National Women's Health
Annual Clinical Report
2015

Welcome *Haere Mai* | Respect *Manaaki* | Together *Tūhono* | Aim High *Angamua*

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National Women's Annual Clinical Report 2015

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My work often reflects my interest in the culture and traditions of the Pacific Islands. In this pastel, two women sit beside a basket of 'kuru' or breadfruit, perhaps enjoying a rest in the cool shade of the tree. Grown throughout the Pacific, breadfruit is known as Kuru in Cook Island Māori, Uru in Tahitian, Ulu in Samoan and 'Ulu in Hawaiian. The fruit is a nutritious food staple while the large impressive trees have many uses, including providing shelter for other crops, wood for homes and canoes, making medicines and as boundary markers.

Disclaimer

The purpose of this publication is to promote discussion and audit of outcomes. The opinions expressed in this publication do not necessarily reflect the official views of National Women's Health and Auckland District Health Board.

Acknowledgements

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1 EXECUTIVE SUMMARY

1.1 Director's Comment

Once again I am proud to present the outcomes of our care in 2015 in this Annual Clinical Report. The tradition of taking full account for the care we deliver is deeply embedded in the National Women's culture. This year our report has been given an update in form and content. Colour has been used as an aid to interpreting data presented in graphical form. Data tables have been incorporated into the body of the report rather than being included in appendices. Our Maternity Quality and Safety report, monitored by the National Maternity Monitoring Group is once again integrated into the maternity section of the report. A slightly different approach to the analysis and presentation of our birthing outcome data; where relevant we have presented data according to the professional group providing care.

For the first time since 1989 the number of women birthing in our service has fallen below 7,000. This decline is mostly accounted for by a reduction in birthing numbers for our ADHB population. The reason for this decline is unclear and was not predicted by our forecasting work in 2014. The decline in numbers has been accompanied by a change in the ethnic mix of our birthing population with a consistent increase over time in the proportion of our population identifying as Asian, from 22.7% in 2006 to 32.3% in 2015.

Despite a focus on optimising spontaneous vaginal birth rates over the past year our operative birth rates have increased. Our induction of labour in standard primigravida is well above the national average, and our spontaneous vaginal delivery rate well below the national average. Our Caesarean section rate, at 35.6% overall, is highest among Private Obstetricians and lowest for the NW Community midwifery group and for self-employed midwives. These trends are reversed for spontaneous vaginal delivery rates. During 2016 we will work towards better understanding of these differences.

Concerningly, since 2006 we have seen a significant increase in the proportion of babies with low apgar scores at one and five minutes. A low score was significantly more likely to occur when care was delivered by a self-employed LMC or NWH community team than a private obstetrician. An important quality focus in 2016 is to strengthen the competencies of our NWH staff and self-employed midwives in fetal surveillance.

We have seen a notable change in the gestation of our babies at birth. Our rates of preterm birth in 2015 are the lowest they have been in a decade due largely to a reduction in iatrogenic preterm births. This is likely to be due to evidence based changes in practice including more conservative management of pre-term ruptured membranes and hypertensive disorders of pregnancy at lower gestations. Our work on trying to reduce spontaneous pre-term deliveries continues with access to a Preterm Prevention Clinic for those women at highest risk of pre-term birth. Simultaneously we have noted a reduction in births at 40, 41 and 42+ weeks and an increase in births at 38 and 39 weeks due to an increase in inductions and elective Caesarean sections at these gestations.

Perinatal related mortality rates amongst women birthing at National Women's was the lowest for 13 years.

Considerable effort has gone into improving the quality and detail of the gynaecological data. Our Gynaecological Oncology service is the fastest growing segment of our gynaecology service with an almost doubling of referrals into the service since 2007. Increased numbers together with a move towards more radical surgical approaches, particularly for advanced ovarian cancer, requires us to invest in additional staff and physical resources to sustain this service.

Within our general gynaecology service we continue to see fewer women year on year undergoing hysterectomy as non-surgical approaches to managing abnormal uterine bleeding are used. The outpatient hysteroscopy pathway established last year has become more fully established and is successfully streamlining care for this group of women. This model will be scaled up in 2016 to address post-menopausal bleeding and assist us in meeting the MOH faster cancer targets. Where hysterectomies have been performed they are increasingly likely to be performed laparoscopically. The overall surgical complication rate for general gynaecology has fallen progressively since 2013.

Our focus on ensuring that our care delivers measurable value to our patients is unwavering. Over this next year consumer input into our quality and clinical governance structure will increase. We will be exploring ways in which we can incorporate patient valued outcomes into our report, including patients' experiences of care.

I would like to thank all our caregivers for their service and dedication to both delivering the care and to those who contributed to the critical appraisal of the care outcomes. I am also grateful to our Women's Health Intelligence team for their willingness to be innovative in the presentation of the data and their tireless commitment to ensuring the quality of the information.

Dr Sue Fleming, Director National Women's Health

1.2 Consumer Comment

It is hard to believe that another year has passed but it is with great pleasure that we again provide an introduction to this year's Annual Clinical Report from our perspectives as consumer members of National Women's Clinical Governance Framework. The dedication and rigour in annually reporting clinical data at National Women's is to be applauded. It invites scrutiny of clinical outcomes at National Women's leading to increased transparency and accountability; ensuring informed quality improvement initiatives; and supporting reflective clinical practice. However, while the data contained in this report alone tells a powerful story, we must remember that behind every number and statistic are the stories of people who have experienced a profound and lasting moment in their lives, whether that be welcoming a new child into their family, terminating a pregnancy they do not wish to continue, or receiving treatment for gynaecological cancer. We are both honoured and proud to serve the team at National Women's, and the people who use its services, as consumer representatives. We take seriously our responsibility to ensure people are at the centre of its services.

We are pleased to report on a number of consumer-related activities underway at National Women's that we believe set this service apart as a leader in health consumer engagement and participation nationally. Service provision and quality improvement activities at National Women's are overseen by a comprehensive tiered Clinical Governance structure which in 2015 continued to include consumer representatives at multiple levels. Consumer representatives have also been included in a range of quality improvement projects at National Women's in 2015 including the refurbishment of Epsom Day Unit, the implementation of new parenting education services, a collaborative Maternity Plan with Waitemata DHB to explore how best to deliver primary and secondary maternity services to our populations and create better frameworks for primary healthcare providers using DHB services.

This has helped ensure these quality improvement projects are informed by the principles of co-design to deliver improved outcomes and ensure consumer satisfaction. The capturing of patients' experience in the form of feedback is essential to ensure people-centered services. As consumer representatives we are concerned by low-rates of feedback from consumers of National Women's services and have pushed for, and welcomed, a review of how patient feedback is collected and the identification of possible barriers that need to be addressed in order to increase it. We look forward to reporting on some consumer-driven activities to increase patient experience data collection in 2016.

We are excited to report on the first stages of the 'Strengthening Consumer Voice Project'. This is an innovative, consumer-driven project to extend formal consumer representation across National Women's Clinical Governance Group structure. It attests to the level of commitment to collaboration and meaningful consumer participation by National Women's leadership. The project is in its infancy but is currently working to identify a new and replenishing pool of consumer representatives who represent the diversity of ethnicity, culture, and experience amongst those who use National Women's Services. Consumer representatives will be inducted into the clinical governance structure and be provided consumer-led orientation, training and on-going support to ensure they are able to participate effectively. Consumer representatives will also be invited to participate in a Maternity Consumer Quality Group which will form part of the Clinical Governance structure. This group will meet quarterly and will help ensure consumer representation is joined up along with providing a forum for the identification and discussion of consumer related issues. We believe the success of the Strengthening Consumer Voice will be measured through Sustainability (connected, supported, informed and accountable maternity service consumer representatives), Effectiveness (diverse consumer perspectives to inform and shape maternity service design and delivery) and added value (high levels of consumer satisfaction with quality and safety maternity services).

We are looking forward providing a critique on the content of this report at the Annual Clinical report day in August, and to another year supporting the team at National Women's to provide high-quality care with people at its centre.

George Parker and Isis McKay
Consumer Advisors

1.3 Summary of Findings 2015

MATERNITY

The maternity analysis in this report relates to the women who gave birth at NWH in 2015, including women who were transferred for tertiary care.

1 Six thousand nine hundred and thirty three (6933) women birthed seven thousand and seventy four babies (7074; including 266 twin babies and 12 triplet babies) in 2015. This was 467 fewer mothers than birthed at NWH in 2014.

2 The overall Caesarean section rate was 35.6% (36.3% among nullipara and 34.9% among multipara).

3 The perinatal related mortality rate was 11.7/1000 births, with a fetal death rate of 7.6/1000 births and a neonatal death rate of 4.1/1000 live births.

DEMOGRAPHY

1 Of the 6933 birthing mothers in 2015, 66.2% resided in the ADHB area, 14.4% in Waitemata DHB area, and 17.0% in Counties Manukau DHB area.

2 Thirty three percent of birthing mothers were New Zealand European, 11.9% Other European, 6.8% Māori, 11.6% Pacific peoples, 9.5% Indian, 22.8% Other Asian, and 4.3% Other ethnicities. The proportion of mothers identifying as Asian increased from 22.7% in 2006 to 32.3% in 2015.

3 Among women birthing at NWH in 2015, 5.5% reported smoking at booking and 4.7% at birth. This is low compared to national rates, but rates of smoking are high among mothers <=25 years, women living in areas of high socioeconomic deprivation, and Māori and Pacific mothers. Seventy five percent of all smoking mothers at NWH in 2015 identified as Māori or Pacific peoples.

4 At booking, 14% of women attending the NW Community clinic reported that they were smoking; and 45% (170) of smokers attended the Community clinic for primary maternity care. If women receiving LMC care from the diabetes and medical clinics are added to these smokers, 60% (230) are attending NW clinics for care. Of self-employed midwifery clients, 3.7% were smokers, as were 0.2% of private obstetrician clients.

5 Forty one percent of the maternity population birthing at NWH were overweight or obese in 2015 (BMI >25), with 8.7% morbidly obese (BMI >35). There has been no change in obesity rates in the birthing population at NWH from 2009 to 2015.

6 In 2015, 48% of women were registered with a self-employed (or independent) midwife at birth, 27% with a private obstetrician, 18% with the National Women's Community clinic service, and 6% with National Women's specialist medical and diabetes clinic services. Overall 75% of women who gave birth at NWH in 2015 were under the care of a self-employed Lead Maternity Carer compared to 65% in 2006.

7 Twenty nine women were unregistered in 2015, 26 (90%) of whom were Māori or Pacific mothers.

8 Women booked with a private obstetrician were more likely to be older, European, and lesser likely to be living in areas of higher socioeconomic deprivation compared to women booked with other LMCs. Māori and Pacific mothers are less likely than European mothers to be registered with a self-employed LMC (either a midwife or an obstetrician).

ANTENATAL COMPLICATIONS

1 Rates of preterm birth in 2015 are the lowest in the last decade. There has been a decrease in preterm birth rates at <32 weeks and at 32-36 weeks. The most obvious reduction is in spontaneous preterm birth rates in both gestational age groups.

2 Preterm birth is more common among Māori women (total rate 13.6%, spontaneous 6.0% and iatrogenic preterm birth rate 7.7%), teenage mothers (total rate 16%, spontaneous 10.7%), women over the age of 40 years (iatrogenic preterm birth rate 9.4%), current smokers (total preterm birth rate 12.1% with elevated risks for spontaneous and iatrogenic preterm birth), women with a BMI >40 (iatrogenic preterm birth 8.5%)) and women with multiple pregnancy (twins total preterm birth rate 69.2%).

3 There is debate regarding the introduction of routine screening for women at risk of preterm birth. However for this to be of value an accurate screening test must be identified with an intervention that is effective. Many have suggested that cervical length assessment at the time of the anatomy scan with the use of progesterone may provide the appropriate screening test and intervention. However, the most recent and largest study (OPPTIMUM) found no significant benefit on preterm birth rates among women at high risk of preterm birth treated with vaginal progesterone compared to women treated with placebo.

4 Active intervention at 23+0 - 23+6 weeks is not offered as standard routine care at NWH but each case is individualised and tailored to ensure a multidisciplinary and family-centered approach is offered to all women and their families and in appropriately selected cases this includes active intervention and resuscitation.

5 The proportion of SGA babies who were born between 40 and 42 weeks among SGA babies born at term is lower at NWH compared with all NZ secondary/tertiary facilities. This is likely to reflect increased detection and timely birth at NWH, of these very small babies. This may reflect use of the GROW program, the NZMFM SGA guideline and the NWH SGA pathway.

6 There was a significant reduction in multiple birth rate from 2000-2013. Given that there has been an increase in births to older mothers over this time, which is associated with increased rates of spontaneous multiple pregnancy, it is likely that this is a result of a move towards single embryo transfer in assisted reproduction.

7 An audit of the Selective Fetoscopic Laser Photo coagulation service (SFLP) since 2009 at NWH showed that the chance of one live baby after treatment of a monochorionic twin pregnancy was 80% and of two live babies was 65%. These outcomes are in line with the published international data.

8 A randomised controlled trial has shown that vaginal delivery is safe in an uncomplicated twin pregnancy. However, caesarean section rates are trending upwards to 71 percent in 2015 at ADHB.

9 Induction of labour rates are above 50% for all types of diabetes in pregnancy. The Caesarean section rates among mothers with diabetes in 2015 were 59%, 44% and 37% among women with Type 1, Type 2 and gestational diabetes respectively.

10 An audit of women diagnosed with GDM from July-December 2015 to examine the uptake of postpartum screening following GDM found that only 63% of women performed an HbA1c measure within 12 months of birth.

11 There were 6 perinatal losses during 2015 among women with diabetes, all in women with GDM. None of these women had any evidence of undiagnosed pre-existing diabetes.

12 In 2015, 456 women (6.6% of all women who birthed at ACH) had an antepartum haemorrhage or placenta praevia without bleeding. This proportion remains unchanged over the past 15 years. The underlying cause has also remained unchanged with APH of uncertain origin the most frequent “cause”, accounting for 70-80% of cases every year, despite improvements in ultrasound and other imaging modalities.

13 Women with an APH of uncertain origin make up the largest proportion of women presenting with antepartum haemorrhage. APH of uncertain origin is associated with higher rates of preterm birth (28%), SGA (19%), NICU admission (25%), and three times higher perinatal mortality (33/1000 births). Women with APH of uncertain origin should be treated as a high risk group.

14 Health professionals should be aware that domestic violence in pregnancy may result in APH.

15 The overall rate of hypertensive disease in pregnancy in 2015 was 7.6%; gestational hypertension 2.8%, chronic hypertension 2.2% and pre-eclampsia 2.3%, with low rates of super-imposed pre-eclampsia (0.2%). There was one reported case of eclampsia in 2015.

16 Women with preeclampsia or superimposed preeclampsia had high rates of preterm birth (delivery <37 weeks), including significantly higher risks of very preterm birth (<32 weeks). Preterm birth occurred in 14.1%, 14.4%, 47.1%, 46.2% (gestational hypertension, chronic hypertension, superimposed preeclampsia, preeclampsia) compared to women without hypertensive disease (8.5%). Babies of hypertensive mothers also had increased risks of NICU admission, low Apgar scores, and SGA (20%, 25%, 35%, and 37% (gestational hypertension, chronic hypertension, superimposed preeclampsia, preeclampsia) compared to 14% in normotensive mothers).

17 Māori and Pacific women are over represented amongst the overweight/obese groups (70.5% and 86.2% respectively vs 34.4% among European women). The prevalence of obesity among women who smoke in pregnancy is three times higher than in non-smokers (50% vs 16.7%).

18 Rates of chronic hypertension and pregnancy hypertensive complications increase progressively with increasing BMI.

19 Increasing maternal BMI is also strongly associated with increasing rates of gestational diabetes (GDM) and Type 2 diabetes. GDM was diagnosed in 11.4% of overweight/obese women, and 20.5% of women with a BMI >=40. Rates of PPH and SGA are also increased with increasing BMI.

LABOUR AND BIRTH

1 There have been significant changes in gestation at birth between 2006 and 2015. There has been a significant reduction in births 32-36 weeks, a reduction in births at 40, 41 and 42+ weeks, and an increase in births at 38 and 39 weeks due to an increase in induction and elective Caesarean section at these gestations.

2 Of all women giving birth in 2015, one in three had an induction of labour. The induction of labour rate in standard primiparae at 10% puts ADHB well above the national average (6.4%) in the latest report (2014 data).

3 Most of the inductions performed < 39 weeks align with our current induction guideline on indications and timing. However, it seems that for the following indications, more work can be done to increase the overall proportion of elective births planned at 39 weeks or greater: maternal request, maternal age, and diabetes.

4 For women expecting their first baby, in spontaneous labour at term, their chance of emergency caesarean is 15%.

5 The largest contributor to overall rate of elective and pre-labour emergency Caesareans as expected was 'repeat Caesarean section'. For multiparous women, 68% of elective and pre-labour Caesarean sections were performed for this indication. For the second year in a row, the next most common indication was maternal request.

6 Syntocinon was used to augment spontaneous labour for 32% of nulliparous and 5% of multiparous women.

7 In the mid-90s, the overall Caesarean section rate at NWH was around 20%. A peak of 33% was reached in 2006 and since then the rate has been increasing further, to 35.6% in 2015 (score test for trend $p<0.001$).

8 In 2015, 44.5% of all nulliparous women achieved a spontaneous vaginal birth. Among standard primipara (as defined by the Ministry of Health in New Zealand Maternity Clinical Indicators 2014), the spontaneous vaginal birth rate was 57.8%, well below the national average of 63.6%.

9 In 2015, of the 740 parity 1 women with previous Caesarean section presenting at term with a cephalic singleton pregnancy, the elective repeat caesarean rate was 63.8%, which may suggest a reversal of the trend of increasing rates since 2006.

10 Of all women with a previous Caesarean section having a trial of labour, 66% had a vaginal birth in 2015 compared to 44% in 2006. The overall vaginal birth after Caesarean (VBAC) rate was 20.8% in 2015.

11 Elective Caesarean section rates, among parity 1 women with previous Caesarean section presenting at term with a cephalic singleton pregnancy, are highest among women with private obstetrician LMCs (86%) and lowest among women with self-employed midwife LMCs (47%). In addition, successful trial of labour rates are lowest among women with private obstetrician LMCs (36%) and highest among women with self-employed midwife LMCs (63%).

12 In 2015, 16.8% of women who planned a vaginal birth had an instrumental delivery.

13 In 2015, a total of 104 women were referred for ECV (43%), an increasing trend over recent years. The ECV success rate was 49%, consistent with international literature (50-60%). Of the 51 women who had a successful ECV, 35 had a vaginal birth (69%).

14 Epidurals continue to be the most utilised mode of analgesia for the management of labour pain (64% of women in labour), with women having induced labours being the most frequent users (74% compared with spontaneous labour 41%).

LABOUR AND BIRTH OUTCOMES

1 There has been an increase in use of episiotomy over the past 20 years. There has also been an increase in 3rd/4th degree tears from about 2005. At 3.3% of vaginal births (1 woman in 30), this is the highest rate reported among women birthing at NWH since 1995. It is suspected that some of this apparent increase in trauma is due to improved recognition.

2 NWH had a significantly lower intact perineum rate, higher episiotomy rate, and lower 3rd/4th degree tear without episiotomy rate among standard primiparae compared to the national data in the 2014 clinical indicator report.

3 NWH had an increasing rate of transfusion among standard primiparae following vaginal birth from 2009 to 2014, and a significantly higher rate in 2014 than the national rate (2.9% v 2.3%).

4 There has been a significant increase in the rate of NICU admission for infants born at term since 2006, and this increase has been observed across all LMC groups.

5 From 2006 to 2015 there has been a statistically significant increase in the proportion of babies with low Apgar scores at one and 5 minutes (chi square test for trend, $p<0.001$). The proportion of live born babies with Apgar score <7 at 5 minutes was significantly lower among pregnancies with a private obstetrician than self-employed midwives or NW Community LMC.

6 If all years 2006-2015 are considered together, the perinatal related mortality rate at term among pregnancies cared for by private obstetricians (1.3/1000 births) was lower than pregnancies cared for by the NW Community service (2.3/1000 births) ($p=0.04$) but not different from pregnancies cared for by self-employed midwifery LMCs (2.1/1000 births) ($p=0.08$).

7 The hypoxic ischaemic encephalopathy rate per 1000 term babies born at NWH for 2006-2015 was 0.3/1000 for pregnancies under private obstetrician LMC, 0.7/1000 under self-employed midwifery care, 0.5/1000 under NW Community, and 0.7/1000 (excluding the outlying rate in 2006)

among high risk pregnancies under the care of NWH. There were no statistically significant differences.

NEONATAL/POSTNATAL CARE

1 In 2015, the exclusive breastfeeding rate on discharge from hospital following birth was 77%, exceeding the NZ Breastfeeding Authority (NZBFA) target of 75%. The breastfeeding rates increased steadily from 2005 to 2010 from 63.9% to 82.6% but since then there has been a decline in rates to 76.7% in 2015.

2 The overall rate of exclusive/fully breastfeeding at discharge from National Women's Homecare at 4-6 weeks was 62%.

NEWBORN INTENSIVE CARE UNIT (NICU)

1 Over a twenty year period 1995-2015 survival of 24-27 week babies admitted to NICU has been very good compared with benchmarked ANZNN data. However, in comparison with ANZNN and some other international data sets survival at 23 weeks is low. This was highlighted by the external review last year and work has commenced both locally and nationally to review practice and update guidelines.

2 Antenatal steroid use rates for premature babies admitted to NICU are comparable with ANZNN data and over 90% for the 24-27 week bracket.

3 The reported rates of IVH in premature NICU infants are comparable with ANZNN, which for the most vulnerable 24-27 week range is approximately 5-10%.

4 Apropos the other important neonatal outcomes, rates of severe (grade 3-4) ROP and chronic lung disease are similar to the benchmarked ANZNN data but NEC is lower than benchmark and approximately 2% for less than 28 weeks.

5 The data for 2015 show that approximately 70% of infants at 24-27 weeks' gestation receive exclusive breast feeding; nearly 90% of NICU infants below 28 weeks receive breast milk to some degree.

6 Immunisation is seen as a priority by the NICU with 96% being performed and on time. For the three infants recorded as not receiving immunisation on time two sets of parents declined and one was delayed by 48 hours due to transfer to another hospital.

7 Follow up data were obtained for 102 (79%) of babies born in 2013 who weighed less than 1500g. Eighty four percent of these children had normal development, 3 (3%) had severe disability, and 13 (13%) mild or moderate disabilities.

8 Follow up data at 4 years of age were obtained for 84 (71%) babies born <1500g in 2011. Of these, 1 child had severe disability, 7 mild or moderate disabilities, and 76 (90%) normal development. Of the total original population of 119 four year olds, three (4%) were diagnosed with Autistic Spectrum Disorder, which is probably higher than the reported 1:100 incidence in the New Zealand population.

PERINATAL RELATED MORTALITY

1 The perinatal related mortality rate among women birthing at NWH was 11.7/1000 births in 2015 which is the lowest rate reported in the past 13 years.

2 Forty four percent of all perinatal related deaths occurred in women who did not reside in Auckland DHB area. The perinatal related mortality rate for women resident in the ADHB area was 47/4664 (10.1/1000).

3 The post-mortem rate was 42/83 (51%) in 2015, similar to rates in previous years.

MATERNAL MORTALITY AND SEVERE MORBIDITY

1 In 2015, there was one maternal death of a woman who received care from NWH.

2 There were 6 emergency peripartum hysterectomies in 2015 (0.87/1000 births). The rate at NWH is just within the rate nationally for secondary/tertiary facilities.

3 Eclampsia rates are consistent with national rates for secondary/tertiary facilities.

4 In 2015, there were 22 admissions of pregnant or postpartum women, 17 to the department of critical care medicine (DCCM) and 5 to the cardiovascular intensive care unit (CVICU) at Auckland City Hospital, all of whom birthed or miscarried at NWH.

GYNAECOLOGY

GYNAECOLOGICAL ONCOLOGY

1 The number of patient referrals, the number of patients discussed at MDM, and the total number of MDM discussions has increased every year from 2007 to 2015. In 2015 there were 905 referrals accepted by the service, and 1,105 patients discussed at 2,138 MDM discussions.

2 In this 2015 report, we have revised the reporting standards in line with the Faster Cancer Treatment national program. In 2015, the unit was not compliant with the 62 day target for referral to definitive treatment. Compliance with this target is required by July 2016. Improvements in IT support are required to correctly measure this standard as it includes time from initial primary referral while we

are currently measuring time of referral to the Gynecologic Oncology unit.

3 Only one third of surgery is performed within two weeks of first clinic appointment (as recommended by the NZ Gynecological Cancer Group) and lack of timely access to surgery is a result of a combination of a move to more radical ovarian cancer surgery, an increase in minimally invasive techniques, a lack of Gynecologic Oncologist FTE and insufficient theatre capacity.

4 There has been an increase in the proportion of malignant surgeries (80%) among all surgeries performed in the unit in 2015 due to improved triaging and relationships with referring DHBs.

TERMINATION SERVICES

1 The annual number of first trimester abortions continues to decline for the Auckland area with over 30% drop in the past decade and a further 6% decrease in number of abortions in 2015.

2 An audit of first trimester termination (January to June 2015) indicated that 8% of women are choosing a medical (MTOP) rather than surgical termination. The audit found 9% of these women needed a surgical intervention, exceeding the 2-6% rate in the international literature. This may be related to commencing MTOP at gestations exceeding the recommended criteria and incomplete adherence to the interval between medications.

3 Contraception is prescribed post termination for close to 85% of women, and 60% of women choose a long acting reversible method.

GENERAL GYNAECOLOGY

1 There were 1542 primary surgeries performed by the General Gynaecology team in 2015, 24% of these performed acutely. The most common indication for surgery was abnormal bleeding in the non-pregnant woman (21%), and the most common procedure hysteroscopy.

2 Complications of surgery were more common after acute surgery (12% overall) compared to elective surgery (10%). The rate of any complication of surgery was 10.6% in 2015, down from 12.3% in 2014 and 13.6% in 2013.

3 Seven percent of women were transfused after acute surgery and 1.5% after elective surgery.

4 The rate of intraoperative injury to bladder, bowel, ureter, or other major viscus was 0.8% for 2015, consistent with previous years.

5 Each year, fewer women undergo hysterectomy under the General Gynaecology team at NWH. The proportion of hysterectomies performed by the laparoscopic approach has been increasing at the expense of the vaginal approach. The most common indication for hysterectomy under the General team was abnormal uterine bleeding (44.8%). Length of stay has remained at a median of 3 days since enhanced recovery after surgery (ERAS) was implemented in Ward 97 in 2012, and is shorter for laparoscopic hysterectomy with a median of 2 days stay.

6 There were 342 laparoscopic procedures performed by the General Gynaecology team in 2015, 238 of which were elective. Fifty five percent of procedures were for endometriosis, ovarian cysts, or ectopic pregnancy.

7 In 2015, 219 women had a urogynaecology procedure performed as a primary admission. Of these, 62 had tension free vaginal tape repairs (TVT), 132 prolapse repairs, 4 mesh repairs, and 116 other urogynaecology procedures. Twenty eight women had a hysterectomy at the time, or as part, of their urogynaecology procedure.

8 Seventy percent of the urogynaecology caseload was overweight or obese.

9 Prolapse repair with mesh is still offered for those patients where other methods of prolapse repair have failed. Four patients had a mesh augmented repair in the 2015 year. They were all placed abdominally and we know from the international literature that this method of mesh placement is associated with the least long term issues with pain or mesh exposure.

10 There was a significant reduction in readmission of urogynaecology patients for postoperative complications from 2014 to 2015 from 9% to 3%.

11 All NWH colposcopists in 2015 achieved cQuIP certification, and the two colposcopists who joined at the end of the year will complete their certification soon. Fourteen colposcopists performed an average of 131 colposcopies each in 2015, with the annual lowest number being 76.

12 NWH will be moving to reporting against cQuIP colposcopy standards in 2016.

FERTILITY

1 Outcomes at Fertility Plus were consistent with or better than almost all ANZARD benchmarks.

2 As single embryo transfer and freeze all cycles become more common, the outcome of the fresh embryo transfer cycle, the traditionally expressed standard outcome measure, is assuming less relevance as a key performance indicator. Of more relevance is the cumulative live birth rate per woman undergoing IVF stimulation, of healthy singleton babies at term, when all embryos from both fresh and thaw are transferred from one

initiated cycle. It must be noted that our live birth data are not yet available for 2015 but we are reporting for cycles commenced in 2014 that the live birth rates following fresh transfers per initiated cycle was 19% and the cumulative live birth rate following the transfer of fresh and frozen-thaw embryos was 29% per initiated cycle.

3 In 2014 Fertility Plus had a multiple birth rate of 6.5% but in 2015 we only had 2 multiple pregnancies from 246 pregnancies which is similar to the rate for natural pregnancies.

1.4 Data tables: Summary statistics

Table 1: Mother and baby numbers: NWH 2015

Total number of mothers birthing at National Women's	6886
Mothers birthing before arrival (BBA)	47
Total number of mothers	**6933**
Total number of babies born at National Women's	7027
Babies born before arrival (BBA)	47
Total number of babies	**7074**

BBA = Baby born before arrival and is defined as those babies who were born at home or en route to hospital where the intention was to be born in a hospital.

Table 2: Contribution of multiple births to mother and baby numbers: NWH 2015

		Mothers	Babies
National Women's births	Singletons	6796	6796
	Twins	133	266
	Triplets	4	12
BBA	Singletons	47	47
	Twins	0	0
	Triplets	0	0
Totals (including BBA)		**6933**	**7074**

Table 3: Mode of onset of birth NWH 2015

	Birthing Mothers n=6933	
	n	%
Spontaneous onset of labour	3139	45.3
Iatrogenic onset of birth	3794	54.7
CS Elective	1247	18.0
Emergency CS before onset of labour	258	3.7
Induction of labour	2289	33.0

Table 4: Mode of birth by parity NWH 2015

	Birthing Mothers N=6933		Nullipara n=3321		Multipara n=3612	
	n	%	n	%	n	%
Spontaneous Vertex Birth	3556	51.3	1374	41.4	2182	60.4
Vaginal Breech Birth	38	0.5	18	0.5	20	0.6
Operative Vaginal Birth	871	12.6	723	21.8	148	4.1
Forceps	305	4.4	256	7.7	49	1.4
Ventouse	566	8.2	467	14.1	99	2.7
Caesarean Section	2468	35.6	1206	36.3	1262	34.9
CS Elective	1247	18.0	369	11.1	878	24.3
CS Emergency	1221	17.6	837	25.2	384	10.6

Table 5: Neonatal outcomes among babies born at NWH in 2015

	Babies born n=7074	
	n	%
Gender		
Male	3649	51.6
Female	3425	48.4
Preterm birth		
20-27 weeks	90	1.3
28-31 weeks	96	1.4
32-36 weeks	505	7.1
Term birth		
37-41 weeks	6323	89.4
42+ weeks	60	0.8
SGA (by Customised Centile)		
Preterm	233	3.3
Term	826	11.7
	Live births N= 7020	
	n	%
Apgar at 5 min <7		
Preterm	73	1.0
Term	82	1.2
Admission to NICU		
Preterm	411	5.9
Term	421	6.0
	Live births excluding admissions to NICU N=6171	
	n	%
Infant Feeding at discharge from NW facility		
Exclusive breastfeeding	4737	76.7
Fully breastfeeding	278	4.5
Partial breastfeeding	1026	16.6
Artificial feeding	130	2.1

Table 6: Perinatal related mortality NWH 2015

	Babies N	n	Rate
Fetal deaths	7074	54	7.6/1000 births
Early neonatal deaths	7020	23	3.3/1000 live births
Late neonatal deaths	7020	6	0.9/1000 live births
Neonatal death	7020	29	4.1/1000 live births
Perinatal deaths (fetal & early neonatal)	7074	77	10.9/1000 births
Perinatal related deaths (fetal & all neonatal)	7074	83	11.7/1000 births

Table 7: Maternal postpartum outcomes NWH 2015

	Birthing mothers	n	%
PPH ≥1000mls	6933	713	10.3
SVB	3594	260	7.2
Instrumental vaginal birth	871	103	11.8
Caesarean section	2468	350	14.2
Episiotomy among vaginal births	4465	1228	27.5
Third/ fourth degree tears among vaginal births	4465	149	3.3
Postpartum blood transfusions	6933	171	2.5

Table 8: Numbers of mothers and babies 2006-2015

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Mothers	7212	7695	7589	7735	7709	7523	7695	7223	7400	6933
Babies	7379	7875	7753	7897	7866	7690	7863	7377	7551	7074

Table 9: Mode of birth NWH 1998-2015

Year	Total births N	Spontaneous vertex birth n	%	Vaginal breech n	%	Operative vaginal n	%	Caesarean section n	%
1998	**7492**	4645	62.0	75	1.0	922	12.3	1850	24.7
1999	**7501**	4635	61.8	83	1.1	945	12.6	1838	24.5
2000	**7827**	4650	59.4	87	1.1	1010	12.9	2080	26.6
2002	**7775**	4327	55.7	66	0.8	1081	13.9	2301	29.6
2003	**7611**	4269	56.1	58	0.8	1065	14.0	2219	29.1
2004	**7491**	4073	54.4	54	0.7	1171	15.6	2193	29.3
2005	**7194**	3845	53.4	54	0.7	1022	14.2	2273	31.6
2006	**7212**	3815	52.9	51	0.7	956	13.3	2390	33.1
2007	**7695**	4212	54.7	70	0.9	975	12.6	1428	31.7
2008	**7589**	4218	55.5	62	0.8	937	12.3	2372	31.3
2009	**7735**	4313	55.8	61	0.8	947	12.3	2414	31.2
2010	**7709**	4217	54.7	59	0.8	942	12.2	2491	32.3
2011	**7523**	4183	55.6	60	0.8	832	11.1	2448	32.5
2012	**7695**	4173	54.2	45	0.6	907	11.8	2570	33.4
2013	**7223**	3828	53.0	56	0.8	833	11.5	2506	34.7
2014	**7400**	3928	53.1	64	0.9	849	11.5	2559	34.6
2015	**6933**	3556	51.3	38	0.5	871	12.6	2468	35.6

Table 10: Term births by gestation NWH 2005-2015

Gestation	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
37 wks	616	628	648	638	630	626	616	608	643	591
38 wks	1291	1405	1488	1565	1546	1539	1536	1550	1595	1501
39 wks	1817	1847	1802	1965	1983	2078	2172	2055	2078	1989
40 wks	1699	1841	1827	1813	1810	1664	1744	1575	1585	1540
41 wks	958	1083	943	992	977	864	877	754	818	702
>=42 wks	162	167	182	150	133	132	98	61	73	60

2 OUR SERVICES

2.1 Women's Health Vision and Strategic Goals

Women's Health has a clear vision: ***Excellent Women's Health through Empowerment and Partnership***.

In our "Excellence in Women's Health" strategic document we outline the critical elements to achieving our vision as:

- Ensuring that our pathways to care and models of care are based on best available evidence and reflect the social, mental, spiritual, cultural and physical needs of women. Where care may be best delivered in settings outside National Women's we will ensure care pathways are structured to support optimal communication between the various healthcare providers.
- Where separating out primary, secondary and tertiary/quaternary level services has the potential to improve care we will seek to do this. Wherever possible we will support primary care in the community to deliver care to the top of practitioners' scope within safe limits. This includes directing patients to appropriate providers and/or settings and providing clear evidence based guidelines around safe models of care.
- Working with the Ministry of Health and other DHBs to ensure funding for tertiary and quaternary care is appropriate and supports optimal care pathways.
- All women accessing our maternity services will be supported to birth well. This includes ensuring that low risk women are given the opportunity to birth in a midwifery led unit.
- Working collaboratively with our regional DHB partners and in particular Waitemata DHB to find innovative ways of providing women's health care that both improves the quality of the care we provide to women and their families, but also enables us to use our resources more efficiently.
- Ensuring that we have fully functioning and embedded clinical governance across the service with representation that includes consumer, cultural and private practitioner perspectives. Within clinical governance structures we will embed a culture of responsibility so that clinicians are fully engaged and take individual and collective ownership of the quality of care provided.
- Critically evaluating the care we provide both at the individual and the team level in order to achieve outcomes that benchmark well against internal and external quality maternity and gynaecological standards and reduce variation in practice and outcomes. Addressing over and under delivery of care to ensure that we optimize outcomes and reduce harm.
- Delivering care sensitively and in a culturally appropriate manner, recognizing the importance of Whānau Ora, so that it meets the needs of women and their families.
- Having an engaged and productive workforce who work together to achieve a shared vision. We need to develop career paths that are attractive and build commitment. We believe that our links with the University of Auckland and the Auckland University of Technology along with our focus on research are strengths we can further develop to attract and fully engage high quality clinicians.
- Empowering our staff by creating a positive culture and supportive working environment. This will be built on our shared values and documented individual goals and accountabilities for all staff. Accountabilities will be supported through meaningful performance and professional development processes. We also need to plan for the future by embedding succession planning practices.
- Ensuring that time and resources are appropriately allocated to support the growth and development of our workforce. Clinicians within the service will value lifelong learning and openly share their skills and knowledge with their students and peers. We support and encourage clinical and systems innovation in the context of research or a quality improvement cycle.
- We believe we can achieve financial stability by working together to look at the way we deliver care. This will be achieved through ensuring we develop sustainable models of care from primary, through secondary and tertiary care. Improving our production planning and managing our elective volumes to ensure that access to elective surgical procedures is equitable for our population.

2.2 Women's Health Leadership and Structure

In 2015 our Women's Health Service was grouped into 5 groups led by Service Clinical Directors:

- Judy Cottrell, Service Clinical Director, Primary Maternity Services
- Dr Denys Court, Service Clinical Director, Secondary Maternity (& Acute) Services
- Dr Claire McLintock, Service Clinical Director, Regional Maternity Services

- Dr Jenny McDougall, Service Clinical Director, Secondary Gynaecological (& Elective) Services
- Dr Lois Eva, Service Clinical Director, Regional Gynaecology Services.

This leadership structure aligns with our overall governance and clinical governance structure across the directorate.

2.3 Service Provision

2.3.1 Maternity services

National Women's provides national and regional services, as well as primary, secondary and tertiary maternity services to women resident in ADHB region and to women resident outside the region whose private LMC has an access agreement with NWH.

National Services

Maternal

- Management of major maternal cardiac disease – pregnant women who are likely to require bypass or valve surgery during pregnancy. NWH also cares for women with cardiac disease who reside in the Pacific Islands.
- Management of women with major liver disease in pregnancy.

Fetal/Neonatal

- Fetal transfusions for rhesus incompatibility. NWH has a relationship in place to obtain irradiated blood from the National Blood service.
- Management of fetal cardiac anomalies that are "duct-dependent" and require neonatal prostaglandin infusion.
- Care for mothers and babies under the care of Starship Hospital cardiologists who treat fetal cardiac problems throughout the country and from the Pacific region.
- Multi-fetal reduction for high-multiple pregnancies following fertility treatment.
- National service for laser ablation of fetal vessels in twin-twin transfusion
- National Maternal Fetal Medicine Network.

Other

- Transfers of mothers and babies from regions outside ADHB when more proximate neonatal intensive care units and maternity facilities are full.
- National Women's is currently the only centre in New Zealand training obstetricians in maternal fetal medicine.

Regional Services

Maternal

- Pre-existing diabetes in pregnancy services to WDHB.
- Pre-pregnancy counselling for high risk women.
- Care for pregnant women with HIV infection from CMDHB and WDHB. With the rollout of the "National HIV screening in pregnancy" programme, these caseloads have increased but absolute numbers remain small.

Fetal/Neonatal

- Diagnosis and management of major fetal abnormalities, including provision of mid-trimester termination services. This service is also provided to hospitals in the Mid Central DHB on an ad hoc basis due to limitations in the service provided by Waikato.

Wards and clinics in the maternity service

The following wards and clinics make up the maternity service:

Labour and Birthing Suite

- National Women's Labour and Birthing suite is a 16 bed unit including a 2 bed High Dependency unit providing care for obstetric high risk cases.
- Services include one to one midwifery care for women in labour. Pain relief options include water, entonox, pethidine, and epidural anaesthesia. NWH also provides facilities for women wanting a waterbirth.
- Care is provided to women by a multidisciplinary team of midwives and nurses specialised in high risk obstetrics, obstetricians, anaesthetists, obstetric physicians, independent lead maternity carers, hospital aides and ward clerks. To ensure midwives maintain their competency in intrapartum care provision, midwives are rotated from the antenatal/postnatal wards to labour and birthing suite and the community service.
- Labour and birth care is provided by Labour and Birthing Suite (Core) midwives to women whose Lead Maternity Carer is the Community Midwifery Clinic service or the High Risk Maternity and Diabetic Service, to women under the care of private obstetricians who do not have an independent midwife contracted to provide midwifery care, and to women transferred to National Women's secondary and tertiary services. Care is available to mothers under independent midwifery care when their midwife needs relief.
- The Labour and Birthing Suite midwives liaise closely with independent lead maternity carers.

High Dependency Unit (HDU)

- HDU is a 2 bed, level 1 Intensive Care Unit with some level 2 facilities. It managed 205 admissions in 2015. The main reasons for admission are excessive blood loss and hypertensive disease. The midwifery and nursing

staff in this unit work hard to maintain a strong focus on the woman's experience to ensure healthy mother and baby bonding and to encourage breastfeeding.

Women's Assessment Unit (WAU)

- This service is open 24 hours a day, 7 days a week and provides acute care for women experiencing pregnancy and gynaecologic complications.
- Inductions of labour are booked through WAU and inductions performed in this unit. Women are transferred to Labour and Birthing Suite at the onset of labour.
- WAU provides a service for women from 20 weeks gestation requiring second trimester termination of pregnancy or for women who have suffered an intrauterine death.
- Day Assessment Unit (DAU) is a service provided from within WAU, providing appointment based care for women with complex pregnancies, managing approximately 1378 referrals in 2015 (1511 in 2014, 1335 in 2013, 1093 in 2012, 1256 in 2011, 1444 in 2010). DAU has 4 chairs for simultaneous care of up to 4 women. Most common referral reasons are hypertensive disorders, small for gestational age babies and post term assessment.
- An external cephalic version (ECV) clinic is provided at the DAU twice weekly.

Antenatal and Postnatal Wards

- There are 77 antenatal and postnatal beds at National Women's for women and babies requiring secondary and tertiary care. All primary postnatal stays where the mother and baby are well are transferred to Birthcare Auckland, who hold the contract to provide these services.

High Risk Medical Service (including Diabetes Service)

- The High Risk Medical, Fetal Medicine, and Diabetes services are provided from an outpatient clinic located on level 9 in the Auckland City Hospital (ACH) support building. This facility is also used by Newborn Services, including the Child Development Unit, where NICU admissions are followed after discharge to assess long term outcome.
- The High Risk Medical and Diabetes services provide antenatal visits in the clinic at ACH and postnatal midwifery community visits to patients at home as well as in Starship Hospital and on the postnatal wards at ACH. Two ADHB pool cars are available to assist this service.

Community Services

- Community clinics are held at Green Lane Clinical Centre, along with antenatal clinics in 15 General Practice facilities in the ADHB catchment area.
- Community midwifery clinics and postnatal home visits provide continuity of midwifery care during the antenatal and postnatal period with labour and birth midwifery services provided by core midwives in Labour and Birthing Suite.
- Clinics staffed by ADHB obstetricians are held four times a week at Green Lane Clinical Centre seeing women under community midwifery care and reviewing secondary referrals from private LMCs.
- Clinics staffed by obstetric physicians are held two times per week.
- A midwifery staffed Walk in Centre acts as a first point of contact and triage for some pregnant women. These women access the centre by phone or by turning up, either with or without an appointment, and are made aware of their choices for maternity care. If presenting with an acute problem, they are referred to obstetric care as necessary.
- Virtual appointments are held for women who are postdates with a low risk pregnancy.
- The Whānau Ora multidisciplinary team provides a midwifery- led fortnightly forum for midwifery, maternal mental health, and health social workers to plan and coordinate clinical and social care for women with high social acuity. These women are more likely to need the services of statutory child protection services, adding a further layer of complexity. The increased coordination of service has resulted in outcomes such as; fewer traumatic uplifts of new born babies from the hospital; increasing numbers of babies remaining in their parents' care with intensive social service support in place at the time of birth; increasing numbers of babies being placed in kin care without the disruption to attachment inherent in protracted foster placements and reduced interdisciplinary and interagency conflict.
- The PBAC (Positive Birth after Caesarean) clinic was started in February 2011 to promote informed decision making and patient satisfaction. Women are encouraged to attend this obstetric/midwifery clinic 4-6 weeks after a Caesarean section, pre-pregnancy, or in the first half of their next pregnancy to discuss the options for their next birth. Women can be referred by their LMC, via the maternity Walk-in Centre at NWH or can refer themselves. Most women attend the clinic twice during their pregnancy and obtain the remainder of their care from their usual LMC. The service has produced a short film clip on VBAC, and this can be accessed online at:

http://nationalwomenshealth.adhb.govt.nz/services/maternity/pregnancy-advice/vaginal-birth-after-caesarean

2.3.2 Gynaecology service

Secondary Gynaecology

The general gynaecology service provides care to women residing within the ADHB catchment of Central Auckland (population - approximately 400,000). The service is comprised of:

- One inpatient ward (Ward 97) at Auckland City Hospital (ACH)
- Women's Assessment Unit (WAU) at ACH for acute gynaecology
- Day surgery at Greenlane Clinical Centre (GCC)
- Outpatient services at GCC

Regional Gynaecology

- NWH is the largest Gynaecological Oncology Cancer Centre in New Zealand, offering comprehensive cancer care for women with gynaecological malignancies, and hosts the supraregional MDM with videoconferencing links to the eight referring DHBs.
- Vulval clinic provides a multidisciplinary "extended regional service" for all vulval disorders, covering the upper North Island, with quaternary referrals from the lower North Island.
- Female Multidisciplinary Clinic offers a service to women with multifaceted endocrine and anatomical conditions. This is a clinic where the reproductive endocrinologist, gynaecologist, psychologist and gynaecology physiotherapist work together to provide collective complex treatment plans for girls and women with complicated hormonal and gynaecologic concerns.
- First and second trimester termination of pregnancy.

Wards and Clinics in the Gynaecology Service

Inpatient Services – Ward 97, Auckland City Hospital

- Ward 97 is a 22 bed ward providing care for women with acute gynaecology problems, perioperative care for elective and acute general gynaecology, gynaecologic oncology and breast surgery. It also provides care to women with early pregnancy complications and complications of fertility treatment. Medical and surgical terminations of pregnancy up to 20 weeks gestation are also performed.
- Radiology assisted procedures, such as fibroid embolisation, management of AV malformation and image guided biopsy are part of the Gynaecology caseload.
- In preparation for a major surgery we accept referrals for administration of preoperative blood transfusion.
- The service has access to the ACH Level 8 High Dependency Unit (HDU) and the Critical Care Unit for those women requiring a higher level of care and monitoring.
- In recent years this unit was involved in many changes through the Releasing Time to Care project. This improved patients' care and satisfaction as nurses can now spend more time directly caring for their patients.
- Enhanced recovery after surgery was another project that has successfully been implemented. We see great results in terms of improved recovery, timely and well planned discharges from hospital.

Outpatient clinics

The gynaecologic outpatient clinics are held at the Greenlane Clinical Centre and include:

- General gynaecology (i.e. menstrual disorders, pelvic floor dysfunction, sterilisation)
- Hormone replacement therapy and family planning
- Endometriosis and pelvic pain
- Urogynaecology
- Perineal tear clinic
- Colposcopy
- Gynaecologic Oncology
- Vulval Clinic
- Pre admissions clinic
- ESSURE Hysteroscopic Tubal Sterilization
- Abnormal uterine bleeding clinic, offering outpatient hysteroscopy

Early Pregnancy Assessment Unit (EPAU)

EPAU is a nurse-led outpatient service, with a social worker and medical support. The service is based at Greenlane Clinical Centre and provides for women referred for the management of early pregnancy complications, including miscarriage, ectopic and molar pregnancy, and for consultation for second trimester termination. Women requiring surgical management of miscarriage are referred to Ward 97, Auckland City Hospital.

Fertility Plus

Fertility Plus offers a range of secondary and tertiary reproductive endocrinology, infertility and sub-fertility services to the women of the Northern Region. Fertility Plus is one of three public providers in the Auckland region. Private investigation and treatment is also available. Fertility Plus is accredited by the Australasian Reproductive Technologies Accreditation Committee (ARTAC).

Publicly funded fertility treatment is available to women under 40 years of age, who are non-

smokers and have a BMI under 32. If couples do not meet the criteria for publicly funded fertility treatment, private treatment is available.

Women's Assessment Unit (WAU)

This service is open 24 hours a day, 7 days a week and provides acute care for women experiencing gynaecologic complications.

2.3.3 Newborn Service

The Newborn Service located on the 9th Floor of the Auckland City Hospital (ACH) provides neonatal heath care services for the premature and sick newborn and their families/ whānau.

Regional and District Services

The Newborn Service is contracted to provide:

- Level 3 neonatal intensive care to the Northland region, to Central Auckland, and to the West and North Auckland areas – 16 cots (tertiary service).
- Level 2 neonatal care to Central Auckland area – 32 cots (secondary service).
- Babies admitted to the ADHB Newborn Service and who are domiciled in the Waitemata DHB catchment area will be transferred back to North Shore Hospital or Waitakere Hospital to complete the Level 2 component of care closer to home.
- NICU provides a regional service for babies requiring laser treatment for retinopathy of prematurity (secondary service).
- ADHB is the national referral centre for infants requiring Paediatric Cardiology (quaternary services).
- ADHB is the regional referral centre for infants requiring the services of Paediatric and Neonatal Surgery (tertiary service).

The Newborn Service also provides intensive care to babies from other New Zealand DHBs, particularly if the units are at capacity. Inter-regional transfers may also occur for cardiology and surgical services or for complex metabolic diseases and where there is a need for access to subspecialty services.

The Newborn Services support services

The Newborn Service includes the following:-

- Neonatal Homecare Service
- Child Development Unit
- Paediatric Outpatient Service
- Specialist Lactation Service
- Neonatal Emergency Transport Service
- Secondary and tertiary paediatric subspecialty services within the Starship Hospital.

There is a close relationship with tertiary services at Starship with approximately 10% of neonates being transferred from the NICU to Starship each year for ongoing medical services (General paediatrics, respiratory paediatrics, paediatric metabolic and neuroservices) and surgical services (paediatric cardiac, general surgery, gastroenterology).

University Links

There are close research links with the School of Medicine, particularly the Department of Paediatrics and the Liggins Institute. Senior medical staff, University medical staff and the neonatal fellows are involved in clinical research and audit. Recent Newborn fellows have been able to obtain external research funding for their postgraduate degrees.

There continues to be a joint appointment between the Newborn Service and Massey University for the Neonatal Nursing Programme. These courses attract students locally and nationally.

2.3.4 Womens Health Workforce

Womens Health Directorate workforce is made up of a large number of diverse professional roles which provide care to both our Gynaecology and Maternity patients. In addition to our employed workforce self-employed LMCs (both midwives and obstetricians) provide care for a significant proportion of our maternity population.

2.3.4.1 Maternity services

Self-employed Lead Maternity Carer services

The provision of maternity care in New Zealand is funded by the Ministry of Health, which sets policy, through 21 District Health Boards (DHBs). In 1996 significant changes to the way that maternity care was funded, and therefore provided, were outlined in Section 88 of the Public Health and Disability Act. The Section 88 notice requires all women to have a Lead Maternity Carer (LMC), who is chosen by the woman and has responsibility for ensuring provision of maternity services throughout her pregnancy and postpartum period. Maternity services, apart from the services provided by a private obstetrician, are free. LMCs are required to obtain access agreements with any maternity facility where they intend to provide care. To ensure the woman receives continuity of care all LMCs are required to have back up arrangements with another self-employed practitioner who the woman has met. A range of LMC models of care are available in New Zealand. At National Women's the following models are available:

- Independent Midwife. These midwives are self-employed and generally provide continuity of care in the antenatal, intrapartum and postnatal period. Antenatal visits are usually provided through a midwifery clinic in the community and postnatal visits are provided in the woman's home. If the woman's pregnancy and or labour become complicated then the midwife and woman can

choose a private obstetrician or NW secondary services to provide care.

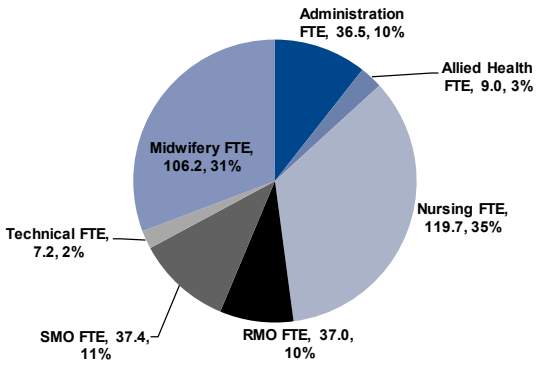
- General Practitioner (GP). Antenatal care is based in the GP's rooms. Midwifery care intrapartum and in the postnatal period for women who choose a GP is provided by either a hospital midwife or an independent midwife. If the woman's pregnancy and or labour become complicated then the GP and woman can choose a private obstetrician or NW secondary services to provide care. There is now only one GP providing LMC care at NW.
- Private Obstetrician. Private obstetricians provide antenatal care in their rooms. Midwifery care when the woman goes into labour and postnatal care can be provided by either the hospital or independent midwives.

As shown in the report LMCs perform approximately 74% of our total births. Currently 160 Independent Midwives and 30 Private Obstetricians hold access agreements with our service. However, around half of the births at NWH (53%) are managed by approximately 60 independent midwives.

2.3.4.2 Employed workforce

National Women's employed 445 staff in 2015 as midwives, nurses, specialist medical officers (SMOs), junior doctors (RMOs), allied health professionals, technical and administrative staff.

Figure 1: Women's Health staff full time equivalents (FTE) by occupational group



As shown in the figure above, our largest workforce sits within Midwifery and Nursing roles, both in the inpatient and outpatient setting.

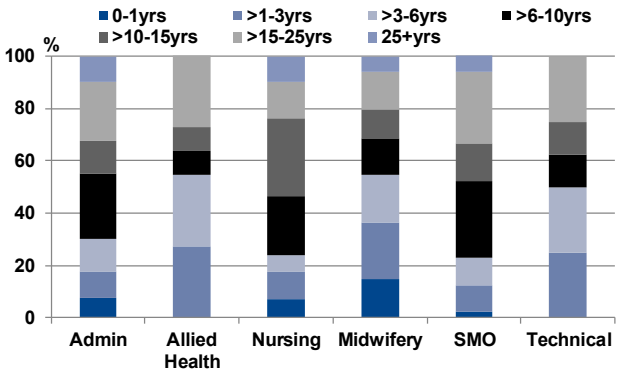
Within our midwifery workforce we also provide LMC services to women not able to access care from a self-employed LMC. National Women's employed midwives deliver their antenatal and postnatal care. Two groups provide care in this way:

- NW Community Midwives. These midwives are employed by the hospital and provide continuity of antenatal and postnatal care to medically low risk, but often socially high risk, women.
- High Risk Medical and Diabetes Midwives. The High Risk service is a multidisciplinary team of midwifery, medical and obstetric practitioners who provide care for women who have diabetes or other medical conditions. If the woman is transferred to NWH care, she will have a named midwife from this service who is her LMC and who provides continuity of antenatal and postnatal care. Some women receive secondary care from NWH and retain their self-employed LMC.

Where National Women's provide LMC service, labour care is provided by the hospital core midwives in Labour and Birthing Suite.

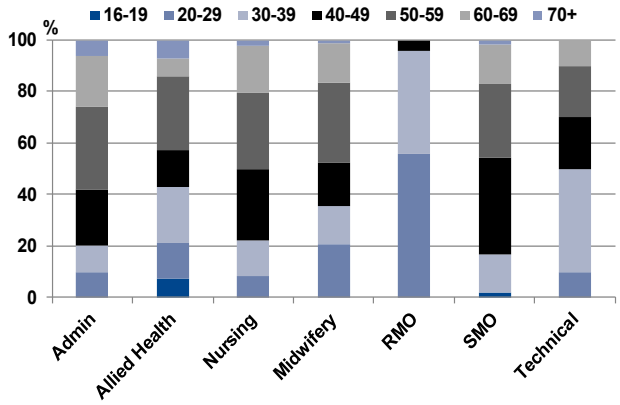
The majority of our employed staff work 0.8 FTE or more.

Figure 2: Length of tenure by NWH occupational group among permanent staff



National Women's has a loyal and committed workforce. The average length of service across all of the occupational groups is 10 years. Within the workforce we have 43% of staff who have worked at National Women's for more than 10 years.

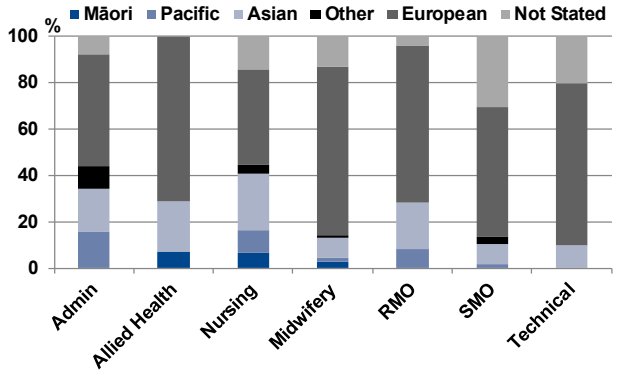
Figure 3: Age of staff by occupational group



We have a mature workforce with almost half of our SMO, midwifery and nursing workforce over the age of 50. The majority of our staff identify as European. It is noted that we have a small percentage of Māori, Pacific and Asian staff and we recognize that in order to provide more culturally responsive care we need to develop strategies to attract staff to our service. There are some initiatives in place to attract Māori and Pacific peoples into the midwifery

workforce; however these could be strengthened by working collaboratively with our training partners. We also recognize the need to grow our cultural competency within our entire workforce to ensure we are responsive to the diverse needs of wahine/women and their families.

Figure 4: Ethnicity of NWH staff by occupational group



We wish to acknowledge the crucial role both our DHB workforce and LMC workforce have played in ensuring that we deliver a high standard of care to our wahine/women and their families. It is our goal to further invest in our workforce to enable us to continue to improve our outcomes of care.

2.3.5 Neonatal Intensive Care (NICU) Workforce

The neonatal workforce operationally belongs to the Child Health Directorate. However, from a care delivery perspective the neonatal services form a critical part of our bundle of care delivery groups. We regard the neonatal service as functionally part of the spectrum of Women's Health Services.

The NICU workforce is 131 FTE provided by 165 staff. As shown in the figures below, the majority of the staff are nursing staff. Seventy seven percent of the staff work 0.7 or more and 37% are aged 50 or more. Forty four percent of staff have worked 10 years or more in the NICU.

Figure 5: NICU full time equivalents (FTE) by occupational group

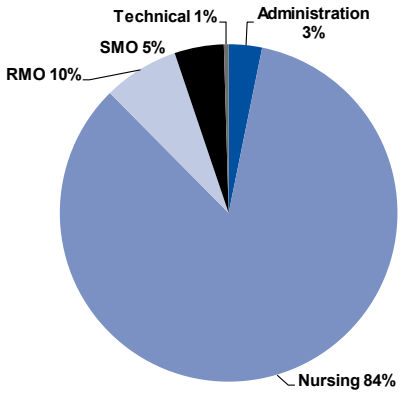
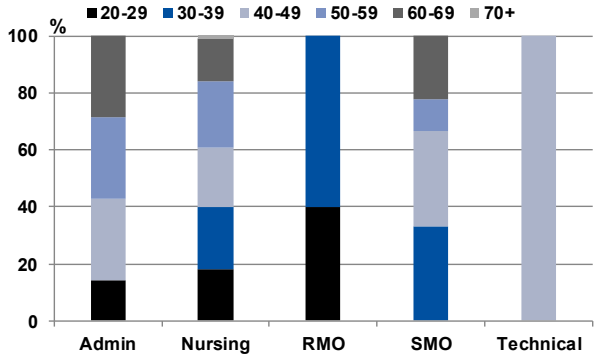


Figure 6: Age of NICU staff by occupational group



Overall the neonatal clinical workforce is younger than the maternity and gynecological workforce.

2.4 Funding of Maternity Services

2.4.1 Independent LMC Maternity Services

Funding for Maternity services is complex and underwent significant changes in 2009. Funding for primary maternity care from self-employed midwives, general practitioners and private obstetricians is funded directly by the Ministry of Health and claimed via Section 88. It is module based, with first, second and third trimester, labour and birth, and postnatal modules, and is a fixed payment per woman per module.

2.4.2 DHB delivered services

DHB provided maternity care, gynaecological care and neonatal care, both outpatient and inpatient care, is funded by the DHB using vote health, population based funding models. Outpatient maternity clinics, whether based at Greenlane Clinical Centre or Auckland City Hospital, are funded through "purchase units codes (PUC)", the value of which are determined nationally by the Ministry of Health. The payment associated with each PUC for an outpatient visit is dependent on the type of visits and who is providing the care e.g.

midwife, obstetrician or physician. Midwifery home visits are also funded via PUCs. Inpatient care is funded on case mix based funding, which looks at the diagnostic related group (DRG) and adjusts for complexity to calculate a Weighted Inlier Equivalent Separation (WIES). WIES has a standardised value, which is adjusted annually, and the WIES weight multiplied by the WIES value gives the funding associated with each unit of inpatient care.

2.4.3 Out of area funding

In New Zealand women can choose where they wish to birth their baby. The funding for the care provided by self-employed LMCs follows the women.

However funding for care provided by the DHB remains associated with the DHB of residence. Agreements between DHBs determine how funding is transferred between DHBs for care provided to women and babies who receive care out of area.

2.4.4 Birthcare Auckland

Birthcare Auckland is a primary maternity unit which also holds a contract with ADHB to provide postnatal facilities to well women and well babies born at NWH and also birthing facilities for women who choose to birth there. This is funded under a contractual arrangement with ADHB Funding and Planning.

2.5 Data tables: NWH Staffing

Table 11: Distribution of NWH staff by individual full time equivalents (FTE)

FTE	Total staff members 445	
	n	%
0-0.2	29	7
0.3-0.4	30	7
0.5-0.6	82	18
0.7-0.8	94	21
0.9-1.0	210	47

Table 12: Distribution of NICU staff by individual FTE

FTE	Total staff members 165	
	n	%
0-0.2	9	5
0.3-0.4	13	8
0.5-0.6	16	10
0.7-0.8	25	15
0.9-1.0	102	62

Table 13: Number of staff and total FTE by occupational group (National Women's Health)

Occupational Group	Staff members	Total FTE
Administration	50	36.5
Allied Health	14	9.0
Nursing	143	119.7
Registered medical officer	25	29.0
Senior medical officer*	63	39.3
Technical	10	7.2
Midwifery	144	106.2
Total	**445**	**345.0**

*There are 1.91 FTE among 4 University SMOs in maternity.

Table 14: Ethnicity of NWH staff by occupational group

	Total Staff	Māori		Pacific		Asian		European		Other		Not Stated	
Occupational Group		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Administration	50		0.0	8	16.0	9	18.0	24	48.0	5	18.0	4	8.0
Allied Health	14	1	7.1		0.0	3	21.4	10	71.4		0.0		0.0
Nursing	143	9	6.3	14	9.8	35	24.5	59	41.3	6	4.2	20	14.0
Midwifery	144	4	2.8	2	1.4	13	9.0	105	72.9	1	0.7	19	13.2
RMO	25		0.0	2	8.0	8	20.0	19	68.0		0.0	1	4.0
SMO*	59		0.0	1	1.7	5	8.5	33	55.9	2	3.4	18	30.5
Technical	10		0.0		0.0	1	10.0	7	70.0		0.0	2	20.0
Total	**445**	**14**	**3.2**	**27**	**6.1**	**74**	**16.0**	**257**	**57.3**	**14**	**3.2**	**64**	**14.4**

*excludes 1.91 FTE among 4 University SMOs

Table 15: Length of tenure by NWH occupational group among permanent staff

		Years of tenure among permanent staff													
	Total	0-1		>1-3		>3-6		>6-10		>10-15		>15-25		25+	
Occupational group	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Administration	40	3	7.5	4	10	5	12.6	10	25	5	12.6	9	22.6	4	10
Allied Health	11	0	0	3	27.3	3	27.3	1	9.1	1	9.1	3	27.3	0	0
Midwifery	134	20	14.9	29	21.6	24	17.9	19	14.2	15	11.2	19	14.2	8	6.0
Nursing	131	9	6.9	14	10.7	8	6.1	30	22.9	39	29.8	18	13.7	13	9.9
SMO*	48	1	2.1	5	10.4	5	10.4	14	29.2	7	14.6	13	27.1	3	6.3
Technical	8	0	0	2	25.0	2	25.0	1	12.5	1	12.5	2	25.0	0	0
Total	**372**	**33**	**8.9**	**57**	**15.3**	**47**	**12.6**	**75**	**20.2**	**68**	**18.3**	**64**	**17.2**	**28**	**7.5**

*excludes 1.91 FTE among 4 University SMOs

Table 16: Number of staff and total FTE by occupational group (NICU)

Occupational Group	Staff members	Total FTE
Administration	7	4.2
Nursing	137	110.8
Registered medical officer	10	9.5
Senior medical officer	11	6.2
Technical	2	1.1
Total	**165**	**131.3**

*There are 0.5 FTE among 2 University SMOs in NICU.

Table 17: Length of tenure by NICU occupational group among permanent staff

		Years of tenure among permanent staff													
	Total	0-1		>1-3		>3-6		>6-10		>10-15		>15-25		25+	
Occupational group	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Administration	7	2	28.6	1	14.3	1	14.3	2	28.6	0	0	1	14.3	0	0
Nursing	131	9	6.9	18	13.7	18	13.7	26	19.8	18	13.7	28	21.4	14	10.7
Senior medical officer*	5	0	0	0	0	2	40.0	1	20.0	1	20.0	0	0	1	20.0
Technical	2	0	0	0	0	1	50.0	1	50.0	0	0	0	0	0	0
Total	**145**	**11**	**7.6**	**19**	**13.1**	**22**	**15.2**	**30**	**20.7**	**19**	**13.1**	**29**	**20**	**15**	

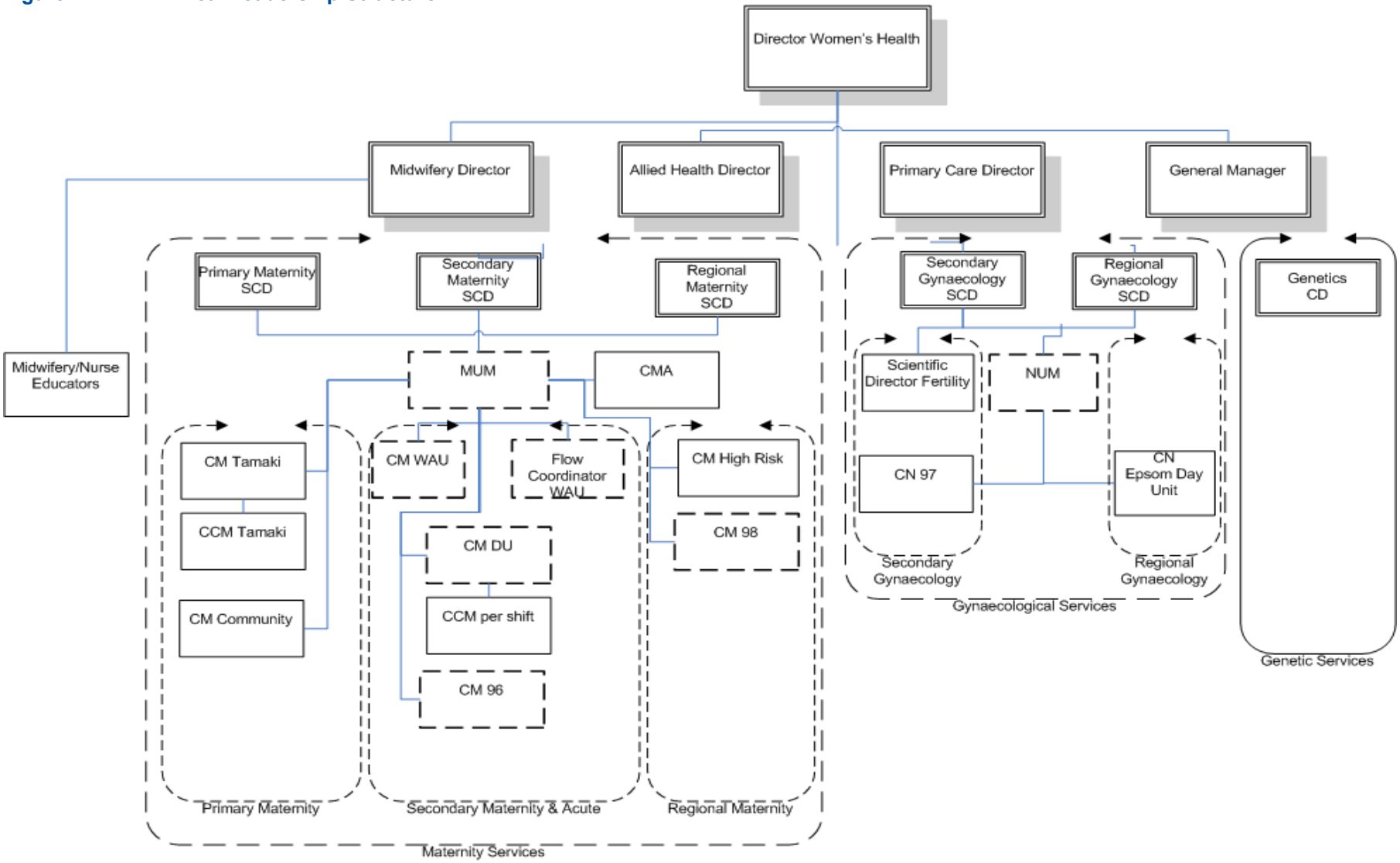
*excludes 0.5 FTE among 2 University SMOs

Table 18: Ethnicity of NICU staff by occupational group

	Total Staff	Māori		Pacific		Asian		European		Other		Not Stated	
Occupational Group		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Administration	7	0	0	1	14.3	2	28.6	4	57.1	0	0	0	0
Nursing	137	1	0.7	3	2.2	28	20.4	75	54.7	5	3.6	25	18.3
Registered medical officer	10	0	0	0	0	1	10.0	6	60.0	2	20.0	1	10.0
Senior medical officer*	9	0	0	1	11.1	0	0	6	66.7	1	11.1	1	11.1
Technical	2	1	50.0	0	0	0	0	1	50.0	0	0	0	0
Total	**165**	**2**	**1.2**	**5**	**3.0**	**31**	**18.8**	**92**	**55.8**	**8**	**4.9**	**27**	**16.4**

*excludes 0.5 FTE among 2 University SMOs

Figure 7: NWH Clinical Leadership Structure



3 QUALITY

Women's Health has a rigorous quality improvement framework implemented across the service. The following outlines the vision, mission statement, goals and values that underpin the service. Specific improvements are presented throughout this chapter.

Vision: Excellent Women's Health through Empowerment and Partnership

Mission: To deliver gold standard care based upon 8 principles

- Women-centered and empowered care
- Evidence-based practice
- Education and training
- Partnership with other healthcare and social service providers
- Engaged staff
- Governance and Leadership
- Efficiency
- Innovation

Goals

- Deliver the best possible outcomes for women and their families
- Provide demonstrably safe care
- Continually improve the quality of care we provide
- Value, support and hold our workforce to account
- Take care of our resources and become sustainable

Values

Welcome | Haere Mai
We see you, we welcome you as a person.

Respect | Manaaki
We respect, nurture and care for each other.

Together | Tuhono
We are a high performing team.

Aim High | Angamua
We aspire to excellence and the safest care.

3.1 Clinical Governance Framework

National Women's Health (NWH) has expanded on a well-developed clinical governance framework and a strong quality improvement focus that is embedded across the service. This framework has recently been modified to reflect the new clinician-led leadership structure within the directorate and across the ADHB.

Most recently the clinical governance framework and management operating system (MOS) framework have been combined to provide a collaborative, cohesive and useful information and knowledge sharing tool whereby fully informed decisions can be made, trialed and implemented.

This clinical governance structure ensures a pathway whereby matters can be discussed and managed at the appropriate level within the service. This helps to empower clinicians delivering care to manage day to day matters promptly but also to escalate more important matters or those that have broader relevance and require wider consideration and decision making.

3.1.1 Structure

The clinical governance structure consists of four levels. Linkages between the various groups are achieved via representational membership. Matters requiring solutions are escalated up through the structure until resolved.

Table 19: Clinical Governance Structure NWH 2015

Level 1	**ADHB Clinical Board**
Level 2	**Directorate Wide Representation** This group is chaired by the Women's Health Quality Lead and provides oversight of quality and safety matters across the directorate. The group is responsible for monitoring the quality of care delivered by Women's Health services and for recommending changes to operational and clinical practice where this is appropriate.
Level 3	**Gynaecology and Maternity Governance Groups** These groups are chaired by the Service Clinical Directors of each area and meet monthly. They have responsibility for matters of quality and safety for their clinical areas. The chairs of these groups have responsibility for ensuring all issues of concern that have been escalated from the Level 4 clinical governance groups are resolved or escalated to the Level 2 Women's Health HSG Clinical Governance Group.
Level 4	**Specific Clinical Governance Groups** Specific groups are focused around particular clinical service areas (such as Labour and Birth, MFM, Diabetes) with membership relevant to the area of focus. Much of the output, such as development of guidelines, comes from the level 4 groups.

3.1.2 Agenda

The agenda for each meeting is consistent and includes:

- Reporting on SAC 1 and 2 Root Cause Analysis (RCAs) including ensuring action plans are completed
- Serious complaints including issues arising from resolution meetings
- Final ratification of policies
- Monitoring the implementation of actions identified from the discussion of cases at perinatal meetings
- Reporting on the findings of clinical audit and any

actions required
- Reporting on the findings of research
- Issues of practice arising from the maternity and gynaecology Protected Quality assurance Activity (PQAA) panel
- Issues arising from the presentation of the annual report
- Outstanding issues from implementation of the maternity standards

3.1.3 Membership

Membership of the clinical governance meetings consists of the relevant stakeholders within the respective groups. For example, the Level 2 Clinical Governance Meeting has a membership consisting of:

- Medical Director (chair)
- Midwifery Director
- General Manager
- Clinical Directors/chairs of gynaecology and maternity Level 3 clinical governance groups
- Women's Health Epidemiologist
- Chair of perinatal meeting
- Clinical Effectiveness Advisor
- Māori advisor representative
- Pacific advisor representative
- Consumer representative
- ADHB Clinical Policy Advisor
- Representative from Birthcare
- Neonatologist
- Strategy and Planning Manager
- Anaesthetist
- Representative from Auckland University Academic Department of Obstetrics and Gynaecology
- Private obstetrician
- LMC midwife
- GP Representative

3.2 Supporting processes

In support of the formal clinical governance structure additional processes are in place which address specific quality matters. The additional processes that feed into the overall clinical governance framework are:

- The Monitoring Triage and Follow-Up Committee (MOTIF) which provides oversight for incidents, complaints, staff and consumer concerns.
- The Rapid Multidisciplinary Panel (RAMP) which reviews events within a multidisciplinary arena in order to identify any system failures to inform quality improvement.
- The Gynaecology Clinical Review Panel (GCRP), a multidisciplinary team, which reviews gynaecological cases in order to support best clinical practise and inform quality improvement.
- Clinical Effectiveness Advisors (CEA) who provide a direct link with the ADHB quality department in which the activities within Women's Health intersect with the wider ADHB quality structure. The quality department supports a 0.3 FTE Clinical Effectiveness Advisor who provides advice on quality processes and leads the serious and sentinel event investigations.
- Consumer Liaison Team. A talented team of consumer liaison coordinators facilitate the timely investigation of and response to complaints and provide an interface with other agencies, for example the HDC.

3.3 The Consumer Voice

3.3.1 Complaints

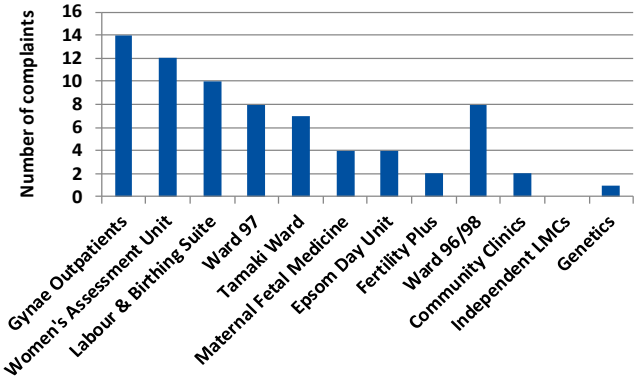
Complaints are received by the Consumer Liaison Service, where they are recorded and processed to the relevant stakeholders, i.e. the senior management team, for further management of the complaint and resolution.

In 2015, a total of 76 formal complaints were received. This is a reduction of 29 complaints compared to the previous year. 14 complaints were referred to our service via the Health and Disability Commission.

The emerging trend from the analysis of the data for the past two years is that two of our areas, the Women's Assessment Unit (WAU) and the Gynecology Department, have received significantly more complaints than the other areas which remain fairly evenly distributed (see the below table).

Identified trends provide learning opportunities for the service and a continued focus on identifying the reasons and contributing factors for the higher levels of complaints within these service areas inform quality improvement measures.

Figure 8: Number of complaints by practice area NWH 2015



3.3.2 Ensuring effective learning from patient feedback

The specific example below illustrates the "lessons learnt" approach our service takes from complaints:

The complaint

A first time mother had a vaginal birth in the afternoon but developed high blood pressure, high heart rate and lightheadedness. She was admitted to the ward overnight for four hourly observations. Her vitals were checked on admission at 8pm but not again until 7am the next morning. She requested assistance with mothercraft on a number of occasions but unfortunately was told the ward was very busy and a midwife would be there to help when she could. She didn't receive any help that night. The woman felt compromised and unsupported.

The lessons our service has learnt from this complaint

This complaint highlighted to our service that our busy ward was adversely affecting the quality of care we were providing to our women. In this instance, our service compromised the woman's care by not using our systems adequately.

As a result, on 27 and 28 October 2015 and 2 and 3 November 2015, we delivered well-attended teaching sessions (of 30 minutes duration) on using an early warning scoring system (EWS) in which each regular observation, such as blood pressure, temperature, etc. is allocated a score. The score helps to inform the women's health status. We added discussion about EWS to the ward's daily management operating system (MOS) board which provides daily focus and visibility for every staff member on the ward.

Following this measure, the charge midwives on the wards have noted an improvement in using the EWS tool. We continue to emphasise the use of the EWS tool on a regular basis.

Further, we have introduced that a particular focus during the daily MOS board meetings is put on reminding all of our staff to ensure that we do not project our busy status to the women we care for and to be mindful and reflective of how we communicate and are perceived at all times. It is as simple as starting our interactions with a smile and providing clear and informative explanations to the women about their journey at every opportunity we have to interact with them.

3.3.3 Compliments

Despite a reasonably low return rate from our patient survey, we receive significantly more compliments than we do complaints. We recognise the importance of sharing our achievements with all of our staff so we are working with the ADHB Quality Department to capture all our compliments and ensure their visibility to enhance staff morale and confidence. The compliment below which has been published with permission is a wonderful example of our staff's commitment to care and we are proud to receive such feedback.

"From the moment we walked in the door of the women's assessment unit till the time we were ready to go home a week later, we were treated with a huge amount of kindness and empathy.

Despite the fact I was induced and ended up having an emergency C-section (rather a far cry from the natural water birth of my naive labour plan dreams) I still felt informed supported and safe every step of the way.

It was clear how overworked and understaffed you all are. So many of the people we encountered were still working hours after the ends of their shifts. But despite the fact we were one of so many families on the ward, everyone took time to chat with us and to offer help when we were struggling.

It's an amazing thing you all do every day and, because of you, my birth experience feels so much less traumatic than it otherwise would have. So thank you to all of the superheroes that helped to take the medicine out of my baby's birth story"

3.3.4 Consumer Representation

During 2015, the nominated consumer representatives, George Parker (Women's Health Action Trust) and Isis McKay (Women's Health Action Trust), continued representing consumers on the Clinical Governance Groups. George attended the Level 2 Women's Clinical Governance Group with strategic oversight for the whole Women's Health Service. Isis attended the Level 3 Secondary Maternity Clinical Governance Group. They are both highly valued contributors to clinical governance oversight at ADHB through the provision of consumers' perspectives.

3.3.5 Consumer Information

We provide a variety of information resources for consumers.

3.3.5.1 Women's Health Information Unit (WHIU)

The Women's Health Information Unit provides a variety of information on health matters for both women and their families/whānau and staff. The office is located in the atrium on level 9 at Auckland City Hospital and is staffed on a part-time basis on Mondays, Wednesdays and Thursdays.

3.3.5.2 Consumer Information Requests

The WHIU receives approximately 80 emails per month from consumers via the National Women's

health website and Healthpoint. Emails and phone calls are answered and, where appropriate, forwarded to the relevant department.

3.3.5.3 Online Resources

- **National Women's Health website**
  http://nationalwomenshealth.adhb.govt.nz/about-us/patient-visitor-information
  The National Women's Health website is the main source of online information for patients, families and staff. The website generates patient queries via the "Contact Us" online form or phone calls.
- **Healthpoint website**
  Women's Health has four ADHB maternity pages on Healthpoint: Community Team Midwives, Labour & Birthing Suite, Maternity/Pregnancy Care, and Auckland DHB Pregnancy and Parenting Education. Patients can use the web queries email address or WHIU phone number to make contact.
- **Pregnancy and Family Care Facebook page**
  The Facebook page provides an additional way of engaging and connecting with women in their own space. Maternity and family care information is shared and connections are made with other organisations e.g. Plunket, Teen Thrive Parent Support, Mokopuna Ora, ADHB, and TAHA. There are approximately 340 people "liking" this page. Users can post to the page or send private messages.

3.3.5.4 Paper-based Resources

A selection of paper resources is available from the WHIU.

3.3.5.5 Face to face service

Patients and family/whānau visiting or staying in the hospital frequently visit the office when staffed for specific information resources.

3.4 Incident Management

During the course of the year 2015, there have been improvements in the tracking and implementation of recommendations that have arisen out of the review of complaints and incidents, and plans are in place to make further improvements. The focus for the year ahead is closing the information loop by ensuring that all staff are fully informed and up-to-date about quality news and improvements.

All incidents occurring at ADHB are logged and monitored within an incident monitoring system, RiskPro. All Women's Health incidents are reviewed and triaged at the MOTIF meetings. Depending on the type of incident and its severity investigation occurs in one of several ways:

- Lower level incidents are reviewed by the relevant area charge nurse, midwife or clinical lead;
- Severity Assessment Code (SAC) 1 & 2 incidents are subject to a formal review process, using the Root Cause Analysis methodology;
- Maternity incidents of lesser severity but where there are opportunities for system improvements are reviewed using the Rapid Multidisciplinary Panel (RAMP) review process;
- Gynecological incidents related to surgical care are referred to the Gynecological Clinical Review meetings or the level 3 Gynecological Clinical Governance Group.

3.4.1 SAC 1 & 2 Reviews

In line with the National Reportable Events Policy, Women's Health reports on and reviews serious adverse events that occur within the service using a formal review process under the direction of the Quality Department.

All reported events are given a Severity Assessment Code (SAC) which is a numerical rating created by the level of harm and likelihood of reoccurrence ("1" being the most serious and "4" being the least serious) . A formal review is undertaken of all SAC 1 and 2 events. SAC 3 and 4 events are reviewed within the relevant service area.

The following table highlights the reported events in Women's Health in the year 2015 in accordance with the SAC method.

Table 20: Reported events in Women's Health 2015 by Severity Assessment Code (SAC) score

SAC	Number of reported events
1	4
2	3
3	110
4	285
Not completed	79
TOTAL	**481**

The following two investigations provide an illustrative example of the application and success of the SAC review method:

Example 1 – Missed Absence of Red Eye Reflex

Part of routine postnatal care is for a newborn baby to have a "red eye reflex" check to ensure visual competence.

In this particular incident there were a number of missed opportunities in a variety of settings for ensuring a red eye reflex check had been done. Concerns about the child's ability to track, fix and follow at 5 months of age prompted an urgent referral to ophthalmology where the absence of red eye reflex in one eye was noted and a congenital cataract was diagnosed.

The incident revealed a lack of appropriate processes to ensure national guidance on timing of red eye reflex testing was achieved. A

knowledge/skill gap was identified in the ability of staff to correctly perform testing and interpret results. Further, limited access to ophthalmoscopes in all areas caring for newborns was identified. Lastly, the incident revealed issues with the documentation of assessments, in that the Tamariki Ora Wellchild book provides a tick-box to indicate that an eye check has been performed but does not specifically provide a place to comment on red eye reflex test results.

Following the investigation and SAC review, the service implemented a range of measures to avoid reoccurrence of similar issues. In particular:

- Ophthalmoscopes made available in all clinical areas caring for newborns;
- The College of Midwives, Council of Midwifery and Ministry of Health were informed of the challenges around ensuring staff competence in red eye reflex testing;
- All midwifery educators were retrained by ophthalmologists as expert red eye reflex screeners. These midwives have taken responsibility to ensure all Women's Health clinical staff are progressively trained;
- Best practice communicated to Primary Health Organisations and other relevant stakeholders to promote the sharing of learning from this incident;
- A sticker was created to go in Well Baby books to accurately record red eye reflex screening;
- The use of a sticker to indicate unchecked red eye reflex was ceased. Following this incident, red eye reflex is to be recorded as "checked" or "not checked" in the postnatal discharge summary;
- A field of red eye reflex (date of test and comments) has been added to the electronic discharge summary;
- There is ongoing education and training courses for red eye reflex testing for all staff in the organisation involved in baby checks; and
- Recommendations were made to the Ministry of Health by the ADHB based on the findings.

Example 2 – Guthrie Screening Improvement

The Newborn Metabolic Screening Programme (NMSP) offers a test to all newborn babies in New Zealand to screen for a number of congenital disorders (e.g. PKU, cystic fibrosis, congenital hyperthyroidism) which have significant morbidity and mortality and are preventable by early detection and treatment. The Ministry of Health National Screening Unit (NSU) oversees and is responsible for the NMSP and contracts the ADHB to provide the laboratory testing, which is done at LabPlus.

An incident occurred where it initially appeared that the results of a newborn screen on one of the inborn babies may have been subject to a laboratory or labelling error. It was quickly ascertained that no such error had occurred and that the baby had an abnormal result. Immediate treatment ensued.

The investigation into this incident, which involved a broader look at the administration of the NMSP, gave rise to concerns in relation to the governance over the screening pathway and process. Systems errors were identified. A working group was established which was chaired by the Director of Midwifery and involved members of the NSU, pathology and the maternity service.

The group initiated a trial by which a list of births was sent to the screening laboratory and matched by health number to the screening tests. If there were any cases of "not completed" or "unmatched health numbers", LMCs were engaged to complete screening.

In 2015, an audit was conducted to determine the effectiveness of the trial. All matched files, mismatched files, and subsequently received samples and notifications were reviewed by month throughout 2015. Out of the 7026 babies that were live born in the facility, 6962 newborn screening samples were found. Changes to the system allowed better identification and the follow up of the few babies that were not screened, including those babies whose families had declined screening.

The data showed a significant improvement between 2014 (144 missing) and 2015 (2 missing) which is a remarkable achievement.

3.4.2 Rapid Multidisciplinary Panel Review Process (RAMP)

The RAMP process is described earlier in this chapter (3.3 above). In 2015, 14 cases were reviewed using the RAMP process. The below table provides an overview of those cases.

Table 21: Women's Health Rapid Multidisciplinary Panel (RAMP) cases 2015

Primary clinical diagnosis	No. of cases
Chorioamnionitis	1
Hypoxic Ischaemic Encephalopathy (HIE)	7
Secondary PPH	1
Idiopathic Thrombocytopenic Purpura (ITP)	1
Pneumonia	1
Iron deficiency anaemia	1
Obstructive pyelonephritis	1
Neonatal Death	1
TOTAL	**14**

The issues and recommendations identified from the reviews are entered into a log and allocated to specific staff for the purpose of tracking their implementation. In 12 out of the 14 cases contributory factors were identified.

The below example is illustrative of the changes made to the service in response to the outcomes of

RAMP reviews:

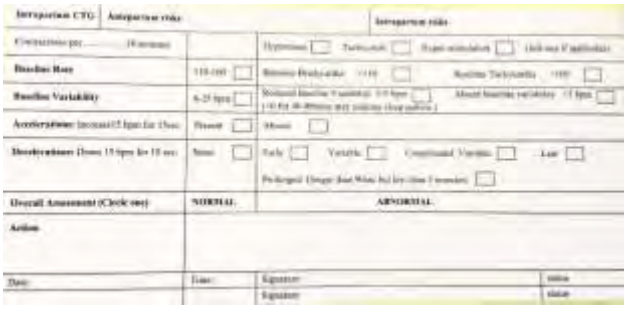
Example 3 - Hypoxic Ischemic Encephalopathy (HIE) cases

The recommendations arising from the RAMP reviews were that staff use appropriate and consistent fetal surveillance terminology as outlined by RANZCOG; that regular fetal surveillance training and education sessions are attended by staff providing care; that a review of all traces by a second person during labour is undertaken; that abnormal traces are escalated in a timely manner to facilitate optimal outcomes; and that staff use the documentation tool provided (see below) to support a standardised approach to interpretation and escalation.

With regard to post-natal care, it was highlighted that post-natal care is as important as intrapartum care; that HIE can develop or become apparent in the hours following birth; whilst expedited birth is an important "therapeutic step" for a hypoxic baby, it is only step one - there is an ongoing requirement to monitor, refer to the appropriate level, and to treat. All babies that have had an abnormal CTG require at least a lactate at birth regardless of the mode of birth.

In September 2015, the Service Clinical Director for Secondary Maternity and the Service Clinical Director for Newborn Services delivered a well-attended presentation to ensure the RAMP recommendations were made known to staff and being implemented. The key message to staff was that "*CTG interpretation is a necessary competency for all our maternity staff*".

In conjunction with the presentation, the Labour and Birth Clinical Governance Group developed and implemented a new CTG sticker to be used for documentation for every birth where a CTG is used.



This sticker demands a closer look at each component of the trace where the result can only be normal or abnormal. The application of the sticker also demands a fresh pair of eyes after a set period of time so the woman's status is reviewed regularly.

The Labour and Birth Clinical Governance Group also developed a policy to accompany the changes in the CTG monitoring to support the use of the sticker. The group is currently considering how best to implement the MOH consensus statement to guide practice 2012 *"Observation of mother and baby in the immediate post-natal period"* into policy and practice.

Whilst improvements have been made, further work is required to ensure best practise is met.

3.5 ADHB & Waitemata DHB Collaboration Maternity Plan

Since 2013, Women's Health services in Waitemata DHB (WDHB) and ADHB have been working collaboratively to explore how best to deliver primary and secondary maternity services to their populations, and create better frameworks for primary healthcare providers using DHB services.

In 2014, a collaboration project was formally established. The project is overseen by the ADHB and WDHB Collaboration Initiative and managed by the Women's Health Collaboration Steering Group, comprising clinical leaders and managers from both DHBs, Planning and Funding, Māori, Pacific and Asian Health Gain Managers and two consumer representatives, providing representation across ADHB and WDHB.

The focus of the collaboration has been on primary and secondary maternity services with particular emphasis on the community aspects of care and linkages to secondary services. It is noted that ADHB maternity services also provide highly specialised (tertiary and quaternary) maternity and paediatric services for the entire Northern Region and for New Zealand. However, these 'tertiary' services are beyond the scope of this chapter.

On 25 November 2015, the "Collaboration Maternity Plan" was launched. The plan provides a framework to work with professional stakeholders and communities to improve the quality of maternity care in the combined catchments.

There are five themes:

- Directing care towards priority populations
- Enhancing maternity quality and safety
- Enhancing continuity of care
- Strengthening confidence in normal birth
- Supporting transition to parenthood and infant attachment

The principles and models of care will be established by the working groups. Shared learning will be ensured. The implementation of the outputs will occur at DHB level. Some of this work has already commenced.

3.6 Maternity Quality and Safety Programme (MQSP)

The MQSP, including the maternity standards and

clinical indicators, forms part of the Maternity Quality Initiative, along with the Maternity Referral Guidelines, the development of a standardised electronic maternity information system, and improved maternity information systems and analysis, which was introduced in 2011 by the Ministry of Health.

In 2012, the National Maternity Monitoring Group (NMMG) was established by the Ministry of Health to oversee the maternity system in general and, more specifically, the implementation of the Maternity Standards.

The national initiatives have been incorporated within the Maternity Clinical Governance framework at ADHB and also through the collaboration project between the ADHB and the WDHB.

The following roles have been established and supported through MQSP funding:

- Clinical Governance Coordinator: In the last year this position has supported case review, and enabled the development of systems to track and follow-up on recommendations from incident reviews, consumer feedback and concerns from staff
- Women's Health Information Intelligence team: This team has been supported to continue the development of an Annual Clinical Report, provide data for audits and clinical indicators; and review of performance against targets/best practice
- Consumer, midwife and obstetric LMC representatives: These representatives attend Level 2 and 3 Clinical Governance groups.

The following provides an outline of the MQSP achievements and project streams in the year 2015, and the current and planned progress to be made by 2017. A table providing an executive summary can be found at the end of this chapter.

3.6.1 Strengthening Consumer Representation

Women's Health is fortunate to have the support and participation of two excellent consumer representatives who assist the service to connect with the "consumer voice". There is consumer representation on some (but not all) of the Clinical Governance Groups. There is a plan to extend formal consumer representation across Governance Groups.

3.6.1.1 Project Description

Consumer representatives have taken the lead on a project to develop more innovative ways of capturing the voice of consumers. The establishment of a diverse and multicultural working group of consumers for regular discussions of ideas, events, improvements and feedback on consumer related issues is planned.

