

Economic Analysis of Maternal Health Behaviours

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I hereby certify that the work embodied in the thesis is my own work, conducted under normal supervision. The thesis contains no material which has been accepted, or is being examined, for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository, subject to the provisions of the Copyright Act 1968 and any approved embargo.

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- Katelyn A. Barnes, Zoe Szewczyk, Jaimon T Kelly, Katrina L Campbell, Lauren E. Ball. How cost-effective is nutrition care delivered in primary healthcare settings? A systematic review of trial-based economic evaluations. *Nutr Rev*. 2021 Oct 4:nuab082. doi: 10.1093/nutrit/nuab082. Epub ahead of print. PMID: 34605888.

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List of Abbreviations

Abbreviation	Description
ADG	Australian Dietary Guidelines
AES	Australian Eating Survey
AIHW	Australian Institute of Health and Welfare
ALSWH	Australian Longitudinal Study on Women's Health
AR-DRGs	Australian Refined Diagnosis Related Groups
ARFS	Australian Recommended Food Score
AUD	Australian Dollars
BIA	Budget Impact Assessment
BMI	Body Mass Index
CBA	Cost-Benefit Analysis
CCA	Cost-Consequence Analyses
CE	Cost-Effective
CEA	Cost-Effectiveness Analyses
CHEERS	Consolidated Health Economic Evaluation Reporting Standard
CI	Confidence Interval
CReditTS	Clinical Research Design and Statistical Services
CUA	Cost Utility Analyses
DAG	Directed Acyclic Graph
DALY	Disability Adjusted Life Year
EGWG	Excessive Gestational Weight Gain
FASD	Fetal Alcohol Spectrum Disorder
GDM	Gestational Diabetes Mellitus
HMRI	Hunter Medical Research Institute
HNEH	Hunter New England Health
HNELHD	Hunter New England Local Health District
HTA	Health Technology Assessment
ICER	Incremental Cost Effectiveness Ratio
IQR	Interquartile Range
JHH	John Hunter Hospital
MSAC	Medical Services Advisory Committee
NCD	Non-Communicable Diseases
NHMRC	National Health and Medical Research Council
NRV	Nutrient Reference Values
NSW	New South Wales
OR	Odds Ratio
PBAC	Pharmaceutical Benefits Advisory Committee
QALY	Quality Adjusted Life Year
RCT	Randomised Controlled Trial
RECap	Research Electronic Data Capture

RR	Rate Ratio
SD	Standard Deviation
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology
WHO	World Health Organisation

Thesis Abstract

Background and aims: Identifying, measuring, and valuing the economic impact of antenatal guidelines and their implementation has been identified as a key strategy for informing investment in health promotion and improving efficiency in healthcare. The research question of this thesis was: what is the economic impact of improving the modifiable maternal health risk behaviours, alcohol and dietary intake, on health care resource use during the antenatal period? To address this question, the thesis aims were:

1. Identify and synthesize evidence regarding the costs and impacts of antenatal nutrition and alcohol interventions and their associated implementation strategies.
2. Assess the cost, cost-consequence, and cost-effectiveness of a multi-strategy practice change intervention in increasing antenatal care addressing the consumption of alcohol by pregnant women.
3. Assess the economic impact of maternal diet quality and weight status of pregnant women and their impact on resource use in the delivery period.

Methods: To address the first objective, a systematic review of economic evaluations of antenatal nutrition and alcohol interventions and their associated implementation strategies was conducted. For the second objective, an economic evaluation was undertaken alongside a randomised controlled trial (RCT) of a multi-strategy practice change intervention designed to support antenatal care staff in providing a model of care consistent with clinical guideline recommendations for alcohol consumption in pregnancy. For the third objective, an observational study was conducted to gather self-report data and inpatient medical records for N=670 pregnant women in Newcastle, Australia, to examine the economic impact of maternal diet quality on resource use in the antenatal period.

Results: The systematic review identified a paucity of economic evidence regarding antenatal nutrition and alcohol interventions and no economic evaluations of associated investment in implementation. The trial-based economic analysis determined the practice change intervention to be both more effective and more costly than usual care. The average incremental cost per eligible clinician was \$993 (range: \$640-\$1928) and \$591 (range: \$329 - \$940) per woman who received all guideline elements. The observational study found higher body mass index (BMI) was associated with increased odds of caesarean delivery; women in obese class II (35.0–39.9 kg/m²) had significantly higher odds of caesarean delivery compared to women of normal weight (OR = 2.13, 95% CI 1.03 to 4.39; p = 0.04). The average cost per patient was \$7962, \$9309, and \$9914 for women in

the normal weight category, obese class II, and obese class III, respectively. Higher diet quality was associated with a small statistically significant reduction in maternal length of stay.

Conclusion: The research included in this thesis addressed a small and significant gap in the evidence base necessary to inform greater understanding of the cost and cost-effectiveness of current nutrition and alcohol recommendations in pregnancy. The thesis provides new evidence regarding the economic impact of maternal health behaviours and antenatal health promotion interventions. Specifically, the economic evidence available to inform investment in future maternal alcohol and nutrition interventions was mapped, synthesized, and the gaps in the literature identified. The trial-based economic evaluation was the first to identify, measure, and value investment in antenatal guideline implementation efforts. Whilst healthcare funders' willingness to pay for the incremental effect of this intervention is unknown, the strategic investment in systems change is expected to improve the efficiency of the practice change intervention over time. The observational study identified that poor dietary patterns are common during pregnancy; thus, interventions to improve maternal BMI and diet quality could deliver substantive economic benefits to the healthcare system and community. The evidence presented in this thesis addresses the need for decision makers to be cognisant of the resource use implications of policy implementation.