The opportunity costs of birth in Australia: hospital resource savings for a post-covid-19 era

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THE OPPORTUNITY COSTS OF BIRTH IN AUSTRALIA: HOSPITAL RESOURCE SAVINGS FOR A POST-COVID-19 ERA

ABSTRACT

Background: COVID-19 caused significant disruptions to health systems globally, however, restricting family presence during birth saw an increase in women considering community birth options. This study aimed to quantify the hospital resource savings that could occur if all low-risk women in Australia gave birth at home or in birth centres.

Methods: A whole-of-population linked administrative dataset containing all women (n=44,498) who gave birth in Queensland, Australia between 01/07/2012 and 30/06/2015 was reweighted to represent all Australian women giving birth in 2017. A static microsimulation model of woman and infant health service resource utilisation was created based on 2017 data. The model was comprised of a base model, representing 'current' care, and a counterfactual model, representing hypothetical scenarios where all low-risk Australian women gave birth at home or in birth centres.

Results: If all low-risk women gave birth at home in 2017, caesarean section rates would have reduced from 13.4% to 2.7%. Similarly, there would have been 860 fewer inpatient bed days and 10.1 fewer hours of women's intensive care unit time per 1,000 births. If all women gave birth in birth centres, caesarean section rates would have reduced to 6.7%. Also, over 760 inpatient bed days would have been saved along with 5.6 hours of women's intensive care unit time per 1,000 births.

Conclusions: Significant health resource savings could occur by shifting low-risk births from hospitals to home birth and birth centre services. Greater examination of Australian women's preferences for home birth and birth centre birth models of care is needed.

Keywords: Opportunity costs; Birth; Birth models of care; COVID-19; Resource utilisation

INTRODUCTION

The COVID-19 pandemic highlighted the value of hospital resources like never before in recent history. Beds, clinical staff, operating theatres, consumables and equipment were all of upmost importance.[1,2] In an effort to divert resources to those in greatest need, many governments suspended non-essential surgeries, and departments prepared for only the most critical surgeries to take place.[3,4] Maternity services similarly underwent rapid restructuring to comply with social distancing requirements, and prepare for the continuance of services in the event of reduced staffing.[5,6]

To some extent, the changes made to maternity services were related to limitations that existed pre-COVID-19. Many countries adopted or strengthened community-based antenatal and postnatal care and/or telehealth services to reduce face-to-face contact for routine care.[7] Prior to COVID-19, women with additional or complex needs generally attended hospital for antenatal and postnatal care. However, the pandemic saw many of these services devolve out into community settings in combination with telehealth. Birth practices also changed, including the use of additional personal protective equipment, strict protocols regarding birth room occupation (e.g. limiting the presence of partners and other attendants),[8] and even discouraging skin to skin contact at birth.[9] Some services looked to medical intervention to control the timing of births in an attempt to meet resource availability.[5,10] In the early stages of the pandemic, some of the changes to maternity service delivery were driven by women who expressed concern about travelling to and attending hospitals for care during pregnancy and/or for birth. Consequently, giving birth outside of the hospital environment gained more consideration as a viable option (particularly for women without identified pregnancy concerns).

Choice of birth setting is at the heart of woman-centred care and the demand for birth outside the hospital setting was further emphasised during the COVID-19 pandemic. Midwifery-led birth centres (which can be within or alongside hospitals, or separate) are designed for women whose pregnancy is deemed to be 'low-risk'. They provide a 'homely' environment and support birth with minimal medical intervention but with links to referral services if required.[11] Growing evidence suggests that hospitals are not optimised to support low-risk birth,[12] and a number of studies and reviews have demonstrated the safety of home and birth centres as acceptable places for birth, particularly for low-risk women.[13,14] Notably, research suggests that home births pose no greater mortality or morbidity risks to either the woman or baby than giving birth in a hospital, can reduce the odds of neonatal intensive care unit (NICU) admission, and results in the use of fewer medical interventions during birth (e.g. reduced rates of instrumental birth).[15,16] Previously, birth centres and homebirths were viewed as optional services, advocated to promote women's choice about how and where they would like to birth. However, the post-COVID-19 era might see these services become a necessary component of maternity service delivery to reserve hospital resources for those who truly need them.

