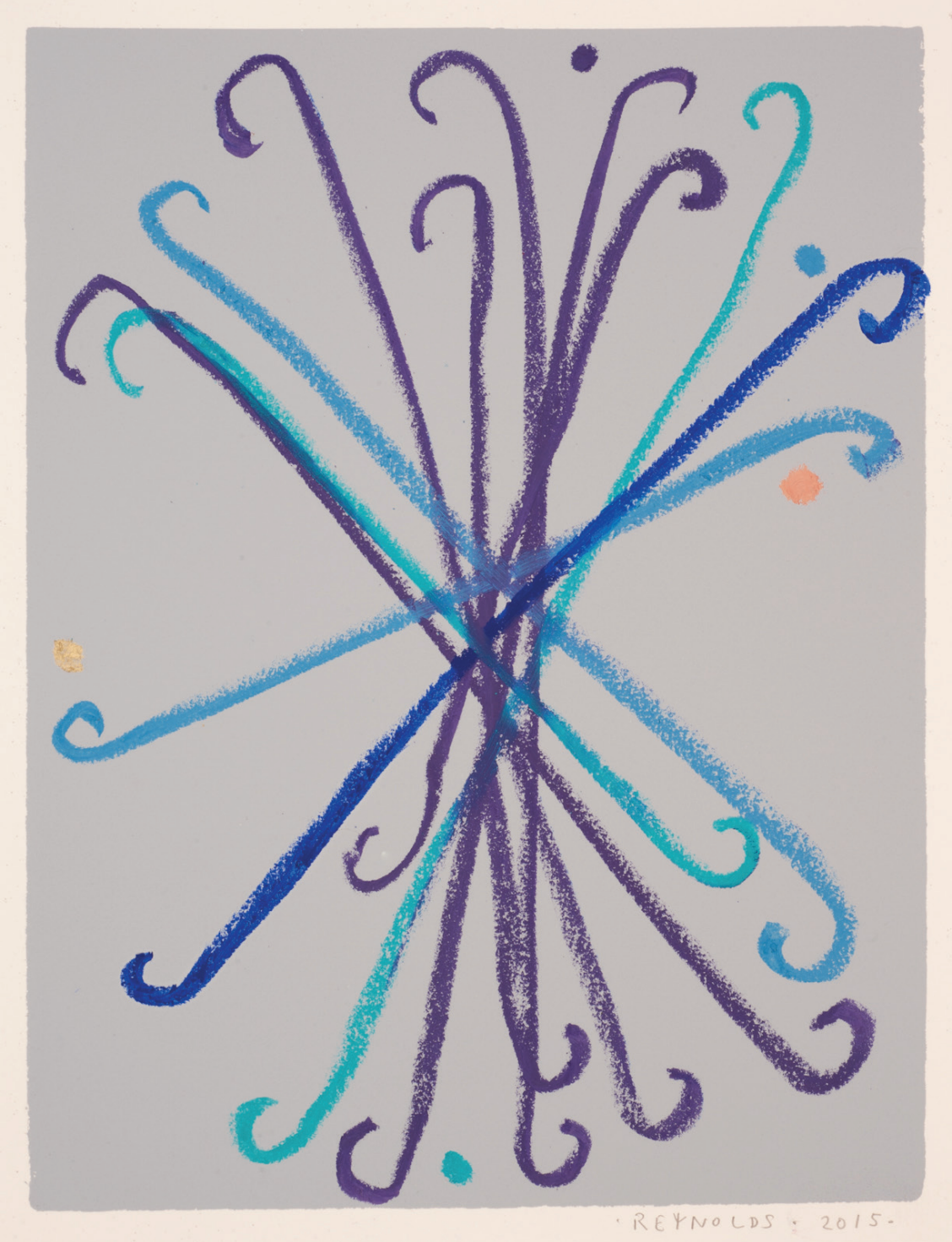
National Women's Annual Clinical Report
2014



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National Women's Annual Clinical Report 2014

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Cover artwork: John Reynolds
A Pacific blue array of overlapping and languorous koru forms, suggest the soft architecture of unravelling chrysanthemum petals, or perhaps an expanding diagram of connectivity, intensities, and circulation. Patterning the ever-repeating cycles of blossoming and fertility, the rawly calligraphic lines arc and loop - rapturous and bountiful against a seamless blue sky.

All efforts have been taken to produce accurate data for this report, however some inaccuracies may exist. Please contact any members of the project team if required.

Acknowledgements

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EXECUTIVE SUMMARY

1 EXECUTIVE SUMMARY

1.1 Director's Comment

This Annual Clinical Report is part of a long tradition of recognising that as a clinical service we must take full account of the care that we deliver. Historically this report has served to:

- chronical maternity, neonatal, and gynaecological care and outcomes of care over the previous calendar year;
- demonstrate trends in the population, service provision, interventions and outcomes over time;
- stimulate enquiry and improvement in services provided by national Women's
- encourage external commentary and critique of care provided at NW
- provide a benchmark for maternity and neonatal care in New Zealand against which other services might benchmark themselves.

The report contains a wealth of information about our services and outcomes of care using well defined and historical outcomes measures. This is particularly so for our maternity and neonatal service where we have a long established practice of collecting data via our maternity clinical information system (currently Healthware) and devoting considerable effort and resource to ensuring the data is reliable.

Maternity Quality and Safety has been formally monitored by the National Maternity Monitoring Group (NMMG), a committee of the Ministry of Health since 2012. All maternity services as required to report their core maternity outcomes and their performance against a set of defined standards. Each three years the NMMG determines priority areas for quality improvements. Maternity services are then required to report their performance annually against these priority objectives. In previous years we have created a separate Maternity, Quality and Safety Report. This year we have chosen to change the format of our Annual Clinical Report to incorporate the MQSP reporting requirements. Our performance against the MQSP initiatives is integrated into this report (chapter 3 Quality).

Overall our service delivers high quality care that benchmarks well, where comparable data is available. In our maternity service our overall caesarean section rate and spontaneous vaginal birth rate remains largely unchanged since 2010. At the same time the number of women choosing to birth in a midwifery unit (Birthcare) has continued to slowly decline. The gestation at birth has changed markedly over time with a significant reduction in later preterm births. High level perinatal outcomes measures have remained stable over the past 3 years. We have worked collaboratively with our regional partners to bring a more consistent approach to maternity care across greater Auckland. One example of this is the development of a regionally agreed induction of labour pathway. We are also in the final stages of producing a report which outlines the critical areas of focus for ADHB-WDHB to ensure we best meet the maternity needs of our populations over the next 10 years.

Our tradition of capturing and reporting on our gynaecology outcomes is less established and also less robust than for our maternity data. Our outcome measures are largely limited to demographic descriptors, volumes of procedures and a catalogue of complications. In areas such as colposcopy where we have mandatory reporting requirements and well defined standards our data contains a greater level of detail.

It is a priority for 2015 to improve the quality of our gynaecological data. This requires commitment and collaboration from our clinical workforce. Nationally and internationally there is growing interest from external agencies and the public in having access to reliable procedure specific outcome data. We believe that in addition to providing service level outcome data, such as is collated within this report, there is also value in having individual clinician level data to help drive quality improvement.

Within our gynaecological service a number of important service improvements occurred in 2014. Considerable progress was made in mapping patient pathways to care for common gynaecological conditions. This has enabled transition to electronic referrals which has enabled more efficient and better quality triaging to occur. An end to end pathway for women with abnormal uterine bleeding (the commonest reason for referral to the gynaecology service) was agreed regionally. This has culminated in the development of an outpatient hysteroscopy service, saving many women the need for an inpatient operative procedure.

In addition the gynaecological service achieved compliance to MOH defined elective targets in respect of the timeliness with which patients receive care at each step in their pathways. Work commenced on better defining pathways to care for women at risk of malignancy, defined as “high suspicion of cancer”, in preparation for compliance to new MOH targets due to commence mid 2015. Work is underway to redesign the Epsom Day Unit. Epsom Day Unit historically operated as an outpatient termination service but the range of procedures provided in the “day unit” is increasing to include those that manage and treat abnormal uterine bleeding and assist with fertility management.

During 2014 and into 2015 our Women’s Health service underwent a major reorganisation of its leadership and clinical governance structure along with the rest of ADHB. This was designed to ensure a more joined up approach to delivering care. One that took account of both the cost of care, timeliness of care and the quality of care delivered. It is too soon to report on the success of this new approach. However we anticipate that moving forward a quality agenda with a focus on patient valued outcomes will be reflected in objectively measured outcomes of care.

Our primary goal must be to achieve high value for our patients. Value in this context must take account both of the measurable outcomes of care and the cost of delivering that care. At present DHBs give considerable focus to measuring the processes of care rather than the outcomes of care. National Women’s has a solid foundation to build on given its commitment over time to measuring and reporting outcome data. However, we need to shift our focus from traditional measures to include those valued by our patients. While we are working as part of ADHB to better integrate our patients voice into our governance systems, we still have a way to go to give full strength to our patient’s voice and to work with them collaboratively to determine the outcomes of importance for our patient population.

Dr Sue Fleming, Director National Women’s Health

1.2 Consumer comment

It is with great pleasure that we provide this consumer overview and comment on the National Women's Annual Clinical Report 2014, as part of our roles as consumer members of ADHB's Maternal Maternity Quality and Safety Programmes' Clinical Governance Framework and our involvement with consumer organisation, Women's Health Action Trust. This is the first time a consumer voice has been included in the report signalling an increasing recognition of the value of consumer partnership.

The Annual Clinical Report produced by National Women's is a highly regarded and valued resource, which supports the accountability of the service for the care that has been delivered. It also provides an annual opportunity to assess whether National Women's Health's vision of "Excellent Women's Health Through Empowerment and Partnership" is being realised in the daily experience of care.

With over 280 pages in the report this year we are pleased to see the addition of the executive summary and summary of findings that provide a snap shot of service outcomes for the year. This will enhance the accessibility of the report to consumers and other interested members of the community. We welcome the range of service improvement programmes underway across the service in 2014, in particular improvements to patient pathways in gynaecology, the implementation of the Epsom Day Unit service review report, the review of the induction of labour process, and the introduction of overnight stays for family members in maternity. These are all welcome developments that stand to improve outcomes and enhance consumer satisfaction with the care provided at National Women's. We hope these efforts will be positively reflected in the outcomes presented in next years report.

We also note the identification of a number of other areas requiring improvements such as the high and growing caesarean section rate, the low number of women accessing external cephalic version for breech presentation, high rates of episiotomy, and the decreasing number of women achieving a vaginal birth after caesarean. We look forward to these areas being prioritised for service improvements over the next year. We support the increased focus on improving gynaecology outcomes and the quality of gynaecological data in 2015, especially given the higher level of formal complaints about the gynaecology outpatient service.

Capturing consumer experience remains a challenge for National Women's. A key vehicle for this remains the Patient Experience Surveys however with a return rate of less than 10% the survey gives a very limited insight into women's views of their journey through the services at Nationals Women's. We must also remember that although satisfaction surveys are widely considered a useful tool we hold concerns about the ability of satisfaction surveys to detect real differences in consumers' opinions. Research has shown that findings of high satisfaction in patient experience surveys can be misleading for example it can be difficult for a woman to express a preference for something else if she does not know what services are or could be made available or improved. In the case of termination services we know that consumers' experience is particularly difficult to capture because of the stigma and silence associated with the procedure. Through our roles as consumer advisors we are looking forward to supporting National Women's to develop innovative strategies for consumer feedback, engagement and participation to ensure the diversity of consumer perspectives are captured and responded too. This is fundamental to quality and safe services at National Women's and the fulfilment of its vision of partnership at the heart of excellent women's health services.

We commend the team at National Women's for the hard work that has gone into the preparation of this report and for continuing to encourage external commentary and critique of care provided at National Women's.

Isis McKay and George Parker, Consumer Advisors

1.3 Summary of findings 2014

MATERNITY

The data outcomes described in this report relate to the women who gave birth at NWH in 2014, including women who were transferred for tertiary care.

1 Seven thousand and four hundred (7400) women birthed at NWH in 2014 (including 47 women who intended to birth at NWH but birthed at home or on their way to hospital). There were 7551 babies born, including 286 twins and 12 triplets. Birthing numbers have been relatively stable at NWH since 1998.

DEMOGRAPHY

2 There continues to be a reduction in the proportion of women giving birth at NWH who are <21 years of age. In 2014, there was also a reduction in the proportion of women aged 36-40 and 41+ years among women giving birth at NWH. There has been an increase in the proportion of women giving birth at 31-35 years of age.

3 The population of mothers birthing at NWH continues to change by ethnicity, with the proportion of NZ European, Pacific and Maori women reducing year upon year, and the proportion of Indian, Other Asian, and Other European women increasing.

4 The rate of smoking at pregnancy registration was only 5.1% of mothers in 2014, and only 4.3% of mothers at the time of birth. However, smoking rates are high among Maori (31%) and Pacific (14%) mothers, and among mothers under 21 years of age (24%).

5 In 2014, 48% of women were registered with a self-employed midwife, 25% with a private obstetrician, and 26% with NWH clinic services.

ANTENATAL COMPLICATIONS

6 In 2014, there was a reduction in preterm births, both among early preterm births (<32 weeks) and late preterm births (32-36 weeks). The reduction is most marked among spontaneous preterm births.

7 NWH runs a Preterm Birth Clinic which receives referrals, from public and private LMCs, of women at high risk of preterm birth, and provides an assessment, management, and second trimester surveillance service.

8 Babies born small for gestational age (SGA) by customised centiles are at increased risk of morbidity and mortality compared to appropriately grown babies. In 2014, the national guideline for management of SGA babies from 34 weeks was implemented at NWH to increase antenatal detection and to improve evidence based management of suspected SGA babies.

9 The rate of multiple births remains low suggesting good compliance with single embryo transfer policies in assisted reproduction. Multiple pregnancy is an important risk factor for preterm birth, SGA, perinatal morbidity and mortality.

10 There has been an increase in the rate of elective Caesarean among twin pregnancies without any new evidence to explain this change.

11 In 2014, 96.4% of women birthing at NWH were screened for diabetes. Our data do not include details of the type of screening and when screening was performed.

12 The proportion of women at NWH with all types of diabetes continues to increase. In 2014, 9.8% of women who gave birth at NWH had gestational diabetes, 1.2% Type 2 diabetes, and 0.6% Type 1 diabetes.

13 Induction of labour rates among women with all types of diabetes were at least 55% in 2014. The Caesarean section rate for women with gestational diabetes was 37.4%.

14 Perinatal related death rates among babies of mothers with diabetes were not higher than among women without diabetes at NWH in 2014. Approximately 6% of babies of mothers with GDM had glucose levels <2.3mmol/l and 3% of babies were treated with intravenous dextrose.

15 Birth was artificially started in 75% or more of women with all types of hypertension in pregnancy i.e. birth followed induction of labour, elective Caesarean, or emergency Caesarean prior to labour.

16 Chronic hypertension and pre-eclampsia were associated with higher rates of perinatal related mortality, SGA, low Apgar scores, and NICU admission than normotensive pregnancies and pregnancies complicated by pregnancy induced hypertension alone.

17 High body mass index (BMI) is associated with hypertension, diabetes, primary Caesarean section, postpartum haemorrhage (both after vaginal birth and after Caesarean section), iatrogenic preterm birth, SGA, and admission to NICU.

18 The maternal fetal medicine unit (MFM) cared for 1081 new referrals in 2014. Babies with cardiac anomalies are the most common reason for review.

LABOUR AND BIRTH

19 Among term births, there has been an increase in births at 38 and 39 weeks. There has been a corresponding reduction in births at both 40 weeks and above, and at 32-36 weeks.

20 Among all mothers giving birth in 2014, approximately half (47.6%) of labours began spontaneously.

21 There were 1281 (17.3%) elective Caesarean sections, 281 (3.8%) emergency Caesarean sections before labour and 2315 (31.3%) of women started their births with an induction of labour.

22 The elective caesarean rate is highest among women attending a private obstetrician (36.5%) and this increases year over year.

23 There was a reduction in the rate of induction of labour to 31% in 2014, although it is still approximately 5% higher than 10 years ago. This may be due to a review of the evidence base for induction and implementation of a regional guideline in late 2014.

24 Induction of labour increases with increasing BMI. Women under the care of medical clinic have a higher rate of induction of labour (49%) compared to community women (30%), but the rate of induction in both groups were lower than in 2013.

25 Term ruptured membranes is the most common indication for induction (5.5% of all births), followed closely by diabetes (4.9%), small for gestational age (4.5%) and postdates (4.3%). Term ruptured membranes and postdates are the most common indications for induction among women having their first baby, while diabetes and small for gestational age are the most common among women having subsequent babies.

26 Only 7% of inductions for postdates in 2014 occurred prior to 41 weeks (an improvement compared with 12% in 2013 and 15% in 2012).

27 The spontaneous (unassisted) vaginal birth rate was 54%. The spontaneous vaginal birth rate in standard primiparae at NWH was 62.6% in 2012 compared to the national average in secondary and tertiary facilities of 64.7%.

28 Pacific and Maori women having their first baby have higher rates of spontaneous vaginal birth than other ethnic groups.

29 The Caesarean section rate was 34.6%, with half of these being elective and half emergency Caesareans. The Caesarean section rate was 35.8% among women having their first baby and 33.5% among multiparous mothers. In the mid-1990s the Caesarean rate was 20%; and has been relatively stable since a peak reached in 2006.

30 Caesarean section rates increase with age and BMI and vary by ethnicity and LMC.

31 The most common reason for elective or prelabour emergency Caesarean is “repeat Caesarean” (41%) and the second most common is maternal request (12%; 19% among nullipara and 8% among multipara).

32 There has been an increase in the Caesarean section rate among women who have had a previous Caesarean section and have a singleton cephalic term pregnancy from 69% in 2004 to 79% in 2014.

33 The successful vaginal birth rate among all women who have had a prior Caesarean birth at NWH was 20% in 2014; 63% of women who have had a prior Caesarean birth had an elective Caesarean section in 2014.

34 The proportion of women who had one previous birth which was a Caesarean and presented at term with a singleton cephalic pregnancy and attempted a VBAC and were successful increased (but not significantly) from 44% to 51% between 2006 and 2014; however, as the proportion of women attempting a VBAC decreased over this time, the proportion of women achieving a VBAC overall dropped significantly from 22.6% to 17.3% over this time.

35 The operative vaginal birth rate was 11.5%, 4.3% of babies delivered with the assistance of forceps and 7.2% with the assistance of Ventouse. The operative vaginal birth rate was 19.8% among women having their first baby and 3.6% among multiparous women.

36 Seventy three women had an attempted external cephalic version for breech presentation in 2014. This is 32% of the potentially eligible population (breech presentation at term or attempted ECV) which is fewer than in 2013. The success rate was 43%. Eighty one percent of women who had a successful ECV went on to have a vaginal birth.

37 Sixty eight percent of women laboring with their first baby, and 34% of women laboring with a subsequent baby had an epidural in 2014. The use of pethidine for pain relief in labour has reduced with 6.9% of laboring women given pethidine in 2014 compared to 21.5% in 2006. Fewer than 10% of laboring women used a birthing pool for analgesia in 2006 and 2014.

38 Epidural anaesthesia was used significantly more often for pain relief by women whose labours were induced than by those whose labours began spontaneously. Among both nulliparous and multiparous women, this increased usage is of the order of at least 20% of women undergoing induction of labour.

39 There was a higher rate of interventions among women under private obstetrician LMCs including a higher rate of induction of labour, elective and emergency Caesarean and episiotomy.

40 In 2014, 421 women started labour at Birthcare Auckand. Twenty percent of women (37% of women having their first baby, 7% of women having subsequent babies) transferred to Auckland Hospital in labour and birthed there. The overall spontaneous vaginal birth rate for women beginning labour at Birthcare Auckland was 89%. Six babies required admission to neonatal intensive care (1.4%). The exclusive breastfeeding rate among all women beginning labour at Birthcare Auckland was 95.2%.

LABOUR AND BIRTH COMPLICATIONS

41 In 2014, 1371 women had an episiotomy (28.3% of vaginal births), and 139 women suffered third or fourth degree tear (2.9% of vaginal births). Episiotomy rates at NWH were the highest they have been in 20 years in 2014, while third/fourth degree tears have remained at a stable rate since the increase (probably due to increased education on recognition of perineal injury) in 2007.

42 Episiotomy and third and fourth degree tear rates are compared nationally among standard primipara. Rates of episiotomy without third or fourth degree tear at NWH are significantly higher than the national average rates. The rate of third or fourth degree tear with and without episiotomy are equal to and lower than (respectively) the national rate. In our response to the National Maternity Monitoring Group in 2014, it was noted that this was in part explained by higher rates of perineal trauma among Asian women who make up 43% of the standard primipara population at NWH, and in part explained by higher rates of episiotomy among self-employed midwifery and obstetrician LMCs.

43 A new tool to document perineal trauma has been introduced to the service to ensure accurate ascertainment of data and evidence based care and follow up for all women with perineal trauma after birth.

44 Overall blood transfusions were given to 181 (2.5%) of women birthing at NWH in 2014. This rate has stabilized since the highest rates of 3.0 and 3.3% in 2008 and 2009.

45 Postpartum bleeding of 1000mls or more was recorded after 10.1% of births, after 7.3% of spontaneous vaginal births, 12.7% of operative vaginal births and after 13.5% of Caesarean sections. This is the highest rate recorded in our service, but is a less objective measurement than transfusion rate which has decreased, and may be explained by improved measurement of blood loss.

46 Perinatal related mortality rate was 12.8/1000 babies born at NWH in 2014. This is the lowest rate reported since 2001.

NEONATAL/POSTNATAL CARE

47 In 2014, 2313 (31%) of women were discharged to Birthcare Auckland for postnatal care, 4777 (64%) to NWH postnatal wards, and 4.2% to home or other postnatal units. The most common reason for women to stay at NWH for postnatal care was for neonatal care (40%).

48 In total 809 babies born at NWH (10.8%) were admitted to the neonatal intensive care unit (NICU) in 2014; 409 babies born preterm (<37 weeks) and 400 babies born at term (>=37 weeks). Three babies born before arrival were also admitted to the neonatal intensive care unit.

49 A further 101 babies were admitted to the NICU at NWH after birth in another facility.

50 The exclusive breastfeeding rate among live born babies excluding those admitted to NICU was 77.7% in 2014. One hundred and thirteen (1.7%) of live born babies not admitted to NICU were discharged solely artificially fed.

GYNAECOLOGY

51 Clinical outcomes of fertility cycles (IVF and ICSI) at Fertility Plus in 2014 meet ANZARD 2012 benchmarks for women of all ages.

52 Fertility Plus piloted a New Zealand mandatory single embryo transfer policy in the latter half of 2014 and maintain multiple pregnancy rates below the Australasian standard.

53 Gynaecology surgical data are intended to be entered at point of care by the surgeon, and post-operative complications later by clerical staff. Improvement is required in data processes to spread the workload to maintain the completeness and accuracy of the dataset and to enhance the usefulness of this report.

54 Half of our elective gynaecology surgical population had a BMI above the normal range in 2014.

55 Overall complication and readmission rates remain stable, however blood transfusion remains above benchmark. Transfusion rates with hysterectomy have however decreased slightly. A significant proportion of gynaecology surgery transfusions in 2014 were due to acute early pregnancy complications.

56 More information is required regarding possible areas for improvement in readmissions.

57 Overall intraoperative injury rates are stable and within benchmark. There were no cases of ureteric injury in 2014 and no cases of bladder injury at laparoscopic hysterectomy for benign conditions. Laparoscopic hysterectomy has had no cases of ureteric injury reported for the past 7 years at ADHB.

58 The ethnic mix of women undergoing hysterectomy at ADHB does not reflect that of the Auckland region, which may be an indicator of access to private medical care.

59 There is some concern regarding injury rates for repeat urogynaecological procedures in the same compartment.

Colposcopy

60 Referrals for Colposcopy for women under 20 years of age continue to fall, in line with the National Cervical Screening guidelines.

61 Data quality for colposcopy is compromised pending an upgrade of the database.

62 Colposcopic prediction of biopsy-proven high grade disease is still not meeting the standard.

63 The ‘no dyskaryosis after treatment’ rate remains below standard, however the number of patients requiring a second treatment remains low and is not practitioner-dependant.

64 General anaesthesia for LLETZ procedures continues to be utilized at a rate above standard. Further information is required regarding a possible effect on waiting times for treatment.

65 Most women who have no follow up after cervical treatment have moved from this practice area. All had adequate attempts at contacting the patient and their referrer. All patients were offered an appointment within the expected 8 month time frame.

66 The ‘primary haemorrhage’ after treatment rate remains very low, with conservative management being sufficient in both cases which did occur.

67 Waiting times for initial appointments are within the national standard. Treatment waiting times are highly variable and sometimes outside of the standard. An audit of the latter is planned.

68 Non-attendance rates at colposcopy clinic remain stable, varying on a monthly basis between 6-14%.

REGIONAL GYNAECOLOGY

69 A combined Gynaecologic Oncology Multidisciplinary Meeting (MDM) has been established, with live video links to all 8 referring DHBs across Northern and Midland Regions.

70 The Gynaecologic Oncology workload continues to rise steadily, with 10% increase in MDM workload in 2014.

71 There were 969 referrals and 2075 MDM discussions in 2014.

72 431 inpatient surgeries were performed in 2014 and complication rates have fallen further.

73 More than 95% of referrals to Gynaecologic Oncology are discussed at MDM or seen in clinic within 2 weeks.

74 Ministry of Health Faster Cancer Treatment 62 day targets are not being met. A project is underway to explore this pathway and the limitations.

75 The number of terminations of pregnancy continues to fall with 3842 procedures in 2014.

NEWBORN

76 There were 910 neonatal unit admissions for 2014 with an average occupancy of 95% over the year. This is a little lower than in 2013 but still very high for an intensive care unit (NICU).

77 The ethnicity of babies admitted to NICU was 36.2% NZ European, 15.2% Asian, 15% Maori and 14.6% Pacific. This is the first year that Asian babies have formed a higher proportion of admissions than Maori.

78 In 2014 there was an increase in the numbers of late infections due to *Staphylococcus epidermis* and Coagulase negative staphylococcus, which prompted the unit to undertake further work addressing this problem.

79 Respiratory support is an important part of intensive care. Hi Flow humidified air/oxygen was introduced in to the unit a couple of years ago and use continues to increase with 170 babies supported in this way for 2014, approximately a third of these are term babies. This system offers advantages in the ease of care during neuro-developmentally appropriate activities and softer interface with the baby.

80 Key neonatal outcomes are benchmarked against the Australia New Zealand Neonatal Network (ANZNN) dataset. For 2014 the rates of retinopathy of prematurity (ROP), Chronic lung disease and necrotising enterocolitis (NEC) were all favourable in comparison with ANZNN. However, numbers are small so rates vary from year to year.

Chapter 2

OUR SERVICES

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. The appointment of a Service Clinical Director for primary services is the beginning of this process.
- 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 Whanau 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 agreed 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 2013 Auckland District Health Board embarked on a major transformation of leadership roles within the organization. The basis of this change was to strengthen the concept of clinical leadership and appoint clinical leaders who were responsible for not only clinical quality but also operational and financial performance of their directorates and/or services.

Clinical leadership as the point of accountability is described as "delivery of safe and effective services and sustainable results for:

- Increased patient safety
- Better quality care
- Improved health status/patient outcomes
- Staff engagement
- Economic sustainability."

Our Women's Health Service is now 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.

The structure now allows us to be more intentional about the way in which we deliver care to our local Auckland population compared to those services we deliver for the region or in some cases New Zealand. It also better supports the development of clear patient pathways to care (from community to Women's Health) and pathways of care (within Women's Health).

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

2.3 Collaboration between ADHB and WDHB

Since 2013, Women's Health services in Waitemata DHB (WDHB) and Auckland DHB (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, which comprises of clinical leaders and managers from both District Health Boards (DHBs), Planning and Funding, Maori, Pacific and Asian Health Gain Managers and two consumer members, providing representation for both ADHB and WDHB.

The purpose of the collaboration is to develop viable options for future maternity service configuration across the two DHBs in a way that ensures:

- Increased responsiveness to the needs of wāhine/women and their whanau/families
- Strengthened clinical practice
- Equitable access to services, particularly for wāhine/women with high social needs and from minority ethnic groups
- Improved system function and consistency
- The most efficient use of ADHB/WDHB combined resources.

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

In order to inform future maternity system design the Collaboration Steering Group has:

- Undertaken a review of the current models of care and configuration of services across primary, and secondary services

- Modelled future demand for primary and secondary maternity volumes over the next 10 years
- Developed a collaborative model of care that includes recommendations for location and configuration of future services.

Stakeholder engagement has been a critical and important part of our process to help us identify gaps in our current maternity services and issues related to how we deliver care. Stakeholder engagement has included:

- Focus groups with a variety of internal and external stakeholders
- Focus groups with Maori, Pacific and Asian women
- A stakeholder workshop in January 2015 where patient scenarios were used to test our understanding of the issues and possible solutions.

Five broad groups of issues were identified through stakeholder engagement and a review of evidence

- Inequalities in health outcomes, particularly for Maori, Pacific and some Asian wāhine/women and babies, as evidenced by, lower birth weights (Maori and Asian), more gestational diabetes (Pacific and Asian), perineal trauma (Asian) and perinatal mortality (Maori and Pacific and Indian)
- Fragmented care for some wāhine/women, as evidenced by late registration with an LMC, lack of access to timely availability of clinical information, and duplication of activity
- Inconsistency in the models of care, for example, variation in practice such as access to elective Caesareans
- Quality and safety issues, for example, declining primary birthing and rising intervention rates
- Facility issues, particularly access to primary birthing options, and future capacity issues.

The next step is to consult on a range of proposals that are intended to address the issues described above. On completion of consultation, the steering group will collate feedback and review the proposals to ensure their alignment with the needs of the community and maternity professionals, and individual DHBs strategic plans to inform final decisions to be taken by both DHBs' boards. in October/November 2015.

Following approval from the DHB boards, implementation will begin in 2016. Wherever possible, co-design principles will be used in detailed planning of the service and facility enhancements to ensure ongoing consumer, community, Iwi and clinician involvement.

Summary of Stakeholder engagement in plan development

Consumer engagement has been a strong feature of the process to clarify the key issues and develop the proposals for enhancement of maternity services. Expressions of interest for consumer membership of the Steering Group were canvassed from key consumer organisations, and two consumer representatives were appointed on the basis of their strong background and links with consumer organisations and networks (including Women's Health Action, Playcentre, national maternity consumer networks, and homebirth community and breastfeeding networks). Additionally a number of small targeted focus groups with Māori, Pacific, Asian and general maternity consumers were also carried out.

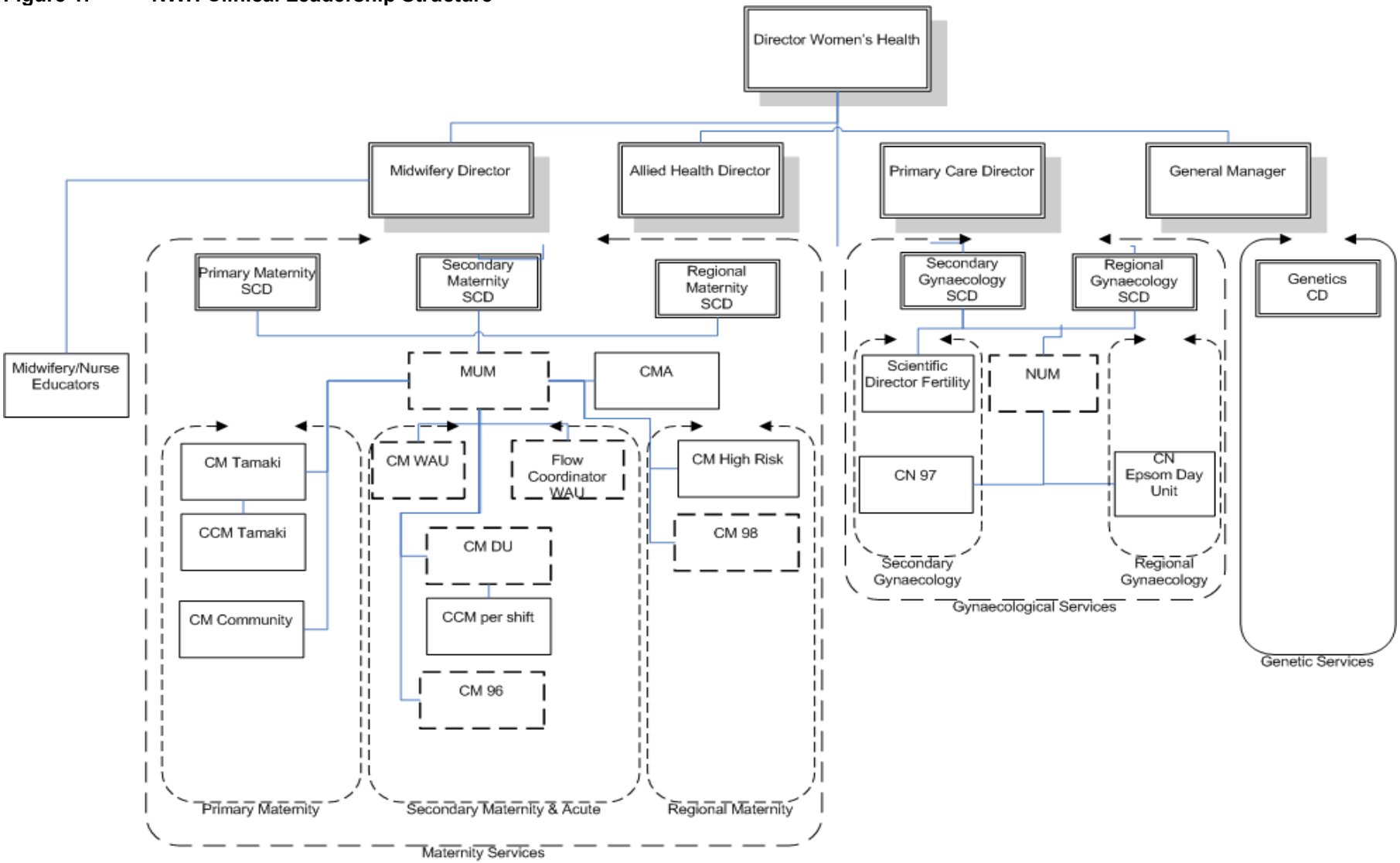
In addition, key stakeholders, including representation from Pacific and Māori health providers, Asian health stakeholders, consumer groups, and teenage parenting specialist groups, were invited to attend a Stakeholder Workshop in January 2015 where the key issues and service enhancement proposals were tested using case vignettes.

The following community organisations and provider groups were engaged through attending the Stakeholder Workshop and/or via individual and small group interviews undertaken for the Steering Group by *Health Partners*:

- Health Link North
- Kidz First
- La Leche League
- MAMA Maternity
- Maternity Services Consumer Council
- Tani Health Babies, Healthy Futures
- Te Haoranga
- The Fono
- Thrive Teen Parents

- Waitakere Health Link
- Whakawhetu
- Women’s Health Action.

Figure 1: NWH Clinical Leadership Structure



2.4 Service Provision

2.4.1 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 who is 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. NW 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 on occasion 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 184 admissions in 2014. 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 1511 referrals 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 number for virtual clinics has increased during 2014 for women with particular conditions.
- The Whanau Ora multidisciplinary team provides a midwifery- lead fortnightly forum for midwifery, maternal mental health, 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; less 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

2.4.2 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.

2.4.3 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/ whanau.

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.

2.4.4 Womens Health Workforce

Womens' Health Directorate workforce is made up of a large number of diverse professional roles which provide care to both our Gynecology 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.

2.4.4.1 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 Midwifery. 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.

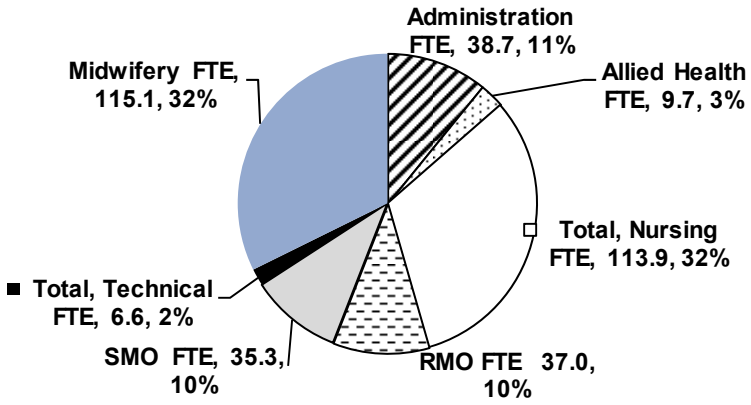
As shown in the report LMCs perform approximately 74% of our total births. Currently 160

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.

2.4.4.2 Employed workforce

National Women's employed 463 staff in 2014 as midwives, nurses, specialist medical officers (SMOs), junior doctors (RMOs), allied health professionals, technical and administrative staff.

Figure 2: 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.

