NEW ZEALAND RESEARCH

# Place of birth and outcomes for a cohort of low risk women in New Zealand: A comparison with Birthplace England


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## ABSTRACT

**Background:** Choice, safety and availability of different birth settings are important issues for women and midwives in New Zealand (NZ). In England, the Birthplace England Research Study (BPE) has provided detailed information on outcomes for low risk women related to place of birth. These outcomes cannot be generalised to New Zealand owing to differences in context, culture and models of maternity care. **Aim:** This observational study has used retrospective data to determine demographic differences between planned birth place setting, neonatal outcomes and transfer rates for a cohort of low risk New Zealand women and compared these findings where possible with those of the Birthplace England research. **Method:** Data from the New Zealand College of Midwives Clinical Outcomes Research (NZCOMCORD) database were analysed for the years 2006 to 2010 inclusive for low risk women. Comparisons have been made between place of birth (home, primary unit) and parity, ethnicity, age, body mass index, transfer rates, and neonatal outcomes (Apgars, NICU admission, perinatal mortality). **Results:** There were 61,072 women considered low risk, of whom 8% had planned a home birth and 16.6% a primary unit birth. Women who planned to birth at home in New Zealand were older and more likely to be multiparous. These were similar findings to those of the Birthplace England study. The rates of transfer from home (16.9%) or primary unit (12.6%) to hospital were lower than the Birthplace England cohort (21%). There was a higher proportion of nulliparous women (35%) in the planned homebirth group who transferred although this was significantly lower than the Birthplace England cohort (45%) (P<0.002). NZ Māori are the indigenous ethnicity of New Zealand, and a greater proportion of Māori planned birth in a primary unit (27.2%) than a secondary unit (23.2%), home (17.4%) or tertiary hospital (11.1%). The actual number of perinatal mortality outcomes was low across all settings for low risk women in New Zealand and differences in birthplace were not statistically significant (p < 0.14). **Conclusion:** A greater proportion of indigenous New Zealand women planned to birth at home or in a primary unit. Fewer women were transferred in labour in the NZ study. This research further refines our understanding of who plans to birth where, and reinforces the evidence that, where a low risk woman plans to birth in NZ, does not significantly increase adverse outcomes for her baby.



## KEY WORDS

Home birth, primary unit birth, transfer rates, neonatal outco


## INTRODUCTION

The place of birth and, in particular, the option of and provision for homebirth continues to be a highly debated issue for women and midwives in many fully resourced countries. Even with the evidence supporting good outcomes for homebirth it continues to be viewed as an alternative to the mainstream. The debate reflects differences in philosophy and ideology with a wide gulf between opposing sides (Declercq, 2012). The decision to birth at home is culturally and socially driven and is often considered challenging when the default place of birth is a hospital setting. The provision of homebirth as a choice of birth setting requires both that women have autonomy and rights over their bodies and that midwives have autonomy to advocate for women and support homebirth.

Pregnant women in New Zealand have the right to choose where they give birth with a range of options available to most of them such as home, in a primary maternity unit (midwifery-led birthing unit) or in a secondary or tertiary obstetric hospital (Health and Disability Commissioner). The availability of some of these options (such as a primary birthing unit) can be dependent on the region/area in which the woman lives although choice may also be driven by the woman's own personal philosophy and expectations.

An issue for midwives and women is the lack of quality evidence relating to all place of birth settings. The feasibility of undertaking a randomised controlled trial (to aim to provide evidence at that level) comparing place of birth was considered in the Netherlands where there is a high rate of home births (Hendrix et al., 2009). Researchers found that many women declined enrolment because they were unwilling to be assigned to a particular birth setting. Thus the only available evidence

providing information on safety of birth place setting has come from observational studies.

The majority of observational studies published to date have demonstrated benefits for low risk women who give birth at home or in midwifery-led primary units (Birthplace in England Collaborative Group, 2011; Davis et al., 2011; de Jonge et al., 2009; Janssen et al., 2009; Overgaard, A Moller, Fenger-Gron, Knudsen, & Sandall, 2011). However, there have also been a few studies that have suggested poorer outcomes for babies (Evers et al., 2010; Kennare, Keirse, Tucker, & Chan, 2009). Observational studies have inherent methodological challenges which are frequently used to find fault and subsequently dismiss the findings. Variations in methodology, geography and model of maternity care provision increase the potential for conflicting differences in findings.

