

# Cost-effectiveness of a dietitian delivered telephone coaching program during pregnancy for preventing gestational diabetes mellitus.

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Weight gain above recommendations during pregnancy confers a greater risk of gestational diabetes with subsequent healthcare costs and financial and emotional burden for women

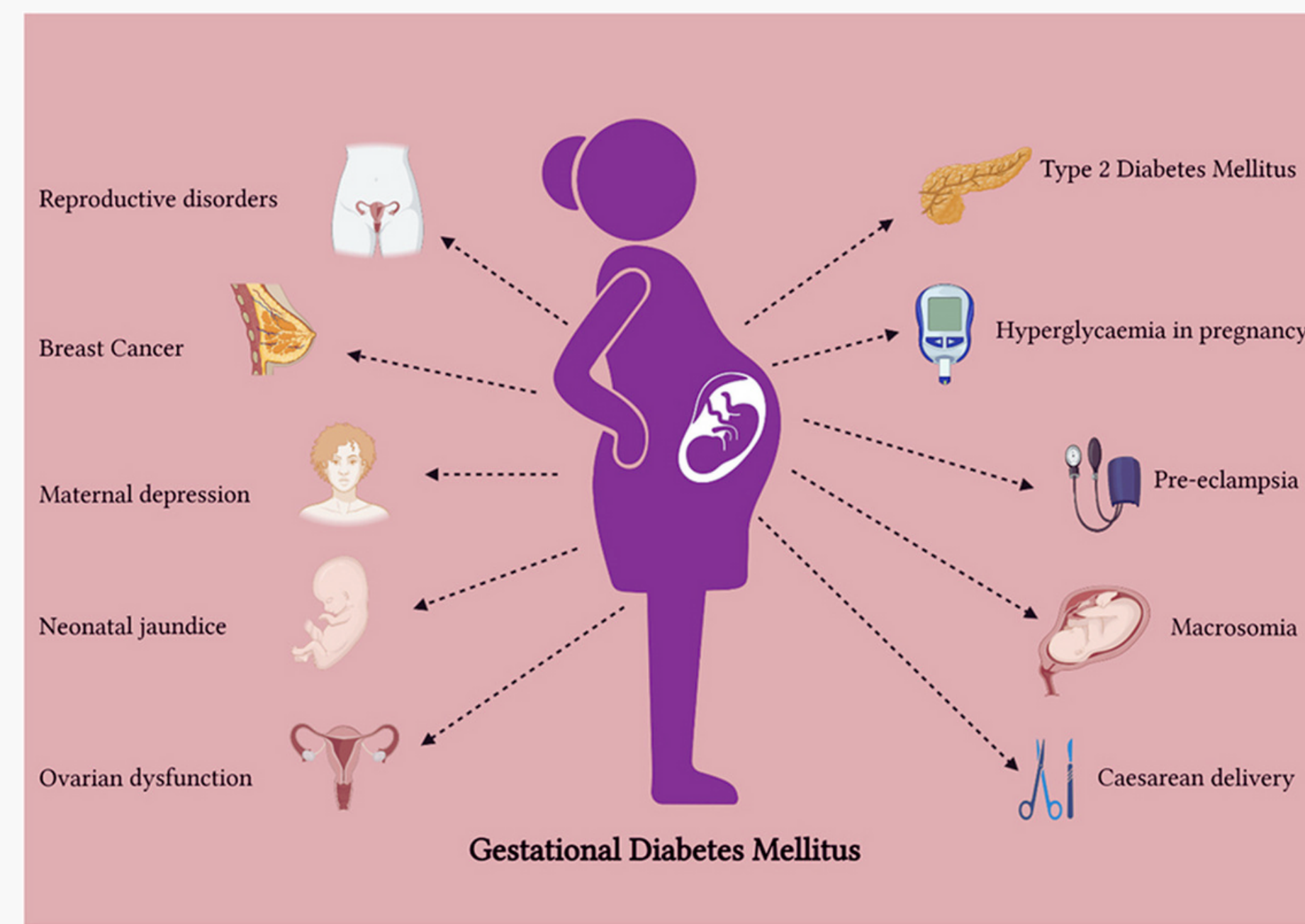


Image 1. Sequelae of gestational diabetes, reproduced from: Abbas Alam Choudhury, V. Devi Rajeswari, Gestational diabetes mellitus - A metabolic and reproductive disorder, Biomedicine & Pharmacotherapy, Volume 143, 2021, <https://doi.org/10.1016/j.biopha.2021.112183>.