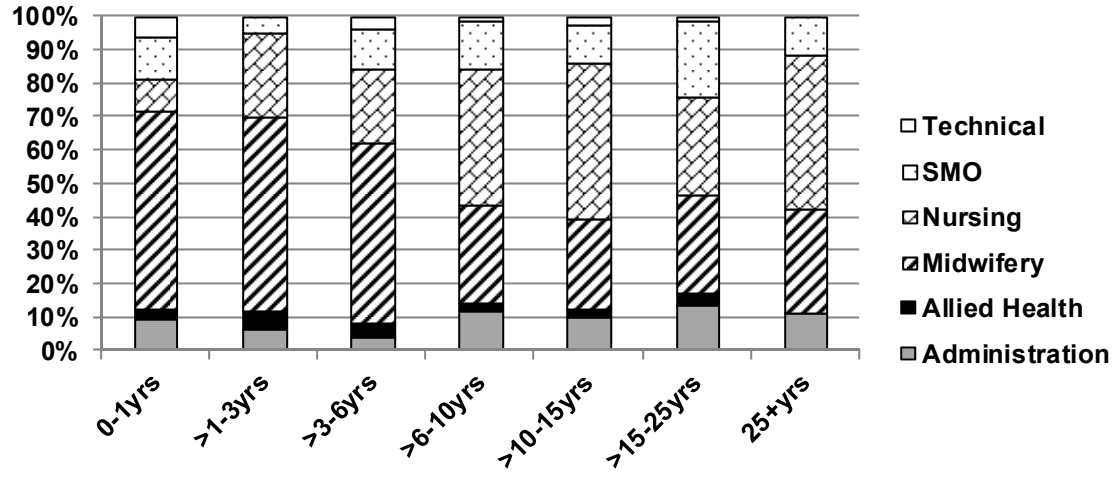
Where National Women's provide LMC service, labour care is provided by the hospital core midwives in Labour and Birthing Suite.

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

Table 1: Distribution of NWH staff by individual full time equivalents (FTE)

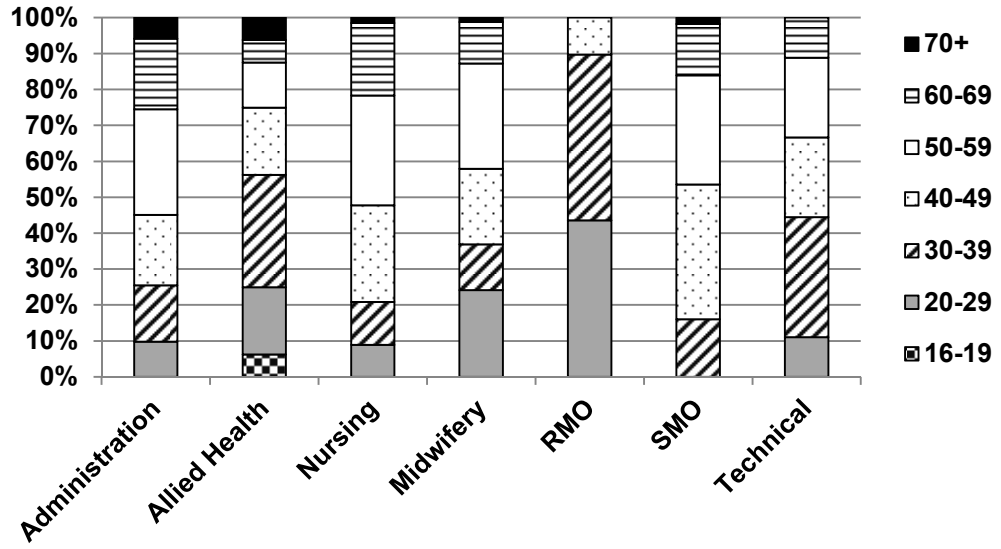
FTE	Total staff members 463	
	n	%
0.3-0.4	35	8
0.5-0.6	70	15
0.7-0.8	100	22
0.9-1.0	229	49

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



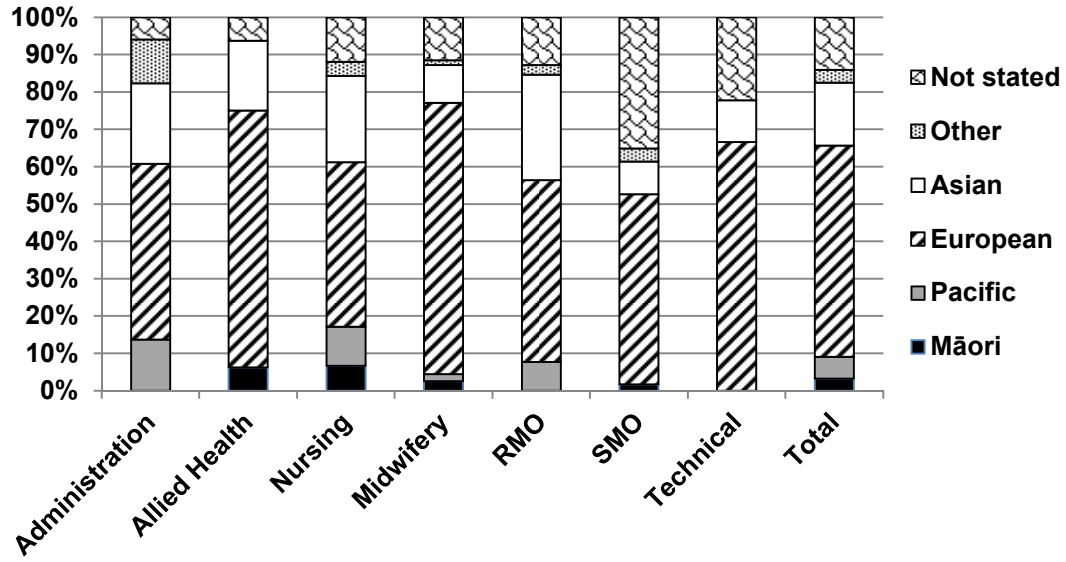
National Women's has a loyal and committed workforce. The average length of service across all of the occupational groups is 10 years. Within the workforce we have 41% of staff who have worked at National Women's for more than 10 years.

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 Maori, 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 Maori 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.

2.4.5 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 149 FTE provided by 164 staff. As shown in the figures below, the majority of the staff are nursing staff. Eighty one percent of the staff work 0.7 or more and 38% are aged 50 or more. Forty one percent of staff have worked 10 years or more in the NICU.

Figure 3: NICU full time equivalents (FTE) by occupational group

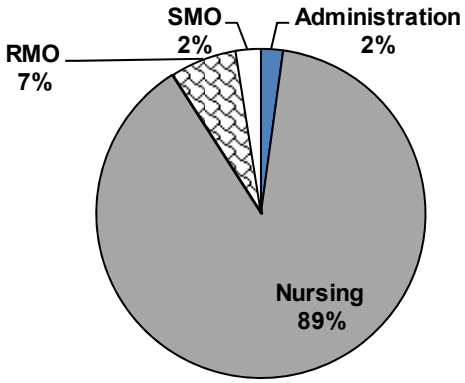
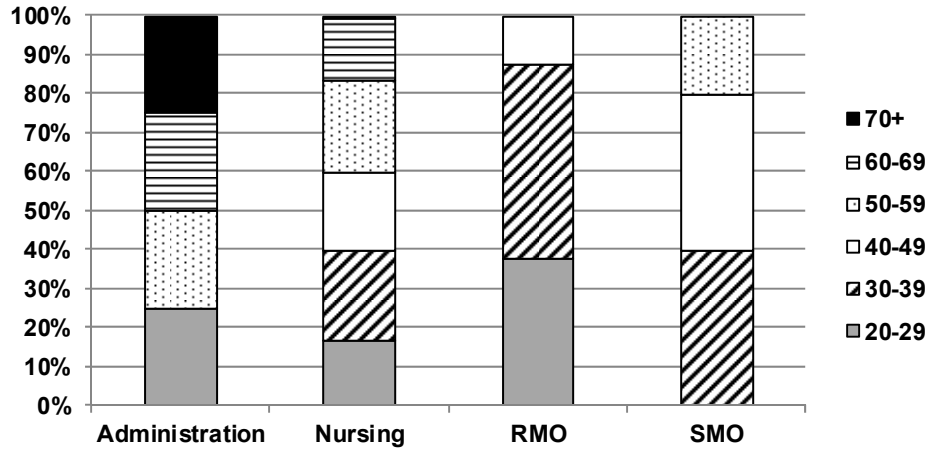


Table 5: Distribution of NICU staff by individual FTE

FTE	Total staff members 149	
	n	%
0-0.2	7	5
0.3-0.4	7	5
0.5-0.6	16	11
0.7-0.8	23	16
0.9-1.0	96	65

Figure 6: Age of NICU staff by occupational group



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

2.5 Funding of Maternity Services

2.5.1 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.

2.5.2 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.

2.5.3 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.

2.5.4 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.

Chapter 3

QUALITY

3 QUALITY

Women's Health has a strong quality improvement framework implemented across the services. The following outlines the structures to ensure a rigorous approach to quality. Specific improvements are presented under the service headings.

3.1 Clinical Governance Framework

National Women's has an integrated governance structure which brings together clinical quality with other structures and measures of service quality under a combined Clinical Governance and Management Operating Systems (MOS), framework. The structure supports, enables and provides a broad oversight and governance across the Women's Health Directorate from Directorate level to the ward and sub-service level. The structure includes:

- Level 2 Clinical Governance/MOS group- multidisciplinary representations across whole of Women's Health with membership from other services involved in providing care: anaesthetics, radiology and neonatology.
- Level 3 Clinical Governance Groups which relate to service level issues and under the responsibility of the Service Clinical Directors.
- Level 4 Clinical Governance/MOS groups which relate to specific areas of sub-service groups and are under the responsibility of the Charge Nurse, Charge Midwife or lead Clinician.

Feeding into the Clinical Governance structure are a number of other quality activities:

The MOnitoring Trlage and Follow up Committee (MOTIF)

The MOTIF (MOnitoring Triage and Follow up) Committee consists of the senior leadership team and provides oversight for incidents, complaints, staff and consumer concerns within the service. This well-established group meets weekly and ensures issues are being appropriately reviewed, follow-up occurs and actions tracked.

Rapid Multidisciplinary Review Panel (RAMP)

The aim of the review process is to efficiently and effectively review events, using a multidisciplinary process, to identify system failures and inform quality improvement. The RAMP is not used for serious or sentinel events (SAC 1 and 2) or for review of individual practice. Cases have been reviewed since 2013.

Following discussion, the team determine whether there were contributory factors present, and whether there are specific issues or recommendations arising from the review which address the factors identified. Contributory factors were defined for this purpose as modifiable components of the health system and issues of quality of care that cover a broad spectrum of management, personnel, and patient responsibility. The tool for assessment of contributory factors and potentially avoidable morbidity and/or mortality is adapted from the PMMRC (Perinatal & Maternal Mortality Review Committee) tool.

Gynaecology Clinical Review Panel (GCRP)

Gynaecological cases with complications are reviewed by this multidisciplinary group. The purpose is to support best surgical practice and identify opportunities for service improvement. Recommendations about service improvement are fed back to the appropriate level Clinical Governance group.

The quality framework enables the following;

- Escalation and reporting to the level 2 Women's Health Clinical Governance Group and MOS meetings; and cascading and delegating to related Level 4 Service Governance Groups
- Maintaining coherence of processes, information and actions across the hierarchy of Levels 2, 3 and 4 Women's Health Governance Groups, including coherence and linkage with Daily Meetings (where these exist in the service) in order to create a continuum of governance at all levels of the directorate; from the staff who deliver clinical care, to the Director of Women's Health.
- Ensuring Women's Health Services provided are safe, of a high quality and are consumer centered.

- Monitoring the financial and operational performance of the Women's Health Services
- Monitoring clinical and operational risk and adopting risk mitigation strategies as agreed or directed
- Assessing Women's Health Service performance against strategic plans, including District Annual Plan, the Ministry of Health Maternity Quality and Safety Program, and other relevant accountability documents, documented standards and legislation.
- Assessing strategic issues relating to the provision of services in relation to the strategic direction of the overall Women's Health Service.

3.2 ADHB Quality Department

The activities of Women's Health feed into and intersect with the broader ADHB quality structure. The Women's Health Clinical Governance structure is supported by a 0.33FTE Clinical Effectiveness Advisor (CEA) from the ADHB Quality of Service Department. The CEA provides advice on quality processes, taking the lead for co-ordinating the serious and sentinel SAC 1 and 2 event investigations, review of other reportable events, certification, risk management and providing a link between other ADHB services.

3.3 The Consumer Voice

3.3.1 Consumer Representation

During 2014 Senior Policy Analyst George Parker (Women's Health Action Trust) and Maternal Child Health Promoter Isis McKay (Women's Health Action Trust), nominated representatives, continued their consumer representations 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 Maternity Clinical Governance Group. They are both highly valued contributors to clinical governance oversight at Auckland DHB through the contribution of consumers' perspectives.

Through their roles as consumer representatives they have both participated in a number of working parties and review groups. Projects include the induction of labour working party, early registration with a Lead Maternity Carer working party and abnormal uterine bleeding pathway review group.

3.3.2 Patient Experience Survey

ADHB emails a survey each week to all people who have been discharged 1 to 2 weeks previously to find out about their experience. The survey covers all the core dimensions that most directly impact on consumer satisfaction and allows each person to talk in more depth about the areas most important to them. In 2014 there were a total of 877 surveys completed for Women's Health (606 for maternity and 271 gynaecology). Although the proportion of women who have responded is small (<10%) the individual units are able to use the qualitative data.

The survey relies on validated email addresses being available. The service has become aware that the number of emails obtained and then approved as correct is only 25% of all inpatient admissions. Increasing the collection of email addresses and then adhering to the ADHB process of ensuring they are accurate and officially validated will increase the proportion of women who are sent the survey.

The following are a small representative sample of the type of feedback our patients give us via this survey tool:

The entire team of Tamaki Ward not only did their jobs with competence and professionalism, but also displayed emotional awareness, understanding and great deal of kindness. "better described as professionalism with a human touch."

The consumer was very appreciative of the incredible support she received from the team at the Women's Assessment Unit (WAU). The amazing help and support given was of great help and comfort to her. The fetal specialist team who cared for her and her partner during the difficult time of losing their little baby. She would like to acknowledge the incredible work of the teams.

Needed a little more follow through and what happens after I leave the hospital.

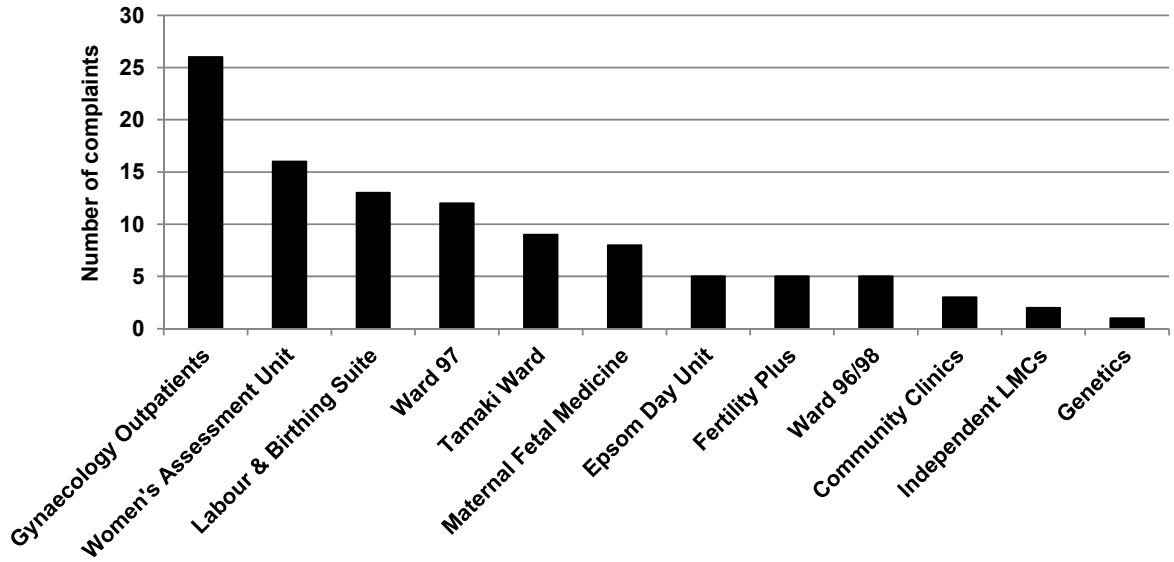
I had a 10 hour wait for my surgery - not enough communication on what was happening.

What I was in hospital for was quite a personal issue and they were very professional in dealing with it with me which was very important and comforting.

3.4 Complaints 2014

A total of 105 formal complaints were received during 2014. This includes 10 complaints that were referred via the HDC. The complaints are fairly evenly distributed across our services. The Consumer Liaison Service receives the complaints and forwards to the senior management team to manage the response process. The goal during 2014 and onwards has been to ensure improvement actions outlined in the responses to consumers have been tracked and implemented.

Figure 4: Number of complaints by area 2014



3.5 Consumer Information

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/whanau 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, Tuesdays and Wednesdays.

Consumer Information requests

Email / phone calls. The WHIU receives approximately 80 emails per month from consumers via the National Women's health website and Healthpoint. These emails and any phone calls received are answered and/or forwarded to the correct department.

Online presence

- *National Women's Health website*
  http://nationalwomenshealth.adhb.govt.nz/about-us/patient-visitor-information
  The National Women's Health website is our main source of electronic 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 three ADHB maternity pages on Healthpoint. Community Team Midwives, Labour & Birthing Suite, Maternity/Pregnancy Care. 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 us with 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, ADHB, TAHA. We have 199 people "liking" our page. Users can post to our page or send private messages.

Paper Resources

- A selection of paper resources is available from the WHIU on level 9.

Face to face service

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

3.6 Incident Management

During 2014 there has been significant improvement in the tracking of recommendations and completion of recommendations. Although there is further work to be done processes have been set up to ensure closing of the loop will occur.

All incidents occurring at ADHB are logged and monitored within an incident monitoring system (RiskPro). All Women's Health incidents are reviewed and triaged by the MOTIF meeting. Depending on the type of incident and its severity it will be investigated in one of several ways:, lower level incidents are reviewed by the relevant area charge nurse, midwife or clinical lead;SAC (Severity Assessment Code) 1 & 2 incidents are subjected to a formal review process, using standardized methodology; maternity incidents of lesser severity but where it is felt there are opportunities for system improvement are reviewed using the Rapid Multidisciplinary Panel (RAMP) Review Process; gynaecological incidents related to surgical care are referred to the Gynaecological Clinical Review Meeting or the level 3 Gynaecological Clinical Governance Group;

SAC 1 & 2 reviews

Table 7: Reported events in Women's Health 2014 by Severity Assessment Code (SAC) score

SAC score	Number of reported events
1	4
2	4
3	92
4	292
Not completed	46
TOTAL	**438**

In line with the National Reportable Events Policy, Women's Health reports 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 Score which is a numerical rating created by the level of harm and likelihood of reoccurrence, 1 being the most serious. A formal review is undertaken of all SAC 1 & 2 events. Below are some of the learnings from these events.

Incorrect Unordered Medication/Fluid: Following a medication error in the Birthing Suite it was found that there was a culture of only one midwife being present at the birth. An education programme was introduced which included the role of the 'second midwife' to assist with preparation of medications at the time of birth. This practice is now embedded.

Retained Vaginal Swab: In response to incidents of retained vaginal swabs the Birthing Suite removed all swabs from the birthing packs. The spare packets of suturing swabs available in the unit are only large. A new process of recording swab count has been introduced. Audits are being undertaken to evaluate the implementation.

Burn from Heat Pack: Following a review of a burn from a heat pack it was found that other services within ADHB also needed a temperature controlled heat pack. The product development team are looking at developing an effective product for all areas.

Hearing support: In 2013 and 2014, the HDC hearing support person took two four hour sessions on caring for women with hearing loss, which were well attended and found by the staff to be useful.

3.6.1 Rapid Multidisciplinary Panel (RAMP) Review Process

This process is described earlier in this chapter (3.1). Below is an analysis of the 23 cases reviewed using the RAMP process during 2014.

Table 8: Women's Health Rapid Multidisciplinary Review Panel (RAMP) cases 2014

Area within Women's Health	Number of cases
Maternity (Total)	**14**
Placenta accreta	1
Infection	2
Preeclampsia/eclampsia	2
Rhesus incompatibility	1
PPROM	1
Undiagnosed SGA	1
Ruptured splenic artery aneurysm	1
Puerperal sterilisation	1
Renal calculi with nephrostomy	1
Maternal collapse	1
Uterine Rupture	1
Stillbirth	1
Gynaecology (Total)	**2**
Endometrial carcinoma	1
Discontinued surgery	1
Neonatal (Total)	**7**
Neonatal encephalopathy	5
Neonatal death at home	1
Neonatal stroke	1
TOTAL	**23**

The issues and recommendations identified from the reviews are entered into a log and allocated an owner so that the implementation can be tracked.

Contributory Factors Identified
Twenty of the 23 cases were identified as having contributory factors.

Communication: Communication between services was a contributory factor in three cases. In a further three cases communication between staff was inadequate and considered a contributory factor.

Improvements in process: Below is an example of changes made to the service in response to identification of issues within the case review.

Anti-D: The practice of referring to a transcribed blood group led to Anti-D being missed. At registration the blood group is no longer entered into the maternity clinical database (Healthware) to reduce the risk of a transcribing error. Health professionals are required to find the blood group directly from the original laboratory results. An extra field was added to Healthware in a further attempt to create a system which ensures that Anti-D has been given if required.

Community Antenatal care of indwelling catheters: An education session was given to the community midwives at a team meeting to increase awareness of the District nursing department referral system and of their ability to care for women with indwelling catheters.

RAMP Feedback

Consumer feedback has been improved following significant events with the introduction of the RAMP review process. It has enabled the service to provide explanations to women and their families about what happened and what will be improved based on a rigorous review.

With the introduction of the new Women's Health structure, the Service Clinical Directors will take responsibility for review processes such as RAMP, including informing LMCs of reviews, sharing findings and following up any recommendations made.

The report templates are being refined to meet the needs of the service and the women and their families.

3.7 ADHB Family Violence Intervention Training

The ADHB Family Violence Intervention programme is part of the Ministry of Health Violence Intervention Programme (VIP). The Family Violence Screening Programme (as it exists today) began in Women's Health in 2005.

- This programme is run nationally in New Zealand with standardised management, training and evaluation systems
- The intention of the programme is to ensure that Women's Health staff are able to competently and confidently routinely screen all women on suspicion of abuse, and support and protect children and young people subjected to abuse and neglect
- An integral element of the Family Violence intervention programme is the provision of staff training. This training comprises Core training (8 hours), Advanced training (4 hours) and updates (1 hour)
- The primary focus of the training is to increase staff knowledge and skills in family violence intervention including:
  - Routine questioning for partner abuse
  - Recognising signs and symptoms of child abuse and neglect and how to respond effectively to disclosure
  - Assessment including dual risk assessment
  - Safety planning
  - Making appropriate referrals to specialist family violence agencies and CYF
  - Documentation requirements for health professionals.

Table 3: Staff attending Family Violence Intervention training 2014

	Core training	Advanced training	Updates	FV Champion Day
Midwives	18	2	22 (Community)	4
Nurses	5	1		
Allied health	2	1		
Other	16	1		
Total	41	5	22	4

New Zealand Family Violence intervention audit data

- The purpose of the audits is to provide useful, reliable and meaningful data which can then be used to inform the family violence intervention programme at ADHB. Staff value knowing how well their ward or department is screening and being advised on any issues that the auditing process has identified
- Each DHB submits data to a unique database maintained by Auckland University of Technology. The aim is to be able to provide national statistics on family violence screening and disclosure rates
- Between 2005 and 2015, we have attempted several styles of auditing. The process we are now using has provided several months/years of meaningful data
- The expectation is that all women receive routine screening as pregnancy is known to be a period of increased risk of family violence
- Screening rates across Women's Health range from at their lowest, 0% to their highest 67%
- The average screening rate across Women's Health for April 2014 was 39%
- In 2013, the ADHB Family Violence Steering Group decided to set 'target rates' for screening. These are based on the rates already achieved as seen in the audits and a desire to see more women given the opportunity to seek help if they are experiencing violence. The 2014 target for Women's Health was 40%.

In summary, while it is apparent that Women's Health came close to achieving our screening target, we fell short of that the Ministry of Health's expectation that 100% of women are screened. We are concerned that the uptake of training opportunities we provide has been low. Both of these issues will be given a greater focus in 2015.

3.8 Maternity Quality and Safety Programme

The Maternity Quality and Safety Programme, 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 ADHB and WDHB.

The following roles have been supported through Maternity Quality and Safety Programme 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 recommendations from incident reviews, consumer feedback and concerns from staff, thus closing the loop
- Women's Health Information Intelligence team has been supported to continue the development of an Annual Clinical Report, provide data for audits and clinical indicators
- Administration support for the above roles and activities
- Funding for consumer, midwife and obstetric LMC representatives to attend Level 2 and Level 3 Clinical Governance groups.

3.8.1 Maternity Quality and Safety Program Priorities

3.8.1.1 Early Registration with an LMC (NMMG and PMMRC priority)

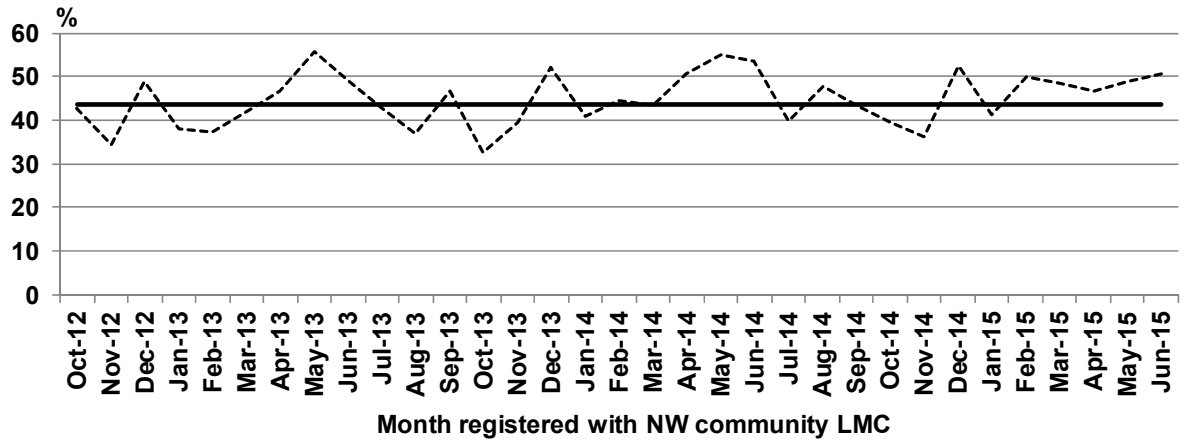
It is a national, regional and local priority to ensure that women are seen early in their pregnancy and register with an LMC by 13 weeks. Early registration affords the opportunity to:

- Offer screening for congenital abnormalities, sexually transmitted disease family violence and maternal mental health, with referral as appropriate
- Provide education around nutrition, smoking, alcohol and drug use, and other at-risk behaviour
- Recognize underlying medical conditions, with referral to secondary care as appropriate, and
- Identification of at-risk women (maternal age, obesity, maternal mental health problems, multiple pregnancy, socioeconomic deprivation, maternal medical conditions).

Over the past 3 years a number of ADHB projects have been undertaken to help us understand why a proportion of our women do not achieve early registration. We know that commonly it is women with difficult social circumstances, and from our more deprived communities who are over represented in the group of women who book late.

In addition we have explored ways in which we might work together with our regional DHB partners, particularly Waitemata DHB under our Maternity Collaboration project, to explore ways in which we can work together to achieve more consistent early registration across our maternity populations.

Figure 5: Registration rates with a NW community midwife <13 weeks gestation (2012-2014)



Understanding why women book late

In 2014, 63.5% of women who birthed at NW and registered with an LMC did so in the first trimester compared to 64.3% in NZ overall. Of women who registered with an ADHB community clinic LMC in 2014, only 48% did so within the first trimester.

We have undertaken significant work to help us better understand local factors which contribute to women in Auckland booking after 12 weeks with an LMC.We know from our data analysis that women who register with the community clinic after 13 weeks gestation are more likely to be of Maori or Pacific ethnicity, younger and to live in areas of higher socioeconomic deprivation.

To further understand the reasons and barriers to timely LMC registration we have undertaken analysis of electronic visit data for women under the care of NWH Community midwifery clinics, surveys of late registrants, and surveys of LMCs. A full report of these projects will be available via the NWH website when complete.

To date we have identified the following significant barriers to achieving the DHB goal of 80% of women registered by 13 weeks gestation as:

- A shortage of self-employed midwives in the ADHB area
- Self-employed midwives in the community are busy (due to the shortage)
- Women not understanding the importance of registering early
- Recent immigration and lack of knowledge of the New Zealand system
- Women not knowing they are pregnant
- First trimester of care funding model for GPs.
- Care is not always delivered in a manner that is accessible and culturally appropriate

We are working to improve the quality of information collected on why women are registering after 13 weeks by modifications to the facility booking form and Healthware (maternity database).

Work to encourage early registration with an LMC:

Work streams which have been undertaken by ADHB to improve the early registration rate include:

Expanding the capacity of the Walk-in-Centre.

The Walk-in-Centre is based on the Greenlane site. It provides a triage service for all the referrals which come from GPs, self-employed midwives and direct self-referrals from women to the secondary service. The number of midwives in this service has been increased to improve the processing time of the referrals. There are approximately 250 referrals a month from GPs for a pregnant woman to be seen by a midwife and approximately 5000 total referrals a year through the centre. The Walk-in-Centre supports women to find a self-employed midwife. If a self-employed midwife cannot be found then the woman will be cared for by the ADHB employed midwives at the community midwifery service.

Strengthening relationships with General Practice

There has been a strong focus on developing relationships with the GPs so they refer women early and increase the information they provide on referral. NWH has increased the number of ADHB employed midwives working from GP practice rooms and there has been an aim on further increasing this presence.

NWH has been visiting and talking at PHO group meetings. The Walk-in-Centre has written articles for GP newsletters on their role and referrals. The feedback from GP meetings has been very positive; the role of the Walk-in-Centre is well-defined. GPs have named midwife contacts and are building relationship with the service.

Working with Priority Populations

Midwives caring for teen mothers and their families, liaising with the local schools and working on improving communication with Well child/Tamariki Ora services and Thrive Teen Parent Support.

Maori and Pacific engagement of women has been encouraged by Maori and Pacific midwives working with other services such as Ngati Whatua o Orakei Health Services - Tamariki Ora Services team to ensure information about booking early is widely known and point of contact easily identified.

A pathway for referral to the Walk-in-Centre has been developed for the local CYF service, following visits and discussion around the importance of early antenatal care in pregnancy. Liaison has been

set up with the New Migrant Centre to provide education and information on pregnancy and the reasons for booking early.

Improving communication and information

Self-employed LMCs have also been encouraged to book women at less than 13 weeks gestation through communication at clinical governance groups, regular Access Holders meetings and email updates.

We have also improved the information on how to locate a midwife on our National Women's website and we have developed a Facebook page to encourage early registration, "Pregnancy and Early Family Care".

Regional Early Engagement operational (working) group (EEG)

A regional Early Engagement operational (working) group (EEG) which reports to the Auckland DHB and Waitemata DHB Women's Pregnancy and First Year of Life Alliance has been established. A number of workstreams have been established:

- Clinical pathway progression
- Promotion of early engagement to women (education/information/advertising)
- Survey of GPs to provide evidence of current practice
- Development of 'good news stories'
- Education and relationship building GPs and LMCs
    - Pathway promotion when complete
    - Funding clarified
    - Clarity around current GP first trimester practice
- Improving the ease of referral/booking – e-referral, maintenance of systems that work
- Progress strategies to support information sharing between providers
- Progress work on pregnancy care coding in primary care.

Support LMCs to transition to self-employed practice

To meet the needs of women in the ADHB area to have a self-employed midwife there would need to be another 40 self-employed midwives with access agreements at NWH. NWH has worked with AUT to promote a midwifery workforce model where a new graduate midwife works at ADHB for a year, finishing her 3 monthly rotations in the community service. From the community service the midwife can go into self-employed practice taking her employed caseload with her. This overcomes the barrier for midwives of not earning for 6 months when they first go out into practice. These midwives will be well supported by the NWH employed community midwifery team.

Enhancing the cultural appropriateness of care

We know that wāhine/women who identify as Māori or Pacific and teenage wāhine/women tend to register later for maternity care, have more fragmented care and fewer antenatal appointments than wāhine/women from other backgrounds. Feedback from these wāhine/women tells us that many do not fully understand our maternity system or know how to make contact with a midwife. We are exploring within our Maternity Collaboration project way in which we can make care more accessible for these vulnerable populations by offering care in more culturally ways.

Early registration work for the next 12 months:

Develop regional educational material for women.

The GPs of Auckland often work in different practices and some women are highly mobile. Collaboration with regional DHBs to develop joint educational material for women will ensure that consistent messages are being given to GPs and women.

Focused work with GP's in targeted locations

ADHB has identified that women living in Mt Roskill and 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 next step for NWH is to work with the GPs in these areas to improve early referral rates or to support the GPs to provide first trimester care and to find LMCs who would like to work in those areas.

Develop creative ways of providing information to women

A number of regional early engagement initiatives are already underway to encourage and enable

early engagement with a LMC. One proposal being explored regionally is to develop a pregnancy phone application (App) to provide women with key information to navigate the maternity system. We know from a recent survey that over 95% of pregnant women living in the Waitemata area have access to a smart phone.

3.8.1.2 Variation in gestation at birth

Overall pre-term births

We have observed a drop in preterm birth at 32-36 weeks from 7.2% in 2004 to 6.2% among births at NWH. During this period, there has also been a reduction in preterm births <32 weeks (from 2.9% in 2004 to 2.5% in 2014). These downward trends are due to a significant reduction in spontaneous preterm births.

National Womens has a number of clinical and research activities in the area of pre-term birth which both drive improvement in outcomes and enhanced understanding of the reasons and possibly interventions to further reduce spontaneous pre-term birth.

Further detail is available in this report in sections: 5.1 Pre-term birth and 6.1 Gestation at birth.

Reducing Late Preterm Births

Late preterm birth was a specific interest area for the National Maternity Monitoring Group in 2014. This has been a specific area of focus for our service. Improvement projects have focused on timing of induction of labour and planned caesarean section to reduce the incidence of iatrogenic late pre-term birth.

An agreed regional induction of labour guidelines, Auckland Consensus Guideline (ADHB, WDHB & WDHB), provides a more consistent approach to induction of labour. This is available on our website for access by all health professionals.

A more structured induction of labour booking process, commenced later 2014 allows us to collect prospectively information on indications and gestation to enable more appropriate management and triage of induction bookings.

We continue to provide support to women with previous caesarean sections to consider vaginal birth at our Positive Experience after Vaginal Birth Clinic (PBAC).

Despite these initiatives we have observed a consistent trend to an increasing percentage of births occurring at 37, 38 and 39 weeks gestation (see **Figure 47**).

Further detail is available in sections: 6.1 Gestation at birth and and 6.2 Iatrogenic birth..

3.8.1.3 Consistent and Coordinated Maternal Mental Health Services

Acute Perinatal and Infant Mental Health pathway

Considerable progress has been achieved in strengthening the acute end of this pathway across the Northern Region. We have worked collaboratively with our DHB partners and multidisciplinary mental health, maternal mental health and inpatient teams to ensure 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
- Enhancements of the maternal mental health workforce

The Request for Proposals (RFP) for the Evaluation of services within the continuum has been completed and a successful organisation has been identified. The Northern Region Acute Mother and Baby Mental Health Service Clinical Governance Group continues to meet and is responsible for supporting clinical and peer networking across the region. Regional coordination is working well and Maternal Mental Health teams are working collaboratively to prioritise access to the Mother Baby Unit

(MBU). The Crisis Respite and Support Hours Service will commence in May 2015. WALSH Trust have taken a tenancy on a four bedroom house in Te Atatu as an interim while the six bed facility is built and beds will be operational as soon as sufficient staff are employed and trained. The implementation of the full "Northern Region Perinatal and Infant Mental Health Model of Care" has been delayed due to difficulties with recruitment to the after-hours roster. Negotiations with the Unions are continuing. A contingency plan and risk mitigation strategies are in place to support the MBU and other elements of the model.

The referrals will be access managed by the maternal mental health services for both the mother baby unit and the residential respite and support hours service. GPs and midwives can refer women directly to the maternal mental health service who will follow up with the referral and ensure that women meet the eligibility criteria. This is an acute continuum of care so these services are prioritised to women with acute mental health needs. These services are not for the mild to moderate end of the spectrum.

Non-acute maternal mental health pathway

A focus for the future is for the non-acute part of the spectrum of need. This has been highlighted as an area of focus within the Maternity Collaboration strategic plan.

