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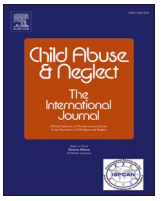

Breaking the cycle: Effect of a multi-agency maternity service redesign on reducing the over-representation of Aboriginal and Torres Strait Islander newborns in out-of-home care: A prospective, non-randomised, intervention study in urban Australia

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ABSTRACT

Background: Strategies to reduce over-representation of Indigenous children in out-of-home care must start in pregnancy given Indigenous babies are 6 % of infants (<1 year), yet 43 % of infants in out-of-home care.
Objective: To determine if an Indigenous-led, multi-agency, partnership redesign of maternity services decreases the likelihood of babies being removed at birth.
Participants and setting: Women carrying an Indigenous baby/babies who gave birth at the Mater Mothers' Public Hospital, Brisbane (2013–2019).
Methods: A prospective, non-randomised, intervention trial evaluated a multi-agency service redesign. Women pregnant with an Indigenous baby birthing at a tertiary hospital were offered standard care or Birthing in Our Community (BiOC) service. We compared likelihood of babies being removed by Child Protection Services (CPS) at birth by model of care. Inverse probability of treatment propensity score weighting controlled baseline confounders and calculated treatment effect. Standardized differences were calculated to assess balance of risk factors for each copy of multiple imputation. Australian New Zealand Clinical Trial Registry, ACTRN12618001365257.
Results: In 2013–2019, 1988 women gave birth to 2044 Indigenous babies, with 40 women having babies removed at birth (9 BiOC, 31 standard care). Adjusted odds of baby removal were significantly lower for mothers in BiOC compared to standard care (AOR 0.37, 95 % CI 0.16, 0.84). In total, 2.0 % of Indigenous babies were removed by CPS; eight times higher than non-Indigenous babies at the same hospital (0.25 %).
Conclusions: BiOC reduced removals of newborn Indigenous babies likely disrupting generational cycles of CPS contact, trauma, and maltreatment, and contributing to short and long-term health and wellbeing benefits for mothers and babies.

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1. Introduction

Indigenous peoples in well-resourced settler-colonial countries, like Australia, Canada, New Zealand and the United States experience over-representation in child protection services (CPS) (Duthie et al., 2019). Contact with CPS can begin in pregnancy (Everitt et al., 2017), and result in removal at birth (Everitt et al., 2017), particularly if health practitioners, CPS workers, or private citizens are concerned about potential harm to the baby after birth. The current CPS system does not address prevention by supporting and prioritising the needs of families (Tune, 2016) and while there are circumstances where intervention and child removal is required for the protection of infants, separating mother and baby rarely results in positive outcomes for families (Everitt et al., 2015; Marsh et al., 2019; Nathoo et al., 2013). The circumstances are complex and varied. In some situations, infants may face risks, whereby they would benefit from a different environment however, this is often because most strategies and funding are not directed at strengthening families in the antenatal period and instead are directed towards child removal after birth.

Infant removal causes emotional distress, trauma and psychological harm to parents (Broadhurst & Mason, 2020; Marsh et al., 2019) and infants (Trivedi, 2019) who may experience difficulties in forming secure attachments and developing trust, crucial for emotional and psychological well-being. The sudden separation of the mother-child bond leads to grief, loss, anger and confusion and removes the opportunity for exclusive, or perhaps any, breastfeeding which benefits infants by reducing the risk of sudden infant death, infection (gastrointestinal, respiratory tract, otitis media), obesity, Type 1 and Type 2 diabetes and increases intelligence (Wheeler & Agho, 2020).

Additionally, long-term consequences can be far reaching and include risks of developmental delays, behavioural issues, poor health, and issues related to substance misuse, mental health and violence (Hughes et al., 2017). Childhood contact with CPS is also a risk factor for future harm, generational maltreatment, subsequent CPS reporting (Armfield et al., 2021) and an increased likelihood of future birth removals (Tsantefski et al., 2014).

Over-representation of Aboriginal and Torres Strait Islander (respectfully hereafter, Indigenous) families in CPS is symptomatic of systemic structural inequalities stemming from Australia's colonial foundation that embedded institutionalised racism, resulting in intergenerational trauma (Duthie et al., 2019). Australia's historic assimilation practices lead to the forced removal of Indigenous children from the late 1800s until the 1980s, known today as the Stolen Generations (Human Rights and Equal Opportunity Commission, 1997). These practices were not unique to Australia, as Indigenous peoples of Canada (Barnes & Josefowitz, 2019), New Zealand (Hyslop, 2021), and the United States (Jacobs, 2009) experienced similar policies of forced child removals. Separating families interrupts cultural and kinship connections fundamental to the health and wellbeing of Indigenous peoples (Duthie et al., 2019; Krakouer et al., 2018).

