Women and Birth xxx (xxxx) xxx

Contents lists available at ScienceDirect

Women and Birth

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

The financial impact of offering publicly funded homebirths: A population-based microsimulation in Queensland, Australia

Yanan Hu [a], Jyai Allen [a,b], David Ellwood [c,d], Valerie Slavin [a,d,e], Jenny Gamble [e,f], Jocelyn Toohill [f,g], Emily Callander [a,*]

[a] Monash Centre for Health Research and Implementation, Faculty of Medicine, Nursing and Health Sciences, Monash University, Melbourne, Australia
[b] Molly Wardaguga Research Centre, Charles Darwin University, Brisbane, Australia
[c] School of Medicine & Dentistry, Griffith University, Gold Coast, Australia
[d] Gold Coast University Hospital, Gold Coast Hospital and Health Service, Southport, Australia
[e] School of Nursing and Midwifery, Griffith University, Gold Coast, Australia
[f] School of Nursing, Midwifery and Health, Coventry University, Coventry, United Kingdom
[g] Clinical Excellence Division, Queensland Health, Queensland, Australia

ARTICLE INFO

Keywords:
Cost saving
Birth
Planned homebirth
Models of care

ABSTRACT

Background: Despite strong evidence of benefits and increasing consumer demand for homebirth, Australia has failed to effectively upscale it. To promote the adoption and expansion of homebirth in the public health care system, policymakers require quantifiable results to evaluate its economic value. To date, there has been limited evaluation of the financial impact of birth settings for women at low risk of pregnancy complications.
Objective: This study aimed to examine the difference in inpatient costs around birth between offering homebirth in the public maternity system versus not offering public homebirth to selected women who meet low-risk pregnancy criteria.
Methods: We used a whole-of-population linked administrative dataset containing all women who gave birth in Queensland (one Australian State) between 01/07/2012 and 30/06/2018 where publicly funded homebirth is not currently offered. We created a static microsimulation model to compare the inpatient cost difference for mother and baby around birth based on the women who gave birth between 01/07/2017 and 30/06/2018 (n = 36,314). The model comprised of a base model – representing standard public hospital care, and a counterfactual model – representing a hypothetical scenario where 5 % of women who gave birth in public hospitals planned to give birth at home prior to the onset of labour (n = 1816). Costs were reported in 2021/22 AUD.
Results: In our hypothetical scenario, after considering the effect of assumptive place and mode of birth for these planned homebirths, the estimated State-level inpatient cost saving around birth (summed for mother and babies) per pregnancy were: AU$303.13 (to Queensland public hospitals) and AU$186.94 (to Queensland public hospital funders). This calculates to a total cost saving per annum of AU$11 million (to Queensland public hospitals) and AU$6.8 million (to Queensland public hospital funders).
Conclusion: A considerable amount of inpatient health care costs around birth could be saved if 5 % of women booked at their local public hospitals, planned to give birth at home through a public-funded homebirth program. This finding supports the establishment and expansion of the homebirth option in the public health care system.

Statement of significance

Problem or issue

What is the financial impact of offering planned homebirth in public health care system?

What is already known

Homebirth has been associated with fewer birth interventions, positive maternal experiences, no greater risk of neonatal

* Correspondence to: University of Technology Sydney, Building 10, Level 8, Room 109, 235-253 Jones Street, Ultimo, NSW 2007, Australia.
E-mail address: Emily.Callander@uts.edu.au (E. Callander).

https://doi.org/10.1016/j.wombi.2023.07.129
Received 24 March 2023; Received in revised form 17 July 2023; Accepted 19 July 2023

mortality or morbidity, reduced hospital resource utilisation and lower costs.

What this paper adds

Our results showed that a considerable amount of inpatient health care costs around birth could be saved (to both public hospitals and public hospital funders), if 5 % of women booked at their local public hospitals, planned to give birth at home through a public-funded homebirth program.

Data Availability

Individual level data from this study cannot be shared by the research team, due to the ethics approval and access approvals granted. Requests for access to the individual level data may be made directly to the data custodians via the Queensland Health, Statistical Services Branch with appropriate ethics and relevant approvals. The author scan share the Data Dictionary upon request.