3.8.1.4 Understanding and monitoring Maternity ultrasound usage

The National Maternity Monitoring Group 2014 report identified that there has been a trend towards the number of ultrasounds being performed in each pregnancy increasing across New Zealand from 2 per woman in 2004/5 to almost 3.5 per woman in 2011/12. The section 88 claims data from the MOH, as published in the NMMG report showed the average for women of Auckland DHB domicile to be about 3.7/pregnancy.

Hypotheses to explain the increase include increasing complexity of women, increased use of the 'dating scan', and increased use of scans without evidence-based clinical indication. One of the consequences of inappropriate use of ultrasounds is pressure on ultrasound resources such that scans are not available for clinically important reasons.

In order to address the use of ultrasound where there is no clear clinical indication MQSP has asked DHBs to do the following:

- DHBs should work with consumer networks through the MQSP to ensure they're fully informed about the reason for ultrasounds and their screening purpose.
- DHBs and the professional colleges to prioritise ultrasounds by jointly reviewing the evidence in relation to scans and the indications for ordering them in relation to the evidence

Work to date

A regional Obstetrics Ultrasound Governance group, under the auspices of the Northern Regional Radiology Network, has been established, to monitor and define quality standards for obstetric ultrasound including reasons for use. This group includes representation from community ultrasound providers, DHB professionals and independent LMCs.

Future work planned

To work collaboratively across the region and with the professional colleges to understand reasons for increased ultrasound use.

To educate the maternity workforce around the appropriate timing of ultrasound scans.

3.8.2 Other Maternity Improvement Projects

Maternity Services continually look to improve the services they provide to women and their families. Below are some examples of projects in response to consumer needs. Many of these projects are identified and managed through the Clinical Governance Groups. The following are some examples:

3.8.2.1 Consumers with Additional Health and Social Needs

The known inequitable health outcomes for women in high needs groups are beginning to be addressed through the work of the collaboration between ADHB and WDHB. This is demonstrated through one of its objectives 'to achieve equitable access to services, particularly for wāhine/women with high social needs and from minority ethnic groups'. The following initiatives are in progress.

Ensuring a culturally diverse team of health care professionals

National Women's has developed a Maori Midwifery team and has recruited three Māori midwives. The Māori team will enable the development of a kaupapa Māori in Women's Health and facilitate more Māori women being cared for by Māori. The goal is to provide a similar team for the Pacific Community.

The community team has employed a case loading Pacific midwife who services the Glen Innes/Panmure area and we have been working with the Tongan Health Society (THS) for a year now, holding clinics in their Onehunga practice. Although numbers have been small, the building of relationships with THS and with Counties Manukau DHB and self-employed midwives for Tongan women living in the south has been very beneficial.

Recruitment of new staff has been through a stronger cultural lens in order to reflect the ethnicities of our population. This year among 12 new graduate midwives employed we have two Māori, one Afghani, one Chinese, one Cook Islander, one Fijian Indian, one Somalian and five Pakeha.

Enhancing governance over priority populations

Relationship building through the Well Child/Tamariki Ora working group meetings has improved understanding and facilitated better communication.

A Wahine Ora multidisciplinary team meets fortnightly to plan care of families with high social acuity. The Wahine Ora Advisory Group is transitioning to provide a governance process for the Wahine Ora multidisciplinary team. This group is following the guidance of the national 'Toolkit' that has recently been released to develop a referral pathway for women with high social needs.

The aims of the Wahine Ora Advisory Group are to:

- Give appropriate advice and support to clinicians providing care to wahine with social complexities during their pregnancy and throughout the postnatal period.
- Identify and support wahine with social complexities
- Ensure timely and appropriate care planning to support the best possible outcomes for wahine, pepe and their whanau.
- Assist wahine and their whanau to access appropriate support services
- Encourage relationships between agencies to ensure effective communication and collaboration

Appropriate and timely triage of referrals

The Walk-in-Centre has had an increase in the midwifery FTE (within the community budget) to accommodate and triage an increased number of referrals. The referral process has been improved to facilitate more timely contact of women after antenatal referral from within our own service. It is also now part of the admission process to ensure all women reviewed or admitted without an LMC are referred to the Walk-in-Centre prior to discharge in order for the midwives to have a conversation about choice of LMC with the woman.

Work has also been done to encourage consented referral to the Walk-in-Centre from the Emergency Department, Well child/Tamariki Ora services, Sexual health and CYFS.

The standard of clinical information provided for a secondary referral consult has improved substantially on Healthware, ensuring the obstetric team is able to make well informed decision/plans regarding care.

Healthy Families Healthy Futures

The Healthy Families Healthy Futures pilot programme is a MOH funded project, led by WDHB that NW is participating in. The funding has enabled a collective of Pacific providers to run 50 workshops targeting Pacific women and their families across ADHB and WDHB to improve health literacy/education specifically the importance of

- Nutrition
- Smoking
- Exercise
- Healthy weight gain
- Eat for one
- Food safety and listeria
- Iodine, iron and folic acid
- No alcohol, smoking and drugs

- Movement - walk 3-4 times a week

3.8.2.2 Overnight stay for family members in maternity

Following the success of a trial of 'rooming in' of a family member in one of the maternity wards, all maternity wards have been set up to cater for one nominated person to stay with women at all times. The following comments are examples of those received via the Patient Experience survey from women and their families who have stayed in the service.

I was able to have my husband over any time of the day and night which really helped not only me but it was flexible that he was able to check on my family at home too

Having my husband stay made a huge difference from the last time I had a baby at ADHB.

My partner didn't even need to ask if he could stay with me after my C-section, the midwives brought him sheets and a mattress and kept him involved in the care of our baby the whole time.

3.8.2.3 Enhanced Recovery after Obstetric Surgery (EROS)

EROS was introduced for all elective caesarean sections in August 2014. A multidisciplinary group developed a patient care pathway adapting the principles of enhanced recovery to obstetric surgery, a patient information booklet and diary, and a pictorial chart of pain medication.

Following research approval, audits were conducted before and after the introduction of EROS examining its impact on a range of subjective and objective measures. This included an anonymous questionnaire survey of 100 patients pre and post introduction with visual analogue scores for pain, satisfaction with information provided, side effects of analgesia, ability to carry out baby care activities and satisfaction with overall care and length of stay. A retrospective notes review collected data on time to first mobilisation, bladder catheter management, length of stay, breastfeeding rates at discharge and readmission within 28 days of discharge.

Time to first mobilisation was a median of 5.5 hours earlier post EROS compared to pre EROS; there was a slight reduction in duration of bladder catheterisation from a median of 20.7 hours to 16.9 hours with an increase in recatheterisation rates from 2% to 3%. Median length of stay was reduced by a day from 4 days to 3, with 93% of patients agreeing that was "about right" (compared to 96% pre EROS).

Satisfaction with information given deteriorated slightly (even though there were many written comments praising the new patient information booklet) as did median pain scores on day of surgery from 12.5 pre to 22 post (visual analogue sacle 0 - 100 mm).

The already high satisfaction with overall care scores remained similar and exclusive breast feeding rates at discharge also remained high, 91% post and 86% pre EROS.

Our initial experience following the introduction of an Enhanced Recovery pathway has demonstrated an improvement in objective measures of a reduced length of stay, quicker mobilisation and a modest reduction in duration of bladder catheterisation. Slightly increased pain scores on day of surgery could be related to the earlier mobilisation. Exclusive breastfeeding at discharge has not deteriorated and neither have satisfaction scores with overall care.

Continued education and audit will be needed to ensure that the benefits of Enhanced Recovery are maximised.

3.8.2.4 Adoption of the Small for Gestation (SGA) Pathway

The development and implementation of an ADHB specific SGA pathway, based on the national pathways developed by the Maternal and Fetal Medicine Network (MFMN) was a key project in 2014.

Audit of compliance with the pathway showed that the guideline standards audited were met at the time of the audit, including:

- 50% of SGA babies were recognised as suspected SGA antenatally
- 98% of suspected SGA babies managed on the SGA pathway were delivered prior to the guideline standard of 39 weeks
- The proportion of women managed on the pathway whose babies were not SGA was 9%.

3.8.2.5 Enhanced governance over Newborn Metabolic Screening

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 preventable by early detection and treatment. The Ministry of Health National Screening Unit (NSU) is responsible for the NMSP and contracts Auckland DHB 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 our inborn babies did not belong to that baby and that there had been a laboratory or labelling error. It was quickly determined that no error had occurred and the baby correctly had an abnormal result and subsequently commenced treatment.

Investigation into this incident, and a broader look at the administration of the NMSP, raised concerns about governance over the screening pathway and process. The working group established to investigate the original incident is now an Newborn Metabolic Screening Governance Group with a formal terms of reference to implement changes to the overall process; the group includes membership from the NSU, pathology and the maternity service and is chaired by the Director of Midwifery. The group reports to the Women's Health and the Pathology Clinical Governance groups.

3.8.2.6 Acute Pathway review (phase I) in Women's Assessment Unit (WAU)

In the year from 1 May 2013 to 30 April 2014 occupancy in the Women's Assessment Unit (WAU); which receives all not-in-labour acute admissions to the Women's Health Directorate; was greater than 100% for 661 hours over 189 days. This led to delays in the provision of timely and safe care to women requiring our acute services and poorer patient experience and/or outcomes. A survey of women admitted to our service acutely indicated that though the service was highly regarded, the most commonly stated need for improvement was for staff to be able to inform women of what care was intended, when and by whom. Following a Six Sigma/Lean Thinking project, an evidence-based performance improvement project was implemented involving:

- A unified referral process to determine the need for admission and to provide advance indication of diagnostic group, acuity and priority
- A triage process to determine priority of care provision upon admission
- Active monitoring of the patient's assessment and care-planning journey in WAU through flow coordination processes.

A standard that there should not be more than 210 minutes of 100% occupancy per week (30 minutes per day) was set. Since the new processes, commencing January 19, 2015, there has only been one week in which this standard has not been met. The mean weekly 100% occupancy has been 35 minutes.

The provision of timely care has thus been improved with women having a greater understanding of their care pathways.

3.8.2.7 Womens Escalation Dashboard

Attaining the above bed-occupancy standard in WAU required development of a directorate-wide escalation plan. This plan provides specific and detailed processes with individual responsibilities (e.g. tasks for charge midwives in Labour and Birth Unit and the wards; and for the on-call specialists) for ensuring inpatient bed-availability. When 'bed-block' in WAU occurs, a bed can be made available in WAU within 30 minutes by ensuring transfer of existing WAU patients (once care-planning is complete) to a ward. The standard set was that 90% of women referred to Women's Health from the Adult ED would be transferred from AED to WAU within 45 minutes (i.e. 30 minutes for the escalation process to make a WAU bed available, and 15 minutes to transfer the patient.) Currently the mean for meeting the 45 minute standard is 82% but improving over time.

3.8.2.8 Review of Induction of Labour Process

It is known that induction of labour (IOL) can be the first step in a 'cascade of intervention' which may complicate the woman's experience of birth and satisfaction with the care given. Limiting IOL to inductions with evidence based indications is important in the provision of quality care. In 2014 a regional consensus on indications for induction of labour (IOL) was reached against which practice can now be measured. In December 2014 a formalised booking system was introduced and practice is being audited against this. Individualised, non-identified, comparative feed-back on practitioners' IOL statistics in relation to the consensus document will be given to encourage reflection on individual performance as part of an approach to reducing IOL rates.

3.8.2.9 Review of access to Maternal Diabetes Clinic

The Maternity Diabetes service is under pressure from increasing demand due to a growing population of women with diabetes in the community. The service provides specialist antenatal care for the women, including nutritional advice and regular medical checks. The service first reviewed the waiting list of women referred and agreed a maximum timeframe within which women would be seen. The service then implemented changes to the system to track all referrals, changed triage to ensure equitable access, and formalised the virtual assessment process to make first contact with the women more efficient. In addition, the service made changes to the rosters to enable continuous care by the same healthcare practitioner. These changes are being embedded in the process and are starting to have an effect. The wider team also participated in a whole of service strategic planning day where longer term issues were identified using a co-design approach. From this planning day, several initiatives have been scoped for further work and implementation. One of these involves the careful review of how the service can provide the most value to the women in terms of outcomes and experience, using the most efficient model of care.

3.8.2.10 Guidelines for consultation with Obstetric and related Medical Services (Referral Guidelines)

Guidelines exist under section 88 which specify the indications for an LMC to refer a women to a secondary service for advice or ongoing care. These guidelines do not provide information as to the appropriate timeliness of referral.

NWH, building on a document proposed and prepared by WDHB, and in consultation with self-employed LMCs, has reviewed the National Referral Guidelines to include information on when to refer to NWH. This local implementation will be further developed to include whether a virtual appointment or visit to the clinic is appropriate. There are 160 self-employed LMCs working at NWH and they have requested more guidance on the use of the referral guidelines. It is hoped that this will result in an improvement in referral quality which will in turn ensure that women are seen by the right caregiver at the right time.

Referrals for secondary care are currently triaged by midwives in the Walk-in-Centre and a clinically appropriate appointment is allocated, usually within 2-3 weeks, depending on clinical need. In situations where a timely appointment cannot be offered, a specialist Virtual Consultation is undertaken. This ensures that the LMC is provided with an interim plan which is documented on Healthware until the patient can be seen face to face in clinic.

A specific fast track pathway has been established for pregnancies where the only concern is prolonged gestation (41:1 weeks or more.) Referrals are received by fax and are reviewed within 48 hours. On review if they are deemed low risk they are allocated a post term virtual consultation based upon gestation on receipt (for example if the referral was received at 39.6 weeks they would not be reviewed until 41.1 weeks). At the time of virtual review, and if appropriate, women are allocated an induction of labour date. Providing there is evidence of reassuring fetal status induction will be booked for as close to 41:5 weeks as possible. In cases where SGA is suspected an appointment (including an ultrasound) will be allocated within 7days of receipt of referral for low risk women and on the same day in Womens' Assessment Unit for high risk women.

Referrals for Iron infusion are frequently allocated virtual appointments within 24-48hrs which usually result in an appointment to go directly to our Day Assessment Unit (DAU) within 2 weeks again depending on gestation and clinical need.

Audits are planned in other areas of National Women's, particularly with respect to the tertiary services, to look at the timeliness of review of women referred. Audits of compliance of referrals with the referral guidelines are also planned.

3.9 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 2012, there were 15 indicators in the clinical indicator report as listed in Table 9. Publication of the next report, including 2013 indicators, is expected late in 2015.

Table 9 includes the indicator rates for NWH compared to rates for all secondary and tertiary facilities. The indicators where NWH is inappropriately above or below the national average are shaded in the table. These include mode of birth for standard primiparae, episiotomy rate, and blood transfusion.

Table 9: NZ Maternity Clinical Indicators 2012 (NWH and NZ Facility rates for all secondary and tertiary facilities)

Indicator		NWH 2012	NZ 2012	Comment
1	Registration with a LMC in the first trimester of pregnancy	67.0	64.2	No concern
2	Standard primigravida who have a spontaneous vaginal birth	62.6	64.7	Moderate concern
3	Standard primigravida who undergo an instrumental birth	17.2	17.2	No concern
4	Standard primigravida who undergo Caesarean section	19.9	17.8	Concern
5	Standard primigravida who undergo induction of labour	5.4	4.7	Moderate concern
6	Standard primigravida with an intact lower genital tract	15.4	22.8	Moderate concern
7	Standard primigravida undergoing episiotomy and no 3rd or 4th degree tears	32.9	23.4	Moderate concern
8	Standard primigravida sustaining a 3rd or 4th degree tear and no episiotomy	2.9	4.0	Excellent
9	Standard primigravida undergoing episiotomy and sustaining a 3rd or 4th degree tear	2.1	1.9	No concern
10	Women having a general anaesthetic for Caesarean section	4.9	8.6	Excellent
11	Women requiring a blood transfusion with Caesarean section	2.7	3.2	No concern
12	Women requiring a blood transfusion with vaginal birth	2.3	2.0	Moderate concern
13	Number of women diagnosed with eclampsia during birth admission	0	14/53,711	Excellent
14	Women identified as smokers during postnatal period (2 weeks after birth)	2.3	12.8	Excellent
15	Premature births (between 32 and 36 wks gestation)	9.5	8.4	No concern

3.9.1 Blood transfusion during birth admission for vaginal birth

The NMMG has expressed concerns about the level of blood loss following birth. We share that concern. In collaboration with the NWH transfusion committee we have undertaken considerable work in recent years on criteria for transfusion. The NWH PPH guideline is closely aligned to the national guideline for the treatment of postpartum haemorrhage. Implementation of the pathway is included in the annual midwifery emergency training and in our multidisciplinary training day.

Recent quality improvements include:

- Development of a guideline for recognition and treatment of iron deficiency in the antenatal period, including development of a pathway for outpatient iron infusion. This guideline has been audited recently with further improvements recommended to improve recognition and management of iron deficiency to reduce the requirement for transfusion intra and postpartum.
- Audit of augmentation of labour against criteria for augmentation to encourage more robust evidence-based decision-making in the use of oxytocin in labour.

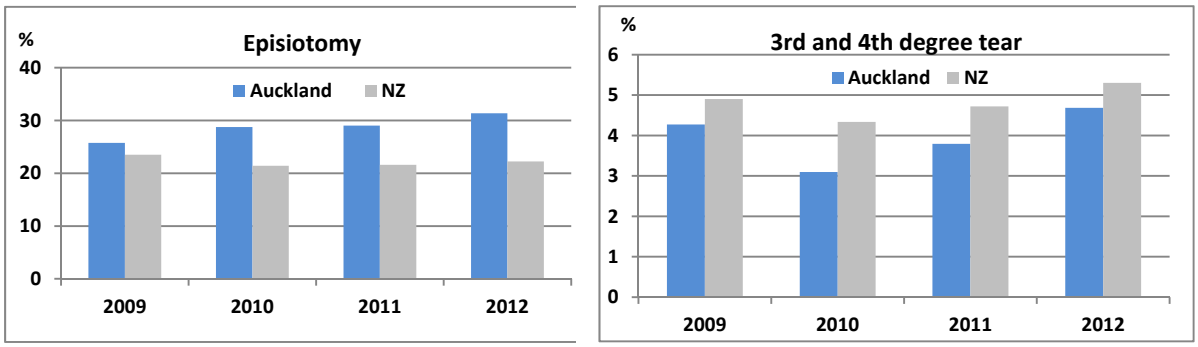
3.9.2 Episiotomy

NWH shows variance from the national average for the following perineal injury clinical indicators:

- Indicator 6: Intact lower genital tract amongst standard primigravida giving birth vaginally
- Indicator 7: Standard primigravida undergoing episiotomy and no 3rd or 4th degree tears

NWH is an outlier with high rates of episiotomy and low rates of intact perineum. NWH has (non-significantly) lower rates of third and fourth degree tear without episiotomy (8) and generally equivalent rates of third and fourth degree tear with episiotomy (9) when compared to national rates (Table 9). The episiotomy and third and fourth degree tear rates have been an area of focus for clinical leadership and practitioners at NWH for some time as highlighted in previous Annual Clinical Reports. The following figures compare episiotomy rates and third and fourth degree tear rates at NWH (residence) compared to national rates.

Figure 6: Perineal trauma rates among standard primigravida NWH and NZ 2009-2012



The average episiotomy rate among standard primigravida from 2009-2012 was 22.2% nationally and 28.7% at NWH. The average third and fourth degree tear rate was 4.8% nationally and 4.0% at NWH.

There is a marked variance in episiotomy rate by LMC (section 7.1). For example, where NWH is the LMC, the episiotomy rate for spontaneous vertex births in nullipara is 17.6% and in multipara 5.5%.

There has been considerable accent in the service in recent years on the avoidance of, diagnosis of, and appropriate surgical repair of anal sphincter damage (third and fourth degree tears). The episiotomy rate at NWH has increased over the years presented (and since) and the service will continue to remind practitioners that episiotomy should not be routine.

Our practice improvement endeavours have focused on appropriate support for a birthing woman through a policy of a second midwife being present at birth as well as encouraging a hands-on (rather than hands-off) approach to crowning of the fetal head. Senior midwives are available on the unit to assist in identification of third and fourth degree tears and to support appropriate referral as required for repair. A second midwife at delivery is the goal at all births in the unit to support and assist with decision making at the time of birth.

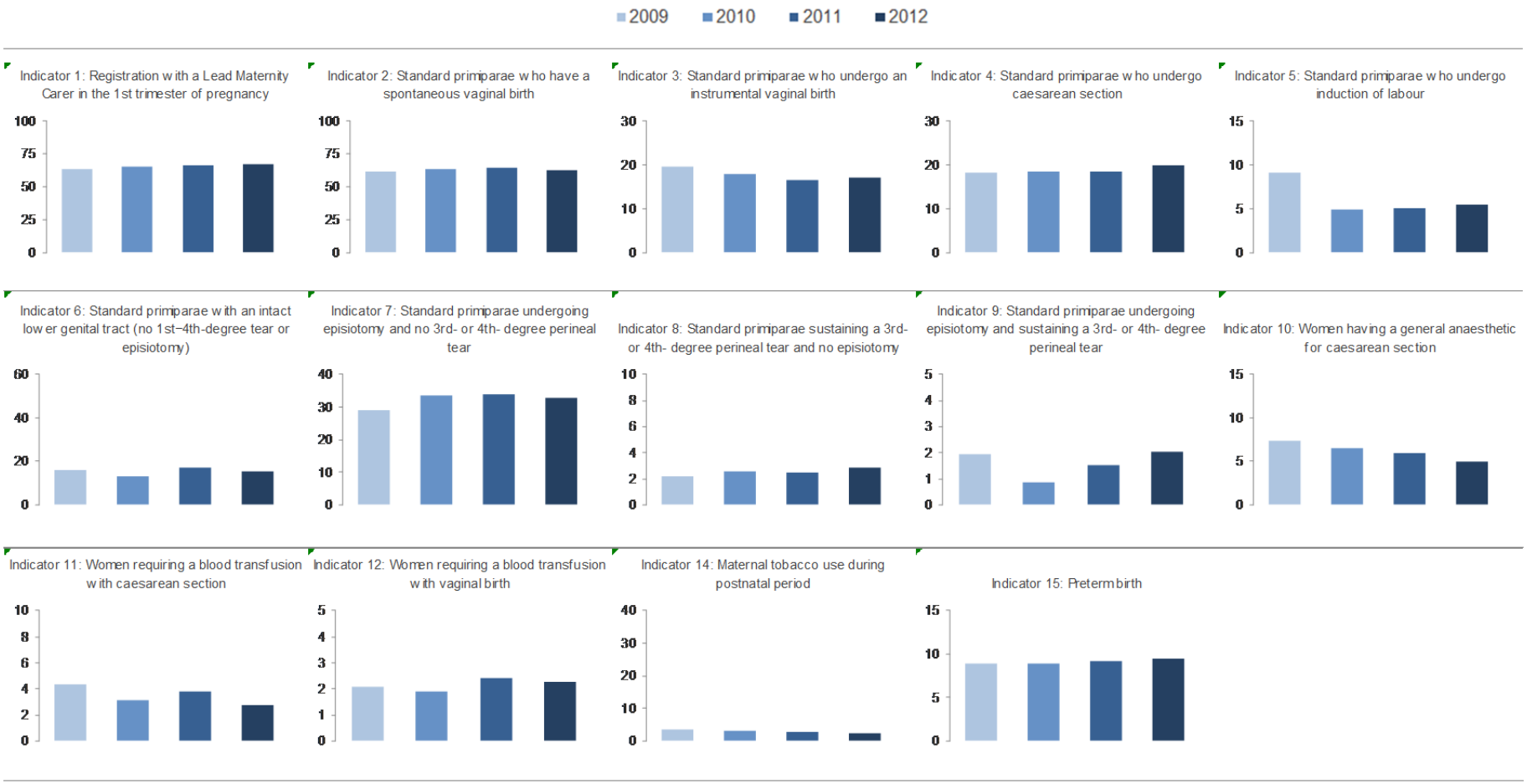
In 2014, education boards were developed for the clinical area regarding birthing practice and techniques to support intact perineum, episiotomy where indicated, and classification of tear. Further education is planned for 2015 by the Labour and Birth midwifery educator.

During 2013 and 2014, the NZCOM regional suturing workshop was well attended by core and LMC midwives, providing education on prevention, recognition and identification of the degree of tear, debate around research and evidence, and supervised practise of suturing.

In 2014 a Clinical Charge Midwife and two obstetricians attended the Health Round Table meeting on improving perineal management. From this meeting a supplementary perineal injury form has been created to ensure clear documentation of findings, procedures and on-going appropriate treatment and follow-up.

The figure which follows shows how the national maternity clinical indicators have varied at NWH over the years 2009-12.

Auckland City (tertiary facility)



Note: annual rates for diagnosis of eclampsia at birth admission (indicator 13) is not presented due to very low numbers; see table below for numbers.

Publication: New Zealand Maternity Clinical Indicators 2012
Source: National Maternity Collection

3.10 Maternity Quality and Safety Program Goals for 2015/2016

Maternity Collaboration goals

During 2015/2016 the major focus of our activity will be aligned to the collaborative work undertaken together with WDHB.

Directing care towards priority populations

This will build on the work already on-going to ensure timely and accessible maternity care is provided to our most vulnerable women.

Strengthening confidence in normal birth

This will be a large and collaborative piece of work across the region to ensure that women are provided with the best opportunity to birth well and, where appropriate, normally.

Support transition to parenthood and infant attachment

We wish to better prepare women for parenthood and support them to be confident and competent parents, including helping them to successfully breastfeed.

Enhancing our continuity of care

We wish to ensure that across our combined populations we develop consistent pathways to care and pathways of care that support best care to women. In order to support this we will work with the Auckland Regional DHBs to enable better information transfer between clinicians and DHBs.

Further enhancing maternity quality and safety

We will widen the range of community partners who are represented in our maternity clinical governance structures.

We will provide more detailed information to individual clinicians about the care that they provide to women.

Improving the management of care for women with diabetes

Demand for our diabetes in pregnancy service increases year on year. A detailed description of our diabetes volumes and outcomes can be seen in Section 5.4. Work is currently underway to look at ways in which the service can be streamlined to enable timely access and to reduce non-value added waiting times for women needing to use the service. This work will be expanded and progressed.

Support for health professionals following a critical incident

During 2015/2016 we will build on work we have done around managing critical incidents, recognizing that involvement in adverse outcomes is very challenging for the health professionals involved as well as for families. We are exploring ways in which we can better support and debrief staff.

Improve Family Violence Screening

We wish to ensure that all of our patients are screened for risk of family violence. At present this is not happening. One of our priorities over the next 12 months is to improve the confidence and competence of our workforce to screen effectively and understand what to do when they uncover risk.

3.11 Gynaecology Improvement Projects

3.11.1 Electronic Referrals for Gynaecology

In 2014 a regional project was commenced to optimize the e-referral template for general gynaecology. Templates were agreed with a view to moving to online triage. This transition has occurred successfully at ADHB with a team of general gynaecologists on a daily roster. Daily

reporting of triage timeframes allows us to ensure all referrals are triaged within 10 days, most within 5 days. The work has dovetailed nicely with the setting up of the Abnormal Uterine Bleeding (AUB) clinic and the AUB clinicians do their own online triage into the clinic, supported by the newly published AUB regional pathway.

3.11.2 Faster Cancer Treatment

The Ministry of Health has set a target for 85% of patients with a high suspicion of cancer to be treated within 62 days of referral by July 2016. Currently Women's Health does not meet this target, though the planned reorganisation for multidisciplinary oncology meetings has improved some components of the timelines. Minimum data points are mapped by DHB cancer trackers, but the Gynaecology tumour pathways are complex and vary by tumour site. The Gynaecological Oncology Department receives referrals from 8 DHBs across 2 regions and cancer networks. In order to try and identify the bottlenecks and barriers to accessing timely and equitable care, we obtained funding from the Ministry of Health to map the pathways across the patient journey. We have engaged with all referring DHBs to map their local pathways and the referral pathways involving surgical Gynaecological oncology and medical and radiation oncology. The project is currently analysing data and is due to report by July 2015. It is hoped that a list of recommendations for service improvements, both generic and specific to each DHB will be generated as a result of this initiative. Meanwhile the newly formed gynaecology governance group at ADHB has formulated local reporting measures aimed at supporting service improvement.

3.11.3 Urogynaecology

Urogynaecology includes the areas of pelvic organ prolapse and urinary incontinence in women. We offer both conservative treatments such as pelvic floor physiotherapy, vaginal ring pessary placement through to surgery for prolapse repair and urinary stress incontinence.

The team now includes four gynaecologists with a special interest in Urogynaecology, one RANZCOG accredited Certified Urogynaecologist, a nurse specialist and a physiotherapist. Once a month we also have a Urologist with a special interest in female urology in clinic.

In the 2014 year we have set up a Urogynaecology Multidisciplinary Meeting for the discussion of complex patients and those requiring repeat procedures. These are attended by our Auckland Urogynaecologists, Radiologists, Physiotherapists as well as Urologists with a special interest in female urology. More recently it has been attended by some of our colleagues from the private sector and other DHBs. We now have a nurse-led vaginal pessary clinic which is running well. This has allowed women who have vaginal pessaries for treatment of prolapse more timely assessment and ring change, as well as easier access to follow up if they are experiencing problems. There has been some work on a regional Urogynaecology referral pathway which will be used by all three Auckland DHBs. Finally, in a joint venture with Counties Manukau DHB, a Urogynaecology Fellow position has been approved by the RANZCOG.

3.11.4 Abnormal Uterine Bleeding (AUB) Management Service

The year 2014 was a busy one regionally with work proceeding on a new AUB clinical pathway which was published in 2015. Parallel to this, a local service improvement project was commenced with a group of enthusiastic gynaecologists led by the Performance Improvement team. The aim was to develop a more streamlined approach to providing outpatient care to women with premenopausal abnormal uterine bleeding. Previous audits had shown that multiple follow up appointments occurred before treatment was initiated for this common problem which represents 30% of all gynaecology outpatient referrals. In 2015, a new clinic was set up to provide a combined FSA (first specialist appointment) and outpatient hysteroscopy service with most patients being offered diagnostics and limited treatments prior to or on the day, moving promptly to a definitive treatment procedure where indicated. The eventual goal is increased outpatient hysteroscopic treatment procedures in the clinic within the same appointment. Currently the surgeons are trialling new equipment in GSU (outpatient theatre) with this goal in mind.

3.11.5 Women's Health Physiotherapy wait times

The Women's Health (WH) Physiotherapy service identified unacceptably long waiting times, particularly for those patients with non-obstetric related referrals. A lean six sigma project was undertaken to address access and waiting times.

Baseline data showed 91% of patients were not seen within the ADHB target time frame of 6 weeks between Jan 2012 and Oct 2013. Patients waited an average of 140 days in 2012 and 89 days in 2013 for first scheduled appointments (FSA), with marked disparity noted in the waiting times for different clinical categories.

In November 2014, only 14% of patients waited longer than 42 days. The team is now able to focus on patient care rather than managing the wait list of patients. The project team, led by one of the Physiotherapists, won the ADHB Health Excellence Award for Process and Systems Improvement.

3.11.6 Epsom Day Unit Model of Care Review

In 2011, a review of Epsom Day Unit was commenced to identify gaps, key issues and opportunities for the service to ensure it met the Abortion Supervisory Committee (ASC) Standards and the needs of the women accessing the service.

Feedback from consumers identified gaps, duplication, poor processes and long waits on Day 1. Furthermore there was negative feedback from GPs about the referral process.

The recommendations of the initial project were to comply with ASC standards and to improve services for women. A number of recommendations relating to adherence to the ASC standards were accepted and progressed.

A final decision document was released to staff in February 2013, which outlined acceptance of further options proposed by the original project, including a nurse primary role at assessment and implementation of a Medical Termination of Pregnancy (MTOP) service. A formal change management process was completed that resulted in a change to the scope of the nursing role in assessment of women attending the unit. It was also agreed that women would not have to be seen by a Social Worker unless they were less than 17yrs old or were victims of family violence or on request.

The service has successfully introduced the option of a MTOP for those women who meet the criteria. Patient information, policy and procedures have been developed to ensure safe clinical practice and informed choice.

The service has made a number of improvements to reduce waiting times with changes to scheduling as well as embedding the nursing assessment role and a dedicated Nurse Coordination role.

Chapter 4

MATERNAL DEMOGRAPHY

4 MATERNAL DEMOGRAPHY

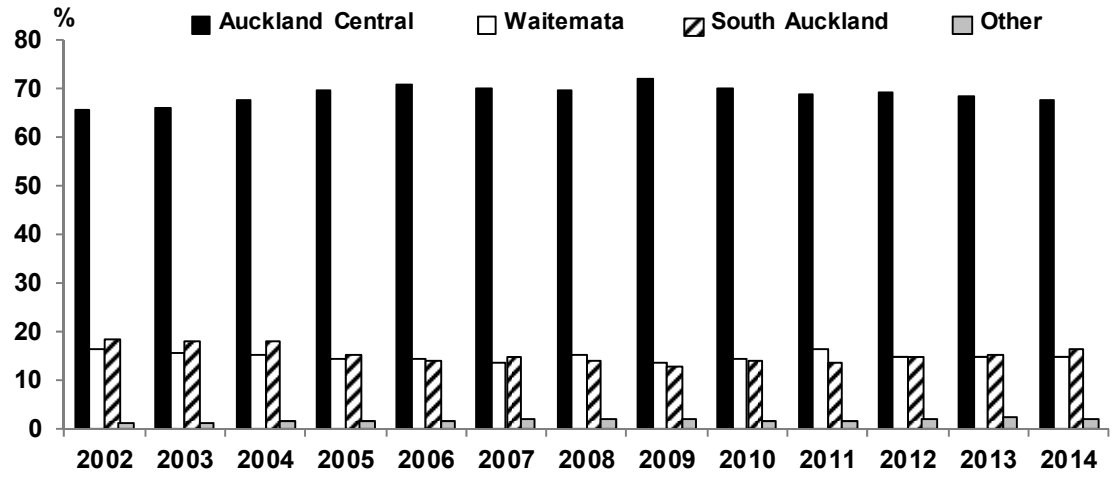
This chapter describes the demographic characteristics of the women giving birth at NW in 2014. Additional data pertaining to this chapter can be found in Appendix 3.

Information on the sources of data in the maternity chapters which follow,cleaning of these data and analytical methods can be found in Appendix 1.

4.1 Maternal domicile

In 2014, 67% of women giving birth at National Women's were from the Auckland District Health Board area. This proportion has changed very little over the last 10 years. The proportion from Waitemata DHB area has remained unchanged irrespective of the new service at WDHB for mothers with gestational diabetes who used to receive care from the ADHB service. Some mothers from outside ADHB catchment area require tertiary services, but a substantial proportion of the 33% of our clientele from other DHBs are making a personal choice to birth at NW.

Figure 7: Domicile (DHB of residence) of women birthing at NWH (2002-2014



4.2 Maternal age, parity, and ethnicity

4.2.1 Maternal Age

The steady rise in the proportion of women aged over 35 giving birth at National Women's has stabilised in recent years. Women over 40 in 2013 accounted for 3.9% of births. Although still a small proportion of our total maternity population this group contribute to an increased demand for medical services within the department.

At the same time, there has been a gradual and on-going reduction in births among mothers up to 25 years of age, including among mothers up to 20 years of age. While mothers up to age 20 contributed 5.5% of all births in 2000 they now make up 3.1% of the birthing population. This is a national and international trend.