Continued over-representation of Indigenous families in CPS, is a human rights issue (United Nations, 1989) and has been recognised by the Australian Commonwealth Government as a national priority. In 2021, the Australian government committed to reduce the rate of over-representation of Aboriginal and Torres Strait Islander children (0–17 years old) in out-of-home care by 45 %, by 2031 (Productivity Commission, 2021). However, the rate of Indigenous children in out-of-home care increased from 17,978 (54.2 per 1000 births [‰]) in 2019 to 19,432 (56.8 ‰) in 2022 while rates for non-Indigenous children decreased from 26,864 (5.1 ‰) in 2019 to 25,924 (4.8 ‰) in 2022. This represents an increase in the rate-ratio from 10.6 to 11.7 (Australian Institute of Health and Welfare, 2023). At the same time, the rate-ratio for Indigenous compared to non-Indigenous infants (<1 year) in out-of-home care increased from 9.3 to 10.4 (26.5 versus 2.6 ‰) (Australian Government Productivity Commission, 2023; Australian Institute of Health and Welfare, 2023). The data on unborn notifications (child protection services in pregnancy) are only reported in three jurisdictions (NSW, Qld, WA) but show a rate-ratio of 8.1 for Indigenous compared to non-Indigenous babies, though this could be higher as there was underreporting of Indigenous status in the available data (16 % were not identified as either Indigenous or non-Indigenous infants (2022)). Strategies to reverse the upward trend in Indigenous child removals clearly need to start in pregnancy.

Pregnancy and childbirth provide an opportune time to break cycles of trauma, as women can desire a 'fresh start' (Chamberlain et al., 2019). For this reason, activities aimed at supporting and empowering women may assist in reducing CPS removals. However, there is scant literature to support this theory (Mason et al., 2019) and to understand the protective factors that strengthen families, keep them together (family preservation) and reduce removals (Rutman et al., 2020). In Canada, four Indigenous-specific single-access programs for pregnant women experiencing substance use issues have reported reduced baby removals at birth (Nathoo et al., 2013). The programs, designed with Indigenous knowledges and input, feature collaborative partnerships that enable access to multiple services and wraparound support through pregnancy and early parenting. Another program that has shown reductions in CPS reports and removals in the United States (Olds et al., 1986) and Netherlands (Mejdoubi et al., 2015) is the Nurse-Family Partnership home visiting program (pregnancy until child is two-years-old), with the Australian adaptation also reporting a reduction at one site (Segal et al., 2018).

In our study evaluating the impact of a redesigned service (the Birthing in Our Community [BiOC] service) for women birthing Indigenous babies, we reported significant improvements in maternal and infant clinical outcomes (Kildea et al., 2021), including reductions in preterm births (Kildea et al., 2019) and cost-saving for government and women (Gao et al., 2023). Qualitative findings from multiple stakeholders highlighted that the service may also provide protective factors for women at risk of statutory CPS baby removals due to the comprehensive family strengthening strategy. This study aimed to answer the research question: For women pregnant with an Indigenous baby, does an Indigenous-led maternity service (BiOC) decrease the likelihood of babies being removed by CPS at birth, compared to women who received standard care?

Table 1
BiOC Maternity Service compared to standard maternity care.

