

# Cost-Effectiveness of Universal Screening for Hypothyroidism in Malaysian Pregnant Women

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## CONCLUSIONS

Universal screening is cost-effective compared to no screening and high-risk screening, as the higher overall costs are associated with less expected events (miscarriages and preterm deliveries) and higher QALYs.

These findings provide a valuable starting point for further research to understand the long-term impact of universal screening for hypothyroidism in pregnancy, and to help contribute to the development of national screening policy.

### Hypothyroidism Universal Screening Impact

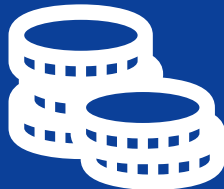


**500K**  
pregnancies  
annually

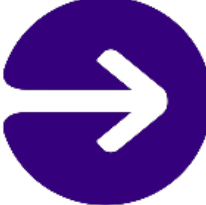


**Events avoided:**  
21,853 vs no screening  
3,981 vs high-risk screening

**QALYs gained:**  
9,178 vs no screening  
2,909 vs high-risk screening



**Cost-effectiveness in the public sector:**  
ICER MYR 15,655/QALY vs no screening  
ICER MYR 13,753/QALY vs high-risk screening



## INTRODUCTION

- Hypothyroidism is a prevalent health concern in Malaysia and worldwide.
- In Malaysia, an estimated 91.90% of pregnant women receive antenatal care in public facilities.<sup>1</sup>
- To date, no cost-effectiveness analysis of universal hypothyroidism screening has been conducted in the Malaysian pregnant population.
- Implementing cost-effective screening and intervention strategies in the pregnant population is essential to mitigate the associated costs of untreated hypothyroidism and improve maternal and fetal outcomes in Malaysia.



## OBJECTIVES

- Assess the cost-effectiveness of universal hypothyroidism screening during the first and second trimesters versus high-risk screening and no screening.
- Support healthcare policies and decision-making processes regarding the most efficient approach to hypothyroidism screening during pregnancy in Malaysia.



## METHODS

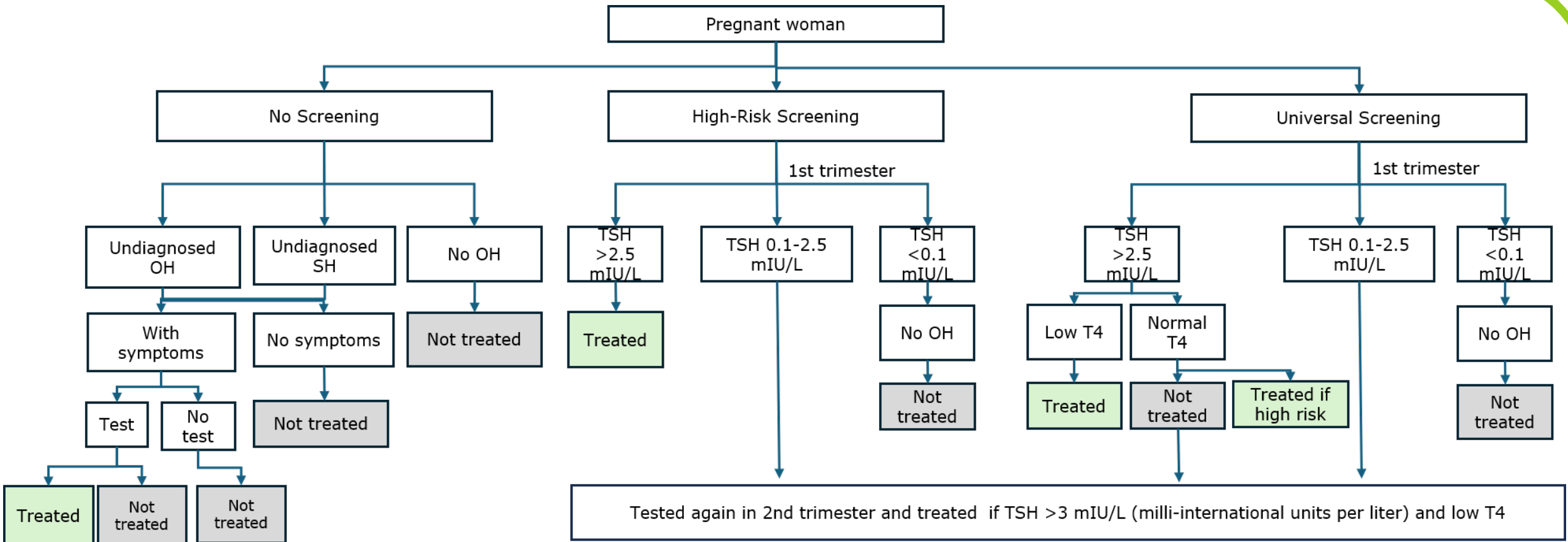
A decision-analytic model (Figure 1) assessed costs and outcomes (miscarriages, preterm births, QALYs) of universal hypothyroidism screening, high-risk screening and no screening.