The current study sought to quantify health resource savings in the acute inpatient public hospital setting if *all low-risk women* routinely gave birth at home or in a birth centre. While there is some research to suggest that non-hospital birth can be cost saving,[17-19] this research has been minimal and not considered in the context of the post-COVID-19 era. We sought to quantify the number of inpatient bed-days, women's intensive care unit (ICU) bed hours, infant's special care nursery (SCN) days, and infant's neonatal intensive care unit (NICU) days associated with birth.

METHODS

We created a static microsimulation model of woman and infant health service utilisation associated with birth, using a population-based linked administrative dataset. Microsimulation models use individual-level data to estimate the impact of change before it occurs, and have traditionally been used to model income and tax policy changes. By drawing on real-world data, microsimulation models can estimate the actual relationships between events that are currently observed within a population (e.g. between gestation at birth and an infant's admission to SCN).

Our model was designed to represent the Australian population of women giving birth in 2017. This was the most recent year with benchmarking data available. Microsimulation models are comprised of two parts: the *base model* containing details of the status quo, and the *counterfactual model* that estimates change under hypothetical scenarios; in this case, low-risk birth occurring at home or in a birth centre. The methods we undertook for completing these two parts are outlined below and illustrated in Figure 1.

Underlying dataset

Our microsimulation model is based on a pre-existing dataset created from a whole-of-population administrative data linkage. The dataset contains all women who gave birth between 01/07/2012 and 30/06/2015 in Queensland (QLD), Australia, and both woman and infant clinical and health service use records from conception to the time the infant was two years of age. The dataset contains 186,789 women and 189,809 infants.[20] The pre-existing dataset was linked with *Perinatal Data Collection* (PDC) data to identify women and their infants for inclusion. The PDC contains the details of all births regardless of location (private hospital, public hospital), information on maternal demographics, maternal clinical characteristics, medical interventions preformed in pregnancy and childbirth, and infant outcomes. It also records length of hospital stay, a woman's time in an ICU, and an infant's time in a SCN or NICU at time of birth.

[INSERT FIGURE 1 ABOUT HERE]

Weighting to produce national estimates for 2017

We reweighted the data of women giving birth between 01/07/2014 and 30/06/2015 (n=61,801) to reflect the Australian population of women giving birth between 01/01/2017 and 31/12/2017. Reweighting was conducted using GREGWT, a generalised regression reweighting algorithm developed by the Australian Bureau of Statistics (ABS).[21] Weighting was conducted using national benchmarks for a woman's age based on Indigenous identification, a woman's age by parity, remoteness, and sector of birth (public or private) using data from the Australian Institute of Health and Welfare's (AIHW) Mothers and Babies 2017 report.[22]

The base model

The base dataset was limited to women who gave birth in a public hospital (n=44,498), as we were interested in public hospital decision-making about location of birth. To quantify the health resources utilised in current standard care, the number of inpatient bed-days, ICU hours, SCN days, and NICU days were summed based on actual health resource use.

Estimating the impacts of change (the "counterfactual model")

Scenario one – Homebirths

The first simulation estimated the health resources that would be utilised in a hypothetical scenario where all low-risk women gave birth at home. Women who had a higher risk of pregnancy complications were defined as having any of the following characteristics at the start of labour: a multiple pregnancy, being more than 41 weeks of gestation, a non-cephalic presentation, were classified as obese (BMI>30), had a prior caesarean section or previous uterine surgery, grand multiparity (≥ five previous births), or any maternal medical condition deemed to affect pregnancy.[23] Women at higher risk, will be referred to as 'women with risk

120 factors' throughout this paper. Women without any of these characteristics were classified as
121 having a low-risk pregnancy for this study.