Birthing in Our Community service (intervention cohort)	Standard Care (reference cohort)
Partnerships and governance	
Multiagency partnership - First Nations leadership and governance formalised through a Steering Committee underpinned by a joint Statement of Commitment and Memorandum of Understanding.	No overarching First Nations governance of maternity services.
Integrated management and operations	
A dedicated BiOC Service Manager is employed by the Community Controlled partner to provide overarching service coordination, day to day management of the BiOC team and a single point of reference for communication with external stakeholders. The services operates from a community based hub, operated by the Institute for Urban Indigenous Health. Middle managers from partner organisations meet monthly. Troubleshooting is managed between the BiOC Service manager and the MGP manager at the hospital, both of whom attended the Risk Planning Meetings (see below).	Electronic or postal referrals and discharge summaries are the main source of communication between agencies. Referrals to community support agencies as required. The service operates from the hospital.
Continuity of midwifery carer across the maternity journey	
A community-based Midwifery Group Practice, providing 24/7 continuity of carer by a known (caseload) midwife to enrolled women throughout pregnancy, birth and up to six weeks postnatally; care is provided in a community-based hub, the home and the hospital according to hospital guidelines; birthing services are in the hospital (no home or birth centre service). The caseload midwife works in a small group of midwives who provide backup in designated circumstances such as annual leave, sick leave, having more than one woman in labour, or being scheduled off call. Midwives are employed on an annualised salary and women are allocated a primary midwife and have 24/7 phone access their MGP midwife or back up midwife.	Antenatal care may be received from community-based Aboriginal Medical Service, family doctor, hospital-based midwives or doctors who rotate throughout the service on rosters or work in the Murri Antenatal Clinic based at the hospital (provides antenatal continuity, no intrapartum or postnatal care). Care according to primary carer or hospital guidelines; birthing services in the hospital (no home or birth centre service). Birthing support is likely to be by a midwife the woman has never met. Can call hospital birthing suite in emergency. Postnatal visit/s or phone call/s from a rostered community midwife available for women who discharge before 48 h for vaginal birth and 72 h for caesarean section; usually for <2-weeks.
First Nations workforce	
Women are assigned a First Nations Family Support Worker, providing continuity of care through pregnancy and into the postnatal period. The Family Support Worker leads identification of, and advocacy for, the broader well-being needs of families, walking alongside to enhance service access and to address key social, cultural and economic determinants of health. First Nations Family Support Workers were an integral part of the risk planning meetings (see below). Investment from partner organisations in strengthening the First Nations workforce – resourcing and actively creating opportunities to access professional pathways in education and training (cadetships for midwifery and human services students) and vocationally prepared roles (such as family support workers, administration and transport workers), in business hours. As per Standard Care Aboriginal Liaison Officers are available in the hospital.	Hospital care is supported by Aboriginal Liaison Officers who provide cultural and social support, in business hours across all hospital services, including maternity. If accessing care in an Aboriginal Medical Service women may see Aboriginal Health Practitioners or other First Nations staff.
Cultural framework and cultural safety	
Indigenous governance, leadership and workforce all support a strong framework of cultural safety. Additionally, all staff are provided with a comprehensive program of orientation and induction to the Aboriginal community controlled partners' cultural integrity framework ("The Ways"), and regular clinical/cultural supervision. A key function of the BiOC Hub is supporting strong community and cultural connection for women and families, with weekly community "drop-in" days and regular activities to connect, interact, share and learn from each other and from Elders.	Frontline staff may seek out their own cultural training or clinical supervision, not routinely provided.
Holistic wrap around services	
Transport services provided by First Nations staff employed through the BiOC Hub address a key barrier to access for First Nations women. Women and infants are able to access the majority of specialist and allied health services they may need in the safe and familiar environment of the BiOC Hub, including physiotherapy, dietician, social work, perinatal psychology, child health nursing, and parenting education and support. Women requiring access to hospital-based services, including Medical Specialists, diabetes educator and others, are assisted with transport support and accompanied by Family Support Worker as required. Multidisciplinary, Multiagency, Risk Planning Meetings coordinated by the Mater Hospital Risk Planning Midwife and held in the antenatal clinic. Meetings were held weekly and included midwives, Aboriginal Liaison Officers, a social worker, a child protection liaison officer and medical staff (optional) if women have identified risk factors for child removal in pregnancy.	Women may be referred to allied health services (e.g. psychologist, social worker) via the hospital or their primary health service (family doctor or Aboriginal Medical Service). Access to hospital medical staff a social worker, child safety officers and other professionals (e.g. diabetic educator) as required. Multidisciplinary, Risk Planning Meetings coordinated by the Mater Hospital Risk Planning Midwife and held in the antenatal clinic. Meetings were held weekly and included midwives, Aboriginal Liaison Officers, a social worker, a child protection liaison officer and medical staff (optional). Some women may access additional care through the drug and alcohol service.

(*continued on next page*)

Table 1 (*continued*)

Birthing in Our Community service (intervention cohort)	Standard Care (reference cohort)
Some women may access additional care through the drug and alcohol service. After establishment of the BiOC model, the meeting expanded to bring together members of the broader BiOC and hospital teams to address communication, coordination and integration of care for women and families with more complex health and well-being- including psychosocial-risks and needs.	

NOTE: This is a modified version of the original 'Table 2' in our publication: Kildea S, Gao Y, Hickey S, et al. Effect of a Birthing on Country service redesign on maternal and neonatal health outcomes for First Nations Australians: a prospective, non-randomised, interventional trial. The Lancet Global Health 2021; 9(5): e651-e9 with additions providing more details about the services we propose could be impacting the results presented in this paper.

2. Methods

2.1. Design and setting

This prospective, non-randomised, interventional trial was conducted at the Mater Mothers' Hospital (Brisbane), and at the IUIH BiOC Community Hub located in Salisbury (Brisbane), Queensland, Australia. The catchment of this hospital is home to one of the largest and fastest growing Indigenous populations in Australia (Queensland Government Statistician's Office, 2021), and occurred at a time when Queensland was experiencing a 31 % rise in Indigenous children in out-of-home care from 34.3 ‰ in 2018 to 45.0 ‰ in 2022 (Australian Institute of Health and Welfare, 2023). A participatory action research approach facilitated the implementation of the co-designed service (Kildea et al., 2017), to provide care for approximately 120–140 women annually; doubling capacity ($n = 240$) in late 2016 after securing additional government funding. The key components of the BiOC service (intervention cohort) and standard hospital care (reference cohort) are listed in Table 1 and expanded from those published previously (Kildea et al., 2021). In summary, BiOC is a community-based service operating out of an Indigenous owned community hub that provides continuity of midwifery care with First Nations governance, supported by a First Nations workforce under a First Nations cultural safely framework, providing holistic and coordinated wrap around services. Women were eligible for study inclusion if they were carrying a First Nations baby and intended to birth at the study hospital. The First Nations Family Support Workers are community women employed in the model to work closely with families and midwives to improve access to safe housing, financial, legal and other supports when needed (e.g. transport, food vouchers). They help build trust and relationships that enable connection to other services that strengthen families and reduce the need for CPS involvement (See Table 1 for further details).