The potential benefits of achieving broader and sustainable consumer engagement have been identified. Consumer representatives (from Women's Health Action Trust) have commenced a project to develop further innovative ways of capturing the voice of consumers. This project will continue into the 2016/17 financial year.

The project's focus is on *Sustainability (*connected, supported, informed and accountable maternity service consumer representatives), *Effectiveness (*diverse consumer perspectives to inform and shape maternity service design and delivery) and *Added value (*high levels of consumer satisfaction with quality and safety maternity services). This will be achieved through:

- The recruitment and selection of suitable, diverse consumer representatives for all Level 2 and 3 Clinical Governance Groups
- A formal induction, training and ongoing external support structure for all consumer representatives
- The establishment of a Consumer Governance Group embedded into the existing clinical governance structure
- The development of a set of maternity consumer driven outcomes/measurables and targets; and
- Working in collaboration with Patient Experience and Performance Improvement teams to engage diverse multicultural groups of maternity consumers via innovative methods.

The key measures will be an increase of consumer representatives from multiple cultures and the overall functioning of a Consumer Governance Group.

3.6.1.2 Progress to date

A comprehensive induction and training manual for Maternity Consumer Representatives is being developed. It is expected that the manual is ready to be signed off by the ADHB by the end of the third quarter 2016. The information included in this package has been tailored to provide future ADHB Maternity Consumer Representatives with:

- Practical orientation and ADHB structural information (Including building access processes, parking , health and safety protocols and cultural safety training opportunities)
- Information on consumer rights and representation in the New Zealand health care environment
- Maternity related national guiding documents and the national maternity structure
- Internal and external complaints mechanisms, including patient experience and consumer

feedback pathways
- Demographics of ADHB service users, clinical outcome trends, membership of Clinical Governance Groups, information on the annual clinical reports and annual clinical report days and information on how to access clinical policies and guidelines; and
- Commonly used acronym definitions.

3.6.1.3 Selection of Group Members and Next Steps

With regard to the promotion and marketing of consumer roles, including with Māori, Pacific and Asian health organisations, work has been undertaken with the following organisations and individuals to identify suitable consumer representative nominees:

- Ngati Whatua Orakei Whai Maia Limited
- The Asian Network Incorporated (TANI) – Healthy Babies Healthy Futures Coordinator
- THRIVE Teen Parent Support Trust
- Health Star Pacific Trust
- Former 'NICU mums'; and
- La Leche League.

There is also a plan to connect with Maternal Mental Health Consumers and the Chinese New Settlers Service Trust (CNSST) in the short term.

The next steps in relation to this project will involve shortlisting of expressions of interest, and the subsequent interviewing of potential Consumer Governance Group members.

3.7 Patient Experience Survey

ADHB distributes a generic patient experience survey that covers all the core dimensions that most directly impact on consumer satisfaction and allows each person to talk in detail about the experiences most important to them. This year a project on the current method of capturing the consumer's experience is outlined below.

3.7.1.1 Project Rationale and Goal

With regard to the project's rationale, capturing of patients' experiences allows identification of service strengths and areas for improvement.

The current method of capturing the patient experience is via an electronic patient experience survey. This survey is sent to women's email addresses two weeks after their discharge from the service.

In 2014, there were a total of 877 online patient experience surveys completed for Women's Health. This equated to fewer than 10% of women who used the service. One of the possible barriers identified was that the electronically sent survey depends on validated emails being entered electronically into the system. In 2014, fewer than a quarter of inpatient admissions had validated email addresses entered.

This project aims to increase the overall number of email addresses entered and validated electronically in order to increase the proportion of women who are sent and will respond to the patient experience survey. This will enable review of the methodology for measuring patient satisfaction and its success (which may, for example, be defined as at least 50% of patients participating in a patient experience survey) or whether consideration should be given to using a different methodology.

3.7.1.2 Project outline

When women engage with Women's Health services they fill in a registration form which asks for an email address (provision of which confirms the woman's permission/consent to send clinical information and a questionnaire on their hospital experience to them via email). That email address should then be entered electronically into CMS and the consent validated.

3.7.1.3 Project Progress

In October 2015, 100 sets of records of women who gave birth at ADHB were audited to establish how many email addresses had been obtained on the registration form. They were then entered and validated electronically in the system in a manner that allowed a patient experience survey to be sent out. Out of those 100 records 51 had email addresses available but they had not been entered; 14 were entered correctly; 22 had no email address or did not give consent; 8 had no registration form; and 3 were on an old registration form which did not provide space for an email address to be recorded.

Following this audit, a consultation process took place with relevant staff to establish and confirm the appropriate processes for entering the information from the registration form into the electronic system. Relevant staff and their team leaders were subsequently reminded of the importance of entering the patient's own email addresses into the system electronically and asked to further identify barriers that prevent them from entering and validating the email addresses electronically.

In the first phase, work with the Labour and Birthing Unit is being undertaken to capture email addresses at the time of birth for the next 6 months in order to account for the time lag between booking (and filling in the registration form) and the use of services at the time of birth (two weeks after which the survey is sent). The data is to be collected monthly on newly booked patients for six months thereafter. Barriers will be addressed if and when they arise. The second phase will involve addressing these issues

in the Gynaecology department. The available data will then be analysed to inform the next steps.

3.7.1.4 Results

The above progress points were initiated according to the plan. Despite all the remedial steps taken, the data was rechecked and still only 10% of women who birth at ADHB have their email addresses entered and validated. This indicates that the current methodology for measuring patient satisfaction is not providing a complete picture of women's experiences. Thus, consideration will be given to using a different methodology in addition to the ADHB generic survey. Consumer representatives will lead a project to enhance this aspect of the service.

3.7.2 Support staff to deliver best care

Projects in this respect involve support for health professionals following a critical incident, support for new graduate Lead Maternity Carer (LMC) midwives and improving the interface between core and independent staff using the Women's Health Service.

3.7.2.1 Support for health professionals following a critical incident

The service has been exploring ways in which better support and debriefing of staff can occur, including Lead Maternity Carers (LMC), following a critical incident – that is an unexpected outcome where staff or patients require time for reflection, discussion or support. Work has been commenced with Diana Austin (RM), who is completing her doctorate on this particular subject. Diana is a Midwifery Lecturer at AUT and also works as a midwife for ADHB.

A survey and subsequent workshop indicated that the current support following a critical incident was provided on an ad hoc basis. A working group was established to look at ways of strengthening the available resources for staff. Alongside this, Diana worked with the group to develop an Action Research project. This involves working together in a cyclic process of plan, act, observe and reflect. A variety of health professionals were interviewed in depth or met in groups to talk about what had supported them following a critical incident. These themes were created into topics that have formed the basis of an information resource. The interactive eBook begins with a series of ten 'I statements' so the user can select what they need in that moment, such as "I feel really upset after what happened. Everyone else seems to be coping better" or "I need to talk to someone. What are my options?" and "I am the most senior person on duty. How do I help my team members?" When the statements are chosen the reader will be navigated to information relating to the topic, including stories from health professionals within the service.

The tool was evaluated by a wide range of potential users in the service. Feedback was used to revise the content. Approximately 45 ADHB staff and LMCs with access agreements have worked together with Diana in providing content, developing the resource, and evaluating it.

The tool will be made available on the National Women's website in August 2016 and therefore accessible to all staff and LMCs. It will be embedded as part of the services provided as support following a critical incident.

3.7.2.2 Support for new graduate Lead Maternity Carer (LMC) midwives/Transition to LMC project

The transition to LMC project was commenced in December 2015. The programme stemmed from the early engagement work ADHB has been doing in collaboration with WDHB. This programme aims to support midwives, including new graduate midwives, into self-employed practice by spending time working in Women's Health at ADHB and gaining experience with processes and systems to assist them when in their own practices. The aim was to encourage LMC midwives to work in areas with higher needs women to avail them of the benefits of full continuity of care as well as to assist to increase the number of LMCs in the ADHB catchment area.

The plan was initially for any midwife interested in the programme to spend six months with the community midwifery team at Greenlane and to build a caseload of women, whilst gaining experience of case loading without the same full continuity of care offered by self-employed LMCs.

For new graduate midwives, we offered rotation for a year in the hospital on the new graduate midwifery first year of practice course (MFYP), followed by a transfer to the community team to build their caseload.

ADHB's support included building in one day a fortnight working on the Labour and Birthing unit and 7 days a fortnight in the community team. Assistance was also offered for midwives to connect with a midwifery practice and facilitation into an experienced local practice with good support and mentoring.

Assistance from ADHB was provided in setting up a GP practice link and one of the midwives has kept this city practice where she continues to run antenatal clinics.

ADHB commenced with two newly graduated midwives who opted to come onto the programme after hearing about the process at AUT in the last months of their education. Midwives appreciated the process and managed to build their caseloads

appropriate to the numbers they could manage and they found continuing their relationships and regular experience in the Labour and Birthing Suite beneficial. Working with the obstetric team and the Maternity-Walk-In-Centre midwives at Greenlane was also advantageous, consolidating their knowledge of the referral systems and pathways.

Another advantage was to gain the assistance of the walk in centre to gain referrals.

At the end of their time with the community team both midwives were able to take a caseload, one only leaving nine women out of forty three for the team to continue care.

Some of the challenges have been to facilitate caseloads for newly graduated midwives which are predominantly lower risk women due to the increasing complexity of women presenting. The midwifery team have provided great support with this in conjunction with sharing learning opportunities.

Another challenge has been the appropriate timing to offer the course to new graduates. Differing opinions range from new graduates spending six months in the hospital, six months in the community team and then out as an LMC to spending one or two years before leaving with their caseload. Our first round of new graduates both felt 12 months on the wards and with the community team total was ideal for them.

After learnings from this year, the opportunity for the programme has been shared again with this year's new graduates and there is interest from those who commenced with ADHB under the MFYP course in April 2016.

Two midwives have provided specific feedback on this programme. They stated that:

"The process of transitioning into an LMC over our new graduate year has been really enjoyable. The programme has helped to increase our confidence levels and has provided both of us with a wide range of clinical experience. Working within a multidisciplinary team and getting to know the staff well has been a really beneficial part of this programme. We have both felt well supported throughout the programme. Our preceptors that were allocated to us at Greenlane Community Midwives were especially supportive, and were able to help us with difficult cases and issues when necessary. Having this support was a big factor in building confidence in our abilities, and helped to consolidate our knowledge prior to going out as LMC midwives. One of the most valuable parts of this programme was being able to offer continuity of care to women who otherwise may not have had this. Many women in the community are unable to access LMC services due to the shortage of LMC midwives in the Auckland area. Our women have really appreciated having a familiar face at their births, one women quoted as saying, "I was so grateful to have her at my birth; she was so supportive and encouraging". Building this relationship and partnership with women prior to going out as LMCs has been incredible. We are both very grateful to have had the opportunity to be part of the Transition to LMC Programme at ADHB".

3.7.2.3 Improving the interface between core and independent staff using the Women's Health Service

Work has commenced to improve and optimise the working relationships between the internal and external stakeholders of the service which in turn will improve the quality of care provided to women and their families.

A survey has been conducted to identify stakeholder concerns and issues. Next, analysis of the issues will be commenced and together with representatives from both groups development of a strategy to improve and foster the relationships between the groups.

Success will be an improvement in stakeholder interface in our workplace, creating professional and harmonious working relationships. A further survey will be conducted to evaluate the outcomes.

3.7.3 Increasing access to services, including vulnerable populations

3.7.3.1 ADHB Māori Community Midwives

In July 2015, the ADHB Māori Community Midwifery team, Te Manawa ō Hine, was established. Since then, the team has grown to include two Māori Women's Health Social Workers and a Consultant Obstetrician.

The need to improve maternity outcomes for Māori women and whānau is widely documented. As "Māori caring for Māori", maternity inequities will be addressed through the provision of individualised care in partnership, with participation and protection, to empower women and whānau through a Māori worldview. Practice comes from a place of knowledge and understanding of indigenous history, culture and Tikanga. These factors, in addition to the provision of care and education, have a significant impact on the health care experiences and outcomes of Māori.

The team provides antenatal and postnatal care and education to women and whānau in the community. Visits take place either in women's homes or in a community clinic. The team works closely with Ngāti Whātua ō Ōrakei health services and other social support services to provide culturally safe and appropriate care. The philosophy of the team aligns

with Te Tiriti ō Waitangi and acknowledges Ngāti Whātua as manawhenua.

3.7.3.2 Matariki – Māori New Year 2016 - Celebration and Education

On Tuesday 14th June the Māori Midwifery Team visited the wards and connected with women and babies who identified as Māori to celebrate the Māori New Year and incorporated the celebration with consented education about safe sleeping practice.

The Safe Sleep education included the Whakawhetu 'PEPE' acronym:

Place baby in his/her own bed
Eliminate smoking from living environment
Position baby on back with face clear
Encourage and support mum to breastfeed

The team discussed safe sleep practice and inquired whether or not the family had a baby bed at home and offered the pepi-pod programme as an intervention if they didn't. The pepi-pod is a baby bed that has Ministry of Health endorsement and is provided to the family in conjunction with safe sleep education by a certified pepi-pod distributor.

In addition, each mother was given a gift pack (Safe Sleep T-shirt, a 'back to sleep' stretch and grow, woollen hat, woollen booties, breastfeeding DVD, Shaken Baby Syndrome DVD, Getting to Know Your Baby DVD, Whakawhetu PEPE card, baby socks, various nipple creams and some homemade lactation cookies). The gift pack was intended to capture attention, reinforce the PEPE message and provide for intervention if needed.

The visits captured six babies in NICU, one woman and baby in Ward 96, one woman and baby in Ward 98 and three women and babies in Tamaki ward. One of the families didn't have a baby bed and consented to participate in the pepi-pod programme.

3.7.3.3 Development of a pilot community hub in collaboration with Ngāti Whātua (MQSP investment 2016/17, aligned to both ADHB localities work, and ADHB-WDHB Maternity Plan)

Persistent inequity in access to care and in health outcomes for Māori and other vulnerable women attending maternity services at Auckland Hospital has been identified.

In particular, women living in Glen Innes are less likely to have a self-employed LMC. These women are also more likely to register late with a hospital employed LMC. The plan is to develop a new model of care for the delivery of ante and postnatal services in a community setting in collaboration with Ōrākei Health Services. Aiming to improve:

- Access to maternity services for Māori, their whānau and other vulnerable populations
- Access to social services for Māori women, their whānau and other vulnerable populations
- The ability for whānau to self-manage their health and wellbeing
- Cultural appropriateness of health services for Māori and their whānau
- Patient experience
- Relationships between DHB and Māori health providers
- Information sharing between DHB and Māori health providers; and
- Multiagency assessment, collaboration and care planning with Māori health providers.

With regard to the progress made to date, site visits were undertaken and a venue was chosen. A planning meeting has taken place in which models of care and first steps towards the models were discussed. It is anticipated that there will be 15-20 potential secondary maternity consultation visits through the Māori Midwifery team each month. These appointments are anticipated to take place at Greenlane and Glen Innes sites. A clinic with the Māori Midwifery team has taken place to establish what works best. The first Glen Innes clinic took place on 5 May 2016. A fortnightly meeting has been established to discuss cases in a multidisciplinary and collegial fashion. Appropriate communication networks have been established for referrals between primary and secondary care.

With regard to the next steps, planning is underway for a portable obstetric ultrasound scanner for the Glen Innes clinic.

3.7.4 Strengthening support for women with social and mental health needs

3.7.4.1 Strengthen non-acute Maternal Mental Health services (MQSP investment 2016/17, aligned with ADHB-WDHB collaboration and Pregnancy and First year of Life Alliance)

Considerable progress has been made in strengthening the acute end of this pathway across the Northern Region. Collaborative work with DHB partners and multidisciplinary mental health, maternal mental health and inpatient teams has ensured a clear, equitable, and appropriately resourced pathway to care for women with acute mental health issues in pregnancy and for the first 12 months postpartum. The Perinatal and Infant Mental Health (Metro Auckland) Operational Pathway is available at:

http://www.networknorth.org.nz/file/Resources/PIMH/moc-operational-pathway-final.pdf).

This project resulted in the following deliverables:

- An agreed acute maternal mental health pathway

- Development of an inpatient mother and baby unit
- Enhanced flexible community supports
- Development of residential and crisis respite
- Packages of care to wrap around women in the community antenatally and postnatally; and
- Enhancements of the maternal mental health workforce.

There is however, a perceived service delivery gap for women and infants requiring primary mental health services. It is anticipated that if that gap could be eliminated it may reduce the need for high resource inpatient services.

In 2016/2017, collaborative work with the ADHB Funder who will lead a project to stocktake current services, identify service gaps and formulate a plan to address these, will be commenced. This work will be supported by the Pregnancy and First year of Life Service level Alliance.

3.7.4.2 Better identification of Family Violence

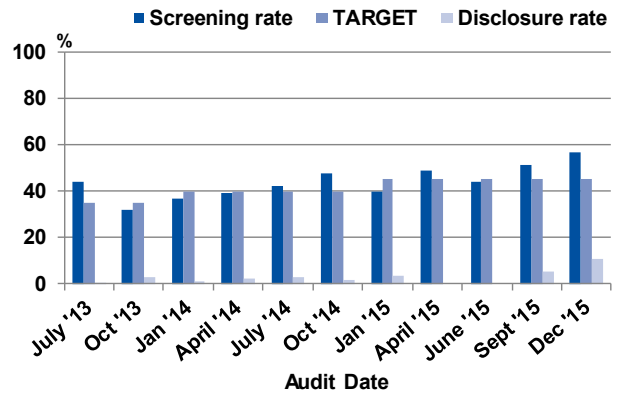
3.7.4.2.1 Women's Health Family Violence Intervention Programme

The ADHB Family Violence Intervention Programme is part of the Ministry of Health Violence Intervention Programme (VIP). This programme is run nationally in New Zealand with standardised management, training and evaluation systems.

Quarterly auditing is undertaken in Women's Health to reduce the health harm of family violence by implementing early intervention programmes in health systems. This audit reports on the data available on family violence interventions so that it can be utilised to inform the VIP programme, screening rates trends and disclosures.

Women's Health is currently sitting at a 57% screening rate. This is 7% above the target set for 2016.

Figure 9: Family Violence Screening NWH 2013 – 2015



Whilst the screening rate in Women's Health is improving, disclosure rates across the board remain low. This can, in part, be a reflection of the quality of a routine screen. Other issues identified by staff include not having the privacy/space to engage in screening on a ward, confidence in asking the routine screening questions, and an overall lack of clarity regarding the relationship between family violence, health, and the health practitioners' responsibilities. Further work is required to address these issues.

In summary, while it is apparent that Women's Health exceeded the screening target, it fell short of the Ministry of Health's expectation that 100% of women are screened.

3.7.4.2.2 Introduction of role of SHINE family violence advocate Maggie Andrade

The SHINE family violence advocate role supports men and women (and children) who have disclosed family violence primarily by making an assessment of their safety and providing appropriate safety options when accessing resources in the community. Some of these options include giving information about Protection Orders, Police Safety Orders, refugees, counselling and programmes for victims of family violence. At times there is an immediate need to arrange "an escape", and because this work takes place in the hospital environment, it provides a higher degree of safety and confidentiality for the patient.

Following a risk assessment, a safety plan is created and further support/information and education is provided depending on immediate safety needs. This role supports staff undertaking routine enquiry/screening. Another important component of this work is connecting patients with agencies that offer further services and provide a voice for them when that is needed. In addition to advocating for patients, this role also allows provision of training and educational sessions to professionals as well as acting as a family violence liaison between Shine and ADHB.

Based on the overwhelming positive feedback received from ADHB professionals that utilise this service, and the increase of referrals, this role has managed to generate more referrals from all over the hospital, not just from social work. Referrals tend to come from Adult Emergency Department, Starship, Women's Health social workers, Mother & Baby unit, nurses, doctors from all areas and midwives, although the position was initially only rolled out in Women's Health social work. The awareness about the role is due to the *Violence Intervention Programme* (VIP) training sessions, ward family violence champions, and through different professionals who have knowledge about the service.

Being a clear presence in the hospital allows others to feel more comfortable about the work that

surrounds FV disclosures. More consultations and confidence in their knowledge about FV shows that the presence itself is changing some of the fear around family violence screening and disclosures. Having a family violence specialist service within the hospital allows for patients of all ages and backgrounds to receive assistance and support related to family violence. The opportunity to provide services to people who normally would not contact social services on their own is enormous. Usually, language barriers, little knowledge about family violence, or fear of retaliation might hinder people getting help. In a hospital setting however, the safe environment surrounded by medical and other health professionals allows for better screening options, hence potentially more disclosures. Patients do not have to worry about their partner finding out about the disclosures, so conversations about safety can be planned without risk to the patient or their children. Liaising with Women's Health social work provides the role with the opportunity to engage with high risk pregnant women, who will most likely stay longer in hospital or be engaged with several other medical professionals as outpatients. This means that there is more time to assess their situation and offer a comprehensive risk assessment and safety plan.

3.7.4.3 Improved response to child protection issues

A national focus on improving the quality of care provided to vulnerable children, via the Children's Action Plan requires ADHB to ensure that maternity services play an active role in identifying and responding to vulnerability during pregnancy. Effectively responding to the needs of socially complex pregnant women will inevitably rely on the skills and support of a multi-professional, multiagency team. The purpose of these teams is to wrap services around pregnant women, in order to reduce the risks associated with the social factors impacting on their wellbeing. Often the way to reduce child protection risks is to collectively respond to the identified needs of pregnant women.

Pregnancy is recognised as 'a window of opportunity' for women to make essential life changes. In order to maximise this opportunity however, proactive and timely identification of the issues is critical. This proactive approach makes it more likely that the pregnant women will receive the necessary services, in a planned and coordinated way, thereby reducing the likelihood that Child Youth and Family Service will be required to step in.

A critical review of our care suggests that once identified, risks of family violence are not consistently managed in the best possible way. The focus over the next 12-24 months will be to:

- Develop a comprehensive pathway for pregnant women experiencing complex social factors impacting the wellbeing of mother and baby which will be informed by, and incorporate where appropriate, the national Maternal Care Wellbeing and Child Protection Multiagency Group tool kit
- Develop a comprehensive alert management system, to ensure the effective management of local, regional and national antenatal alerts
- Produce a comprehensive workforce development programme, which will include promoting the appropriate use of the multiagency planning forum, to ensure all relevant maternity staff are provided with the necessary skills to implement the patient pathway for vulnerable women
- Work in partnership with Child Youth and Family Service to develop best practice guidelines for the management of pregnant women experiencing complex social factors
- Ensure appropriate metrics are developed and implemented for inclusion in Women's Health Score Card; and
- The ADHB Child Protection Coordinator will review the Watch Policy.

Significant progress has been made. To date, the pathway has been developed, and the workforce development to support its successful implementation is underway. Referral documentation and process are agreed. Work is in progress to ensure alert management reflects national expectations – including a robust process for placing and removing antenatal alerts.

3.7.5 Preparing women for parenthood and infant attachment

3.7.5.1 Antenatal Education (Pregnancy and Parenting Education Service)

3.7.5.1.1 Background

The Pregnancy and Parenting Education Service sits under the Women's Health Directorate and is overseen by a governance group. The governance group provides oversight of the program, ensuring consistent, high quality and culturally responsive education is accessible and delivered across the ADHB region with a focus on first time mothers with additional needs, such as Māori, Pacific people, Asian, refugees, teenagers and those whose first language is not English, and meets the requirements of the Pregnancy and Parenting Information and Education curriculum, Mokopuna Ora.

The service is free to all women who are expecting their first baby and their partner/whānau, and (who live within the Auckland DHB area and have New Zealand residency status). Through the service

women can access face to face pregnancy and parenting education in their local community.

A particular focus for the service is on first time mothers/parents and for women who have not previously accessed traditional antenatal classes, i.e. Māori, Pacific peoples, teenagers, and women for whom English is a second language.

Exciting new features of the service include the Mokopuna Ora – Healthy Pregnancy and Baby curriculum, website and mobile device application (App). The contribution of mothers, whānau, and stakeholder feedback is especially acknowledged, together with Conectus, an alliance of organisations at the University of Auckland, including TAHA and Whakawhetu, who produced Mokopuna Ora – Healthy Pregnancy and Baby. Each shares a common interest in improving aspects of health for infants, children and their whānau.

In addition to the information and education curriculum the Mokopuna Ora website provides online access to the curriculum, pregnancy and parenting tips and much more. Furthermore, the Mokopuna Ora App provides Smartphone access to the Mokopuna Ora website at any time to help mums and dads find trusted pregnancy information, provide weekly updates on mother and baby's development, a calendar to enter appointments, tips, help in locating useful services and connecting with them, e.g. midwives, GPs, pharmacies, labs etc. Online registration allows women to locate the ADHB Pregnancy and Parenting Education Service webpage, choose an education class and register online for it.

3.7.5.1.2 Service launch

The Pregnancy and Parenting Education Service was soft launched on Monday 23 May 2016 before a gathering of Women's Health management and maternity services staff, representatives from ADHB Planning and Funding, Communications, and contract service providers and stakeholders.

3.7.5.2 Lactation support

Breastfeeding is the best way of providing young infants with the nutrients they need for healthy growth and development. Exclusive breastfeeding is recommended up to six months of age, with continued breastfeeding along with appropriate complementary foods up to two years of age or beyond. The exclusive breastfeeding rates, (especially for Māori and Pacific women) decline following discharge from hospital and there is a significant decline in the exclusive breastfeeding rates at 3 months.

It was identified via a consumer survey that women within the ADHB region who experienced breastfeeding complications had limited access to funded breastfeeding support in the community. The purpose of the survey was to gain insight into the services women accessed for breastfeeding support and their experience of these services. In addition, limited breastfeeding community support was also raised by Children's Emergency Department (CED) and a Starship Ear, Nose and Throat (ENT) Specialist.

As a result of this feedback a full time Lactation Consultant has recently been appointed to provide lactation support to women within the ADHB community. The focus of the service is to support women who experience significant breastfeeding complications that are not able to be managed by their Lead Maternity Carer (LMC) or Well Child Tamariki Ora (WCTO) Provider. The role is based in community clinics and has the capacity to provide expert lactation support to women within their home environment, where required.

The following outcomes from the service will be recorded:

- Numbers of referrals
- Indication for referrals
- Source of referrals
- Ethnicity of women accessing the service
- Number of first consultations
- Number of follow up face to face consultations; and
- Number of follow up consultations performed by phone.

The above outcomes will be assessed and the service will be reviewed regularly to ensure all women are able to access appropriate support to improve exclusive breastfeeding rates.

3.8 Performance against New Zealand Maternity Clinical Indicators

The maternity clinical indicators are part of the Maternity Quality and Safety Programme. The Ministry of Health uses the national maternity dataset (MAT), which is compiled from LMC early pregnancy data and hospital discharge outcome data to produce indicator data for each DHB and facility and for New Zealand. In 2015, there were 21 indicators in the clinical indicator report for 2014 as listed in Table 22. Publication of the next report, including 2015 indicators, is expected late in 2016.

Table 22 includes the indicator rates for NWH compared to rates for all secondary and tertiary facilities. The indicators where NWH is significantly outside average national rates and which are cause for concern are shaded in the table.

Table 22: NZ Maternity Clinical Indicators 2014 (NWH and NZ Facility rates for all secondary and tertiary facilities)

Indicator		NWH 2014	NZ 2014	Comment
1	Registration with a LMC in the first trimester of pregnancy	72.7	68.0	No concern
2	Standard primiparae who have a spontaneous vaginal birth	57.8	63.6	Concern
3	Standard primiparae who undergo an instrumental birth	19.3	17.8	No concern
4	Standard primiparae who undergo Caesarean section	22.8	18.2	Concern
5	Standard primiparae who undergo induction of labour	10.4	6.4	Concern
6	Standard primiparae with an intact lower genital tract (no 1st- to 4th-degree tear or episiotomy)	10.1	20.5	Concern
7	Standard primiparae undergoing episiotomy and no 3rd or 4th degree perineal tear	41.7	27.2	Concern
8	Standard primiparae sustaining a 3rd or 4th degree perineal tear and no episiotomy	3.4	4.7	Excellent
9	Standard primiparae undergoing episiotomy and sustaining a 3rd or 4th degree tear	2.2	1.8	No concern
10	Women having a general anaesthetic for caesarean section	5.8	8.4	Excellent
11	Women requiring a blood transfusion with caesarean section	3.0	3.2	No concern
12	Women requiring a blood transfusion with vaginal birth	2.9	2.3	Concern
13	Diagnosis of eclampsia at birth admission	0.04	0.04	No concern
14	Women having a peripartum hysterectomy	0.14	0.07	No concern
15	Women admitted to ICU and requiring ventilation during the pregnancy or postnatal period	0.01	0.03	No concern
16	Maternal tobacco use during postnatal period	1.8	11.9	Excellent
17	Women with BMI over 35	6.8	9.3	-
18	Preterm birth	9.2	8.2	No concern
19	Small babies at term (37 - 42 weeks' gestation)	3.3	3.3	No concern
20	Small babies at term born at 40 – 42 weeks' gestation	29.9	37.9	Excellent
21	Babies born at 37+ weeks' gestation requiring respiratory support	2.6	2.2	Concern

National and NWH data for these indicators for 2009-2014 are included in the sections of the report to which they relate e.g. indicators 2-5 and 10 can be found in chapter 6, indicators 6-9 and 11-12 in chapter 7.

3.9 Maternity Quality and Safety Projects NWH 2015-2017

This table illustrates an overview of Women's Health Directorate achievements so far and continuing work plan into 2017.

Table 23: Maternity Quality & Safety Projects 2015-2017

Project stream	Measure	Progress
Strengthen consumer voice		
Strengthening Consumer Representation & Consumer Voice	Consumer representation on all governance groups An increase of our consumer representatives from multiple cultures A functioning Consumer Governance Group	In progress - See 3.7.1
Patient Experience Survey Project	Whether this methodology for measuring patient satisfaction is successful for our service.	Achieved – see 3.7.2
Real time consumer feedback	A system whereby real time consumer feedback is captured while the person is an inpatient.	Planning for this project will begin once our consumer governance group has been integrated into the service and is fully functioning.
Support staff to deliver best care		
Support for health professionals following a critical incident	System in place to better support staff	Provision of a working support and feedback system is underway – see 3.7.3.1
Support for new graduate LMC midwives	Successful transition to LMC for new graduate midwives	Achieved – see 3.7.3.2
Improve the interface between core and independent staff using the Women's Health Service	Improved interface	In progress – see 3.7.3.3
Improve patient safety		
Recognition and management of deteriorating patient	Improvement as shown by audit in the use of the early warning score (EWS) system to aid response.	In progress
Improvement in CTG competency	Implement regular training in the interpretation of CTGs and capture ongoing competency for both medical and midwifery staff. Our aim is to eliminate the contributory factor "lack of recognition and escalation of an abnormal CTG" resulting in the development of or contribution to the severity of HIE.	In progress – see 3.5.2
Increase access to services, including vulnerable populations		
Development of a pilot community hub	Improved and utilised access to maternity services for Māori, their whānau and other vulnerable populations.	In progress – See 3.7.4.2
Enhance the cultural appropriateness of our care	Enhanced culturally appropriate care	The ADHB-WDHB collaboration maternity plan is working on this project – A Women's Health Workforce Strategy is being developed.
Strengthen support for women with social and mental health needs		
Strengthen non-acute Maternal Mental Health services	A strong functioning overall mental health service	This work will be supported by one of the Maternity Collaboration working groups and will align with service planning being undertaken by ADHB Mental Health Services – see 3.7.5.1
Better identifying risk of family violence	Improved confidence and competence of our workforce to screen effectively and understand what to do when they uncover risk.	In progress – See 3.7.5.2
Improved response to child protection issues	A functioning comprehensive pathway for pregnant women experiencing complex social factors impacting the wellbeing of mother and baby	In progress – See 3.7.5.3
Preparing women for parenthood and infant attachment		
Antenatal education	An evidenced based core curriculum plus a curriculum tailored to meet the needs of Māori and Youth to be developed.	Achieved – See 3.7.6
Lactation support	Development of a community Lactation Consultant service	Achieved – See 3.7.6.2

4 Maternal Demography

This chapter describes the demographic characteristics of the women giving birth at NW in 2015. Some tables pertaining to this chapter can be found in the text and the remainder at the end of the chapter.

4.1 Maternal domicile

In 2015, 66% of women giving birth at National Women's were women who reside in the Auckland DHB area. This proportion has dropped a small amount from 70% in the mid-2000s (Table 26).

For the last 10 years between 14% and 16% of women giving birth at NWH were residing in Waitemata and 13% to 17% in Counties Manukau DHB regions. Small numbers (generally fewer than 1% per year) of women from other regions also birth at NWH.

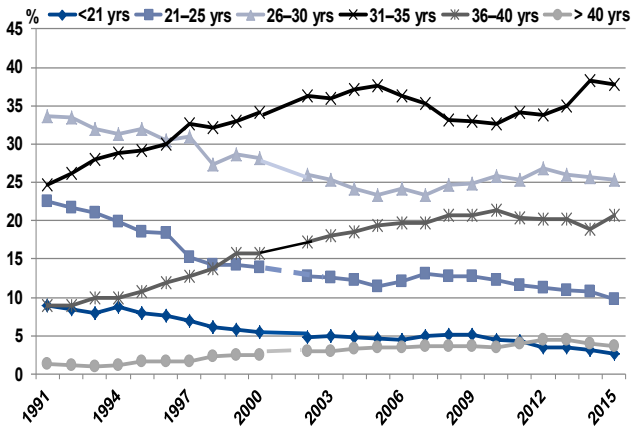
Some of the 32% of mothers who reside outside ADHB area require tertiary services, but others are making a personal choice to birth at NWH.

4.2 Maternal age, parity, and ethnicity

There was considerable change in the age of women birthing at NWH from 1991 to 2005, with a reduction in births to mothers up to 30 years (from 65% down to 40%), and an increase in births to mothers over 30 (from 35% up to 60%). However, other than an ongoing reduction in the proportion of teenage mothers, there has been little change in the past 10 years (Table 27).

In 2015, 255 (3.7%) of mothers birthing at NWH were aged over 40 years and 187 (2.7%) under age 20 years.

Figure 10: Maternal age distribution among women birthing at NWH (1991-2015)



The ratio of multiparous to nulliparous women has remained fairly constant over recent years at close to 1:1. This is a significant change from the 1990s when the ratio of multiparous to nulliparous mothers: was 1.2-1.31.

Figure 11: Parity distribution among women birthing at NWH (1992-2015)

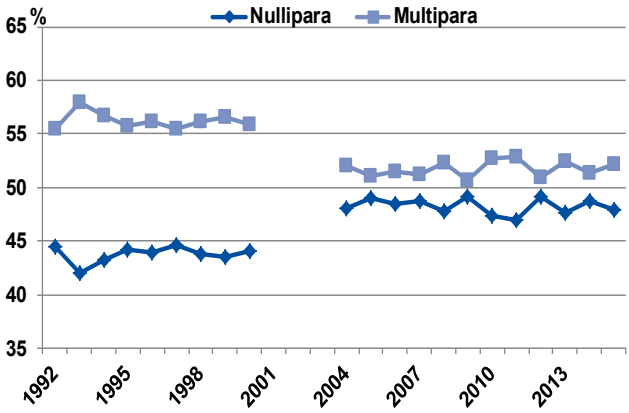
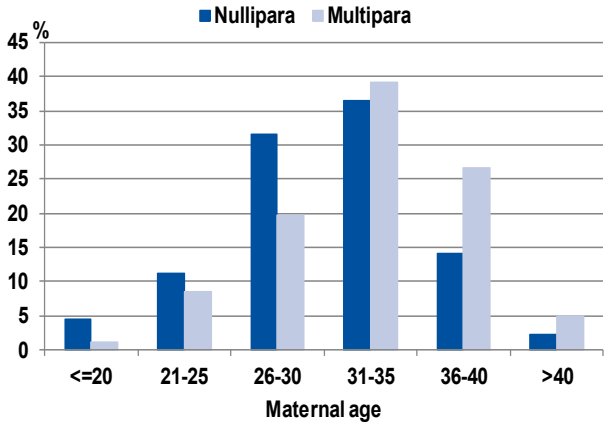
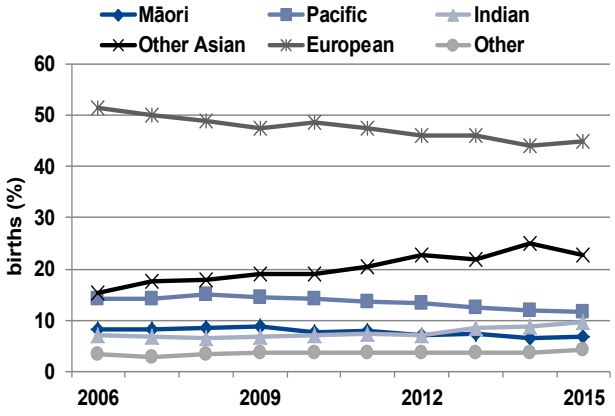


Figure 12: Maternal parity by age NWH 2015



While parity and age are highly correlated, 16% of nullipara in 2015 were aged over 35. This is a group of women with increased risk due to a combination of their parity and their age (Table 28).

Figure 13: Ethnicity of mothers giving birth at NWH 2006-2015



Reported ethnicity is prioritised. This means that when more than one ethnicity is identified by a mother, her ethnicity is assigned according to the following hierarchy: Māori, Pacific peoples, Indian, Other Asian, Other, Other European, NZ European.

In 2015, of mothers giving birth at NWH 6.8%

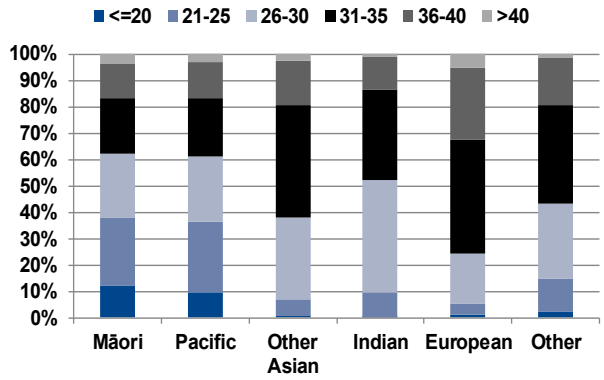
identified as Māori, 11.6% Pacific peoples, 9.5% Indian, 22.8% Other Asian, 11.9% Other European, 33.0% NZ European, and 4.3% Other ethnicities.

Table 24: Prioritised ethnicity of women giving birth at National Women's 2015 (for information on assigning ethnicity and prioritising ethnicity, see APPENDIX 1)

	Birthing mothers 2015	
Prioritised ethnicity	**n=6933**	
	n	**%**
New Zealand European	2291	33.0
Chinese	906	13.1
Other European	698	10.1
Māori	469	6.8
Indian	660	9.5
Samoan	289	4.2
Tongan	271	3.9
Other Asian	397	5.7
Southeast Asian	226	3.3
European NFD	129	1.9
Middle Eastern	141	2.0
Cook Island Māori	98	1.4
African	74	1.1
Niuean	58	0.8
Asian NFD	52	0.7
Fijian	57	0.8
Latin American	81	1.2
Other Pacific Peoples	28	0.4
Tokelauan	4	0.1
Other Ethnicity	4	0.2

The proportion of women birthing at National Women's who identified as Indian, Chinese or other Asian increased from 22.7% in 2006 to 32.3% in 2015. This change in the population ethnic demography may have implications for how our services and patient information are provided.

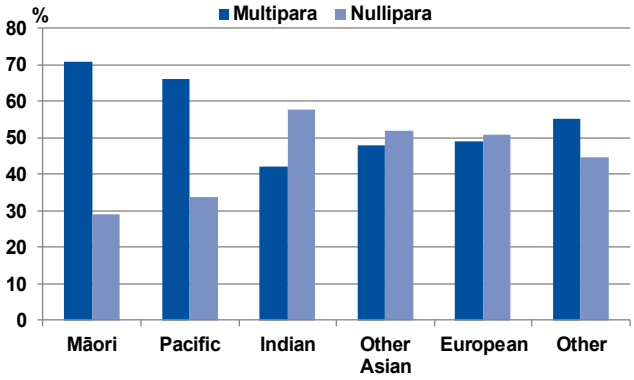
Figure 14: Maternal age by maternal ethnicity NWH 2015



There are clear differences in maternal age at birth according to the mother's ethnicity as shown in Figure 14.

While approximately one half of "non-Indian" Asian (52%) and European mothers (51%) giving birth at NWH are having their first baby, only one third of Māori (29%) and Pacific Island mothers (34%) are giving birth to their first baby. Parity and age need to be considered in analyses of obstetric interventions by ethnicity.

Figure 15: Parity distribution by maternal ethnicity NWH 2015



4.3 Smoking

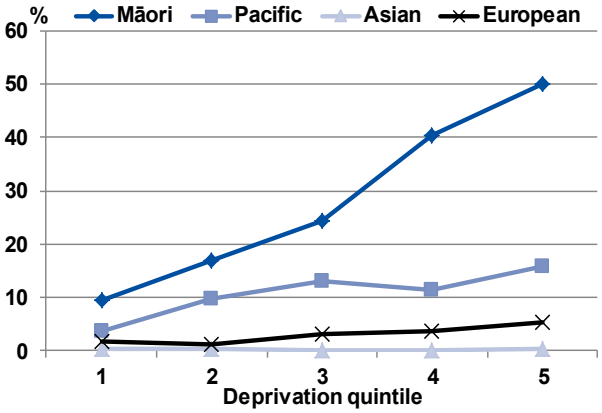
Among women birthing at NW in 2015, 5.5% reported smoking at booking and 4.7% at birth.

While the smoking rate among women birthing at NWH is low compared to the NZ birthing population (15% at the time of birth)(MOH Report on Maternity 2014), some populations within NWH have very high rates, including mothers under 26 years old, women living in areas of high socioeconomic deprivation, and Māori and Pacific mothers.

Table 25: Smoking status of women at booking and at birth NWH 2015

Smoking Status	Smoking at booking		Smoking at birth	
	n=6933		n=6933	
	n	%	n	%
Yes	381	5.5	328	4.7
No	6551	94.5	6605	95.3
Missing data	1	0.0	0	0.0

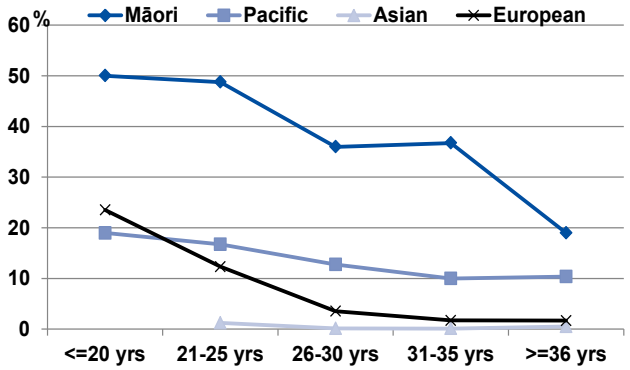
Figure 16: Smoking at booking by deprivation quintile and maternal ethnicity NWH 2015



Within ethnic groups, there is an increased rate of smoking among younger mothers and among mothers living in areas with higher deprivation.

Seventy five percent of all smoking mothers at NWH in 2015 identified as Māori or Pacific peoples.

Figure 17: Smoking rates at booking by age and ethnicity NWH 2015



At booking, 14% of women attending the NWH Community clinic reported that they were smoking. And the largest cohort of smokers by LMC (170 of the 381 smokers in 2015 (45%)) attended the Community clinic for primary maternity care. If women receiving LMC care from the diabetes and medical clinics are added to these smokers, 230 (60%) are attending NWH clinics for care. Of self-employed midwifery clients, 3.7% were smokers, as were 0.2% of private obstetrician clients.

These data help to identify the most at risk groups who need help with this important modifiable risk factor.

4.3.1 Health Targets

ADHB Smokefree Services works with Women's Health to achieve two Ministry of Health tobacco Health Targets:

1. Over 95% of current smokers that attend NWH are given documented brief advice to stop smoking and an offer of help to do so.
2. Over 90% of pregnant women who identify as smokers upon registration with a DHB-employed midwife or LMC are offered brief advice and support to quit smoking.

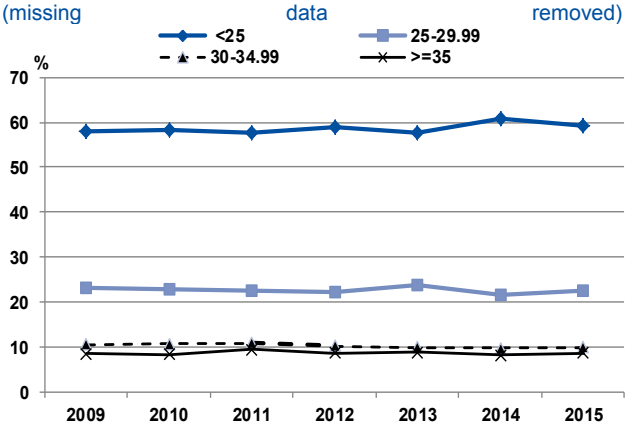
In the 12 months, 1/4/15 to 31/3/16, Women's Health achieved 93.6% towards the first target and 100% in the second. In relation to the above, ADHB Smokefree Services carried out ward audits and face to face staff education, as well as provision of an online learning programme. There is a specific form available for documentation and referral throughout National Women's Heath.

4.3.2 Stop Smoking Service

In the period 1/7/15 to 30/6/16 ADHB Smokefree Services held a Smokefree pregnancy contract that involved employing 3 FTE clinical smoking cessation practitioners. Each practitioner is required to enrol at least 120 currently smoking pregnant women into a 12 week smoking cessation programme over a 12 month period. This target is problematic within the ADHB catchment because the smoking rate is very low; 5-6% of pregnant women present as current smokers. In the period 1/7/15 to 31/5/16 the team received 203 referrals against a requirement of 270 to enrol despite numerous attempts to display their presence. An attempt to increase referrals was employed in quarters 2 and 3 by implementing a monitored incentives programme whereby a pregnant mother trying to stop smoking is rewarded with gift cards every week she remains smokefree up to 16 weeks. This has increased referrals from ADHB employed midwives, self-referrals, and referrals from GPs.

4.4 Body mass index

Figure 18: BMI over time NWH 2009-2015 (missing data removed)



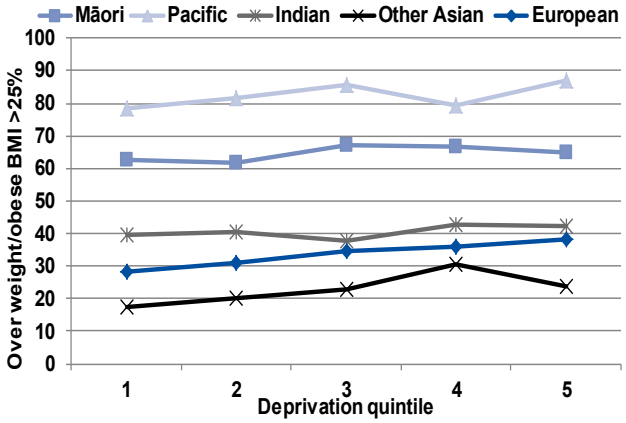
Forty one percent of the maternity population birthing at NWH were overweight or obese in 2015 (BMI ≥25), with 8.7% morbidly obese (BMI ≥35). There has been no change in obesity rates in the birthing population at NWH from 2009 to 2015.

Figure 19 below shows the strong association between ethnicity and prevalence of overweight or obesity (BMI>25). Pacific mothers have the highest rate of overweight or obesity (84%), followed by Māori (65%) and Indian mothers (41%).

There is a small increase in the rate of overweight/obesity with increasing socio-economic deprivation within most ethnicities, but the most important predictor shown here is ethnicity. This figure suggests that ethnicity is a stronger predictor of obesity than socioeconomic status.

Analyses of BMI and maternity outcomes can be found in section 5.15.

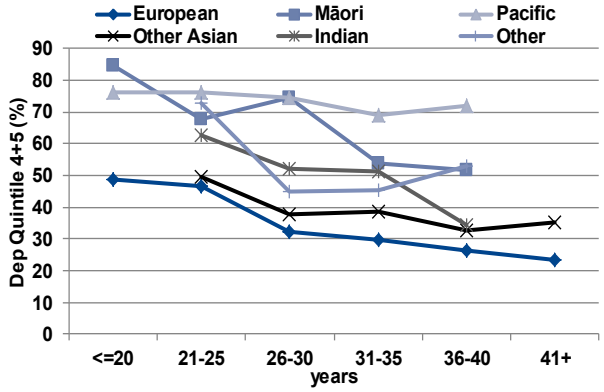
Figure 19: Over weight/obese (BMI >25) by ethnicity and deprivation quintile NWH 2015



4.5 Socio-economic status

Socio-economic status is measured by deprivation score (NZ Dep 06) within Census area units (CAU). The decile score has been compressed to quintiles in the figures. Quintile 1 includes the least deprived two deciles and quintile 5 the most deprived two deciles.

Figure 20: Deprivation (quintile 4 or 5) by age and ethnicity 2015



Rates suppressed if denominator <30 women

Figure 20 shows that age and ethnicity have independent effects on socioeconomic deprivation. As age increases the proportion of women living in areas of high socioeconomic deprivation decreases. Socioeconomic deprivation varies by ethnicity, with Pacific most likely and European least likely to be living in areas in the top two quintiles of deprivation.

The gradient in the association between age and socio-economic deprivation is less pronounced in some ethnicities (e.g. Pacific people) than others.

4.6 Lead Maternity Carer (LMC) at birth

The data given throughout this report for LMC relate to LMC at birth.

In 2015, 48% of women were registered with a self-employed (or independent) midwife at birth, 27% with a private obstetrician, 18% with the National Women's Community clinic service, and 6% with National Women's specialist medical and diabetes clinic services. Overall 75% of women who gave birth at NWH in 2015 were under the care of a self-employed LMC compared to 65% in 2006.

There is only one GP who has an access agreement to birth babies at NWH, who was the LMC at birth for 16 women (0.2%) in 2015. Because of small numbers, these data are not represented in the figures in this section.

Twenty nine women were unbooked in 2015, 26 (90%) of whom were Māori or Pacific mothers.

Figure 21: LMC at birth and maternal age NWH 2015

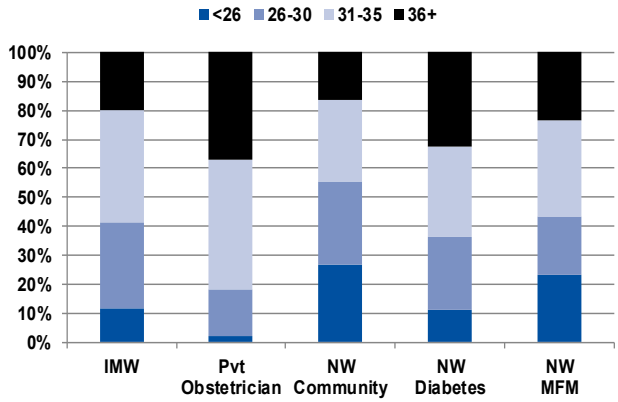
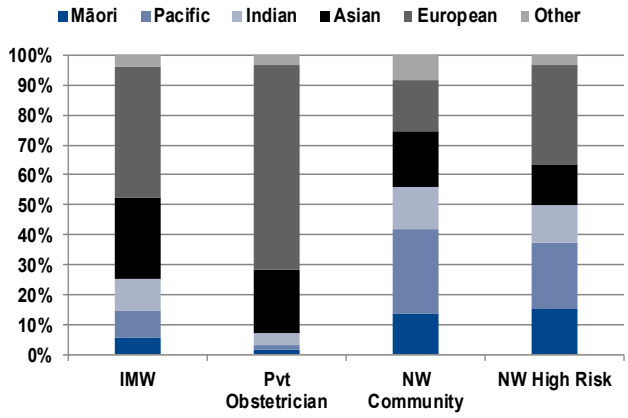
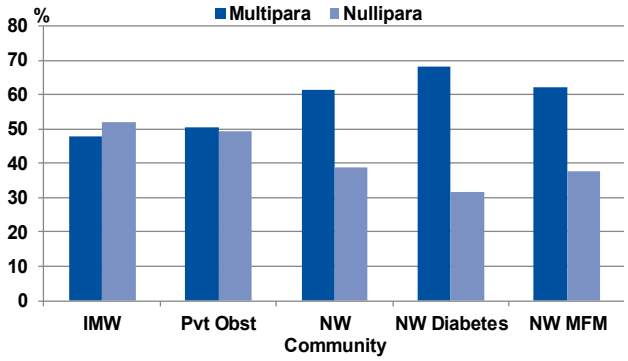


Figure 22: LMC at birth and maternal ethnicity NWH 2015



Women booked with a private obstetrician were more likely to be older, European, and more likely to be living in areas of lesser socioeconomic deprivation compared to women booked with other LMCs. Sixty seven percent of women registered under private obstetrician care were living in the top 5 least deprived socioeconomic deciles compared to 38 percent overall. Māori and Pacific mothers are less likely than European mothers to be registered with a self-employed LMC (either a midwife or an obstetrician).

Figure 23: LMC at birth and parity NWH 2015



Women receiving primary maternity care from DHB services (NWH Community, Diabetes and Medical clinics) are more likely to be multiparous than women under the care of self-employed LMCs (midwives and private obstetricians).

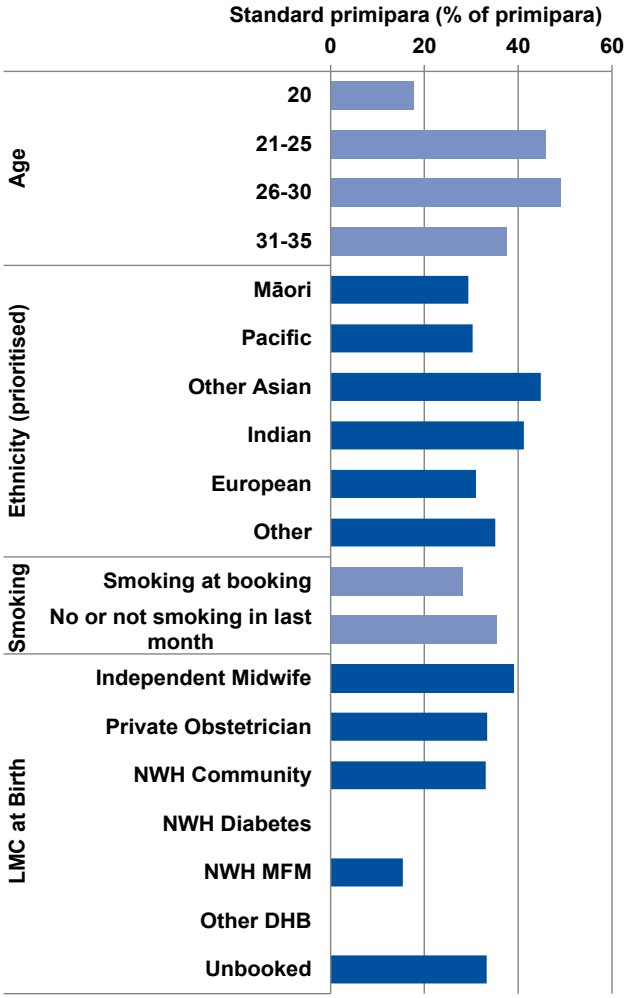
4.7 Standard primipara

A standard primiparous mother is defined at NWH as a woman with no prior birth at 20 or more weeks gestation, aged 20-34 years at birth, with a singleton pregnancy, cephalic presentation, gestation 37-41 weeks at birth, with a normally grown baby (customised centile $\geq 10^{th}$), without medical disease (cardiac disease, renal disease, mental health disorder, SLE, HIV infection, CVA/TIA, diabetes or hypertension), gestational diabetes, pregnancy associated hypertensive disease, or antepartum haemorrhage. This differs from the current definition used by the Ministry of Health in the NZ Maternity Clinical Indicators report.

The objective of reporting outcomes for this tightly defined sub-group is to permit comparisons over time, between individual caregivers, and with other institutions.

In 2015, 35% of primiparous women were defined as standard by the NWH definition. Mode of birth at term for standard primipara by LMC is presented in Figure 86; and outcomes for standard primipara at NWH compared to secondary/tertiary units in New Zealand (using the MOH definition in the Maternity Clinical Indicators report 2014) are presented where applicable in chapter 6.

Figure 24: Characteristics of standard primipara 2015



4.8 Data tables: Maternal demography

Table 26: DHB of domicile of mothers giving birth at National Women's 2005-2015

	2005		2006		2007		2008		2009		2010	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	4985	69.3	5100	70.7	5382	69.9	5267	69.4	5551	71.8	5392	69.9
Waitemata	982	13.7	994	13.8	1043	13.6	1127	14.9	1054	13.6	1110	14.4
Counties Manukau	1089	15.1	994	13.8	1136	14.8	1060	14.0	991	12.8	1082	14.0
Northland	31	0.4	40	0.6	41	0.5	40	0.5	40	0.5	43	0.6
Other North Island	93	1.3	69	1.0	73	0.9	71	0.9	79	1.0	64	0.8
South Island	9	0.1	13	0.2	14	0.2	18	0.2	15	0.2	17	0.2
Overseas	5	0.1	2	0.03	6	0.1	6	0.1	5	0.1	1	0.01

	2011		2012		2013		2014		2015	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	5176	68.8	5302	68.9	4937	68.4	4979	67.3	4587	66.2
Waitemata	1220	16.2	1126	14.6	1057	14.6	1070	14.5	996	14.4
Counties Manukau	1009	13.4	1113	14.5	1079	14.9	1208	16.3	1177	17.0
Northland	40	0.5	39	0.5	38	0.5	38	0.5	40	0.6
Other North Island	52	0.7	91	1.2	88	1.2	76	1.0	99	1.4
South Island	18	0.2	14	0.2	13	0.2	15	0.2	18	0.3
Overseas	6	0.1	10	0.1	11	0.2	14	0.2	16	0.2

*2 Women of unknown DHB

Table 27: Maternal age distribution NWH 2000-2015

		≤20 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
2000	7827	431	5.5	1091	13.9	2204	28.2	2670	34.1	1232	15.7	199	2.5
2002	7775	376	4.8	998	12.8	2018	26.0	2816	36.2	1335	17.2	232	3.0
2003	7611	372	4.9	959	12.6	1933	25.4	2738	36.0	1380	18.1	229	3.0
2004	7491	357	4.8	913	12.2	1809	24.1	2781	37.1	1384	18.5	247	3.3
2005	7194	330	4.6	828	11.5	1685	23.4	2702	37.6	1395	19.4	254	3.5
2006	7212	323	4.5	869	12.0	1735	24.1	2619	36.3	1421	19.7	245	3.4
2007	7695	386	5.0	1005	13.1	1798	23.4	2710	35.2	1514	19.7	282	3.7
2008	7589	394	5.2	963	12.7	1863	24.5	2519	33.2	1570	20.7	280	3.7
2009	7735	400	5.2	992	12.8	1916	24.8	2552	33.0	1600	20.7	275	3.6
2010	7709	335	4.3	943	12.2	1998	25.9	2516	32.6	1644	21.3	273	3.5
2011	7523	325	4.3	878	11.6	1918	25.4	2576	34.2	1534	20.3	292	3.9
2012	7695	267	3.5	862	11.2	2065	26.8	2606	33.8	1555	20.2	340	4.4
2013	7223	254	3.5	790	10.9	1874	25.9	2525	35.0	1463	20.3	317	4.3
2014	7400	227	3.1	783	10.6	1891	25.6	2824	38.2	1390	18.8	285	3.9
2015	6933	187	2.7	677	9.8	1756	25.3	2623	37.8	1435	20.7	255	3.7

Table 28: Maternal age and parity NWH 2015

	Total		<=20 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	N=6933		**n=187**		**n=677**		**n=1756**		**n=2623**		**n=1435**		**n=255**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Nullipara	3321	47.9	146	78.1	374	55.2	1046	59.6	1208	46.1	471	32.8	76	29.8
Multipara	3612	52.1	41	21.9	303	44.8	710	40.0	1415	53.9	964	67.2	179	70.2

Table 29: Time trends in nulliparity and multiparity NWH 2006-2015

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Number of births	7212	7695	7589	7735	7709	7523	7695	7223	7400	6933
Nullipara	3499	3752	3623	3811	3650	3539	3778	3441	3604	3321
%	48.5	48.8	47.7	49.3	47.3	47.0	49.1	47.6	48.7	47.9
Multipara	3713	3943	3966	3924	4059	3984	3917	3782	3796	3612
%	51.5	51.2	52.3	50.7	52.7	52.9	50.9	52.4	51.3	52.1

*Does not include 39 BBA's

Table 30: Maternal ethnicity and age NWH 2015

	Total	Māori		Pacific		Other Asian		Indian		European		Other	
Age	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	6933	469	6.8	805	11.6	1581	22.8	660	9.5	3118	45.0	300	4.3
<=20	187	57	30.5	79	42.2	9	4.8	2	1.1	34	1.1	6	3.2
21-25	677	121	17.9	215	31.8	103	15.2	61	9.0	138	4.4	39	5.8
26-30	1756	114	6.5	196	11.2	488	27.8	281	16.0	592	19.0	85	4.8
31-35	2623	98	3.7	180	6.9	671	25.6	227	8.7	1336	42.8	111	4.2
36-40	1435	63	4.4	111	7.7	271	18.9	84	5.9	852	59.4	54	3.8
>40	255	16	6.3	24	9.4	39	15.3	5	2.0	166	65.1	5	2.0

Table 31: Maternal ethnicity and parity NWH 2015

		Māori		Pacific		Other Asian		Indian		European		Other	
		n=469		**n=805**		**n=1581**		**n=660**		**n=3118**		**n=300**	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Nullipara	3321	136	29.0	271	33.7	820	51.9	382	57.9	1578	50.6	134	44.7
Multipara	3612	333	71.0	534	66.3	761	48.1	278	42.1	1540	49.4	166	55.3

Table 32: Smoking and socioeconomic deprivation (NZ Dep06) NWH 2015

	Total		Smoking at booking	
	N=6933		**n=381**	
Deprivation decile	**n**	**%**	**n**	**%**
1	472	6.8	8	1.7
2	659	9.5	10	1.5
3	716	10.3	14	2.0
4	585	8.4	12	2.1
5	645	9.3	22	3.4
6	790	11.4	30	3.8
7	665	9.6	35	5.3
8	723	10.4	54	7.5
9	577	8.3	48	8.3
10	819	11.8	130	15.9
Missing*	282	4.1	18	6.4

* These women lived overseas

Table 33: Ethnicity of women birthing at NWH 2008-2015

	2008		2009		2010		2011		2012		2013		2014		2015	
	n=7589		**n=7735**		**n=7709**		**n=7523**		**n=7695**		**n=7223**		**n=7400**		**n=6933**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Māori	641	8.4	670	8.7	579	7.5	597	7.9	534	6.9	532	7.4	483	6.5	469	6.8
Niuean	111	1.5	94	1.2	96	1.2	95	1.3	74	1.0	82	1.1	76	1.0	58	0.8
Cook Is	137	1.8	135	1.7	112	1.5	112	1.5	123	1.6	105	1.5	117	1.6	98	1.4
Samoan	433	5.7	400	5.2	422	5.5	380	5.1	368	4.8	319	4.4	298	4.0	289	4.2
Tongan	349	4.6	394	5.1	378	4.9	342	4.5	346	4.5	312	4.3	304	4.1	271	3.9
Fijian	58	0.8	57	0.7	46	0.6	59	0.8	73	0.9	51	0.7	60	0.8	57	0.8
Other Pacific	44	0.6	35	0.5	34	0.4	29	0.4	39	0.5	35	0.5	23	0.3	32	0.5
Indian	505	6.7	520	6.7	539	7.0	548	7.3	553	7.2	620	8.6	643	8.7	660	9.5
Chinese	874	11.5	995	12.9	950	12.3	984	13.1	1171	15.2	962	13.3	1146	15.5	906	13.1
Other Asian	478	6.3	440	5.7	526	6.8	545	7.2	588	7.6	614	8.5	696	9.4	675	9.7
NZ European	2995	39.5	2967	38.4	2898	37.6	2712	36.0	2696	35.0	2548	35.3	2421	32.7	2291	33.0
Other European	713	9.4	707	9.1	856	11.1	851	11.3	847	11.0	776	10.7	852	11.5	827	11.9
Other	251	3.3	321	4.1	273	3.5	269	3.6	283	3.7	267	3.7	281	3.8	300	4.3

Table 34: Smoking status at booking by prioritised ethnicity and maternal age NWH 2015

		Smoking at booking		Not currently smoking	
	N	n	%	n	%
Total	6933	381	5.5	6551	94.5
Ethnicity					
Māori	469	179	38.2	289	61.6
Pacific	805	108	13.4	697	86.6
Other Asian	1581	5	0.3	1576	99.7
Indian	660	1	0.2	659	99.8
European	3118	86	2.8	3032	97.2
Other	300	2	0.7	298	99.3
Age					
<=20	187	51	27.3	135	72.2
21-25	677	114	16.8	563	83.2
26-30	1756	90	5.1	1666	94.9
31-35	2623	78	3.0	2545	97.0
>=36	1690	48	2.8	1642	97.2

Missing data (n=1)

Table 35: Smoking status at booking by LMC at birth NWH 2015

	Independent midwife		Private Obstetrician		GP		NWH Community		NWH High Risk*		Other DHB	
	n=3341		n=1854		n=16		n=1234		n=456		n=32	
	n	%	n	%	n	%	n	%	n	%	n	%
Smoking at booking	123	3.7	3	0.2	0	0.0	170	13.8	76	16.7	9	28.1
Not smoking	3218	96.3	1851	99.8	16	100	1064	86.2	379	83.1	23	71.9

*NWH High Risk includes women booked under the Diabetes and Medical teams and unbooked women.
Missing data (n=1) in NWH High Risk Group

Table 36: BMI >25 by deprivation quintile and prioritised maternal ethnicity NWH 2015

	All ethnicities			Māori			Pacific		
Dep quintile	**Total**	**BMI>25**		**Total**	**BMI>25**		**Total**	**BMI>25**	
	N	**n**	**%**	**N**	**n**	**%**	**N**	**n**	**%**
Total	**6933**	**2754**	**39.7**	**469**	**308**	**65.7**	**805**	**674**	**83.7**
1	1126	321	28.5	32	20	62.5	28	22	78.6
2	1306	438	33.5	47	29	61.7	82	67	81.7
3	1436	529	36.8	70	47	67.1	91	78	85.7
4	1381	617	44.7	99	66	66.7	203	161	79.3
5	1396	738	52.9	206	134	65.0	373	324	86.9
Missing#	288	111	38.5	15	12	80.0	28	22	78.6

	Other Asian			Indian			European*		
Dep quintile	**Total**	**BMI>25**		**Total**	**BMI>25**		**Total**	**BMI>25**	
	N	**n**	**%**	**N**	**n**	**%**	**N**	**n**	**%**
Total	**1581**	**356**	**22.5**	**660**	**268**	**40.6**	**3118**	**1037**	**33.3**
1	263	46	17.5	38	15	39.5	728	207	28.4
1	263	46	17.5	38	15	39.5	728	207	28.4
2	290	58	20.0	106	43	40.6	735	229	31.2
3	381	87	22.8	174	66	37.9	662	230	34.7
4	290	89	30.7	178	76	42.7	544	195	35.8
5	258	61	23.6	144	61	42.4	333	127	38.1
Missing#	99	15	15.2	20	7	35.0	116	49	42.2

* Includes NZ European and Other European #Missing includes overseas addresses

Table 37: Deprivation Quintile (NZ Dep06) by prioritised maternal ethnicity NWH 2015

	Māori		Pacific		Other Asian		Indian		European		Other	
	n=469		n=805		n=1581		n=660		n=3118		n=300	
Quintile	n	%	n	%	n	%	n	%	n	%	n	%
1	32	6.8	28	0.0	263	16.6	38	5.8	728	23.3	37	12.3
2	47	10.0	82	10.2	290	18.3	106	16.1	735	23.6	46	15.3
3	70	14.9	91	11.3	381	24.1	174	26.4	662	21.2	58	19.3
4	99	21.1	203	25.2	290	18.3	178	27.0	544	17.4	67	22.3
5	206	43.9	373	46.3	258	16.3	144	21.8	333	10.7	82	27.3
Missing	15	3.2	28	3.5	99	6.3	20	3.0	116	3.7	10	3.3

Table 38: Deprivation Quintile (NZ Dep06) and maternal age NWH 2015

Deprivation quintile	<=20		21-25		26-30		31-35		36-40		>40	
	n=187		n=677		n=1756		n=2623		n=1435		n=255	
	n	%	n	%	n	%	n	%	n	%	n	%
1	5	2.7	45	6.6	218	12.4	497	18.9	309	21.5	52	20.4
2	15	8.0	60	8.9	294	16.7	546	20.8	331	23.1	60	23.5
3	35	18.7	116	17.1	393	22.4	558	21.3	281	19.6	53	20.8
4	39	20.9	159	23.5	387	22.0	501	19.1	245	17.1	50	19.6
5	85	45.5	268	39.6	388	22.1	412	15.7	214	14.9	29	11.4
Missing	8	4.3	29	4.3	76	4.3	109	4.2	55	3.8	11	4.3

Table 39: LMC at birth NWH 2008-2015

	2008		2009		2010		2011		2012		2013		2014		2015	
	n=7589		n=7735		n=7709		n=7523		n=7695		n=7223		n=7400		n=6933	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
IMW	3150	41.5	3422	44.2	3552	46.1	3522	46.8	3654	47.5	3446	47.7	3561	48.1	3341	48.2
Pvt Obst	1759	23.2	1718	22.2	1734	22.5	1672	22.2	1823	23.7	1862	25.8	1843	24.9	1854	26.7
GP	128	1.7	115	1.5	94	1.2	56	0.7	45	0.6	17	0.2	20	0.3	16	0.2
NW Community	1734	22.8	1702	22.0	1505	19.5	1387	18.4	1447	18.8	1336	18.5	1408	19.0	1234	17.8
NW Diabetes	293	3.9	304	3.9	325	4.2	422	5.6	280	3.6	201	2.8	214	2.9	151	2.2
NW MFM	389	5.1	377	4.9	379	4.9	377	5.0	354	4.6	300	4.2	281	3.8	276	4.0
Other DHB	86	1.1	39	0.5	63	0.8	50	0.7	42	0.5	33	0.5	36	0.5	32	0.5
Unbooked	50	0.7	58	0.7	57	0.7	37	0.5	50	0.6	28	0.4	37	0.5	29	0.4

Table 40: LMC at birth and maternal age NWH 2015

	Total	<=20		21-25		26-30		31-35		36-40		>40	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Total	6933	187	2.7	677	9.8	1756	25.3	2623	37.8	1435	20.7	255	3.7
Independent Midwife	3341	63	1.9	328	9.8	983	29.4	1293	38.7	602	18.0	72	2.2
Private Obstetrician	1854	1	0.1	33	1.8	306	16.5	827	44.6	567	30.6	120	6.5
General Practitioner	16	0		2	12.5	4	25.0	8	50.0	2	12.5	0	0.0
NW Community	1234	94	7.6	234	19.0	358	29.0	343	27.8	167	13.5	38	3.1
NW Diabetes	151	2	1.3	15	9.9	38	25.2	47	31.1	38	25.2	11	7.3
NW MFM	276	16	5.8	48	17.4	55	19.9	92	33.3	54	19.6	11	4.0
Other DHB	32	7	21.9	6	18.8	6	18.8	8	25.0	2	6.3	3	9.4
Unbooked	29	4	13.8	11	37.9	6	20.7	5	17.2	3	10.3	0	0.0

Table 41: LMC at birth and prioritised maternal ethnicity NWH 2015

	Total	Māori		Pacific		Other Asian		Indian		European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Total	6933	469	6.8	805	11.6	1581	22.8	660	9.5	3118	45.0	300	4.3
Independent Midwife	3341	179	5.4	313	9.4	900	26.9	353	10.6	1469	44.0	127	3.8
Private Obstetrician	1854	27	1.5	29	1.6	385	20.8	79	4.3	1277	68.9	57	3.1
General Practitioner	16	0		4	25.0	11	68.8	0		1	6.3	0	
NW Community	1234	170	13.8	349	28.3	226	18.3	174	14.1	214	17.3	101	8.2
NW Diabetes	151	15	9.9	41	27.2	29	19.2	28	18.5	34	22.5	4	2.6
NW MFM	276	49	17.8	55	19.9	28	10.1	26	9.4	108	39.1	10	3.6
Other DHB	32	12	37.5	5	15.6	2	6.3	0		13	40.6	0	
Unbooked	29	17	58.6	9	31.0	0		0		2	6.9	1	3.4

Table 42: LMC at birth and parity NWH 2015

	Total	Nullipara		Multipara	
	N	n	%	n	%
Total	**6933**	**3321**	**47.9**	**3612**	**52.1**
Independent Midwife	3341	1742	52.1	1599	47.9
Private Obstetrician	1854	918	49.5	936	50.5
General Practitioner	16	5	31.3	11	68.8
NW Community	1234	477	38.7	757	61.3
NW Diabetes	151	48	31.8	103	68.2
NW MFM	276	104	37.7	172	62.3
Other DHB	32	18	56.3	14	43.8
Unbooked	29	9	31.0	20	69.0

Table 43: Deprivation decile (NZ Dep 06) by LMC NWH 2015

Deprivation decile	Independent Midwife		Private Obstetrician		General Practitioner		NWH Community		NWH Diabetes		NWH Medical		Other DHB		Unbooked	
	n=3341		n=1854		n=16		n=1234		n=151		n=276		n=32		n=29	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	172	5.1	266	14.3	0	0.0	21	1.7	4	2.6	9	3.3	0	0.0	0	0.0
2	274	8.2	305	16.5	1	6.3	49	4.0	6	4.0	17	6.2	2	6.3	0	0.0
3	343	10.3	259	14.0	1	6.3	77	6.2	13	8.6	21	7.6	3	9.4	2	6.9
4	277	8.3	198	10.7	3	18.8	85	6.9	10	6.6	11	4.0	3	9.4	0	0.0
5	331	9.9	210	11.3	2	12.5	69	5.6	10	6.6	18	6.5	3	9.4	3	10.3
6	409	12.2	166	9.0	0	0.0	158	12.8	22	14.6	28	10.1	6	18.8	0	0.0
7	364	10.9	136	7.3	1	6.3	99	8.0	18	11.9	37	13.4	3	9.4	4	13.8
8	393	11.8	93	5.0	3	18.8	168	13.6	22	14.6	37	13.4	1	3.1	3	10.3
9	297	8.9	80	4.3	1	6.3	140	11.3	14	9.3	36	13.0	3	9.4	8	27.6
10	337	10.1	59	3.2	3	18.8	328	26.6	26	17.2	49	17.8	7	21.9	8	27.6
Missing	144	4.3	82	4.4	1	6.2	40	3.2	6	4.0	13	4.7	1	3.1	1	3.5

Table 44: Demographic characteristics of standard and non-standard primipara NWH 2015

	Total primipara	Standard primipara		Non-standard primipara	
	N	n	%	n	%
Total	3321	1167	35.1	2154	64.9
Age					
<=20	146	26	17.8	120	82.2
21-25	374	172	46.0	202	54.0
26-30	1046	515	49.2	531	50.8
31-35	1208	454	37.6	754	62.4
36-40	471	0	0.0	471	100.0
>40	76	0	0.0	76	100.0
Ethnicity (prioritised)					
Māori	136	40	29.4	96	70.6
Pacific	271	82	30.3	189	69.7
Other Asian	382	171	44.8	211	55.2
Indian	820	338	41.2	482	58.8
European	1578	489	31.0	1089	69.0
Other	134	47	35.1	87	64.9
LMC at Birth					
Independent Midwife	1742	680	39.0	1062	61.0
Private Obstetrician	918	307	33.4	611	66.6
General Practitioner	5	3	60.0	2	40.0
NWH Community	477	158	33.1	319	66.9
NWH Diabetes	48	0	0.0	48	100.0
NWH MFM	104	16	15.4	88	84.6
Other DHB	18	0	0.0	18	100.0
Unbooked	9	3	33.3	6	66.7
Smoking					
Smoking at booking	110	31	28.2	79	71.8
Not currently smoking	3210	1136	35.4	2074	64.6
Missing	1	0	0.0	1	100.0

5 Antenatal Complications

5.1 Preterm birth

Preterm birth is defined as birth prior to 37 completed weeks. Since 2004, iatrogenic birth has been defined as induction of labour (including induction for preterm premature rupture of membranes (PPROM)), elective Caesarean section and emergency Caesarean before the onset of labour.

Findings

In 2015 we have continued to see a downward trend in rates of preterm birth both overall and at very early gestations (<32 weeks), with rates of 8.5% and 2.4% respectively, the lowest seen in the last decade. As seen in 2014 there has been a further fall in the rate of iatrogenic preterm births at 32-36 weeks.

Figure 25: Preterm birth rate 32-36 weeks (mothers) NWH 2004-2015

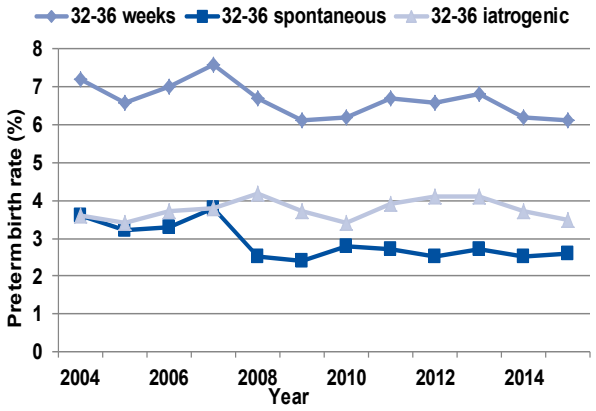


Figure 26: Preterm birth rate < 32 weeks (mothers) NWH 2004-2015

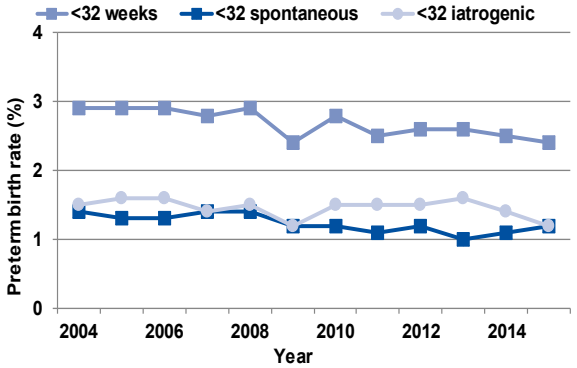
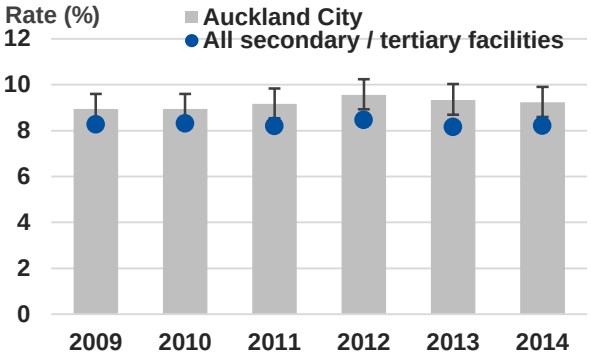
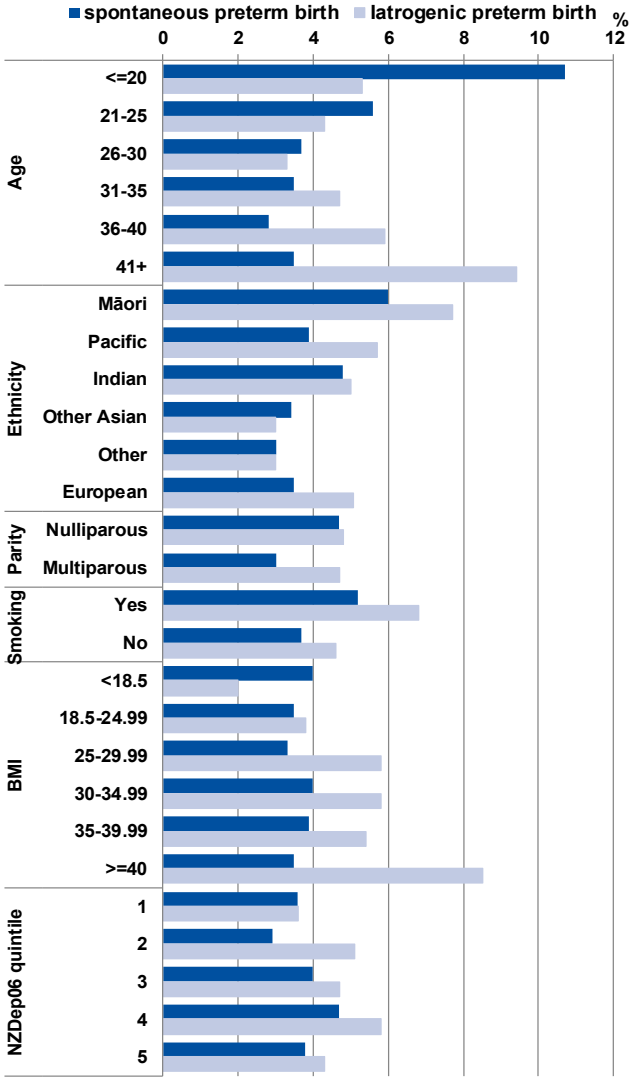


Figure 27: NZ Maternity Indicators 2014: Preterm birth NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for the facility rate

Figure 28: Demography of preterm birth (<37 weeks) NWH 2015



We may expect the population of women who give birth at National Women's Health to have comparatively high rates of iatrogenic preterm birth. This is likely to reflect the tertiary level care provided for women with significant medical and obstetric risk and our changing demographic; including rising rates of high BMI and advanced maternal age. These factors probably explain the significantly higher rates of preterm birth seen at NWH compared to the national data in the 2014 Maternity Clinical Indicators.

Last year's annual report suggested that a change in practice reducing iatrogenic preterm birth may have occurred as a consequence of implementation of the findings of two major research studies suggesting improved neonatal outcomes without compromise to the mother if delivery is delayed in women with preterm prelabour rupture of membranes and hypertensive disease at 34-37 weeks. Figure 28 shows that iatrogenic preterm birth is more common in older women; a group that is likely to continue to grow in the future. The challenge will therefore be to continue to aim to reduce or stabilise rates of iatrogenic preterm birth.

In the past increasing confidence in neonatal care may have led some to lower thresholds for delivery. Continued education and awareness of the risks and implications of late preterm birth as well as updating our practice to reflect current best evidence may help to prevent this occurring.

We continue to see high rates of preterm birth in certain populations, most specifically Māori women (total rate 13.6%, spontaneous 6.0% and iatrogenic preterm birth rate 7.7%), teenage mothers (total rate 16%, spontaneous 10.7%), women over the age of 40 years (iatrogenic preterm birth rate 9.4%), current smokers (total preterm birth rate 12.1% with elevated risks for spontaneous and iatrogenic preterm birth), women with a BMI >40 (iatrogenic preterm birth 8.5%)) and women with multiple pregnancy (twins total preterm birth rate 69.2%).

It is unlikely that Māori ethnicity itself is a significant risk factor for preterm birth. It is more likely to reflect other socio-economic risk factors, BMI and smoking related risks. Continued efforts to help all women become smoke-free in pregnancy are likely to lead to a reduction in preterm birth.

It is interesting to note that the majority of preterm births for twin pregnancy are iatrogenic (total rate 69.2% but only 15.8% are after spontaneous birth). This may in part reflect the inclusion of delivery after PPROM in the category of iatrogenic birth but may also suggest lower thresholds for indicated early delivery in women with a twin pregnancy. Further investigation for the reasons of these iatrogenic births would help to identify ways these early births (putting two infants at risk) may be avoided.

There is mounting interest and debate regarding the introduction of routine screening for women at risk of preterm birth. However for this to be of value an accurate screening test must be identified with an intervention that is effective. Many have suggested that cervical length assessment at the time of the anatomy scan with the use of progesterone may provide the appropriate screening test and intervention. However, current evidence for progesterone continues to fluctuate. The most recent and largest study from the UK, the OPPTIMUM study, was published early in 2016. This study found no significant benefit on preterm birth rates or on neonatal, infant or two year outcomes of off-spring born to women at high risk of preterm birth treated with vaginal progesterone compared to women treated with placebo.

It is unlikely that a single test or single intervention will alone have a significant impact on preterm birth. The multifactorial aetiology of preterm birth means that a number of different interventions are required. The state government of Western Australia has provided funding and support for the WA Preterm Birth Prevention Initiative. This program includes the use of progesterone and cerclage in women at high risk of preterm, assessment of cervical length at the time of the anatomy scan and the introduction of a Preterm Birth Prevention Clinic for those at highest risk. However a number of other 'interventions' are included in the program such as preconception care, avoidance of non-medically indicated late preterm birth, reducing tobacco exposure and judicious use of fertility treatment.
http://www.thewholeninemonths.com.au/wp-content/uploads/2014/11/1507_booklet_interventions.pdf. It will be interesting to review initial results of this program which should, not only report on whether preterm birth rates have reduced since its introduction, but also identify which interventions were most effective. This may provide insight and opportunity for National Women's Health to expand on the services currently offered for preterm birth prevention.

Last year's Annual Report created much discussion around the care of the peri-viable fetus and we were challenged by remarks made in the Neonatology Critique regarding our care of 23 week fetuses/infants. In 2015, only 3 of 6 infants born at 23 weeks were alive at birth and none survived, however, it seems likely that active intervention was not offered. At gestational ages 24-25 weeks when active intervention is more likely to be offered all but one of 15 babies born alive survived. During the latter part of 2015 a group of MFM subspecialists and neonatologists reconsidered our approach to this small group of vulnerable babies. Active intervention at 23+0 - 23+6 weeks is not offered as standard routine care but recommendation is made that each case is individualised and tailored to

ensure a multidisciplinary and family-centered approach is offered to all women and their families and in appropriately selected cases this includes active intervention and resuscitation.

National Women's Health remains very active in clinical trials research endeavouring to reduce spontaneous and iatrogenic preterm birth rates and also to reduce morbidity and mortality associated with preterm birth. The EPPI trial (Enoxaparin for the Prevention of Preeclampsia and IUGR) and the STRIDER NZAus trial (a randomised placebo controlled trial of sildenafil in severe early onset IUGR) are Auckland led international multi-centre randomised trials. The Auckland based Preterm Birth Biomarkers study aims to identify the best predictive biomarker for women presenting with threatened preterm labour and our continued involvement in multicentre trials such as MAGENTA (Magnesium sulphate at 30-34 weeks Gestational age Neuroprotection Trial) and APTS (Australian Placental Transfusion Study) provide opportunity to improve outcomes for babies that are born preterm.

Summary and Implications

Being born too early continues to impose risks of neonatal morbidity and mortality with life-long implications. Reassuringly National Women's Health preterm birth rates may be reducing. Many preterm births are unavoidable and in some cases essential when the mother or fetus is significantly compromised. However, we should continue to aim to reduce rates of spontaneous preterm birth and improve management of maternal and fetal conditions to safely reduce the need for early birth. This includes simple measures such as continued smoke change advice to all smoking pregnant women and early implementation of practice change supported by high quality published research and continued involvement in relevant clinical trials.

5.2 Data tables: Preterm birth

Table 45: Perinatal outcome of preterm babies by gestation at birth NWH 2015

Gestation	Births	Fetal deaths	Live births	% Liveborn	Neonatal Death	% of live births surviving >=28 days
20	8	7	1	13	1	0
21	9	4	5	56	5	0
22	9	6	3	33	3	0
23	6	3	3	50	3	0
24	12	6	6	50	1	83
25	10	1	9	90	0	100
26	14	0	14	100	0	100
27	22	4	18	82	0	100
28	20	1	19	95	1	95
29	16	0	16	100	0	100
30	26	3	23	88	0	100
31	34	2	32	94	0	100
32	46	2	44	96	2	95
33	45	3	42	93	2	95
34	85	0	85	100	0	100
35	93	0	93	100	1	99
36	236	0	236	100	1	100
Totals	691	42	649	94	20	97

Table 46: Rates of total, spontaneous and iatrogenic preterm birth NWH 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total birthing women	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**	**6933**
Women birthing preterm (<37) total	716	796	733	658	689	684	709	673	647	592
Incidence %	9.9	10.3	9.7	8.5	8.9	9.1	9.2	9.3	8.7	8.5
Women birthing <32 weeks	212	212	222	185	212	190	203	185	185	168
Incidence %	2.9	2.8	2.9	2.4	2.8	2.5	2.6	2.6	2.5	2.4
Spontaneous and iatrogenic preterm birth										
Spontaneous 32-36 weeks	239	292	188	184	218	200	194	193	187	179
Incidence %	3.3	3.8	2.5	2.4	2.8	2.7	2.5	2.7	2.5	2.6
Spontaneous <32 weeks	96	105	105	91	94	79	90	72	79	84
Incidence %	1.3	1.4	1.4	1.2	1.2	1.1	1.2	1.0	1.1	1.21
Iatrogenic 32-36 weeks	265	292	323	289	259	294	312	295	275	245
Incidence %	3.7	3.8	4.2	3.7	3.4	3.9	4.1	4.1	3.7	3.5
Iatrogenic <32 weeks	116	107	117	94	118	111	113	113	106	84
Incidence %	1.6	1.4	1.5	1.2	1.5	1.5	1.5	1.6	1.4	1.2
Total preterm babies	**836**	**904**	**843**	**769**	**793**	**787**	**820**	**774**	**759**	**691**
Total babies 32-36 weeks	591	667	590	555	547	573	592	568	554	505
Total babies <32 weeks	245	237	253	214	246	214	228	206	205	186

Table 47: Preterm birth and maternal demographic characteristics NWH 2015

	Total	Total preterm birth		Iatrogenic preterm		Spontaneous preterm	
	N	n	%	n	%	n	%
Total	6933	592	8.5	329	4.8	263	3.8
Age							
<=20	187	30	16.0	10	5.3	20	10.7
21-25	677	67	9.9	29	4.3	38	5.6
26-30	1756	123	7.0	58	3.3	65	3.7
31-35	2623	214	8.2	123	4.7	91	3.5
36-40	1435	125	8.7	85	5.9	40	2.8
41+	255	33	12.9	24	9.4	9	3.5
Ethnicity							
Māori	469	64	13.6	36	7.7	28	6.0
Pacific	805	77	9.6	46	5.7	31	3.9
Asian	1581	101	6.4	47	3.0	54	3.4
Indian	660	65	9.8	33	5.0	32	4.8
NZ European	2291	197	8.6	115	5.0	82	3.6
Other European	827	70	8.5	43	5.2	27	3.3
Other	300	18	6.0	9	3.0	9	3.0
Parity							
Nulliparous	3321	314	9.5	158	4.8	156	4.7
Multiparous	3612	278	7.7	171	4.7	107	3.0
Plurality							
Singleton	6796	496	7.3	256	3.8	240	3.5
Twins	133	92	69.2	71	53.4	21	15.8
Triplets	4	4	100	2	50.0	2	50.0
Smoking at booking							
Currently smoking	381	46	12.1	26	6.8	20	5.2
No or not in past month	6551	545	8.3	303	4.6	242	3.7
Unknown	1	1	10	0	0.0	1	100
BMI							
<18.5	249	15	6.0	5	2.0	10	4.0
18.5-24.99	3791	275	7.3	144	3.8	131	3.5
25-29.99	1528	138	9.0	88	5.8	50	3.3
30-34.99	671	66	9.8	39	5.8	27	4.0
35-39.99	332	31	9.3	18	5.4	13	3.9
>=40	258	31	12.0	22	8.5	9	3.5
Missing	104	36	34.6	13	12.5	23	22.1
Deprivation quintile (NZ Dep 06)							
1	1126	82	7.3	41	3.6	41	3.6
2	1306	104	8.0	66	5.1	38	2.9
3	1436	125	8.7	68	4.7	57	4.0
4	1381	145	10.5	80	5.8	65	4.7
5	1396	113	8.1	60	4.3	53	3.8

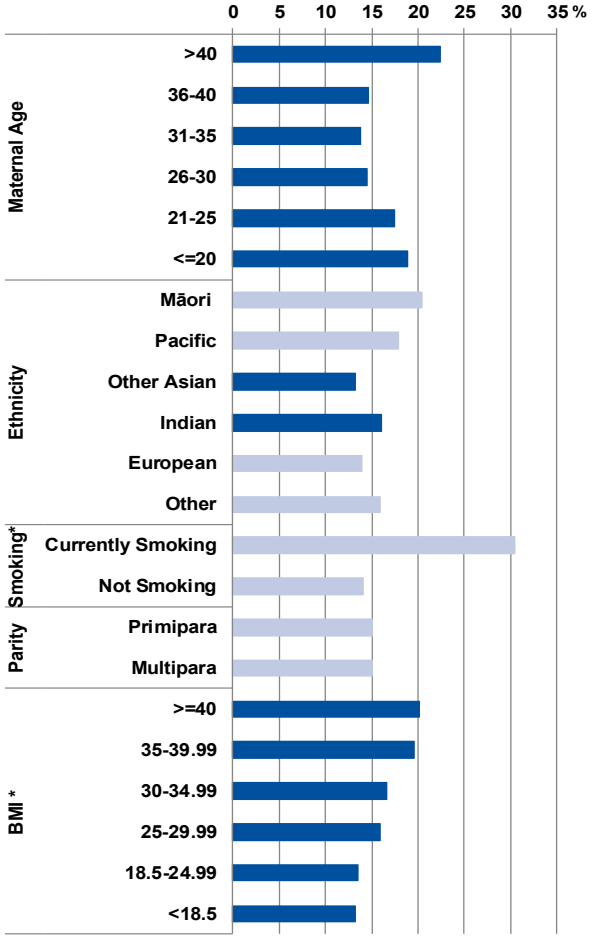
5.3 Small and large for gestational age babies

Customised birthweight centiles, which adjust size at birth for gestation, gender, maternal ethnicity, height, booking weight, and parity, are used to define size at birth in the maternity service at NWH. From 2013, an updated algorithm, based on more recent NWH data, has been applied to the data to determine customised birthweight centiles (Anderson et al BJOG 2012; DOI: 10.1111/j.1471-0528.2012.03313.x.) Small for gestational age (SGA) is defined as birthweight <10th customised centile. Customised centiles define 10% of the "normal" population as SGA with the consequence that rates of SGA in a complex population like National Women's are >10% (15% in 2014). LGA (large for gestational age) is defined as birthweight >90th customised centile.