122 Two sub-datasets were created from the base dataset: the first, containing women with risk
123 factors, whose health resource use remained as it was recorded on the base dataset (n=26,596);
124 and the second, comprised of low-risk women (n=17,902). Actual rates of unplanned caesarean
125 section, vaginal birth with vacuum, vaginal birth with forceps, and unassisted vaginal birth
126 (without vacuum or forceps) were then identified for these low-risk women in our population.
127 The relative risk reduction of each of these events produced by homebirth and birth centre
128 births was identified from odds ratios reported in a recently published population-based
129 retrospective study of outcomes for women who had planned homebirths or birth centre
130 births.[24] These relative risk reduction values were applied to the observed probability of
131 unplanned caesarean section, vaginal birth with forceps, and vaginal birth with vacuum to give
132 a counterfactual probability of each of these birth types occurring (Table 1). Monte Carlo
133 simulation[25] was then used to randomly assign the low-risk women in the second sub-dataset
134 to each of these birth types.

135 [INSERT TABLE 1 ABOUT HERE]

136 Still using the second sub-dataset, subsequent health resource use for the records of low-risk
137 women (the 'recipient' records) were then imputed by matching to similar 'donor' records who
138 had the same demographic and clinical characteristics, and mode of birth. The donor records
139 were drawn from the complete linked dataset of low-risk women (covering births from
140 01/07/2012 and 30/06/2015). Recipient records were then assigned the health resource use
141 trajectories of the donor records, thus representing the counterfactual scenarios. For example,
142 if a recipient record of a woman was assigned in the Monte Carlo simulation step to have a
143 vaginal birth with forceps, that record was given the subsequent health resource use of a similar
144 donor record who actually had a vaginal birth with forceps. This recreates the actual observed

dynamics in health states and resource use captured in the real world data.[26] Radius matching was used due to its performance with real world data.[27] Matching scores were based on a woman's age, BMI score, if it was the woman's first pregnancy, smoking status before 20-weeks' gestation, Indigenous identification, socioeconomic status, and rurality of residence. These variables were chosen as they have previously been shown to be associated with total healthcare costs[28] – an outcome of primary importance[29] – but not influenced by mode of birth. 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.

For the homebirth simulation, it was assumed that where women gave birth vaginally with no forceps or vacuum, there was no inpatient bed use for either the woman or baby at time of birth. However, ICU, SCN and NICU use was included from the matched donor records. Those with an unplanned caesarean section, vaginal birth with vacuum, or vaginal birth with forceps were assumed to be transferred to a public hospital with inpatient, SCN, NICU and ICU use based on the counterfactual modelling. As this study focused on acute inpatient resource use, we did not consider the ambulance transfer resource use that may be required.

Scenario two – Birth centres

The second simulation of the study estimated the health service resources utilised if all low-risk women gave birth at birth centres. Low-risk was defined as above, and the aforementioned counterfactual methodology was repeated. For the birth centre simulation, it was also assumed that where women gave birth vaginally with no forceps or vacuum, there was no inpatient bed use for either the woman or baby at time of birth, and both remained in the birth centre until they were discharged home. However, ICU, SCN and NICU use were included. Those with an unplanned caesarean section, vaginal birth with vacuum, or vaginal birth with forceps were assumed to be transferred to a public hospital with inpatient, SCN, NICU and ICU use based on the counterfactual modelling.

Generation of results

After the simulation, the two sub-datasets of women with risk factors and low-risk women were recombined, and the number of inpatient bed-days, ICU hours, SCN days and NICU days were compared with those in the base dataset (representing current standard care). This was repeated for the two counterfactual simulations representing the homebirth and birth centre scenarios. The mean number of health resources utilised per woman, and the health resource savings that could be made per 1,000 public hospital births were presented.

RESULTS

There were 44,498 records of women in the base dataset, which once weighted represented 215,615 women giving birth in Australian public hospitals in 2017. Of these women, 43.9% were considered low-risk and 56.1% were considered higher risk. From our base model (standard care), 58.2% of women had a vaginal birth without forceps or vacuum, and 29.1% had an unplanned caesarean section. Of the low-risk women, a higher proportion (70.8%) had a vaginal birth without forceps or vacuum, and 13.6% had an unplanned caesarean section (Table 2).