2.2. Data sources

Records of all mothers who were carrying an Indigenous baby/babies who birthed at the Mater Mothers' Hospital between 1 Jan 2013 and 31 Dec 2019 were extracted from the hospital's database that was routinely collected and prospectively entered: 944 women received the BiOC service (intervention), and 1044 women received standard care (Fig. 1).

2.3. Outcome of interest

The variable of interest was a baby recorded as being removed by CPS if the reason for the mother discharging from hospital without her baby was recorded as 'baby in foster care', or the reason for admission to neonatal nursery was 'baby awaiting adoption/ foster care' or 'child protection issues'.

2.4. Statistical analysis

Pearson's chi-square test was first conducted for categorical variables to explore differences between mothers whose baby/babies were removed or not removed by CPS. Simple logistic regression and multiple logistic regression models were performed to identify the significant risk factors for the baby being removed by CPS. Crude odds ratio (OR) and 95 % confidence intervals (95 % CI) and adjusted OR (AOR) with 95 % CI were presented to show the association between each risk factor and study outcome.

To address the selection bias from the non-randomised study design regarding women being allocated to BiOC or standard care, an inverse probability of treatment propensity-score weighting approach was used to control confounding by constructing a weighted cohort of women who only differed with respect to the model of care they received but were similar with respect to other measured characteristics. A propensity score of a mother was defined as the conditional probability of her receiving the BiOC service given the values of observed baseline confounders, calculated from a logistic regression. We adjusted all available baseline risk factors for child unborn notification identified from the literature including woman's age, Indigenous status and education level, whether they were partnered, and if their medical notes stated they used cannabis, hallucinogens, heroin, amphetamines, ecstasy, or cocaine. We also adjusted for smoking in pregnancy, recent major stress (in the last 12 months- any major worries, stress or change affecting you now), if

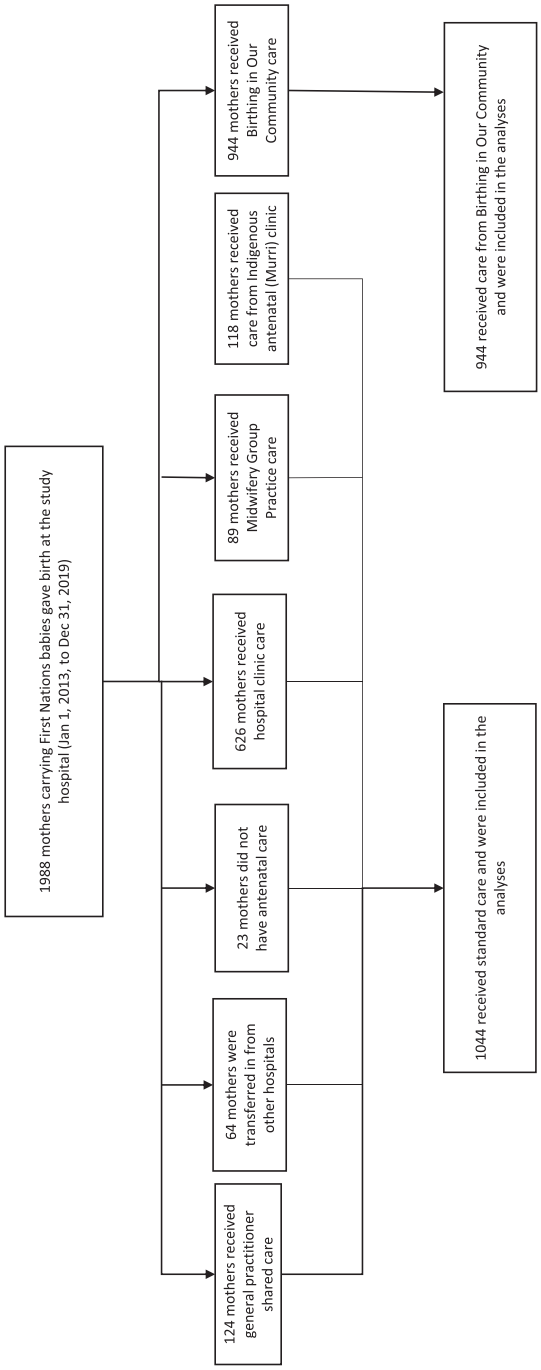

Fig. 1. Study participants' flowchart-mother.

they had previous CPS involvement, other children in the care of someone else, experienced domestic violence or had a documented pre-existing mental health illness. For the BiOC cohort, the weights were calculated as 1/propensity score and for the Standard Care cohort as 1/(1-propensity score). We did not aim to match post-baseline variables as they could be influenced by the model of care. Standardized differences were calculated to assess the balance of measured baseline risk factors for each copy of multiple imputation. A standardized difference <10 % is considered adequate balance has been achieved between groups (Table S2). Three risk factors (education level, marriage status, and mental health issue) had missing data: in each case, missing data represented <5 % of the total, other than for education (Standard Care 10.4 % and BiOC 5.8 %) (Table S1). To ensure estimates were not biased by missing data, a multiple imputation analysis by chained equations ($n = 10$) was performed. We assumed our missing data were at least missing at random.