A customised centile was not calculated among perinatal deaths if gestation at death was less than 20 weeks, unknown, or death was suspected to have occurred more than one week prior to birth.

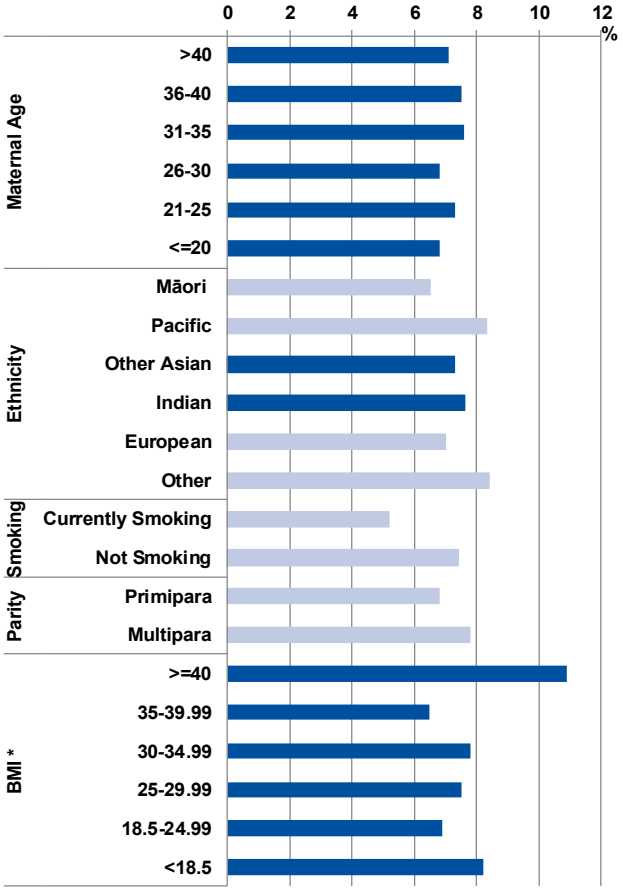
Findings

Figure 29: Rates of SGA (customised) by demographic characteristics NWH 2015



*missing excluded

Figure 30: Rates of LGA (customized) by demographic characteristics NWH 2015



*missing excluded

Consistent with findings in previous reports there are differences in age and ethnicity between mothers with SGA and AGA infants. There is a U shaped relationship between age and risk of SGA with elevated risk in both young and older mothers. Māori, Pacific and Indian mothers also have an increased risk of SGA. In Māori women the elevated risk may be associated with the higher rates of smoking in pregnancy and in Indian and Pacific women this may be related to associated factors such as hypertensive disorders and obesity. Independent risk factors for SGA in the National Women's population have recently been published and after adjustment for confounders ethnicity was not an independent risk factor (Anderson et al Aust NZ J Obstet Gynecol 2012, DOI: 10.1111/ajo.12016). The increased risk of SGA among obese women (18.6% (234/1261)) is clinically relevant as it is more difficult to detect these SGA infants before birth. The recent publication from National Women's reported an increased risk of SGA in obese women (adjusted odds ratio 1.24 (1.11-1.39)) that was independent of other common confounders such as hypertensive disorders. Consistent with international literature women who smoke have an elevated risk of SGA infants. Ceasing smoking in early pregnancy can

prevent this risk of SGA in smokers and is an important goal of antenatal care.

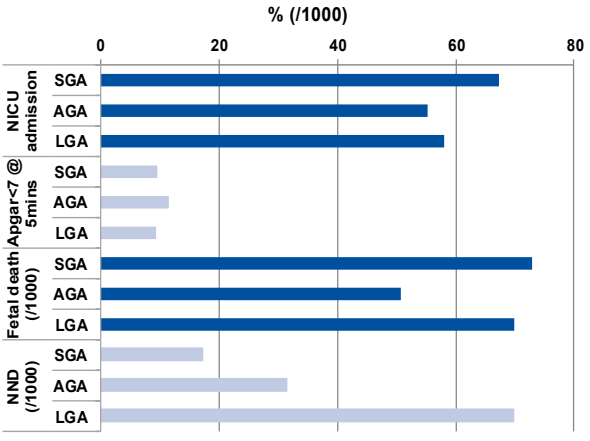
Other independent risk factors for SGA identified by Anderson et al were: age >35 years, nulliparity, gestational hypertension and preeclampsia, chronic hypertension, placental abruption, APH of unknown origin, along with smoking and obesity already mentioned above.

Table 48: Birthweight and gestation at birth among SGA, LGA and appropriately grown (AGA) babies (n=babies) NWH 2015

	Customised Birthweight <10th% (SGA) N=1059		Customised Birthweight >=10th% & <=90th% (AGA) N=5495		Customised Birthweight >90th% (LGA) N=517	
	n	%	n	%	n	%
Gestation at birth						
Term	826	78.0	5081	92.5	474	91.7
Preterm	233	22.0	414	7.5	43	8.3
<32 wks	63	5.9	108	2.1	14	2.7
Median gestation (IQR) weeks						
	38(37-40)		39(38-40)		39(38-39)	
Median birth weight(IQR)g						
	2672.5 (2320-2945)		3400 (3100-3675)		4095 (3840-4365)	

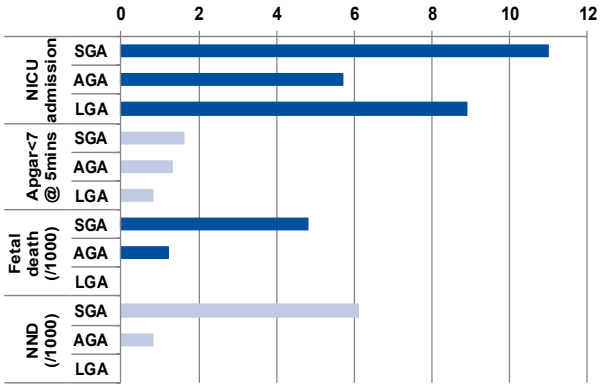
Consistent with findings in previous years approximately one quarter of SGA infants were born preterm and 5.9% were born < 32 weeks. Rates of preterm delivery were not increased in LGA infants compared with AGA. Iatrogenic preterm birth is more common among SGA babies, compared with AGA or LGA babies. This is likely because of an association with preeclampsia, and antenatal diagnosis of SGA in other "placental insufficiency" syndromes.

Figure 31: Outcomes among SGA, AGA, and LGA babies born preterm (<37weeks) NWH 2015



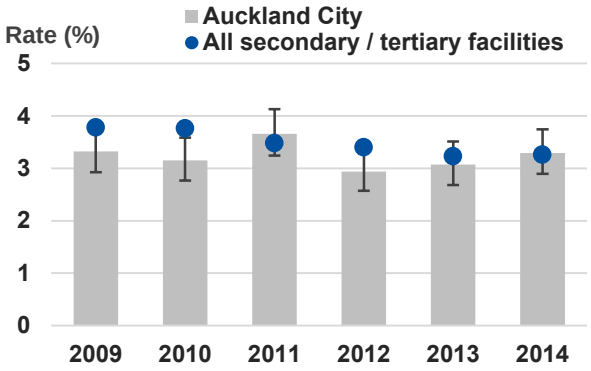
SGA infants were at higher risk of fetal death compared with AGA in 2015 but did not have an elevated risk of neonatal death. The higher rates of fetal and neonatal deaths in LGA preterm babies is based on small numbers (n=3) in each group.

Figure 32: Outcomes among SGA, AGA and LGA babies born at term NWH 2015



5.4 Small babies at term

Figure 33: NZ Maternity Indicators 2014: Small babies at term (37-42 weeks' gestation) (NWH and NZ secondary/tertiary facilities 2009-2014)



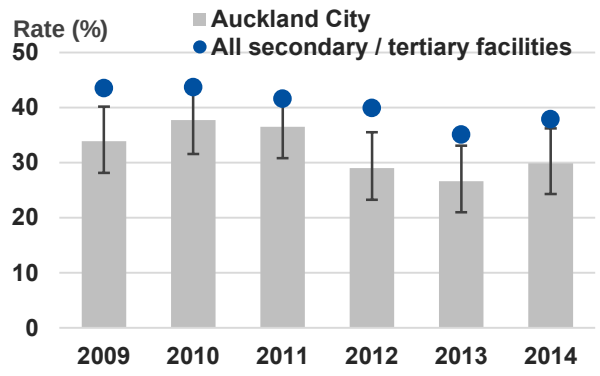
Error bars represent the 95% confidence interval for the facility rate

Detection of poor fetal growth may reduce the risk of stillbirth by enabling enhanced surveillance and timely delivery. This clinical indicator has been developed to compare rates of SGA delivery at term (37-42 weeks) between DHBs. SGA for this indicator is defined as birthweight < 10th centile using the recently published INTERGROWTH-21 growth charts (Villar J Lancet 2014;384:857-68INTERGROWTH-21). A recent publication using National Women's data (Anderson et al AMJOG 2015) has shown that rates of SGA using INTERGROWTH-21 growth charts is 4.5% and by customised standards is 11.6%. Anderson et al showed that babies who were small by both customised and INTERGROWTH-21 standards had the highest perinatal mortality and neonatal morbidity. Babies who were SGA by the customised standard but not by INTERGROWTH-21 also had increased stillbirth and neonatal morbidity whereas infants small by INTERGROWTH-21 alone did not have higher rates of adverse outcomes. INTERGROWTH-21 may therefore not be the best standard to define SGA in NZ, however it does identify the majority of the smallest babies and

hence a severe sub-group of SGA. The rates of SGA babies by INTERGROWTH-21 born between 37 and 42 weeks at NWH are comparable to elsewhere in NZ.

5.5 Small babies at term born at 40–42 weeks' gestation

Figure 34: NZ Maternity Indicators 2014: Small babies at term born at 40-42 weeks' gestation (NWH and NZ secondary/tertiary facility rates 2009-2014)



Error bars represent the 95% confidence interval for the facility rate

This indicator measures the proportion of SGA babies at term (37–42 weeks) who were born at 40–42 weeks'. Best practice recommends the expedited birth of babies identified as SGA once they reach term, and ideally before 40 weeks; this indicator is a measure of the proportion of unrecognised or sub-optimally managed cases. It is reassuring to see that the proportion of SGA babies who are born between 40 and 42 weeks is lower at NWH compared with all NZ secondary/tertiary facilities. This is likely to reflect increased detection and timely birth at NWH of these very small babies. This may reflect use of the GROW program, the NZMFM SGA guideline and the NWH SGA pathway.

Summary / Implications

These 2015 data again confirm that babies who are SGA by customised centiles have higher rates of morbidity and mortality compared with AGA babies. Women who smoke have higher rates of SGA than non-smokers. Cessation early in pregnancy with appropriate support should be the goal for all pregnant smokers. A paper which describes independent risk factors for SGA in our population has recently been published and provides more information for the interested reader.

5.6 Data Tables: Small and large for gestational age babies

Table 49: Onset of birth and neonatal outcomes among SGA, AGA, and LGA babies born preterm NWH 2015

	Customised Birthweight <10th% (SGA) n=233		Customised Bwgt >=10th% & <=90th% (AGA) n=414		Customised Bwgt >90th% (LGA) n=43	
	n	%	n	%	n	%
Onset of birth						
Spontaneous labour	61	26.2	203	49.0	23	53.5
Induced labour	57	24.5	92	22.2	7	16.3
Elective and Prelabour Emergency CS	115	49.4	119	28.7	13	30.2
NICU admission						
Any stay	157	67.4	229	55.3	25	58.1
>=2 days in NICU	152	65.2	224	54.1	24	55.8
Apgar at 5 mins < 7	22	9.4	47	11.4	4	9.3
Fetal death (n/1000 births)	17	73.0	21	50.7	3	69.8
Neonatal death (n/1000 live births)	4	17.2	13	31.4	3	69.8

Table 50: Rates of SGA and LGA as defined by customised birthweight centiles (compared to AGA) by demographic characteristics NWH 2015

	Total Babies	Customised Birthweight <10th% (SGA)		Customised Birthweight >=10th% & <=90th% (AGA)		Customised Birthweight >90th% (LGA)	
	N	n	%	n	%	n	%
Total*	**7074**	**1059**	**15.0**	**5495**	**77.7**	**517**	**7.3**
Maternal Age							
<=20	191	36	18.8	142	74.3	13	6.8
21-25	689	120	17.4	519	75.3	50	7.3
26-30	1784	259	14.5	1404	78.7	121	6.8
31-35	2683	370	13.8	2106	78.5	205	7.6
36-40	1460	214	14.7	1136	77.8	109	7.5
>40	267	60	22.5	188	70.4	19	7.1
Ethnicity							
Māori	2355	339	14.4	1857	78.9	159	6.8
Pacific	479	98	20.5	349	72.9	31	6.5
Asian	823	147	17.9	608	73.9	68	8.3
Indian	1592	210	13.2	1265	79.5	116	7.3
NZ European	670	107	16.0	512	76.4	51	7.6
Other European	847	109	12.9	671	79.2	66	7.8
Other	308	49	15.9	233	75.6	26	8.4
Parity							
Multipara	3681	551	15.0	2842	77.2	287	7.8
Primipara	3393	508	15.0	2653	78.2	230	6.8
Smoking at booking							
Currently smoking	387	118	30.5	249	64.3	20	5.2
Not smoking	6683	940	14.1	5246	78.5	497	7.4
Unknown	1	1	100	0	0.0	0	0.0
BMI							
<18.5	257	34	13.2	195	75.9	21	8.2
18.5-24.99	3867	521	13.5	3078	79.6	267	6.9
25-29.99	1560	248	15.9	1194	76.5	117	7.5
30-34.99	682	113	16.6	516	75.7	53	7.8
35-39.99	341	67	19.6	252	73.9	22	6.5
>=40	267	54	20.2	183	68.5	29	10.9
Missing	107	22	20.6	77	72.0	8	7.5
Plurality							
Singleton	6794	940	13.8	5339	78.6	515	7.6
Multiple	277	119	43.0	156	56.3	2	0.7

* customised centile is not assigned to stillborn babies if gestation at death was less than 20 weeks, unknown, or death was suspected to have occurred more than one week prior to birth

Table 51: Onset of birth and neonatal outcomes among SGA, AGA and LGA babies at term NWH 2015

	Customised Birthweight <10th% (SGA) n=826		Customised Bwgt >=10th% & <=90th% (AGA) n=5081		Customised Bwgt >90th%(LGA) n=474	
	n	%	n	%	n	%
Onset of birth – preterm						
Spontaneous labour	288	34.9	2405	47.3	182	38.4
Induced labour	401	48.5	1629	32.1	142	30.0
Elective and Prelabour Emergency CS	137	16.6	1047	20.6	150	31.6
NICU admission						
Any stay	91	11.0	288	5.7	42	8.9
>=2 days in NICU	74	9.0	216	4.3	32	6.8
Apgar at 5 mins < 7	13	1.6	65	1.3	4	0.8
Fetal death (n/1000 births)	4	4.8	6	1.2	0	0.0
Neonatal death (n/1000 live births)	5	6.1	4	0.8	0	0.0

5.7 Multiple pregnancy

This section describes the characteristics and outcomes of mothers who gave birth to twins and triplets at NWH during 2015 and the outcomes of their babies.

Findings

The database does not consistently report the proportion of monochorionic and dichorionic twins. However, 40 monochorionic twin/triplet pregnancies were managed by the Maternal Fetal Medicine service at NWH. Reasons for review were: Twin to twin transfusion syndrome (TTTS) (6 cases), selective fetal growth restriction (sFGR) (14 cases) and other complications (3 cases). The remainder (16 cases) were reviewed and discharged with reassurance. Not all mothers of monochorionic twins gave birth at NWH.

The Selective Fetoscopic Laser Photo coagulation (SFLP) service has been running in New Zealand since 2009. In 2015 the first outcome audit was completed as a result of the expected learning curve of cases having been reached. For women undergoing SFLP the chance of taking one baby home was 80% and two babies 65%. These outcomes are in line with the published international data and are reassuring for the team running the service.

As previously noted there was a significant reduction in multiple birth rate from 2000-2013 (chi square test for linear trend p<0.00001). Given that there has been an increase in births to older mothers over this time, which is associated with increased rates of spontaneous multiple pregnancy, it is likely that this is a result of a move towards single embryo transfer in assisted reproduction.

The perinatal mortality rate is higher in twins than singletons at NWH (18.8/1000 births versus 10.9/1000 births in 2015) and is stable. The rate of perinatal mortality has varied a great deal over the last 10 years and this probably reflects the small absolute numbers. There is no significant trend in the rate (p=0.34). Changes need to be interpreted with care.

In 2015 in 5 of the 6 losses, the history or findings suggested preterm birth mechanisms as a probable cause. Unfortunately there are no good interventions for Preterm birth in multiples aside from the usual recommended lifestyle changes.

Figure 35: Twin perinatal mortality rate (per 1000 twin babies) NWH 1997-2015 with 95% confidence intervals

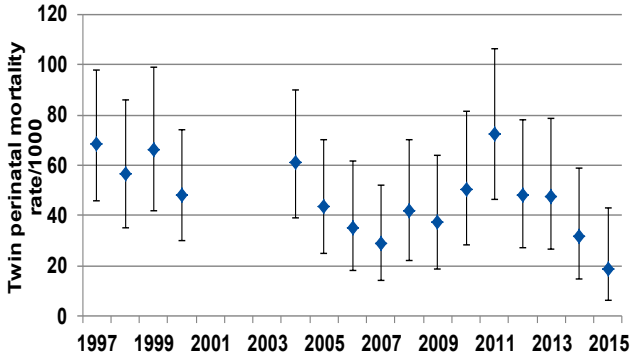


Table 52: Mode of onset of birth among twin pregnancies (mothers) by gestation at birth NWH 2015

	Preterm births n=92		Term births n=41	
	n	%	n	%
Mode of onset of birth				
CS elective	33	36	25	61
CS emergency before labour	12	13	1	2
Induction of labour	26	28	14	34
Spontaneous labour	21	23	1	2

Spontaneous labour is a rarity in the setting of a twin pregnancy. This will be in part due to earlier planned delivery as outcomes are shown to be improved with delivery around 37 weeks and also increased elective Caesarean section rates prior to spontaneous labour.

Seventy-one percent of twin pregnancies are delivered abdominally. As noted in previous reports caesarean section has become the norm. The trend is towards an increase in caesarean section rate though this is not significant (p=0.11). In 2015 three women had a vaginal birth for the first twin and caesarean section for the second twin. This represents a 1 in 50 chance.

Figure 36: Caesarean section rate among twin births (2004-2015)

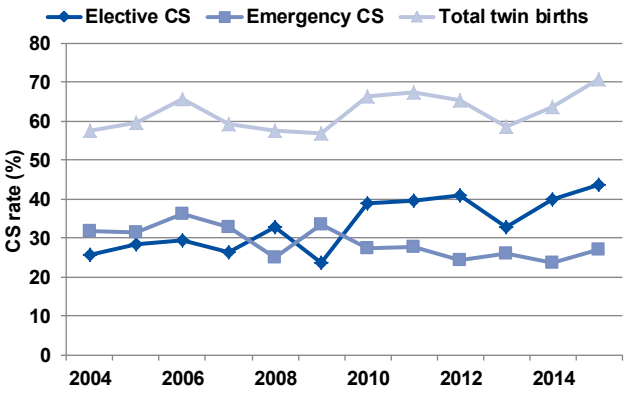


Table 53: Perinatal-related deaths in twin pregnancies by gestation at birth NWH 2015

	Twin pregnancies			
	One twin died		Both twins died	
Gestation at birth	n	Outcome	n	Outcome
<20	1	FD		
20 – 23			2	FD/ENND
24 – 27	1	LNND		
28 – 31				
32 – 36	2	ENND/ENND		
37 – 40				

FD=Fetal death; ENND=Early neonatal death; LNND=Late neonatal death

Summary / Implications

Multiple pregnancy rates are steady. Perinatal mortality rates in twin pregnancies are higher than in singleton pregnancies. Data from 2015 shows this is just under double. Twins are high risk pregnancies and should be managed in conjunction with an obstetrician. Section 88 guidelines recommend that the care of a multiple pregnancy is led by an obstetrician. Where there are monochorionic twins the risks are higher and closer monitoring is needed and regular ultrasound scanning should be instituted early at 16 to 18 weeks.

The outcomes of the treatment of TTTS in New Zealand are in line with international standards and highlight the need to refer women for early ultrasound scans and review if any concerns.

On reaching 37 weeks twin pregnancies should be delivered as the outcomes are improved. A randomised controlled trial has shown that vaginal delivery is safe in an uncomplicated twin pregnancy. However, caesarean section rates are trending upwards to 71 percent at ADHB. The rate of elective caesarean section has shown a significant increase and it is unclear as to why this is. Further investigation into the indication for elective caesarean would help inform this question.

5.8 Data tables: Multiple pregnancy

Table 54: Multiple pregnancy rates NWH 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total number of multiple pregnancies	162	177	160	159	153	163	162	151	147	137
Incidence %	2.2	2.3	2.1	2.1	2.0	2.2	2.1	2.1	2.0	1.9
Number of twin pregnancies	157	174	156	156	149	159	156	147	143	133
Number of triplet pregnancies	5	3	4	3	4	4	6	4	4	4

Table 55: Fetal/neonatal outcomes of multiple pregnancies NWH 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total number of babies born in a multiple pregnancy	329	357	324	321	310	330	330	305	298	278
Incidence %	4.5	4.5	4.2	4.1	3.9	4.3	4.2	4.1	4.0	3.9
Number of multiple pregnancies where one or more babies died	8	9	12	9	13	17	11	10	8	5
Incidence % (no. of multiple pregnancies where a baby died/number of multiple pregnancies)	4.9	5.1	7.5	5.8	8.5	10.4	6.8	6.6	5.4	3.6
Number of babies who died in a multiple pregnancy	12	11	16	13	16	26	18	16	10	6
Total number of babies born in a twin pregnancy	314	348	312	321	298	318	312	293	286	266
Twin perinatal deaths (< 7days)	11	10	13	12	15	23	15	14	9	5
Twin perinatal mortality rate*	35.0	28.7	41.7	37.4	50.3	72.3	48.1	47.8	31.5	18.8

*Perinatal twin deaths (<7 days)/1000 twin babies born

Table 56: Mode of birth among twin pregnancies NWH 2006-2015

	2006 n=157		2007 n=174		2008 n=156		2009 n=156		2010 n=149		2011 n=159		2012 n=156		2013 n=147		2014 n=143		2015 n=133	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
SVB/vaginal breech both twins	38	24	47	27	52	33	48	31	36	24	38	24	34	22	50	34	36	25	34	26
SVB 1st twin, operative vaginal 2nd twin	7	4	3	2	3	2	2	1	2	1	6	4	3	2	2	1	5	3	2	2
Operative vaginal 1st twin, SVB 2nd twin	5	3	6	3	4	3	7	4	7	5	5	3	9	6	3	2	4	3	1	1
Operative vaginal birth both twins	3	2	11	6	4	3	9	6	4	3	2	1	4	3	5	3	4	3	2	2
SVB 1st twin, Caesarean section 2nd twin	1	1	2	1	3	2	1	1	1	1	1	1	4	3	1	1	3	2	2	2
Operative vaginal birth 1st twin, Caesarean section 2nd twin	0		0		0		0		0		0		0		0		0		1	1
CS elective both twins	46	29	46	26	51	33	37	24	58	39	63	40	64	41	48	33	57	40	59	44
CS emergency both twins	57	36	59	34	39	25	52	33	41	28	44	28	38	24	38	26	34	24	32	24

Table 57: Fetal/newborn outcomes of twin babies NWH 2015

	Singletons N=6796			Twins babies N=266		
	Total singletons	NICU >=2 days		Total twins	NICU >=2 days	
	N	n	%	N	n	%
Admission to NICU >=2days	6796	605	8.9	266	109	41.0
<=34 weeks	271	215	79.3	82	78	95.1
35-36	225	70	31.1	101	28	27.7
>=37 weeks	6300	320	5.1	83	3	3.6
Apgar<7 at 5 minutes	6796	141	2.1	266	11	4.1

5.9 Diabetes

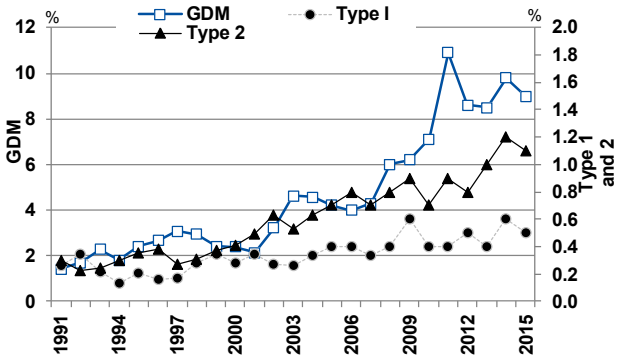
The data in this section relate to women with a diagnosis of pre-existing diabetes (Type 1 and 2), Type 2 diagnosed for the first time in pregnancy and gestational diabetes who birthed at National Women's in 2015.

This report includes women with a diagnosis of diabetes who delivered from 20 weeks' at National Women's. Forty two women were cared for by the Community Diabetes Team which is based at Greenlane; 151 women were cared for by the Diabetes service based at ACH as their LMC; and the remainder of the women had their diabetes care provided by the NW Diabetes service while the LMC role remained with the independent midwife or private obstetrician.

Findings

Numbers were similar to 2014. It is difficult to comment on any change in prevalence as, with dissemination of the NZ GDM Guidelines Screening Flow Diagram through the College of Midwives and RANZCOG, a number of access holders are reverting to screening for GDM at 24-28 weeks with a 50g glucose challenge test, which will lead to fewer women diagnosed with GDM than going directly to 75g OGTT. At NWH, we continue to recommend that women with risk factors for GDM are offered a 75g OGTT at 24-28 weeks', as this practice is more appropriate for our population.

Figure 37: Prevalence of diabetes (% of all inborn and BBA births) NWH 1991-2015



5.1.1 Demographic characteristics of women with diabetes NWH 2015

Each year we comment on the unusually low rates of GDM detected in Pacific women by glucose screening. We have found these women are more likely to have hyperglycaemia detected by early HbA1c screening and approximately 80% with HbA1c >40mmol/mol require medication in addition to lifestyle intervention. We are in the process of collecting more data about women with an early HbA1c of 41-49mmol/mol (PINTO trial, see later).

Figure 38: Incidence of diabetes by maternal BMI NWH 2015

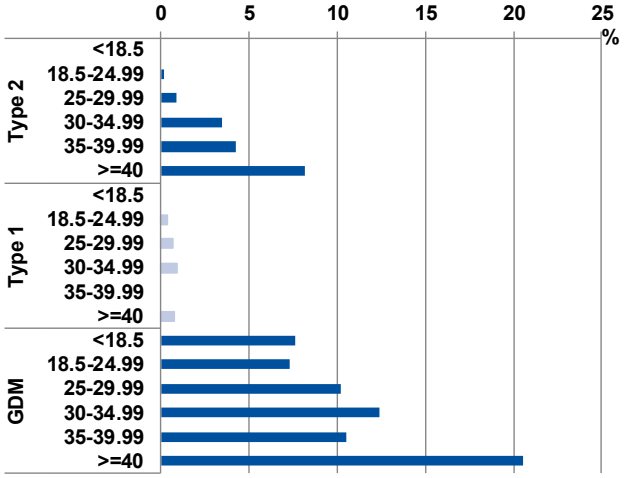
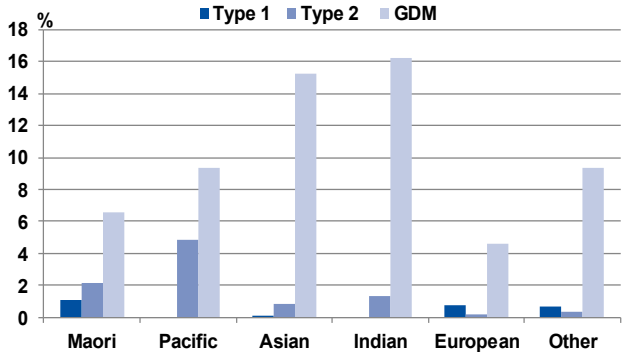
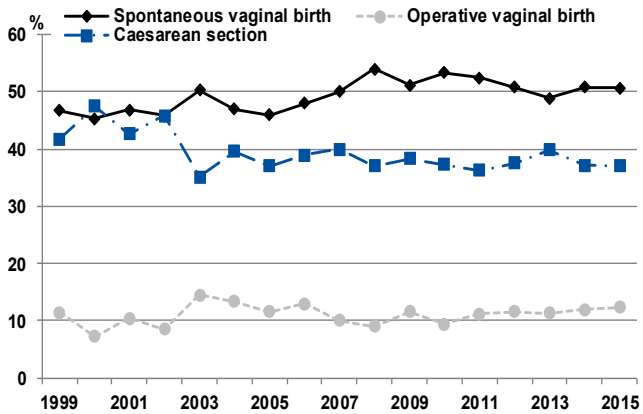


Figure 39: Incidence of diabetes by ethnic group NWH 2015



Maternal interventions and outcomes of pregnancies complicated by diabetes

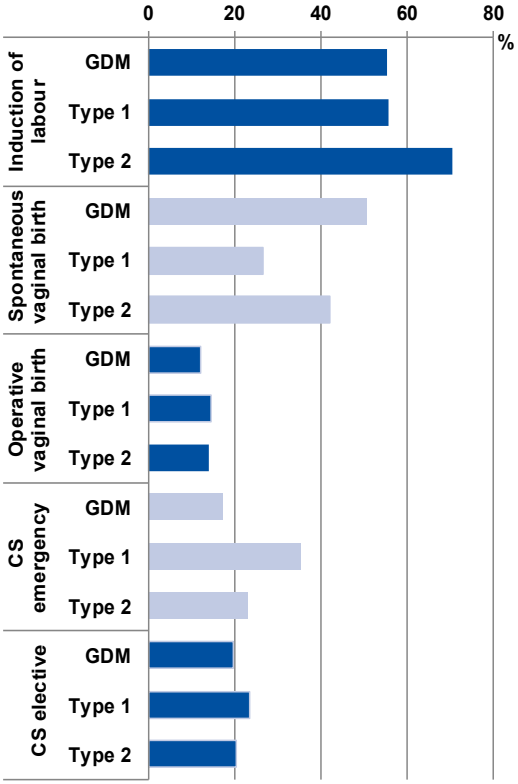
Figure 40: Mode of birth among women with GDM NWH 1999-2015



It is reassuring to see that our women with GDM have delivery outcomes similar to the background population, suggesting effective management. Rates of Caesarean birth in women with type 1 and type 2 diabetes remain similar to or better than other centres. The high induction rate reflects additional

morbidity in these women or suboptimal diabetes control, as diabetes, per se, is not used as an indication for induction unless women with GDM are beyond 40 weeks or women with pre-existing diabetes reach 38-39 weeks.

Figure 41: Induction of labour and mode of birth by diabetes status 2015



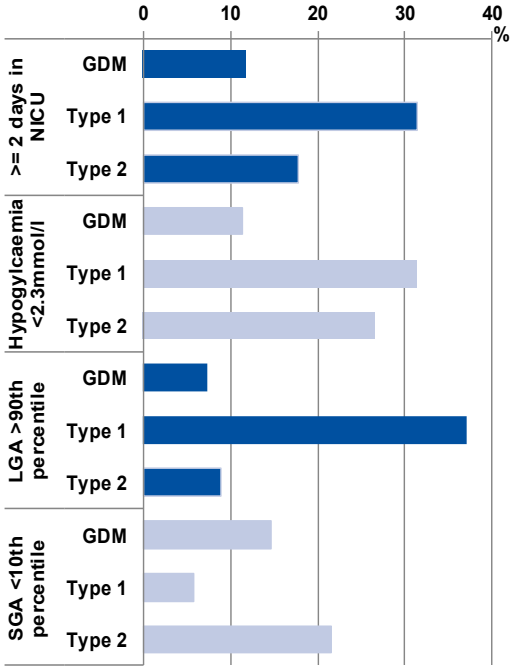
5.9.1 Maternal postpartum glucose tolerance testing

In 2014 we moved to recommending HbA1c at three months postpartum and follow up in primary care, which is consistent with the NZ GDM Guidelines recommendation. This impacts on data collection and possibly with compliance with testing, compared with the 6 week OGTT recommended in the past and followed up by the diabetes clinic midwives. Our data (Table 63) reflect a check of HbA1c results sometime between 3 and 6 months after birth, so we may miss tests performed after this time. A TI audit of women diagnosed with GDM and birthing from January-June 2015 to examine the uptake of postpartum screening following GDM found that 63% of women performed an HbA1c measure within 12 months of birth; 16% within 1-2months, 26% between 4-6 months and the rest over the following 6 months. Screening was lowest in Māori and Pacific women, at 58% and 33%, respectively. We plan to liaise further with primary care and find ways to improve follow up.

Neonatal outcomes among babies of women with diabetes in pregnancy

It is pleasing to see the neonatal outcomes of women with GDM are similar to the background population. We expect outcomes to be worse in women with pre-existing diabetes and these data compare favourably with other centres.

Figure 42: Neonatal outcomes by diabetes status 2015



5.9.2 Perinatal losses

There were 6 losses during 2015. All were in women with GDM. None of these women had any evidence of undiagnosed pre-existing diabetes.

Two were in twin pregnancies, where one twin died but the other remained alive. One of these was a donor MCDA twin whose mother delivered spontaneously at 33 weeks 5 days. The baby died day 5 following a major pulmonary haemorrhage. Infection was suspected but not proven. The other was a growth restricted twin with a fetal abnormality born at 32 weeks and 4 days and died at 12 days of age.

The other four losses included a termination of a trisomy 21, a severe fetal hydrops secondary to toxoplasmosis, a neonate diagnosed with multiple anomalies after birth, including esophageal atresia. (This mother had been diagnosed with GDM in later pregnancy after polyhydramnios was noted.) The final loss related to placental insufficiency and fetal growth restriction in a woman with a raised BMI who was being treated for cardiac arrhythmias.

Development of service in relation to NZ GDM Guidelines

There are a few key recommendations from the NZ GDM Guidelines that are of relevance for NWH:

It is recommended that HbA1c screening is offered to all pregnant women with first antenatal bloods:

- Labtests has automatically added this to the first antenatal screen since mid-December 2015.

Research is recommended to demonstrate whether early diagnosis and treatment of women with an early HbA1c of 41-49mmol/mol improves maternal and infant outcomes

- Our centre has published data (Rowan et al. Diabet Med 2016:33;25-31), that show:
  - Women with an HbA1c 41-49mmol/mol are a higher risk subgroup of women with GDM
  - Compared with women with GDM and HbA1c <41mmol/mol (a lower risk GDM population), women with HbA1c 41-49 treated <24 weeks had similar outcomes, but those treated ≥24 weeks had higher rates of preeclampsia, preterm birth and neonatal unit admission.
  - If women with an HbA1c 41-49mmol/mol treated <24 weeks' are compared to women treated ≥24 weeks', early treatment is associated with reduced risk of preeclampsia.
- We are just completing a feasibility trial (PINTO) led by Ruth Hughes in Christchurch, comparing outcomes of women with early HbAc1 41-46mmol/mol randomised to early care in diabetes clinic versus lifestyle advice and OGTT at 24-28 weeks. PINTO 2 is being developed, with a crossover study design, to address feasibility issues that have arisen in PINTO.

A research recommendation was made to compare current NZ OGTT diagnostic criteria with International/WHO criteria.

- This trial (GEMS) is underway at NWH, being led by Caroline Crowther.

Summary

- Outcomes for 2015 were similar to previous years and remain good.
- Guidelines and research at NWH are aligning with the NZ GDM Guidelines.

Objectives/Aims

- Continue research, as outlined, to provide evidence to guide best practice, as the NZ GDM Guidelines are only able to provide good practice points for many recommendations
- Continue to develop models of care for lower risk GDM women, so that current resource restrictions do not impact on outcomes.

5.10 Data tables: Diabetes

Table 58: Women with diabetes birthing at NWH at or beyond 20 weeks gestation 1994-2015

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Type I	12	19	15	14	21	26	22	26	21	20	25
Type 2	26	32	35	22	23	28	32	37	49	40	47
GDM	160	221	245	247	221	181	186	161	251	352	343
Total	198	272	295	283	265	235	240	224	321	412	415
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Type I	31	33	26	31	47	30	33	40	29	42	34
Type 2	52	57	54	63	71	55	70	64	69	86	78
GDM	304	286	331	457	480	545	821	662	613	725	626
Total	387	376	411	551	598	630	924	766	711	853	738

Table 59: Perinatal related deaths (1996 – 2015) among births complicated by diabetes

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total number of perinatal related losses	6	3	6	1	2	2	3	6	0	2	8
Perinatal related loss rate /1000	20	11	21	4	8	9	9	9	0	5	21
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
Total number of perinatal related losses	9	1	4	10	5	10	6	9	6		
Perinatal related loss rate /1000	22	2	7	16	5	13	16	11	7.9		

Table 60: Demographic characteristics of women with diabetes NWH 2015

		Type 1 n=34		Type 2 n=78		GDM n=626		No Diabetes N=6195	
	N	n	%	n	%	n	%	n	%
Age									
<=20	187	1	0.5	1	0.5	7	3.7	178	95.2
21-25	677	5	0.7	6	0.9	42	6.2	624	92.2
26-30	1756	12	0.7	17	1.0	119	6.8	1608	91.6
31-35	2623	9	0.3	18	0.7	297	11.3	2299	87.6
36-40	1435	6	0.4	28	2.0	140	9.8	1261	87.9
41+	255	1	0.4	8	3.1	21	8.2	225	88.2
Ethnicity									
Māori	469	5	1.1	10	2.1	31	6.6	423	90.2
Pacific	805	0	0	39	4.8	75	9.3	691	85.8
Asian	1581	2	0.1	13	0.8	241	15.2	1325	83.8
Indian	660	0	0	9	1.4	107	16.2	544	82.4
NZ European	2291	18	0.8	4	0.2	103	4.5	2166	94.5
Other European	827	7	0.8	2	0.2	41	5.0	777	94.0
Other	300	2	0.7	1	0.3	28	9.3	269	89.7
BMI									
<18.5	249	0	0.0	0	0.0	19	7.6	230	92.4
18.5-24.99	3791	15	0.4	7	0.2	277	7.3	3492	92.1
25-29.99	1528	11	0.7	13	0.9	156	10.2	1348	88.2
30-34.99	671	6	0.9	23	3.4	83	12.4	559	83.3
35-39.99	332	0	0.0	14	4.2	35	10.5	283	85.2
≥40	258	2	0.8	21	8.1	53	20.5	182	70.5
Missing	104	0	0.0	0	0.0	3	2.9	101	97.1
Smoking									
Smoking at booking	381	5	1.3	16	4.2	23	6.0	337	88.5
Not currently smoking	6551	29	0.4	62	0.9	603	9.2	5857	89.4
Missing	1	0	0	0	0	0	0	1	100

Table 61: DHB of domicile of women with diabetes birthing at NWH 2015

	Type 1 n=34		Type 2 n=78		GDM n=626		No Diabetes n=6195	
DHB	n	%	n	%	n	%	n	%
Auckland	10	29.4	34	43.6	404	64.5	4139	66.8
Waitemata	19	55.9	38	48.7	89	14.2	850	13.7
Counties Manukau	3	8.8	5	6.4	119	19.0	1050	16.9
Other	2	5.9	1	1.3	14	2.2	156	2.5

Table 62: Maternal outcomes among women with diabetes NWH 2015

	Type 1 n=34		Type 2 n=78		GDM n=626		No diabetes n=6195	
	n	%	n	%	n	%	n	%
Induction of labour	19	55.9	55	70.5	348	55.6	1867	30.1
Mode of Birth								
Spontaneous vaginal birth	9	26.5	33	42.3	317	50.6	3235	52.2
Ventouse	3	8.8	5	6.4	57	9.1	501	8.1
Forceps	2	5.9	6	7.7	20	3.2	277	4.5
CS emergency	12	35.3	18	23.1	108	17.3	1083	17.5
CS elective	8	23.5	16	20.5	124	19.8	1099	17.7
Gestation at birth								
<32 weeks	0	0	2	2.6	9	1.4	157	2.5
<37 weeks	10	29.4	10	12.8	63	10.1	509	8.2
PPH >=500mls	19	55.9	29	37.2	244	39.0	2141	34.6
PPH >=1000 mls	6	17.6	4	5.1	63	10.1	640	10.3
Postpartum transfusion	1	2.9	1	1.3	15	2.4	165	2.7

Table 63: Rates of postnatal glucose tolerance testing (GTT) among women with GDM NWH 2006-2015

	2006 n=286		2007 n=331		2008 n=457		2009 n=480		2010 n=548		2011 n=821		2012 n=662		2013 n=613		2014 n=725		2015 n=626	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Postnatal GTT/HbA1c	206	72	249	75	313	68	324	68	369	67	480	58	401	61	328	54	361	50	286	46
No post-natal GTT/HbA1c	80	28	82	25	144	32	156	32	179	33	341	42	261	39	285	46	364	50	340	54

Table 64: Neonatal outcomes among babies of women with diabetes NWH 2015

	Type 1 n=35		Type2 n=79		GDM n=642		No diabetes n=6318	
	n	%	n	%	n	%	n	%
Birthweight (Median(IQR))	3500(2965-3820)		3310(2795-3590)		3165(2850-3520)		3365(3000-3713)	
<1500g	0	0	3	3.8	12	1.9	160	2.5
<2500g	4	11.4	10	12.7	62	9.7	545	8.6
SGA <10th percentile	2	5.7	17	21.5	94	14.6	946	15.0
LGA >90th percentile	13	37.1	7	8.9	47	7.3	450	7.1
Admission to NICU								
Any admission	12	34.3	15	19.0	81	12.6	724	11.5
>= 2 days in NICU	12	34.3	15	19.0	74	11.5	672	10.6
Hypoglycaemia < 2.3 mmol/l	11	31.4	21	26.6	73	11.4	0	0
Hypoglycaemia 2.3 - 2.5 mmol/l	6	17.1	9	11.4	74	11.5	0	0
IV Dextrose	6	17.1	8	10.1	21	3.3	0	0
Perinatal related losses (/1000)	0	0	0	0	6	9.3	77	12.2

5.11 Antepartum Haemorrhage

Antepartum haemorrhage has been defined here to include vaginal bleeding from any cause at or beyond 20 weeks gestation, during pregnancy and labour, and includes placenta praevia without bleeding. While bleeding before 20 weeks is also important we do not reliably collect these data.

Data cleaning includes reconciling antenatal summary data and intrapartum complication data with indications for induction and operative birth. Data were also reconciled with inpatient coding data.

Findings

Table 65: Antepartum haemorrhage incidence NWH 2011-2015

	2011	2012	2013	2014	2015
Total APH	455	511	460	469	456
Incidence %	6.0	6.6	6.4	6.3	6.6
Proven abruption	54	47	50	37	35
Proven placenta praevia	60	63	66	54	69
APH (uncertain origin)	341	401	344	378	352

In 2015, 456 women (6.6% of all women who birthed at ACH) had an antepartum haemorrhage or placenta praevia without bleeding (Table 66). This proportion has remained unchanged at between 5 and 7 per cent for the last fifteen years. The underlying causes have also remained unchanged with APH of uncertain origin the most frequent "cause", accounting for 70-80% of cases every year. This is despite improvements in ultrasound and other imaging modalities. History taking, careful examination and clinical acumen remain important when assessing women with bleeding in pregnancy.

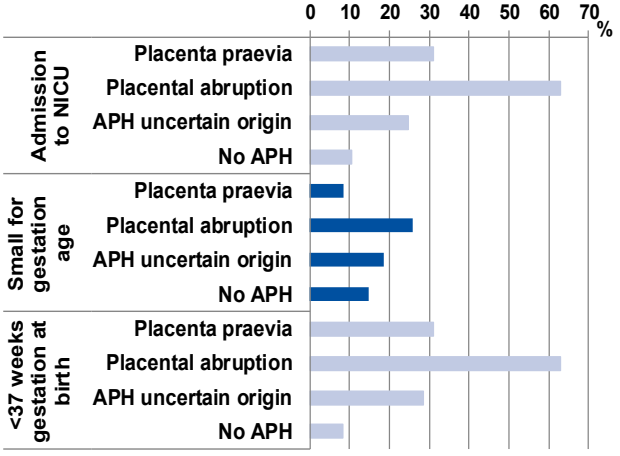
The number of cases with proven placenta praevia has remained similar since 1999. Placenta praevia is significantly more common with increasing maternal age (see Table 68). There was an incidence of 0.7% (39 of 5243 women) in women aged 35 or under versus 1.8% in women aged >35 (30 of 1690 women), relative risk for placenta praevia in women over 35 years of age versus those under 35 years is 2.4 (95% CI 1.5-3.8). The incidence of placenta praevia in women with a previous caesarean section was 1.4% (17 of 1197 women), compared to 0.8% among nulliparous women (27 of 3321 women) and 1.0% (25 of 2415 women) among multipara without a previous birth by Caesarean section. This is consistent with previous Caesarean section being a risk factor for placenta praevia, however the difference did not reach statistical significance; relative risk for placenta praevia in cases with versus without previous caesarean section is 1.6 (95% CI 0.9-2.7). Smoking status, BMI and hypertensive disease were not associated with placenta praevia.

Women with a placenta praevia had a significantly higher requirement for blood products with 13% (9 of 69 women) of these women requiring transfusion during pregnancy or birth, versus 2.5% (173 of 6864 women) of women without placenta praevia requiring transfusion ($p<0.0001$). However, it is reassuring that 87% were managed without resort to blood transfusion (see Table 67).

A confirmed placental abruption is an uncommon diagnosis with an incidence of 0.5% in 2015 (35 of 6933 women). Hypertension and pre-eclampsia are significant risk factors with an incidence of 1.1% (6 of 526 women) in these groups compared to 0.5% (29 of 6407 women) in normotensive women. Relative risk for placental abruption in women with versus without hypertensive disease is 2.5 (95% CI 1.1-6.0).

Smoking is also a significant risk factor with an incidence of abruption of 1.8% in smokers (7 of 381 women) compared to 0.4% in non-smokers (28 of 6551 women). Relative risk for placental abruption in smokers versus nonsmokers is 4.3 (95% CI 1.9-9.8). Placenta abruption seems to be more common in women under 20 years of age (3 of 184 women) versus women aged 20 or older (32 of 6714 women), relative risk 3.4 (1.1-11.1). These numbers need to be interpreted with caution, because this is not a known risk factor, numbers are small and smoking and drug abuse may be confounding factors. There does not appear to be any association with BMI or previous Caesarean section.

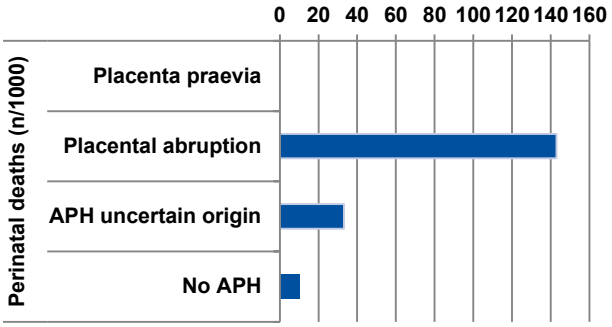
Figure 43: Neonatal outcomes among pregnancies complicated by antepartum haemorrhage NWH 2015



Placental abruption is associated with significant maternal morbidity with 40% requiring delivery by caesarean section and 15% needing blood transfusion (Table 67). Fetal morbidity is also high with a median birthweight of 2010 g, and 63% of babies admitted to neonatal intensive care unit

(NICU) (Table 69). There were 5 perinatal deaths amongst 35 babies in this group (143 per 1000 births).

Figure 44: Perinatal related deaths (n/1000) among pregnancies complicated by antepartum haemorrhage NWH 2015



The management of women with an antepartum haemorrhage of unknown origin remains challenging. These women have a higher rate of preterm birth (28%) and emergency caesarean section (25%) (Table 67). Nineteen percent of babies born after APH of unknown origin are small for gestational age, and 25% need NICU admission. The perinatal related mortality rate is three times higher (at 33 per 1000 births) in pregnancies where an APH of unknown origin has occurred compared to women with no antepartum haemorrhage (Figure 43). Placental abruption is associated with significant maternal morbidity with 40% requiring delivery by caesarean section and 15% needing blood transfusion (Table 67). Fetal morbidity is also high with a median birthweight of 2010 g, and 63% of babies admitted to neonatal intensive care unit (NICU) (Table 69). There were 5 perinatal deaths amongst 35 babies in this group (143 per 1000 births). Women with APH of uncertain origin should be treated as a high risk group.

Women with an APH of uncertain origin make up the largest proportion of women presenting with antepartum haemorrhage (363 of 469 women). A proportion of the morbidities associated with APH of unknown origin will be related to preterm birth. The APH may either be a symptom of the start of preterm labour, or alternatively be a trigger for preterm labour or rupture of membranes. Ultrasound can be used to diagnose placenta praevia but does not exclude placental abruption. A proportion of women with no firm diagnosis for their APH may have had unconfirmed small abruptions, and this may also have contributed to the increased perinatal morbidity and mortality associated with APH of uncertain origin. Health professionals should also be aware that domestic violence in pregnancy may result in APH.

5.12 Data tables: Antepartum haemorrhage

Table 66: Antepartum haemorrhage incidence NWH 2000-2015

	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total APH	594	398	411	533	424	438	438	455	511	460	469	456
Incidence %	7.6	5.5	5.7	6.9	5.6	5.7	5.7	6.0	6.6	6.4	6.3	6.6
Proven abruption	54	41	44	58	36	39	50	54	47	50	37	35
Proven placenta praevia	69	81	68	94	73	66	58	60	63	66	54	69
APH (uncertain origin)	471	276	299	381	315	333	330	341	401	344	378	352

Table 67: Maternal outcomes of pregnancies complicated by antepartum haemorrhage NWH 2015

	Placenta praevia		Placental abruption		APH uncertain		No APH	
	n=69		n=34		n=352		n=6477	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	2	2.90	17	50.0	172	48.9	3403	52.5
Operative vaginal	2	2.90	3	8.8	37	10.5	829	12.8
CS elective	42	60.9	2	5.9	54	15.3	1149	17.7
CS emergency	23	33.3	12	35.3	89	25.3	1096	16.9
Maternal transfusion	9	13.0	5	14.7	7	2.0	161	2.5

Table 68: Characteristics of pregnancies complicated by antepartum haemorrhage NWH 2015

		Placenta praevia		Placental abruption		APH uncertain origin		No APH	
		n=69		n=35		n=352		n=6477	
	Total	n	%	n	%	n	%	n	%
Maternal ethnicity									
NZ European	2291	22	1.0	7	0.3	91	4.0	2171	94.8
Māori	469	3	0.6	6	1.3	37	7.9	423	90.2
Pacific	805	9	1.1	7	0.9	55	6.8	734	91.2
Asian	1581	19	1.2	8	0.5	86	5.4	1468	92.9
Indian	660	6	0.9	5	0.8	32	4.8	617	93.5
Other European	827	7	0.8	2	0.2	32	3.9	786	95.0
Other	300	3	1.0	0	0.0	19	6.3	278	92.7
Maternal age									
<=20	187	0	0.0	3	1.6	13	7.0	171	91.4
21-25	677	3	0.4	4	0.6	41	6.1	629	92.9
26-30	1756	13	0.7	10	0.6	84	4.8	1649	93.9
31-35	2623	23	0.9	13	0.5	115	4.4	2472	94.2
36-40	1435	25	1.7	3	0.2	78	5.4	1329	92.6
>40	255	5	2.0	2	0.8	21	8.2	227	89.0
Parity									
Nulliparous	3321	27	0.8	16	0.5	179	5.4	3099	93.3
Multip previous CS	1197	17	1.4	3	0.3	61	5.1	1116	93.2
Mullip no previous CS	2415	25	1.0	16	0.7	112	4.6	2262	93.7
Multiple pregnancy									
Multiple	137	2	1.5	0	0.0	11	8.0	124	90.5
Singleton	6796	67	1.0	35	0.5	341	5.0	6353	93.5
Smoking status at booking									
Currently smoking	381	3	0.8	7	1.8	35	9.2	336	88.2
Not currently smoking	6551	66	1.0	28	0.4	317	4.8	6140	93.7
Unknown	1	0	0.0	0	0.0	0	0.0	1	100
BMI									
<18.5	249	2	0.8	2	0.8	10	4.0	235	94.4
18.5-24.99	3791	33	0.9	15	0.4	180	4.7	3563	94.0
>=25-29.99	1528	23	1.5	8	0.5	81	5.3	1416	92.7
30-34.99	671	1	0.1	3	0.4	43	6.4	624	93.0
35-39.99	332	5	1.5	4	1.2	18	5.4	305	91.9
>=40	258	0	0.0	1	0.4	11	4.3	246	95.3
Missing	104	5	4.8	2	1.9	9	8.7	88	84.6
Hypertensive disease									
Gestational hypertension	197	1	0.5	2	1.0	6	3.0	188	95.4
Chronic hypertension	153	2	1.3	0	0.0	8	5.2	143	93.5
Chronic hypertension with	17	0	0.0	1	5.9	1	5.9	15	88.2
Preeclampsia	159	0	0.0	3	1.9	8	5.0	148	93.1
Nil	6407	66	1.0	29	0.5	329	5.1	5983	93.4

Table 69: Fetal/neonatal outcomes of pregnancies complicated by antepartum haemorrhage NWH 2015

	Placenta praevia		Placental abruption		APH uncertain origin		No APH	
	n=71		n=35		n=363		n=6605	
	n	%	n	%	n	%	n	%
Gestation at birth								
<37 weeks	22	31.0	22	62.9	103	28.4	544	8.2
<32 weeks	10	14.1	14	40.0	44	12.1	118	1.8
Birthweight								
Median(IQR)	3100		2010		3080		3365	
<2500g	14	19.7	21	60.0	90	24.8	496	7.5
<1500g	8	11.3	13	37.1	38	10.5	116	1.8
Small for gestation age	6	8.5	9	25.7	67	18.5	980	14.8
Perinatal related deaths (n/1000)	0	0.0	5	142.9	12	33.1	66	10.0
Any Admission to NICU	22	31.0	22	62.9	90	24.8	698	10.6
>=2 days stay in NICU	22	31.0	22	62.9	87	24.0	642	9.7

5.13 Hypertensive disease

The following definitions of hypertension in pregnancy have been used in this report:

- **Gestational hypertension**: Gestational hypertension (GH) is a blood pressure systolic ≥ 140 and/or diastolic ≥ 90 mmHg on two or more consecutive occasions at least 4 hours apart or one measurement systolic BP ≥ 170 and or diastolic BP ≥ 110 mmHg, arising after 20 weeks gestation.
- **Preeclampsia**: Gestational hypertension accompanied by proteinuria measured as ≥ 2+ protein on one dipstick sample or Protein Creatinine Ratio (PCR) ≥ 30 on a spot urine sample, or a 24 hour collection ≥ 0.3g in 24 hours.
- **Chronic hypertension**: diastolic BP ≥ 90mmHg at booking or a medical history of essential hypertension. Includes women with superimposed pre-eclampsia if these are not categorised separately.
- **Super-imposed preeclampsia:** The development of preeclampsia in a woman with chronic hypertension.

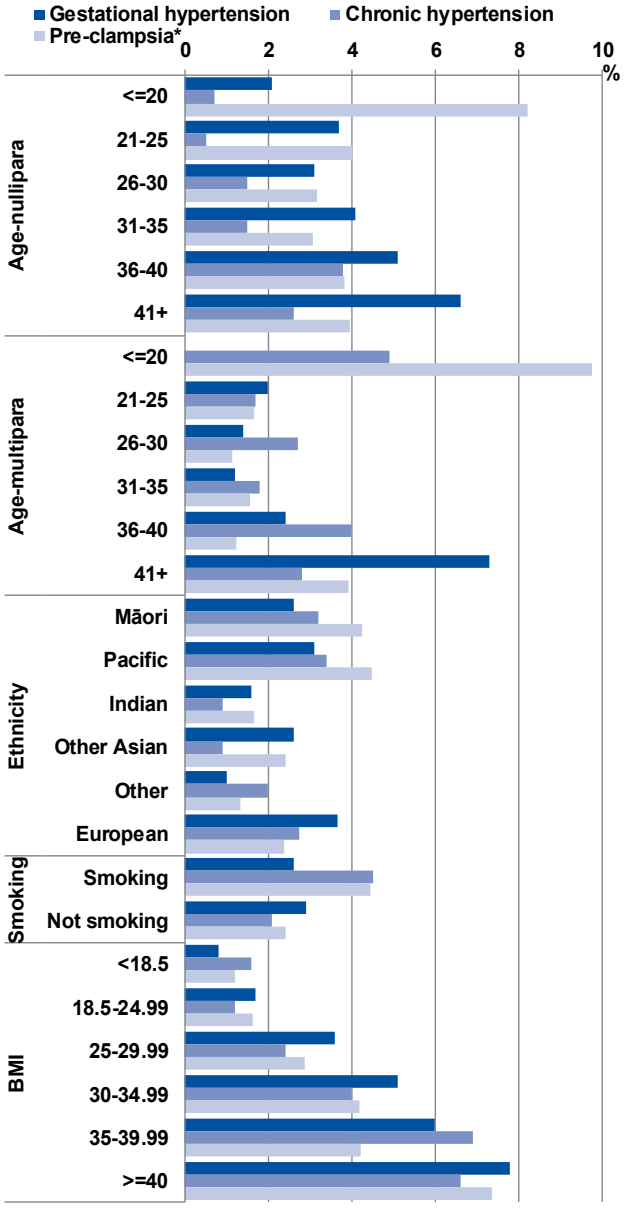
The cleaning of hypertension data involves reconciling data from booking history, indication for induction and operative birth, reason for admission to the ward or to High Dependency Unit, and data collected at birth and coded data from the Business Intelligence Unit (BI).

Findings

The overall rate of hypertensive disease in pregnancy (7.6%) is the same as that recorded last year. There are similar rates of gestational hypertension (2.8%), chronic hypertension (2.2%) and pre-eclampsia (2.3%), with low rates of super-imposed pre-eclampsia (0.2%). As expected, there is an increasing rate of gestational hypertension with advancing maternal age in both nulliparous and multiparous women. Chronic hypertension is more common in the multiparous population. Women of Māori, Pacific or European ethnicity had higher rates of hypertensive disorders in pregnancy compared to women of Indian or other Asian descent. The risk of hypertensive disease in pregnancy increases with increasing body mass index (BMI.) Women with a BMI higher than 40 had almost an 18% risk of hypertensive disease in pregnancy. There was only one reported case of eclampsia in 2015. This occurred in a nulliparous woman.

Hypertensive disease is associated with increased obstetric intervention. Forty seven percent (47%) of normotensive women went into labour spontaneously, compared with only 19.3%, 11.3% and 25.5% of the women with gestational hypertension, pre-eclampsia or chronic hypertension respectively. Women with hypertensive disease in pregnancy have higher rates of delivery by caesarean section (Gestational hypertension 49.8%, Pre-eclampsia 55.9%, Chronic hypertension 41.2%) compared with normotensive women (34.4%).

Figure 45: Demography of women with hypertensive disease in pregnancy by parity NWH 2015



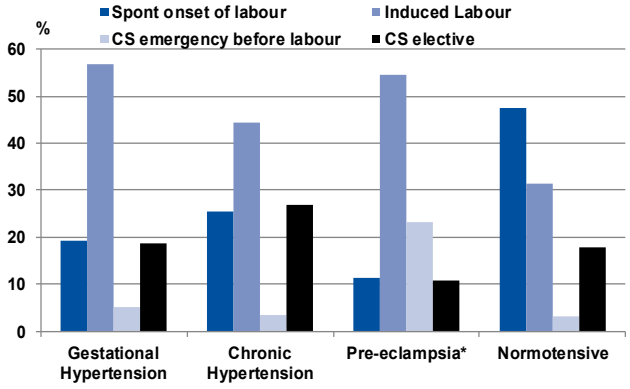
*pre-eclampsia includes pre-eclampsia, super-imposed pre-eclampsia and eclampsia

More than half of all women elected to have an epidural placed for their delivery. There were low rates of general anaesthetic use across all groups, however women with gestational hypertension or pre-eclampsia had more than double the risk of requiring a general anaesthetic, when compared to women without hypertensive disease.

Table 70: Hypertensive disease in pregnancy by parity NWH 2015

	All women n=6933		Nullipara n=3321		Multipara n=3612	
	n	%	n	%	n	%
Any hypertensive disease	526	7.6	303	9.1	223	6.2
Gestational hypertension	197	2.8	128	3.9	69	1.9
Chronic hypertension	153	2.2	57	1.7	96	2.7
Superimposed pre-eclampsia	17	0.2	7	0.2	10	0.3
Pre-eclampsia	159	2.3	111	3.3	48	1.3
Eclampsia	1	0.01	1	0.03	0	0.0

Figure 46: Onset of birth by hypertensive disease status NWH 2015

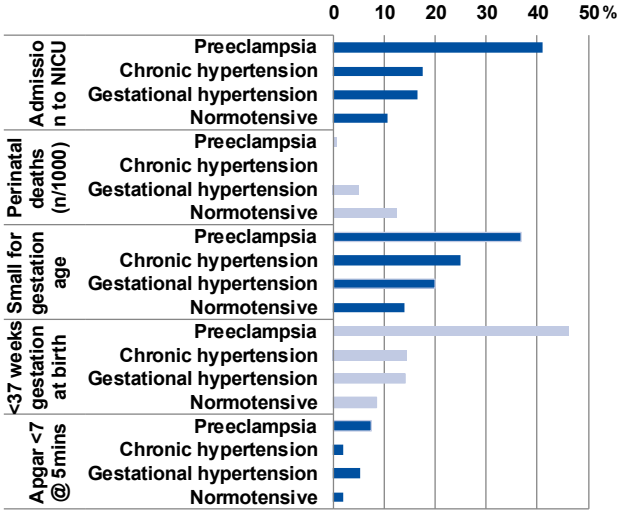


*pre-eclampsia includes pre-eclampsia and super-imposed pre-eclampsia

Women with hypertensive disease had increased rates of poor perinatal outcomes. In particular, women with preeclampsia or superimposed preeclampsia had high rates of preterm birth (delivery <37 weeks), including significantly higher risks of very preterm birth (<32 weeks.) Preterm birth occurred in 46.2%, 47.1%, 14.1%, 14.4% (preeclampsia, superimposed preeclampsia, gestational hypertension, chronic hypertension) compared to women without hypertensive disease (8.5%).

There were associated increased risks of NICU admission, prolonged NICU hospitalisation and low Apgar scores in babies born to mothers with hypertensive disease. Small for gestational age birthweight (<10th customised centile) rates were higher for all groups of hypertensive disease when compared to normotensive women.

Figure 47: Perinatal outcomes and hypertensive disease in babies NWH 2015



*pre-eclampsia includes pre-eclampsia and super-imposed pre-eclampsia

It is difficult to be conclusive regarding perinatal mortality rates amongst hypertensive women as the overall numbers are small.

Summary / Implications

Hypertensive disorders of pregnancy remain a common problem in obstetrics. The overall rate of hypertensive disease remains stable. It is known that hypertensive disease is associated with a significant risk of operative birth, growth restriction, prematurity and associated poor perinatal outcomes. There is an ongoing need to adequately screen for, diagnose, and treat hypertensive disorders in pregnancy to improve outcomes for both mother and neonate.

5.14 Data tables: Hypertensive disease

Table 71: Demographic characteristics of women with hypertensive disease NWH 2015

	N=6933	Gestational hypertension n=197		Chronic hypertension n=153		Superimposed preeclampsia n=17		Preeclampsia n=159		Normotensive n=6407	
	Total	n	%	n	%	n	%	n	%	n	%
Ethnicity (prioritised)											
Māori	469	12	2.6	15	3.2	3	0.6	17	3.6	422	90.0
Pacific	805	25	3.1	27	3.4	6	0.7	30	3.7	717	89.1
Asian	1581	26	1.6	14	0.9	2	0.1	24	1.5	1515	95.8
Indian	660	17	2.6	6	0.9	1	0.2	15	2.3	621	94.1
Other	300	3	1.0	6	2.0	0	0.0	4	1.3	287	95.7
Other European	827	36	4.4	23	2.8	1	0.1	21	2.5	746	90.2
NZ European	2291	78	3.4	62	2.7	4	0.2	48	2.1	2099	91.6
Maternal age (nullipara)											
<=20	146	3	2.1	1	0.7	1	0.7	11	7.5	130	89.0
21-25	374	14	3.7	2	0.5	0	0.0	15	4.0	343	91.7
26-30	1046	32	3.1	16	1.5	3	0.3	30	2.9	965	92.3
31-35	1208	50	4.1	18	1.5	2	0.2	35	2.9	1103	91.3
36-40	471	24	5.1	18	3.8	1	0.2	17	3.6	411	87.3
41+	76	5	6.6	2	2.6	0	0.0	3	3.9	66	86.8
Maternal age (multipara)											
<=20	41	0	0.0	2	4.9	1	2.4	3	7.3	35	85.4
21-25	303	6	2.0	5	1.7	1	0.3	4	1.3	287	94.7
26-30	710	10	1.4	19	2.7	1	0.1	7	1.0	673	94.8
31-35	1415	17	1.2	26	1.8	5	0.4	17	1.2	1350	95.4
36-40	964	23	2.4	39	4.0	0	0.0	12	1.2	890	92.3
41+	179	13	7.3	5	2.8	2	1.1	5	2.8	154	86.0
Smoking											
Currently smoking	381	10	2.6	17	4.5	1	0.3	16	4.2	337	88.5
Not currently smoking	6551	187	2.9	136	2.1	16	0.2	143	2.2	6069	92.6
Unknown	1	0	0.0	0	0.0	0	0.0	0	0.0	1	100
BMI											
<18.5	249	2	0.8	4	1.6	0	0.0	3	1.2	240	96.4
18.5-24.99	3791	65	1.7	44	1.2	4	0.1	58	1.5	3620	95.5
25-29.99	1528	55	3.6	36	2.4	4	0.3	40	2.6	1393	91.2
30-34.99	671	34	5.1	27	4.0	2	0.3	26	3.9	582	86.7
35-39.99	332	20	6.0	23	6.9	0	0.0	14	4.2	275	82.8
>=40	258	20	7.8	17	6.6	7	2.7	12	4.7	202	78.3
Missing	104	1	1.0	2	1.9	0	0.0	6	5.8	95	91.3

Table 72: Onset and mode of birth among women with hypertensive disease NWH 2015

	Gestational hypertension n=197		Chronic hypertension n=153		Superimposed preeclampsia n=17		Pre-eclampsia n=159		Normotensive n=6407	
	n	%	n	%	n	%	n	%	n	%
Spontaneous onset of labour	38	19.3	39	25.5	2	11.8	18	11.3	3039	47.4
Induced of labour	112	56.9	68	44.4	11	64.7	85	53.5	2013	31.4
CS emergency before onset of labour	10	5.1	5	3.3	4	23.5	37	23.3	205	3.2
Mode of birth										
Normal vaginal	74	37.6	71	46.4	8	47.1	48	30.2	3393	53.0
Operative vaginal	25	12.7	19	12.4	1	5.9	22	13.8	804	12.5
CS elective	37	18.8	41	26.8	0	0.0	19	11.9	1150	17.9
CS emergency	61	31.0	22	14.4	8	47.1	70	44.0	1060	16.5
Epidural	126	64.0	98	64.1	10	58.8	94	59.1	3295	51.4
General Anaesthetic*	12	6.1	7	4.6	1	5.9	11	6.9	191	3.0

*GA generally at time of caesarean, but sometimes postpartum for management of PPH.

Table 73: Perinatal outcomes and hypertensive disease (babies) NWH 2015

	Gestational hypertension n=206		Chronic hypertension n=160		Superimposed preeclampsia n=17		Preeclampsia n=159		Normotensive n=6407	
	n	%	n	%	n	%	n	%	n	%
Gestation at birth										
<37 weeks	29	14.1	23	14.4	8	47.1	79	46.2	552	8.5
<32 weeks	3	1.5	5	3.1	1	5.9	20	11.7	157	2.4
SGA	41	19.9	40	25.0	6	35.3	63	36.8	909	13.9
NICU Admission	34	16.5	28	17.5	10	58.8	67	39.2	693	10.6
>=2 days in NICU	28	13.6	26	16.3	8	47.1	64	37.4	596	9.1
Apgar <7 at 5 minutes	11	5.3	3	1.9	1	5.9	13	7.6	127	1.9
Perinatal related	1	4.9	0	0.0	0	0.0	1	5.8	81	12.4

5.15 Body Mass Index

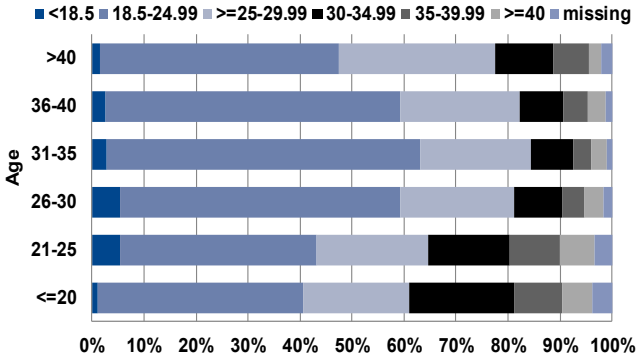
BMI is calculated as weight (kg) divided by height (m) squared. Weight used for this calculation is the first recorded weight in pregnancy. Out of range heights and weights are checked for accuracy.

Findings

Rates of obesity, including morbid obesity (BMI>=35) have remained similar over the last 8 years. Over time, data collection has improved with only 1.5% of the data missing in 2015. For trends in prevalence of obesity at NWH please see Table 74 and Figure 18.

It is unknown what proportion of pregnant mothers booked at NWH have their height and weight measured (strongly recommended and routine practice at ADHB) versus self-reported. A recent NZ publication showed discrepancies between measured and self-reported height and weight, which resulted in significant under-estimation of BMI. This has potential to impact on results of MSS screening and plotting of fundal height and estimated fetal weight on customised growth charts. (Jeffs E 2014)

Figure 48: Distribution of BMI by maternal age NWH 2015



As observed in previous years, the relationship between BMI and maternal age is "U shaped" with a larger proportion of overweight and obesity in younger and to a lesser extent in older mothers. Higher rates of obesity in younger pregnant women are associated with higher rates of socio-economic deprivation and also with ethnicity.

Māori and especially Pacific women are over represented amongst the overweight/obese groups (70.5% and 86.2% respectively vs 34.4% among European women). Overweight/obesity is more common amongst parous women (46.3%), perhaps partly reflecting weight gained during a previous pregnancy and not lost postpartum, as well as increasing age. The prevalence of obesity among women who smoke in pregnancy is three times higher than in non-smokers (50% vs 16.7%). This high rate of smoking will also contribute to pregnancy complications in these women.

Figure 49: Distribution of BMI by ethnicity NWH 2015

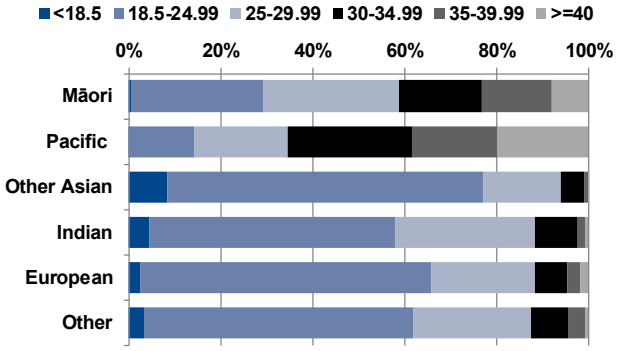
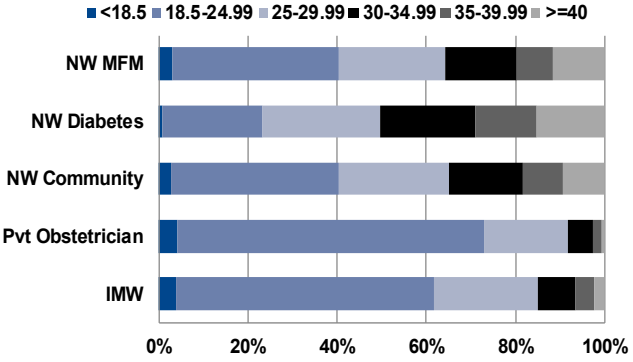
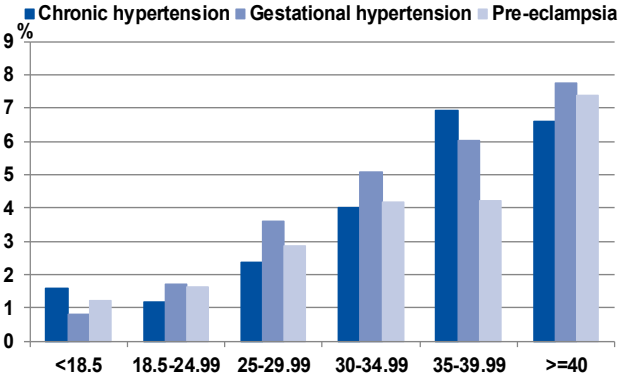


Figure 50: Distribution of BMI by LMC at birth NWH 2015



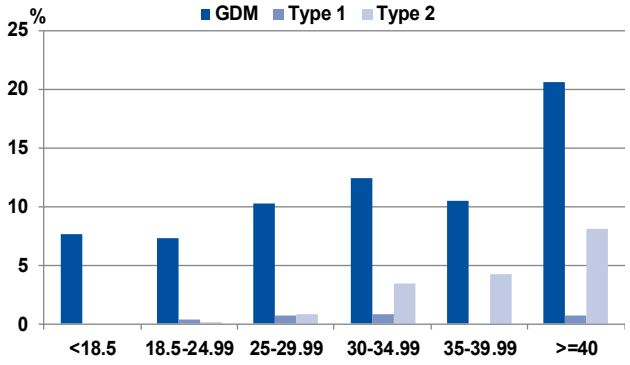
Rates of obesity are highest in the NW diabetes clinic, followed by NW community and MFM clinics. Rates are lowest amongst pregnant women booked with private obstetricians and independent midwives.

Figure 51: Hypertensive disease rates by maternal BMI NWH 2015 (Pre-eclampsia includes superimposed pre-eclampsia).



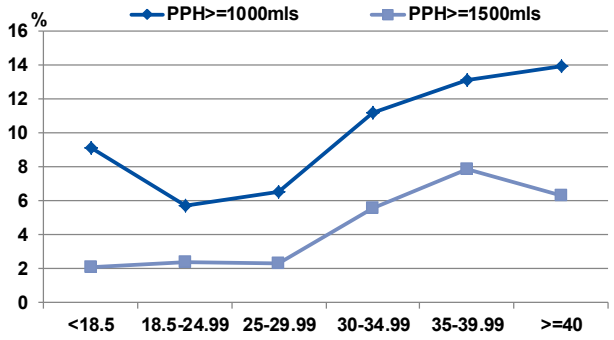
As has been shown in the international literature, rates of chronic hypertension and pregnancy hypertensive complications increase progressively with increasing BMI.

Figure 52: Diabetes rates by maternal BMI NWH 2015



Increasing maternal BMI is also strongly associated with increasing rates of gestational diabetes (GDM) and Type 2 diabetes as shown above. GDM was diagnosed in 11.4% of overweight/obese women, and 20.5% of women with a BMI >=40. Obese women with GDM are also more likely than normal weight women to be subsequently diagnosed with Type 2 diabetes therefore follow-up testing with HBA1c at 3 months postpartum in primary care is crucial.

Figure 53: Postpartum haemorrhage rate by BMI among spontaneous vaginal births NWH 2015



Rates of major PPH are increased in women with high BMI who have spontaneous vaginal births. The reasons for this are unclear, but a recent report from NWH data found that obese nulliparous women had an elevated risk of major PPH (>=1000mls) independent of other risk factors such as infant birthweight, induction of labour, etc. (Fyfe et al, BMC Pregnancy and Childbirth 2012, 12:112; doi:10.1186/1471-2393-12-112) It is recommended that women with high BMI should receive active management of the third stage.

Rates of major PPH are also increased in women with high BMI who have Caesarean births, especially in those with BMI >=40. In the same NWH publication described above, nulliparous obese women were again found to have an elevated risk for major PPH (>=1000mls) at the time of Caesarean section. This finding may be partially explained by factors such as increased operation time and greater operative difficulty.

Figure 54: Postpartum haemorrhage rate by BMI among Caesarean sections NWH 2015

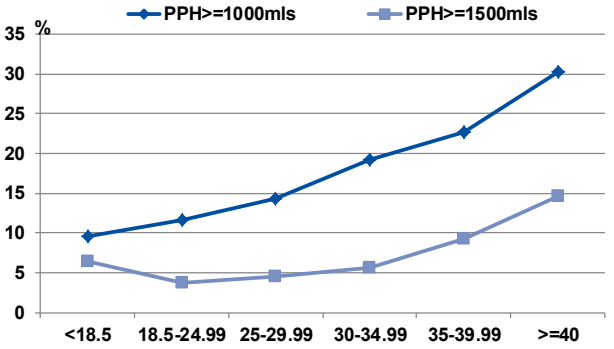
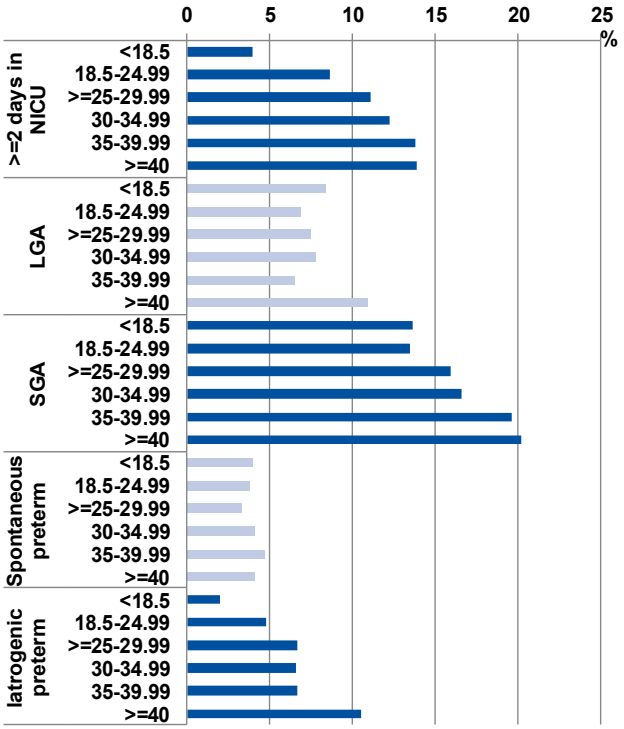


Figure 55: Preterm birth and neonatal outcomes in relation to BMI NWH 2015



Rates of SGA are increased in women with elevated BMI. Not surprisingly there is also an increased risk of iatrogenic preterm birth in heavier women, with the greatest risk in women with BMI >=40. This is likely to at least partly explain the higher rates of NICU stay for >=48 hours in these women. Unlike findings from some international literature, there was not an increased risk of spontaneous preterm birth in obese women at National Women's Health in 2015.

5.16 Data tables: Body Mass Index

Table 74: Maternal BMI using WHO categories NWH 2009-2015

	2009		2010		2011		2012		2013		2014		2015	
	n=7735		n=7709		n=7523		n=7695		n=7223		n=7400		n=6933	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<18.5	442	5.8	443	5.7	439	5.8	481	6.3	255	3.5	313	4.2	249	3.6
18.6-24.99	3867	50.0	3913	50.8	3790	50.4	3949	51.3	3826	53.0	4106	55.5	3791	55.5
25-29.99	1709	22.1	1715	22.3	1641	21.8	1678	21.8	1679	23.2	1565	21.1	1528	22.4
30-34.99	780	10.1	797	10.3	790	10.5	771	10.0	699	9.7	696	9.4	671	9.8
35-39.99	377	4.8	356	4.7	368	4.9	354	4.6	367	5.0	357	4.8	332	4.9
>=40	250	3.3	265	3.4	309	4.1	289	3.8	250	3.5	234	3.2	258	3.8
Missing	310	4.0	220	2.8	186	2.5	173	2.3	147	2.0	129	1.7	104	1.5

Table 75: LMC at birth and BMI NWH 2015

	Total	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40		Missing	
	6933	n=249		n=3791		n=1528		n=671		n=332		n=258		N=104	
Totals	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%
IMW	3341	130	3.9	1911	57.2	766	22.9	285	8.5	141	4.2	73	2.2	35	1.0
Pvt Obst	1854	76	4.1	1264	68.2	348	18.8	106	5.7	36	1.9	10	0.5	14	0.4
NWH Comm	1234	33	2.7	457	37.0	302	24.5	199	16.1	109	8.8	115	9.3	19	0.6
NWH Diabetes	151	1	0.7	34	22.5	40	26.5	32	21.2	21	13.9	23	15.2	0	0.0
NWH MFM	276	8	2.9	100	36.2	64	23.2	43	15.6	22	8.0	31	11.2	8	0.2
GP	16	0	0.0	14	87.5	1	6.3	0	0.0	1	6.3	0	0.0	0	0.0
Other DHB	32	1	3.1	10	43.5	6	26.1	4	17.4	0	0.0	2	8.7	9	0.3
Unbooked	29	0	0.0	1	3.4	1	3.4	2	6.9	2	6.9	4	13.8	19	0.6

Table 76: Demographic characteristics and BMI NWH 2015 (excludes missing data)

	Total	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	6829	n=249		n=3791		n=1528		n=671		n=332		n=258	
Totals	N	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity													
Māori	437	2	0.5	126	28.8	129	29.5	79	18.1	66	15.1	35	8.0
Pacific	788	2	0.3	110	14.0	159	20.2	214	27.2	147	18.7	156	19.8
Asian	1571	129	8.2	1080	68.7	269	17.1	76	4.8	13	0.8	4	0.3
Indian	657	28	4.3	352	53.6	201	30.6	60	9.1	12	1.8	4	0.6
NZ European	2265	57	2.5	1425	62.9	505	22.3	168	7.4	62	2.7	48	2.1
Other European	815	21	2.6	525	64.4	189	23.2	50	6.1	21	2.6	9	1.1
Other	296	10	3.4	173	58.4	76	25.7	24	8.1	11	3.7	2	0.7
Age													
<=20	180	2	1.1	74	41.1	38	21.1	38	21.1	17	9.4	11	6.1
21-25	655	37	5.6	256	39.1	145	22.1	106	16.2	66	10.1	45	6.9
26-30	1728	94	5.4	948	54.9	382	22.1	165	9.5	74	4.3	65	3.8
31-35	2598	74	2.8	1584	61.0	556	21.4	212	8.2	92	3.5	80	3.1
36-40	1418	38	2.7	812	57.3	330	23.3	122	8.6	65	4.6	51	3.6
>40	250	4	1.6	117	46.8	77	30.8	28	11.2	18	7.2	6	2.4
Parity													
Nullipara	3277	137	4.2	1993	60.8	712	21.7	257	7.8	111	3.4	67	2.0
Multipara	3552	112	3.2	1798	50.6	816	23.0	414	11.7	221	6.2	191	5.4
Smoking status at booking													
Smoking*	354	3	0.8	92	26.0	83	23.4	74	20.9	53	15.0	49	13.8
Not currently smoking	6475	246	3.8	3699	57.1	1445	22.3	597	9.2	279	4.3	209	3.2

*smoking status missing for one woman

Table 77: Pregnancy complications and BMI NWH 2015 (excludes missing data)

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n=249		n=3791		n=1528		n=671		n=332		n=258	
	n	%	n	%	n	%	n	%	n	%	n	%
Diabetes												
GDM	19	7.6	277	7.3	156	10.2	83	12.4	35	10.5	53	20.5
Type 1	0	0.0	15	0.4	11	0.7	6	0.9	0	0.0	2	0.8
Type 2	0	0.0	7	0.2	13	0.9	23	3.4	14	4.2	21	8.1
No diabetes*	230	92.4	3492	92.1	1348	88.2	559	83.3	283	85.2	182	70.5
Hypertension												
Chronic hypertension	4	1.6	44	1.2	36	2.4	27	4.0	23	6.9	17	6.6
Gestational hypertension	2	0.8	65	1.7	55	3.6	34	5.1	20	6.0	20	7.8
Pre-eclampsia	3	1.2	58	1.5	40	2.6	26	3.9	14	4.2	12	4.7
Superimposed pre-eclampsia	0	0.0	4	0.1	4	0.3	2	0.3	0	0.0	7	2.7
No hypertension	240	96.4	3620	95.5	1393	91.2	582	86.7	275	82.8	202	78.3

*includes women who have not had diabetes screening in pregnancy

Table 78: Postpartum haemorrhage rates among spontaneous vaginal births (N=3916) by BMI NWH 2015

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n=142		n=1917		n=764		n=358		n=191		n=158	
Totals	n	%	n	%	n	%	n	%	n	%	n	%
PPH>=1000mls	13	9.2	109	5.7	50	6.5	40	11.2	25	13.1	22	13.9
PPH>=1500mls	3	2.1	46	2.4	18	2.4	20	5.6	15	7.9	10	6.3

Table 79: Postpartum haemorrhage rates among Caesarean sections (N=2522) by BMI NWH 2015

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n=63		n=1321		n=593		n=250		n=119		n=89	
Totals	n	%	n	%	n	%	n	%	n	%	n	%
PPH>=1000mls	6	9.5	154	11.7	85	14.3	48	19.2	27	22.7	27	30.3
PPH>=1500mls	4	6.3	50	3.8	27	4.6	14	5.6	11	9.2	13	14.6

Table 80: Maternal interventions and birth outcomes by BMI NWH 2015

	BMI<18.5		BMI 18.5-24.99		BMI >=25-29.99		BMI 30-34.99		BMI 35-39.99		BMI >=40	
	n=249		n=3791		n=1528		n=671		n=332		n=258	
	n	%	n	%	n	%	n	%	n	%	n	%
Onset of birth												
Spontaneous labour	140	56.2	1821	48.0	639	41.8	258	38.5	132	39.8	78	30.2
Induced labour	69	27.7	1168	30.8	512	33.5	267	39.8	129	38.9	132	51.2
Emergency CS	5	2.0	114	3.0	85	5.6	19	2.8	11	3.3	12	4.7
Elective CS	35	14.1	688	18.1	292	19.1	127	18.9	60	18.1	36	14.0
Mode of birth												
Spontaneous	142	57.0	1917	50.6	764	50.0	358	53.4	191	57.5	158	61.2
Operative vaginal	44	17.7	553	14.6	171	11.2	63	9.4	22	6.6	11	4.3
Elective CS	35	14.1	688	18.1	292	19.1	127	18.9	60	18.1	36	14.0
Emergency CS	28	11.2	633	16.7	301	19.7	123	18.3	59	17.8	53	20.5

Table 81: Neonatal outcomes by BMI NWH 2015 (excludes missing data)

	TOTAL		<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	N=6967*		n=250		n=3867		n=1560		n=682		n=341		n=267	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Preterm	652	9.4	15	6.0	330	8.5	156	10.0	73	10.7	39	11.4	39	14.6
Iatrogenic preterm	390	5.6	5	2.0	184	4.8	105	6.7	45	6.6	23	6.7	28	10.5
Spontaneous	262	3.8	10	4.0	146	3.8	51	3.3	28	4.1	16	4.7	11	4.1
Term	6315	90.6	235	94.0	3537	91.5	1404	90.0	609	89.3	302	88.6	228	85.4
Iatrogenic term	3486	50.0	105	42.0	1847	47.8	814	52.2	378	55.4	183	53.7	159	59.6
Spontaneous term	2829	40.6	130	52.0	1690	43.7	590	37.8	231	33.9	119	34.9	69	25.8
SGA	1037	14.9	34	13.6	521	13.5	248	15.9	113	16.6	67	19.6	54	20.2
>= 2 days in NICU	683	9.8	10	4.0	333	8.6	173	11.1	83	12.2	47	13.8	37	13.9
Perinatal deaths	83	11.9	3	12.0	39	10.1	16	10.3	14	20.5	5	14.7	5	18.7

*BMI of mother missing for 107 babies

5.17 Fetal Medicine Unit

The data included in this section have been extracted from the MFM Viewpoint database for 2015.

Findings

Figure 56: Number of visits over time (2010-2015)

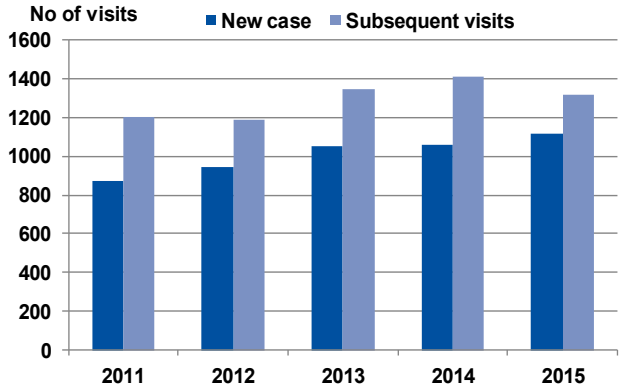
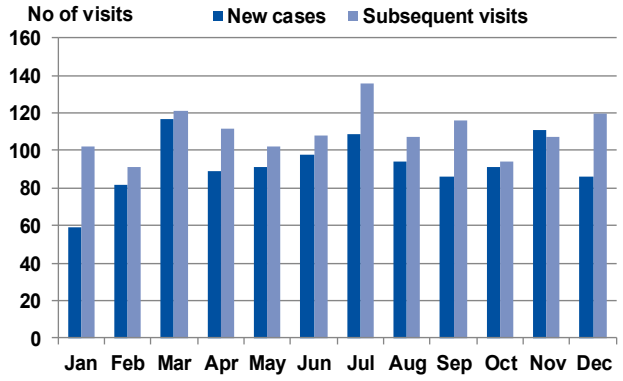


Table 82: Number of visits over time (2010-2015)

	New cases	Subsequent visit
2010	738	1169
2011	877	1413
2012	960	1245
2013	1072	1492
2014	1076	1502
2015	1113	1316

Figure 57: Number of new cases and subsequent visits to Fetal Medicine Unit NWH 2015



In 2015 there were on average 93 new cases per month and 110 subsequent visits.

Table 83: Number of mothers/procedures performed in fetal medicine service NWH 2010-2015

	2011	2012	2013	2014	2015
Amniocentesis*	156	165	165	141	123
CVS*	97	89	87	76	99
Echocardiogram*	366	410	457	411	449
Intrauterine transfusion (mothers)	4	10	11	8	8
Intrauterine transfusion (procedures)	9	25	29	17	25
Other procedures (mothers)	20	26	50	49	46
Other procedures (procedures)	21	26	60	51	52

*Amniocentesis, CVS and Echocardiogram data apply to the total number of procedures performed, so the count may include multiple procedures for one baby and may include more than one procedure in multiple pregnancies

Intrauterine transfusion and other procedure data are given as total number of procedures and number of individual women who had a procedure.

Other procedures includes fetal blood sampling, amnio-drainage, amnio-infusion, other sampling, shunt, embryo reduction/fetocide, and laser ablation.

Table 84: Diagnoses by pregnancy (multiple pregnancies (n=69; 64 twin, 5 triplet) represented once only) among first presentations to Fetal Medicine service in 2015

Findings	2015 N=1113	
	n	%
No obvious fetal defect	296	26.6
Genetic/multisystem disorders	137	12.3
Heart	136	12.2
Liquor/growth	79	7.1
Genitourinary tract	70	6.3
Face and neck	58	5.2
Haematological/Others/Fetal demise	58	5.2
Preterm birth risk	57	5.1
Abdominal wall and GI tract	54	4.9
Brain	45	4.0
Multiple gestation	43	3.9
Musculoskeletal	42	3.8
Placenta, membranes, umbilical cord	14	1.3
Chest	12	1.1
Spine	6	0.5
First trimester problem	3	0.3
Infection	3	0.3

Comment

There has been a slight fall in the number of new referrals following the increase seen in 2013, which was likely to have been due to the Auckland Fetal Medicine Service providing the tertiary service for the Waikato DHB region.

Although MSS1 has resulted in a reduction in invasive procedures, women with a high risk result and normal appearing fetal anatomy are seen in the Women's Health Ultrasound department. NIPT (noninvasive prenatal testing) undertaken in the private sector has little impact on the fetal medicine service as only those high risk cases with abnormal

anatomy (for example nuchal translucency >3.5mm) are seen through this service.

Babies with cardiac anomalies are the most common reason for review. The majority of intrauterine transfusion procedures are performed for red cell isoimmunisation and Anti-D remains the most common red cell antibody.

6 LABOUR AND BIRTH

This chapter includes data on labour and birth interventions and outcomes, including induction of labour and mode of birth. Tables pertaining to this chapter can be found at the end of each section.

6.1 Gestation at birth

Figure 58: Distribution of gestation at birth NWH 2006-2015

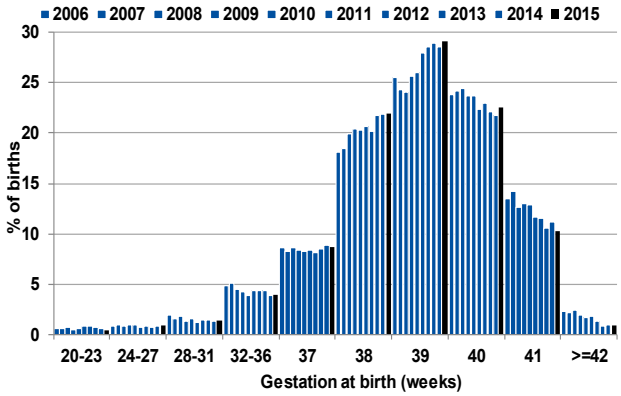
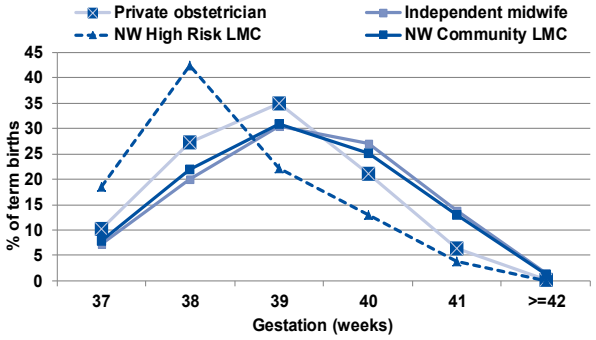


Figure 59: Distribution of gestation at birth among term births by LMC 2015



There has been a marked change in gestation at birth among births at NWH (Figure 58).