The results of our counterfactual model show that if all low-risk women had a homebirth, then 93.5% would have a vaginal birth with no forceps or vacuum, 2.1% would have a vaginal birth with vacuum, 0.7% would have a vaginal birth with forceps, and 3.7% would have an unplanned caesarean section (Table 2). This would have increased the population-level percentage of women having a vaginal birth without forceps or vacuum to 68.6%, and the percentage of women having an unplanned caesarean section would have reduced to 24.5%.

If all low-risk women had given birth in a birth centre, 85.9% would have had a vaginal birth with no forceps or vacuum, 5.1% would have had a vaginal birth with vacuum, 2.3% would have had a vaginal birth with forceps, and 6.7% would have had an unplanned caesarean section

(Table 2). The population-level percentage of women having a vaginal birth without forceps or vacuum would have increased to 65.4%, and the percentage of women having an unplanned caesarean section would reduce to 25.9%.

[INSERT TABLE 2 ABOUT HERE]

Under current standard care, the mean number of inpatient bed days per birth is 2.6 (Table 3). The mean number of ICU hours for women is 0.1, and the mean number of days infants spend in SCN and NICU is 1.1 and 0.4 respectively. If all low-risk women gave birth at home, the mean number of inpatient bed days would reduce to 1.7 per birth. The total number of bed days utilised in 2017 would have reduced from 539,953 to 356,828 if all low-risk women gave birth at home. The total number of hours women spent in the ICU would have reduced from 27,737 to an estimated 24,896 (Table 3). Similarly, if all low-risk women gave birth in a birth centre, the mean number of inpatient bed days per birth would be 1.8. The total number of inpatient bed days would have reduced to 374,453 and the total ICU hours for women would have reduced to 25,764.

[INSERT TABLE 3 ABOUT HERE]

If homebirth was available to all low-risk women, then for every 1,000 births an estimated 860 inpatient bed days, 11.5 infant SCN days, 2.1 NICU days, and 10.1 ICU hours for women would be saved (Table 4). If birth in a birth centre was available to all low-risk women, then for every 1,000 births an estimated 768.2 inpatient bed days, 3.9 SCN days, 1 NICU days, and 5.6 ICU hours for women would be saved (Table 4).

[INSERT TABLE 4 ABOUT HERE]

DISCUSSION

Our analysis indicates that enabling all low-risk women to routinely give birth at home or in birth centres would substantially increase the rate of spontaneous vaginal birth (i.e. without assistance) and reduce the rates of unplanned caesarean section by more than half. Importantly, substantial resource savings would arise from reduced inpatient bed days and hours spent in the ICU by women if all low-risk births moved out of the acute inpatient public hospital setting. This study contributes to the current dearth of literature regarding resource savings associated with giving birth at home or in birth centres. Furthermore, it is the first study that we are aware of, to consider the discussion of resource savings for childbirth in the post-COVID-19 era. This research is crucial for informing discussions about freeing up acute inpatient hospital resources for those with the greatest need, and preparing for the next, inevitable global pandemic.

The findings of this study depict that rates of unplanned caesarean section would have reduced from 13.4% per 1,000 women to less than 4% in 2017 if all low-risk women gave birth at home, or less than 7% if they gave birth in a birth centre. This has significant implications for the Australian public healthcare system in terms of resource savings. Rates of caesarean section are particularly high in low-risk nulliparous women.[30,31] Among nulliparous women in Australia, the rate of caesarean section increased by 4% between 2004 and 2017.[32] Caesarean section in nulliparous women can also increase the risk of complications in subsequent births for women and babies, and increases the chances of undergoing additional caesarean sections, which exacerbates the risks and costs associated with birth.[33,34] Unplanned caesarean sections in particular, are the most costly birth procedure in Australia.[35] Recent research demonstrates that the cost of births by caesarean sections in Australian public hospitals was AU$31,939 in comparison to AU$18,521 for vaginal births with no instruments, including costs for women and children up to two years postpartum.[36] Though not as disparate, evidence from other countries also indicates that there is a