Figure 8: Maternal age distribution among women birthing at NWH (1991-2014)

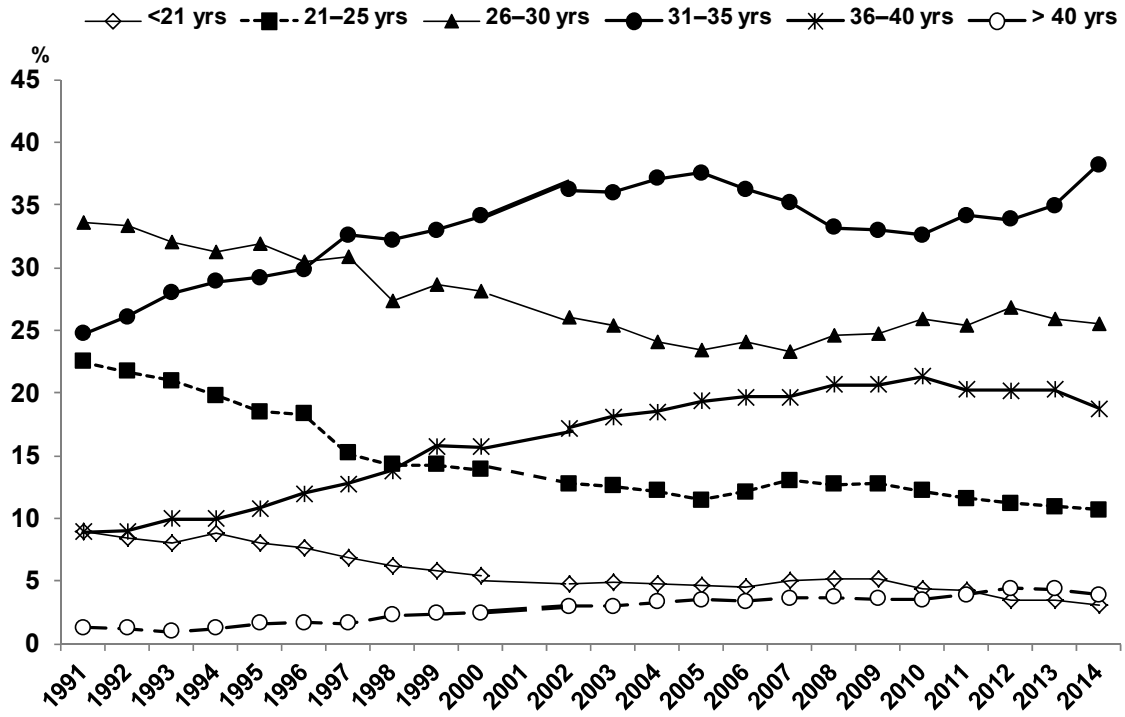
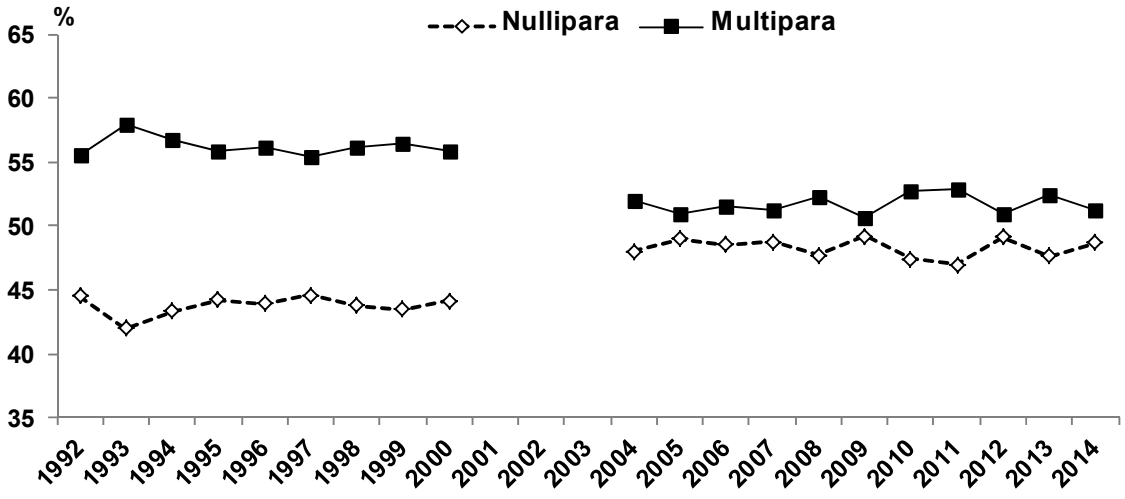


Figure 9: Parity distribution among women birthing at NWH (1992-2014)



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 1.2-1.3:1.

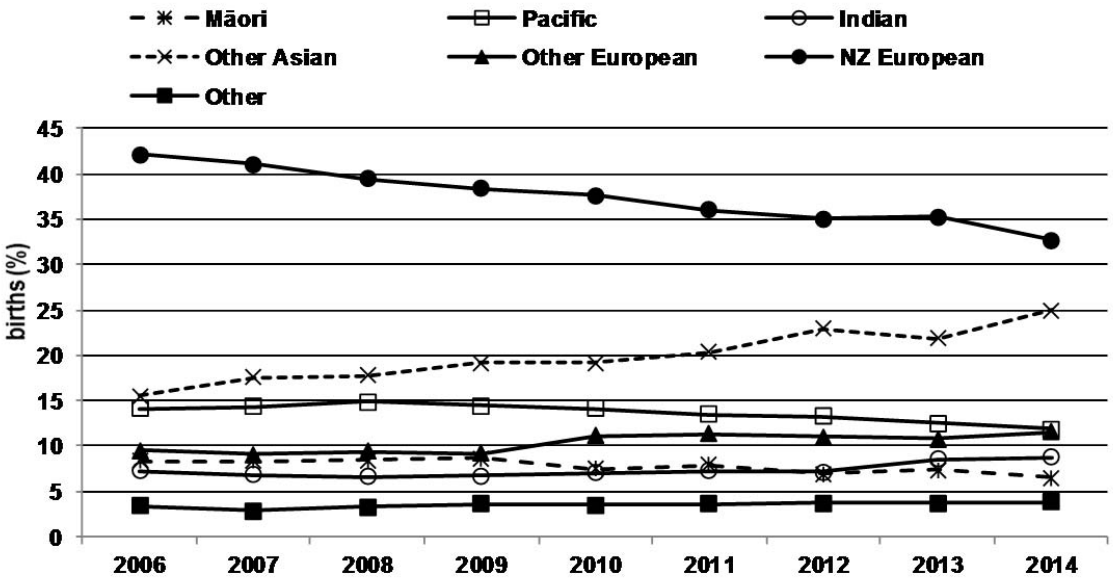
4.2.2 Maternal ethnicity

When more than one ethnicity is given, reported ethnicity has been prioritised, with priority assigned according to the following hierarchy: Māori, Pacific peoples, Indian, Other Asian, Other, Other European, NZ European.

In 2014, 6.5% of mothers giving birth at NW were prioritised as Māori, 11.9% Pacific peoples, 8.7% Indian, 24.9% Other Asian, 11.5% Other European, 32.7% NZ European, and 3.7% Other ethnicities.

The proportion of women birthing at National Women's of Chinese and other Asian origin has increased from 15.6% to 24.9% in seven years and this may have implications for how our antenatal services are provided and how patient information is provided.

Figure 10: Ethnicity of mothers giving birth at NWH 2006-2014



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

While approximately one half of Asian (53%) and NZ European mothers (49%) giving birth at NW are having their first baby, only one third of Māori (38%) and Pacific Island mothers (34%) are giving birth to their first baby. Parity needs to be considered in analyses of obstetric interventions by ethnicity.

Figure 11: Maternal age by maternal ethnicity NWH 2014

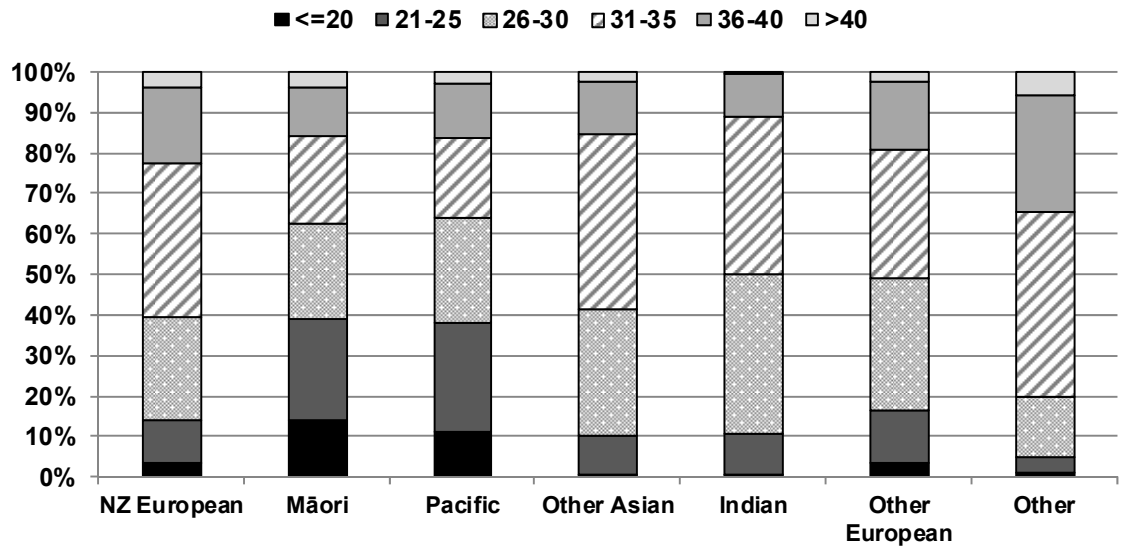
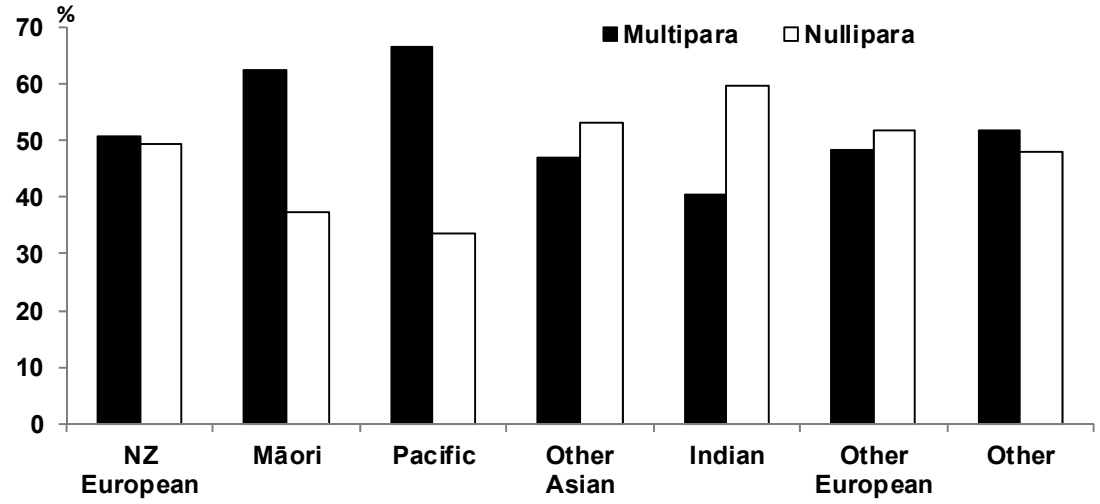


Figure 12: Parity distribution by maternal ethnicity NWH 2014



4.3 Smoking

Table 10: Smoking status of women at booking and at birth NWH 2014

Smoking Status	Smoking at booking n=7400		Smoking at birth n=7400	
	n	%	n	%
Yes	375	5.1	319	4.3
No	7022	94.9	7066	95.5
Missing data	3		15	0.2

Among women birthing at NW in 2014, 5.1% reported smoking at booking and 4.3% at birth. This is a 16% decrease in smoking rates from booking to birth, suggesting a positive response to smoking cessation education.

Figure 13: Smoking at booking by deprivation quintile and maternal ethnicity NWH 2014

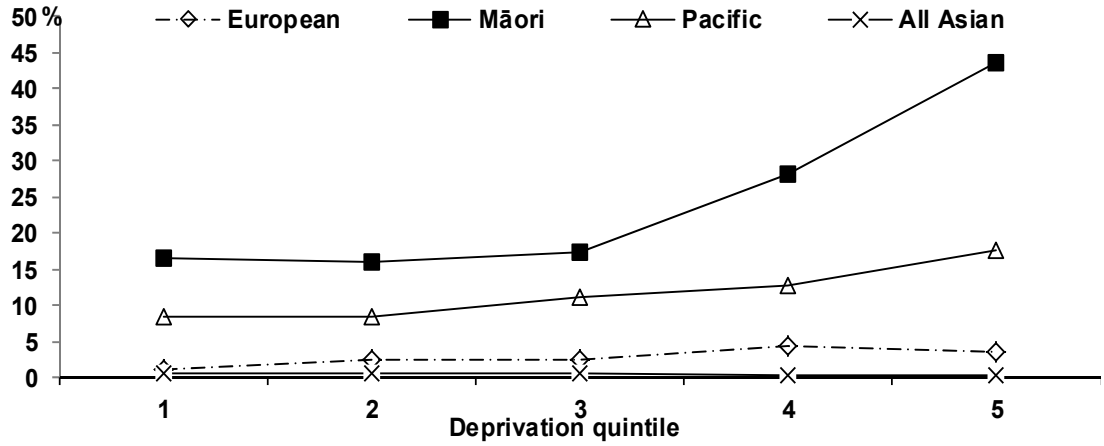
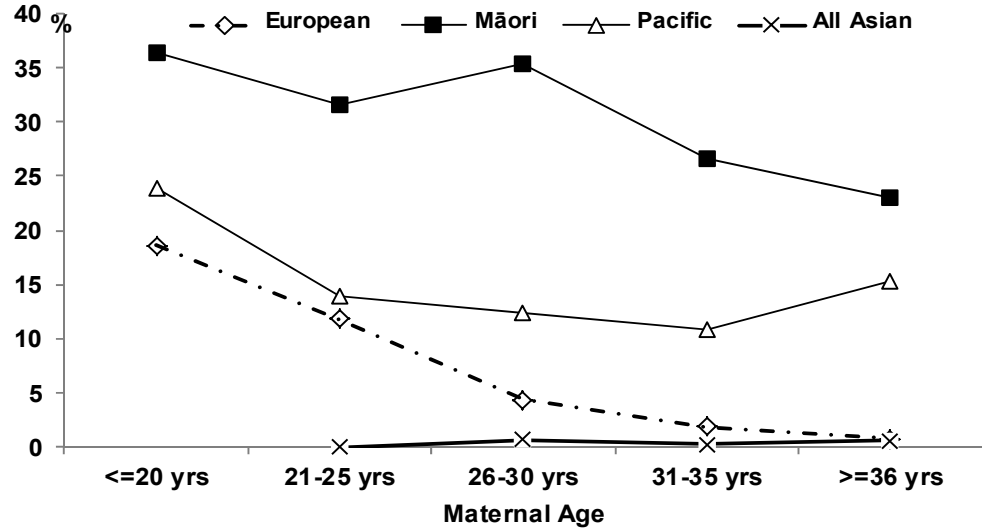


Figure 14: Smoking rates at booking by age and ethnicity NWH 2014



While the smoking rate among women birthing at NW is low compared to the NZ birthing population (15% at the time of birth)(NMMG, Annual report 2013), some populations within NW have very high rates, including mothers under 26 years old, women living in areas of high socioeconomic deprivation, and Māori and Pacific mothers. Within ethnic groups, there is an increased rate of smoking among younger mothers and among mothers living in areas with higher deprivation. Seventy three percent of all smoking mothers at NWH in 2014 identified as Māori or Pacific people.

At booking, 13% of women attending the NW Community clinic reported that they were smoking.

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 MoH tobacco Health Targets:

1. Over 95% of current smokers that attend National Women's Health are given documented brief advice to stop smoking and an offer of help to do so.
2. Over 90% of pregnant women who are current smokers on first booking by an independent midwife are given documented brief advice to stop smoking and an offer of help to do so.

In relation to the above, ward audits and staff education was given face to face, as well provision of an online learning programme, to develop the means to do this. A form was released in 2014 in all the wards of Women's Health to facilitate documentation of brief advice, provision of NRT, and a referral mechanism. During the period 1/5/14 to 30/5/15 Women's Health achieved the 95% ABC target.

4.3.2 Stop Smoking Service

ADHB Smokefree Services also holds a Smokefree pregnancy contract that involves 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. In the year 1/5/14 to 30/4/15 the team received 292 referrals and enrolled 182 (62%) for cessation support. The stop smoking success rate of the team at 4 and 12 weeks varied between 40-45% each quarter.

4.4 Body mass index

Forty percent of the maternity population birthing at NW were overweight in 2014 (BMI ≥25), 17% obese (BMI ≥30), and 8% morbidly obese (BMI ≥35). These rates have remained pretty stable over the last five years.

Table 11: Maternal BMI NWH 2010-2014

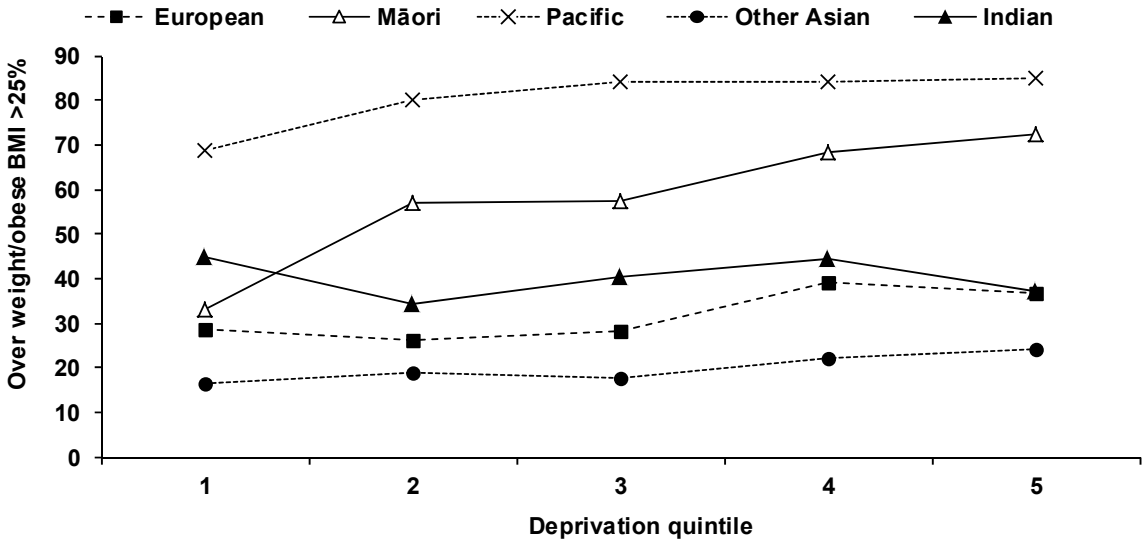
	2010		2011		2012		2013		2014	
	n=7709		n=7523		n=7695		n=7223		n=7400	
	n	%	n	%	n	%	n	%	n	%
<18.5	443	5.7	439	5.8	481	6.3	255	3.5	313	4.2
18.5-24.99	3913	50.8	3790	50.4	3949	51.3	3826	53.0	4106	55.5
25-29.99	1715	22.3	1641	21.8	1678	21.8	1679	23.2	1565	21.1
30-34.99	797	10.3	790	10.5	771	10.0	699	9.7	696	9.4
35-39.99	356	4.7	368	4.9	354	4.6	367	5.1	357	4.8
>=40	265	3.4	309	4.1	289	3.8	250	3.5	234	3.2
Missing	220	2.8	186	2.5	173	2.3	147	2.0	129	1.7

Figure 15 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 accentuating poor nutrition, but the most important predictor shown here is ethnicity.

Analyses of BMI and maternity outcomes can be found in Chapter 5.7.

Figure 15: Over weight/obese (BMI >25) by ethnicity and deprivation quintile NWH 2014



In all ethnicities at least 20% of mothers are overweight or obese.

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 after the first table. Quintile 1 includes the least deprived two deciles and quintile 5 the most deprived two deciles.

Table 12: Deprivation decile (NZDep2006) among women birthing at NWH 2014

	Women giving birth in 2014	
	n=7400	
Deprivation decile	**n**	**%**
1	520	7.0
2	794	10.7
3	809	10.9
4	604	8.2
5	679	9.2
6	861	11.6
7	746	10.1
8	860	11.6
9	603	8.1
10	910	12.3
missing	14	0.2

Figure 16: Deprivation quintile by maternal ethnicity NWH 2014

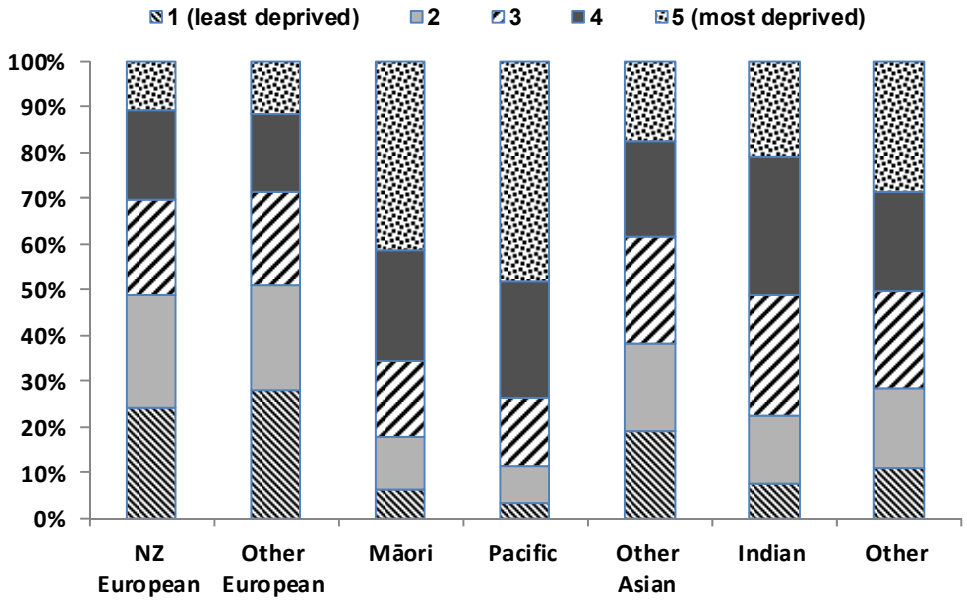


Figure 17: Deprivation quintile by maternal age NWH 2014

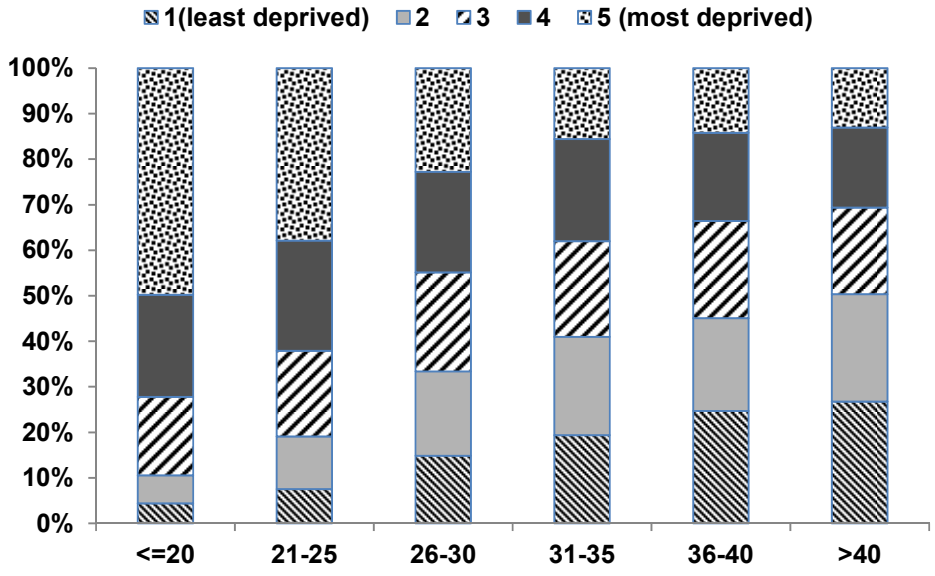
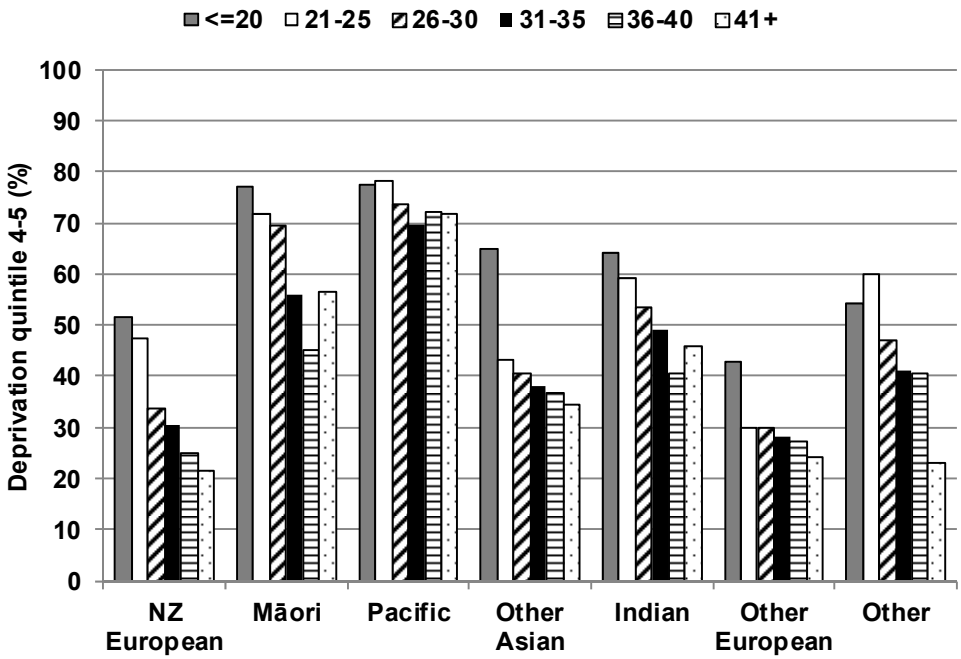


Figure 18 shows that there is an association between age and living in areas of higher socio-economic deprivation independent of ethnicity. It also shows that ethnicity is independently associated with socioeconomic deprivation and that the gradient in the association between ethnicity and socio-economic deprivation is less pronounced in some ethnicities (e.g. Pacific people) than others.

Figure 18: Deprivation (quintile 4 or 5) by age and ethnicity



Rates not presented if denominator <30 women

4.6 Lead Maternity Carer (LMC) at birth

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

In 2014, 48% of women were registered with a self-employed (or independent) midwife at birth, 25% with a private obstetrician, 19% with the National Women's Community clinic service, and 7% with National Women's specialist medical and diabetes clinic services. Overall 73% of women who gave birth at NW in 2014 were under the care of a self-employed Lead Maternity Carer compared to 65% in 2006.

There is only one GP who has an access agreement to birth babies at NW, who was the LMC at birth for 20 women (0.2%) in 2014. Because of small numbers, these data are not represented in the figures in this section.

Thirty-seven women were unbooked in 2014, 30 (81%) of whom were Māori or Pacific mothers.

Figure 19: LMC at birth and maternal age NWH 2014

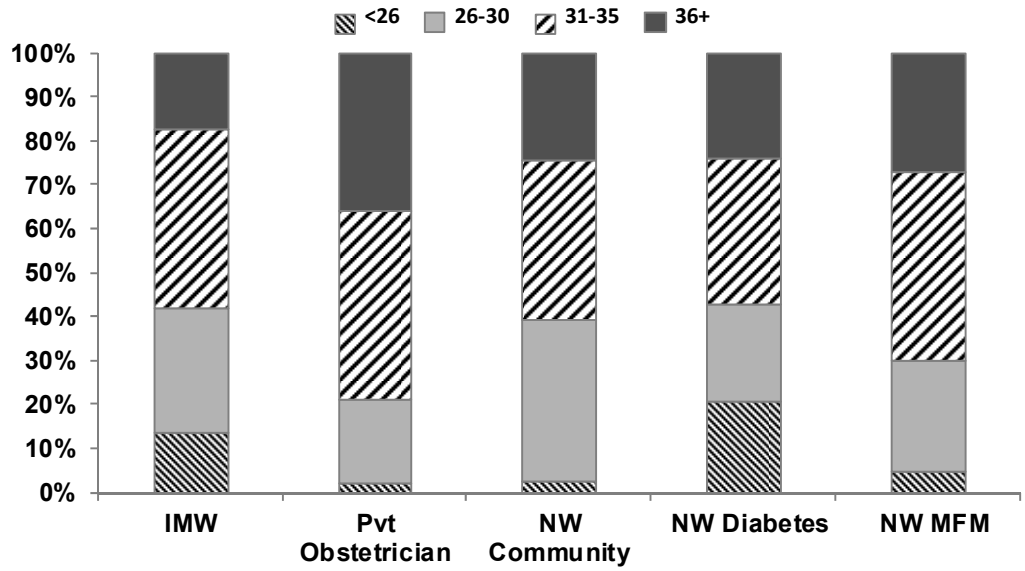
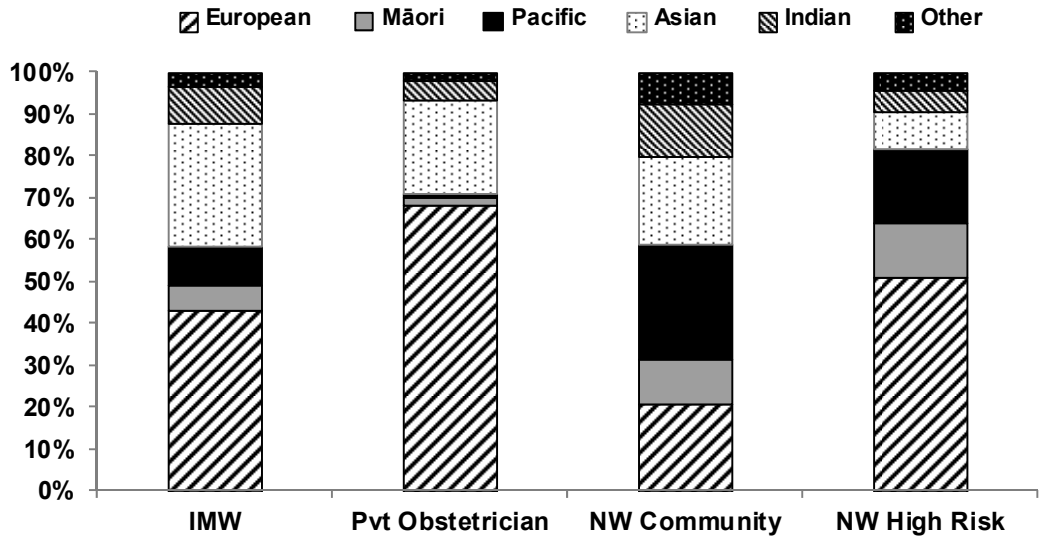
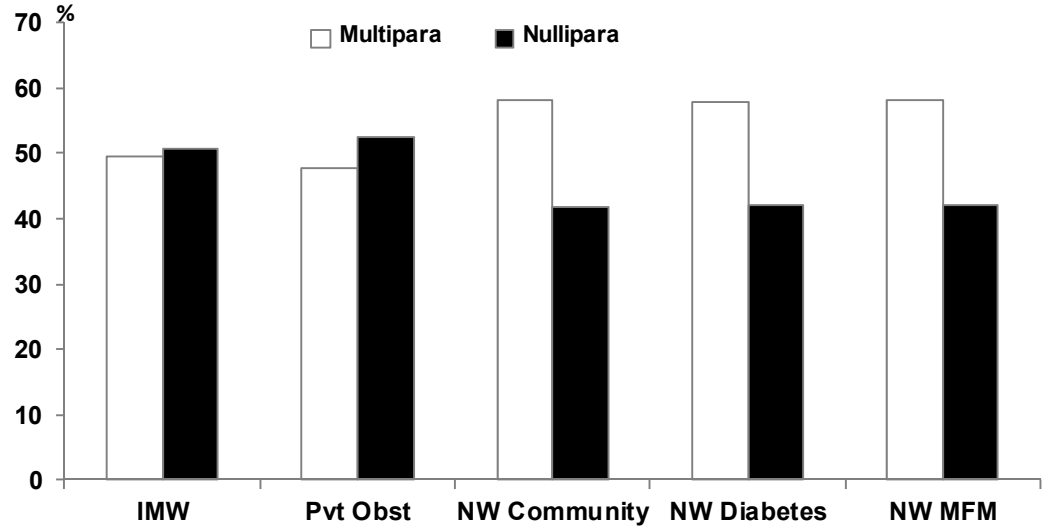


Figure 20: LMC at birth and maternal ethnicity NWH 2014



Women booked with a private obstetrician were more likely to be older, particularly over 35 years, 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).

Figure 21: LMC at birth and parity NWH 2014



4.7 Standard primipara

A standard primiparous mother is defined 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.

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 2014, 35% of primiparous women were defined as standard. Outcomes for standard primipara are given in section 6.

Figure 22: Proportion of standard primipara among primipara by maternal ethnicity NW 2014

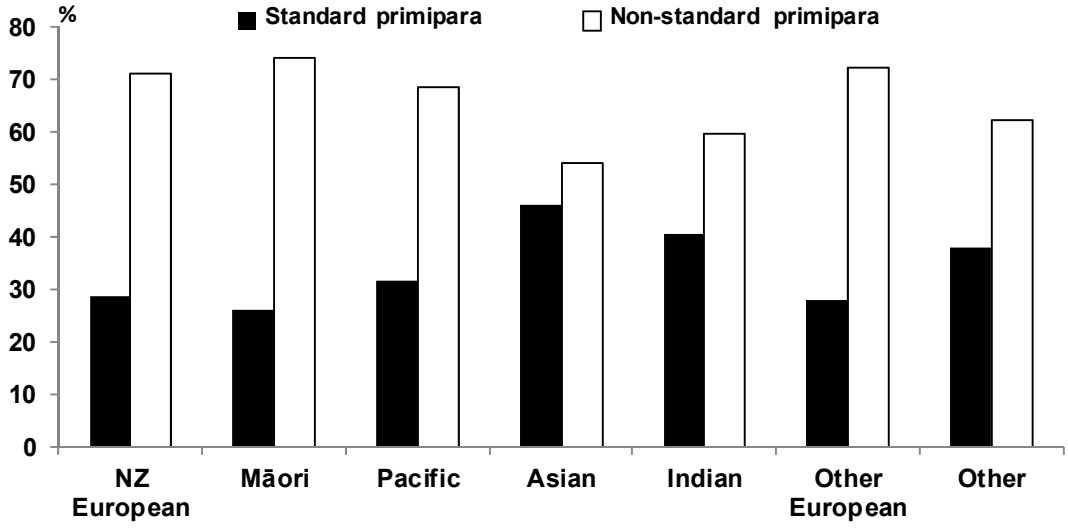
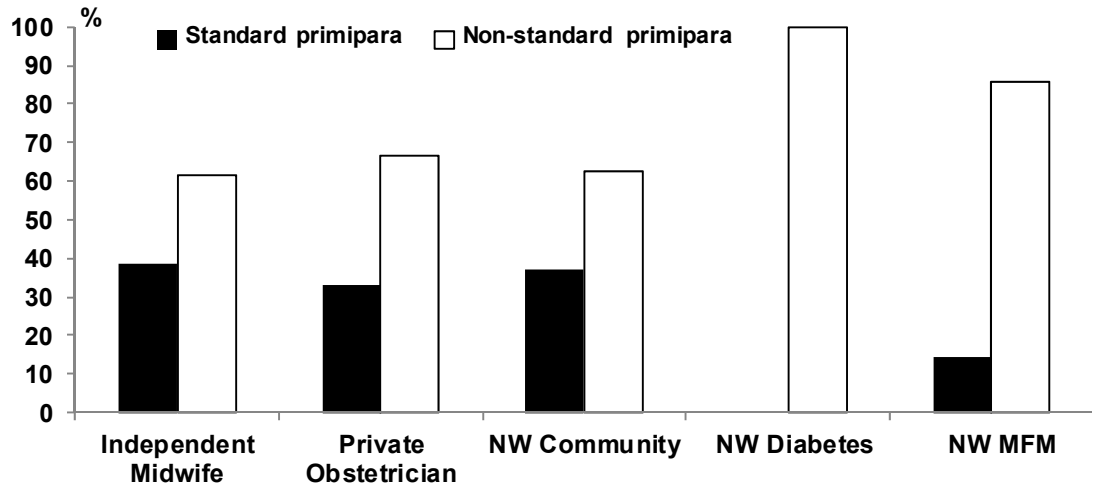


Figure 23: Standard primipara by LMC at birth NW 2014



Chapter 5

ANTENATAL COMPLICATIONS

5 ANTENATAL COMPLICATIONS

This chapter provides data and analyses on risks and complications that affect women in the antenatal period, namely preterm birth, growth restriction, multiple pregnancy, antepartum haemorrhage, diabetes, hypertensive disease, and obesity. It also includes data from the fetal medicine service. Additional data on these complications can be found in Appendix 4.