There has been a significant reduction in late preterm births (32-36 weeks). Approximately half of preterm births within our unit are due to spontaneous labour or preterm pre-labour rupture of membranes (PPROM). Current therapeutic strategies are unlikely to prevent preterm birth in women presenting with threatened preterm labour. However we do have opportunity to identify those at most risk of going on to preterm birth so interventions that reduce neonatal morbidity and mortality can be targeted appropriately. Whether the recently instituted Preterm Birth Clinic has had an impact on this rate remains unclear. Other reasons to consider include a reduction in smoking rates (a recent Lancet paper reported a reduction in preterm birth rates in areas/countries with smoking bans) and a reduction in multiple birth rates from assisted reproduction. In future years examining these data for singletons alone may be useful.

Against this trend, lower thresholds for delivery at late preterm gestations contribute to an increase in preterm birth. It remains to be seen whether in future the results of the PPROMT may halt or reverse this trend, as women with PPROM are managed expectantly until 37 weeks.

The distribution of gestation at birth has also changed among term births, with an increase in births at 38 and 39 weeks. This is probably due to an increase in elective induction of labour for specific diagnoses (such as diabetes and small for gestational age), and to an increase in elective Caesarean section prior to 39 weeks. This is of concern due to research suggesting increased long term morbidity among babies born at 37 and 38 weeks compared to births at 39 weeks gestation and over. Both the induction of labour and caesarean guidelines are due for revision this year, and there will be a greater emphasis on delaying elective birth to 39 weeks or more if not medically necessary earlier.

6.2 Iatrogenic birth

Methods

The four pathways to birth are: (1) induction of labour, (2) elective Caesarean section, (3) emergency Caesarean prior to onset of labour, and (4) spontaneous onset of labour. If any woman had a failed induction followed by emergency Caesarean, she has been categorised as an induced labour for the purposes of this section.

Input of induction-related data to the Healthware database requires active opening of an induction screen. This is not consistently done, especially if 'inductions' are performed on the Labour and Birthing Suite (typically by ARM with or without an oxytocin infusion). To improve capture of these inductions, clinical notes were reviewed if the indication for ARM (artificial rupture of membranes) was induction or if an ARM was performed or syntocinon commenced before the onset of contractions. From 2008 clinical notes were also reviewed if syntocinon was commenced before 3cm dilatation. Indication for induction is prioritised at data entry to primary and secondary indication. Primary indications are given here.

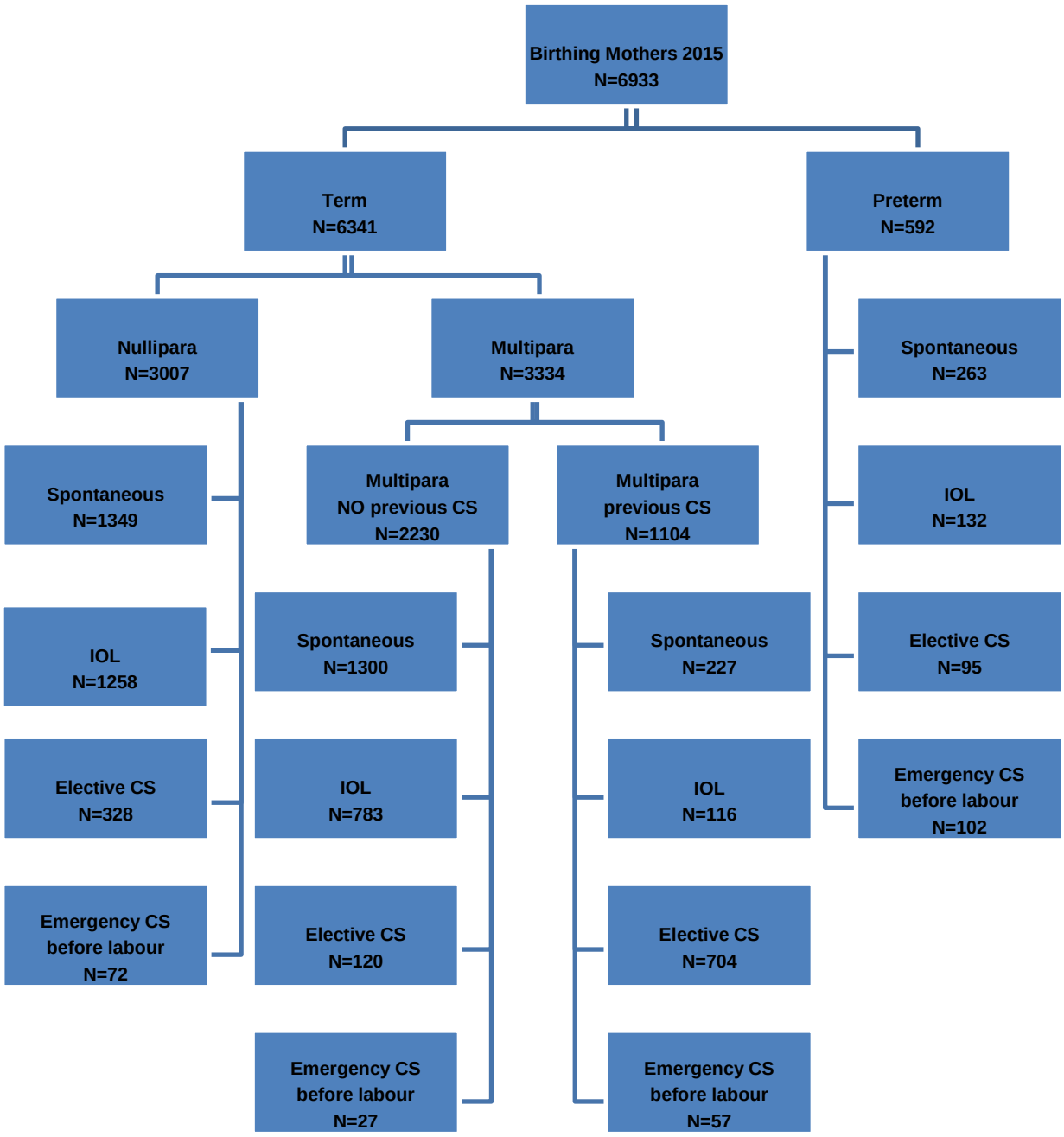


Figure 60: Pathways to birth by gestation and parity NWH 2015

Findings

The decrease in induction rates seen in 2014 for nullipara and multipara at term was likely related to the adoption of an Auckland consensus guideline on indications for induction of labour. Unfortunately, this decrease in rates was not maintained in 2015 (Figure 61). Of all women giving birth in 2015, one in three had an induction of labour. However, audit is ongoing to determine if the proportion of inductions performed for guideline-based reasons has increased.

Figure 61: Induction of labour rates NWH 1992-2015

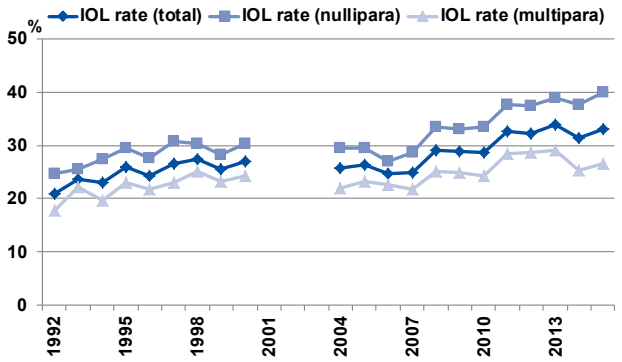
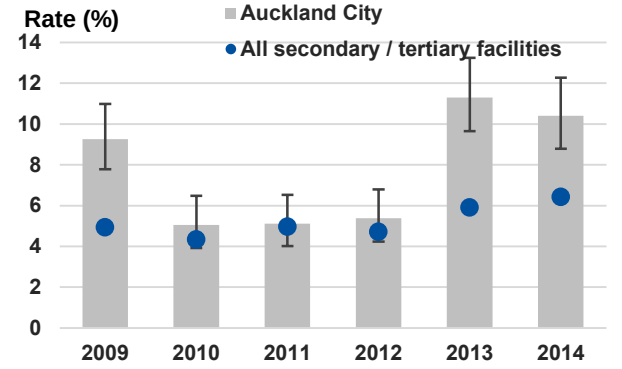


Figure 62: NZ Maternity Indicators 2014: Standard primiparae who undergo induction of labour NWH and NZ secondary/tertiary facility rates 2009-2014



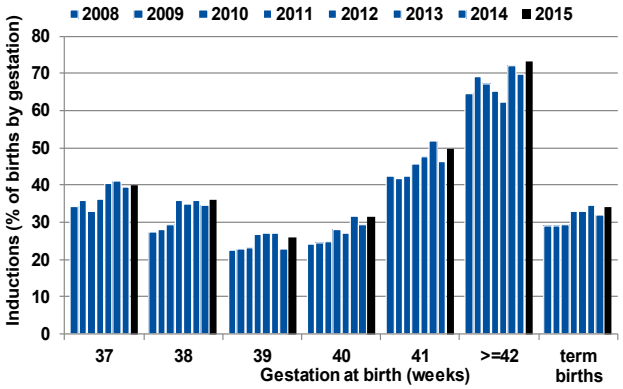
Error bars represent the 95% confidence interval for NWH rate.

The induction of labour rate in standard primiparae (as defined by the Ministry of Health in New Zealand Maternity Clinical Indicators 2014 http://www.health.govt.nz/system/files/documents/publications/nz-maternity-clinical-indicators-2014-may16.pdf) is one of the clinical indicators reported annually by the Ministry of Health as part of the Maternity Quality and Safety Programme. This allows the opportunity to compare ADHB with other secondary/tertiary facilities around NZ.

The rates of induction among standard primiparae during 2010-2012 are out of keeping with the rates in the surrounding years and in our own data suggesting that these are incorrect.

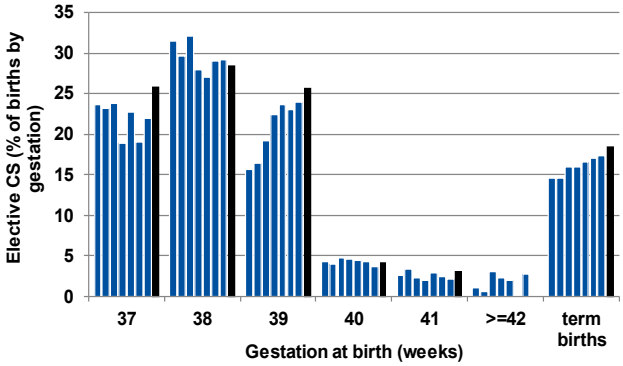
At 10% in 2014, ADHB was well above the national average (6.4%) in the latest report (2014 data). All practitioner groups should strive for excellence in care and realise the potential for improvement in induction of labour rate in this low risk group of women.

Figure 63: Induction of labour rates by gestation at birth NWH 2008-2015



It is disappointing to see an increase in induction of labour rates at 37 and 38 weeks (Figure 63) knowing that the babies born at these gestational ages do not do as well as those born electively at 39 to 40 weeks. The observed increase in induction rates at >=42 weeks is misleading as the total number of births from 42 weeks has decreased significantly over the time period (Figure 58) and the absolute numbers of inductions from 2013-2015 are the lowest in the time period (44-51 births).

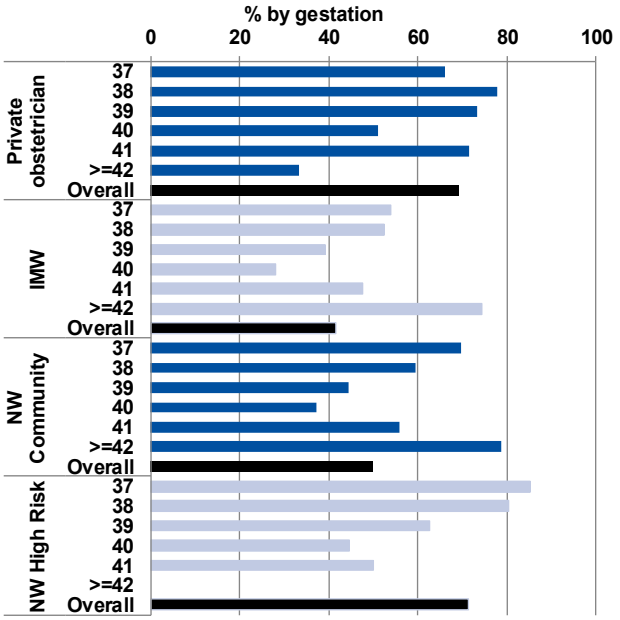
Figure 64: Elective Caesarean rates by gestation at birth NWH 2008-2015



It is reassuring to see fewer elective caesareans done at 38 weeks, and more at 39, 40 and 41 weeks (Figure 64). Given that most elective caesareans are done for women with previous caesarean, it is possible that our service is supporting women to choose VBAC if they spontaneously labour (higher chance of vaginal birth and lower risk of scar rupture) whilst reserving elective repeat caesarean for later gestational ages.

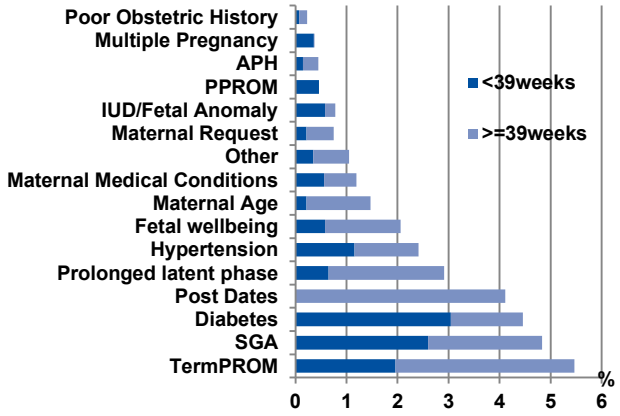
It was disappointing to see that despite the introduction of the national GDM guideline in 2014, there was no reduction in inductions at less than 40 weeks in 2015.

Figure 65: Iatrogenic onset of birth rate (induction and elective Caesarean) at term by LMC at birth NWH 2015



Indication for induction

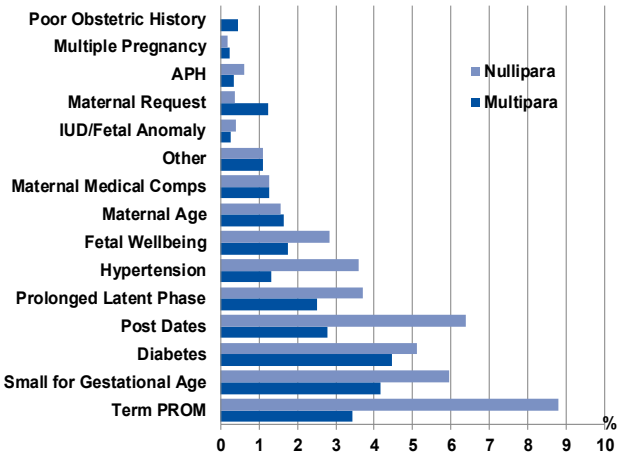
Figure 66: Primary indication for induction by gestation (as a percentage of all births) NWH 2015



In December 2014 a formal booking system for elective and acute inductions was implemented. The goal was to clarify the primary indication for induction of labour. For elective indications for induction at term, the majority were performed for SGA, diabetes and post-dates. Pre-labour rupture of membranes was the most common indication for acute induction.

Figure 66 shows indication for induction by gestation. Most of the inductions performed < 39 weeks align with our current induction guideline on indications and timing. However, it seems that for the following indications, more work can be done to increase the overall proportion of elective births planned at 39 weeks or greater: maternal request, maternal age, and diabetes.

Figure 67: Primary indication for induction at term as a percentage of term births by parity NWH 2015



Approximately 9% of women having their first baby at term are induced for pre-labour ruptured membranes, while approximately 3% of women having subsequent babies at term are induced for ruptured membranes.

Figure 68: Induction rate at term by ethnicity and parity NWH 20

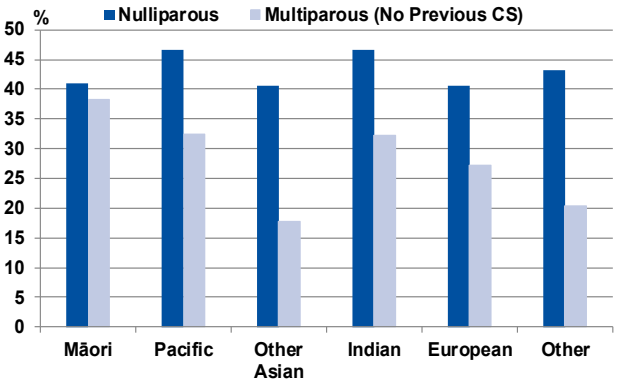


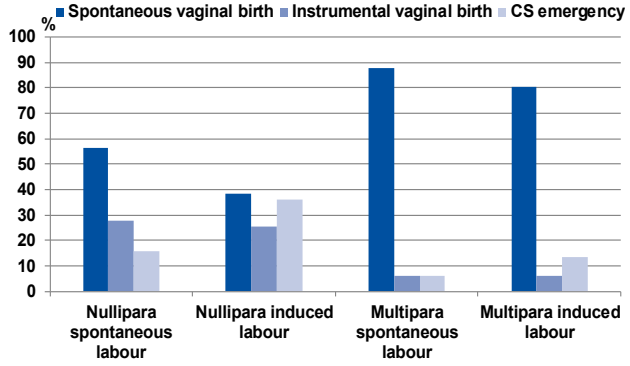
Table 85: Gestation at birth among women whose primary indication for induction was 'post-dates' NWH 2015

	Total n=285		Age<35 n=200		Age>=35 n=85	
	n	%	n	%	n	%
40-40[6]	28	9.8	16	8.0	28	9.8
41-41[6]	218	76.5	153	76.5	218	76.5
42-42[6]	38	13.3	30	15.0	38	13.3

When post-dates was stated to be the primary indication for induction, 10% occurred prior to 41 weeks (up from 7% in 2014) (Table 85).

Mode of birth following induced and spontaneous onset of labour by parity

Figure 69: Mode of birth among intended vaginal births at term by parity and onset of labour (excludes previous Caesarean) NWH 2015



For women expecting their first baby, in spontaneous labour at term, their chance of emergency caesarean is 15%. In women without previous caesarean (nullipara and multipara), the emergency Caesarean rate following induction is higher than following spontaneous onset of labour. However these observational data need to be interpreted with caution. Numerous randomized trials have shown that when labour is induced for an appropriate indication, the Caesarean rate in the induced group is actually lower than the Caesarean rate in the control "conservative management" group.

Figure 70: Mode of birth at term among nullipara by indication for induction NWH 2015

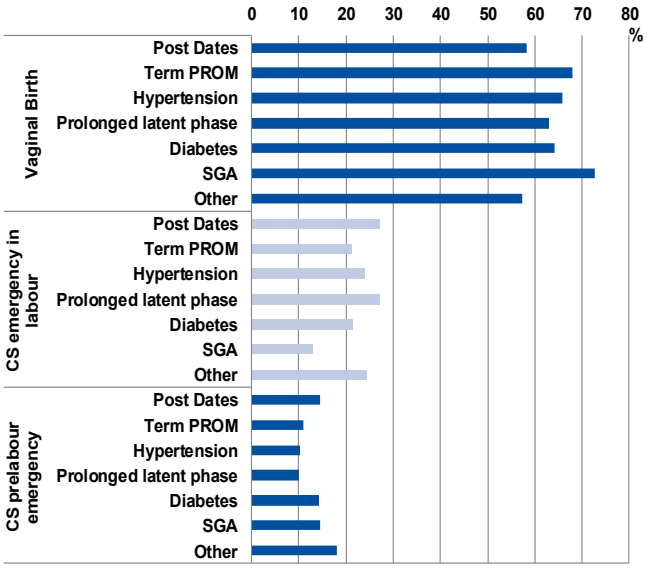
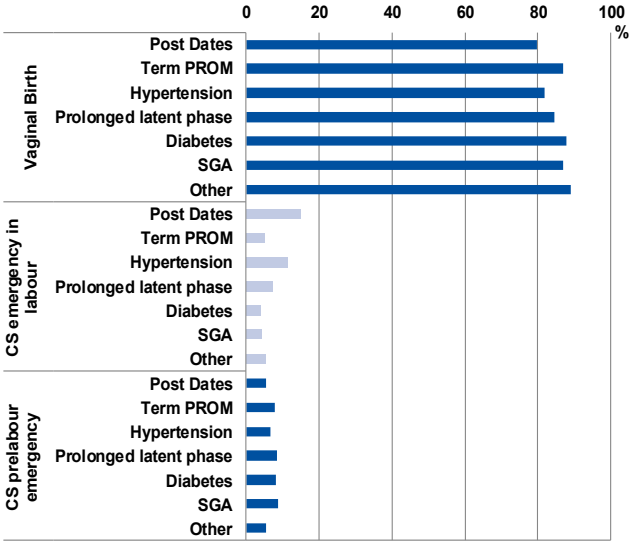


Figure 71: Mode of birth at term among multipara by indication for induction NWH 2015

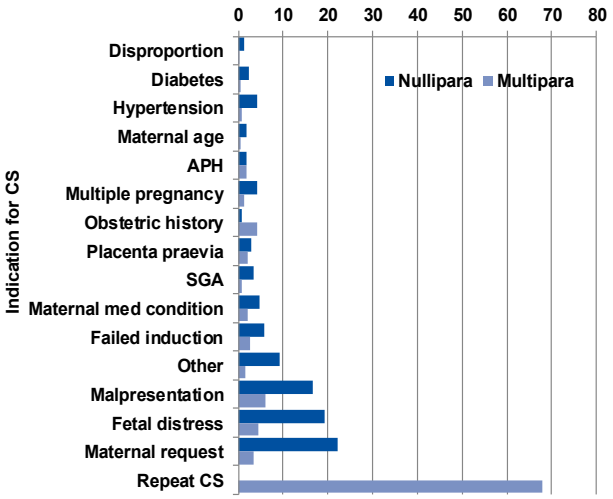


6.2.1 Indication for elective and pre-labour Caesarean section

The largest contributor to overall rate of elective and pre-labour emergency Caesareans as expected was 'repeat Caesarean section'. For multiparous women, 68% of elective and pre-labour Caesarean sections were performed for this indication. For the second year in a row, the next most common indication was maternal request.

It is of concern that at NWH in 2015, 148 nulliparous women had an elective caesarean section for the indication of maternal request; representing 22% of all nulliparous elective or prelabour caesarean sections, and up from 16% in 2012.

Figure 72: Reported primary indication for elective or prelabour CS as proportion of all CS by parity NWH 2015



6.2.2 Use of syntocinon

All data are checked for women who are given syntocinon prior to 3 cm dilatation, to differentiate augmentation from induction of labour.

Table 86: Use of syntocinon by onset of labour and parity NWH 2015

	Total birth	Syntocinon	
	N	n	%
Total	6933	2167	31.3
Induced labour			
Nullipara	1328	993	74.8
Multipara	961	586	61.0
Spontaneous labour			
Nullipara	1505	483	32.1
Multipara	1634	89	5.4

Syntocinon was used to augment spontaneous labour for 32% of nulliparous and 5% of multiparous women. It is possible we have seen a slight reduction from 2014 as a result of the new syntocinon guideline requiring the Delivery Unit Team on call to prescribe syntocinon only after a 3-way discussion in person with the woman and her LMC. However, the use of syntocinon augmentation of labour in multiparous women is open to challenge given international evidence that syntocinon in established labour shortens length of labour but does not increase the vaginal birth rate

Figure 73: Use of syntocinon for induction and augmentation of labour by parity, onset of labour, and LMC NWH 2015

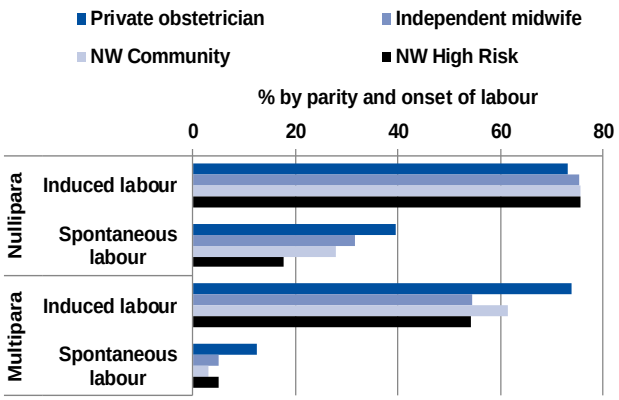
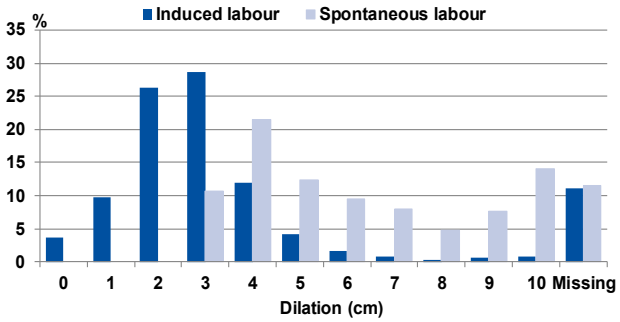


Figure 74: Dilatation at commencement of syntocinon infusion among labouring women by induction status NWH 2015



Summary / Implications

In the 2012 Annual Clinical Report it was stated that "*there is concern that the rate of induction is too high.*" Our service has worked hard over the last few years to increase the proportion of inductions that are guideline-based, to improve the booking of induction of labour, and to improve documentation as to the primary indication for induction. Despite continued increases in induction rates, we hope that we are meeting these goals. In 2016 we will reconvene the induction of labour multidisciplinary working group, with plans to revise the induction of labour guideline to incorporate new evidence on indications for induction (such as macrosomia), increase the use of balloon catheter induction, and make the actual induction processes on WAU more efficient (contact DU Charge Midwife if you want to be involved in this group).

6.3 Data tables: Iatrogenic onset of birth: Induction of labour and pre-labour Caesarean section

Table 87: Maternal demographic characteristics by onset of birth at term NWH 2015

	Total	Spontaneous Labour		Induced labour		CS Elective		CS Emergency before labour	
	N	n	%	n	%	n	%	n	%
Total	6327	2867	45.3	2153	34.0	1151	18.2	156	2.5
Maternal Age									
<=20	157	90	57.3	64	40.8	3	1.9	0	0.0
21-25	610	347	56.9	213	34.9	37	6.1	13	2.1
26-30	1633	861	52.7	559	34.2	172	10.5	41	2.5
31-35	2409	1077	44.7	797	33.1	487	20.2	48	2.0
36-40	1310	467	35.6	439	33.5	361	27.6	43	3.3
41+	222	34	15.3	85	38.3	92	41.4	11	5.0
Ethnicity									
Māori	405	197	48.6	158	39.0	44	10.9	6	1.5
Pacific	728	378	51.9	270	37.1	67	9.2	13	1.8
Asian	1480	759	51.3	438	29.6	252	17.0	31	2.1
Indian	595	249	41.8	240	40.3	80	13.4	26	4.4
European	2851	1148	40.3	965	33.8	667	23.4	71	2.5
Other	282	145	51.4	86	30.5	42	14.9	9	3.2
BMI									
<18.5	234	130	55.6	65	27.8	34	14.5	5	2.1
18.5-24.99	3516	1690	48.1	1103	31.4	640	18.2	83	2.4
25-29.99	1390	589	42.4	487	35.0	266	19.1	48	3.5
30-34.99	605	231	38.2	250	41.3	117	19.3	7	1.2
35-39.99	301	119	39.5	121	40.2	56	18.6	5	1.7
>=40	227	69	30.4	121	53.3	32	14.1	5	2.2
Missing	68	48	70.6	10	14.7	7	10.3	3	4.4
LMC at Birth									
IMW	3108	1761	56.7	1007	32.4	284	9.1	56	1.8
Private Obstetrician	1724	472	27.4	575	33.4	614	35.6	63	3.7
NW Community	1134	543	47.9	383	33.8	183	16.1	25	2.2
NW Medical	210	66	31.4	95	45.2	40	19.0	9	4.3
NW Diabetes	127	5	3.9	90	70.9	30	23.6	2	1.6
Other DHB	6	3	50.0	2	33.3	0	0.0	1	16.7
Unbooked	18	17	94.4	1	5.6	0	0.0	0	0.0

Table 88: Induction of labour rates 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Births	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**	**6933**
Women Induced	1776	1906	2203	2238	2214	2463	2483	2438	2315	2289
Incidence (%)	**24.6**	**24.8**	**29.0**	**28.9**	**28.7**	**32.7**	**32.3**	**33.8**	**31.3**	**33.0**
Total Nullipara	3499	3752	3623	3811	3650	3539	3778	3441	3604	3321
Nullipara Induced	940	1047	1207	1260	1226	1330	1382	1337	1354	1328
Incidence (%)	**26.9**	**27.9**	**33.3**	**33.1**	**33.5**	**37.6**	**36.5**	**38.9**	**37.5**	**40.0**
Total Multipara	3713	3943	3966	3924	4059	3984	3917	3782	3796	3612
Multipara Induced	836	859	996	978	988	1133	1101	1101	961	961
Incidence (%)	**22.5**	**21.8**	**25.1**	**24.9**	**24.3**	**28.4**	**28.1**	**29.1**	**25.3**	**26.6**

Table 89: Indication for induction by gestation NWH 2015

	Preterm n=592		Term n=6341		Total N=6933	
	n	%	n	%	n	%
Total	**132**	**22.3**	**2157**	**34.0**	**2289**	**33.0**
TermPROM	0	0.0	379	6.0	379	5.5
Diabetes	6	1.0	303	4.8	309	4.5
Small for Gestational Age	17	2.9	318	5.0	335	4.8
Post Dates	0	0.0	285	4.5	285	4.1
Hypertension	15	2.5	152	2.4	167	2.4
Prolonged latent phase	7	1.2	195	3.1	202	2.9
Fetal wellbeing	0	0.0	143	2.3	143	2.1
Other	3	0.5	70	1.1	73	1.1
Maternal Age	0	0.0	102	1.6	102	1.5
Maternal Medical Complications	3	0.5	80	1.3	83	1.2
IUD/Fetal Anomaly	33	5.6	21	0.3	54	0.8
PPROM	32	5.4	0	0.0	32	0.5
Maternal Request	0	0.0	52	0.8	52	0.8
Poor Obstetric History	1	0.2	15	0.2	16	0.2
APH	2	0.3	29	0.5	31	0.4
Multiple Pregnancy	13	2.2	13	0.2	26	0.4

Table 90: Indication for induction by parity (term births) NWH 2015

	Nullipara n=3007		Multipara n=3334		Total n=6341	
	n	%	n	%	n	%
Total	**1258**	**41.8**	**899**	**27.0**	**2157**	**34.0**
Term PROM	265	8.8	114	3.4	379	6.0
Diabetes	154	5.1	149	4.5	303	4.8
Small for Gestational Age	179	6.0	139	4.2	318	5.0
Post Dates	192	6.4	93	2.8	285	4.5
hypertension	108	3.6	44	1.3	152	2.4
Prolonged latent phase	111	3.7	84	2.5	195	3.1
Fetal wellbeing	85	2.8	58	1.7	143	2.3
Maternal Age	47	1.6	55	1.6	102	1.6
Other	33	1.1	37	1.1	70	1.1
Maternal Medical Complications	38	1.3	42	1.3	80	1.3
Maternal Request	11	0.4	41	1.2	52	0.8
Poor Obstetric History	0	0.0	15	0.4	15	0.2
APH	18	0.6	11	0.3	29	0.5
IUD/Fetal Anomaly	12	0.4	9	0.3	21	0.3
Multiple Pregnancy	5	0.2	8	0.2	13	0.2

Table 91: Rates of induction by age and ethnicity (prioritised) among term nullipara and multipara (excluding previous Caesarean) NWH 2015

	Term Nullipara	Induction of labour		Term Multipara	Induction of labour	
	N	n	%	N	n	%
Total	**3007**	**1258**	**41.8**	**3334**	**899**	**27.0**
Age						
<=25	455	192	42.2	312	85	27.2
26-30	967	388	40.1	666	171	25.7
31-35	1105	456	41.3	1304	341	26.2
>=35	480	222	46.3	1052	302	28.7
Ethnicity						
Māori	117	48	41.0	288	110	38.2
Pacific	238	111	46.6	490	159	32.4
Other Asian	767	312	40.7	713	126	17.7
Indian	337	157	46.6	258	83	32.2
European	1423	576	40.5	1428	389	27.2
Other	125	54	43.2	157	32	20.4

Table 92: Mode of birth at term by onset of birth and parity (excluding women with prior CS) among intended vaginal births NWH 2015

	Nullipara				Multipara (no prev CS)			
	Spontaneous labour n=1349		Induced labour n=1258		Spontaneous labour n=1527		Induced labour n=899	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB	762	56.5	485	38.6	1344	88.0	724	80.5
Operative vaginal	374	27.7	320	25.4	90	5.9	54	6.0
CS emergency in labour	213	15.8	281	22.3	93	6.1	58	6.5
CS emergency not in labour*	0	0.0	172	13.7	0	0.0	63	7.0
Epidural	781	57.9	1060	84.3	378	24.8	489	54.4

*failed induction rate at term

Table 93: Mode of birth at term among nullipara by indication for induction NWH 2015

	Post dates n=192		Term PROM n=265		Hypertension n=108		Prolonged latent phase n=111		Diabetes n=154		SGA n=179		Other n=249	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	68	35.4	115	43.4	40	37.0	40	36.0	59	38.3	89	49.7	74	29.7
Operative vaginal	44	22.9	65	24.5	31	28.7	30	27.0	40	26.0	41	22.9	69	27.7
CS emergency in labour	52	27.1	56	21.1	26	24.1	30	27.0	33	21.4	23	12.8	61	24.5
CS emergency not in labour*	28	14.6	29	10.9	11	10.2	11	9.9	22	14.3	26	14.5	45	18.1
Epidural	153	79.7	229	86.4	85	78.7	101	91.0	133	86.4	147	82.1	212	85.1

*failed induction rate at term

Table 94: Mode of birth at term among multipara (excluding previous Caesarean) by indication for induction NWH 2015

	Post dates n=84		Term PROM n=97		Hypertension n=38		Prolonged latent phase n=71		Diabetes n=122		SGA n=120		Other n=251	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	68	81.0	85	87.6	32	84.2	64	90.1	68	81.0	85	87.6	32	84.2
Operative vaginal	4	4.8	6	6.2	1	2.6	2	2.8	4	4.8	6	6.2	1	2.6
CS emergency in labour	9	10.7	2	2.1	4	10.5	3	4.2	9	10.7	2	2.1	4	10.5
CS emergency not in labour*	3	3.6	4	4.1	1	2.6	2	2.8	3	3.6	4	4.1	1	2.6
Epidural	39	46.4	51	52.6	21	55.3	47	66.2	39	46.4	51	52.6	21	55.3

*failed induction rate at term

Table 95: Dilatation at start of syntocinon infusion among labouring women by induction status NWH 2015

	Induced labour n=1579		Spontaneous labour n=572	
Dilatation	**n**	**%**	**n**	**%**
0	57	3.6	0	0
1	155	9.8	0	0
2	414	26.2	0	0
3	453	28.7	61	10.7
4	188	11.9	123	21.5
5	66	4.2	71	12.4
6	27	1.7	54	9.4
7	14	0.9	46	8.0
8	6	0.4	27	4.7
9	11	0.7	44	7.7
10	13	0.8	80	14.0
Missing	175	11.1	66	11.5

6.4 Mode of birth

Findings

Figure 75: Mode of birth NWH 1991–2015

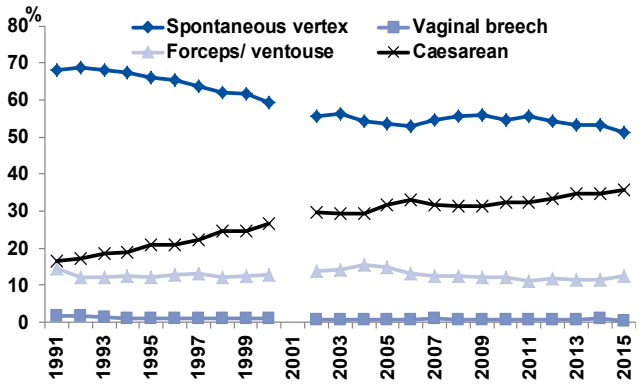


Figure 76: Mode of birth among nullipara NWH 1993-2015

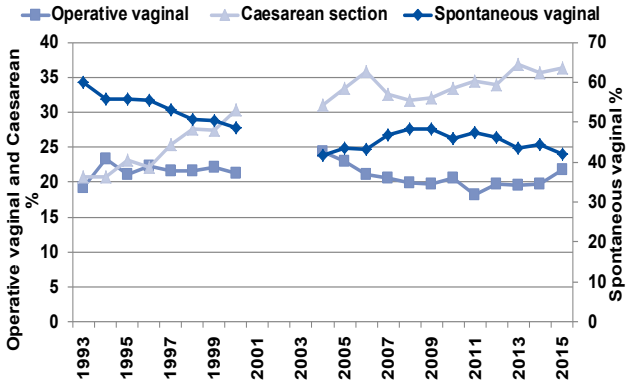
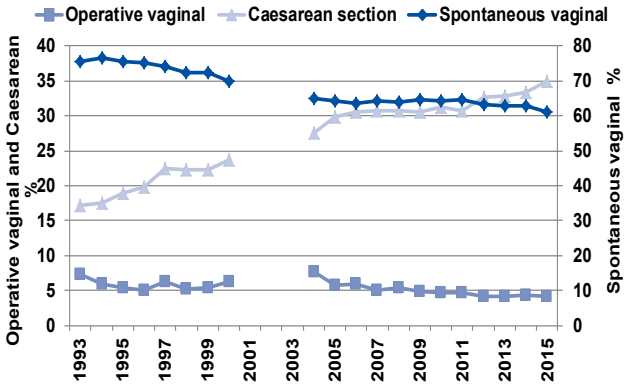
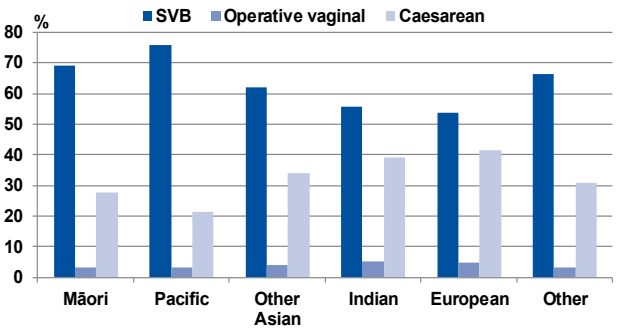


Figure 77: Mode of birth among multipara NWH 1993-2015



In the mid-90s, the overall Caesarean section rate at NWH was around 20%. A peak of 33% was reached in 2006 and since then has been increasing further, with a peak reached in 2015 of 35.6% (score test for trend p<0.001). It is of note that whilst the rate of spontaneous vaginal birth has been stable for multipara over the past decade, it is not possible to be as confident that this will remain the case for nullipara.

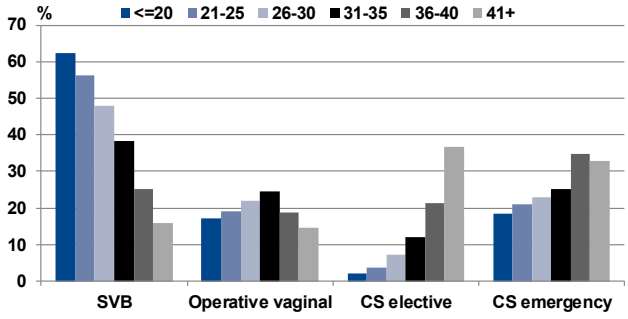
Figure 78: Mode of birth by ethnicity among nulliparous women NWH 2015



As has been the case for many years, Pacific and Māori women have higher rates of spontaneous

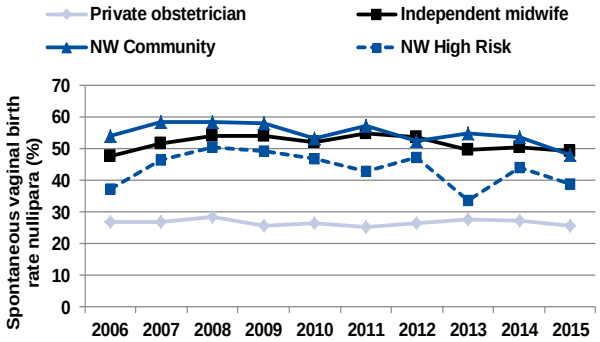
vaginal birth (SVB) than all other ethnic groups (Figure 78).

Figure 79: Mode of birth by maternal age among nullipara NWH 2015



The spontaneous vaginal birth rate falls with increasing age (Figure 79). Operative vaginal birth increases with increasing age until 35 years, beyond which there is a marked increase in elective caesarean section rate.

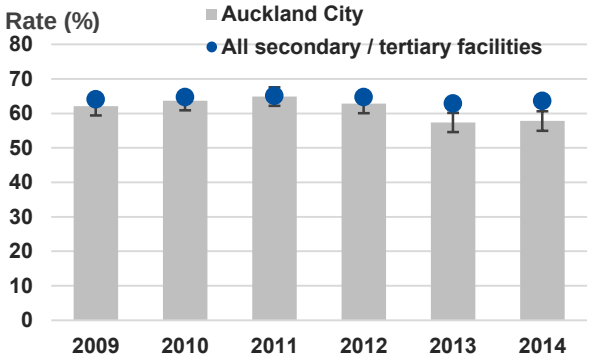
Figure 80: Spontaneous vaginal birth rate among all nullipara by LMC 2015



The group of main concern is nulliparous women with only 41.9% achieving a spontaneous vaginal birth in 2015 (Figure 76).

We can begin to improve this statistic by focusing on reducing primary Caesarean in nullipara. The primary Caesarean rate for nulliparous women who have had labour induced at term is 36% (14% have a failed induction and 22% have emergency caesarean in labour). Are we as practitioners, using evidence based indications for induction of labour in nulliparous women? And why are 'low risk' nulliparous women opting for elective caesarean?

Figure 81: NZ Maternity Indicators 2014: Standard primiparae who have a spontaneous vaginal birth NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for NWH rate.

The spontaneous vaginal birth rate in standard primiparae (as defined by the Ministry of Health) is one of the clinical indicators reported annually by the Ministry of Health as part of the Maternity Quality and Safety Programme. This allows the opportunity to compare ADHB with other secondary/tertiary facilities around NZ. At 57.8%, ADHB was well below the national average (63.6%) in the latest report (2014 data).

Water birth

Thirty seven babies were recorded in the database as having been born in water in 2015. Ten of these were under the care of NWH LMC service, twenty five were under the care of an independent midwife and two were under the care of a private obstetrician.

6.5 Caesarean section

Methods

Since 2004, we have collected data on elective and emergency Caesarean. An elective Caesarean is defined as a Caesarean which was planned in advance and performed either prior to, or after, the onset of labour. An emergency Caesarean is defined as an unplanned Caesarean section that is performed either prior to onset of labour or during labour. Caesarean following failed induction is classified as an emergency Caesarean prior to labour.

Findings

The Caesarean section rate in 2015, at 35.6%, is the highest it has ever been at NWH. The largest contribution to the Caesarean section rate comes from repeat Caesarean. This is followed closely by nullipara having Caesareans before labour or following induction of labour. See Robson groups on the following page which show the contribution of various clinical groupings to the Caesarean section

rate.

Figure 82: Robson groups 1&2: Nulliparous caesarean section rates among singleton cephalic term pregnancies by onset of labour NWH 2004-2015

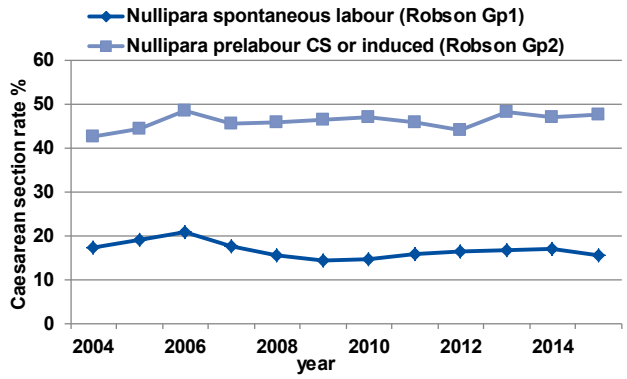
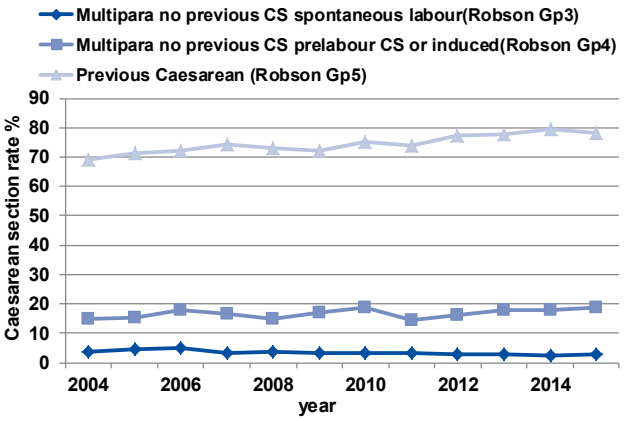


Figure 83: Robson groups 3-5: Multiparous caesarean section rates among singleton cephalic term pregnancies by onset of labour and previous caesarean status NWH 2004-2015



There are differences in the demography of the case loads by LMC eg by age, ethnicity, smoking behavior, socioeconomic status as illustrated and documented in the demography section of this report (Chapter 4). There are also differences in obstetric risk, and these differences probably explain the higher levels of intervention among women labeled NW High Risk in the figures. These women received their primary maternity care from the Diabetes Clinic or the Maternal Fetal Medicine service, were unregistered at the time of birth, or were transferred from other DHBs. The differences between women under private obstetrician and self-employed midwifery or NW Community service primary care are unlikely to explain the differentials in intervention rates and these differences are probably due to variances in the choices made by women and their LMCs.

Figure 84: Caesarean section rate among all nullipara by LMC 2015

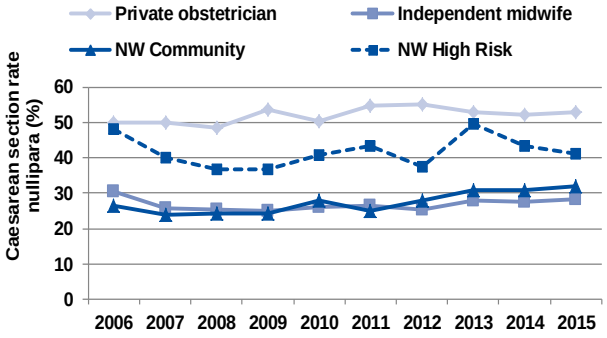
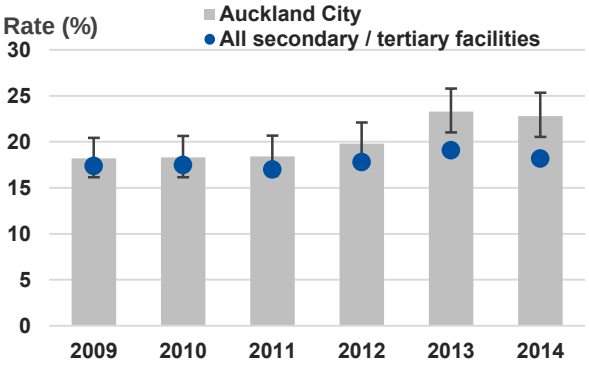


Figure 85: NZ Maternity Indicators 2014: Standard primiparae who undergo caesarean section NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for NWH rate.

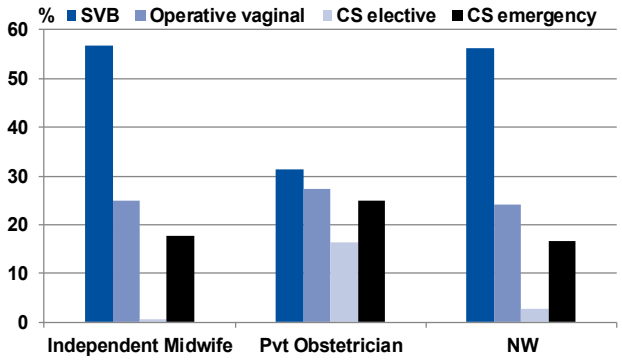
The caesarean section rate in standard primiparae (as defined by the Ministry of Health) is one of the clinical indicators reported annually by the Ministry of Health as part of the Maternity Quality and Safety Programme (Figure 85). This allows the opportunity to compare ADHB with other secondary/tertiary facilities around NZ. At 22.8%, ADHB was well above the national average (18.2%) in the latest report (2014 data).

The last two years, Auckland DHB has had significantly more low risk nulliparous women have a caesarean section compared to similar facilities around New Zealand. It is possible it reflects the demographics of our women (older women, higher BMI, etc.) or the other interventions in labour (induction of labour, epidural in labour). However, we also need to look at our model of care (few birth at a birthing centre, the role of private obstetrics) and to consider whether some of these caesareans were unnecessary. Work can be done on the largest contributor to our emergency caesarean rate such as routine offering of manual rotation of occiput posterior in early second stage of labour, and being more patient during induction and in first and second stages of labour. We could also institute some element of peer review of decisions for caesareans in low risk nulliparous women.

Research evidence is clear that multiple repeat Caesarean sections are strongly associated with adverse maternal outcomes, such as abnormal placentation, postpartum haemorrhage and peripartum hysterectomy.

National Women's supports vaginal birth after Caesarean; see section 6.5.3. We also have a policy of consultant attendance for any possible Caesarean section at full dilatation to ensure robust decision making and safe care. This policy has been more strictly implemented in 2014 since an audit revealed low compliance.

Figure 86: Mode of birth at term by LMC at birth among standard primipara NWH 2015



The standard primipara was defined in order to remove the confounding of maternal age and medical and obstetric complications associated with operative delivery. Figure 86 uses the NWH definition of standard primipara (see APPENDIX 1). Comparing rates of operative delivery by LMC in this group of low-risk women, we can truly understand the variation in practice by LMC. Of the three caregiver groups compared in the figure above, spontaneous vaginal birth rates are lowest, and elective Caesarean section rates highest, for standard primiparae under private specialist obstetrician care. These data support the argument above that the drivers for higher Caesarean section rates among women under private obstetrician LMC care are non-clinical.

Robson 10-group classification 2007-2015

The Robson-10 group classification attempts to "dissect" Caesarean section practice so that the maternity unit can understand trends within similar groups of mothers. The final column shows the contribution to the overall Caesarean section rate from each of these groups of mothers, and shows very clearly the impact of repeat Caesarean section on the Caesarean section rate at NWH.

Table 96: Robson 10-Group Classification NWH 2008-2015

	2008			2009			2010			2011			2012			2013			2014			2015			
Robson Group	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**Contribution to CS rate**
	n	n	%	n	n	%	n	n	%	n	n	%	n	n	%	n	n	%	n	n	%	n	n	%	%
Totals	**2372**	**7589**	**31.3**	**2414**	**7735**	**31.2**	**2491**	**7709**	**32.3**	**2448**	**7523**	**32.5**	**2570**	**7695**	**33.4**	**2506**	**7223**	**34.7**	**2559**	**7400**	**34.6**	**2468**	**6933**	**35.6**	
1 Nullip, singleton, cephalic, term, spontaneous labour	279	1809	15.4	281	1950	14.4	251	1736	14.5	244	1555	15.7	275	1684	16.3	238	1426	16.7	266	1565	17.0	206	1342	15.4	8.3
2 Nullip, singleton, cephalic, term, induced or CS before labour	581	1275	45.6	647	1393	46.4	648	1384	46.8	669	1465	45.7	686	1555	44.1	735	1530	48.0	731	1554	47.0	726	1529	47.5	29.4
3 Multip, singleton, cephalic, no previous CS, term, spontaneous labour	62	1640	3.8	55	1599	3.4	53	1693	3.1	49	1503	3.3	41	1467	2.8	35	1359	2.6	34	1457	2.3	35	1292	2.7	1.4
4 Multip, singleton, cephalic, no previous CS, term, induced or CS before labour	119	806	14.8	144	839	17.2	159	856	18.6	141	977	14.4	154	957	16.1	176	980	18.0	156	868	18.0	165	883	18.7	6.7
5 Previous CS, singleton, cephalic, term	741	1017	72.9	698	967	72.2	757	1005	75.3	752	1016	74.0	757	977	77.5	755	970	77.8	834	1051	79.4	815	1042	78.2	33.0
6 Nullip, singleton, breech	166	195	85.1	164	174	94.3	177	199	88.9	151	172	87.8	186	202	92.1	154	172	89.5	146	167	87.4	137	152	90.1	5.6
7 Multip, singleton, breech (incl prev CS)	135	151	89.4	132	161	82.0	115	141	81.6	117	142	82.4	132	154	85.7	127	147	86.4	101	127	79.5	101	113	89.4	4.1
8 All multiple (incl prev CS)	97	160	60.6	93	159	58.5	104	153	68.0	111	163	68.1	112	163	68.7	91	151	60.3	98	147	66.7	98	137	71.5	4.0
9 All abnormal lie (incl prev CS)	29	32	90.6	55	63	87.3	62	69	89.9	53	56	94.6	40	47	85.1	17	22	80.0	26	27	96.3	22	25	88.0	0.9
10 All preterm singleton cephalic (incl prev CS)	163	504	32.3	145	430	33.7	165	473	34.9	161	474	34.0	187	489	38.2	178	466	38.2	167	437	38.2	163	418	39.0	6.6

6.5.1 Indication for in labour emergency Caesarean section

Figure 87: Indication for in labour emergency Caesarean section NWH 2015

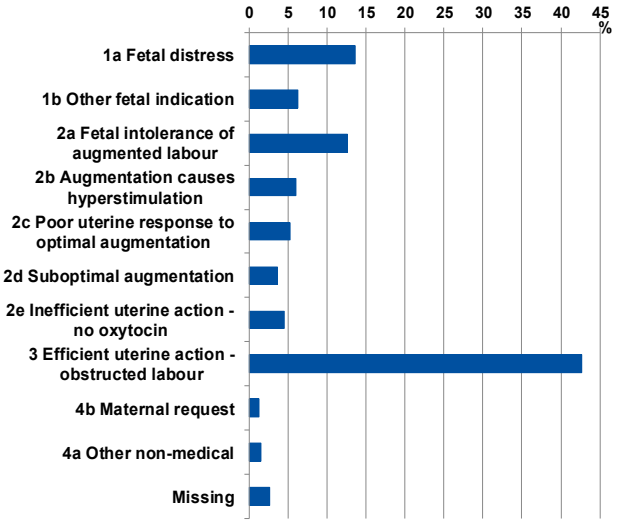


Figure 87 above shows the reasons for emergency Caesarean section in labour, of which the most frequent is still "obstructed labour." Other fetal indications includes all fetal indications where the CTG is not necessarily abnormal e.g. this includes cord prolapse, antepartum haemorrhage, suspected uterine rupture, and also malpresentation such as undiagnosed breech, deflexed OP, and deep transverse arrest.

The data suggest effective use of oxytocin in labour, and the new oxytocin guideline published last year may have further improved caesarean rates for this category.

Caesareans performed for "fetal intolerance" or "fetal distress" where fetal blood sampling (FBS) was not performed may be unnecessary. The use of FBS prior to a conclusive diagnosis of fetal intolerance of augmented labour or fetal distress is to be encouraged when practicable in line with best practice.

6.5.2 Vaginal birth after Caesarean section (VBAC)

The figure which follows looks at trends in trial of labour and VBAC rates at NWH over the years 2006 to 2015 among parity 1 women with a previous CS presenting at term with cephalic singleton pregnancy. The three stacked bars to the left of each figure represent women who present for a trial of labour and the bar to the right represents elective repeat caesarean section. In 2015, of these 740 women, the elective repeat caesarean rate was 63.8%, which may suggest a reversal of the trend of increasing rates since 2006.

Meanwhile, of all women with a previous Caesarean section having a trial of labour, 44% had a vaginal birth in 2006 compared to 66% in 2015. The overall vaginal birth after Caesarean (VBAC) rate was 20.8% in 2015.

Figure 88: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies NWH 2006-2015

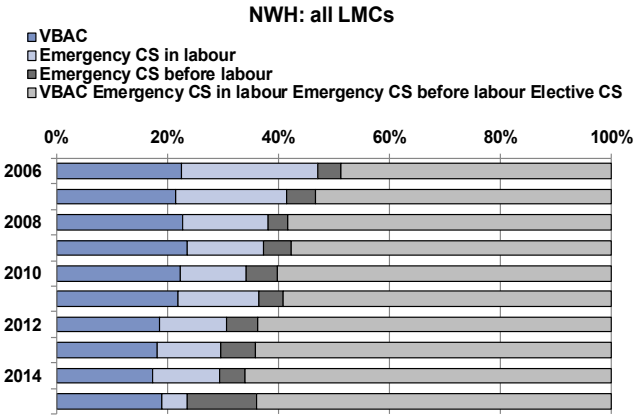


Table 112 and Table 113 and the remaining figures in this section show trends by LMC. Note that this subgroup excludes women with previous vaginal birth and previous VBAC, which is the clinical factor most strongly associated with VBAC. Hence our successful trial of labour rate is on the low end of the range reported in the international literature.

Of these 740 women, 32% had a trial of labour after caesarean (similar to last year). In women who had a trial of labour, 60% had a vaginal birth (compared to 51% in 2014).

Of these 740 women, the rate of planned caesarean prior to labour varied by LMC: 47% for women under the care of independent midwives (down from 50% in 2014), 51% for women under the care of NW (down from 56%), and 86% for women under the care of private obstetricians (up from 84%). The rate of successful trial of labour also varied by LMC: 63% for women under the care of independent midwives (up from 59% in 2014), 46% for women under the care of NW (up from 44%), and 36% for women under the care of private obstetricians (down from 43%). It is challenging to impact the VBAC rate for the hospital when the majority of women with previous caesarean are under the care of private obstetricians.

Of these 740 women, the successful trial of labour rate also varied by mode of onset of labour, from 72% in spontaneous labour to 36% if labour was induced (stable since 2012).

These data inform the patient information booklet available on the national women's website, and should be used to provide consistent counseling to all women with previous caesarean. Of note, the

philosophy of the Positive Birth After Caesarean (PBAC) clinic, which started in February 2011, is to provide evidence-based information about options for mode of birth, make an individualized plan for the woman, and support her choice during pregnancy and in labour.

6.5.3 VBAC rates by LMC

Figure 89: VBAC rates among parity 1 term cephalic singleton previous Caesarean pregnancies – private obstetrician LMC 2006-2015

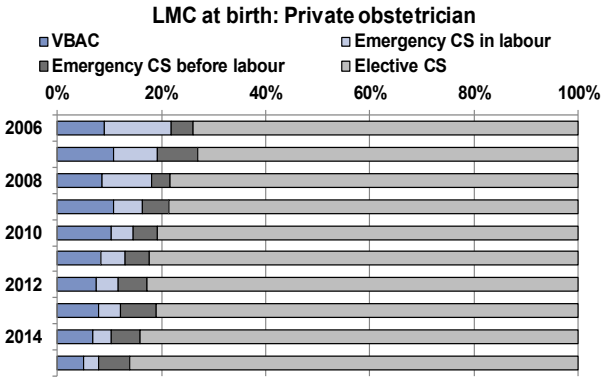


Figure 90: VBAC rates among parity 1 term cephalic singleton previous Caesarean pregnancies – Independent midwife LMC 2006-2015

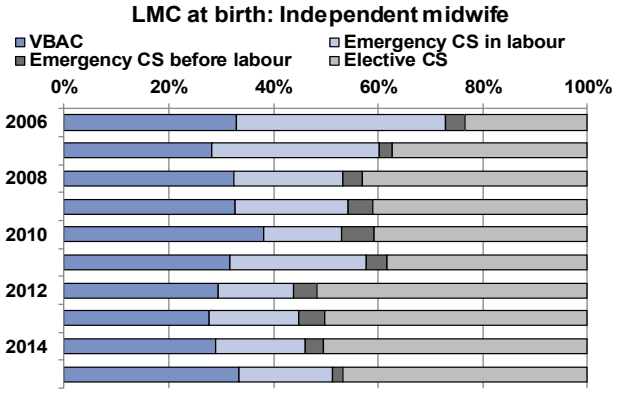
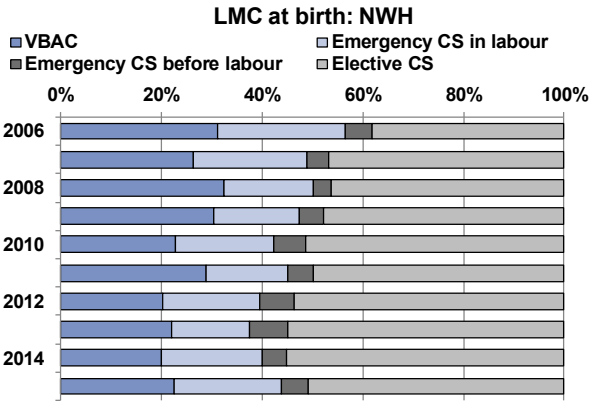


Figure 91: VBAC rates among parity 1 term cephalic singleton previous Caesarean pregnancies – NW primary maternity care 2006-2015



6.6 Data tables: Mode of birth

Table 97: Mode of birth trends NWH 2000-2015 (n = mothers)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of births	7827	7452	7775	7611	7491	7194	7212	7695	7589	7735	7709	7523	7695	7223	7400	6933
	%		%	%	%	%	%	%	%	%	%	%	%	%	%	%
Spontaneous vertex	59.4		55.7	56.1	54.4	53.5	52.9	54.7	55.6	55.8	54.7	55.6	54.2	53.0	53.1	51.3
Vaginal breech	1.1		0.8	0.8	0.7	0.8	0.7	0.9	0.8	0.8	0.8	0.8	0.6	0.8	0.9	0.5
Forceps/ ventouse	12.9		13.9	14.0	15.6	14.2	13.3	12.6	12.4	12.2	12.2	11.1	11.8	11.5	11.5	12.6
Caesarean	26.6		29.6	29.2	29.3	31.6	33.1	31.7	31.3	31.2	32.3	32.5	33.4	34.7	34.6	35.6
Elective					10.4	11.6	12.8	13.4	14.4	14.6	15.9	15.7	16.6	17.0	17.3	18.0
Emergency					18.8	20.0	20.3	18.3	16.9	16.6	16.4	16.8	16.8	17.7	17.3	17.6

From 1998, data exclude postnatal transfers. Data for 2001 are not available.
In the case of twins only one mode of birth is given and mode of birth is prioritised as Caesarean, forceps/ventouse, vaginal breech, then spontaneous vaginal.

Table 98: Spontaneous vaginal birth rates NWH 2005-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total births (mothers)	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**	**6933**
Spontaneous vaginal birth	3866	4282	4280	4374	4217	4243	4218	3884	3992	3594
Incidence %	53.6	55.6	56.4	56.4	55.5	56.4	54.8	53.8	53.9	51.8
Total nullipara	3499	3752	3623	3811	3650	3539	3778	3441	3604	3321
Spontaneous vaginal birth	1509	1755	1749	1839	1675	1674	1746	1501	1603	1392
Incidence %	43.1	46.8	48.3	48.3	45.9	47.3	46.2	43.6	44.5	41.9
Total multipara	3713	3943	3966	3924	4059	3984	3917	3782	3796	3612
Spontaneous vaginal birth	2357	2527	2531	2495	2601	2569	2472	2383	2389	2202
Incidence %	63.5	64.1	63.8	63.6	64.1	64.5	63.1	63.0	62.9	61.0

Table 99: Caesarean section rates NWH 2001-2015

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total births (mothers)	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**	**6933**
Caesarean Sections	*	2301	2219	2193	2273	2390	2438	2372	2414	2491	2448	2570	2506	2559	2468
Incidence %	*	29.6	29.2	29.3	31.6	33.1	31.7	31.3	31.2	32.3	32.5	33.4	34.7	34.6	35.6
Total nullipara	*	*	*	**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**	**3778**	**3441**	**3604**	**3321**
Caesarean	*	*	*	1118	1178	1253	1225	1152	1219	1223	1222	1288	1266	1289	1206
Incidence %	*	*	*	31.1	33.4	35.8	32.6	31.8	32.0	33.5	34.5	34.1	36.8	35.8	36.3
Total elective				233	249	296	310	313	340	383	353	408	396	379	369
Elective %	*	*	*	6.5	7.1	8.5	8.3	8.6	8.9	10.5	10.0	10.8	11.5	10.5	11.1
Total emergency				885	929	957	915	839	879	840	869	880	870	910	837
Emergency %	*	*	*	24.6	26.4	27.4	24.4	23.2	23.1	23.0	24.6	23.3	25.3	25.2	25.2
Total multipara	*	*	*	**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**	**3917**	**3782**	**3796**	**3612**
Caesarean	*	*	*	1075	1095	1137	1213	1220	1195	1268	1226	1282	1240	1270	1262
Incidence %	*	*	*	27.6	29.8	30.6	30.8	30.8	30.5	31.2	30.8	32.7	32.8	33.5	34.9
Total elective				548	584	628	720	780	792	843	830	868	831	902	878
Elective %	*	*	*	14.1	15.9	16.9	18.3	19.7	20.2	20.8	20.8	22.2	22.0	23.8	24.3
Total emergency				527	511	509	493	440	403	425	396	414	409	368	384
Emergency %	*	*	*	13.5	13.9	13.7	12.5	11.1	10.2	10.5	9.9	10.6	10.8	9.7	10.6

From 1998, data excludes postnatal transfers. * Data not available

Table 100: Mode of birth by parity and previous Caesarean section status NWH 2015

	Nullipara preterm n=314		Nullipara term n=3007		Multipara no prev CS preterm n=185		Multipara no prev CS term n=2230		Multipara prev CS preterm n=93		Multipara prev CS term n=1104	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Spontaneous vertex	127	40.4	1247	41.5	102	55.1	1899	85.2	16	17.2	165	14.9
Vaginal breech	18	5.7	0	0.0	12	6.5	4	0.2	4	4.3	0	0.0
Operative vaginal birth	29	9.2	694	23.1	3	1.6	81	3.6	1	1.1	63	5.7
Ventouse	12	3.8	455	15.1	1	0.5	60	2.7	0	0.0	38	3.4
Forceps	17	5.4	239	7.9	2	1.1	21	0.9	1	1.1	25	2.3
Caesarean section	140	44.6	1066	35.5	68	36.8	246	11.0	72	77.4	876	79.3
Emergency	99	31.5	738	24.5	49	26.5	126	5.7	37	39.8	172	15.6
Elective	41	13.1	328	10.9	19	10.3	120	5.4	35	37.6	704	63.8

Table 101: LMC by parity and previous Caesarean section status NWH 2015

	IMW n=3341		Pvt Obstetrician n=1854		GP n=16		NWH n=1661		Other DHB n=32		Unbooked n=29	
	n	%	n	%	n	%	n	%	n	%	n	%
Primipara	1742	52.1	918	49.5	5.0	31.3	629	37.9	18	56.3	9	31.0
Standard primipara	680	20.4	306	16.5	3.0	18.8	455	27.4	0	0.0	3	10.3
Multipara	1599	47.9	936	50.5	11.0	68.8	1032	62.1	14	43.8	20	69.0
Previous CS	369	11.0	444	23.9	3.0	18.8	377	22.7	2	6.3	2	6.9
No prev CS	1230	36.8	492	26.5	8.0	50.0	655	39.4	12	37.5	18	62.1

Table 102: Mode of birth at term by LMC at birth (nullipara) NWH 2015

	IMW n=1640		Pvt Obstetrician n=849		GP n=5		NWH n=541		Other DHB n=3		Unbooked n=5	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	783	48.8	213	25.1	2	40.0	244	45.1	2	66.7	3	60.0
Vaginal breech	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Forceps	117	7.3	74	8.7	0	0.0	48	8.9	0	0.0	0	0.0
Ventouse	262	16.3	118	13.9	1	20.0	73	13.5	0	0.0	1	20.0
CS elective	72	4.5	220	25.9	0	0.0	36	6.7	0	0.0	0	0.0
CS emergency	370	23.1	224	26.4	2	40.0	140	25.9	1	33.3	1	20.0

Table 103: Mode of birth at term by LMC at birth (standard primipara) NWH 2015

	IMW n=680		Pvt Obstetrician n=306		GP n=3		NWH n=174		Other DHB n=0		Unbooked n=3	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	386	56.8	96	31.4	1	33.3	98	56.3	0	0.0	2	66.7
Vaginal breech	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Forceps	55	8.1	30	9.8	0	0.0	16	9.2	0	0.0	0	0.0
Ventouse	115	16.9	54	17.6	0	0.0	26	14.9	0	0.0	1	33.3
CS elective	4	0.6	50	16.3	0	0.0	5	2.9	0	0.0	0	0.0
CS emergency	120	17.6	76	24.8	2	66.7	29	16.7	0	0.0	0	0.0

Table 104: Mode of birth at term by LMC at birth (multipara, no previous CS) NWH 2015

	IMW n=1161		Pvt Obstetrician n=463		GP n=6		NWH n=584		Other DHB n=3		Unbooked n=13	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	1017	87.6	363	78.4	6	100.0	497	85.1	3	100.0	13	100.0
Vaginal breech	2	0.2	0	0.0	0	0.0	2	0.3	0	0.0	0	0.0
Forceps	9	0.8	8	1.7	0	0.0	4	0.7	0	0.0	0	0.0
Ventouse	28	2.4	20	4.3	0	0.0	12	2.1	0	0.0	0	0.0
CS elective	50	4.3	43	9.3	0	0.0	27	4.6	0	0.0	0	0.0
CS emergency	55	4.7	29	6.3	0	0.0	42	7.2	0	0.0	0	0.0

Table 105: Mode of birth at term by LMC at birth (multipara, previous CS) NWH 2015

	IMW n=343		Pvt Obstetrician n=412		GP n=3		NWH n=346		Other DHB n=0		Unbooked n=0	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	84	24.5	17	4.1	0	0.0	64	18.5	0	0.0	0	0.0
Vaginal breech	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Forceps	14	4.1	3	0.7	0	0.0	8	2.3	0	0.0	0	0.0
Ventouse	18	5.2	2	0.5	1	33.3	17	4.9	0	0.0	0	0.0
CS elective	162	47.2	351	85.2	1	33.3	190	54.9	0	0.0	0	0.0
CS emergency	65	19.0	39	9.5	1	33.3	67	19.4	0	0.0	0	0.0

Table 106: Mode of birth by ethnicity NWH 2015

	Māori n=469		Pacific n=805		Other Asian n=1581		Indian n=660		European n=3118		Other n=300	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	304	64.8	552	68.6	835	52.8	296	44.8	1418	45.5	151	50.3
Vaginal breech	2	0.4	8	1.0	5	0.3	7	1.1	15	0.5	1	0.3
Forceps	8	1.7	28	3.5	53	3.4	42	6.4	159	5.1	15	5.0
Ventouse	19	4.1	36	4.5	137	8.7	64	9.7	284	9.1	26	8.7
CS elective	55	11.7	74	9.2	264	16.7	91	13.8	720	23.1	43	14.3
CS emergency	81	17.3	107	13.3	287	18.2	160	24.2	522	16.7	64	21.3

Table 107: Mode of birth by ethnicity (nullipara) NWH 2015

	Māori n=136		Pacific n=271		Other Asian n=820		Indian n=382		European n=1578		Other n=134	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	74	54.4	153	56.5	364	44.4	144	37.7	598	37.9	41	30.6
Vaginal breech	2	1.5	3	1.1	3	0.4	4	1.0	5	0.3	1	0.7
Forceps	3	2.2	22	8.1	48	5.9	38	9.9	130	8.2	15	11.2
Ventouse	13	9.6	25	9.2	112	13.7	54	14.1	242	15.3	21	15.7
CS elective	10	7.4	12	4.4	79	9.6	28	7.3	227	14.4	13	9.7
CS emergency	34	25.0	56	20.7	214	26.1	114	29.8	376	23.8	43	32.1

Table 108: Mode of birth by ethnicity (multipara) NWH 2015

	Māori n=333		Pacific n=534		Other Asian n=761		Indian n=278		European n=1540		Other n=166	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	230	69.1	399	74.7	471	61.9	152	54.7	820	53.2	110	66.3
Vaginal breech	0	0.0	5	0.9	2	0.3	3	1.1	10	0.6	0	0.0
Forceps	5	1.5	6	1.1	5	0.7	4	1.4	29	1.9	0	0.0
Ventouse	6	1.8	11	2.1	25	3.3	10	3.6	42	2.7	5	3.0
CS elective	45	13.5	62	11.6	185	24.3	63	22.7	493	32.0	30	18.1
CS emergency	47	14.1	51	9.6	73	9.6	46	16.5	146	9.5	21	12.7

Table 109: Mode of birth by maternal age (nullipara) NWH 2015

	<=20 n=146		21-25 n=374		26-30 n=1046		31-35 n=1208		36-40 n=471		>40 n=76	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	89	61.0	207	55.3	496	47.4	457	37.8	114	24.2	11	14.5
Vaginal breech	2	1.4	3	0.8	4	0.4	4	0.3	4	0.8	1	1.3
Forceps	10	6.8	28	7.5	79	7.6	99	8.2	37	7.9	3	3.9
Ventouse	15	10.3	43	11.5	151	14.4	198	16.4	52	11.0	8	10.5
CS elective	3	2.1	14	3.7	77	7.4	147	12.2	100	21.2	28	36.8
CS emergency	27	18.5	79	21.1	239	22.8	303	25.1	164	34.8	25	32.9

Table 110: Mode of birth by maternal age (multipara) NWH 2015

	<=20 n=41		21-25 n=303		26-30 n=710		31-35 n=1415		36-40 n=964		>40 n=179	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	33	80.5	234	77.2	493	69.4	841	59.4	517	53.6	64	35.8
Vaginal breech	0	0.0	1	0.3	5	0.7	7	0.5	6	0.6	1	0.6
Forceps	0	0.0	4	1.3	6	0.8	20	1.4	15	1.6	4	2.2
Ventouse	0	0.0	9	3.0	18	2.5	37	2.6	28	2.9	7	3.9
CS elective	1	2.4	26	8.6	108	15.2	372	26.3	296	30.7	75	41.9
CS emergency	7	17.1	29	9.6	80	11.3	138	9.8	102	10.6	28	15.6

Table 111: VBAC: Mode of birth among prior Caesarean pregnancies by mode of onset of birth (n=1197) NWH 2015

Previous Caesarean (1 or more), all gestations										
	Spontaneous labour n=256		Induced labour n=124		CS elective n=739		CS emergency before onset of labour n=78		Total n=1197	
	n	%	n	%	n	%	n	%	n	%
SVB	137	53.5	48	38.7	0	0	0	0	185	15.5
Operative vaginal birth	52	20.3	12	9.7	0	0	0	0	64	5.3
CS elective	0	0.0	0	0.0	739	100	0	0	739	61.7
CS emergency	67	26.2	64	51.6	0	0	78	100	209	17.5

Table 112: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by mode of onset of birth (n=740) NWH 2015

Parity 1, previous Caesarean, singleton, cephalic, term										
	Spontaneous labour n=155		Induced labour n=80		CS elective n=472		CS emergency before onset of labour n=33		Total n=740	
	n	%	n	%	n	%	n	%	n	%
SVB	63	40.6	20	25.0	0	0	0	0	83	11.2
Operative vaginal birth	49	31.6	9	11.3	0	0	0	0	58	7.8
CS elective	0	0.0	0	0.0	472	100	0	0	472	63.8
CS emergency	43	27.7	51	63.8	0	0	33	100	127	17.2

Table 113: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by LMC at birth (n=740) NWH 2015

Parity 1, previous Caesarean, singleton, cephalic, term								
	IMW n=248		Pvt Obstetrician n=303		NW n=187		Total n=740	
	n	%	n	%	n	%	n	%
SVB	53	21.4	11	3.6	19	10.2	83	11.2
Operative vaginal birth	30	12.1	4	1.3	23	12.3	58	7.8
CS elective	116	46.8	261	86.1	95	50.8	472	63.8
CS emergency	49	19.8	27	8.9	50	26.7	127	17.2

* National Women's patients include Community, Medical and Diabetic

Table 114: Primary indication for elective or pre labour emergency Caesarean section (all gestations) NWH 2015

	Total N=1749		Nullipara n=666		Multipara n=1083	
	n	%	n	%	n	%
Abruption/APH	33	1.9	12	1.8	21	1.9
Diabetes	20	1.1	15	2.3	5	0.5
Disproportion	10	0.6	8	1.2	2	0.2
Failed Induction	67	3.8	38	5.7	29	2.7
Fetal Distress	176	10.1	128	19.2	48	4.4
Hypertension	35	2.0	27	4.1	8	0.7
Malpresentation	176	10.1	110	16.5	66	6.1
Maternal Age	16	0.9	12	1.8	4	0.4
Maternal Medical Condition	54	3.1	32	4.8	22	2.0
Maternal Request	184	10.5	148	22.2	36	3.3
Multiple Pregnancy	40	2.3	27	4.1	13	1.2
Obstetric History	50	2.9	5	0.8	45	4.2
Placenta Praevia with or without bleeding	43	2.5	20	3.0	23	2.1
Repeat Caesarean Section	735	42.0		0.0	735	67.9
Small for Gestational Age	31	1.8	22	3.3	9	0.8
Other (please specify)	79	4.5	62	9.3	17	1.6

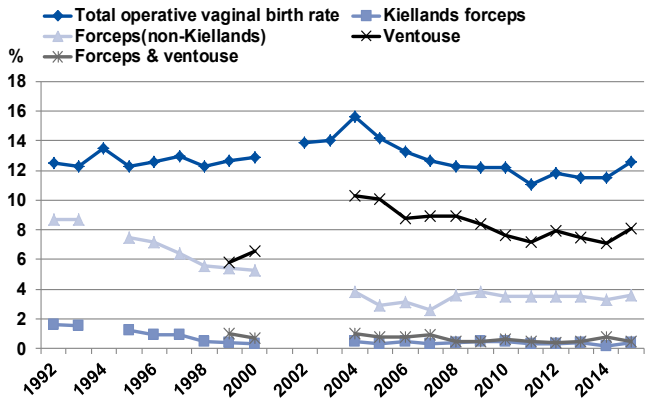
Table 115: Indication for in labour emergency Caesarean section all gestations (spontaneous or induced onset of labour) (n=719) NWH 2015

	n=719	
	n	%
1a Fetal distress	98	13.6
1b Other fetal indication	45	6.3
2a Fetal intolerance of augmented labour	91	12.7
2b Augmentation causes hyperstimulation	43	6.0
2c Poor uterine response to optimal augmentation	38	5.3
2d Suboptimal augmentation	26	3.6
2e Inefficient uterine action - no oxytocin	32	4.5
3 Efficient uterine action - obstructed labour	307	42.7
4b Maternal request	9	1.3
4a Other non-medical	11	1.5
Missing	19	2.6

6.7 Instrumental vaginal birth

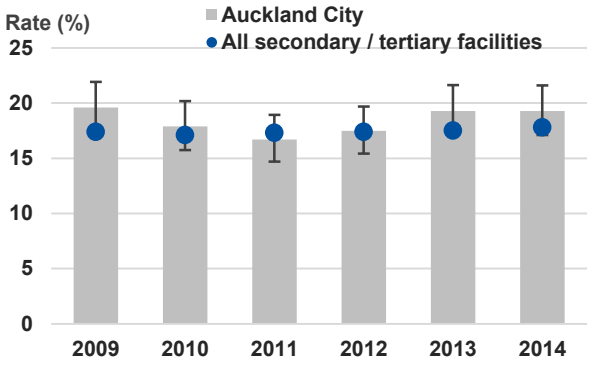
The rate of instrumental delivery has been fairly stable over recent years. In 2015, 16.8% of women who planned a vaginal birth had an instrumental delivery. Of all women giving birth, the instrumental delivery rate was slightly higher than last year (Figure 92). This is due to an increase in both forceps and ventouse deliveries. Combined with the slight increase in caesarean section rate, the spontaneous vaginal birth rate has actually decreased to our lowest rate ever (51.8%).

Figure 92: Operative vaginal birth NWH 1992-2015



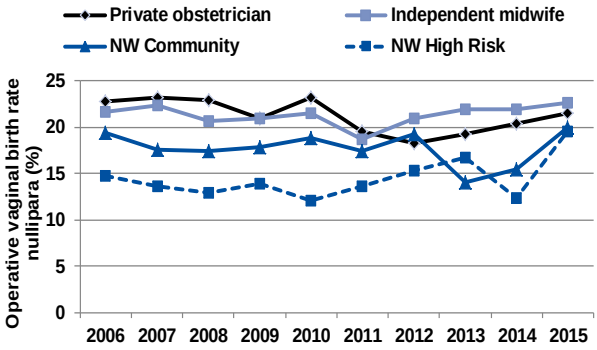
The instrumental delivery rate in standard primiparae is one of the clinical indicators reported annually by the Ministry of Health as part of the Maternity Quality and Safety Programme. This allows the opportunity to compare ADHB with other secondary/tertiary facilities around NZ. At 19.3%, ADHB was on par with the national average (17.8%) in the latest report (2014 data).

Figure 93: NZ Maternity Indicators 2014: Standard primiparae who undergo an instrumental vaginal birth NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for NWH rate.

Figure 94: Operative vaginal birth rate among all nullipara by LMC 2015



6.7.1 Double instrumental and attempted instrumental prior to emergency Caesarean births

These data apply to the birth of a baby using more than one instrument (eg ventouse and forceps, or different types of forceps) and to birth of a baby by

Caesarean section after an attempted vaginal instrumental birth.

Of 5184 women attempting a vaginal birth in 2015, only 32 women had a double instrumental delivery, and only 27 women had an emergency caesarean following a failed instrumental attempt. These low proportions are reassuring.

Figure 95: Maternal outcomes following double or single instrumental vaginal birth, attempted instrumental vaginal birth prior to emergency Caesarean section and emergency Caesarean section in labour NWH 2015

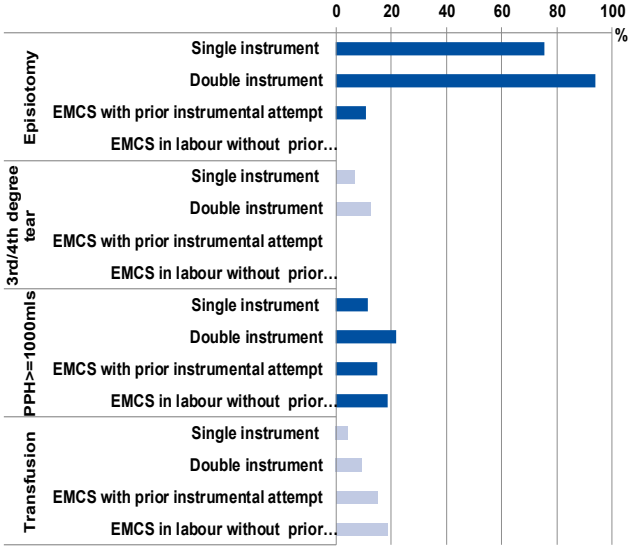
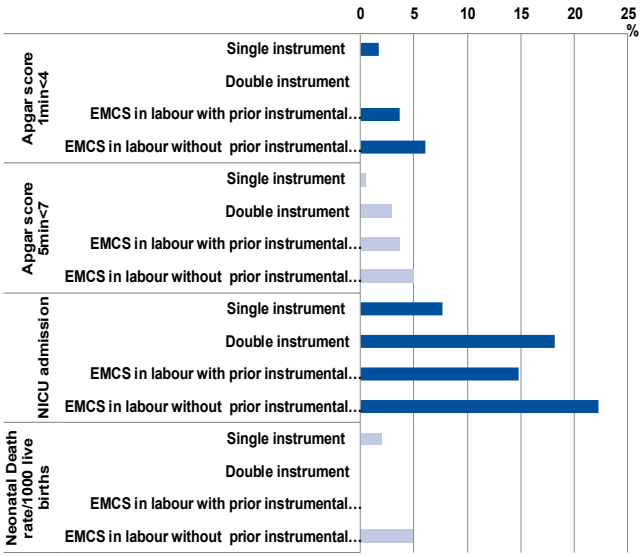


Figure 96: Neonatal outcomes following double or single instrumental vaginal birth, attempted instrumental vaginal birth prior to emergency Caesarean section and emergency Caesarean section in labour NWH 2015



6.8 Breech presentation

6.8.1 Breech birth

In 2015, 10% of breech babies were born vaginally. However, 99% of women with breech presentation at term were delivered by caesarean. Considerable effort is made in counselling and advising women who wish to attempt vaginal breech birth. All of our obstetricians support women having the option for vaginal breech birth should they wish to make this choice, however, not all are confident and skilled at performing vaginal breech birth. Breech birth workshops have been held over the last few years to try to address this issue.

6.8.2 External cephalic version

This section reports statistics relating to women who attended the Day Assessment Unit at NWH for external cephalic version (ECV) for breech presentation. Data regarding ECV are captured directly into Healthware at the time of the procedure.

International and local guidelines recommend that women with persistent breech presentation at term be referred for ECV.

Findings

In 2015, a total of 104 women were referred for ECV (43%), an increasing trend over recent years. The ECV success rate was 49%, consistent with international literature (50-60%). Most ECVs were attempted at 36-37 weeks (range 35 to 40 weeks gestation). The majority of ECVs were attempted by one operator but increasing numbers of obstetricians are gaining experience in this technique.

Table 116: Mode of birth following attempted ECV NWH 2015

	Failed ECV n=53		Successful ECV n=51	
	n	%	n	%
Type of Birth				
Vaginal	2	3.8	35	68.6
SVB	2	3.8	25	49.0
Operative vaginal	0	0.0	10	19.6
CS elective	41	77.4	4	7.8
CS emergency	10	18.9	12	23.5

Descent of the breech into the pelvis is associated with unsuccessful ECV. If there was no descent, the success rate was 67% compared with 0% if there was any descent at all (consistent with previous findings). This is consistent with data published from a NWH study (2008) reporting an unengaged presenting part to be the strongest predictor for successful ECV.

Ninety two percent of successful ECVs remained cephalic at the time of birth, and six women whose ECV was unsuccessful also had a cephalic presentation at birth. Of the 51 women who had a successful ECV, 35 had a vaginal birth (69%). This is consistent with the range of rates reported internationally (63-85%).

There was no statistically significant association between ECV among women with singleton breech at term (n=242) and maternal age, ethnicity, or BMI. There was a significant difference by LMC at birth, ranging from 60% of women under the care of an independent midwife to 23% of women under the care of a private obstetrician. Only 16% (7/44) of women with prior Caesarean were referred for ECV compared to 49% (97/198) of women with no prior caesarean. There is no evidence from the international literature that a history of previous Caesarean section is a contraindication for ECV.

ECV continues to be a safe procedure at NWH, effective in reducing the number of breech presentations at birth and the number of caesareans performed. The challenge still remains to increase the numbers of women undergoing attempted ECV. We are excited to see that in 2015 almost one in two women was referred for ECV, compared to one in three women a few years ago. We commend the work and effort put into the governance of, and the implementation of, the ECV clinical pathway. In future, we will be developing an informational video for the NWH website of a woman having an ECV.

Labour and Birth Summary / Implications

The Caesarean section rate continues to increase and has reached an all-time high in 2015. The leading contributors to the total rate are multipara having repeat Caesarean, and nullipara having Caesarean before labour or following induction of labour. Work is planned to explore the reasons for nullipara making a maternal request for elective Caesarean (which is now the second most common indication for elective Caesarean) and to audit emergency Caesarean among induced nullipara.

Although one third of all women giving birth at NWH had an induction of labour, we will be auditing the proportion that meets our guidelines for indication. We will endeavour to reduce the proportion of inductions and elective caesareans being performed at less than 39 weeks, consistent with best practice.

Seventy percent of women with one previous Caesarean section opt for elective Caesarean for their next birth, and this is consistent over the years. This is despite the fact that most women who try for VBAC will have a vaginal birth regardless of the reason for their first Caesarean. More women with previous Caesarean eligible for trial of labour should be counselled and supported about this option, especially those under the care of private obstetricians who have the lowest rates of trial of labour after caesarean, and successful trial of labour.

There is a marked difference in intervention rates by LMC, with the highest rates of emergency Caesarean, and episiotomy, seen among women under the care of private obstetricians. The newly developed Private Obstetricians Governance Group has been formed to discuss issues pertaining to the needs of their practices and the women under their care.

The referral rate for ECV among women with breech presentation at term continues to increase. Almost half of women with breech presentation at term had an attempt at ECV, and almost half were successful (even in nulliparous women). More women with breech presentation, if suitable, should be referred for consultation about ECV.

6.9 Data tables: Operative vaginal birth, Vaginal breech birth

Table 117: Operative vaginal birth rates 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total births (mothers)	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**	**6933**
Total operative vaginal births	956	975	937	947	942	832	907	833	849	871
Incidence %	13.3	12.7	12.3	12.2	12.2	11.1	11.8	11.5	11.5	12.6
Total nullipara	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**	**3778**	**3441**	**3604**	**3321**
Operative vaginal births	737	772	722	753	752	643	744	674	712	723
Nulliparous operative vaginal birth rate (%)	21.1	20.6	19.9	19.8	20.6	18.2	19.7	19.6	19.8	21.8
Total multipara	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**	**3917**	**3782**	**3796**	**3612**
Operative vaginal births	219	203	215	194	190	189	163	159	137	148
Multiparous operative vaginal birth rate (%)	5.9	5.1	5.4	4.9	4.7	4.7	4.2	4.2	3.6	4.1

Table 118: Type of operative vaginal birth 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total births	**7212**	**7695**	**7589**	**7753**	**7709**	**7523**	**7695**	**7223**	**7400**	**6933**
Total operative vaginal births	956	975	937	947	942	832	907	833	849	871
% of all births	13.3	12.7	12.3	12.2	12.2	11.1	11.8	11.5	11.5	12.6
Total forceps alone	256	222	301	339	308	288	267	256	259	275
% of all births	3.5	2.9	4.0	4.0	4.0	3.8	3.5	3.5	3.5	4.0
Kiellands forceps	33	22	29	42	38	25	22	31	13	26
% of all births	0.5	0.3	0.4	0.5	0.5	0.3	0.3	0.4	0.2	0.4
Other forceps	223	200	272	297	270	263	245	225	246	249
% of all births	3.1	2.6	3.6	3.8	3.5	3.5	3.2	3.1	3.3	3.6
Ventouse alone or forceps	700	753	677	650	634	544	640	577	588	596
% of all births	9.7	9.8	8.9	8.4	8.3	7.2	8.3	8.0	7.9	8.6
Ventouse alone	639	686	636	608	584	509	606	540	527	564
% of all births	8.9	8.9	8.4	7.8	7.6	6.8	7.9	7.5	7.1	8.1
Forceps+ventouse	61	67	41	35	50	35	34	37	61	32
% of all births	0.8	0.9	0.5	0.5	0.6	0.5	0.4	0.5	0.8	0.5

Table 119: Maternal outcomes following double and single instrumental vaginal birth, attempted instrumental vaginal birth prior to emergency Caesarean section and emergency Caesarean section in labour NWH 2015

	Single instrument (vaginal birth) n=839		Double instrument (vaginal birth) n=32		Emergency Caesarean with prior instrumental attempt n=27		Emergency Caesarean in labour without prior instrumental n=1194	
	n	%	n	%	n	%	n	%
Episiotomy	634	75.6	30	93.8	3	11	0	
Third or fourth degree tear	56	6.7	4	12.5	0		0	
PPH>=1000mls	96	11.4	7	21.9	4	14.8	224	18.8
Transfusion	38	4.5	3	9.4	4	14.8	38	3.2

Table 120: Neonatal outcomes following double and single instrumental vaginal birth, attempted instrumental vaginal birth prior to emergency Caesarean section and emergency Caesarean section in labour NWH 2015

	Single instrument (vaginal birth) n=841		Double instrument (vaginal birth) n=33		Emergency Caesarean with prior instrumental attempt n=27		Emergency Caesarean in labour without prior instrumental n=1229	
	n	%	n	%	n	%	n	%
Apgar score 1min <4	14	1.7	0		1	3.7	75	6.1
Apgar score 5min <7	4	0.5	1	3.0	1	3.7	62	5.0
NICU admission	65	7.7	6	18.2	4	14.8	274	22.3
Neonatal Death rate (/1000 live births)	2	2.0	0		0		6	4.9

Table 121: Breech birth 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total babies born	7379	7875	7753	7897	7866	7690	7863	7377	7551	7074
Total breech births	419	449	439	335	434	406	463	401	367	345
Percent of total births	5.7	5.7	5.7	4.2	5.5	5.2	5.9	5.4	4.9	4.9
Total singleton babies	7050	7518	7427	7576	7556	7360	7533	7072	7253	6796
Total singleton breech	328	351	346	335	340	310	356	319	294	265
Percent of singletons	4.7	4.7	4.7	4.4	4.3	4.2	4.7	4.5	4.1	3.9
Total multiple babies	329	357	324	321	310	330	330	305	298	278
Total multiple breech	91	98	93	89	94	96	107	82	73	80
Percent of multiple births	27.7	27.5	28.7	27.7	30.3	34.3	32.4	26.9	24.5	28.8

Table 122: Mode of birth by breech presentation (singletons) NWH 2015

	N	Total breech	% Breech/total singleton birth	Breech & CS	% CS/total breech
Total singleton births	6796	265	4	238	90
20-24 weeks	40	13	33	1	8
25-31 weeks	111	25	23	18	72
32-36 weeks	345	36	10	30	83
>=37 weeks	6300	191	3	189	99

Table 123: Mode of birth by type of breech (singletons only) NWH 2015

	Extended leg n=133		Flexed leg n=78		Unspecified n=54		Total breech n=265	
	n	%	n	%	n	%	n	%
Vaginal breech	15	11.3	8	10.3	4	7.4	27	10.2
Caesarean	118	88.7	70	89.7	50	92.6	238	89.8
CS emergency	38	28.6	26	33.3	14	25.9	78	29.4
CS elective	80	60.2	44	56.4	36	66.7	160	60.4

Table 124: Mode of birth by type of breech (multiples only) NWH 2015

	Extended leg n=22		Flexed leg n=33		Unspecified n=25		Total breech n=80	
	n	%	n	%	n	%	n	%
Vaginal breech	8	36.4	4	12.1	0	0.0	12	15.0
Caesarean	14	63.6	29	87.9	25	100.0	68	85.0
CS emergency	6	27.3	10	30.3	8	32.0	24	30.0
CS elective	8	36.4	19	57.6	17	68.0	44	55.0

Table 125: Referral for ECV (women at term with singleton breech presentation or attempted ECV) by demographic and clinical characteristics NWH 2015

	Singleton breech at term or attempted ECV N=242	ECV n=104		No ECV n=138	
		n	%	n	%
Age (years					
≤ 20	1	1	100	0	0
21-30	74	34	46	40	54
31-40	161	67	42	94	58
≥ 41	6	2	33	4	67
Ethnicity (prioritised)					
Māori/ Pacific Island	26	8	31	18	69
Other Asian	52	25	48	27	52
Indian	23	11	48	12	52
NZ/Other European	136	57	42	79	58
Other	5	3	60	2	40
BMI					
<18.5	5	2	40	3	60
18.5-24.99	153	69	45	84	55
>=25-29.99	49	21	43	28	57
30-34.99	18	6	33	12	67
35-39.99	10	5	50	5	50
>=40	6	1	17	5	83
missing	1	0	0	1	100
LMC at birth					
Independent MW	111	67	60	44	40
NWH Community	35	12	34	23	66
NWH Diabetes/Medical	16	7	44	9	56
Private Obstetrician	80	18	23	62	78
Previous CS					
Yes	44	7	16	37	84
No	198	97	49	101	51

6.10 Obstetric analgesia

Data on use of analgesia and anaesthesia for birth are collected by staff in Labour and Birthing Suite. These data include method of analgesia; and time, dilatation and indication for epidural. Data below exclude elective Caesarean section and emergency Caesarean before labour where appropriate.