241 significant difference between the procedural cost of vaginal birth and caesarean section.[12,37]
242 Consequently, the results of the current study suggest that shifts toward home and birth centre
243 births for low-risk women may result in healthcare system savings in the tens to hundreds of
244 millions of dollars by reducing the proportion of unplanned caesarean sections undertaken,
245 and significant improvements in women's and children's health outcomes

246 Our findings also depict that while shifting all low-risk women's births to birth centres and
247 home births may only modestly reduce infant NICU and SCN days, we could see major
248 reductions in the number of days women spent as inpatients, and hours spent in the ICU. A
249 2012 Australian study comparing women giving birth in midwifery-led birth centres and
250 those experiencing usual care (birth in a hospital labour ward) evidenced similar resource
251 savings.[38] The authors concluded that there was a statistically significant difference between
252 the cost of receiving care in the birth centre versus the hospital which equated to roughly
253 AU$1,000 saved per birth for the hospital and an additional AU$1,000 saved by the
254 government.[38] However, despite these resource savings, few women have access to alternate
255 birth settings.

256 In 2017, 97% of births in Australia occurred in hospitals; 74% in public hospitals, and 26% in
257 private hospitals.[22] Only 0.3% of births took place in the home.[22] Low rates of homebirths are
258 underpinned by several contentious issues. First, there are very few publicly-funded
259 homebirth programs in Australia, with different reports suggesting between 14-19 known
260 programs.[39,40] Low rates of homebirth are also partly due to professional indemnity insurance
261 restrictions placed on both public and private practising midwives in the early 2000's.[41] Most
262 available programs cater to women in metropolitan areas thereby propagating inequity of
263 access for regionally and remotely located women. Moreover, neither Queensland nor
264 Tasmania offer publicly funded homebirth programs.[40] Women's access to homebirth can
265 also be financially restricted due to a lack of public funding. Women who want to give birth

at home with a private midwife can expect to pay between $3,500-$6,000 out-of-pocket.[42] Even women eligible for publicly-funded homebirths can still expect to pay up to $1,500 out-of-pocket depending on the additional tests, scans and support sought.[42] Thus, both geographical and financial limitations impede Australian women's access to suitable support for homebirth.

There are more birth centres than homebirth programs in Australia, but only marginally. In 2016, there were at least 10 birth centres in NSW – five co-located on hospital premises or adjacent to hospital labour wards, and five midwifery-led, free-standing birth centres.[43] *Pregnancy, Birth and Beyond Pty Ltd* list 24 birth centres across Australia on their website,[44] catering to the 2.4% of Australian births.[22] By comparison, the Netherlands has a reported 23 birth centres (as of 2017),[45] and a much higher birth centre birth rate of 11.4%.[12]

Generally, there is a paucity of literature on Australian women's preferences for place of birth. Stoll and colleagues examined 760 Western Australian (WA) university students' (>75% of whom were female) preferences for place of birth.[46] Close to half of the participants preferred to give birth in a hospital under obstetrician-led care, roughly 36% preferred a hospital birth under midwifery-led care, and 10% and 1.8% respectively preferred to give birth in birth centres or at home.[46] This does not show an overwhelming preference for homebirth or birth centre births. Instead, this may be a reflection of what participants know to be available, have previously been exposed to, or view as accepted. However, while not extreme, the results do indicate a degree of disparity between current rates of homebirths and birth centre births, and the proportions of women that would prefer these options. An overwhelming majority of the submissions made to the Australian Maternity Services Review in 2009 (a review of maternity services in Australia undertaken by the Government Department for Health and Ageing, eliciting a range of perspectives on gaps in the system at the time) were from women who wanted to be able to give birth in their home, but were