One large, well-structured, prospective, observational study, comparing planned place of birth for healthy women with low risk pregnancies in England, has provided a large volume of data about birth place outcomes (Birthplace in England Collaborative Group, 2011). The study reviewed place of birth and outcomes for 64,538 women and their babies and compared outcomes for each birth place setting: home, a free standing midwifery-led unit, an alongside midwifery-led unit (see below) or an obstetrics-led unit. The findings revealed healthy women with no risk factors who planned to birth at home or in midwifery-led units had fewer labour interventions and operative births than such women who planned to birth in an obstetric unit, and that adverse perinatal outcomes were low in all birth settings. Perinatal mortality was a rare occurrence for this low risk group, so the study used both morbidity and perinatal mortality and reported them together as a composite outcome. Morbidity was defined as one of the following conditions: neonatal encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus or fractured clavicle. Using this composite measure, the study found an increased incidence for nulliparous women who planned a homebirth (OR 1.75, (95% CI 1.07 – 2.86). A secondary finding was that the rate of transfer for nulliparous women planning a homebirth was 45%, which included transfers before and following the birth. The main reasons for transfer were delay in labour progress, fetal distress or meconium stained liquor.

These data from the Birthplace England (BPE) study cannot be generalised to New Zealand owing to differences in context, culture and models of maternity care. An aim of this study was to describe and compare the demographic characteristics, planned birth place setting, transfer rates and neonatal outcomes for a cohort of low risk NZ women with those of the BPE low risk cohort. Low risk women were defined as having a singleton pregnancy at term and without confounding medical or obstetric risk factors. By replicating the criteria used in the BPE study and applying them to the NZ midwifery dataset, we have been able to explore some of the similarities and differences between the two countries more fully.

## DIFFERENCES AND SIMILARITIES BETWEEN THE ENGLISH AND NEW ZEALAND MODELS OF MATERNITY CARE

England and New Zealand have many similarities in the structure of maternity care, with primary maternity care mostly provided by midwives and clear referral guidelines for secondary care and obstetric input. Additionally, many areas of England offer homebirth and birth in midwifery-led primary settings, These latter are described as free-standing midwifery-led units (not part of an obstetric hospital)(FMLU) or alongside midwifery-led units (which are sited next to, or are part of, an obstetric hospital)(AMLU). New Zealand has a large number of primary units (none of which is sited next to, or is part of, an obstetric hospital) providing midwifery-led care. Obstetric hospitals are classed as either secondary or tertiary units dependent on the level of services they provide. Perhaps the biggest difference, though, is the model of maternity care. In New Zealand, women are able to access continuity of care from a midwife Lead Maternity Carer (LMC) which is standard care for the majority of women (Ministry of Health, 2012). This means that the same midwife will commonly provide the pregnancy, intrapartum and post-partum care. Additionally, the frameworks that support midwifery care highlight the importance of continuity, partnership and the pregnant woman's right to be fully involved and informed in decision making (Guilliand & Pairman, 2010; Health and Disability Commissioner; Ministry of Health, 2007; NZCOM, 2008).

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## METHOD

The study used a retrospective observational design which examined data from the New Zealand College of Midwives Clinical Outcomes Research Database (COMCORD) for the years 2006 – 2010. The Health and Disability Commission Upper South Island Ethics Committee reviewed the research proposal in 2011 and considered that formal ethical approval was not required.

### *The New Zealand College of Midwives Clinical Outcomes Research Database*

The COMCORD uses data collected from Lead Maternity Carer (LMC) midwives who are members of the NZ College of Midwives and the Midwifery and Maternity Provider Organisation (MMPO). Whilst not all LMC midwives belong to the MMPO, those who do, provide care to women throughout New Zealand. The LMC midwife provides data collected contemporaneously via a standardised set of maternity notes or through an electronic connection to the MMPO. Information about the woman's clinical care is entered into the database, from early pregnancy through to the birth and the six weeks following the birth. Summary data are entered onto an electronic system which supports payment claims for the maternity services provided by the LMC midwife. This is a practice management system which supports a quality assurance mechanism where the midwife can access reports relating to the outcomes for her clients. These reports contribute to the midwife's preparation for her biennial Midwifery Standards Review requirements.

The COMCORD is drawn directly from the MMPO database containing partially de-identified aggregated data. It is a subset of the full maternity dataset which is collected by the Ministry of Health and reported on annually (Ministry of Health, 2012). The proportions of women whose outcome data are entered into the MMPO database has increased each year from 30% in 2006 to 47% in 2010 (New Zealand College of Midwives & Midwifery and Maternity Providers Organisation, 2006, 2010). Data management and reporting frameworks are in place to ensure confidence in the reliability of data. This involves regular audit to ensure accuracy of data as well as individual midwives' or midwifery group reports. Additionally, the data are screened and cleaned

as part of the process of providing an annual report for midwives (New Zealand College of Midwives & Midwifery and Maternity Providers Organisation, 2010).