Findings

Epidurals continue to be the most utilised mode of analgesia for the management of labour pain (63.9% of women in labour), with women having induced labours being the most frequent users (74% compared with spontaneous labour 41%). Labouring nulliparous patients of private obstetrician LMCs have the highest rate of epidural use (82%). Other predictors of epidural use include European ethnicity and advanced maternal age (>35yrs).

Use of parenteral pethidine is on a steady decline year on year (5.3% in 2015, 5.6% in 2014, 7.0% in 2013, 8.9% in 2012, 13.1% in 2011, and 15.5% in 2010). This is consistent with Australasian observations with some institutions moving towards removing pethidine from their formularies.

Figure 97: Epidural use among women with spontaneous and induced labour 2006-2015

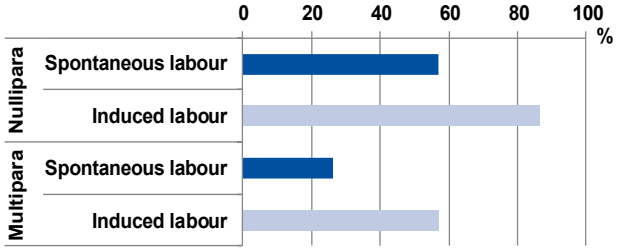
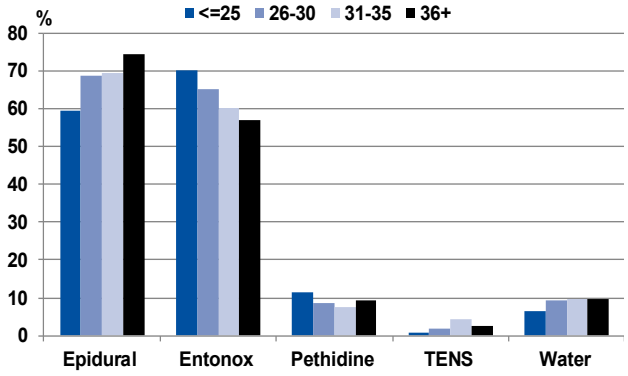


Figure 98: Analgesic use and maternal age among labouring nulliparous women NWH 2015



Use of general anaesthesia (GA) for caesarean section remains reasonable based on internationally recommended levels. In 2015 3.2% of women were administered a GA. This number includes all women given a GA, not just those for caesarean sections. The GA rate for true emergency caesarean sections was 10.3%. Figure 101 from the NZ Maternity Clinical Indicators shows the proportion of women having a general anaesthetic for Caesarean section at NWH in 2014 compared to the proportion in all secondary and tertiary facilities in NZ. NWH is significantly below the national proportion for this indicator.

Figure 99: Analgesic use and LMC at birth among labouring nulliparous women NWH 2015

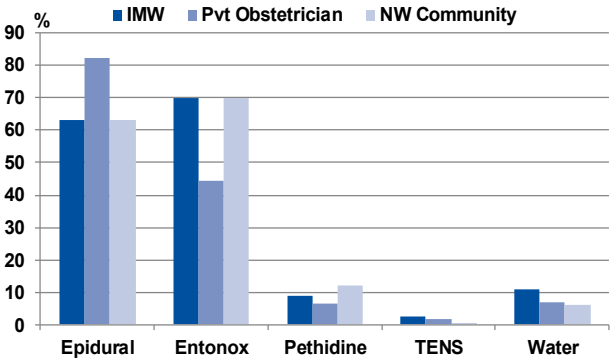


Figure 100: Analgesic use and ethnicity among labouring nulliparous women NWH 2015

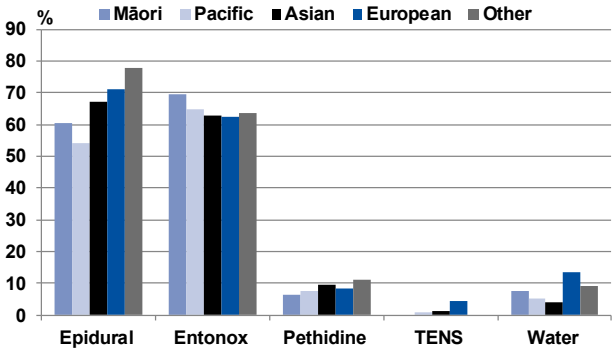
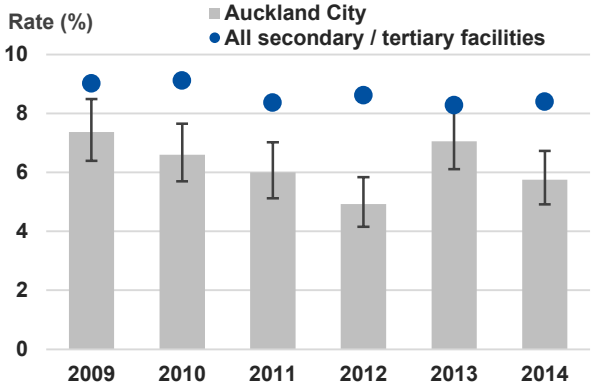


Figure 101: NZ Maternity Indicators 2014: Women having a general anaesthetic for caesarean section NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval or the facility rate

6.11 Data tables: Obstetric Analgesia

Table 126: Analgesic use by parity and mode of onset of birth NWH 2015

	Total	Epidural/Spinal		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
All Women	**6933**	**4432**	**63.9**	**3201**	**46.2**	**365**	**5.3**	**96**	**1.4**	**368**	**5.3**
Mode of onset of birth											
CS elective	1247	1221	97.9	34	2.7	1	0.1	0	0.0	0	0.0
CS emergency before onset of labour	258	228	88.4	27	10.5	3	1.2	1	0.4	2	0.8
Labouring women*											
Nullipara	2833	2007	70.8	1789	63.1	250	8.8	73	2.6	252	8.9
Multipara	2595	976	37.6	1351	52.1	111	4.3	22	0.8	114	4.4
Induced labour											
Nullipara	1328	1149	86.5	768	57.8	131	9.9	24	1.8	57	4.3
Multipara	961	547	56.9	472	49.1	56	5.8	7	0.7	19	2.0
Spontaneous labour											
Nullipara	1505	858	57.0	1021	67.8	119	7.9	49	3.3	195	13.0
Multipara	1634	429	26.3	879	53.8	55	3.4	15	0.9	95	5.8

* Excludes elective Caesarean and emergency Caesarean before onset of labour.

Table 127: GA use and mode of birth NWH 2015

	Total	GA* only		GA* + epidural		Total GA*	
	N	n	%	n	%	n	%
Total	6933	127	1.8	95	1.4	222	3.2
SVB	3594	42	1.2	7	0.2	49	1.4
Operative vaginal	871	2	0.2	4	0.5	6	0.7
CS elective	1247	26	2.1	15	1.2	41	3.3
CS emergency	1221	57	4.7	69	5.7	126	10.3

*General anaesthesia administered to women who had vaginal births were given postpartum for management of retained placenta, postpartum haemorrhage or for women whose epidural pain relief was inadequate for an operative vaginal birth.

Table 128: Epidural use among women with spontaneous and induced labour 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of births	7212	7695	7589	7753	7709	7523	7695	7223	7400	6933
Number women with spontaneous labour	4256	4490	4070	4125	4007	3628	3666	3270	3523	3139
Spontaneous labour and epidural	2168	2057	1743	1717	1686	1483	1571	1297	1423	1237
%	50.9	45.8	42.8	41.6	42.1	40.9	42.9	39.7	40.4	39.4
Number of women with induced labour	1776	1906	2203	2238	2214	2463	2485	2438	2315	2289
Induced labour and epidural	1269	1326	1550	1599	1557	1707	1780	1709	1583	1624
%	71.5	69.6	70.4	71.4	70.3	69.3	71.6	70.1	68.3	70.9

Table 129: Analgesic use and LMC at birth among labouring nulliparous women NWH 2015

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
IMW	1603	1013	63.2	1119	69.8	140	8.7	41	2.6	175	10.9
Pvt Obstetrician	642	529	82.4	284	44.2	41	6.4	25	1.6	45	7.0
NWH_Community	433	274	63.3	303	70.0	53	12.2	3	0.7	26	6.0
NWH_Diabetes	43	39	90.7	27	62.8	3	7.0	0	0.0	1	2.3
NWH_Medical	86	66	76.7	44	51.2	10	11.6	3	3.5	3	3.5
Other DHB	12	2	16.7	5	41.7	1	8.3	0	0.0	0	0.0
Unbooked	9	3	33.3	5	55.6	1	11.1	1	11.1	2	22.2

Table 130: Analgesic use and ethnicity (prioritised) among labouring nulliparous women NWH 2015

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
Māori	122	74	60.7	85	69.7	8	6.6	0	0.0	9	7.4
Pacific	248	134	54.0	161	64.9	19	7.7	2	0.8	13	5.2
Asian	723	482	66.7	449	62.1	61	8.4	13	1.8	26	3.6
Indian	332	229	69.0	215	64.8	39	11.7	1	0.3	18	5.4
NZ European	920	663	72.1	579	62.9	72	7.8	39	4.2	124	13.5
Other European	370	257	69.5	225	60.8	38	10.3	18	4.9	51	13.8
Other	118	92	78.0	75	63.6	13	11.0	0	0.0	11	9.3

Table 131: Analgesic use and maternal age among labouring nulliparous women NWH 2015

Maternal age	Total	Epidural		Entonox		Pethidine		TENS		Water	
(years)	N	n	%	n	%	n	%	n	%	n	%
<=20	141	74	52.5	96	68.1	13	9.2	0	0.0	7	5.0
21-25	344	214	62.2	245	71.2	43	12.5	4	1.2	24	7.0
26-30	934	642	68.7	608	65.1	81	8.7	16	1.7	86	9.2
31-35	1024	711	69.4	617	60.3	77	7.5	43	4.2	98	9.6
36-40	345	255	73.9	200	58.0	34	9.9	8	2.3	33	9.6
>40	45	35	77.8	23	51.1	2	4.4	2	4.4	4	8.9

6.12 Labour and birth at Birthcare Auckland

Birthcare Auckland is a primary maternity hospital located 1km across the Auckland Domain from Auckland City Hospital. Birthcare is contracted by Auckland DHB to provide primary birthing and postnatal facilities. Birthcare is midwifery-led, supporting LMCs to provide labour and birth care. Birthcare provides postnatal care for women who birth at Auckland City Hospital and also to North Shore, Waitakere and Counties Manukau Hospitals. Birthcare has four birthing rooms and 45 postnatal beds.

Birthcare also provides free childbirth education classes, lactation consultant services, paediatric services, physiotherapy services and classes. LMCs have four clinic rooms for antenatal assessments and care.

The data for mothers birthing at Birthcare were provided by Birthcare. The data on mothers transferred to NWH in labour and birthing at NWH were extracted from the NWH clinical database Healthware.

Findings

Three hundred and seventy five women commenced labour at Birthcare in 2015 (down from 421 in 2014). There were 305 births at Birthcare in 2015, a downward trend over the years, from a peak of 451 in 2011. Seventy women (19%) transferred in labour in 2015; 35% of nullipara and 6.5% of multipara. Therefore 65% of nullipara and 93.5% of multipara commencing labour at Birthcare achieved a normal birth at Birthcare. Forty-seven (15%) of women who birthed at Birthcare had a water birth in 2015. Exclusive breastfeeding rate on discharge of mothers birthing at Birthcare was 94%, compared to 89% of the women transferred from Birthcare to NWH intrapartum.

6.13 Data tables: Labour and birth at Birthcare Auckland

Table 132: Demographic characteristics of women labouring at Birthcare by place of birth 2015

	Birth at Birthcare n=305		Intrapartum transfer to NW n=70		Total n=375	
	n	%	n	%	n	%
Parity						
Nullipara	105	34.4	56	80.0	161	42.9
Multipara	200	64.6	14	20.0	214	57.1
Age						
<21	5	1.6	1	1.4	6	1.6
21-25	32	10.5	5	7.1	37	9.9
26-30	84	27.5	29	41.4	113	30.1
31-35	127	41.6	22	31.4	149	39.7
36-40	52	17.0	13	18.6	65	17.3
>40	5	1.6	0	0.0	5	1.3
Ethnicity						
Māori	27	8.9	3	4.3	30	8.0
Pacific	32	10.5	3	4.3	35	9.3
Other Asian	38	12.5	3	4.3	41	10.9
Indian	6	2.0	4	5.7	10	2.7
NZ European	129	42.3	35	50.0	164	43.7
Other European	67	22.0	21	30.0	88	23.5
Other	6	2.0	1	1.4	7	1.9
DHB of Domicile						
Auckland DHB	216	70.8	52	74.3	268	71.5
Counties Manukau DHB	35	11.5	7	10.0	42	11.2
Waitemata DHB	54	17.7	11	15.7	65	17.3
Other	0		0	0.0	0	0.0

Table 133: Interventions and outcomes among women who commenced labour at Birthcare 2015

	Birth at Birthcare n=305		Intrapartum transfer to NW n=70		Total n=375	
	n	%	n	%	n	%
Intrapartum transfer to NW					70	18.7
Mode of birth						
Normal vaginal	305	100.0	23	32.9	328	87.5
Operative vaginal			26	37.1	26	6.9
Emergency caesarean			21	30.0	21	5.6
Perineal trauma						
Episiotomy	14	4.6	26	37.1	40	10.7
Third/fourth degree tear	7	2.3	0		7	1.9
2nd degree tear	98	32.1	12	17.1	110	29.3
1st degree tear	66	21.6	3	4.3	69	18.4
Graze	12	3.9	6	8.6	18	4.8
Vaginal wall tear	3	1.0	9	12.9	12	3.2
Labial tear	10	3.3			10	2.7
Intact	110	36.1	10	14.3	120	32.0
Blood loss					0	0.0
>500 mls	8	2.6	30	42.9	38	10.1
Perinatal outcomes						
Stillbirth (/1000)	0		0			
Admitted to NICU	5	1.6	7	10.0	12	3.2
Neonatal death (/1000)	0		0			
Exclusive breastfeeding rate at discharge from the facility	288	94.4	62	88.6	350	93.3

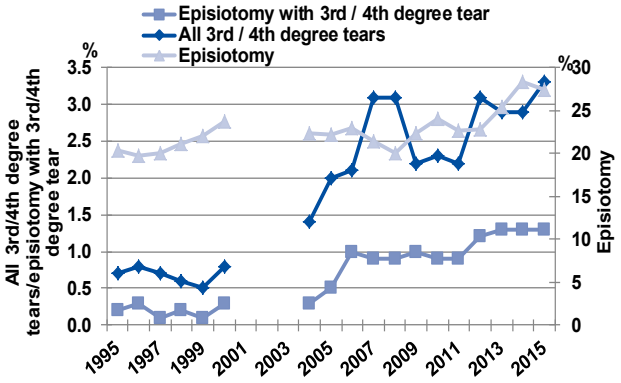
7 LABOUR and BIRTH OUTCOMES

This chapter summarises maternal and neonatal outcomes following labour and birth, including perineal trauma, postpartum haemorrhage, Apgar scores at 1 and 5 minutes, admission to neonatal intensive care, and neonatal death. Some tables pertaining to this chapter can be found in the text and the remainder at the end of the chapter.

7.1 Perineal trauma

Findings

Figure 102: Perineal trauma among all vaginal births NWH 1995-2015



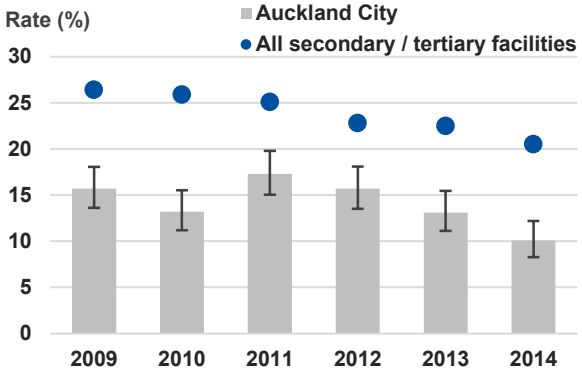
There has been an increase in use of episiotomy over the past 20 years. There has also been an increase in 3rd/4th degree tears from about 2005. At 3.3% of vaginal births (1 woman in 30), this is the highest rate reported among women birthing at NWH since 1995. It is suspected that some of this apparent increase in trauma is due to improved recognition.

The changes seen at NWH are reflected in the national data as seen in the New Zealand Maternity Clinical Indicators 2014 report, showing, among standard primipara from 2009-2014, a statistically significant reduction in intact perineum from 34.7% to 27.7%, increase in episiotomy without 3rd/4th degree tear from 19.5% to 22.7%, increase in 3rd/4th degree tear without episiotomy from 3.4% to 4.5%, and increase in 3rd/4th degree tear with episiotomy from 1.3% to 1.5%.

Figure 103 to Figure 106 illustrate results for NWH compared to secondary and tertiary facilities in New Zealand overall. The 95% confidence intervals around the NWH rates indicate whether the rates differ significantly from national rates. The total rate of 3rd/4th degree tear among standard primipara (as defined in the Clinical Indicators 2014 document) at NWH was 5.0% (or one in 20 women) compared to 5.7% in all secondary or tertiary facilities nationally.

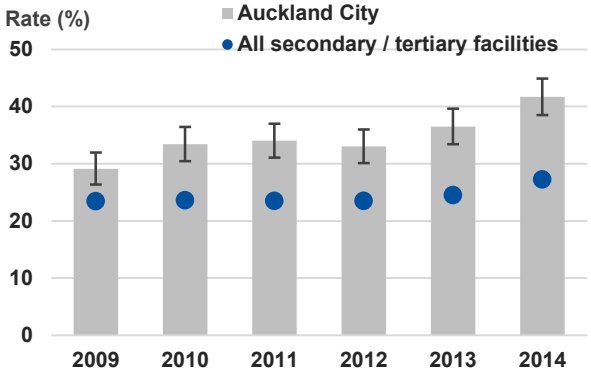
There is a significantly lower intact perineum rate at NWH among standard primipara compared to secondary/tertiary facilities nationally, a significantly higher episiotomy rate, and a non-significantly lower 3rd/4th degree tear rate.

Figure 103: NZ Maternity Indicators 2014: Intact perineum among standard primipara NWH and NZ secondary/tertiary facility rates 2009-2014



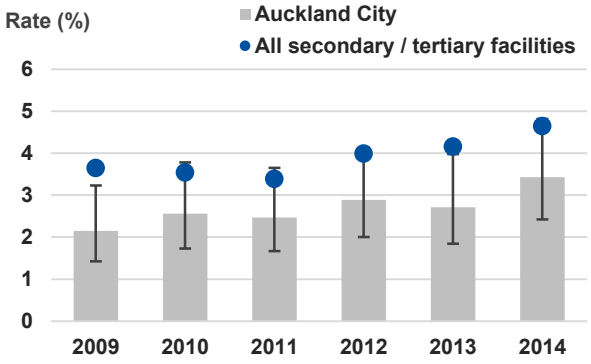
Error bars represent the 95% confidence interval for NWH rate.

Figure 104: NZ Maternity Indicators 2014: Episiotomy without 3rd/4th degree tear among standard primipara NWH and NZ secondary/tertiary facility rates 2009-2014



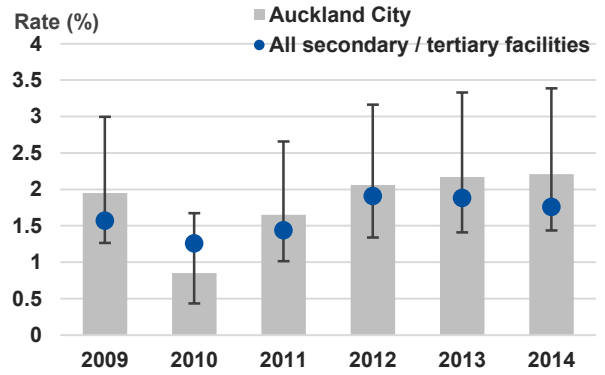
Error bars represent the 95% confidence interval for NWH rate.

Figure 105: NZ Maternity Indicators 2014: Third or fourth degree tear without episiotomy among standard primipara NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for NWH rate.

Figure 106: NZ Maternity Indicators 2014: Episiotomy and 3rd/4th degree tear among standard primipara NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for NWH rate.

Figure 107: Perineal trauma among vaginal births by mode of vaginal birth NWH 2015

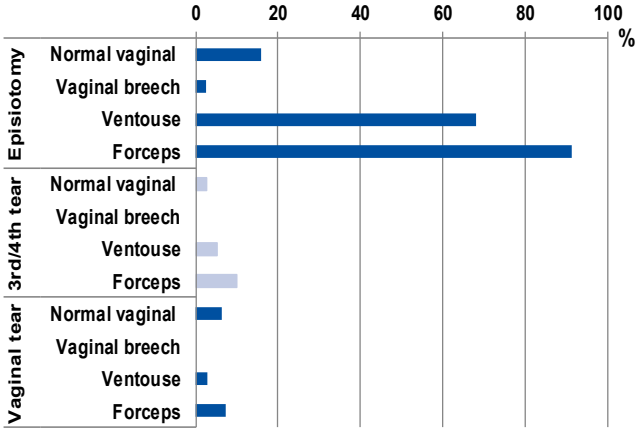
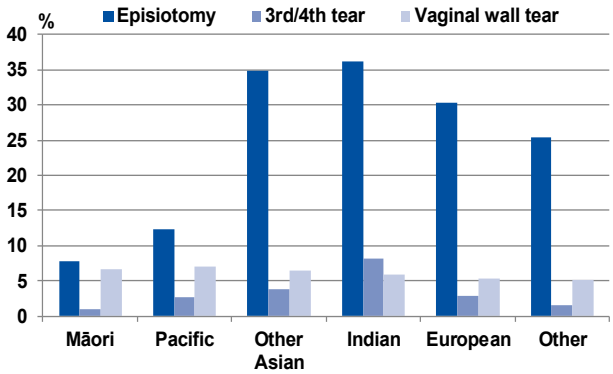


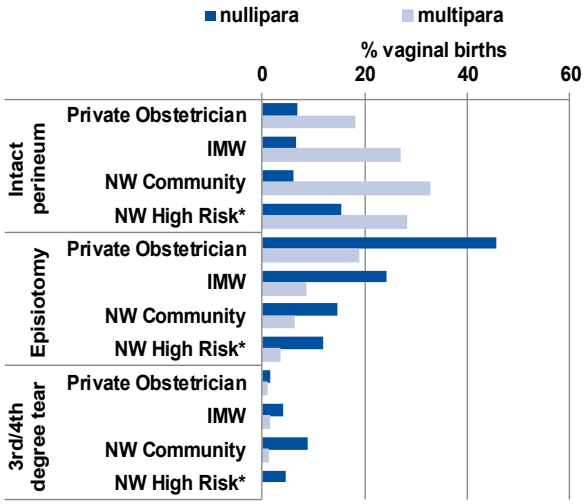
Figure 108: Perineal trauma among vaginal births by ethnicity NWH 2015



In the context of an increase in various risk factors for perineal trauma, including ethnic group (i.e. Indian, Asian women), mean BMI and incidence of LGA babies, continued focus on prevention of perineal trauma remains a priority.

It is not clear whether a low third and fourth degree tear rate is causally consequent upon and/or justifies a higher episiotomy rate. The service accepts that routine episiotomy does not prevent major tears but it remains open to question as to whether selective episiotomy may do so.

Figure 109: Perineal trauma among vaginal births by LMC and parity NWH 2015



*NW High Risk includes Diabetes, MFM, Unbooked and Other DHB.

There are marked differences in perineal trauma rates by LMC. It is evident that LMC groups with higher rates of episiotomy have lower rates of 3rd/4th degree tear and lower rates of intact perineum.

The perineal tear clinic is well utilised with appropriate referrals being received.

The wider context in our practice improvement endeavours has been a focus on appropriate support for a birthing woman through providing a second midwife at birth as well as encouraging a hands-on (rather than hands-off) approach to crowning of the fetal head. Although again the literature is not robust, there is some evidence that protecting the perineum whilst the fetal head is crowning is sphincter protective. Senior midwives are available on the unit and are competent to identify third and fourth degree tears and support appropriate referral as required.

7.2 Third stage management

In 2008, the collection of third stage data was refined to better determine initial management of third stage compared to subsequent treatment in response to postpartum bleeding. Active management of third stage includes routine uterotonic given with birth of the anterior shoulder, early clamping of the cord, followed by gentle traction until the placenta is delivered. Physiologic third stage entails expectant management without uterotonic and with delivery of the placenta by maternal effort.

Findings:

Among vaginal births, 6.2% of women had their third stage managed physiologically, 55.4% actively with syntocinon, and 34.9% actively with syntometrine.

Table 140 looks at the use of active management among women at increased risk of PPH, and shows that for the most part, women with increased risk due to BMI, previous Caesarean, hypertension, and multiple pregnancy status are managed actively.

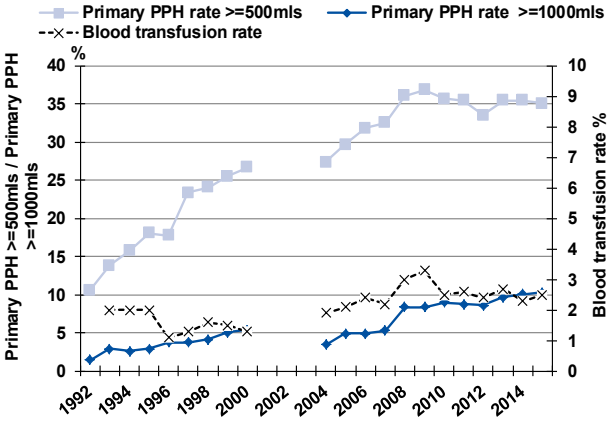
7.3 Postpartum haemorrhage

The source of blood loss data varies for some of the years shown. In the years 2005 to 2007, blood loss in labour and birth was not combined with blood loss recorded postnatally as in numerous cases the total blood loss was recorded in both places. The amended data on PPH rate in 2005 and 2006 given here may underestimate the PPH rate in those years. From 2008, the data have been cleaned extensively. This cleaning has included a comparison of blood loss recorded in Healthware to blood loss in the PIMS theatre database. These data were not available in previous years. The effect of this is likely to have been an increase in the reporting of PPH, especially in those cases giving birth in Labour and Birthing Suite and then transferring to theatre for the management of retained placenta or bleeding.

Further to these data management improvements, the estimation of blood loss including the weighing of all blood is now part of labour ward culture. While this is undoubtedly a more accurate way to measure blood loss, there are still incidences where losses are not measured and these may lead to inaccurate comparisons at this institution and with other units. Postpartum transfusion is recommended as a better comparative measure.

Findings

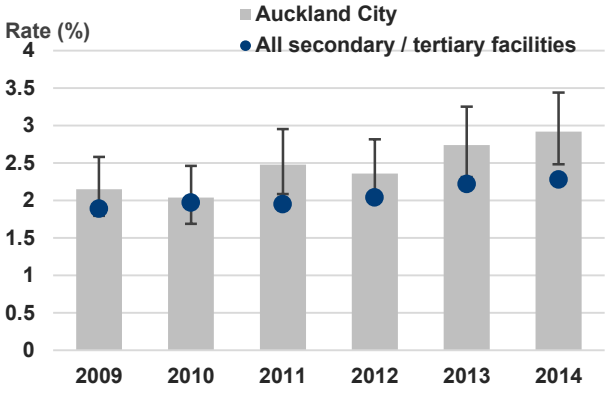
Figure 110: Postpartum haemorrhage and transfusion rates NWH 1992-2015



The primary rate of PPH ≥500mls is unchanged since 2008, the increasing rate of PPH ≥1000mls is concerning. With an overall PPH rate ≥1000mls of 10.3% the challenge for NWH is to decrease the rate.

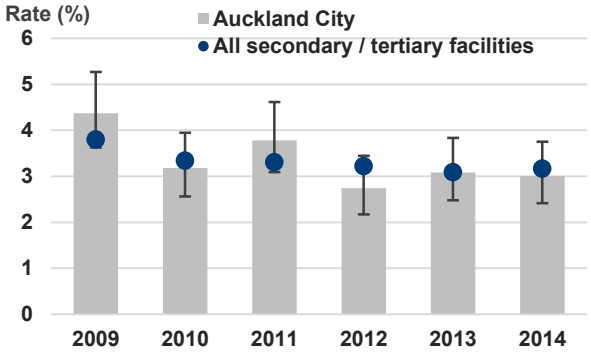
There has been a marginal reduction in transfusion rate since about 2009 at NWH.

Figure 111: NZ Maternity Indicators 2014: Blood transfusion with vaginal birth NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for NWH rate.

Figure 112: NZ Maternity Indicators 2014: Blood transfusion with caesarean section NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for NWH rate.

The 2014 Maternity Clinical Indicators show that the transfusion rate for women having a Caesarean birth at NWH (3%) is the same as the national rate (3.2%); and for women having a vaginal birth is significantly higher (2.9%) than the national rate (2.3%). The NWH rate of transfusion for women having a vaginal birth has increased from 2009-2014.

As shown in Figure 113, postpartum transfusion is associated with operative vaginal birth. Figure 114 shows that postpartum transfusion is also associated with LMC at birth. These figures are somewhat counterintuitive given the high rates of intervention reported among private obstetricians.

Possible factors include higher rates of risk factors, pre-birth haemoglobin and operating skills.

Figure 113: Postpartum transfusion by mode of onset of birth and by mode of birth NWH 2015

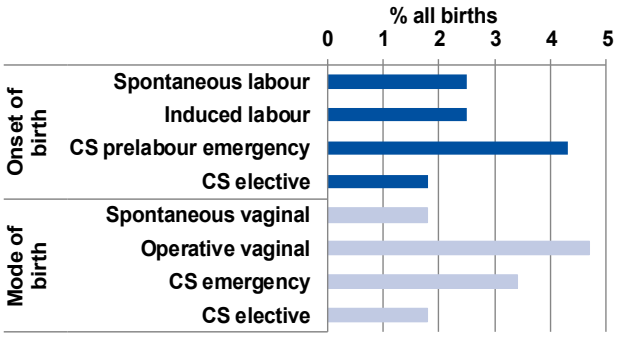


Figure 114: Postpartum transfusion by LMC (% of all births) NWH 2015

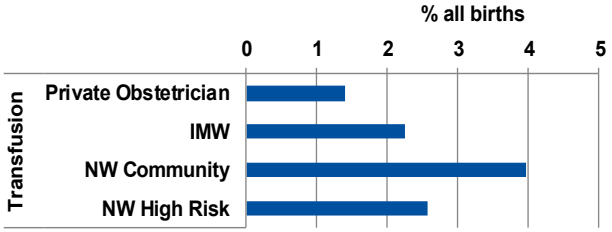


Table 134: Postpartum transfusion rates by recorded blood loss at birth NWH 2015

	Total	Postpartum transfusion	
		n	%
Total	**6933**	**171**	**2.5**
Blood loss <500	4500	13	0.3
PPH 500-999	1720	25	1.5
PPH 1000-1499	429	21	4.9
PPH 1500-2499	227	65	28.6
PPH >=2500	57	47	82.5
Blood loss unknown	0	0	0

A significant number of women were transfused with a blood loss <500mls. These women tended to have had little antenatal care and were admitted to birth with low Haemoglobin.

7.4 Data tables: Perineal trauma

Table 135: Episiotomy rates among vaginal births NWH 2000-2015

	2000 n= 5739	2004 n= 5298	2005 n= 4921	2006 n= 4822	2007 n= 5257	2008 n= 5217	2009 n= 5321	2010 n= 5218	2011 n= 5075	2012 n= 5125	2013 n= 4717	2014 n= 4841	2015 n= 4465
Number of episiotomies	1367	1181	1093	1103	1130	1069	1184	1252	1153	1170	1200	1371	1228
Incidence %	23.8	22.3	22.2	22.9	21.5	20.5	22.3	24.0	22.7	22.8	25.4	28.3	27.5
Episiotomy with 3rd/4th degree tear	17	15	23	47	49	46	56	49	46	60	61	61	58
Incidence %	0.3	0.3	0.5	1.0	0.9	0.9	1.0	0.9	0.9	1.2	1.3	1.3	1.3
All 3rd/4th degree tears	47	72	97	103	161	160	116	120	114	158	138	139	149
Incidence %	0.8	1.4	2.0	2.1	3.1	3.1	2.2	2.3	2.2	3.1	2.9	2.9	3.3

Table 136: Episiotomy rates in vaginal births, all gestations by LMC at birth and parity NWH 2015

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	2115	931	44.0	2350	297	12.6
Independent Midwife	1250	532	42.6	1235	144	11.7
Private Obstetrician	433	257	59.4	435	94	21.6
General Practitioner	3	0	0.0	9	1	11.1
National Women's	429	142	33.1	671	58	8.6

Table 137: Perineal trauma by mode of birth, parity and LMC at birth among all vaginal births NWH 2015

	Total	Episiotomy		3rd/4th tear		Vaginal wall tear	
	N	n	%	n	%	n	%
Total vaginal births	4465	1228	27.5	149	3.3	265	5.9
Mode of birth							
Normal vaginal	3556	563	15.8	89	2.5	227	6.4
Vaginal breech	38	1	2.6	0	0.0	0	0.0
Ventouse	566	385	68.0	30	5.3	16	2.8
Forceps	305	279	91.5	30	9.8	22	7.2
Parity							
Nulliparous	2115	931	44.0	113	5.3	189	8.9
Multiparous	2350	297	12.6	36	1.5	76	3.2
LMC at birth							
Independent Midwife	2485	676	27.2	89	3.6	163	6.6
Private Obstetrician	868	351	40.4	16	1.8	27	3.1
General Practitioner	12	1	8.3	1	8.3	0	0.0
NW Community	827	156	18.9	36	4.4	65	7.9
NW Diabetes	77	14	18.2	4	5.2	2	2.6
NW MFM	155	28	18.1	2	1.3	7	4.5
Other DHB	16	1	6.3	0	0.0	0	0.0
Unbooked	25	1	4.0	1	4.0	1	4.0
Ethnicity							
Māori	333	26	7.8	3	0.9	22	6.6
Pacific	624	77	12.3	17	2.7	44	7.1
Other Asian	1030	359	34.9	39	3.8	67	6.5
Indian	409	148	36.2	33	8.1	24	5.9
European	1876	569	30.3	54	2.9	98	5.2
Other	193	49	25.4	3	1.6	10	5.2

Table 138: Perineal outcomes in spontaneous (non-operative) vertex birth, all gestations, by LMC at birth and parity NWH 2015

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Intact perineum total	**1374**	**95**	**6.9**	**2182**	**578**	**26.5**
Independent Midwife	846	56	6.6	1158	310	26.8
Private Obstetrician	234	16	6.8	397	72	18.1
General Practitioner	2	0	0.0	8	1	12.5
National Women's	292	23	7.9	619	195	31.5
Episiotomy total	**1374**	**354**	**25.8**	**2182**	**209**	**9.6**
Independent Midwife	846	206	24.3	1158	100	8.6
Private Obstetrician	234	107	45.7	397	75	18.9
General Practitioner	2	0	0.0	8	0	0.0
National Women's	292	41	14.0	619	34	5.5
Third or fourth degree tear total	**1374**	**63**	**4.6**	**2182**	**26**	**1.2**
Independent Midwife	846	35	4.1	1158	17	1.5
Private Obstetrician	234	4	1.7	397	4	1.0
General Practitioner	2	1	50.0	8	0	0.0
National Women's	292	23	7.9	619	5	0.8

Table 139: Third stage management among vaginal births NWH 2015

	Physiological n=278		Active syntocinon n=2474		Active syntometrine n=1560		Unknown n=148	
	n	%	n	%	n	%	n	%
Primary PPH (>500mls)	39	14.0	521	21.1	374	24.0	2	14.2
Primary PPH (≥1000mls)	14	5.0	186	7.5	155	9.9	7	4.7
Postpartum blood transfusion	3	1.1	66	2.7	34	2.2	2	1.4

Table 140: Third stage management by PPH risk among vaginal births NWH 2015

	Total	Physiological		Active syntocinon		Active syntometrine		Unknown	
	n	n	%	n	%	n	%	n	%
TOTAL	**4465**	**278**	**6.2**	**2474**	**55.4**	**1560**	**34.9**	**148**	**3.3**
Spontaneous vaginal birth	3594	278	7.7	1938	53.9	1247	34.7	126	3.5
Operative vaginal birth	871	0	0	536	61.5	313	35.9	22	2.5
BMI									
<18.5	186	11	5.9	113	60.8	62	33.3	0	0
18.5-24.99	2470	187	7.6	1354	54.8	845	34.2	81	3.3
>=25-29.99	935	48	5.1	531	56.8	318	34.0	37	4.0
30-34.99	421	15	3.6	249	59.1	142	33.7	14	3.3
35-39.99	213	7	3.3	113	53.1	85	39.9	8	3.8
>=40	169	2	1.2	74	43.8	89	52.7	4	2.4
missing	71	8	11.3	40	56.3	19	26.8	4	5.6
Previous CS	249	7	2.8	147	59.0	82	32.9	12	4.8
Hypertension									
No hypertension	4197	269	6.4	2259	53.8	1525	36.3	139	3.3
Gestational Hypertension	99	1	1.0	83	83.8	13	13.1	2	2.0
Chronic hypertension	90	7	7.8	61	67.8	18	20.0	4	4.4
Superimposed preeclampsia	9	0	0	9	100.0	0	0	0	0
Preeclampsia	70	1	1.4	62	88.6	4	5.7	3	4.3
Singleton	4426	278	6.3	2458	55.5	1537	34.7	148	3.3
Multiple	39	0	0	16	41.0	23	59.0	0	0

7.5 Data tables: Postpartum haemorrhage

Table 141: Postpartum haemorrhage rate NWH 1999-2015

	1999	2000	2004	2005*	2006*	2007*	2008	2009	2010	2011	2012	2013	2014	2015
Total Births	7501	7827	7491	7194	7212	7695	7589	7735	7709	7523	7695	7223	7400	6933
Primary PPH (≥500mls)	1921	2088	2056	2139	2302	2507	2736	2850	2753	2674	2587	2563	2628	2433
Incidence %	25.6	26.7	27.4	29.7	31.9	32.6	36.1	36.9	35.7	35.5	33.6	35.5	35.5	35.1
Primary PPH (≥1000mls)	381	423	262	350	351	410	634	651	695	659	662	701	746	713
Incidence %	5.1	5.4	3.5	4.9	4.9	5.3	8.4	8.4	9.0	8.8	8.6	9.7	10.1	10.3

*Data corrected in 2005-2007. See methodology above.

Table 142: Postpartum blood loss by mode of birth NWH 2015

	Spontaneous vaginal birth n=3594		Operative vaginal birth n=871		CS emergency n=1221		CS elective n=1247		Total n=6933	
	n	%	n	%	n	%	n	%	n	%
PPH>=500mls	678	18.9	278	31.9	874	71.6	603	48.4	2433	35.1
PPH>=1000mls	260	7.2	103	11.8	228	18.7	122	9.8	713	10.3
PPH>=1500mls	113	3.1	50	5.7	83	6.8	38	3.0	284	4.1
Postpartum transfusion	65	1.8	41	4.7	42	3.4	23	1.8	171	2.5

Table 143: Postpartum blood loss by onset of birth NWH 2015

	Spontaneous labour n=3139		Induced labour n=2289		CS emergency before onset of labour n=258		CS elective n=1247		Total N=6933	
	n	%	n	%	n	%	n	%	n	%
PPH >=500mls	832	26.5	839	36.7	159	61.6	603	48.4	2433	35.1
PPH>=1000mls	279	8.9	276	12.1	36	14.0	122	9.8	713	10.3
PPH>=1500mls	116	3.7	111	4.8	19	7.4	38	3.0	284	4.1
Postpartum transfusion	80	2.5	57	2.5	11	4.3	23	1.8	171	2.5

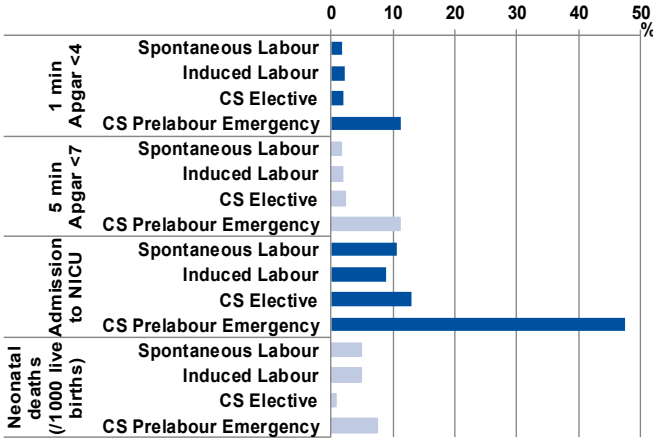
Table 144: Blood transfusion NWH 2000-2015

	2000	2004	2005	2006	2007	2008	2009	2011	2012	2013	2014	2015
Antenatal	0	10	12	11	6	6	18	13	5	4	7	4
Antenatal & intrapartum	0	1	0	0	1	0	0	0	1	1	0	0
Antenatal & postpartum	1	0	3	0	0	2	2	0	1	2	1	0
Intrapartum	4	2	2	6	1	4	3	3	1	6	2	7
Intrapartum & postpartum	4	4	3	3	4	1	2	1	1	2	1	3
Postpartum	96	128	133	150	165	212	228	193	180	192	170	168
Total transfusions	105	145	153	170	177	225	253	210	189	207	181	182
Total transfusion rate	1.3	1.9	2.1	2.4	2.3	3.0	3.3	2.8	2.5	2.9	2.5	2.6

7.6 Neonatal outcomes

Findings

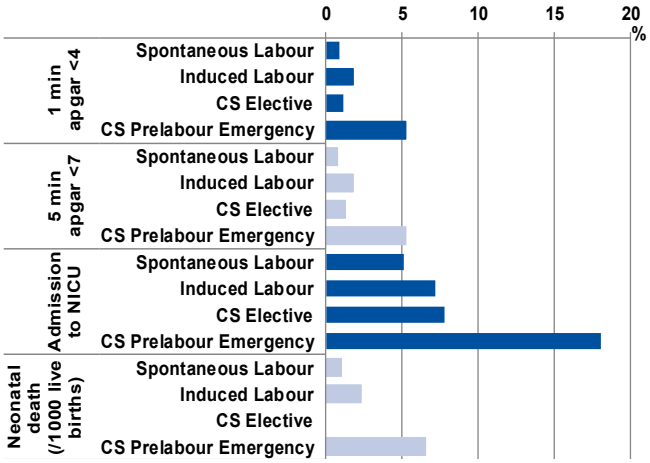
Figure 115: Neonatal morbidity among live births by mode of onset of birth (all gestations) NWH 2015



Birth by prelabour emergency Caesarean section is an indicator of increased risk of adverse neonatal outcome overall and at term (Figure 115 and Figure 116). Increased risk is related to the reasons for prelabour emergency Caesarean section.

7.6.1 Neonatal outcomes among term babies

Figure 116: Neonatal morbidity among live births at term (≥37 weeks) by mode of onset of birth NWH 2015



There has been a significant increase in the rate of NICU admission for infants born at term since 2006.

Admission to NICU at term is similar where the LMC is a self-employed midwife, a private obstetrician or the NWH Community Clinic, and not surprisingly higher where the LMC is a high risk service (including unbooked women, transfers from other DHBs for tertiary care, maternal and fetal medicine and diabetes clinics). The increase in NICU admission from 2006-2015 has been observed across all LMC groups (Figure 118).

Over the same time period (2006-2015) there has been a statistically significant increase in the proportion of babies with low Apgar scores at one and 5 minutes (chi square test for trend, p<0.001) however the clinical significance of these findings is uncertain Figure 119).

Figure 117: NICU admission and low Apgar scores among live births at term NWH 2007-20

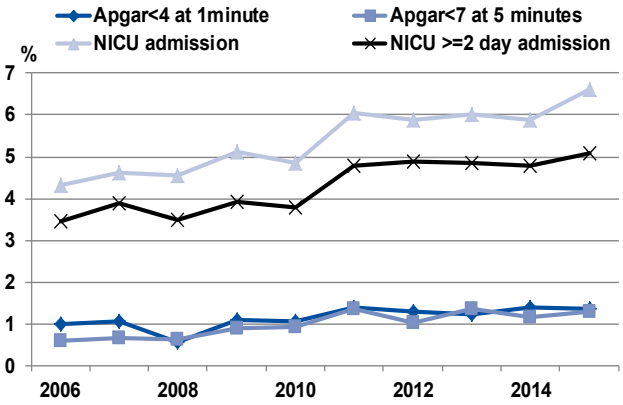


Figure 118: Admission to NICU among live births at term by LMC NWH 2006-2015

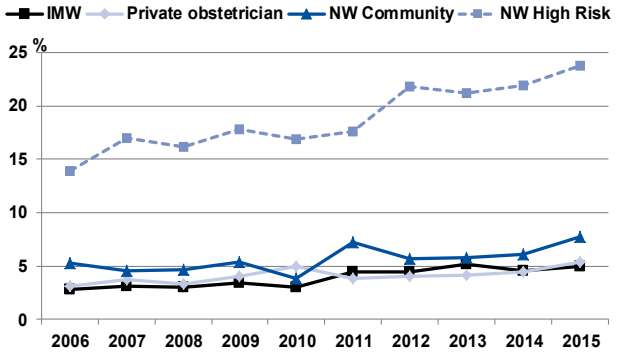
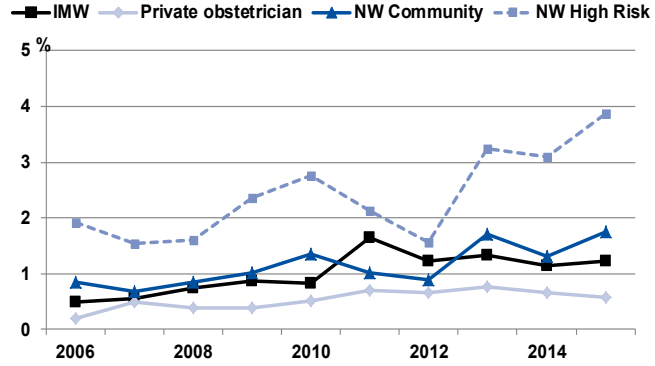
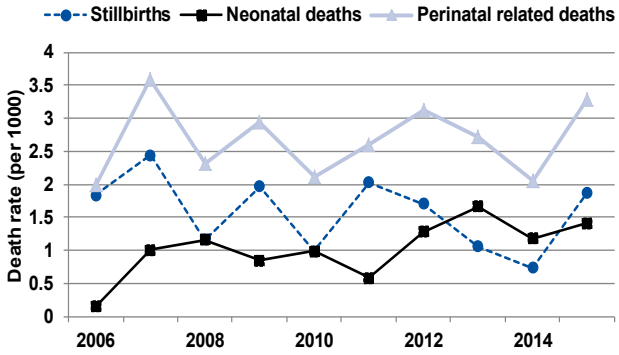


Figure 119: Apgar <7 at 5 minutes among live births at term by LMC NWH 2006-2015



As is seen among NICU admissions, high risk pregnancies under NWH team care contribute the greatest proportion to babies with low Apgar scores at birth. However, when considering all years together, the proportion of live born babies with Apgar score <7 at 5 minutes was significantly lower among pregnancies with a private obstetrician than self-employed midwives or NW Community LMC. There was no difference between self-employed midwifery LMC and NW Community LMC. These differences may be related to care or may be related to underlying differences in the population cared for by each LMC group such as socio-economic status, BMI, age, smoking rates as demonstrated in Chapter 4.

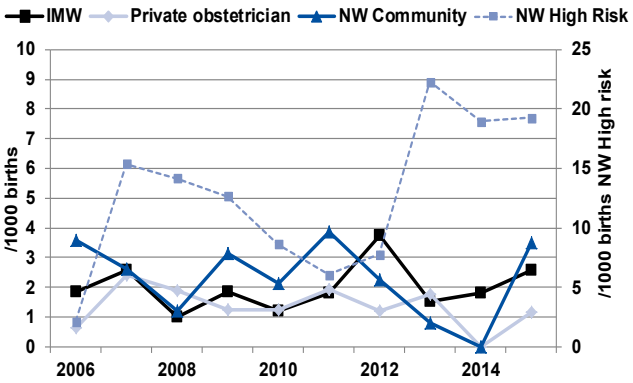
Figure 120: Stillbirth and neonatal death rates at term NWH 2006-2015



Stillbirths and perinatal related deaths are calculated per 1000 births, Neonatal deaths per 1000 live births.

There has been no significant change in perinatal related mortality rate at term between 2006 and 2015.

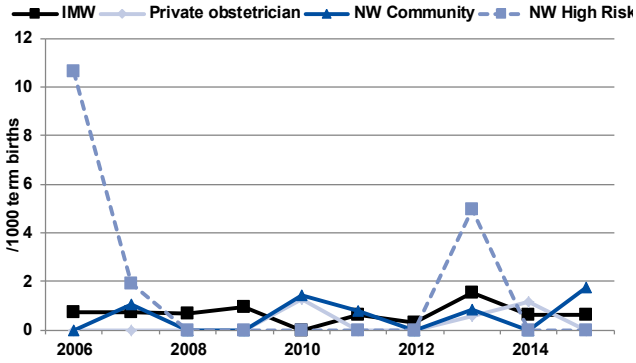
Figure 121: Perinatal related mortality rate at term (per 1000 term births) by LMC NWH 2006-2015



Proportionately more perinatal related deaths at term are contributed by high risk pregnancies under the care of NWH (rate 12.1/1000 births from 2006-2015).

If all years 2006-2015 are considered together, the perinatal related mortality rate at term among pregnancies cared for by private obstetricians (1.3/1000 births) was lower than pregnancies cared for by the NW Community service (2.3/1000 births) (p=0.04) but not different from pregnancies cared for by self-employed midwifery LMCs (2.1/1000 births) (p=0.08).

Figure 122: HIE rate (per 1000 term births) by LMC NWH 2006-2015



The hypoxic ischaemic encephalopathy rate per 1000 term babies born at NWH for 2006-2015 was 0.3/1000 for pregnancies under private obstetrician LMC, 0.7/1000 under self-employed midwifery care, 0.5/1000 under NW Community, and 0.7/1000 (excluding the outlying rate in 2006) among high risk pregnancies under the care of NWH. There were no statistically significant differences.

7.7 Data tables: Neonatal outcomes

Table 145: Neonatal morbidity and mortality among live births by mode of birth (all gestations) NWH 2015

	Spontaneous vertex n=3561		Vaginal breech n=21		Forceps birth n=307		Ventouse birth n=567		CS elective n=1311		CS emergency n=1253		Total N=7020	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	37	1.0	5	23.8	7	2.3	7	1.2	26	2.0	76	6.1	158	2.3
1 min Apgar <7	200	5.6	13	61.9	49	16.0	60	10.6	106	8.1	229	18.3	657	9.4
5 min Apgar <7	53	1.5	5	23.8	3	1.0	2	0.4	29	2.2	63	5.0	155	2.2
Admitted to NICU	304	8.5	8	38.1	31	10.1	40	7.1	171	13.0	278	22.2	832	11.9
≥2 days in NICU	277	7.8	8	38.1	31	10.1	34	6.0	165	12.6	258	20.6	773	11.0
Neonatal deaths (/1000 live births)	16	4.5	4	190.5	1	3.3	1	1.8	1	0.8	6	4.8	29	4.1

Table 146: Neonatal morbidity among live births by mode of onset of birth (all gestations) NWH 2015

	Spontaneous labour n=3149		Induced labour n=2292		CS elective n=1311		CS emergency before onset of labour n=268		Total N=7020	
	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	55	1.7	47	2.1	26	2.0	30	11.2	158	2.3
1 min Apgar <7	252	8.0	221	9.6	106	8.1	78	29.1	657	9.4
5 min Apgar <7	52	1.7	44	1.9	29	2.2	30	11.2	155	2.2
Admitted to NICU	333	10.6	201	8.8	171	13.0	127	47.4	832	11.9
≥2 days in NICU	310	9.8	175	7.6	165	12.6	123	45.9	773	11.0
Neonatal deaths (/1000 live births)	15	4.8	11	4.8	1	0.8	2	7.5	29	4.1

Table 147: Neonatal morbidity by mode of birth in live born term or post term (≥ 37 weeks) babies NWH 2015

	Spontaneous vertex n=3311		Vaginal breech n=4		Forceps birth n=285		Ventouse birth n=554		CS elective n=1177		CS emergency n=1040		Total N=6371	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	20	0.6	0	0.0	5	1.8	7	1.3	13	1.1	41	3.9	86	1.3
1 min Apgar <7	142	4.3	1	25.0	43	15.1	58	10.5	70	5.9	133	12.8	447	7.0
5 min Apgar <7	31	0.9	0		2	0.7	2	0.4	15	1.3	32	3.1	82	1.3
Admitted to NICU	165	5.0	0		19	6.7	35	6.3	92	7.8	110	10.6	421	6.6
≥2 days in NICU	143	4.3	0		19	6.7	29	5.2	86	7.3	93	8.9	370	5.8
Neonatal deaths (/1000 live births)	5	1.5	0		0		1	1.8	0		3	2.9	9	1.4

Table 148: Neonatal morbidity by onset of birth in term or post term live born (≥ 37 weeks) babies NWH 2015

	Spontaneous labour n=2871		Induced labour n=2168		CS elective n=1177		CS emergency before onset of labour n=155		Total N=6371	
	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	25	0.9	40	1.8	13	1.1	8	5.2	86	1.3
1 min Apgar <7	163	5.7	193	8.9	70	5.9	21	13.5	447	7.0
5 min Apgar <7	21	0.7	38	1.8	15	1.3	8	5.2	82	1.3
Admitted to NICU	145	5.1	156	7.2	92	7.8	28	18.1	421	6.6
≥2 days in NICU	109	3.8	117	5.4	74	6.3	23	14.8	323	5.1
Neonatal deaths (/1000 live births)	3	1.0	5	2.3	0	0.0	1	6.5	9	1.4

Table 149: Neonatal morbidity in term or post term live born (≥ 37 weeks) babies NWH 2008-2015

	2008 N=6902		2009 N=7113		2010 N=7065		2011 N=6889		2012 N=7030		2013 N=6596		2014 N=6786		2015 N=6371	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	38	0.5	78	1.1	76	1.1	97	1.4	92	1.3	81	1.2	95	1.4	86	1.3
5 min Apgar <7	44	0.6	63	0.9	65	0.9	94	1.4	73	1.0	90	1.4	79	1.2	82	1.3
Admitted to NICU	314	4.5	364	5.1	343	4.8	417	6.0	413	5.9	396	6.0	400	5.9	421	6.6
≥2 days in NICU	241	3.5	280	3.9	268	3.8	329	4.7	344	4.9	319	4.8	324	4.8	323	5.1
Neonatal deaths (/1000 live births)	8	1	6	1	7	1	4	1	9	1	11	2	8	1	9	1.4

Table 150: Neonatal outcomes among term births by LMC 2006-2015

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	n	n	n	n	n	n	n	n	n	n
Private obstetrician										
Term births (total)	1556	1667	1604	1609	1606	1562	1677	1707	1708	1742
Stillbirth	0	4	3	2	0	2	1	2	0	2
Neonatal Death	1	0	0	0	2	1	1	1	0	0
Apgar<7 at 5 minutes	3	8	6	6	8	11	11	13	11	10
NICU admission	49	62	53	65	79	59	67	71	76	93
≥2 days in NICU	35	53	36	51	52	48	56	39	38	82
Hypoxic ischaemic encephalopathy	0	0	0	0	2	0	0	1	2	0
IMW										
Term births (total)	2689	2743	2968	3255	3376	3335	3460	3246	3332	3115
Stillbirth	5	6	3	5	4	6	9	3	3	7
Termination of Pregnancy	0	1	0	0	1	0	0	0	0	0
Neonatal Death	0	1	0	1	0	0	4	2	3	1
Apgar<7 at 5 minutes	13	15	22	28	28	55	42	43	38	38
NICU admission	76	84	90	110	103	148	155	168	151	153
≥2 days in NICU	54	69	63	90	84	124	139	113	90	133
Hypoxic ischaemic encephalopathy	2	2	2	3	0	2	1	5	2	2
NW Community										
Term births (total)	1686	1909	1652	1602	1420	1295	1347	1230	1310	1148
Stillbirth	6	4	2	5	3	4	1	0	0	1
Neonatal Death	0	1	0	0	0	1	2	1	0	3
Apgar<7 at 5 minutes	14	13	14	16	19	13	12	21	17	20
NICU admission	89	87	76	85	54	93	77	71	80	89
≥2 days in NICU	75	73	61	68	45	77	67	44	46	78
Hypoxic ischaemic encephalopathy	0	2	0	0	2	1	0	1	0	2
DHB primary maternity care - High Risk										
Term births (total)	469	521	564	553	581	660	515	404	422	364
Stillbirth	1	3	0	1	0	2	1	2	3	2
Termination of Pregnancy	0	0	0	1	0	0	0	0	0	0
Neonatal Death	0	5	8	5	5	2	3	7	5	5
Apgar<7 at 5 minutes	9	8	9	13	16	14	8	13	13	14
NICU admission	65	88	91	98	98	116	112	85	92	86
≥2 days in NICU	60	75	79	86	85	99	94	60	62	77
Hypoxic ischaemic encephalopathy	5	1	0	0	0	0	0	2	0	0

8 POSTNATAL CARE

This chapter provides information on infant feeding and postnatal admissions. Some tables pertaining to this chapter can be found in the text and the remainder at the end of the chapter.

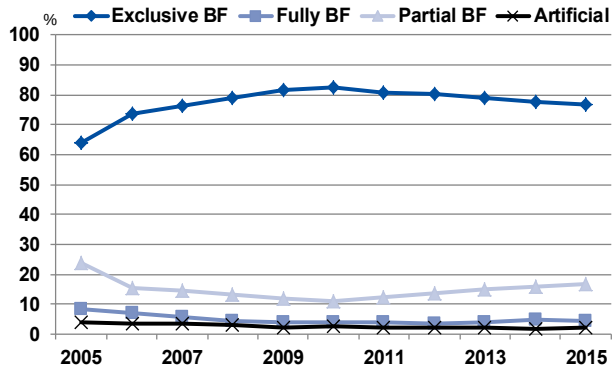
8.1 Infant feeding

The feeding status of infants born at National Women's is collected at the time of discharge from the hospital. For some this is in the immediate postpartum period, leaving from Labour and Birthing Suite, and for others it follows a postnatal stay. Babies admitted to the Neonatal Intensive Care Unit are excluded from the data presented here. Infant feeding data for NICU babies can be found in Chapter 9.

Data are also collected at the time of postnatal discharge (approximately 4-6 weeks post birth) for those women and babies who have midwifery homecare provided by the National Women's Community Team or MFM Diabetes Midwifery Teams.

Findings

Figure 123: Method of infant feeding at discharge from NWH 2005-2015



In 2015, the exclusive breastfeeding rate on discharge from hospital following birth was 77%, exceeding the NZ Breastfeeding Authority (NZBFA) target of 75%. It is of note that this rate includes babies of diabetic mothers, preterm and/or low birth weight babies (<2500g) who do not go to NICU and babies of mothers with medical complications. It is important to interpret the exclusive breastfeeding rate with regard to the complexity of the cohort of women birthing at National Women's.

The service remains committed to supporting breastfeeding through the employment of dedicated lactation consultants (LC). Education of all staff involved with antenatal and postnatal women (as wide reaching as ancillary staff) is a priority and achieved by a variety of modalities which includes on-line courses, quiz dinners, audit projects, compulsory study days, several midwives are undertaking additional LC qualifications, and adherence to the WHO "Ten Steps to Successful Breastfeeding".

Figure 124: Exclusive breastfeeding at discharge from NWH by mode of birth 2005-2015

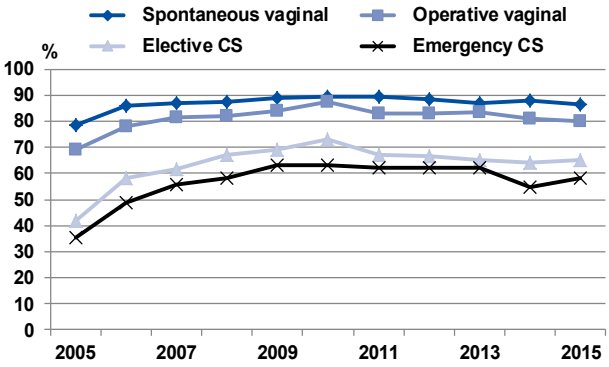


Figure 125: Exclusive breastfeeding rates at discharge from NWH by maternal age 2004-2015

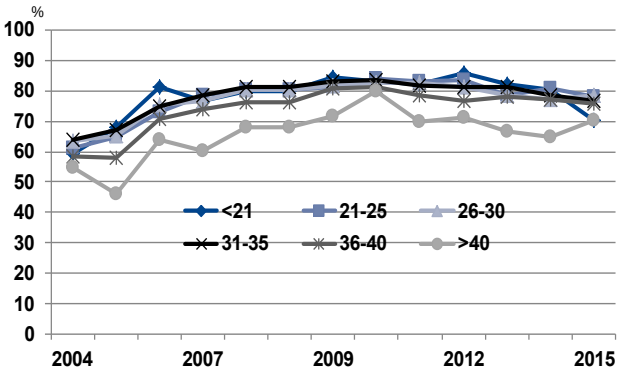
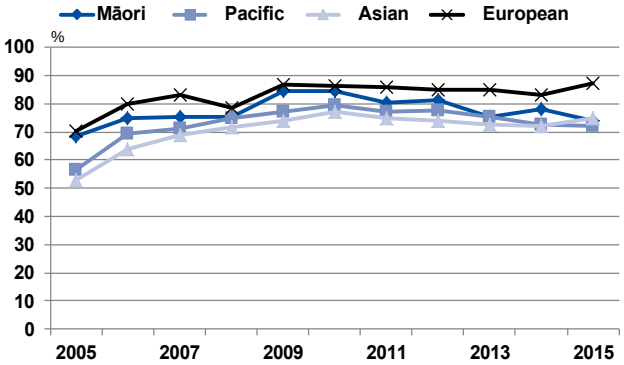
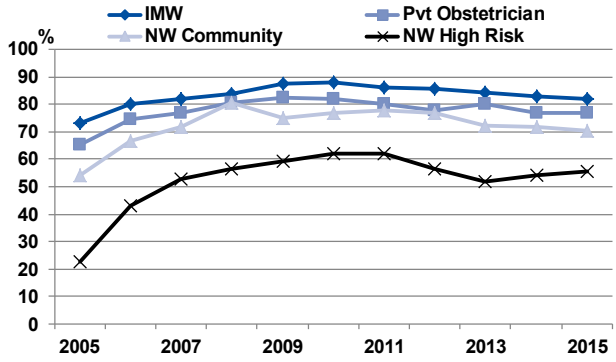


Figure 126: Exclusive breastfeeding rates at discharge from NWH by ethnicity 2005-2015



Breastfeeding rates vary by ethnicity, at 83% for European mothers, 75% for Asian mothers, 74% for Māori mothers and 72% for Pacific mothers.

Figure 127: Exclusive breastfeeding rate at discharge from NWH by LMC at birth 2005-2015



The rates for exclusive breastfeeding remain consistent across all LMC groups. The lower rate among high risk women is statistically significant.

Figure 128: Breastfeeding rates (exclusive and fully breastfeeding) at hospital discharge and at discharge from NWH Homecare (4-6 weeks) (n=990) 2015

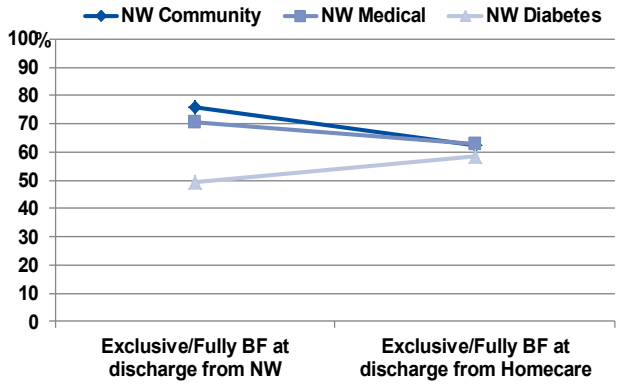


Figure 128 demonstrates the extent to which fully and exclusive breastfeeding rates decrease by the time of Homecare discharge at 4-6 weeks. The figure includes only women under the care of NWH LMC midwives. These are the only breastfeeding data available to us after discharge from hospital. The overall rate of exclusive/fully breastfeeding at discharge from National Women's Homecare was 62%.

The results show that the breastfeeding rates increased steadily from 2005 to 2010 from 63.9% to 82.6% but since then there has been a decline in rates to 76.7% in 2015. The number of women choosing artificial feeding has fallen progressively from 3.8% in 2005 to 1.7% in 2014, but increased to 2.1% in 2015. From 2010 to 2015 there is an upward trend of more women who choose to or need to (for a variety of reasons) supplement breastmilk rather than to exclusively breastfeed.

Maintaining a higher exclusive breastfeeding rate in line with WHO recommendations is multifactorial and needs supportive whānau and community initiatives to contribute to a positive breastfeeding environment. Ensuring that the downward trend is reversed for all age groups, ethnicities and modalities of birth remains a priority of the service.

The 77% exclusive breastfeeding rate among our complex population of women on discharge from the National Women's facility demonstrates the dedication to achieving best practice and care provision for mothers and our future generation.

8.2 Data tables: Infant feeding

Table 151: Method of Infant feeding at discharge from NWH 2006-2015

	2006 n = 6158		2007 n = 6570		2008 n = 6636		2009 n = 6928		2010 n =6941	
	n	%	n	%	n	%	n	%	n	%
Exclusive breastfeeding	4546	73.8	5064	77.1	5254	79.2	5659	81.7	5736	82.6
Fully breastfeeding	441	7.2	348	5.3	304	4.6	287	4.1	260	3.8
Partial breastfeeding	958	15.6	929	14.1	871	13.1	824	11.9	755	10.9
Artificial feeding	213	3.5	229	3.5	207	3.1	158	2.3	190	2.7

	2011 n = 6723		2012 n =6862		2013 n = 6452*		2014 n=6656		2015 n=6171	
	n	%	n	%	n	%	n	%	n	%
Exclusive breastfeeding	5439	80.9	5508	80.3	5094	79.0	5175	77.7	4737	76.7
Fully breastfeeding	285	4.2	243	3.5	256	4.0	312	4.7	278	4.5
Partial breastfeeding	841	12.5	957	13.9	963	14.9	1056	15.9	1026	16.6
Artificial feeding	158	2.4	154	2.2	138	2.1	113	1.7	130	2.1

*1 Infant was missing breastfeeding method at discharge

Table 152: Infant feeding on discharge from NWH by mode of birth, LMC and maternal age NWH 2015

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total *	6171	4736	76.7	278	4.5	1026	16.6	130	2.1
Mode of birth									
Spontaneous vaginal	3254	2814	86.5	89	2.7	278	8.5	72	2.2
Operative vaginal	803	643	80.1	40	5.0	111	13.8	9	1.1
Elective CS	1139	712	62.5	69	6.1	324	28.4	34	3.0
Emergency CS	975	567	58.2	80	8.2	313	32.1	15	1.5
LMC at birth									
IMW	3041	2487	81.8	107	3.5	411	13.5	36	1.2
Private Obstetrician	1717	1317	76.7	71	4.1	301	17.5	28	1.6
GP	14	10	71.4	0	0.0	4	28.6	0	0.0
NWH Community	1090	769	70.6	62	5.7	219	20.1	39	3.6
NWH MFM	158	96	60.8	19	12.0	30	19.0	13	8.2
NWH Diabetes	123	48	39.0	15	12.2	54	43.9	6	4.9
Unbooked	19	9	47.4	1	5.3	2	10.5	7	36.8
Other DHB	9	0	0.0	3	33.3	5	55.6	1	11.1
Maternal age									
≤ 20	137	96	70.1	7	5.1	24	17.5	10	5.8
21-25	588	459	78.1	33	5.6	84	14.3	11	2.2
26-30	1555	1221	78.5	67	4.3	240	15.4	27	1.8
31-35	2392	1836	76.8	118	4.9	398	16.6	40	1.7
36-40	1282	971	75.7	44	3.4	233	18.2	34	3.1
>40	217	153	70.5	9	4.1	47	21.7	8	4.9

Table 153: Infant feeding on discharge from NWH by prioritised maternal ethnicity, gestation, birthweight and among standard primipara NWH 2015

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total	**6171**	**4736**	**76.7**	**278**	**4.5**	**1026**	**16.6**	**130**	**2.1**
Ethnicity									
Māori	372	276	74.2	18	4.8	58	15.6	19	5.1
Pacific	692	498	72.0	41	5.9	118	17.1	35	5.1
Other Asian	1461	1019	69.7	54	3.7	366	25.1	22	1.5
Indian	576	415	72.0	35	6.1	124	21.5	2	0.3
NZ European	2047	1702	83.1	86	4.2	219	10.7	40	2.0
Other European	751	618	82.3	35	4.7	89	11.9	9	1.2
Other	272	208	76.5	9	3.3	52	19.1	3	1.1
Gestation									
< 37 weeks	223	61	27.4	52	23.3	103	46.2	7	3.1
≥37 weeks	5948	4675	78.6	226	3.8	923	15.5	123	2.1
Birth weight									
< 2.5 kgs	195	55	28.2	43	22.1	90	46.2	7	3.6
2.5 - 2.9 kgs	1088	747	68.7	68	6.3	249	22.9	24	2.2
3.0 - 4.4 kgs	4814	3885	80.7	164	3.4	670	13.9	94	2.0
≥ 4.5 kgs	74	49	66.2	3	4.1	17	23.0	5	6.8
Primipara									
Standard	1099	936	85.2	26	2.4	131	11.9	6	0.5
Non standard	5072	3800	74.9	252	5.0	895	17.6	124	2.4
Quintile									
1	1027	821	79.9	40	3.9	149	14.5	17	1.7
2	1174	919	78.3	44	3.7	190	16.2	21	1.8
3	1298	978	75.3	71	5.5	228	17.6	21	1.6
4	1191	928	77.9	57	4.8	182	15.3	24	2.0
5	1225	903	73.7	60	4.9	220	18.0	41	3.3

Table 154: Infant feeding on discharge from NWH Homecare NWH 2015

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Community	869	439	50.5	104	12.0	232	26.7	94	10.8
Medical	75	39	52.0	3	4.0	24	32.0	9	12.0
Diabetes	46	16	34.8	11	23.9	13	28.3	6	13.0

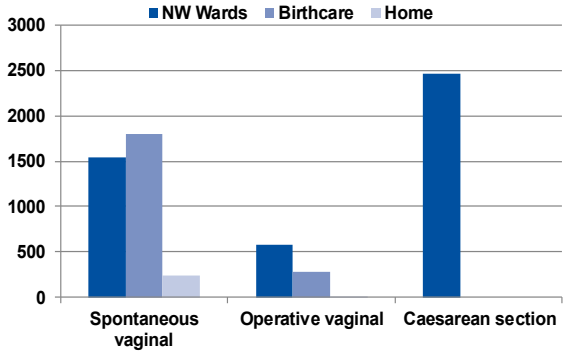
8.3 Postnatal admissions

Primary postnatal care is provided at Birthcare Auckland (under contract). Women requiring secondary/tertiary care or closer observation for themselves or their babies receive postnatal care at National Women's.

Findings

There has been very little change over the past years in the number of women transferring to NWH wards and Birthcare but there has been a reduction in the number of women going directly home from Labour and Birthing Suite.

Figure 129: Maternal destination immediately after birth by mode of birth NWH 2015



As expected, mothers are admitted initially to the NWH wards after Caesarean Section. Over half of the women having a spontaneous vaginal birth are admitted directly to Birthcare Auckland for postnatal care. This figure is a reminder of the high acuity on the postnatal wards at NWH.

Figure 130: Postnatal destination immediately after birth by LMC at birth NWH 2015

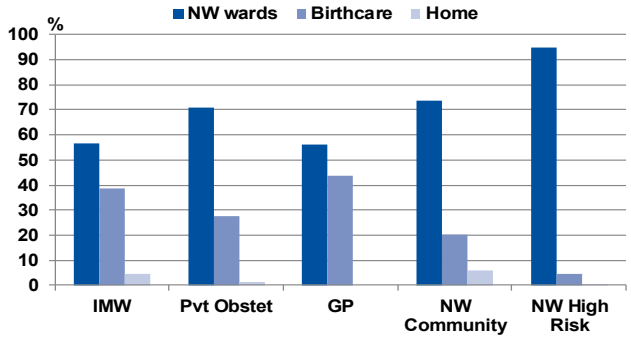
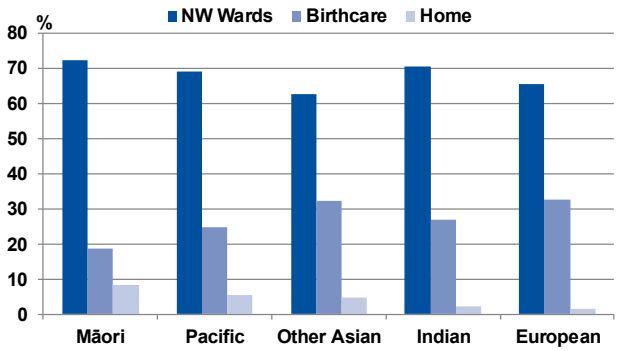


Figure 131: Postnatal destination immediately after birth by ethnicity NWH 2015



Māori, Pacific and Indian women remain underrepresented among women transferring to Birthcare immediately postpartum.

8.3.1 Admission to NWH postnatal ward among women having a spontaneous vaginal birth

The contractual arrangement with Birthcare Auckland is for the provision of postnatal primary care to well women and their babies. Women who have had spontaneous vaginal births and are admitted to National Women's postnatal wards most commonly do so for neonatal care for their baby.

Table 155: Reason for admission to NWH postnatal wards among women having a spontaneous vaginal birth 2015

	N=	1611
	n	%
Neonatal reason*	685	42.5
Postpartum haemorrhage	317	19.7
Diabetes	95	5.9
Hypertensive disorder	54	3.4
Perineal trauma	134	8.3
Retained placenta/products	49	3.0
Fainting/dizziness	8	0.5
Other listed reasons†	269	16.7

*includes admission to NICU, low birth weight (<2500g), requiring paediatrician care, stillbirth, neonatal death.
†includes epidural complications, infection, maternal medical conditions, social issues, cardiac conditions, wound problems, psychiatric disorders, and anaemia.

Table 156: Discharge destination by mode of birth among initial admissions to NW wards

	N=	4690
	n	%
Caesaren section birth - discharged to home	1875	40.0
Caesaren section birth - transferred to Birthcare	471	10.0
Caesaren section birth - transferred to other destinations	147	3.1
Operative vaginal birth - discharged to home	301	6.4
Operative vaginal birth - transferred to Birthcare	259	5.5
Operative vaginal birth - transferred to other destinations	24	0.5
Spontaneous vaginal birth - discharged to home	1114	23.8
Spontaneous vaginal birth - transferred to Birthcare	377	8.0
Spontaneous vaginal birth - transferred to other destinations	122	2.6

8.4 Postnatal readmissions

We were unable to provide these data for 2015 due to discrepancies in the various data sources. Further analysis of the data is required and will be a priority in the next few months.

8.4.1 Admissions to postnatal wards of women who birthed elsewhere

There were 105 admissions in 2015 of mothers who had birthed elsewhere. Most often these births were at Birthcare Auckland, Waitakere, North Shore or Middlemore Hospitals. The majority of admissions were because the baby required admission to the neonatal unit.

8.5 Data tables: Postnatal admissions

Table 157: Maternal destination immediately after birth NWH 2009-2015

	2009 N = 7735		2010 N = 7709		2011 N =7523		2012 N=7695		2013 N=7223		2014 N=7400		2015 N=6933	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
NW Wards	4557	58.9	4661	60.5	4730	62.9	4797	62.3	4617	63.9	4777	64.6	4585	66.1
Birthcare	2637	34.1	2543	33.0	2357	31.3	2469	32.1	2251	31.2	2313	31.3	2083	30.0
Home	517	6.7	481	6.2	414	5.5	407	5.5	336	4.6	293	4.0	251	3.62
Other Units	24	0.3	24	0.3	22	0.3	22	0.3	19	0.3	17	0.2	14	0.2

Table 158: Reason for postnatal admission by place of birth for women who birthed elsewhere NWH 2015

	Total N=105		Birthcare n=31		Home n=6		CMDHB* n=11		North Shore n=16		Waitakere n=24		Other n=17	
	N	%	n	%	n	%	n	%	n	%	n	%	n	%
Neonatal admission	58	55.2	8	25.8	1	16.7	8	72.7	13	81.3	14	58.3	13	76.5
Infection	5	4.8	1	3.2	0		0		0		2	8.3	1	5.9
Breast	9	8.6	4	12.9	0		1	9.1	1	6.3	2	8.3	1	5.9
Postpartum haemorrhage	9	8.6	6	19.4	1	16.7	0		2	12.5	0		0	
Obstetric trauma	6	5.7	4	12.9	2	33.3	0		0		0		0	
Retained placenta/products	1	1.0	1	3.2	0		0		0		0		0	
Other	17	16.2	7	22.6	2	33.3	2	18.2	0		6	25.0	2	11.8

*All 11 from Middlemore hospital

Table 159: Maternal destination following birth by mode of birth NWH 2015

	Total	NWH Wards		Birthcare Auckland		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Total	**6933**	**4585**	**66.1**	**2083**	**30.0**	**251**	**3.62**	**14**	**0.2**
Spontaneous vaginal	3594	1541	42.9	1803	50.2	241	6.71	9	0.3
Operative vaginal	871	579	66.5	280	32.1	10	1.15	2	0.2
CS Elective	1247	1246	99.9	0	0.0	0	0.00	1	0.1
CS Emergency	1221	1219	99.8	0	0.0	0	0.00	2	0.2

Table 160: Maternal destination following birth by prioritised maternal ethnicity NWH 2015

	Total	NW Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Maori	469	339	72.3	88	18.8	40	8.5	2	0.4
Pacific	805	558	69.3	201	25.0	45	5.6	1	0.1
Asian	1581	991	62.7	510	32.3	78	4.9	2	0.1
Indian	660	465	70.5	179	27.1	16	2.4	0	0.0
European	3118	2041	65.5	1015	32.6	53	1.7	9	0.3
Other	300	191	63.7	90	30.0	19	6.3	0	0.0

Table 161: Maternal destination following birth by LMC at birth NWH 2015

	Total	NW Wards		Birthcare		Home		Other units	
	6933	n=	4585	n=	2083	n=	251	n=	14
	N	n	%	n	%	n	%	n	%
Total	**6933**	**4585**	**66.1**	**2083**	**30.0**	**251**	**3.6**	**14**	**0.2**
Independent Midwife	3341	1890	56.6	1296	38.8	147	4.4	8	0.2
Private Obstetrician	1854	1312	70.8	513	27.7	25	1.3	4	0.2
General Practioner	16	9	56.3	7	43.8	0	0.0	0	0.0
NW Community	1234	911	73.8	248	20.1	75	6.1	0	0.0
NW High risk	427	405	94.8	19	4.4	1	0.2	2	0.5
Other DHB	32	32	100.0	0	0.0	0	0.0	0	0.0
Unbooked	29	26	89.7	0	0.0	3	10.3	0	0.0

Table 162: Place of birth for women admitted postnatally who did not birth at NWH 2015

	n=	105
	n	%
Birthcare	31	29.5
Home	6	5.7
Middlemore	10	9.5
North Shore	16	15.2
Waitakere	24	22.9
Papakura Obstetric	1	1.0
Other	17	16.2

9 NEWBORN SERVICES

This chapter provides data on the outcomes of babies cared for at the Neonatal Intensive Care Unit (NICU). Additional data can be found at the end of this chapter. Data in the Newborn section pertain to all babies admitted to and cared for at the NWH Neonatal Intensive Care Unit if born during the 2015 calendar year. This includes babies transferred from other units or home.

Admissions and all other data in this chapter except occupancy relate to babies born in the 2015 calendar year. Occupancy data relate to the unit occupancy for each day in 2015.

In the presentation of the data in this chapter there are a number of comparisons with matched data from other sources. Consequently the denominator used variably relates to (1) all babies born in 2015 and admitted to the Auckland City Hospital (ACH) NICU, (2) inborn (ACH) babies and (3) babies born in 2015 assigned to ACH by the Australia New Zealand Neonatal Network (ANZNN).

Australia New Zealand Neonatal Network (ANZNN)

ANZNN collects standardised data from all level 3 NICUs in Australia and New Zealand. A dataset is collected for each baby admitted to a NICU who is:

- <1500g birth weight
- <32 weeks gestation
- requires assisted ventilation (IPPV, CPAP or HFOV)
- has major surgery (defined as opening of a body cavity)
- babies who were cooled as a treatment for neonatal encephalopathy

Each infant is assigned to the level 3 NICU at which they were originally treated for at least 4 hours, even if that baby was subsequently transferred. Data are collected up to discharge home, even if care is in several hospitals.

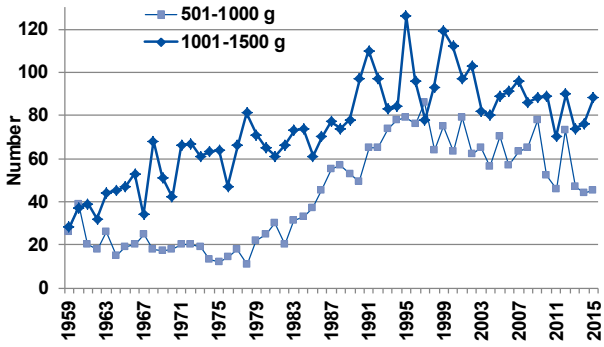
ANZNN was established in 1994 and ACH has supplied data since 1995. De-identified data are sent electronically to the Sydney secretariat. Approval to send data was obtained from the North Health Ethics Committee prior to ACH joining ANZNN. An annual report of the combined data from all units is published each year and feedback data are sent to each unit that contributes comparing the outcomes of that unit to those of the Network overall.

Data presented here are from the ANZNN annual reports and the ACH NICU database. The ANZNN data include data from ACH.

9.1 Inborn live birth at National Women's 1959-2015

This includes all babies born alive (including those who died at or soon after birth and those with lethal anomalies). The weight ranges 501-1000 and 1001-1500 are used as these data have been collected prospectively since 1959, initially by Professor Ross Howie.

Figure 132: Number of inborn live births ≤1500g NWH 1959-2015 (excludes BBAs).



9.2 NICU occupancy

The 2015 occupancy of 13060 bed days is approximately equivalent to a mean of 35.9 babies per day. This number is down from previous years but still represents a high occupancy of just under 90%. Trends for the occupancy by gestational age groups and birth weight are given in the figures below. The number of births increases with an increasing gestational age and the duration of stay decreases, as the infants require less time to achieve maturity. Note that for the last decade the Waitemata units have cared for their own routine level 2 babies so the overall acuity of the ACH unit has risen for a given occupancy.

Figure 133: Occupancy (baby days per year) of NICU by gestational age 1999-2015

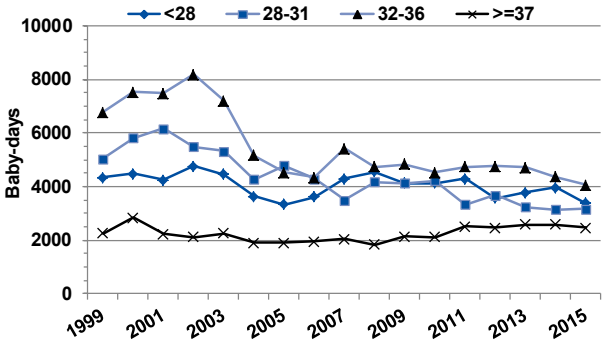
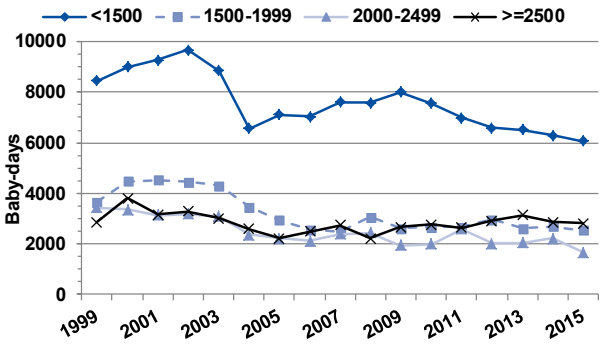


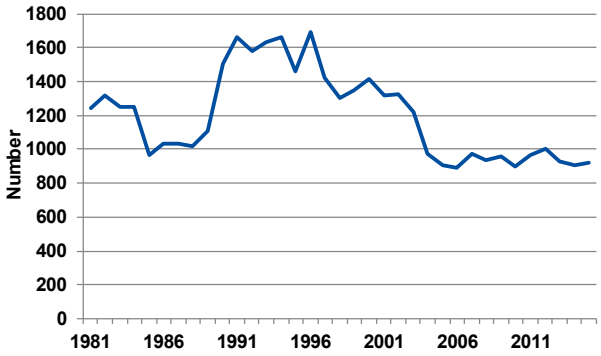
Figure 134: Occupancy (baby days per year) of NICU by birth weight 1999-2015



9.3 Admissions to NICU

Total admissions were 925 for the 2015 calendar year and have remained circa 900-1000 over the last decade. Auckland City Hospital is the level 3 referral unit for the two Waitemata hospitals and for Northland Base Hospital and also provides regional intensive care services for infants undergoing surgical procedures in the newborn period and care for babies with antenatally diagnosed congenital cardiac disease. The neonatal units at North Shore and Waitakere Hospitals admit babies >1500g and >31 weeks gestation and provide Level 2 care including CPAP.

Figure 135: Admissions to NICU 1981-2015



9.3.1 Admissions to NICU by gestation and birth weight

For 2015, the number of babies admitted between 32 and 36 weeks gestation appears to have plateaued at approximately half of the 600 per year seen in 2000. However, the level 3 infants born below 32 weeks remain fairly constant at around 160 per year. The rise in term infants seen from 2008 until 2011 has plateaued over the last 5 years. These babies are likely to have a mixture of problems but the two most common (see Table 181) are respiratory distress and congenital abnormality, which includes cardiac anomalies.

Figure 136: Admissions to NICU (total) by gestational age 1999-2015

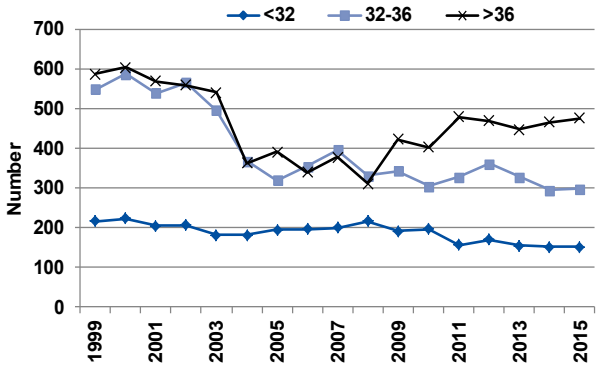


Figure 137: Admissions to NICU (total) by birth weight 2000-2015

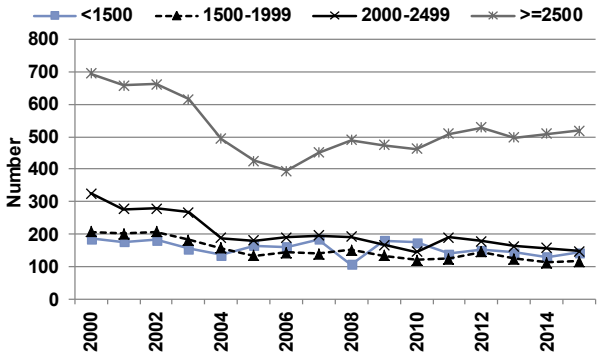
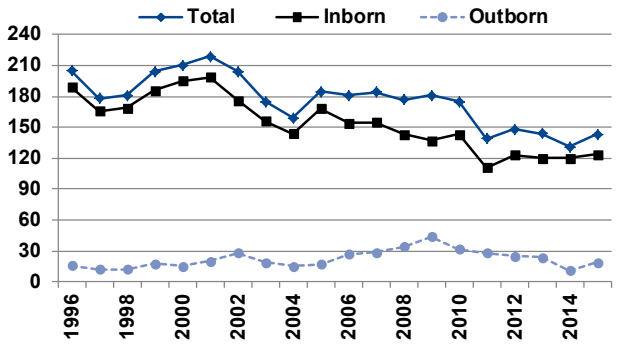


Figure 138: Admissions to NICU of <1500g babies (VLBW) by place of birth 1996-2015 (outborn includes BBAs).

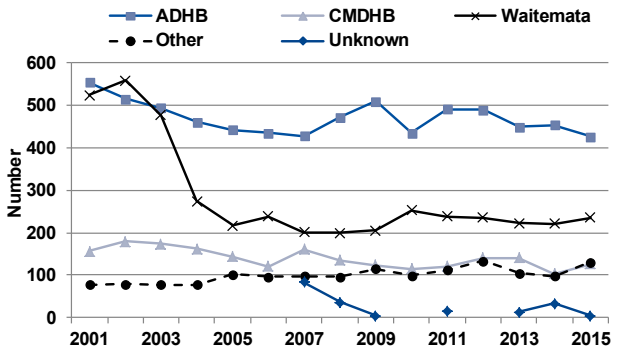


The total number of outborn VLBW infants admitted to the NICU has remained low in 2015. This group of infants includes transfers from level 2 units for level 3 care and those infants who are transferred from Middlemore Hospital NICU for surgical care so are a significant group. As a general principle, antenatal transfer is preferable as this avoids transportation of small or fragile infants. Hence the number of outborn infants is very much lower than the number of infants born to mothers domiciled outside of ADHB.

9.3.2 Admissions to NICU by domicile of mother

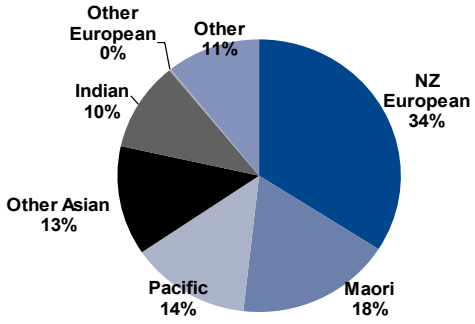
As previously noted there was a decline in admissions of babies whose mothers are domiciled in the Waitemata DHB with the opening of their two level 2 units in the early 2000s. In the last year there was a slight rise in admission numbers from "other" and CMDHB. The reasons for that are not fully elucidated but it could be a mixture of other units being full and movement to Auckland associated with the fetal maternal medicine network providing antenatal care for a small number of infants with anomalies.

Figure 139: Admissions to NICU by maternal domicile 2001-2015



9.3.3 Admissions to NICU by ethnicity of baby

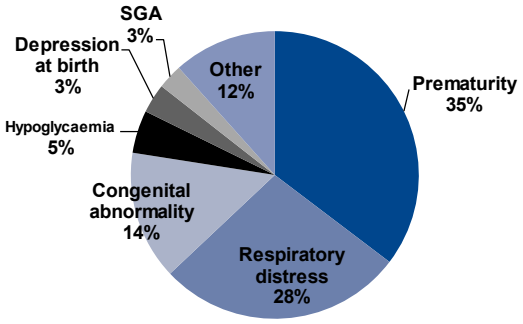
Figure 140: Admissions to NICU by ethnicity of baby 2015



The most frequent ethnicity of NICU admissions was NZ European with 34.1% overall, including 33% of preterm and 35.1% of term infants respectively. The second largest single ethnic group overall was Māori at 18% and Pacific at 14%. There are differences in rates between term and preterm infants, notably Māori have a higher rate for preterm admissions at 19.4% (see Table 180). Due to the change to reporting infant ethnicity made in 2007 we have not reported long term changes in infant ethnicity over time. However, the high rate of non NZ European ethnicity and the growth in the number of Asian admissions over the last 5 years should be noted.