To test the robustness of BiOC on the impact of baby being removed by CPS, we conducted a sensitivity analysis by excluding all those women who were transferred in and those who did not have antenatal care. All analysis was performed in Stata 16.0.

2.5. Ethics

This study was approved by the Mater Misericordiae Limited Human Research Ethics Committee (HREC/15/MHS/24), the Mater Research Governance Office (RG-15-080), the University of Queensland Human Research Ethics Committee (#2015000624) and Charles Darwin University (#H19057). This study is also conducted in accordance with the *Guidelines for Ethical Conduct in Aboriginal and Torres Strait Islander Health Research* (National Health and Medical Research Council, 2018a) and the *National Health and Medical Research Council's Keeping Research on Track* (National Health and Medical Research Council, 2018b).

Table 2
Risk factors for mothers carrying an Indigenous baby removed by child protection services when discharged from hospital following birth, 01/01/2013–31/12/2019.

	Mother whose baby was not removed	Mother whose baby was removed	*p*-value
	($n = 1948$)	($n = 40$)	
Teenager			0.63
No	1705 (87.5 %)	34 (85.0 %)	
Yes	243 (12.5 %)	6 (15.0 %)	
Indigenous			0.020
No	511 (26.2 %)	4 (10.0 %)	
Yes	1437 (73.8 %)	36 (90.0 %)	
Education			<0.0001
≥Grade 10	1633 (83.8 %)	15 (37.5 %)	
<Grade 10	160 (8.2 %)	16 (40.0 %)	
No recorded	155 (8.0 %)	9 (22.5 %)	
Not married or in de facto			<0.0001
No	927 (47.6 %)	5 (12.5 %)	
Yes	982 (50.4 %)	32 (80.0 %)	
No recorded	39 (2.0 %)	3 (7.5 %)	
Used Cannabis in pregnancy			0.015
No	1605 (82.4 %)	27 (67.5 %)	
Yes	343 (17.6 %)	13 (32.5 %)	
Current user: Hallucinogens, Heroin, Amphetamines, Ecstasy, or Cocaine in pregnancy			<0.0001
No	1901 (97.6 %)	34 (85.0 %)	
Yes	47 (2.4 %)	6 (15.0 %)	
Smoke at any time in pregnancy			<0.0001
No	1211 (62.2 %)	7 (17.5 %)	
Yes	737 (37.8 %)	33 (82.5 %)	
In the last 12 months- any major worries stress or change affecting you now			<0.0001
No	1183 (60.7 %)	13 (32.5 %)	
Yes	765 (39.3 %)	27 (67.5 %)	
Have you ever been involved with the Department of Child Safety			<0.0001
No	1634 (83.9 %)	12 (30.0 %)	
Yes	314 (16.1 %)	28 (70.0 %)	
Are any of your children living in the care of other people			<0.0001
No	1751 (89.9 %)	16 (40.0 %)	
Yes	197 (10.1 %)	24 (60.0 %)	
Domestic violence			0.0076
No	1845 (94.7 %)	34 (85.0 %)	
Yes	103 (5.3 %)	6 (15.0 %)	
Pre-existing - Mental health illness			0.0061
No	1162 (59.7 %)	18 (45.0 %)	
Yes	737 (37.8 %)	18 (45.0 %)	
No recorded	49 (2.5 %)	4 (10.0 %)	

3. Results

From 1 Jan 2013 to 31 Dec 2019, 1988 women gave birth to 2044 Indigenous babies: 1935 singletons and 109 multiples. There were 944 women (960 babies) who received the BiOC service and 1044 women (1084 babies) who received the Standard Care service. In total, 40 women had babies removed by CPS, including 39 singletons and one set of twins. Nine of 40 mothers had BiOC care and 31 received standard care. Of the 1988 women carrying an Indigenous baby, 40 (2.0 %) had their baby removed by CPS which was eight times higher than the rate (0.25 %) for women carrying a non-Indigenous baby in the same hospital.

Three variables have missing data which accounted for 221 (11.1 %) of 1988 records: 183 (9.2 %) had one variable missing and 38 (1.9 %) had two variables missing. The univariate analysis showed that mothers who had their baby removed were more likely to be: Indigenous themselves, have lower educational attainment, be without a partner, report use of illicit drugs in pregnancy, smoke in pregnancy, have major worries or stressors in the previous 12 months, have previous involvement with CPS, have children living in the care of other people, have experienced domestic violence, or have pre-existing mental health issues. Being a teenager mother was not significant in the bivariate analysis (Table 2).

