Dear Birth Trauma Inquiry team,

Thank you for forwarding the transcript and supplementary questions for comment.

Please find the answers below:

Supplementary questions: Professor Hannah Dahlen and Dr Hazel Keedle, School of Nursing and Midwifery, Western Sydney University

Answers are to be returned to the Committee secretariat by Tuesday, 3 October 2023

1. There has been an idea put forward in this inquiry that birth itself is often traumatic and sometimes trauma just happens. While sometimes trauma can be unavoidable, can you clarify your research and position in regards to avoidable trauma - is that common and can a large proportion of birth trauma be prevented with better systems and practices put in place?

Birth trauma can be physical and/or psychological. Sometimes birth trauma is unavoidable but the way care is provided and the support and information women receive during and following the birth can have an enormous impact on how this event is processed and resolved for women. Most women (though not all) can emerge resolved from birth trauma eventually if respectful, supportive care and appropriate debriefing and considerations for future pregnancies and birth are in place. Much birth trauma could be avoided or reduced by respectful relationship-based care being in place from the beginning of the childbearing continuum. Our research has shown the lowest rates of birth trauma are experienced by women under private midwifery care, midwifery group practice and private obstetric care. These three models have the highest level of continuous relationship-based care of any of the maternity care modes. I am also attaching a systematic review one of our PhD students undertook looking at PTSD following birth (see attachment).

2. Are the current polices, practices and procedures put in place by NSW Health and the LHDs effective in ensuring women are able to make informed decisions about their care before, during and after birth? If not, why not?

Most women having their first baby in Australia today rely on the advice (or birth experience) of family and friends when making choices about care. One of the first health providers who guides childbirth choices are general practitioners (GPs), who may provide some, but often limited information about maternity care options. This means women are often going into this important, life changing experience with little knowledge about the options that are available and how care can vary by health provider, place of birth, and model of care. Women may also miss out on some models of care that are in high demand as they don't find out about them until they are fully booked up. Women may feel maternity care is a 'one size fits all' when first pregnant but they may not have had the opportunity or encouragement to really consider what matters to them and what they want. There are many factors that inform women's evaluation of their birth experience, such as values (what matters), environment, comfort, treatment, options and recovery.

Different models of maternity care may meet different needs depending on what is important to women. We aim to develop a national decision-making tool (DMT) for Australian women who are planning to have a baby, or are pregnant, to enable them to identify the model of care/place of birth that best suits their choices and provides relevant information, and how to access options locally. We are seeking funding support to do this.

3. Has NSW Health's Continuity of Care Models: A Midwifery Toolkit published in 2023 had many positive benefits? If not, what do you think is needed to implement genuine midwifery continuity of care?

To be honest we are not sure how many people are aware of the Toolkit, but it has also just been released. We think the concept is good but the impact and operationalising of it won't be able to be assessed just yet. The research we are undertaking at WSU on sustainability of midwifery models of care and managing these models will add significantly to the toolkit (Hewitt, Dadich, Hartz, Dahlen 2023). Paper attached and links below.

https://www.womenandbirth.org/article/S1871-5192(23)00272-X/pdf

4. Australia has a much higher rate of c-sections than other countries. Why are we seeing such high c-section rates, and do you think this is cause for concern? What strategies or policy changes would you like to see put in place in NSW regarding c-sections?

So much has been written about this and yes, it is a cause for concern. It is also a major source of women's birth trauma. Women who have spontaneous vaginal births have the lowest rate of birth trauma. I am attaching two papers on this issue.

https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(22)00183-8/fulltext

https://www.thelancet.com/series/caesarean-section#:~:text=A%20three%2Dpart%20Lancet%20Series,to%20reduce%20unnecessary%20caesarean%20sections.

5. Was there anything else raised at the inquiry that you would like?

a) We would like to respond to the question we took on notice on the NSW BHI survey and why they got 94% of women rating their care during labour and birth as very good or good. Having now looked closely at the survey we would like to provide the following comments:

1) This survey only included public maternity models and does not capture private obstetric care (around 24% of care) and women cared for by privately practising midwives who give birth at home. It only covers hospital births and not women who give birth in private hospitals. In the BESt survey we captured all models of care and places of birth in Australia

2) There are very few options for women to make comments in the BHI survey, which was the strength of the BESt survey and has given us the most informative data. There were only two open text questions in the BHI survey that asked for specific information.
3) The questions are skewed to the positive. There are often two qualified 'Yes' responses and one hard unqualified 'No'. This makes it more likely to garner a positive response
4) The question, "how long did you usually spend at your antenatal check-ups between the time you arrived and when you left?" led midwifery models of care to have a negative response based on the metric, as visits are often up to an hour long. This is not poor care but is assessed this way showing a misunderstanding of variations in models.
5) Birth trauma, Obstetric violence and mental health are not asked about and this was a major focus of the BESt survey.

b) We would like to provide information as requested on successful models of care in rural remote Australia. We would like to refer you to the Economic evaluation of the midwifery-led caseload model of care in the York and Northern Local Health Network (YNLHN) that we have attached. They found evidence of improved patient outcomes associated with MCMoC compared with PMOC, and an additional estimated marginal cost per patient of $696 per birth. Highlights being:

-improved continuity of care via increased outpatient utilisation;

-A statistically significant reduction in the average length of stay (ALOS) of 0.7 days, that was found across elective caesareans (and emergency caesareans) and vaginal births of minor and intermediate complexity;

-Increased ability to attract and retain graduate midwives, providing workforce sustainability within the region.

-Possible reductions in adverse patient outcomes

(see attachments)

6. **Regarding the term "birth trauma":**

a. what is the School of Nursing and Midwifery, Western Sydney University preferred definition of the term?

We recognise the description by Beck (2004) that birth trauma "is in the eye of the beholder", meaning that only the woman can identify whether her experience was traumatic for her.

In addition, we recognise that birth trauma encompasses the entire perinatal period and is an umbrella term that can include a variety of different experiences and emotional responses such as a perceived loss of control, fearing for their own or their baby's life, feeling alone and unsupported, experiencing a severe perineal injury or caesarean wound complication, neonatal separation and/or complications and obstetric violence.

b. why is this the preferred definition?

Although there are recurrent themes in birth trauma data surrounding women's experiences there are different perceptions of situations that may cause that trauma. What may be seen as a straightforward birthing experience by clinicians or other women can be experienced as traumatic by a woman. All women who state their pregnancy, labour and birth or postnatal experience was traumatic must be believed and supported.

7. Regarding the term "obstetric violence":

c. what is the School of Nursing and Midwifery, Western Sydney University preferred definition of the term?

We recognise obstetric violence (OV) as a form of gendered violence and support the definition from article 1 of the Declaration on the Elimination of Violence against Women "any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life" (United Nations, 1994)

d. why is this the preferred definition?

Following a UN Special Rapporteur on the mistreatment and violence against women in reproductive health services internationally it was identified that OV can result in physical, sexual or psychological harm. This was supported by our research into OV in Australia that found the three main categories of OV described by women were feeling dehumanised, powerless and violated (Keedle et al, 2023).

8. Can you explain why "informed consent" is necessary for women with respect to decisions they make regarding all aspects of their pregnancy?

The Australian Midwifery Standards for Practice 1.1 state that the midwife "*identifies what is important to women as the foundation for using evidence to promote informed decision-making, participation in care, and self-determination*" (NMBA,2018).

The code of conduct for doctors 4.5.2 states that good medical practice involves "*obtaining informed consent from the patient or where the patient does not have the capacity, from their substitute decision-maker and taking into account any advance care directive (or similar) before you undertake any examination, investigation or provide treatment (except in an emergency), or before involving patients in teaching or research*" (AHPRA,2020).

The Australian Charter of Healthcare Rights states that individuals accessing healthcare services and treatment in Australia have the right to "*make decisions with my healthcare provider, to the extent that I choose and am able to*".

Informed decision making is a cornerstone of healthcare and practice and ensures individuals understand the risks, benefits and alternative options to treatments and practices when accessing healthcare and are able to make the decision of accepting or declining the treatment or practice voluntarily.

Transcript on notice question:

To provide figures on the separate responses for the question regarding obstetric violence.

To note – the data below is based on the entire dataset

Q110 Do you think you experienced obstetric violence (dehumanized treatment or abuse by health professionals towards the body or reproductive process of women)?

Group	Frequency	Percent (%)
Yes	398	4.5
Maybe	593	6.7
No	7555	85.8
Missing	258	2.9
Total		

NSW Dataset

Q110 Do you think you experienced obstetric violence (dehumanized treatment or abuse by health professionals towards the body or reproductive process of women)?

Group	Frequency	Percent (%)
Yes	124	4
Maybe	203	6.5
No	2699	86.2
Missing	105	3.4

The reason both 'Yes' and 'Maybe' were then combined was due to the comments women provided that showed they were talking about disrespectful and abusive care. The term obstetric violence (though we defined it) is still not familiar to women but it was clear from their comments that this was what there were reporting even if they answered maybe.

References

Hewitt, L., Dadich, A., Hartz, D., & Dahlen, H. G. (2023). Midwifery group practice workforce in Australia: A cross-sectional survey of midwives and managers. *Women and Birth, https://doi.org/10.1016/j.wombi.2023.09.002*.

Beck, C. T. (2004). Birth trauma: in the eye of the beholder. *Nursing research, 53*(1), 28-35.

Keedle, H., Keedle, W., & Dahlen, H. G. (2022). Dehumanized, Violated, and Powerless: An Australian Survey of Women's Experiences of Obstetric Violence in the Past 5 Years. *Violence Against Women*. https://doi.org/10.1177/10778012221140138

Medical Board AHPRA (2020) Good medical practice: a code of conduct for doctors in Australia. https://www.medicalboard.gov.au/codes-guidelines-policies/code-of-conduct.aspx

NMBA. (2018). *Midwife Standards for Practice*. Nursing and Midwifery Board of Australia. https://www.nursingmidwiferyboard.gov.au/Codes-Guidelines-Statements/Professional-standards/Midwife-standards-for-practice.aspx

The Australian Commission on Safety and Quality in Health Care (2008) Australian charter of healthcare rights www.safetyandquality.gov.au/national-priorities/charter-of-healthcare-rights/.

United Nations. (1994). *Declaration on the Elimination of Violence Against Women: by General Assembly Resolution 48/104 of 20 December 1993*. https://digitallibrary.un.org/record/179739?ln=en

Economic evaluation of the midwifery-led caseload model of care in the YNLHN

August 2021

Government of South Australia
SA Health

Executive Summary

HEAT was engaged by Commissioning and Performance in conjunction with Yorke and Northern Local Health Network (YNLHN) to conduct an economic evaluation for the pilot of the midwifery caseload model of care (MCMoC) operating across the five birthing sites within the Local Health Network (LHN) (Port Pirie, Crystal Brook, Wallaroo, Clare and Jamestown).

The purpose of this evaluation was twofold being:

1. Determine the incremental costs and benefits of the midwifery caseload model of care for hospitals in the York and Northern Local Health Network (YNLHN) network relative to the previous GP/obstetrician/rostered midwifery models of care (PMoC).
2. Inform the Commissioning Committee of the likely additional funding that would be required to industrialise this model across other LHNs.

Results

We find evidence of improved patient outcomes associated with MCMoC compared with PMOC, and an additional estimated marginal cost per patient of $696 per birth. Highlights being:

- Improved continuity of care via increased outpatient utilisation;
- A statistically significant reduction in the average length of stay (ALOS) of 0.7 days, that was found across elective caesareans (and emergency caesareans) and vaginal births of minor and intermediate complexity;
- Increased ability to attract and retain graduate midwives, providing workforce sustainability within the region.
- Possible reductions in adverse patient outcomes

Financial impact to SA Health

HEAT developed a shadow ABF model. HEAT finds that the net financial cost for SA Health of the MCMoC compared with the PMoC is $276,332 per annum ($696 per supported birth) taking into account SA Health's 55% share to ABF. Additional cost attributed to 3.4 increased FTE ($471,430), is partially offset by revenue received from Commonwealth due to increased outpatient services (55% NEP; -$195,098).

The incremental financial impact to both the LHN and SA Health budgets is larger when considering that two of the five hospitals (Clare and Jamestown) are block funded, the additional cost of the 3.4 FTE ($471,430) will not have Commonwealth offsetting ABF revenue.

The above estimates may be conservative as the analysis does not include adjustments for productivity gains relating to:

- hospitals that relied on dual-qualified nurses for midwifery services. These nurses remain employed for general nursing duties at the hospital and have not been included in the analysis, as this cost remains the same under both MoCs;
- potential reduced use of interventions during birth/labour or reduction in the ALOS. These have not been included in the analysis, as it was not clear whether these savings would in fact be realised under the new MCMoC; and
- costs incurred to treat poor health outcomes.

Whilst this evaluation does demonstrate an increase in marginal costs of MCMoC over the previous model, there are significant data limitations that have constrained assessment of the full suite benefits and costs. In particular short term and ongoing costs associated with poor health outcomes in both MCMoC and PMOC are unknown.

Sustainability and scalability

The financial impact of industrialising the model to scale in other LHNs should allow an additional cost of $696 per birth, which incorporates staffing requirements commensurate with the YNLHN MCMoC model, the Nursing and Midwifery EBA and patient volume. This estimated marginal cost, developed from the shadow ABF model is dependent on developing a similar staffing profile to the YNLHN model and proportional demand.

To avoid potential higher costs taking the model to full scale should include consideration of:

- moving away from block funding this activity, and seeking Commonwealth reimbursement for Tier 2 outpatient services
- adhering to a staffing model that is appropriate under the EBA for expected patient demand.

A key benefit of the MCMoC is its capacity to improve workforce stability, recruitment and retention. YNLHN had managed to recruit a number of graduate midwives into the MoC, which was not possible under the previous models of care.

Methodology

HEAT used a cost-consequence analysis (CCA) which is an appropriate form of economic evaluation where the program or health intervention contains multiple outcomes and benefits that are not able to be aggregated for standard cost effectiveness assessment. This is the case for the MCMoC model where there are multiple benefits of the MCMoC to mothers, babies, and staff.

Like any economic evaluation, an appropriate comparator to the service being evaluated is required. Given that MCMoC represents a best practice approach supported by extensive literature and there is no other alternative new model being considered, the most appropriate comparator is the previous model of care (PMoC). Problematically, before implementing the MCMoC, YNLHN has not collected adequate data on the costs and benefits of the PMoC. This has limited our comparative analysis to considering a reduced number of outcomes/benefits and activity measures than that of the full suite of outcomes and benefits that the MCMoC claims to achieve. Similarly, HEAT has had to rely upon interrogating previous patient activity with a limited view of associated costs. HEAT developed an ABF shadow model to explain the financial impacts. Doing so aligns the cost structure of the model to benchmarked prices for activity determined by IHPA.

Conclusion

The results of this analysis demonstrate that the MCMoC is likely to be cost-effective compared with previous MoCs, and is unlikely to result in substantial additional costs to either the LHN or SA Health while demonstrating non-inferior to superior benefits in terms of patient outcomes, and other productive efficiencies including reduced ALOS.

The analysis indicates that the program is:

- Clinically effective – representing a best practice supported by extensive literature and a separate evaluation of a pilot at University of South Australia;
- Likely to be cost effective, and
- Sustainable from a workforce perspective

1.1. Recommendations

It is recommended

1. that the program be continued across YNLHN and that its deployment be implemented/accelerated across other regional LHNs where a similar approach is not already in place;
2. that funding for the program be either funded under ABF, or that a shadow ABF model is applied;
3. that scalability of the model to other LHNs assumes the staffing / volume proportions of the YNLHN MCMoC model. The estimated marginal cost of $696 per birth should be used to guide the staffing model.

Contents

1. Introduction

HEAT was engaged by Commissioning and Performance in conjunction with Yorke and Northern Local Health Network (YNLHN) to conduct an economic evaluation for the pilot of the midwifery caseload model of care (MCMoC) operating across the five birthing sites within the Local Health Network (LHN) (Port Pirie, Crystal Brook, Wallaroo, Clare and Jamestown). This model of care is recognised in the Maternity Care Classification System (MaCCS) as falling within 'midwifery group practise caseload care' and is one of 11 models of maternity care recognised in Australia.

The MCMoC involves care at all stages provided by a primary midwife with secondary midwives in support. Care is provided in partnership with the midwife, the woman's referring GP, obstetrician or obstetric GP. While the MCMoC is available to all women, some may choose, or need to birth outside the region due to personal choice or level of acuity required. These women may still access a MCMoC midwife for antenatal and postnatal care. Women who have not accessed antenatal care within YNLHN and who have birthed at an Adelaide metropolitan hospital may be referred to a midwife in the MCMoC through Country HomeLink (CHL).

A business case for the pilot of the MCMoC for the YNLHN was approved in January 2018, with a staged implementation occurring between January and June 2019. The business case for the MCMoC did not supply cost information, nor information for the previous MoC (PMoC) that was in operation at the time. The MCMoC officially commenced on 6th July 2019, and was officially launched by the Minister of Health Stephen Wade MLC on 27th August 2019.

From the LHN's perspective, the midwifery-led model of care is expected to deliver superior clinical outcomes across a wide-range of measures at a similar cost per patient as the existing model(s) of care. A literature review revealed a significant list of benefits for the program that demonstrated improved health outcomes for mother and baby and also demonstrated improved workforce sustainability. The suite of benefits of the new MCMoC relative to the PMoC can be contextualised within the Quadruple Aim framework. Quadruple Aim - enhancing patient experience, improving population health, reducing costs, and improving clinician experience – can be viewed as a compass to optimise health system performance(Bodenheimer and Sinsky 2014).

The purpose of this evaluation is therefore to compare the costs and benefits of the MCMoC and the PMoC. Therefore, the aim of this evaluation was twofold being:

1. *Determine the incremental costs and benefits of the midwifery caseload model of care for hospitals in the York and Northern Local Health Network (YNLHN) network relative to the previous GP/obstetrician/rostered midwifery models of care (PMoC).*
2. *Inform the Commissioning Committee of the likely additional funding that would be required to industrialise this model across other LHNs.*

If the model of care is found to be effective and cost-effective, this will not only inform future Commissioning Committee decisions on this model of care for YNLHN but will also inform the deployment of this model to other regional networks. Three networks are currently looking to implement this model or a similar one in the near future.

2. Scope of this analysis

Rationale for the review

The pilot program for the YNLHN MCMOC was designed to run for two years; for women who enter the program between July 2019 and January 2021.

This economic evaluation is prepared for the Commissioning Committee to inform its decision to provide continued funding the MCMoC within YNLHN and to inform its potential expansion to other rural and remote LHNs.

An evaluation of the effectiveness of the MCMoC was undertaken by the Rosemary Bryant AO Research Centre, University of South Australia (referred to as the UniSA Pilot Evaluation herein), and published in June 2021. The overall aim of that evaluation was to inform the Maternity Services Committee of the "effectiveness of the implementation, acceptability and sustainability of the MoC that provides evidence-based, woman-centred continuity of care to residents of the Y&N Region"(Adelson P, Fleet J et al. 2021) . The UniSA Pilot Evaluation was largely limited to the success and failures of the MCMoC. The scope of works did not compare it to the previous MoC (PMoC). The UniSA Pilot Evaluation was not intended to provide an analysis of the costs or financial impact of implementing the MCMoC within the LHN. By contrast, this economic evaluation is therefore intended to complement the UniSA Pilot Evaluation and by extension considers available cost and benefit information of the MCMoC relative to the PMoC.

What is being evaluated?

Evaluation looked at:

- The costs and outcomes of providing maternity services care in new vs old MoC (i.e. average cost per birth of activities using a bottom-up activity-based costing exercise, regardless of funding source).
- Whether the MCMoC could be funded within the YNLHN within ABF funding, and whether any adjustments or additional funding would be required.

Perspective of the evaluation

For the patient-level economic evaluation, we took perspective of the South Australian health system which considers the cost of delivering services under the new vs old MoCs.

We also considered whether current funding structures would be sufficient to cover the costs of this new MOC or whether funding may need to be expanded from the perspective of YNLHN.

2.1. Our approach to this evaluation

All economic evaluations require comparison between proposed intervention and an alternative that would be done in the absence of the program. In the case of evaluating the new MCMoC, the most appropriate comparator is the previous model / practice that has been utilised to satisfy maternity services in YNLHN (referred to as PMoC).

There are several different health economic evaluation tools that could be used to conduct this evaluation. The decision to utilise one tool over another is influenced by the type and extent of available costs and benefits data, contextualised to the evaluations purpose. HEAT utilised cost-consequence analysis (CCA) as the most appropriate form of evaluation

A cost-consequence analysis (CCA) which is an appropriate form of economic evaluation where the program or health intervention contains multiple outcomes and benefits that are not able to be aggregated for standard cost effectiveness assessment. We took this approach because:

1. There were multiple outcome benefits that could not be accurately summarised into a single outcome metric;
2. YNLHN has not collected adequate data on the costs and benefits of the previous practice to support cost assessment of each of the individual benefits of moving towards the new MCMOC; and

Like any economic evaluation, an appropriate comparator to the service being evaluated is required. Given that MCMoC represents a best practice approach supported by extensive literature and there is no other alternative new model being considered, the most appropriate comparator is the previous model of care (PMoC). Problematically, before implementing the MCMoC, YNLHN has not collected adequate data on the costs and benefits of the previous practice. This has limited our comparative analysis to considering a reduced number of outcomes / benefits and activity measures than that of the full suite of outcomes and benefits that the MCMoC claims to achieve. Similarly, HEAT has had to rely upon interrogating previous patient activity with a limited view of associated costs. HEAT developed an ABF shadow model to explain the financial impacts. Doing so aligns the cost structure of the model to benchmarked prices for activity determined by IHPA.

Further details are in the methodology section. Further justification of our approach to use CCA over other health economic evaluation tools is provided in the Appendix B.

2.2. Components of the evaluation

Key components of the evaluation are summarised in Table 1 below.

Table 1: Population, Intervention, Comparator and Outcomes (PICO) of the evaluation

Component	Description
Population	Women living in the York and Northern LHN who require access to antenatal, intrapartum, perinatal and post-natal care (up to six weeks after birth).
Intervention / program	The midwifery caseload model of care. The model provides a consistent (known) midwife to each woman with midwives providing a continuum of care for a woman during her pregnancy and transition to motherhood.
Comparator	Prior to the implementation of the midwifery caseload model, there was a mixture of different models of care within the five birthing hospitals: > Port Pirie (Team 1: Mixed case-load model) > Crystal Brook (Team 1: Mixed case-load model) > Clare (Team 2: Obstetrician led) > Jamestown (Team 2: Obstetrician led) > Wallaroo (Team 3;Mixed case-load model)
Outcomes	Outcomes which will be evaluated for change by the midwifery-led model of care include: > Health outcomes for women and their babies; > Health resource utilisation to treat the average patient; and > Financial impact on implementing this model from the perspective of the LHN, taking into account differences in funding arrangements across the LHN (i.e. case-mix vs block-funded).
Claim	That the midwifery-led model of care delivers superior clinical outcomes across a wide-range of measures at a similar cost per patient as the existing model(s) of care. The costs of providing the new model of care are to be understood on the basis that under present funding structures – a mix of grant and activity funding - there are limited flexibilities in transferring grant resources across the network (between facilities) and this will have an impact on the apparent cost impact.
Economic Evaluation Type	Cost-consequence analysis. A cost consequence analysis provides a comparison of the costs of the two models along with a comparison of patient outcomes (or benefits) including differences in caesarean rates, rates of low birth weight etc. This type of model is often used when there are likely to be impacts to multiple patient relevant outcomes, however, they cannot be reliably either presented as or translated to a single outcome, such as Quality-Adjusted Life years (QALYs).
Financial Evaluation	A financial evaluation was also conducted to show the financial impact of implementing this model within YNLHN, from the perspective of the LHN, also taking into consideration current funding arrangements. The purpose of this

	analysis was to show what – if any – additional funding would be required to continue MCMoC within the LHN.

3. Overview of the Midwifery Caseload Model of Care

The Yorke and Northern Region MCMoC was developed from extensive community stakeholder consultation and engagement.

The Business Case for the MCMoC was approved in January 2018, with the pilot development occurring between April and September 2018. The MoC was introduced in phases across the five sites beginning in January 2019 with transition complete across all sites by July 2019.

Based on information provided to HEAT, the midwifery-led model of care in YNLHN:

- is supported by a wide body of research – a systematic review by Sandall et al 2016 indicated most women – outside of those with existing serious pregnancy or health complications – should be offered midwife-led continuity of care;
- consistent with the woman-centred care strategic directions for Australian maternity services published in August 2019 by the (then) Council of Australian Governments (COAG) Health Council;
- supports a total allocated care rate of approximately 426 births per year (based on up to 38 women per year per 1 FTE, 2x FTE assistant Midwifery Unit Managers (MUMs) with capacity for 20 women and 1x FTE MUM) across all five sites in the YNLHN network;
- fits with the Minister's preference for providing services closer to home where appropriate. This model reduces the flow of maternity related activity to metropolitan hospitals, particularly the WCH;
- delivers superior clinical outcomes but also is a more sustainable model of care given the workforce challenges in many regional areas;
- manages pregnant women of all risk ratings, with high risk pregnancies having more direct contact with obstetricians and/or GP obstetricians but with the midwife remaining in contact;
- should be cost neutral long-term but initially will cost more due to constraints on shifting (grant) funding across the network to accommodate the new model of care; and
- utilises key indicators intended to measure the outcomes of the project cover maternity indicators and birth outcomes for both mother and child. Key data provided is directly from model of care staff in YNLHN as well as comparison reports provided by WCHA.

4. Methodology

4.1. Data sources

This section provides a summary of the data sources used to support the methodology for both the analysis of costs effectiveness. These core data applied in this evaluation are summarised in Table 3 below. Specific data inputs are outlined in the relevant subsections below.

Table 2 Data sources used to establish the effectiveness and cost-effectiveness of the YNLHN midwifery caseload model

Data Source	Application to analysis
WCHA Reports	Benchmarking data for women and children's hospitals across a wide range of clinical measures across Australia, which also covers each of the five facilities covered by this evaluation: > 158 - Port Pirie > 163 - Wallaroo > 146 - Crystal Brook > 148 – Jamestown > 145 - Clare
SA Health 'Health Information Portal' (HIPs)	Activity data to provide before and after measures of maternity services in YNLHN.
SA Health Patient Costing	Costing data to provide estimates of costing for identified activities involved in the delivery of the midwifery-led caseload model.
IHPA	To identify relevant revenues associated with clinical activities covered by this project where relevant.
YNLHN	Data collated across a wide range of key performance measures collected for the purposes of operating the model across years and for antenatal and perinatal statistics. Other materials provided for reference (including operational plan for the project and FTE needs/structure, indicative costings of the model of care and research findings related to the midwifery model of care).
SAICORP	Serious incident data re: birth related trauma and errors as a potential measure of safety and quality change.
AIHW	National Core Maternity Indicators (and other relevant measures) which can provide comparisons and context.
SA Health Pregnancy Outcome Unit	Relevant data to assist in comparing and contextualising the impact of the midwifery-led caseload model on key outcomes.
University of South Australia: Evaluation of the Midwifery Caseload Model of Care Pilot in YNLHN	Provide additional context to the effectiveness, appropriateness and sustainability of the MCMoC to date.

4.2. Effectiveness

HEAT sought to provide a high-level analysis of patient outcomes pre- and post-implementation of the MCMoC. As outlined in the scope, this was not intended to be a comprehensive evaluation of patient outcomes, given that the University of South Australia was undertaking this piece of work for the evaluation of the pilot.

Given the paucity of data available to inform our assessment of effectiveness, this evaluation relied on:

- A review of the literature on other published economic evaluations of MCMoCs within Australia;
- SA Health Activity Data (HIPs);
- A comparison of supplied key clinical KPIs for the Port Pirie Hospital;
- SAicorp baby claims data; and
- Breastfeeding rates.

HEAT acknowledges that there were many other benefits highlighted by the MCMoC program as eluded to in the scope. However, where we have not been able to reasonably align these benefits with an assessment of their costs either in the PMoC or MCMoC we have had to exclude these from our analysis.

HEAT tested these comparisons of available patient outcome data for statistical significance. Noting that the small sample sizes of MCMoC data may not be adequate to detect statistical differences in outcomes, HEAT relied upon peer-review evidence of effectiveness in the literature.

4.2.1. Comparison of proportions of maternity related outcomes

To compare the difference between two independent proportions we used the Newcombe-Wilson method without continuity correction. For details, see (Newcombe 1998).

Confidence intervals for the relative risk are calculated using the methods described by (Armitage and Berry 1994)

4.2.2. Activity Data

HEAT analysed differences in activity data between PMoC and MCMoC, including:

- Average length of stay (ALOS); and
- Maternity and midwifery Tier 2 Activity (Tier 2 Clinic Code 40.28).

Average length of stay

HEAT assessed ALOS between the PMoC and MCMoC to examine if there was a statistically significant difference between these two samples using standard bivariate statistical and non-parametric tests. Patient-level data was extracted from SA Health's 'Health Information Portal' (HIPs).

First, we considered using parametric tests such as the student T-test. However, this test requires specific assumptions to be met. One of these assumptions – normally distributed data – is commonly violated when examining LOS data that typically show a highly right-skewed discrete distribution in which most of the observations are tied. Therefore, we tested whether each of the samples were

normally distributed by using the Kolmogorov-Smirnov and Shapiro-Wilk tests, as well as a visual inspection of histograms.

If assumptions for parametric tests were violated, we considered the use of non-parametric tests such as the Mann-Whitney U and Wilcoxon W. Chazard et al, 2017 concluded that the Wilcoxon and Mann-Whitney U tests are methods with acceptable type 1 error (probability with which a test will detect a significant difference in the mean LOS between two samples—even though the samples have been drawn from the same population) and high power (Chazard, Ficheur et al. 2017).

Maternity-related outpatient visits

HEAT requested outpatient activity data from the Data Analysis and Reporting team in SA Health

Of the 28,198 outpatient attendances we received from the Data Analysis and Reporting team in SA Health, we were able to link 19,005 outpatient attendances to inpatient episodes relating to births by matching:

- MRN;
- Hospital;
- Appointment within 6 weeks after the birth; and
- Appointment within 30 weeks before the date of birth.

We further refined our comparison periods to ensure that we were collecting the whole of the activity relating to the antenatal and postnatal periods for each birth. We included all births that occurred between:

- Pre-implementation of the new MoC: 1/1/ 2017 to 1/1/2019; and
- Post implementation of the new MoC: 1/1/2020 to 30/4/2021.

Note that the majority of 'unlinked' outpatient records were likely to relate to births that happen outside of the two time periods that were considered for comparison.

4.3. Financial Impact

HEAT endeavoured to include as much detail and granularity as possible in the financial-analysis. However, we were constrained by a lack of available data.

Given the paucity of data available to HEAT, and the difficulties in obtaining an accurate account of the activities conducted in the PMoC, HEAT has presented the financial impact of MCMoC vs PMoC under a shadow ABF model. This simplified approach involved analysis of activities for which robust data could be obtained, or reasonable assumptions made.

A key purpose of this anaysis was to show the required additional funding – if any - would be required to support the MCMoC within the LHN. We sought to provide analysis through 'shadowing ABF' – by assessing whether any additional funding would be required to sustain the inremental differences in MCMoC under an ABF System. This included an analysis of any additional cost to SA Health due to inceased FTE and changes in funded activities.

The financial analysis captures:

- Increased expenditure on midwives across the LHN; and

- An offset relating to increased Tier 2 ABF revenue due to increased maternity and midwifery outpatient services.

Our analysis does not capture potential efficiency savings or increased capacity. In particular:

- We have assumed no cost-offset for dual-qualification midwives at these hospitals as HEAT understands that these nurses are still employed for general nursing duties at these hospitals, which will not result in a cost-saving from the perspective of the LHN (and by extension, the South Australian Heath budget).
- Did not include cost offsets associated with reduced length of stay, as capital and salary and wages costs – aside from the midwife – were assumed to be fixed and unlikely to change due to the operation of the MCMoC.