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

Table 13: Rates of total, spontaneous and iatrogenic preterm birth NWH 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total birthing women	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**
Women birthing preterm (<37) total	685	716	796	733	658	689	684	709	673	647
Incidence %	9.5	9.9	10.3	9.7	8.5	8.9	9.1	9.2	9.3	8.7
Women birthing <32 weeks	211	212	212	222	185	212	190	203	185	185
Incidence %	2.9	2.9	2.8	2.9	2.4	2.8	2.5	2.6	2.6	2.5
Spontaneous and iatrogenic preterm birth										
Spontaneous 32-36 weeks	230	239	292	188	184	218	200	194	193	187
Incidence %	3.2	3.3	3.8	2.5	2.4	2.8	2.7	2.5	2.7	2.5
Spontaneous <32 weeks	93	96	105	105	91	94	79	90	72	79
Incidence %	1.3	1.3	1.4	1.4	1.2	1.2	1.1	1.2	1.0	1.1
Iatrogenic 32-36 weeks	244	265	292	323	289	259	294	312	295	275
Incidence %	3.4	3.7	3.8	4.2	3.7	3.4	3.9	4.1	4.1	3.7
Iatrogenic <32 weeks	118	116	107	117	94	118	111	113	113	106
Incidence %	1.6	1.6	1.4	1.5	1.2	1.5	1.5	1.5	1.6	1.4
Total preterm babies	**806**	**836**	**904**	**843**	**769**	**793**	**787**	**820**	**774**	**759**
Total babies 32-36 weeks	559	591	667	590	555	547	573	592	568	554
Total babies <32 weeks	247	245	237	253	214	246	214	228	206	205

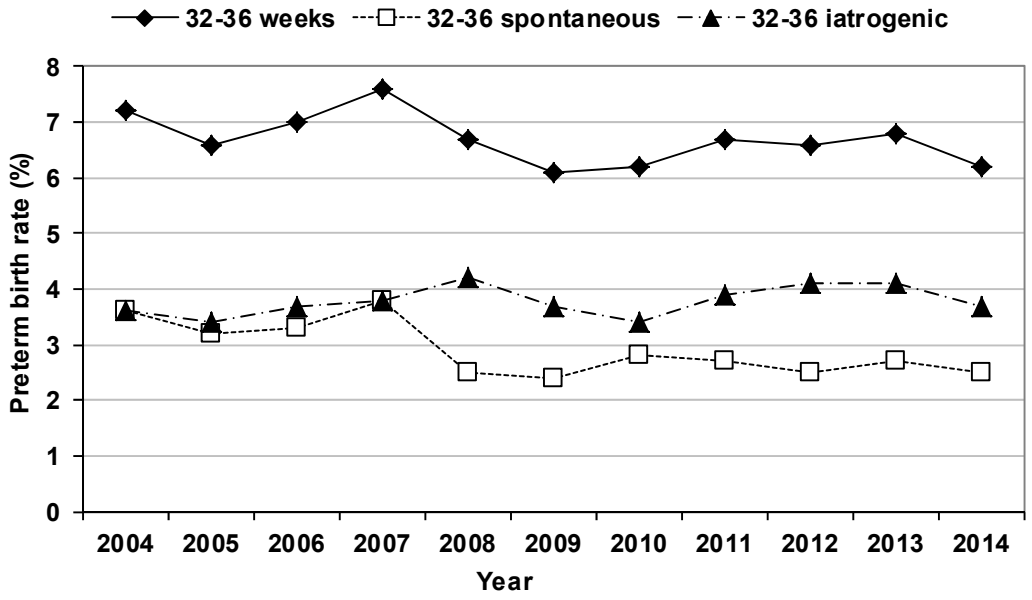
In 2014 we have seen the second lowest overall rate of preterm birth (<37 weeks gestation) since 2004. This is consistent with the significant downward trend seen in the rate of preterm birth over the last decade. Previously this downward trend related to a reduction in spontaneous preterm births (<37 weeks gestation) but this year we have also seen a fall in iatrogenic preterm births at 32-36 weeks.

We expect comparatively high rates of iatrogenic preterm birth reflecting the tertiary level care provided by National Women's Health. Rising rates of iatrogenic preterm birth have previously been highlighted in annual reports. The changing demographic of our general population (e.g. rising rates of BMI >35 and of advanced maternal age) may have contributed to these changes, however, it is also possible that increasing confidence in neonatal care and more intensive surveillance, led to changes in thresholds for delivery.

From the current data supplied it is not clear exactly what may have contributed to this recent observed reduction in iatrogenic preterm birth at 32-36 weeks, however, it is possible that a change in practice as a consequence of new evidence has been influential.

The PPROMT trial, a large international multicentre randomised trial assessing the best timing of delivery for women with PPROM at 34-37 weeks, demonstrated improved neonatal outcomes when an expectant approach to management was applied (opposed to immediate delivery). In addition the HYPITAT II study, a large Dutch multicentre randomised trial assessing the best timing of delivery for women with hypertensive disease at 34-37 weeks, demonstrated that routine delivery was not associated with a reduction in maternal adverse events but did lead to an increase in neonatal morbidity. The results and conclusions of these studies have been circulated to medical and midwifery staff via monthly research updates and have been included in hospital teaching sessions. It is important that we continue to update our practice to reflect current best evidence and to assess its impact on pregnancy outcomes.

Figure 24: Preterm birth rate 32-36 weeks (mothers) NWH 2004-2014



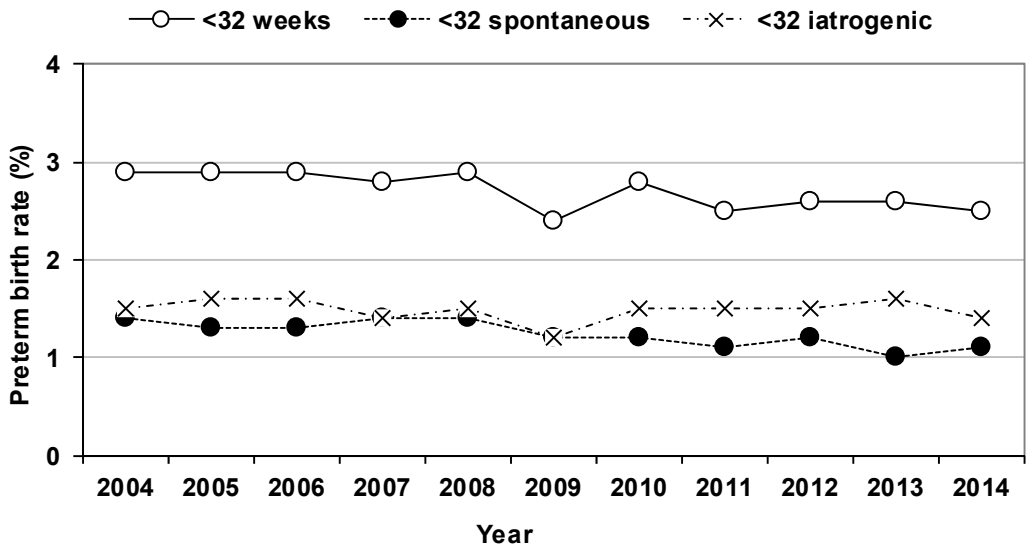
We continue to see high rates of preterm birth in certain populations, most specifically Maori women (total rate 14.6%, spontaneous 6.2% and iatrogenic preterm birth rate 8.3%), teenage mothers (spontaneous preterm birth rate 7.0%), women over the age of 40 years (iatrogenic preterm birth rate 11.2%), current smokers (total preterm birth rate 13.6%) and women with multiple pregnancy (twins total preterm birth rate 72.7%). Although preterm birth cannot be avoided for all and in some cases is indicated in mothers and/or babies best interest there is still potential for reducing rates of preterm birth and improving outcomes and review of these specific groups may be advantageous.

It is unlikely that Maori ethnicity itself is a significant risk factor for preterm birth, however, is more likely to reflect other socio-economic risk factors 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. Further review of preterm births in Maori and young women may reveal other modifiable risk factors that could be targeted and provide potential to further reduce rates of early birth.

Evidence for cervical cerclage, progesterone and cervical pessary continues to emerge with variable results. As yet there is insufficient evidence or resource to instigate a universal approach to cervical length screening for all pregnant women. However, increasing evidence supports the role of multidisciplinary preterm birth prevention clinics for women with recognised pre-existing risk factors for preterm birth. These allow appropriate assessment, surveillance and, where necessary,

treatment of women deemed to be at high risk of preterm birth. Within NWH there has been a relatively informal approach to care of women at high risk of preterm birth until 2013 when the MFM service established a formal Preterm Birth Clinic. This consultant led service provides a weekly half day clinic and is open to referrals from public and private LMCs and also provides a regional (and occasional national) service for women at very high risk of preterm birth.

Figure 25: Preterm birth rate < 32 weeks (mothers) NWH 2004-2014



A pregnancy loss and pre-pregnancy consult service is available along with surveillance +/- treatment through the second trimester of pregnancy. The clinic reviews 1-2 new patients per week and each patient has an average of 4 visits (range 1-10). At first visit women undergo a full risk assessment including detailed history, examination, vaginal swabs, MSU and transvaginal ultrasound assessment of cervical length. Women are then counselled regarding their individual risk and potential modifiable risk factors. A plan of care is made in consultation with each woman including potential interventions in the form of elective or ultrasound indicated cerclage and vaginal progesterone therapy. Women are then offered serial surveillance through the second trimester of pregnancy and an 'exit assessment' utilising quantitative fetal fibronectin (fFN), transvaginal ultrasound assessment of cervical length and obstetric history to provide a risk assessment for early preterm birth <30 weeks to aid care planning for the early third trimester in those at highest risk.

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. If these interventions are found to be beneficial they have the potential to reduce iatrogenic preterm birth. 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.

Figure 26: Iatrogenic and spontaneous preterm birth rates <37 weeks by ethnicity NWH 2014

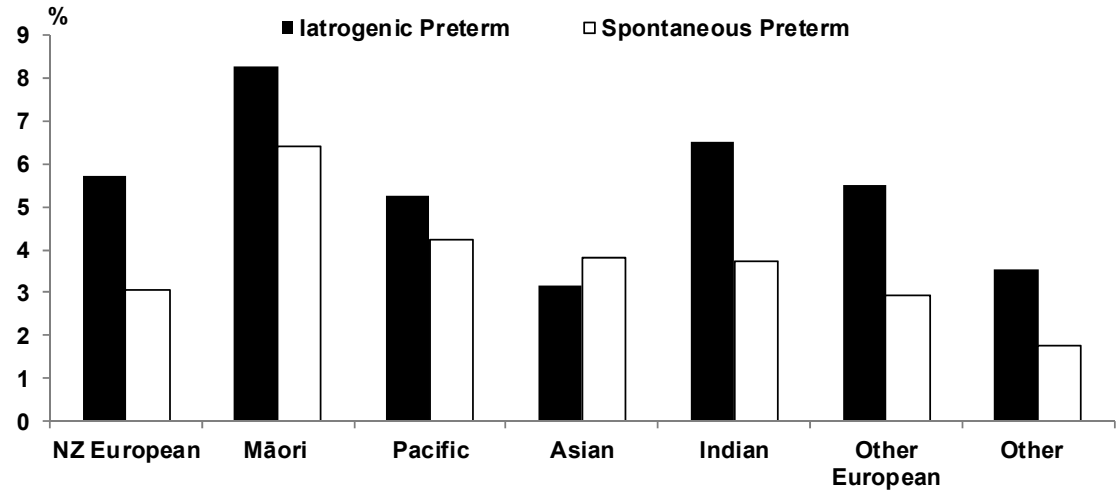


Table 14: Perinatal outcome of preterm babies by gestation at birth NWH 2014

Gestation	Births	Fetal deaths	Live births	% Liveborn	Neonatal Death	% of live births surviving >=28 days
20	16	11	5	31	5	0
21	13	8	5	38	5	0
22	9	6	3	33	3	0
23	9	5	4	44	4	0
24	17	3	14	82	4	71
25	11	4	7	64	0	100
26	21	7	14	67	1	93
27	13	0	13	100	0	100
28	13	2	11	85	1	91
29	19	4	15	79	0	100
30	37	0	37	100	1	97
31	27	1	26	96	0	100
32	27	2	25	93	0	100
33	49	0	49	100	0	100
34	70	1	69	99	1	99
35	137	0	137	100	1	99
36	271	0	271	100	3	99
Totals	759	54	705	93	29	96

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 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% (14.1% 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. This excluded 7 babies in 2014.

Findings

Table 15: Rates of SGA and LGA as defined by customised birthweight centiles (compared to AGA) by demographic characteristics NWH 2014

	Total Babies	Customised Birthweight <10th%(SGA)		Customised Birthweight >=10th% & <=90th% (AGA)		Customised Birthweight >90th%(LGA)	
	N	n	%	n	%	n	%
Total*	**7551**	**1065**	**14.1**	**5898**	**78.1**	**581**	**7.7**
Maternal Age							
<=20	233	39	16.7	177	76.0	17	7.3
21-25	788	113	14.3	611	77.5	64	8.1
26-30	1912	242	12.7	1503	78.6	166	8.7
31-35	2888	401	13.9	2277	78.8	205	7.1
36-40	1429	209	14.6	1107	77.5	112	7.8
>40	301	61	20.3	223	74.1	17	5.6
Ethnicity							
NZ European	2479	340	13.7	1950	78.7	187	7.5
Māori	496	88	17.7	360	72.6	47	9.5
Pacific	893	147	16.5	667	74.7	78	8.7
Asian	1859	225	12.1	1494	80.4	138	7.4
Indian	653	105	16.1	503	77.0	45	6.9
Other European	884	122	13.8	700	79.2	61	6.9
Other	287	38	13.2	224	78.0	25	8.7
Parity							
Multipara	3864	531	13.7	3028	78.4	304	7.9
Primipara	3687	534	14.5	2870	77.8	277	7.5
Smoking at booking							
Currently smoking	384	105	27.3	259	67.4	20	5.2
Not smoking	7157	960	13.4	5636	78.7	561	7.8
Unknown	3	0	0.0	3	100.0	0	0.0
BMI							
<18.5	257	42	16.3	252	98.1	23	8.9
18.5-24.99	4189	502	12.0	3379	80.7	305	7.3
25-29.99	1594	258	16.2	1205	75.6	130	8.2
30-34.99	715	116	16.2	545	76.2	53	7.4
35-39.99	368	71	19.3	252	68.5	44	12.0
>=40	236	48	20.3	170	72.0	18	7.6
Missing	132	28	21.2	95	72.0	8	6.1
Plurality							
Singleton	7250	930	12.8	5742	79.2	578	8.0
Multiple	294	135	45.9	156	53.1	3	1.0

* customised centile was not assigned for 7 babies for whom birthweight was unknown or gestation at death was greater than one week prior to birth or less than 20 weeks gestation AGA=appropriate for gestational age

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 (17.8% (235/1319)) 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.

A high rate of SGA is again noted in multiple pregnancies.

Table 16: Birthweight and gestation at birth among SGA, LGA and appropriately grown (AGA) babies (n=babies) NWH 2014

	Customised Birthweight <10th%(SGA) N=1065		Customised Birthweight >=10th% & <=90th%(AGA) N=5898		Customised Birthweight >90th%(LGA) N=581	
	n	%	n	%	n	%
Median birth weight(IQR) g	2630(2289-2920)		3395(3110-3680)		4100(3865-4405)	
Gestation at birth						
Term	806	75.7	5439	92.2	546	94.0
Preterm	259	24.3	459	7.8	35	6.0
Preterm <32 wks	68	6.4	119	2.2	14	2.4
Median gestation (IQR) weeks	38(37-39)		39(38-40)		39(38-40)	

Consistent with findings in previous years approximately one quarter of SGA infants were born preterm and 6.4% were born < 32 weeks. Rates of preterm delivery were not increased in LGA infants compared with AGA.

Table 17: Interventions and outcomes among SGA, LGA and AGA babies born preterm <37 weeks NWH 2014

	Customised Birthweight <10th%(SGA) n=259		Customised Birthweight >=10th% & <=90th%(AGA) n=459		Customised Birthweight >90th%(LGA) n=35	
	n	%	n	%	n	%
Onset of birth - preterm						
Spontaneous labour	41	15.8	231	50.3	15	42.9
Induction and elective/pre labour CS	218	84.2	228	49.7	20	57.1
NICU admission						
Any stay	174	67.2	223	48.6	15	42.9
>= 48 hrs in NICU	165	20.5	205	3.8	14	2.6
Apgar at 5 mins < 7	15	5.8	35	7.6	5	14.3
Fetal death (n/1000 births)	21	81	22	48	5	143
Neonatal death (n/1000 live births)	8	30	16	35	5	143

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. Preterm SGA infants were twice as likely to be stillborn compared with preterm AGA babies but did not have an elevated risk of death in the neonatal period.

Table 18: Interventions and outcomes among SGA, LGA and AGA babies at term NWH 2014

	Customised Birthweight <10th%(SGA) n=806		Customised Birthweight >=10th% & <=90th%(AGA) n=5439		Customised Birthweight >90th%(LGA) n=546	
	n	%	n	%	n	%
Onset of birth – preterm						
Spontaneous labour	286	35.5	2752	50.6	223	40.8
Induction and elective/pre labour CS	520	64.5	2687	49.4	323	59.2
NICU admission						
Any stay	73	9.1	286	5.3	41	7.5
>= 48 hours	46	5.7	140	2.6	15	2.7
Apgar at 5 mins < 7	13	1.6	63	1.2	3	0.5
Fetal death (n/1000 births)	2	2.2	3	1	0	
Neonatal death (n/1000 live births)	3	4	5	1	0	

Summary / Implications

These 2014 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.

5.3 Multiple pregnancy

This section describes the characteristics and outcomes of mothers who gave birth to twins and triplets at NW during 2014 and the outcomes of their babies.

Findings

Table 19: Multiple pregnancy rates NWH 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total number of multiple pregnancies	187	162	177	160	159	153	163	162	151	147
Incidence %	2.5	2.2	2.3	2.1	2.1	2.0	2.2	2.1	2.1	2.0
Number of twin pregnancies	184	157	174	156	156	149	159	156	147	143
Number of triplet pregnancies	3	5	3	4	3	4	4	6	4	4

Table 20: Fetal/neonatal outcomes of multiple pregnancies NWH 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total number of babies born in a multiple pregnancy	377	329	357	324	321	310	330	330	305	298
Incidence %	5.1	4.5	4.5	4.2	4.1	3.9	4.3	4.2	4.1	4.0
Number of multiple pregnancies where one or more babies died	13	8	9	12	9	13	17	11	10	8
Incidence % (no. of multiple pregnancies where a baby died/number of multiple pregnancies)	7.0	4.9	5.1	7.5	5.8	8.5	10.4	6.8	6.6	5.4
Number of babies who died in a multiple pregnancy	17	12	11	16	13	16	26	18	16	10
Total number of babies born in a twin pregnancy	368	314	348	312	321	298	318	312	293	286
Twin perinatal deaths (< 7days)	16	11	10	13	12	15	23	15	14	9
Twin perinatal mortality rate*	43.4	35.0	28.7	41.7	37.4	50.3	72.3	48.1	47.8	31.5

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

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 (31.5/1000 births versus 10.9/1000 births in 2014) 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 as there is no significant trend in the rate ($p=0.34$). Changes need to be interpreted with care.

Figure 27: Twin perinatal mortality rate (per 1000 twin babies) NWH 1997-2014 with 95% confidence intervals

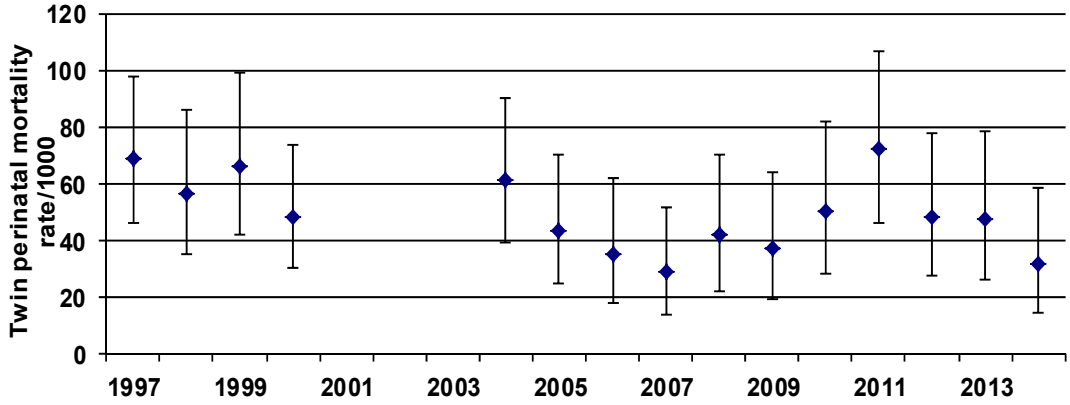


Table 21: Mode of onset of birth among twin pregnancies (mothers) by gestation at birth NWH 2014

	Preterm births n=104		Term births n=39	
	n	%	n	%
Mode of onset of birth				
CS elective	37	36	20	51
CS emergency before labour	20	19	2	5
Induction of labour	26	25	13	33
Spontaneous labour	21	20	4	10

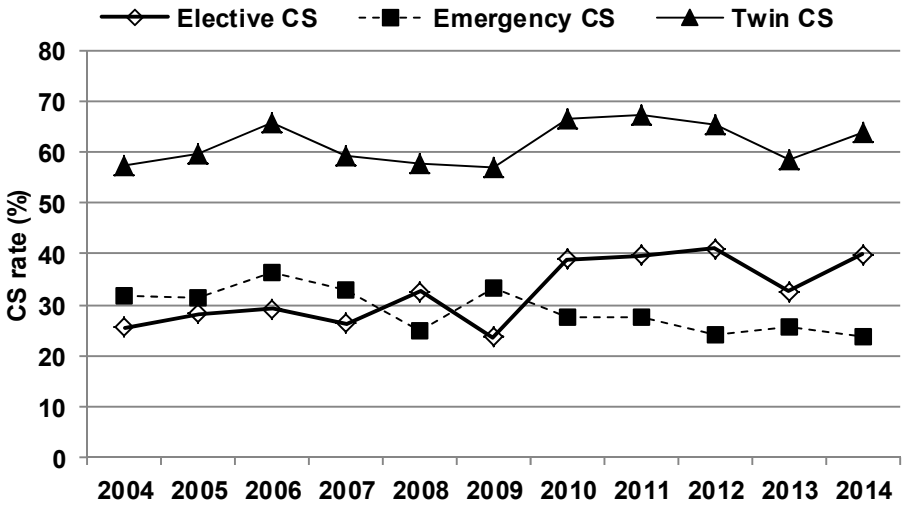
Table 22: Mode of birth among twin pregnancies NWH 2005-2014

	Twin pregnancies																			
	2005 n=184		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	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
SVB/vaginal breech both twins	53	29	38	24	47	27	52	33	48	31	36	24	38	24	34	22	50	34	36	25
SVB 1st twin, operative vaginal 2nd twin	8	4	7	4	3	2	3	2	2	1	2	1	6	4	3	2	2	1	5	3
Operative vaginal 1st twin, SVB 2nd twin	5	3	5	3	6	3	4	3	7	4	7	5	5	3	9	6	3	2	4	3
Operative vaginal birth both twins	7	4	3	2	11	6	4	3	9	6	4	3	2	1	4	3	5	3	4	3
SVB 1st twin, Caesarean section 2nd twin	1	1	1	1	2	1	3	2	1	1	1	1	1	1	4	3	1	1	3	2
Operative vaginal birth 1st twin, Caesarean section 2nd twin	0		0		0		0		0		0		0		0		0		0	
CS elective both twins	52	28	46	29	46	26	51	33	37	24	58	39	63	40	64	41	48	33	57	40
CS emergency both twins	58	31	57	36	59	34	39	25	52	33	41	28	44	28	38	24	38	26	34	24

Sixty-six 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 2014 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 28: Caesarean section rate among twin births (2004-2014)



Reviewing the rates of elective and emergency caesarean section, it can be seen there is an increase in elective caesarean section. Chi-squared test for trend shows that this is a significant increase in elective caesarean section for twins (p=0.0006). It would be useful to consider the reasons for this as there is no new research to support increased elective caesarean section in the setting of a twin pregnancy. Some of this change maybe due to a switch from emergency to elective caesarean section, though there is no concomitant significant fall in emergency caesarean section.

Table 23: Fetal/newborn outcomes of twin babies NWH 2014

	Singletons			Twins		
	N= 7253			N= 286		
	NICU >=48 hours	Total singleton		NICU >=48 hours	Total twins	
	N	n	%	N	n	%
Admission to NICU >=48 hours	461	7253	6.4	112	286	39.2
<=34 weeks	192	264	72.7	68	78	87.2
35-36	71	275	25.8	41	130	31.5
>=37 weeks	198	6714	2.9	3	78	3.8
Apgar<7 at 5 minutes	120	7253	1.7	12	286	4.2

Table 24: Perinatal-related deaths in twin pregnancies by gestation at birth NWH 2014

	Twin pregnancies			
	One twin died		Both twins died	
Gestation at birth (or at death for	**n**	**Outcome**	**n**	**Outcome**
20 – 23	1	FD	2	ENND
24 – 27	3	FD; ENND; LNND	2	FD
28 – 31	2	FD		
32 – 36				
37 – 40				

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

There were 10 perinatal related deaths of twins. Five out of the 10 losses were in a monochorionic twin placentation. All of the cases were complicated by specific monochorionic pathologies. The perinatal losses in the dichorionic twin pregnancies were secondary to spontaneous preterm

labour and growth restriction.

Summary / Implications

Multiple pregnancy rates are steady. Perinatal mortality rates in twin pregnancies remain three times higher than in singleton pregnancies. 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.

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 66 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 section would help inform this question.

5.4 Diabetes

The data in this section relate to women with a diagnosis of pre-existing (Type 1 and 2), Type 2 diagnosed for the first time in pregnancy and gestational diabetes who birthed at National Women's in 2014.

There have been a number of changes in the categories included in the database this year. Therefore there have been changes to the way the data are presented.

Most analyses are based on antenatal diagnosis. One woman was diagnosed with Type 1 diabetes in pregnancy and is included throughout as "Type 1" diabetes. Women with pre-existing Type 2 diabetes (n=73, including one MODY) and women with Type 2 diabetes diagnosed in pregnancy (defined by HbA1c>=50mmol/mol at diagnosis) (n=13) are included as Type 2 diabetes. Women whose Type 2 diabetes was diagnosed after pregnancy are included with gestational diabetes (n=1). Women with known prediabetes prior to pregnancy are included with gestational diabetes (n=21).

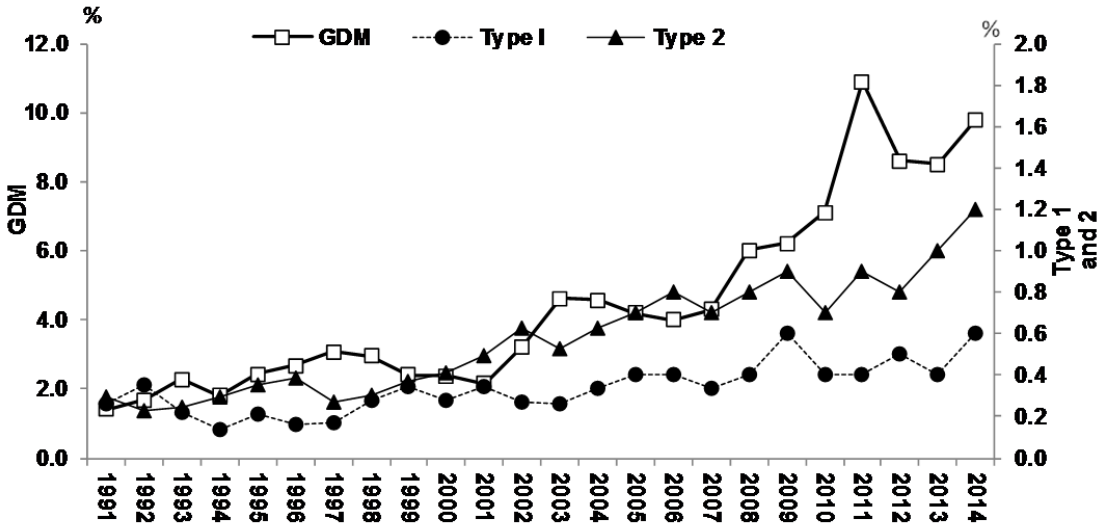
This report includes women who were cared for solely by the National Women's Diabetes Clinic, women with some input from the Diabetes Clinic while under the care of non-Diabetes Clinic LMCs, and women with no Diabetes Clinic input. It does not include women seen by the Diabetes service for pre-pregnancy counselling or those who birthed prior to 20 weeks or elsewhere.

Findings

In 2014, 96.4% of women birthing at NWH were screened for diabetes. Our data do not include details of the type of screening performed.

The trend of increasing rates of diabetes continues overall. There was a decrease in numbers when Waitemata set up their formal diabetes in pregnancy service during 2011. This increase reflects the background population demographics, so it is not surprising.

Figure 29: Incidence of diabetes (% of all inborn and BBA births) NWH 1991-2014



5.4.1 Demographic characteristics of women with diabetes NWH 2014

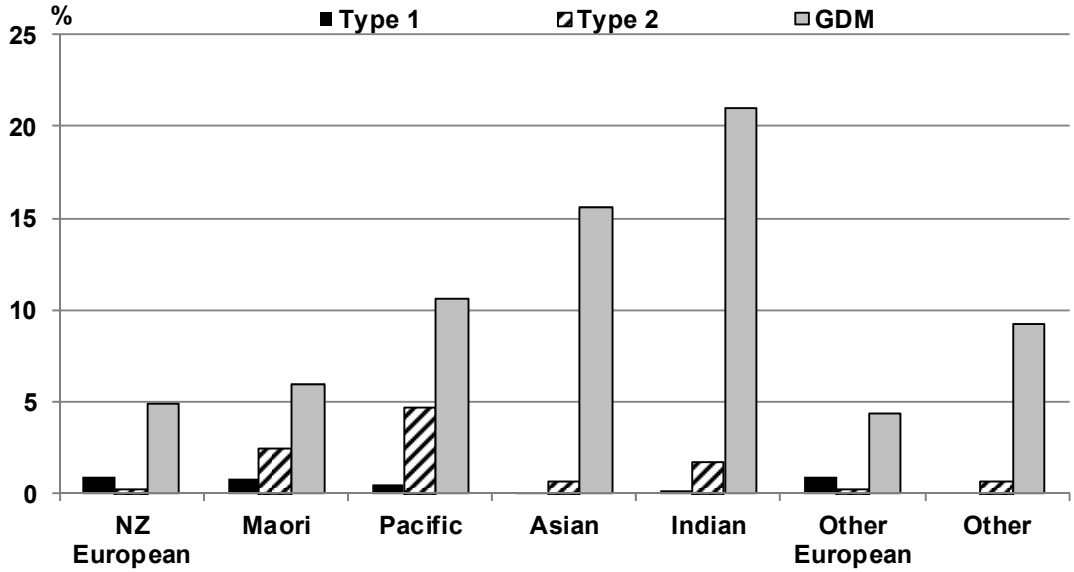
It will be of interest to see what happens to the prevalence of diabetes in pregnancy over the next few years, as several changes are underway. The Ministry of Health published the NZ GDM Guidelines (www.health.govt.nz) in December 2014 and DHBs are expected to implement recommendations during 2015.

One key recommendation is that all pregnant women without previously recognised diabetes should be offered an HbA1 with their first antenatal bloods, to screen for underlying unrecognised

diabetes. All women with an HbA1c ≥50mmol/mol should be referred. At NWH, we have already been recommending a screening HbA1c in women with risk factors for approximately 4 years. Women with HbA1c ≥41mmol/mol have been referred. We have examined outcomes in those women and our data supports our current practice. However, the optimal threshold for referral is debated and more robust data are required. We aim to start a trial in October 2015, led by Ruth Hughes (PINTO) in women with an early pregnancy HbA1c 41-46mmol/mol <14 weeks' to either lifestyle intervention and 75g OGTT at 24-28 weeks' (guidelines recommendation) or early treatment (current practice at NWH) to see if early treatment improves outcomes in these women.

In women with subsequent GDM in the second half of pregnancy, a 75g OGTT remains the recommended diagnostic test. We are also aiming to start recruiting in a trial already underway, which is led by Caroline Crowther (GEMS), to compare our current diagnostic criteria with IADPSG criteria developed by consensus from a large observational study (HAPO). These are endorsed by WHO and FIGO. If we adopt them in NZ, we may find about a third of pregnant women are diagnosed with GDM. This was seen in a recent Spanish study, but despite the prevalence increasing from approximately 10% to 35% in their population, pregnancy outcomes improved across the hospital and it was cost-effective. (Duran et al Diabetes Care 2014)

Figure 30: Incidence of diabetes by ethnic group NWH 2014



There is still a disparity in rates of type 2 diabetes between Pacific and Maori women and other ethnic groups. However rates of GDM are unusually low in Pacific and Maori women. We have previously commented about the possibility that the 50g glucose challenge test and 75g OGTT may be falsely normal in obese Polynesian women. Strategies to improve detection in these women will need to be developed.

Table 25: DHB of domicile of women with diabetes birthing at NWH 2014

	Type 1		Type 2		GDM		No Diabetes	
	n=42		n=87		n=725		n=6547	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	14	33.3	39	44.2	484	66.8	4443	67.9
Waitemata	16	44.4	38	44.2	111	15.3	905	13.8
Counties Manukau	4	9.5	7	8.1	117	16.1	1080	16.5
Other	8	19.0	3	3.5	13	1.8	119	1.8

5.4.2 Maternal outcomes of pregnancies complicated by diabetes

Figure 31: Mode of birth among women with GDM NWH 1999-2014

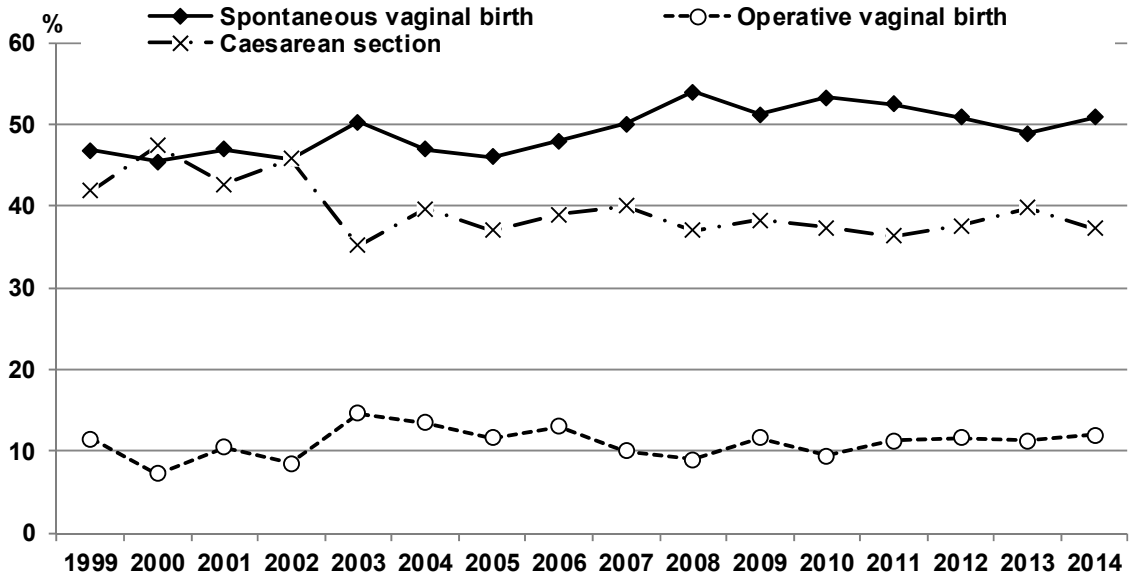


Table 26: Maternal outcomes among women with diabetes NWH 2014

	Type 1 n=42		Type 2 n=87		GDM n=725		No diabetes n=6547	
	n	%	n	%	n	%	n	%
Induction of labour	25	59.5	55	64.0	401	55.3	1834	28.0
Mode of Birth								
Spontaneous vaginal birth	13	31.0	31	36.1	365	50.3	3583	54.7
Ventouse	2	4.8	5	5.8	55	7.6	468	7.1
Forceps	3	7.1	1	1.2	34	4.7	281	4.3
CS emergency	16	38.1	27	31.0	134	18.5	1101	16.8
CS elective	8	19.0	22	25.3	137	18.9	1114	17.0
Gestation at birth								
<32 weeks	2	4.8	2	2.3	15	2.1	167	2.6
<37 weeks	9	21.4	14	16.1	79	10.9	546	8.3
PPH >=500mls	22	52.4	45	52.3	281	38.8	2280	34.8
PPH >=1000 mls	6	14.3	13	14.9	66	9.1	661	10.1
Postpartum transfusion	4	9.5	1	1.2	14	1.9	153	2.3

The induction and caesarean section rates are not increasing in the diabetes population overall. Our rates in women with type 1 and type 2 diabetes are similar to or lower than many countries. Our preterm birth rate in women with pre-existing diabetes is also lower than many centres, which is typically 20-30%.

5.4.3 Maternal postpartum glucose tolerance testing

Table 27: Rates of postnatal glucose tolerance testing (GTT) among women with GDM NWH 2004-2014

	2005 n=304		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	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Postnatal GTT/HbA1c	238	78	206	72	249	75	313	68	324	68	369	67	480	58	401	61	328	54	361	50
No post-natal GTT/HbA1c	66	22	80	28	82	25	144	32	156	32	179	33	341	42	261	39	285	46	364	50

It is difficult to comment on the postpartum results, as we have moved to asking women to do an HbA1c at 3 months postpartum, and seeing their GP for follow up. This request is handed over to the GP by letter. This means however, that the result is not always available at the time the hospital records are completed and we are looking at systems to make this data collection more robust. Of the 361 women with GDM that performed an HbA1c (50%), 109 (30%) were ≥41mmol/mol, showing similar rates of abnormal glucose tolerance to other years. Of note, studies have shown that the HbA1c is not as sensitive as the 75gOGTT, so we may be underestimating our rates of abnormal glucose tolerance. However, we consider that an HbA1c measure will pick up the highest risk women and increase rates of ongoing annual follow up.

5.4.4 Neonatal outcomes among babies of women with diabetes in pregnancy

We have the ongoing uncertainty about the accuracy of the GROW birth weight centiles in our very obese non-European women in particular, which was commented on last year. Otherwise, our outcomes are similar to other years.

