



Cost-effectiveness of screening and intervention strategies for perinatal depression using multi-state Markov model in rural China

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INTRODUCTION

Perinatal depression is a common complication among pregnant women, leading to significant burdens. Women living in rural areas of western China face increased vulnerability due to limited mental health resources, insufficient screening services, and barriers to accessing psychological care. Although early identification and control can be achieved through appropriate psychological interventions, evidence remains insufficient regarding the optimal timing and frequency of screening and the cost-effectiveness of different intervention strategies, particularly in less-developed settings.

OBJECTIVES

This study aims to evaluate different screening and intervention strategies for perinatal depression in rural China from a societal perspective, providing evidence to inform decision-making in resource-limited settings.

METHODS

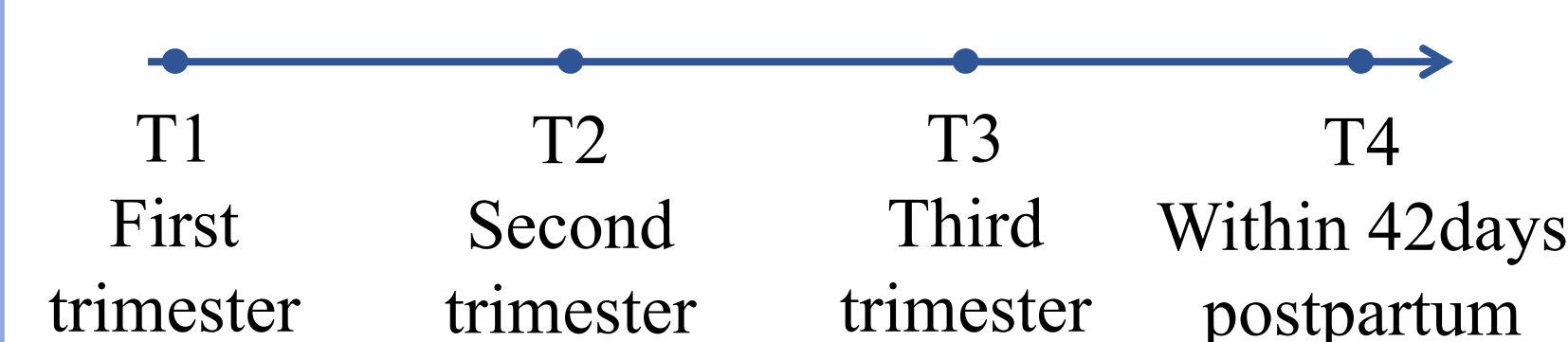
1. Study Design

- Perspective: whole-of-society perspective
- Population: 100,000 pregnant women
- Time horizon: early pregnancy to 1 year postpartum
- Model: markov decision analysis model
- Outcome: QALYs and costs
- Economic evaluation: ICERs
- Sensitivity analysis: One-way and probabilistic sensitivity analyses

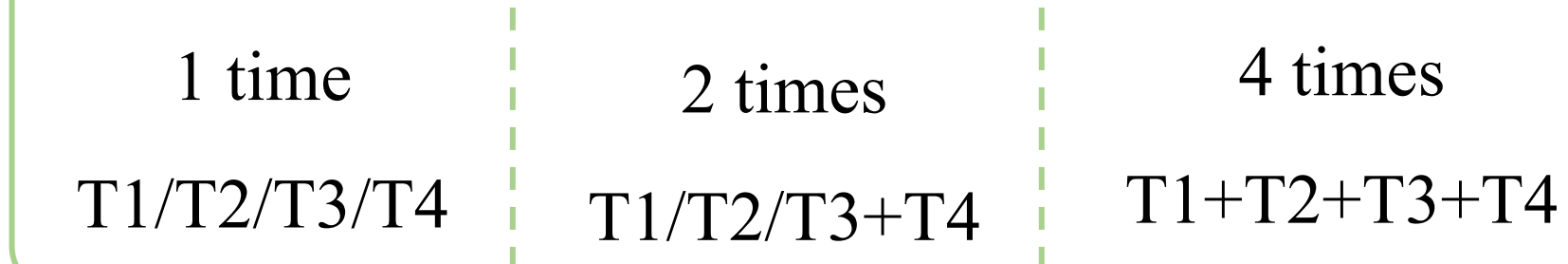
2. Strategy Design(16 intervention strategies)

Strategies were defined by three dimensions: timing of screening, frequency of screening, and types of interventions for women who screened positive.