unable to do so due to limited access and exorbitant out-of-pocket fees associated with the available services.[47,48] The recent COVID-19 pandemic has also led some women to reconsider giving birth in hospitals due to perceived high risks of infection,[49] and restrictions on the presence of family or other support persons. Alarmingly, the pandemic may have also seen a rise in freebirths (homebirths unattended by any health professional) as a consequence of women's preferences for homebirth not being met. Consequently, future research should aim to formally and comprehensively examine Australian women's preferences for birthing at home and in birth centres in order to appropriately inform birthing service-related decision-making. In particular, preference-based methods, such as those that have been used in the UK,[50] may provide a comprehensive backdrop to inform such decisions.

Recommendations

In the wake of COVID-19, there have been calls to make birthing options outside of the hospital more accessible to pregnant women. While there is some evidence to suggest that Australian women would prefer these alternative birthing models of care, current public and private funding arrangements and limited accessibility to non-hospital birthing services pose significant restrictions to women's ability to choose where and how they give birth. Thus, the current study proposes three key recommendations.

First, greater examination of women's preferences for birth centre and homebirths in Australia is crucial to understand the demand for these services. It may also provide us with an indication of the types of funding models that could feasibly support equitable access to these services. Second, few Australian women can access and utilise home births or birth centres due to the limited number of these services nationally, and their tendency to operate in metropolitan cities. Thus, to promote equity in choice of birthplace – irrespective of geographical location – future research should attempt to understand the cost-effectiveness of

315 providing birth centre and homebirth models of maternity care in regional and remote
316 Australia. Third, future research should consider modelling at the individual hospital
317 jurisdiction level based on local population characteristics and risk factors to identify the
318 actual proportion of women who could utilise homebirth or birth centre birth services.

319 **Limitations**

320 A key limitation of the study is that resource savings represent those that could have been
321 made in 2017 instead of the current year (2020), as this is the latest national benchmarking
322 data available. However, this was done so that the sample weighting undertaken was
323 representative of the Australian population. Assumptions in our modelling which are
324 potential limitations, include: transfer into hospital for care such as epidural where a
325 spontaneous vaginal birth was still achieved, other factors which influence suitability for
326 different birth settings such as women's preferences, and additional risk factors not included
327 in our modelling. Additionally, the results represent absolute resource savings; either *all* low-
328 risk births occurring in birth centres or *all* low-risk births occurring at home. It may be
329 unreasonable to assume that all women giving birth would choose the same option, or that no
330 low-risk women would prefer to give birth in public or private hospitals.

331 There are also recognised differences in birth location recommendations for women giving
332 birth for the first time compared to subsequent pregnancies, and differences between
333 maternity provider practices. However, the current analysis aimed to illustrate potential
334 resource savings and generate discussion regarding non-hospital birthing options that are
335 currently inaccessible to many women giving birth in Australia, particularly in light of the
336 COVID-19 global pandemic. Finally, our modelling did not include women's antenatal
337 model of care because this was not available in the dataset. It is recognised that the model of
338 antenatal care has significant impacts on birth outcomes,[51] and is worthy of further research.

Conclusion

The recent COVID-19 pandemic has highlighted the importance of women's ability to choose to give birth at home and in birth centres, and the availability of these services. The current study demonstrates that if all low-risk women gave birth at home or in birth centres, there would be significant reductions in women's health service resource utilisation, and modest reductions in that of their baby. However, we currently have a limited understanding of Australian women's preferences for these services. Future research should aim to understand women's preferences for, and willingness and ability to pay for these services to inform suitable government funding schemes. This research has the potential to address current inequities underpinning maternity care in Australia, and promote greater capacity in woman-centred maternity care globally.

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Table 1: Probability of different birth types applied in the microsimulation models

Birth type[†]	**Probability utilised in counterfactual model, applied to low-risk women – homebirths**	**Probability utilised in counterfactual model, applied to low-risk women – birth centres**
Vaginal birth, no forceps or vacuum	0.9308	0.8641
Vaginal birth, vacuum	0.0204	0.0469
Vaginal birth, forceps	0.0076	0.0261
Unplanned caesarean section	0.0411	0.0630

[†]The actual percentage of women with different birth types is shown in Table 2.