*Sample*

For this study the sample consisted of a low risk cohort of women who met the inclusion and exclusion criteria and had data in the COMCORD between the years 2006 and 2010. The planned place of birth setting was recorded at the onset of labour and included settings such as home, a primary unit, a secondary hospital or a tertiary hospital. The same inclusion and exclusion criteria were applied as for the BPE study. These were:

**Inclusion criteria:**

All women in the database who gave birth between 2006 and 2010 and who:

- Had a singleton pregnancy
- Had a cephalic presentation
- Were at term ( at or more than 37 weeks 0 days)

**Exclusion criteria:**

All women who:

- Had not registered with a midwife LMC at the start of labour
- Had an elective caesarean section
- Had an unplanned homebirth
- Had a body mass index of more than 35
- Had a confounding medical or obstetric risk factor (as per BPE study)

Analysis was undertaken with comparisons made to BPE cohort which involved the key demographic characteristics of age, parity, ethnicity, gestation at birth and body mass index (BMI) along with transfer from home/primary unit to hospital rates. Differences between the two cohort groups were assessed using an online Z test calculator for 2 population proportions using Vassar Stats (http://www.vassarstats.net/index.html).

Neonatal outcomes, including perinatal death, admission to a neonatal intensive care unit, and Apgar score at five minutes, were examined but direct comparison across all parameters with BPE was not possible owing to their use of composite data for analysis.

## FINDINGS

There were 107,216 women with a singleton pregnancy at term in the COMCORD of whom 61,072 (57%) met the inclusion criteria and were categorised as low risk. The majority of women planned to birth in a secondary or tertiary hospital (47.5% and 27.8% respectively) with 8% planning to birth at home and 16.6% in a primary unit (Table 1).

This differed from the BPE cohort, in that their prospective design enabled recruitment to continue until there were comparable numbers in each birth setting group, allowing statistical analysis for difference in outcomes. As such the planned place of homebirth was 26.1% with 43% planning to birth in a midwifery-led environment (FMLU or ALMU) and 30.5% in an obstetric hospital.

### *Table 1:* Planned birth place settings – comparison between NZ COMCORD and BPE

| | Nulliparous | Multiparous | Total Cohorts |
|---|---|---|---|
| **NZ COMCORD** | n (%) | n (%) | n (%) |
| Home | 1286 (26.1) | 3635 (73.9) | 4921 (8.0) |
| Primary unit | 3781 (37.2) | 6377 (62.8) | 10158 (16.6) |
| Secondary Unit | 13915 (47.9) | 15112 (52.1) | 29027 (47.5) |
| Tertiary Unit | 9509 (56.0) | 7457 (43.9) | 16966 (27.8) |
| **Total** | **28491 (45.6)** | **32581 (53.3)** | **61072 (100)** |
| **Birthplace England** * | n (%) | n (%) | n (%) |
| Home | 4568 (27.1) | 12256 (72.8) | 16840 (26.1) |
| Free standing midwifery led unit | 5187 (46.0) | 6078 (53.9) | 11282 (17.5) |
| Alongside midwifery led unit | 8350 (50.0) | 8360 (50.0) | 16710 (25.9) |
| Obstetric hospital | 10626 (53.9) | 9049 (45.9) | 19706 (30.5) |
| **Total** | **28731 (44.5)** | **35743 (55.4)** | **64538 (100)** |

*Small volume of missing parity data in BPE cohort

> In the COMCORD cohort a greater proportion of women who planned to birth in a primary maternity unit or a secondary unit identified as Māori.

The ratio of nulliparous women to multiparous women was similar overall between the two cohorts (COMCORD 45.6% nulliparous, 53.3% multiparous, BPE 44.5% nulliparous, 55.4% multiparous).

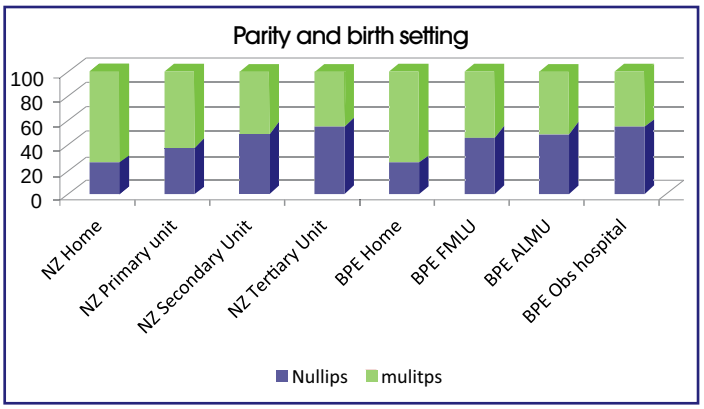


***Figure 1:*** Birth setting and parity

The nulliparous/multiparous ratio differed dependent on birth place setting in both countries (figure 1). For women planning to birth at home the ratio of nulliparous to multiparous women was lower across both countries (COMCORD 26.1% nulliparous, 73.9% multiparous and BPE 27.2% nulliparous, 72.8% multiparous). This pattern continued with fewer nulliparous than multiparous women planning birth in a New Zealand primary unit (nulliparous 37.2%, multiparous 62.8%) or an English free standing maternity unit (FMLU) (nulliparous 46%, multiparous 53.9%). For women planning a hospital birth in both countries there was a higher percentage of nulliparous women compared to multiparous for obstetric hospitals (BPE 53.9% nulliparous, 45.9% multiparous) and tertiary maternity units (COMCORD 56% nulliparous, 43.9% multiparous) but not in the NZ secondary maternity units (47.9% nulliparous, 52.1% multiparous).