Using multiple logistic regression analysis, educational attainment lower than grade 10 (junior high school; OR 2.84, 95 % CI 1.26, 6.40), not partnered (OR 2.72, 95 % CI 1.08, 6.83), previous CPS involvement (OR 3.44, 95 % CI 1.46, 8.13), and having children living in the care of others (OR 3.85, 95 % CI 1.67, 8.86) remained significant risk factors for having a baby removed by CPS, although this effect was reduced in magnitude when compared with the odds ratios from simple logistic regression analysis (Table 3) due to effects of confounding variables.

Compared to the standard care cohort, mothers in BiOC were more likely to be Indigenous, have higher educational attainment, report using drugs in pregnancy and have pre-existing mental health illness (Table S1). The inverse probability weighted cohort balanced all the risk factors between the BiOC and standard care cohorts (all had standardized difference < 10 %) (Table S2). Results from the inverse probability of treatment weighting analysis found that the odds of Indigenous babies being removed by CPS were significantly lower for mothers who had BiOC care compared to those who received standard care (AOR 0.37, 95 % CI 0.16, 0.84) (Table 4). The sensitivity analysis of excluding women who were transferred in and those who did not have antenatal care showed that BiOC was still protective for baby being removed by CPS (AOR 0.43, 95 % CI 0.19, 0.96) (Table S3).

4. Discussion

Current literature identifies a substantial gap in our understanding of protective factors that reduce Indigenous child removals at birth. This is the first study in Australia that examines the impact of an Indigenous-led urban maternity service on reducing statutory child removals at birth for women having Indigenous babies. Women accessing BiOC services were less likely to have their baby removed, suggesting the access to an Indigenous-led model of comprehensive community-based maternity care, supported by continuity of midwifery carer and underpinned by Indigenous cultural governance, safety and workforce was protective, similar to the Canadian services (Nathoo et al., 2013; Rutman et al., 2020). The BiOC service has a strong focus on strengthening and preserving families and preventing the negative lifelong psychological and health impacts associated with infant removals (Broadhurst & Mason, 2020; Trivedi, 2019). It may well interrupt generational maltreatment (Armfield et al., 2021) and assist Australia to meet the closing the gap target of reducing Aboriginal and Torres Strait Islander children in out-of-home care by 45 % by 2031.

In the jurisdiction where the study took place, Indigenous babies account for 9.7 % of all infants, yet 43 % of the babies in out-of-home-care (Australian Institute of Health and Welfare, 2023). Despite small numbers, it remains encouraging to see an increase in women being discharged from hospital with their babies after birth, and a lower removal rate (BiOC: 9.5 per 1000) than the national

Table 3
Simple and multiple logistic regression models for odds of mothers carrying an Indigenous baby having baby removed by child protection services at discharged from hospital, 01/01/2013–31/12/2019-multiple imputation sample.

	Simple logistic regression ($n = 1988$)	Multiple logistic regression (n = 1988)
Variables	Crude OR (95 % CI)	Adjusted OR (95 % CI)
Teenager	1.24 (0.51, 2.98)	1.46 (0.54, 3.92)
Indigenous mother	3.20 (1.13, 9.04) *	1.41 (0.47, 4.19)
Education<Grade10	8.19 (4.08, 16.45) ***	2.84 (1.26, 6.40) *
Not married or in de facto	4.92 (2.05, 11.81) ***	2.72 (1.08, 6.83) *
Use cannabis in pregnancy	2.25 (1.15, 4.41) *	1.28 (0.59, 2.77)
Current user: Hallucinogens, Heroin, Amphetamines, Ecstasy, or Cocaine in pregnancy	7.14 (2.86, 17.82) ***	1.31 (0.46, 3.79)
Smoke in pregnancy	7.75 (3.41, 17.60) ***	2.37 (0.95, 5.90)
Any major worries stress or change in the last 12 months affecting you now	3.21 (1.65, 6.26) **	1.51 (0.72, 3.19)
Involvement with the Department of Child Safety previously	12.14 (6.11, 24.13) ***	3.44 (1.46, 8.13) **
Child living in the care of other people	13.33 (6.96, 25.53) ***	3.85 (1.67, 8.86) **
Domestic violence	3.16 (1.30, 7.70) *	1.29 (0.48, 3.46)
Pre-existing - Mental health illness	1.48 (0.77, 2.85)	0.67 (0.31, 1.44)

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Table 4
Treatment effect of Birthing in Our Community service for mothers carrying an Indigenous baby whose baby was removed by child protection services at discharge from hospital, 01/01/2013–31/12/2019-multiple imputation sample.

Baby removed	Birthing in Our Community (n = 944)	Standard Care (n = 1044)	Crude OR (95 % CI)	p-Value	Adjusted OR (95 % CI)	p-Value
Yes	9 (0.95 %)	31 (2.97 %)	0.31 (0.15, 0.66)	0.0024	0.37 (0.16, 0.84)	0.017
No	935 (99.05 %)	976 (97.03 %)	Ref		Ref	

Variables adjusted: mother age, Indigenous mother, education level, not partnered, use cannabis, hallucinogens, heroin, amphetamines, ecstasy, or cocaine, smoking in pregnancy, recent major stress, previous CPS involvement, other children in the care of someone else, domestic violence and pre-existing mental health illness.

rate of 57.8 per 1000 in 2021/22 (Australian Institute of Health and Welfare, 2023)).