Introduction

Childbearing women are consistently seeking greater autonomy and wider choices for the place of birth, with increasing demand for out-of-hospital birth services (e.g., homebirth and birth centre) [1,2]. For women with low-risk pregnancies, planned homebirth compared to planned hospital birth is safe and it is associated with fewer birth interventions, positive maternal experiences, and no greater risk of neonatal mortality or morbidity [3–7]. In addition to clinical benefits, shifting the balance from hospital birth to homebirth has the potential to reduce some of the financial burden on the public health care system. Hospital care is the largest area of health expenditure (41 % in 2020–2021) with childbirth being the most frequent reason for hospitalisation of women aged 15–44 years [8].

In 2020, 96 % of births in Australia took place in hospitals, 2.9 % in birth centres, 0.7 % in other settings (e.g., born before arrival to hospital), and homebirth accounted for 0.4 % of all births [9]. The low rate of homebirth has persisted despite the implementation of public homebirth in six out of eight states and territories [10]. Other countries with similar public health care systems to Australia have embedded homebirth programs in their mainstream maternity services, generally increasing the percentage: the Netherlands (16.3 % homebirths) [11], New Zealand (3.5 % homebirths) [12], the United Kingdom (2.4 % homebirths) [13], and Canada (2.1 % homebirths) [14]. At 0.4 %, Australia is clearly lagging.

To promote the adoption and expansion of public-funded homebirth programs, policymakers require quantifiable results based on real-world data to evaluate their economic value. To date, evaluation of the financial impact of various birth settings for women at low risk of complications has been limited [15]. A microsimulation model captures the impact of change before it occurs in practice, thus allowing decision-makers to compare available alternatives before implementation [16].

This study aimed to quantify and examine the difference in inpatient costs around birth between public-funded homebirth being offered and the standard maternity care from the perspective of the public health care system. To achieve this, a microsimulation model was constructed using data from one Australian state (Queensland), where public-funded homebirths are not currently available [10], but have been recommended [17].

Methods

We created a static microsimulation model (Fig. 1) of mother and baby health service inpatient costs around birth. This includes the: (i) *base model* containing details of the status quo ('before change' – current standard maternity care); and (ii) *counterfactual model* estimating change under a hypothetical scenario ('after change' – in this case, 5 % of women planned to give birth at home through the public homebirth program) [18]. All analyses were performed using SAS V9.4.

Dataset

This study used a whole-of-population linked administrative dataset including all women who gave birth in Queensland, Australia between 01/07/2012 and 30/06/2018 (n = 359,089 women) [19]. Birthing women and their babies were identified using the Queensland Perinatal Data Collection (QPDC), a mandatory repository for the details of all births in the Australian state of Queensland. Variables used in this study include women's sociodemographic and clinical characteristics prior to and during pregnancy and birth, and birth details including medical interventions performed. These data were then linked to the Queensland Hospital Admitted Patient Data Collection, which records all inpatient events in private and public hospitals in Queensland and includes the Australian Refined Diagnosis Related Groups (AR-DRG) code and admitted date for each admission.

There were 226,972 records of women who gave birth in public hospitals, after excluding the missing data on the included variables (n = 8394), 218,578 women were included in our analysis (Fig. 1).

The base model

The base model included 36,314 women who gave birth in public hospitals between 01/07/2017 and 30/06/2018, including private obstetrician (specialist) care, general practitioner obstetrician care, shared care, combined care, public hospital maternity care, public hospital high-risk maternity care, team midwifery care, midwifery group practice caseload care, and remote area maternity care, as defined by the Maternity Care Classification System (MaCCS) [20].

The counterfactual model

The simulation estimated the inpatient health costs of birth in a hypothetical scenario where 5 % of included women who gave birth in public hospitals would plan to give birth at home prior to the onset of labour. Public homebirth would only be available to women with low-risk pregnancies. For this study, women who had a low-risk pregnancy were defined as not having any of the following characteristics before the onset of labour: a multiple birth (i.e., twins or triplets), preterm (gestation less than 37 weeks), post-term (gestation more than 41 weeks), a non-cephalic presentation, obesity (self-reported body mass index in the four to six weeks prior to or at conception $\geq$ 30), had a previous caesarean section, grand gravidity ($\geq$ five previous pregnancies), or any maternal medical condition which may significantly affect pregnancy or its management (including "pre-existing maternal conditions, hypertension or diabetes, and other diseases, illnesses or conditions arising during the current pregnancy, that are not directly attributable to pregnancy but may significantly affect care during the current pregnancy and/or pregnancy outcome", as defined by the QPDC) [21].