9.3.4 Reasons for admission to NICU

Figure 141: Reasons for admissions to NICU 2015



Other reason for admission includes; cyanotic episode, suspected infection, neurological problem, haemolytic disease, feeding difficulty, bile stained vomiting, jaundice.

Prematurity, respiratory distress and congenital anomalies remain the three commonest reasons for admission to NICU. Hypoglycaemia was also important, particularly in term infants (11.3%). Prevention of this using glucose gel has been the subject of a major ongoing research trial over the last year. The full list of reasons for admission is presented in Table 181.

9.3.5 Antenatal corticosteroids (benchmarked with ANZNN)

Antenatal steroid use has been consistently high in the Network (ANZNN) and ACH over the last five years. In 2015, 88% of ACH babies <32 weeks gestation received some antenatal corticosteroids before birth and 60% received a course starting between 24 hours and seven days before birth. Although data are not available from ANZNN for all years, it appears that ACH and ANZNN rates are similar across age groups 24-31 weeks gestation.

Figure 142: Any antenatal corticosteroids at 24-27 weeks 1995-2015

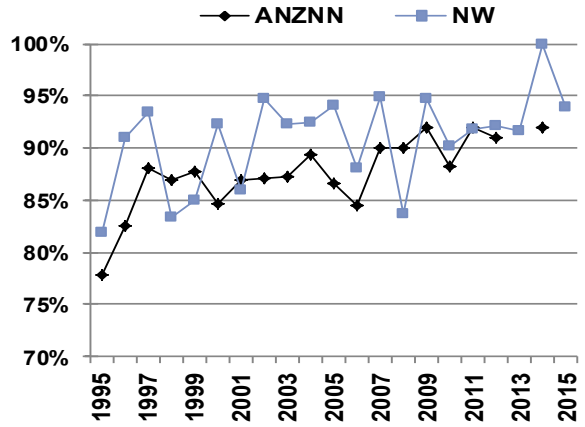
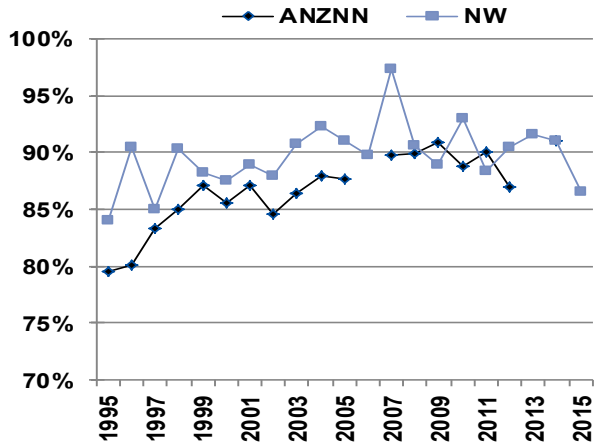


Figure 143: Any antenatal corticosteroids at 28-31 weeks 1995-2015



9.4 Care and complications

9.4.1 Infection (inborn admissions)

In 2015, there were 10 early-onset culture proven septicaemias, which is similar to the previous five years (5-10 cases per year). The organisms included E coli (1) and Group B Streptococcus (3), Coagulase negative Staph (2), plus one each Enterococcus, Enterobacter, Haemophilus and Bacillus species. All three of the Group B Streptococcus infection cases presented with an unwell infant following maternal PPROM. In two of these Group B Streptococcus cases there had been preterm rupture of membranes and the mother had received intravenous antibiotics in labour but the organism was resistant to Erythromycin (as used in both cases). In the other case delivery was at term and the mother had not received antibiotics in labour. In the case of early E coli infection the mother had prolonged rupture of membranes and a urinary tract infection that was treated then received intravenous penicillin and cephalosporin in labour. The E coli was penicillin resistant but cephalosporin sensitive.

There were 22 episodes of late-onset septicaemia, sometimes with more than one organism. This is down from 38 episodes in 2014 but similar to the 22-34 seen over the previous five years. For late onset sepsis the most common organism was Staphylococcus epidermidis / coagulase negative Staphylococcus with 15 episodes identified compared with 32 last year. This decrease coincides with a major project working to decrease central line sepsis rates. Other important organisms involved in late sepsis include two cases each of: E coli with associated meningitis; Staphylococcus aureus and Klebsiella septicaemia.

9.4.2 Hypoxic ischaemic encephalopathy (all admissions)

Six inborn babies developed significant stage 2 hypoxic ischaemic encephalopathy (HIE) in 2015, giving an incidence of 0.9/1000 term live births. No stage 3 HIE was observed in inborn babies. The incidences were between 0.26 and 1.6/1000 term live births for the years between 2003 and 2015 (Table 185).

9.4.3 Intraventricular haemorrhage in very low birth weight infants admitted to NICU 1985-2015

Figure 144: Intraventricular haemorrhage in <1250g infants admitted to NICU 1985-2015

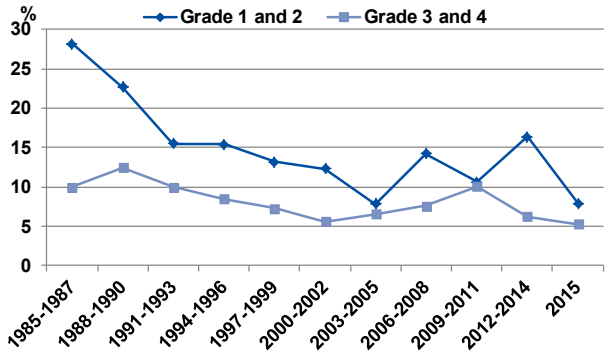


Figure 144 demonstrates the historical trend in IVH rates over the last 30 years. However, there have been some changes in investigation and reporting during this period. In 2005, the criteria for routine cerebral ultrasound scanning was changed to <30 weeks or <1250g. It had previously been <32 weeks or <1500g but there was a very low incidence of significant abnormalities in the larger more mature infants. From 2010 onward, to avoid major changes in the denominator, we have interpreted those infants in whom an ultrasound was not performed, due to the policy change, as negative (no IVH). From 2014, we have redrawn the graph to represent the total number of IVH cases for the two groups (i.e. combined grade 1 & 2 versus combined grade 3

& 4). Previously the data had been crudely averaged and may have under represented total IVH burden. As we consider this a more informative representation we have redrawn the graph back to 1985 so the graph shape is similar previously but with more informative rates, given for each 3 year epoch. These changes will not affect later graphs which compare with ANZNN data.

On the whole, ACH data for rates of IVH are comparable with ANZNN data (Figure 145 to Figure 148) but with more year-to-year variation due to the smaller number of infants in each group. The rates of severe IVH (Grade 3 & 4) are low but these are associated with significant neurodevelopmental consequences so remain an important benchmark. Included in this group are a consistent but small number of outborn babies who have not had tertiary level antenatal care.

9.4.4 IVH (Benchmarked with ANZNN) (see Table 186 and Table 187)

Figure 145: Any IVH at 24-27 weeks 1995-2015

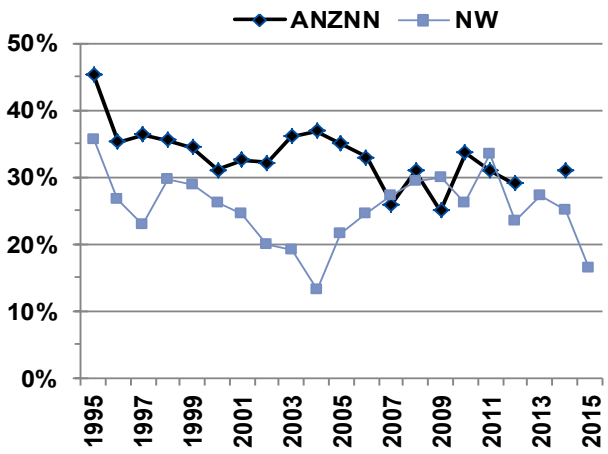


Figure 146: Severe (G3-4) IVH at 24-27 weeks 1995-2015

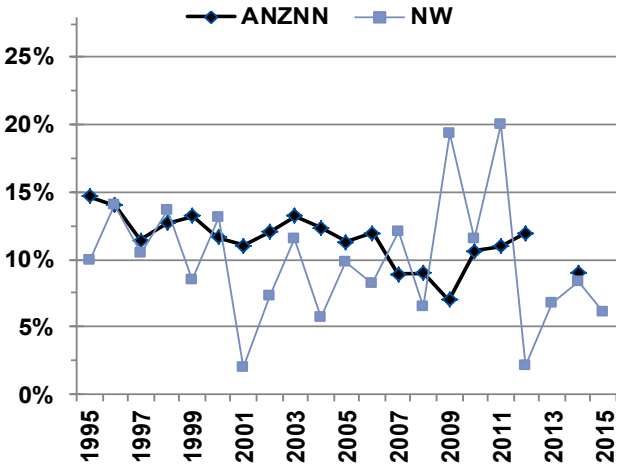


Figure 147: Any IVH at 28-31 weeks 1995-2015

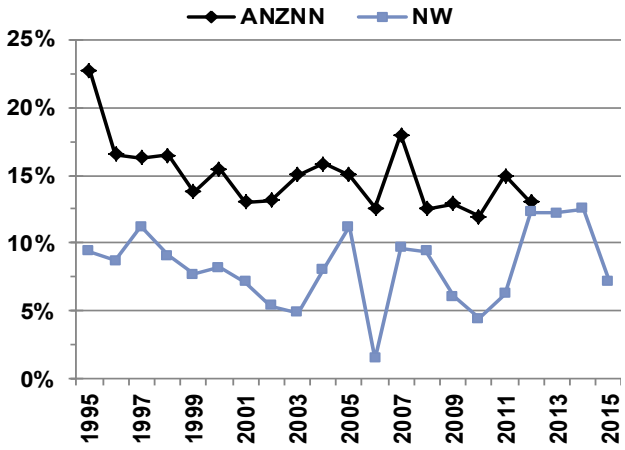
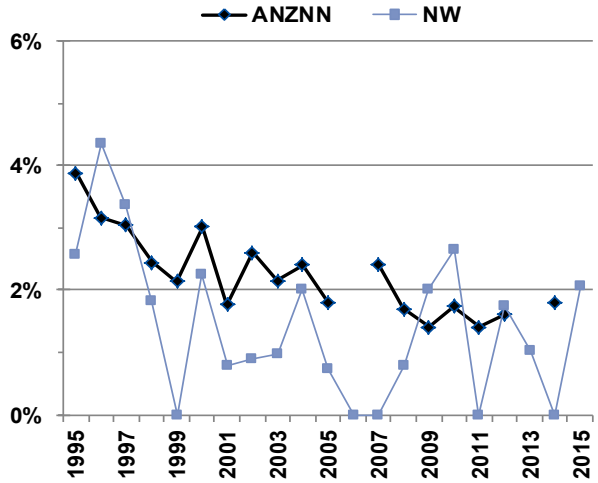


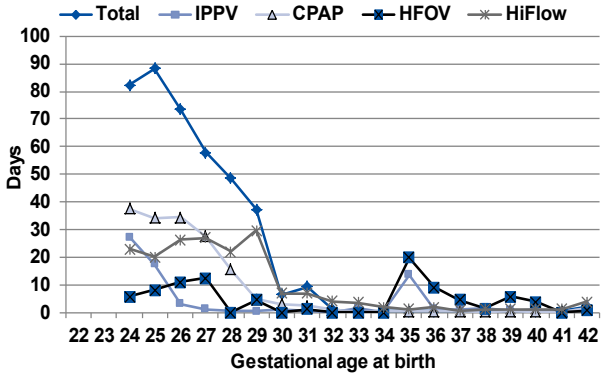
Figure 148: Severe (G3-4) IVH at 28-31 weeks 1995-2015



The rate of severe IVH at 24-27 weeks appears lower for the last three years compared to the period 2009-11. Although this is encouraging, it is expressed as a percentage so variation could reflect modest changes in either numerator or denominator numbers.

9.4.5 Assisted ventilation (all admissions)

Figure 149: Median ventilation days by gestational age among (ventilated) inborn survivors NWH 2015



Data in this section are presented for all inborn babies at ACH, thus excluding babies transferred to NICU in the postnatal period. This allows more meaningful comparisons of postnatal care at ACH over time. Note that we have redrawn the table to include numbers of babies who received support using High Frequency ventilation, which is typically used as a rescue therapy. Importantly we have also added numbers receiving HiFlow air/oxygen. This practice was introduced in 2010/11 but has increased in use and now represents a significant proportion of our respiratory support.

The neonatal unit has used CPAP as the primary mode of respiratory support in uncomplicated inborn premature infants for more than a decade. Although the majority of infants born below 26 weeks gestation receive a period of positive pressure ventilation, there is a steady reduction in the proportion receiving such support from 26 to 32 weeks gestation.

Since 2010, the number of babies receiving ventilation (IPPV and HFOV combined) has remained fairly stable but there has been an increase in the number of babies receiving CPAP and HiFlow, which has resulted in an overall rise in the number of babies receiving any respiratory support compared with a decade ago. The most common reasons for this requirement for support were: respiratory distress, meconium aspiration, congenital anomalies, support for encephalopathy, surgery and "other", which includes metabolic disease. It is routine for babies with encephalopathy who receive whole body cooling to be ventilated due to the sedation they receive, regardless of respiratory status. Note small peaks in HFOV use at 25-27 weeks and around term.

The use of humidified high flow air/oxygen (HiFlow) as a method of weaning off CPAP, particularly after 34 weeks gestation, has been well received by parents and staff and is now becoming the primary method of respiratory support for some babies. This system offers advantages in the ease of care during neuro-developmentally appropriate activities and softer interface with the baby. There is a need to observe the respiratory outcomes and duration of respiratory support with increased use.

9.4.6 Trends in use of assisted ventilation among <32 week inborn survivors

(Note that medians apply only to babies ventilated; babies not ventilated are NOT included in the calculations)

HiFlow High flow air oxygen
HFOV High frequency oscillatory ventilation
IPPV Intermittent positive pressure ventilation
CPAP Continuous positive airway pressure

Figure 150: Median days on IPPV NWH 1995-2015

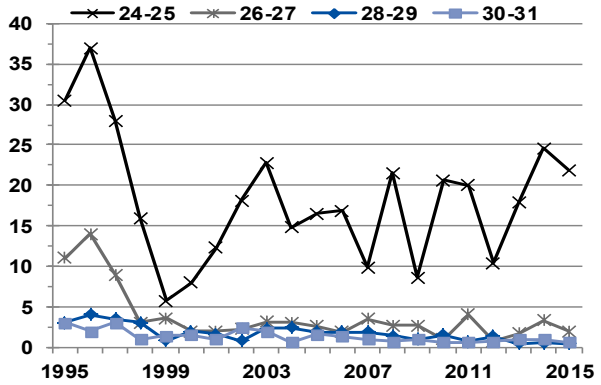


Figure 151: Median days on CPAP NWH 1995-2014

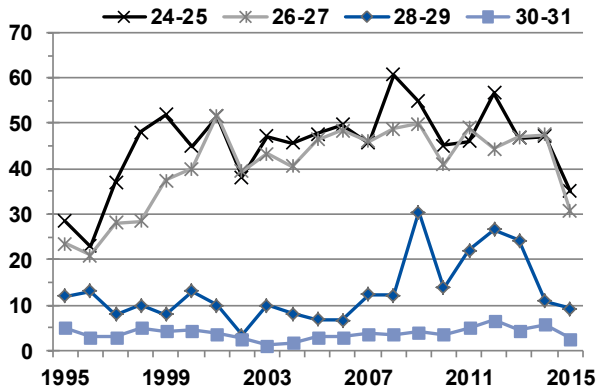
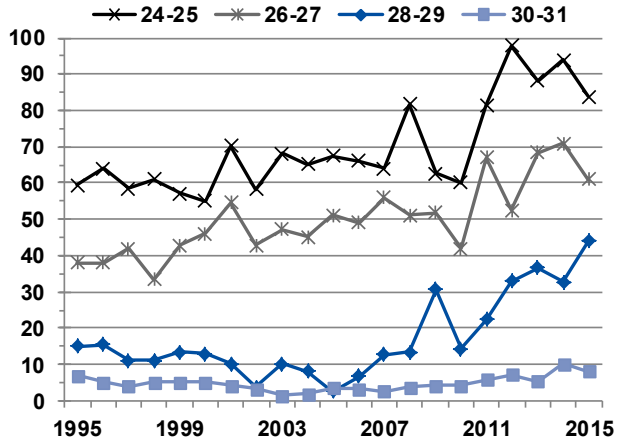


Figure 152: Median days on any ventilation NWH 1995-2015



These figures illustrate median days on respiratory support for inborn survivors. This group may be considered a more homogeneous population than the outborn.

The introduction of CPAP resulted in a decline in the median number of days on IPPV for infants 26-27 weeks gestation. There has been little change in this over the last 14 years and it remains below 5 days for all groups except 24-25 weeks gestation.

As time on IPPV has decreased the time on CPAP has increased. There has been a steady increase over the last 15 years for the most immature babies below 28 weeks. Since 2009, there has been an increase in duration of CPAP use for infants at 28-29, 26-27 and 24-25 weeks gestation but this appears to have plateaued.

9.4.7 Trends in the use of assisted ventilation among all infants born in NW (≥24 weeks gestation).

Figure 153: Number on IPPV NWH 1995-2015

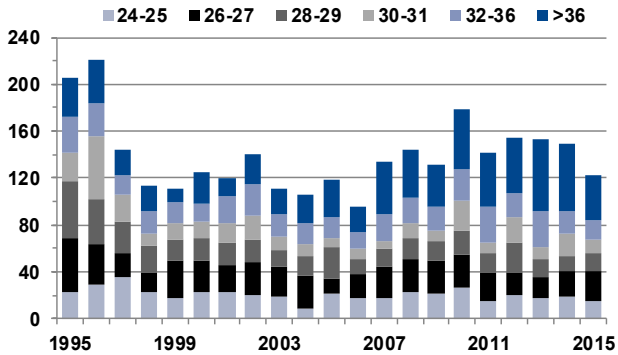


Figure 154: Number on CPAP NWH 1995-2015

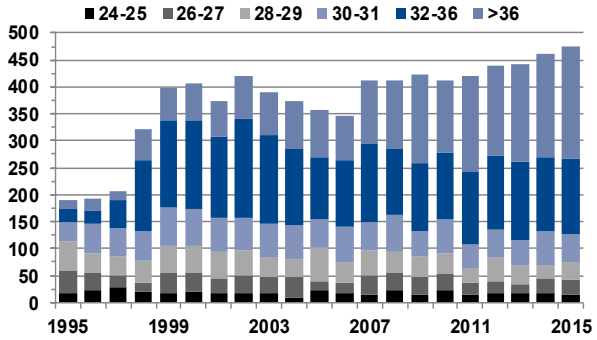


Figure 155: Number on HFOV NWH 2015

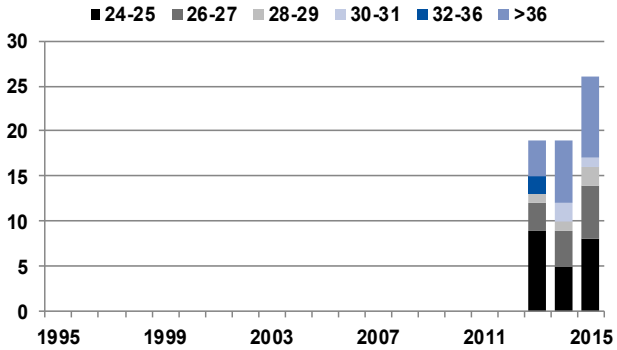


Figure 156: Number on HiFlow NWH 2015

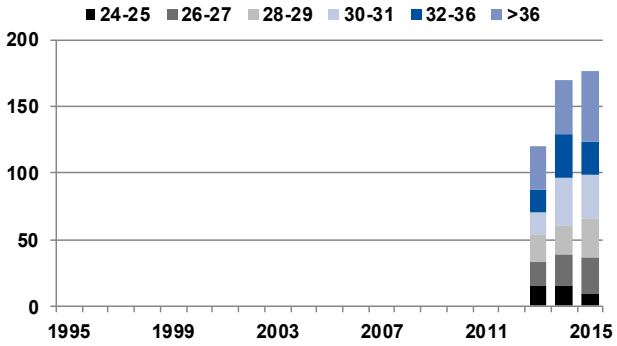
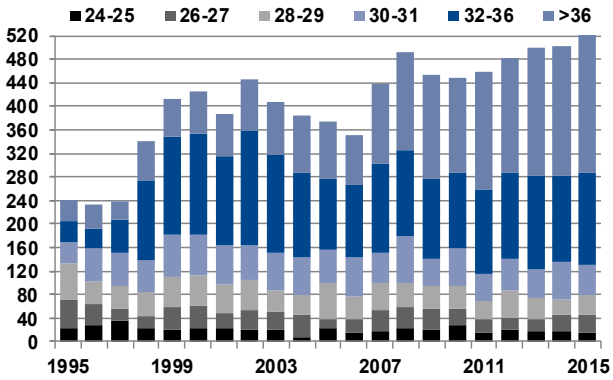


Figure 157: Number on any ventilation NWH 1995-2015



These figures show the number of babies requiring respiratory support at ACH over the last 15 years. The effect of introducing double short-pronged

Hudson® CPAP in 1997 is clear with a reduction in number receiving intubation and assisted ventilation.

From 2011 onward we have collected information on the use of High Flow Humidified Air / Oxygen. Figures representing this data and HFOV were added in 2013. Use of HFOV is fairly stable but HiFlow use continues to increase as the team become more comfortable and it is used in more immature babies. In 2014 NICU introduced the very occasional use of non-invasive ventilation (NIPPV) but numbers are very small and not reported here.

9.4.8 Positive pressure ventilation and CPAP use in NWH and across Australia and New Zealand at 24-27 weeks gestation (ANZNN benchmarking)

These data compare the use of IPPV and CPAP in NICU and across the Australia and New Zealand Neonatal Network. The Network collects standardised data from all NICUs in Australia and New Zealand.

The median data presented here are for all babies ventilated (ie babies not ventilated are excluded).

Figure 158: Percentage on IPPV (24-27 wks ANZNN assigned) NWH 1995-2015

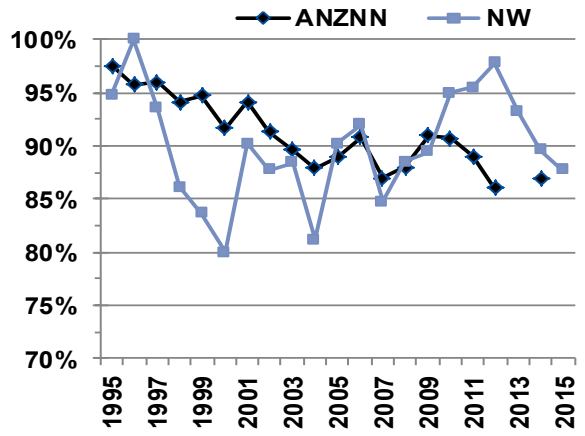


Figure 159: Percentage on CPAP (24-27 wks ANZNN assigned) NWH 1995-2015

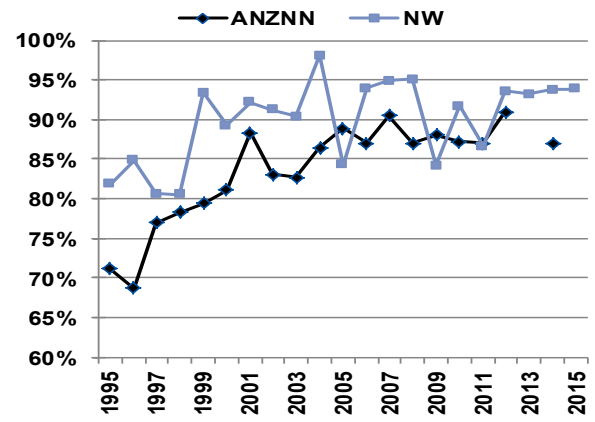


Figure 160: Median days on IPPV (24-27 wks ANZNN assigned) NWH 1995-2015

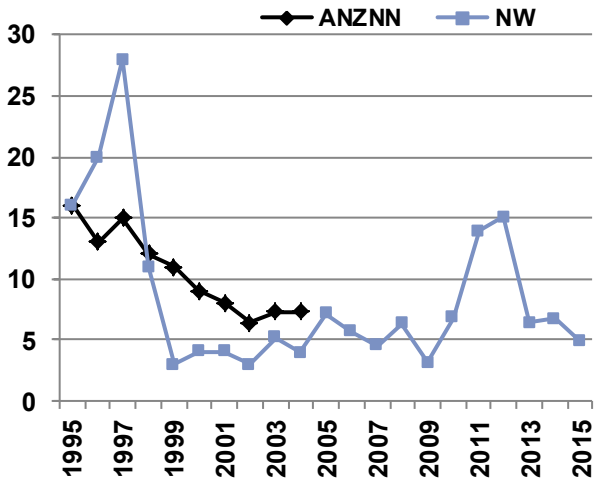
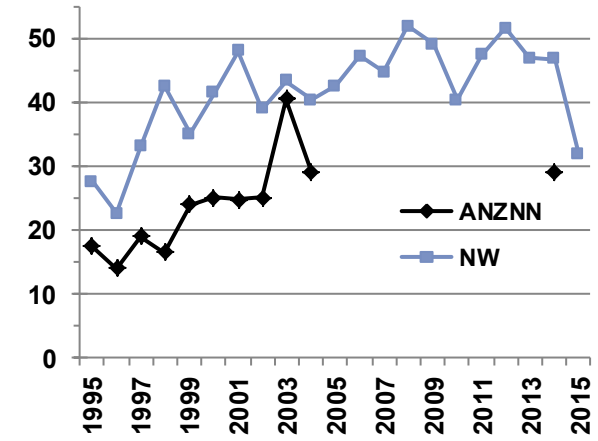


Figure 161: Median days on CPAP (24-27 wks ANZNN assigned) NWH 1995-2015



9.4.9 Positive pressure ventilation and CPAP use in NW and across Australia and New Zealand at 28-31 weeks gestation (ANZNN benchmarking)

Figure 162: Percentage on IPPV (28-31 wks ANZNN assigned) NWH 1995-2015

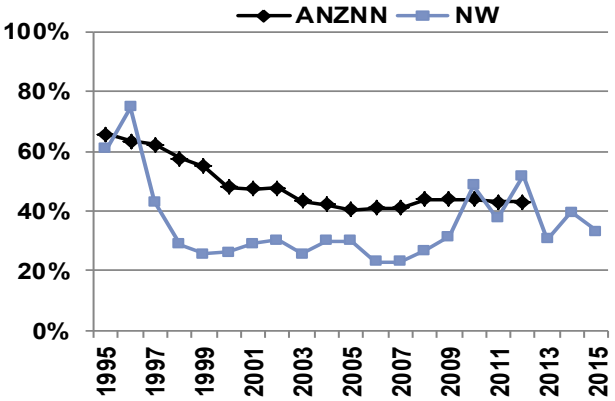


Figure 163: Percentage on CPAP (28-31 wks ANZNN assigned) NWH 1995-2015

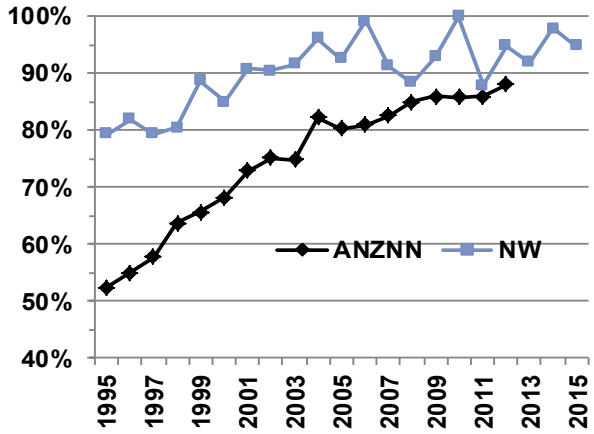


Figure 164: Median days on IPPV (28-31 wks ANZNN assigned) NWH 1995-2015

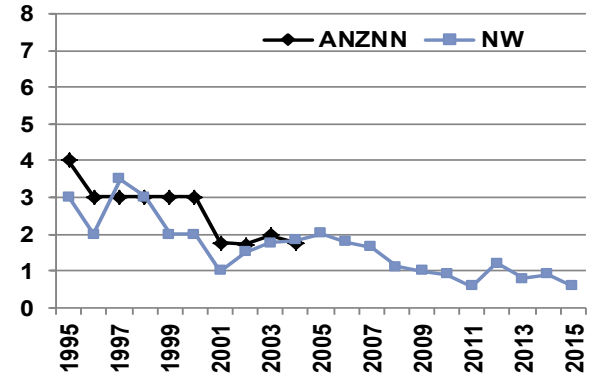
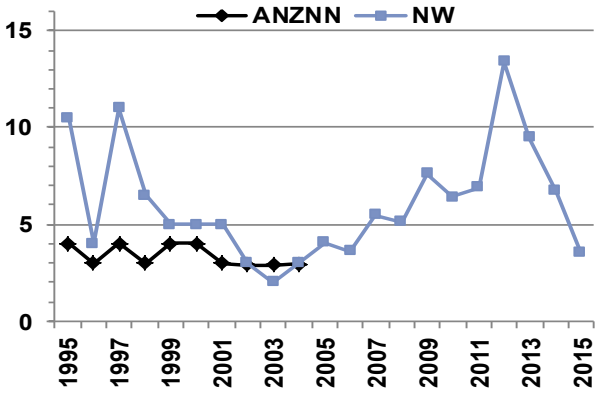


Figure 165: Median days on CPAP (28-31 wks ANZNN assigned) NWH 1995-2015



The pattern of respiratory support in NWH babies of 28-31 weeks gestation parallels that seen in the less mature babies. The decrease in median days on CPAP from 2013 is offset by use of HiFlow.

9.4.10 High frequency oscillatory ventilation and inhaled nitric oxide

These data are on all babies admitted to NICU in each year, including those born in other hospitals or at home.

High frequency oscillatory ventilation (HFOV) is typically used for 'rescue' treatment at ACH. Hence, babies treated with HFOV are the sickest babies in NICU who would be expected to have a very poor outlook whatever the treatment. At all gestations there is a significant mortality in those infants who receive these advanced respiratory supports.

Figure 166: HFOV at 24-27 weeks (ANZNN assigned babies) NWH 1995-2015

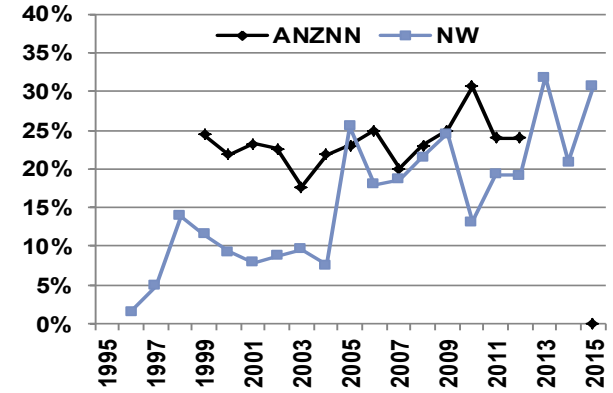
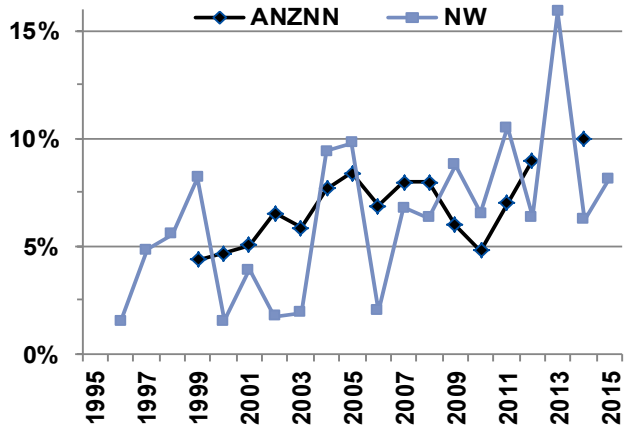


Figure 167: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies) NWH 1995-2015



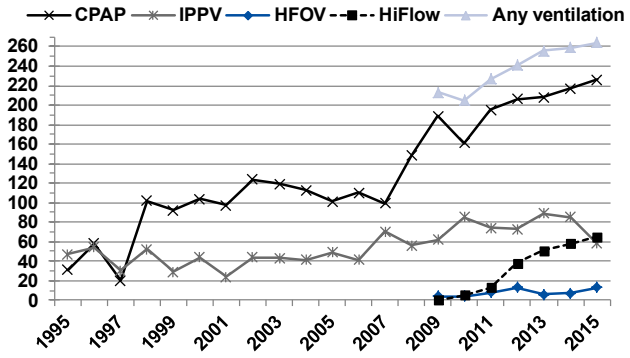
These two figures compare the use of HFOV and iNO at ACH with use across the ANZNN. Generally, the use of these interventions in preterm infants has increased since 2003 but is probably comparable with ANZNN data.

9.4.11 Term/post-term infants on assisted ventilation from 1995 to 2015

This figure shows trends in the number of term infants treated with the available forms of respiratory support. As with preterm infants, in the late 1990s there was a significant increase in CPAP use due to the removal of headbox oxygen as a therapy. Since 2008 there has been an increase in numbers receiving CPAP. In 2013 we revised the figure to include data for HFOV and HiFlow and included an indication of total respiratory support (i.e. all modes combined). For 2015 there was again a small rise in CPAP use and a larger rise in HiFlow use but use of

the other more invasive forms of support appears to be stable.

Figure 168: Number of term and post term babies needing respiratory support (IPPV, HFOV, CPAP and HiFlow) NWH 1995-2015

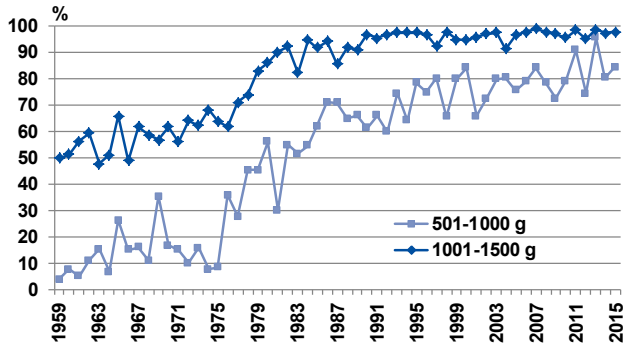


In 2015, TTN/RDS, meconium/PPHN, infection, congenital anomalies, support for surgery, neonatal encephalopathy and "other", which could include a neuromuscular problem, were the reasons for ventilation in term infants.

9.5 Outcomes

9.5.1 Survival of NWH inborn babies by birth weight

Figure 169: Neonatal survival (0-28 days) of ≤1500g inborn live births NWH 1959-2015



Over the years the definitions used have been the same, counting all babies, including those who died soon after birth, if they showed signs of life.

The numbers of babies with anomalies and the number who were not actively treated because of their low gestation varies from year to year, and has a big influence on the overall survival rate, particularly in the extremely low birth weight group (500-1000g, ELBW).

Significant advances in neonatal care have been reviewed in previous reports. However, it is worth noting the current quality of survival, in terms of neurodevelopment, as reported in the Child Development Unit (CDU) section of the report (section 9.9).

9.5.2 Survival of inborn babies (23 to 31 weeks) by gestational age

Figure 170: Numbers of live inborn babies 23 to 31 weeks gestation NWH 2003-2015 (n=2055)

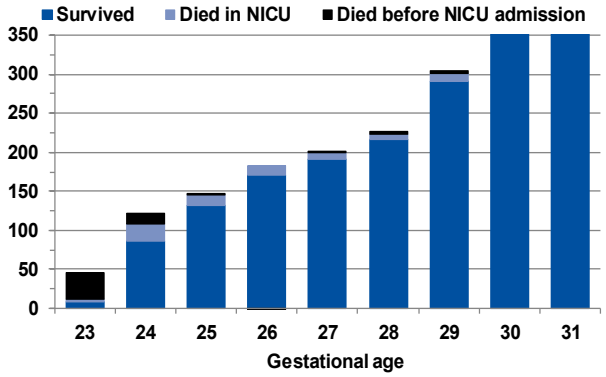


Figure 171: Survival of live inborn babies 23-31 weeks NWH 2003-2015 (n=2055)

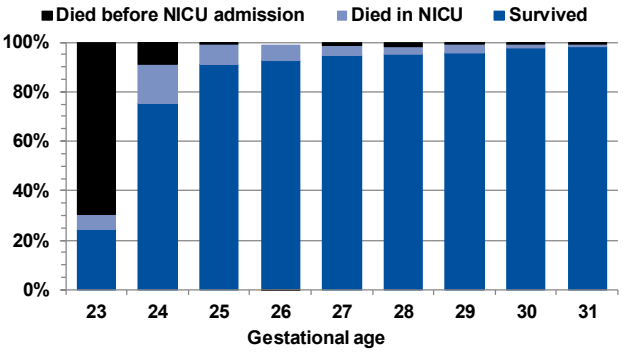
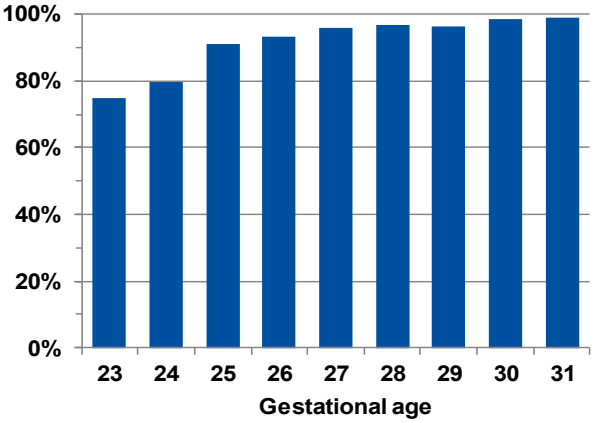


Figure 172: Survival of live inborn babies admitted to NICU 2003-2015 (n=1993)



There is a gradient in the survival rates between 23 and 27 weeks gestational age. Although the number of infants in each group per year is small, the pattern of survival in very preterm infants has been steady over the last decade. In comparison with ANZNN and some other international data sets survival at 23 weeks is low. This point was made by

the external review last year and work has commenced both locally and nationally to review practice and update guidelines. At gestations greater than 24 weeks ACH survival rates are comparable to outcomes published by ANZNN, which approximate population data.

9.5.3 Survival of 24-27 week babies admitted to NICU (benchmarked with ANZNN)

Figure 173: Survival at 24-25 weeks gestation compared with ANZNN data NWH 1995-2015

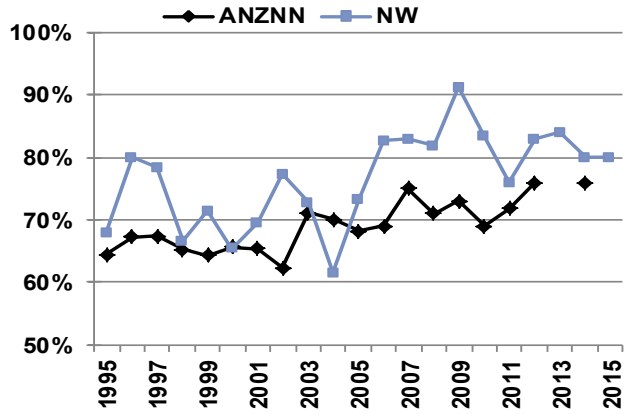
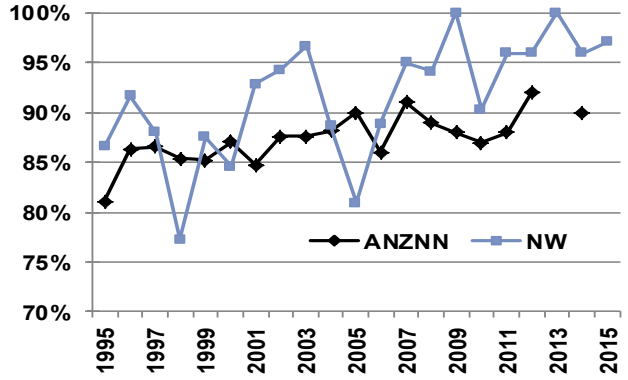


Figure 174: Survival at 26-27 weeks compared with ANZNN data NWH 1995-2015



Survival rates for 24-27 weeks gestation are consistently around 80% although there is some variation due to relatively small numbers at 24-25 weeks gestation. These data are for all inborn babies admitted, including those with lethal malformations but excluding deaths in Labour and Birthing Suite.

9.5.4 Cystic periventricular leukomalacia (PVL)

In 2015 there was one outborn 30 week gestation baby who was transferred in for shunting of post haemorrhagic ventricular dilatation associated with intraventricular haemorrhage and periventricular leucomalacia.

9.5.5 Retinopathy of prematurity benchmarked with ANZNN

Rates of stage 3-4 ROP compare reasonably with ANZNN data but fluctuate each year due to small numbers. As previously reported, changes in the screening technique and the appointment of a new ophthalmologist in 2006 were associated with an increased incidence of ROP. However, a large proportion of the increase was due to increased detection of milder grades (Stage 1 and 2) that do not have any short or long-term consequences.

The rates of significant (Stage 3 or 4) ROP remained low for 2015 and are comparable to the ANZNN data. One 24 week infant received intravitreal Bevacizumab injection for stage 3 ROP. One other infant was born at 25 weeks and transferred back to their DHB of domicile at 29 weeks then subsequently required laser treatment for Stage 3 ROP.

Figure 175: Stage 3-4 ROP at 24-27 weeks NWH 1995-2015

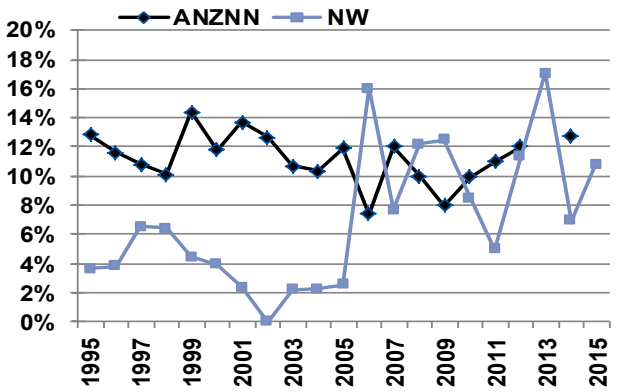
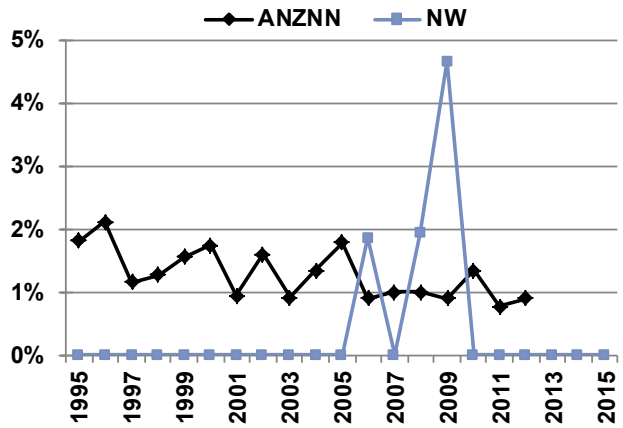


Figure 176: Stage 3-4 ROP at 28-31 weeks NWH 1995-2015



Chronic lung disease (CLD) benchmarked with ANZNN

Chronic lung disease is an important clinical outcome, particularly in the very preterm population. Although a variety of definitions exist in the literature

the graphs below have consistently used a rate defined by *"the use of support or oxygen at 36 weeks corrected gestation".* ANZNN has also used this definition.

The graphs below give a 20 year outline of CLD in the NICU compared with ANZNN. It has been previously noted that changes in the target oxygen saturation levels were associated with altered rates of CLD. In the late 1990s target levels were increased only then to fall in 2002 with the presentation of the BOOST trial of oxygen saturation in CLD. Between 2005 and 2011 there were no discernible major trends in the incidence of chronic lung disease. However, in 2010 the SUPPORT trial reported a higher risk of death if oxygen saturation was targeted in the range 85-89% compared with 91-95% so there has once again been a shift upwards in rates of lung disease defined by ongoing use of respiratory support or supplementary oxygen.

From 2016, ANZNN data for babies born at <28 weeks gestation onwards will be based on a chronic lung disease measured quantitatively to determine physiological chronic lung disease status and to provide a comparable indicator of lung disease severity regardless of NICU practice (modified from Quine et al. 2006 Arch Dis Child Fetal Neonatal Ed 91:F409 and Walsh et al. 2004 Pediatrics 114:1305).

Figure 177: Chronic lung disease at 24-27weeks NWH 1995-2015

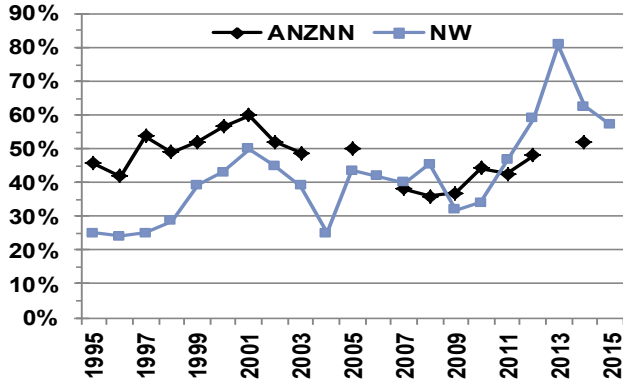
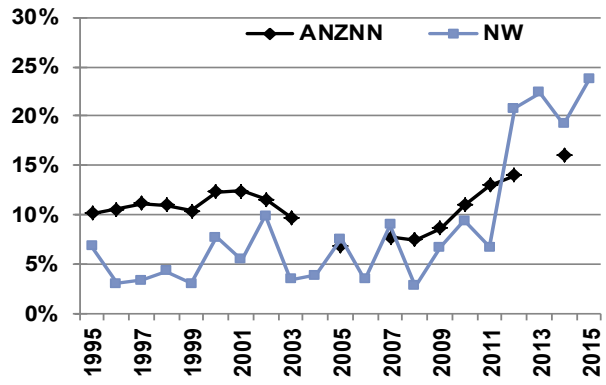


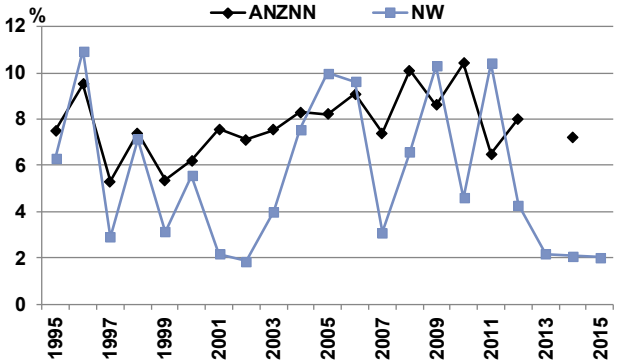
Figure 178: Chronic lung disease at 28-31weeks NWH 2015



9.5.6 Necrotising enterocolitis benchmarked with ANZNN

The benchmarking figure below compares rates for babies below 28 weeks gestation from ACH and the ANZNN. Moderate variability in rate due to small numbers has been typical. However, probiotic use was introduced in 2011 initially as a clinical trial and more recently as a standard procedure for infants below 1500g or 32 weeks gestation so it is important to continue to observe NEC rates closely. Data for individual NEC cases by gestation and birth weight are given in Table 200 and Table 201 and it is notable that for the last three years the rate has been circa 1-2% for infants <32 weeks gestation.

Figure 179: Necrotising enterocolitis (NEC) in ANZNN assigned babies under 28 weeks gestation compared with the incidence in ANZNN 1995-2015



9.5.7 Patent Ductus Arteriosus (all babies)

In 2015, 22 infants (21 inborn, 1 outborn) below 1500g or 32 weeks gestation were treated medically for a symptomatic PDA. In four cases a second course was given. The majority of infants who received treatment for a symptomatic PDA associated with prematurity (i.e. did not have a congenital cardiac anomaly) were less than 1000g. Infants who had a PDA ligation in association with congenital cardiac anomalies are not included here. In 2015, one inborn (NOT ANZNN assigned to NWH) NICU infant had surgical ligation of their PDA. This number is similar to previous years.

9.5.8 Pneumothorax needing drainage (all babies)

In total 5 babies developed a pneumothorax that needed drainage in 2015 (3 inborn, 2 outborn). Gestation at birth 25, 33, 38, 39, 41. This number of infants requiring chest drain insertion is fairly typical.

9.5.9 Postnatal corticosteroids (ANZNN babies)

These data are on the use of postnatal corticosteroids to treat CLD. Data on steroid use to facilitate extubation, associated with upper airway

oedema, are excluded. The denominator used in the figures is the number of babies alive at 1 week of age.

In 2015, 16 inborn infants below 28 weeks gestation received postnatal steroids for chronic lung disease. At 24-25 weeks gestation use was common and 67% received steroids. This decreased to 19% at 26-27 weeks gestation and none of those born at 30-31 weeks gestation were treated with postnatal steroids. There is an intention to use steroids rationally and at the lowest required dose.

Figure 180: Percentage receiving postnatal dexamethasone by gestational age (ANZNN alive at one week <32wks) NWH 1995-2015

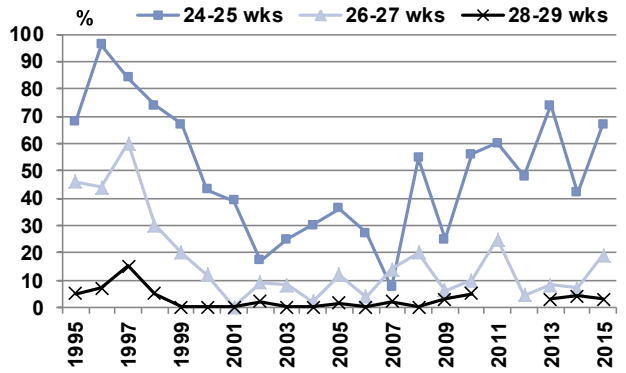
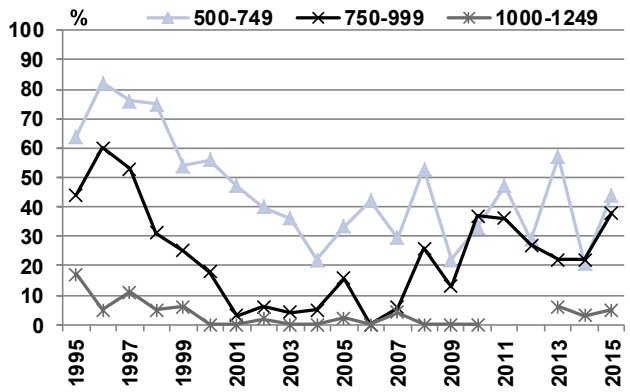


Figure 181: Percentage receiving postnatal dexamethasone by birth weight (ANZNN alive at one week <1500g) NWH 1995-2015



9.6 Immunisation

9.6.1 Hepatitis B

In 2015, 10 infants were identified as HepB positive and all given immunoglobulin. There were 11 cases where maternal HepB status was not known; one baby was given HepB vaccine before admission, one baby died, two babies had very brief admission to NICU, 6 were late admissions to NICU from other units, and there was no further information available for the remaining case.

9.6.2 BCG

In 2015 there was one baby who was given BCG vaccination whilst in the neonatal unit.

9.6.3 Infrarix Hexa and Prevanar at 6 weeks

There were 69 babies who were first admitted before 42 days and discharged at or after 42 days, and who did not die so were potentially eligible for their 6 week immunisation. Sixty-six babies (96%) had their immunisation at the routine time. Of the 3 who are not recorded as receiving immunization, two sets of parents declined immunization, and one was transferred at day 44 to be immunized at the receiving hospital.

9.6.4 Infrarix Hexa and Prevanar at 3 months

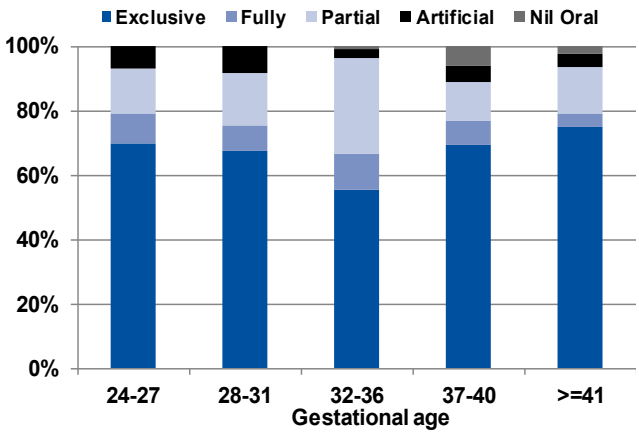
There were 20 eligible babies in 2015 who were first admitted before 90 days and finally discharged at or after 90 days, and who did not die who were potentially eligible for immunization.

Nineteen of these received immunisation at the routine time but in one case it was delayed until after transfer back to the local hospital.

9.7 Infant Feeding (Inborn)

Data are presented on babies admitted to the NICU who were either discharged to the postnatal ward or to home. Note it is a standard of care for VLBW infants to receive human milk fortifier, which is classified as a breast milk substitute. For the purposes of this report VLBW infants who only receive breast milk and fortifier are classified as exclusive breast feeding.

Figure 182: Method of feeding at discharge from NICU by gestational age 2015



The data for 2015 show that approximately 70% of infants at 24-27 weeks' gestation receive exclusive breast feeding. Nearly 90% of NICU infants below 28 weeks receive breast milk to some degree. Rates of fully or exclusively breastfeeding are also good for the other gestational age groups. Overall these data are consistent with the high rates of breast milk feeding reported previously.

The newborn service strives to achieve a high rate of breast feeding across the range of gestational age groups. However, there are on-going and different challenges for the different groups of babies. Preterm infants born below 28 weeks gestation may be in hospital for 3 or more months and neonatal growth is a major issue. In addition, the mothers may have to express milk for many weeks before the baby is ready to breast feed, often at times of considerable maternal stress. Some mothers are unable to maintain their supply up to the time of infant discharge despite input and support from the staff but nevertheless have provided valuable breast milk earlier in the neonatal course. Another situation where exclusive breast feeding may not be possible is when the mother is unwell and not able to express sufficient milk to maintain supply for a relatively large well infant.

9.8 Neonatal deaths prior to NICU discharge among babies admitted to NICU

For 2015 there were 10 neonatal deaths occurring in inborn infants who had been admitted to the NICU (Table 208) plus another 3 deaths in outborn infants admitted to the NICU (Table 207). Infant (<12 month) deaths that occurred following transfer from NICU to Starship Hospital are not reported here as these are largely cardiac or multiple anomalies and are reported by the Starship services involved.

9.9 Child Development Unit

9.9.1 Follow up at 2 years (corrected) of children under 1500 grams born in 2013

One hundred and thirty-one infants born in 2013 who weighed less than 1500 grams (very low birth weight) were cared for in the Newborn Service and survived to hospital discharge. Of these children:

- 48 infants (37%) weighed less than 1000 grams
- 66 infants (63%) had a gestational age of between 23 and 28 weeks
- 17 infants (13%) were SGA

No children died after discharge.

Follow up data were obtained for 102 children (79%). Information was not obtained, or not provided in this report, for 29 children for the following reasons:

- 25 children were lost to follow up either because of multiple DNAs (1 child), living overseas (5 children) or the families could not be traced or declined follow up (16 children)
- Results for two children were excluded because they were tested outside the time required for data collection
- Results were excluded for a further two children who were diagnosed with Autistic Spectrum Disorder.

One hundred and two children received individual assessment at the Child Development Unit. The Bayley Scales of Infant and Toddler Development-III were administered by a registered psychologist as close as possible to the child reaching two years (corrected age). Neurological examinations were carried out by paediatricians. Children were placed in outcome categories as set out in Table 164 below.

Table 163: Outcome categories for infants under 30 months of age

Category I	**(Severe disability): one or more of the following**	
	(i)	Sensorineural deafness (requiring hearing aids)
	(ii)	Bilateral blindness
	(iii)	Severe cerebral palsy
	(iv)	Developmental delay (Bayley* Cognitive Score 2 or more standard deviations below mean)
Category II	**One or more of the following**	
	(i)	Bayley* Cognitive Score between 1 & 2 standard deviations below mean
	(ii)	Mild-moderate cerebral palsy without developmental (cognitive) delay
	(iii)	Impaired vision requiring spectacles
	(iv)	Conductive hearing loss requiring aids
Category III**	**Presence of tone disorder or motor delay**	
		Bayley* Motor Score more than 1 standard deviation below mean (but Cognitive score within average range)
Category IV	**Normal development**	
	(i)	No apparent tone disorder, and
	(ii)	No apparent developmental delay (Bayley* Cognitive and Motor Scores within average range or above)

Note: Outcome categories modified from Kitchen et al, 1984, 1987.

* *Bayley Scales of Infant & Toddler Development III – all scores adjusted for gestational age.*

** *Category III is included to signal that a number of preterm infants tested at an early age have minor tone disorders or motor delay. These may improve as the children mature with age and experience.*

Table 164 presents the results, using these outcome categories, for the 102 children tested at 2 years of age (corrected).

Table 164: Outcome categories at 2 years (corrected) for children under 1500g born in 2013 (n=102) NWH

	Number	Description
Category I	3 (3%)	3 children with Cognitive scores 2 or more standard deviations below the mean.
Category II	11 (11%)	4 children with mild-moderate cerebral palsy. 1 child with impaired vision requiring glasses. 1 child with hearing aids. 5 children with Cognitive scores between 1 and 2 standard deviations below the mean.
Category III	2 (2%)	2 children with Motor scores more than 1 standard deviation below the mean but Cognitive scores within the average range.
Category IV	86 (84%)	Children with no apparent tone disorders and no apparent developmental delay.

The distribution of the children within each Category is presented by gestational age (Table 165) and by birthweight (Table 166) below:

Table 165: Outcome of children <1500g born in 2013 at 2 years (corrected) by gestational age groups (n=102) NWH

	Gestational age (weeks)					
Outcome	**23 - 28 weeks n= 52**		**29 - 35 weeks n=50**		**Total n=102**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	3	6	0	0	3	3
II	7	13	4	8	11	11
III	2	4	0	0	2	2
IV	40	77	46	92	86	84

Table 166: Outcome of children <1500g born in 2013 at 2 years (corrected) by birthweight groups (n=102) NWH

	Birthweight (grams)					
Outcome	**<1000g n=36**		**1000 – 1499g n=66**		**Total n=102**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	3	8	0	0	3	3
II	4	11	7	11	11	11
III	2	2	0	0	2	2
IV	27	75	59	89	86	84

The distribution by Category for this 2013 (2 year old) cohort is compared with NWH outcomes since 2001 in Figure 183.

Figure 183: Outcome at 24 months (corrected age) of children <1500g birthweight born 2001-2013 NWH

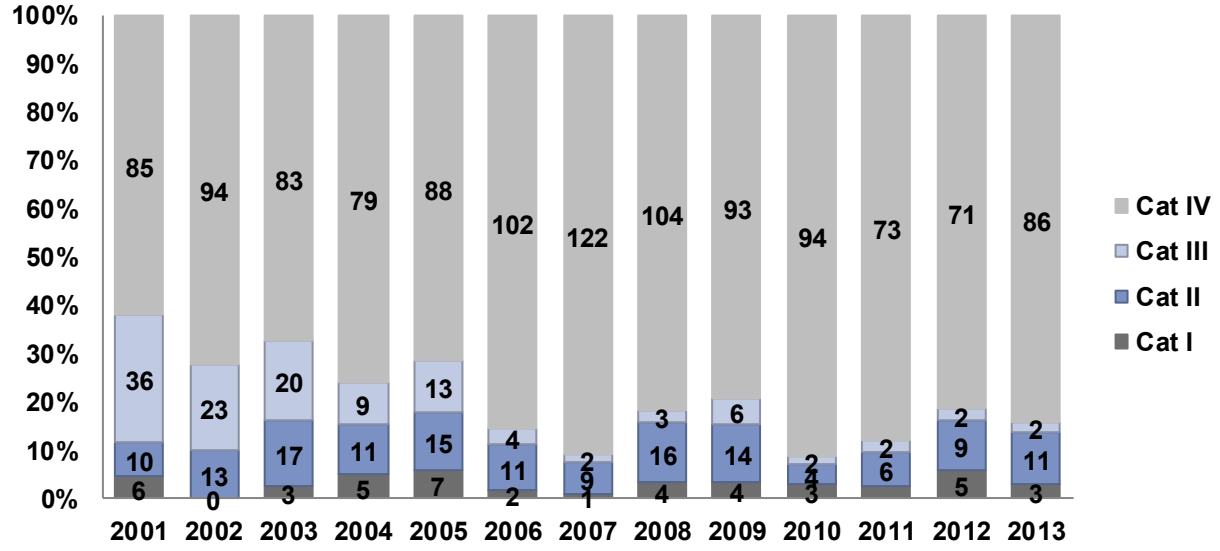
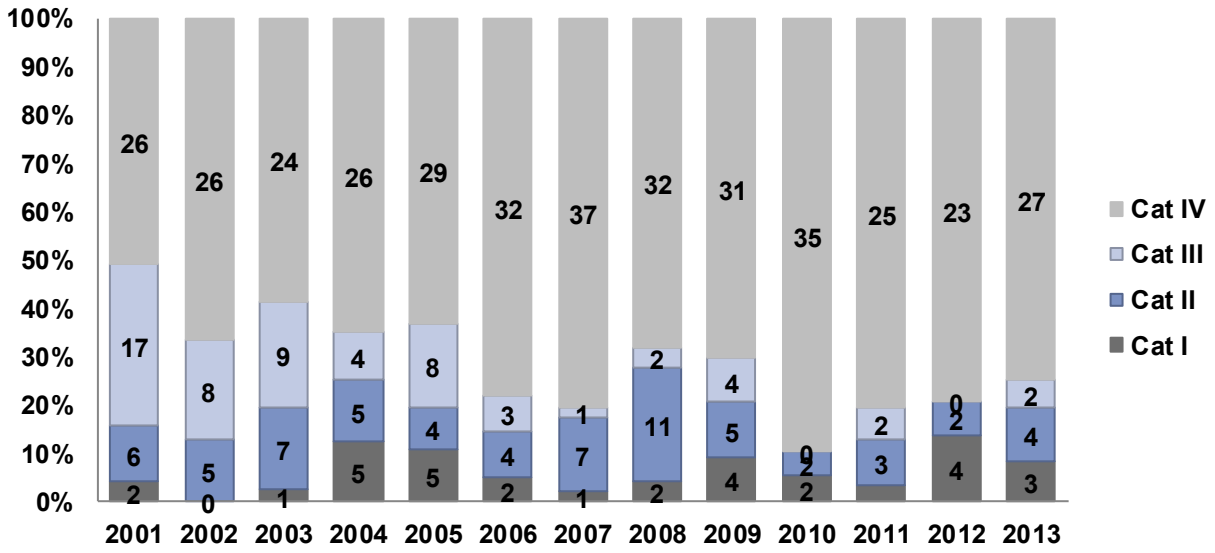


Figure 184 presents a comparison of the distribution by Category for babies weighing under 1000 grams at birth, from 2001 to 2013.

Figure 184: Outcome at 24 months (corrected age) of children <1000g birthweight born 2001-2013 NWH



9.9.2 Development at 4 years of children under 1500g born in 2011

One hundred and nineteen children born in 2011 who weighed less than 1500 grams were cared for in the Newborn Service and survived to hospital discharge. Of these children:

- 43 infants (36%) weighed less than 1000 grams
- 62 infants (52%) had a gestational age of between 24 and 28 weeks
- 17 infants (14%) were SGA.

At four years of age data were obtained for 84 children (71%). Information was not able to be obtained for 35 children for the following reasons:

- Five children died after discharge
- Six children were excluded by reason of congenital anomalies (n=3) or diagnoses of Autistic Spectrum Disorder (n=3)
- 24 children were not tested either because of multiple DNAs (1 child), living overseas (9 children), living in other New Zealand centres (4 children), or unable to be traced or declined follow up (10 children).

At four years chronological age, data were obtained for 84 children. When it was not possible to assess children directly because of distance from home to National Women's (n=3) reports were obtained from paediatricians, psychologists and other professionals monitoring the children's progress. A registered psychologist interviewed parents, administered standardised tests and carried out clinical assessments with 81 children on an individual basis. Children were then placed in Outcome Categories as set out in Table 167.

Table 167: Outcome categories at 4 years

Category I	(Severe disability): one or more of the following	
	(i)	Sensorineural deafness (requiring hearing aids)
	(ii)	Bilateral blindness
	(iii)	Severe cerebral palsy
	(iv)	Stanford-Binet* Composite Score (Full Scale IQ) 2 or more standard deviations below mean
Category II	One or more of the following:	
	(i)	Mild-moderate cerebral palsy
	(ii)	Stanford-Binet* Composite Score (Full Scale IQ) between 1 & 2 standard deviations below mean.
Category III		Motor Skills† Standard Score more than one standard deviation below mean
Category IV	Normal development i.e. none of the above	

* *The Stanford-Binet Intelligence Scales 5th edition*

† *Vineland Adaptive Behavior Scales, 2005*: Motor Skills Domain.

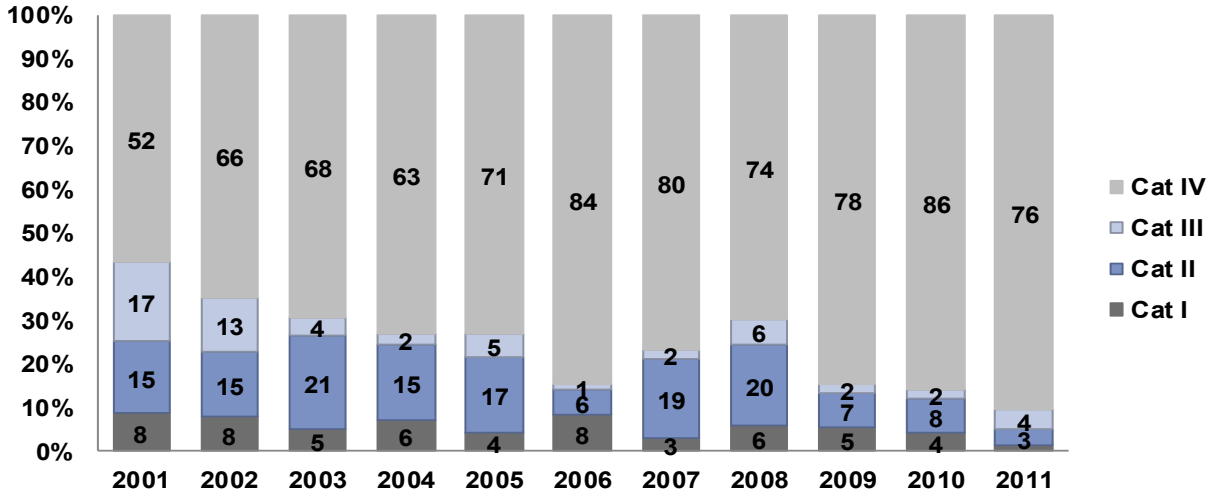
Using these Categories the results for the 84 children are presented in Table 168 below.

Table 168: Outcome categories at 4 years for children under 1500g born 2011 (n =84)

	Number	Description
Category I	1 (1%)	1 child (750g, 24 weeks gestation) with left hemiplegia, shunted hydrocephalus and global developmental delay.
Category II	3 (4%)	3 children (3 children < 1000g and ≤ 27 weeks gestation) with Full-Scale IQ scores between 1 and 2 standard deviations below the mean
Category III	4 (5%)	1 child (740g, 28 weeks gestation) with diagnosed CP Level 1 3 children with Motor Scores more than 1 standard deviation below the mean. (2 children < 1000g and < 25 weeks gestation)
Category IV	76 (90%)	

Figure 185 provides a comparison of the distribution by Category of the (above) 2011 cohort with outcomes for the period 2001 to 2011:

Figure 185: Outcome at 4 years (corrected age) of children <1500g birthweight born 2001-2011 NWH



SGA

Of the original 119 children, seventeen babies (14%) were identified as being SGA at birth. At four years outcome data were obtained for eight SGA children. Seven of the eight children (88%) were placed in Category IV indicating normal development at that stage. One child was placed in Category II with diagnosed CP and test scores greater than one standard deviation below the mean.

Autistic Spectrum Disorders

Of the total population of 119 four year olds, three (4%) were diagnosed with Autistic Spectrum Disorder. The NW numbers are small but the incidence for this cohort appears to be slightly higher than the 1:100 incidence thought to occur in the wider New Zealand population:

http://www.health.govt.nz/your-health/conditions-and-treatments/disabilities/autism-spectrum-disorder
(Website updated April 2016)

Summary

Babies weighing less than 1500 grams at birth are identified in the literature as being at risk for developmental problems. In 2015 the Child Development Unit assessed the developmental outcomes for 102 two year old very low birth weight children born in 2013 and for 84 four year old very low birth weight children born in 2011.

Outcome data for the children at two years indicated that 84% of this population had no apparent tone abnormalities or developmental delays. Three percent of the cohort presented with severe disabilities, all of these children had birth weights below 1000 grams and gestational ages of 28 weeks or less. A further 13% demonstrated mild or moderate disabilities.

For the four year old children results indicated that 90% were within the average range for cognitive and motor abilities. One child (one percent) had a severe disability. A further nine percent presented with mild or moderate disabilities. A comparison of these outcomes over the past 11 years appears to indicate a modest improvement in the percentage of children allocated to Category IV by four years of age.

9.10 Data tables: Newborn services

Table 169: Characteristics of <32 week or <1500g babies cared for at NWH NICU by ANZNN status 2015

	<32 weeks or <1500g					
	Total		ANZNN		Non ANZNN	
Gestation (weeks)	**n**	**%**	**n**	**%**	**n**	**%**
<24	0	0.0	0	0.0	0	0.0
24-25	17	9.7	15	8.9	2	28.6
26-27	35	19.9	34	20.1	1	14.3
28-29	41	23.3	39	23.1	2	28.6
30-31	59	33.5	58	34.3	1	14.3
32-36	22	12.5	21	12.4	1	14.3
>36	2	1.1	2	1.2	0	0.0
Weight (g)						
<500	0	0.0	0	0.0	0	0.0
500-749	18	10.2	16	9.5	2	28.6
750-999	26	14.8	23	13.6	3	42.9
1000-1249	42	23.9	42	24.9	0	0.0
1250-1499	55	31.3	55	32.5	0	0.0
1500-1999	32	18.2	31	18.3	1	14.3
2000-2499	3	1.7	2	1.2	1	14.3
Birthplace						
National Women's	156	88.6	156	92.3	0	0.0
Northland	3	1.7	3	1.8	0	0.0
Waitemata DHB	3	1.7	3	1.8	0	0.0
Counties Manukau DHB	3	1.7	0	0.0	3	42.9
Other	11	6.3	7	4.1	4	57.1

9.11 Data tables: NICU Occupancy

Table 170: Occupancy (baby days) on NICU 2002– 2015

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Baby days	20551	19249	14958	14541	14212	15228	15296	15236	14982	14877	14461	14296	14070	13060

Table 171: Occupancy (baby-days) for NICU by gestational age 2006-2015

Gestation (weeks)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	14212	15228	15296	15236	14982	14877	14661	14296	14070	13050
<28	3612	4282	4546	4129	4133	4302	3563	3774	3956	3370
28-31	4322	3490	4170	4137	4230	3336	3684	3228	3153	3157
32-36	4326	5423	4750	4844	4519	4736	4752	4713	4362	4066
≥37	1952	2033	1830	2126	2100	2503	2462	2581	2599	2457

Table 172: Occupancy (baby-days) for NICU by birth weight 2006-2015

Weight(g)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	14212	15228	15296	15236	14982	14877	14461	14296	14070	13060
<1500	7034	7618	7584	7996	7563	6988	6583	6517	6302	6059
1500-1999	2568	2489	3071	2620	2662	2658	2951	2606	2687	2530
2000-2499	2111	2384	2432	1953	2005	2592	2009	2031	2209	1661
≥2500	2499	2737	2209	2667	2752	2639	2918	3142	2872	2810

9.12 Data tables: Admissions to NICU

Table 173: NICU admissions by year 1998-2015

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number	1220	975	906	890	972	939	957	902	963	1000	930	910	925

Table 174: Admissions of inborn babies to NICU by birth weight 2006-2015

Birth Weight (g)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	**791**	**870**	**822**	**820**	**791**	**839**	**872**	**831**	**809**	**825**
<500	0	1	0	0	2	0	1	0	1	0
500-749	19	19	19	15	23	20	14	13	19	16
750-999	24	37	37	42	29	24	25	32	23	21
1000-1249	34	47	35	31	39	25	35	29	37	39
1250-1499	57	51	52	49	50	42	48	46	40	48
1500-1999	130	130	135	126	110	110	132	112	102	109
2000-2499	182	188	180	155	135	176	169	152	145	131
2500-2999	125	139	118	117	126	129	118	115	121	124
3000-3999	183	198	212	246	226	259	277	270	270	288
≥4000	37	60	34	39	51	54	53	62	51	49

Table 175: Admissions of inborn babies to NICU by gestational age 2006-2015

Gestation (weeks)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	**791**	**870**	**822**	**820**	**791**	**839**	**872**	**831**	**809**	**825**
23	1	5	0	1	0	2	0	1	0	0
24	9	4	8	9	13	8	7	7	12	6
25	9	13	16	12	15	8	13	10	7	9
26	13	18	17	15	10	14	7	13	14	14
27	12	18	17	20	20	11	13	8	13	17
28	16	21	13	19	16	16	16	21	11	17
29	25	26	29	20	21	15	31	15	15	17
30	29	27	37	22	36	22	25	21	37	23
31	49	33	43	30	33	28	30	31	26	31
32	63	46	40	42	29	42	34	43	25	43
33	50	63	48	65	59	44	53	66	46	40
34	88	114	90	82	90	96	96	77	65	83
35	82	82	83	69	55	68	81	62	68	46
36	48	72	70	57	51	55	70	60	70	60
37	58	59	54	64	58	72	61	65	67	70
38	69	81	86	89	93	84	111	92	105	99
39	52	68	68	77	67	107	99	92	98	110
40	78	74	70	83	78	78	76	98	80	93
41	37	39	23	38	41	59	41	46	46	43
42	3	6	10	6	6	10	8	3	4	4
43	0	1	0	0	0	0	0	0	0	0

Table 176: Admissions of outborn babies to NICU by birth weight 2006-2015

Birth Weight (g)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	**99**	**102**	**117**	**137**	**111**	**124**	**128**	**99**	**101**	**100**
<500			1		1	0	1	0	0	0
500-749	10	8	7	4	5	3	4	2	3	1
750-999	5	11	7	17	11	10	5	9	2	3
1000-1249	7	6	13	15	8	10	7	4	1	5
1250-1499	5	4	7	8	7	5	8	9	6	10
1500-1999	13	10	16	8	10	15	13	12	10	7
2000-2499	8	8	12	12	10	14	9	12	11	16
2500-2999	15	13	13	12	10	14	22	16	14	13
3000-3999	26	33	31	50	37	41	50	27	44	38
≥4000	9	9	10	11	12	12	9	8	10	7

Table 177: Admissions of outborn babies to NICU by gestational age 2006-2015

Gestation (weeks)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	**99**	**102**	**117**	**137**	**111**	**124**	**128**	**99**	**101**	**100**
22	0	0	0	0	1	0	0	0	0	0
23	0	0	1	0	0	1	0	1	0	0
24	3	5	3	4	4	6	1	1	3	0
25	8	6	7	3	4	1	4	4	1	2
26	5	5	5	11	3	5	3	5	2	1
27	3	6	5	4	7	4	4	2	0	3
28	2	3	2	10	7	3	5	2	1	4
29	6	5	4	6	5	6	4	3	1	3
30	4	1	8	2	2	4	4	4	4	3
31	2	3	2	3	0	3	2	6	4	2
32	5	2	8	3	3	4	3	3	2	2
33	1	4	1	7	4	6	6	1	4	5
34	6	4	6	3	3	4	7	4	5	6
35	9	4	8	5	4	5	4	6	4	5
36	2	4	4	10	5	4	7	5	5	7
37	3	9	8	11	9	8	13	12	6	12
38	5	10	5	8	12	9	17	5	12	13
39	9	9	8	5	9	15	13	13	15	10
40	17	9	22	30	17	19	18	19	18	12
41	8	9	7	11	11	17	12	2	13	9
42	1	4	3	1	1	0	1	1	1	1

Table 178: Domicile of mother of all babies admitted to NICU 2009-2015

	2009 n=957		2010 n=902		2011 n=963		2012 n=1000		2013 n=930		2014 n=910		2015 n=925	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Northern Region	872	91.1	847	92.1	892	92.6	915	91.5	856	92.0	822	90.3	830	89.7
Auckland	509	58.4	435	48.2	491	51.0	489	48.9	449	48.3	454	49.9	427	46.2
Counties	123	14.1	115	12.8	121	12.6	141	14.1	141	15.2	104	11.4	127	13.7
Waitemata	206	23.6	253	28.1	239	24.8	236	23.6	222	23.9	221	24.3	235	25.4
Northland	34	3.9	44	4.9	41	4.3	49	4.9	44	4.7	43	4.7	41	4.4
Midland	50	5.2	23	2.5	24	2.5	33	3.3	24	2.6	30	3.3	54	5.8
Central	15	1.6	16	1.8	12	1.2	23	2.3	26	2.8	12	1.3	10	1.2
Southern	16	1.7	15	1.7	15	1.6	20	2.0	11	1.2	13	1.4	20	2.2
Overseas	0	0.0	1	0	0		0		0		0		2	0.4
Missing	4	0.4	0		20	2.0	9	0.9	13	1.4	33	3.6	9	1.0

Table 179: DHB of mothers of all babies admitted to NICU 2015

	2015 n=925			2015 n=925	
DHB	**n**	**%**	**DHB**	**n**	**%**
Auckland	427	46.2	**Hawkes Bay**	3	0.3
Counties Manukau	127	13.7	**Mid-Central**	3	0.3
Waitemata	235	25.4	**Hutt**	1	0.1
Northland	41	4.4	**Capital & Coast**	1	0.1
Waikato	29	3.1	**Nelson Marlborough**	3	0.3
Bay of Plenty	9	1.0	**Canterbury**	11	1.2
Wairarapa	0		**South Canterbury**	0	
Tairawhiti	6	0.6	**Southern**	6	0.6
Taranaki	2	0.2	**West Coast**	0	
Lakes	8	0.9	**Overseas**	2	0.2

*11 missing DHB

Table 180: Prioritised ethnicity of babies admitted to NICU 2015

	Preterm (<37 weeks) N=449		Term (>=37 weeks) N=476		Total N=925	
	n	%	n	%	n	%
NZ European	148	33.0	167	35.1	315	34.1
Māori	87	19.4	77	16.2	164	17.7
Pacific	55	12.2	72	15.1	127	13.7
Other Asian	58	12.9	62	13.0	120	13.0
Indian	50	11.1	48	10.1	98	10.6
Other European	2	0.4	0	0.0	2	0.2
Other	49	10.9	50	10.5	99	10.7

Table 181: Main reason for admission to NICU 2015

	Preterm N=449		Term N=476		Total N=925	
	n	%	n	%	n	%
Prematurity	272	60.6	1	0.2	273	29.5
Respiratory distress	90	20.0	202	42.4	292	31.6
Congenital abnormality	17	3.8	108	22.7	125	13.5
Hypoglycaemia	16	3.6	35	7.4	51	5.5
Depression at birth	6	1.3	13	2.7	19	2.1
SGA	19	4.2	6	1.3	25	2.7
Cyanotic episode	3	0.7	7	1.5	10	1.1
Suspected infection	2	0.4	11	2.3	13	1.4
Neurological problem	5	1.1	19	4.0	24	2.6
Haemolytic disease	3	0.7	7	1.5	10	1.1
Feeding difficulty		0.0	3	0.6	3	0.3
Bile stained vomiting	2	0.4	7	1.5	9	1.0
Jaundice	2	0.4	4	0.8	6	0.6
Other	12	2.7	53	11.1	65	7.0

One unknown at term is included with other

9.13 Data tables: Antenatal corticosteroids

Table 182: Percentage receiving antenatal corticosteroids by birth weight among ANZNN assigned babies 2012-2015

Birth weight (g)	2012			2013			2014			2015		
	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d n(%)	Any n(%)	N n	1-7d n(%)	Any n(%)
Total	139	68	91	134	56	88	126	80(63)	120 (95)	136	84(62)	120(88)
<500	1	100	100	0	0	0	1	1(100)	1(100)	0	0	0
500-749	14	64	100	14	64	100	20	14(70)	20(100)	16	14(88)	16(100)
750-999	29	69	90	36	56	89	24	11(46)	23(96)	23	12(52)	21(91)
1000-1249	40	73	95	31	65	94	37	28(76)	36(97)	42	24(57)	37(88)
1250-1499	55	64	85	53	49	81	44	26(59)	40(91)	55	34(62)	46(84)

Table 183: Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies (2012-2015)

Gestation (weeks)	2012			2013			2014			2015		
	N n	1-7d %	N n	1-7d %	N n	1-7d %	N n	1-7d %	Any %	N n	1-7d %	Any %
Total	161	65	161	65	161	65	144	86(60)	135(94)	146	82(56)	130(89)
<24	0		0		0		0	0	0	0	0	0
24-25	23	57	23	57	23	57	20	12(60)	20(100)	15	11(73)	15(100)
26-27	24	63	24	63	24	63	28	20(71)	28(100)	34	18(53)	31(91)
28-29	54	65	54	65	54	65	28	18(64)	27(96)	39	20(51)	29(74)
30-31	60	70	60	70	60	70	68	36(53)	60(88)	58	33(57)	55(95)

9.14 Data tables: Care and complications

9.14.1 Infection

Table 184: Organisms causing serious infection in NICU 2015

Organism	Early Infection	Late Infection
E Coli	1	2
Staph aureus	0	2
Coagulase negative *staphylococcus*	2	15
Enterococcus	1	0
Entrobacter	1	1
Candida	0	1
Citrobacter	0	0
Group B Strep	3	0
Listeria monocytogenes	0	0
Klebsiella	0	2
Pseudomonas	0	1
Other / Unknown	2	0

9.14.2 Hypoxic ischaemic encephalopathy (all admissions)

Table 185: Details of inborn hypoxic ischaemic encephalopathy (HIE) Stages 2 or 3 2015

	Gestation	Birth Weight	HIE stage	Apgar 1/5	Comment
Theatre	35	3310	2	0/4	Maternal urosepsis, severe multi-organ failure, PPHN, cooled, seizures, MRI re-assuring
Theatre	38	3480	2	0/2	Placental abruption and antepartum hemorrhage, cooled, multi-organ failure, MRI re-assuring
Theatre	39	2750	2	6/8	Postnatal collapse during skin to skin, cooled, MRI re-assuring
Theatre	39	3230	2	3/3	PROM 3 days, cooled, MRI re-assuring
Theatre	40	3500	2	8/9	Postnatal hemorhage mother, abnormal transition, severe PPHN, cooled, seizures, MRI IVH and mild hydrocephalus
Theatre	41	3090	2	1/6	Slowing of intra-uterine growth, cooled, MRI re-assuring

9.14.3 Intraventricular haemorrhage

Table 186: Intraventricular haemorrhage by birth weight 2015 (benchmarked with ANZNN)

Birth Weight (g)	N	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**169**	**62**	**92**	**9**	**1**	**2**	**3**
<500	0						
500-749	16	0	14	0	0	0	2
750-999	23	2	16	3	1	1	0
1000-1249	42	5	34	2	0	0	1
1250-1499	55	30	23	1	0	1	0
1500-1999	31	24	5	2	0	0	0
2000-2499	2	1	0	1	0	0	0

Table 187: Intraventricular haemorrhage by gestation 2015 (benchmarked with ANZNN)

Gestation (weeks)	N	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**169**	**62**	**92**	**9**	**1**	**2**	**3**
<24	0						
24-25	15	0	12	2	0	0	1
26-27	34	2	27	2	1	1	1
28-29	39	6	30	2	0	0	1
30-31	58	37	17	3	0	1	0
32-36	21	15	6	0	0	0	0
>36	2	2	0	0	0	0	0

Table 188: Intraventricular haemorrhage in all <1250g babies admitted to NICU 1990-2015

Year	Total	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
1990	98	16	59	8	5	4	6
1991	125	14	81	16	4	2	8
1992	103	11	68	8	4	7	5
1993	114	7	82	6	10	3	6
1994	117	13	75	13	8	4	4
1995	121	11	82	12	8	1	7
1996	127	10	95	7	3	3	9
1997	117	12	82	9	4	3	7
1998	90	7	66	7	4	0	6
1999	121	6	93	13	3	0	6
2000	116	5	88	7	5	2	9
2001	122	5	95	16	4	0	2
2002	116	3	97	7	3	1	5
2003	97	0	85	2	3	0	7
2004	96	1	83	4	1	3	4
2005	117	3	94	4	10	3	3
2006	99	8	75	8	3	0	5
2007	129	5	95	7	10	4	8
2008	101	0	77	14	3	3	4
2009	124	17	85	3	7	3	9
2010	118	18	80	5	7	5	3
2011	92	12	56	8	2	7	7
2012	92	13	63	9	4	0	3
2013	89	8	58	12	3	3	5
2014	86	8	59	13	1	1	4
2015	85	9	66	5	1	1	3

9.14.4 Assisted ventilation

Table 189: Number of babies on assisted ventilation (inborn) NWH 2004-2015

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Any ventilation	402	395	384	444	446	455	453	469	482	501	501	522
IPPV	123	140	96	141	145	134	184	154	154	154	149	122
CPAP	388	367	374	419	415	423	418	427	441	443	462	476
HFOV			11	18	21	22	11	17	20	19	19	29
HiFlow								63	125	121	170	176

Table 190: HFOV and inhaled nitric oxide (iNO) use and survival NWH 2015

	HFOV		iNO		HFOV + iNO	
	Treated n	Survivors n(%)	Treated n	Survivors n(%)	Treated n	Survivors n(%)
Total	**35**	**31(89)**	**20**	**18(90)**	**16**	**15(94)**
<28 weeks	16	14(88)	4	3(75)	3	3(100)
28-31 weeks	3	3(100)	2	2(100)	2	2(100)
32-36 weeks	3	2(67)	2	2(100)	2	2(100)
≥37 weeks	13	12(92)	12	11(92)	9	8(89)

Table 191: High Frequency Oscillatory Ventilation 2005-2015

Gestation (wks)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	%
Total	12/15	19/23	15/27	15/29	21/28	18/20	21/29	19/25	12/20	31/35	197/271	73
<28	6/9	11/14	9/17	8/18	12/18	11/12	6/10	11/14	5/10	14/16	102/152	67
28-31	2/2	3/4	0/1	2/3	3/3	1/1	3/5	1/2	1/3	3/3	22/30	73
32-36	1/1	1/1	3/4	3/5	2/3	1/1	1/1	2/3	0	2/3	16/23	70
≥37	2/2	4/4	3/5	2/3	4/4	5/6	11/13	5/6	6/7	12/13	57/66	86

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 192: Inhaled Nitric Oxide (iNO) 2006-2015

Gestation (wks)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	%
Total	8/10	26/29	15/18	10/20	32/36	20/26	26/33	25/29	12/17	18/20	205/254	81
<28	0/1	4/5	3/5	2/7	7/9	4/6	2/4	6/7	1/3	3/ 4	34/56	61
28-31	1/1	2/3	2/2	0/2	3/4	1/2	3/4	0/1	1/2	2/2	16/24	67
32-36	1/1	5/6	2/2	2/3	4/5	6/6	0/0	3/5	1/1	2/2	29/34	85
≥37	6/7	15/15	8/9	6/8	18/18	9/12	21/25	16/16	9/11	11/12	126/140	90

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 193: iNO plus HFOV 2006-2015

Gestation (weeks)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	%
Total	3/4	10/12	6/9	5/12	12/15	9/11	15/19	11/14	7/10	15/16	99/130	76
<28	0/1	3/4	2/4	2/6	5/7	4/5	2/4	5/6	1/3	3/3	29/46	63
28-31	-	2/3	-	0/1	2/2	1/1	3/3	0/1	1/1	2/2	12/15	80
32-36	1/1	1/1	2/2	2/3	1/2	1/1	0/0	1/2	0	2/2	11/15	73
≥37	2/2	4/4	2/3	1/2	4/4	3/4	10/12	5/5	5/6	8/9	47/54	87

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 194: Reason for IPPV and CPAP in term and post-term infants 2006-2015

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
TTN/RDS	2/42	3/55	8/76	3/84	8/100	7/88	8/96	9/111	10/108	6/112	11/144
Infection	2/8	2/10	3/7	-/10	1/16	2/9	2/18	3/14	0/11	4/18	3/23
Meconium	7/16	8/15	9/19	4/13	4/15	10/14	13/30	15/32	12/21	11/22	5/16
Anomaly	9/10	7/7	8/6	10/8	6/5	9/8	7/9	5/4	4/6	6/6	10/7
PPHN	4/6	3/3	7/4	5/6	5/6	9/10	4/4	7/4	7/7	5/4	4/3
Encephalopathy	9/4	4/1	8/7	6/2	7/8	11/1	8/5	1/2	13/2	11/4	6/3
Support for surgery				14/8	10/3	13/6	9/3	15/4	23/9	13/5	8/1
Other			21/25	6/13	17/36	21/24	14/30	17/35	20/43	28/46	11/29
Missing reason			3/2		1/0				0/1	1/0	

Numbers in each cell are IPPV/CPAP. Some babies from 2003 – 2006 with other diagnoses are not included in this table.

9.15 Data tables: Outcomes

9.15.1 Survival

Table 195: Numbers of survivors by gestational age of babies <32 weeks gestation 2015

Gestation (weeks)	20	21	22	23	24	25	26	27	28	29	30	31
Born alive in NWH				3	6	9	14	17	18	16	23	32
Died at birth in NWH				3	0	0	0	0	0	0	0	0
Born alive at NWH and admitted to NICU					6	9	14	17	18	16	23	32
Born alive at NWH and survived					4	8	14	17	17	16	23	32
Outborn admitted						2	1	3	4	3	3	2

9.15.2 Retinopathy of prematurity

Table 196: Retinopathy of prematurity by birth weight in babies surviving to 36 weeks gestation (ANZNN assigned babies) 2015

Birth Weight(g)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**165**	**92**	**37**	**18**	**14**	**4**	**0**
<500							
500-749	14	1	3	2	4	4	0
750-999	22	4	5	4	9	0	0
1000-1249	41	14	17	9	1	0	0
1250-1499	55	43	9	3	0	0	0
1500-1999	31	28	3	0	0	0	0
2000-2499	2	2	0	0	0	0	0

Table 197: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks gestation (ANZNN assigned babies) 2015

Gestation (wks)	N	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**165**	**92**	**37**	**18**	**14**	**4**	**0**
<24							
24-25	12	1	2	2	5	2	0
26-27	34	8	10	7	7	2	0
28-29	38	13	15	8	2	0	0
30-31	58	50	7	1	0	0	0
>31	23	20	3	0	0	0	0

9.15.3 Chronic lung disease

Table 198: Chronic lung disease by birth weight (inborn babies <1500gms) 2015

Birth Weight (g)	Inborn <1500g n	Dead by 36 wks	Alive at 36 wks	In O_2	O_2 + CPAP/ IPPV	CPAP/ IPPV	CLD	CLD/ livebirth admissions %	CLD/ survivors to 36 wks %
Total	**124**	**4**	**120**	**4**	**11**	**29**	**44**	**35**	**37**
<500									
500-749	16	2	14	0	4	7	11	69	79
750-999	21	1	20	1	3	10	14	67	70
1000-1249	39	1	38	2	4	6	12	31	32
1250-1499	48	0	48	1	0	6	6	13	13

Table 199: Chronic lung disease by gestational age (inborn babies <32weeks) 2015

Gestation (weeks)	Inborn <32wks n	Dead by 36 wks	Alive at 36 wks	In O_2	O_2+CPAP/ IPPV	CPAP/ IPPV	CLD	CLD/ livebirth admissions %	CLD/ survivors to 36 wks %
Total	**134**	**4**	**130**	**4**	**11**	**32**	**47**	**35**	**36**
24-25	15	3	12	1	3	8	12	80	100
26-27	31	0	31	0	7	7	14	45	45
28-29	34	1	33	3	1	12	16	47	48
30-31	54	0	54	0	0	5	5	9	9

9.15.4 Necrotising enterocolitis ANNZN

The data in the two tables below are for babies with “confirmed” NEC and therefore do not include babies with “probable” NEC.

