

Cost-effectiveness and Budget Impact analyses of non-invasive prenatal testing (NIPT) for screening of fetal chromosomal aneuploidies in Brazilian Private Health System

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INTRODUCTION

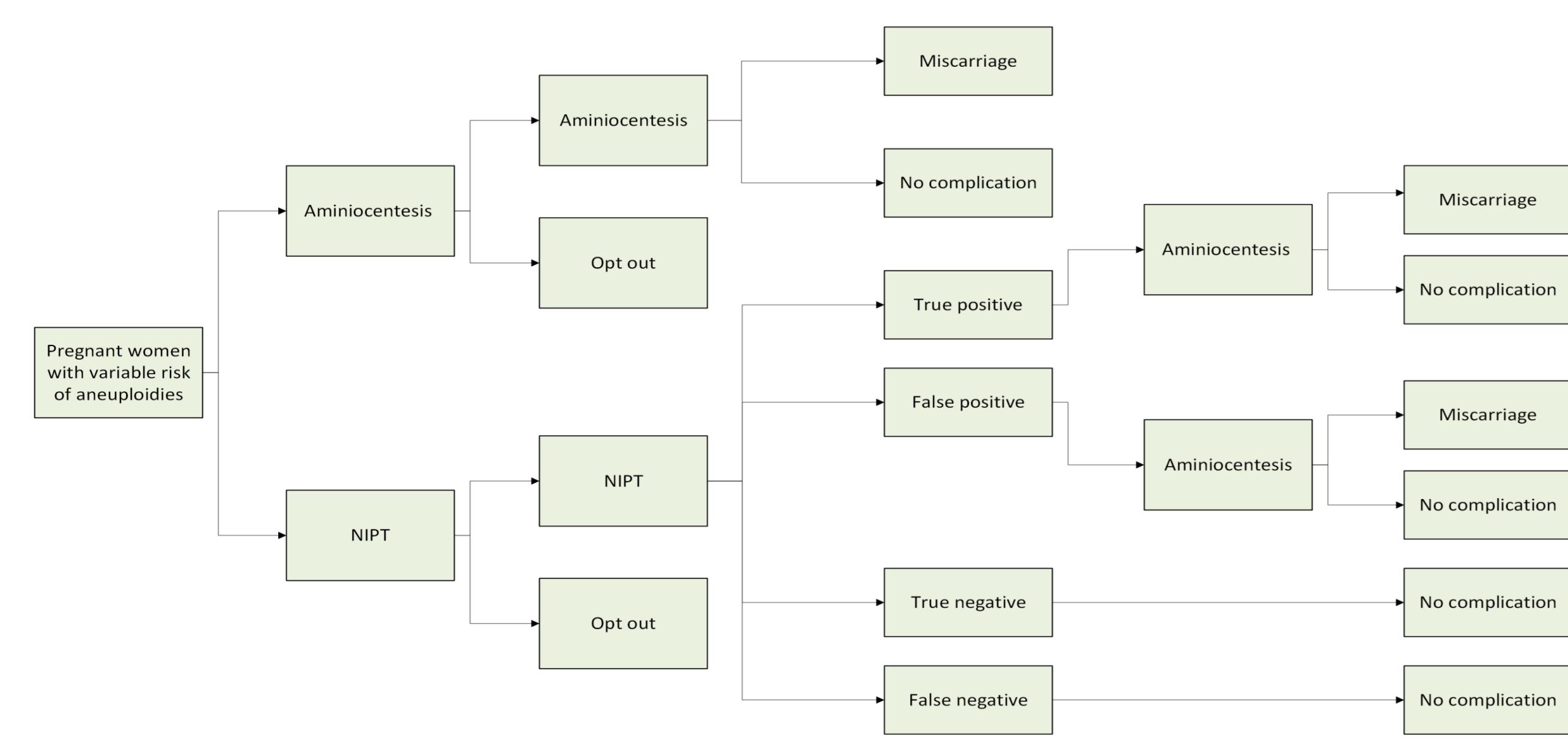
Non-invasive prenatal testing (NIPT) has emerged as a highly accurate screening modality for fetal aneuploidies. However, its cost-effectiveness in resource-constrained settings remains unclear.

This study assessed the cost-effectiveness and budget impact of introducing NIPT for detecting common fetal chromosomal aneuploidies among pregnant women with singleton pregnancies, from the perspective of the Brazilian private healthcare system.

METHODS

- A decision tree model with a one-year time horizon was developed in Microsoft Excel 2019 (Microsoft Corporation, Redmond, WA, USA).
- The strategies compared were: NIPT-based screening followed by confirmatory amniocentesis versus direct amniocentesis.