Two sub-datasets were created from the base dataset: the first containing 95 % of the total included women, whose health resource use remained as it was recorded on the base dataset (n = 34,498); the second comprising 5 % of the total included women (all satisfied the criteria for low-risk pregnancies), whose health resource use were imputed (n = 1816) – imputation detailed in 'process of simulation'.

The two sub-datasets were merged after the simulation to represent

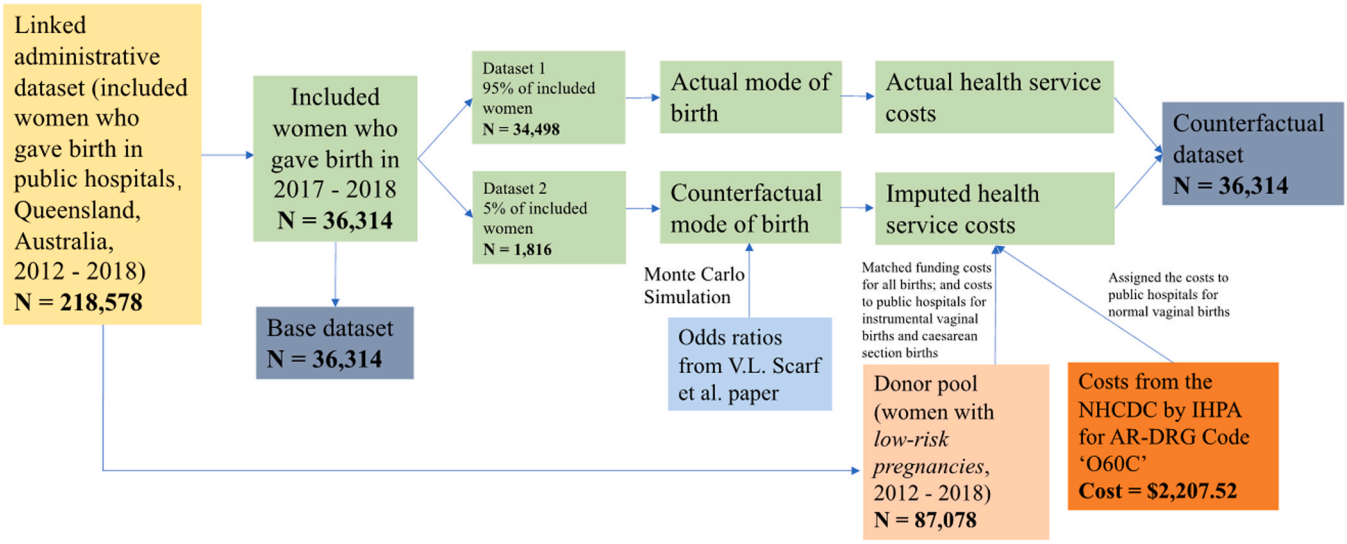

Fig. 1. Generation of the microsimulation models using linked administrative data – women who gave birth in public hospitals, Queensland, Australia, 2012–2018. Abbreviation: NHCDC = National Hospital Cost Data Collection; IHPA = Independent Hospital Pricing Authority; AR-DRG = Australian Refined Diagnosis Related Groups. $ = AUD 2021/22.

the State-level impact 'after change', and total costs per year and mean costs per pregnancy (summed for mother and babies) were compared with those in the base model ('before change').

Process of simulation

Firstly, the actual ('before change') proportions of the mode of birth were calculated for these women who were hypothetically assigned to have planned homebirths (n = 1816): caesarean section (without labour), caesarean section (with labour), normal vaginal birth (without vacuum or forceps), and instrumental vaginal birth (with vacuum or forceps). The relative risk ratios by planned place of birth from a previous study [3] were then applied to generate counterfactual probabilities for each mode of birth if all these women planned to give birth at home (Table 2). Monte Carlo simulation was used to randomly assign the mode of birth to these planned homebirths [22].