Table 200: Necrotising enterocolitis (NEC) by birth weight ANNZN <1500g 2011-2015

Weight (g)	2011			2012			2013			2014			2015		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**121**	**5**	**4**	**139**	**3**	**2**	**134**	**1**	**1**	**126**	**2**	**2**	**136**	**1**	**1**
<500	0	0	0	1	0	0	0	0	0	1	0	0			
500-749	22	2	9	14	1	7	14	0	0	20	1	5	16	1	6
750-999	26	2	8	29	1	3	36	1	3	24	0	0	23	0	0
1000-1249	28	1	4	40	1	3	31	0	0	37	1	3	42	0	0
1250-1499	45	0	0	55	0	0	53	0	0	44	0	0	55	0	0

Table 201: Necrotising enterocolitis by gestational age ANNZN <32wks 2011-2015

Gestation (weeks)	2011			2012			2013			2014			2015		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**139**	**6**	**15**	**161**	**3**	**2**	**144**	**1**	**1**	**144**	**3**	**2**	**146**	**1**	**1**
<24	3	1	33	0	0	0	2	1	50	0	0	0	0		
24-25	17	2	12	23	2	9	19	0	0	20	1	5	15	1	7
26-27	28	2	7	24	0	0	25	0	0	28	0	0	34	0	0
28-29	37	1	3	54	1	2	40	0	0	28	0	0	39	0	0
30-31	54	0	0	60	0	0	58	0	0	68	2	3	58	0	0

9.15.5 Pneumothorax (All babies <1500g)

Table 202: Pneumothorax requiring drainage by birth weight (<1500g) 2011-2015

Birth weight (g)	2011			2012			2013			2014			2015		
	N	n	%	N	n	%	N	n	%	N	n	%	N	N	%
Total <1500g	**139**	**0**	**0**	**148**	**0**	**0**	**144**	**2**	**1**	**131**	**2**	**2**	**143**	**1**	**1**
<500	2	0	0	0	0	0	2	0	0	1	0	0	0		
500-749	23	1	4	23	0	0	18	0	0	22	2	9	17	1	6
750-999	34	0	0	30	0	0	41	1	2	25	0	0	24	0	0
1000-1249	35	0	0	42	0	0	33	0	0	38	0	0	44	0	0
1250-1499	47	0	0	56	0	0	55	1	2	45	0	0	58	0	0

Table 203: Pneumothorax requiring drainage by gestation (all babies <32wks) 2011-2015

Gestation (weeks)	2011			2012			2013			2014			2015		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <32wks	**157**	**1**	**1**	**169**	**0**	**0**	**155**	**2**	**1**	**151**	**3**	**2**	**152**	**1**	**1**
<24	3	0	0	0	0	0	2	0	0	0			0		
24-25	23	0	0	25	0	0	22	0	0	23	1	4	17	1	6
26-27	34	0	0	27	0	0	28	1	4	29	1	3	35	0	0
28-29	40	0	0	56	0	0	41	0	0	28	0	0	41	0	0
30-31	57	1	2	61	0	0	62	1	2	71	1	1	59	0	0

Table 204: Inborn babies receiving postnatal corticosteroids by birth weight 2015 (babies alive at 1 week and less than 1500g)

Birth weight (g)	N	n	%
Total	**123**	**17**	**14**
<500	0	0	
500-749	16	7	44
750-999	21	8	38
1000-1249	38	2	5
1250-1499	48	0	0

Table 205: Inborn babies receiving postnatal corticosteroids by gestational age 2015 (babies alive at 1 week and less than 32 weeks)

Gestation (weeks)	N	n	%
Total	**133**	**17**	**13**
<24	0	0	
24-25	15	10	67
26-27	31	6	19
28-29	33	1	3
30-31	54	0	0

Table 206: Method of feeding at discharge from NICU by gestational age and birth weight 2015 (inborn)

	Total	Exclusive		Fully		Partial		Artificial		Nil Oral	
	N	n	%	n	%	n	%	n	%	n	%
Total	803*	521	64.9	71	8.8	149	18.6	38	4.7	24	3.0
Gestation (weeks)	0										
24-27	43	30	69.8	4	9.3	6	14.0	3	7.0	0	0.0
28-31	86	58	67.4	7	8.1	14	16.3	7	8.1	0	0.0
32-36	262	145	55.3	30	11.5	78	29.8	7	2.7	2	0.8
37-40	364	252	69.2	28	7.7	44	12.1	19	5.2	21	5.8
≥41	48	36	75.0	2	4.2	7	14.6	2	4.2	1	2.1
Birth weight (gms)*											
<500											
500-749	14	8	57.1	1	7.1	4	28.6	1	7.1	0	0.0
750-999	20	14	70.0	1	5.0	2	10.0	3	15.0	0	0.0
1000-1249	38	28	73.7	2	5.3	5	13.2	3	7.9	0	0.0
1250-1499	47	33	70.2	5	10.6	9	19.1	0	0.0	0	0.0
1500-1999	106	68	64.2	11	10.4	23	21.7	4	3.8	0	0.0
2000-2499	125	66	52.8	12	9.6	37	29.6	5	4.0	5	4.0
2500-2999	118	66	55.9	13	11.0	29	24.6	6	5.1	4	3.4
3000-3999	286	209	73.1	21	7.3	30	10.5	13	4.5	13	4.5
>3999	49	29	59.2	5	10.2	10	20.4	3	6.1	2	4.1

*missing data for 10 babies

9.16 Data tables: Details of deaths prior to discharge among in born and outborn babies admitted to NICU

Table 207: Outborn neonatal and post-neonatal deaths prior to discharge 2015

Born at	Gestational age	Birth Weight	Apgar @1 min	Apgar @ 5 min	Age at death (d)	Cause of death
Northland	34	2190	14	1	1	Brain injury associated with maternal collapse
Waitakere	40	3230	1	7	12	Brain injury associated with fetal sepsis
Born before Arrival	27	780	-	-	125	Chronic lung disease

Table 208: Inborn neonatal and post-neonatal deaths prior to discharge from NICU 2015

Birthplace	Gestational age	Birth weight	Apgar @1 min	Apgar @ 5 min	Age at death (d)	Main Cause of death
Theatre	24	770	2	4	35	Sepsis
Theatre	37	2360	5	7	12	Multiple complex anomalies
Theatre	24	660	2	7	16	Respiratory failure
Theatre	35	1830	7	9	38	Pseudobulbar palsy due to TTTS
Theatre	33	2400	0	2	4	Multiple organ failure gastroschisis
Delivery Suite	33	2045	7	7	4.7	Multi organ failure associated with pulmonary haemhorrhage and TTS
Delivery Suite	28	1150	5	7	1	Respiratory failure
Delivery Suite	39	2215	2	4	4	Severe metabolic disorder
Delivery Suite	39	2800	5	6	0	Congenital Anomalies
Theatre	25	730	1	2	28	NEC

10 PERINATAL RELATED MORTALITY

This chapter provides information on perinatal related deaths.

NWH has pregnancy loss counseling services to provide support for women with stillbirth and neonatal death and also those who undergo termination for fetal abnormality or other cause.

Methods

Perinatal related mortality data are obtained from the Healthware clinical database and also from a stand-alone Access database. These data include classifications of cause of death assigned following multi-disciplinary discussion.

The classification of perinatal related death uses the Perinatal Society of Australia and New Zealand (PSANZ) system which was first released in May 2003, updated in November 2004 and most recently in March 2009. It includes a classification system by antecedent cause (PSANZ-PDC). In addition neonatal deaths are classified by relevant conditions preceding neonatal death using the PSANZ-NDC. PSANZ Perinatal Death Classification (PSANZ-PDC) is used to identify the single most important factor which led to the chain of events that resulted in the death. PSANZ Neonatal Death Classification (PSANZ-NDC) is applied, in addition to the PSANZ-PDC, to identify the single most important factor in the neonatal period which caused the neonatal death. Two associated factors can also be recorded in each of these systems, but associated factors are not included in the analysis in this report. The PSANZ system was developed because of shortcomings in ICD10 coding alone and in the Whitfield system which classified a higher proportion of deaths as unexplained.

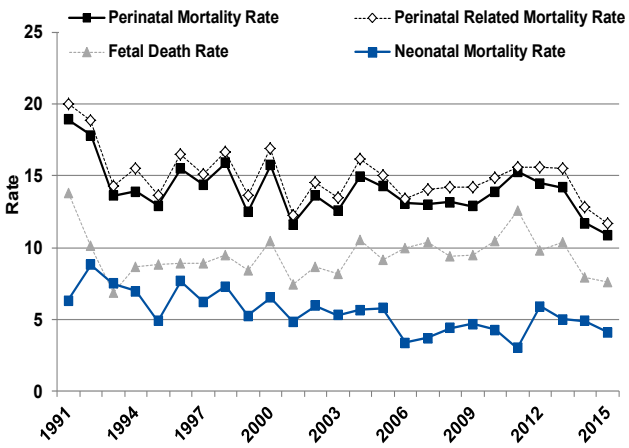
Perinatal mortality rate is defined in New Zealand as fetal death (stillbirth of a baby of at least 20 weeks of gestation at issue or at least 400 grams birth weight if gestation is unknown) plus early neonatal death (death of a live born baby, of at least 20 weeks of gestation at issue or at least 400 grams birth weight if gestation is unknown, before completion of the first 7 days of life), and expressed as a rate per 1000 total babies born. Perinatal related mortality rate includes, in addition, late neonatal deaths (death of a live born baby of at least 20 weeks of gestation at issue or at least 400 grams birth weight if gestation is unknown following 7 days of life but before completion of 28 days of life). Perinatal related death risk is presented by gestation and in this case is the risk of fetal death or neonatal death per 1000 babies remaining in utero to represent the risk at a specific gestation in pregnancy. Fetal death rate is calculated per 1000 babies born, meaning babies remaining in utero if data are presented by gestation, or meaning total babies born if presented as an overall rate. Neonatal death rate is per 1000 live born babies, except in the perinatal mortality time trends figure where neonatal death rates are per 1000 total babies born. This variation is to demonstrate the contribution of fetal deaths and neonatal deaths to overall perinatal related mortality rates.

Perinatal related mortality rates are also presented excluding deaths of babies with or from congenital abnormality. This is calculated by excluding fetal deaths where the primary PDC classification was congenital abnormality and neonatal deaths where the primary PDC and/or NDC classification was congenital abnormality.

All perinatal related deaths are reviewed monthly by a multidisciplinary team comprising an obstetrician (MFM subspecialist and perinatal mortality meeting convener), neonatologist, midwife, perinatal pathologist and administrator. This group classifies the cause of death and summarises recommendations for management if there is a future pregnancy. They also complete the documentation for the NZ Perinatal and Maternal Mortality Review Committee (PMMRC) including assigning contributing factors and determining whether the death was potentially avoidable.

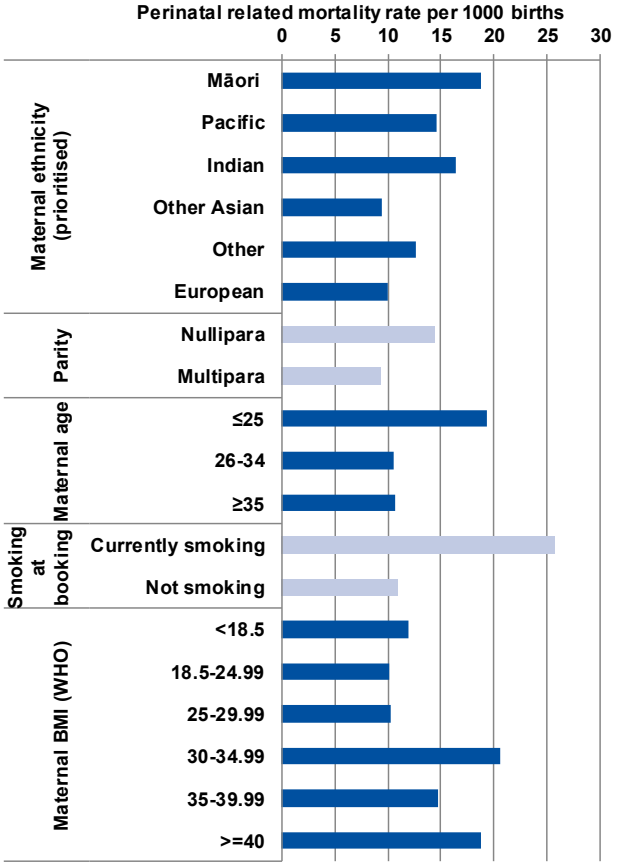
10.1 Perinatal and perinatal related mortality rates

Figure 186: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate NWH 1991-2015 (all rates expressed as deaths/1000 births)



Perinatal mortality at NWH has remained relatively stable over the last 3 years.

Figure 187: Perinatal related mortality rate (/1000 births) by maternal demographic characteristics 2015



Consistent with national data, perinatal mortality is higher in obese women, women who smoke in pregnancy, women under 25, nullipara and women from Māori, Pacific and Indian ethnic groups. Forty four percent of all perinatal related deaths occurred in women who did not reside in Auckland DHB area. The majority of these deaths were from pregnancies/babies who required transfer to our tertiary centre for their care. The perinatal related mortality rate for women resident in the ADHB area is 47/4664 (10.1/1000), similar to the rate last year of 10.5 /1000 total births.

10.2 Gestational age and perinatal related mortality

In 2015 there were three post term perinatal deaths, one due to SUDI and two babies with anomalies.

10.3 Multiple births and perinatal related mortality

In multiple pregnancies the perinatal related mortality rate remains higher than the rate for singleton pregnancies, confirming the high risk nature of these pregnancies especially in mono-chorionic di-amniotic twin pregnancies. Details regarding the cause of death in multiple pregnancies are found in section 5.7. The perinatal mortality in multiples in 2015 (21.6/1000) is lower than the rate in 2014 (33.6/1000).

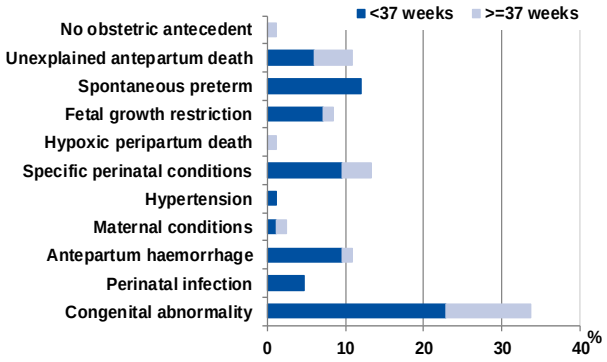
10.4 Lead maternity carer (LMC) and perinatal related mortality

There are 3 groups with higher perinatal mortality: unbooked women, women booked in other DHBs and those attending the medical clinic. As has been found in other reports, unbooked women have increased perinatal related mortality (103/1000) reflecting acute transfers often at very preterm gestations.

Perinatal deaths among mothers attending the MFM clinics also include deaths in the fetal medicine service. Five of the 15 deaths (33%) were terminations of pregnancy. The commonest causes of perinatal related death among women attending the MFM clinics were: congenital abnormality 8 (53%) and specific perinatal conditions 5 (33%). The remainder died from fetal growth restriction (1) and antepartum haemorrhage (1).

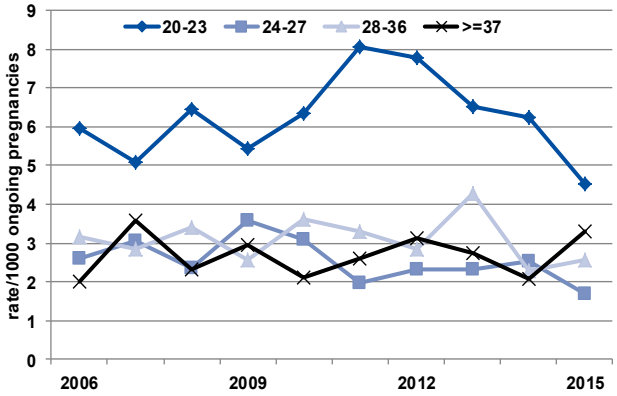
10.5 Classification (PSANZ-PDC) of perinatal related deaths

Figure 188: Contribution to perinatal related death by obstetric antecedent cause (PSANZ-PDC) and gestation at birth NWH 2015



The commonest cause of perinatal related deaths is congenital anomalies, which is in keeping with data from previous years. The overall distribution of classifications is similar to previous years.

Figure 189: Perinatal related mortality risks (/1000 ongoing pregnancies) by gestation 2006-2015



10.6 Neonatal deaths

Table 209: Neonatal deaths by neonatal classification (PSANZ-NDC) and gestational age at birth NWH 2015

	Total neonatal deaths		< 37 weeks n=20		≥ 37 weeks n=9	
	N	%	n	%	n	%
Total						
Extreme prematurity	10	34	10	50	0	0
Congenital abnormality	13	45	5	25	8	89
Infection	2	7	2	10	0	0
Gastrointestinal	0	0	0	0	0	0
Neurological	1	3	1	5	0	0
Cardio-respiratory disorders	1	3	1	5	0	0
Other	1	7	1	5	1	11

Deaths due to congenital abnormality (45%) and extreme prematurity (34%) were the commonest causes of neonatal death in 2015.

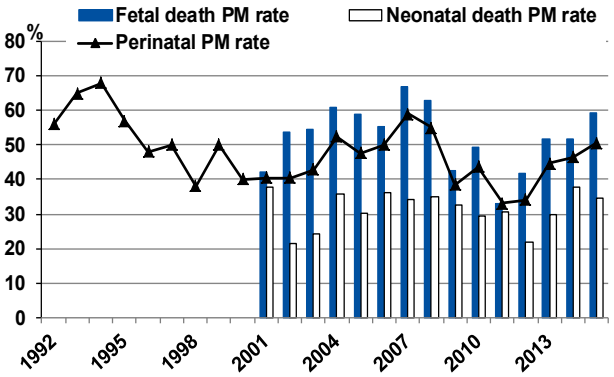
10.7 Fetal Growth Restriction and Perinatal Related Death

Fetal growth restriction (FGR) was the primary perinatal death classification assigned for seven of the 83 deaths in 2015. This classification is **only** used when there is antenatal diagnosis of FGR or where pre-specified pathological criteria for FGR are identified.

However, of singleton perinatal deaths (excluding congenital abnormalities), 15/34 (44%) of stillbirths and 3/13 (23%) of neonatal deaths were small for gestational age (birthweight <10th customised centile). Centiles were not calculated when gestation at death was unknown or was thought to have occurred more than one week prior to birth (three stillbirths) or when death occurred prior to 20 weeks.

10.8 Post-mortem

Figure 190: Post-mortem rates NWH 1992-2015



Post-mortem is the gold standard investigation for perinatal related death. NWH is fortunate to have access to a world-class perinatal pathology service provided by Drs Kate Strachan, Kate Bartlett, and Jane Zuccollo. The post-mortem rate was 42/83 (51%) in 2015, similar to rates in previous years.

10.9 Data Tables: Perinatal related mortality

Table 210: Inborn and BBA deaths NWH 2003-2015

		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fetal deaths	20-22 wks	23	25	26	24	24	29	24	33	41	33	24	25	17
	23-24 wks	8	18	11	12	15	11	14	9	16	11	18	8	9
	25-26 wks	6	3	3	6	7	4	4	8	5	9	6	11	1
	27-28 wks	1	10	6	3	5	8	6	5	2	4	4	2	5
	29-38 wks	24	13	17	24	19	21	19	24	26	13	20	13	12
	>38 wks	2	13	5	5	12	3	8	4	7	7	5	1	10
Total fetal deaths		**64**	**82**	**68**	**74**	**82**	**76**	**75**	**83**	**97**	**77**	**77**	**60**	**54**
Neonatal deaths	Early neonatal deaths (≤7 days)	34	33	38	23	20	26	27	26	21	37	28	28	23
	Late neonatal deaths (8-28 days)	7	9	5	2	9	8	10	8	2	9	9	9	6
Total neonatal deaths		**41**	**42**	**43**	**25**	**29**	**34**	**37**	**34**	**23**	**46**	**37**	**37**	**29**
Total deaths		105	124	111	99	111	110	112	117	120	123	114	97	83
Perinatal mortality rate/1000		12.6	15.0	14.4	13.1	13.0	13.2	12.9	13.9	15.3	14.5	14.2	11.7	10.9
Perinatal related mortality rate/1000		13.5	16.2	15.0	13.4	14.1	14.2	14.2	14.9	15.6	15.6	15.5	12.8	11.7
Perinatal related mortality rate (excluding lethal & terminated fetal abnormalities)		8.9	12.4	9.9	8.4	8.0	9.8	10.3	10.5	10.1	9.2	9.8	7.5	9.3

Table 211: Perinatal related loss and DHB of residence NWH 2015

DHB of residence	TOP n=20		Stillbirth n=38		Neonatal death n=25		Perinatal related death n=83	
	n	%	n	%	n	%	n	%
Auckland	12	60	24	63	11	44	47	57
Counties Manukau	2	10	4	11	4	16	10	12
Waitemata	4	20	8	21	6	24	18	22
Other	2	10	2	5	4	16	8	10

*due to rounding not all % columns add to 100

Table 212: Gestational age and perinatal related mortality NWH 2015

	Births N=7074		Fetal deaths n=54			Neonatal deaths n=29			Total perinatal related deaths n=83		
	n	%	n	%	FD risk*	n	%	NND rate **	n	%	Perinatal related mortality risk***
<24 weeks	44	0.6	26	48.1	3.7	13	44.8	722.2	39	47.0	5.5
24-27 weeks	45	0.6	5	9.3	0.7	0	0.0	0.0	5	6.0	0.7
28-31 weeks	97	1.4	6	11.1	0.9	1	3.4	†	7	8.4	1.0
32-36 weeks	505	7.1	5	9.3	0.7	6	20.7	12.0	11	13.3	1.6
37-40 weeks	5621	79.4	11	20.4	1.7	7	24.1	1.2	18	21.7	2.8
≥41 weeks	762	10.8	1	1.9	†	2	6.9	†	3	3.6	3.9

* Fetal death risk = number of fetal deaths per 1000 babies remaining in utero
** NND rate = number of deaths per 1000 live births in that gestation category
*** Perinatal related death risk = number of perinatal related deaths per 1000 babies remaining in utero
† Not calculated due to small numbers

Table 213: Multiple births and perinatal related mortality NWH 2015

	Births N=7074		Fetal deaths n=54			Neonatal deaths n=29			Total perinatal related deaths n=83		
	n	%	n	%	FD rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Singleton	6796	96.1	52	96.3	7.7	25	86.2	3.7	77	92.8	11.3
Multiple	278	3.9	2	3.7	†	4	13.8	14.5	6	7.2	21.6

* Fetal death rate = number of fetal deaths per 1000 births
‡ Neonatal Death rate = number of deaths per 1000 live births
† Perinatal-related mortality rate = number of perinatal related deaths per 1000 births
† Not calculated due to small numbers

Table 214: LMC at birth and perinatal related mortality NWH 2015

	Births N=7074		Fetal deaths n=54			Neonatal deaths n=29			Total perinatal related deaths n=83		
	N	%	n	%	FD rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Independent Midwife	3370	47.6	27	50.0	8.0	8	27.6	2.4	35	42.2	10.4
Private Obstetrician	1905	26.9	7	13.0	3.7	5	17.2	2.6	12	14.5	6.3
G.P.	16	0.2	0	0.0	∞	0	0.0	∞	0	0.0	∞
NW Community	1269	17.9	10	18.5	7.9	5	17.2	4.0	15	18.1	11.8
NW Diabetes	155	2.2	0	0.0	0.0	1	3.4	∞	1	1.2	∞
NW MFM	296	4.2	6	11.1	20.3	9	31.0	31.0	15	18.1	50.7
Other DHB	34	0.5	1	1.9	∞	1	3.4	∞	2	2.4	∞
Unbooked	29	0.4	3	5.6	103.4	0	0.0	0.0	3	3.6	103.4

Unbooked = not registered with an LMC prior to labour
* Fetal death rate = number of fetal deaths per 1000 births
‡ Neonatal Death rate = number of deaths per 1000 live births
† Perinatal related mortality rate = number of perinatal related deaths per 1000 births
∞ Not calculated due to small numbers

Table 215: Perinatal death by Perinatal Death Classification (PSANZ-PDC) NWH 2015

	Fetal deaths n=54			Neonatal deaths n=29			Total n=83		
	n	%	Rate*	n	%	Rate**	n	%	Rate*
Congenital abnormality	15	27.8	2.1	13	44.8	1.9	28	33.7	4.0
Perinatal infection	3	5.6	0.4	1	3.4	†	4	4.8	0.6
Antepartum haemorrhage	6	11.1	0.8	3	10.3	0.4	9	10.8	1.3
Maternal conditions	2	3.7	0.3	0	0.0	0.0	2	2.4	0.3
Hypertension	1	1.9	†	0	0.0	0.0	1	1.2	†
Specific perinatal conditions	8	14.8	1.1	3	10.3	0.4	11	13.3	1.6
Hypoxic peripartum death	1	1.9	†	0	0.0	0.0	1	1.2	†
Fetal growth restriction	7	13	1	0	0.0	0.0	7	8.4	1.0
Spontaneous preterm	2	3.7	†	8	27.6	1.1	10	12.0	1.4
Unexplained antepartum death	9	16.7	1.3	0	0.0	0.0	9	10.8	1.3
No obstetric antecedent	0	0	0	1	3.4	†	1	1.2	†

* Rate: per 1000 births ** Rate: per 1000 live births
† Not calculated due to small numbers

Table 216: Maternal characteristics and perinatal related mortality NWH 2015

	Births n=7074		Stillbirths n=54			Neonatal deaths n=29			Perinatal related deaths n=83		
	N	%	n	%	SB rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Maternal ethnicity (prioritised)											
Māori	478	6.8	4	7.4	8.4	5	17.2	10.5	9	10.8	18.8
Pacific	823	11.6	5	9.3	6.1	7	24.1	8.6	12	14.5	14.6
Indian	670	9.5	10	18.5	14.9	1	3.4	∞	11	13.3	16.4
Other Asian	1590	22.5	10	18.5	6.3	5	17.2	3.2	15	18.1	9.4
Other	317	4.5	3	5.6	9.7	1	3.4	∞	4	4.8	13.0
Other European	847	12.0	5	9.3	5.9	1	3.4	∞	6	7.2	7.1
NZ European	2349	33.2	17	31.5	7.2	9	31.0	3.9	26	31.3	11.1
Parity											
Nullipara	3393	48.0	34	63.0	10.0	15	51.7	4.5	49	59.0	14.4
Multipara	3681	52.0	20	37.0	5.4	14	48.3	3.8	34	41.0	9.2
Maternal age											
≤25	880	12.4	8	14.8	9.1	9	31.0	10.3	17	20.5	19.3
26-34	3959	56.0	30	55.6	7.6	12	41.4	3.1	42	50.6	10.6
≥35	2235	31.6	16	29.6	7.2	8	27.6	3.6	24	28.9	10.7
Maternal smoking at booking											
Currently smoking	388	5.5	4	7.4	10.3	6	20.7	15.6	10	12.0	25.8
Not smoking	6685	94.5	50	92.6	7.5	23	79.3	3.5	73	88.0	10.9
Missing data	1	0.0	0	0.0	∞	0	0.0	∞	0	0.0	∞
Maternal BMI (WHO)											
<18.5	250	3.5	3	5.6	12.0	0	0.0	0.0	3	3.6	12.0
18.5-24.99	3867	54.7	24	44.4	6.2	15	51.7	3.9	39	47.0	10.1
25-29.99	1560	22.1	14	25.9	9.0	2	6.9	1.3	16	19.3	10.3
30-34.99	682	9.6	8	14.8	11.7	6	20.7	8.9	14	16.9	20.5
35-39.99	341	4.8	0	0.0	0.0	5	17.2	14.7	5	6.0	14.7
>=40	267	3.8	4	7.4	15.0	1	3.4	3.8	5	6.0	18.7
missing	107	1.5	1	1.9	9.3	0	0.0	0.0	1	1.2	∞
NZDep 2006 (quintile)											
1	1146	16.2	7	13.0	6.1	1	3.4	∞	8	9.6	7.0
2	1331	18.8	4	7.4	3.0	2	6.9	1.5	6	7.2	4.5
3	1469	20.8	11	20.4	7.5	5	17.2	3.4	16	19.3	10.9
4	1420	20.1	17	31.5	12.0	9	31.0	6.4	26	31.3	18.3
5	1420	20.1	12	22.2	8.5	9	31.0	6.4	21	25.3	14.8
Missing data	288	4.1	3	5.6	10.4	3	10.3	10.5	6	7.2	20.8

* Stillbirth rate = number of stillbirths per 1000 births,
‡ Neonatal Death rate = number of neonatal deaths per 1000 live births
† Perinatal related mortality rate = number of stillbirths & neonatal deaths to 27 days per 1000 births
∞ Not calculated due to small numbers (<3)

Table 217: Postnatal transfer deaths (babies born elsewhere who transferred to NWH for postnatal care) 2005-2015

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Early neonatal deaths	<7 days	3	3	5	3	4	5	3	4	2	3	2
Late neonatal deaths	7–27 days	3	3	2	3	5	1	0	0	2	1	2
Total deaths		6	6	7	6	9	6	3	4	4	4	4

Table 218: Perinatal full postmortem rates (%) 1993-2015

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Perinatal postmortem (%)	65	68	57	48	50	38	50	40	40	41	43

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Perinatal postmortem (%)	52	48	50	59	55	38	44	33	34	45	46	51

Table 219: Classification of perinatal-related death (PSANZ-PDC) 2008-2015

Classification (PSANZ-PDC)	2008 N=110		2009 N=112		2010 N=117		2011 N=120		2012 N=123		2013 N=114		2014 N=97		2015 N=83	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Congenital abnormality	34	31	31	28	48	41	43	36	48	39	38	33	37	38	28	34
Perinatal infection	5	5	4	4	4	3	4	3	2	2	6	5	2	2	4	5
Hypertension	4	4	6	5	4	3	4	3	5	4	3	3	5	5	1	1
APH	13	12	15	13	11	9	9	8	15	12	15	13	10	10	9	11
Maternal conditions	3	3	6	5	9	8	8	7	10	8	4	4	7	7	2	2
Specific perinatal conditions	22	20	16	14	9	8	23	19	14	11	21	18	13	13	11	13
Hypoxic peripartum death	1	1	1	1	2	2	1	1	1	1	2	2	2	2	1	1
Fetal growth restriction	9	8	5	4	2	2	8	7	3	2	8	7	5	5	7	8
Spontaneous preterm	11	10	19	17	18	15	10	8	15	12	9	8	9	9	10	12
Unexplained antepartum death	7	6	9	8	10	9	9	8	10	8	8	7	6	6	9	11
No obstetric antecedent	1	1	0	0	0		1	1	0		0		1	1	1	1

Table 220: Classification of death (PSANZ-PDC) among terminations of pregnancy 2015

Classification (PSANZ-PDC)	Termination of pregnancy n=20	
	n	%
Congenital abnormality	12	60
Antepartum haemorrhage	1	5
Perinatal Infection	1	5
Specific perinatal conditions	3	15
Maternal condition	1	5
Fetal growth restriction	2	10

Table 221: Perinatal related deaths by classification (PSANZ-PDC) and gestational age 2015

	Total deaths		Preterm (<37 weeks)		Term (> 37 weeks)	
	n	%	n	%	n	%
Congenital abnormality	28	34	19	31	9	43
Perinatal infection	4	5	4	6	0	0
Antepartum haemorrhage	9	11	8	13	1	5
Maternal conditions	2	2	1	2	1	5
Hypertension	1	1	1	2	0	0
Specific perinatal conditions	11	13	8	13	3	14
Hypoxic peripartum death	1	1	0	0	1	5
Fetal growth restriction	7	8	6	10	1	5
Spontaneous preterm	10	12	10	16	0	0
Unexplained antepartum death	9	11	5	8	4	19
No obstetric antecedent	1	1	0	0	1	5

11 MATERNAL MORTALITY AND SEVERE MORBIDITY

This chapter provides data on maternal deaths and some of the severe maternal morbidities among women giving birth at NWH during 2015.

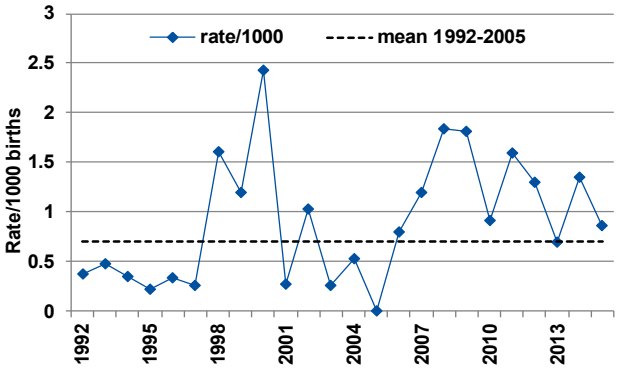
11.1 Maternal Mortality

In 2015 there was one first trimester antenatal maternal death of a woman who had received care from the fertility service at NWH. There were no deaths among women who birthed or booked to birth at National Women's.

11.2 Emergency peripartum hysterectomy

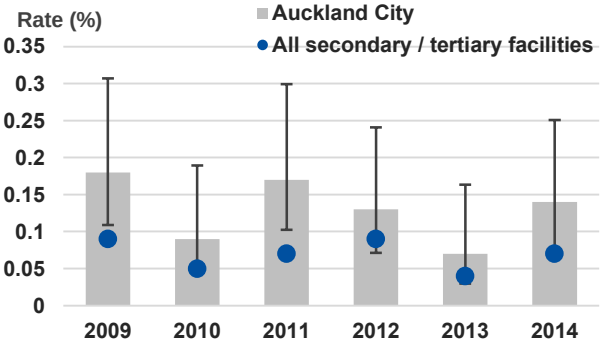
Emergency peripartum hysterectomy is defined as hysterectomy performed for complications related to pregnancy within 6 weeks of birth, when that pregnancy resulted in birth at NWH at or beyond 20 weeks gestation. Semi-elective cases are excluded.

Figure 191: Emergency peripartum hysterectomy rates/1000 births NWH 1992-2015



There were 6 emergency peripartum hysterectomies in 2015 (0.87/1000 births). This includes planned Caesarean hysterectomy for morbidly adherent placentae but does not include hysterectomy for malignancy.

Figure 192: NZ Maternity Indicators 2014: Emergency peripartum hysterectomy rates NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for the facility rate.

There are small absolute numbers per year and so the rate is highly variable. However, the run chart in figure 191 indicates that there has been a significant increase in rate from the mean in 1992-2005 with ten data points at or above the mean line.

11.3 Other Severe Maternal Morbidity

These data are collected as part of the AMOSS study or by queries from Healthware and the hospital discharge database.

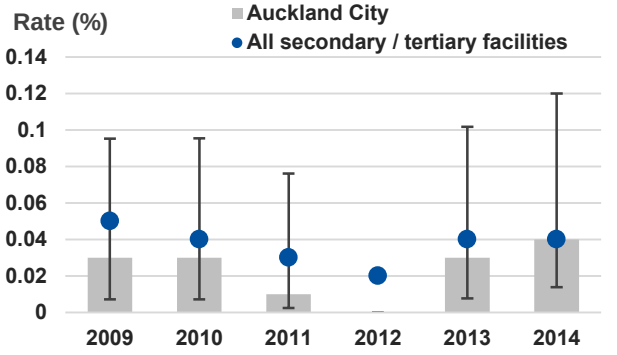
Table 222: Incidence (rate or ratio) of severe maternal morbidities NWH 2013-2015

	Women birthing 2013 n=7223		Women birthing 2014 n=7400		Women birthing 2015 n=6933	
Diagnosis	**n**	**/1000**	**n**	**/1000**	**n**	**/1000**
Amniotic fluid embolism	1	0.14	1	0.14	0	
Eclampsia	3	0.42	2	0.27	1	0.14
Rheumatic heart disease	20	2.77	17	2.29	ND	
Emergency peripartum hysterectomy	5	0.69	10	1.35	6	0.87
Admission to DCCM	20	2.77	22	2.97	22	3.17

ND=not collected in specified year

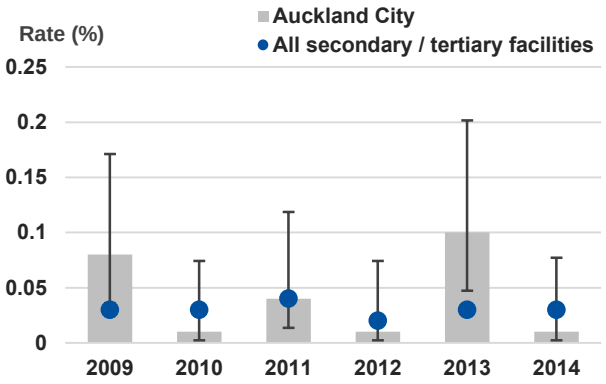
Specific and complete ascertainment of women diagnosed with one of a set of predefined rare conditions associated with severe maternal morbidity has been set up in New Zealand by the Australasian maternity outcomes surveillance system (AMOSS) under the auspices of the Perinatal and Maternal Mortality Review Committee (PMMRC). Data collection is undertaken by monthly queries to individual clinicians to identify cases, supported by hospital discharge coding data. Data collection started in NZ in January 2010. The only current reportable condition is amniotic fluid embolism. The conditions collected vary from year to year.

Figure 193: NZ Maternity Indicators 2014: Eclampsia at birth admission NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for the facility rate.

Figure 194: NZ Maternity Indicators 2014: Admission to ICU requiring ventilation during the pregnancy or postnatal period NWH and NZ secondary/tertiary facility rates 2009-2014



Error bars represent the 95% confidence interval for the facility rate.

In 2015, there were 22 admissions of pregnant or postpartum women, 17 to the department of critical care medicine (DCCM) and 5 to the cardiovascular intensive care unit (CVICU) at Auckland City Hospital, all of whom birthed or miscarried at NWH. Three were admitted acutely from other hospitals and then delivered at NWH. Four women were admitted antenatally, all of whom had urosepsis.

Overall, reason for admission was sepsis (8), cardiac condition (5), haemorrhage (4), preeclampsia (2), acute fatty liver of pregnancy (1), acute renal failure (1), and bowel perforation (non-traumatic) (1).

12 GYNAECOLOGY

12.1 Colposcopy

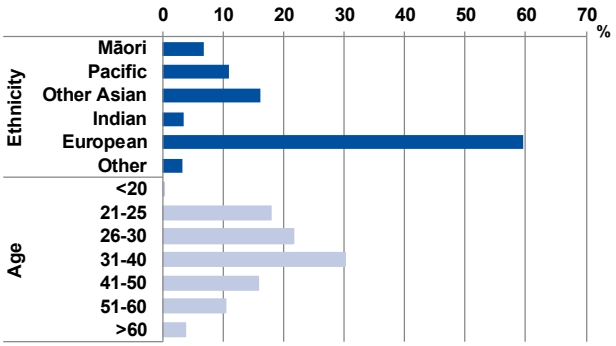
The data presented in this section come from data entered into the Solutions Plus record by clinicians and support staff, after cleaning against appointments recorded in the PHS outpatient services management system. Post-treatment data are based on treatments in 2014.

The standards used in this section are taken from the BSCCP guidelines/NHS Cancer Screening Program (Publication 20, April 2004, and updated May 2010).

Findings:

There were 1806 cervical colposcopies performed in the department in 2015, of which 1182 were initial cervical colposcopies.

Figure 195: Demographic details of women having an initial colposcopic examination in NWH 2015



Referrals for women under the age of thirty have remained consistently around 40% of the total, suggesting we are yet to see the benefits of HPV vaccination, and possibly indicative of relatively low vaccination uptake to date.

The number of women under 20 being seen in the clinic continues to fall, with only three referred, and it is reassuring that NZ guidelines are increasingly being adhered to. Ongoing vigilance and education of all smear takers is vital to reduce this to zero.

The smoking data are still incomplete and reflect that this is not a mandatory field in the database. Attempts to make it a mandatory field have failed and alternative ways to ensure women's smoking status is asked (and counselled) about will need to be used. It is noted that such information is often documented in the clinic letter but not on the clinical record.

Colposcopy standard: "Documentation that the entire squamo-columnar junction is seen and whether the upper limit of any cervical lesion is seen".

There is 100% compliance with this standard following the introduction of mandatory fields in electronic data collection several years ago.

Figure 196: Satisfactory colposcopic examination by type of colposcopic visit NWH 2015

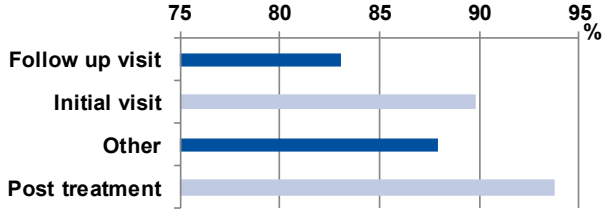


Table 223: Referral smear cytology among women presenting for initial colposcopy NWH 2015

	Initial visit N=1182	
	n	%
Invasive	2	0.2
High grade	326	27.6
Low grade	766	64.8
Atypical Glandular	17	1.4
Unsatisfactory	3	0.3
Other	1	0.1
Normal	55	4.7
No smear Taken	12	1.0

Table 224: Histology of biopsy among women presenting for initial colposcopy NWH 2015

	Initial visit N=1182	
	n	%
Invasive	0	
High Grade	221	18.7
Low grade	242	20.5
Dysplasia NOS	33	2.8
HPV	90	7.6
Inflammation	74	6.3
Insufficient sample	3	0.3
Normal	106	9.0
No biopsy taken	413	34.9

The 'insufficient sample' rate of 0.3% (0.4% of all biopsies taken) is well within the cQuIP and BSCCP standards of <10% (ie well-above 90% of all biopsies taken are suitable for histological examination.

Colposcopy Standards: Biopsy rate in women with high grade cytology		Standard	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013	NW 2014	NW 2015
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Biopsy taken	>95	76	80	82	83.3	79.9	86.0	276/328 =84.1
Denominator	Women referred with high grade cytology for initial colposcopy examination								

Table 225: Histological diagnosis (biopsy at initial colposcopy) by referral smear cytology NWH 2015

Referral smear cytology	Total Colposcopies	Histological diagnosis																	
		No biopsy		Invasive		High Grade		Low Grade		Dysplasia NOS		Condyloma/ inflammation		HPV		Insufficient Sample		Normal	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1182**	**413**	**34.9**	**0**		**221**	**18.7**	**242**	**20.5**	**33**	**2.8**	**74**	**6.3**	**90**	**7.6**	**3**	**0.3**	**106**	**9.0**
Invasive	2	0		0		1	50.0	0		0		0		0		0		1	50.0
High grade	326	52	16.0	0		146	44.8	63	19.3	11	3.4	10	3.1	18	5.5	1	0.3	25	7.7
Low grade	766	309	40.3	0		65	8.5	167	21.8	21	2.7	61	8.0	67	8.7	2	0.3	74	9.7
Atypical glandular	17	2	11.8	0		6	35.3	3	17.6	0		0		2	11.8	0		4	23.5
Unsatisfactory	3	1	33.3	0		0		1	33.3	0		1	33.3	0		0		0	
Other	1	1	100	0		0		0		0		0		0		0		0	
Normal	55	40	72.7	0		0		7	12.7	1	1.8	2	3.6	3	5.5	0		2	3.6
No Smear	12	8	66.7	0		3	25.0	1	8.3	0		0		0		0		0	

The “no biopsy” rate now shows a clear reduction over the last 4 years, initially 45%, then 41% and 37%, now 35%. Overall this means the biopsy rate is now 65%.

With regard to the above standard, 84% of women referred with a high grade smear had a biopsy. Similar to last year, this remains below the standard.

A review of the 52 patients referred with high grade smear, but who had no biopsy at colposcopy, showed that the reason for “no biopsy” was mostly a normal colposcopy. Of the total (52), most (42) had a normal colposcopy and either a low grade smear or a normal smear at the colposcopy visit. After review at MDM, seven patients had an excisional biopsy. Four patients were pregnant. On review of all case notes, all patients had appropriate clinical management for their circumstances, usually involving multidisciplinary review.

If pregnant women are excluded (none of the pregnant women had evidence of invasion, thus biopsy was not indicated), the biopsy rate for high grade referral smears is 85%. The cQuIP standard excludes women who are pregnant, and is the same as the BSCCP standard at 95%.

A similar discussion has occurred in previous Annual Clinical Reports - this does seem to be one standard that is consistently not reached, but where, on review, clinical management is still found to be appropriate. **Colposcopy Standard: Predictive value of a colposcopic high grade diagnosis**		**Standard**	**NW 2009**	**NW 2010**	**NW 2011**	**NW 2012**	**NW 2013**	**NW 2014**	**NW 2015**
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	High grade histology	65	55	56	52	58	62	58	60
Denominator	Initial satisfactory colposcopies where colposcopic diagnosis is high grade								

Table 226: Cervical histology findings by colposcopic diagnosis (at initial colposcopy if satisfactory) NWH 2015

Colposcopic diagnosis	Total Colposcopies	Histological diagnosis																	
		No biopsy		Invasive		High Grade		Low Grade		Dysplasia NOS		Condyloma/ inflammation		HPV		Insufficient Sample		Normal	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1061**	**328**	**30.9**	**0**		**215**	**20.3**	231	21.8	**29**	**2.7**	**68**	**6.4**	**87**	**8.2**	**3**	**0.3**	**100**	**9.4**
Invasive	1	0		0		1	100	0		0		0		0		0		0	
High grade	222	4	1.8	0		134	60.4	45	20.3	6	2.7	7	3.2	14	6.3	0		12	5.4
Low grade	521	54	10.4	0		73	14.0	171	32.8	19	3.6	55	10.6	65	12.5	3	0.6	81	15.5
Condyloma/ inflammation	8	3	37.5	0		1	12.5	1	12.5	0		1	12.5	2	25.0	0		0	
Other	25	12	48.0	0		4	16.0	2	8.0	2	8.0	1	4.0	2	8.0	0		2	8.0
Normal	282	253	89.7	0		2	0.7	12	4.3	2	0.7	4	1.4	4	1.4	0		5	1.8
No opinion given	2	2	100	0		0		0		0		0		0		0		0	

Colposcopic prediction of high grade disease is similar to the previous three years, but still a little below the standard. Clinical photographs are routinely taken and presented at MDM, and colposcopists are encouraged to know their own “positive predictive value” for colposcopic impression of high grade dysplasia.

Four patients had colposcopic impression of high grade dysplasia but no biopsy. One patient declined, but subsequently had a LLETZ with confirmed high grade dysplasia. The other three patients were pregnant with no evidence of invasive disease.

This year’s report does not contain the table seen in previous years entitled “Histological diagnosis (biopsy at initial colposcopy) by referral reason”. This is because, due to a database upgrade part way through the year, it has not been possible to extract comparable data. Use of the new database variables will commence next year.

Table 227: Cervical treatments NWH 2015

	2015	
	n=	300
	n	%
LLETZ	284	94.7
Cone knife cone	14	4.7
Total hysterectomy	0	0.0
Other	2	0.7

There were 67 LLETZ treatments under general anaesthesia, which means 78% of patients underwent LLETZ with local anaesthesia on an outpatient basis. This still falls slightly short of the 80% NCSP standard, but is slightly higher than last year's result (76%). It is pleasing not to see a further decrease in the outpatient LLETZ rate. Colposcopists will need to continue to assess their own rates of treatment under general anaesthetic. It is noted, however, that patient choice regarding anaesthesia is also an important standard of care.

The number of women under 25 being treated is stable at 46 (compared to 45 last year). Recruitment continues for the PRINCess trial (conservative management for women under 25 with CIN2). It is expected that recruiting will be completed by the end of 2016 and the results of the trial are awaited with interest.

12.1.1 Post treatment follow up

Table 228: Colposcopy Standards: Follow up after treatment

Colposcopy Standards: Follow up after treatment		
Numerator	Follow up visit no later than 8 months following treatment	
Denominator	All treatments	
	Standard	**NWH**
Year	**%**	**%**
2008	>90	88
2009		88
2010		81
2011		92
2012		87
2013		80
2014		80

This standard has not changed, however all women were offered an appointment within the time frame (including all of those who were seen after 8 months).

Table 229: Timing of follow up colposcopy (ACH) after treatments NWH 2014

	2014 N=282	
	n	%
≤ 8 months	225	79.8
> 8 months	17	6.0
No follow up	40	14.2

Among the 40 women with no attendance at follow up, 13 moved out of our DHB catchment area and referrals were sent to the new DHB where the address was known or a letter went to the GP with a copy to the patient. Ten patients were known to have gone overseas indefinitely and they were all clearly advised to have follow-up in their new countries. One patient had follow up through the Gynaecology Oncology service due to invasive disease. One patient declined follow-up. In the remaining case, the indication for treatment was not dysplasia. In circumstances of serial non-attendance (12 cases), a discharge letter was sent to the referrer and the patient recommending a repeat smear.

Table 230: Colposcopy Standards: Dyskaryosis* after treatment

Colposcopy Standards: Dyskaryosis* after treatment		
Numerator	Treated women with no dyskaryosis* following treatment	
Denominator	All treatments	
	Standard	**NWH**
Year	**%**	**%**
2008	>90	90
2009		92
2010		76
2011		81†
2012		81†
2013		83†
2014		79†

*HSIL or LSIL on cytology
† excludes ASCUS

Table 231: Cytology and histology findings post cervical treatment NWH 2014

	2014 treatments N=282	
	N	%
Cytology findings at post treatment follow up		
Normal	178	63.1
High grade	8	2.84
Low grade	50	17.7
Other	1	0.35
Unsatisfactory	3	1.06
No cytology	2	0.71
Non attendance	40	14.2
Histology findings at post treatment follow up		
No biopsy taken	216	76.6
High grade	1	0.35
Low grade	4	1.42
Dysplasia NOS	1	0.35
HPV	4	1.42
Inflammation	3	1.06
Normal	13	4.61
Non attendance	40	14.2

The performance against the standard for dyskaryosis in follow up smears after LLETZ treatment has fallen slightly and is still outside of the expected proportion.

Most (86%) of the residual abnormal cytology was low grade.

This is one area where the more clinically relevant cQuIP standard (see summary) may be more meaningful. The cQuIP standard is that "the proportion of confirmed high grade histological treatment failures should not exceed 5% in 12 months". If this standard is used, the rate of treatment failure is well within standard (<1%).

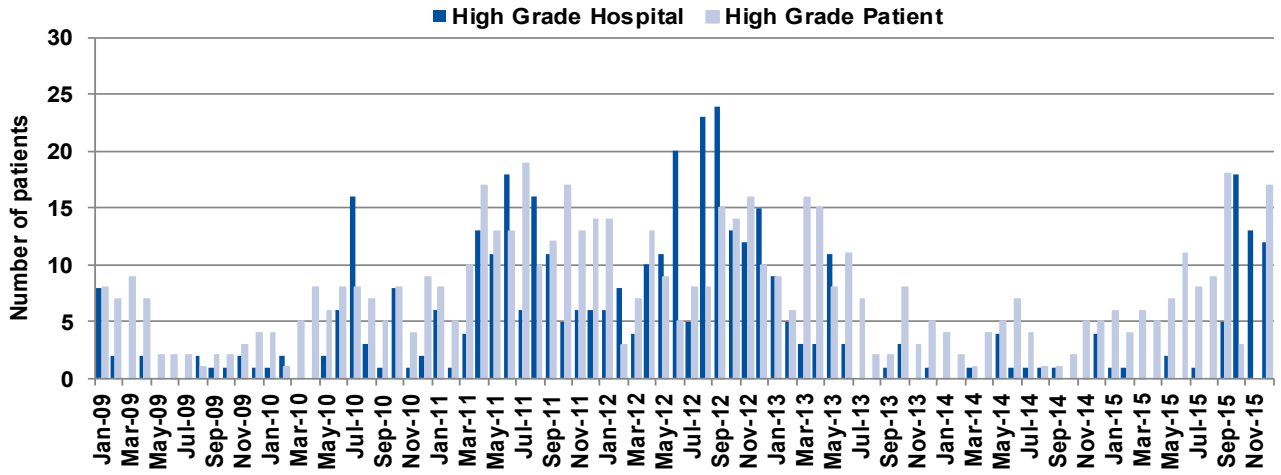
Table 232: Colposcopy Standards: Primary haemorrhage after treatment

Colposcopy Standards: primary haemorrhage after treatment		
Numerator	Treated women who require treatment for primary haemorrhage	
Denominator	All treatments	
	Standard	**NWH**
Year	**%**	**%**
2008	<5	1
2009		0.5
2010		0
2011		1.7
2012		0.75
2013		0.6
2014		0.0

There were no cases of primary haemorrhage in 2014.

12.1.2 Waiting times for first appointment/DNA rates (Data from NSU monthly data reports) NWH 2009-2015

Figure 197: High grade referrals outside National Screening Unit Targets NWH 2009-2015: Hospital vs patient related delays



Waiting times for initial colposcopy continue to be within the standard, with the majority of delays being due to patient-related factors. A slight increase at the end of the year was corrected by the beginning of 2016 with additional colposcopists returning to work after prolonged leave.

Figure 198: Low grade referrals outside National Screening Unit Targets NWH 2009-2015: Hospital vs patient related delays

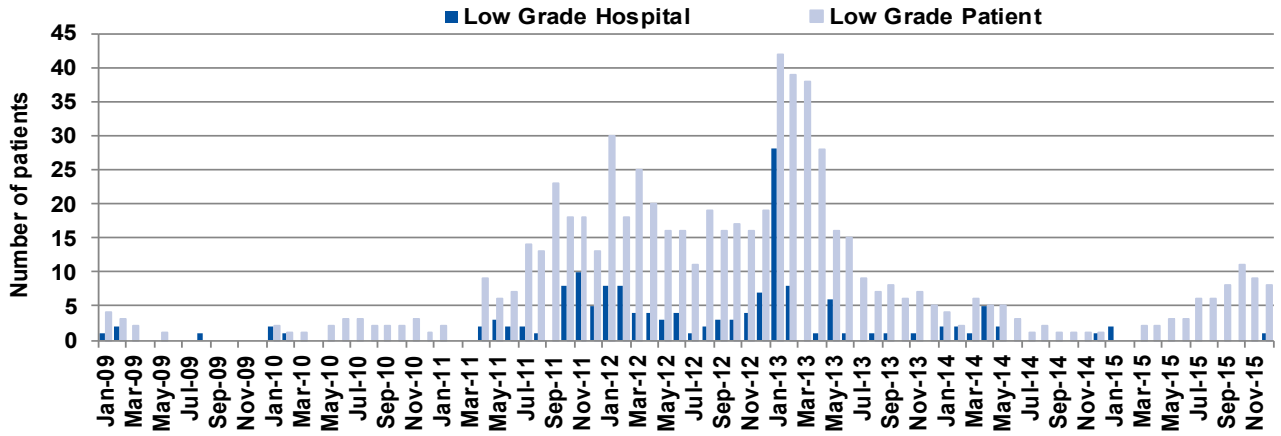
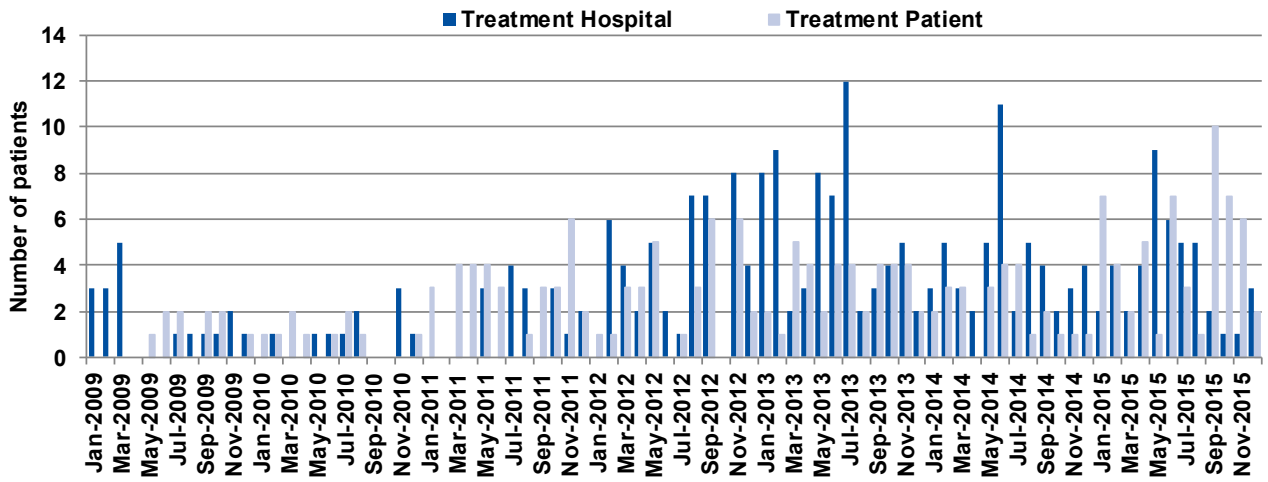


Figure 199: Treatments outside National Screening Unit Targets NWH 2009-2015: Hospital vs patient related delays

Virtually all patients with low grade disease were offered appointments within the target time frame.



An audit regarding delays in treatments under general anaesthesia highlighted some areas where delays could be reduced. One of these was in the timely completion of the Anaesthesia Health Questionnaire. Changes were made in the clinic process and this form is now completed at the time of initial colposcopy for any patients who are assessed as likely to require a general anaesthetic for treatment, regardless of the colposcopic opinion. This was introduced mid-2015 and appears to have had a positive impact. A re-audit of this is planned.

Summary

In May 2015, Health and Disability Audit New Zealand conducted a routine audit of Colposcopy services at NWH on behalf of the NCSP. Three standards for service provision were 'partially attained', with the remaining standards all met. The three areas were:

1) Attendance of colposcopists at MDM (5/13 colposcopists with more than the 50% attendance standard) – this has improved over the last twelve months to 10/14 colposcopists meeting the standard. Continued improvements are expected.
2) 74% (standard is 80%, eventual total for 2015 is 78%) of women having LLETZ treatment as outpatients. As discussed previously, this is a standard that we have difficulty meeting, mostly due to patient request. It is noted that provision of patient choice regarding method of anaesthesia is also part of the NCSP treatment standards.
3) Lack of a policy for management of women who decline to attend colposcopy (separate to the DNA policy). This has now been completed.

Mandatory RANZCOG cQuIP (colposcopy quality improvement program) certification for colposcopists was planned to be implemented across Australasia in March 2015. This was delayed in Australia, until 2016, mostly due to concerns there about maintaining the required numbers of colposcopies for certification (75 over 3 years). In New Zealand, however, mandatory cQuIP certification (or supervision by a cQuIP accredited colposcopist whilst working toward certification) was introduced by NCSP as planned. The three year minimum standard of 75 colposcopies is less than the 50 per year required by the NCSP. All NWH colposcopists in 2015 achieved cQuIP certification, and the two colposcopists who joined at the end of the year will complete their certification soon. Fourteen colposcopists performed an average of 131 colposcopies each in 2015, with the annual lowest number being 76.

Now that we have local colposcopy standards in the form of cQuIP, we should consider altering future Annual Clinical Reports to reflect these standards.

Reasons for referral and patient demographics remain similar to 2014. We are yet to see a significant impact from HPV vaccination on referrals; however the number of women under 25 being treated for high grade dysplasia remains similar to 2014 but lower than previous years. This may in part be due to recruitment for the PRINCess trial.

After a long-awaited upgrade to Solutions Plus occurred (in August 2015), it is frustrating to report that smoking status is still not a mandatory field and will not be made such.

Pleasingly, the 'no biopsy' rate is continuing to decline, and audit of those cases with high grade

referral smears where no biopsy was done has again shown appropriate clinical management.

Colposcopic prediction of high grade dysplasia is still just below standard and individual colposcopists are encouraged to know their own "positive predictive value".

The 'no dyskaryosis on smear' rate after treatment remains outside the BSCCP standard however the rate of true histological treatment failure is very low and well within the cQuIP standard.

The number of women having treatment under local anaesthesia remains just outside the standard but overall waiting times for LLETZ have fallen in the second half of the year.

Most women who have no followup after treatment have moved area. All had adequate attempts at contacting the patient and their referrer. All patients were offered an appointment within an eight month time frame.

Women with low grade referral smears are virtually all offered an appointment within the target time of 6 months. At the end of 2015 there was an increase in hospital-related delay for first appointment with high grade referral smear. It is anticipated that this will be improved again after the return to work of two colposcopists from extended leave, along with the employment of another Gynaecologic Oncologist who also commenced colposcopy clinics. This variation in the service's ability to meet waiting time targets demonstrates how little leeway we have with regard to staffing and how vulnerable we are to small variations in staffing levels.

12.2 Data tables: Colposcopy

Table 233: Demographic details of women having an initial colposcopic examination in NWH 2010-2015

	Initial colposcopy in 2010 N=1214		Initial colposcopy in 2011 N=1289		Initial colposcopy July-Dec 2012 N=759		Initial colposcopy in 2013 N=1406		Initial colposcopy in 2014 N=1357		Initial colposcopy in 2015 N=1182	
	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity												
Māori	113	9.3	121	9.4	51	6.7	105	7.5	88	6.5	79	6.7
Pacific	109	9.0	126	9.8	83	10.9	131	9.3	133	9.8	129	10.9
Other Asian	198	16.3	198	15.4	112	14.8	198	14.1	40	2.9	191	16.2
Indian	63	5.2	56	4.3	45	5.9	56	4.0	232	17.1	40	3.4
European	688	56.7	749	58.1	444	58.5	855	60.8	801	59.0	704	59.6
Other	16	1.3	14	1.1	24	3.2	61	4.3	63	4.6	39	3.3
Not stated	27	2.2	25	1.9	0		0		0		0	
Age (yrs)												
≤20	29	2.4	40	3.1	10	1.3	7	0.5	6	0.4	3	0.3
21-25	422	34.8	535	41.5	312	41.1	281	20.0	247	18.2	212	17.9
26 -30							271	19.3	278	20.5	256	21.7
31-40	389	32.0	374	29.0	199	26.2	447	31.8	407	30.0	357	30.2
41-50	218	18.0	189	14.7	128	16.9	216	15.4	239	17.6	186	15.7
51-60	106	8.7	108	8.4	87	11.5	136	9.7	117	8.6	123	10.4
>60	50	4.1	43	3.3	23	3.0	48	3.4	63	4.6	45	3.8
Smoking status												
Currently smoking	266	21.9	279	21.6	64	8.4	131	9.3	97	7.1	62	5.2
Not currently	943	77.7	981	76.1	174	22.9	467	33.2	465	34.3	304	25.7
Unknown	5	0.4	29	2.3	521	68.6	808	57.5	795	58.6	816	69.0
Referral to smoking cessation	255	21.0	259	20.1	NA	NA	NA	NA	NA	NA	NA	NA
DHB of residence												
Auckland	1131	93.2	1188	92.2	709	93.4	1317	93.7	1272	93.7	1112	94.1
Counties Manukau	25	2.1	22	1.7	14	1.8	27	1.9	19	1.4	17	1.4
Waitemata	39	3.2	48	3.7	25	3.3	38	2.7	45	3.3	29	2.5
Other	19	1.6	31	2.4	11	1.4	24	1.7	21	1.5	24	2.0

NA=not available

Table 234: Adequacy of colposcopic examination by type of colposcopic visit NWH 2015

Satisfactory Colp	Total		Follow up visit		Initial visit		Other		Post treatment	
	N=	1806	n=	71	n=	1182	n=	537	n=	16
Yes	1607	89.0	59	83.1	1061	89.8	472	87.896	15	93.75
No	199	11.0	12	16.9	121	10.2	65	12.1	1	6.25

Table 235: Cervical treatments NWH 2011 – 2015

	2011 N=236		July-Dec 2012 N=133		2013 N=339		2014 N=286		2015 N=300	
	n	%	n	%	n	%	n	%	n	%
LLETZ	220	93.2	118	88.7	298	87.9	262	91.6	284	94.7
Cold knife cone	16	6.8	11	8.3	29	8.6	21	7.3	14	4.7
Hysterectomy	0		1	0.8	11	3.2	3	1.0	0	
Other			3	2.3	1	0.3			2	0.7

Table 236: Timing of follow up colposcopy (ACH) after treatments (2007-2010, 2012-2014)

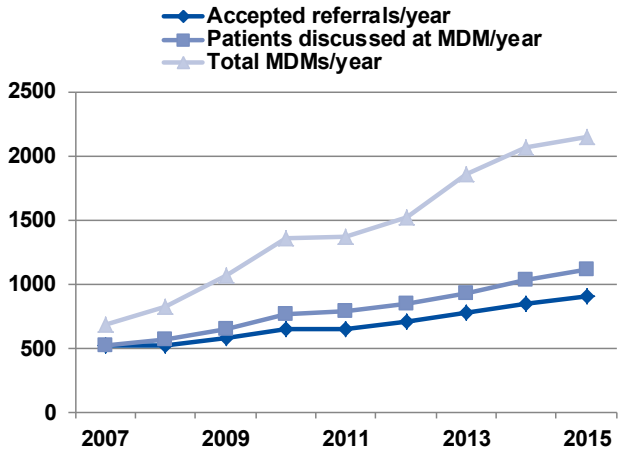
	2007 N=191		2008 N=213		2009 N=199		2010 N=198		2012 N=133		2013 N=339		2014 N=282	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
≤ 8 months	168	88	182	86	162	81	271	80	182	92	115	87	225	79.8
> 8 months	3	2	3	1	4	2	25	7	2	1	11	8	17	6.0
No follow up	20	11	28	1	33	17	43	13	14	7	7	5	40	14.2

12.3 Gynaecologic oncology surgical services

Findings

The data in this chapter are extracted from a stand-alone Gynaecologic Oncology (GO) referrals database, a stand-alone GO clinical database (including details of all cases referred to multidisciplinary review or for surgery, and details of all surgeries undertaken by the GO team), the hospital CMS database, and the theatre database (PIMS).

Figure 200: Referrals and Multidisciplinary meetings (MDMs) 2007-2015



The data in most of the clinical tables pertain to those patients with data in the GO clinical database.

There continues to be a rise in the number of referrals of new cases and the number of discussions of individual patients, which reflects the increasing clinical complexity we are seeing. We are now discussing 40 – 50 cases at each weekly meeting and had a total of 2138 discussions in 2015.

The combined MDM is working well with live videoconferencing links to the 8 referring DHBs, which allows real-time discussion of patients with the local clinicians and has streamlined the patient pathway. However this comes with a large administrative workload for the GO department and so far attempts to develop a less cumbersome electronic solution have failed due to inadequate technology currently available within the DHB. This needs to be addressed again in the future as it is using clinical time unnecessarily.

There has been a significant rise in the number of referrals from Waikato, Northland and Bay of Plenty, reflecting the appropriate centralisation of cancer surgery, with a relative decrease in referrals from the Auckland DHBs. This has logistical impacts as these women need to travel further and require more support. This impacts on our resources as appointments need to be scheduled to allow travel time, increased use of beds on the ward as early discharge is not always possible and ensuring that preadmission appointments are made on the same day as oncology clinics.

This is largely coordinated by the clinical nurse specialist (CNS) in conjunction with her counterparts in the referring DHBs and demand is now well beyond the capacity of a single CNS.

Figure 201: Demography of women discussed at MDM 2015 (n=1105)

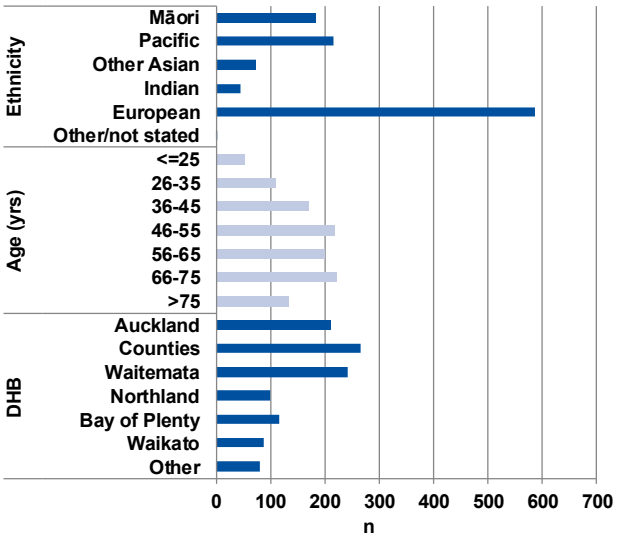
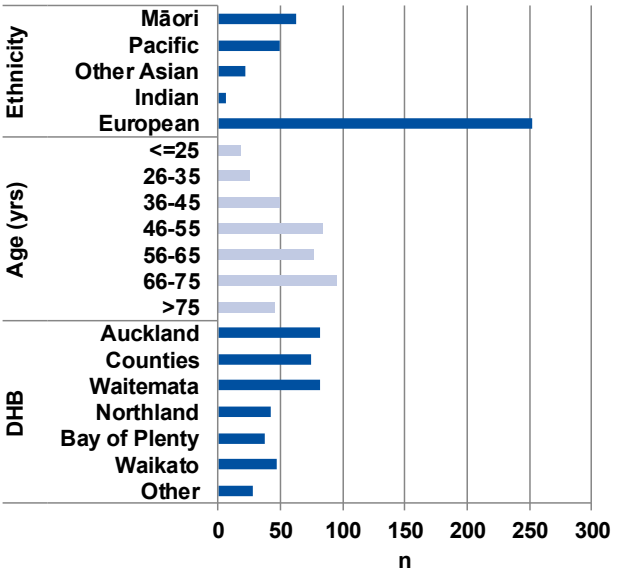


Figure 202: Demography of women undergoing surgery by the Gynaecologic Oncology team 2015 (n=394)



12.3.1 Reporting to Faster Cancer Treatment standards

The National Standards were published by the Ministry and the Faster Cancer Treatment (FCT) 62 day target (from referral to definitive treatment) came into force in July 2014. Mandatory targets are 85% compliance by July 2016 and 90% by June

2017.

Currently we are not meeting these targets. Work by the Regional Tumour Stream and Northern and Midland Cancer Networks have identified bottlenecks in the pathway, which initially appeared to be at the diagnostic end of the pathway, but we are increasingly seeing deficiencies in capacity of the treatment end of the pathway.

Table 237: Time from referral (referrals received in 2015) to first MDM.

	2015	
	N=	818
	n	%
<7 days	324	39.6
7-14 days	472	57.7
>14 days	22	2.7

Excludes referrals for molar pregnancy and consideration of prophylactic surgery.

Over 97% of patients are now discussed at the MDM within 2 weeks of referral, with 40% occurring within 7 days. The deadline for referral is Friday 12pm for discussion the following Wednesday morning, to allow time for radiology and pathology to be reviewed. Images are transferred electronically via PACS, but pathology slides need to be physically couriered to ADHB for centralized pathology review and the increasing numbers are impacting heavily on pathology resource.

This year the MDM ran every week, including between Christmas and New Year, which reduced significantly treatment decision delays over the holidays, which had been a big factor in previous years.

This year the biggest reason for delay (7 patients) was access to radiological investigation at the referring DHB. Introduction of electronic referrals to a generic email has removed the delay in receipt of written referrals and only 1 patient was delayed due to inappropriate referral pathways this year, which is a significant improvement.

Table 238: Time from first MDM (first MDM in 2015) to first Clinic appointment

	2015	
All cases	N=	837
	n	%
Seen in GO clinic	278	33.2
Clinic before MDM	5	0.6
No clinic	559	66.8
Cases seen in GO clinic	N=278	
	n	%
<7 days	27	10
7-14 days	152	55
>14 days	94	34
Clinic before MDM	5	1

A third of the referrals need surgery at the Cancer Centre. The remaining patients either have surgery provided by the local service or are referred for non-surgical treatments. Traditionally only urgent referrals had clinic appointments immediately, and in 2015 only 10% patients were seen in the same week as the MDM discussion. Following work by the Regional Tumour Stream group there is now a recommendation that patients are seen in clinic the following day if possible to try and streamline the FCT pathways. These efforts should remove a week from the patient pathway. Some appointments, such as the patients requiring interval debulking surgery are scheduled later to coincide with chemotherapy cycles.

Table 239: Time from first Clinic visit (visit in 2015) to surgery

	2015	
	N=	221
	n	%
<14 days	76	34.4
14 - 31 days	85	38.5
>31 days	54	24.4
Surgery before clinic	6	2.7

NZGCG recommendation is that patients are offered surgery within 2 weeks of their FSA. Currently we are only achieving this in a third of patients. A shift in departmental policy to more radical ovarian surgery and increasing minimal access techniques is impacting on available theatre space and up to date capacity planning of both Gynaecological Oncologist FTE and number of theatre lists is required, as our current resources are insufficient to meet this standard.

Table 240: Time from referral (referrals in 2015) to surgery by site

	Total	<62 days		>=62 days	
	N	N=	208	N=	43
	n	n	%	n	%
Any site	251	208	82.9	43	17.1
Ovary/Tube/ Peritoneum	94	82	87.2	12	12.8
Cervix	31	20	64.5	11	35.5
Vulval/Vagina	22	21	95.5	1	4.5
Endometrium	98	81	82.7	17	17.3
Uterus	2	1	50.0	1	50.0
Non-gynae cancer	4	3	75.0	1	25.0

These figures relate to time from referral to Gynaecologic Oncology, not from initial primary referral and therefore do not reflect the true FCT results, as the initial part of the pathway has been excluded. Regional work has shown that the diagnostic pathway should be aiming for 28 days, leaving 34 days for the treatment part of the pathway. These results presented therefore need to be interpreted with caution, as they are overly optimistic.

When analysed by site, vulval cancers are the only tumour type that is hitting the targets. This is because there is direct referral into a specialist service, with control of the entire pathway. Cervical cancers have a more convoluted pathway, as they need access to theatre twice (for staging EUA and then for definitive surgery) and this is adversely affecting the timelines. Ovarian and endometrial

cancers often require more pre-operative workup, which can cause delays.

Ovarian cancer patients potentially use more resources than other cancers, with longer operating times and length of stay, greater use of other specialties and greater need for high dependency/ intensive care and this must be factored in to future service planning. There is good evidence that this maximal surgical effort directly correlates with increased survival rates.

12.3.2 Gynaecologic Oncology surgeries

This section describes the surgery and short term outcomes of women undergoing inpatient surgery in 2015 under the care of the Gynaecologic Oncology team. Unfortunately we still do not have the facility for collection of long term outcome data or survival reporting.

The department performed 454 operations in 2015, compared to 431 in 2014, of which 361 (80%) were malignant cases. This is an increased proportion compared to previous years, due to improved triaging and reflects the better relationships with the referring DHBs.

During the past few years there has been a move towards more extensive surgery for ovarian cancer, which takes a large amount of theatre time, often with only one case allocated to a full day list. This often involves collaboration with other specialties and is resource hungry. More recently there has also been a move to more laparoscopic procedures, which has an associated learning curve.

A new Gynaecological Oncologist was appointed in October 2015, which has increased the number of lists. However due to this change in practice this has probably not increased our capacity proportionally and we are still behind in both FTE and operating theatre space for the workload.

The number of procedures includes minor procedures generated by the colposcopy and vulval clinics, as well as brachytherapy, as there is no dedicated radiation oncology list and these patients take up a significant portion of operating lists, which is having an impact on waiting times. A dedicated brachytherapy list is still required, although a monthly minors list at GSU was created with the new SMO appointment, to try and ease the pressure on the main theatre lists.

Table 241: Surgical debulking rates at primary and interval surgery for ovarian cancer 2015

	Total		Primary surgery		Interval surgery	
	N	90	N	64	N	26
	n	%	n	%	n	%
Residual disease						
None	70	77.8	52	81.3	18	69.2
<1cm	11	12.2	5	7.8	6	23.1
>=1cm	8	8.9	6	9.4	2	7.7
missing	1	1.1	1	1.6	0	0.0
Bowel surgery						
Yes	7	7.8	2	3.1	5	19.2
No	80	88.9	60	93.8	20	76.9
NA	2	2.2	1	1.6	1	3.8
missing	1	1.1	1	1.6	0	0.0

The number of ovarian operations and the bowel resection rates have doubled in the past 3 years, reflecting our move to more aggressive surgery. The numbers of ovarian referrals have increased, due to the change in referral patterns from the Midland region.

Data for ovarian cancer patients who are not offered surgery is not available and in future, debulking rates should be report against the denominator of all ovarian cancer patients to be more meaningful.

Table 242: Clinical outcomes among inpatient surgeries performed by the Gynaecologic Oncology team by cancer status 2015

	Total		Malignant		Premalignant/ Benign	
	N	454	N	361	N	93
	n	%	n	%	n	%
Intraoperative complications						
>1000ml blood loss	22	4.8	20	5.5	2	2.2
Bowel injury	3	0.7	2	0.6	1	1.1
Bladder injury	2	0.4	1	0.3	1	1.1
Ureteric injury	1	0.2	1	0.3	0	0.0
Other	3	0.7	2	0.6	1	1.1
Postoperative complications						
Transfusion	50	11.0	45	12.5	5	5.4
Febrile morbidity	12	2.6	10	2.8	2	2.2
Wound infection	12	2.6	10	2.8	2	2.2
Thromboembolism	0	0.0	0	0.0	0	0.0
Cardiovascular	6	1.3	4	1.1	2	2.2
Gastro-intestinal	18	4.0	4	1.1	2	2.2
Urinary retention	24	5.3	23	6.4	1	1.1
Return to theatre within 6 wks	8	1.8	8	2.2	0	0.0
Readmission with complication within 6 wks	20	4.4	17	4.7	3	3.2
Death	1	0.2	1	0.3	0	0.0

Complication rates remain stable and acceptable, compared to previous years and it is predictable that the malignant cases will have a higher complication rate than the more straightforward benign procedures. Unfortunately we do not have a robust mechanism of collecting data after discharge and so are unable to produce complete meaningful data.

Summary/Implications

The highlight of 2015 was the appointment of a 4th Gynaecological Oncologist, Dr Michelle Harris. This has helped in some way to address the surgical workload, but despite this we are still beyond capacity. A comprehensive business case is being prepared in 2016 to quantify the resources needed to provide a modern gynaecological oncology service and to plan for the likely continuing increased demand.

Clinical Nurse Specialist (CNS) support is crucial to this service and is currently woefully stretched. Nurse led clinics are increasingly common in Cancer Centres and need to make up part of our future service. Sister Penny Bognuda recently attended the Peter Mac Cancer Centre in Melbourne, supported by a grant from the New Zealand Gynaecological Cancer Foundation in order to try and establish a survivorship clinic in Auckland.

We now provide services for all the eight DHBs within the Northern and Midland Cancer Networks, with a catchment population of approximately 2.3 million. International evidence recommends 3 FTE per million population and therefore ADHB is likely to need 2- 3 additional appointments. The change in worldwide practice of gynaecological oncology has also lead to greater need for multidisciplinary team surgery, increased need for specialist nursing personnel and greater use of operating theatre, ward and HDU resources. Development of specialist nursing and anaesthetic teams helps to optimize the resources that we have available and this is the path we need to take.

The implementation of the FCT targets in 2016 and 2017 provides additional drivers for implementing more efficient services and the need to streamline the pathway and invest sufficient resource for timely treatment to improve patient outcomes.

The changes we have implemented so far, in particular in relation to the functioning of the MDM have dramatically reduced timelines on the patient pathway. The close relationships we have with our medical and radiation oncology, pathology and radiology colleagues has been paramount in achieving this and has led to increased collegiality with our referring teams. This has directly improved the quality of patient care.

This achievement was recognised by the DHB's clinical excellence awards, where we were the winners of the Excellence in Clinical care award for 2015 and our MDM now held up as an example that other tumour streams are being urged to follow.

Funding was secured in 2013 from the Ministry of Health for a project to map the pathways across the eight DHBs accessing regional Gynaecologic Oncology services at Auckland Hospital. This project commenced in the last quarter of 2014 and reported in 2015. This has identified the areas of bottlenecks in the patient journey, which initially were concentrated in the first diagnostic part of the pathway. Work has shown that if a diagnosis is not achieved by day 28 of the FCT pathway, then achieving compliance with the 62 day standard is unlikely. We have led further work in collaboration with the Northern and Midland Cancer Networks that has shown that establishing a named Unit Lead within the general gynaecology department, who coordinates the High suspicion of cancer (HiScan) referrals through a rapid access clinic is paramount to achieve a prompt diagnosis and appropriate referral to tertiary services.

Unfortunately the second part of the project which was to explore the need for a centralised database, to allow direct electronic access and streamline workflow, as well as enabling collection of short and long term follow up data has not been possible due to technological and funding deficiencies.

Regional Network review and audit against the National Standards has shown that we are partially compliant and has led to the establishment of the Supra-regional Northern and Midland Gynae-Oncology Tumour Stream in 2015. This group is supported by personnel from the Northern Network and Dr Eva has been invited to be the Chair. This group has representation from all specialties across both regions and is tasked with trying to identify barriers and provide solutions to improve the quality of care and feedback recommendations to the DHBs. A work plan has been developed and signed off by the Cancer Governance Board and tumour site specific workshops have already been held and produced recommendations for the DHBs.

The Ministry decision on Service Configuration of Gynaecological Cancer in New Zealand has still not been forthcoming, which has caused uncertainty throughout the country, but ADHB needs to plan for the predicted future increase in workload regardless.

Another major achievement, led by Dr Tan, has been the accreditation of the department by RANZCOG to become a training Centre for the CGO and to be able to appoint a Fellow. New Zealand does not have sufficient Gynaecological Oncologists for the current population and succession planning becomes more urgent each year. Unfortunately funding is not available for appointment of a trainee, but all efforts need to be made to rectify this.

The department has produced only a modest academic output in 2015, but continues to participate in the PRINCESS study of conservative management of CIN2 and the ANZGOG study of sentinel nodes in vulval cancer, and it is hoped that the ANZGOG supported FEMME study into conservative management of complex atypical hyperplasia and early low grade endometrial cancers will get underway soon.

Members of the department continue to contribute to national and international cancer working groups and are on the steering committee for the new NCSP guidelines and introduction of primary HPV testing.

Overall, we have had a busy year with some major improvements, but we still have a long way to go. This is an exciting time for cancer care in New

Zealand and with supported planning we have the potential to develop a world class service.

12.4 Data tables: Gynaecologic oncology

Table 243: ADHB Gynaecologic Oncology MDM workload: Referrals and MDM discussions 2007 – 2015

	2007	2008	2009	2010	2011	2012	2013	2014	2015
All referrals (by year of referral)									
Not accepted	29	50	9	9	4	6	6	20	23
Accepted	520	519	576	645	643	703	775	839	905
Referral reason (accepted only)									
Molar pregnancy		14	48	52	64	72	49	76	59
Consideration of prophylactic surgery		15	23	10	13	7	15	15	15
Other	520	490	505	583	566	624	711	748	831
Referral status (accepted only)									
New	449	515	566	638	637	703	773	838	904
Follow up	23	4	9	4	4		2	1	
Repeat	42								
Recurrence	1		1	3	2				1
Unknown	5								
Referrals proceeding to MDM (accepted referrals only)									
Had MDM	470	474	534	624	616	692	753	818	878
No MDM	50	45	42	21	27	11	22	21	27
Total patients discussed @ MDM by year (irrespective of referral date)	516	562	644	759	788	839	924	1026	1105
Total MDM reviews per year	681	822	1071	1351	1363	1517	1856	2060	2138

Table 244: Demographic characteristics of women discussed at MDM in 2015 by primary site

	Total		Ovary		Peritoneum		Fallopian tube		Endometrium		Uterus		Cervix		Vulva		Vagina		Placenta		Non-gynae cancer		Unknown	
	N=	1105	N=	331	N=	47	N=	61	N=	323	N=	38	N=	110	N=	48	N=	11	N=	66	N=	31	N=	39
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity																								
Māori	183	16.6	44	13.3	5	10.6	7	11.5	62	19.2	7	18.4	34	30.9	2	4.2	1	9.1	5	7.6	8	25.8	8	20.5
Pacific	215	19.5	63	19.0	9	19.1	7	11.5	85	26.3	4	10.5	11	10.0	1	2.1	1	9.1	14	21.2	7	22.6	13	33.3
Other Asian	74	6.7	24	7.3	1	2.1	4	6.6	15	4.6	5	13.2	10	9.1	4	8.3	0		7	10.6	1	3.2	3	7.7
Indian	44	4.0	17	5.1	2	4.3	0	0.0	9	2.8	1	2.6	4	3.6	0		1	9.1	6	9.1	1	3.2	3	7.7
NZ European	477	43.2	150	45.3	25	53.2	31	50.8	128	39.6	16	42.1	38	34.5	36	75.0	7	63.6	25	37.9	12	38.7	9	23.1
Other European	110	10.0	33	10.0	5	10.6	12	19.7	24	7.4	4	10.5	12	10.9	5	10.4	1	9.1	9	13.6	2	6.5	3	7.7
Other	2	0.2	0		0		0		0		1	2.6	1	0.9	0		0		0		0		0	
Age																								
<=25	52	4.7	31	9.4	1	2.1	0		2	0.6	2	5.3	2	1.8	0		0		12	18.2	0		2	5.1
26-35	110	10.0	40	12.1	1	2.1	0		8	2.5	4	10.5	17	15.5	1	2.1	1	9.1	36	54.5	0		2	5.1
36-45	171	15.5	46	13.9	1	2.1	5	8.2	40	12.4	9	23.7	37	33.6	6	12.5	0		16	24.2	6	19.4	5	12.8
46-55	218	19.7	71	21.5	5	10.6	12	19.7	61	18.9	11	28.9	21	19.1	8	16.7	3	27.3	2	3.0	11	35.5	13	33.3
56-65	199	18.0	58	17.5	12	25.5	18	29.5	83	25.7	2	5.3	12	10.9	6	12.5	2	18.2	0		2	6.5	4	10.3
66-75	221	20.0	54	16.3	14	29.8	21	34.4	89	27.6	6	15.8	10	9.1	11	22.9	1	9.1	0		7	22.6	8	20.5
>75	134	12.1	31	9.4	13	27.7	5	8.2	40	12.4	4	10.5	11	10.0	16	33.3	4	36.4	0		5	16.1	5	12.8
DHB of Residence																								
Auckland	212	19.2	58	17.5	6	12.8	10	16.4	65	20.1	5	13.2	16	14.5	7	14.6	3	27.3	21	31.8	11	35.5	10	25.6
Counties Manukau	265	24.0	76	23.0	7	14.9	12	19.7	97	30.0	10	26.3	21	19.1	11	22.9	1	9.1	15	22.7	3	9.7	12	30.8
Waitemata	243	22.0	77	23.3	15	31.9	14	23.0	64	19.8	13	34.2	21	19.1	6	12.5	1	9.1	23	34.8	4	12.9	5	12.8
Northland	99	9.0	33	10.0	6	12.8	4	6.6	34	10.5	3	7.9	9	8.2	2	4.2	1	9.1	1	1.5	5	16.1	1	2.6
Bay Of Plenty	117	10.6	40	12.1	6	12.8	6	9.8	29	9.0	4	10.5	14	12.7	5	10.4	2	18.2	3	4.5	2	6.5	6	15.4
Waikato	88	8.0	26	7.9	5	10.6	9	14.8	15	4.6	1	2.6	16	14.5	12	25.0	2	18.2	0		1	3.2	1	2.6
Lakes	52	4.7	14	4.2	2	4.3	3	4.9	12	3.7	1	2.6	8	7.3	2	4.2	1	9.1	2	3.0	4	12.9	3	7.7
Tairawhiti	22	2.0	5	1.5	0		3	4.9	5	1.5	0		4	3.6	2	4.2	0		1	1.5	1	3.2	1	2.6
Other	7	0.6	2	0.6	0		0		2	0.6	1	2.6	1	0.9	1	2.1	0		0		0		0	

Table 245: Demographic characteristics of women undergoing surgery under the GO team in 2015 by primary site

	Total		Ovary		Peritoneum		Fallopian tube		Endometrium		Uterus		Cervix		Vulva		Vagina		Non-gynae cancer	
	N=	394	N=	107	N=	13	N=	35	N=	96	N=	5	N=	51	N=	69	N=	14	N=	4
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity																				
Māori	63	16.0	14	13.1	2	15.4	6	17.1	16	16.7	2	40	14	27.5	5	7.2	3	21.4	1	25
Pacific	50	12.7	21	19.6	1	7.7	4	11.4	17	17.7	0	0	5	9.8	1	1.4	0	0.0	1	25
Other Asian	22	5.6	6	5.6	0		3	8.6	6	6.25	0	0	5	9.8	1	1.4	1	7.1	0	0
Indian	6	1.5	3	2.8	0		0		0	0	1	20	1	2.0	0	0.0	1	7.1	0	0
NZ European	204	51.8	51	47.7	7	53.8	17	48.6	48	50	2	40	17	33.3	55	79.7	5	35.7	2	50
Other European	48	12.2	12	11.2	3	23.1	5	14.3	9	9.4	0	0	8	15.7	7	10.1	4	28.6	0	0
Other	1	0.3	0		0		0		0	0	0	0	1	2.0	0		0		0	0
Age (yrs)																				
<=25	18	4.6	11	10.3	0		0		1	1.0	1	20	2	3.9	2	2.9	1	7.1	0	0
26-35	25	6.3	7	6.5	1	7.7	0		1	1.0	0	0	12	23.5	4	5.8	0		0	0
36-45	49	12.4	13	12.1	0	0.0	2	5.7	8	8.3	1	20	14	27.5	8	11.6	2	14.3	1	25
46-55	84	21.3	29	27.1	2	15.4	6	17.1	16	16.7	3	60	9	17.6	15	21.7	2	14.3	2	50
56-65	77	19.5	24	22.4	4	30.8	10	28.6	21	21.9	0	0	5	9.8	8	11.6	5	35.7	0	0
66-75	95	24.1	18	16.8	4	30.8	16	45.7	32	33.3	0	0	5	9.8	16	23.2	3	21.4	1	25
>75	46	11.7	5	4.7	2	15.4	1	2.9	17	17.7	0	0	4	7.8	16	23.2	1	7.1	0	0
DHB of residence																				
Auckland	82	20.8	21	19.6	1	7.7	6	17.1	16	16.7	2	40	16	31.4	16	23.2	3	21.4	1	25
Counties Manukau	75	19.0	21	19.6	3	23.1	5	14.3	20	20.8	2	40	9	17.6	13	18.8	2	14.3	0	0
Waitemata	82	20.8	22	20.6	2	15.4	8	22.9	27	28.1	1	20	10	19.6	9	13.0	3	21.4	0	0
Northland	42	10.7	12	11.2	0		3	8.6	14	14.6	0	0	6	11.8	2	2.9	4	28.6	1	25
Bay Of Plenty	38	9.6	14	13.1	4	30.8	4	11.4	9	9.4	0	0	3	5.9	4	5.8	0		0	0
Waikato	47	11.9	12	11.2	2	15.4	6	17.1	4	4.2	0	0	4	7.8	17	24.6	2	14.3	0	0
Lakes	19	4.8	4	3.7	1	7.7	2	5.7	4	4.2	0	0	2	3.9	4	5.8	0		2	50
Tairawhiti	8	2.0	1	0.9	0		1	2.9	2	2.1	0	0	1	2.0	3	4.3	0		0	0
Nelson Marlborough	1	0.3	0		0		0		0		0	0	0	0.0	1	1.4	0		0	0

Table 246: Malignant status prior to and after surgery by primary site among all surgical procedures performed by the GO team in 2015 (some women will have multiple surgeries included)

	Total		Ovarian		Peritoneum		Fallopian tube		Endometrium		Uterus		Cervix		Vulva		Vaginal		Non-gynae cancer	
	N=	454	N=	112	N=	13	N=	35	N=	97	N=	5	N=	91	N=	82	N=	15	N=	4
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
MDM in 2015																				
Yes	392	86.3	108	96.4	13	100	35	100	97	100	4	80	81	89	48	59	2	13.3	4	100
No	62	13.7	4	3.6	0	0	0	0	0	0	1	20	10	11	34	41	13	86.7	0	0
Diagnosis (prior to surgery)																				
Benign	15	3.3	3	2.7	0		0		0		1	20	0		8	9.8	3	20.0	0	0
Premalignant	68	15.0	1	0.9	1	7.7	0		3	3.1	0	0	11	12.1	41	50.0	11	73.3	0	0
Malignant	275	60.6	44	39.3	11	84.6	29	82.9	87	89.7	2	40	74	81.3	26	31.7	0		2	50
Prophylactic	3	0.7	3	2.7	0		0		0		0	0	0		0		0		0	0
Unknown	93	20.5	61	54.5	1	7.7	6	17.1	7	7.2	2	40	6	6.6	7	8.5	1	6.7	2	50
Diagnosis (after surgery)																				
Benign	47	10.4	22	19.6	1	7.7	0	0	1	1.0	3	60	1	1.1	16	20	3	20	0	0
Pre-malignant	46	10.1	0		0		0	0	0		0	0	10	11	25	30	11	73	0	0
Malignant	361	79.5	90	80.4	12	92.3	35	100	96	99.0	2	40	80	87.9	41	50	1	6.7	4	100

12.5 Termination of pregnancy

Epsom Day Unit (EDU) is the Auckland regional service for first trimester terminations of pregnancy. It is a multi-disciplinary service incorporating staff nurses, health care assistants, social workers, surgeons from ADHB Women's Health Service, community doctors with a particular interest in family planning, and a small administrative support team. EDU provides both medical and surgical termination services.

A medical termination of pregnancy (MTOP) is a safe, effective, and acceptable alternative to a surgical procedure for many women in the early first trimester. It has a lower risk of infection and surgical complications such as uterine perforation and cervical trauma. MTOP requires an anti–progestin (mifepristone) followed 24-48 hours later with a synthetic prostaglandin analogue (misoprostil). Suitability criteria for MTOP include gestation <63 days at commencement, appropriate psychosocial circumstances, able to return to EDU to take medication at 24-48 hours, and compliance with follow up to ensure the pregnancy is not on going. The woman is discharged home to abort, with afterhours telephone contact with a dedicated on call member of the EDU nursing staff.

An audit of 6 months of data (n=140) at EDU January to June 2015 indicates around 8% of women are choosing a medical rather than surgical termination. The audit found 9% of women having MTOP at EDU needed a surgical intervention. Women closer to 9 weeks gestation and those that had misoprostil less than 24 hours after mifepristone were more likely to need a surgical intervention. This exceeds the rate reported in international literature (2-6%). The 2011 RCOG evidence based guideline recommends 95% of women should not require surgical intervention after MTOP. Stricter adherence to the 24-48 hour interval between medication, education and training of general practitioners that promotes timely referral to EDU, were identified as possible solutions to decrease the need for surgical intervention after MTOP.

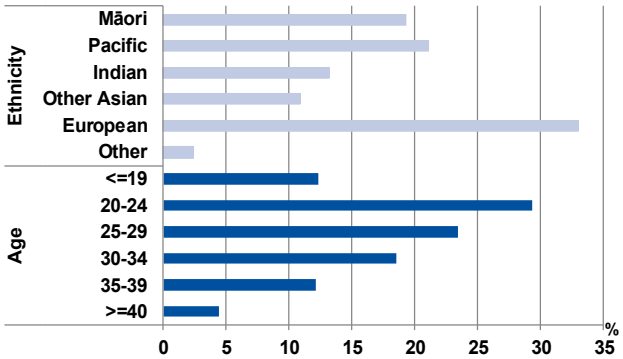
The surgical termination service is also a two-day service but can cater for a one day system depending on a woman's circumstances. On day one, assessment is undertaken, including psychosocial, medical, legal certification, contraceptive prescription and education. The women will meet with a nurse, community doctor and a social worker if required. On day two a second certifying assessment is undertaken and, if certified, the surgical termination of pregnancy occurs.