Table 28: Neonatal outcomes among babies of women with diabetes NWH 2014

	Type 1 n=42		Type2 n=87		GDM n=736		No diabetes n=6686	
	n	%	n	%	n	%	n	%
Birthweight (Median(IQR))	3500(2970-3840)		3310(2762-3630)		3165(2845-3520)		3370(3005-3720)	
<1500g	1	2.4	2	2.3	14	1.9	174	2.6
<2500g	4	9.5	12	13.8	80	10.9	566	8.5
SGA <10th percentile	1	2.4	17	19.5	108	14.7	939	14.0
LGA >90th percentile	17	40.5	8	9.2	66	9.0	490	7.3
Admission to NICU								
Any admission	15	35.7	22	25.3	90	12.2	685	10.3
>= 48 hours	10	23.8	14	15.9	64	8.7	497	7.4
Hypoglycaemia < 2.3 mmol/l	10	23.8	11	12.6	46	6.3	NA	
Hypoglycaemia 2.3 - 2.5 mmol/l	1	2.4	6	6.9	49	6.7	NA	
IV Dextrose	7	16.7	5	5.7	20	2.7	NA	
Perinatal related losses (/1000)	0	0	1	11	8	11	87	13

NA=not available

5.4.5 Perinatal losses

There were 9 perinatal related losses during 2014.

Four were related to fetal anomalies, one of these in a woman with poorly controlled type 2 diabetes, two in women with probable underlying pre-diabetes and one in a woman with GDM, whose infant had an inherited mutation.

Two of the remaining 5 were in women with preterm SROM, one at 20 weeks with underlying pre-diabetes treated from 18 weeks', one with prolonged SROM who developed GDM at 28 weeks and delivered at 29 weeks'. The infant died of cardiorespiratory complications.

A further loss was in a 46 year old with donor egg, APH and severe growth restriction. GDM was diagnosed a week before fetal demise. Another was the loss of a DCDA twin at 24 weeks. The mother subsequently developed GDM and the second twin was healthy at delivery at 38 weeks. The final loss was at 40 weeks in a woman with GDM, well-controlled on insulin. She was admitted in advanced labour with a fresh still birth.

Summary

- Outcomes for 2014 were similar to previous years.
- The population of women with diabetes in pregnancy continues to rise.

Objectives/Aims

- We have not yet addressed the GROW chart birth weights to see if they require modification (eg BMI limits) in our diabetes population.
- Research over the next few years will better guide us about the optimal threshold for referring women with early HbA1c screening. Practice may vary between centres in the interim.
- Research will also guide us whether to adopt the WHO/FIGO/IADPSG diagnostic criteria for GDM.

5.5 Antepartum Haemorrhage

Antepartum haemorrhage has been defined here to include 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.

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 29: Antepartum haemorrhage incidence NWH 1999-2014

	1999	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total APH	484	594	398	411	533	424	438	438	455	511	460	469
Incidence %	6.5	7.6	5.5	5.7	6.9	5.6	5.7	5.7	6.0	6.6	6.4	6.3
Proven abruption	49	54	41	44	58	36	39	50	54	47	50	37
Proven placenta praevia	74	69	81	68	94	73	66	58	60	63	66	54
APH (uncertain origin)	361	471	276	299	381	315	333	330	341	401	344	378

In 2014, 469 women (6.3% of the total pregnant population) had an antepartum haemorrhage or placenta praevia without bleeding (**Table 29**). 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 60-75% 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.

In 2014 there were the lowest number of cases of placenta praevia (54 women) since 1999. Placenta praevia is significantly more common with increasing maternal age (see appendix 4.2) there was an incidence of 0.4% (11 of 2901 women) in women aged 30 or under rising to 1.5% in women aged >35 (25 of 1675 women). The incidence of placenta praevia in women with a previous Caesarean section was 1.8% (22 of 1225 women) compared to 0.5% among nulliparous women (19 of 3604 women) and 0.5% (13 of 2571 women) among multipara without a previous birth by Caesarean section. This is consistent with previous Caesarean section being a risk factor for placenta praevia. Smoking status, BMI and hypertensive disease were not associated with placenta praevia.

Table 30: Maternal outcomes of pregnancies complicated by antepartum haemorrhage NWH 2014

	Placenta praevia		Placental abruption		APH uncertain		No APH	
	n=54		n=37		n=378		n=6931	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	1	1.85	6	16.7	188	49.7	3797	54.8
Operative vaginal	0	0.00	1	2.8	51	13.5	797	11.5
CS elective	39	72.2	3	8.3	47	12.4	1192	17.2
CS emergency	14	25.9	27	72.9	92	24.3	1145	16.5
Maternal transfusion	9	16.7	8	22.2	18	4.8	145	2.1

Women with a placenta praevia had a significant requirement for blood products with 16.7% (9 of 54 women) of these women requiring transfusion during pregnancy or birth. However, it is reassuring that 83% were managed without resort to blood transfusion.

A confirmed placental abruption is a less common diagnosis with an incidence of 0.5% in 2014 (37 of 7400 women). Hypertension and pre-eclampsia may be a significant risk factor with an

incidence of 0.9% (5 of 561 women) in these groups compared to 0.5% (32 of 6839 women) in normotensive women. Smoking does not appear to be a significant risk factor with an incidence of abruption of 0.8% in smokers compared to 0.7% in non-smokers. There does not appear to be any association with maternal age, BMI or previous Caesarean section.

Placental abruption is associated with significant maternal morbidity with 72% requiring birthing by emergency Caesarean section and 22% being transfused. Fetal morbidity is also high with a median birthweight of 2315g and 53% of these babies admitted to NICU. There were four perinatal deaths amongst 38 babies in this group (105 per 1000 births).

The management of women with an antepartum haemorrhage of unknown origin remains challenging. They have a higher rate of preterm birth (41.5%), emergency caesarean section (24%), and an increased requirement for blood transfusion (4.8%). The perinatal mortality rate is five times higher (at 49 per 1000 births) in pregnancies where an APH of unknown origin has occurred compared to women with no antepartum haemorrhage. 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 (378 of 499 women). Placenta praevia can be confirmed or excluded reliably by ultrasonography. It is likely that many of these women with no firm diagnosis had unconfirmed small abruptions and the increased perinatal morbidity and mortality associated with APH of uncertain origin would support this assumption.

Table 31: Fetal/neonatal outcomes of pregnancies complicated by antepartum haemorrhage NWH 2014

	Placenta praevia		**Placental abruption**		**APH uncertain origin**		**No APH**	
	n=54		**n=38**		**n=385**		**n=7074**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Gestation at birth								
<37 weeks	14	25.9	21	55.3	111	28.8	613	8.7
<32 weeks	2	3.7	12	31.6	49	12.7	142	2.0
Birthweight								
Median(IQR)	3170 (2760-3460)		2315 (1230-3390)		3125 (2482.5-3512.5)		3360 (3000-3710)	
<2500g	8	14.8	20	52.6	97	25.2	537	7.6
<1500g	3	5.6	11	28.9	45	11.7	132	1.9
Small for gestation age	7	13.0	5	13.2	68	17.7	992	14.0
Perinatal related deaths (n/1000)	0	0.0	4	105.3	19	49.4	74	10.5
Any Admission to NICU	12	22.2	20	52.6	88	22.9	692	9.8
>=48 hours	11	20.4	17	44.7	81	21.0	476	6.7

5.6 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.
- **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 (BI).

Findings

The overall rate of hypertensive disease in pregnancy (7.6%) is similar to the rate in 2013 (7.3%). It still remains a very common medical disorder in pregnancy. Chronic hypertension is more common in the multiparous population, with gestational hypertension and preeclampsia being predominant in nulliparous women. Women of Maori or Pacific ethnicity had higher rates of hypertensive disorders in pregnancy. Women with increased BMI had higher rates of chronic hypertensive disease in pregnancy, especially if their BMI was greater than 40. Twenty-one percent of women with a BMI over 40 had hypertensive disease in pregnancy.

There were 2 reported cases of eclampsia in 2014 both occurring in primigravid women under 25 years of age. One case was a presumed eclamptic seizure at home in a woman with limited antenatal care. The second case occurred in hospital, in a woman with known preeclampsia who had represented with headache and elevated blood pressure. Both women and their babies had good outcomes and have received postnatal specialist followup.

Table 32: Hypertensive disease in pregnancy by parity NWH 2014

	All women n=7400		Nullipara n=3604		Multipara n=3796	
	n	%	n	%	n	%
Any hypertensive disease	561	7.6	309	8.6	252	6.6
Gestational hypertension	235	3.2	136	3.8	99	2.6
Chronic hypertension	149	2.0	51	1.4	98	2.6
Superimposed pre-eclampsia	16	0.2	7	0.2	9	0.2
Pre-eclampsia	161	2.2	115	3.2	46	1.2
Eclampsia	2	0.03	2	0.06	0	

Hypertensive disease is associated with an increase in interventions to interrupt pregnancy. Fifty-one percent of normotensive women went into labour spontaneously, compared with only 21%, 26% and 25% of the women with gestational hypertension, pre-eclampsia or chronic hypertension respectively. A diagnosis of gestational hypertension, preeclampsia, chronic hypertension or superimposed preeclampsia is associated with a higher rate of Caesarean section birth (43%, 56%, 48%, and 75% respectively).

Figure 32: Onset of birth and hypertensive disorders of pregnancy NWH 2014

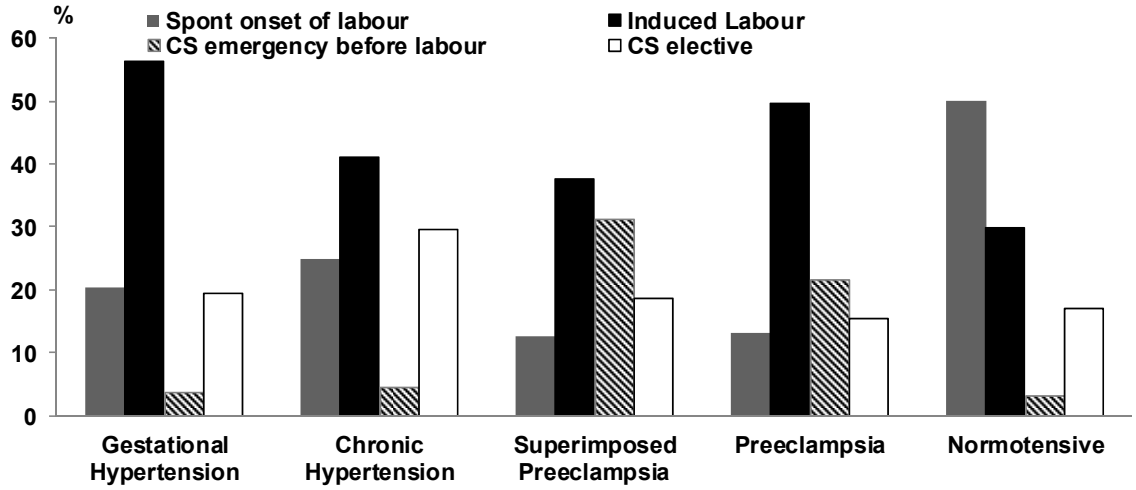


Table 33: Mode of birth among women with hypertensive disease NWH 2014

	Gestational hypertension n=235		Chronic hypertension n=149		Superimposed preeclampsia n=16		Pre-eclampsia n=161		Normotensive n=6839	
	n	%	n	%	n	%	n	%	n	%
Mode of birth										
Normal vaginal	104	44.3	66	44.3	3	18.8	57	35.4	3762	55.0
Operative vaginal	29	12.3	11	7.4	1	6.25	14	8.7	794	11.6
CS elective	46	19.6	44	29.5	3	18.8	25	15.5	1163	17.0
CS emergency	56	23.8	28	18.8	9	56.3	65	40.4	1120	16.4
Epidural	138	58.7	87	58.4	4	25.0	95	59.0	3525	51.5
General Anaesthetic*	4	1.7	7	4.7	1	6.3	11	6.8	173	2.5

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

Table 34: Perinatal outcomes and hypertensive disease (babies) NWH 2014

	Gestational hypertension n=244		Chronic hypertension n=152		Superimposed preeclampsia n=18		Preeclampsia n=175		Normotensive n=6962	
	n	%	n	%	n	%	n	%	n	%
Gestation at birth										
<37 weeks	29	11.9	25	16.4	8	44.4	77	44.0	620	8.9
<32 weeks	0	0.0	5	3.3	3	16.7	23	13.1	174	2.5
SGA	46	18.9	36	23.7	8	44.4	72	41.1	903	13.0
NICU Admission	35	14.3	25	16.4	7	38.9	64	36.6	681	9.8
>=48hrs in NICU	21	8.6	15	9.9	7	38.9	60	34.3	482	6.9
Apgar <7 at 5 minutes	3	1.2	4	2.6	2	11.1	4	2.3	121	1.7
Perinatal related deaths (n/1000)	1	4.1	3	19.7	2	111.1	6	34.3	85	12.2

Hypertensive disease in pregnancy is associated with a range of adverse perinatal complications. Very preterm birth (<32 weeks) is more common in women who have superimposed preeclampsia or preeclampsia (17% and 13% of births respectively, compared to 2.5% of normotensive pregnancies).

SGA is also increased in all of the hypertensive groups, as is NICU admission and prolonged NICU stay. This is most pronounced in the pre-eclamptic groups, probably reflecting the increased risk of prematurity and SGA in this group. The perinatal related mortality rates given may not

reflect the true risk, because of the small numbers in each hypertensive group. There were twelve perinatal related deaths in the hypertensive group, an increase on the seven deaths in 2013.

Summary / Implications

Occurring at a rate of 7.6%, antenatal hypertensive disease is one of the most common medical complications associated with pregnancy at NW. Gestational hypertension is less often associated with significant adverse maternal or perinatal outcomes. The negative pregnancy outcomes associated with the other hypertensive conditions are reflected in the 2014 data. This reemphasises the need to adequately monitor hypertensive pregnancies and ensure timely referral for specialist level care.

5.7 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

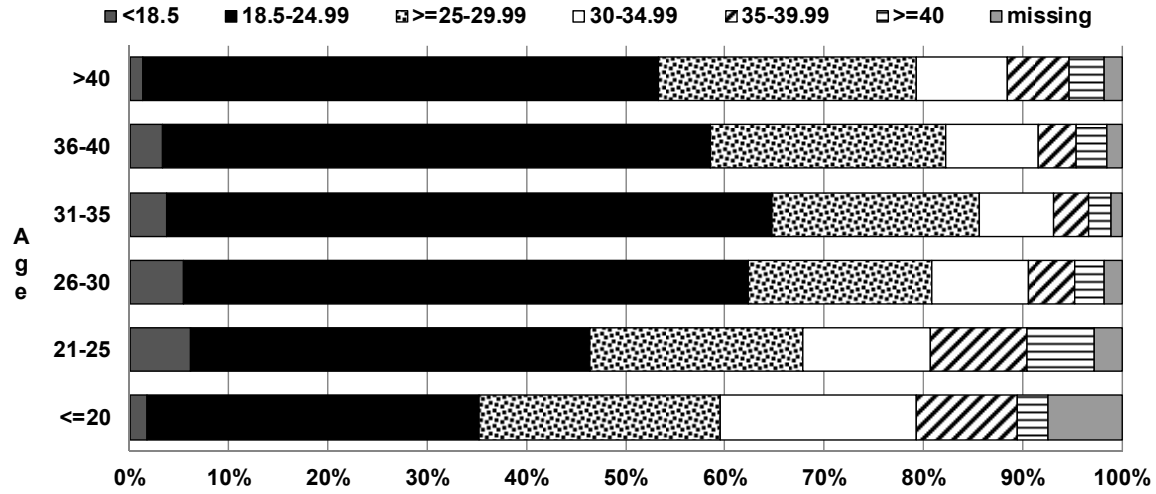
Table 35: Maternal BMI using WHO categories NWH 2008-2014

	2008		2009		2010		2011		2012		2013		2014	
	n=7589		n=7735		n=7709		n=7523		n=7695		n=7223		n=7400	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<18.5	405	5.3	442	5.8	443	5.7	439	5.8	481	6.3	255	3.5	313	4.2
18.6-24.99	3705	48.8	3867	50.0	3913	50.8	3790	50.4	3949	51.3	3826	53.0	4106	55.5
25-29.99	1659	21.9	1709	22.1	1715	22.3	1641	21.8	1678	21.8	1679	23.2	1565	21.1
30-34.99	727	9.6	780	10.1	797	10.3	790	10.5	771	10.0	699	9.7	696	9.4
35-39.99	356	4.7	377	4.8	356	4.7	368	4.9	354	4.6	367	5.0	357	4.8
>=40	264	3.5	250	3.3	265	3.4	309	4.1	289	3.8	250	3.5	234	3.2
Missing	471	6.2	310	4.0	220	2.8	186	2.5	173	2.3	147	2.0	129	1.7

Rates of obesity, including morbid obesity (BMI≥35) have remained similar over the last 7 years. Over time, data collection has improved with < 2 % of the data missing in 2014.

It is unknown what proportion of pregnant mothers booked at NW 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 with potential to impact on clinical outcomes. (Jeffs E 2014)

Figure 33: Distribution of BMI by maternal age NWH 2014



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.

Figure 34: Distribution of BMI among Māori women NWH 2014

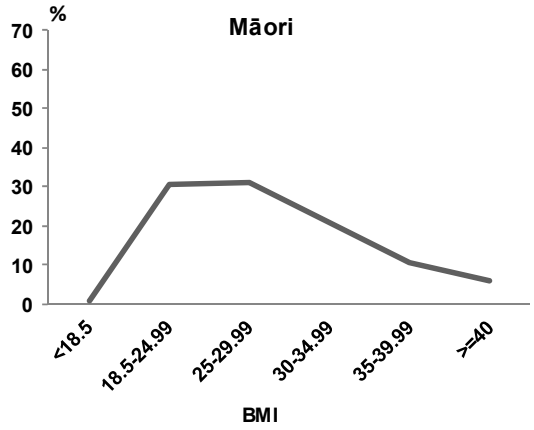


Figure 35: Distribution of BMI among Pacific women NWH 2014

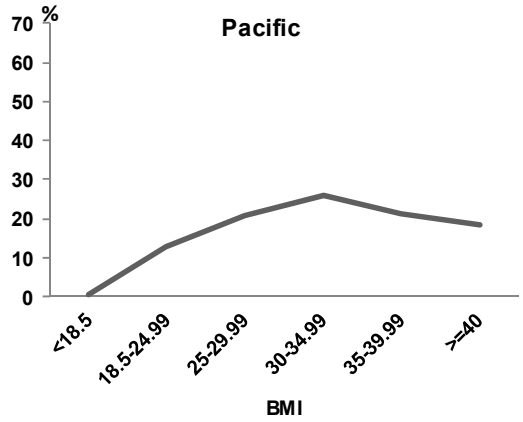


Figure 36: Distribution of BMI among Indian women NWH 2014

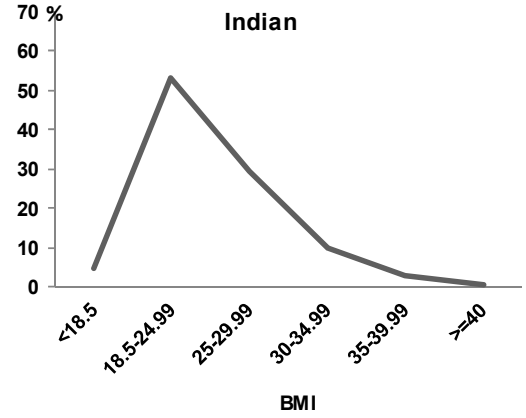


Figure 37: Distribution of BMI among European women NWH 2014

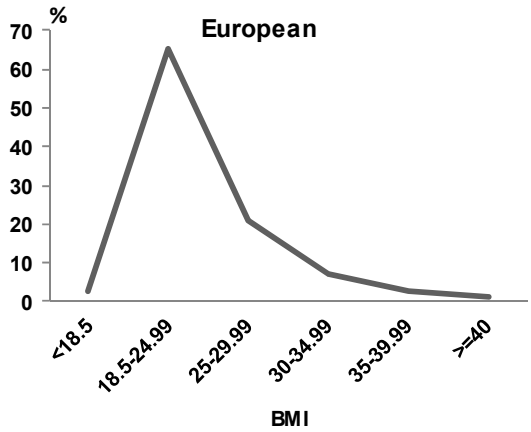
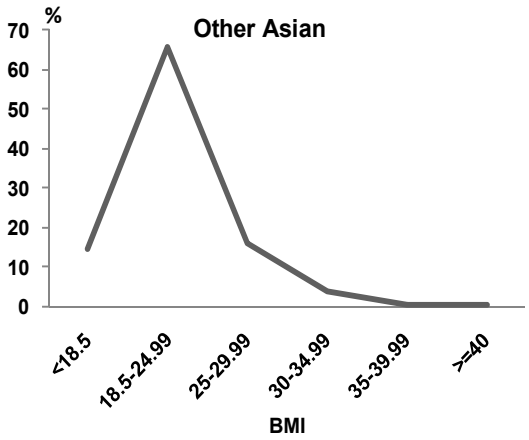
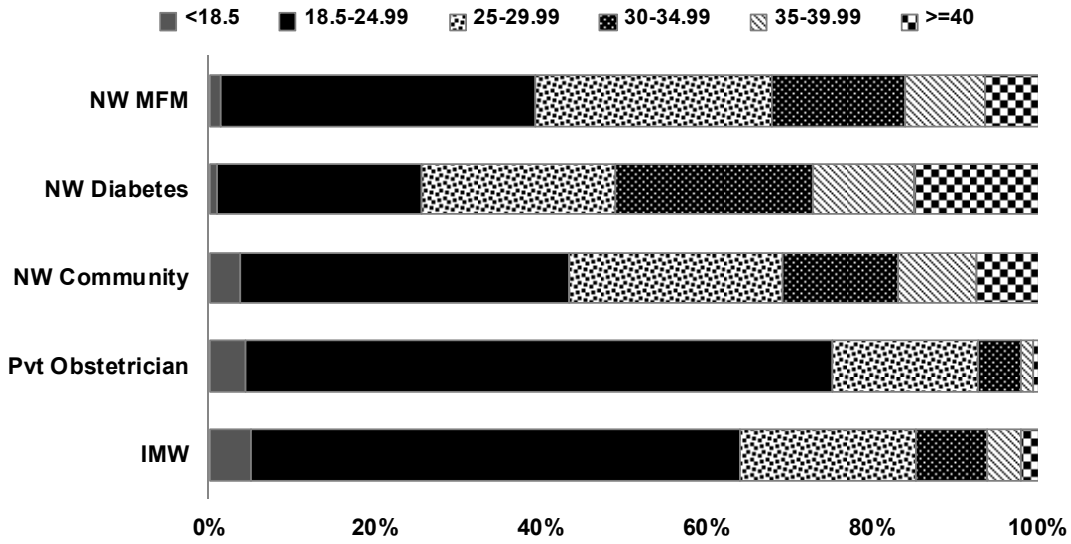


Figure 38: Distribution of BMI among Other Asian women NWH 2014



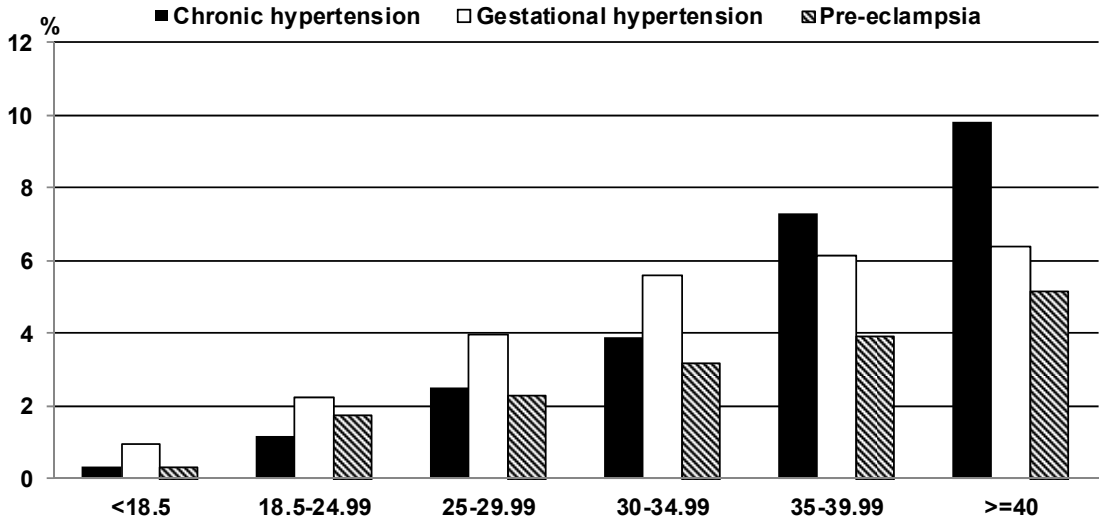
Māori and especially Pacific women are over represented amongst the overweight/obese groups (68.5% and 86.5% respectively vs 33.3% among European women). Overweight/obesity is more common amongst parous women, perhaps partly reflecting weight gained during a previous pregnancy and not lost postpartum, as well as increasing age. The prevalence of smoking is also increased amongst overweight/obese women (smoking rate 12.4% in obese, 6.7% in overweight and 2.7% in women with normal BMI). This high rate of smoking is also likely to contribute to pregnancy complications in these women. (Appendix section 4.5)

Figure 39: Distribution of BMI by LMC at birth NWH 2014



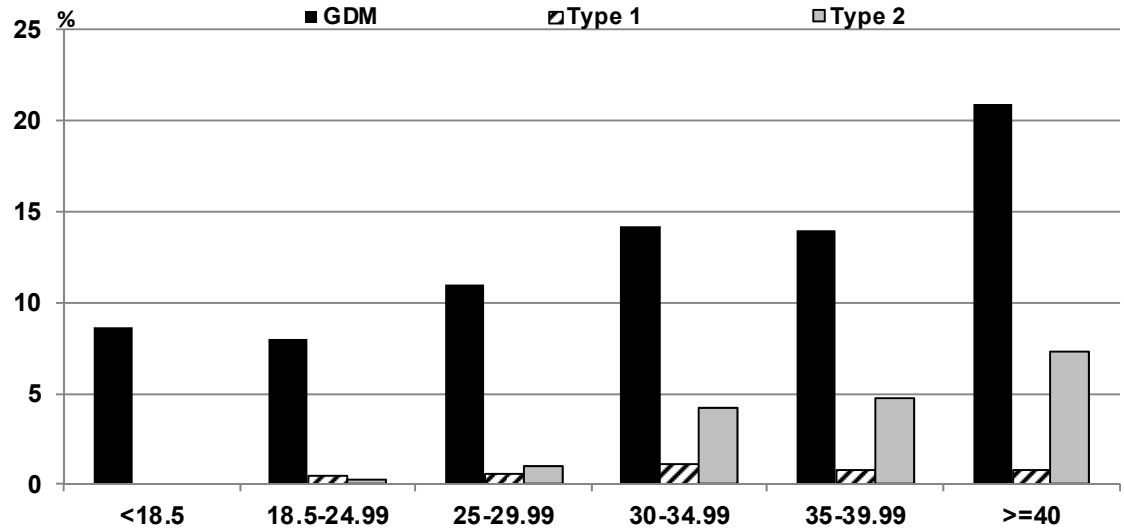
Rates of obesity are highest in the NW diabetes clinic and lowest amongst pregnant women booked with private obstetricians and independent midwives.

Figure 40: Rates of hypertensive diseases by maternal BMI NWH 2014 (Chronic hypertension includes superimposed pre-eclampsia)



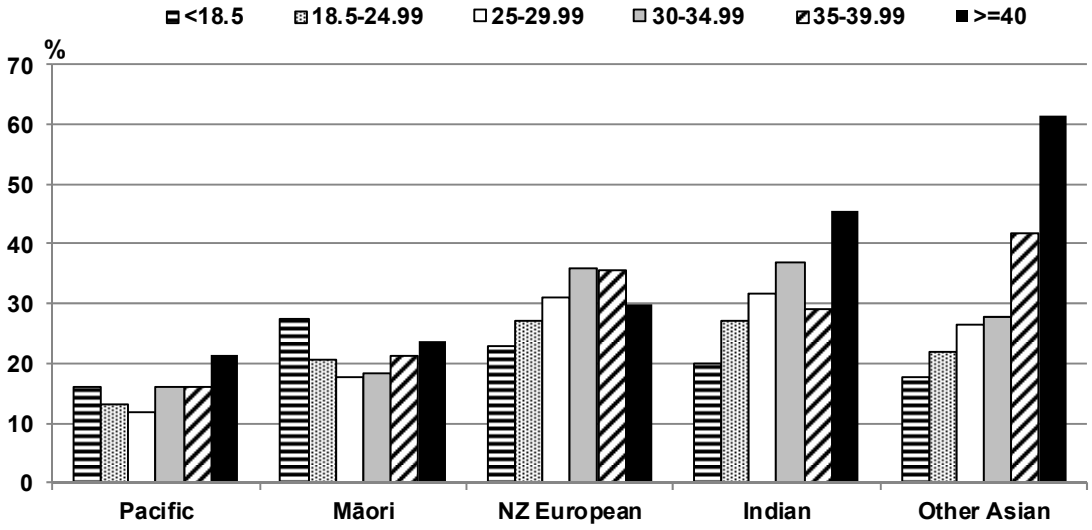
As has been shown in the international literature, rates of chronic hypertension and pregnancy hypertensive complications increase progressively with increasing BMI.

Figure 41: Rates of diabetes by maternal BMI NWH 2014



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 12.9% of overweight/obese women, and 20.9% 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.

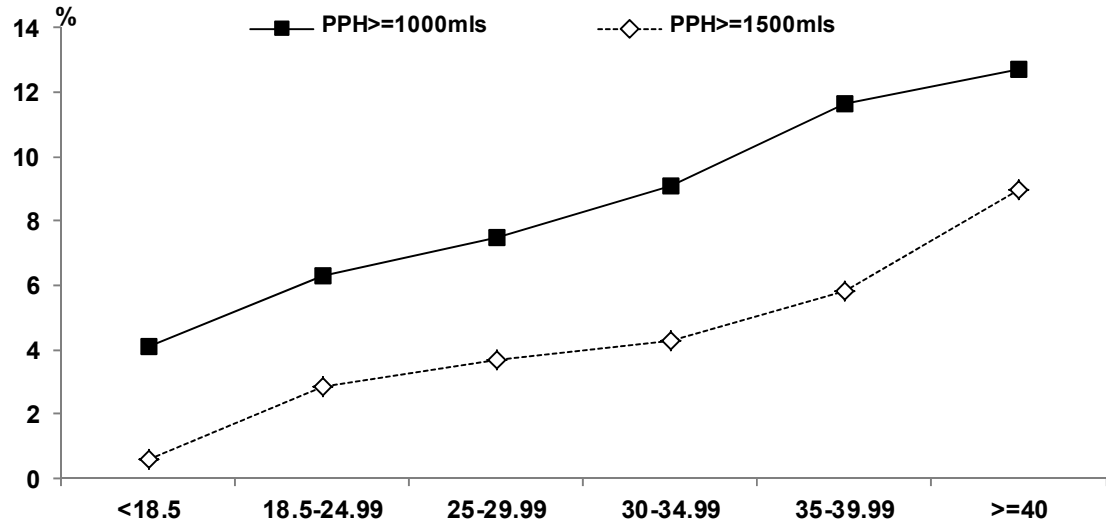
Figure 42: Primary Caesarean section rate by BMI and ethnicity NWH 2009-2014



The above figure shows that among women who not had a previous Caesarean section, increasing BMI is generally associated with increasing primary Caesarean rates. Overall, European, Indian and other Asian women have higher rates of Caesarean section than Pacific and Māori women. However there are likely to be a number of confounding factors, such as maternal age (European women are older than Māori and Pacific mothers), and pregnancy complications that influence Caesarean section rates. A recent publication from National Women's which explored the relationship between ethnicity and Caesarean section in term nullipara (after adjusting for confounders such as age and BMI) found that Pacific and Chinese women had lower rates of Caesarean section than European whereas Indian women had

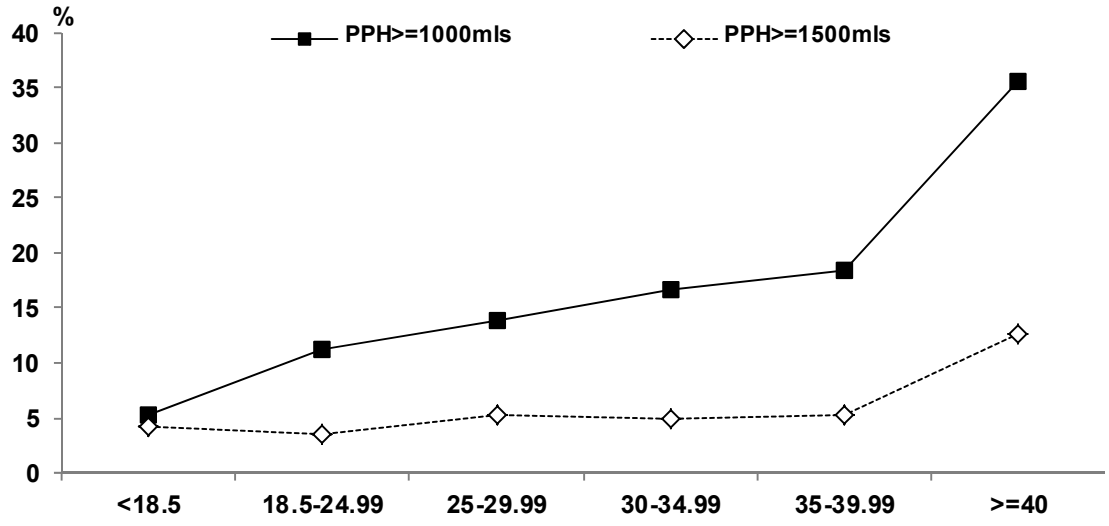
elevated rates (Anderson et al Aust N Z J Obstet Gynaecol. Jan 2013. DOI: 10.1111/ajo.12036).

Figure 43: Postpartum haemorrhage rate by BMI among spontaneous vaginal births NWH 2014



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.

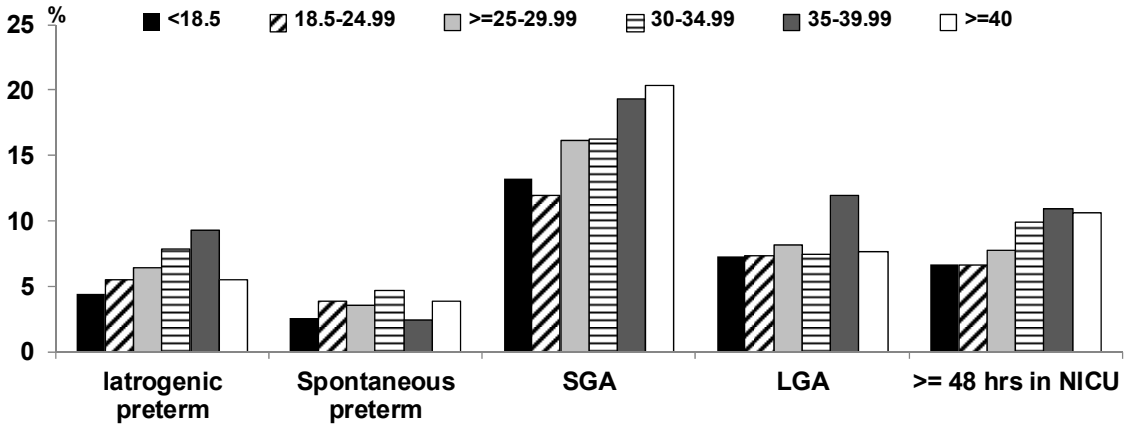
Figure 44: Postpartum haemorrhage rate by BMI among Caesarean sections NWH 2014



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 45: Preterm birth and neonatal outcomes in relation to BMI NWH 2014



Higher rates of SGA occur in obese women which raises particular challenges as SGA is less likely to be detected antenatally. The higher rates of NICU admission for babies of obese women may be explained by higher rates of SGA and/or higher rates of iatrogenic preterm birth associated with increased rates of pre-eclampsia, SGA and diabetes.