The Living Well During Pregnancy program, a dietitian-delivered telephone counselling service aimed to reduce excess gestational weight gain. Up to 10 coaching sessions were delivered. The program included healthy eating, and physical activity, consistent with dietary and physical activity guidelines for pregnancy.

**INTRODUCTION**

EXCESSIVE GESTATIONAL WEIGHT GAIN (GWG) DURING PREGNANCY IS A COMMON PROBLEM AFFECTING 40-60% OF PREGNANCIES. THIS INCREASES THE RISK OF ADVERSE HEALTH OUTCOMES SUCH AS GESTATIONAL HYPERTENSION, GESTATIONAL DIABETES MELLITUS (GDM), AND LARGE-FOR-GESTATIONAL BABIES, RESULTING IN HIGHER HEALTHCARE COSTS. GDM, A PERSISTENT CONDITION CHARACTERIZED BY ELEVATED BLOOD GLUCOSE LEVELS, AFFECTS AROUND 15% OF PREGNANCIES IN AUSTRALIA, AND EXCESSIVE GWG INCREASES THE RISK OF GDM BY 1.4 TIMES.

**OBJECTIVE**

The aim of this study was to calculate the cost-effectiveness of an intervention to reduce GDM. A secondary aim is to calculate the breakeven point of reducing GDM.

**METHODOLOGY**

A decision tree model was built in TreeagePro® to compare coaching intervention to routine care to women with a BMI of 25kg/m<sup>2</sup> or greater. Data was sourced from a large quaternary hospital in Brisbane, Australia. Costs included staff time for the coaching intervention. For costs of births, all babies birthed between 1 September 2016 to 31 August 2017 were included in the cost analysis. Total costs for each type of birth per BMI category were calculated. Probabilities were calculated from the data on types of birth and presence of GDM. Utilities were sourced from published studies