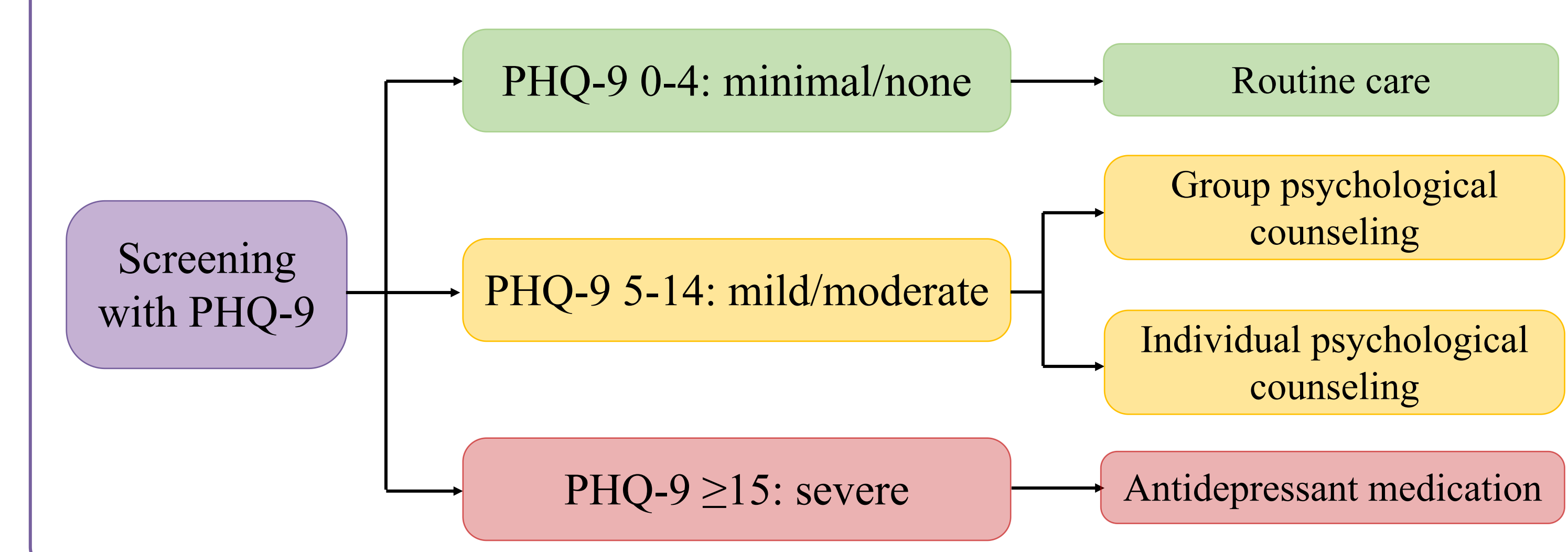
A. Timing of screening



B. Frequency of screening



C. Intervention type for screen-positive women



RESULTS

Table 1 Cost-effectiveness analysis of different screening and intervention strategies

Screening strategy	Cost (CNY/Person)	Incremental QALYs (Year/100,000 persons)	ICER vs no screening
No screening	1720.05	-	-
Strategy (1)	1619.62	490	-20585.12
Strategy (2)	1713.25	370	-1829.31
Strategy (3)	1758.46	220	17135.07
Strategy (4)	1760.64	130	30818.02
Strategy (5)	1653.53	630	-10626.53
Strategy (6)	1743.32	510	4527.22
Strategy (7)	1787.58	380	17858.37
Strategy (8)	1547.71	1400	-12268.96
Strategy (9)	1872.99	510	29843.03
Strategy (10)	1559.91	400	60465.94
Strategy (11)	1897.48	240	75304.70
Strategy (12)	1869.15	140	106834.36
Strategy (13)	2014.89	660	44833.78
Strategy (14)	2096.41	550	68984.20
Strategy (15)	2028.55	400	77936.14
Strategy (16)	2223.44	1460	34522.42

Compared with no screening, all intervention strategies generated greater gains in healthy life-years and are cost-effective. Specifically, strategy(8) which consisted of one screening during the first, second, and third trimesters and one within 42 days postpartum, combined with group psychological counseling, demonstrated the highest cost-effectiveness. This strategy yielded an ICER of -12,269.96 CNY per healthy life-year, indicating a cost saving of 12,269.96 CNY for each additional healthy life-year.

