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Literature Review

Cost-effectiveness of screenings for mental health in pregnancy: A systematic review

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Abstract

Mental disorders posses significant obstacles both during and after pregnancy for many women. Birth weight, premature birth, perinatal and infant deaths, postpartum psychopathology, emotional difficulties, inappropriate behavior in children and adolescents, and adverse effects on other people are just a few of the negative impacts that mental disorders are linked to during pregnancy in that family. Women with mental disorders may experience issues after giving birth, affecting their health throughout pregnancy. Infections, including depression, frequently go undiagnosed and receive subpar treatment despite routine interactions with medical providers during pregnancy. Hormonal changes impact Mother's body movements; for example, she moves more slowly and gets exhausted more rapidly. Pregnant ladies who are in this scenario tend to become indolent. A systematic assessment of research findings on the effectiveness of economic evaluation of mental health screening instruments during pregnancy is frequently used to encourage early detection of mental health in pregnant women as maternal reactions become more sensitive, irritable, and irritable. These investigations mostly used the EPDS and PHQ-9. For the systematic review portion of this investigation, the PRISM ScR 2020 Flowchart was employed, and the A search of the literature was done using the databases Pubmed and Whiley. This article was assessed using the CHEC-Extended checklist. Two reports satisfied the inclusion criteria after an investigation of 890 chosen papers. The systematic review identified three themes: cost, effectiveness, and threshold. Given the variety of treatments used to treat mental health issues in pregnant women, it is clear that using two approaches rather than just one will result in greater cost-effectiveness

Keywords: *CEA; Post Effectiveness Analysis; Mental Health screening; Pregnant*

1. Introduction

Mental disorders are a significant problem faced during and after pregnancy for many women. When this occurs during pregnancy, mental disorders are associated with a variety of poor outcomes, such as low birth weight babies, premature birth, perinatal and infant deaths, postnatal psychopathologies, emotional and subsequent behavioral problems in children and adolescents, and negative impacts on other family members. Antenatal mental disorders, including depression, are often unrecognized and untreated, despite frequent contact with health care workers during pregnancy (Heslin, et. al, 2022).

Antenatal mental disorders are common, with depression affecting 11% of women in early pregnancy and up to 18% of women in the entire pregnancy period. Interventions are therefore needed to reduce the adverse impact of mental health problems during pregnancy, due to the potential risks to the fetus (Trevillion et al., 2014). It is estimated that 50% of women who experience depression during and after pregnancy experience undiagnosed and untreated depression, which makes it the most

undiagnosed and untreated obstetric complication. However, most mothers (80%) report that they are comfortable with undergoing depression screening. Inadequate screening rates for perinatal depression and limited access to evidence-based treatment are due to the stigma associated with mental health. Patients are worried about emotional, educational factors and systemic limitations around screening delivery and payment. Perinatal depression has long-term and even permanent impacts on the physical and mental health of parents and their children such as poor family functioning, increased risk of child abuse and neglect, delayed infant development, perinatal obstetric complications, difficulties in breastfeeding and increased expensive health care. Perinatal depression can disrupt the interaction and initial attachment between parents and babies, causing long-term disruptive impacts on a child's physical, emotional, cognitive, and social development. Fortunately, perinatal depression can be identified and treated (Earls et al., 2019).

The World Health Organization (WHO) reports that nearly one billion people in the world experience some form of mental health disorder. In 2019, 970 million people worldwide indicated to be living with mental disorders, and in 2020 anxiety disorders increased by 26% and depression by 28%, due to COVID-19 (WHO, 2020). Depression affects approximately 20% to 40% of mothers who have toddlers, with the highest rate in women with low socioeconomic status. The most commonly used depression screening tools are the Patient Health Questionnaire (PHQ-9 and PHQ-2) and the Edinburgh Postnatal Depression Scale (EPDS) (Chen et al., 2020).

The PHQ-9 and PHQ-2 are a compact set of self-administered or provider-administered tools for assessing depression, with high sensitivity (88%) and specificity (88%) for major depressive disorder. PHQ-2 contains the first two items of PHQ-9 which assesses the extent to which a person has experienced a depressed mood over the past two weeks. Individuals screened above the PHQ-2 limit should proceed to PHQ-9 for further evaluation to determine if the woman meets the diagnostic criteria for depression (Chen et al., 2020). The Edinburgh Postnatal Depression Scale (EPDS) is one of the instruments that is well-known and used to screen for depression in mothers who have given birth, to see if there are any depressive symptoms, and to measure the level of risk for postpartum depression (PPD) (FARHAN KAMALI ADLI, 2022).