There are multiple reports describing the critical role of Indigenous community-controlled organisations in improving Indigenous peoples' health (Harfield et al., 2018; Mazel, 2016). A distinct feature of BiOC that may have contributed to the outcome is the multi-agency partnership between Aboriginal community-controlled health services (ACCHS) and a tertiary hospital, whereby Indigenous leadership, agency and focus was reflected in all levels of governance and operation of the service. This partnership, underpinned by Indigenous ways of knowing, being and doing, creates an opportunity to deliver culturally appropriate, strengths-based, respectful care, responsive to the specific needs of the community it aims to serve. The partnership allows Indigenous health and wellness approaches to be embedded when supporting families and is further strengthened by the Indigenous workforce and cultural activities and support through the community hub, led by an Indigenous BiOC Service Manager. The importance of a safe Indigenous place and space cannot be underestimated (Hickey et al., 2021). The ACCHS primary health care setting links women to support services that can assist with housing, financial assistance, interactions with the justice system and other issues that put them at risk of child removal. This approach centres the needs of women and baby while promoting agency, connection and strength-based relationships, informed by Indigenous concepts of relationality (Tynan, 2021). Through this connection and sense of belonging women come earlier and more often in pregnancy (Kildea et al., 2021), build trusting relationships, are more likely to trust staff, disclose challenges and engage with integrated services. This early antenatal engagement can be at odds with what often occurs with women concerned about CPS removals at birth, who can delay or entirely avoid accessing maternity care to specifically avoid detection or involvement with CPS (Marsh et al., 2019; Mason et al., 2019; Wall-Wieler et al., 2019).

Many CPS programs aim to initiate increased support for vulnerable and high-risk pregnant women impacted by disadvantage; however, they operate from a Euro-Western (frequently white, middle class) worldview and often fail to meaningfully engage families (Duthie et al., 2019). Programs are often reactive and individual-focussed, operating from a deficit-based risk model (Conley Wright et al., 2021), whereas Indigenous peoples believe in holistic health and wellbeing which requires more considered responses inclusive of culturally-appropriate programs and wrap-around supports (Duthie et al., 2019; Nathoo et al., 2013). In BiOC, intentional employment of a frontline Indigenous workforce allows Family Support Workers to be cultural intermediaries and advocates between women, midwives, and other service providers. Family Support Workers can facilitate early disclosure of family worries and social stressors, while supporting women to recognise their resilience, identify their strengths and activate personal agency. Leveraging the resources of an integrated community-controlled health service can lead to timely mobilization of activities and supports that address various issues, such as homelessness, food insecurity, financial distress, and safety in the home. Having an Indigenous workforce who may have similar lived experience is pivotal in removing barriers to access, reducing distrust in government agencies, hospitals and medical services (Harfield et al., 2018).

The BiOC services provide women with continuity of care from a culturally responsive primary midwife who receives ongoing cultural training and supervision. This caseload model enables trusting relationships through the maternity journey, critical for genuine engagement, especially for women concerned about being reported to CPS (Marsh et al., 2019; Mason et al., 2019). Midwifery philosophy is closely aligned with an Indigenous definition of health and wellbeing and recognises a woman's rights to self-determination (West et al., 2016). Unique to caseload models, midwives have the capacity to go ‘above and beyond’ what standard care offers, empowering women through respectful care while facilitating choice and control, where women feel safe, and supported (Allen et al., 2017). Building trust during the continuing relationship between women and their dedicated midwife and Family Support Worker allows for advocacy with the hospital child protection liaison officer during risk planning meetings that discuss concerns for pregnant women; where BiOC staff can highlight women's strengths and wrap-around supports.

Instead of purely providing maternity care, BiOC assists women to build on their strengths, through connection and relationships. The service provides an opportunity for women to embed themselves in a broader community that includes having a safe community hub, free of judgement and stigma. Regular Community Days provide opportunities to engage with Indigenous Elders and facilitate cultural connections. These increased cultural connections drive synergistic health engagement, whereby women attend regularly, build emotional resilience and engage in selfcare (Harfield et al., 2018). This approach supports women's agency and resilience, thereby providing an opportunity to interrupt the transmission of intergenerational trauma and child maltreatment (Armfield et al., 2021), while promoting a focus on keeping families together. Separation from a baby's cultural and familial roots impacts sense of belonging and cultural identity. If removal is not prevented, or reunification efforts are not successful, children may grow up in the foster care system, experiencing multiple placements and instability, with negative short and long-term impacts that are avoidable. BiOC may be breaking this cycle of trauma.