Figure 1. Decision Tree



- The target population included pregnant women with singleton pregnancies and variable aneuploidy risk.
- Clinical parameters were derived from systematic literature review, while costs and resource utilization data were obtained from the UNIMETRICS database, a real-world database from Unimed.
- Outcomes included cost per miscarriage avoided and cost per amniocentesis avoided.
- Deterministic and probabilistic sensitivity analyses assessed parameter uncertainty using 5,000 Monte Carlo simulations.

DISCUSSION

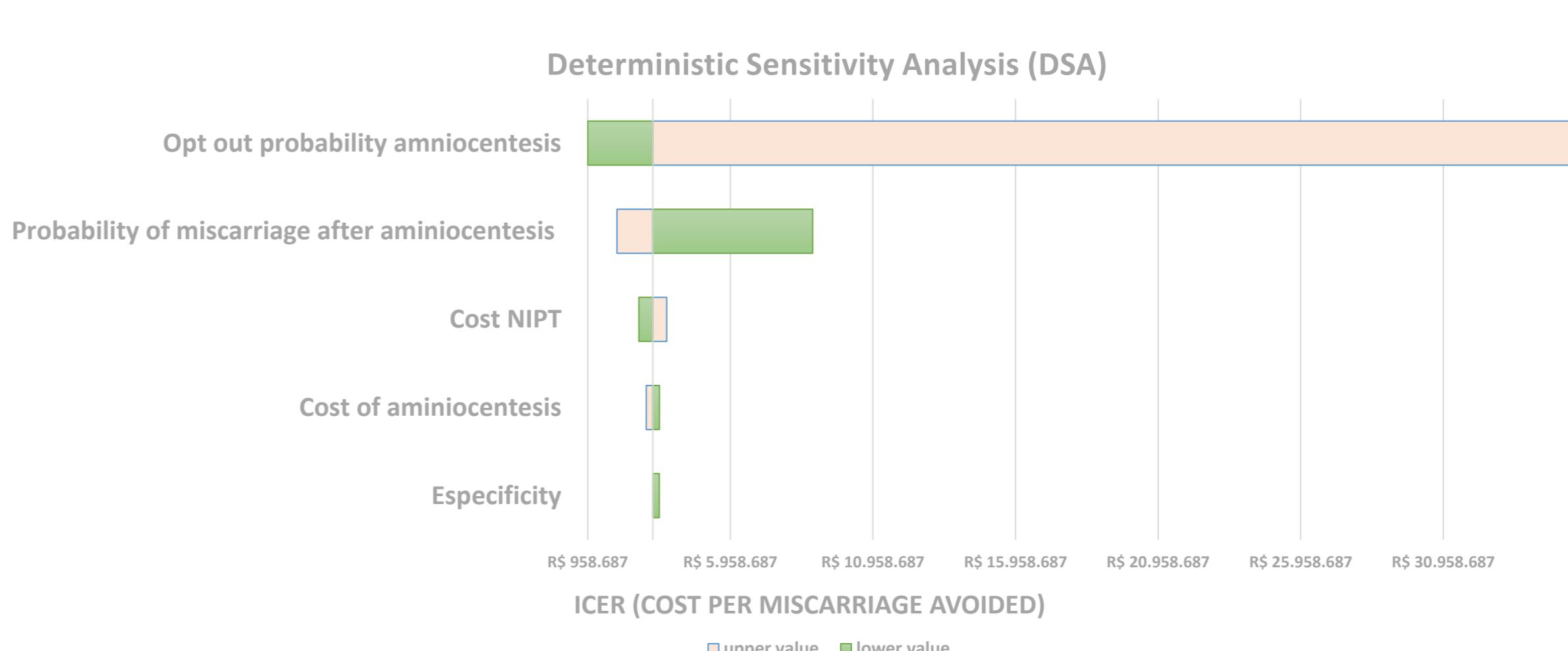
In the context of NIPT, novel elements of value beyond traditional cost-effectiveness could include the psychological benefit of reduced anxiety associated with the non-invasive nature of testing, the insurance value provided by having access to genetic information for family planning decisions, and the broader societal value of advancing precision medicine approaches.

One strength of this analysis is the cost data applied to this analysis represents real world data from the largest private healthcare payer in Brazil.