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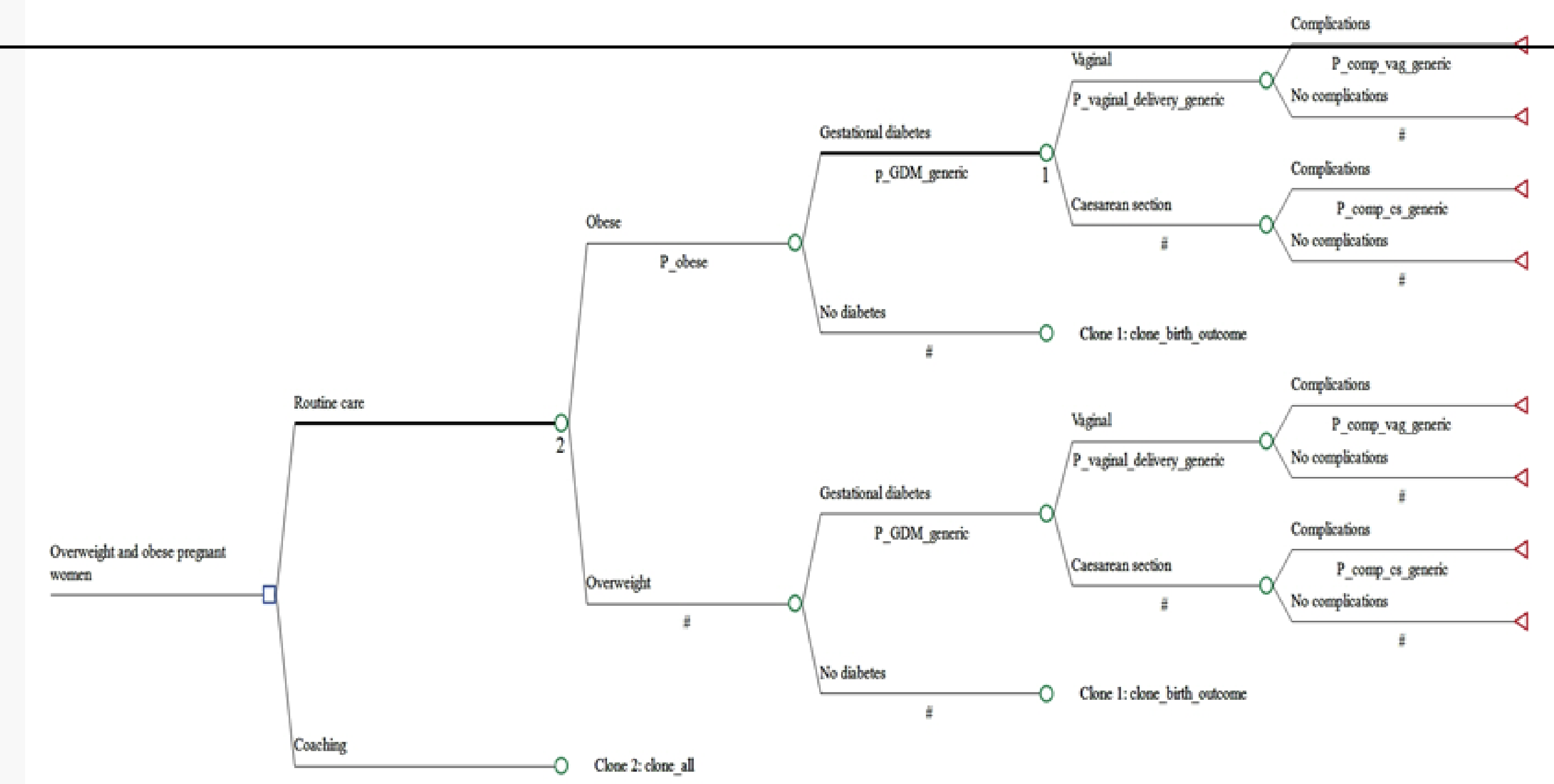
Image 2. A key component is improving diet quality

**ACKNOWLEDGEMENTS**

THE AUTHORS WISH TO THANK ALL WOMEN WHO PARTICIPATED IN THE EVALUATION OF THE LIVING WELL DURING PREGNANCY PROGRAM, CLINICAL AND ADMINISTRATIVE STAFF FROM MATERNITY SERVICES AT THE ROYAL BRISBANE AND WOMEN'S HOSPITAL AND HEALTH COSTING AND ANALYSIS STAFF. THE AUTHORS ALSO WISH TO ACKNOWLEDGE CO-INVESTIGATORS FOR THEIR CONTRIBUTION ON THE CLINICAL EVALUATION OF THE LIVING WELL DURING PREGNANCY STUDY LEONIE CALLAWAY, SHELLEY WILKINSON, AND HILARY POWLESLAND.

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Image 3. Simplified diagram of the decision tree model used to analyze the cost-effectiveness of coaching to reduce gestational diabetes