4.1. Strengths and limitations

Our study included all eligible Indigenous births and controlled for a large number of potential confounders through inverse propensity treatment weighting. The modelling is superior to conventional regression modelling when the number of events is low compared to the number of confounders, as in this study, because it produces less biased, more robust, precise estimates. However, unlike randomised trials which aim to adequately balance both measured and unmeasured variables across treatment groups, the inverse propensity treatment weighting can only balance measured cofounders that were included in the calculation of the propensity score. While we believe the impact of unmeasured risk factors on child removal has been mitigated by inclusion of substantial social, economic and medical risk factors in the propensity score, it is possible that hidden bias may still remain. The baseline characteristics of each group were different yet balanced through inverse propensity treatment weighting.

The strength of the new service included its location within an integrated primary health care service and community hub which provides easier access to wraparound care through the Family Support Workers the Intensive Family Support Service, the Australian Nurse Family Partnership Program, the Institute for Urban Indigenous Health (IUIH) Community Legal Centre integrated Health Justice partnership, and other purpose-specific programs. It is possible that unmeasured service utilisation, of these or other programs and services, may be impacting outcomes. Further research could aim to provide a deeper understanding of the mechanisms that may be contributing to improved outcomes.

5. Conclusion

Reducing removals at birth is a national priority and a key strategy to reduce inherent, persistent inequalities that start early in life. These findings inform us of the opportunities to improve family preservation and protection through a service that focuses on Indigenous values and wellbeing. Further research is required to test if the expansion of BiOC services can replicate this reduction in removals of babies at birth. The implications for policy and practice are clear. Investment must begin in pregnancy. Funding should be directed to Indigenous organisations and include employment of an Indigenous workforce to work side-by side with families and 24/7 midwives. Indigenous governance and multiagency, redesign of maternity services should be prioritised across the country, if we are to change the trajectory of unborn and child removals for Indigenous families.

Contributors

BOD led the literature search and manuscript writing. YG, YR, SKr, CN and SKi were involved in the protocol, study design and writing the manuscript. YG was responsible for formal data analysis and completed tables and figures. SH contributed to monitoring the study, data collection, ethics approvals, and writing of the manuscript. YR was responsible for Indigenous oversight of the study. AC, KWa, JCu, RB, MR, KWi and JCo contributed to development and delivery of the service and writing the manuscript. SH, SKi, SKr, CN, JCo and KWa monitored fidelity of the intervention. SKi was involved in conceptualization of the intervention, led the funding application, ethical approvals; had oversight of data collection; and key decisions in data analysis and writing of the manuscript. SKi and YG accessed and verified all data in the study. All authors reviewed the final manuscript. The corresponding author had final responsibility for the decision to submit for publication.

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The funder of the study (NHMRC) was independent of study design, data analysis, data interpretation, or writing of this paper.

CRediT authorship contribution statement

Birri O'Dea: Conceptualization, Writing – original draft, Writing – review & editing. **Yvette Roe:** Conceptualization, Supervision, Writing – review & editing. **Yu Gao:** Data curation, Formal analysis, Methodology, Writing – review & editing, Writing – original draft. **Sue Kruske:** Writing – review & editing, Conceptualization, Supervision, Writing – original draft. **Carmel Nelson:** Validation, Writing – review & editing, Project administration, Resources. **Sophie Hickey:** Methodology, Supervision, Writing – original draft, Writing – review & editing. **Adrian Carson:** Writing – review & editing. **Kristie Watego:** Writing – review & editing. **Jody Currie:** Writing – review & editing. **Renee Blackman:** Project administration, Resources, Writing – review & editing. **Maree Reynolds:** Resources, Writing – review & editing. **Kay Wilson:** Resources, Writing – review & editing. **Jo Costello:** Resources, Writing – review & editing. **Sue Kildea:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The research team received an Australian NHMRC partnership grant (GNT1077036), and the partner organisations funded delivery of the new health service, with additional funding from the Queensland Government to the Institute for Urban Indigenous Health (to AC, CN, and KWa) to expand health service delivery. During the study: SKi and YG were employed by Mater Research Institute and University Queensland, then Charles Darwin University; SH was employed by Mater Research Institute then Charles Darwin University; YR was employed by the Institute of Urban Indigenous Health, then Mater Research Institute, then Charles Darwin University. CN, AC, JCu, KWa, and SKr were employed by Institute of Urban Indigenous Health, with JCu then employed by Aboriginal and Torres Strait Islander Community Health Service Brisbane, and SKr then employed by Charles Darwin University. MR, KWi and JCo were employed by Mater Hospital, then JCo employed by the Institute of Urban Indigenous Health. Some of the NHMRC funding that supported the research contributed to salaries of YR, SH and YG. BOD received funding from the Australian Government (Research Training Program Scholarship) and the Alison Mary Jackson and Nancy Rosemary Kingsland Scholarship, through the Molly Wardaguga Research Centre as part of her PhD Candidature at Charles Darwin University. We declare no other competing interests.

Data availability

The study protocol is published and available in an open-access article. The statistical analysis plan is available upon request to the corresponding author. The deidentified data supporting the conclusion of this article would only be available if approval was given by the Birthing in Our Community Steering Committee (Brisbane, Australia) and the research team.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chiabu.2024.106664.

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