In the following analyses comparisons have been made between primary units (NZ) and free standing midwifery-led units (England) but we have excluded the alongside midwifery-led unit (England) because there are no primary units in New Zealand which sit alongside an obstetric hospital. The comparison with the obstetric unit has compared both secondary and tertiary hospital outcomes in the cohort to that of the obstetric unit in the BPE cohort.

## ETHNICITY

Ethnicity profiles differ markedly between England and New Zealand. Whilst both countries have a degree of ethnic variation, the heterogeneity and proportional totals of the ethnic groups are greater in the NZ cohort (Table 2). In the New Zealand COMCORD cohort there were 63.9% of women identifying as NZ European, 20% as Māori (indigenous people of NZ), 5.2% as Pasifika and 7.1% as Asian. This compares to 97% categorised as 'white' and less than 3% for ethnicity other than 'white', in the BPE cohort.

## ***Table 2:*** Ethnicity comparisons by planned place of birth between NZ COMCORD and BPE

| **NZ Ethnicity** | Home | Primary unit | Secondary hospital | Tertiary hospital | Total |
|---|---|---|---|---|---|
| | n (%) | n (%) | n (%) | n (%) | n (%) |
| NZ European | 3645 (74.1) | 6308 (62.1) | 17753 (61.2) | 11313 (66.7) | 39019 (63.9) |
| Māori | 855 (17.4) | 2764 (27.2) | 6728 (23.2) | 1882 (11.1) | 12229 (20) |
| Pasifika | 132 (2.7) | 461 (4.5) | 1509 (5.2) | 1076 (6.3) | 3178 (5.2) |
| Asian | 132 (2.7) | 400 (3.9) | 2065 (7.1) | 1764 (10.4) | 4361 (7.1) |
| Other | 135 (2.7) | 205 (2.0) | 880 (3.0) | 849 (5.0) | 2069 (3.4) |
| Not stated | 22 (0.4) | 20 (0.2) | 92 (0.3) | 82 (0.5) | 216 (0.4) |
| **Total** | **4921 (100)** | **10158 (100)** | **29027 (100)** | **16966 (100)** | **61072 (100)** |
| | Home | Free standing midwifery-led unit | Obstetric Hospital | | Total |
| **Ethnicity Birthplace England** | n (%) | n (%) | n (%) | | n (%) |
| White | 15937 (94.8) | 10329 (91.6) | 16068 (81.7) | | 42334 (88.5) |
| Indian | 67 (0.4) | 87 (0.8) | 477 ( 2.4) | | 631 (1.3) |
| Pakistani | 41 (0.2) | 164 ( 1.5) | 636 (3.2) | | 841 (1.7) |
| Bangladeshi | 14 (0.1) | 147 ( 1.3 ) | 297 (1.5) | | 458 (0.9) |
| Black Caribbean | 127 (0.8) | 48 ( 0.4 ) | 265 ( 1.3) | | 440 (0.9) |
| Black African | 112 (0.7) | 94 ( 0.8) | 670 (3.4) | | 876 (1.8) |
| Mixed | 280 (1.7) | 124 ( 1.1) | 328 (1.7) | | 732 (1.5) |
| Other | 241 (1.4) | 284 ( 2.5 ) | 938 (4.8) | | 1463 (3.0) |
| Missing | 21 (0.1) | 5 (0.04) | 27 (0.1) | | 53 (0.1) |
| **Total** | **16840 (100)** | **11282 (100)** | **19706 (100)** | | **47828 (100)** |

## ***Table 3:*** Comparison of demographic characteristics by planned place of birth between COMCORD and Birthplace England

| | NZ COMCORD | | Birthplace England | |
|---|---|---|---|---|
| | Planned home birth | Planned primary unit birth | Planned home birth | Planned FMLU birth |
| **Age** | n (%) | n (%) | n (%) | n (%) |
| <20 | 145 (2.9) | 1059 (10.4) | 218 (1.3) | 677 (6.0) |
| 20-24 | 640 (13.0) | 2220 (21.9) | 1706 (10.1) | 2132 (18.9) |
| 25-29 | 1291 (26.2) | 2695 (26.5) | 4346 (25.8) | 3267 (29.0) |
| 30-34 | 1663 (33.8) | 2636 (25.9) | 5848 (34.7) | 3248 (28.8) |
| 35-39 | 987 (20.1) | 1321 (13.0) | 4017 (23.9) | 1690 (15.0) |
| 40+ | 195 (4.0) | 227 (2.2) | 671 (4.0) | 254 (2.3) |
| Missing | 0 (0.0) | 0 (0.0) | 34 (0.2) | 14 (0.1) |
| *Total* | **4921 (100)** | **10158 (100)** | **16840 (100)** | **11282 (100)** |
| BMI | n (%) | n (%) | n (%) | n (%) |
| <18.5 | 109 (2.2) | 231 (2.3) | 321 (1.9) | 234 (2.1) |
| 18.5 - 24.9 | 2572 (52.3) | 4938 (48.6) | 8155 (48.4) | 5605 (49.7) |
| 25.0 - 29.9 | 902 (18.3) | 2307 (22.7) | 3776 (22.4) | 2653 (23.5) |
| 30.0 - 35.0 | 296 (6.0) | 1075 (10.6) | 1226 (7.3) | 912 (8.1) |
| Missing | 1042 (21.2) | 1607 (15.8) | 3362 (20.0) | 1878 (16.6) |
| **Total** | **4921 (100)** | **10158 (100)** | **16840 (100.3)** | **11282 (100.2)** |