Secondly, the corresponding inpatient health service use around birth for the planned homebirths ('recipient' records) were then imputed by matching to similar women who had the same sociodemographic and clinical characteristics, and mode of birth ('donor' records), which were drawn from all low-risk pregnancies from 01/07/2012 to 30/06/2018 (n = 87,078). Recipient records were then assigned based on the inpatient health service use of the donor records, thus representing the counterfactual scenario. This recreates the observed dynamics in inpatient health service use captured in the real-world data [23]. Radius matching was used and matching scores were based on the mother's age, if it was the mother's first pregnancy, smoking status before 20 weeks' gestation, Indigenous identification (Aboriginal and/or Torres Strait Islander), socioeconomic status (Socio-Economic Indexes for Areas (SEIFA) [24]), and rurality of residence (Accessibility/Remoteness Index of Australia (ARIA+) [25]) [26]. These variables were chosen as they have been shown to be associated with total public health care costs but not influenced by the mode of birth [27]. Recipient and donor records were matched if their score fell within 0.02 standard deviations of the logit of the matching score, using the greedy matching technique.

Identification of 'around birth'

The inpatient services 'around birth' were identified based on the difference between the admitted date of inpatient service and the birth date. The dataset recorded only the month and year of inpatient services dates and birth. This was a requirement from the data custodians to minimise the risk of identification. Therefore, for this study, the period of time 'around birth' includes the health services used during the same month as the birth month.

Identification of inpatient health service costs

Costs from the public hospital funders' perspective

In Australia, the health services in hospitals are funded based on Activity Based Funding, which means that health service providers receive fixed payments from the funders based on the type of activity performed. The activities are classified into specific classes based on whether a similar amount of resources are used [28,29]. Inpatient services are classified based on the AR-DRG code, thus we assigned the inpatient costs to public hospitals funders (Federal and state governments) based on the average cost for each AR-DRG classification identified from the National Hospital Cost Data Collection (NHCDC) produced by the Independent Hospital Pricing Authority (IHPA) [30], and adjusted in accordance with the adjustments specified in the National Efficient Price Determination [31]. It was assumed that funding per pregnancy, even for planned homebirth, would continue to be based on the current AR-DRG code, which stipulates the mode of birth, not the location of birth.

Costs from the public hospitals' perspective

From the public health care providers' (i.e., public hospitals) perspective, the actual incurred expenses that be attributed to the provision of inpatient care are generally different from the funding costs from public hospital funders. Thus, the actual costs to public hospitals were extracted from the Clinical Costing Unit records from Queensland Heath. For the simulation of this study, it was assumed that mother and baby with a normal vaginal birth at home had no inpatient admission at time of birth, so the inpatient costs to public hospitals were assigned based on corresponding AR-DRG (O60C 'Vaginal Delivery Single Uncomplicated W/O Other Condition') cost weights for the 'ward nursing (midwifery) direct and overhead costs' from the Round 23 (2018–19) NHCDC by IHPA (costs = $2207.52 after inflation, which is similar to results from a micro-costing study [32]). This was assumed to cover the costs of two midwives' time attending the homebirth. For births not occurring as normal vaginal birth, the actual inpatient costs to public hospitals were imputed from matching to the donor pool.

For each pregnancy, the costs were summed up for the mother and baby/babies (if twins or triplets) of their inpatient service use around birth. The same woman can be included more than once if she had multiple birth episodes during 2017/18. All costs were inflated to 2021–2022 Australian dollars based on the Reserve Bank of Australia Inflation Calculator [33]. Australian dollars are presented throughout.

Results

We included 36,314 public-funded women who gave birth in public hospitals in Queensland, Australia between 01/07/2017 and 30/06/2018, and 34.57 % (n = 12,555) were classified as low-risk pregnancies. The sociodemographic and obstetric characteristics of women included in our base model were presented in Table 1. Compared with women who did not satisfy the low-risk pregnancy criteria, women with low-risk pregnancies were younger, and less likely to have the most advantaged socioeconomic status, live in major cities, had previous pregnancies, smoke before 20 weeks of gestation, and identify as Indigenous.