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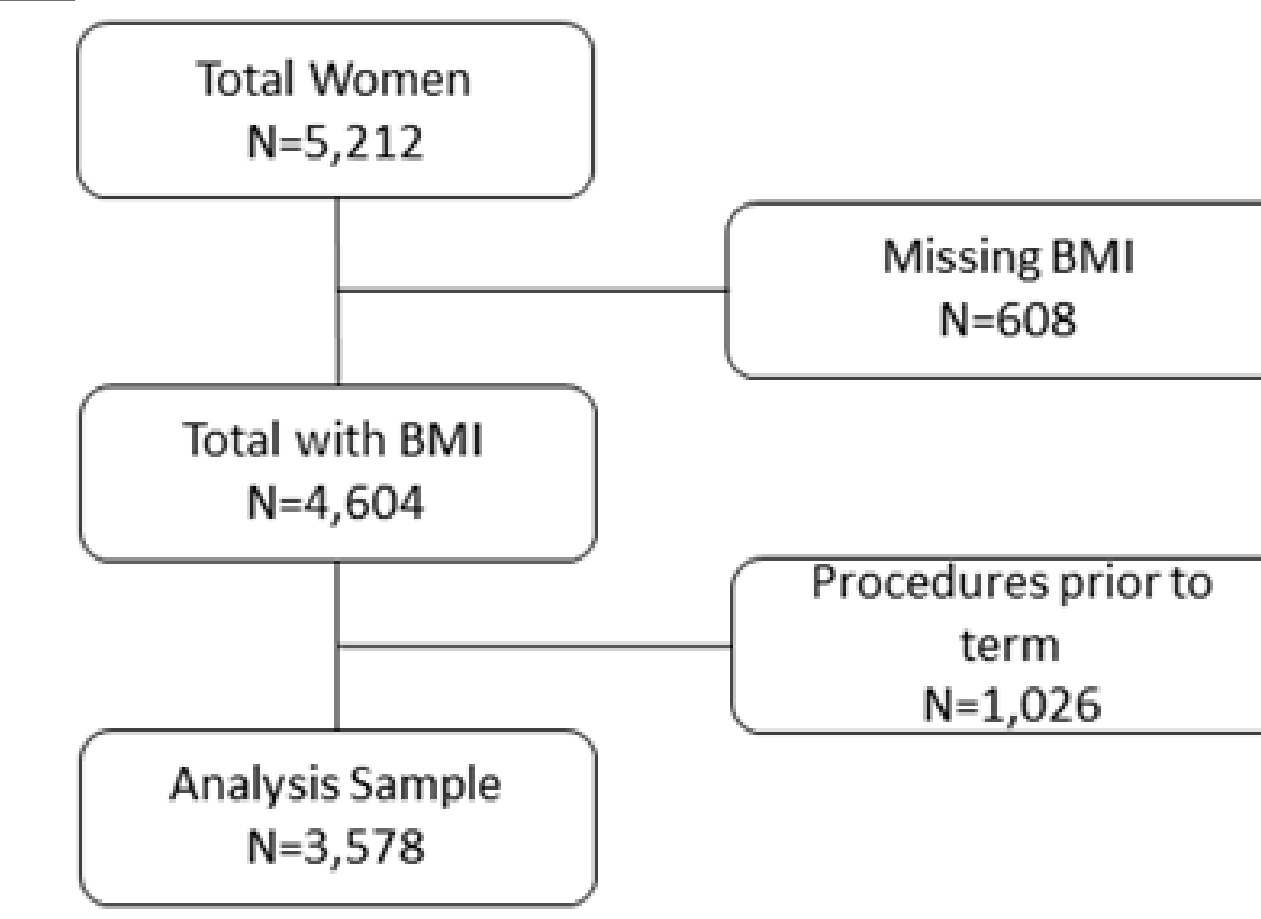


Image 4. Analysis sample for costs and probabilities.