5. Results

5.1. Effectiveness

Key findings:

- Systematic reviews have shown that midwifery-led care and obstetric-led care are equally safe and effective, and a trend towards decreased interventions in midwifery-led models of care;
- As noted in the methodology section, given the small event rates it was unsurprising that the vast majority of patient outcome measures would not be statistically significant. The only clinical outcome at PPHS that was statistically significant was the reduced use of syntocinon for the augmentation of labour, although there were some overall trends in improved patient outcomes.
- Literature indicates a significant life impact (in both societal and economic terms) for several of the key clinical measures provided, most notably those related to low birthweight and premature (<37 weeks gestation) birth.
- There was a statistically significant difference in the average length of stay (ALOS) pre- and post-implementation, which is unlikely to be due to chance (0.7 days). This result was observed across the following birthing categories: elective caesarean; emergency caesarean; and vaginal births of minor complexity. The ALOS for vaginal births of major complexity remained unchanged.
- The ALOS across YNLHN exceeded the KPIs in the business case: vaginal births of low and intermediate complexities 1.63 vs 2.2 days; elective caesareans 2.46 vs 3.1 days; and emergency caesareans 3.04 vs 3.9 days.
- There was a statistically significant increase in the number of Tier 2 Outpatient occasions of service across YNLHN (5.9 visits vs 10.2 visits). A statistically significant increase was observed across all YNLHN hospitals, with the exception of Wallaroo that remained unchanged (9.1 vs 9.23 visits).
- At Port Pirie, there was also a reduction in the average number of Tier 2 Obstetric services (2.07 visits per birth) that was statistically significant.

5.1.1. Review of published economic evaluations

A 2016 Cochrane Systematic Review that showed that there were consistently less use of some interventions for women who were randomised to receive midwifery-led continuity of care compared to women randomised to receive other models of care without detriment to outcomes (Sandall, Soltani et al. 2016). These included reduced use of regional analgesia, episiotomy and instrumental birth. Women were, on average, more likely to experience spontaneous vaginal birth, a longer mean length of labour, and to be attended at birth by a known midwife, although there were no differences in caesarean birth rates.

The literature indicates a significant life impact (in both societal and economic terms) for several of the key clinical measures provided, most notably those related to low birthweight and premature (<37 weeks gestation) birth. A significant number of studies, including those focussed on Australia, have provided a range of costs associated with each of these occurrences and this provides a basis on which to estimate the broader economic benefit suggested by the implementation of the caseload midwifery model.

Low birthweight significantly influences adult health – equivalent to being 12 years older when they reach 30 – 40 yeas. Weighing less than 5.5 pounds at birth increases the probability of being in fair or poor health as an adult by over 70 per cent.

We identified a number of economic studies to date – including several Australian studies that used detailed activity-based costing data – that found on the whole that midwifery-led maternity care was lower cost than medical-led maternity care. Specifically:

- Kenny (1994) found that the average cost of antenatal care in the midwifery-led continuity of care was AUD 1122 compared to AUD 1220 control;
- Rowley (1995) found that the average cost for deliver was higher in the standard care group (AUD 3475) compared to the team-midwifery group (AUD 3324);
- Tracy (2013) found that Caseload midwifery care for unassisted vaginal birth cost significantly less than standard maternity care. This difference contributed to a significant difference in the overall median cost of birth per woman of AUD 566.74 (95% CI 106.17 to 1027.30) P = 0·02).
- Homer (2001) found that costs for all stages of antenatal, intrapartum and postnatal care was cost-saving in the team midwifery group compared to the standard arm of the study (mean cost per woman: AUD 2579 versus AUD 3483, respectively).
- Callender et al 2021 found that when adjusting for clinical and demographic differences between groups, other models of care were 22% higher than midwifery caseload model of care.

However, there was a lack of consistency in estimating cost across these studies and they also were untaken across a significant time period (late 1980s to 2010s), which may limit their applicability to the South Australian context.

5.1.2. Comparison of supplied key clinical KPIs

Table 3 below compares a range of clinical outcomes relating to births at PPRHS over time. The direction of change is noted as a simple observation of collated data and the general improvement in outcomes should not be taken to infer causality for the new model over the previous. The direction of change is noted as either ‘improved’ or ‘declined’. The direction of change refers to the desirability of the measure’s direction – so a decline in the rate of a negative or unwanted outcome is designated as improved and vice versa. Clinical measures which were either very small numbers or incomplete/missing for key time periods were omitted.

Of the 18 clinical measures included in the comparison table, 13 (72%) indicate an improvement and 5 (28%) exhibited a decline (or worsening) in clinical outcomes. It is noted that two of the three metrics that declined did improve in the implementation phase but declined in the period following full implementation of the model.

As noted in the methodology section, given the low event rates it was unsurprising that the majority of patient outcome measures would not be statistically significant. The only clinical outcome that was statistically significant was the reduced use of syntocinon for the augmentation of labour.

These results could reflect the selection of cases, changes in the nature of cases seen (risk levels of patients being retained at PPRHS) and the times selected for comparison. However, these results are congruent with the findings of Sandall et al's review of caseload model outcomes more generally, which showed a broad improvement on most metrics.

Table 3: Comparison of key clinical metrics over time – Port Pirie Hospital

Clinical measure	Pre-caseload model *(Jul 16 to Dec 2018)*	Post-implementation *(July 2019 to Oct 2020)*	Relative risk [95% CI]	Health outcome improved
Total births	**335**	**174**		
Spontaneous vaginal delivery	68.7% [63.5%, 73.4%] n=230	71.3% [64.1%, 77.5%] n=124	1.04 [0.92, 1.17]	Y
Operative vaginal - forceps	2.1% [1%, 4.2%] n=7	0.6% [0.1%, 3.2%] n=1	0.28 [0.03, 2.22]	Y
Caesarean section (total)	30.4% [25.8%, 35.6%] n=102	28.2% [22%, 35.3%] n=49	0.92 [0.69, 1.23]	Y
Elective	14.9% [11.5%, 19.1%] n=50	16.1% [11.4%, 22.3%] n=28	1.08 [0.7, 1.65]	N
Emergency	15.5% [12%, 19.8%] n=52	12.1% [8%, 17.7%] n=21	0.78 [0.48, 1.25]	Y
Epidurals in labour	10.7% [7.9%, 14.5%] n=36	14.4% [9.9%, 20.3%] n=25	1.34 [0.83, 2.15]	N
Epidural/spinal for caesarean	26% [21.6%, 30.9%] n=87	25.9% [19.9%, 32.8%] n=45	1 [0.73, 1.36]	Y
General anaesthetic	2.4% [1.2%, 4.6%] n=8	0.6% [0.1%, 3.2%] n=1	0.24 [0.03, 1.91]	Y
Episiotomy	4.2% [2.5%, 6.9%] n=14	4% [2%, 8.1%] n=7	0.96 [0.4, 2.34]	Y
VBAC	2.4% [1.2%, 4.6%] n=8	0% [0%, 2.2%] n=0	N/A	N
Induction of labour	27.2% [22.7%, 32.2%] n=91	28.7% [22.5%, 35.9%] n=50	1.06 [0.79, 1.42]	N
Augmentation = syntocinon	19.4% [15.5%, 24%] n=65	10.3% [6.6%, 15.8%] n=18	**0.53 [0.33, 0.87]**	Y
Perinatal deaths	0.9% [0.3%, 2.6%] n=3	0% [0%, 2.2%] n=0	N/A	Y
Low birth weight (<2500g)	2.7% [1.4%, 5%] n=9	1.1% [0.3%, 4.1%] n=2	0.43 [0.09, 1.96]	Y
Preterm (<37 weeks)	2.1% [1%, 4.2%] n=7	1.1% [0.3%, 4.1%] n=2	0.55 [0.12, 2.62]	Y
Preterm (<34 weeks)	1.5% [0.6%, 3.4%] n=5	0.6% [0.1%, 3.2%] n=1	0.39 [0.05, 3.27]	Y
APGAR @ 5 minutes (6 or less)	2.1% [1%, 4.2%] n=7	1.7% [0.6%, 4.9%] n=3	0.83 [0.22, 3.15]	Y

Clinical measure	Pre-caseload model *(Jul 16 to Dec 2018)*	Post-implementation *(July 2019 to Oct 2020)*	Relative risk [95% CI]	Health outcome improved
Transfer to neo-natal unit	3.9% [2.3%, 6.5%] n=13	6.3% [3.6%, 11%] n=11	1.63 [0.75, 3.56]	N

Source: Data provided by YNLHN; calculations by HEAT

5.1.3.SAicorp: Baby Claims

SAicorp is the captive insurer for the Government of South Australia. It provides comprehensive insurance protection, insuring the risks of South Australian Government Agencies and provides insurance advice and assistance to those agencies.

SAicorp data for baby-related claims was examined for YNLHN. The data did not reveal any claims relating to births within YNLHN during either the PMoC or MCMoC periods in question as at 31st January 2021.

5.1.4.Breast-feeding rates

Breastfeeding has been shown to protect both breastfeeding mothers and breastfed infants against numerous diseases, which in turn reduces associated costs to the health system (The Parliament of the Commonwealth of Australia (APH) 2007).

The cost implications can be either short-term (i.e. diarrhoea and respiratory infections (Horta, Victora et al. 2013)) or long-term (type 2 diabetes, obesity and ulcerative colitis(Bernardo, Cesar et al. 2013)). Njoto et al (2018) reported that:

> In 2002, exclusive breastfeeding saved the Australian hospital system from A$60 to A$120 million incurred by three diseases alone (gastrointestinal diseases, necrotising enterocolitis, and ear and respiratory infections).

Review of breast-feeding rates for women giving birth in the MCMoC (2019-2020) compared with the PMoC (2018-2019) revealed that the proportion of women initiating breastfeeding at birth increased from 83% to 92%, respectively. It appeared that the proportion of women who continued to exclusively breastfeed also increased with 76% women exclusively breastfeeding at discharge in PMoC, and 82% breastfeeding 4 weeks post birth in MCMoC.

Table 4: Breast-feeding rates, 2018-19 (PMoC) and 2019-2020 (MCMoC)

Measure	PMoC (2018-2019)	MCMoC (2019-2020)
Initiation at birth	83%	92%
Exclusively breastfeeding: discharge hospital	76%	N.R.
Exclusively breastfeeding: 4 weeks post birth	N.R.	82%

Source: As supplied by YNLHN.

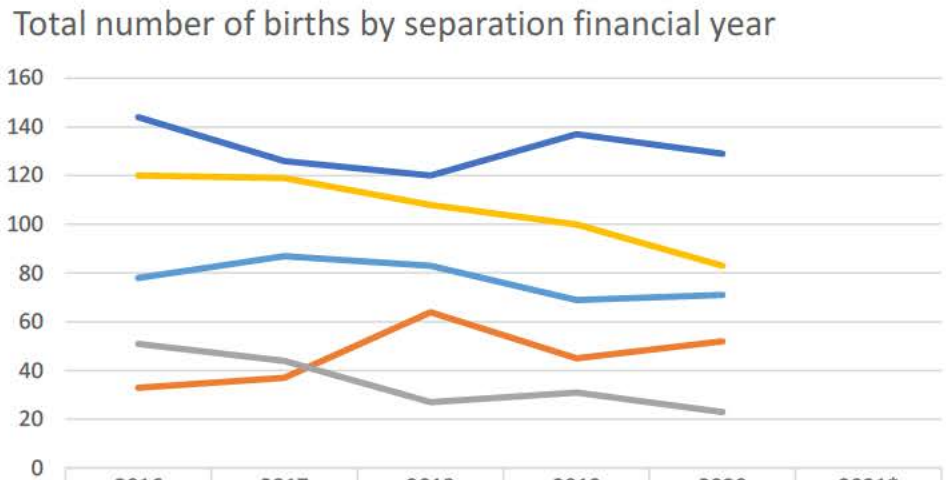
5.1.5.Analysis of activity data

Births

The business case for the midwifery caseload model of care noted that the average number of births per year over the preceding five financial years was 420 births per annum. It appeared that the average number of births decreased in 2019 and 2020 financial years relative to earlier years,

resulting in a reduction in the average number of births over the last five complete financial years (2015-16 to 2019-20) being slightly lower at 397 births.

Figure 1: Total number of births per year by hospital, 2016 -2020 financial years, and 2021 financial year to date (to 30 April 2021).

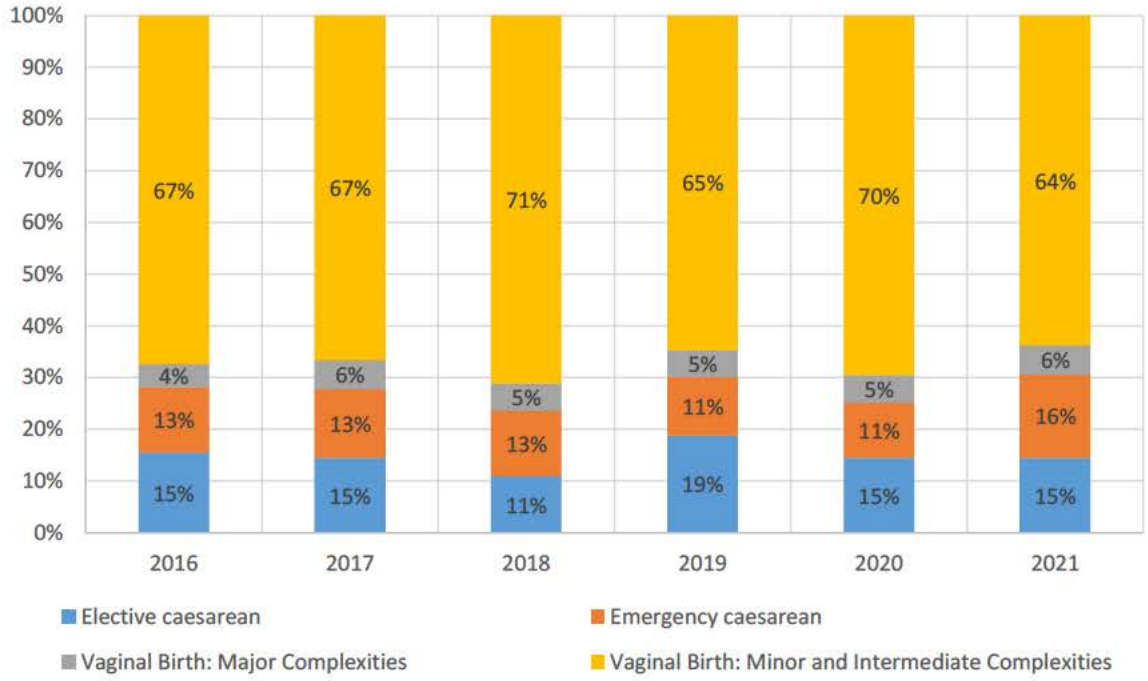


	2016	2017	2018	2019	2020	2021*
Clare	78	87	83	69	71	71
Crystal Brook	33	37	64	45	52	37
Jamestown	51	44	27	31	23	25
Wallaroo	120	119	108	100	83	92
Port Pirie	144	126	120	137	129	112
Total	426	413	402	382	358	337

*part year: 1 July 2020 – 30 April 2021
Source: SA Health 'Health Information Portal' (HIPs)

There appeared to be no strong trends on the distribution of births by caesarean rates (emergency vs elective) and vaginal births (with minor/intermediate complexity vs major complexity). See Figure 2. Any differences in these rates pre- and post-implementation would be difficult to attribute to the MoC as key information on the risk profile of patients is not available.

Figure 2: Proportion of births by category by financial year – all YNLHN hospitals



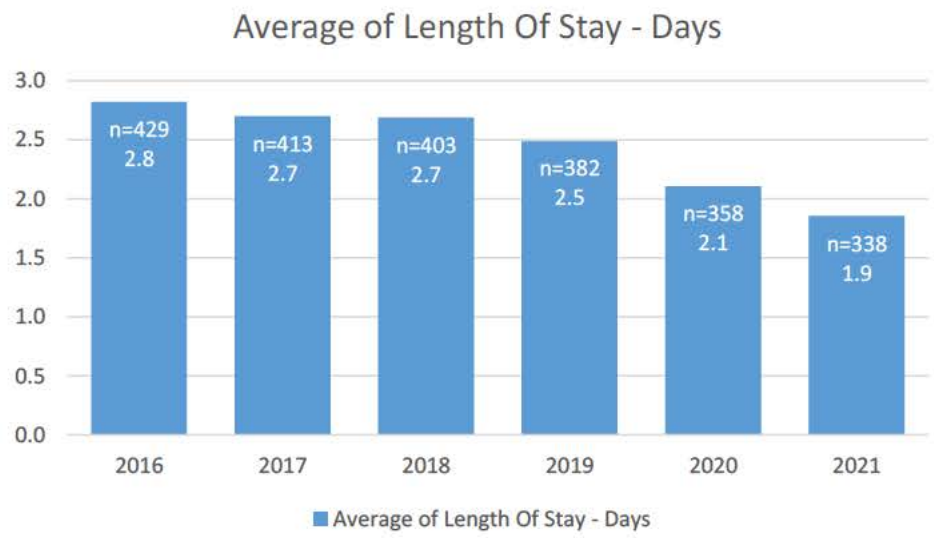
Note: 2021 part year: 1 July 2020 – 30 April 2021
Source: SA Health 'Health Information Portal' (HIPs)

Average length of stay (ALOS)

A key metric of greater clinical and cost benefit associated with the new model are reductions in average length of stay (ALOS) for births.

Figure 3 summarises the average length of stay per birth by financial year for all YNLHN hospitals. The graph shows that the average length of stay per birth remained stable at 2.7-2.8 days per birth, and has decreased in later years after the implementation of the MCMoC in January – June 2019 to approximately 1.9 days in 2021 FY YTD.

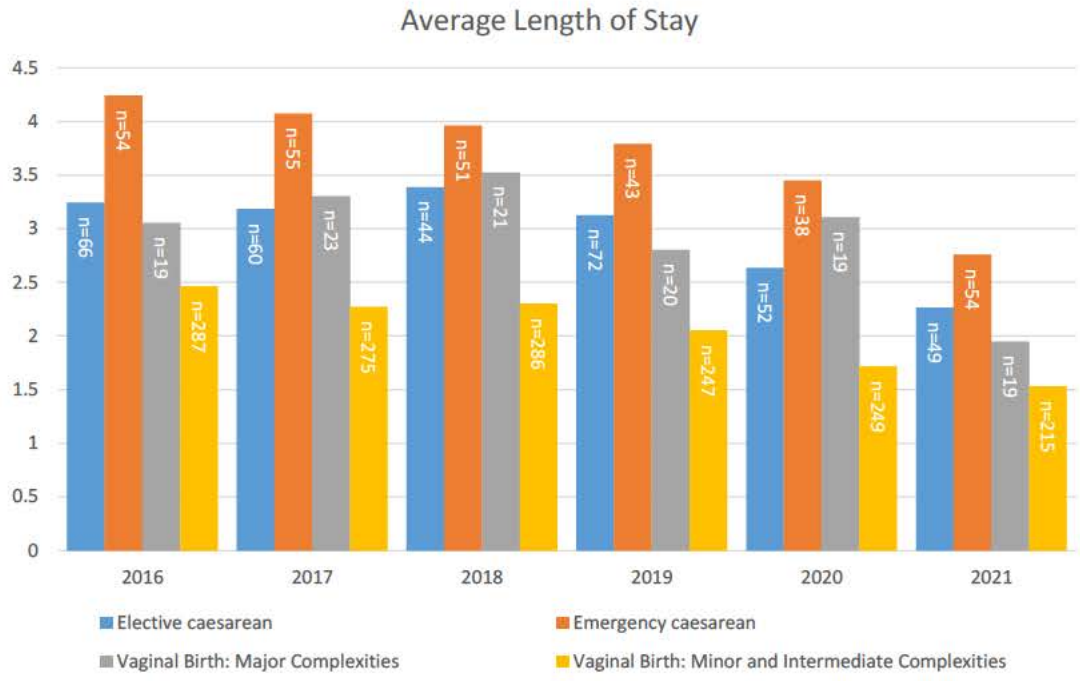
Figure 3: Average length of stay per birth by financial year, all YNLHN hospitals, 2016- 2021 YTD*



*YTD is 1 June 2020 - 30 April 2021.
Source: SA Health's Health Information Portal

Figure 2 summarises the average LOS by birth type and financial year at all YNLHN hospitals, and shows that the ALOS appears to be decreasing for all birth types.

Figure 4: Average length of stay (ALOS) per birth, by birth type and financial year, all YNLHN hospitals



*YTD is 1 June 2020 - 30 April 2021.
Source: SA Health's Health Information Portal

The business case for the introduction of this model noted the following benchmarks for ALOS for births under the new midwifery model:

- Vaginal births: low and intermediate complexities – 2.2 days
- Elective caesarean – 3.1 days; and
- Emergency caesarean – 3.9 days

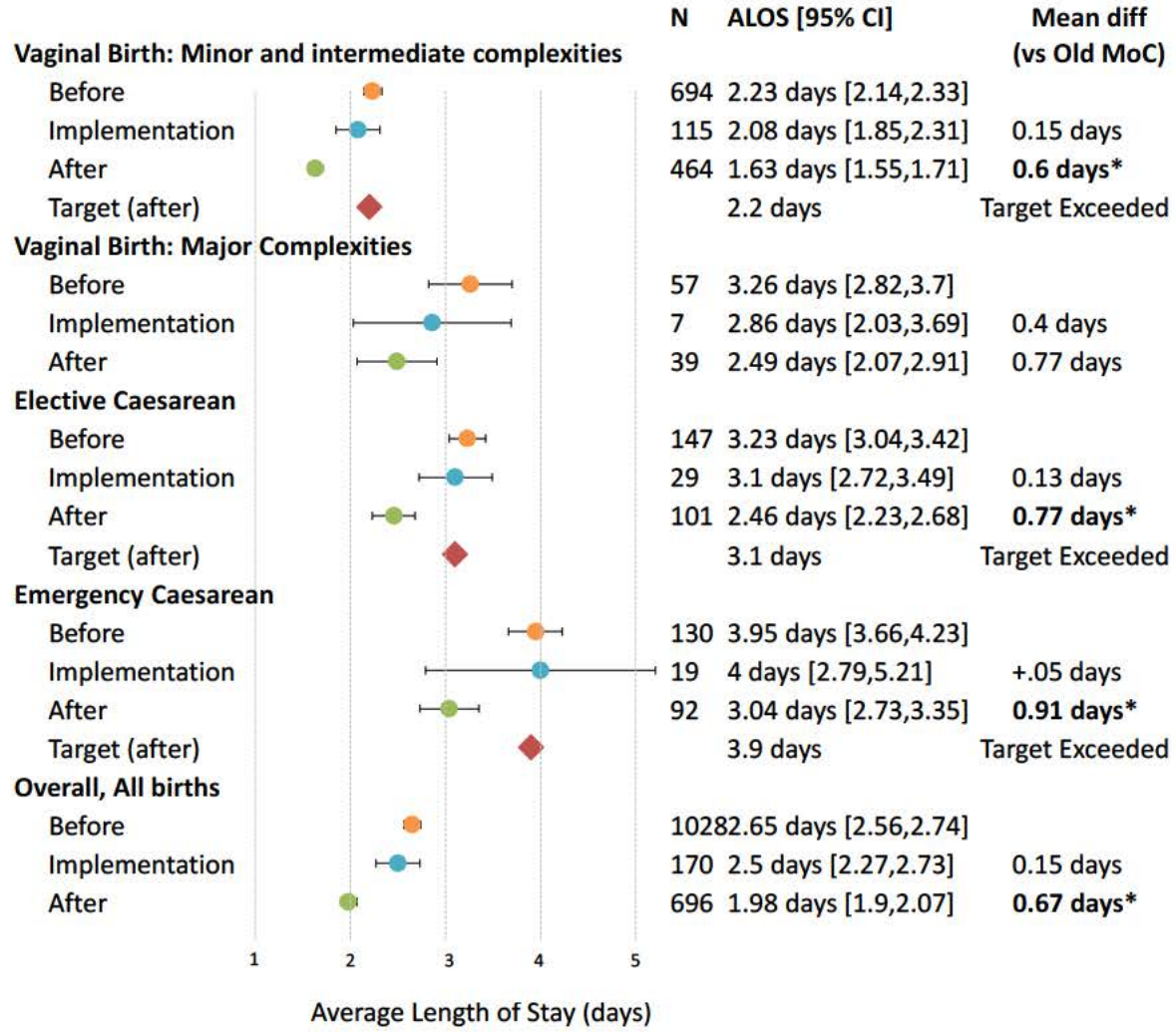
Figure 5 provides a summary of the mean LOS, 95% CIs and mean difference compared to the time period the period before the implementation of the new MoC (Jul 2016 – Dec 2019) and the target KPI for after implementation.

None of the distributions were normally distributed so the Mann-Whitney U and Wilcoxon W tests were used to determine whether the distribution of LOS was different between the two time periods. The results show that for all births, the distribution of the LOS before and after the implementation of the MCMoC were statistically significantly different, and where therefore not likely to be the result of chance. The distribution of the LOS before and after the implementation of the new MCMoC was also statistically significantly different for all birthing categories, except for vaginal birth with major complexities, although numbers were small for this comparison.

A reduction in the ALOS will reduce the average cost per patient, and will offset some of the costs associated with the new MoC. Across YNLHN there was a statistically significant reduction in the length of stay of approximately 0.7 days, which may provide a potential saving of $2,153 per birth[1]. It is unclear whether this saving might be realised in a practical sense, given the nature of the true fixed and variable costs within each of the hospitals.

[1] The average nursing cost per bed day was based on patient costing for the Port Pirie Hospital from 2018-2019 which was the latest available, and the only YNLHN hospital for which patient costing data was available. We included only the Ward Medical, Ward Nursing, and Hotel Services cost buckets. These costs were indexed to 2021-22 dollars based on the increase in the national efficient price (NEP) over this period (11.7%).
This resulted in an average cost of $3,076 per bed-day, and an average reduction of $2,153 per birth for inpatient hospital costs.

Figure 5: Summary Average length of stay by birth type before, during and after implementation of the new midwifery-led MoC



*Distribution of LOS statistically significantly different compared to the time period prior to the implementation of the new MOC, as tested using the Mann-Whitney U and Wilcoxon W non-parametric tests for independent samples.
Source: SA Health's Health Information Portal; KPIs from YNLHN midwifery business case

Outpatient Visits

Using Tier 2 Clinic outpatient data for YNLHN, we examined differences between the pre- and post-implementation period in:

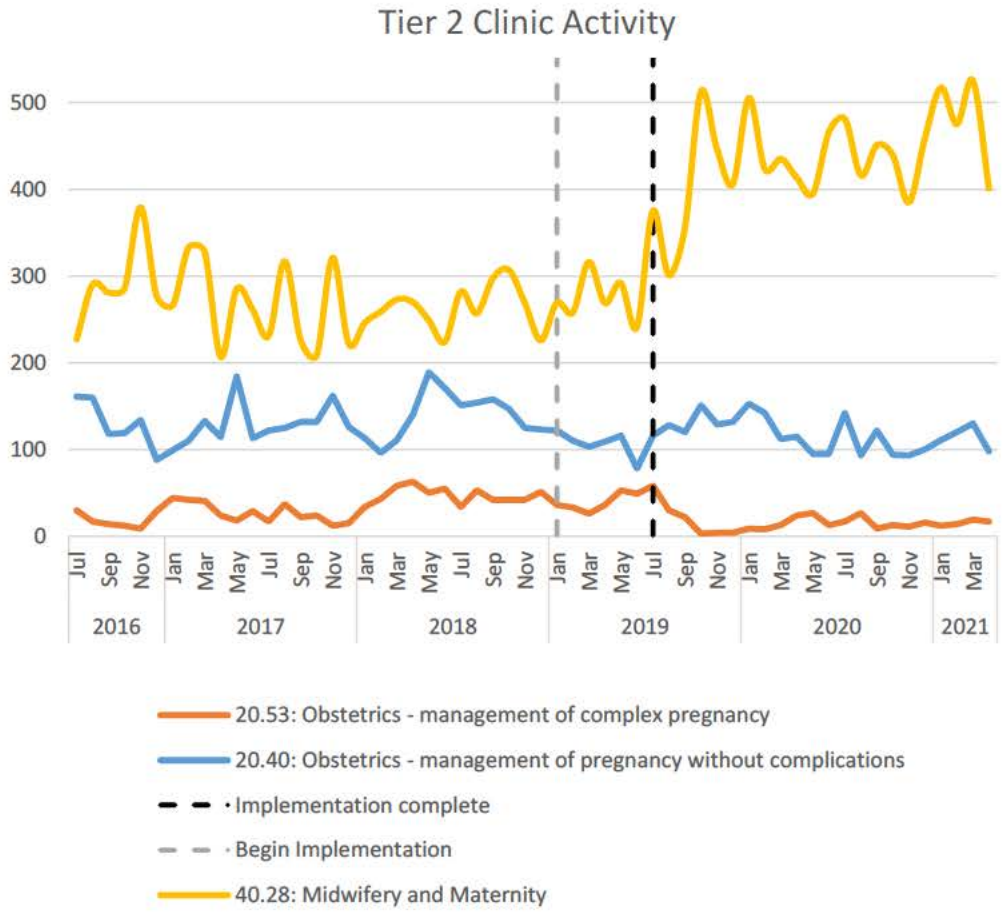
- Monthly averages of Tier 2 Clinic activity by Tier 2 Clinic Code; and
- Average number of Tier 2 Clinic attendances per birth in MCMoC and PMOC.

These are discussed separately below.

Total number of maternity-related outpatient visits

The total monthly number of maternity-related outpatient visits at YNLHN hospitals is summarised in Figure 6.

Figure 6: Total number of OP attendances related to maternity at YNLHN hospitals, by month, July 2016 – April 2021.



Source: Data Analysis and Reporting team in SA Health

Comparing the total number of maternity-related outpatient visits in the MCMoC vs PMOC revealed that:

- The total number of outpatient attendances for maternity and midwifery services (as captured by Tier 2 Clinic code 40.28) increased for the LHN (270 OP attendances / month prior to the implementation of the MCMoC vs 435.5 attendances / month after implementation of the new MoC)– but did so at different rates among individual hospitals (see Table 5 below).
- The number of outpatient attendances related to the obstetric management of complex pregnancy decreased. However, this data relates to services provided at Port Pirie Hospital, only.
- The number of OP attendances for the obstetric management of pregnancies without complications appeared similar. Again, this data only relates to services provided at Port Pirie hospital.