Table 2: Distribution of different birth types in the base dataset and counterfactual scenarios where all low-risk women gave birth at home or at a birth centre, weighted to the Australian population, 2017

Birth type	Current standard care		Homebirth counterfactual model		Birth centre counterfactual model	
	N(%) All-risk	N(%) Low-risk	N(%) All-risk	N(%) Low-risk	N(%) All-risk	N(%) Low-risk
Vaginal birth, no forceps or vacuum	124,031 (59.1%)	64,244 (71.2%)	144,119 (68.6%)	84,332 (93.5%)	137,263 (65.4%)	77,476 (85.9%)
Vaginal birth, vacuum	17,581 (8.4%)	9,629 (10.7%)	9,837 (4.7%)	1,885 (2.1%)	12,532 (6.0%)	4,580 (5.1%)
Vaginal birth, forceps	8,255 (3.9%)	4,260 (4.7%)	4,618 (2.2%)	623 (0.7%)	6,114 (2.9%)	2,119 (2.3%)
Unplanned caesarean section	60,174 (28.6%)	12,089 (13.4%)	51,468 (24.5%)	3,383 (3.7%)	54,132 (25.8%)	6,047 (6.7%)

Table 3: Mean number of health resources utilised per birth, and total numbers utilised for all birth, weighted to the Australian population, 2017

Resource type	Current standard care		Homebirth		Birth centre	
	Mean (SD)	Total	Mean (SD)	Total	Mean (SD)	Total
Inpatient bed days	2.6 (3.7)	539,953	1.7 (4.4)	356,828	1.8 (4.4)	374,453
Infant SCN days	1.1 (10.9)	233,522	1.1 (11.0)	228,165	1.1 (11.0)	230,005
Infant NICU days	0.4 (9.8)	74,670	0.4 (9.8)	74,260	0.4 (9.8)	73,475
Woman ICU hours	0.1 (5.4)	27,737	0.1 (5.2)	24,896	0.1 (5.3)	25,764

SD = standard deviation; SCN = special care nursery; NICU = neonatal intensive care unit; ICU = intensive care unit

Table 4: Estimated resources saved per 1,000 births if all low-risk women gave birth at home or in a birth centre

Resource type	Resources saved per 1,000 births	
	Homebirth	**Birth centre**
Inpatient bed days	860.0	768.2
Infant SCN days	11.5	3.9
Infant NICU days	2.1	1.0
Woman ICU hours	10.1	5.6

SCN = special care nursery; NICU = neonatal intensive care unit; ICU = intensive care unit

Figure 1 legend: Generation of the counter-factual dataset using pre-existing linked administrative data for all live births occurring between 2012-15 in Queensland, Australia

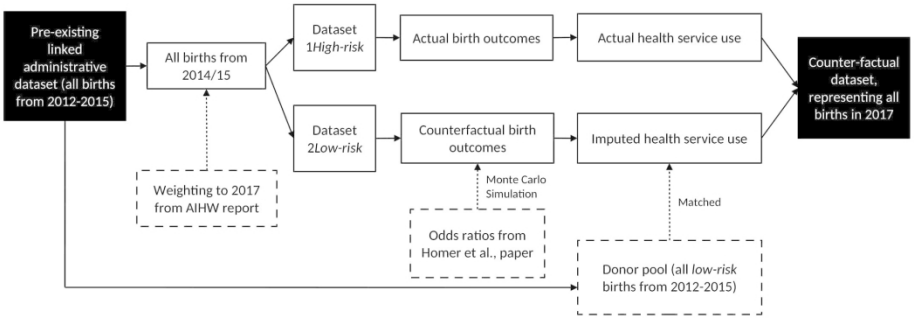

Figure 1: Generation of the counterfactual model

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