Table 2 shows the proportion and mean cost of four types of mode of birth for planned homebirths (n = 1816) in the base model and counterfactual model. In the base model, representing current standard maternity care, 75.11 % of women had normal vaginal births, 12.28 % of women had instrumental vaginal births, 10.79 % of women had caesarean sections with labour, and 1.82 % of women had caesarean sections without labour. In the counterfactual model, if 5 % of women who gave birth in public hospitals planned to have homebirths, 89.10 % of them would have normal vaginal births and thus hypothetically gave birth at home, whilst 10.90 % of them would need to be transferred to hospitals: 5.01 % of them would have instrumental vaginal births, 4.07 % of them would have caesarean sections without labour, and 1.82 % of them would have caesarean sections without labour. In total, costs to public hospitals for these planned homebirths would reduce from $17.49 million to $6.48 million; costs to public hospital funders would reduce from $41.16 million to $34.37 million. On per pregnancy basis, costs to public hospitals for normal vaginal births would decrease from $7769.76 to $2207.52 (as assumed).

Table 3 shows the State-level impact on mode of birth rates and costs if 5 % of women who gave birth in public hospitals were planned homebirths. Total costs to public hospitals for all births in Queensland would decrease from $497.99 million to $486.99 million; and costs to Queensland public hospital funders would decrease from $941.69 million to $934.90 million.

Table 1
Sociodemographic and obstetric characteristics of women at the base model – women who gave birth in public hospitals, Queensland, Australia, 2017–2018.

Variables	Low-risk pregnancies N, %	Non-low-risk pregnancies N, %	All N, %
Total	12,555, 34.57	23,759, 65.43	36,314
Mother's age (years) Mean ± standard deviation	28.32 ± 5.27	29.97 ± 5.70	29.40 ± 5.61
Socioeconomic status (SEIFA)			
1st quintile (most disadvantaged)	1256, 10.00	2132, 8.97	3388, 9.33
2nd quintile	606, 4.83	1267, 5.33	1873, 5.16
3rd quintile	2528, 20.14	4919, 20.70	7447, 20.51
4th quintile	6561, 52.26	10,237, 43.09	16,798, 46.26
5th quintile (most advantaged)	1604, 12.78	5204, 21.90	6808, 18.75
Rurality of residence (ARIA+**)**			
Major city	7207, 57.40	14,128, 59.46	21,335, 58.75
Inner regional	2991, 23.82	4673, 19.67	7664, 21.10
Outer regional	1989, 15.84	4249, 17.88	6238, 17.18
Remote and very remote	368, 2.93	709, 2.98	1077, 2.97
First pregnancy			
Yes	4729, 37.67	5732, 24.13	10,461, 28.81
No/Not stated	7826, 62.33	18,027, 75.87	25,853, 71.19
Smoking status before 20 weeks' gestation			
Yes	1397, 11.13	3943, 16.60	5340, 14.71
No/Not stated	11,158, 88.87	19,816, 83.40	30,974, 85.29
Indigenous status (Aboriginal and/or Torres Strait Islander)			
Yes	780, 6.21	2101, 8.84	2881, 7.93
No/Not stated	11,775, 93.79	21,658, 91.16	33,433, 92.07

Abbreviation: SEIFA = Socio-Economic Indexes for Areas; ARIA+ = Accessibility/Remoteness Index of Australia.
% is column percent except for 'total'.

Discussion

The results of this study demonstrated that offering public-funded homebirth to women with low-risk pregnancies would generate substantial cost savings for public hospitals ($11 million if offered to 5 % of women who gave birth in public hospitals) and their funders ($6.79 million) by reducing hospital admissions associated with childbirth. The finding aligns with previous research that homebirth has been associated with reduced hospital resource utilisation and lower costs [15,34–36]. In addition to short-term cost savings around childbirth, a lower rate of caesarean section further reduces the likelihood of caesarean section in following births which will potentially generate cumulative long-term economic value [37]. Along with the financial impact of other clinical benefits (e.g., lower odds of maternal infection, epidural analgesia, episiotomy [6], and postpartum haemorrhage [38]) not included in our microsimulation model, these prospected financial savings could further reduce health costs associated with the initiation of public-funded homebirth programs over time.

In addition to financial benefits, a cross-sectional study examining women's experiences of current public-funded homebirth programs showed a high satisfaction rate [39]. Women choose out-of-hospital birth for various reasons, dominated by previous negative experiences of hospital birth, while home feels more comfortable [40]. The COVID-19 pandemic further escalated women's demand for birth at home and birth centres as women have increasingly wanted to avoid hospital settings [41]. All childbearing women have a right to receive respectful, supportive and self-determined care [42].