Perinatal depression is known as a mental health condition. But in practice, less than 50% cases are identified, mostly because of the terms 'depression' and 'hopelessness', so women generally do not disclose symptoms of depression. Health professionals focus on identifying mothers and babies in patients to promote counseling about mental health. Health workers used a 10-item questionnaire, the Edinburgh Postnatal Depression Scale (EPDS), to detect symptoms of depression. The National Institute for Health and Care Excellence recommends a shorter questionnaire ("Whooley's question") (Littlewood, et. al, 2018). A total of 96% of patients completed EPDS at the first appointment with an average score of 3.8. Screening at 28 weeks of pregnancy, it is known that 60% of patients have an average score of 3.8 and postpartum mothers, 84% have an average score of 3.5.

Veterans Affairs (VA) patients and girls have significantly higher EPDS scores than women of childbearing age. Screening for depression has been shown to have significant benefits for patients. A recent systematic review showed significant reductions of up to 18% and 59% in the risk of depression of subsequent visits when screening programs were used. The same review also showed a sensitivity of 67% to 100% with a specificity of more than 87% perinatal and postpartum depression using a score of 13 on the Edinburgh Postnatal Depression Scale (EPDS) (Gisseman MC USA et al., 2021). This study aims to systematically review mental health screening tools in all pregnant women.

2. Research Method

This study uses the design of a systematic review based on the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. In the systematic review, the following steps were taken: formulating research questions, identifying search keywords, searching for relevant

article databases, selecting articles both abstract and full text, extracting articles according to selection criteria and reviewing the quality of articles.

2.1. Research Question

This study used a framework called PICOS (Population, Intervention, Comparation, Outcome, Study Design), as shown in Table 1.

Table 1. Framework of PICOS

P	***I***	***C***	***O***
Pregnant women	Healt Mental Screening	No Health Mental Screening	ICER

The question of this study is how to effectively and analyze the effectiveness of financing mental health screening tools in pregnant women.

2.2. Identify Relevant Study

The process of identifying relevant articles. The researcher has set parameters for determining as the inclusion and exclusion criteria, presented in Table 2. To find out relevant literature, several databases were used: PubMed, and Whiley. The database search was carried out on June 14-21, 2023. In the article search, Boolean, Medical Subject Heading (MESH) terms and Truncation were used with keywords such as Pregnan* OR Perinatal OR Gestation* OR Pregnancy AND Screen* OR Early detection* OR Mass screening AND Mental Health* OR Mental Disorders* AND Cost effectiveness analysis OR cost utility analysis.

Table 2. Inclusion and Exclusion Criteria

Inclusion Criteria	***Exclusion Criteria***
a. Publications in Indonesian and english Languages b. Original articles and Full Text c. Relevant articles on effectiveness, economic evaluation and mental health	a. Opinio Articles b. Reviewa Articles

2.3. Selection of Study Results

The study found two databases and obtained a total of 320 articles from PubMed and 570 articles from Whiley. Of these, 887 articles were selected for further analysis and there were three duplicate articles. After that, further screening was carried out so that two articles were obtained in accordance with the review sought. The results of this search are documented in the PRISMA CsR Flowchart presented in Figure 1.