*FMLU = Free standing midwifery-led unit

In the COMCORD cohort a greater proportion (27.2%) of women who planned to birth in a primary maternity unit or a secondary unit identified as Māori, (23.2%). In contrast more women who identified as Asian (10.4%) or Pasifika (6.3%) planned to give birth in a tertiary hospital. A higher proportion of women who identified as NZ European planned to birth at home (74.1%).

In the BPE cohort the obstetric hospital had the greatest range of ethnic variation when compared to the other birth place settings. The majority of women who planned a homebirth in the BPE study were white (94.8%) with only small proportions from other ethnicities.

*Other Demographic Comparisons*

The key demographics of age and body mass index for women planning to birth at home or in a primary unit were compared (Table 3).

Women who planned to birth in a primary unit or an FMLU had a relatively wide age range with more NZ women (32.3%) under the age of 25 years planning primary unit birth when compared to the BPE study (24.9%). From the COMCORD data 15.9% of women under the age of 25 year gave birth in a secondary unit and 23% in a tertiary unit compared to 29.2% of the BPE cohort who planned birth in an obstetric hospital.

Women who planned a homebirth in both countries were older, with more women in the over 35 years age group in both homebirth groups. However, the NZ cohort had a lower proportion of women over 35 years of age when compared to BPE (COMCORD homebirth 24.0% and BPE homebirth 27.8%, Z = -5.31, P <0.002).

In both cohorts a greater proportion of women with a BMI between 18.5 and 24.9 (normal range) planned a home or primary unit birth (52.3% COMCORD to 48.4% BPE). There was a comparable volume of missing BMI data across both datasets. There were significantly fewer women with a BMI over 24.9 who planned to birth at home in the New Zealand data when compared to BPE data (COMCORD 24.3%, BPE 29.7%, P <0.002). A higher proportion of women with a BMI that placed them in the obese category planned a primary unit birth in the NZ dataset (COMCORD 10.6%, BPE 8.1%, P <0.001).

*Transfer rates*

The transfer rates for NZ women who planned a homebirth or a primary unit birth are presented in Table 4 with comparison to the BPE cohort. In the COMCORD cohort there was a significant difference between the transfer rates of women who planned to birth at home compared to in a primary unit (16.9% home, 12.6% primary, P <0.001). Both transfer rates were also significantly lower than the BPE cohort where 21% of women who had planned a homebirth or a free standing midwifery led unit birth were transferred (p<0.001).

Transfer rates for nulliparous women who planned a primary unit birth were also significantly lower in New Zealand.

When comparing parity the Birthplace England study demonstrated high transfer rates for nulliparous women planning to birth at home (45%). In New Zealand nulliparous women who planned to birth at home also had a higher rate of transfer (compared to multiparous women) but at 35.8% the rate was significantly lower than in the BPE study (P< 0.001). Transfer rates for nulliparous women who planned a primary unit birth were also significantly lower in New Zealand (25.4%) when compared to the rates for women who planned to birth in a free standing midwifery-led unit in the BPE cohort (36.3%) (P< 0.001).

*Neonatal outcomes*

This section describes the neonatal outcomes in the New Zealand cohort. A direct comparison of neonatal outcomes with the Birthplace England study was not possible owing to some specific English variables not captured in the New Zealand data source (such as shoulder dystocia and fractured clavicle).

The incidence of adverse outcomes, such as Apgar score less than seven at five minutes, admission to a neonatal unit and perinatal mortality for the New Zealand cohort, is presented in Table 5.

The actual number of perinatal mortality outcomes was low across all settings in New Zealand and differences were not statistically significant (p< 0.14). We were unable to discern whether the perinatal death occurred before or after the commencement of labour in the dataset or whether mortality was due to lethal congenital anomaly. A significantly higher proportion of babies had Apgar scores of less than seven, and/or were transferred to a neonatal unit when the planned place of birth was a secondary or tertiary hospital (p=0.0001).