Public-funded homebirth is available in most states and territories in Australia through 15 services [10]. Despite this, the number of women accessing these services is very low, partly due to the lack of easily accessible information [43], limited available places, and restrictive eligibility criteria [10]. Indeed, our analysis showed that only one in three women would meet general low-risk pregnancy criteria. Due to the limited number of public-funded homebirth programs being offered, women may access homebirth with private midwives. However, availability is still restricted due to affordability issues to women and the number of midwives in private practice declining [40,44]. A lack of access to the preferred birth setting (e.g., homebirth and birth centres) might force women to choose freebirth (i.e., without a midwife or doctor), which exposes mother and baby to a significantly increased risk of adverse health outcomes [1,40,45].

It is important to note that the intended place of birth might differ from the actual place of birth. One key concern regarding the safety of homebirth relates to the need for hospital transfer either antenatal, intrapartum or postnatal. In our simulation for low-risk women who plan homebirth, the hypothetical transfer rate was 10.90 % for operative births, which is comparable to the transfer rates reported in two

Table 2
Mode of birth and mean inpatient cost of *planned* homebirths in the base model and counterfactual model – public hospitals, Queensland, Australia, 2017–2018.

Mode of birth	Base model – current standard care			Counterfactual model – planned homebirth		
	N, %	Mean inpatient cost to public hospitals ± SD	Mean inpatient cost to public hospital funders ± SD	N, %	Mean inpatient cost to public hospitals ± SD	Mean inpatient cost to public hospital funders ± SD
Normal vaginal birth	1364, 75.11	$7769.76 ± $6386.18	$21,261.52 ± $9120.86	1618, 89.10	$2207.52 ± $0.00	$18,054.19 ± $6738.28
Instrumental vaginal birth	223, 12.28	$11,082.67 ± $6908.18	$22,647.40 ± $6769.30	91, 5.01	$9750.73 ± $4847.60	$19,432.36 ± $6305.05
Caesarean section with labour	196, 10.79	$18,352.79 ± $18,834.78	$28,778.54 ± $11,510.21	74, 4.07	$16,212.14 ± $6799.30	$25,991.38 ± $7143.59
Caesarean section without labour	33, 1.82	$24,916.58 ± $58,711.73	$44,345.95 ± $92,491.80	33, 1.82	$24,916.58 ± $58,711.73	$44,345.95 ± $92,491.80
Per pregnancy cost	**1816**	**$9630.39 ± 12,275.07**	**$22,662.50 ± $15,722.66**	**1816**	**$3568.85 ± $9064.81**	**$18,924.45 ± $14,483.66**
Total inpatient costs	**-**	**$17,488,779.80**	**$41,155,100.07**	**-**	**$6,481,079.14**	**$34,366,810.08**

Abbreviation: SD = Standard Deviation.
$ = AUD 2021/22.

Table 3
Mode of birth and mean inpatient cost of *all* births in the base model and counterfactual model – public hospitals, Queensland, Australia, 2017–2018.

Mode of birth	Base model – current standard care			Counterfactual model – with planned homebirth		
	N, %	Mean inpatient cost to public hospitals ± SD	Mean inpatient cost to public hospital funders ± SD	N, %	Mean inpatient cost to public hospitals ± SD	Mean inpatient cost to public hospital funders ± SD
Normal vaginal birth	22,215, 61.17	$9787.63 ± $14,394.74	$22,633.15 ± $14,390.47	22,469, 61.87	$9364.28 ± $14,356.29	$22,386.68 ± $14,293.37
Instrumental vaginal birth	3528, 9.72	$13,061.60 ± $11,237.84	$24,190.21 ± $13,228.99	3396, 9.35	$13,102.83 ± $11,346.21	$24,164.02 ± $13,428.24
Caesarean section with labour	4467, 12.30	$22,650.68 ± $36,705.31	$33,618.37 ± $24,307.44	4345, 11.97	$22,734.90 ± $37,011.29	$33,706.79 ± $24,541.43
Caesarean section without labour	6104, 16.81	$21,838.15 ± $27,077.21	$33,318.69 ± $26,748.26	6104, 16.81	$21,838.15 ± $27,077.21	$33,318.69 ± $26,748.26
Per pregnancy cost	**36,314**	**$13,713.56 ± $21,408.73**	**$25,931.85 ± $18,973.26**	**36,314**	**$13,410.43 ± $21,427.34**	**$25,744.91 ± $18,973.67**
Total costs	**-**	**$497,994,189.60**	**$941,689,023.00**	**-**	**$486,986,438.90**	**$934,900,733.00**

Abbreviation: SD = Standard Deviation.
$ = AUD 2021/22.

retrospective cohort studies that were conducted in other states (Victoria and New South Wales, respectively) of Australia for private homebirths [46,47]. Despite the possibility of hospital transfer, previous studies also found no evidence of increased risk of adverse maternal and perinatal outcomes when a hospital transfer was required for low-risk women planning homebirths [46,48].

