview 26-28 weeks	58	91	77	82

	n=126				

Notes: sensitivity = proportion of women who are possible cases (based on the EPDS) who are identified as possible cases (using Whooley/Arroll); specificity = proportion of women who are non-cases (based on the EPDS) who are identified as being non-cases (using Whooley/Arroll); NPV (Negative Predictive Value) = proportion of women with negative test result (on Whooley/Arroll) who are correctly classified as non-cases; PPV (Positive Predictive Value) = proportion of women with positive test result (on Whooley/Arroll) who are correctly classified as possible cases; n/r = not reported; diagnostic interviews were completed approximately two weeks after completion of the Whooley questions and original PHQ-2; sample size is the number for which both data sets were available, not the number recruited

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	Full sample completing research questionnaire (n=191)	Sub-sample interviewed (n=22)
Age (years)	mean 31.1 sd 5.3 (19-46)	mean 31.7 sd 4.2 (26-39)
Ethnicity	129 (67.9%) White British	17 (77.3%) White British
In a relationship	174 (91.1%)	20 (90.9%)
Primigravida (first pregnancy)	71 (37.2%)	7 (31.2%)
Primipara (first birth)	111 (58.1%)	9 (40.9%)
Gestation (weeks) at booking	mean 13 sd 5.4 (8-38) 144 (75.4%) 1st trimester	mean 13 sd 2.8 (8-20) 15 (68.2%) 1st trimester
Timing of interviews (weeks)	not applicable	Antenatal Time 1: mean 16 sd 2.8 (10-22) Time 2: mean 33 sd 1.7 (28-36) Postnatal Time 3: mean 10 sd 1.4 (7-13)

Table 3 Validation of the Whooley questions against the EPDS, using yes to either item as case criterion (n=160)

EPDS threshold	Whooley (either item)		Measures of performance			
	No (n=130)	Yes (n=30)	Sensitivity	Specificity	PPV	NPV
< 10 (n=114)	105 (65.6)	9 (5.6)	21/46 (45.7)	105/114 (92.1)	21/30 (70.0)	105/130 (80.8)
≥ 10 (n=46)	25 (15.6)	21 (13.1)				
< 13 (n=137)	118 (73.8)	19 (11.9)	11/23 (47.8)	118/137 (86.1)	11/30 (36.7)	118/130 (90.8)
≥ 13 (n=23)	12 (7.5)	11 (6.9)				
< 15 (n=146)	124 (77.5)	22 (13.8)	8/14 (57.1)	124/146 (84.9)	8/30 (26.7)	124/130 (95.4)
≥ 15 (n=14)	6 (3.8)	8 (5.0)				

Notes: NPV = Negative Predictive Value; PPV = Positive Predictive Value

Table 4 Validation of the Whooley questions against the EPDS, using Arroll 'help' item as case criterion (n=157)*

EPDS threshold	Arroll 'help' item		Measures of performance			
	No (n=151)	Yes (n=6)	Sensitivity	Specificity	PPV	NPV
< 10 (n=113)	111 (70.7)	2 (1.3)	4/44 (9.1)	111/113 (98.2)	4/6 (66.7)	111/151 (73.5)
≥ 10 (n=44)	40 (25.5)	4 (2.5)				
< 13 (n=136)	132 (84.1)	4 (2.5)	2/21 (9.5)	132/136 (97.1)	2/6 (33.3)	132/151 (87.5)
≥ 13 (n=21)	19 (12.1)	2 (1.3)				
< 15 (n=145)	141 (89.8)	4 (2.5)	2/12 (16.7)	141/145 (97.2)	2/6 (33.3)	141/151 (93.4)
≥ 15 (n=12)	10 (6.4)	2 (1.3)				

Notes: NPV = Negative Predictive Value; PPV = Positive Predictive Value

* EPDS scores were not available for two women