**Table 4:** Transfer rates comparison NZ COMCORD & Birthplace England

| | Homebirth N=4921 | | | Primary unit N=10158 | | |
|---|---|---|---|---|---|---|
| | Actual | Transfer | **Total** | Actual | Transfer | **Total** |
| *NZ COMCORD* | N (%) | N (%) | | N (%) | N (%) | |
| All women | 4088 (83.1) | 833 (16.9) | **4921** | 8877 (87.4) | 1281 (12.6) | **10158** |
| Nulliparous women | 825 (64.2) | 461 (35.8) | **1286** | 2819 (74.6) | 962 (25.4) | **3781** |
| Multiparous women | 3263 (89.8) | 372 (10.2) | **3635** | 6058 (95.0) | 319 (5.0) | **6377** |
| *Birthplace England* | Homebirth N=16840 | | **Total** | Free standing Midwifery-led unit N=11282 | | **Total** |
| Homebirth N=16840 | Total | Free standing | | | | |
| Midwifery-led unit N=11282 | Total | | | | | |
| | Actual | Transfer | **Total** | Actual | Transfer | **Total** |
| All women | 13310 (79.0) | 3530 (21.0) | **16840** | 8814 (78.1) | 2468 (21.9) | **11282** |
| Nulliparous women | 2511 (55.0) | 2057 (45.0) | **4568** | 3303 (63.7) | 1884 (36.3) | **5187** |
| Multiparous women | 10784 (88.0) | 1472 (12.0) | **12256** | 5505 (90.6) | 573 (9.4) | **6078** |

**Table 5:** COMCORD Neonatal outcomes by planned place of birth

| | HOME | PRIMARY UNIT | SECONDARY HOSPITAL | TERTIARY HOSPITAL | Total | Chi Square |
|---|---|---|---|---|---|---|
| | n (%) | n (%) | n (%) | n (%) | n (%) | P= |
| *Apgars at 5 min* | | | | | | |
| <7 | 73 (1.5) | 177 (1.7) | 664 (2.3) | 473 (2.8) | 1387 (2.3) | <0.0001 |
| >7 | 4845 (98.5) | 9972 (98.2) | 28330 (97.6) | 16478 (97.1) | 59625 (97.6) | |
| Missing | 3 (0.06) | 9 (0.09) | 33 (0.1) | 15 (0.05) | 60 (0.09) | |
| **Total** | **4921 (100)** | **10158 (100)** | **29027 (100)** | **16966 (100)** | **61072 (100)** | |
| *Transfer to NNU* | | | | | | |
| Transfer No | 4829 (98.1) | 9933 (97.8) | 28139 (96.9) | 16315 (96.2) | 59216 (96.9) | |
| Transfer Yes | 92 (1.8) | 225 (2.2) | 888 (3.1) | 651 (3.8) | 1856 (3.1) | <0.0001 |
| **Total** | **4921 (100)** | **10158 (100)** | **29027 (100)** | **16966 (100)** | **61072 (100)** | |
| *Perinatal mortality per 1000 births* | | | | | | |
| Live birth | 4911 (99.8) | 10139 (99.8) | 28945 (99.7) | 16911 (99.7) | 60906 (99.7) | |
| Perinatal death | 10 (0.2) | 19 (0.19) | 82 (0.3) | 55 (0.3) | 166 (0.3) | <0.14 |
| **Total** | **4921 (100)** | **10158 (100)** | **29027 (100)** | **16966 (100)** | **61072 (100)** | |

One of the key findings of the BPE study was the increased risk of an adverse neonatal outcome for nulliparous women who planned a homebirth. Owing to the smaller sample size in the New Zealand homebirth group and the rarity of the adverse outcome, we considered it inappropriate to explore the differences between nulliparous and multiparous women. However, we were able to examine the differences in perinatal outcomes dependent on actual place of birth or transfer following the onset of labour (Table 6).

While all adverse outcomes were rare, our data show that rates of Apgar score <7 at five minutes, neonatal unit admission and perinatal mortality were significantly higher for babies born to women who transferred from home or a primary unit after labour had commenced. The women who gave birth in the planned place of birth had lower levels of perinatal mortality (0.07% home, 0.1% primary units) than women who were transferred from home or a primary unit (0.8% and 0.6% respectively).

## DISCUSSION

This review of New Zealand place of birth data has found both similarities and differences in demographics to those of the Birthplace England cohort. Women from the NZ cohort who planned to birth at home were more likely to be multiparous, older and with a lower BMI when compared to those women planning to birth in other settings. This replicates findings from the BPE cohort and several other observational studies (Birthplace in England Collaborative Group, 2011; Hildingsson, Lindgren, Haglund, & Radestad, 2006; MacDorman, Declercq, & Matthews, 2011; Nove, Berrington, & Matthews, 2011). In these developed countries (Sweden, America, UK), it would appear that women who plan to give birth at home are more likely to be