Table 5: Average number of outpatient attendances per month by Tier 2 Clinic, all YNLHN birthing hospitals

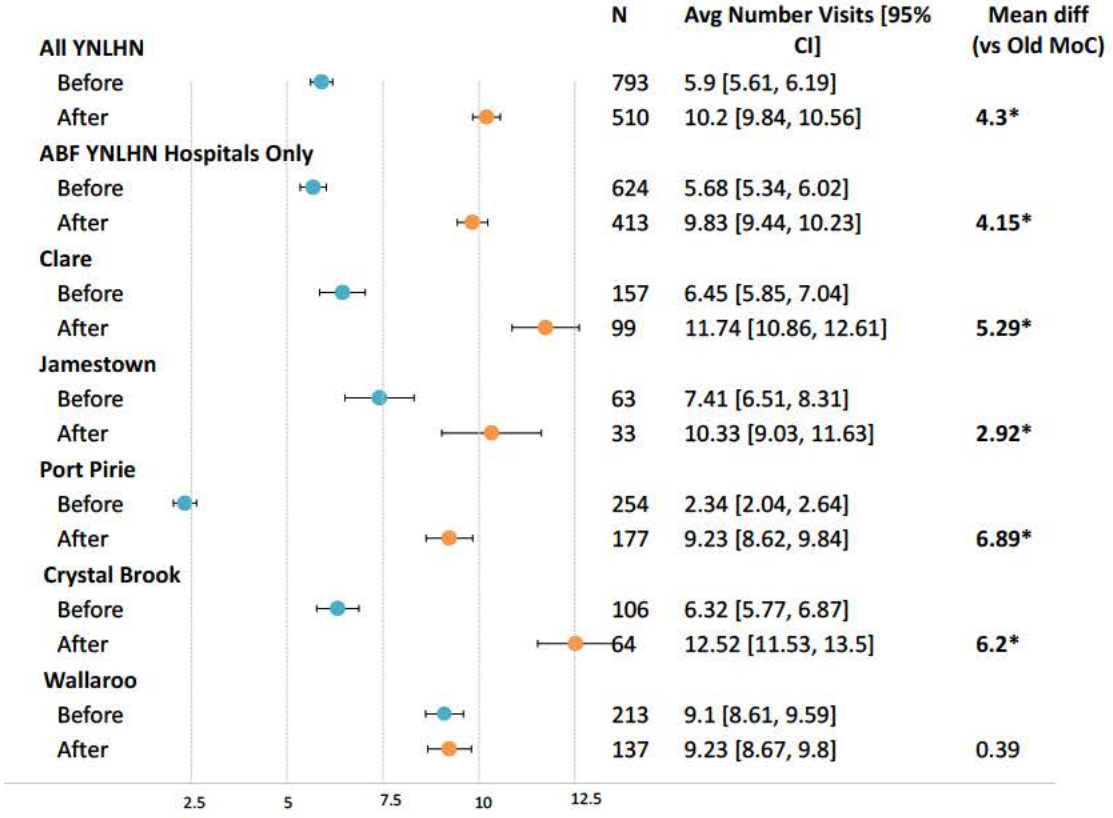
Tier 2 Clinic Code	Pre-caseload model (PMoC) *(Jul 16 to Dec 2018)*	Implementation phase *(Jan 2019 to Jun 2019)*	Post-implementation (MCMoC) *(July 2019 to Oct 2020)*	% Difference: pre vs post implementation
20.40: Obstetrics - management of pregnancy without complications	**133.6**	**106.3**	**117.8**	**-12%**
20.53: Obstetrics - management of complex pregnancy	**33.4**	**38.8**	**16.8**	**-50%**
40.28: Midwifery and Maternity	**270.2**	**274.2**	**435.5**	**61%**
Clare	64.3	31.5	102.3	59%
Crystal Brook	37.1	31	78.8	112%
Jamestown	33.2	39.5	35.2	6%
Wallaroo	96.2	96.5	93.0	-3%
Port Pirie	39.3	75.7	126.2	221%
ABF hospitals				

Source: Data Analysis and Reporting team in SA Health, SA Health's Health Information Portal, and calculations by HEAT

Average number of visits per birth

The average number of maternity and midwifery Tier 2 (Clinic Code 40.28) services per birth increased at all hospitals across the YNLHN. This result was statistically significant for all YNLHN hospitals with the exception of Wallaroo where there was no change (9.1 vs 9.23 visits per birth). The largest change was for Port Pirie, which increased from an average of 2.34 visits per birth to 9.23 visits per birth. See Figure 7 below.

Figure 7: Average number of Tier 2 Maternity and Midwifery (40.28) services pre and post implementation of the midwifery caseload MOC



*Distribution of LOS statistically significantly different compared to the time period prior to the implementation of the new MOC, as tested using the Mann-Whitney U and Wilcoxon W non-parametric tests for independent samples.
Source: Data Analysis and Reporting team in SA Health, calculations by HEAT.

Tier 2 clinic activity relating to obstetric services was limited to Port Pirie. There was a statistically significant decrease in the average number of obstetrician visits per birth (Tier 2 Clinic codes 20.40 and 20.53) of 2.08 visits (10.45 visits to 8.37 visits). When looking at the average number of obstetrician visits per birth across the whole of YNLHN, the mean number of visits reduced from 3.3 (95% CI 3.0, 3.7) to 2.9 (95% CI 2.5, 2.5) visits per birth, a change that was not statistically significant. See Table 6 below.

Table 6: Average number of obstetric Tier 2 Clinic visits per birth, Port Pirie Hospital only.

Tier 2 Clinic Code	PMoC n/N [95% CI]	MCMoC n/N [95% CI]	Difference
20.40: Obstetrics - management of pregnancy without complications	8.91 [8.44, 9.37]	7.5 [7.08, 7.92]	**1.41***
20.53: Obstetrics - management of complex pregnancy	1.54 [1.17, 1.91]	0.88 [0.56,1.19]	0.66
Overall average per birth	10.45 [9.87, 11.02]	8.37 [7.89, 8.85]	**2.08***

*Distribution of LOS statistically significantly different compared to the time period prior to the implementation of the new MOC, as tested using the Mann-Whitney U and Wilcoxon W non-parametric tests for independent samples.

5.1.6. Summary of results of effectiveness

Although we intended to provide a tabulated list of patient outcomes, showing differences in the PMoC and MCMoC, it was evident that the low event rate and small number of births within YNLHN meant that it was difficult to exclude any differences as not being by chance alone.

Our analysis of effectiveness found that:

- There was a trend towards improved outcomes in the MCMoC vs PMoC at PPHS. Given the small numbers it was not possible to determine whether these results were statistically significant, or whether they were due to chance alone.
    - The only statistically significant improvement in maternity indicators was the reduced use of synto for augmentation of labour (19.4% of births in PMoC vs 10.3% in MCMoC, R 0.53 [95% CI 0.33, 0.87])
- Our finding is consistent with a Cochrane Systematic Review (Sandall, Soltani et al. 2016) that also noted that there was a trend toward less use of some interventions for women who were randomised to receive midwife-led continuity of care compared to women randomised to receive other models of care
    - Specifically, women were on average less likely to experience regional analgesia, episiotomy, and instrumental birth. Women were also on average more likely to experience spontaneous vaginal birth, a longer mean length of labour, and to be attended at birth by a known midwife, however, there were no differences in caesarean birth rates.
- There were was no evidence of poor health outcomes related to maternity and midwifery services in the SAicorp claims data for YNLHN in either the PMoC or MCMoC periods included in our analysis.
- There appeared to be an improvement in beast-feeding rates, which has been correlated with improved health outcomes for infants both in the short and long term (Bernardo, Cesar et al. 2013, Horta, Victora et al. 2013)
- There was a statistically significant decrease in the average length of stay across all birthing categories (ALOS 2.65 vs 1.98 days in the PMOC and MCMoC, respectively).
- There was a statistically significant increase in the average number of outpatient maternity and midwifery services (Tier 2 Clinic Code 40.28) of 4.3 visits (5.9 vs 10.2 in the PMOC and MCMoC, respectively).

5.2. Results of the financial analysis

Key Findings:

.HEAT finds that the net additional financial position for SA Health of the MCMoC compared with the PMoC is $276,332 per annum ($696 per supported birth) taking into account SA Health's 55% share to ABF. Additional cost attributed to 3.4 increased FTE ($471,430), is partially offset by revenue received from Commonwealth due to increased outpatient services (55% NEP; -$195,098).

The incremental financial impact to both the LHN and SA Health budgets is larger when considering that two of the five hospitals (Clare and Jamestown) are block funded, the additional cost of the 3.4 FTE ($471,430) will not have Commonwealth offsetting ABF revenue.

The above estimates may be conservative as the analysis does not include adjustments for productivity gains relating to:

- hospitals that relied on dual-qualified nurses for midwifery services. These nurses remain employed for general nursing duties at the hospital and have not been included in the analysis, as this cost remains the same under both MoCs;
- potential reduced use of interventions during birth / labour or reduction in the ALOS. These have not been included in the analysis, as it was not clear whether these savings would in fact be realised under the new MCMoC; and
- costs incurred to treat poor health outcomes.

Whilst this evaluation does demonstrate an increase in marginal costs of MCMoC over the previous model, there are significant data limitations that have constrained assessment of the full suite benefits and costs. In particular short term and ongoing costs associated with poor health outcomes in both MCMoC and PMOC are unknown.

>

5.2.1. Increased costs associated with expanded midwifery workforce

Consultation with YNLHN revealed that:

- Port Pirie: prior to the implementation of the MCMoC there was 0.9 full-time equivalent (FTE) Midwife operating the antenatal clinic, and 0.8 maternity domiciliary care. HEAT understands that these (1.7) FTE have moved into the new MCMoC.
- Crystal Brook: Six midwives (four FTE) were previously employed under the PMoC. HEAT understands that these midwives, are operating under the new MCMoC. The total midwife FTE for Port Pirie and Crystal Brook hospitals is 4.5 FTE.
- Neither Clare nor Jamestown had dedicated midwives, instead relying on dual qualification midwives when rostered on shift for general nursing duties. The two FTE dual-qualification nurses at Jamestown also shared on-call duties. HEAT understand that 3.7 FTE midwives were recruited to operate at the Clare and Jamestown hospitals.

In addition to the above, a Midwife Unit Manager (MUM; 1 FTE) was also employed in both the PMoC and MCMoC. This resulted in 3.4 FTE increase across YNLHN to support the new MCMoC (9.5 FTE vs 12.9 FTE in the PMoC and MCMoC, respectively). See Table 7.

Table 7 Summary of differences between the number of FTE prior and post introduction of the midwifery caseload MoC

Hospital	Pre-caseload model (PMoC)		Post-implementation (MCMoc)		FTE Growth
	Description	FTE	Description	FTE	
Port Pirie	Antenatal clinic midwife	0.9	Midwifery team	4.5	-1.2
	Maternity domiciliary care	0.8			
Crystal brook	6 midwives – capacity to care for PPHS patients	4			
Clare	No dedicated midwife	0		3.7	3.7
Jamestown	2x dual qualification nurses, rostered on for general nursing duties.	0			
Wallaroo	Midwifery FTE	2.8		3.7	0.9
YNLHN	MUM	1	MUM	1	0
Total		***9.5***		***12.9***	***3.4***

Source: Consultation with YNLHN MUM, and data supplied by YNLHN

The total cost of FTE under each of the MoCs was based on:

- The distribution of FTE by classification in both the PMOC and MCMoC was established in consultation with YNLHN.
- Pay and conditions for the MCMoC was based on Appendix 8, Midwifery Caseload Practice Agreement, Enterprise Agreement Nursing/Midwifery (South Australian Public Sector) Enterprise Agreement 2020. 2021-22 dollars.
- Similarly, pay and conditions for midwives under the PMOC was based on the Agreement Nursing/Midwifery (South Australian Public Sector) Enterprise Agreement 2020, with payments for night shift, on-call and qualifications allowances, also using 2021-22 dollars.

Total costs estimated costs of midwives under the MCMoC and PMoC are provided in Table 8.

Table 8: Estimated cost of MCMoC and PMoC midwives, 2021-22 dollars

Classification	Old MoCs (PMoC)		Midwifery Caseload MoC (MCMoc)	
	FTE	Total ($)	FTE	Total ($)
RN1(graduate)			4.95	$498,267
RN1 (experienced)	8.5	$986,847	4.95	$629,140
RN2 (assistant MUM)			2	$284,566
RN3 (MUM)	1	$127,568	1	$149,893
Total	9.5	$1,114,415	12.9	$1,561,865

Source: FTE based on discussions with YNLHN MUM, calculations by HEAT.

In addition to the midwifery salary and wages costs we included:

- One vehicle for the MUM, $12,000 per annum, as estimated by YNLHN in both the PMoC and MCMoC.
- In the MCMoC, average on costs of $2,200 per FTE, which includes the provision of a mobile phone as per the Enterprise Agreement Nursing/Midwifery. In the PMOC we assumed the average on cost of $2,200 for the MUM only.

5.2.2.Increased Tier 2 ABF Revenue

As noted in Section 5.1.5, there was a statistically significant increase in the number of Tier 2 Maternity and Midwifery Outpatient Clinic (40.28) Services between the MCMoC and PMoC,

Differences in the absolute number of Tier 2 Clinic Code 40.28 Maternity and Midwifery services in the YNLHN between the MCMoC (May 2020 – April 2020) and PMoC (May 2017 – April 2018) time periods were used to estimate the likely increase in services.

The national efficient price for Tier 2 Clinic Code 40.28 in 2021-22 ($189.72 per visit) was retrieved from the IHPA National Efficient Price Determination 2021-22.

The National Weighted Activity Unit for this Tier 2 Clinic Code was then multiplied by the IHPA National Efficient Price (NEP) to determine the NEP of Tier 2 Clinic Code 40.28.

HEAT also considered using the average number of visits per birth (MCMoC 9.83 vs PMoC 5.68) multiplied by the expected number of births at ABF hospitals (average 397 births over previous 5 financial years). However, this would not take into consideration outpatient activity associated with women who chose to birth outside of YNLHN, and is therefore unlikely to capture all activity.

The expected number of ABF-funded Tier 2 Clinic Code 40.28 Maternity and Midwifery services, and associated funding is summarised in Table 9.

Table 9: Increase in ABF revenue for Tier 2 Clinic Code 40.28 Maternity and Midwifery

Expected number of Tier 2 Clinic Code 40.28 services	PMOC	MCMoC	Difference	Difference ($)
ABF Hospitals only	2,292	4,011	1,719	$326,160
ALL YNHN Hospitals	3125	5410	2285	$433,552

5.2.3. Summary of financial analysis results

The results show that there is a negligible financial impact of moving to a MCMoC, if the cost of additional midwife FTE can be mostly offset by an increase in Tier 2 ABF funding.

The financial impact of moving from the PMoC to MCMoC in YNLHN (2021-22 dollars), under a shadow ABF model from the perspective of SA Health is provided in Table 10.

Table 10: Results: Financial impact to SA Health of sustaining MCMoC vs PMoC in YNLHN under a shadow ABF System

Component	MCMoC (NEW MODEL)	PMoC (PREVIOUS MODEL)	Incremental	Comment
Cost of Midwives	$1,561,865	$1,114,415	$447,450	Increase in 3.4 FTE new model
Vehicle	$12,000	$12,000	$0	No change
Goods and Services	$28,380	$4,400	$23,980	Additional equipment per FTE
Gross costs	$1,602,245	$1,130,815	$471,430	
Less IHPA Revenue (45% NEP as Commonwealth Share)	$266,819	$461,918	-$195,098	ABF revenue received for Tier 2 Outpatient Maternity and Midwifery visits
Net cost to SA Health	$1,869,065	$1,592,733	$276,332	
Average impact per supported birth to SA Health budget of the midwifery caseload model of care relative to old models of care under a shadow ABF (assumed avg of 497 births per annum based on last five years)			$696.05	Additional cost to SA Health to support women under the MCMoC relative to the PMoC

Impact of block-funded hospitals

The incremental financial impact to SAHealth budgets is larger when considering that two of the five hospitals (Clare and Jamestown) are block funded. The net financial impact to SA Health and YNLHN budgets is greater as offsets due to increases in ABF-funded activity do not apply.

While there appears to be a small increase in funding required to support the MCMoC relative to the PMoC in YNLHN, the analysis does not capture that there are likely to be productivity gains across other areas of the hospital. This is particularly true for those hospitals whom relied on dual-qualification nurses to provide midwifery care. As noted in the Methodology section, estimates of nursing time were not included in the analysis as these nurses remain employed under both PMoC and MCMoC. Similarly, we have not included any impact of reduced ALOS or potential for reduced interventions during labour / birth.

6. Discussion

The results of our analysis are consistent with previous published evaluations both internationally and within Australia. This section discusses our findings.

6.1.1. Effectiveness

Midwifery-led MoCs have been shown to be as equally safe and effective as medical-led maternity care (Sandall, Soltani et al. 2016). This finding is consistent with outcomes observed in the YNLHN MCMoC Pilot that showed similar patient outcomes, although there was a trend toward improvement in a number of important patient outcomes. Although, given the small number of events and the smaller sample size, we could not rule out that any differences were due to chance alone.

Our findings are also consistent with Callender et al 2021 that found that, although not statistically significant, there was a trend towards improvement in some outcomes in the midwifery caseload model compared to other models of care offered at a large tertiary hospital in Australia. The study also found that there were no significant differences in Quality-Adjusted Life Yeas (QALYs) between the MoCs (Callander, Slavin et al. 2021).

Our findings mirror those reported in the 2016 Cochrane Systematic Review that showed that there were consistently less use of some interventions for women who were randomised to receive midwifery-led continuity of care compared to women randomised to receive other models of care without detriment to outcomes (Sandall, Soltani et al. 2016). These included reduced use of regional analgesia, episiotomy and instrumental birth. Women were, on average, more likely to experience spontaneous vaginal birth, a longer mean length of labour, and to be attended at birth by a known midwife, although there were no differences in caesarean birth rates.

We found that, on average, the MCMoC resulted in a statistically significant increase in maternity and midwife outpatient Tier 2 services provided per birth (4.3 occasions of service) across YNLHN. However, we found that this varied between hospitals and was typically higher for those hospitals who previously did not have dedicated midwives. The largest increase in Tier 2 maternity and midwifery activity was observed in Port Pirie (2.34 vs 9.23,or 6.89 visits), with Wallaroo being the only hospital to observe no change.

We also found that there was a statistically significant reduction in the ALOS between the two models of care (0.7 days overall), with the largest decrease for emergency caesarean births (0.91 days). This is likely due to the increase postnatal support provided under the MCMoC, and could result in efficiency savings to YNLHN which might be as high as $2,153 per birth, based on Port Pirie patient costing data.

Our results are congruent with UniSA Pilot Evaluation that also outlined a number of key benefits associated with the MCMoC.

6.1.2.Financial impact

HEAT concurs with the view that consideration must be given to ensure that the perceived cost should not constrain ongoing effective, acceptable care (Tran, Longman et al. 2017, Adelson P, Fleet J et al. 2021).

While every effort was made to conduct a robust cost analysis, HEAT was constrained by a lack of available data. At the time of the evaluation, activity-based costing results were not available for the 2019/2020 financial year as they were still being finalised. A further complicating factor was that of the

five birthing hospitals only one (Port Pirie) was included in the patient costing process, covering approximately one-third of all births in the region in the 2020 financial year. It is possible that changes in the average cost per birth in the antenatal, acute inpatient and post-natal phases between the two MoCs in Port Pirie are not representative of changes across the whole LHN. Analysis of the Tier 2 outpatient data revealed that Port Pirie experienced the greatest increase in monthly maternity and midwifery outpatient visits (39.3 vs 126.2; 221%), compared to the YNLHN average (270.2 vs 435.5; 61%).

The results of our analysis show that additional funding required to support the MCMoC within the LHN would be minimal under an ABF – with much of the financial impact of the increased FTE likely to be offset by ABF-funding due to increased Tier 2 occasions of service. From the perspective of SA Health, this would result in a slight additional cost due to SA Health's share of ABF (55% NEP).

It is possible that some of this increased cost to SA Health may be offset when incorporating:

- any productivity gains associated with dual-qualification midwives time;
- the reduction in costs associated with the reduced use of some interventions; and
- costs of treating adverse events or sequale associated with the treatment of poor maternal health outcomes over the life of the infant.

As noted in earlier sections our analysis does not incorporate any of the above estimates due to a lack of statistical power, and the assumption that non-maternity activity at these hospitals are unlikely to change based on the MoC in question.

This analysis appeared broadly consistent with the QLD experience whereby revenue associated with the MCMoC is sustainable within the state's casemix funding model. Again, robust patient costing for all YNLHN hospitals would be required to conclusively establish this.

6.1.3. Sustainability and scalability

At current activity and staffing levels, the MCMoC is unlikely to result in substantial additional costs to either YNLHN or SA Health Budgets. The majority of the financial impact on YNLHN budgets is due to the number of block-funded hospitals an inability to capture offset of increase costs with ABF-revenue.

The UniSA Pilot Evaluation noted that one aspect that was evident through the evaluation was that the current caseload of 38 women was considered challenging by some midwives. Similar themes were reported in a study that explored midwives experience in working in a caseload model in rural Victoria (Hildingsson, Kashani et al. 2021). In the context other rural and remote LHNs, this caseload may be problematic where the geographical region covered by the midwives teams is large, which may reduce the applicability of these results to other LHNs.

If the average caseload per midwife decreases, it is possible that there may be an increased cost per patient in the MCMoC. Whether or not this might be offset by reduced interventions and ALOS for delivery are unclear, although overall costs of the MCMoC would be expected to be minimal.

The UniSA Pilot Evaluation provided evidence that the MCMoC is effective, acceptable and sustainable and that it had strong support from consumers and all providers.

Consultation with YNLHN revealed that a key benefit of the MCMoC is its capacity to improve workforce stability, recruitment and retention. YNLHN had managed to recruit a number of graduate midwives into the MoC, which was not possible under the previous models of care.

7. Conclusion

The results of this analysis demonstrate that the MCMoC is likely to be cost-effective compared with previous MoCs, and is unlikely to result in substantial additional costs to either the LHN or SA Health while demonstrating non-inferior to superior benefits in terms of patient outcomes, and other productive efficiencies including reduced ALOS.

The analysis indicates that the program is:

- Clinically effective – representing a best practice supported by extensive literature and a separate evaluation of a pilot at Uni of SA;
- Likely to be cost effective, and
- Sustainable from a workforce perspective

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Appendix A: Detailed Results

7.1. Length of Stay

All births

- LOS not normally distributed – see Figure 8 and Table 11 below.
- Mann-Whitney U/Willcoxon W tests that showed that the distributions of LOS before and after the implementation of the new MOC as statically significantly different See Table 14.

Figure 8: Histogram: Length of Stay, all births, before and after implementation of new MOC

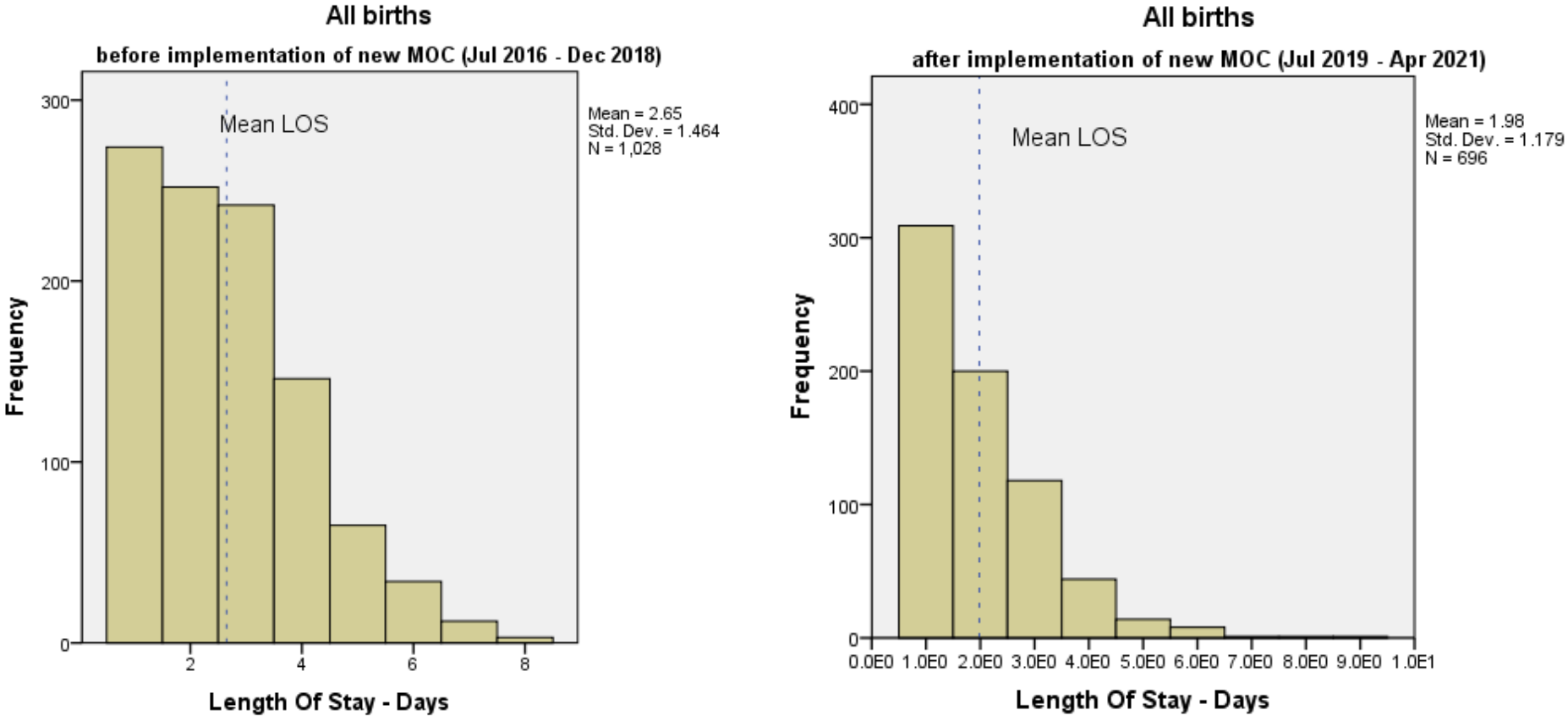


Table 11: SPSS Output: Tests of normality, all births, length of stay

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Time Period	Statistic	df	Sig.	Statistic	df	Sig.
Length Of Stay - Days	1-Exclud	.151	429	.000	.898	429	.000
	2-Before	.183	1028	.000	.891	1028	.000
	3-Implem	.199	170	.000	.799	170	.000
	4-After	.242	696	.000	.785	696	.000

a. Lilliefors Significance Correction

Table 12: SPSS Output – All births: Mann-Whitney U and Wilcoxon W, tests of two independent samples, before vs after implementation of new MOC, length of stay

Ranks

	TimePeriod_Code	N	Mean Rank	Sum of Ranks
Length Of Stay - Days	Before	1028	957.61	984418.50
	After	696	722.03	502531.50
	Total	1724		

Test Statistics[a]

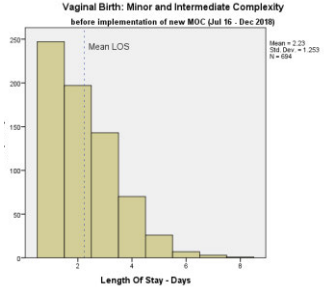
	Length Of Stay - Days
Mann-Whitney U	259975.500
Wilcoxon W	502531.500
Z	-9.982
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: TimePeriod_Code

Vaginal Births of minor and intermediate complexity

- LOS not normally distributed – see Figure 9 and Table 13 below.
- Mann-Whitney U/Willcoxon W tests that showed that the distributions of LOS before and after the implementation of the new MOC as statically significantly different See Table 14.

Figure 9: Histogram: Length of Stay, Vaginal births of low and intermediate complexity, before and after implementation of new MOC



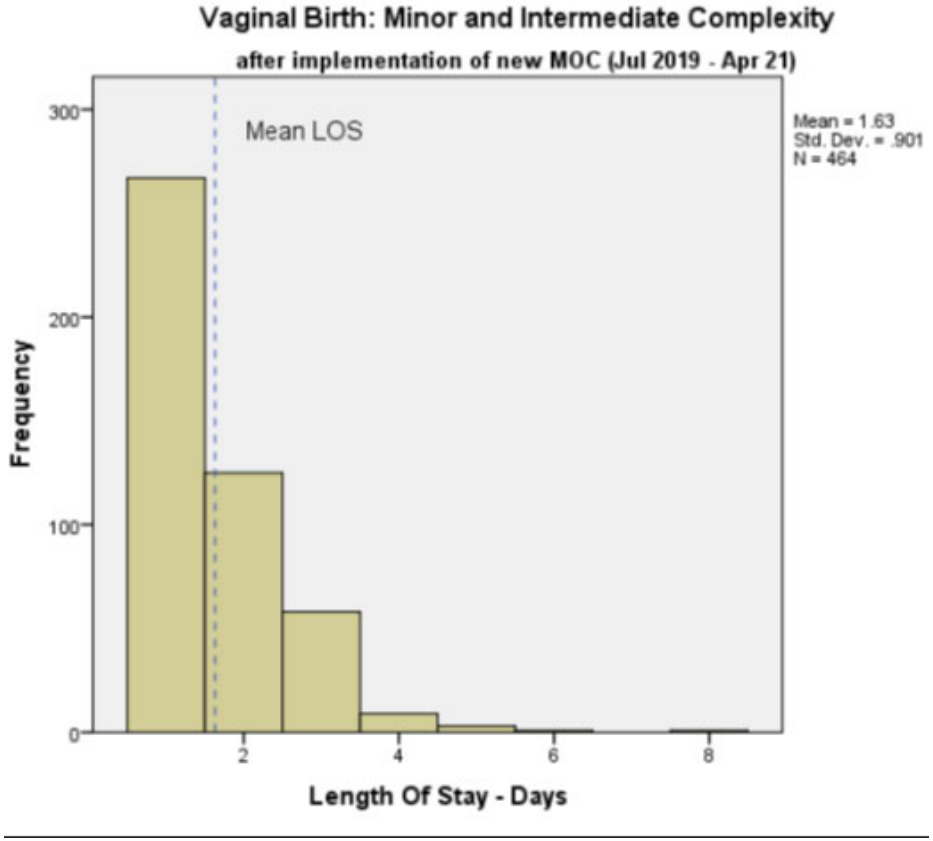


Table 13: SPSS Output: Tests of normality, Vaginal births of minor and intermediate complexity, length of stay

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	TimePeriod_Code	Statistic	df	Sig.	Statistic	df	Sig.

Length Of Stay - Days	Before Implementation (Jul16 - Dec 2018)	.214	694	.000	.849	694	.000
	During Implementation (Jan - Jun 2019)	.238	115	.000	.781	115	.000
	After implementation (Jul 2019 - April 2021)	.333	464	.000	.701	464	.000

a. Lilliefors Significance Correction

Table 14: SPSS Output – vaginal birth minor and intermediate complexities: Mann-Whitney U and Wilcoxon W, tests of two independent samples, before vs after implementation of new MOC, length of stay

Ranks[a]

	TimePeriod Code	N	Mean Rank	Sum of Ranks
Length Of Stay - Days	2	694	645.72	448132.00
	4	464	480.45	222929.00
	Total	1158		

a. BirthingCategory_KPI = Vaginal Birth Minor and Intermediate Complexities

Before implementation vs after implementation: Test Statistics[a]

	Length Of Stay - Days
Mann-Whitney U	115049.000
Wilcoxon W	222929.000
Z	-8.758
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: TimePeriod_Code

Vaginal births of major complexities

- LOS not normally distributed – see Figure 9 and Table 13 below.
- Mann-Whitney U/Willcoxon W tests that showed that the distributions of LOS before and after the implementation of the new MOC as statically significantly different See Table 14.