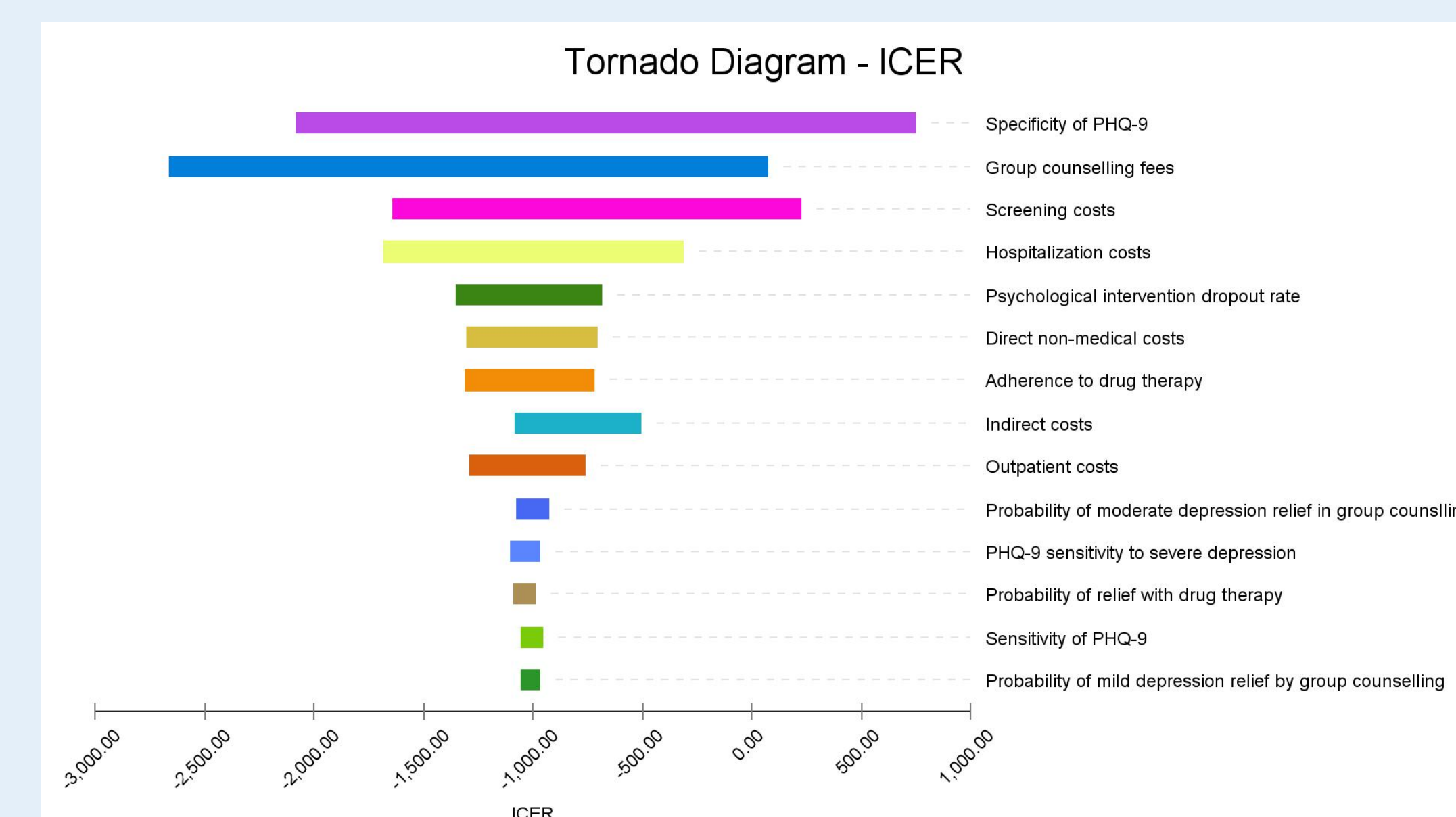


Figure 1. Sensitivity analysis of single factors tornado diagram

For Strategy(8), all ICER scatter points fell within the cost-effective region under the WTP threshold (257,094 CNY/QALY), indicating a 100% probability of cost-effectiveness. The probability of Strategy (8) being dominant (lower cost and greater effectiveness) was 61.9%.

Compared with the no-screening strategy, the five parameters with the greatest impact on the ICER of Strategy(8) were the specificity of the PHQ-9, the cost of group psychological counseling, screening cost, hospitalization cost, and the dropout rate from psychological interventions.