**Table 6:** Neonatal outcomes by actual place of birth (home and primary units): Women at terms with a singleton pregnancy and no confounding risk factors

| | HOME | | | PRIMARY UNIT | | | TOTAL |
|---|---|---|---|---|---|---|---|
| | Actual | Transferred | Chi square | Actual | Transferred | Chi square | n (%) |
| | n (%) | n (%) | P= | n (%) | n (%) | P= | |
| Apgars >7 at 5 min | 4048 (99) | 797 (95.7) | | 8750 (98.6) | 1222 (95.4) | | 14817 (98.3) |
| Apgars <7 at 5 min | 38 (0.9) | 35 (4.2) | <0.0001 | 119 (1.3) | 58 (4.5) | <0.0001 | 250 (1.7) |
| Missing data | 2 (0.05) | 1 (0.1) | | 8 (0.09) | 1 (0.07) | | 12 (0.08) |
| No Transfer to NICU | 4029 (98.6) | 800 (96) | | 8700 (98) | 1233 (96.3) | | 14762 (97.9) |
| Transferred to NICU | 59 (1.4) | 33 (4.0) | <0.0001 | 177 (2.0) | 48 (3.7) | <0.0001 | 317 (2.1) |
| Live birth | 4085 (99.9) | 826 (99.2) | | 8866 (99.9) | 1273 (99.4) | | 15050 (99.8) |
| Perinatal mortality | 3 (0.07) | 7 (0.8) | * | 11 (0.1) | 8 (0.6) | <0.0001 | 29 (0.2) |
| **Total** | **4088 (100)** | **833 (100)** | | **8877 (100)** | **1281 (100)** | | **15079 (100)** |
| *numbers too small for statistical test | | | | | | | |

multiparous, with a maternal age between 30 and 35 years of age, a high level of education, married or with a partner, and Caucasian or white. In addition, low BMI, non-smoking status and geographical location have been associated with women who birth at home. Even the Netherlands which has a very strong culture of homebirth has found that multiparous women were more likely to have a homebirth than nulliparous women (Anthony, Buitendijk, Offerhaus, Dommelen, & Bruin, 2005).

A major difference in the New Zealand cohort is the ethnic diversity of the maternity population and the high proportion of women planning to birth either in a primary unit or at home who identified as Māori. This finding indicates that options and choice of maternity setting are being provided for low risk women. Whilst we acknowledge that women who opt for homebirth are self-selecting, of note is the high proportion of Māori women who make this choice. We cannot be sure, but surmise that our partnership model of care, which enables the woman to be central to decision-making, is attractive to our indigenous population who value the opportunity to be supported in birthing practices which are culturally safe and which may be more easily honoured in homebirth/primary unit settings.

*Transfer rates*

Transfer rates for women planning homebirth and primary unit birth in New Zealand were lower than that of the BPE cohort but comparable to several other international research studies that have reported this outcome. A Swiss study of 489 women in matched pairs comparing home and hospital birth reported a transfer rate of 15.9% for the homebirth group following onset of labour with a higher transfer rate (25%) for primiparous women (Ackermann-Liebrich et al., 1996). A Canadian study comparing outcomes for a cohort of 6692 low risk women who planned homebirths reported a combined intrapartum and postpartum transfer rate of 14.3% (Hutton, Reitsma, & Kaufman, 2009). A study from the Netherlands involving 37,735 babies reported referral during labour for 14.6% of the homebirth cohort with a higher referral rate of 22.9% for nulliparous women (Evers et al., 2010). Finally, a study involving 15,574 women who planned to birth in a birth centre in the United States of America (USA) reported a transfer rate of 12.4% for women admitted once labour had started (Stapleton, Osborne, & Illuzzi, 2013). Of this group 81.6% were nulliparous. The main reason for transfer was most commonly prolonged labour or labour arrest with only a small proportion requiring transfer for emergency reasons such as a fetal distress.

Of interest are the differing demographics of the New Zealand women who choose to birth in a primary unit as opposed to home. The primary unit group had a greater diversity of age, parity and BMI, yet the transfer rate for this group (which could be argued to be at greater risk) was lower than for women who planned to birth at home. To uncover the reasons for this difference would require further research.

*Neonatal outcomes*

Perinatal mortality in our cohort ranged from between 0.19% to 0.3% dependent on the planned birth setting at the commencement of labour but differences were not statistically significant. We were unable to exclude from our sample babies born with lethal congenital anomalies or women whose babies may have died prior to labour. This may have resulted in a higher perinatal mortality rate when compared to studies where these mortalities have been excluded such as Birthplace England. In New Zealand the overall perinatal mortality rate in 2012 was 6.8 per 1000 babies (using the UK definition) with a neonatal mortality rate of 2.9 per 1000 (of which 30% were due to congenital abnormality) (Perinatal and Maternal Mortality Review Committee, 2014). Māori and Pasifika babies have higher neonatal mortality rates than other ethnicities (Perinatal and Maternal Mortality Review Committee, 2014). Given that the perinatal mortality numbers in this study were low it was not possible to make comparisons by ethnicity.