Figure 10: Histogram: Length of Stay, Vaginal births of major complexity, before and after implementation of new MOC

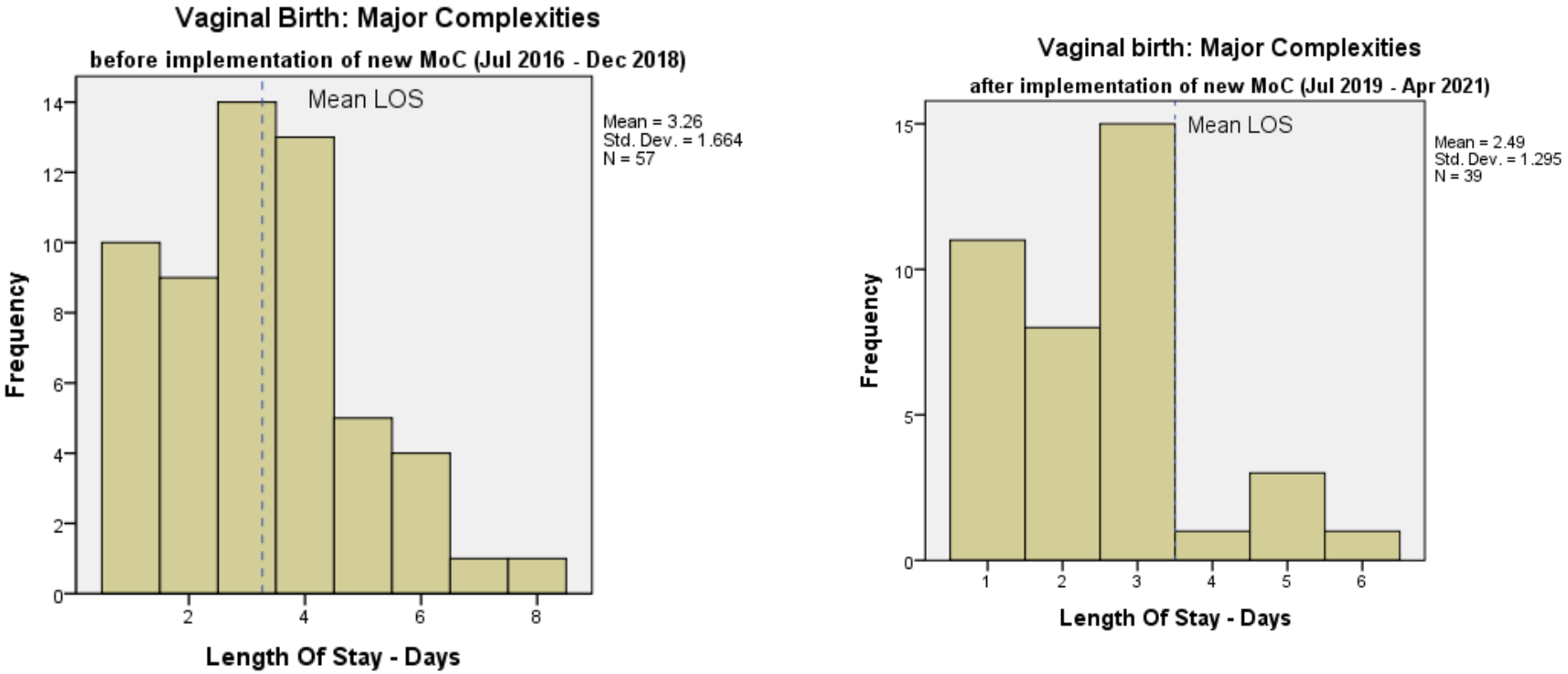


Table 15: SPSS Output: Tests of normality, Vaginal births major complexities, length of stay

Tests of Normality[a]

		Kolmogorov-Smirnov[b]			Shapiro-Wilk		
	TimePeriod_Code	Statistic	df	Sig.	Statistic	df	Sig.
Length of stay	Before Implementation (Jul16 - Dec 2018)	.142	57	.006	.932	57	.003
	During implementation (Jan – Jun 2019)	.258	7	.174	.818	7	.062
	After implementation (Jul 2019 - April 2021)	.218	39	.000	.863	39	.000

a. BirthingCategory_KPI = Vaginal Birth Major Complexities

b. Lilliefors Significance Correction

Table 16: SPSS Output – vaginal birth major complexities: Mann-Whitney U and Wilcoxon W, tests of two independent samples, before vs after implementation of new MOC, length of stay

Ranks[a]

	TimePeriod_Code	N	Mean Rank	Sum of Ranks
Length Of Stay - Days	Before Implementation (Jul16 - Dec 2018)	57	53.98	3077.00

	After implementation (Jul 2019 - April 2021)	39	40.49	1579.00
	Total	96		

a. BirthingCategory_KPI = Vaginal Birth Major Complexities

Before implementation vs after implementation: Test Statistics[a]

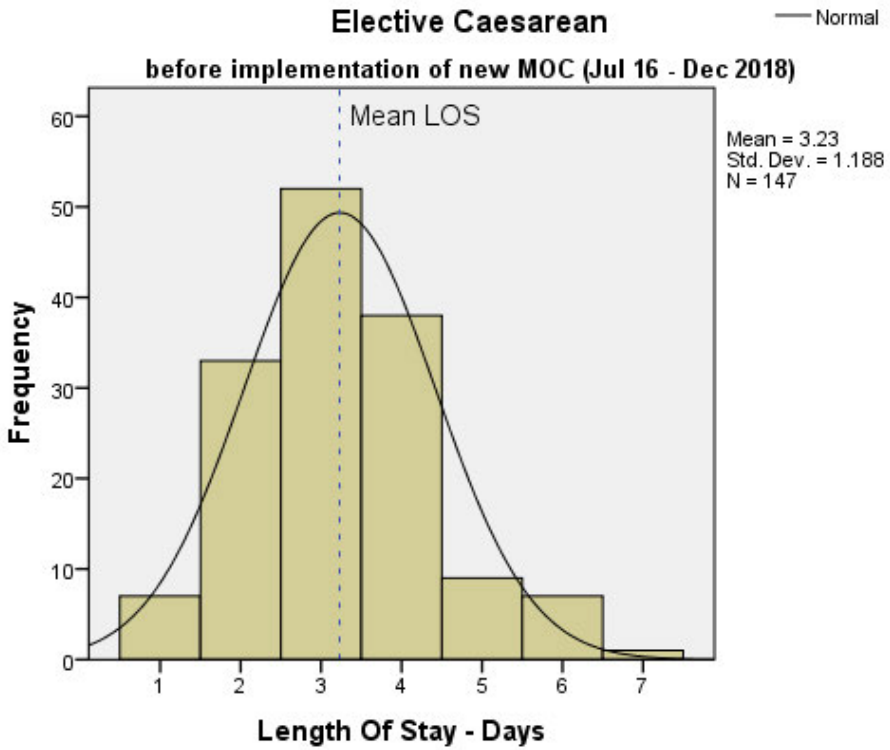
	Length Of Stay - Days
Mann-Whitney U	115049.000
Wilcoxon W	222929.000
Z	-8.758
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: TimePeriod_Code

Elective Caesarean

- LOS not normally distributed – see Figure 11 and Table 17Figure 9 below.
- Mann-Whitney U/Willcoxon W tests that showed that the distributions of LOS before and after the implementation of the new MOC as statically significantly different See Table 18.

Figure 11: Histogram: Length of Stay, elective caesarean, before and after implementation of new MOC



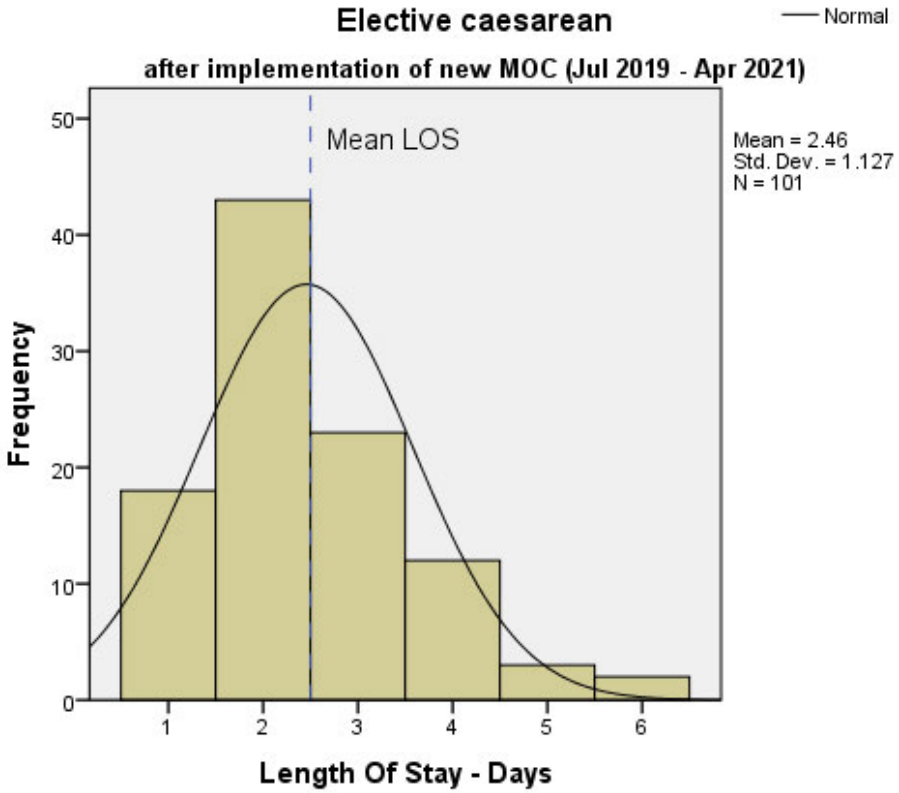


Table 17: SPSS Output: Tests of normality, elective caesarean length of stay

Tests of Normality[a]

	Time Period	Kolmogorov-Smirnov[b]	Shapiro-Wilk

		Statistic	df	Sig.	Statistic	df	Sig.
Length Of Stay - Days	1-Exclud	.229	66	.000	.904	66	.000
	2-Before	.203	147	.000	.918	147	.000
	3-Implem	.230	29	.000	.908	29	.015
	4-After	.261	101	.000	.874	101	.000

a. BirthingCategory_KPI = Elective caesarean

b. Lilliefors Significance Correction

Table 18: SPSS Output: Mann-Whitney U and Wilcoxon W, before vs after implementation of new MOC, length of stay, Elective caesarean

Ranks[a]

	TimePeriod_Code	N	Mean Rank	Sum of Ranks
Length Of Stay - Days	2	147	143.63	21113.00
	4	101	96.66	9763.00
	Total	248		

a. BirthingCategory_KPI = Elective caesarean

Test Statistics[a,b]

	Length Of Stay - Days
Mann-Whitney U	4612.000
Wilcoxon W	9763.000
Z	-5.241
Asymp. Sig. (2-tailed)	.000

a. BirthingCategory KPI = Elective caesarean

b. Grouping Variable: TimePeriod_Code

Emergency Caesarean

- LOS not normally distributed – see Figure 12 and Table 19 below.
- Mann-Whitney U/Willcoxon W tests that showed that the distributions of LOS before and after the implementation of the new MOC as statically significantly different See Table 20.

Figure 12: Histogram: Length of Stay, emergency caesarean, before and after implementation of new MOC

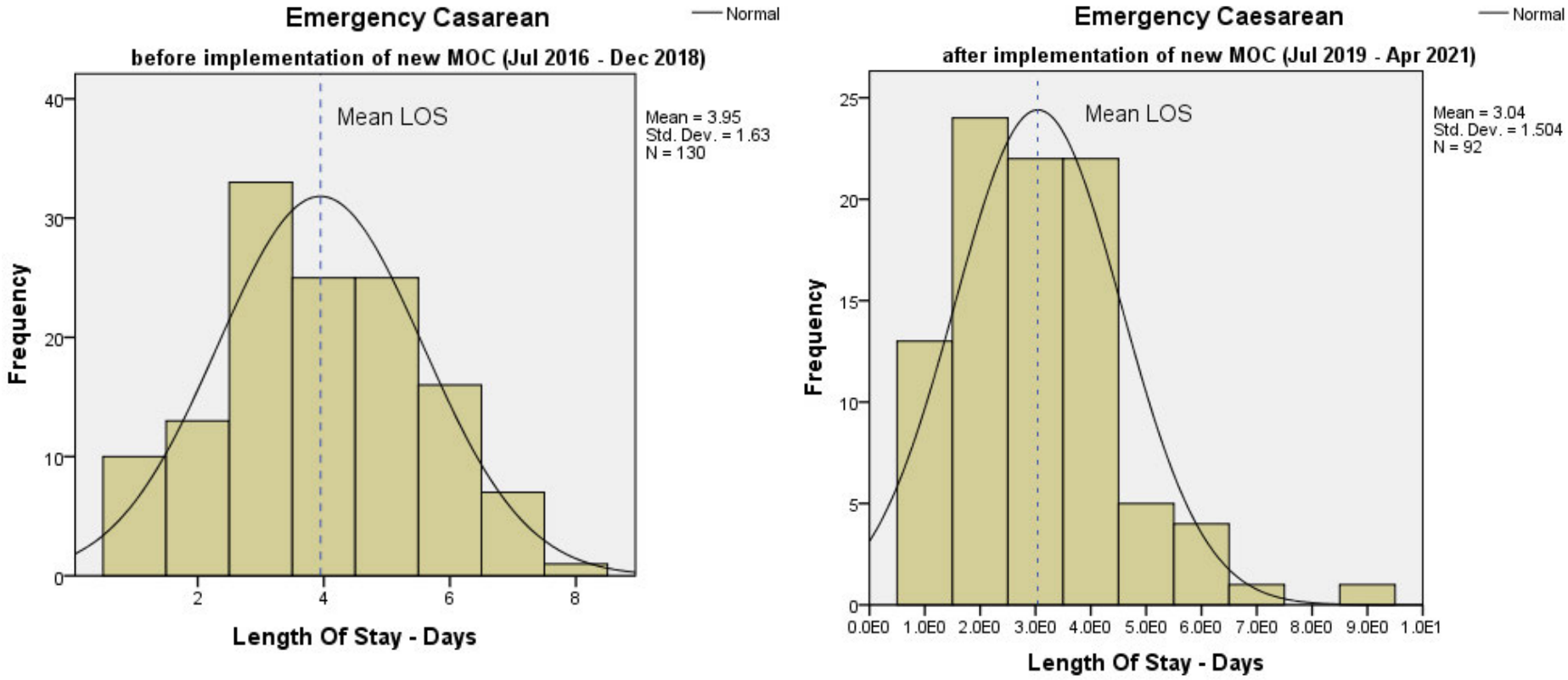


Table 19: SPSS Output: Tests of normality, emergency caesarean length of stay

Tests of Normality[a]

		Kolmogorov-Smirnov[b]			Shapiro-Wilk		
	Time Period	Statistic	df	Sig.	Statistic	df	Sig.
Length Of Stay - Days	1-Exclud	.205	54	.000	.910	54	.001
	2-Before	.150	130	.000	.955	130	.000
	3-Implem	.237	19	.006	.828	19	.003
	4-After	.158	92	.000	.905	92	.000

a. BirthingCategory_KPI = Emergency caesarean

b. Lilliefors Significance Correction

Table 20: SPSS Output: Mann-Whitney U and Wilcoxon W, before vs after implementation of new MOC, length of stay, emergency caesarean

Ranks[a]

	TimePeriod_Code	N	Mean Rank	Sum of Ranks
Length Of Stay - Days	2	130	126.61	16459.00
	4	92	90.15	8294.00
	Total	222		

a. BirthingCategory_KPI = Emergency caesarean

Test Statistics[a,b]

	Length Of Stay - Days

Mann-Whitney U	4016.000
Wilcoxon W	8294.000
Z	-4.238
Asymp. Sig. (2-tailed)	.000

a. BirthingCategory_KPI = Emergency caesarean

b. Grouping Variable: TimePeriod_Code

Appendix B – Justification for CCA over other types of health economics evaluation

The type of economic evaluation will generally depend on the direction and magnitude of the impact of the intervention / program that is being evaluated. For example, for programs / interventions that are expected to result in improved patient outcomes relative to their comparator, a cost-effectiveness analysis that measures the incremental cost per outcome gained will be appropriate. However, if patient outcomes are likely to be the same (or at least non-inferior) for both programs, but there is likely to be a cost-saving, a cost-minimisation or cost analysis may be more appropriate. Prior to the evaluation, we will refer to this as a **'claim'**. That is, what is the expected direct and magnitude of impact of the program / intervention relative to the nominated comparator?

The type of economic evaluation to be conducted depends on the claim associated with the effectiveness of the intervention / program, and the outcome measures that may be reliably collected as part of the evaluation. For example:

- If the intervention is unlikely to impact patient outcomes (or at least patient outcomes are similar or non-inferior), then a cost-analysis or cost-minimisation analysis may be appropriate.
- If the intervention / program is likely to lead to superior patient outcomes:
    - A cost-utility analysis may be conducted if sufficient information is available; or
    - A cost-consequence analysis may be appropriate where there are a number of different outcomes, but they cannot be expressed in a single measure (ie Quality-adjusted life years as is the case for many cost-utility analyses).

More information on the different types of economic evaluations of health care interventions are provided in the table below.

Table 21: Types of economic analysis

Method of analysis	Cost Measurement	Outcome Measurement
Cost-minimisation analysis	$	Equivalence demonstrated or assumed for intervention and comparator
Cost-effectiveness analysis	$	Single 'natural' unit outcome measure
Cost-utility analysis	$	Multiple outcomes, measured in life-years adjusted for quality of life
Cost-consequence analysis	$	Multi-dimensional listing of outcomes.
Cost-benefit analysis	$	$

Cost-utility analysis (CUA) is often considered the best practice, a single summary ratio which provides information the incremental cost per quality-adjusted life-year (QALY) gained of a new intervention (or model of care), compared to current best practice. CUA is often recommended as it facilitates the comparison of results across programs of work. A CUA is not always possible or practical, particularly when information about morbidity – such as quality of life questionnaires like the EuroQoL-5-D, are not available, as is the case with routinely collected patient data. CUA is a type of cost-effectiveness analysis (CEA), where the outputs are expressed as a single summary ratio of the incremental cost per single outcome measure. Neither CUA or CEA were found to be appropriate for this evaluation because:

- There was insufficient information on health outcomes of women and their babies both before or after the implementation of the MCMoC to enable transformation to QALYs to inform a CUA; and
- The MCMoC provides a range of benefits to both mother and baby – as well as broader benefits in terms of workforce sustainability – which cannot be combined into a single metric to enable a CEA.

A literature review revealed a significant list of benefits for the program that demonstrated improved health outcomes for mother and baby and also demonstrated improved workforce sustainability. The suite of benefits of the new MCMoC relative to the PMoC can be contextualised within the Quadruple Aim framework. Quadruple Aim - enhancing patient experience, improving population health, reducing costs, and improving clinician experience – can be viewed as a compass to optimise health system performance(Bodenheimer and Sinsky 2014).

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For more information

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Government of South Australia

SA Health

Building cost effective health system capacity:

Industrialisation of the midwifery caseload model across regional LHNs

August 2022

Government of South Australia
SA Health

This report has been prepared by the Health Economics and Analytics Team (HEAT) of the System Leadership and Design Division, SA Department of Health.

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Executive summary

The Health Economics and Analytics Team (HEAT) was engaged by the Nursing and Midwifery Office (NMO) to provide advice on the likely economic impact of rolling out the midwifery caseload model of care (MCMoC) across all the State's regional local health networks (LHNs), compared to existing models of care. Existing models of care include obstetrician-led, and GP-obstetrician led models of care, with several hospitals already using a mixture of these models and MCMoC.

While the primary emphasis of this analysis is on implementation in regional LHNs, a long-term goal is the implementation of this model in full across all LHNs. The scope of this analysis is to provide information on the likely economic impact of moving towards a regional LHN implementation of the MCMoC for the purposes of commissioning. In this regard the existing models of care are the appropriate comparator for this analysis.

This economic impact assessment draws upon:

- The 2021 economic evaluation undertaken by HEAT of the cost effectiveness of the MCMoC in the YNLHN (Health Economics and Analytics Team, 2021).
- Literature finding that the MCMoC is a cost-effective alternative, providing greater value to mothers, babies, families, and staff compared with traditional models at a similar cost;
- Staffing ratios from YNLHN and adhering to the maximum caseload as deemed appropriate under the Enterprise Bargaining Agreement (EBA), as advised by the NMO. Current midwifery staffing numbers are as provided by the respective LHNs.

We find that industrialising the MCMoC across regional South Australian public birthing hospitals is estimated to:

- Have a net financial cost to SA Health of $1.65m ($466 additional marginal cost per patient). This result is dependent on the program being funded under an Activity Based Funding (ABF) (or shadow ABF) model. Doing so allows reasonable comparison of commissioning costs at nationally determined efficient pricing.
- Free-up the equivalent of 1,890 bed-days, providing a significant benefit in terms of reduced opportunity cost from continuing with medical-led models of maternity care. These bed days would be available for the provision of higher value care to patients.
- Improve workforce stability, recruitment, and retention.

Based on our findings, the industrialisation of the MCMoC across regional SA LHNs, in place of existing models of care, will have a modest financial impact to SA Health and has the potential to result in additional efficiency savings for the health system.

- HEAT recommends that this model be implemented across all regional LHNs on the basis that the weight of this modelling in conjunction with studies previously undertaken for the YNLHN as well as in other Australian jurisdictions strongly point towards the MCMoC being cost-effective.

1. Introduction

The Nursing and Midwifery Office (NMO) engaged HEAT to prepare an economic impact assessment for a State-wide expansion of the Midwifery Caseload Model of Care (MCMoC). At present, this model of care (MoC) has been implemented across birthing hospitals in the York and Northern Local Health Network (YNLHN) as well as select birthing hospitals across a number of other Local Health Networks (LHNs). Several larger hospitals, including all birthing hospitals in metropolitan LHNs, concurrently run a mix of midwifery models (including MCMoC) within individual hospitals.

HEAT has adapted elements of its evaluation methodology of the implementation of the MCMoC model in the YNLHN to estimate the economic impact of deploying the MCMoC across the State's public birthing hospitals. This includes the adoption of a shadow Activity Based Funding (ABF) model.

Where available, unique characteristics of each birthing hospital have been used to calculate the impact of deploying the MCMoC across LHNs. Most LHNs already have individual hospitals where MCMoC models are in the process of being deployed and our assessment has adjusted the estimates accordingly. Where the MCMoC is yet to be deployed, our methodology estimates the impacts of this. As per the original evaluation, we do not address potential inpatient cost differences as there is insufficient data to undertake this appropriately.

As many of the hospitals have not yet transitioned to MCMoC, it will not be possible to compare clinical outcomes on a before and after basis. A very significant body of literature combined with the practical experience of the YNLHN indicates a strong basis for the implementation of the model to maintain clinical outcomes at their current level and suggests overall improved health outcomes for birthing women who are treated under the MCMoC. HEAT assumes, based on established peer review published evidence, that these same clinical outcomes will be achievable across the State.

HEAT notes that the MCMoC does not in any way preclude an ongoing collaborative element with GP/obstetricians where clinically appropriate or where desired by the birthing woman.

Case for Change

The South Australian health care system continues to have capacity challenges. In regard to the provision of maternity services, particularly in birthing hospitals in regional areas, workforce sustainability is a key limiter on continued ability to provide maternity services in those locations. The MCMoC increases reliance on midwives and reduces demands for medical specialists. Increasing the midwifery workforce in regional locations is a more sustainable approach than continuing to rely on a very small number of specialist medical staff. As a collaborative partnership model of care, the MCMoC makes the best use of limited workforce resources to provide a continuous level of high quality care to birthing mothers.

The YNLHN evaluation found that this cost estimate may be conservative as the analysis did not include adjustments for productivity gains relating to:

- potential reduction of interventions during birth/labour
- reduction in the average length of stay (ALOS).

  These have not been included in the analysis as dollar savings, as it was not clear whether these savings would in fact be realised under the new MCMoC; and
- costs incurred to treat poor health outcomes.

This analysis uses the unique characteristics of midwifery and nursing needs and outpatient services to develop individual per birth costs within each hospital across all regional LHNs with birthing activity.

Organisation of this report

This report is organised into chapters. An outline of these are as follows.

The rest of this chapter outlines the brief for this economic impact assessment.

Chapter 2 - provides a background which includes what HEAT has been asked to do and note the benefits that are provided by implementing a MCMoC.

Chapter 3 - methodological approach and data modelling.

Chapter 4 – results (including costs) of proposed model.

Chapter 5 - discussion of results.

Our brief for this analysis

HEAT was engaged by the NMO to undertake an economic impact assessment of implementing a MCMoC across the State's regional LHN birthing hospitals following on from HEAT's earlier evaluation of the introduction of the MCMoC across the YNLHN birthing hospital network. A key focus of the NMO is the development of strategies and enablers that make the provision of midwifery and maternity services sustainable. The MCMoC is one example of innovation which will help achieve this.

The evaluation findings for YNLHN provided the basis for supporting the implementation of this model on a wider basis. Given this, there is interest in understanding the dimensions of introducing this model of care more broadly across regional South Australian public hospitals and understanding the potential economic and financial impacts of doing so.

The purpose of this assessment is therefore to compare the costs and benefits of the MCMoC and non-MCMoC based on the incremental costs and benefits of the MCMoC as implemented in the YNLHN network of birthing hospitals. This work will inform the NMO and potentially the Commissioning Committee of the likely additional funding that would be required to industrialise this model across other regional LHNs.

Scope of the analysis

The review will provide a comparison of the implementation of the MCMoC caseload model across regional LHNs in South Australia as proposed by the NMO with the alternative being the current situation. The current situation involves a number of alternative models of providing maternity services, including medical-led models and team midwifery models.

Each of these other models have differing workforce requirements, clinical outcomes, and economic and financial impacts. This impact assessment adapts previous modelling undertaken by HEAT to provide an estimate of the requirements and outcomes likely to be associated with the industrialisation of that model across all regional LHNs across South Australia. Economic analysis is based on efficient commissioning of services utilising national ABF as a guide to funding of services in all locations. This allows a stable economic comparison to be made.

These issues are understood to already be under consideration by the NMO (Yates, 2022, Nursing and Midwifery Office, 2012). Table 1 below provides a summary of the decision problem:

Table 1: Population, Intervention, Comparator and Outcomes of the economic impact assessment

Component	Description
Population	Women living in regional LHNs in South Australia who require access to antenatal, intrapartum, perinatal and post-natal care (up to six weeks after birth).
Intervention / program	All regional LHN birthing hospitals transition to MCMoC, including those currently running the model for some births. The model provides a consistent (known) midwife to each woman with midwives providing a continuum of care for a woman during her pregnancy and transition to motherhood.
Comparator	Prior to the industrialisation of the MCMoC across the State's regional public hospitals, there are a variety of MoC in place. These include: > MCMoC > Medical led, including GP Obstetrician and Obstetrician led model > Team midwifery models
Outcomes	Outcomes which will be evaluated for change by the MCMoC include: > Health resource utilisation to treat the average patient; and > Financial impact on implementing this model from the perspective of the LHN and at the state-wide level.
Claim	That the MCMoC has a similar cost per patient as the existing model(s) of care with greater sustainability. Clinical outcomes of the MCMoC versus other models of care are expected to be non-inferior to superior, based on a review of the literature, and our findings in YNLHN.
Economic Evaluation Type	Economic impact assessment based on a methodology constructed for estimating the impact of the MCMoC in the YNLHN adapted for South Australia as a whole.
Financial Evaluation	Financial modelling based on a methodology that assumes a shadow ABF model is in place.

Source: HEAT

2. Background

MCMoC

The MCMoC involves midwifery care across the continuum of care, provided by a primary midwife with secondary midwives in support and a strong partnership with the obstetric medical workforce, allied health, community services but especially the woman and her family. This model of care is recognised in the Maternity Care Classification System (MaCCS) as falling within 'midwifery group practise caseload care' and is one of 11 models of maternity care recognised in Australia. It is noted in stating this that:

> The setting of care (hospital, community or home) and structure of the care (for example, when antenatal care starts and when postnatal care finishes) can also vary. Furthermore, models of care are not fixed, with new models being developed and their implementation refined. As such, what constitutes the status quo, or 'standard care' can vary considerably across sites. This makes the applicability of results from clinical trial environments less reliable for local-level decision-makers when exploring whether MGP caseload care will alter health outcomes and costs compared to the care currently delivered within their settings.(Callander et al., 2021)

HEAT recognises that many LHNs currently operate a number of variations of different models of care across their networks due to geographic, staff specific and historical reasons more generally. Based on the information provided, these models currently in place have been grouped as either MCMoC or non-MCMoC according to the main model of maternity care under which a particular hospital has been indicated to function. Non-MCMoC includes a broad spectrum of other models of midwifery care including various forms of medical-led care, team midwifery and shared care.

Within a MCMoC, care is provided in partnership with the midwife, the woman's referring GP, obstetrician, or obstetric GP. While the MCMoC is available to all women, some may choose, or need to birth outside the region due to personal choice or level of acuity required. These women may still access a MCMoC midwife for antenatal and postnatal care. Women who have not accessed antenatal care within their regional LHN and who have birthed at an Adelaide metropolitan hospital may be referred to a midwife in the MCMoC through Country HomeLink (CHL) or transferred back directly to the known midwife in the MoC.

From the LHN's perspective, the midwifery-led model of care is expected to deliver superior clinical outcomes across a wide-range of measures at a similar cost per patient as the existing model(s) of care. A literature review revealed a significant list of benefits for the program that demonstrated improved health outcomes for mother and baby and also demonstrated improved workforce sustainability. The suite of benefits of the new MCMoC relative to non-MCMoC can be contextualised within the Quadruple Aim framework. Quadruple Aim - enhancing patient experience, improving population health, reducing costs, and improving clinician experience – can be viewed as a compass to optimise health system performance (Bodenheimer and Sinsky, 2014).

Implementation of the MCMoC in YNLHN

The YNLHN MCMoC was developed from extensive community stakeholder consultation and engagement. The business case for that MCMoC was approved in January 2018, with the pilot development occurring between April and September 2018. The MCMoC was introduced in phases across the five sites beginning in January 2019 with transition complete across all sites by July 2019. The business case for the MCMoC did not supply cost information, nor information for the previous

non-MCMoC that was in operation at the time. The MCMoC officially commenced on 6th July 2019 and was launch by the SA government Minister for Health and Wellbeing on 24 August 2019.

Benefits of a MCMoC

Midwives have proven effective in addressing medical workforce shortages in regional and rural areas. A key benefit of the MCMoC is its capacity to improve workforce stability, recruitment, and retention. In YNLHN, a number of graduate midwives were recruited into the MCMoC, which was not possible under previous models of care.

Based on information provided to HEAT, the MCMoC in YNLHN:

- was supported by a wide body of research – a systematic review by Sandall et al 2016 indicated most women – outside of those with existing serious pregnancy or health complications – should be offered midwife-led continuity of care;
- consistent with the woman-centred care strategic directions for Australian maternity services published in August 2019 by the (then) Council of Australian Governments (COAG) Health Council;
- supports a total allocated care rate of approximately 426 births per year (based on up to 38 women per year per 1 FTE, 2x FTE assistant Midwifery Unit Managers (MUMs) with capacity for 20 women and 1x FTE MUM) across all five sites in the YNLHN network;
- fitted with the (then) Minister's preference for providing services closer to home where appropriate. This model reduces the flow of maternity related activity to metropolitan hospitals, particularly the WCH;
- delivers superior clinical outcomes but also is a more sustainable MoC given the workforce challenges in many regional areas;
- manages and is inclusive of all pregnant women, of all risk ratings, with high-risk pregnancies having more direct contact with obstetricians and/or GP obstetricians but with the midwife remaining in contact;
- should be cost neutral long-term but initially will cost more due to constraints on shifting (grant) funding across the network to accommodate the new MoC; and
- utilises key indicators intended to measure the outcomes of the project cover maternity indicators and birth outcomes for both mother and child. Key data provided directly from MoC staff in YNLHN as well as comparison reports provided by WCHA.

This analysis applies a similar assumption around staffing and levels of care, based on experience in the YNLHN and within the boundaries defined by enterprise agreements as to maximum caseload and supervisory limits applicable to a given nurse or midwife. It is acknowledged that each regional LHN may have some specific sites that, due to excessive distance from patients or other variations from normal, may require some specific adjustments based on knowledge particular to that LHN.

In the context of the Quadruple Aim framework, the industrialisation of the MCMoC across regional LHNs is therefore expected to achieve positive gains in all four domains:

- Improving population health (reflected in a wide range of typical improvements in a large number of birth related health measures);
- Sustainable cost (understood as increased cost-effectiveness in this example);
- Enhancing the patient experience (providing greater value to mothers, babies, families and staff compared with traditional models); and

Improving provider satisfaction (reflected in easier recruitment and retention of staff and a more sustainable model of care).

3. Methodology

What we did

To the extent possible, this analysis utilised a similar methodology as utilised for the YNLHN specific evaluation completed in August 2021. As this analysis is necessarily different, both in scope and in intent (to cost a model that has yet to be fully deployed, as is the case in other LHNs outside YNLHN), a range of assumptions have been made. The analysis is underpinned by the following key assumptions and their justification in Table 2 below:

Table 2: Key modelling assumptions

Assumption	Justification
Caseload is set at the level outlined in enterprise agreements and utilised in the YNLHN implementation.	Advised by NMO Midwifery Director to maintain this caseload for modelling purposes.
ABF rules for Commonwealth contributions applied to Tier 2 outpatient data items (shadow ABF model).	The clawback of Tier 2 service funding (Commonwealth contribution) through IHPA is not currently consistent across SA public hospitals.
Outpatient visits, ALOS and staff requirements per birth under MCMoC modelled on those in YNLHN.	YNLHN is a fully transitioned MCMoC birthing model and operates in the same industrial and institutional context as other local LHNs.
Cost of outpatient (Tier 2) services for items 40.28, 20.4 and 20.53 determined at national benchmark of NEP.	SA Health outpatient activity linked costing data is of very poor quality and makes individual per hospital/per LHN costs unreliable.
Staff costs based on enterprise agreements in the configuration (step levels) as per YNLHN.	Staff data on the individual step levels within a nursing classification and their distribution within each hospital is not known.
Existing staff numbers (and FTE) inferred where data was missing in that provided by LHNs. LHN-wide averages or similar hospital data were used where possible.	Missing data would preclude modelling from occurring; best estimates were made where staff data was absent to enable completion of modelling.

Source: HEAT

Data sources

This section provides a summary of the data sources used for both the analysis of effectiveness and cost effectiveness. Table 3 below describes the data sources and their application to the analysis.