The analysis considered a within-pregnancy horizon and the perspective of the Malaysian healthcare system. Local clinical experts validated the model assumptions, and one-way sensitivity analysis (OWSA) identified key drivers of the results. Both public and private sector scenarios were modelled; a full public funding was assumed as base case, given their direct relevance to national policy.

Clinical inputs (56.0% high-risk; TSH >2.5 mIU/L in 14.0% of first-trimester and >3 mIU/L in 20.9% of second-trimester women) were sourced from regional studies.<sup>2-8</sup> Adverse-event risks (preterm delivery 4.0–12.4%, first-trimester miscarriage 17.1–24.5%, depending on thyroid status and treatment) and utilities (0.671–0.947 by health state; 0.840 miscarriage, 0.724 preterm delivery) were sourced from published literature,<sup>9-14</sup> while input costs (Table 1) were taken from a government source.<sup>15</sup>

Table 1. Cost inputs in public sector

| a. Cost Inputs                     | Unit cost (MYR) |
|------------------------------------|-----------------|
| Treatment (monthly cost)           | 4               |
| Visits to endocrinologist          | 390             |
| Thyroid profile (TSH and T4 tests) | 65              |
| Preterm delivery                   | 7,434           |
| Miscarriage                        | 1,399           |



Key Model Assumptions

- Thyroid-stimulating hormone (TSH) levels were based on the American Thyroid Association Guidelines 2011, as there are currently no existing Malaysia-specific TSH reference ranges for pregnancy.<sup>2,16</sup>
- TSH and thyroxine (T4) levels were tested in 1<sup>st</sup> and 2<sup>nd</sup> trimesters and treatment was initiated for TSH >2.5 mIU/L and low T4. Normal T4 women with TSH >2.5 mIU/L started treatment if they were at high risk (previous miscarriage, infertility).
- Unscreened women could undergo symptom-related testing.
- Each woman accrues QALYs over the 9-month pregnancy at the utility for her hypothyroid state. For those who miscarry (at 3 months on average) or deliver preterm (at 7 months on average), the remaining months are re-valued at the event utility instead.

Figure 1. Decision tree model



## RESULTS

- The incremental cost-effectiveness ratio (ICER) of universal screening vs high risk screening was MYR 13,753/QALY, while the ICER of universal screening vs no screening was MYR 15,655/QALY, all ICERs well below Malaysia GDP/capita of MYR 55,800 (2024 Malaysian GDP per capita). (Figure 2). Results are most sensitive to utility values, prevalence of hypothyroidism in the second trimester and screening costs.
- Base case results assuming public funding show that universal screening for hypothyroidism is cost-effective compared to no screening and high-risk screening, as the higher overall costs are associated with less expected events (miscarriages and preterm deliveries), and higher QALYs (Table 2).
- These results can be considered conservative as they do not include long-term effects on offspring, such as neurocognitive impairment, associated with hypothyroidism during pregnancy.<sup>17</sup> The pregnancy-only horizon was chosen to focus on immediate maternal and perinatal outcomes that drive short-term costs and QALYs in the Malaysian antenatal setting. A limitation of this study is that the cost of Anti-TPO testing and its role in guiding treatment decisions were not factored in.
- Given the differences in clinical practice in Malaysia, TSH thresholds for initiating treatment may vary among clinicians. Some use a threshold of 2.5 mIU/L, while others use 4.0 mIU/L. This analysis uses the 2.5 mIU/L threshold; therefore, it may not fully reflect real-world treatment practices, which may limit its generalizability across clinical settings in Malaysia.