		Obese		Overweight		Normal Weight	
		GDM	No GDM	GDM	No GDM	GDM	No GDM
Vaginal birth	Probability	0.54 (0.46, 0.62)	0.57 (0.53, 0.61)	0.56 (0.47, 0.65)	0.61 (0.57, 0.66)	0.67 (0.60, 0.74)	0.72 (0.70, 0.74)
	Cost	\$11,577 (\$4,653)	\$10,302 (\$4,417)	\$11,324 (\$3,571)	\$11,170 (\$5,221)	\$12,170 (\$3,911)	\$10,113 (\$4,054)
Vaginal birth + major complication	Probability	0.85 (0.78, 0.93)	0.64 (0.59, 0.70)	0.82 (0.72, 0.91)	0.62 (0.57, 0.67)	0.87 (0.81, 0.93)	0.55 (0.52, 0.58)
	Cost	\$19,170 (\$25,602)	\$19,961 (\$32,001)	\$23,305 (\$35,274)	\$17,434 (\$27,376)	\$15,955 (\$10,666)	\$15,272 (\$19,646)
Caesarean Section	Probability	0.45 (0.34, 0.57)	0.40 (0.33, 0.47)	0.44 (0.31, 0.58)	0.39 (0.32, 0.45)	0.33 (0.21, 0.45)	0.28 (0.24, 0.32)
	Cost	\$15,712 (\$4,113)	\$15,936 (\$4,370)	\$16,360 (\$3,408)	\$15,137 (\$4,154)	\$16,837 (\$3,696)	\$15,664 (\$5,028)
Caesarean Section + major complication	Probability	0.88 (0.81, 0.96)	0.67 (0.60, 0.73)	0.73 (0.61, 0.85)	0.55 (0.48, 0.61)	0.78 (0.67, 0.89)	0.52 (0.48, 0.56)
	Cost	\$32,311 (\$38,686)	\$44,385 (\$51,696)	\$30,498 (\$32,865)	\$31,281 (\$38,558)	\$26,393 (\$23,947)	\$26,973 (\$30,278)

Notes: GDM = gestational diabetes mellitus

Image 5. Costs of births with and without GDM

**RESEARCH / FINDINGS**

The cost of LWdP intervention is lower than the routine care intervention, and the effectiveness of the LWdP strategy is slightly higher compared to the routine care strategy. As a result, the value of ICER turns to be negative, and the routine care strategy was dominated.

Multiple one-way sensitivity analyses of the cost-effectiveness of the LWdP intervention against routine care in pregnant women is shown in Image 6.

- The sensitivity of ICER is highest to the costs of major complexity in caesarean section in women classified as overweight,
- It is also sensitive to the cost of major complexity in vaginal delivery in women classified as overweight and costs of major complexity in vaginal delivery in women classified as obese.
- The value of ICER is least sensitive to the value of disutility associated with a caesarean birth with minor complexity.

Strategy	Cost	Effectiveness	ICER
LWdP Coaching	22,537	0.894	
Routine care	22,827	0.893	
Incremental Cost / Effect	-\$289	0.001	Dominant

Notes: ICER = incremental cost-effectiveness ratio

This research contributes to the growing body of evidence supporting the cost-effectiveness of evidence-based lifestyle interventions that target nutrition behavior change in reducing GDM from the Australian healthcare system's perspective. A life course approach to preventive healthcare that focuses on promoting healthy eating behaviors in women before conception and early pregnancy is likely to have a positive long-term impact on the health and economics of both women and their offspring. To lower the short-term costs associated with GDM to the healthcare system, healthcare policymakers and decision-makers need to consider telehealth and widely available delivery of structured lifestyle interventions during pregnancy. While further investigation is needed to confirm long-term cost savings, they are likely to occur due to the reduction in subsequent development of type 2 diabetes and other complications.