Table 3: Data sources used and applicability

Data Source	Application to analysis
SA Health 'Health Information Portal' (HIPs)	Activity data to inform MCMoC and non-MCMoC measures of maternity services in each LHN (and cumulatively across South Australia). Outpatient data to be sought directly from data unit.
SA Health Patient Costing	Costing data to provide estimates of costing for identified activities involved in the delivery of the midwifery-led caseload model.
IHPA	To identify relevant notional revenues associated with outpatient clinical activities (Tier 2 national price weights, 2021-22)
YNLHN	The model of MCMoC used as a basis for the evaluation is heavily driven by the experience and known structures and costs noted in the previous YNLHN evaluation.
Nursing and Midwifery Office	Provision of information on staff and models in place across all regional LHNs.
AIHW	National Core Maternity Indicators (and other relevant measures) which can provide comparisons and context.

Source: HEAT

Comparator models of maternity care

Table 4 below identifies the maternity model categories in active use in South Australia, the share of those models (not births) across the State and provides a short description of each. HEAT relied on descriptive information provided by each LHN via the NMO to identify which models were in use across hospitals and LHNs. These were then grouped under either the midwifery group practice caseload care category (referred to here as MCMoC) where appropriate or categorised as non-MCMoC covering the remaining major models of maternity care.

Table 4: Comparator models of maternity care (South Australia, 2021)

Major model category	Proportion of models of care (%)	Summary Description
Midwifery group practice caseload care	20.8	Antenatal, intrapartum and postnatal care is provided within a publicly-funded caseload model by a known primary midwife with secondary backup midwives providing cover and assistance, in collaboration with doctors in the event of identified risk factors. Antenatal care and postnatal care are usually provided in the hospital, community or home with intrapartum care in a hospital, birth centre or home. By definition, this category provides continuity of carer for the whole of duration of the maternity period.
Public hospital maternity care	31.3	Antenatal care is provided in hospital outpatient clinics (either onsite or outreach) by midwives and/or doctors and may include specific clinics. Care could also be provided by a multidisciplinary team. Intrapartum and postnatal care is provided in hospital by the midwives and in collaboration with doctors as required. Postnatal care may continue in the home or community by hospital midwives
Shared care	16.7	Antenatal care is provided by a community maternity service provider (doctor and/or midwife) in collaboration with the hospital medical and/or midwifery staff under an established agreement and can occur both in the community and in hospital outpatient clinics. This would usually include an agreed schedule of antenatal care between the two providers. Intrapartum and early postnatal care usually takes place in the hospital, by hospital midwives and doctors, often in conjunction with the community doctor or midwife (particularly in rural settings).
Private obstetrician (specialist) care	12.5	Antenatal care is provided by a private specialist obstetrician. Intrapartum care is provided in either a private or public hospital by the private specialist obstetrician in collaboration with hospital midwives. Postnatal care is usually provided in the hospital by the private specialist obstetrician and hospital midwives and care by midwives may continue in the home, hotel, or hostel.
Public hospital high risk maternity care	6.3	Antenatal care is provided to women with medical high risk/complex pregnancies by public hospital maternity care providers (specialist obstetricians and/or maternal-fetal medicine subspecialists in collaboration with midwives). Intrapartum and postnatal care is provided by hospital doctors and midwives.
General Practitioner	8.3	Antenatal care is provided by a GP obstetrician. Intrapartum care is provided in either a private or public hospital by the GP obstetrician in collaboration with

obstetrician care		the hospital midwives. Postnatal care is usually provided in the hospital by the GP obstetrician and hospital midwives.
Combined care	2.1	Antenatal care is provided by a private maternity service provider (doctor and/or midwife) in the community. Intrapartum and early postnatal care is provided in a public hospital, by hospital midwives and doctors. Postnatal care may continue in the home or community by hospital midwives.
Team midwifery care	2.1	Antenatal, intrapartum and postnatal care is provided by a small team of rostered midwives (no more than eight) in collaboration with doctors in the event of identified risk factors. Intrapartum care is usually provided in the hospital or birth centre. Postnatal care may continue in the home or community by the team midwives. By definition, no continuity of carer during any period exists within this category.

Source: AIHW – MoC NBPDS (2021), AIHW Major Model Category information sheet. This data refers to number of active models in place across SA. Actual births under the MCMoC provided by information provided by LHNs through the NMO (see Table 5 below).

Bookings for births and associated births by regional LHN

There are a number of births which are booked at a regional LHN and which are transferred (for a time) to metropolitan hospitals. The MCMoC in these situations can ensure a smooth transition of care to metropolitan hospitals and support the return home and any necessary follow up care. Data on these bookings is dependent on each site as it is not always recorded whether a patient intended to give birth in a particular hospital.

HEAT understands that midwifery resources in MCMoC are allocated based on these bookings. Based on the information supplied by regional LHNs for hospitals where a MCMoC are already in place, a broadly similar ratio of bookings to births can be observed across all of them (typically around 5 bookings per 4 actual births[1]). By using the implicit ratio of bookings to births in the YNLHN as the exemplar of a fully implemented MCMoC model, the modelled resources required per birth therefore can be scaled to represent the resources required per booking.

As insufficient information is available to model a potential reduction in the transfers of regionally booked births under the full MCMoC, the modelling assumes the current proportions of booked to actual births in regional LHNs remains constant with the introduction of the MCMoC.

[1] Based on internal data provided to HEAT from regional LHNs via the NMO.

Current distribution of births by midwifery model

Table 5 below shows the breakdown of current midwifery MoC in place across regional South Australian public hospitals that provide maternity services grouped by broad type of model category as described in information provided by LHNs. In 2020-21, approximately 24% of births in South Australian regional public hospitals occurred under a MCMoC with 76% occurring under a non-MCMoC – including various forms of medical-led model, shared care and team midwifery.

Table 5: Births by current MoC (South Australian public hospitals, 2020-21)

LHN	MCMoC		Non-MCMoC		Total births
	No. births	% of LHN births	No. births	% of LHN births	
BHFLHN	95	7.5%	1,171	92.5%	1,266
EFNLHN	28	9.1%	281	90.9%	309
FUNLHN	162	38.8%	255	61.2%	417
LCLHN	0	0.0%	649	100.0%	649
RMCLHN	147*	30.0%	343	70.0%	490
YNLHN	401	99.8%	1	0.2%	402
Overall	**833**	**23.6**	**2,700**	**76.4**	**3,533**

Source: Data provided via LHNs through NMO; Broad groupings by HEAT. Some missing values augmented by HIPs extracts. *trial ending October 2022.

Staff impacts

The modelling undertaken for this economic impact assessment provides for a number of staff covering a fixed number of cases per FTE of midwives, along with the assistant midwifery unit manager (A/MUM) (allocated 20 cases) and the midwifery unit manager (MUM) (allocated 10 cases). For the purposes of this modelling and given the initial focus on introducing the model in regional LHNs, the assumption was made to limit this supervisory capacity to two units of six midwives per NUM. We note however those supervisory ratios vary where MCMoC have already been introduced within regional LHNs and that in practice these change over time.

This calculation is subject to a number of conditions, including that FTE data provided to HEAT may refer to some nurses/midwives who provide other services within their FTE that are not exclusive to maternity services.

Table 6 below compares the total FTE calculated to be presently utilised to provide maternity services across regional LHNs and the future FTE required under a complete transition to MCMoC. Overall, despite the MCMoC typically being more intensive with regard to demand for nursing staff, there are some regional LHNs where a reduction in staff is calculated. As noted previously, this economic impact assessment allows only for the efficient implementation of the model which assumes particular caseload capacities for a given configuration of staff. Any introduction of MCMoC will require a detailed re-examination of FTEs devoted to maternity services across each of the LHNs to clarify the current resourcing.

Table 6: Impact on maternity nursing and midwife staffing (FTE)

LHN	Current	Future	No. FTE	% change
BHFLHN	33.8	44.7	10.9	32.3%
EFNLHN	18.4	10.9	-7.5	-40.7%*
FUNLHN	10.0	14.7	4.8	47.9%
LCLHN	20.4	22.9	2.5	12.4%
RMCLHN	21.6	17.3	-4.3	-20.0%
YNLHN	15.8	14.2	-1.6	-10.2%
Overall	**120.0**	**124.7**	**4.7**	**4.0%**

Source: Data provided via LHNs through NMO, HEAT adjustments and modelling.

*: Some LHNs provided headcounts without FTE for certain hospitals or omitted data for non-MCMoC births. In these cases, we have assumed the average FTE:HC ratio based on their other hospitals within network or, where absent, the broader system average.

ALOS impacts including bed day savings

A reduction in the ALOS will reduce the average cost per patient and may offset some of the costs associated with the new MoC. Reductions in average length of stay (ALOS) are a noticeable characteristic in studies of MCMoC (Sandall et al., 2016). For the modelling here, the indicative reduction in ALOS observed in YNLHN (0.7 days per birth) has been applied across the system. While there is a potential financial saving associated with this reduction in ALOS, it is not modelled here. Costing data in the context of an individual hospital bed is difficult to estimate with present data quality and it is unclear whether this saving might be realised in a practical sense, given the nature of the true fixed and variable costs within each of the hospital. Regardless, the bed days freed up remain a tangible benefit that would reduce the opportunity cost of using other midwifery models and provide resources for other health services to be provided.

Table 7 below reflects the bed day impact of transitioning to a MCMoC in all birthing hospitals across regional LHNs where it is not presently in place. Reductions in ALOS are assumed to have already occurred for births currently under an MCMoC. As all birthing hospitals in YNLHN have effectively already transitioned to a MCMoC, there is no change in estimated bed day requirements. The net impact is to free up 1,890 bed days across all regional LHNs and an effective reduction in ALOS per birth of around 28%.

Table 7: Projected bed-day requirements for births per annum

LHN	Current ALOS (days)	Future ALOS (days)	% Reduction in ALOS per birth	Bed days made available
BHFLHN	1.7	1.1	-37%	819
EFNLHN	1.6	1.0	-39%	197
FUNLHN	2.5	2.1	-17%	179
LCLHN	2.0	1.3	-34%	454
RMCLHN	2.4	1.9	-20%	240
YNLHN	1.5	1.5	0%	1
Overall	**1.9**	**1.4**	**-28%**	**1,890**

Source: Data provided via LHNs through NMO, Health Information Portal, HEAT modelling.

Outpatient services

A key characteristic of the MCMoC is that it typically involves a higher number of midwifery outpatient services (Tier 2 category 40.28 – midwifery) than a non-MCMoC approach. With each LHN currently having a different mix of models, sometimes within a hospital, it is difficult to individually differentiate on the available data which outpatient services are tied to patients under one MoC versus another MoC. In order to estimate the change in midwifery outpatient services, the average number of services observed in the YNLHN – where clinical outcomes are known and all birthing hospitals have transitioned to the MCMoC – were utilised. The increase observed in Tier 2 category 40.28 services was found to be statistically significant. All births across each hospital were then allocated this quota of services and the resulting total was used to adjust upward or downward the number of services which would likely apply in a LHN when all births occur under a MCMoC.

Table 8 below shows the current average outpatient services per birth, across all three outpatient categories relevant to birth:

- 40.28 – Midwifery and maternity;
- 20.4 – Obstetrics – management of pregnancy without complications; and
- 20.53 – Obstetrics – management of complex pregnancy

The data indicates that, with the exception of BHFLHN, all regional LHNs (which also have either a mixed or non-MCMoC approach) have fewer average item 40.28 services per birth than YNLHN (13.7 services per patient) where MCMoC is fully in place. This is to be expected given that in a non-MCMoC approach antenatal care would often be provided by private GPs and/or obstetricians offsite and therefore is not contained in SA Health data. We do not estimate differences in Medicare Benefits Schedule (MBS) items as these are out of scope from the SA Health perspective in terms of funding. As noted in the discussion contained in Chapter 5, modelling the potential for bringing some of these 'in house' requires access to MBS data which may not be available at the granularity required.

Table 8: Average outpatient services per birth under current MoC configuration per annum

LHN	Average 40.28 services per birth	Average 20.4 services per birth	Average 20.53 services per birth	Current MoC
BHFLHN	14.7	1.6	0.2	Mixed
EFNLHN	7.5	0.1	0.0	Mixed
FUNLHN	11.1	3.4	2.3	Mixed
LCLHN	6.8	0.4	1.7	Non-MCMoC
RMCLHN	6.1	0.0	0.0	Mixed
YNLHN	13.7	3.2	0.5	MCMoC
Overall	**10.9**	**1.4**	**0.7**	**Mixed**

Source: SA Health outpatient data, HEAT modelling.

Table 9 below shows the estimated change in Tier 2 outpatient midwifery services (item 40.28) from transitioning all regional births to the MCMoC. On this basis, the number of outpatient midwifery services is expected to increase by almost 30% from current. There is significant variation across LHNs based on their present activity levels and the types of maternity model currently in place. The small increase projected for YNLHN is a result of rounding of average services across multiple hospitals in that network and otherwise reflects business-as-usual given the transition to MCMoC across their birthing hospital network is complete.

Table 9: Projected midwifery (40.28) outpatient services before and after MCMoC transition per annum

LHN	Current	Future (14 visits per birth)	Net outpatient services (Tier 2 40.28)	% change
BHFLHN	18,631	17,710	-921	-4.9%
EFNLHN	2,309	4,312	2,003	86.7%
FUNLHN	4,620	5,881	1,261	27.3%
LCLHN	4,383	9,488	5,105	116.5%
RMCLHN	2,990	6,861	3,871	129.5%
YNLHN	5,494	5,628	134	2.4%
Overall	**38,427**	**49,880**	**11,453**	**29.8%**

Source: SA Health outpatient data, HEAT modelling.

Part of the modelling, as per experience in YNLHN, was a small reduction in the average use of obstetric outpatient services – item numbers 20.4 and 20.53. That reduction has been modelled to reflect the expectation (based on literature and experience in YNLHN) that a MCMoC approach will have a downward impact on the frequency of use of obstetric outpatient services. This reduction (14% in the example of YNLHN) is not guaranteed but reflects is a real-world South Australian example of the impact of introducing the MCMoC approach across a LHN and as such is within the realms of normal expectation that similar reductions might be expected across the network.

Table 10 below presents the anticipated impact of this on Tier 2 obstetric outpatient services across each LHN with the full transition to a MCMoC. As the YNLHN has already fully transitioned to MCMoC across all its birthing hospitals, there is no anticipated change in activity for obstetric outpatient services. The net change in obstetric outpatient services is explained by the varying proportions of births within each LHN that have already been transitioned to a MCMoC approach (where it is therefore assumed any benefit is already present in existing data). On a state-wide basis, the full transition to a MCMoC model is anticipated to reduce obstetric outpatient activity in Tier 2 items 20.4 and 20.53 by approximately 11% from the current level.

Table 10: Projected obstetric (20.4, 20.53) outpatient services before and after MCMoC transition per annum

LHN	Current	Future	Net outpatient services (Tier 2 20.4, 20.53)	% change
BHFLHN	2,215	1,949	-266	-12.0%
EFNLHN	48	43	-5	-10.5%
FUNLHN	2,356	2,120	-236	-10.0%
LCLHN	1,406	1,209	-197	-14.0%
RMCLHN	2	2	0	-14.0%
YNLHN	1,476	1,476	0	0.0%
Overall	**7,503**	**6,799**	**-705**	**-9.4%**

Source: SA Health outpatient data, HEAT modelling.

Transfers from regional hospitals to metropolitan hospitals

There is significant interest in the potential for the introduction of MCMoC across the state to have an impact on the level of transfers from regional to metropolitan hospitals. While data is available to indicate whether a particular birth involved a transfer to another (typically metropolitan) hospital, the ability to quantify the impact of the MCMoC in this regard remains constrained. In undertaking the evaluation of the YNLHN implementation of the MCMoC, the difficulty in quantifying this impact was driven by an awareness that changes in this transfer rate could be influenced by:

- the selection of cases (including whether transfers occurred due to patient preference)
- changes in the nature of cases seen (for example, differences in the risk levels of patients being retained under the new MoC); and
- timeframes selected for comparison.

Table 11 below presents a summary of the data that is available on the levels of transfer currently noted in births across each regional LHN. The data indicates that in 2020-21, approximately 4.0% of all regional births involved a transfer to another hospital.

Table 11: Transfers of births from initial hospital 2020-21

LHN	Transfers	Births	% of total births transferred
BHFLHN	53	1,266	4.2%
EFNLHN	17	309	5.5%
FUNLHN	14	418	3.3%
LCLHN	13	651	2.0%
RMCLHN	29	489	5.9%
YNLHN	14	402	3.5%
Overall	**140**	**3,535**	**4.0%**

Source: SA Health Health Information Portal (HIP)

Cost comparisons of MCMoC with non-MCMoC

HEAT endeavoured to include as much detail and granularity as possible in the financial analysis. However, we were constrained by a lack of available data. This is particularly the case with inpatient costs. Given the paucity of data available to HEAT, we have presented the financial impact of MCMoC vs non-MCMoC under a shadow ABF model. This simplified approach involved analysis of activities for which robust data could be obtained, or reasonable assumptions made.

A key purpose of this analysis was to show the required additional funding – if any - would be required to support the transition to MCMoC within the LHN where it is not already in place. We sought to provide analysis through 'shadowing ABF' – by assessing whether any additional funding would be required to sustain the incremental differences in MCMoC vs Non-MCMoC under an ABF System from the perspective of SA Health. This included an analysis of any additional cost to SA Health due to inceased FTE and changes in funded activities. We note that we have only allowed for efficient costs, which in this context relates to IHPA's NEP for outpatient services and in the context of staff, the FTEs required under the established caseload limits as per enterprise agreements.

The financial analysis captures:

- Increased expenditure on midwives across the regional LHN; and
- An offset relating to increased Tier 2 ABF revenue due to increased maternity and midwifery outpatient services from Commonwealth contributions.

Our analysis does not capture potential efficiency savings or increased capacity. In particular:

- We have assumed no cost-offset for dual-qualification midwives at these hospitals as HEAT understands that these midwives are typically still employed also for general nursing duties in rural, remote and regional hospitals, which will not result in a cost-saving from the perspective of the LHN (and by extension, the South Australian Heath budget).

Table 12 below presents the key current costs (where identifiable) relevant to maternity staff services and the estimated future costs of transitioning all regional births to a MCMoC. Additional clarification may be required from the LHNs to ascertain more precise estimates. Net additional staffing costs across regional areas is estimated at $0.6m in total. This estimate reflects information provided by LHNs which was incomplete in some instances and required the application of assumptions.

Table 12: Current and future estimated staff costs of transitioning to a MCMoC ($m) per annum

LHN	Current	Future	Net cost
BHFLHN	$4.1	$5.5	$1.4
EFNLHN	$2.2	$1.3	-$0.9
FUNLHN	$1.2	$1.8	$0.6
LCLHN	$2.5	$2.8	$0.3
RMCLHN	$2.7	$2.1	-$0.6
YNLHN	$1.9	$1.7	-$0.2*
Overall	**$14.6**	**$15.2**	**$0.6**

Source: Data provided via LHNs through NMO, HEAT modelling. *: decline in YNLHN relates to differences in data collection dates. 2020-21 dollars.

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Table 13 below presents the key current costs (where identifiable) relevant to maternity outpatient services and the estimated future costs of transitioning all regional births to a MCMoC. Net additional outpatient costs across regional areas is estimated at $1.1m in total.

Table 13: Current and future estimated outpatient net costs of transitioning to a MCMoC ($m) per annum

LHN	Current	Future	Net cost
BHFLHN	$2.2	$2.1	-$0.1
EFNLHN	$0.2	$0.4	$0.2
FUNLHN	$0.8	$0.9	$0.1
LCLHN	$0.6	$1.1	$0.5
RMCLHN	$0.3	$0.7	$0.4
YNLHN	$0.8	$0.8	$0.0
Overall	**$4.9**	**$6.0**	**$1.1**

Source: Data provided via LHNs through NMO, IHPA Tier 2 price weights, HEAT modelling. Costs refer to net costs to SA Health assuming an ABF shadow mechanism is in place to recover Commonwealth funding towards the efficient price of providing outpatient services. 2020-21 dollars.

Table 14 shows the combined impact of the change in both staffing and outpatient costs in a transition to a MCMoC model on a regional LHN basis. The net cost to SA Health under a shadow ABF model is approximately $1.6m. This is consistent with findings in literature that a MCMoC is typically possible within existing funding envelopes.

Table 14: Current and future estimated combined costs of transitioning to a MCMoC ($m) per annum

LHN	Current	Future	Net cost
BHFLHN	$6.4	$7.6	$1.2
EFNLHN	$2.4	$1.8	-$0.7
FUNLHN	$2.0	$2.7	$0.7
LCLHN	$3.2	$3.9	$0.8
RMCLHN	$3.0	$2.8	-$0.2
YNLHN	$2.7	$2.5	-$0.2
Overall	**$19.7**	**$21.3**	**$1.6**

Source: Data provided via LHNs through NMO, IHPA Tier 2 price weights, HEAT modelling. Costs refer to net costs to SA Health assuming an ABF shadow mechanism is in place to recover Commonwealth funding towards the efficient price of providing outpatient services. 2020-21 dollars.

Table 15 below breaks these staffing and outpatient costs into costs per birth by each regional LHN to indicate the change estimated in net cost per birth. On an all regional LHN basis, the net cost per birth increases by $466. There is significant variability across regional LHNs, with the net cost per birth ranging from an additional $1,622 through to a net saving per birth of $2,135. This reflects factors including the current mix of models used to deliver birthing services in an LHN.

Table 15: Current and future estimated average costs per birth of transitioning to MCMoC ($) per annum

LHN	Current	Future	Net cost per birth
BHFLHN	$5,023	$5,994	$970
EFNLHN	$7,918	$5,782	-$2,135
FUNLHN	$4,815	$6,437	$1,622
LCLHN	$4,869	$6,071	$1,202
RMCLHN	$6,140	$5,763	-$377
YNLHN	$6,727	$6,247	-$479
Overall	**$5,572**	**$6,039**	**$466**

Source: Data provided via LHNs through NMO, IHPA Tier 2 price weights, HEAT modelling. Costs refer to net costs to SA Health assuming an ABF shadow mechanism is in place to recover Commonwealth funding towards the efficient price of providing outpatient services. 2020-21 dollars.

4. Results

Cost and value

Industrialising the MCMoC across regional South Australian public birthing hospitals is estimated to have a net financial cost to SA Health of $1.6m per year (a net $466 additional marginal cost per birth). This result is dependent on the program being funded under an ABF (or shadow ABF) model. Table 16 below presents these estimated net cost changes by LHN.

Table 16: Estimated net cost changes by LHN per annum

LHN	Net cost per birth ($)	Net cost change ($m)
BHFLHN	$970	$1.2
EFNLHN	-$2,135	-$0.7
FUNLHN	$1,622	$0.7
LCLHN	$1,202	$0.8
RMCLHN	-$377	-$0.2
YNLHN	-$479	-$0.2
Overall	**$466**	**$1.6**

Source: HEAT modelling (2020-21 dollars).

System benefit

A key benefit of the MCMoC is its capacity to improve workforce stability, recruitment and retention. In implementing a MCMoC, YNLHN was able to recruit a number of graduate midwives into the MoC, which was not possible under the previous models of care. This capability would be of significant benefit to a number of regional LHNs in particular. Moreover, the MCMoC also reflects the manner in which midwives are currently trained in continuity-of-care which is likely to assist in both recruitment and retention efforts of the midwifery workforce.

It is estimated that state-wide industrialisation of the MCMoC would also free-up the equivalent of 1,890 bed-days across the State's regional birthing hospitals, providing a significant benefit in terms of reduced opportunity cost from continuing with medical-led models of maternity care. These bed days would be available for the provision of higher value care to patients.

Patient benefit

Systematic reviews have shown that midwifery-led care and obstetric-led care are equally safe and effective, and a trend towards decreased interventions in midwifery-led models of care.

Summary

Based on our findings, the industrialisation of the MCMoC model across all SA LHNs will have a modest financial impact to SA health and has the potential to result in additional efficiency savings for the health system. This analysis does not comment on the appropriateness of these models of care, nor any modifications that might be deemed appropriate within individual LHNs. It is intended only to provide information on the likely impact of moving towards a state-wide implementation of the MCMoC for the purposes of commissioning.

5. Discussion

Financial impact

HEAT concurs with the view that consideration must be given to ensure that the perceived cost should not constrain ongoing effective, acceptable care (Adelson P et al., 2021, Tran et al., 2017).

The results of our analysis show that additional funding required to support the MCMoC within the LHNs would be minimal under an ABF – with much of the financial impact of the increased FTE likely to be offset by ABF-funding due to increased Tier 2 occasions of service. From the perspective of SA Health, this would result in a slight additional cost due to SA Health's share of ABF (55% NEP).

It is possible that some of this increased cost to SA Health may be offset when incorporating:

- any productivity gains associated with dual-qualification midwives time (where they have been working in other capacities at a site);
- the reduction in costs associated with the reduced use of some interventions; and
- costs of treating adverse events or sequale associated with the treatment of poor maternal health outcomes over the life of the infant.

This analysis appeared broadly consistent with the Qld experience (Nursing and Midwifery Office, 2012) whereby revenue associated with the MCMoC is sustainable within the state's casemix funding model. Where inpatient costs have been able to be considered, studies have indicated that the MCMoC can deliver significant overall reductions in cost (Callander et al., 2021). Again, robust patient costing for all LHN hospitals would be required to conclusively establish this.

Block and activity-based funding of hospitals

The incremental financial impact to SA Health budgets is larger when considering that 7 of 20 birthing hospitals included in the analysis are block funded. The net financial impact to SA Health and regional LHN budgets is greater as offsets due to increases in ABF-funded activity do not necessarily apply where the hospital is currently block funded.

To avoid potential higher costs taking the model to full scale should include consideration of:

- moving away from block funding this activity, and seeking Commonwealth reimbursement for Tier 2 outpatient services
- adhering to a staffing model that is appropriate under the EBA for expected patient demand.

Clinical effectiveness

MCMoC have been shown to be as equally safe and effective as medical-led maternity care (Sandall et al., 2016). This finding is consistent with outcomes observed in the YNLHN MCMoC Pilot that showed similar patient outcomes, although there was a trend toward improvement in a number of important patient outcomes. Although, given the small number of events and the smaller sample size, we could not rule out that any differences were due to chance alone.

Our findings in the earlier YNLHN evaluation were also consistent with Callander et al 2021 that found that, although not statistically significant, there was a trend towards improvement in some outcomes in the MCMoC compared to other models of care offered at a large tertiary hospital in Australia. The study also found that there were no significant differences in Quality-Adjusted Life Years (QALYs) between the MoCs (Callander et al., 2021).

Our earlier findings also mirrored those reported in the 2016 Cochrane Systematic Review that showed that there were consistently less use of some interventions for women who were randomised to receive midwifery-led continuity of care compared to women randomised to receive other models of care without detriment to outcomes (Sandall et al., 2016). These included reduced use of regional analgesia, episiotomy and instrumental birth. Women were, on average, more likely to experience spontaneous vaginal birth, a longer mean length of labour, and to be attended at birth by a known midwife, although there were no differences in caesarean birth rates.

The results of the YNLHN evaluation were also congruent with the UniSA Pilot Evaluation (Adelson P et al., 2021) that also outlined a number of key benefits associated with the MCMoC as implemented in the YNLHN.

The results of our analysis for YNLHN were therefore consistent with previous published evaluations both internationally and within Australia. We have no reason to believe this would be different for other LHNs as they implement the same MCMoC, particularly given the very strong support for the literature of this model providing appropriate outcomes across a wide range of countries and hospital types.

Medical staff impacts and requirements

An additional potential avenue for the implementation of MCMoC on a state-wide basis to benefit sustainability of the system relates to the demands on medical staff, particularly in regional LHNs. HEAT understands from consultations with LHNs that GP obstetrics primarily occurs on a fee for service (FFS) basis by visiting medical officers (VMOs) within regional LHNs. There are variations on this in particular locations where, typically, local staff arrangements can be made or salaried obstetricians can be rotated in.

Continuity of care would likely be enhanced for patients who have access to a regular GP obstetrician who are familiar with the MCMoC. However, from the perspective of SA Health, funding of salaried models are more expensive than the FFS approach which currently exists in most regional LHNs. In particular, FFS antenatal visits in the clinic are billed to the MBS. In addition to this, there are numerous issues to do with costs specific to VMOs that would require detailed analysis for incorporation into a salaried GP Obstetrician model.

A separate analysis would be required to fully model potential implications of introducing a salaried GP Obstetrician model in lieu of FFS, given detailed information is required not only of each LHN's staffing arrangements in regard to medical staff but also substituting and costing FFS activity (where this is possible). Advice provided to HEAT suggests this would only be possible for regional LHNs given the multiple sources of clinical care that also contribute to birthing mothers in metropolitan areas. This approach will require investigation with the Commonwealth to obtain detailed MBS data at a level sufficient level to properly identify which LHN the births are attributable to.

Sustainability

At current activity and staffing levels, the MCMoC deployed across regional LHNs is unlikely to result in substantial additional costs to SA Health Budgets. The majority of the financial impact on regional LHN budgets is due to the number of block-funded hospitals and their inability to capture offset of increase costs with ABF-revenue.

The UniSA Pilot Evaluation of the YNLHN implementation (which is the model evaluated here for all LHNs) (Adelson P et al., 2021) noted that one aspect that was evident through the evaluation was that the current caseload of 38 women was considered challenging by some midwives. Similar themes were reported in a study that explored midwives experience in working in a caseload model in rural Victoria (Hildingsson et al., 2021). In the context other rural and remote LHNs, this caseload may be problematic where the geographical region covered by the midwives teams is large, which may reduce the applicability of these results to other LHNs.

Consultation with YNLHN revealed that a key benefit of the MCMoC was its capacity to improve workforce stability, recruitment and retention. YNLHN had managed to recruit a number of direct entry midwives as well as a larger cohort of graduate midwives into the MoC, which was not possible under the previous models of care. This will be of benefit to a number of other regional LHNs in providing maternity services to birthing mothers on a sustainable basis. In the context of regional LHNs, travel requirements in rural/regional locations must be accounted for in determining calculations around direct hours of care per FTE. If the caseload for rural and remote LHNs is reduced to support time management and management of fatigue, it is possible that there may be an increased cost per patient in the MCMoC. Whether or not this might be offset by reduced interventions and ALOS for delivery are unclear, although overall costs of the MCMoC would be expected to be minimal.

We assume therefore that these benefits apply to the implementation of the MCMoC in other regional LHNs. With ongoing staff and budget pressures, the value of the MCMoC in producing a more sustainable and viable model of quality care for birthing mothers underscores the benefits already covered in both this modelling and a number of studies of the MCMoC previously undertaken.

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SA Health

Women and Birth xxx (xxxx) xxx

Contents lists available at ScienceDirect

Women and Birth

journal homepage: www.sciencedirect.com/journal/women and birth

Original research

Midwifery group practice workforce in Australia: A cross-sectional survey of midwives and managers

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ARTICLE INFO

Keywords:
Continuity of carer models
Midwifery-led continuity of care
Management
Midwifery group practice

ABSTRACT

Background: Despite robust evidence on the benefits of midwifery group practice (MGP), there remains difficulties with implementing and sustaining the model. However, contemporary data on the MGP workforce and how each model has been operationalised are limited. This constrains an understanding of the factors that help or hinder implementation and sustainability of MGP.

Aim: To describe the characteristics of Australian MGPs and the factors that help or hinder sustainability.

Methods: A national cross-sectional survey was undertaken in Australia between March 2021 and July 2022, inclusive. Quantitative data were analysed using descriptive analysis while qualitative data were analysed using content analysis.

Findings: Of 669 survey responses, 579 were midwives and 90 were managers. The mean years of experience for clinical midwives was eight years, and 47.8% (almost twice the national average) completed a Bachelor of Midwifery (BMid). Half (50.2%) the models provided care for women of all risk. Midwives resigned from MGP because of the MGP work conditions (30%) and how the service was managed or supported (12.7%). Managers resigned from MGP because of role changes, conflict with their manager, and limited support. Almost half (42.6%) of MGP managers also managed other areas, leading to heavy workloads, competing demands, and burnout.

Conclusion: The BMid appears to be a common educational pathway for MGP midwives, and many MGP services are providing care to women with complexities. Flexible practice agreements, organisational support and appropriate workloads are vital for recruitment, retention, and sustainability of MGP.