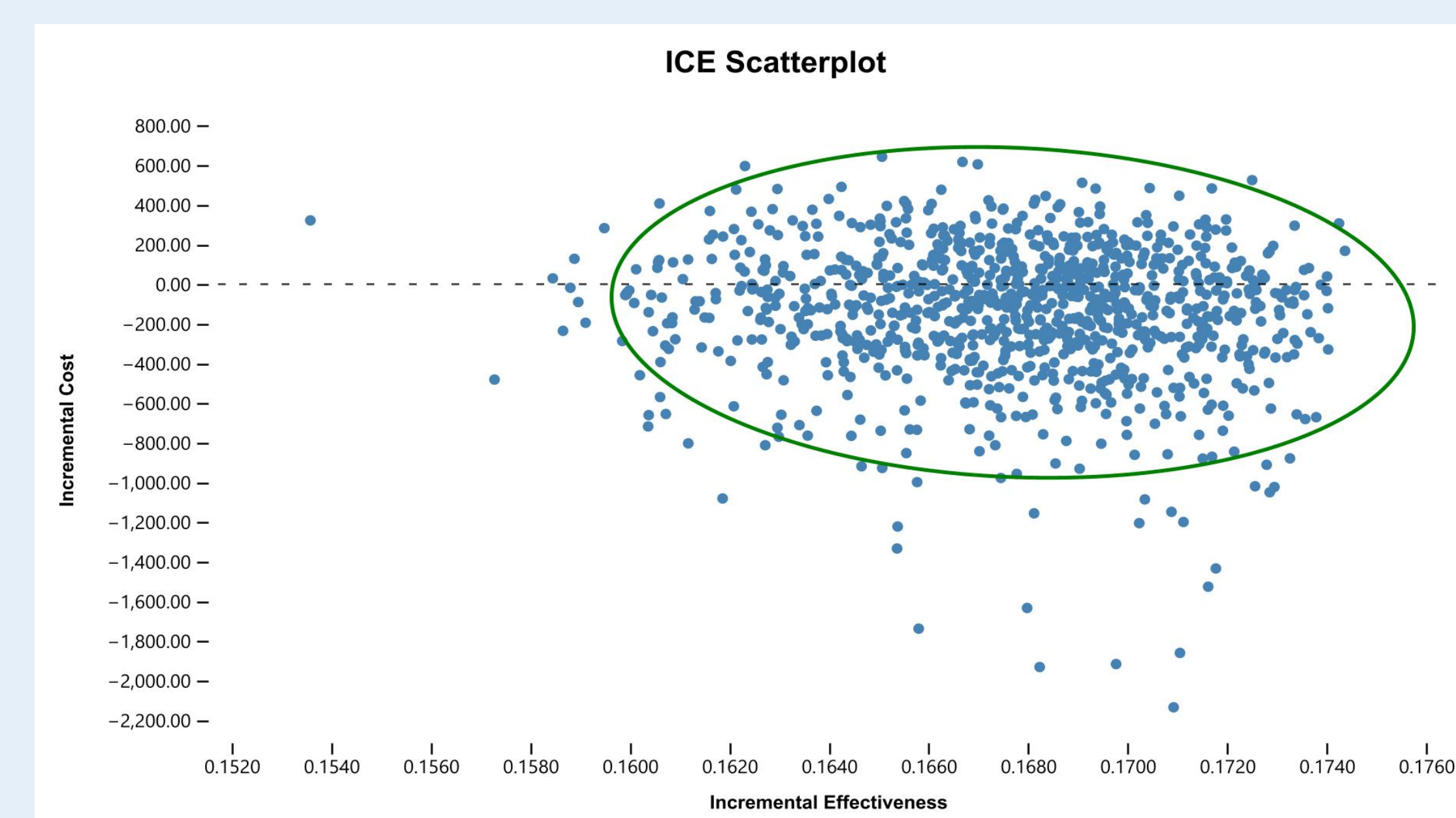


Figure 2. Sensitivity analysis of screening strategies

CONCLUSIONS

This study is the first to conduct Markov decision analysis model in rural China to evaluate perinatal depression screening and intervention strategies. The model considered various screening timings, frequencies, and psychological intervention methods, resulting in 16 intervention strategies that form a comprehensive screening program for perinatal depression in Chinese women. These findings provide an evidence-based reference for decision-making in perinatal depression prevention and control policies in rural China and other resource-limited contexts.

For resource-limited settings, multiple depression screenings combined with group counseling constitute the most cost-effective strategy for perinatal depression prevention and management, and should therefore be prioritized in policy-making.