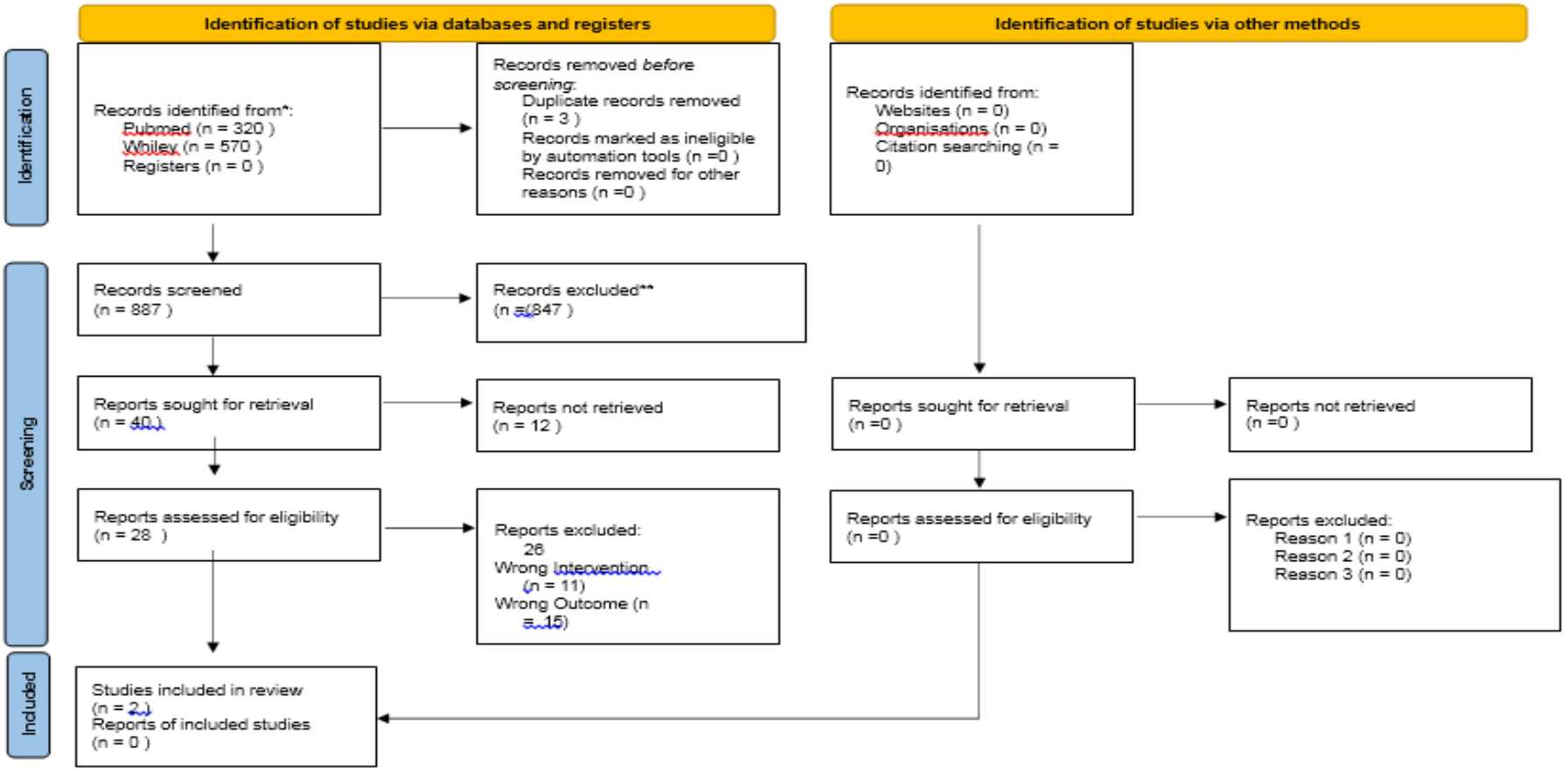

Figure 1. Prisma CsR Flowchart, 2020

Table 3: Data Charting

No	Writers/Country	Title	Population	Intervention	Comparison	Outcome	Goals	Type of articles	Screening Mechanism	Results
1.	(Heslin, et al., 2022b) Ingris	Cost-effectiveness of screening tools for identifying depression in early pregnancy: a decision treemodel	Pregnant women of 16+ years	Screeningof depression on all pregnant women, and first antenatal visit	Whooley, EPDS and Whooley followed by EPD and without screning	ICER	Exploring cost effectiveness on various screening tools to identify depression in early pregnancy compared with no screening	Cost Effectiveness Analysis (CEA)	Compare case identification Standard care (without screening tools) with the following screenings: only Whooley's questions; EPDS only; Whooley's question was followed by EPDS; and Whooley's question followed by PH-9. The authors report that the Whooley question followed by PHQ-9 had the highest probability of saving a probability cost of 0.47–0.48 for willingness to pay within the threshold of £20,000–£30,000	In a 4-way comparison, Whooley, EPDS and Whooley were followed by EPDS each who had the same probability of saving around 30% of costs, willing to pay at a value of £20,000–30,000 per QALY compared to 20% who did not pay.