Statement of significance

Problem or issue

There is limited contemporary data on MGP workforce and the many ways MGPs have been operationalised throughout Australia might clarify what is required to promote staff retention and model sustainability.

What is already known

Difficulties in implementing and sustaining MGP services are multifactorial and include stakeholder understanding and commitment to the model, staff recruitment, and retention.

What this paper adds

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https://doi.org/10.1016/j.wombi.2023.09.002
Received 5 July 2023; Received in revised form 25 August 2023; Accepted 12 September 2023

We provide contemporary data regarding the MGP workforce and problems identified. The BMid appears to be the most common educational pathway for midwives working in MGP.

Introduction

Background

Midwifery group practice (MGP) caseload care is a publicly funded model where childbearing women have a known midwife who provides continuity of carer, throughout their pregnancy, birth, and postpartum period. Midwives work in a group to cover for time off and backup, and collaborate with doctors as required [1]. Continuity of midwifery-led care has robust evidence showing improved outcomes for both mothers and babies when compared with other models of care [2]. Some of the first Australian models appeared in the 1990 s [3] and have since become more accessible to both childbearing women and midwives who want to provide relational care, and work to their full scope of practice [4]. However, MGP can be difficult to implement and sustain, with issues like funding; support; and workforce shortage [4]. Insufficient recruitment might be due to midwives being deterred by: the on-call requirement; increased responsibility; or inflexibility of the service [5]. Not encouraging new grads into MGP, means that some services miss the opportunity to 'grow their own' [6]. MGP managers are integral to retaining staff by: ensuring the MGP is functioning sustainably; being responsive to what the midwives require; resolving tensions within and outside the group; and educating other core services on the benefits of MGP [7]. Sustaining the workforce including the manager requires a commitment from senior managers to support, value,and prioritise the MGP [5]. Funding should not be an argument given the research that has shown how cost effective MGP is, yet it remains a perceived barrier for some institutions to implement this program [4,8].

There are alternative models to MGP that provide midwifery-led continuity of care. Private midwifery care [9] and team midwifery [1], are examples of this, although team midwifery has less continuity. Nevertheless, MGP is the most common way for women to access a known, primary midwife, throughout the maternity continuum in Australia [10]. Unfortunately, obtaining operational information on these models and other midwifery specific data like education, workforce, and regulation are often challenging [11].

Obtaining data specific to midwifery is necessary to monitor workforce shortfalls, educational requirements, and the accessibility of MGP models for women; it is also necessary to ascertain what is happening in the midwifery profession. For example, in 2016, Dawson and colleagues [4] estimated that only 8% of women had access midwifery-led continuity of care in Australia. In 2022, 14.8% of the models in Australia were MGP [10]. While informative, this does not clarify how many women access MGP. The Australian National Health Workforce Dataset provides information on the number of midwives who work in MGP, which increased from 937 in 2016–1094 in 2019 [12]. However, to calculate the number of women who could access MGP care, more information on each MGP service is needed. Data are required on the number of midwives providing MGP care, the full-time equivalent (FTE) of each midwife and their caseload (number of women each midwife cares for) requirement per FTE.

Although one of the oldest professions [13], midwifery was integrated into nursing about a century ago and became a post registration nursing certificate [14]. Because of this, most midwifery workforce data are still enmeshed with nursing data. Although there have been recent efforts to separate these data, accurate data are difficult to obtain [11]. In the past 25 years in Australia, there have been changes that have improved the midwifery profession's visibility and quality of practice. These include national midwifery registration standards and regulation laws, the expansion of midwifery continuity models, and the introduction of the Bachelor of Midwifery (BMid), where students are not required to have a nursing degree first [11]. The BMid is a three-year degree, to promote midwifery as a distinct profession, advocate woman-centredness and prepare graduates to confidently provide continuity of care [15]. However, there are multiple pathways to registration as a midwife in Australia; these include a post-graduate pathway for nurses, as well as undergraduate double nurse/midwife degrees and the BMid [16]. The regulatory board for midwifery – the Nursing and Midwifery Board of Australia – continues to blend midwifery and nursing professions, albeit with discreet registers. Furthermore, the BMid is also under scrutiny and threat of viability because of escalating costs, restrictive clinical education models and limited public awareness [11,15].

Contemporary data on the MGP workforce in Australia are limited, and access to these data could inform ways to improve and sustain MGP. Although there are many ways to operationalise an MGP model to meet the needs of a community, a health service, women, and midwives [17], a recent UK study found that "many UK midwives are not currently able or willing to change the way they work to implement continuity"[18]. Having flexible ways of operationalising the models might be more appropriate and sustainable. Sharing knowledge of how services operationalise MGP might provide the information needed to tailor MGPs to suit all stakeholders [7]. Being aware of what midwives require to sustain their practice, and what managers require to optimally manage a service, might also help to implement more sustainable models [5,19].

This study is part of a large research program to clarify the conditions that optimise MGP management in Australia. This is achieved by examining the MGP manager's role and the attributes that enable them to lead and sustain MGPs. This paper presents an overview of: MGP models with reference to the consumers they target; where care is provided; the population of MGP midwives and managers; as well as factors that help or hinder the sustainability of the model.

Methods

Study design and data collection

A national survey was undertaken as the second phase of a larger, mixed methods study. Participants from the first phase (withheld-for-blind-review) were invited to pilot-test the survey. Six participants offered feedback, which was used to refine the survey. Approximately 1094 midwives were estimated to work in MGP [12]. A representative sample of 278 responses from midwives was deemed adequate from a population of approximately 1000 midwives working in continuity of care models. This was calculated using a 5% margin of error and a 95% confidence index. We were pleased to exceed this with around half of midwives working in MGP models in Australia responding to this survey. Participants were recruited via social media and advertisements posted in member emails from the Australian College of Midwives and Women's Health Care Australasia. Participants were invited to complete the survey if they were working (or had been within the previous five years) as an MGP midwife, MGP manager (Midwifery Unit Manager with direct clinical oversight), or senior manager (Strategic or Operational only) with responsibilities that include MGP. Once they commenced the survey, they were asked to self-identify which position they held and were taken to the end of the survey if they chose 'none of the above'. The survey was designed using the online survey platform, Qualtrics®[20]. Survey data were collected from 30th March 2021 until the 22nd of July 2022, inclusive to accommodate disruptions caused by the COVID-19 pandemic and to reach as many participants as possible. During this time most services went through a rapid change with many midwives being unable to provide the care they wanted to, one-to-one care increasingly moved to online, postnatal care was reduced, MGP care was cut back and in some cases MGP services were closed [21].

The survey was designed to explore MGP midwives' and managers' views and included seven sections. This article presents participants'

demographic information, MGP model conditions (who the model caters for and where care is provided), and some employment conditions. Participants were invited to respond to open ended questions to expand on the closed item responses or where further explanation was required.

Ethics

The study was approved by Western Sydney University Human Research Ethics Committee (approval number: withheld-for-blind-review). Participants were offered detailed information (via a link) at the beginning of the survey and asked whether they consented, if they responded as 'no' they were taken to the end of the survey. Survey responses were anonymous and thus participant responses could not be withdrawn after submission.

Quantitative analysis

Descriptive analysis of the demographic items of the survey was undertaken (See Table S1: Survey Questions). Survey data were cleaned to remove 121 surveys that had not completed all the demographic information, as well as contributions from participants who were not an MGP midwife, manager, or executive manager of an MGP service, within the previous five years. Without basic demographics completed the aim of the survey would not have been met and the data would not have been useful. Quantitative data were analysed calculating descriptive statistics, frequencies, percentages, means, and independent sample *t*-test using IBM SPSS software [22].

Qualitative analysis

Content analysis was performed on the qualitative data using NVivo [23]. Content analysis was used to ascertain and quantify patterns in text [24]. This approach has a long history in the social sciences, with many variations, attracting critique [25]. Although some researchers do not define it as qualitative research, others argue that content analysis is qualitative research with some quantitative elements [26].

An inductive/conventional approach was used to gain direct information from the raw data as described by Hsieh and Shannon [27]. This was achieved by (re)reading the open-ended text, noting keywords or phrases that captured the meaning of the text. Once preliminary phrases were identified, text was coded using these phrases or codes. New codes were added as phrases were found that did not fit with existing codes. Some codes were combined while others were split into other subcategories. Once the codes were organised into main categories and subcategories, the authors discussed and critiqued these. The final codes were reported in narrative form accompanied by the frequency distribution of responses (number count) and percentage.

Researcher position

As midwives with extensive experience providing midwifery care and leadership of continuity of midwifery care models, three authors have an insider's perspective. One of the researchers is not a midwife, providing an outsider's perspective, encouraging reflexive approaches to the analysis. These insider and outsider views helped us to draw on our individual strengths and expose any biases that might have resulted from extended immersion in the field.

Findings

Participant backgrounds

Of the 790 participants, 669 responded to all the demographic items, representing half of the survey items, and so were included. Responses were received from MGP midwives (*n* 579, 86.5%) managers of MGP services (*n* 68, 10.2%), and senior managers of services that offered an MGP (*n* 22, 3.3%, see Table 1). Most participants were born in Australia (*n* 525, 78.5%), with others born in Europe (*n* 92, 13.7%), or New Zealand and Pacific Islands (*n* 29, 4.3%), among other locations. Eight (1.2%) participants identified as Aboriginal or Torres Strait Islander, close to the national percentage of indigenous midwives of 1.3% [12].

The largest proportion of participants was over 50 years of age (*n* 207, 31.0%); however, the mean age of midwives was 38 years, and the mean age of managers was 46 years. The largest proportion of participants had practiced as a midwife between five to nine years (*n* 175, 26.2%). The mean years of midwives' experience was eight years and for the managers, it was 18 years. The largest proportion of participants had entered midwifery via a BMid (*n* 297, 44.4%). However, some participants had completed a master's (*n* 153, 24.0%) or doctoral degree

Table 1
Midwives' Demographics and Characteristics ($n = 669$).

Position	Participants	Percentage
MGP midwife	579	86.5
MGP manager	68	10.2
Senior manager of an MGP service	22	3.2
Indigenous status		
Yes, Aboriginal and/or Torres Strait Islander	8	1.2
Rather not say	3	0.4
Ethnicity		
Australia	525	78.5
Europe	92	13.7
New Zealand and Pacific Islands	29	4.3
North, South and Central America	14	2.0
Africa and Middle East	2	0.29
North, South and Central Asia	7	1.0
States and Territories working		
New South Wales	216	32.3
Queensland	192	28.7
Victoria	84	12.6
South Australia	59	8.8
Western Australia	64	9.6
Tasmania	16	2.4
Northern Territory	20	3.0
Australian Capital Territory	18	2.7
Remote, Rural, and Metropolitan Area Classification		
Metropolitan Area	558	68.4
Rural	175	26.1
Remote	35	5.2
Missing	1	0.1
Age range (years)		
21–29	128	19.1
30–39	171	25.6
40–49	163	24.4
50 and over	207	31.0
Years practising midwifery		
0–9	340	50.9
10–19	152	22.8
20–29	93	13.9
30 or more	82	12.3
Not a midwife	2	0.3
Midwifery qualification		
Bachelor of midwifery	297	44.4
Graduate diploma in midwifery	176	26.3
Double nursing/midwifery degree	66	9.9
Hospital certificate in midwifery	94	14.1
Other	32	4.8
Not a midwife	2	0.3
Missing	2	0.3
Highest level of education	**Participants (n=637)**	**Percentage**
Hospital certificate	27	4.2
Qualification from Technical and Further Education or diploma	7	1.0
Undergraduate university degree	271	42.5
Postgraduate diploma	169	26.5
Postgraduate Masters' degree	153	24.0
Doctorate	5	0.8
Missing	5	0.8

(*n* 5, 0.8%, see Table 1). Almost half the clinical MGP midwives (*n* 276, 47.8%) completed a BMid, while the largest proportion of managers entered midwifery via a graduate diploma (*n* 36, 40%). According to registration data from the same years, the percentage of midwives working in MGP who completed a BMid is close to twice the percentage of those working nationally as 'midwife only' registered midwives (2021, 24.4% and 2022, 26.9%) [28].

Although most midwives worked fulltime (*n* 345, 59.6%), of those who worked part-time, almost one-quarter had reduced to part-time work after initially working fulltime (*n* 54, 23.1%). Almost one-fifth of the midwives no longer worked in MGP (*n* 102, 17.6%), while close to one-quarter of the managers had ceased working as an MGP manager (*n* 16, 23.5%). Over forty percent of MGP managers also managed another service as well as MGP (*n* 29, 42.6%, see Table 2).

Reasons midwives reduced or ceased MGP work

Midwives reduced to part-time employment or left MGP, because: of how it was managed; of personal reasons; or the MGP work conditions (see Table 3). While one-quarter of the participants left for personal reasons (*n* 57, 25.4%), of these one-third left due to pregnancy or birth (*n* 14, 33.3%). The rest described dissatisfaction with one or more aspects of the service – namely, how it was managed or the impact on their lifestyle.

MGP work conditions

MGP was found to be an all-consuming lifestyle for some, especially when working fulltime. The reasons cited for this assessment included limited work-life balance, an excessive workload, burnout, stress, and being on-call, with some citing multiple reasons. Although some of the MGP work condition, concerns might be dealt with by effective management, some may also be the result of being on-call and the ebbs and flow of MGP where there are quiet times followed by times that are extremely busy. Of the participants that had reduced to part-time or left MGP these factors were reported by 51.9% (*n* 118):

> I felt like my family and life came second to my women because I felt that I always had to be there for them. Being on call 24 h a day is exhausting and even on days off there is an expectation and a want to go in and deliver your ladies. On days off I would still check my phone and respond to messages when I wasn't away from home. Knowing all your colleagues are busy makes you very reluctant to pass jobs on (*ID222*).

Table 2
Working Arrangements.

Midwives Full Time Equivalent (FTE)	Participants (*n*=579)	Percentage
Fulltime	345	59.6
0.9 FTE	18	3.1
0.8 FTE	132	22.8
0.7 FTE	48	7.2
0.6 FTE	9	1.6
0.5 FTE	25	4.3
0.4 – 0.2 FTE	2	0.4
Midwives still employed in MGP		
Yes	477	82.4
No	102	17.6
Midwives reduced to part-time after starting fulltime	**Participants (*n*=234)**	**Percentage**
Yes	54	23.1
No	180	76.9
Manager still managing MGP	**Participant (*n*=68)**	**Percentage**
Yes	52	76.5
No	16	23.5
Manager managing other services as well as MGP		
Yes	29	42.6
No	39	57.4

Table 3
Midwife Reasons for Reducing or Ceasing MGP Employment.

Main Category Subcategory	Quotes (*n*)	Percentage
Personal reasons		
Maternity, personal or family reasons	57	25.1
MGP work conditions		
Poor work life balance, excessive workload, stress, on-call, burnout	118	51.9
Culture		
Bullying, poor culture, poor group dynamics	14	6.1
How it was managed		
Issues with how MGP was managed and supported	29	12.7
Model changed, service closed, contract ended	9	3.9

Being available to the women and the group practice on a full-time basis was difficult for many midwives. Having a family made it even harder. Consequently, some reduced to a part-time position to enable them to continue working in the model:

> Huge commitment and detriment to personal life, I have a young family and need to balance work/life better! (*ID554*).

> Too many women a year [40] allocated at full time in an all-risk model. Too overwhelming and felt I wasn't providing depth of care, only breadth (*ID104*).

While some midwives worked part-time, they were still required to be on-call the same as a full-time midwife. For others, part-time employment within the MGP model was not an option. However, some MGP services only offered part-time employment. While this might be to improve sustainability, some midwives preferred full-time employment:

> I dropped to 0.8 (FTE) but was still on-call the same as full timers (*ID607*).

> MGP not offering part-time (*ID505*).

> There is no option to work full-time. I've worked as part time for almost 18 months and would actually prefer full-time, but it is not offered (*ID48*).

Bullying and poor organisational culture

Bullying and poor organisational culture explained why some midwives stopped working in MGP (*n* 14, 6.1%). Some reported feeling bullied because of working differently, causing some to cease midwifery. Limited support and poor cohesion among MGP members also contributed to midwives leaving MGP:

> I started up another MGP that was more a medical model. I was bullied by some of the midwives. I believe due to me speaking up for giving women all their choices and promoting informed decision making (*ID436*)

> I left the profession due to workplace bullying (*ID411*).

> Lack of support from core staff and team issues (different ways of working on call) it became quite stressful with little time out" (*ID639*).

How the model was managed and supported

Issues with how the model was managed and supported accounted for why some midwives left MGP, or reduced to part-time employment (*n* 29, 12.7%). Some were concerned by the managers' strategic

direction, preventing the MGP from reaching its full potential. On a practice level, they described limited or no leave provisions including cover for sick leave, poor rostering, and limited resources. Some midwives stated that managers were ineffective, not committed to the model or offered limited support. Others needed more options and flexibility around their work conditions and better financial compensation:

> Misguided direction from senior management, lots of barriers put in place preventing fully functioning MGP in a rural setting (*ID330*).

> No flexible working arrangements on return from maternity leave (*ID338*).

> Burn out, lack of managerial and clinical support. Unreasonable hours that I felt weren't compensated appropriately financially (*ID270*).

MGP manager issues

The reasons some managers left MGP were because they had moved into other positions, or had their positions downgraded (*n* 10, 22.2%). However, others described issues like that of the midwives. They spoke of conflict with executive managers, and concerns over the work environment.

Executive managers

Almost one-quarter of the managers described conflict with their line manager and limited support (*n* 11, 24.4%, see Table 4). Most concerns with executive managers involved barriers to model improvement or expansion:

> Conflict with exec management over MGP management. I wanted to expand the service by adding more midwives to the team, and I wanted to employ more early career midwives, exec didn't agree (*ID56*).

Nurses are often in positions representing and managing both nursing and maternity services in Australian hospitals, and there are few midwives in executive management positions [29]. This might be because nursing is a much larger professional group than midwifery, or that midwives are not assuming executive positions. However, some managers found it difficult to be managed by a different profession:

> Being managed by a nurse is equivalent to a dentist managing an engineer as per Joy Alcocks recent article. It was ridiculous. (*ID289*)

Work environment

In addition to the MGP, almost half of the managers managed other areas (*n* 29, 42.6%, see Table 2). While some managers reported no issue with this (*n* 3, 6.6%, see Table 4), others reported their work environment was a major concern (*n* 21, 46.6%). They cited poor culture, competing demands, a heavy workload, and burnout:

Table 4
Managers' Comments on Managing an MGP.

Main Category Subcategory	Quotes (*n*)	Percentage
Change in position		
Position downgraded, personal caseload removed, moved to another position	10	22.2
Executive management		
Conflict with management, no support	11	24.4
Work environment		
Poor culture, burnout, workload too heavy, competing demands	21	46.6
No issues	3	6.6

> Splitting myself between 3 models of care and 2 different hospital sites is difficult. Never enough time to feel like I've completed anything well. Always rushed, competing demands, multiple personalities that don't always agree with the other models (*ID442*).

Because managing an MGP might differ from what hospital ward managers encounter, there might be limited understanding from both. This might be especially true when MGPs are based offsite from the hospital, hindering communication between MGP and hospital clinicians. Although the managers found managing other areas challenging, one manager recognised benefit in seeing the health service from a wider viewpoint:

> Managing other services means I can't dedicate as much time as I would like to grow and build our MGP, however it also means I have a broader view and advocate for MGP across all maternity services (*ID218*).

Where MGP was provided

Midwives working in MGP responded from every Australian state and territory, with survey responses from most states and territories roughly equating to or higher than the jurisdictions' rate of employed midwives. The exceptions were Western Australia (*n* 64, 9.6%) and Victoria (*n* 84, 12.6%), as the proportion of participants from these states was underrepresented [30]. The greatest proportions of participants worked in New South Wales (*n* 216, 32.3%) and Queensland (*n* 192, 28.7%, see Table 1). Most midwives worked in MGP models located in major metropolitan centres (*n* 458, 68.4%), just over a quarter of midwives worked in MGPs in rural areas (*n* 175, 26.1%), and there were 35 (5.2%) midwives working in remote MGP services. This was assessed using the Rural, Remote and Metropolitan Areas (RRMA) index via the Health Workforce Locator, and the RRMA filter [31].

Care was provided mostly through public hospitals (*n* 640, 95.6%). During birth, midwifery care was offered in various settings, with most women giving birth in a hospital birthing suite (*n* 584, 61.7%). While MGP was traditionally implemented to care for women of low obstetric risk [32], this survey revealed half of the MGP services operated as 'all risk models' (*n* 336, 50.2%, see Table 5). This means there were more options of MGP care for women with complexities, with some MGPs specifically targeting women with high obstetric risk factors (*n* 23, 3.4%).

Table 5
MGP Operationalisation.

MGP Arrangements	Participants (*n*=669)	Percentage
MGP model or models (services can have more than one MGP)		
Low risk model	154	23
Low risk entry, no exit	183	27.4
All risk model	336	50.2
High risk model	23	3.4
None of the above	39	5.8
MGP is situated within:		
Public Hospital	640	95.6
Private Hospital	4	0.6
Neither	25	3.7
Women give birth in: (multiple answers accepted)	**Participants (*n*=946)**	**Percentage**
Free-standing birth centre	31	3.2
Alongside birth centre	110	11.6
Birth centre	73	7.7
Birth unit, birthing suite, or labour ward	584	61.7
The home	124	13.1
Community centre	2	0.2
Aboriginal and/or Torres Strait Islander birthing service	22	2.3

Discussion

This study explored contemporary data on MGP models across Australia with reference to: the consumers they target; where care is provided; a population of 579 MGP midwives and 90 managers; as well as factors that help or hinder the sustainability of the model. Research has focused on the benefits, satisfaction, and sustainability of midwifery-led models [2, 33–38]; however, contemporary data on the MGP workforce are limited with little understanding of how the models are operationalised. This knowledge might help to identify facilitators and barriers to MGP sustainability. This study extends Dawson and colleagues' [4] research, which reported on the availability and characteristics of caseload midwifery in Australia in a study on maternity managers views.

MGP for all women

Since most MGP intrapartum care (61.7%) was provided in a hospital birth suite, with onsite medical support as required, it seems appropriate that MGP should cater for women experiencing complexities. Although high-level evidence on midwifery-led continuity of care supports the care of healthy pregnant women [2], the trend of continuity of midwifery care for women with obstetric and social risk factors might be increasing. While previous research indicated that one-third of models were 'all risk' [4], this study found that 50% of models were 'all risk'.

Although recent studies demonstrated favourable outcomes for women with complexities who have received MGP care [39,40]. There is some debate about the strength of the evidence relating to MGP care for these women [39]. Some authors suggested that larger appropriately powered studies are required to evaluate cost, resource use, and clinical outcomes [40]. However, most studies suggest that all women (including those with complexities), benefit from equitable access to MGP care [41,42].

This study also found that most MGP services are offered in the public sector, and very few are offered in the private sector (0.6%). A recent study indicated that women want to choose their doctor, but also have access to midwifery-led care in the private sector [43]. Since there is a deficit of these models in the private sector, there is an opportunity for obstetricians to consider midwifery continuity models to be incorporated into private hospitals.

How midwives were educated

The midwife participants' mean age was 38 years – less than the national midwife mean age of 45 years in 2019 and 47.3 years in 2022 [12,44]. Their mean years of experience was only eight years, and they were more likely to have completed a BMid. The participant rates from each jurisdictions' midwifery workforce were fairly representative, with the exception of Western Australia and Victoria. This underrepresentation might reflect the predominate double degree/postgraduate entry point into midwifery in both states [45,46] and the absence of the BMid.

A higher rate of midwives working in MGP who had completed a BMid might indicate this form of education encourages midwives to provide MGP care. This could be due to the longer education in midwifery specific subjects and clinical environments, compared to the postgraduate or double degree pathways. There might also be more extensive exposure to this model while being a student compared to other midwifery education programs due to the longer period. Future midwives attracted to the BMid might also have different priorities to those seeking a nursing pathway first or a combined nursing and midwifery pathway (double degree). However, McKellar and colleagues indicated that in direct consultation with consumers, the BMid curricula was underpinned by a feminist philosophy, promoting woman-centred care to prepare midwives to work in continuity of care [15]. Although all midwifery educational pathways promote these qualities the BMid might offer more exposure due to the length of midwifery specific study [47]. It is therefore important to ensure the BMid continues to be available to educate midwives in all states and territories so that midwifery-led continuity of care models grow. Blended nursing/midwifery educational approaches might not be fit-for-purpose to ensure a future woman-centred workforce [11]. Combining nursing science (closely related to the medical model) and midwifery philosophies might not encourage graduates to pursue woman-centred continuity of care [45].

However, the BMid is constantly under scrutiny [11]. This is partly because the workforce is deemed less versatile for rural and remote settings, highlighting the continued focus on nursing, with limited recognition of the uniqueness of the role and scope of a midwife [48]. Other reasons the BMid is threatened, despite being in high demand is: cost; issues with providing clinical experience; and limited visibility within nursing [15]. Since there is a preference for the double (or dual) degree in both Western Australia and Victoria over the BMid [46,48], the future workforce of midwifery continuity of care models in these states might be also threatened. Further evidence of the value of midwife centric programs, like the BMid is seen in countries with the highest midwifery-led continuity in the world, like New Zealand, which educates its midwives via a three-year direct entry BMid [16].

Sustaining midwives

Only sixty percent of MGP midwives worked full-time, suggesting that many health services were supporting part-time employment. However, the findings suggest that some health services are not offering part-time positions or that the on-call does not reflect the part time hours. Job sharing might be a solution for these services, effectively making two part time midwives a full-time equivalent reducing the on-call and the load on other midwives in the group. Some health services require MGP midwives to work part-time, presumably to reduce burnout and promote sustainability. This arrangement would only work in states and territories that renumerated MGP midwives at a rate that provided financial stability on part-time contracts. Yet, there are different renumeration agreements across Australia, with some states paying considerably less than others [49]. If the pay level enabled midwives to work part-time, it might improve the work-life balance. This in turn might alleviate stress and anxiety, and potentially prevent burnout, especially if the on-call requirements were also reduced. Midwives in this study said they left MGP due to inflexible working conditions during pregnancy and being unable to work part-time after having children. Although more continuity of carer is achievable with midwives working fulltime, a service that supports childbearing women should also support the childbearing midwives. While some services employed part-time MGP midwives, on-call hours do not always reflect part-time hours. Reducing work hours might sustain some midwives in their MGP role; but it only addresses some of the problems midwives highlighted.

Limited support, bullying, and poor organisational culture caused some midwives to leave MGP. Although midwives who provide continuity of care can experience less burnout than midwives working in standard care, bullying and limited support (as reported in this study) can compromise organisational culture. It can erode trust and collaboration, silence dissent, foster disengagement, and disillusionment with work, decrease productivity and the quality of work, and ultimately contribute to burnout [50,51]. MGP might offer some protection to burnout, but some midwife characteristics might put them at risk, as found in this study. Over half the midwife participants reported practising midwifery for under ten years – and according to Mathews and colleagues [51], they have a higher risk of burnout. Catling and colleagues [52] found that MGP can marginalise midwives who work within a hospital, leading to hostility. Collegial support, reciprocity, good managerial support, positive outcomes, and the ability to form relationships with women are vital in supporting a healthy, positive work environment [5,52]. Although it is important for MGP midwives to have collegial support from fellow MGP group members [53], it is also

important for midwives to have the support of core midwives [5].

To sustain an MGP, a positive relationship with the manager is essential [5,19]. Catling and colleagues noted that managers were responsible for laying the foundations for organisational culture and responding to unacceptable behaviour or workplace bullying [50]. It is also their responsibility to ensure open lines of communication and that MGP midwives feel supported, feel trusted, and can put their families first [19]. Of course, this might be asking a lot of a manager who manages other services as well as the MGP.

Sustaining managers

Just under half of the participating managers described the difficulty of managing their myriad responsibilities, particularly when they managed additional services. This might arise from a historical belief that midwives are self-managing and autonomous; thus, the MGP manager has a lighter workload than other ward managers [54]. However, some participating managers reported leaving MGP because of a heavy workload. This warrants concern given that limited manager stability can reduce MGP sustainability [19].

Supporting the model in an optimal way is very difficult for managers that manage competing interests [19]. Hewitt and colleagues [19] described how the manager is pivotal to MGP, assuming a different role to that of most health service managers. For instance, MGP managers must ensure midwives can provide woman-centred care by facilitating midwife-centred management. This requires them to: be available to the midwives; know what is happening within the model; communicate with stakeholders to debunk myths; and improve understanding of how MGP midwives work along with the benefits of the model [5].

Some managers stated that limited support from executive managers contributed to their decision to leave MGP. Since their role differs from that of other health service managers, they might not have as much collegial support; it is therefore important that executive managers support them [55]. Some managers noted that limited executive manager support for MGP hindered its growth. This might reflect a hierarchical, industrialised culture [56], the deficit of midwifery executive managers relative to nursing executive managers [29], and/or limited understanding about the importance of MGP [55]. Nursing executives in an organisation might not: value the autonomous nature of MGP; appreciate midwives being on-call as a responsive workforce instead of working shifts; or recognise the significance of the relationship between midwives and women [55]. Limited midwifery representation at executive levels might also be the reason that MGP has taken so long to be implemented across Australia [29]. Without high level executive support for the model, MGP remains an 'add on' to the mainstream hospital, contributing to an 'us and them' culture, and limited support of MGP managers [19]. As midwifery is recognised as a separate discipline to nursing there is an increased urgency for midwifery representation at executive and national levels from midwives who understand models of care, who promote midwifery visibility and who support MGP midwives and managers [29].

Limitations

Given that approximately 1094 midwives were estimated to work in MGP [12], this survey had about a 50% response rate of the available MGP midwifery workforce. As such, the responses might not reflect the responses of all Australian midwives. The survey also will not be able to inform decisions made by maternity service providers in other countries. The midwives and managers who responded might have done so due to personal biases or other motivations – as such, responses might not reflect all MGP midwives and managers. However, to our knowledge, this is one of the largest surveys of the Australian MGP workforce and has the advantage of capturing insights from both MGP midwives and managers. The scope and depth of this study was limited in order to optimise survey completion. Further probing of workforce issues and conditions might have been useful. These include limited exploration of workplace arrangements for on call management, roster flexibility and personal family life details. Because this study was undertaken during the COVID-19 pandemic, the responses might have been shaped or limited due to the extra pressure health workers were under during this time.

Recommendations

This study has clear implications for midwives, managers, scholars, and policymakers. For midwives, it is imperative to escalate poor behaviour to managers and encourage flexibility within the MGP. It is also vital that midwives can express their needs for future model planning. For managers, the models need to be supported and managed to deal with the identified cultural problems of working in an MGP within a hospital. Midwives and consumers need to have opportunities to contribute to the ongoing service planning to ensure the model works for both. Executive managers should be aware of the need for MGP support and the need to ensure the manager can properly manage the MGP. For scholars: future research should consider the factors that keep some midwives in MGP positions for long periods. Ongoing research is required to show how models have changed over time to promote sustainability, including the impact of family life on these models. Detailed working arrangements also need to be captured including: caseload numbers; practice arrangements; days off; and all working conditions. A review of midwifery continuity of care for women with complexities is urgently required to encourage service providers to confidently offer this care to all women. Research is also required to investigate the impact of non-midwifery managers and senior managers on the success of midwifery models of care. Further research is also required on the workload of MGP managers regarding managing other services and the impact of managers in smaller units taking a caseload. For policy makers, the BMid should be prioritised and expanded as it is an important pathway towards staffing continuity of care models for women in Australia. There is currently a threat and a trend in the other direction which is concerning. A national approach is required to reimburse midwives adequately for the contribution and commitment that is expected to work in MGP. Midwifery needs to be recognised as a separate profession to nursing and midwifery specific data that is reliable should be readily available.

Conclusions

To sustain MGP services, working conditions need to reflect staff requirements to ensure adequate staffing (retention and recruitment) of both midwives and managers. Midwives are asking for flexible work conditions, manageable workloads, appropriate renumeration, with adequate support from managers and core services. MGP Managers also require support from their line managers and a workload that allows them to adequately manage the MGP. Since the BMid appears to be a common educational route for MGP midwives, it might be an important pathway to staffing MGP services. MGP is no longer a service for women without obstetric risk with many MGP services providing care for women with complexities.

Funding

None declared.