RESULTS

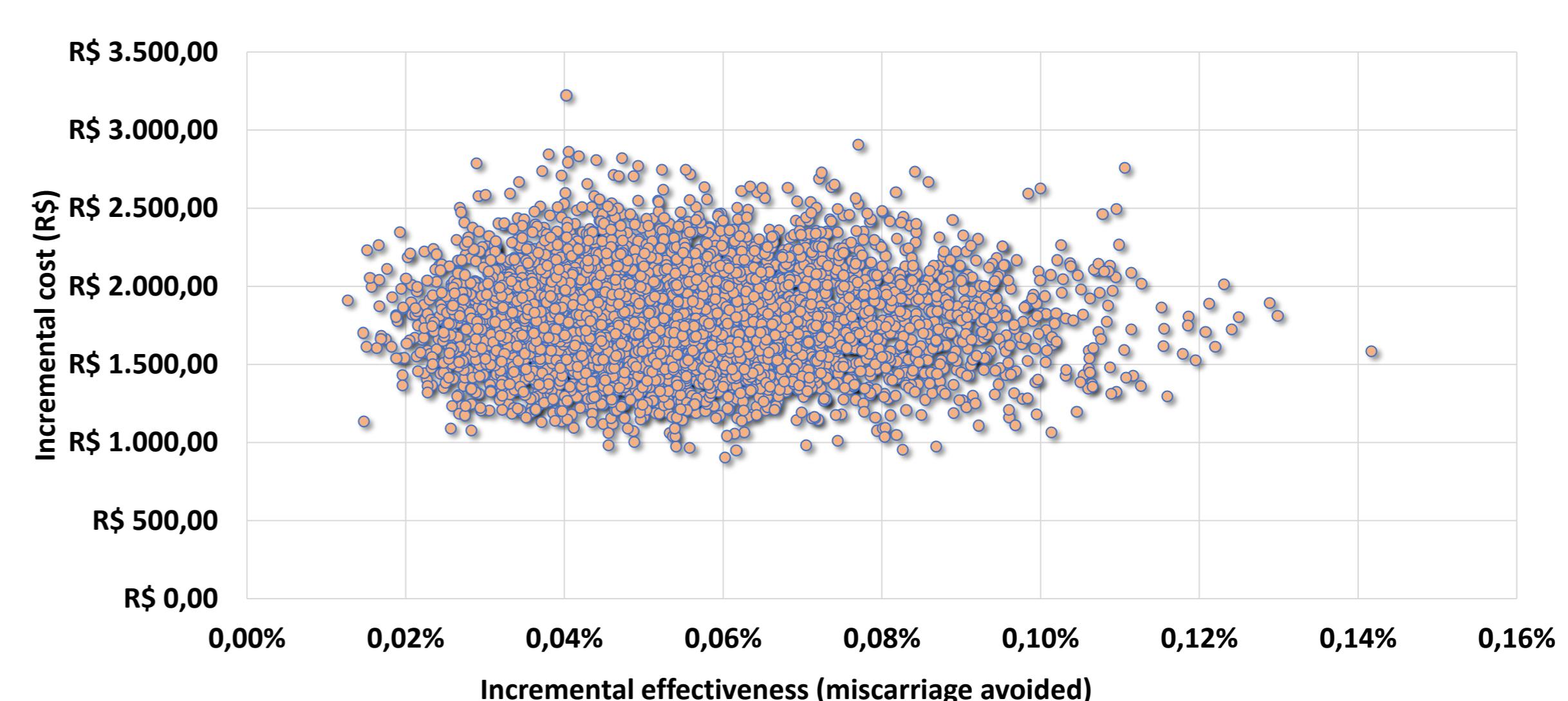
- Among pregnant women with variable risk, implementing NIPT increased per-patient costs by R\$ 1,759.52, reduced the number of amniocentesis procedures by 18.4%, and avoided 0.06% of procedure-related miscarriages.
- The incremental cost-effectiveness ratio (ICER) was R\$ 3,183,442.50 per abortion avoided and R\$ 9,550.33 per amniocentesis avoided.
- Deterministic sensitivity analysis (DSA) indicated that the willingness to initiate investigation was the most influential parameter.

Figure 2. Tornado Diagram (DSA)



- Probabilistic sensitivity analyses (PSA) confirmed that NIPT consistently resulted in higher costs but fewer invasive procedures and related miscarriages.

Figure 3. Scatterplot (PSA)



- The cumulative five-year budget impact for an estimated 243,845 eligible patients was R\$ 943,914,520, assuming a market share increase from 10% in the first year to 80% by year five.

CONCLUSIONS

Incorporating NIPT for prenatal screening in women with varying risk profiles reduces the need for invasive procedures and associated miscarriages, although it increases costs for the private healthcare system. NIPT is most cost-effective in contexts with high demand for prenatal chromosomal investigation and frequent use of amniocentesis. These results provide valuable evidence to inform policy decisions regarding the adoption of NIPT in Brazilian private healthcare settings.

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