Approximately 40% of women accessing the service are resident in Counties Manukau DHB area, a third from within Auckland DHB and Waitemata DHB respectively. In their 2014 report, the Abortion Supervisory Committee (ASC) recognised the challenge women in the Greater Auckland area have to access a termination service. The largest group of women resident in South Auckland have the most significant burden. Two appointments on separate days are the norm for most women accessing the service. Counties Manukau DHB has a regional agreement with ADHB to manage first trimester pregnancy terminations but ASC have encouraged development of a more localised service for these women. Preliminary discussions about the feasibility of local access to abortion services have occurred with CMDHB. The redesign project for EDU will need to take account of strategic plans for termination services in the wider Auckland region.

Pregnancy option counselling refers to an appointment a woman had with a social worker prior to her assessing appointment. Declines refer to the number of women who do not meet the legal criteria for abortion as agreed by two certifying consultants.

The annual number of first trimester abortions continues to decline for the Auckland area with over 30% drop in the past decade and a further 6% decrease (n=239) in number of abortions in 2015. This reflects the trend nationally and has been most marked since long acting subdermal hormonal implants were licensed and funded in late 2010. The greatest decline in abortion numbers has been in the under 19 year old age group which again is reflecting a similar trend nationally which has been attributed to long acting reversible contraception. The majority of Jadelle sub-dermal implants are inserted at EDU by the nursing staff.

Figure 203: Demography of women having a first trimester termination of pregnancy NWH 2015



Contraception is prescribed post termination at EDU for close to 85% of women, and 60% of women choose a long acting reversible method (LARC). The uptake of LARCs is comparable to rates quoted in the literature for NZ abortion providers. The EDU contraception data has been collated within Womens Health since mid-2015. It is reported monthly to the EDU governance group. More study

is required for around 15% women who decline contraception when discharged from EDU. This group is recognised to be most at risk for a further unplanned pregnancy. The uptake of the Levonorgestreal intrauterine system (LNG-IUS) has declined significantly since the restriction of funding for the devices was introduced in the last 5 years.

Due to the decline in the number of terminations, EDU is widening its scope to provide other general gynaecology procedural clinics such as ESSURE hysteroscopic sterilisation (at Colposcopy clinic with EDU nursing staff) and the Abnormal Uterine Bleeding (AUB) outpatient hysteroscopy clinics held in the EDU facility with EDU nursing staff.

12.6 Second trimester termination of pregnancy

This section describes the characteristics and outcomes of women having a second trimester (up to 20 weeks) medical termination of pregnancy or induction of labour for intrauterine death. The care for these women is provided in ward 97.

Findings:

Forty women had a medical termination of pregnancy/induction of labour between 14 and 20 weeks in 2015. In 2015 the most common indications for second trimester medical termination of pregnancy or induction were fetal anomaly and intrauterine death.

International studies have shown that smaller doses of Mifigynae (200-400mg instead of 600mg) are equally effective. In 2015, 16 women received 200mg mifegynae. The results are encouraging but the numbers are too small at this stage to make a useful conclusion.

Also following international studies, we have started to administer Misoprostol buccally instead of vaginally (8 women in 2015). This route has the same effect but is less invasive and more comfortable for women. We are keen to carry on with this approach and present our new data next year.

In mid-2011 we introduced the administration of intravenous Oxytocin 10IU post-delivery of the fetus to advance delivery of the placenta. In 2009-2010 the rate of manual removal was 12% and in the years 2011-2014, since introduction of Oxytocin 10 IU, the rate has been significantly lower at 5% (p=0.02). In 2015, 5 women (13%) required manual removal of the placenta. The increase in manual removals compared to 2014 does require monitoring for possible contributing factors.

Ninety-five percent of women were managed either as a day stay or required one night in hospital in 2015.

One woman required a blood transfusion, this being associated with her medical condition, rather than with the second trimester termination of pregnancy/induction of labour.

12.7 Data tables: Termination of pregnancy

Table 247: Number of terminations NWH 2004-2015

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total number of terminations	5809	5598	5548	5558	5550	5391	5049	4949	4535	4213	3842	3603

Table 248: Number of counselling sessions NWH 2004-2015

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	n	n	n	n	n	n	n	n	n	n	n	n
Post op counselling	22	35	33	23	25	22	33	32	18	41	33	28
Pregnancy option	92	89	87	86	99	102	84	76	64	84	66	63
Declines %	2.5	2.4	2.8	2.2	2.5	2.7	2.8	3.0	2.9	2.9	3.4	2.4

Table 249: Demography and characteristics of women attending EDU NWH 2004-2015

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Ethnicity	%	%	%	%	%	%	%	%	%	%	%	%
Māori	18.4	19.1	20.4	21.2	20.5	19.9	20.4	19.5	19.3	19.3	18.8	19.3
Pacific	22.8	23.2	23.8	24.5	23.1	24.3	24.1	22.6	24.6	23.5	21.9	21.1
Other Asian	11.6	11.2	11.4	10.5	10.8	10.6	10.3	10.9	11.0	10.3	11.9	10.9
Indian	7.7	8.3	8.2	8.3	9.4	10.2	11.7	11.7	10.6	12.1	12.5	13.2
New Zealand	27.4	26.5	27.4	27.6	27.7	26.1	25.7	27.2	27.0		25.8	26.8
Other	5.4	5.7	5.0	4.5	4.8	5.1	5.2	5.7	5.5	5.6	6.3	6.3
Other	6.6	6.0	3.8	3.3	2.6	3.3	2.6	2.4	2.1	2.8	2.9	2.4
Age												
≤ 19	19.3	19.8	21.5	22.3	21.7	22.2	20.7	17.8	16.6	14.6	13.6	12.3
20 – 24	28.9	28.5	29.7	29.6	29.0	29.8	30.6	30.6	31.3	31.8	29.6	29.3
25 – 29	20.9	21.1	20.7	20.1	21.6	20.8	19.9	21.6	21.7	22.3	22.9	23.4
30 – 34	16.1	15.7	14.4	14.3	13.3	13.9	14.1	15.4	16.0	16.8	17.7	18.5
35 –39	10.9	10.7	9.5	9.7	10.1	9.3	10.0	10.2	10.0	10.4	11.4	12.1
≥40	3.9	4.3	3.9	4.0	4.3	4.0	4.7	4.4	4.5	4.1	4.9	4.4
Gestation												
6	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	1.9	1.7
7	0.9	0.4	0.2	0.2	0.1	0.6	2.7	1.4	1.1	4.4	6.1	8.2
8	17.2	10.5	11.0	8.8	13.0	18.4	33.7	30.3	25.3	17.2	20.4	20.5
9	23.9	20.9	23.1	20.8	23.9	24.5	23.7	26.9	27.4	23.9	21.6	19.8
10	21.4	22.7	24.0	25.1	25.1	24.3	16.8	18.4	18.8	22.8	19.4	19.0
11	20.6	24.0	23.5	24.1	21.3	18.8	13.0	12.6	14.4	16.9	15.9	15.6
12	14.5	20.0	17.6	20.9	16.7	13.2	10.1	9.9	11.7	13.6	13.5	15.1
≥13	1.4	1.3	0.5	0.0	0.2	0.1	0.0	0.4	1.2	1.0	1.1	0.1

Table 250: Characteristics of women undergoing second trimester medical termination of pregnancy NWH 2010-2015

	2010		2011		2012		2013		2014		2015	
	n=46		n=69		n=52		n=40		n=51		n=40	
	n	%	n	%	n	%	n	%	n	%	n	%
DHB of residence												
Auckland	37	80	56	81	44	85	32	80	43	84	33	83
Counties Manukau	3	7	9	13			6	15	2	4	4	10
Waikato	0				3	6			1	2	0	0
Waitemata	3	7	3	4	3	6	2	5	5	10	2	5
Other	3	7	1	1	2	4					1	3
Indication for termination of												
Fetal anomaly	21	16	24	35	27	52	14	35	24	47	15	38
Intrauterine death	7	15	19	28	8	15	8	20	13	25	10	25
Maternal mental health	14	30	20	29	10	19	13	33	8	16	10	25
Spontaneous rupture of	4	9	6	9	7	13	5	13	6	12	5	13
Gestation (wks)												
12			1	1	1	2						
13	3	7	4	6					7	14		
14	5	11	13	19	3	6	4	10	6	12	7	18
15	1	2	6	9	6	12	4	10	5	10	9	23
16	12	26	12	17	10	19	10	25	9	18	6	15
17	4	9	11	16	11	21	1	3	15	29	4	10
18	10	22	8	12	8	15	10	25	5	10	4	10
19	11	24	12	17	13	25	11	28	4	8	9	23
20			1	1							1	3
21			1	1								

Table 251: Clinical details and outcomes of second trimester medical termination NWH 2009-2015

	2010 N=46		2011 N=69		2012 N=52		2013 N=40		2014 N=51		2015 N=40	
	n	%	n	%	n	%	n	%	n	%	n	%
Mifegynae	44	96	64	93	46	88	36	90	48	94	39	98
Vaginal misoprostol	45	98	68	99	50	96	38	95	45	88	27	68
Buccal misoprostol									4	8	8	20
Oral misoprostol												
Not given	4	9	23	33	8	15	6	15	17	50	13	33
1 dose	20	43	26	38	19	37	22	55	17	50	12	30
2 dose	11	24	9	13	10	19	4	10	11	32	3	8
3 doses	5	11	5	7	9	20	3	8	2	6	2	5
≥ 4 doses	6	13	6	9	6	12	5	13	4	12	10	25
Syntocinon infusion	7	15	6	9	5	10	4	10	4	8	6	15
Manual removal of placenta	7	15	3	4	3	6	3	8	2	4	5	13
Retained products of conception	3	7	4	6	6	12	4	10	2	4	3	8
Transfusion	3	7	0		0		2	5	3	6	1	3
Nights in hospital												
0	13	28	39	57	24	46	23	58	30	59	20	50
1	27	59	26	38	24	46	13	33	17	33	18	45
2-3	4	9	4	6	3	6	3	8	4	8	1	3
>3	4	9			1	2	1	3			1	3

12.8 General Gynaecology inpatient surgery

The data presented in this section pertain largely to inpatient gynaecologic surgeries from Ward 97 that were performed by the general gynaecology team. Surgeries performed by the Gynaecologic Oncology team are collected in a separate database and are presented in section 12.3. In 2015, there are 161 surgeries undertaken at the Greenlane Surgical Unit (GSU) (of 1263 gynaecologic outpatient surgeries undertaken there) included with the data presented in this chapter.

The numbers relate to episodes of surgery rather than individuals. Some individuals had more than one surgical episode in the year.

As more than one procedure may occur at a single operation, it may appear that numbers are not consistent within this section. If a specific procedure is discussed, then all accounts of the procedure are included, however for summary tables, the first procedure entered into the database has been used to represent the primary surgical episode.

Definitions

Where surgical complications are given, these relate to the following definitions:

Intra operative injury to internal organs: Injury to bladder, bowel, ureter, major blood vessel, other.

Significant postop infection: Any infection (defined by evidence of wound dehiscence or wound collection, pelvic abscess, or fever>39^{0}C) occurring as a result of surgery.

Readmission: Re-admission to hospital (hospital stay of 3 hours or more) for a reason related to the surgical procedure within 6 weeks of surgery. In 2015, total readmissions include planned and unplanned readmissions but the number of planned readmissions are also identified separately.

Other significant complications: Includes gastrointestinal complications (ileus, bowel obstruction), fistulae.

Findings

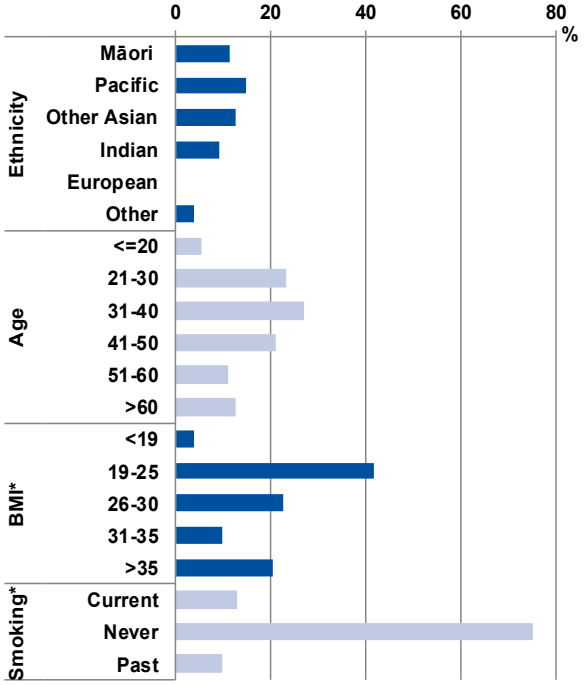
In 2015, there were 1590 general gynaecologic surgeries entered into the database; 1542 (97%) of these were for primary procedures, 40 (2.5%) were admissions for repeat surgery as a result of complications of surgery at ACH and 8 (0.5%) were admissions for repeat surgery as a result of complications of surgery at a private hospital. Only primary procedures are included in the data presented. Volumes of primary procedures are stable over several years.

Abnormal bleeding in the non-pregnant patient remains the most common cause for gynaecologic surgery in 2015. Pregnancy related procedures have reduced as a proportion of the total, which may be related to increased use of medical management of miscarriage, and most procedures being done electively at GSU.

Table 252: Primary indication for primary inpatient gynaecologic surgery NWH 2015

	2015	
	N=	1542
	n	%
Primary indication for surgery		
Abnormal bleeding, non-pregnant	324	21.0
Miscarriage/Termination	319	20.7
Urogynaecology / Prolapse	195	12.7
Ovarian cyst	96	6.2
Abscess	67	4.3
Pain, cause unknown	86	5.6
Cancer / Pelvic mass	53	3.4
Endometriosis	74	4.8
Ectopic pregnancy	71	4.6
Infertility	42	2.7
Anatomical anomalies of the genital tract	21	1.4
CIN/VIN/VAIN	32	2.1
Polyp(s)/Endometrial Sampling	50	3.2
Other, Please specify	112	7.3

Figure 204: Demographic details of women having inpatient primary surgery performed by the general gynaecology team NWH 2015



*BMI missing for 24 women and smoking status for 37 women.

In 2015, 13% of patients admitted to being a current smoker – this figure is relatively unchanged over the last 5 years. Absence of clear documentation of smoking status in this unit is 2.4%.

One in five patients having elective gynaecologic surgery at ADHB are domiciled outside the ADHB area.

Table 253: Primary surgical procedure and timing of surgery among inpatient primary surgeries performed by the general gynaecology team NWH 2015

		Timing of surgery			
	Total	Acute		Elective	
	N	n	%	n	%
Total	**1542**	**365**	**23.7**	**1177**	**76.3**
Ovarian and /or tubal surgery	159	70	44.0	89	56.0
Hysteroscopy	239	17	7.1	222	92.9
Evacuation retained products conception	121	85	70.2	36	29.8
Surgical termination of pregnancy	176	2	1.1	174	98.9
Urogynaecology procedure	184	7	3.8	177	96.2
Hysterectomy	139	5	3.6	134	96.4
Diagnostic laparoscopy	124	44	35.5	80	64.5
Endometriosis surgery	59	2	3.4	57	96.6
Other vulval procedure	91	58	63.7	33	36.3
Other uterine/cervical	195	59	30.3	136	69.7
Fibroid embolization	7	0	0.0	7	100.0
Other	48	16	33.3	32	66.7

Table 254: Intra operative injury at primary surgery NWH 2012-2015

	2013 N=1606		2014 N=1607		2015 N=1542	
	n	%	n	%	n	%
Bladder	10	0.6	5	0.3	6	0.4
Bowel	6	0.4	3	0.2	1*	0.1
Ureter					2	0.1
Other	2	0.1	1	0.1	3	0.2
TOTAL	18	1.1	9	0.6	12	0.8

*Single case of pseudomembranous colitis due to antibiotic prophylaxis for embolisation, required surgical management, diagnosis confirmed on histology.

Table 255: ACHS Gynaecology Indicators: Injury to major viscus

ACHS Gynaecology Indicator: Injury to MAJOR VISCUS	
Numerator	Injury to major viscus, with repair, during or up to 2 weeks post operation
Denominator	Gynaecological surgeries

	ACHS	NWH
Year	**%**	**%**
2009	0.32	0.98
2010	0.32	0.25
2011	0.40	0.67
2012	0.38	0.85
2013	0.42	1.12
2014	0.40	0.56
2015		12/1542=0.8

The intraoperative injury rate in 2015 was 0.8%. This is consistent with rates in previous years. There have been no ureteric injuries at laparoscopic hysterectomy for the past eight years; see the relevant Laparoscopy section for more detail on intra-operative injury (section 12.12). Overall complication and readmission rates remain stable. However despite some improvement, the blood transfusion rate still remains well above outlier range by ACHS standards. Readmission data has been the subject of an improvement project for 2015. Monthly audit with detailed sub analysis by reviewing clinical records has confirmed a stable rate lower than that suggested here. The focus of quality improvement for the coming year will be on regional data collection for Gynaecologic Oncology, and readmission for chronic pelvic pain.

Figure 205: Complications of surgery by timing of surgery NWH 2015

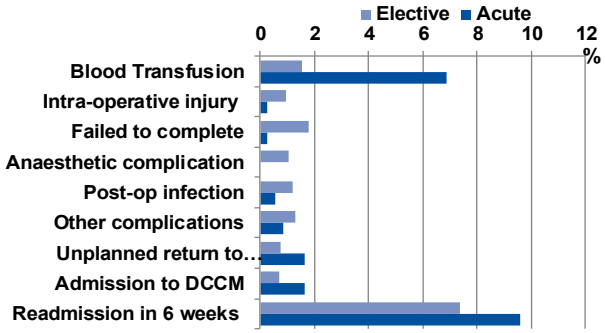
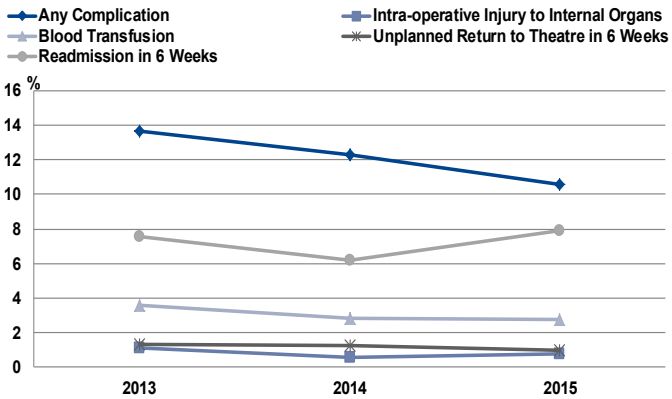


Table 256: Complications of surgery by timing of surgery NWH 2015

	Acute admission N=365		Elective admission N=1177	
	n	%	n	%
Any complication	**44**	**12.1**	**120**	**10.2**
Failure to complete planned procedure	1	0.3	21	1.8
Intra operative injury to internal organs	1	0.3	11	0.9
Significant post op infection	2	0.5	14	1.2
Anaesthetic complication	0	0.0	12	1.0
Other significant complication	3	0.8	15	1.3
Thromboembolic complication	0	0.0	1	0.1
Unplanned return to theatre in 6 weeks	6	1.6	9	0.8
Admission to DCCM	6	1.6	8	0.7
Readmission in 6 weeks	35	9.6	87	7.4
Postop complication	15	4.1	50	4.2
Planned re-admission	2	0.5	15	1.3
Transfusion	2	0.5	0	0.0
Other, please specify	16	4.4	22	1.9
Transfusion	25	6.8	18	1.5

Figure 206: Complications of surgery over time NWH 2013-2015



*definitions of surgical complications can be found in section 12.8

Table 257: Postoperative complications among primary inpatient surgeries by PRIMARY surgical procedure NWH 2015

	Total	Any complication		Failure to complete planned procedure		Intra operative injury to internal organs		Blood Transfusion		Significant post-op Infection		Unplanned return to theatre in 6 weeks		Readmission in 6 weeks		Anaesthetic complication		Thrombo-embolic complication		Other significant complication		Admission to DCCM	
	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	1542	164	10.6	22	1.4	12	0.8	43	2.8	16	1.0	15	1.0	122	7.9	12	0.8	1	0.1	18	1.2	14	0.9
Ovarian and /or tubal surgery	159	23	14.5	4	2.5	0	0.0	6	3.8	1	0.6	0	0.0	12	7.5	4	2.5	0	0.0	3	1.9	1	0.6
Hysteroscopy	239	13	5.4	5	2.1	1	0.4	2	0.8	1	0.4	1	0.4	13	5.4	1	0.4	0	0.0	1	0.4	1	0.4
Urogynaecology procedure	184	22	12.0	2	1.1	6	3.3	2	1.1	1	0.5	2	1.1	12	6.5	2	1.1	0	0.0	1	0.5	2	1.1
Hysterectomy	139	30	21.6	0	0.0	2	1.4	13	9.4	13	9.4	7	5.0	25	18.0	1	0.7	0	0.0	10	7.2	6	4.3
Endometriosis surgery	59	8	13.6	1	1.7	1	1.7	0	0.0	0	0.0	0	0.0	8	13.6	1	1.7	0	0.0	1	1.7	0	0.0
Fibroid embolisation	7	2	28.6	0	0.0	1*	14.3	0	0.0	0	0.0	1	14.3	1	14.3	0	0.0	0	0.0	1	14.3	1	14.3
Surgical termination of pregnancy	176	4	2.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	1.7	1	0.6	0	0.0	0	0.0	0	0.0
Evacuation retained products of conception	121	15	12.4	1	0.8	0	0.0	5	4.1	0	0.0	0	0.0	15	12.4	0	0.0	1	0.8	0	0.0	0	0.0
Diagnostic laparoscopy†	124	14	11.3	6	4.8	1	0.8	2	1.6	0	0.0	0	0.0	9	7.3	0	0.0	0	0.0	0	0.0	2	1.6
Other vulval procedure	91	3	3.3	0	0.0	0	0.0	1	1.1	0	0.0	1	1.1	2	2.2	0	0.0	0	0.0	0	0.0	1	1.1
Other uterine/cervical	195	23	11.8	1	0.5	0	0.0	9	4.6	0	0.0	2	1.0	19	9.7	2	1.0	0	0.0	0	0.0	0	0.0
Other	48	7	14.6	2	4.2	0	0.0	3	6.3	0	0.0	1	2.1	3	6.3	0	0.0	0	0.0	1	2.1	0	0.0

† Includes cases that progressed from diagnostic laparoscopy to therapeutic procedure but where the primary procedure was entered in the database as diagnostic laparoscopy.
*Single case of pseudomembranous colitis due to antibiotic prophylaxis for embolisation, required surgical management, diagnosis confirmed on histology.

Definitions of complications:

Intra operative injury to internal organs: Injury to bladder, bowel, ureter, major blood vessel, or other.
Significant postop infection: Any infection (defined by evidence of wound dehiscence or wound collection, pelvic abscess, or fever>39^{o}C) occurring as a result of surgery.
Readmission: Re-admission to hospital (hospital stay of 3 hours or more) for a reason related to the surgical procedure occurs within 6 weeks of surgery. This includes planned readmission.
Other significant complications: Includes gastrointestinal complications (ileus, bowel obstruction), fistulae.

12.9 Data tables: General Gynaecology inpatient surgery

Table 258: Primary indication for primary inpatient gynaecologic surgery NWH 2011-2015

	2011 N=1628		2012 N=1528		2013 N=1606		2014 N=1607		2015 N=1542	
	n	%	n	%	n	%	n	%	n	%
Primary indication for surgery										
Abnormal bleeding, non-pregnant	384	25.1	379	23.3	359	22.4	338	21.0	324	21.0
Miscarriage / Termination	301	19.7	343	21.1	333	20.7	354	22.0	319	20.7
Urogynaecology / prolapse	202	13.2	203	12.5	218	13.6	207	12.9	195	12.6
Ovarian cyst	123	8.1	165	10.1	126	7.9	126	7.8	96	6.2
Abscess	60	3.9	72	4.4	45	2.8	53	3.3	67	4.3
Pain, cause unknown	82	5.4	95	5.8	88	5.5	86	5.4	86	5.6
Cancer / Pelvic mass	94	6.2	72	4.4	63	3.9	91	5.7	53	3.4
Endometriosis	94	6.2	98	6.0	77	4.8	74	4.6	74	4.8
Ectopic pregnancy	63	4.1	101	6.2	84	5.2	83	5.2	71	4.6
Infertility	21	1.4	21	1.3	42	2.6	26	1.6	42	2.7
Anatomical anomalies of the genital tract							11	0.7	21	1.4
CIN/VIN/VAIN							47	2.9	32	2.1
Polyps/endometrial sampling							55	3.4	50	3.2
Other, please specify	104	6.8	79	4.9	171	10.7	56	3.5	112	7.3

Table 259: Demographic details of women having inpatient gynaecologic primary surgery NWH 2011-2015

	2011		2012		2013		2014		2015	
	n	%	n	%	n	%	n	%	n	%
Ethnicity										
Māori	167	10.3	154	10.1	168	10.5	189	11.8	175	11.3
Pacific	286	17.6	260	17.0	246	15.3	261	16.2	229	14.9
Other Asian	220	13.5	174	11.4	194	12.1	184	11.4	193	12.5
Indian	124	7.6	137	9.0	132	8.2	124	7.7	142	9.2
European	779	47.9	737	48.2	808	50.3	790	49.2	743	48.2
Other	44	2.7	57	3.7	51	3.2	52	3.2	60	3.9
Not stated	8	0.5	9	0.6	7	0.4	7	0.4	0	
Age										
≤20	94	5.7	84	5.5	85	5.3	103	6.4	82	5.3
21-30	361	22.2	312	20.4	340	21.2	345	21.5	357	23.1
31-40	478	29.4	432	28.3	446	27.8	452	28.1	416	27.0
41-50	342	21.0	357	23.4	375	23.4	331	20.6	324	21.0
51-60	191	11.9	170	11.1	179	11.2	180	11.2	170	11.0
>60	161	9.9	170	11.1	179	11.2	196	12.2	193	12.5
Missing	1		3	0.2	2	0.1				
BMI										
<19	59	3.6	44	2.9	66	4.1	65	4.0	61	4.0
19-25	648	39.8	636	41.6	681	42.4	626	38.9	643	41.7
26-30	335	20.6	350	22.9	360	22.4	346	21.5	349	22.6
31-35	196	12.0	203	13.3	197	12.3	165	10.3	151	9.8
>35	287	17.6	251	16.4	258	16.1	306	19.0	314	20.3
Missing	103	6.3	44	2.9	44	2.7	99	6.2	24	1.6
Smoking status										
Currently smoking	288	17.7	267	17.5	237	14.8	252	15.7	197	12.8
Past smoker	215	13.2	185	12.1	173	10.8	154	9.6	1159	75.2
Never	1121	68.9	1074	70.3	1192	74.2	1192	74.1	148	9.6
Unknown	4	0.3	2	0.1	4	0.2	9	0.6	37	2.4
DHB of residence										
Auckland	1346	82.7	1236	80.9	1308	81.4	1273	79.2	1238	80.3
Counties Manukau	114	7.0	118	7.7	120	7.5	132	8.2	144	9.3
Waitemata	135	8.3	123	8.1	132	8.2	151	9.4	112	7.3
Other	33	2.0	51	3.3	38	2.4	46	2.9	39	2.5
Unknown					8	0.5	5	0.3	9	0.6

BMI and smoking status are predictors of post-surgical morbidity and mortality.

Table 260: Complications of surgery NWH 2013-2015

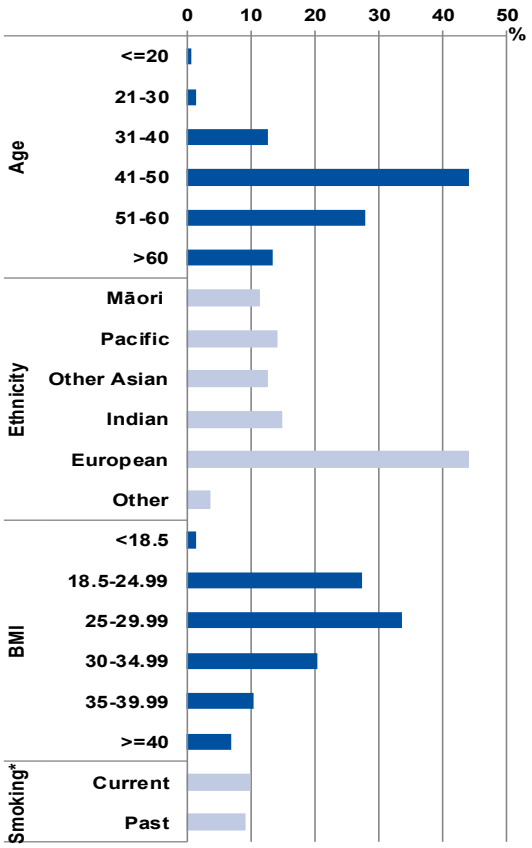
	2013 N=1606		2014 N=1607		2015 N=1542	
	n	%	n	%	n	%
Total complications	219	13.6	198	12.3	164	10.6
Blood transfusion	58	3.6	46	2.9	43	2.8
Intra-operative injury to internal organs	18	1.1	9	0.6	12	0.8
Failure to complete planned surgery	20	1.2	30	1.9	22	1.4
Anaesthetic complications	11	0.7	9	0.6	12	0.8
Significant postoperative infection	20	1.2	16	1.0	16	1.0
Other significant complications	22	1.4	13	0.8	18	1.2
Unplanned return to theatre	21	1.3	20	1.2	15	1.0
Admission to DCCM	10	0.6	8	0.5	14	0.9
Readmission to hospital (post op complication)	121	7.5	99	6.2	105	6.8
Planned re-admission					17	1.1

12.10 Hysterectomy

This section does not include hysterectomies performed by the Gynaecologic Oncology team, or hysterectomy cases done from another hospital ward or under the care of other services (eg urology).

Findings

Figure 207: Characteristics of women undergoing hysterectomy as primary surgery performed by the general gynaecology team NWH 2015



*Missing smoking status of 2 women

There were 33 fewer women undergoing hysterectomy in 2015 than in 2014, continuing a downward trend in number of hysterectomies performed at National Womens. The ethnicity of women seeking hysterectomy remains unchanged. In 2015, 69% of women who underwent hysterectomy had a BMI ≥ 25 and 22% had a BMI ≥35. There is an apparent reduction in current smokers with only 9.8% of women reporting current smoking in 2015, but this may be due to chance (p=0.06).

The proportion of women undergoing the laparotomy approach in 2015 remains similar to 2013 and 2014 at just over 50%. However, there is an increasing trend to performing proportionally more total laparoscopic hysterectomies and fewer by vaginal approach over the past 3 years. The indication for hysterectomy in 2015 was similar to previous years with abnormal uterine bleeding still the most common reason. The length of hospital stay remains unchanged by all methods since the drop by one day in median length of stay in 2012 which was associated with the introduction of the enhanced recovery program in gynaecology. Laparoscopic approach has the shortest stay of 2 days on average. Vaginal approach is more likely to be linked to other prolapse surgery which can affect discharge timing.

Figure 208: Route of hysterectomy among hysterectomies performed by general gynaecologists NWH 2000-2015

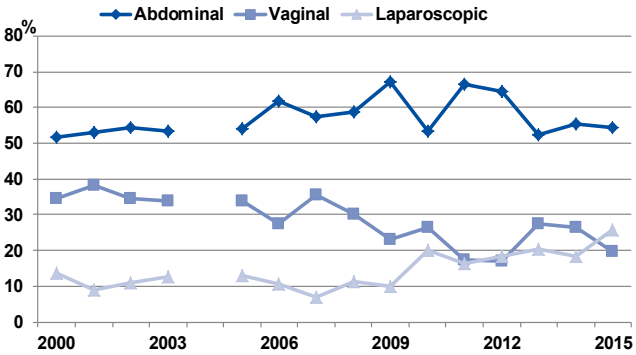
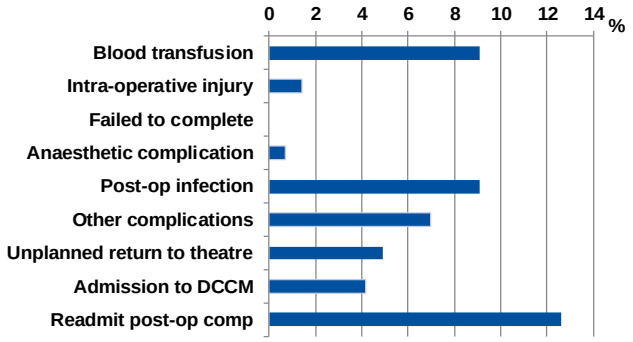


Figure 209: Complications of surgery among women undergoing hysterectomy performed by the general gynaecology team NWH 2015

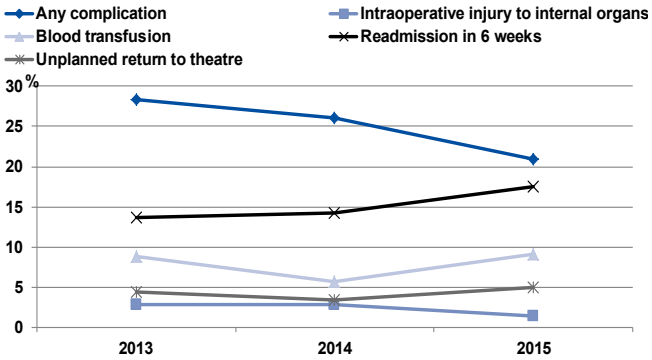


*definitions of surgical complications can be found in section 12.8

The overall complication rate for hysterectomy under the General Gynaecology Service in 2015 has reduced to 21% (Table 262). The previous 4 years were reported at around 26-28%. There were differences in the type of complication that had occurred compared to previous years. Some patients appeared in multiple categories of complications.

Thirteen patients (9.1%) required transfusion either intra-operatively or post operatively. This was higher than in 2014 but comparable to other previous years. Of those, 7 patients had a history of heavy menstrual bleeding and fibroid uterus.

Figure 210: Complications of surgery among women undergoing hysterectomy performed by the general gynaecology team NWH 2013-2015



*definitions of surgical complications can be found in section 12.8

Two patients (1.4%) had documented intraoperative major organ injury. There was one ureteric injury and one of bladder injury at laparoscopy with conversion to laparotomy for repair.

The sole anaesthetic complication was hypotension requiring inotropic support post-operatively with background history of cardiomyopathy.

Thirteen (9.1%) patients re-presented with a significant post-operative infection. Six patients had post-operative vault haematoma/collection, five patients had wound infection/dehiscence, one patient had a UTI, and one patient had infection of unknown source.

Ten (7%) patients had 'other' significant post-operative complication. Three patients had rectus sheath dehiscence, three patients had post-operative ileus, two patients had opioid overuse and sequelae, one patient had active bleeding forming vaginal haematoma, requiring re-operating, and one patient had hypotension from dehydration requiring vasopressor support.

The rates of significant post-operative infection or 'other' complication in 2015 appeared proportionally higher than previous years. This may be explained possibly by more thorough data cleaning for 2015.

Seven (4.9%) patients had an unplanned return to theatre. Three patients returned to theatre for re-closure of sheath dehiscence, one for vaginal repair of an active bleeding vessel, one for drainage of vault haematoma, one for drainage and debridement of subcutaneous collection, one for exploratory laparotomy for intraabdominal bleeding followed by embolisation of inferior epigastric artery.

Six patients (4.2%) required post-operative admission to DCCM.

Eighteen patients (12.6%) required readmission for the various reasons stated above, as well as extra analgesia requirements without a specific complication found.

Summary / Implications

The total number of hysterectomies performed continues to decrease in 2015 compared to previous years. The proportion of laparoscopic hysterectomies being performed continues to increase but there are fewer done by the vaginal approach. The total complication rate has also decreased compared to previous years but there may be cause for concern with a higher infection rate and a higher rate of other significant complications.

12.11 Data tables: Hysterectomy

Table 261: Characteristics of women undergoing hysterectomy as primary surgery performed by the general gynaecology team (excluding gynaecologic oncology) NWH 2012-2015

	2012 N=175		2013 N=205		2014 N=176		2015 N=143	
	n	%	n	%	n	%	n	%
Age								
<20	0		1	2.5	1	0.6	1	0.7
21-30	1	0.6	1	2.5	1	0.6	2	1.4
31-40	37	21.7	26	12.7	20	11.4	18	12.6
41-50	85	48.6	100	48.8	90	51.1	63	44.1
51-60	28	16.0	45	22.0	40	22.7	40	28.0
>60	24	13.7	31	15.1	24	13.6	19	13.3
Unknown			1	0.5				
Ethnicity								
Māori	16	9.1	23	11.2	23	13.1	16	11.2
Pacific	28	16.0	36	17.6	31	17.6	20	14.0
Other Asian	23	13.1	26	12.7	23	13.1	18	12.6
Indian	22	12.6	25	12.2	17	9.7	21	14.7
European	83	47.4	91	44.4	79	44.9	63	44.1
Other	2	1.1	2	1.0	3	1.7	5	3.5
Not Stated	1	0.6	2	1.0	0		0	
District Health Board of residence								
Auckland	158	90.3	194	94.6	153	86.9	126	88.1
Waitemata	7	4.0	6	2.9	8	4.5	5	3.5
Counties Manukau	6	3.4	2	1	7	4	4	2.8
Other	4	2.3	2	1.0	7	4.0	7	4.9
Unknown			1	0.5	1	0.6	1	0.7
BMI								
<18.5	2	1.1	7	3.4	1	0.6	2	1.4
18.5-24.99	51	29.1	50	24.4	51	29.0	39	27.3
25-29.99	54	30.9	62	30.2	45	25.6	48	33.6
30-34.99	37	21.1	42	20.5	39	22.2	29	20.3
35-39.99	19	10.9	30	14.6	12	6.8	15	10.5
>=40	12	6.7	14	6.8	26	14.8	10	7.0
Missing	0		0		2	1.1	0	
Smoking								
Currently smoking	29	16.6	32	15.6	30	17.0	14	9.8
Past smoker	23	13.1	18	8.8	18	10.2	13	9.1
Never smoked	123	70.3	155	75.6	128	72.7	114	79.7
Unknown	0	0.6	0				2	1.4

Table 262: Complications of surgery among women undergoing hysterectomy performed by the general gynaecology team NWH 2013-2015

	2013 N=205		2014 N=176		2015 N=143	
	n	%	n	%	n	%
Any complication	**58**	**28.3**	**46**	**26.1**	**30**	**21.0**
Blood transfusion	18	8.8	10	5.7	13	9.1
Intraoperative injury	6	2.9	5	2.8	2	1.4
Anaesthetic complications	1	0.5	0	0.0	1	0.7
Significant postoperative infection	12	5.9	6	3.4	13	9.1
Other significant complications	11	5.4	5	2.8	10	7.0
Unplanned return to theatre	9	4.4	6	3.4	7	4.9
Admission to DCCM	2	1.0	3	1.7	6	4.2
Readmission to hospital	28	13.7	25	14.2	25	17.5
Planned readmissions					1	0.7
Postop complications					18	12.6
Other					6	4.2
Failed to complete planned surgery	1	0.5	4	2.3	0	0.0

Table 263: Surgical details of hysterectomies performed by the general gynaecology team NWH 2011-2015

	2011 N=166		2012 N=175		2013 N=205		2014 N=176		2015 N=143	
	n	%	n	%	n	%	n	%	n	%
Approach										
Laparotomy	107	64.5	107	61.1	105	51.2	96	54.5	75	52.4
Total laparoscopic hysterectomy	15	9.0	24	13.7	34	16.6	19	10.9	30	21.0
Laparoscopic assisted vaginal	12	7.2	8	4.6	8	3.9	13	7.4	7	4.9
Laparoscopic converted to laparotomy	3	1.8	6	3.4	2	1.0	2	1.1	3	2.1
Vaginal	29	17.5	30	17.1	56	27.3	46	26.3	28	19.6
Timing of surgery										
Elective	164	98.8	173	98.9	198	96.6	173	98.2	136	95.1
Acute	2	1.2	2	1.1	7	3.4	3	1.8	7	4.9
Primary indication for surgery										
Abnormal bleeding, non-pregnant	75	45.2	84	48.0	98	47.8	87	49.4	64	44.8
Cancer /pelvic mass	37	22.3	43	24.6	40	19.5	34	19.3	26	18.2
Urogynaecology / prolapse	25	15.1	21	12.0	36	17.6	33	18.8	25	17.5
Pain, cause unknown	6	3.6	8	4.6	6	2.9	4	2.3	3	2.1
Endometriosis	5	3.0	5	2.9	5	2.4	5	2.8	4	2.8
Ovarian cyst	12	7.2	6	3.4	6	2.9	5	2.8	5	3.5
Other	6	3.6	8	4.6	14	6.8	8	4.6	16	11.2
ASA rating										
1	57	34.3	65	37.1	66	32.2	38	21.6	50	35.0
2	81	48.8	86	49.1	98	47.8	72	40.9	58	40.6
3	20	12.1	17	9.7	35	17.1	19	10.8	11	7.7
5	0		0		0		1	0.6	1	0.7
Missing	8	4.8	7	4.0	6	2.9	46	26.1	23	16.1
LENGTH OF STAY	**Median(IQR)**		**Median(IQR)**		**Median(IQR)**		**Median(IQR)**		**Median(IQR)**	
All hysterectomies	4	(3-5)	3	(3-4)	3	(2-4)	3	(2-4)	3	(2-4)
By approach:										
Laparotomy	4	(4-5)	3	(3-4)	3	(3-4)	3	(2-4)	3	(3-4)
Laparoscopy	3	(3-5)	3	(2-3.5)	2	(2-2)	2	(2-3)	2	(2-2)
Vaginal	3	(2-3)	3	(2-4)	3	(2-3)	3	(2-3)	3	(2-3)

Table 264: Route of hysterectomy among hysterectomies performed by the general gynaecology team NWH 2007-2015

	2007 N=189		2008 N=150		2009 N=162		2010 N=173		2011 N=166		2012 N=175		2013 N=205		2014 N=176		2015 N=143	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Abdominal	109	57.7	88	58.7	109	67	92	53.2	110	66.3	113	64.6	107	52.2	98	55.7	78	54.5
Vaginal	67	35.4	45	30.0	37	23	46	26.6	29	17.5	30	17.1	56	27.3	46	26.1	28	19.6
Laparoscopic	13	6.9	17	11.3	16	10	35	20.2	27	16.3	32	18.3	42	20.5	32	18.2	37	25.9

12.12 Gynaecology laparoscopic procedures

As in all sections 12.4-12.7, procedures performed by the gynaecologic oncology team are excluded.

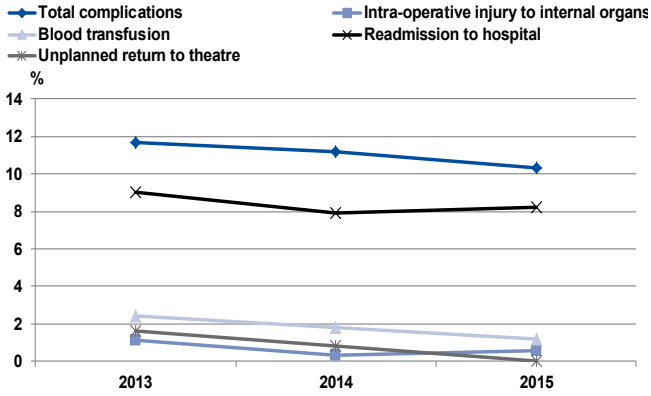
Findings

In 2015, there were 342 laparoscopic procedures, 238 elective and 104 acute procedures. Fifty five percent of gynaecologic laparoscopic surgeries in 2015 were for endometriosis, ovarian cysts or ectopic pregnancy.

Table 265: Complications of primary inpatient gynaecologic laparoscopic surgery NWH 2015

	Total N=341	
	n	%
ANY COMPLICATION	**35**	**10.3**
Blood transfusion	4	1.2
Intra operative injury	2	0.6
Failure to complete procedure	10	2.9
Anaesthetic complications	2	0.6
Significant post-operative infection	4	1.2
Unplanned return to theatre	0	0.0
Admission to DCCM	3	0.9
Readmission to hospital	28	8.2
Post op complications	13	3.8
Planned re-admission	3	0.9
Other	12	3.5
Other significant complications	3	0.9

Figure 211: Complications of primary inpatient gynaecologic laparoscopic surgery NWH 2015



*definitions of surgical complications can be found in section 12.8

In 2015 there were the following complications.

1. Re-admission to hospital:

Nineteen patients were readmitted to hospital following a planned procedure. The majority of these patients (8) returned with abdominal pain including acute exacerbation of chronic pain (5). Two patients were given a diagnosis of postoperative constipation, one patient had urinary retention presenting with abdominal pain. Four patients were admitted and managed conservatively for vaginal vault hematoma/ abscess. Two patients returned to hospital with endometritis and one with a UTI. One patient had scopoderm patches prescribed for pain management to return with blurred vision. Two patients had planned readmissions for further surgery.

2. Injury to Internal organs:

In total two patients had organ injury during laparoscopic surgery, one patient a perforated uterus, and the other an anal mucosal tear from a rectal probe.

3. Admission to DCCM:

Three patients were admitted to DCCM, one for septic shock from laparoscopic drainage of tubo-ovarian abscess and washing, one for morphine narcosis managed with naloxone, and the third for observation.

4. Failure to complete procedure:

Ten patients had incomplete procedures. Five of these patients were severe endometriosis who had a diagnostic laparoscopy, where severe grade IV disease with obliteration of the Pouch of Douglas was diagnosed. They were all referred for further surgery by advanced laparoscopic and colo-rectal surgeons. Two patients had failed hysteroscopy for tight os. Two patients were booked for salpingo-oopherectomy and the procedure was not completed due to adhesions. One patient was to have a bilateral salpingo-oophorectomy but was found to have ovarian cancer and extensive adhesions and was referred to Oncology.

5. Blood transfusion:

Four patients had a blood transfusion, all related to ectopic pregnancy surgery. All the transfusions were related to the disease process; that is bleeding from an ectopic pregnancy sac rather than from a complication of surgery.

6. Significant post-operative infection:

Four patients had significant postoperative infections after laparoscopic procedures, all related to pelvic haematomata. One patient had significant infection from a posterior vaginal wall repair. The patient developed a vaginal wall hematoma which was secondarily infected. The same patient had laparoscopic BSO but no complication related to that procedure.

7. Urinary complications:

Two patients presented with retention postoperatively; both were related to pain and had successful catheter removals.

8. Anaesthetic complications:

Two patients had anaesthetic complications. One patient had a rash due to histamine release from muscle relaxant. One patient undergoing hysteroscopy and D&C had difficult intubation.

12.13 Data tables: Gynaecology laparoscopic procedures

Table 266: Primary surgery performed, and timing of surgery among women having inpatient primary laparoscopic procedures NWH 2015

Primary procedure	Surgery in 2015	Acute admission		Elective admission	
	N	n	%	n	%
Total	**341**	**103**	**30.2**	**238**	**69.8**
Ovarian/tubal	110	55	50.0	55	50.0
Diagnostic laparoscopy	112	41	36.6	71	63.4
Endometriosis surgery	56	1	1.8	55	98.2
Hysterectomy	37	1	2.7	36	97.3
Other uterine/cervical	15	3	20.0	12	80.0
Hysteroscopy	7	2	28.6	5	71.4
Urogynaecology	2	0	0.0	2	100.0
Fibroid embolisation	0	0	0.0	0	0.0
Other	2	0	0.0	2	100.0

Table 267: Primary indication for surgery by timing of surgery among women having primary inpatient laparoscopic procedures NWH 2015

Primary indication	Surgery in 2015	Acute admission		Elective admission	
	N	n	%	n	%
Total	**341**	**103**	**30.2**	**238**	**69.8**
Endometriosis	66	5	7.6	61	92.4
Ovarian cyst	61	16	26.2	45	73.8
Ectopic pregnancy	61	60	98.4	1	1.6
Pain, cause unknown	56	13	23.2	43	76.8
Abnormal bleeding	36	1	2.8	35	97.2
Infertility	29	0	0.0	29	100.0
Cancer/Pelvic mass	8	0	0.0	8	100.0
Urogynaecology/Prolapse	5	0	0.0	5	100.0
Other	18	6	33.3	5	27.8

Table 268: Complications of laparoscopic surgery NWH 2013-2015

	2013		2014		2015	
	N=377		N=391		N=341	
	n	%	n	%	n	%
Any complications	**44**	**11.7**	**44**	**11.2**	**35**	**10.3**
Blood transfusion	9	2.4	7	1.8	4	1.2
Intra-operative injury to internal organs	4	1.1	1	0.3	2	0.6
Failure to complete planned surgery	3	0.8	11	2.8	10	2.9
Anaesthetic complications	4	1.1	1	0.3	2	0.6
Significant postoperative infection	4	1.1	1	0.3	4	1.2
Other significant complications	3	0.8	2	0.5	3	0.9
Unplanned return to theatre	6	1.6	3	0.8	0	0.0
Admission to DCCM	1	0.3	2	0.5	3	0.9
Readmission to hospital	34	9.0	31	7.9	28	8.2
Post op complications	22	5.8	16	4.1	13	3.8
Other	10	2.7	13	3.3	3	0.9
Planned re-admission	2	0.5	2	0.5	12	3.5

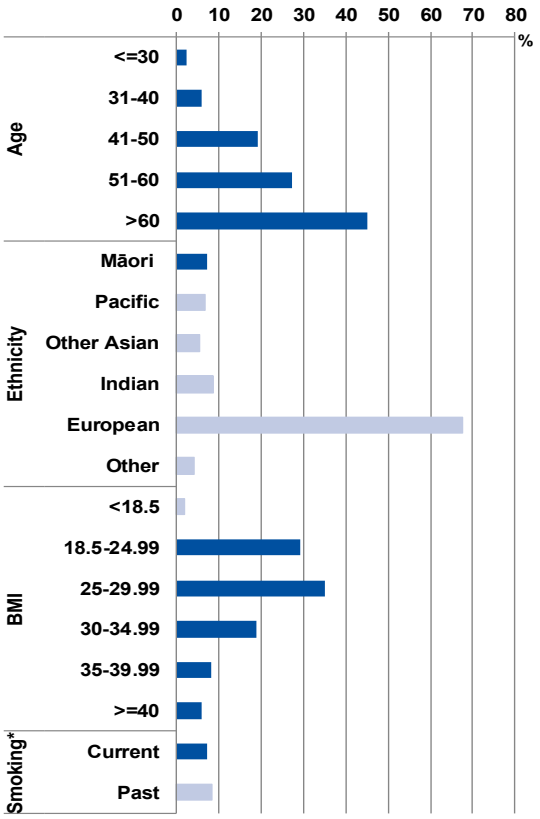
12.14 Urogynaecology

The section on urogynaecology will concentrate on operative procedures rather than clinic throughput or urodynamic investigations as only surgical data are systematically collected.

From 2012, urogynaecology procedures were categorized as: procedures including hysterectomy; incontinence tape procedures; prolapse repairs using synthetic mesh augmentation; 'other' prolapse repairs.

Findings

Figure 212: Demography of women undergoing primary inpatient urogynaecology surgery NWH 2015



*missing smoking status for 5 women and missing BMI for 2 women

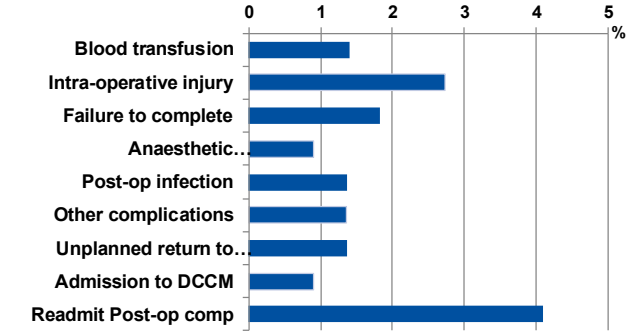
In 2015, 219 women had an urogynaecology procedure as a primary admission.

Of the 219 primary admissions, there were 62 tension free vaginal tape repairs (TVT), four mesh repairs, 132 prolapse repairs, and 116 other urogynaecology procedures. Many women will have had two or more urogynaecology procedures at primary surgery.

Twenty eight women also had a hysterectomy at the time of their primary admission for urogynaecology surgery.

The urogynaecology case mix has been similar to previous years (Table 269). Patients that are overweight or obese are 70% of all cases. The age range is very similar as is the ethnicity to the previous year. We do take tertiary referrals from other Gynaecology units at 14%. Waitemata and Counties Manukau have their own urogynaecology units, so patients from these DHBs are usually those who have moved during work up or those who have been long term patients.

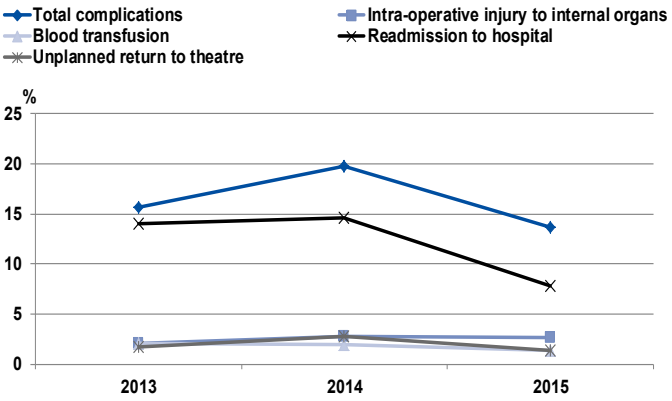
Figure 213: Complications of primary urogynaecologic surgery procedures NWH 2015



*definitions of surgical complications can be found in section 12.8

Complications were seen in a total of 30 women (13.7%) who underwent urogynaecological surgery. As the data indicate, some patients had more than one complication recorded.

Figure 214: Complications of primary urogynaecologic surgery procedures NWH 2013-2015



*definitions of surgical complications can be found in section 12.8

We are still providing the option of prolapse repair with mesh for those patients where other methods of prolapse repair have failed. Four patients had a mesh augmented repair in the 2015 year. They were all placed abdominally and we know from the international literature that this method of mesh placement is associated with the least long term issues with pain or mesh exposure.

The operative complications have been analysed. This year our rate of major viscus injury has been stable. There were no bowel or urethral injuries. Three out of the five bladder injuries were due to trocar injuries at placement of incontinence tape and

all were recognized at cystoscopy and safely replaced in the correct position without any ongoing issues for the individual patients. Two out of the five bladder injuries had had prior surgery in the same compartment. One patient sustained a cystotomy during vaginal prolapse repair. The injury was noted to be close to the ureteric opening of a duplex system and primary ureteric re-implantation was undertaken.

Three patients having prolapse repairs required blood transfusion, which was the same as last year. There were two patients that required admission to the Department of Critical Care Medicine (DCCM). One was for complications associated with their surgery and the second was admitted due to hypotension not associated with hypovolemia or operative complication.

Returns to theatre within six weeks of surgery have decreased from six to only three this year. Two required evacuation of haematomata and one returned for release of suture due to pain.

Readmission rate only includes 7 admitted for acute post-operative problems. There were 5 admitted for infection, the rest for issues such as pain, voiding dysfunction, haematuria, and constipation or diarrhoea.

There was a statistically significant reduction in readmissions for postoperative complications from 20 in 2014 to 7 in 2015.

Over all the complication rates within urogynaecology have remained relatively stable.

12.15 Data tables: Urogynaecology

Table 269: Demography of women undergoing primary inpatient urogynaecology surgery NWH 2012-2015

	2012 N=212		2013 N=235		2014 N=212		2015 N=219	
	n	%	n	%	n	%	n	%
Age								
≤ 30	1	0.5	5	2.1	2	0.9	5	2.3
31-40	12	5.7	15	6.4	20	9.4	13	5.9
41-50	40	18.9	58	24.7	46	21.7	42	19.1
51-60	61	28.8	60	25.5	54	25.5	60	27.3
>60	98	46.2	97	41.3	90	42.5	99	45.2
Ethnicity								
Māori	17	8.0	20	8.5	20	9.4	16	7.3
Pacific	17	8.0	20	8.5	19	9.0	15	6.8
Other Asian	13	6.1	12	5.1	17	8.0	12	5.5
Indian	8	3.8	20	8.5	20	9.4	19	8.6
European	147	69.3	159	67.7	131	61.8	148	67.6
Other	9	4.3	4	1.7	5	2.4	9	4.1
Not stated	1	0.5			0	0.0	0	
District Health Board of residence								
Auckland	175	82.6	201	85.5	181	85.4	189	86.3
Waitemata	13	6.1	10	4.3	14	6.6	13	5.9
Counties Manukau	11	5.2	6	2.6	3	1.4	2	0.9
Other	13	6.1	18	7.7	13	6.1	14	6.4
Missing					1	0.5	1	0.5
BMI								
<18.5	2	0.9	2	0.9	3	1.4	4	1.8
18.5-24.99	65	30.7	64	27.2	50	23.6	64	29.2
25-29.99	70	33.0	81	34.5	80	37.7	77	35.0
30-34.99	50	23.6	52	22.1	38	17.9	41	18.6
35-39.99	11	5.2	23	9.8	23	10.8	18	8.2
>=40	14	6.6	13	5.5	16	7.5	13	5.9
Missing					2	0.9	2	0.9
Smoking								
Currently smoking	19	9.0	23	9.8	21	9.9	15	6.8
Past smoker	31	14.6	31	13.2	24	11.3	18	8.2
Never smoked	162	76.4	181	77.0	167	78.8	181	82.6
Missing							5	2.3
Length of stay Median (IQR)	2	(1-3)	2	(1-3)	2	(1-3)	2	(1-3)

Table 270: Complications of primary urogynaecologic surgery procedures NWH 2013-2015

	2013 N=235		2014 N=212		2015 N=219	
	n	%	n	%	n	%
Total complications	37	15.7	42	19.8	30	13.7
Blood transfusion	5	2.1	4	1.9	3	1.4
Intra-operative injury to internal organs	5	2.1	6	2.8	6	2.7
Failure to complete planned surgery	1	0.4	5	2.4	4	1.8
Anaesthetic complications	1	0.4	4	1.9	2	0.9
Significant postoperative infection	5	2.1	8	3.8	3	1.4
Other significant complications	4	1.7	4	1.9	3	1.4
Unplanned return to theatre	4	1.7	6	2.8	3	1.4
Admission to DCCM	0	0	1	0.5	2	0.9
Readmission to hospital	33	14.0	31	14.6	17	7.8
Planned re-admission	9	3.8	9	4.2	9	4.1
Postoperative complication	19	8.1	20	9.4	7	3.2
Other	5	2.1	2	0.9	1	0.5

12.16 Fertility PLUS

These are the 2015 results of IVF/ICSI autologous cycles i.e. women having their own eggs used for insemination and resultant embryos transferred. Our results are benchmarked against the ANZARD (Australian and New Zealand Assisted Reproduction) Database which records all treatment cycles for Australia and New Zealand.

These data include women of all ages including those over 40 years of age. Donor/recipient, surrogacy and PGD cycles are not included.

Table 271: Fertility Plus IVF cycle outcomes 2015

	IVF cycles 2014		IVF/ICSI cycles 2015	
	n	%	n	%
Number of cycles started	**605**		**536**	
Number of cycles stopped	**50**	**8**	**50**	**9**
ANZARD Benchmark for % cycles stopped (2012)		**9**		**9**
Reasons for stopped cycles				
1) Over response	5	1	6	1
2) Poor response	38	6	34	6
3) Other (including patient choice)	7	1	10	2
Number of cycles reaching oocyte pick up (OPU)	**555**	**92**	**486**	**91**
Number of cycles reaching embryo transfer	**437**	**72**	**362**	**68**
ANZARD Benchmark for cycles started / with transfer (2012)		**73**		
Reasons for no transfer				
1) Freeze all cycle	95	16	97	18
- Egg vitrification	7		4	
- Elevated progesterone	30		31	
- OHSS risk	25		20	
- Endometrial (needing surgery)	11		3	
- Agonist trigger	22		39	
2) No eggs	5	1	5	1
3) No fertilisation	14	2	12	2
4) Other	4	1	10	2
Clinical pregnancy/cycle started	138	23	108	20
ANZARD Benchmark for pregnancy rate/cycle started (2013)		22		20
Clinical pregnancy rate/OPU	138/555	25	108/486	22
ANZARD Benchmark for pregnancy rate/OPU (2013)		24		
Clinical pregnancy rate/embryo transfer	138/437	32	108/362	30
ANZARD Benchmark for pregnancy rate /embryo transfer (2013)		30		
IVF/ICSI cycles Single Embryo Transfer (SET)				
SET – all ages	358/437	82	347/362	96
ANZARD Benchmark for women having SET - all ages (2013)		72		79
Clinical pregnancy rate for Day 5 SET		43		44
Twinning	**11/138**	**8**	**1/108**	**1**
From DET	9/138	7	0	0
From SET (monozygotic)	2/138	2	1	1
RTAC Guidelines	<10		<10	
Clinical pregnancy rate per thawed embryo replacement	48/177	27	139/455	31
ANZARD Benchmark for pregnancy rate per thawed embryo replacement (2013)		24		31
Clinical pregnancy rate per thawed blastocyst replacement	39/124	31	114/338	34
ANZARD Benchmark for pregnancy rate per thawed blastocyst replacement (2013)		30		36
% which were SET thaw cycles	163/177	92	447/455	98
ANZARD Benchmark for % SET thaw cycles		83		90
Twinning rate from embryo thaw cycles	0/48	0	1/139	1
Admission for OHSS	6/605	1	2/535	0.4

In 2015: There were 15 started donor egg cycles, 10 with synchronized transfer and 6 clinical pregnancies, 4 freeze-alls and two with clinical pregnancies and 1 stopped cycle because of risk of OHSS. There were two surrogacies and neither had on going pregnancies. The data collection for all accredited fertility clinics allows individual units to make their own comparisons against the figures for all patients in Australia undergoing treatment in any given year. As a comparison group for our 2015 data, we have been able to use the data from the ANZARD Report for 2014 (the most recently published ANZARD data). It must be noted that our live birth data are not yet available for 2015 but we are reporting for cycles commenced in 2014 that the live birth rates following fresh transfers per initiated cycle was 19% and the cumulative live birth rate following the transfer of fresh and frozen-thaw embryos was 29% per initiated cycle.

Stopped cycles

The definition of a 'stopped cycle' is one in which the cycle starts (with treatment designed to stimulate the ovaries) but it is stopped before an egg collection takes place. Our 8% stopped cycle rate is similar to the ANZARD benchmark 9%. Only five of 605 started cycles were stopped owing to over-response and these women were considered to have too high a risk of severe ovarian hyperstimulation syndrome (OHSS) to have an egg collection. Our 0.4% rate of hospitalisation for OHSS in 2015 was 2 from 535 started cycles and compares favourably with the 2012 ANZARD benchmark of 0.7% per egg collection.

The majority of stopped cycles were for poor ovarian response (34 from 50 stopped cycles). In most women poor response is based on poor ovarian reserve which is not amenable to any treatment. Women with poor ovarian reserve who do not respond to maximal gonadotrophins can be offered ovum donation.

No embryo transfer

Seventy-two percent of cycles had an embryo transfer and this is similar to the 73% ANZARD benchmark.

The commonest reason for 'freeze-all' cycles was the woman was at risk for severe OHSS and this included 20 women undergoing stimulation with an 'antagonist stimulation cycle' who received a 'GnRH agonist trigger' (the final injection designed to complete the maturation of the eggs before egg collection was undertaken) and 25 women receiving 'hCG trigger' who were considered at risk for OHSS. This reason for 'freeze-all' is that pregnancy may exacerbate severe OHSS. The use of the GnRH agonist trigger significantly reduces the chance of developing mild, moderate or severe OHSS (OR 0.15, 95% CI 0.05 to 0.47; eight RCTs, 989 women)[1] but is also associated with a reduced pregnancy rate with fresh embryo transfer (OR 0.70, 95% CI 0.54 to 0.91; 11 studies, 1198 women).[1] Freezing all the embryos allows a later transfer when the risk of OHSS is no longer present.

Evidence is emerging that it is the sustained elevation of progesterone for around three days prior to trigger for egg collection that is associated with endometrial advancement and thus poor synchrony with the maturity of the embryo in a fresh embryo transfer. We recommend that all embryos are frozen if the progesterone is ≥6 nmol/L.

Endometrial anomalies seen on ultrasound that we judge might reduce the chance of an embryo implantation is also a reason for freeze-all that is on the increase.

Seventeen women of the 486 undergoing egg collection did not develop embryos. Five women had no eggs collected (this is always a potential hazard in women with a low response and only a couple of follicles or fewer). Of the 12 women who had no fertilization of their eggs, the majority were women who had very few or very poor quality eggs, with unexpected failed fertilization of good numbers of apparently good quality eggs being a rare event.

Pregnancies

As single embryo transfer and freeze all cycles become more common, the outcome of the fresh embryo transfer cycle, the traditionally expressed standard outcome measure, is assuming less relevance as a key performance indicator. Of more relevance is the cumulative live birth rate per woman undergoing IVF stimulation, of healthy singleton babies at term, when all embryos from both fresh and thaw are transferred from one initiated cycle.

Single embryo transfer

Although single embryo transfer had been gradually introduced at Fertility Plus for over 10 years, it was only in the second half of 2014 that a mandatory single embryo transfer policy was introduced regardless of funding. In 2014 Fertility plus had a multiple birth rate of 6.5% but in 2015 we only had 2 multiple pregnancies from 246 pregnancies which is similar to the rate for natural pregnancies.

References

Youssef MAFM, Van der Veen F, Al-Inany HG, et al. Gonadotropin-releasing hormone agonist versus HCG for oocyte triggering in antagonist-assisted reproductive technology. Cochrane Database Syst Rev 2014;10:CD008046.

Maheshwari A, Pandey S, Shetty A, et al. Obstetric and perinatal outcomes in singleton pregnancies resulting from the transfer of frozen thawed versus fresh embryos generated through in vitro fertilisation treatment: a systematic review and meta-analysis. Fertil Steril 2012;98:368-376.

APPENDIX 1 METHODOLOGY

Maternity data

Description of women and babies included in the Annual Clinical Report.

The maternity section of this Annual Clinical Report includes data pertaining to women giving birth to babies at and beyond 20 weeks gestation at NWH during the 2015 calendar year or, if prior to arrival, due to unplanned birth at home or en route (BBA = born before arrival), and the babies of these women.

Data sources

Maternity data for this report have been extracted from the NWH maternity clinical database (Healthware CSC). Data from the ATLAS database (ICD-10 coded data on hospital discharges), supported by the Business Intelligence Unit, and from the PIMS-theatre database were used to check the accuracy of some maternity data.

Maternity data for years prior to 2001 were collected into the AMSIS (Auckland Maternity Services Information System) database. For this report, most data for the years prior to 2001, included in tables and figures to demonstrate time trends, have been obtained from previous Annual Clinical Reports.

The majority of registration data for mothers with self-employed lead maternity caregivers (LMCs) were shared by LMCs and entered into Healthware by one Healthware administrator. Registration data for mothers under the care of NWH primary maternity services, and all antenatal, birth, and postnatal data were entered by clerks and NWH midwives.

The data included in the Maternal Fetal Medicine Service (MFM) section have been extracted from the MFM Viewpoint database for 2015.

Data quality

Data cleaning is undertaken daily prior to extraction of the birth list for Births, Deaths and Marriages (BDM). On a monthly basis, cleaning of place and mode of birth and reconciliation with Birthcare numbers is undertaken.

For the 2004 - 2015 years, the data have been cleaned for ad hoc analysis for service provision, audit and research, policy, and for this clinical report. Cleaning has included completing missing data and checking out of range and inconsistent data. These cleaning strategies have been focused around priority areas for reporting and areas where cleaning could be efficiently completed within the resource available. Further details of variables cleaned are provided below.

NWH acknowledges that these cleaning efforts, whilst extremely time consuming, are not comprehensive. On occasion, it became apparent during analysis that further cleaning was required and this was performed on an ad hoc basis and may not be included in the list provided.

Services or individuals wishing to use the NWH data for further analysis should be aware that areas not mentioned may not have been cleaned. For further advice please contact the Women's Health Intelligence Department.

The introduction of comprehensive computerised clinical records (CRIS, 3M, Concerto, Éclair and Impax (Radiology PACS System)) by ADHB has enhanced data collection, checks on data integrity and clinical audit tremendously. Authorised clinical staff can access the complete clinical record electronically so that no clinical record is lost and the delays inherent in the old paper-based system are avoided.

Newborn Data

Data in the Newborn section pertain to all babies admitted to and cared for at the NWH Neonatal Intensive Care Unit if born during the 2015 calendar year. This includes babies transferred from other units or home.

Data for this report have been extracted from stand-alone databases for neonatology.

Neonatal Intensive Care Unit (NICU) data are collected prospectively by the Resident Medical Officers and Nurse Specialists - Advanced Neonatal Practice working on the NICU. The neonatal database is used to produce problem lists, flow sheets and letters which also ensures checks of data integrity throughout a baby's stay. Further data are collected and accuracy checked for the Australia and New Zealand Neonatal Network (ANZNN).

Newborn Data Quality

Additional checks of the accuracy of the data (including checking clinical records and some original radiology) were made in preparing the annual report and prior to sending the data to ANZNN.

Images were checked on all serious adverse outcomes (IVH, PVL, ROP, NEC, death). Laboratory and clinical records were checked on all possible or definite septicaemias or meningitides. Records were checked when the data entered in different fields in the database appeared inconsistent. Maternal and neonatal records of all babies with encephalopathy or neonatal seizures were reviewed.

Gynaecology data

Data sources

Gynaecology data were largely obtained from stand alone Access databases. Fertility Plus data were extracted and reported by the service and Epsom Day Unit data were extracted from the PHS system.

General gynaecology surgery data are entered on all inpatient gynaecologic surgeries from Ward 97. Gynaecology Oncology team cases are entered in a separate database. It is the intention of the service that intra-operative data are entered by the surgeon at point of care, and post-operative complications are entered later by the ward clerical staff. This process is to be audited in order to improve performance and therefore data quality for the 2016 report.

The data presented in the Colposcopy section arise from data collected from 2009-2011 into Healthware and data collected into the (Solutions Plus) Colposcopy database from July 2012. Data are not included for the transition period from January-July 2012.

The data in the Gynaecology Oncology section have been obtained from an ACCESS database recording gynaecologic oncology referrals, and an ACCESS database of all MDM reviews and inpatient surgeries among women cared for by the gynaecologic oncology service.

Data Quality

The data in the gynaecology oncology and general gynaecology surgery databases were compared to surgeries entered in the PIMS theatre database and to hospital discharge coded surgeries which are stored in the ATLAS data warehouse to identify missing, inconsistent and out of range data. Inconsistencies were clarified by review of clinical case records. Clinical review of individual cases where complications occurred was also undertaken by clinicians responsible for individual surgical areas.

The definitions used in these databases can be viewed on the shared computer drive at N:\Groups\O and G Projects\Gynaecology Surgical Cases Database\Update and N:\Groups\Gynae Oncology\Database.

Analytical and statistical methods

All data have been analysed using Access, Excel, and STATA13. Tables are formatted with either column or row percentages as indicated.

Data cleaning queries (Maternity data)

The following is a list of the data cleaning and validation queries which were carried out for the production of this report. This list is not exhaustive and some further ad hoc cleaning was carried out during analysis.

Lead Maternity Carer

Check all LMC have correct LMC type and group
Check all unbooked women that LMC screen is correct
Check that all women have a LMC screen at birth
If women have booked after 13 weeks with NW LMC check that there is a reason for late booking

Antenatal

Ethnicity is Not Stated or Other
Check parity if parity is less than parity at previous live birth (although previously parity was defined as 2 for twins). Check that obstetric history has been completed for women with a gravidity >1.
Previous Caesarean; If indication for Caesarean section=repeat Caesarean, previous Caesar=yes and parity is > 0.
BMI (Body Mass Index) Calculated from earliest weight recorded, as weight (kg)/height(m)^2. If BMI <17 or >40, check height and weight or any mismatch of data

Antenatal Complications

If Antenatal Admission for Hypertension, APH or Diabetes, check Labour and birth mother screen, medical conditions is not = missing &/or check data is consistent.
If Induction Indication is Hypertension, APH or Diabetes, check Labour and birth mother screen medical conditions is not = missing &/or check data is consistent.
If Reason for Operative Birth is Hypertension, APH or Diabetes, check Labour and birth mother screen medical conditions is not = missing &/or check data is consistent.
If HDU Admission for Hypertension, APH or Diabetes, check AN or PN screen medical conditions & blood loss/ transfusion is not = missing &/or data is consistent.
Eclampsia = Yes in check Labour and birth mother screen.
Antenatal Diabetes screen without a PN Diabetes Screen & vice versa.
Newborn Diabetes; Newborn Discharge Summary, check for missing diabetic data.
Height and weight, check all fields are complete.
Smoking, check all women have smoking status at booking and at birth. Check all women who smoke have been offered smoking cessation.

Induction of Labour

If SROM at term and syntocinon is given before established labour then reason for induction is prolonged latent phase.
If time at ARM is earlier than established labour time, assume this is an induction.
If time at start of Syntocinon is earlier than established labour time, then check this is an induction.
If Syntocinion is started before 3 cms dilated check for Induction.
If indication for ARM is induction and time of ARM is established labour, then induction data are entered.
If indication for ARM is induction and time of ARM is after established labour time, then indication for ARM is labour augmentation.
If an induction occurred, there is an Induction Indication entered.
Indication for Induction Is Other Please Specify and Comment fields for checking.
Induction indication rupture of membranes at term but gestation is preterm.
Induction indication PPROM but baby is term.
Induction indication multiple pregnancy but baby is singleton.
Induction indication maternal age but baby is preterm.
Induction indication is poor Ob Hx but baby is preterm.

Pregnancy/Birth

Homebirths & BBA's (babies born before arrival at hospital when intended birth in hospital) All checked as appropriately classified.
Check all transfers in labour from Birthcare.
Check 'Delivered by' is not missing.
Check that admission to Labour & Birth Suite/Operating Theatre/WAU is before birth time (unless is recorded as BBA).
If birth location is BBA, then birth time is before admission.
Onset of contraction time is before full dilatation which is in turn before Birth time (sometimes there is no onset of contraction time because of pre-labour Caesarean).
Onset of contraction time should **not** be missing if method of Birth is Caesarean (elective or emergency) in labour.
Full Dilatation Time should not be null if Birth Method is a vaginal birth.
If indication for induction is SRM then rupture of membrane time should be before induction start time which in turn is before onset of contraction time.
Syntocinon time is before birth time.
Membranes ruptured time is not null.
Membranes ruptured time is before birth time.
Time of epidural insertion is before birth time.
Full dilatation time is before birth time.
Birth time is always before birth of placenta time.
Placenta birth time is not null.
Check all Classical Caesareans to ensure they are authentic.
Check all in established labour CS.
A Caesarean Section (CS) must have an option from the expanded tree to describe what type of CS. Cannot be just Lower Segment Caesarean Section or Classical Caesarean Section.
All emergency in labour CS must have an audit screen, Robson Group, urgency status. All emergency CS are checked by Labour and Birthing Suite.
If Birth Method is anything other than SVD or Spontaneous Breech Birth, check there is a reason for Operative Birth.
If Birth Method is a SVD or Spontaneous Breech Birth, check there is NO reason for operative birth.
If indication for operative birth is fetal distress, then fetal distress variable (in Labour & Birth Baby) is yes or meconium was present.
Check that elective CS does not have a reason for CS as failed induction.
Indication for Operative Birth Is Other Please Specify + Comment fields - for checking.
If Birth Presentation is Breech, should not be a Spontaneous Vertex Birth.
If Birth method is breech, then presentation is breech.
If Birth method is 'Elective CS' then Dilatation at Syntocinon should be null.
Membrane method is SRM but has indication for ARM, check.
If ARM check there is an indication for ARM.
If vaginal birth, membranes method should not be At time of C/S.
Birth Presentation is null.
If Dilatation at Epidural is not Null then Anaesthesia should show Epidural Lumbar or Epidural Spinal.
If Time of Epidural is not Null then Anaesthesia should show Epidural Lumbar or Epidural Spinal.
If Caesarean is mode of birth, anaesthesia is not missing.
Analgesia with elective CS.
If had an epidural, then dilatation at last VE is not missing and time of epidural is not missing.
If there is postpartum transfusion and blood loss is < 1000 mls, check blood loss.
Blood Loss is not out of range ie: <50, >1500 or is null.
Blood Loss >=1500 & Blood Transfusion = No.
Blood Loss <1500 & Blood Transfusion =Yes.
Vaginal Birth & Lacerations is Null.
Sutured by Is Not Null, Lacerations Is Null.
If Instrumental Birth (Forceps) then check for Episiotomy.
If woman has placenta praevia but not an elective CS.

Postnatal

Mothers Destination to Ward is somewhere within Auckland City Hospital but PN screen does not reflect this.
Mothers and baby's destination are not null.
Mothers destination not NWH's & PN Admission screen entered.
PN Adm - Missing 'Admitted to ward time', 'CMS Discharge date' or 'Admission Type'.
PN Adm - 1° Reason for PN Admission is Other & Comment.
PN Adm - 1° Reason for PN Admission is Null or SVD.
Mothers Destination to Ward & Admitted to (PN Admission Screen) do not match or is null.
If reason for admission is CS or instrumental birth but none of these occurred.
PN Admission - missing Admission Type.
Baby Destination (L&B Baby) is a NWH location, check Discharge Time & Discharge to & Discharge Care (Newborn Discharge Summary) is not null.
Newborn Discharge Summary Missing Data (If DHB is ADHB & LMC is NWH LMC).
Discharge Care - Postnatal Admission is NWH Homecare (includes Diabetic etc) but missing Postnatal Homecare Summary or Newborn Discharge Summary.
Discharge Care - Postnatal Admission NOT NWH, but Postnatal Homecare Summary Screen.
Postnatal Homecare Missing Data.
Breast Feeding Baby Unknown or missing fields from Immediate Newborn Assessment & Newborn Discharge Summary Screen.

Baby

Birth weight – check if <400g or >5kg.
If gestation <35 weeks, check birth weight if >2500g.
If gestation >35 weeks, check birth weight if <2500g.
Gestation: check if < 20wks or > 44 wks.
If indication for induction is post term, check gestation if gestation is < 40 weeks.
Gestation to Neonatal Gestation (Immediate Newborn Assessment screen) > 1 week difference if <28 weeks and >2 weeks difference if $\underline{\geq}$ 28 weeks.
Perinatal mortality database for perinatal deaths gestation to derived gestation > 1 week difference
Neonatal database gestation to derived gestation > 1 week difference.
(Because of the incomplete reconciliation of data sets, there may be a minimal number of cases where gestation varies in reporting of the neonatal and maternity data.)
Gestational Age (Immediate Newborn Assessment) Is Null.
Days in NICU/PIN/Paed care on Ward are not null or check if >30.
Missing Apgars.
Live birth with Apgars 1min or Apgars 5 min of 0.

Data Checks with Other Sources

CMS/ Coding data to ensure correct birth numbers.

Neonatology database; fields checked include Birthweight, Gestation, Apgars & Days in NICU.

Perinatal related deaths database fields cross-referenced with Healthware include; ethnicity, gestation – LMP/EDD, LMC, Gravida/Parity, Height/Weight/BMI, Outcome, Apgars, Sex, Gestation, Birth Weight, PSANZ-PDC & PSANZ-NDC classifications, customised centile.

PIMs theatre data checked against Healthware for epidural and GA, blood loss, operative vaginal birth and CS

ATLAS coding data cross checked with Healthware for hypertension, APH, diabetes, perineal trauma, mode of birth

APPENDIX 2 GLOSSARY OF ABBREVIATIONS

ABA	American Board of Anaesthesiologists	IUD	Intrauterine death
ACH	Auckland City Hospital	ICSI	Intracytoplasmic sperm injection
ACL	Anticardiolipin antibody	IVF	In vitro fertilisation
ACHS	Australian Council Healthcare Standards	IVH	Intraventricular haemorrhage
AMOSS	Australasian maternity outcomes surveillance	KPI	Key performance indicator
AMSIS	Auckland Maternity Services Information System	LB	Live birth
ANA	Antinuclear antibody	Ligate	Surgical ligation of PDA
ANZNN	Australia and New Zealand Neonatal Network	LLETZ	Large loop excision of the transformation
APH	Antepartum haemorrhage	LMC	Lead Maternity Carer
ARM	Artificial rupture of membranes	LMP	Last menstrual period
ASA	American Society of Anaesthesiologists	LNND	Late neonatal death
AUT	Auckland University of Technology	LSCS	Lower segment Caesarean section
BBA	(Baby) Born Before Arrival (not a planned home	LSIL	Low-grade squamous intraepithelial lesion
BFHI	Baby Friendly Hospital Initiative	LV	Left ventricle
BI	Business Intelligence	MAS	Meconium aspiration syndrome
BMI	Body mass index	MCDA	Monochorionic diamniotic twin
BP	Blood Pressure	MCMA	Monochorionic monoamniotic twin
BPD	Bronchopulmonary dysplasia	MDM	Multidisciplinary meeting
CDU	Child Development Unit	MFM	Maternal Fetal Medicine
CHD	Congenital Heart Disease	MSU	Mid Stream Urine
CI	Confidence Interval	N/R	Not resuscitated
CLD	Chronic lung disease	NAS	Neonatal abstinence syndrome
CPAP	Continuous positive airways pressure	NEC	Necrotising enterocolitis
CRIS	Clinical Records Information System	NFD	Not further defined
CS	Caesarean section	NICU	Neonatal Intensive Care Unit
CVA	Cerebro Vascular Accident	NIDDM	Non-insulin dependent diabetes mellitus
CVS	Chorionic villus sampling	NWH	National Women's
DAU	Day Assessment unit	NPSU	National perinatal statistics unit (Australia)
DBP	Diastolic blood pressure	NSU	National screening unit
DCCM	Department of Critical Care Medicine	NZBFA	NZ Breast Feeding Authority
DCDA	Dichorionic diamniotic twin	OP	Occiput posterior
DHB	District Health Board	OPU	Oocyte pick up
DIC	Disseminated intravascular coagulopathy	PCR	Protein Creatinine ratio
DNA	Did not attend	PDA	Patent ductus arteriosis
DORV	Double outlet right ventricle	PE/PET	Pre-eclampsia
DRG	Diagnosis related groups	PG	Prostaglandin
ECMO	Extra Corporeal Membrane Oxygenation	PIN	Parent Infant Nursery
EDU	Epsom Day Unit	PM	Postmortem
ENND	Early neonatal death	PMMRC	Perinatal & Maternal Mortality Review Committee
ERPOC	Evacuation of retained products of conception	PMR	Perinatal mortality rate
fFN	Fetal Fibronectin	PPHN	Persistent pulmonary hypertension of the newborn
FH	Fetal heart	PRLR	Perinatal related loss rate
FTE	Fulltime equivalent	(P)PROM	(Preterm) prolonged rupture of membranes
GA	General anaesthetic	PROM	Prolonged rupture of membranes
GDM	Gestational diabetes mellitus	PVL	Periventricular leukomalacia
GH	Gestational hypertension	RDS	Respiratory distress syndrome
GLH	Green Lane Hospital	ROP	Retinopathy of prematurity
GO	Gynaecologic oncology	PMMRC	Perinatal & Maternal Mortality Review Committee
GP	General Practitioner	PMR	Perinatal mortality rate

GPH	Gestational proteinuric hypertension	PPHN	Persistent pulmonary hypertension of the newborn
GSU	Greenlane Surgical Unit	PRLR	Perinatal related loss rate
GTT/OGTT	Oral Glucose Tolerant Test	RR	Relative risk
Hb	Haemoglobin	SBP	Systolic blood pressure
HbA1c	Glycosylated heamoglobin	SCBU	Special Care baby Unit
HDU	High Dependency Unit	SGA	Small for gestational age
HELLP	Hemolysis, Elevated Liver Enzymes, Low Platelets	SRM	Spontaneous rupture of membranes
HiFlow	High flow air oxygen	SLE	Systemic Lupus Erythematosus
HFOV	High frequency oscillatory ventilation	STOP	Surgical termination of pregnancy
HIE	Hypoxic ischaemic encephalopathy	SVB	Spontaneous vaginal birth
HIV	Human Immunodeficiency Virus	TCM	Transcutaneous oxygen monitor
HMD	Hyaline Membrane Disease	TGA	Transposition of the great arteries
HPV	Human papilloma virus	TIA	Transient Ischaemic Attack
ICH	Intracerebral haemorrhage	TOP	Termination of pregnancy
IDDM	Insulin dependent diabetes mellitus	UAC	Umbilical artery catheter
Indo	Treated with indomethacin	US/USS	Ultrasound/ultrasound scan
iNO	Inhaled nitrous oxide	VBAC	Vaginal birth after Caesarean
IPPV	Intermittent positive pressure ventilation	VLBW	Very low birth weight
IOL	Induction of labour	VSD	Ventricular septal defect
IUD	Intrauterine death	WAU	Women's Assessment Unit
ICSI	Intracytoplasmic sperm injection	wks	Weeks
IVF	In vitro fertilisation	WHO	World Health Organisation
IVH	Intraventricular haemorrhage		

APPENDIX 3 DEFINITIONS

Antepartum haemorrhage (APH)

Antepartum haemorrhage includes vaginal bleeding from any cause at or beyond 20 weeks during pregnancy and labour, and includes placenta praevia without bleeding. While bleeding before 20 weeks is also important we do not reliably collect these data.

Augmentation

Describes use of oxytocin or artificial rupture of membranes to accelerate established labour.

Breastfeeding

Exclusive breastfeeding: The infant has never, to the mother's knowledge, had any water, formula or other liquid or solid food. Only breast milk, from the breast or expressed, and prescribed (as per Medicines Act 1981) medicines have been given from birth.
Fully breastfeeding: The infant has taken breast milk only, no other liquids or solids except a minimal amount of water or prescribed medicines, in the past 48 hours.
Partial breastfeeding: The infant has taken some breast milk and some infant formula or other solid food in the past 48 hours.
Artificial feeding: The infant has had no breast milk but has had alternative liquid such as infant formula with or without solid food in the past 48 hours.

Chronic hypertension (CH)

Diastolic BP > 90mmHg at booking or a medical history of essential hypertension.

Early Neonatal Death (ENND)

Death of a live born baby in the first week of life before completion of 7 days of life.

Elective Caesarean section

An elective Caesarean is defined as a Caesarean which was scheduled in advance and scheduled prior to the onset of labour. Therefore, Caesarean sections performed after the onset of labour but booked prior to labour are included with elective Caesarean.

Ethnicity

Ethnicity is collected at each hospital registration with the standard census 2001 question. The ethnicity used in this report represents the most recent response by an individual to the ethnicity question, and so may not be the ethnicity given at the time of birth admission. Up to three options are input into the CMS (Case Management System) database. In preparing the data for this report, each mother has been allocated to a single ethnic group. When more than one ethnic group is recorded, the prioritised ethnicity system outlined in 'Ministry of Health. 2004. *Ethnicity Data Protocols for the Health and Disability Sector*. Wellington: Ministry of Health.' (available online at *http://www.nzhis.govt.nz/documentation/ethnicity/index.html)* has been used.

Table 272: Level 2 prioritisation of ethnicity as outlined in 'Ministry of Health. 2004. Ethnicity Data Protocols for the Health and Disability Sector.'

Priority order	Ethnic Group Code Description
1	Māori
2	Tokelauan
3	Fijian
4	Niuean
5	Tongan
6	Cook Island Māori
7	Samoan
8	Other Pacific Island
9	Pacific Island NFD (Not Further
10	South East Asian
11	Indian
12	Chinese
13	Other Asian
14	Asian NFD
15	Latin American / Hispanic
16	African
17	Middle Eastern
18	Other
19	Other European
20	European NFD
21	NZ European

The most summarised (Level 1) prioritisation is as follows: Māori, Pacific peoples, Asian, other groups except NZ European, NZ European. To this, we have added 'Other European' and split 'Indian' from Asian, both because these are a large group in our population and because their obstetric risk profile is significantly different from the remaining women in the 'Other' or 'Asian' category. In the majority of figures in this document, these categories are recombined. Level 2 prioritisation is given below.

Fetal Death

Baby of at least 20 weeks gestation, or at least 400 grams birth weight if gestation is unknown, born without any signs of life.

Gestation

The gestation used in the maternity section of this report is derived from Best Estimate of date of birth (EDD Best) calculated by Healthware at booking based on Last Menstrual Period (LMP), scan data (overriding LMP data based on scan

accuracy data sourced from the Australasian Society for Ultrasound Medicine), or clinical override of these dates as deemed appropriate. Healthware does not include gestation calculated from these data into its dataset, so this gestation, in weeks, is derived by taking the integer value of 40 + (date of birth - EDD Best)/ 7.

Gestational Diabetes (GDM)

This diagnosis is based on either a fasting glucose > 5.5mmol/L or a 2 hour glucose > 9.0mmol/L after a 75 gram oral glucose tolerance test, or glucose >11.0 after a polycose test.

Gestational hypertension (GH)

Gestational hypertension (GH) is a blood pressure systolic ≥140 and or diastolic ≥90 mmHg on two or more consecutive occasions at least 4 hours apart or one measurement systolic ≥170 and or diastolic ≥110 mmHg.

Infant Death

Death of a baby born alive before the age of 1 year.

Large for Gestational Age (>90th customized centile)

Birth weight greater than 90th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator.

Late Neonatal Death (LNND)

Death of a baby after the 7th day and before completion of 28 days of life.

Lead Maternity Carer (LMC)

The Lead Maternity Carer is the practitioner or caregiver service selected by the woman to have the legal professional and practical responsibility for ensuring the woman and her baby are given clinically appropriate care.

National Women's LMC services

- **Community Midwives** are the LMC for women who either self-refer or are referred to NWH for maternity care. The midwives provide continuity of antenatal and postnatal care to women who live in NWH geographical boundary. Labour and birth care is provided by NWH core Labour and Birthing Suite midwives.
- **Diabetic Midwives** are the LMC for women who are referred to the Diabetic Service for secondary/tertiary and LMC care. The midwives provide continuity of antenatal and postnatal care to women who live in NWH geographical boundary. The Diabetic Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.
- **Medical Midwives** are the LMC for women who are referred to the Medical Service for secondary/tertiary and LMC care. These women have complex medical needs. The midwives provide continuity of antenatal and postnatal care to women who live in NWH geographical boundary. The Medical Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.
- **Self-employed LMC services / Independent midwife**
- **General Practitioner** (arranges private or hospital midwifery care)
- **Private Obstetrician** (arranges private or hospital midwifery care)

Other LMC Services

- **Unbooked** are women who present at NWH, usually in labour or pre-labour, and who do not have an LMC.
- **Other DHB**: These women are usually transferred to NWH in late pregnancy, and remain with their original LMC. This LMC might be another District Health Board LMC or a non-NWH access holder (e.g. a private obstetrician or independent midwife without access rights at NWH or a homebirth midwife without access rights at NWH).

Live birth

Birth of a baby showing signs of life. In this report, live births are only included if ≥20 weeks gestation or ≥400g if gestation unknown.

Maternal age

Defined as mother's age at her baby's birth.

Mode of birth for multiple pregnancies

For analyses where the denominator is mothers, mode of birth is represented as the mode of birth of the baby requiring most intervention. Mode of birth has been prioritised as emergency Caesarean, elective Caesarean, forceps, ventouse, vaginal breech, then spontaneous vertex birth.

Onset of birth

Onset of birth has been defined by the 4 pathways to birth: (1) elective Caesarean section, (2) emergency Caesarean before the onset of labour, (3) induction of labour, and (4) spontaneous onset of labour.

Neonatal hypoglycaemia

Blood glucose < 2.3mmol/L.

Neonatal Death

Death of a live born baby before completion of 28 days of life.

Neonatal Death Rate

Early and late neonatal deaths per 1000 live births.

NZ Deprivation Index (2006)

An area-based measure of socioeconomic deprivation derived from variables from the Census of Population and Dwellings 2006. The score is assigned according to most recently recorded maternal place of residence and may not be place of residence at time of birth and is presented as a decile or quintile. Increasing deciles of deprivation, from least deprived (decile 1) to most deprived (decile 10), are associated with higher mortality and rates of many diseases (Salmond and Crampton 2002a, 2002b). Census area unit level data are used throughout this report.

Parity

The number of times a woman has given birth to a live born baby of any birth weight or gestation or to a stillborn infant at or after 20 weeks gestation or where the infant weighed 400g or more if gestation is unknown. Multiple birth adds only one to parity total.

Perinatal Mortality Rate (PMR)

Fetal and early neonatal deaths per 1000 total births.

Perinatal Related Mortality Rate (PRLR)

Fetal and early and late neonatal deaths per 1000 total births.

Postnatally (or newly) Diagnosed Type 2 Diabetes

Type 2 diabetes diagnosed by postnatal glucose tolerance test (GTT) or HbA1c in a woman diagnosed as a gestational diabetic (GDM) during pregnancy.

Postpartum haemorrhage (PPH)

Primary PPH is $\geq$500mls blood loss from the genital tract within the first 24 hours of birth. Secondary PPH is $\geq$500mls blood loss from the genital tract after 24 hours up to 6 weeks postpartum.

Preeclampsia (PE or PET)

Gestational hypertension accompanied by proteinuria measured as ≥2+ protein on one dipstick sample or PCR ≥30 on a spot urine sample, or a 24 hour collection ≥0.3g in 24 hours.

PSANZ-PDC (PSANZ Perinatal Death Classification)

Identifies the single most important factor which led to the chain of events which resulted in the perinatal death.

PSANZ-NDC (PSANZ Neonatal Death Classification)

Used in addition to the PSANZ-PDC to identify the single most important factor in the neonatal period which caused a neonatal death.

Small for gestational age (SGA) (customised)

Birthweight less than 10th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator.

Standard primipara

A woman with

- no prior birth $\geq$ 20 weeks
- aged 20-34 years at index birth
- with a singleton pregnancy
- cephalic presentation
- gestation 37-41 completed weeks
- baby not small for gestational age (customised centile $\geq 10^{th}$)
- no medical disease, defined as no history of cardiac disease, renal disease, mental health disorder, SLE, HIV infection, CVA/TIA, diabetes or hypertension
- no gestational diabetes in index pregnancy
- no pregnancy associated hypertensive disease in index pregnancy
- no antepartum haemorrhage during index pregnancy.

Vaginal birth after Caesarean section (VBAC)

Vaginal birth in a pregnancy subsequent to one in which birth was by Caesarean section.

Very Low Birth Weight

Birth weight less than 1500g.