International comparisons of perinatal mortality are difficult to make owing to differences in definitions and inclusion criteria. De Jonge and colleagues (2009) reported an intrapartum and neonatal death rate (0 – 7 days) of 0.06% for homebirth babies and 0.07% for hospital birth, although their method excluded women who had a known intrauterine death before labour and lethal abnormalities. Studies which have not excluded stillbirth prior to labour and congenital abnormalities have reported mortality rates ranging from 0.17 to 0.2% for women giving birth at home (Hutton et al., 2009; Johnson & Daviss, 2005; Lindgren, Radestad, Christensson, & Hildingsson, 2008).

An important finding was the increased incidence of the adverse perinatal outcomes of admission to NICU, low Apgar or perinatal mortality for the babies of women who were transferred from home or primary unit to hospital. This is a similar finding to that of Evers et al. (2010) in the Netherlands who reported higher rates of mortality (without congenital malformations) for women who were referred to secondary care during labour (1.05% compared to 0.96%). This finding could be interpreted as appropriate transfer to hospital of women or babies who need referral owing to complications arising during labour. Until we are able to exclude antenatal fetal mortality and/or lethal congenital abnormalities, it is difficult to ascertain whether this is a true difference and what may be contributing to the difference.

*Strengths and limitations of this study*

The fact that we have used retrospective data has meant there was a need to apply multiple exclusions to obtain a sample of low risk women and although exclusions were carefully and consistently applied there may still be confounding variables that could have an influence on outcome and which have not been accounted for. Additionally, we were unable to analyse confounding social factors such as socio-economic status.

The inclusion of women who transferred is appropriate for this study as our research question focused on the intended place of birth. Women who transferred remained in the sample group in which they began. Initial care provider (LMC midwife) was constant in all settings. A number of women in the homebirth and primary unit birth groups did transfer in labour but the research team were unable to determine impact of transfer of care (responsibility for care) to obstetrician or core (hospital employed) midwife. It would be useful to conduct further research focused on women who transfer from their planned place of birth, and whether continuity of care was maintained or not, to determine the impact of this on maternal and neonatal outcomes.

Exclusion of high risk women (e.g., multiple pregnancy, preterm labour and unplanned or unattended homebirth) across all samples in all four settings was a useful way of reducing the risk of including perinatal deaths that would have occurred regardless of place of birth. Unfortunately it was not possible to exclude antenatal stillbirths for the study sample as the timing of fetal demise was not available in the COMCORD dataset. Similarly we were unable to exclude congenital abnormality as a cause of mortality. Now that these issues have been identified, changes to the MMPO notes and database will ensure that future studies (from 2012 onwards) will include this important information. It is possible that the inclusion of antenatal stillbirths will have inflated the perinatal deaths in all groups and particularly in the secondary and tertiary hospital groups as the majority of women affected by an antenatal stillbirth would plan to birth at a secondary or tertiary hospital.

There is a growing body of evidence demonstrating that maternal outcomes (increased likelihood of normal birth and fewer interventions during labour) are improved for women who, when considered to be low risk, plan to birth at home or in a midwifery-led facility instead of in an obstetric hospital (secondary or tertiary hospital) setting (Birthplace in England Collaborative Group, 2011; Davis et al., 2011; Lindgren et al., 2008; Janssen et al., 2009). Our findings demonstrate that adverse neonatal outcomes are low and comparable between birth place settings for women who are classed as low risk.

## CONCLUSION

Midwives need to be able to provide information about the benefits and contraindications for each birth place setting to aid women in their

decision making. This study provides information that is context specific for New Zealand about the outcomes for homebirth and primary unit births. Collecting and publishing data in this way are important as they enable informed decision making and support midwives and women to assess the individual relationship of the pregnancy with risk.

The demographic characteristics of this cohort of women planning a homebirth in New Zealand show similarities with the BPE with women who plan to birth at home in both countries more likely to be older and multiparous. A major difference is the ethnic diversity of New Zealand which is reflected in the birth place setting data with indigenous Māori women accessing both home and primary (midwifery led) maternity facility care in significant numbers. Fewer nulliparous women planned homebirth and for those that did, more than a third were likely to transfer to an obstetric hospital. Women who planned to birth in primary units were younger than women planning homebirth, had a greater range of BMI and parity and a larger proportion were Māori. Despite this the intrapartum transfer rate was lower than for women planning to give birth at home. Perinatal mortality was a rare event with the majority of women achieving a live born baby with good Apgar scores and no need for admission to NICU. The comparison of data with the Birthplace England study has demonstrated some similarities in that adverse outcomes are rare, but also some differences between the cohorts which may be attributed to differences in context and culture.

Changes to the collection of NZ data (maternity notes) have been made to ensure that in future lethal congenital abnormality and pre-labour mortality can be identified and excluded. This will improve our ability to compare New Zealand data to other datasets. Further research is needed focused on women who transfer during labour and whether continuity of care continues or not, to determine the potential impact this may have on maternal and neonatal outcomes.

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