2	(Littlewood, et al., 2018a) Inggris	Identifying perinatal depression with case-finding instruments: a mixed-methods study (BaBY PaNDA – Born and Bred in Yorkshire PeriNatal Depression Diagnostic Accuracy)	391 pregnant women.	Regular visits, support, full attention, visit HV listening and provide CBT if getting training. Socialization: young parent groups, breastfeeding groups, live and play, self-help actions.	Whooley, EPDS and diagnostic reference standards (CIS-R)	ICER	To determine the diagnostic accuracy, acceptance and cost-effectiveness of the Whooley and Edinburgh Postnatal Depression Scale (EPDS) questions to identify perinatal depression.	Cost Effectiveness Analysis (CEA)	Clinical Interview, Women complete Whooley questions, EPDS and diagnostic reference standards. During pregnancy (20 weeks) and after childbirth (3-4 months). Qualitative interviews were conducted with health professionals (HP) and a subsample of women.	*Diagnostic accuracy results: the prevalence rate of depression is 10.3% during pregnancy and 10.5% after give birth. The Whooley question and EPDS (cut-off point ÿ 10) were performed quite well, with sensitivity comparable to that of pregnancy: Whooley question 85.0%, 95% confidence interval (CI) 70.2% to 94.3%; EPDS 82.5%, CI 95% 67.2% to 92.7%; postnatal: Whooley questions 85.7%, 95% CI 69.7% to 95.2%; EPDS 82.9%-95% CI 66.4% to 93.4%] and and pregnancy specificity: Whooley's question 83.7%, 95% CI 79.4% to 87.4%; EPDS 86.6%, 95% CI 82.5% to 90.0%;*

postnatal: Whooley questions 80.6%, 95% CI 75.7% to 84.9%; EPDS 87.6%, 95% CI 83.3% to 91.1%). Diagnostic accuracy of EPDS (cut-off point ÿ 13) was poor at both time points (pregnancy: sensitivity 45%, 95% CI 29.3% to 61.5%, and specificity 95.7%, 95% CI 93.0% to 97.6%; postnatal: sensitivity 62.9%, 95% CI 44.9% to 78.5%, and specificity 95.7%, 95% CI 92.7% to 97.7%). Qualitative evaluation: women and HP support screening/case discovery for perinatal depression. EPDS is preferred over Whooley's questions by women and HP, mainly because of their 'softer' words.

Whooley's question 1 was considered less acceptable, largely because of the terms 'depressed' and 'hopeless', which caused women not to disclose their symptoms of depression. HP identifies a 'patient-centered' environment that focuses on mothers and babies to promote about mental health. Cost-effectiveness results: Case screening or discovery using Whooley or EPDS questions alone is not the most common strategy Cost-effective. The two-stage strategy, 'Whooley's questions followed by the Patient Health Questionnaire' (a measure that assesses depressive symptoms), is the

most cost-effective strategy in the range between £20,000 and £30,000 per year of quality-adjusted life in both prenatal and postnatal decision models.

3. Results and Discussion

3.1. Result

In this study, researchers found two relevant articles, which were then critically assessed using the CHEC-Extended checklist to help the research evaluate a clear, transparent and productive health economy (Odnoletkova, 2017).