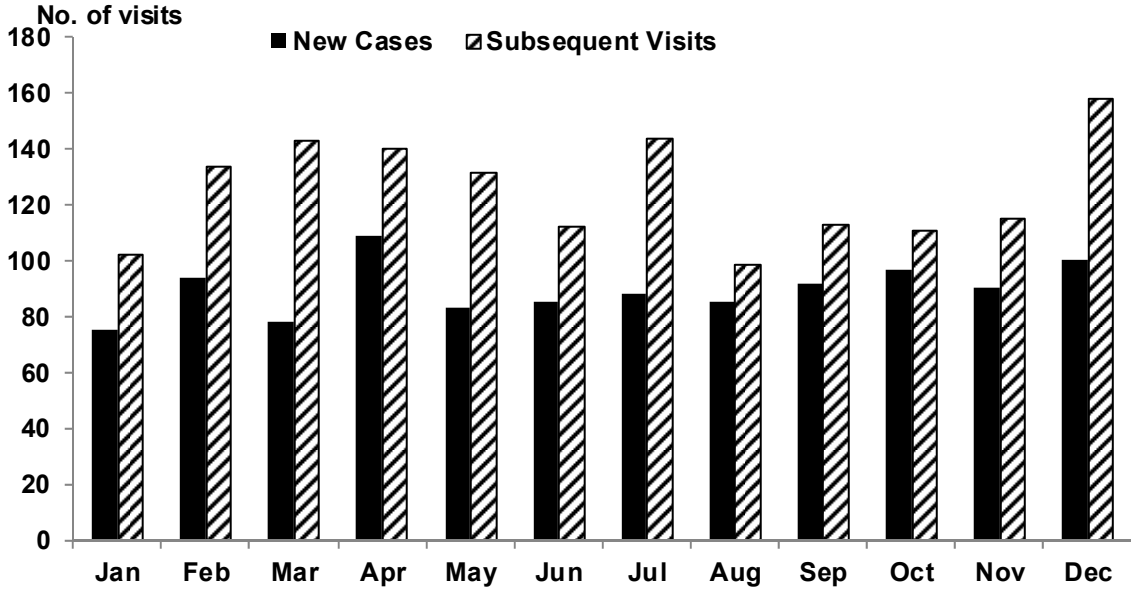
5.8 Fetal Medicine Unit

The data included in this section have been extracted from the MFM Viewpoint database for 2014.

Findings

In 2014 the service provided care for 1081 new referrals, of which 989 were singleton pregnancies, 83 twin pregnancies, 8 triplet pregnancies and 1 quadruplet pregnancy. Note these figures differ from those in the multiple pregnancy chapter as not all women cared for in the service birth at National Women's Health.

Figure 46: Number of new cases and subsequent visits to Fetal Medicine Unit NWH 2014



In 2014 there were on average 90 new cases per month and 125 subsequent visits.

Table 36: Number of mothers/procedures performed in fetal medicine service NWH 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Amniocentesis*						142	156	165	165	141
CVS*						43	97	89	87	76
Echocardiogram*						257	366	410	457	411
Intrauterine transfusion (mothers)	*	2	11	5	10	7	4	10	11	8
Intrauterine transfusion (procedures)	*	3	21	8	21	11	9	25	29	17
Other procedures (mothers)	*	36	40	37	24	22	20	26	50	49
Other procedures (procedures)	*	44	49	39	26	25	21	26	60	51

*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.

Amniocentesis, CVS and Echocardiogram data not available for 2002-2009

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

Table 37: Babies diagnosed with fetal abnormalities NWH 2013-2014

Fetal abnormalities	2013 N=263		2014 N=226	
	n	%	n	%
Heart	38	14.4	21	9.3
Kidneys	28	10.6	32	14.2
Brain	41	15.6	28	12.4
Extremities	38	14.4	27	11.9
Abdominal wall	18	6.8	14	6.2
Face	16	6.1	9	4.0
Gastrointestinal system	10	3.8	24	10.6
Head	24	9.1	12	5.3
Thorax	12	4.6	27	11.9
Spine	15	5.7	17	7.5
Neck/Skin	12	4.6	11	4.9
Skeleton	9	3.4	3	1.3
Genitalia	2	0.8	1	0.4

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. The number of amniocenteses and chorionic villous samplings has reduced slightly and the reason for this is not clear. It may be due to the lower number of women attending the service. 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 number of echocardiograms increased steadily to 2013 but the last year has shown a reduction in referrals. This probably reflects a number of training programmes that have been implemented to improve antenatal detection and a lower threshold for referral.

The numbers of intrauterine transfusion procedures has also dropped slightly. The majority of these are performed for red cell isoimmunisation and Anti-D remains the most common red cell antibody.

The number of other complex procedures appears to have stabilised following the increase in 2013. The relative contributions of different fetal organs affected in the case of anomalies remains similar to previous years.

Chapter 6

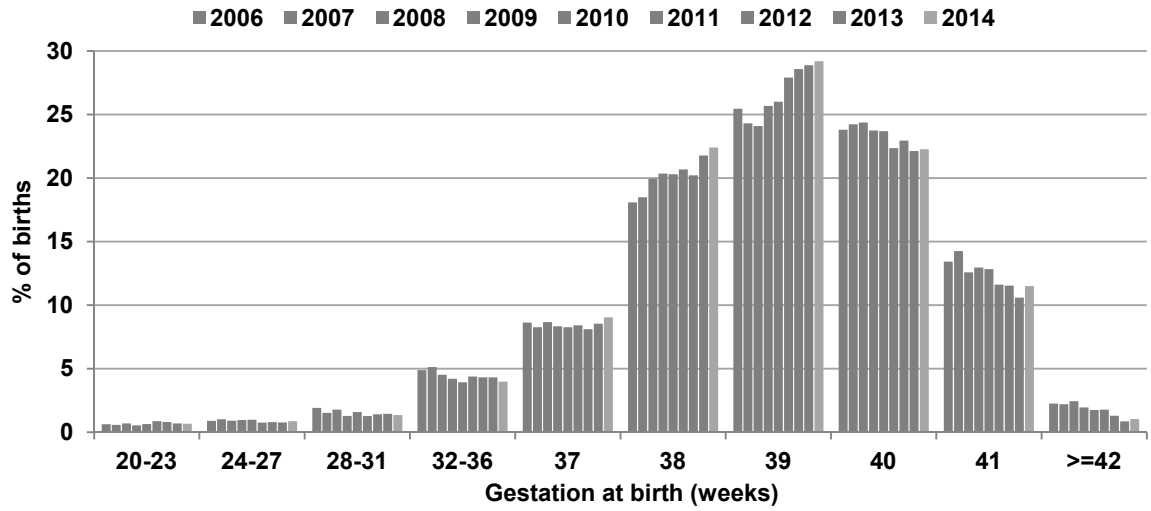
LABOUR and BIRTH

6 LABOUR AND BIRTH

This chapter includes data on labour and birth interventions and outcomes, including induction of labour and mode of birth. For further data relating to this chapter, see Appendix 5.

6.1 Gestation at birth

Figure 47 : Distribution of gestation at birth NWH 2006-2014



There has been a marked change in gestation at birth among births at NWH. There has been a significant reduction in late preterm births. 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 onto 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 PTB 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 induction of labour rates for specific diagnoses (such as small for gestational age) following considerable revision to the induction guideline, and to an increase in the number of elective Caesarean sections prior to 40 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. This may contribute to the increase in admissions to NICU in recent years.

On the other hand, there has also been an increase in births at 41 weeks or more, and this may be a result of the same induction guideline that now discourages induction for other diagnoses (such as macrosomia and maternal age < 40 years). It may also be related to the ability for women with previous caesarean to delay their elective repeat caesarean to 41 weeks to improve their chances of spontaneous labour and thus their VBAC rate.

Over the years 2007-2014, alongside the increase in interventions, there has been a trend towards a reduction in term stillbirth (chi square test for trend for 2006-2014: p=0.05). There has also been

an increase in admissions of term babies to NICU (chi square test for trend 2006-2013: p<0.0001) and a trend towards increasing term neonatal deaths (chi square test for trend for 2006-2014: p=0.05).

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.

Findings

Nulliparous women were more often induced than multiparous women. Almost one in three women had induction of labour in 2014. For the first time, there has been a decrease in induction rates for both term nullipara (40% to 39%) and term multipara (30% to 26%). This is likely related to the adoption of an Auckland consensus guideline on indications for induction of labour. In December 2014 we introduced a formal booking system for elective and acute inductions, and we may see further reductions in induction rate in 2015 as a result. The use of Foley catheters for induction of labour as a cost-effective and clinically safe method in selected cases, such as women with previous caesarean, or with growth restricted babies, is now embedded.

Figure 48 : Induction of labour rates NWH 1992-2014

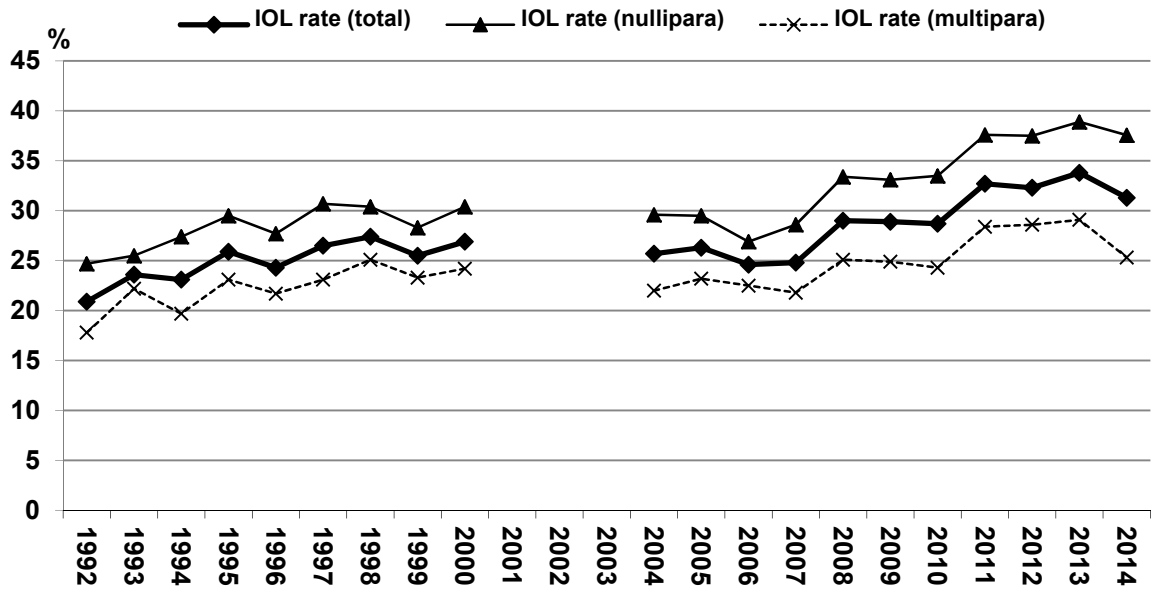


Figure 49: Induction of labour rates by gestation at birth NWH 2008-2014

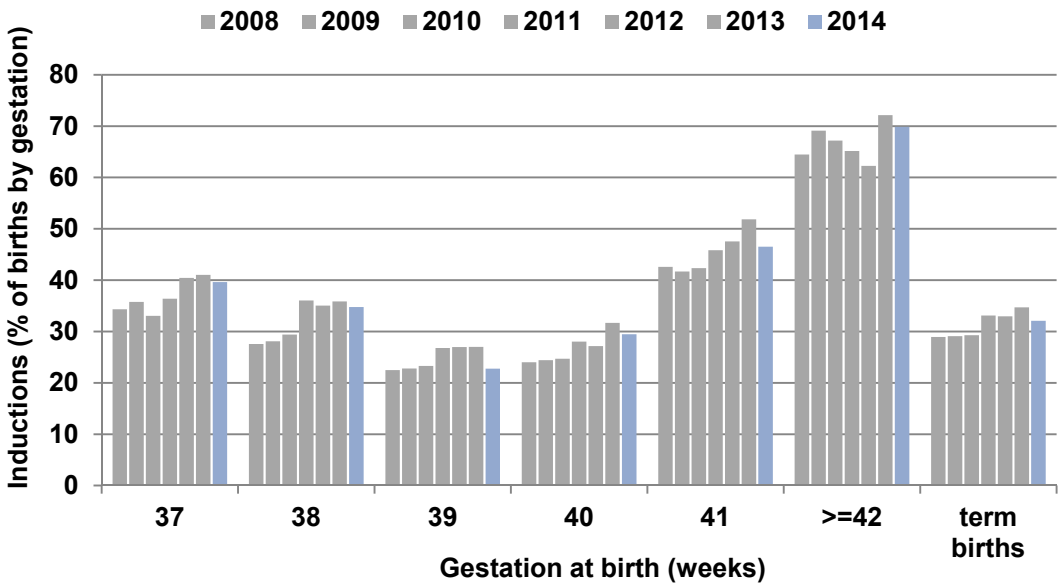
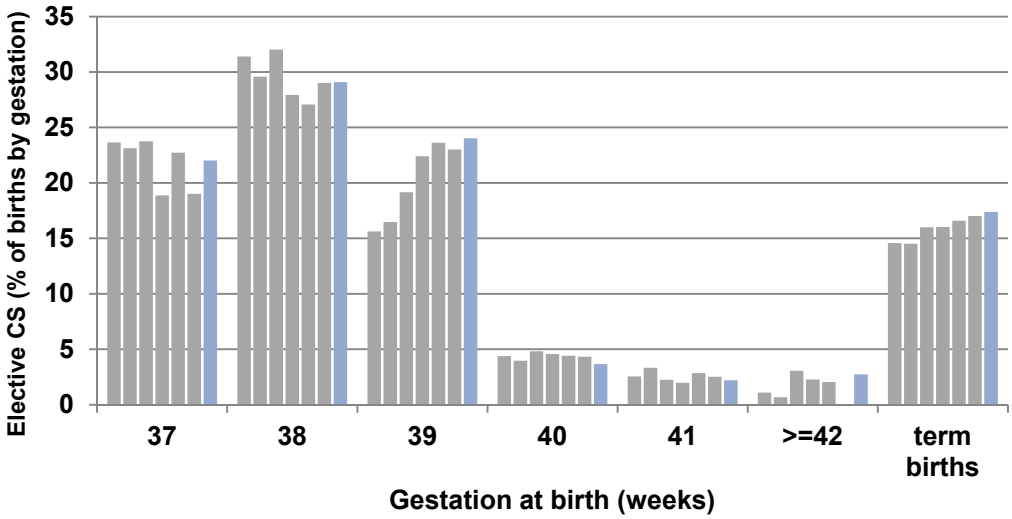


Figure 50: Elective Caesarean rates by gestation at birth NWH 2008-2014



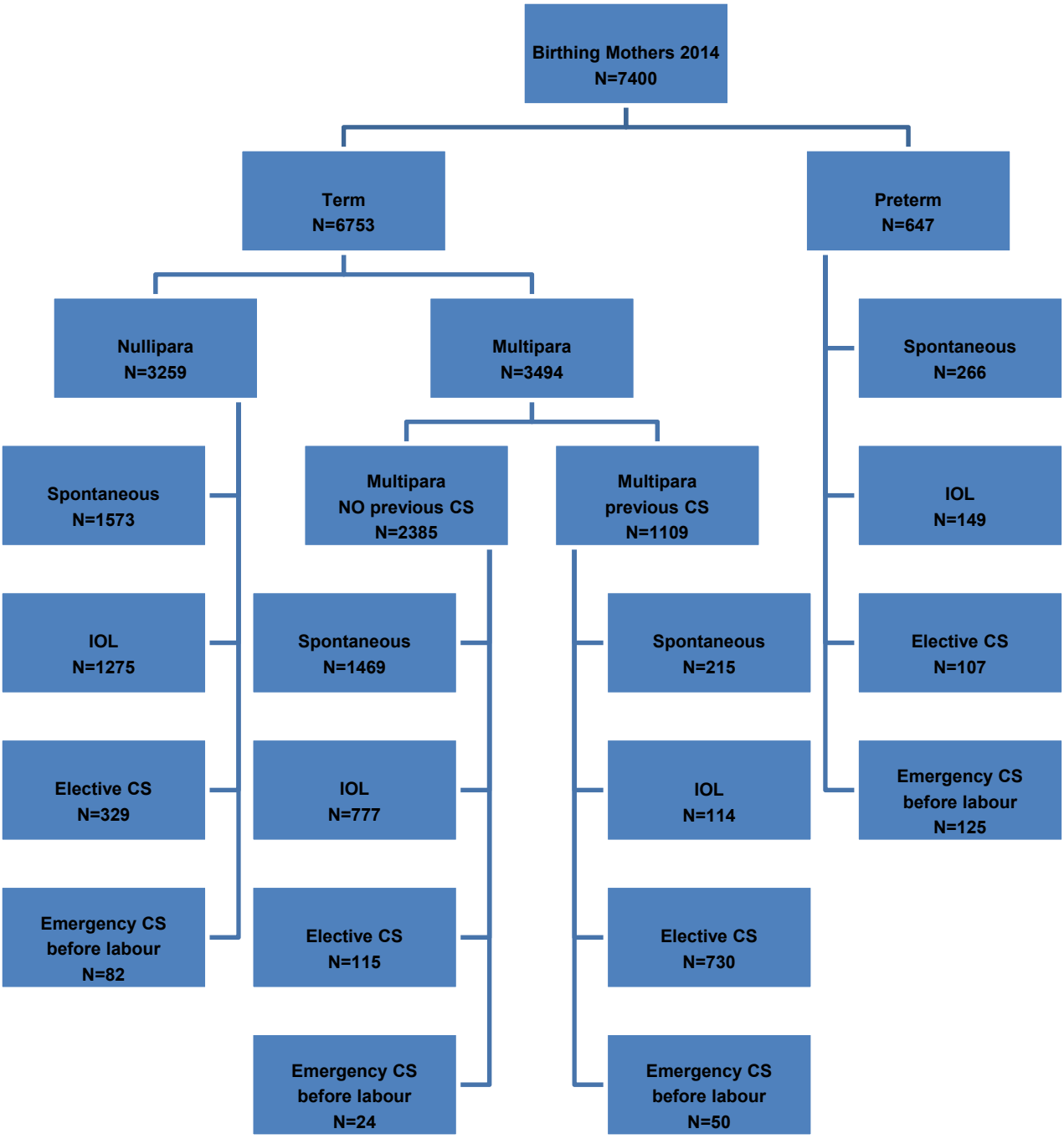


Figure 51: Pathways to birth by gestation and parity NWH 2014

Table 38: Maternal demographic characteristics by onset of birth at term NWH 2014

	Total	Spontaneous Labour		Induced labour		CS Elective		CS Emergency before labour	
	N	n	%	n	%	n	%	n	%
Total	6733	3243	48.2	2163	32.1	1171	17.4	156	2.3
Maternal Age									
<=20	199	141	70.9	52	26.1	5	2.5	1	0.5
21-25	713	456	64.0	206	28.9	41	5.8	10	1.4
26-30	1738	937	53.9	576	33.1	200	11.5	25	1.4
31-35	2592	1238	47.8	825	31.8	462	17.8	67	2.6
36-40	1266	442	34.9	412	32.5	369	29.1	43	3.4
41+	245	43	17.6	95	38.8	97	39.6	10	4.1
Ethnicity									
NZ European	2209	933	42.2	724	32.8	502	22.7	50	2.3
Māori	412	227	55.1	126	30.6	48	11.7	11	2.7
Pacific	795	446	56.1	272	34.2	63	7.9	14	1.8
Asian	1714	913	53.3	495	28.9	264	15.4	42	2.5
Indian	577	268	46.4	216	37.4	75	13.0	18	3.1
Other European	780	342	43.8	246	31.5	176	22.6	16	2.1
Other	266	128	48.1	87	32.7	46	17.3	5	1.9
BMI									
<18.5	295	165	55.9	80	27.1	43	14.6	7	2.4
18.5-24.99	3778	1917	50.7	1126	29.8	663	17.5	72	1.9
>=25-29.99	1428	635	44.5	472	33.1	277	19.4	44	3.1
30-34.99	623	264	42.4	240	38.5	104	16.7	15	2.4
35-39.99	319	130	40.8	133	41.7	51	16.0	5	1.6
>=40	213	67	31.5	104	48.8	33	15.5	9	4.2
missing	97	79	81.4	11	11.3	3	3.1	4	4.1
LMC at Birth									
IMW	3323	1998	60.1	988	29.7	289	8.7	48	1.4
Private Obstetrician	1695	459	27.1	558	32.9	618	36.5	60	3.5
NW Community	1297	685	52.8	387	29.8	187	14.4	38	2.9
NW Medical	199	58	29.1	97	48.7	38	19.1	6	3.0
NW Diabetes	185	15	8.1	130	70.3	38	20.5	2	1.1
Other DHB	7	4	57.1	2	28.6	1	14.3	0	0.0
Unbooked	27	24	88.9	1	3.7	0	0.0	2	7.4

There is an increase in rate of elective caesarean as maternal age increases, reaching 40% in women over 40 years. European women remain twice as likely to have elective caesarean as women of other ethnicities. The elective caesarean rate is highest among women attending a private obstetrician (36.5%) and this increases year over year. It is likely that this involves several drivers, which would include provider-selection by women who have a preferred mode of birth. In 2014 a Private Obstetricians' Governance Group has been formed which (in part) may assist with the clarification of such drivers.

Induction of labour increases with increasing BMI. Women under the care of medical clinic have a higher rate of induction of labour (49%) compared to community women (30%), but rate of induction in both groups were lower than in 2013. Women under diabetes clinic have the highest rate of induction (70%) which has increased from 2013. With the introduction of the national GDM guideline, we may see a reduction in inductions at less than 40 weeks in 2015.

Indication for induction

Figure 52: Primary indication for induction by gestation (as a percentage of all births) NWH 2014

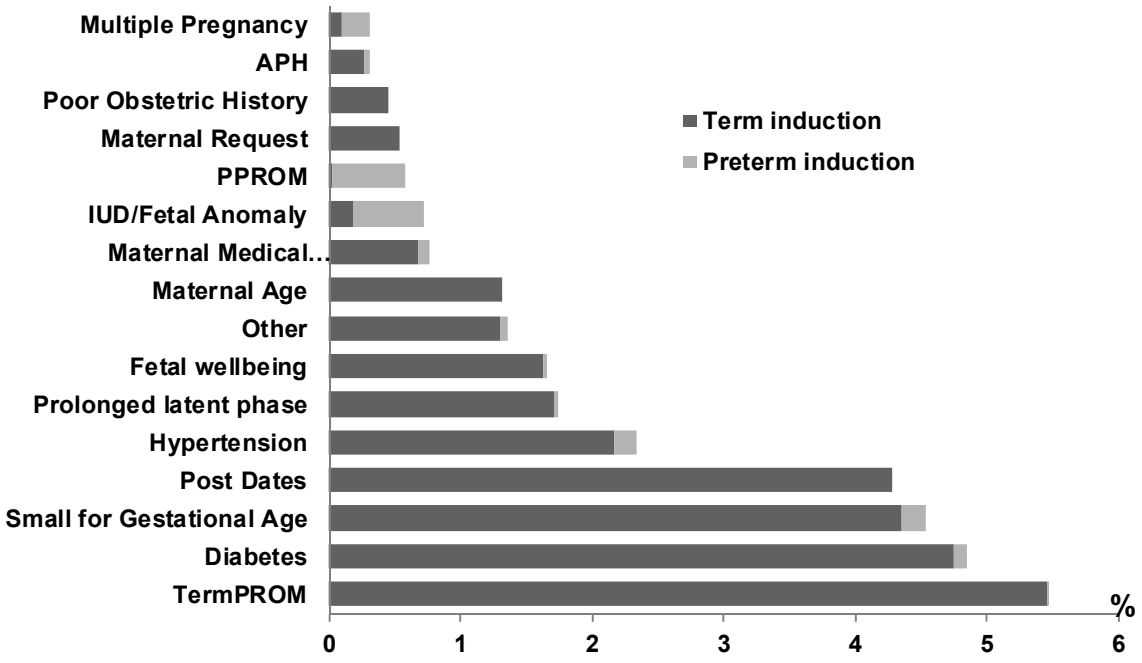


Figure 52 shows indication specific induction rates. For example, 4.5% of all births start with an induction for SGA; 4.4% at term and 0.2% preterm.

Figure 53: Primary indication for induction at term by parity (as a percentage of term births) NWH 2014

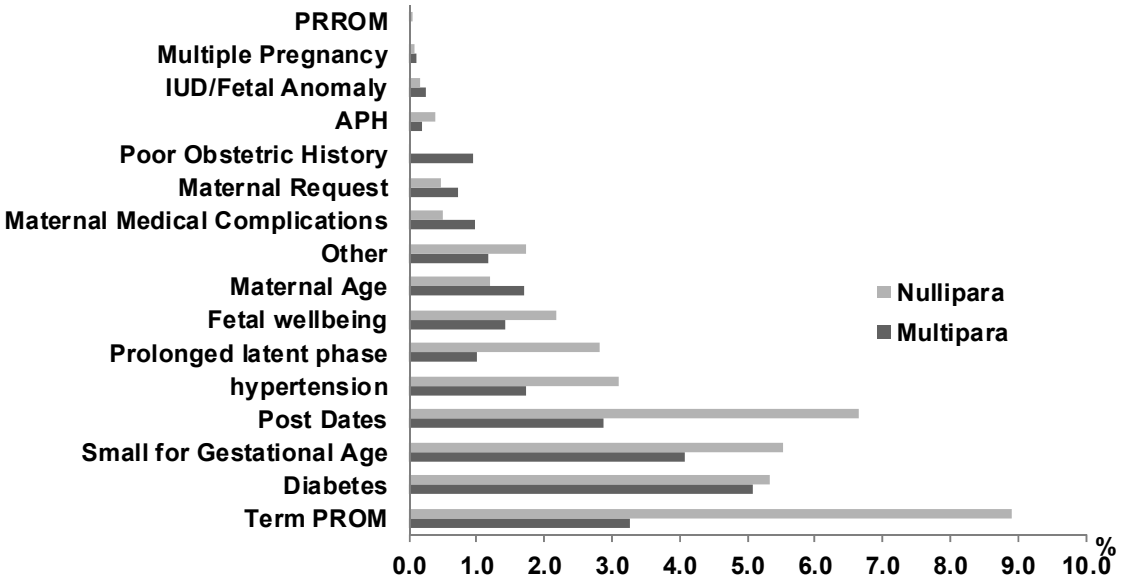


Figure 53 shows indication specific induction of labour rates by parity. For example, approximately 9% of women having their first baby at term are induced for ruptured membranes at term and approximately 3% of women having subsequent babies at term are induced for ruptured membranes.

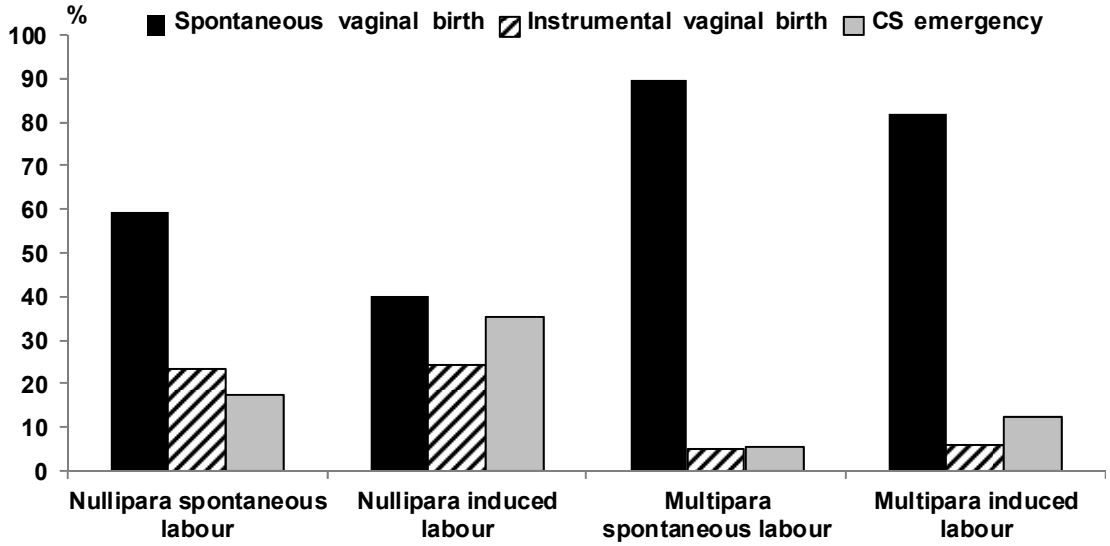
Table 39: Gestation at birth among women whose primary indication for induction was 'post-dates' NWH 2014

	Total n=317		Age<35 n=243		Age>=35 n=74	
	n	%	n	%	n	%
40-40[6]	22	6.9	16	6.6	6	8.1
41-41[6]	249	78.5	186	76.5	63	85.1
42-42[6]	44	13.9	39	16.0	5	6.8

When post-dates was stated to be the primary indication for induction, 7% occurred prior to 41 weeks (down from 12% in 2013 and 15% in 2012), and 14% occurred at or beyond 42 weeks. The form to book induction of labour introduced in December 2014 will further clarify and categorise indication for IOL.

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

Figure 54: Mode of birth among intended vaginal births at term by parity and onset of labour (excludes previous Caesarean) NWH 2014



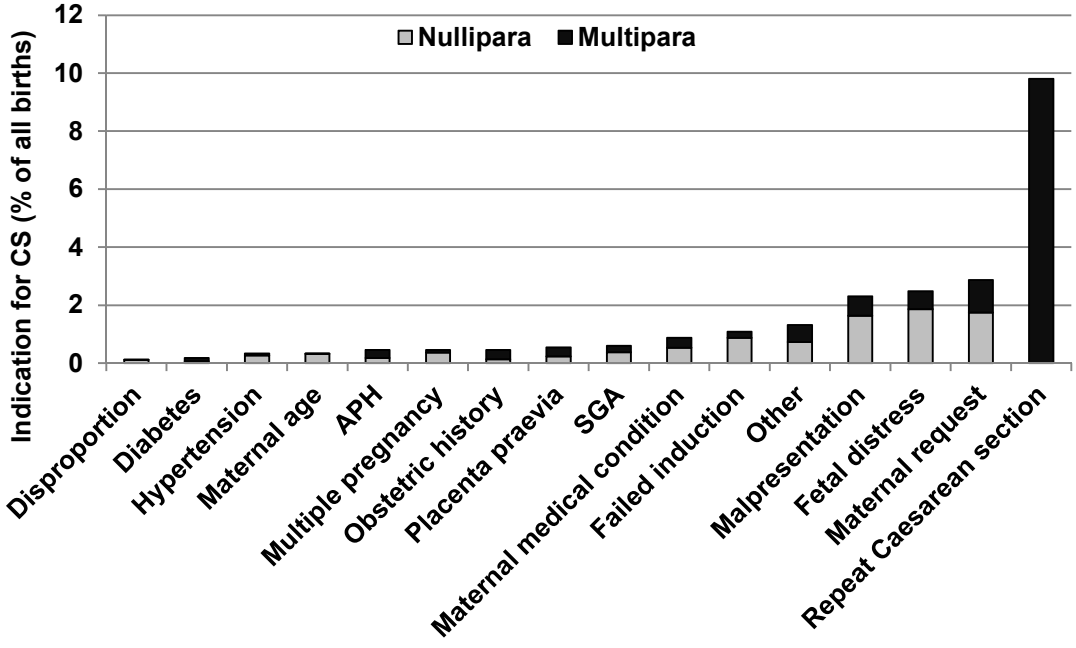
The emergency Caesarean section rate following induction is higher than following spontaneous onset of labour, for both nullipara and multipara without previous Caesarean.

6.2.1 Indication for elective and pre labour Caesarean section

Forty percent of all elective and pre-labour emergency Caesarean sections were performed for the primary indication of 'repeat Caesarean section'. For multiparous women, 66% of elective and pre-labour Caesarean sections were performed for this indication. For the first time ever, the next most common indication overall for elective or pre-labour Caesarean section was maternal request.

It is of concern that at NWH in 2014, 129 nulliparous women had an elective caesarean section for the 'indication' of maternal request; representing 19% of all nulliparous caesarean sections, and up from 16% in 2012.

Figure 55: Reported primary indication for elective or pre-labour CS by parity as proportion of all births NWH 2014



6.2.2 Indication for in labour emergency Caesarean section

Figure 56: Indication for in labour emergency Caesarean section NWH 2014

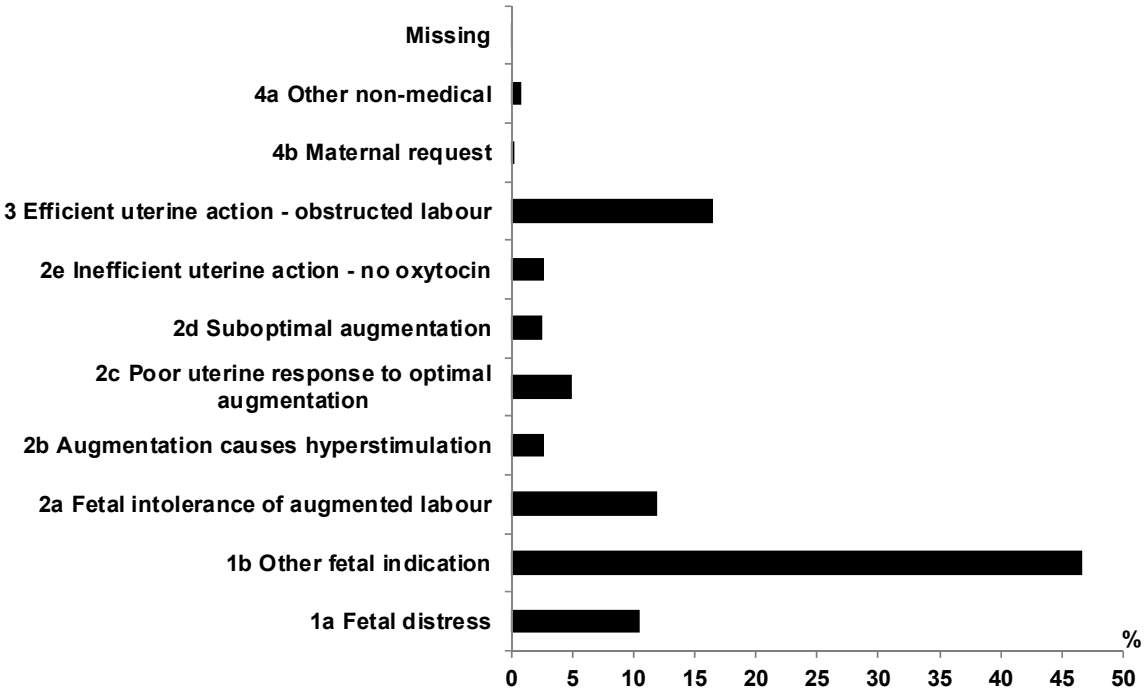


Figure 56 above shows the reasons for emergency Caesarean section in labour, of which the most frequent are still “obstructed labour” and “other fetal indications”. Other fetal indications includes all fetal indications where the CTG is not necessarily abnormal e.g. this includes emergency Caesarean section for cord prolapse, antepartum haemorrhage, suspected uterine rupture,

undiagnosed breech, and also malpresentation such as 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" without fetal blood sampling (FBS) in labour are more likely to be unnecessary. The use of FBS prior to a conclusive diagnosis of fetal intolerance of labour is to be encouraged when practicable. Similarly; caesareans for fetal distress, other than where category 1 indications existed, will include some unnecessary procedures. Electronic fetal heart rate monitoring in labour is a screening test for fetal hypoxia with a well-established high false positive rate and very low false-negative rate.

6.2.3 Use of syntocinon

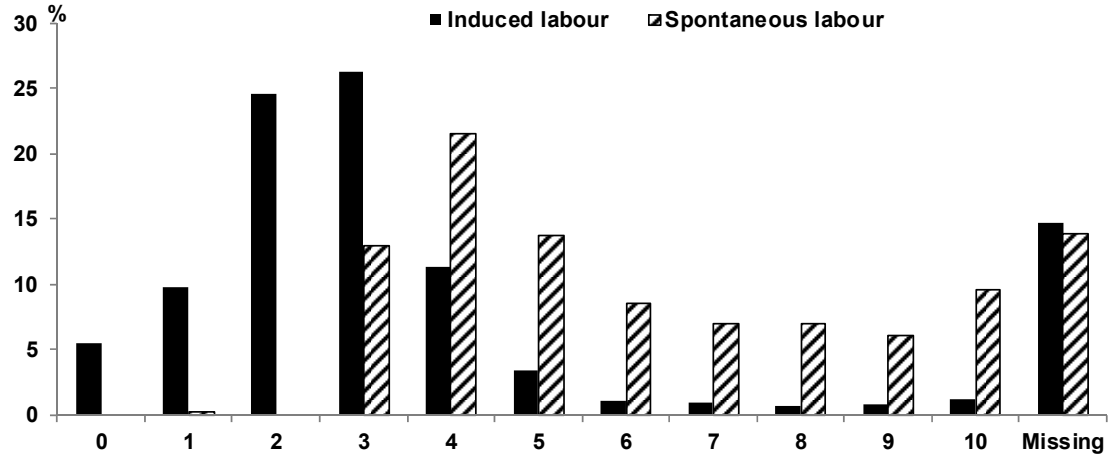
Table 40: Use of syntocinon by onset of labour and parity NWH 2014

	Total birth	Syntocinon	
	N	n	%
Total	7400	2323	31.4
Induced labour			
Nullipara	1354	1004	74.2
Multipara	961	576	59.9
Spontaneous labour			
Nullipara	1720	609	35.4
Multipara	1803	116	6.4

All data are checked for women who are given syntocinon prior to 3 cm dilatation, to ensure these are spontaneous and not induced labours.