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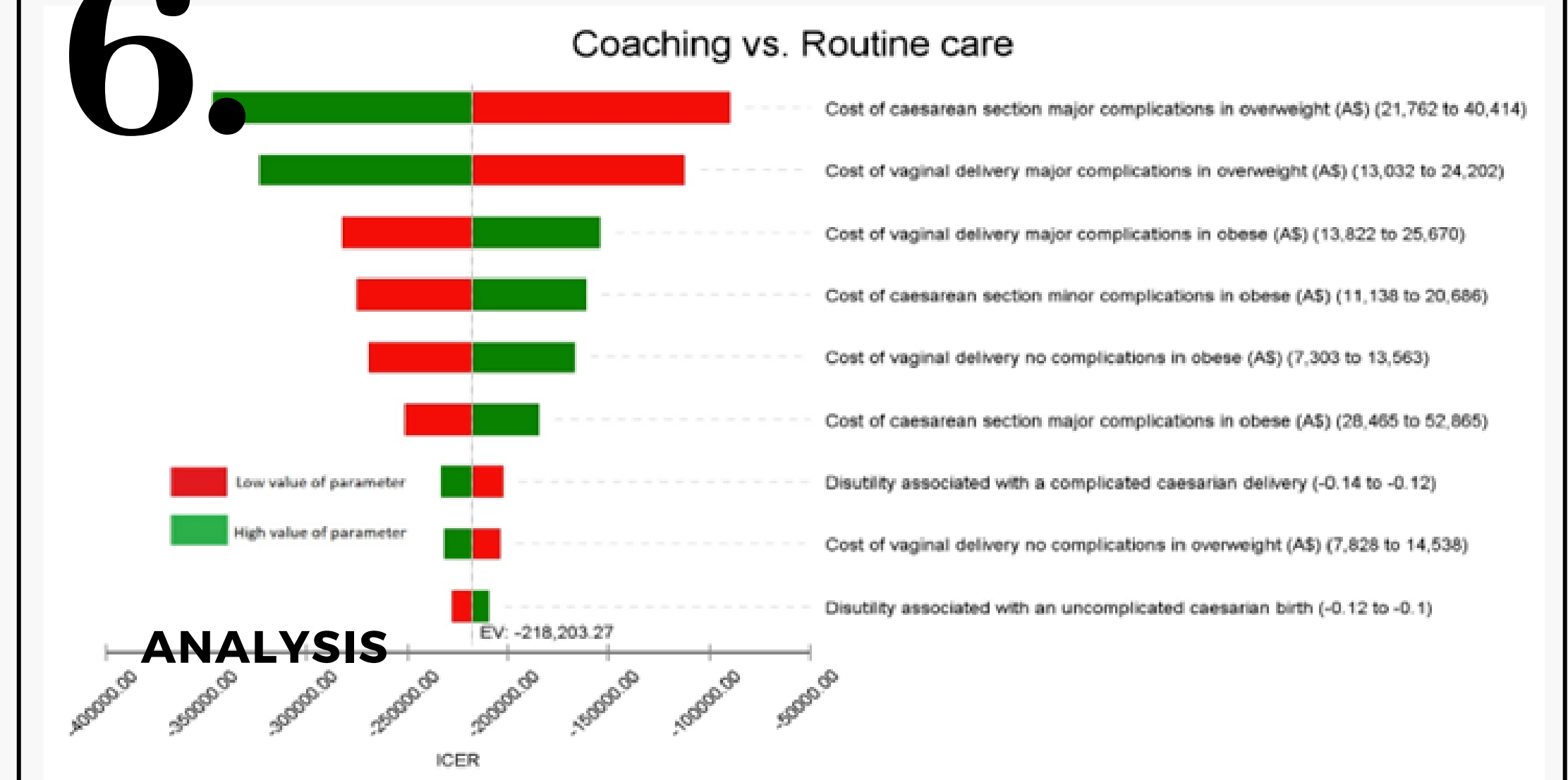


Image 6. Sensitivity analysis of LWdP

**CONCLUSION**

- This study aimed to evaluate the cost effectiveness of a dietitian delivered telephone lifestyle coaching program in reducing the risk of GDM in women with a BMI >25 kg/m<sup>2</sup>.
- The Living Well During Pregnancy program, a dietitian-delivered telephone counselling service that aimed to reduce excess gestational weight gain costs less than usual care for preventing gestational diabetes with higher effectiveness.
- A woman with GDM had a higher probability of a vaginal or caesarean delivery of intermediate/major complexity at each BMI category, increasing the cost of care.
- The analysis demonstrated that a coaching intervention that reduces GDM is likely to be cost saving to the health system when considering the immediate pregnancy and delivery costs.

**RELATED LITERATURE**

de Jersey SJ, Nicholson JM, et al. A prospective study of pregnancy weight gain in Australian women. Australian and New Zealand Journal of Obstetrics and Gynaecology. 2012;52(6):545-51.  
 de Jersey S, Meloncelli et al. Outcomes from a hybrid implementation-effectiveness study of the living well during pregnancy Tele-coaching program for women at high risk of excessive gestational weight gain. BMC Health Services Research. 2022.