Table 4. CHEC-Extended checklist

No	*Questions*	*A1 (Heslin, et al., 2022a)*	*A2 (Littlewood, et al., 2018)*
1.	Is The study population clearly described?	1	1
2.	Are competing alternatives clearly described?	1	1
3.	Is a well-defined research question posed in answerable form?	1	1
4.	Is the economic study design appropriate to the stated objective?	1	1
5.	Are the structural assumptions and the validation methods of the model properly reported?	1	1
6.	Is the chosen time horizon appropriate in order to include relevant costs and consequences?	0	0
7.	Is the actual perspective chosen appropriate?	1	0
8.	Are all important and relevant costs for each alternative identified?	0	0
9.	Are all costs measured appropriately in physical units?	1	1
10.	Are costs valued appropriately?	1	1
11.	Are all important and relevant outcomes for each alternative identified?	1	1
12.	Are all outcomes measured appropriately?	1	1
13.	Are outcomes valued appropriately?	1	1
14.	Is an appropriate incremental analysis of costs and outcomes of alternatives performed?	1	1
15.	Are all future costs and outcomes discounted appropriately?	1	0
16.	Are all important variables, whose values are uncertain, appropriately subjected to sensitivity analysis?	1	0
17.	Do the conclusions follow from the data reported?	1	1
18.	Does the study discuss the generalizability of the results to other settings and patient/client groups?	1	1
19.	Does the article/report indicate that there is no potential conflict of interest of study researcher(s) and funder(s)?	1	0
20.	Are ethical and distributional issues discussed appropriately?	1	1
	Total	18	14
	Score	90	70

In Table 4, the results were obtained in the form of two articles in the good 50% and medium categories

3.1.1. Characteristics of Sources of Evidence

The following are some characteristics of the two articles that have been selected :

a. Characteristics of the studies reviewed

Table 5. Characteristics of the studies reveiwed

Authors	*Country (Level of income)*	*Study Design*	*Economic*	*Population*	*Interventions Compared*
(Heslin, et al., 2022a)	London	cross-sectional	CEA	Pregnant women aged 16+	Whooley, EPDS and Whooley followed by EPD and no screening
(Littlewood, et al., 2018b)	UK	Study cohort	CEA	391 pregnant women.	Whooley, EPDS and diagnostic reference standards (CIS-R)

In Table 5, articles from developed countries, namely London (100%) and economic studies using CEA (100%).

b. Study characteristics reviewed from sensitivity analysis

Table 6. Study Characteristics reviewed from Sensitivity Analysis

Authors	*Time Horizon*	*Perspective*	*Discount Rate*	*Probabilistic sensitivity Analysis*	*One-Way Sensitivity Analysis*	*Scenario Analysis*	*Model Validation*
(Heslin et al., 2022)	Three month	NHS and Personal Sosial services	unclear	yes	yes	no	yes
(Littlewood et al., 2018)	Three month	NHS and Personal Sosial services	unclear	yes	yes	no	yes

c. Characteristics based on cost effectiveness of articles

Table 7. Cost Effectiveness based on Articles

Authors	*Effectiveness outcome measure*	*Currency and year*	*ICER*	*Conclusion By Authors (Quality Of Studies According To Chec)*
(Heslin, et. al, 2022)	QALY	£ (2022)	ICER worth £135,000 per QALY for EPDS versus Whooley and £240,000 per QALY for Whooley versus Whooley-EPDS	Of the three screening approaches examined, there was a higher probability of cost savings than no option. In the absence of a clear cost-effectiveness advantage for any of the screening options, the choice between screening approaches can be made for other reasons, such as the clinical burden of the screening options. Its limitations include the availability of data and a short time frame, so further research is needed. (Good)

Table 7. Continued

Authors	*Effectiveness outcome measure*	*Currency and year*	*ICER*	*Conclusion By Authors (Quality Of Studies According To Chec)*
(Littlewood, et al., 2018)		£(2018)	ratio (ICER) > £40.000 per QALY. EPDS £29.186 per QALY vs PHQ-9 £75.354	The Whooley and EPDS questions have acceptable sensitivity and specificity but their use in practice may be limited by low predictive values and vary in their acceptance. A two-stage strategy will be more cost-effective than a one-stage strategy. There are no case discovery instruments that meet the criteria of the National Screening Committee. (Medium) The Whooley and EPDS questions have acceptable sensitivity and specificity but their use in practice may be limited by low predictive values and vary in their acceptance. A two-stage strategy will be more cost-effective than a one-stage strategy. There are no case discovery instruments that meet the criteria of the National Screening Committee. (Medium)

3.2.Discussion

3.2.1. Result of Individual Sources of Evidence

The following are some of themes that emerged from the Systematic Review conducted by the researcher, presented in table 8 as follows:

Table 8. Mapping Theme

Theme	*Article*
Cost	A1, A2
Effectiveness	A1, A2
Treshold	A1, A2

3.2.2. Summary of Evidance

Based on the two selected articles, the right articles were gained in accordance with the objectives of the systematic review, with discussions on cost, effectiveness and thresholds.

a. Cost

In article 1, the use of EPDS only, the Whooley question was followed by EPDS, and the Whooley question was followed by Patient Health. Questionnaire-9 (PHQ-9) with routine clinical assessment (without screening tools). They concluded that Whooley's question followed by PHQ-9 was the most cost-effective option.