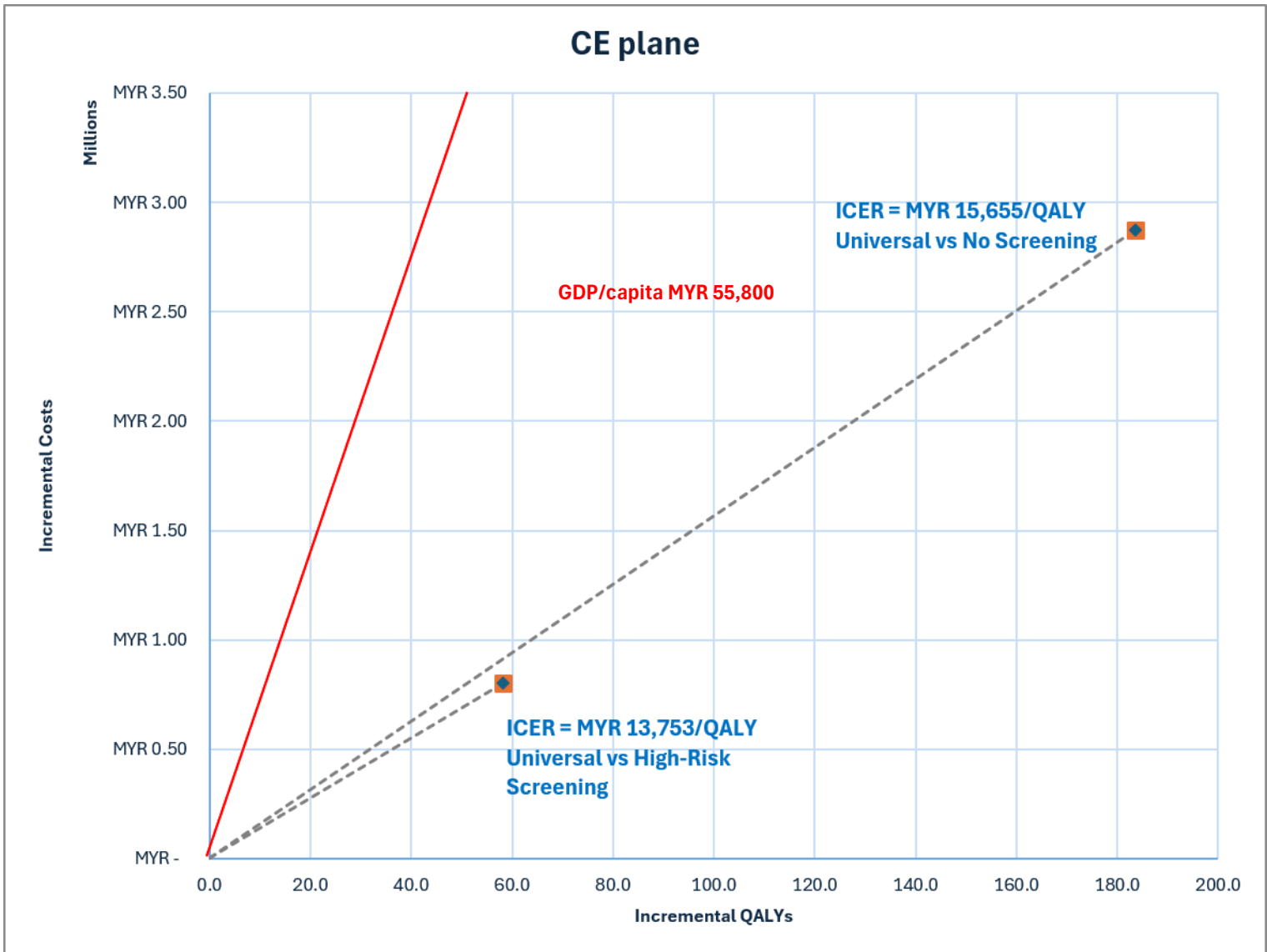


Figure 2. Cost-effectiveness plane

Table 2. Results

| 10,000 Pregnant women                   | No Screening  | High-risk Screening | Universal Screening |
|-----------------------------------------|---------------|---------------------|---------------------|
| <b>Costs</b>                            |               |                     |                     |
| Cost of screening strategy              | MYR 26,037    | MYR 798,477         | MYR 1,462,621       |
| Cost of visits                          | MYR 288,159   | MYR 3,410,288       | MYR 3,758,363       |
| Cost of treatment                       | MYR 3,267     | MYR 43,740          | MYR 48,655          |
| Cost of preterm births and miscarriages | MYR 8,639,610 | MYR 6,778,134       | MYR 6,561,193       |
| Overall costs                           | MYR 8,957,073 | MYR 11,030,638      | MYR 11,830,831      |
| <b>Outcomes</b>                         |               |                     |                     |
| Total expected preterm deliveries       | 796           | 571                 | 553                 |
| Total expected miscarriages             | 1946          | 1814                | 1752                |
| Total expected outcome                  | 2742          | 2384                | 2305                |
| Total expected QALYs                    | 6766          | 6892                | 6950                |

Note: ICER values differ slightly from those reported in the abstract due to updated values after abstract submission.

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**Abbreviations:** Anti-TPO, Anti-thyroid peroxidase antibody; CEA, Cost-effectiveness analysis; GDP, Gross domestic product; ICER, Incremental cost-effectiveness ratio; MYR, Malaysian ringgit; OH, Overt hypothyroidism; OWSA, One-way sensitivity analysis; QALY, Quality-adjusted life year; SH, Subclinical hypothyroidism; T4, Thyroxine; TSH, Thyroid-stimulating hormone.

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