Ethical Statement

Ethical approval of the study was granted by Western Sydney University Human Research Ethics Committee, HREC Approval Number H13428, 10th September 2019. The study was undertaken according to research ethics guidelines, participation was voluntary, and informed consent was obtained from all participants.

CRediT authorship contribution statement

Leonie Hewitt: Conceptualization, Formal analysis, Data curation, Investigation, Writing – original draft. **Ann Dadich:** Supervision, Writing – review & editing, Validation. **Donna Hartz:** Supervision, Writing – review & editing, Validation. **Hannah Dahlen:** Supervision, Writing – review & editing, Validation, Project administration.

Declaration of Competing Interest

None declared.

Acknowledgements

We thank the midwives and managers of MGP that participated in this survey. We appreciate their time, honesty, and commitment to supporting MGP.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.wombi.2023.09.002.

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Women and Birth 31 (2018) 367–379

Contents lists available at ScienceDirect

Women and Birth

journal homepage: www.elsevier.com/locate/wombi

Review article

Postnatal post-traumatic stress: An integrative review

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ARTICLE INFO

Article history:
Received 13 August 2017
Received in revised form 24 November 2017
Accepted 4 December 2017

Keywords:
Childbirth
Posttraumatic stress disorder
Postnatal
Pregnancy care

ABSTRACT

Problem: Post traumatic stress disorder and post traumatic stress symptoms following birth occur amongst a small proportion of women but can lead to poor maternal mental health, impairment in mother infant bonding and relationship stress. This integrative review aims to examine the associated risk factors and women's own experiences of postnatal post traumatic stress in order to better understand this phenomenon.

Method: Fifty three articles were included and critically reviewed using the relevant Critical Appraisal Skills Program checklists or Strengthening the Reporting of Observational studies in Epidemiology assessment tool.

Findings: Risk factors for postnatal post traumatic stress symptoms and disorder include factors arising before pregnancy, during the antenatal period, in labour and birth and in the postnatal period. Potential protective factors against postnatal post traumatic stress have been identified in a few studies. The development of postnatal post traumatic stress can lead to negative outcomes for women, infants and families.

Discussion: Risk factors for post traumatic stress symptoms and disorder are potentially identifiable pre pregnancy and during the antenatal, intrapartum and postnatal periods. Potential protective factors have been identified however they are presently under researched. Predictive models for postnatal post traumatic stress disorder development have been proposed, however further investigation is required to test such models in a variety of settings.

Conclusions: Postnatal post traumatic stress symptoms and disorder have been shown to negatively impact the lives of childbearing women. Further investigation into methods and models for identifying women at risk of developing postnatal post traumatic stress following childbirth is required in order to improve outcomes for this population of women.

Statement of significance

Problem or issue

Women who develop post traumatic stress symptoms or disorder after birth experience negative outcomes in terms of their own health and mother infant bonding.

What is already known

Individual studies have reported a range of risk factors for developing postnatal post traumatic stress symptoms and disorder but less is known about protective factors.

What this paper adds

This paper collates the findings of quantitative and qualitative research on postnatal post traumatic stress symptoms and disorder, identifying factors that contribute to the development of post traumatic stress symptoms and disorder, as well as a limited number of factors that are potentially protective.

1. Introduction

The birth of a child is often a joyful, celebrated event for women and their families. However, for some women, the birth experience

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https://doi.org/10.1016/j.wombi.2017.12.003
1871-5192/

leaves them traumatised, which can lead to negative outcomes such as difficulty bonding with and breastfeeding their newborn, developing postnatal depression, parenting stress, disruption to personal relationships and post traumatic stress (PTS) symptoms, with a small proportion of women meeting the full diagnostic criteria for post traumatic stress disorder (PTSD).[1,2] PTSD is defined as the development of a certain cluster of symptoms, such as persistent, involuntary and intrusive memories, avoidance of stimuli, recurrent distressing dreams, dissociative reactions, altered mood state and intense or prolonged psychological distress following exposure to a traumatic event that represents an actual or perceived threat to the life of an individual.[3] In order be diagnosed with PTSD, an individual must meet particular criteria as set out in the Diagnostic and Statistic Manual of Mental Health Disorders (DSM). The most recent version of the DSM, the fifth edition (DSM V) requires individuals over the age of six to meet the following criteria in order to be diagnosed with PTSD: exposure to actual or threatened death, serious injury or sexual violence (criterion A); presence of intrusive symptoms associated with the traumatic event/s (criterion B); persistent avoidance of stimuli associated with the traumatic event/s (Criterion C); negative alterations in cognition and mood related to the traumatic event/s (Criterion D); significant alteration in arousal and reactivity (Criterion E). The duration of criteria B to E must be greater than one month (Criterion F); the disturbance must cause clinically significant distress or impairment in functionality (Criterion G) and the disturbance must not be attributed to effects of any substance or other medical condition (Criterion H).[3]

The development of postnatal PTSD is a particularly poor psychological outcome for women and has been reported as occurring in 1.7 9% of women in the postnatal period.[4–6] Postnatal PTS symptoms and PTSD (PTS/D) have been shown to have a negative impact on the lives of women and on infant development in terms of mental health outcomes, breastfeeding and mother infant bonding.[7,8] Additionally, PTS/D can have a negative impact on relationships between women and their partners.[9] Therefore, further investigation into the development of postnatal PTS/D is warranted to better understand why some women experience birth as such a traumatic event that they subsequently develop PTS/D. The aim of this integrative review is to examine the risk and

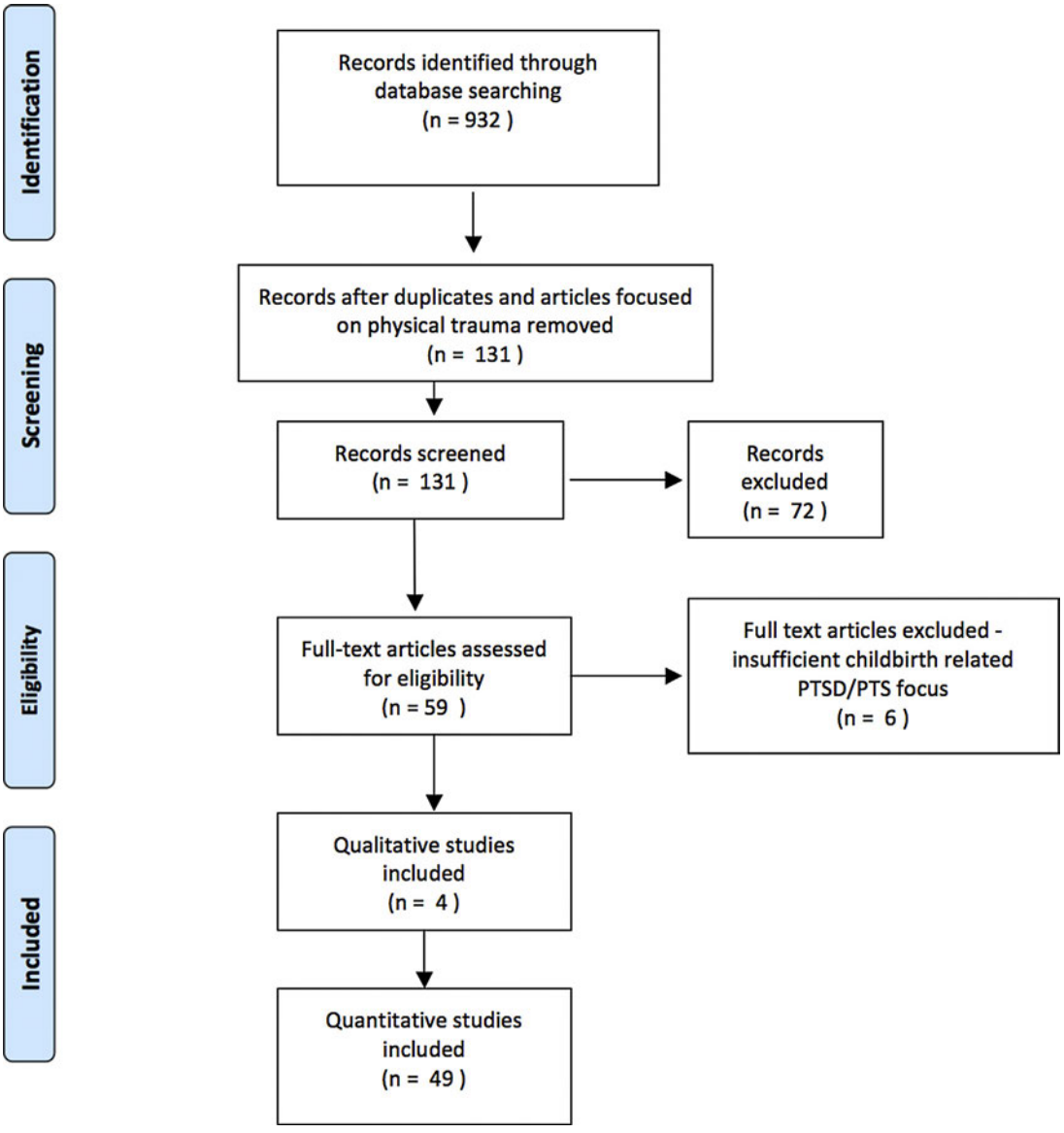


Fig. 1.

protective factors and potential outcomes and implications for the women who develop PTS/D following birth, in order to better understand this phenomenon.

2. Method

Whittemore and Knafl state that integrative literature review can contribute to better understanding of a health related phenomenon by providing a more holistic perspective of the health condition being studied.[10] This is attributed to the allowance for review and synthesis of study results from diverse research methodologies, inclusive of qualitative, experimental quantitative and non experimental quantitative methods. As the aim of this review is to gain a better, more holistic, understanding of the postnatal PTS/D phenomenon, integrative review of the literature has been determined to be the most appropriate review method to use in this case.

2.1. Search strategy

The literature search was undertaken through the following databases Cochrane Library, SCOPUS, CINAHL, Science Direct, Maternity and Infant Care database, Medline, Wiley Science and EBSCO Academic Search Complete databases, using the following search terms; traumatic childbirth; childbirth; psychological aspects; and childbirth post traumatic stress. The timeframe for publication was limited to the past 13 years, from January 2004 up to and inclusive of July 2017, and articles published in languages other than English were excluded. The thirteen year timeframe for inclusion is based on time past since very a comprehensive systematic literature review on postnatal PTS/D was undertaken by Olde et al.,[11] covering literature published up until 2004. Other review papers have been published since then, however, none of these utilised the integrative review method. At the time of publication of Olde et al.'s review, no qualitative studies on postnatal PTS/D had been published.

2.2. Search results

A total of 53 articles were included in this review after eliminating duplicates, articles related to physical childbirth trauma and articles that did not specifically discuss or had minimal focus on childbirth related PTS/D. In order to reduce the risk of duplicating results or double reporting, review articles were also excluded. The search strategy follows the Preferred Reporting Items for Systematic review and Meta Analysis (PRISMA) guide line, as per Fig. 1.

2.3. Evaluation of the literature

The literature was critically reviewed using the relevant Critical Appraisal Skills Program (CASP) Checklists,[12] with the exception of the cross sectional studies as there is no CASP check list related to appraising cross sectional studies. The cross sectional studies determined to be relevant to the review were read in conjunction with the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) statement checklist for reporting of cross sectional studies.[13]

For the studies reviewed using the CASP checklists, all those that scored above 7 were considered to be of a good standard in terms of quality of the research. Scoring was done as follows; a "yes" answer to a question on the CASP checklist received 1 point, a "can't tell" answer received no points and a "no" answer received no points. Only two studies included scored less than 7, both scoring 6, however were still included in the review as one study[9] contributed to the limited number of qualitative studies and the other was the only study that followed up participants for an extended period of time of two years.[14]

2.4. Data extraction, reduction and analysis

In order to extract and collate all the relevant information required for this review, an extensive database was created and populated, where applicable, with the following information from each article included in the review; *title, authors, year, country, methodology/research design, methods, aim, sample size, inclusion/exclusion criteria, PTSD assessment tools used, birth characteristics and/or mode of birth, breastfeeding and/or bonding, model of care/continuity of carer, results, limitations and conclusions.*

From this database, smaller more manageable databases were created to gather information about the most frequently used PTS/D screening and diagnostic tools throughout the literature and also to list all the identified risk factors for the development of PTS/D, found in the results from the studies included in this integrative review, across the pregnancy, birth and postnatal periods.

3. Results

The fifty three articles selected as part of the current review included two randomised control trials (RCTs), 35 cohort studies, four qualitative studies, 11 cross sectional studies and one case controlled study (Table 1). The two RCTs included in this review explicitly mentioned risk factors associated with postnatal PTS/D. RCTs that were excluded may have included women with PTSD but did not identify specific risk factors or report on the impact of postnatal PTS/D on the lives of women and their families.

As outlined in Table 1, the included studies were conducted across wide range on countries, such as Australia, the United Kingdom, United States of America, Canada, Nigeria, Israel, Turkey, Iran, France, Italy, Belgium, Norway, the Netherlands, Switzerland, Brazil, Croatia, Germany, South Korea and Japan. Study participant numbers ranged from six, which was in a small qualitative study, to 1824 in the largest of the cohort studies. Included studies reported on risk and protective factors related to postnatal PTS/D and/or the impact of postnatal PTS/D on the lives of women and their families.

3.1. Risk factors for postnatal PTS/D

Forty seven of the 53 articles discussed risk and/or protective factors associated with the development of postnatal PTS/D. As shown in tables two, three and four, these risk factors have been divided into three categories: pre existing and antenatal, intra partum, and postnatal.

3.2. Pre existing and antenatal risk factors

Twenty one antenatal risk factors have been identified in 30 articles (Table 2). By far the most frequently identified risk factor identified was women who had experienced a previous traumatic event, with a total of 13 references to previous trauma as a risk factor.[15–23] When trauma history was subdivided in specific categories, a history of sexual trauma was identified as a risk factor in six studies.[15–17,19,21,22] Mental health/emotional issues and disorders was a risk factor in 13 of the 30 articles.[16,18–20,22–30] This was followed by women experiencing complex pregnancy or who had pre existing medical conditions that impacted on their pregnancy,[15,24,25,27,31–33] women reporting antenatal fear of labour and/or birth,[18,22,23,25,34,35] financial factors, such as low socio economic status and no access to medical insurance,[4,20,24,36] and demographic factors such as age, education level, Latin American or African ethnic background or Islamic religious back ground.[5,20,31,32,36,37] There were a number of factors or variables

Table 1
Studies relating to postnatal PTS symptoms and PTSD.

Authors	Country	Methodology	Sample size	Aim	Assessment tool/s used
Abdollahpour et al.[58]	Iran	RCT	84	Investigate the influence of the magical first hour (immediate, uninterrupted skin to skin contact and baby led breastfeeding) after birth on post-traumatic stress in traumatic childbirths.	IES-R
Adewuya et al.[33]	Nigeria	Cross-sectional study	876	Estimate the prevalence of post-traumatic stress disorder after childbirth postpartum Nigerian women and to examine associated factors	Neuropsychiatric Interview-Post-Traumatic Stress Disorder (MINI-PTSD)
Alcorn et al.[48]	Australia	Cohort study	933	Examine the prevalence of PTSD following childbirth in a large sample while controlling for pre-existing PTSD and affective symptomatology	PDS
Ayers et al.[9]	UK	Qualitative	6	Explore the long-term effects of childbirth-related PTSD on women, their relationship with their partner and their relationship with their child.	PDS
Ayers et al.[38]	UK	Cohort study	76	Examine the interaction between women's attachment style, severity of birth, and support during birth in postpartum PTSD.	PDS
Ayers et al.[63]	UK	Qualitative	44	Examined whether narrative characteristics of traumatic birth were specific to women with PTSD or observed in all women who experience a highly emotive and potentially traumatic birth	PSS-SR or IES
Ayers et al.[57]	UK	Cross-sectional study	1078	Examine whether hyperarousal symptoms differ between women who have traumatic or non-traumatic births, whether the construct of hyperarousal is coherent in postnatal women and whether hyperarousal symptoms are useful for identifying women who have traumatic births or PTSD	PDS
Ayers et al.[49]	UK	Cross-sectional study	64	Determine what proportion of men have severe symptoms of PTSD after birth, what impact postnatal PTSD symptoms have on the parent–baby bond, what impact postnatal PTSD symptoms have on the couple's relationship and what birth factors are associated with PTSD in men and women.	IES
Ayers et al.[21]	UK	Cross-sectional study	1297	Examine the presentation and symptom structure of PTSD after birth and key risk factors in women from internet and community samples.	PDS
Beck[1]	International	Qualitative	38	Aim of this phenomenologic study was to describe the essence of mothers' experiences of post-trau- matic stress disorder after childbirth.	Self report of Dx by health professional
Beck et al.[4]	USA	Cohort study	1573	Examine the results that focus on the posttraumatic stress disorder data obtained from a two-stage United States national survey conducted by Childbirth Connection: Listening to Mothers II (LTM II) and Listening to Moth- ers II Postpartum Survey (LTM II/PP)	PSS-SR
Borghini et al.[45]	France	RCT	83	Investigate the impact of an early intervention on maternal PTS symptoms and on the quality of mother–infant interactions, in a sample of very preterm infants and their mothers	PPQ
Choi and Seng[51]	USA	Cohort study	564	Follow up on an earlier finding that peritraumatic dissociation in labor was associated with adverse postpartum outcomes by identifying predictors of dissociation in labor.	PDEQ
Cigoli et al.[28]	Italy	Cohort study	160	Examine if stress symptoms are related to the support which women reported to have received or to have needed by some significant others	PTSDQ
Cohen et al.[20]	Canada	Cohort study	200	Determine if a difficult birth was associated with symptoms of PTSD as well as considering sociodemographics, history of violence, depression, social support and traumatic life events	Davidson Trauma Scale (DTS)
Davies et al.[55]	UK	Cross sectional study	211	Examine the relationship between posttraumatic stress and depressive symptomatology at 6 weeks' postpartum and mother's perceptions of their infants, their behavioral characteristics, mother-to-infant attachment, and the quality of early dyadic interaction.	PTSDQ, IES
De Schepper et al.[36]	Belgium	Cohort study	340	Examine the prevalence of PTSD and the role of personal and obstetric risk factors, as well as the role of midwifery team care factors in a cohort of Flemish women.	IES-R and TES
Denis et al.[5]	France	Cohort study	239	Determine the prevalence of post-traumatic stress disorder (PTSD) following birth in a French sample, as well as to examine predictive variables.	IES-R
Fairbrother and Woody[29]	USA	Cohort study	99	Examine psychological and obstetrical predictors of enduring postpartum symptoms of depression and post-traumatic stress disorder.	PSS-SR
Ford and Ayers[6]	UK	Cohort study	138	Examine the role of health practitioner support and personal control during birth as predictors of PTS symptoms, adjusting for vulnerability factors of prior trauma, depression, control beliefs and birth intervention and investigate interactions between support, prior trauma and birth intervention and their association with PTS symptoms.	PDS
Ford et al.[41]	UK	Cohort study	138	Apply a well-established cognitive model of PTSD to childbirth to determine if it could predict PTS symptoms following birth. Second aim was to examine whether the addition of social support strengthens the predictive power of a cognitive model in this particular population.	PDS
Furuta et al.[27]	UK	Cohort study	1824		IES

Table 1 (*Continued*)

Authors	Country	Methodology	Sample size	Aim	Assessment tool/s used
				Identify factors associated with birth-related post-traumatic stress symptoms during the early postnatal period.	
Gamble and Creedy[42]	Australia	Cohort study	400	Examine negative childbirth experiences and how they can result in the development of trauma symptoms and post-traumatic stress disorder (PTSD).	Neuropsychiatric Interview-Post-Traumatic Stress Disorder (MINI-PTSD)
Garthus-Niegel et al.[14]	Norway	Cohort study	1437	Extend research by examining stress, social support, and other possible maintaining factors of short and long-term symptoms of PTSD in a Norwegian cohort of women who were recruited in pregnancy and followed up to two years after birth.	IES
Garthus-Niegel et al.[62]	Norway	Cohort study	1472	Prospectively examine the impact of maternal PTSD symptoms on four important areas of child development	IES
Ghorbani et al.[44]	Iran	Case controlled	164	Compare anxiety, post-traumatic stress, and social supports in parents of premature and mature infants	DSM-IV based questionnaire to assess PTSD
Haagen et al.[26]	Netherlands	Cohort study	505	Assess childbirth-related PTSD risk-factors using an etiological model inspired by the transactional model of stress and coping.	PSS-SR
Halperin et al.[43]	Israel	Cohort study	171	Examine the subjective recall of childbirth experiences and PTSD symptoms of Israeli Jewish and Arab women, examine comparatively the prevalence of PTSD symptoms six to eight weeks after childbirth and to establish the factors that predict PTSD symptoms.	PSS-SR
Harris and Ayers[46]	UK	Cross sectional study	675	Determine whether women report hotspots during birth experiences and explore the content of hotspots and to examine whether particular events, cognitions or emotions during hotspots are related to increased likelihood of PTSD	PDS
Hoedjes et al.[31]	Netherlands	Cohort study	149	Describe the prevalence of postpartum PTSD based on the DSM-IV criteria, including its symptoms of intrusion, avoidance and hyperarousal after pregnancies complicated by preeclampsia, and examine which variables are associated with PTSD and its symptoms.	Self-rating Inventory for PTSD (dutch version)
Ionio and Di Blasio[8]	Italy	Cohort study	19	Investigate whether postpartum stress symptoms may affect mother–child relationships	PPQ
IsbIr et al.[30]	Turkey	Cohort study	242	Examine the relationships between PTS after birth, antenatal factors of adaptation in pregnancy, birth self-efficacy, poor postpartum adaptation and fear of childbirth, potential protective factors of support and control during and after birth.	IES-R
Kim et al.[47]	South Korea	Cohort study	251	Understand how postpartum posttraumatic stress disorder (PTSD) symptoms in mothers of high-risk infants progress and identify what factors predict postpartum PTSD	PPQ
King et al.[37]	International	Cross sectional study	157	Examine whether theoretically-derived variables of the cognitive model explain unique variance in postnatal PTSD symptoms when key demographic, obstetric and clinical risk factors are controlled for	TES
Leeds and Hargreaves[40]	UK	Cohort study	102	Determine how many women with postnatal PTSD are also affected by postnatal depression and to determine which factors might predict levels of psychopathology in women 6–12 months after the birth of a baby	PPQ, PCL
Lopez et al.[50]	Switzerland	Cohort study	175	Assess anaesthesia-linked factors in the development of acute postpartum PTSD	PCL
McDonald et al.[7]	UK	Cohort study	79	Investigate levels of childbirth-related PTS symptoms reported by women at 2 years postpartum, associations between childbirth-related PTS symptoms and parenting stress and mothers' perceptions of their child at 2 years postpartum and whether early childbirth-related PTS symptoms within the first 3 months after childbirth are associated with subsequent parenting stress and mothers' perceptions of the child	PTSDQ
Meades et al.[52]	UK	Cohort study	80	Evaluate midwife-led postnatal debriefing services in two NHS trusts	PSS-SR
Modarres et al.[32]	Iran	Cross sectional study	400	Estimate the prevalence of childbirth-related post-traumatic stress symptoms and its obstetric and perinatal risk factors among a sample of Iranian women.	Post-traumatic Symptom Scale-Interview (PSS-I)
Nicholls and Ayers[61]	UK	Qualitative	6	Explore the experience and perceived impact of childbirth-related PTSD on couples	PDS
O'Donovan et al.[19]	Australia	Cohort study	933	Examine predictors of birth-related trauma as a first step in the creation of a screening questionnaire.	PDS
Oliveira et al.[22]	Brazil	Cross sectional study	456	Examine the relationship between childhood sexual abuse (CSA), psychological and physical intimate partner violence (IPV) during pregnancy, and other covariates relate to each other and to PTSD symptoms in the postpartum period	PCL
Polachek et al.[18]	Israel	Cohort study	102	Assess the prevalence of postpartum PTSD in a cohort of women in Israel and examine factors affecting its development.	PDS
Polachek et al.[34]	Israel	Cohort study	102		PDS

Table 1 (*Continued*)

Authors	Country	Methodology	Sample size	Aim	Assessment tool/s used
				Explore the phenomenon of postpartum anxiety, depression and PTSD in a cohort of women in the general population and to investigate possible associated factors	
Schwab et al.[17]	Austria	Cohort study	52	Evaluate the proportion of women who develop post-traumatic stress disorder as a result of childbirth.	PDS
Shahar et al.[56]	Israel	Cohort study	96	Analyze the direction of relationships among symptoms of depression and PTSD.	PDS
Shlomi Polachek et al.[25]	Israel	Cohort study	101	Aimed to examine the prevalence of PTSD, both complete and partial, among women with complicated (high-risk) pregnancies, to explore possible antepartum risk factors for developing the disorder and to search for a predictive model for postpartum PTSD in this population.	PDS
Stramrood et al.[39]	Netherlands	Cross sectional study	428	Assess the prevalence of posttraumatic stress disorder (PTSD) following childbirth in homelike versus hospital settings and to determine risk factors for the development of posttraumatic stress symptoms.	TES-B
Srkalović Imsˇiragić, A., en Begić, D., Sˇ imicˇevic´, L., Bajić, Z. (2016)	Croatia	Cohort study	262	Identify predictors of posttraumatic stress disorder and its symptomatology following childbirth using a biopsychosocial model	IES-R
Takegata et al.[35]	Japan	Cohort study	238	Identify the aetiological relationships of psychosocial factors in postnatal traumatic symptoms among Japanese primiparas and multiparas	IES-R
Verreault et al.[16]	Canada	Cohort study	308	Estimate the incidence and course of full and partial Post-Traumatic Stress Disorder (PTSD) following childbirth and to prospectively identify factors associated with the development of PTSD symptoms at 1 month following childbirth	PTSD Module of the Structured Clinical Interview for DSM-IV, modified PSS-SR
Vossbeck-Elsebusch et al.[15]	Germany	Cross-sectional study	246	Replicate the association of PTSD symptoms after childbirth with predictors identified in earlier research and examine cognitive predictors derived from Ehlers and Clark's (2000) model of PTSD were examined.	PDS
Zambaldi et al.[24]	Brazil	Cohort study	400	Investigate PTSD in a sample of 400 Brazilian women between 2 and 26 weeks postpartum	Mini-International Neuropsychiatric Interview (MINI)

that were tested less frequently. For example adult attachment style,[38] primiparity[5,21,28] as well as multiparity,[30] short intervals between pregnancies,[32] unplanned pregnancy [4] and planned pregnancy,[30] low attendance at antenatal appointments,[32] poor body image,[18] fear of birth and labour pain and low sense of coherence, self efficacy or poor coping style.[30,39]

Although previous trauma has been noted as the most significant pre existing risk factor, there were two studies that showed no association between particular trauma history sub categories and risk of developing postnatal PTS/D. While Schwab et al.[17] did note previous sexual trauma and previous traumatic life events as a pre existing risk factor, they found no association between previous traumatic birth experience and the develop ment of PTS/D in subsequent pregnancy. Leeds and Hargreaves[40] examined previous traumatic life experience as a risk factor and found no association.

3.3. Intrapartum risk factors

Twenty five intrapartum risk factors were identified in 40 studies (Table 3). Operative birth, that is either caesarean section or instrumental birth, was identified 23 times throughout the literature as a risk factor for postnatal PTS/D development.[4,15,17,21,23,27,29,31–33,37–39,41–43] When subcategorised, emergency caesarean section was the most frequently identified risk factor in the operative birth category.[15,17,23,27,29,32,33,39,42] This was followed by instrumental birth[21,33,37,41,44] and elective caesarean.[4,15,17] Caesarean section in general as a risk factor, meaning those not specified as emergency or elective, was noted twice and a final subcategory on "operative birth unspecified" was created to capture the three instances in which the authors did not clearly identify the type of operative birth in their articles. In contrast, two studies did not show any association between operative birth and postnatal PTS/D.[18,20] Adewuya et al.[33] found no association between elective caesarean section and PTS/D.

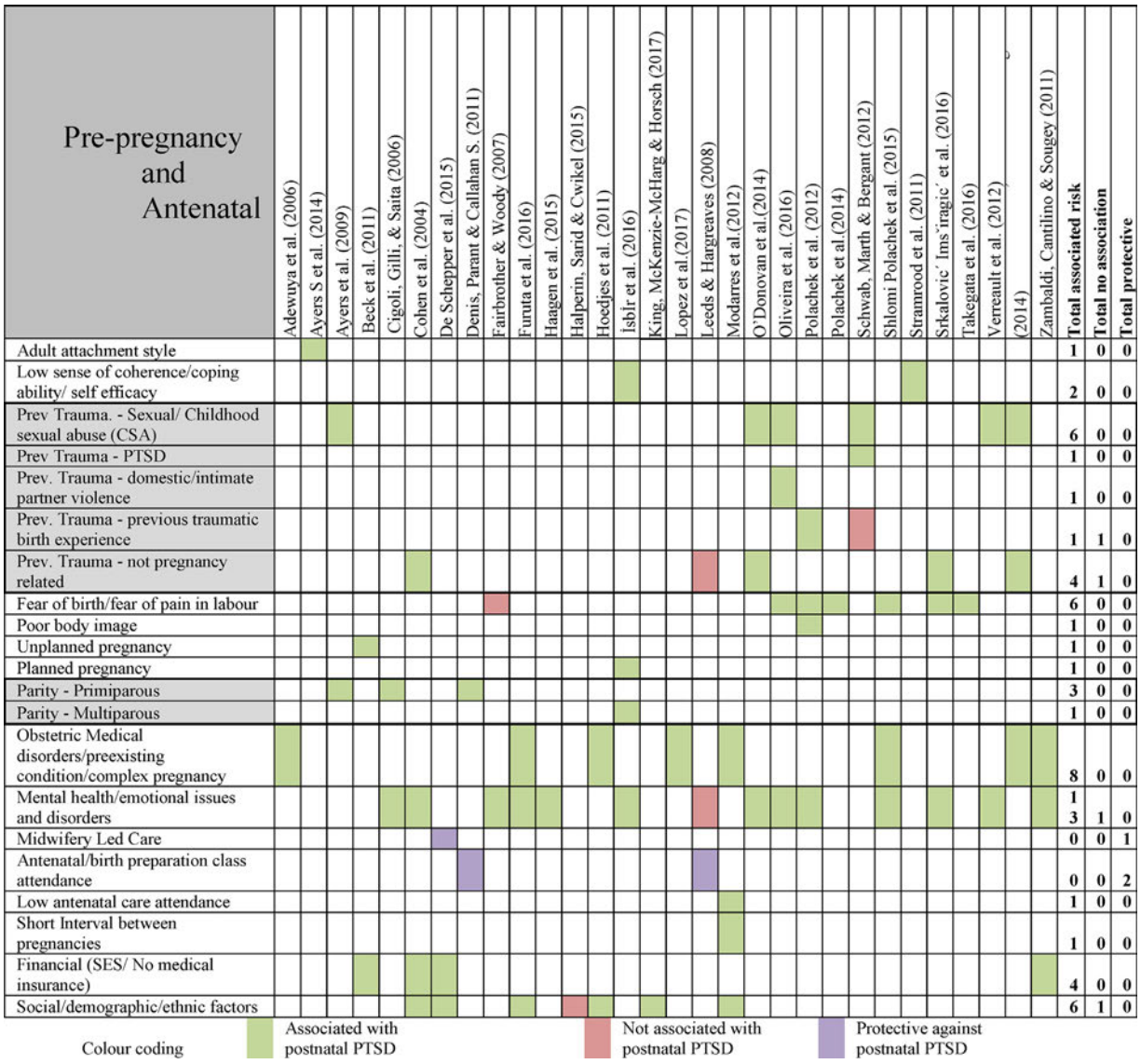
Neonatal complications, preterm birth or fear for the safety of the neonate was the second most common intrapartum risk factor, with 10 of the 40 articles reporting this association.[24,27,29,31,32,34,44–47] Traumatic obstetric event/birth experience or maternal complications during labour were also identified as risk factors for postnatal PTS/D in nine of the 40 articles.[15,23,25,36,40,46,48–50] Low support,[6,28,30,34,38,46] sense of loss of control or external locus of control[5,6,27,30,33,34,40,46] and perception of pain during labour and birth[5,18,19,39,46] were also more likely to be associated with postnatal PTS/D.