In article 2, it was obtained the results of the economic costs of perinatal depression. A small study in the UK estimated the economic burden of postpartum depression on health and social services in the UK at around £54 million (1.04 trillion) per year (ranging from £52 million (1 trillion) to £65 million

(1.26 trillion)), although it has been suggested that this figure is likely an underestimate of the actual economy. The average cost of mother and baby over the 18 months after birth for women with postpartum depression has been found to be an additional cost of £591(11,463,969).

The health and social care costs of fathers at risk of depression during the postpartum period were supplemented by £159 (3,084,215) and £130 (2,521,685), respectively, compared to fathers who were not depressed (£945 (18,330,713)) (at price range in 2008). In the United Kingdom, estimates from the cost consequences of a child with perinatal depression are around £8190 (£158,866,180 per child including public costs, the cost of declining income and costs associated with a health-related decline in quality of life).

b. Effectiveness

In article 1, the results of the cost-effectiveness of the screening approach at 20 weeks of pregnancy (later than recommended by NICE), lost the opportunity to detect and treat depression in early pregnancy. There are a number of reasons why screening effectiveness and cost-effectiveness may differ when applied to the first antenatal visit compared to 20 weeks of pregnancy due to emotional states related to early pregnancy.

In article 2, from the results obtained, it shows that this study is based on the latest NICE guidelines (2014) on clinical management of antenatal and postnatal depression as well as reflecting clinical practice on the NHS sites involved in the BaBY PaNDA study. The screening or discovery strategies of one- and two-stage cases are compared as follows: whooley questions only, EPDS only, whooley questions followed by EPDS and whooley questions followed by PHQ-9 case identification treatment. In the EPDS instrument, it is used in the cost-effectiveness analysis.

c. Treshold

From article 1, it is obtained that the results of screening with EPDS can save about 85% or worth £27,500 (533,433,450), £20,000 (387,951,600) NICE threshold. However, in the pooling of cost-effectiveness for depression screening and psychosis, The Whooley Question followed by PHQ-9 had the highest probability, with a probability cost-saving of 0.47–0.48 for willingness to pay a threshold of £20,000–£30,000 (387,951,600–581,927,400).

In article 2, the study used either a single stage of the Whooley question alone or EPDS alone and never saved costs, although EPDS alone had a higher probability of saving costs than the Whooley question. A single-stage strategy like this has an additional cost-effectiveness ratio that is above the conventional threshold of £20,000–30,000 (387,951,600-581,927,400) per QALY. Two-stage strategies are more cost-effective than single-stage strategies. In the prenatal period, the 'Whooley question was followed by the PHQ-9 Health Questionnaire, which was used to assess the symptomatology of depression and had the highest probability of cost-saving at the WTP threshold of £20,000 (387,951,600) (probability = 0.47), and £30,000 (581,927,400) per QALY (probability = 0.48), followed by the 'Whooley question with EPDS (cut-off point 13)'. Similarly, in the postnatal period, the 'Whooley question followed by the PHQ-9' had the highest probability of saving costs at the threshold of £20,000 (387,951,600) (probability = 0.43), and £30,000 (581,927,400) per QALY (probability = 0.35). The difference in net profit (i.e. QALYs × WTP – cost) between the two cost-saving strategies in the prenatal and postnatal periods was relatively small (< £15 (290,963) at the threshold of £20,000 (387,951,600) and £30,000 (581,927,400).

4. Conclusion

In this systematic review, the study identified three themes: cost, effectiveness and threshold. Of the many strategies used in conducting mental health screening in pregnant women, in terms of cost, two screening tool methods can save health expenses compared to one method alone. The Whooley test or EPDS is not the most cost-effective strategy, although the EPDS has a higher probability of becoming

more cost-effective than the Whooley question. So it can be said that a combination of whooley questions and EPDS or PHQ-9 can save costs at a threshold between £20,000 to £30,000.

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