Policy implications

Health policy could better reflect the cost-efficacy, safety, and benefit of public-funded homebirth for selected low-risk women [49]. Support and endorsement by governments for planned homebirth are expected to improve access to this option for many women who currently cannot afford to employ a privately practising midwife, therefore reducing inequity [48]. Public and private maternity providers also could be encouraged to provide homebirth services for women based on their risks and preferences and in accordance with relevant guidelines. Continuing efforts need to be made to ensure that this model of care is not only implemented but prospers and sustains over time. Our study has demonstrated that planned homebirth is financially viable and provides a cost saving to both public hospitals and government funders.

Strengths and limitations

The strength of this study is that our microsimulation model was built from a population-based linked administrative dataset. This is the first study to measure the economic value of public-funded homebirth by simulating a hypothetical scenario based on real-world data. Nonetheless, there are limitations. Although our sample size is relatively large, it was collected from one state (Queensland) of Australia, which may limit the generalisability of our results in other settings. The costs estimated are related to acute inpatient service use, thus other costs (e.g., transfer costs from home to hospital after normal vaginal births or before birth for instrumental births) are not included in our simulation. According to the guidelines for publicly funded homebirth programs in Victoria, the health services are responsible for covering the costs of ambulance transport during admitted episodes [50]. However, not all transfers to the hospital occur via ambulance, emergency transfer is very rare [51,52], and to be eligible for the programme, one of the inclusion criteria is that women must reside within a 30-minute ambulance geographic boundary to a health service [50]. Thus, the costs associated with ambulance transport are relatively low compared to inpatient costs. For example, non-emergency transport (first 50 kilometres) in Queensland was priced at $522.65 in 2022 [53]. Therefore, this limitation did not significantly impact our study's results, as the main factor driving cost savings in our research was the changes in the mode of birth, specifically the reduction in the rate of operative births. Furthermore, the results were simulated based on women who gave birth between 01/07/2017 and 30/06/2018, whilst it is possible that the utilisation of services and related costs have changed over time, especially due to the COVID-19 pandemic [54]. As the datasets are updated over time, this will enable future research on this topic.

Conclusion

Inpatient health costs could be significantly reduced by incorporating public-funded homebirth into current options for maternity care, after considering the effect of assumptive place and mode of birth. The

finding supports the establishment and expansion of homebirth as an option in the public health care system and provides an impetus for change by policymakers and health care providers. The implementation options should be further explored to support feasible service redesign.

Ethical Statement

The data used in this study were de-identified before use. All methods were performed in accordance with the Declaration of Helsinki. The Townsville Hospital and Health Service Human Research Ethics Committee (HREC; HREC/16/QTHS/223) and the Australian Institute of Health and Welfare HREC (EO2017-1-338) granted permission to access the raw data used in this study.

Consent for publication

Not applicable.

Code availability

SAS V9.4. The code used for this study is available from the corresponding author upon reasonable request.

Funding

EC receives salary support from the National Health and Medical Research Council (NHMRC) through fellowship schemes. Yanan receives support from the Australian Government Research Training Program (RTP) Scholarship.

CRediT authorship contribution statement

YH led the data analysis and drafting of the manuscript. EC conceived the original study idea and contributed to interpreting the results and editing the final manuscript. JA, DE, VS, JG, and JT contributed to interpreting the results and editing the final manuscript. All authors read and approved the final manuscript.

Conflict of interest

None declared.

Data Availability

Individual level data from this study cannot be shared by the research team, due to the ethics approval and access approvals granted. Requests for access to the individual level data may be made directly to the data custodians via the Queensland Health, Statistical Services Branch with appropriate ethics and relevant approvals. The author scan share the Data Dictionary upon request.

Acknowledgements

The authors acknowledge the data linkage team of the Statistical Services Branch (SSB), Queensland Health for linking the data sets used for this project.

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