Other intrapartum factors reported less frequently in the literature included feelings of danger, threat to life or negative perception of the birth,[15,16,18,34,37,49] disassociation during la bour[26,46,50,51] subjective distress during labour,[40,43,49] pressure to agree to unwanted interventions or procedures,[4] intrapartum transfer of care[5] multiple interventions during labour and birth,[6,20] third stage of labour complications,[33] urinary catheterisation during labour,[30] rapid first stage of labour[29] anaesthesia compli cations[50] and expected level of support during labour.[35]

3.4. Postnatal risk factors

Eighteen articles identified and discussed postnatal risk factors for PTS/D (Table 4). By far the most significant risk factor throughout the literature during the postnatal period is low social

Table 2
Pre-pregnancy and antenatal factors.



support after birth.[4,14,16,18,27,28,37,41,52] This particular factor is mentioned nine of the 18 articles that discuss risk factors in the postnatal period. Social support after experiencing a traumatic event is noted as a moderator in the development of PTSD symptoms in the general population, with strong social support reducing the effect of the event for people experiencing of PTSD.[53] Friedman et al.[54] states that good social support is the most important protective factor against a traumatised individual going on to develop PTSD. When taking these facts into consideration, it is not surprising that a lack of social support after birth is identified numerous times as a postnatal PTS/D risk factor. It is also noted that generally in regard to social support and PTSD, negative responses from the members of an individual's social network can adversely affect PTSD sufferers, particularly women.[53]

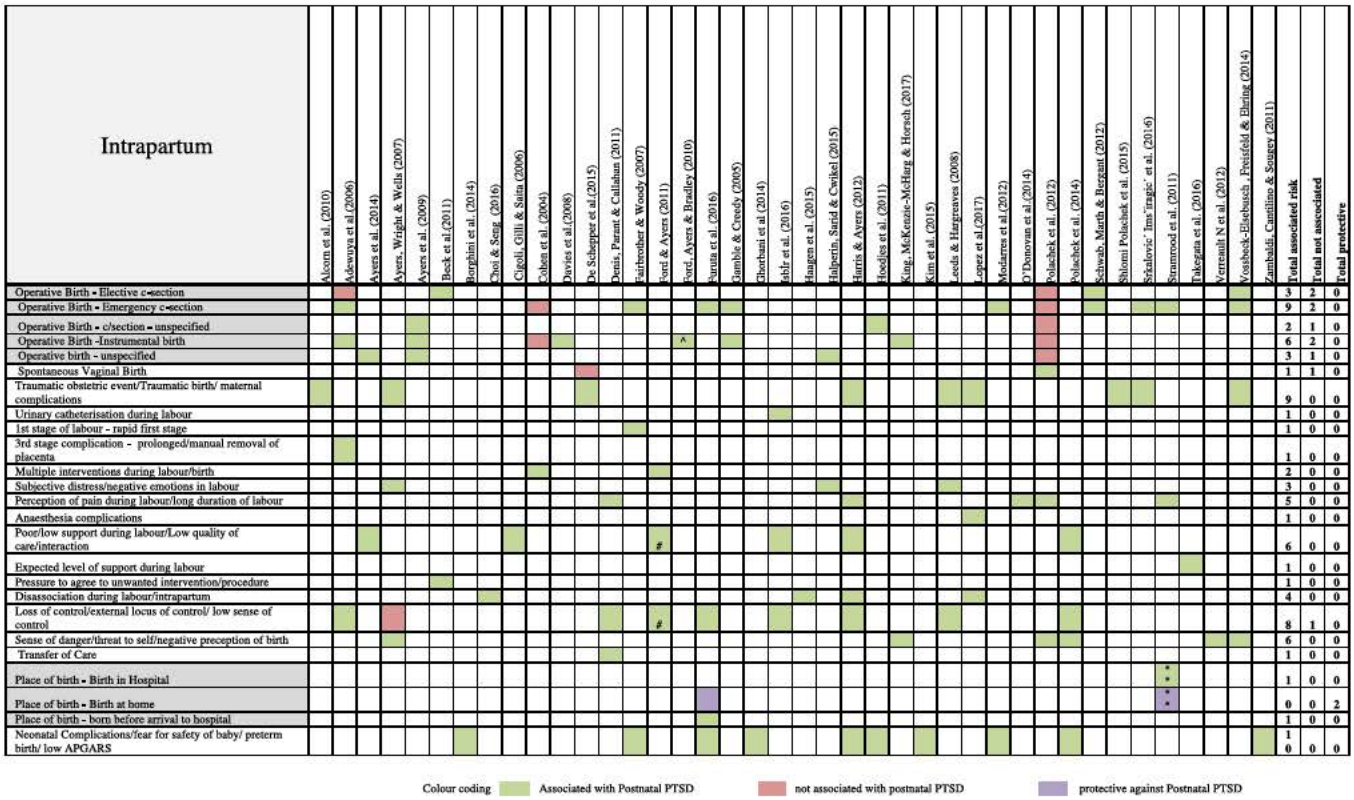
Following on from low postnatal social support, increased postnatal physical pain, trauma and maternal morbidity[4,27,50] postnatal depressive symptoms,[5,52,55,56] not exclusively breast feeding or breastfeeding as long as planned,[4,43] and postnatal consultation with a mental health professional[5,55,56] are identified multiple times as risk factors for postnatal PTS/D.

Postnatal risk factors identified at low frequency were re experiencing or reliving the birth experience,[57] low satisfac tion with hospital care,[30] insomnia,[14] dysfunctional cognition such ruminating, numbing and disorganised trauma memo ry,[37] poor self perception in relation to the birth experience,[37] poor psychological adaptation to motherhood, increased fear of birth postpartum[30] and negative maternal infant interac tions, such as negative perception of the infant, negative perception of attachment and less desire for proximity to the infant.[55]

3.5. The potential protective factors against the development of postnatal PTS/D

Of the 53 studies included in this review, only eight discussed potential protective factors against postnatal PTS/D development. During the antenatal period, two studies reported attendance at antenatal or birth preparation classes as protective against postnatal PTS/D development.[5,40] One study noted midwifery led care as a potential protective factor, reporting that team

Table 3
Intrapartum factors.



Key - * = targeted samples only ** = not significant when controlling for "uncomplicated nature of home b irth" ^ = Forceps only # = only in women with prior trauma

midwifery care was significantly associated with fewer postnatal PTSD symptoms.[36]

In terms of intrapartum potential protective factors, place of birth was noted in three of the articles as a risk factor and a protective factor for developing PTS/D. In a comparison study of birth in a homelike and hospital environment, Stramrood et al.[39] stated that, initially, their results showed that birthing in a home like setting was protective against women developing PTS symptoms and birthing in a hospital constituted a risk factor. However, they then go on to say that when controlling for the less complex nature of home birth, these protective and risk factor are nullified. Furuta et al.[27] identified home birth as a protective factor, and birth before arrival at a hospital as a risk factor for developing postnatal PTS symptoms in their secondary analysis of a large prospective cohort study of 1824 women. Haagen et al.[26] noted that women who birthed at home were least likely to have traumatic childbirth experiences, however, the authors did not comment on whether or not this was protective against developing postnatal PTS/D.

Some postnatal protective factors against the development of postnatal PTS/D have also been identified in the literature, and are included in this review. Factors identified as protective against postnatal PTS/D included uninterrupted skin to skin and baby led or immediate breastfeeding after birth,[18,58] living as part of a nuclear family and living in a city area.[23]

3.6. The impact of PTSD and PTS symptoms breastfeeding and mother infant attachment

Postnatal PTS/D symptoms have been shown throughout the literature to have a negative impact on mother infant bonding and attachment, as well as on breastfeeding rates and ability. In general, the ability to interpret infant emotions has been observed to be impaired in women with postnatal mental health disorders, causing them to be less sensitive to the needs of the infant.[59] Postnatal PTS/D has been shown to cause difficulty for women in relating to their infants and seeing the infant in a positive light. McDonald et al.[7] found that women with PTS symptoms were more likely to perceive their child as difficult, as well as being more likely to experience higher levels of parenting stress. Experiencing PTS/D in the postnatal period has also been associated with difficulties initiating positive interactions between mothers and infants, negative maternal perception of their infant and attach ment with their infant, and less maternal desire for close proximity with their infant.[8,55] Maternal PTS/D has also been found to cause anxiety in the infant.[28] Disassociation during labour, one of the intrapartum PTS/D risk factors, has been shown to have a negative effect on mother infant bonding.[51] Additionally, in the qualitative literature, women who experienced postnatal PTS/D identified issues around interacting and bonding with their infants.[9,60,61] For example, negative perception of the infant by mothers with PTS symptoms was noted by Nicholls and Ayers.[61] The authors also reported that that some women attributed more positive attributes to their infants in order to compensate for their traumatic birth experience. Women included in this study also described having poor bonds with their infants and bonding styles ranged from avoidant or rejecting, to overprotective or anxious.[61]

In addition to impacting on mother infant attachment, postnatal PTS/D has been shown to affect children's social and emotional development. Garthus Niegel et al.[62] found in a two year longitudinal study that children of women with PTSD symptoms who have displayed difficult temperament, male

Table 4
Postnatal factors.

Postnatal	Abdollahpour,Khosravi & Bolbolhaghighi (2016)	Ayers, Wright & Ford (2015)	Beck et al. (2011)	Cigoli, Gilli & Saita (2006)	Davies et al. (2008)	Denis, Parant & Callahan (2011)	Ford, Ayers & Bradley (2010)	Furuta et al. (2016)	Garthus-Niegel et al.(2014)	Halperin, Sarid & Cwikel (2015)	Ishir et al. (2016)	King, McKenzie-McHarg & Horsch (2017)	Lopez et al (2017)	Meades et al. (2011)	Polachek et al. (2012)	Shahar et al. (2015)	Sykalović´ Ims˙tragic´ (2016)	Verreault et al (2012)	**Total risks**	**Total not associated**	**Total protective**
Not exclusively breastfeeding/ not BF as long as planned																			**2**	**0**	**0**
Physical trauma/pain/complication after birth/Maternal morbidity																			**3**	**0**	**0**
Low partner/family/social support (postnatal)																			**9**	**1**	**0**
Low satisfaction with hospital care																			**1**	**0**	**0**
Consultation RE: mental health (postnatal)																			**2**	**0**	**0**
Postnatal Depressive Symptoms																			**4**	**0**	**0**
Insomnia (postnatal)																			**1**	**0**	**0**
Dysfunctional cognition (rumination/numbing)																			**1**	**0**	**0**
Dysfunctional cognition (disorganised trauma memory)																			**1**	**0**	**0**
Poor self perception RE: labour and birth																			**1**	**0**	**0**
Poor psychological adaptation to motherhood																			**1**	**0**	**0**
Increased fear of birth postpartum																			**1**	**0**	**0**
Breastfeeding immediately after birth																			**0**	**0**	**1**
Uninterrupted skin to skin and baby led BF 1st hour after birth																			**0**	**0**	**1**
Negative maternal perception of infant																			**1**	**0**	**0**
Negative maternal perception of attachment with infant																			**1**	**0**	**0**
Less maternal desire for close proximity to infant																			**1**	**0**	**0**
Living as part of a nuclear family																			**0**	**0**	**1**
Living in a city/metro area																			**0**	**0**	**1**
Re-experiencing/re-living the birth experience																			**1**	**0**	**0**

Colour coding: Associated with postnatal PTSD; Not associated with posnatal PTSD; Protective against postnatal PTSD

children in particular, are more likely to have higher levels of social and emotional problems.

3.7. How PTSD and PTS symptoms affect the lives and relationships of women

Four qualitative studies of women's experiences of postnatal PTS/D and how these conditions have impacted on their lives have been included in this literature review, in order to expand on and provide women's voices an opportunity to be heard. As traumatic events are the primary contributors to the development of PTS/D, it is important to understand from women themselves what constitutes a traumatic event during the postnatal period. It is also vital to reflect on what women find to be supportive, and what undermines them during their pregnancy, birth and postnatal experiences.

3.8. Women's perspective what makes birth traumatic and how it affects them

Being in pain, denial of analgesia and inadequate analgesia in labour contributed to women with postnatal PTSD experiencing birth as a traumatic event.[61] This supports the findings in the quantitative data that pain in labour is a potential risk factor for the development of postnatal PTSD.

Women's ability to function as they did prior to their birth experience was impeded by the development of PTS/D symptoms. Ayers et al.[9] described situations in which participants were confined to their home environment due to their heightened levels of fear, created regimented daily routines and attempted to control their environment and make it "perfect" by imposing extremely high standards upon themselves.

Women with postnatal PTS/D symptoms also described feeling mutilated, questioning their bodies, feeling extremely drained from physical pain and feeling physically depressed,[9] as well as reporting more physical problems after birth.[63] The women also developed morose and negative views of their vaginas, describing them as 'dead', 'cut', 'battered' and 'horrible', which on one occasion led to a woman constantly washing herself with antiseptic solution and pulling out her pubic hair.[9]

Negative emotions were mentioned frequently in the qualita tive studies. Some examples of negative emotions experienced during labour and birth were feeling helpless, humiliation and shock, as well as feeling violated and dehumanised.[61] Negative feelings and reactions to the birth experience in the postnatal period included suicidal ideation, depression, feelings of

inadequacy, anger, numbness, detachment and disassociation.[9,60] Women who developed postnatal PTSD described simply going through the motions of daily life and feeling isolated, anxious and depressed after their traumatic birth experiences.[60] Women's perception of a lack of autonomy was demonstrated through perception of an external locus of control, non involvement in decision making, lack of choice, being restrained and not having expectations met also contributed to birth becoming a traumatic event for women.[61]

Fear of future pregnancy and birth after a traumatic birth experience among some women who developed PTS/D led to them choosing not to have any more children, requests for tubal ligation and other forms of medical sterilisation, stringent birth planning for future pregnancies to avoid another traumatic experience and constant fear and anxiety through a subsequent pregnancy.[9,60] Women reported that their birth experience and development of postnatal PTS/D also led to sexual dysfunction due to fear of becoming pregnant and having to give birth again,[61] with one woman stating she did not have sex with her husband for seven years for fear of falling pregnant again.[9]

3.9. Postnatal PTS/D and impact on relationships

Women frequently reported that their birth experiences and subsequent PTS/D damaged or impaired the important relationships in their lives. In particular, relationships with their partners became fraught when women felt their partners did not provide adequate support or did not understand what they were experiencing.[9] Women also reported that relationship strain was caused by a lack of intimacy, loss of self esteem following birth, disagreements, poor communication and blaming partners for events during the birth.[9,61]

Relationships between women and their wider social network are also impacted by the development of postnatal PTS/D. Some women described losing social connections due to lack of trust, no desire to socialise and being trapped in their “own little world”.[9] Women also reported cutting themselves off from other mothers who had not experienced traumatic birth, as they could not cope with being around them.[60]

Women who developed postnatal PTS/D described reliving their traumatic birth experience repeatedly and being stuck in that moment in time, which impacted on their ability to interact with their infants and their partners.[60] Women needed to talk through and relive their birth experiences though revisiting the birth room, making multiple appointments with doctors and midwives and frequently re telling their birth stories, which sometimes had the detrimental effect of making them feel even more isolated and unheard.[60]

Ayers et al.[63] found that at 6 months post birth, women with PTS/D demonstrated that the narrative content of their birth stories continued to show negative emotions around the birth experience despite having a reduction in severity of PTS/D symptoms. These women also reported more postnatal mental health and physical problems and an increase in relationship difficulties with their partners compared to the women in the control group. The birth stories of women with PTSD showed that these women relived their birth experience more frequently than the women in the control group and had a tendency to focus on specific memories from the birth.[63]

3.10. Moving on from traumatic birth and PTS/D

In terms of healing the trauma, some women did report that subsequent positive birth experiences helped them to recover and feel empowered, strong and confident again.[60] This is supported by Thomson and Downe's[64] research on the redemptive quality of positive subsequent birth experiences for women who have previously experienced birth as a traumatic event.

4. Discussion

It is clear from the available qualitative research that postnatal PTS/D negatively affects women’s lives and relationships, both with their partner and their baby. What is difficult to discern from the current literature are the long term outcomes associated with postnatal PTS/D, as well as the duration of symptoms. The cohort studies reviewed often had short follow up phases, often between 6 weeks to 6 months after birth, which becomes problematic when trying to determine whether or not this is a chronic condition, as chronic PTSD is defined as PTSD which lasts more than one year.[54] Without being able to determine the duration and severity of symptoms over a longer period of time, it is difficult to assess whether or not mother infant bonding and breastfeeding issues, relationship difficulties and negative emotions and negative perceptions of pregnancy and birth continue to affect women, their partners and infants beyond six months postpartum.

Enlow et al.[65] studied the effect of PTSD on mother infant attachment and intergenerational transmission of PTSD symptoms. The authors found, in their first study, that elevated PTSD symptoms increased the incidence of insecure and disorganised mother infant attachment styles. They also found in their second study that a history of disorganised attachment in infancy predicted the severity of the infant experiencing PTSD symptoms such as hyper arousal, re experiencing and avoidance, as well as total symptoms, in late adolescence. These studies provide some valuable insight into the possible long term effects of PTSD and mother infant bonding which is not available in the literature focused on the development of postnatal PTS/D symptoms.

Impaired or damaged relationships as a result of postnatal PTS/D is a crucial area for further investigation, considering that the highest risk factor for developing PTS/D after birth is low social support, as demonstrated in the quantitative data. If a woman has multiple risk factors for postnatal PTS/D, the erosion of her social support network can lead to a significant increase in likelihood that she will go on to develop PTS/D in the postnatal period.

An interesting similarity between the qualitative and quantitative data is support during labour and birth. Support during labour for women with postnatal PTS symptoms was identified as an important factor in their birth experience,[63] which correlates with findings in the quantitative data relating to low support during labour and birth and its relationship to the development of postnatal PTS/D. This particular risk factor could be managed by increasing awareness of, and education about women who may be vulnerable to developing psychological disorders such as postnatal PTS/D, as demonstrated by the success of McKenzie McHarg et al.’s[66] “Think Pink!" psychological alert sticker study. The author's found that through identifying women at risk of experiencing psychological distress antenatally and communicating this risk by marking women's pregnancy record with a pink sticker, vulnerable women did not require referral to psychological services as a result of experiencing birth as a traumatic event.[66]

Considering that the themes of social support and quality of care in labour have emerged in both the quantitative and qualitative research, it would be beneficial to consider the value of midwifery led care for women at increased risk of developing postnatal PTS/D. Midwifery led care has been noted as a protective factor against PTS/D, although this area is under investigated at this point in time. It would be pertinent to extend the research into midwifery led care as a protective factor, particularly in regard to continuity of care models. Sandall et al.’s[67] systematic review showed that women who participate in midwifery led continuity of care models are less likely to experience obstetric interventions,

such as regional analgesia, caesarean section and instrumental birth, and are more satisfied overall with their care. Continuity of midwifery care models could potentially reduce risk factors for PTS/D through the provision of care with a known provider and the opportunity to develop a high quality, professional woman midwife relationship throughout the pregnancy, birth and postnatal journey.

Based on the multitude of identified risk factors for women who may develop postnatal PTS/D, a clear step to take towards understanding the phenomenon of postnatal PTS/D is to create a pregnancy specific predictive model of PTSD and PTS symptoms and test the validity of the model in future studies. PTS/D clearly does not evolve from a single risk factor alone, as demonstrated by Ehlers and Clarke's predictive model for PTSD.[68] Ehlers and Clarke's predictive model has been well validated and shows that PTSD develops in the context of characteristics of the individual and prior beliefs, characteristics of the traumatic event, coping ability of the individual and cognition during the traumatic events, further compounded by negative appraisal of the trauma and its sequelae and nature of the trauma memory.[68] King et al.[37] applied the Ehlers and Clark predictive model to a population of postnatal women and found that including cognitive behavioural factors, in conjunction with identified risk factors, helped to explain 73.7% variance in postnatal PTS/D. Risk factors alone only accounted for 43% of symptoms variance.[37] Ayers et al.[69] proposed an updated diathesis stress model for predicting the development postnatal PTSD based on systematic review and meta analysis of PTSD risk factors, which is yet to be tested. Further investigation into predictive models for postnatal PTS/D, inclusive of maternal and obstetric risk factors, as well as cognitive behavioural factors, is needed to assist in early identification of women at risk of developing postnatal PTSD. The map of maternal, cognitive and obstetric risk factors, displayed in Fig. 2, can be used to aid further research into identifying and testing the risk and protective factors associated with postnatal PTSD.

The benefit of testing predictive models for postnatal PTS/D is that it may facilitate early identification of women at risk of developing postnatal PTS/D during first antenatal contact, or booking in, visits and therefore provides an early opportunity for midwives to refer at risk women to appropriate support services, such as perinatal mental health services or sustained early childhood nurse home visiting programs, and continuity of midwifery models of care, in order to reduce the risk of developing postnatal PTS/D.

Kemp et al.'s RCT[70] demonstrated that sustained home visiting programs improved child development outcomes and the experience of mothering for women identified as having antenatal psychosocial distress. Considering that antenatal psychosocial stressors, child development and experience of mothering have been identified in this review as risk factors for postnatal PTS/D, this intervention warrants further investigation as a potential protective factor against postnatal PTS/D development. Engagement with specialist perinatal mental services for women at risk for postnatal PTS/D development is another intervention that requires further investigation, considering that insecure adult attachment style, previous experience of trauma and difficulties with mother infant bonding have been identified as postnatal PTS/D risk factors. Working with specialist perinatal mental health clinicians has been shown to help identify women with complex trauma histories and helps to improve mother infant attachment through clinicians modeling secure attachment relationships with their clients.[71]

In terms of midwifery led interventions for the treatment of postnatal PTS/D, Gamble et al.'s[72] RCT showed that a brief counseling intervention can be successfully implemented by midwives with some basic counseling training, without causing

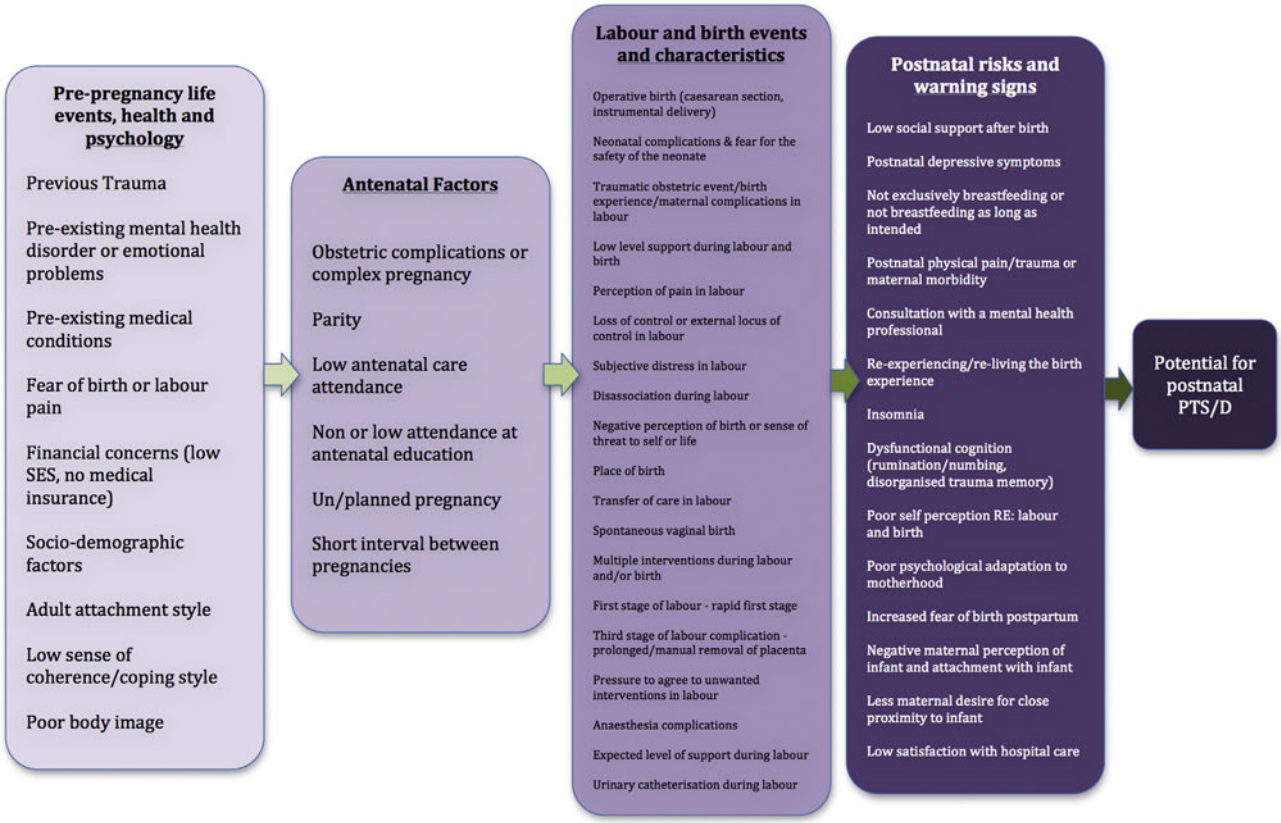


Fig. 2. Mapping the variables associated with risk of postnatal PTS/D through the pregnancy, birth and postnatal journey.

any harm to women. This simple counseling intervention benefited women in the intervention arm of the RCT by reducing their trauma symptoms and accelerating their psychological recovery,[72] thus midwifery led counseling for women experiencing postnatal PTS/D warrants further investigation in future research.

4.1. Limitations

There are several limitations of this integrative review of the literature. Firstly, there was some difficulty synthesising the quantitative data due to the variety of perspectives, or lenses, of the authors of each study. For example, researchers who are examining the phenomenon of postnatal PTS/D through the lens of psychology will have different interests and identify different risk factors than those looking through the midwifery lens. Homoge neity of terminology may be affected and particular data may be captured under an incorrect category or captured in multiple locations. An example of this would be the Traumatic obstetric event/Traumatic birth experience/maternal complications in labour (current) category and the operative birth group. A traumatic obstetric event may be covered in the operative birth group, however, without clear definition of what a traumatic obstetric event constitutes, it is near impossible to get a true representation of the data for each category of risk.

Secondly, the short follow up periods in the majority of the cohort studies also limited this review to some extent. As previously stated, the lack of follow up beyond six months postpartum does not give an accurate picture of the duration of postnatal PTS/D and creates difficulties in assessing the long term impact of these conditions.

Lastly, studies that discuss PTS symptoms do not always include criteria to indicate what PTS symptoms means or covers. While some studies clearly outline what is meant by PTS symptoms, or partial or subclinical PTSD, this is not the case in all the studies.

5. Conclusion

In conclusion, there are a number of recommendations to be made. Firstly, that predictive models for postnatal PTS/D, inclusive of maternal, obstetric risk factors and cognitive behavioural factors, be trialed in future research in order to effectively identify women who may be at risk of developing PTSD and enable referral to appropriate models of care. Secondly, to ensure that the negative effects of postnatal PTS/D are reduced through further investiga tion into appropriate models of pregnancy care, interventions and treatment strategies. Finally, that further research is done to investigate the potential protective benefits, or otherwise, of additional social support services, midwifery led care and home birth or birth in a home like setting in relation to the development of postnatal PTS/D, as these areas are currently under researched and may contribute to the prevention of postnatal PTS/D.

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Supporting midwifery is the answer to the wicked problems in maternity care

Hannah G Dahlen • Daniela Drandic • Neel Shah • Franka Cadee • Address Malata

Open Access • Published: July, 2022 • DOI: https://doi.org/10.1016/S2214-109X(22)00183-8 •

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PlumX Metrics

The film *Don't Look Up*, examines what it will take to get world leaders and the public to be proactive about a comet that is on a collision course with earth. We argue that the same attitude of self-interested denialism is stopping crucial action being taken when it comes to supporting midwifery models of care to address the current problems in maternity care.

Although life-saving when indicated, medical interventions in childbirth can be harmful when overused.[1] A challenge in striking the right balance is that the bar for benefit when it comes to birth outcomes has been set at immediate survival. This approach overlooks clinical complications, such as placenta praevia or accreta associated with caesarean, and fails to value the personal autonomy of women and communities. In global settings, caesarean section rates, which are often used as a proxy to understand the safety of a maternity system, have recently come under scrutiny. Inquiries into adverse outcomes in the Shrewsbury and Telford Hospital National Health Service Trust in the UK has led to sensational media reporting and concerns about the dangers of setting caesarean section targets.[2] This reporting has led to a focus on individual decision makers rather than faulty systems. We know a bad system will beat the best health-care provider every time

The centrality of midwives in supporting the physiological process of giving birth is at the core of this debate. Midwives have been singled out for blame when it comes to poor outcomes, with little consideration given to the fragmented models of care they work in, where they do not always have professional autonomy and respectful collaboration. This attitude creates an environment of professional and philosophical conflict that does not put women's optimal care and needs at the centre. Relational models of care such as continuity of midwifery care, which are supported by high-level evidence as being cost effective and leading to optimal outcomes,[3] are ignored. Such models have the potential to save 4·3 million lives per year,[4] but realising this opportunity requires a deeper understanding of why they are not reaching scale.

The way we treat women during pregnancy, childbirth, and postpartum, and the institutional options of care we provide them within health systems, directly reflect the way we value women in our societies. In too many settings we are ignoring the benefits of midwifery models of care, degrading the status of midwives, and removing financing from midwifery services and education, under the guise of safety that ignores physiology and women's chances for optimal mental and physical health.

There is a shortage of approximately a third of the midwives we need globally, which is crucial considering that midwives who are educated and regulated to international standards of care can provide 87% of essential maternity care needs and would prevent 67% of maternal deaths, 64% of newborn deaths, and 65% of stillbirths.[4] Midwifery provides a 16 times return on investment.[3, 5] Evidence is mounting on how midwives improve maternity care globally; yet, midwives are leaving the profession—burned out, disillusioned, and under valued.[6] The latest sensationalised media reporting in the UK has demoralised midwives even more, with global impacts. As a predominantly female profession, midwives continue to be marginalised, overworked, poorly paid, and do not have decision making authority in many countries.[6]

The aim of intervening in the physiological processes of pregnancy and birth is to improve outcomes and safety for women and babies.[7] Commonly used birth interventions such as caesarean sections and induction, which were previously used to treat obvious complications, are used more commonly for women that are unlikely to benefit from them, and can even cause harm to healthy women.[8, 9] These harms contribute to gender, racial, and geographical inequities, and there is growing concern regarding generational inequities. Less concern is afforded to women suffering from birth trauma, which is higher following intervention in birth, especially when women feel poorly informed and coerced into this.[10]

Although high-income countries (HICs) often drive the dominant discourse when it comes to maternity care, in some low-income and middle-income countries (LMICs) women cannot access a safe caesarean section even when it is needed, demonstrating significant inequalities in maternal care.[11] Caesarean section rates have escalated in LMICs without adequate training or access to additional skills such as anaesthetics, leading to deadly outcomes; and maternal mortality rates are up to 100 times higher in LMICs than HICs.[12] There is increased economic hardship for communities and stretched health systems, and distrust of hospital care and health-care providers.[8] Women who become pregnant after caesarean section are at a higher risk of subsequent surgery, with inadequate attention given to additive morbidity over their reproductive life course.

The use of technology and interventions in childbirth scale up quickly and are difficult to de-implement, even when there is evidence of harm. Fiscal accountability and resource-intense care that contributes to the health-care carbon footprint (10% of the US total) should be key considerations.

To meet the 2030 Sustainable Development Goals and prevent an unfolding disaster, we call for urgent action and a united voice on the four main groups of action in the Midwifery 2030 Pathway (panel).[13]

+ Panel

Safe care means respectful care that is informed by women and provided by a known midwife who provides a relational model of care within a responsive, collaborative, and evidence-based health system. Sustainable care happens in health systems that prioritise finite health-care resources, are cognisant of their environmental impact and responsibilities, and value and protect their workforce. Midwifery care uses more efficient resources and provides better outcomes and value than other models of maternity care.[5] In light of growing global crises and misinformation, now is the time to provide a united and diligent response to humanise and de-escalate the overmedicalisation of maternity services. What will it take to get the world to “look up” when it comes to maternity care?

We declare no competing interests.

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Article info

Publication history

Published: July 2022

Identification

DOI: https://doi.org/10.1016/S2214-109X(22)00183-8

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