Syntocinon was used to augment spontaneous labour for 35% of nulliparous and 6% of multiparous women (unchanged from 2013). Given international evidence that syntocinon in established labour has an impact on length of labour but no significant impact on mode of birth, the use of syntocinon infusions to augment labour in multiparous women is open to challenge.

Figure 57: Dilatation at commencement of syntocinon infusion among labouring women by induction status NWH 2014



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, and we are starting to see a downward trend in IOL rate overall in 2014 for the first time. Whilst it is an open question as to what is an "appropriate" induction rate, it is hoped that the evidence based regional consensus on indications and timing of induction, and the implementation of a new induction of labour guideline at NWH, will allow an audit of practice and see sustained improvements in this area.

6.3 Mode of birth

Findings

Table 41: Mode of birth trends NWH 1999-2014 (n = mothers)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of births	7501	7827	7452	7775	7611	7491	7194	7212	7695	7589	7735	7709	7523	7695	7223	7400
	%	%		%	%	%	%	%	%	%	%	%	%	%	%	%
Spontaneous vertex	61.8	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
Vaginal breech	1.1	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
Forceps/ ventouse	12.6	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
Caesarean	24.5	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
Elective						10.4	11.6	12.8	13.4	14.4	14.6	15.9	15.7	16.6	17.0	17.3
Emergency						18.8	20.0	20.3	18.3	16.9	16.6	16.4	16.8	16.8	17.7	17.3

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.

Figure 58: Mode of birth NWH 1991–2014

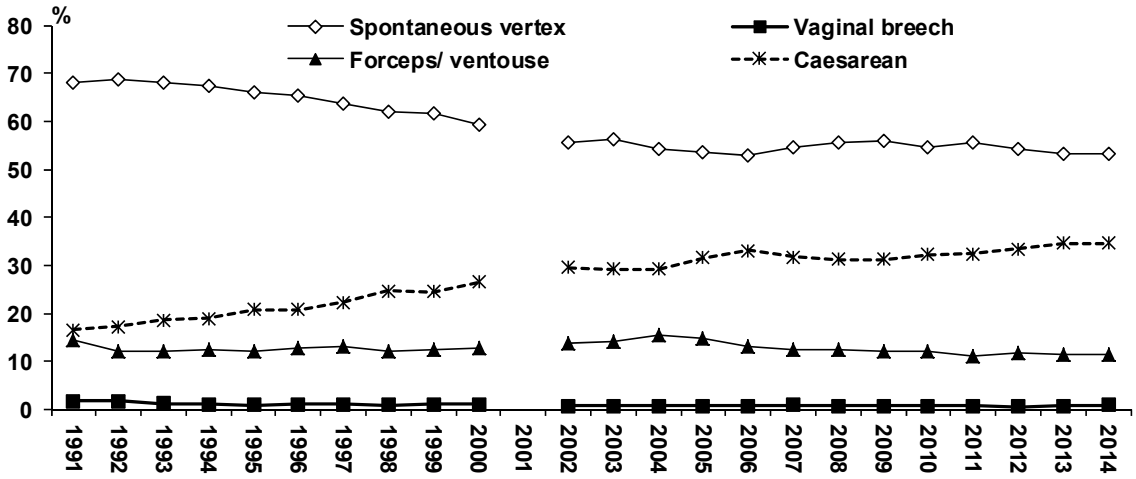
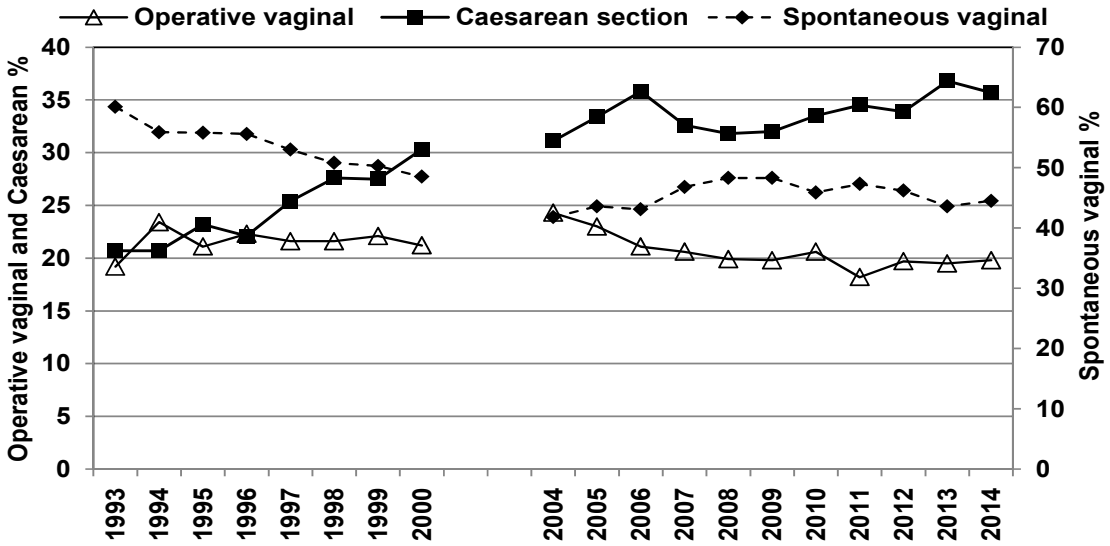


Figure 59: Mode of birth for nullipara NWH 1993-2014



In the mid-90s, the overall Caesarean section rate at NW was around 20%. A peak of 33% was reached in 2006 and since then the rate has not significantly changed. However, subsequent years may prove a slow upward trend which reaches significance. 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 60: Mode of birth for multipara NWH 1993-2014

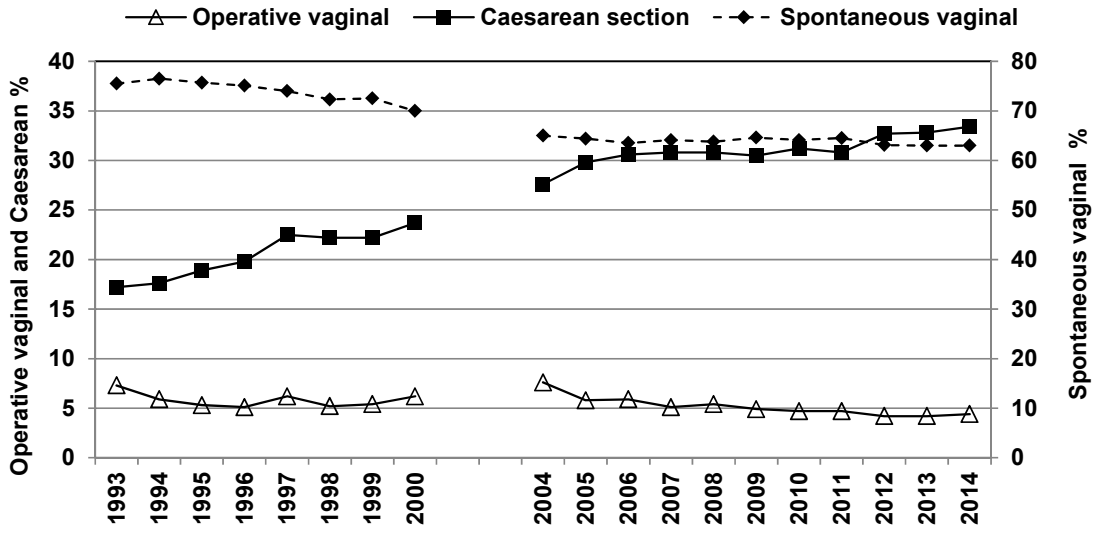
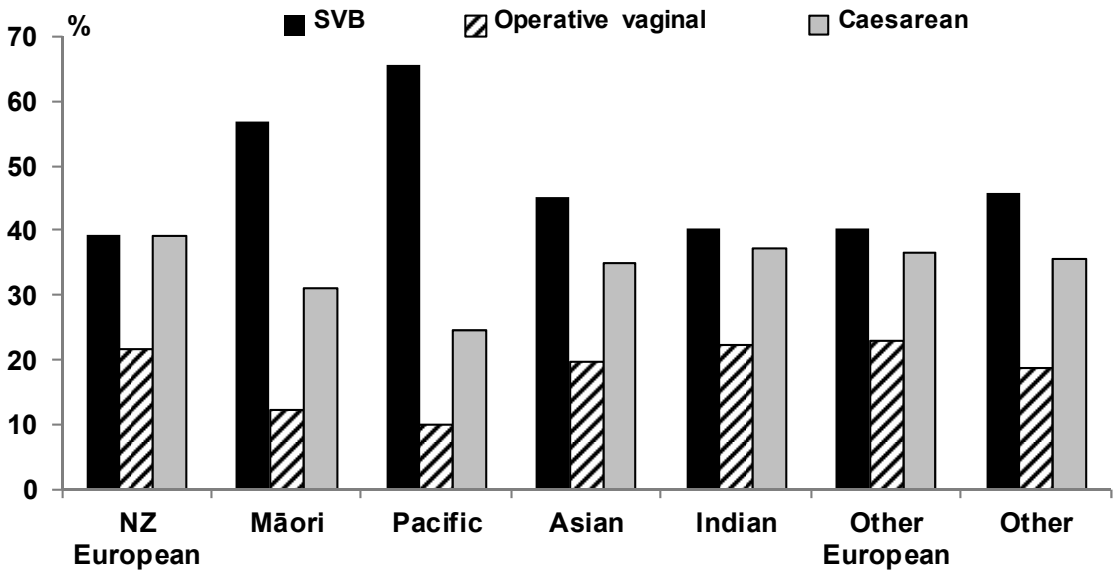
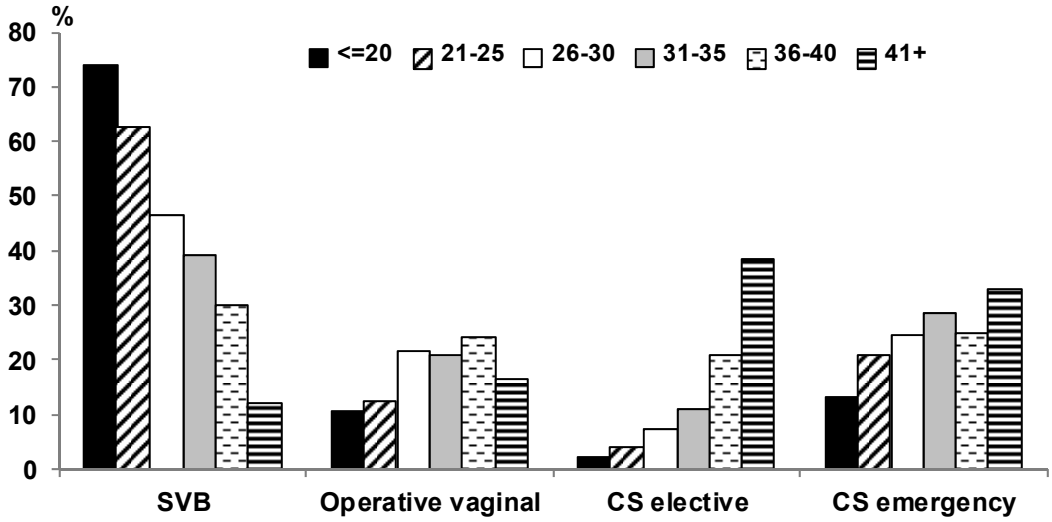


Figure 61: **Mode of birth by ethnicity among nulliparous women NWH 2014**



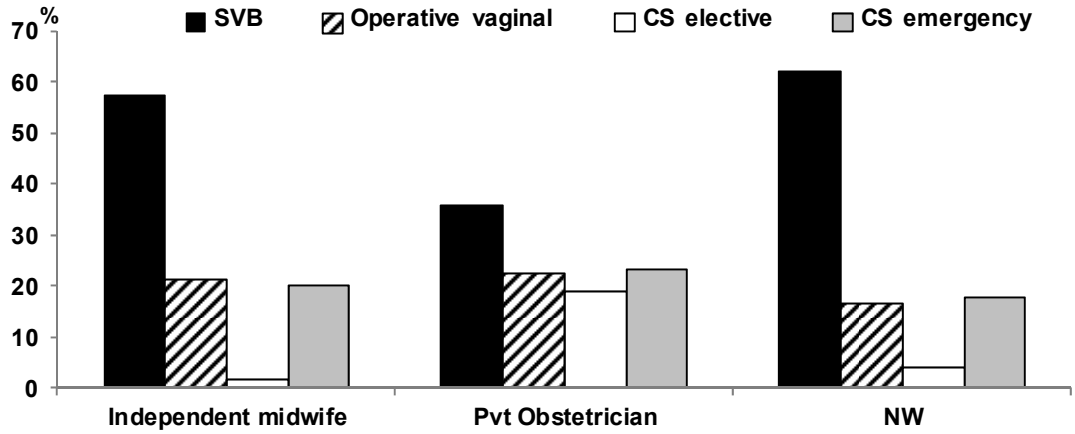
As has been the case for many years, Pacific women have higher rates of spontaneous vaginal birth (SVB) than all other ethnic groups, with Māori and Asian ethnicities also showing higher rates than other groups.

Figure 62: **Mode of birth by maternal age among nulliparous women NWH 2014**



The spontaneous vaginal birth rate falls with increasing age. Operative vaginal birth increases with increasing age until 40 years, beyond which there is a marked increase in elective caesarean section rate.

Figure 63: Mode of birth at term by LMC at birth among standard primipara NWH 2014



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. By doing this comparison in standard primiparae, and removing the women at higher risk of operative delivery based on age and medical and obstetrical risk, this figure shows true variation in intervention by provider.

6.4 Spontaneous vaginal birth

Table 42: Spontaneous vaginal birth rates NWH 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	n	n	n	n	n	n	n	n	n	n
Total births (mothers)	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**
Spontaneous vaginal birth	3899	3866	4282	4280	4374	4217	4243	4218	3884	3992
Incidence %	54.2	53.6	55.6	56.4	56.4	55.5	56.4	54.8	53.8	53.9
Total nullipara	3522	3499	3752	3623	3811	3650	3539	3778	3441	3604
Spontaneous vaginal birth	1535	1509	1755	1749	1839	1675	1674	1746	1501	1603
Incidence %	43.6	43.1	46.8	48.3	48.3	45.9	47.3	46.2	43.6	44.5
Total multipara	3672	3713	3943	3966	3924	4059	3984	3917	3782	3796
Spontaneous vaginal birth	2364	2357	2527	2531	2495	2601	2569	2472	2383	2389
Incidence %	64.4	63.5	64.1	63.8	63.6	64.1	64.5	63.1	63.0	62.9

The spontaneous vaginal birth rate has remained consistently low since 2004. The group of main concern is nulliparous women with only 44.5% achieving a spontaneous vaginal birth.

We can begin to improve this statistic by focusing on reducing primary Caesarean section in nullipara from its current 35.8%. The primary Caesarean section rate for nulliparous women who have had labour induced is 58%. 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 LSCS (Figure 63)?

The spontaneous vaginal birth 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 with national rates. ADHB at 62.6% was below the national average in the latest report, which was for 2012 data. All practitioner groups should strive for excellence in care and realise the potential for improvement in spontaneous vaginal birth rate in this low risk group of women. (See appendix for definition of the standard primipara).

6.4.1 Waterbirth

Thirty five babies were recorded in the database as having been born in water in 2014. Two of

these were under the care of NW LMC service and thirty three were under the care of an independent midwife. One baby was admitted to the NICU. All were live births.

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

Table 43: Caesarean section rates NWH 1999-2014

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total births (mothers)	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**
Caesarean Sections	1837	2084	*	2301	2219	2193	2273	2390	2438	2372	2414	2491	2448	2570	2506	2559
Incidence %	24.5	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
Total nullipara	**3262**	**3454**	*	*	*	**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**	**3778**	**3441**	**3604**
Caesarean	898	1047	*	*	*	1118	1178	1253	1225	1152	1219	1223	1222	1288	1266	1289
Incidence %	27.5	30.3	*	*	*	31.1	33.4	35.8	32.6	31.8	32.0	33.5	34.5	34.1	36.8	35.8
Total elective						233	249	296	310	313	340	383	353	408	396	379
Elective %	*	*	*	*	*	6.5	7.1	8.5	8.3	8.6	8.9	10.5	10.0	10.8	11.5	10.5
Total emergency						885	929	957	915	839	879	840	869	880	870	910
Emergency %	*	*	*	*	*	24.6	26.4	27.4	24.4	23.2	23.1	23.0	24.6	23.3	25.3	25.2
Total multipara	**4239**	**4372**	*	*	*	**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**	**3917**	**3782**	**3796**
Caesarean	939	1037	*	*	*	1075	1095	1137	1213	1220	1195	1268	1226	1282	1240	1270
Incidence %	22.2	23.7	*	*	*	27.6	29.8	30.6	30.8	30.8	30.5	31.2	30.8	32.7	32.8	33.5
Total elective						548	584	628	720	780	792	843	830	868	831	902
Elective %	*	*	*	*	*	14.1	15.9	16.9	18.3	19.7	20.2	20.8	20.8	22.2	22.0	23.8
Total emergency						527	511	509	493	440	403	425	396	414	409	368
Emergency %	*	*	*	*	*	13.5	13.9	13.7	12.5	11.1	10.2	10.5	9.9	10.6	10.8	9.7

From 1998, data excludes postnatal transfers, * Data not available

The Caesarean section rate (34.6%) 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.

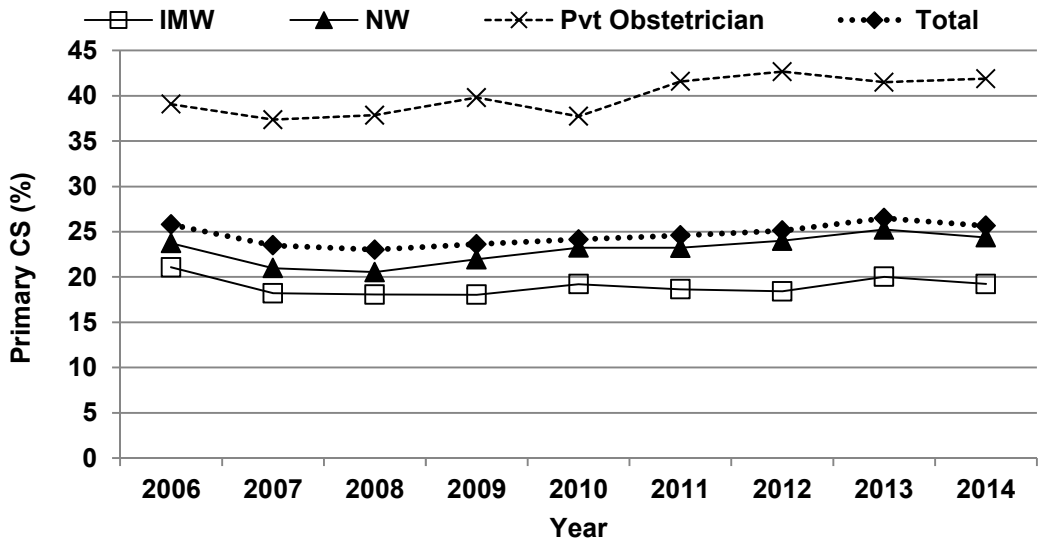
Research evidence is clear that repeated Caesarean sections are strongly associated with adverse maternal outcomes, such as abnormal placentation, postpartum haemorrhage and peripartum hysterectomy.

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.

Primary Caesarean section

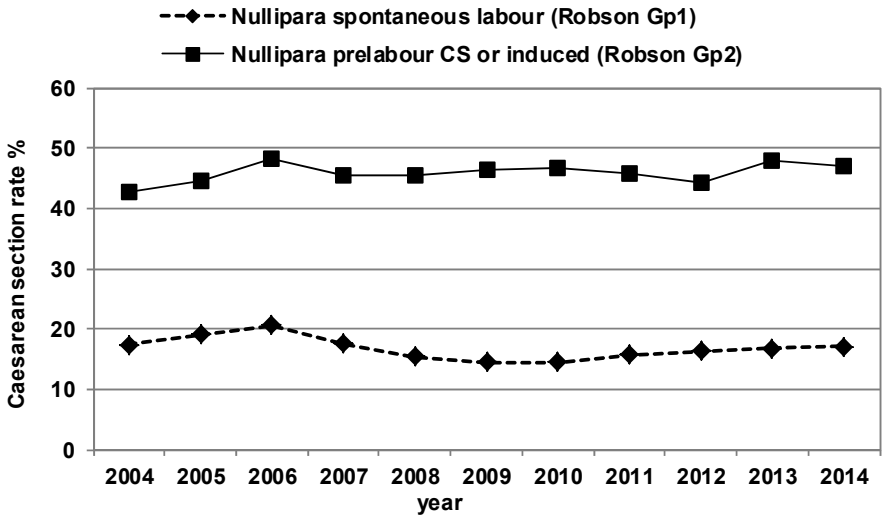
Primary Caesarean section means Caesarean section in the group of women who have not previously had a Caesarean. This includes all nulliparous women and 68% of multiparous women in the NWH population.

Figure 64: Primary Caesarean section rate by LMC at birth



Primary Caesarean section rate has been relatively stable from 2006-2014. Figure 64 shows that the rate of primary Caesarean section is approximately double when the LMC is a private obstetrician compared to a member of another LMC group.

Figure 65: Robson groups 1&2: Nulliparous caesarean section rates among singleton cephalic term pregnancies by onset of labour NWH 2004-2014



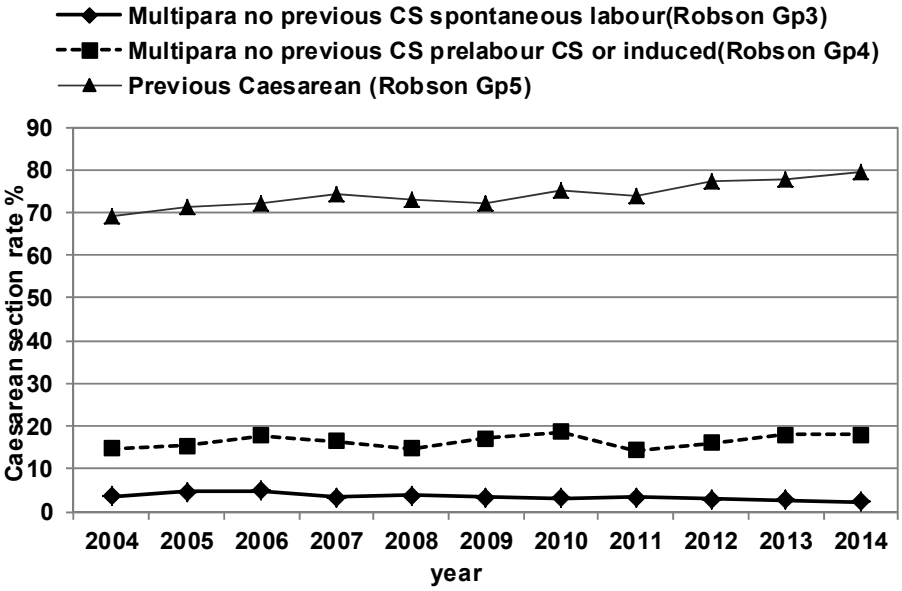
Robson 10-group classification 2007-2014

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 NW.

Table 44: Robson 10-Group Classification NWH 2006-2013

	2007			2008			2009			2010			2011			2012			2013			2014			
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	**2438**	**7695**	**31.7**	**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**	
1 Nullip, singleton, cephalic, term, spontaneous labour	353	2004	17.6	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	10.4
2 Nullip, singleton, cephalic, term, induced or CS before labour	515	1132	45.5	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	28.6
3 Multip, singleton, cephalic, no previous CS, term, spontaneous labour	57	1690	3.4	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	1.3
4 Multip, singleton, cephalic, no previous CS, term, induced or CS before labour	123	735	16.7	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	6.1
5 Previous CS, singleton, cephalic, term	748	1008	74.2	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	32.6
6 Nullip, singleton, breech	183	208	88.0	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	5.7
7 Multiip, singleton, breech (incl prev CS)	121	143	84.6	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	3.9
8 All multiple (incl prev CS)	110	177	62.1	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	3.8
9 All abnormal lie (incl prev CS)	26	27	96.3	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	1.0
10 All preterm singleton cephalic (incl prev CS)	202	571	35.4	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	6.5

Figure 66: Robson groups 3-5: Multiparous caesarean section rates among singleton cephalic term pregnancies by onset of labour and previous caesarean status NWH 2004-2014



6.5.1 Vaginal birth after Caesarean section (VBAC)

Table 45: VBAC: Mode of birth among prior Caesarean pregnancies by mode of onset of birth (n=1225) NWH 2014

Previous Caesarean (1 or more), all gestations										
	Spontaneous labour		Induced labour		CS elective		CS emergency before onset of labour		Total	
	n=247		n=128		n=770		n=80		n=1225	
	n	%	n	%	n	%	n	%	n	%
SVB	145	58.7	58	45.3	0	0	0	0	203	16.6
Operative vaginal birth	35	14.2	12	9.4	0	0	0	0	47	3.8
CS elective	0	0.0	0	0.0	770	100	0	0	770	62.9
CS emergency	67	27.1	58	45.3	0	0	80	100	205	16.7

Table 45 includes all women with a history of previous Caesarean section. Of these 1225 women, overall 63% had a planned caesarean prior to labour, and 37% attempted vaginal birth after Caesarean (VBAC). The VBAC success rate was 55% and the total VBAC rate 20.4%.

The remaining tables and figure in this section relate to 733 women giving birth at NW in 2014 who previously had only one birth where that one birth was a Caesarean.

Table 46: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by mode of onset of birth (n=733) NWH 2014

Parity 1, previous Caesarean, singleton, cephalic, term										
	Spontaneous labour		Induced labour		CS elective		CS emergency before onset of labour		Total	
	n=143		n=72		n=484		n=34		n=733	
	n	%	n	%	n	%	n	%	n	%
SVB	66	46.2	21	29.2	0	0	0	0	87	11.9
Operative vaginal birth	29	20.3	11	15.3	0	0	0	0	40	5.5
CS elective	0		0		484	100	0	0	484	66.0
CS emergency	48	33.6	40	55.6	0	0	34	100	122	16.6

Of these 733 women, overall 66% had a planned caesarean prior to labour (64% in 2013). The VBAC success rate was 51% (compared to 50.4% in 2013) and the total VBAC rate 17.3% (18.2% in 2013).

Table 47: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by LMC at birth (n=733) NWH 2014

Parity 1, previous Caesarean, singleton, cephalic, term	IMW n=233		Pvt Obstetrician n=312		NW n=185		Total n=733	
	n	%	n	%	n	%	n	%
SVB	48	20.6	16	5.1	23	12.4	87	11.9
Operative vaginal birth	20	8.6	5	1.6	13	7.0	40	5.5
CS elective	117	50.2	263	84.3	103	55.7	484	66.0
CS emergency	48	20.6	28	9.0	46	24.9	122	16.6

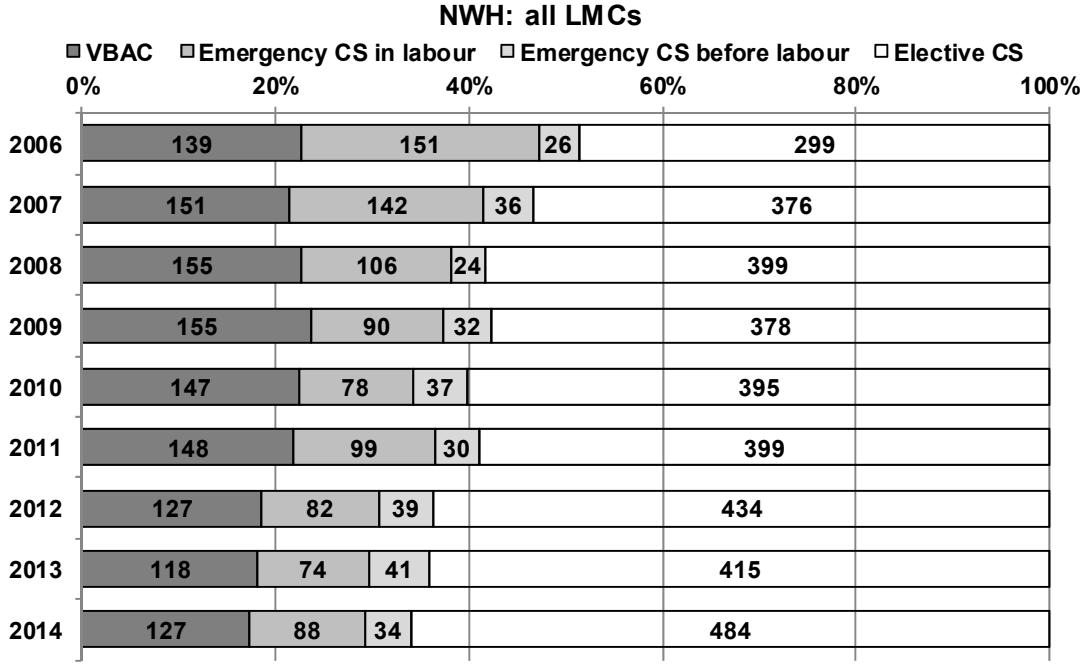
* National Women's patients include Community, Medical and Diabetic
This table includes one unbooked and 2 patients under GP LMC

For women with a singleton cephalic pregnancy who delivered at term, the rate of planned caesarean prior to labour varied by LMC: 50% for women under the care of independent midwives, 56% for women under the care of NW, and as high as 84% for women under the care of private obstetricians (up from 81% last year). The rate of successful trial of labour also varied by LMC: 44% for women under the care of NW (down from 49% last year), 59% for women under the care of independent midwives (up from 56%), and only 43% for women under the care of private obstetricians (unchanged). 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.

The successful trial of labour rate in women with singleton cephalic pregnancy at term also varied by onset of labour, from 66% in spontaneous labour (from 72% last year and 68% in 2012) to 44% if labour was induced (unchanged).

These data could inform how we counsel women during pregnancy about the decision to plan VBAC or to plan repeat 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.

Figure 67: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies NWH 2006-2014



The figure above looks at trends in trial of labour and VBAC rates at NWH over the years 2006 to 2014 among Para 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. Since 2006, there has been an increase in the proportion of women birthing by elective repeat Caesarean section from approximately 49 percent in 2006 to 66 percent in 2014. Meanwhile, of trials of labour, 44 percent were successful in 2006 compared to 51 percent in 2014. This is not a statistically significant increase (chi squared for trend p=0.08). The proportion of women achieving a VBAC among this group of primiparous women with one previous caesarean at term with a cephalic singleton has dropped significantly from 22.6% to 17.3% from 2006-2014 (p=0.0007).

Trial of labour, among parity 1 women at term with singleton cephalic pregnancy, was successful in 52 and 54 percent of women having a trial of labour under DHB and independent midwifery LMC care respectively on average over the years 2006-2014. Significantly fewer women (43%) under the care of private obstetricians had a successful VBAC.

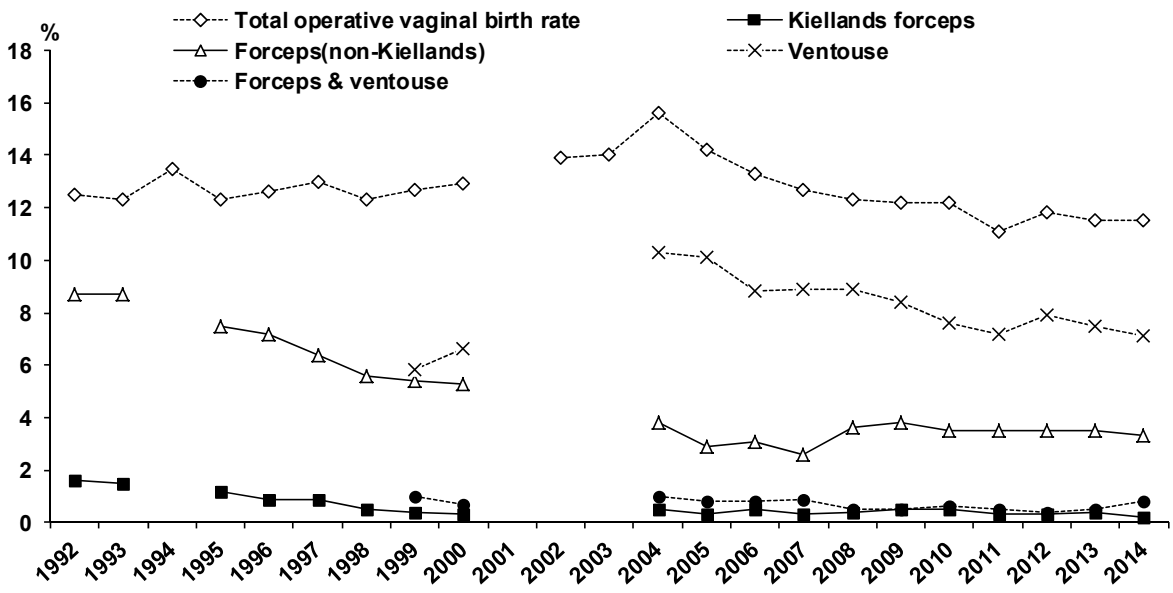
6.6 Instrumental vaginal birth

The rate of instrumental birth has consistently trended down over recent years and dropped in 2011 to below 12% for the first time since 1997, and has remained stable at around 12% since. The rate for multiparous women has fallen even further than in 2011 and is now 4.2%. Rates of instrumental vaginal birth for term nullipara remain stable at around 20.8%. However, given the increasing caesarean section rate, the spontaneous vaginal birth rate has not altered.

It was noted in the previous Annual Clinical Report that best practice for choice of instrument (ventouse or forceps) needed to recognise that ventouse was more likely to result in a double instrument procedure. The rate of ventouse birth has reduced over recent years with non-rotational forceps births remaining plateaued. It is therefore of concern that the rate of double instrument birth increased in 2014 (see 6.6.1). Close attention to this would be prudent in 2015.

However, perineal trauma rates remain a focus in our service and there is reduced risk of perineal trauma with a successful ventouse delivery. This remains especially so in women of Indian ethnicity where the rate of perineal trauma is too high with forceps delivery for forceps to be considered the instrument of choice.

Figure 68: Operative vaginal birth NWH 1992-2014



6.6.1 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.

The rate of double instrumental vaginal births (as a proportion of all vaginal births) at NW in 2014 was

1.3% (63 mothers/4841 vaginal births) or 1.03% of mothers who attempted labour (63 mothers/6119 mothers). Thirty two mothers had an emergency Caesarean section after a prior attempt at instrumental birth (32/6119 = 0.52% of mothers who attempted labour). This represents a significant increase in double instrumental birth but a significant decrease in emergency Caesarean following failed instrumental attempt.

Table 48: Maternal outcomes following double instrumental vaginal birth compared to single instrumental vaginal birth, attempted instrumental vaginal birth prior to emergency Caesarean section and emergency Caesarean section in labour NWH 2014

	Single instrument (vaginal birth) n=787		Double instrument (vaginal birth) n=63		Emergency Caesarean with prior instrumental attempt n=32		Emergency Caesarean in labour without prior instrumental n=1245	
	n	%	n	%	n	%	n	%
Episiotomy	600	76.2	61	96.8	0	0	1	0.1
Third or fourth degree tear	45	5.7	6	9.5	0	0	2	0.2
PPH>=1000mls	96	12.2	12	19.1	5	15.6	237	19.0
Transfusion	33	4.2	4	6.5	0	0	43	3.5

Table 49: Neonatal outcomes following double instrumental vaginal birth compared to single instrumental vaginal birth, attempted instrumental vaginal birth prior to emergency Caesarean section and emergency Caesarean section in labour NWH 2014

	Single instrument (vaginal birth) n=792		Double instrument (vaginal birth) n=63		Emergency Caesarean with prior instrumental attempt n=32		Emergency Caesarean in labour without prior instrumental n=1281	
	n	%	n	%	n	%	n	%
Apgar score 1min <4	16	2.0	3	4.8	0	0	56	4.4
Apgar score 5min <7	12	1.5	0	0	2	6.3	44	3.4
NICU admission	70	8.8	5	7.9	6	18.8	277	21.6
Neonatal Death rate (/1000 live births)	0	0	0	0	0	0	6	4.7

6.7 Breech presentation

6.7.1 Breech birth

Table 50: Mode of birth by breech presentation (singletons) NWH 2014

	N	Total breech	% Breech/total singleton birth	Breech & CS	% CS/total breech
Total singleton births	7253	294	4	247	84
20-24 weeks	58	26	45	3	12
25-31 weeks	108	32	30	20	63
32-36 weeks	373	35	9	32	91
>=37 weeks	6714	201	3	192	96

Breech births constituted 8.1% of all births in 2014; 4% of singletons. The NWH guideline on Breech Birth was updated in May 2012 to reflect changes in guidelines internationally towards offering the options of planned vaginal breech birth versus planned caesarean birth, where strict selection criteria are met and ECV has been unsuccessful.

In 2014, 11.9% of singleton breeches were born vaginally. Considerable effort is made in counselling and advising women who wish to attempt vaginal breech birth. Although only a small number of obstetricians will consider conducting vaginal breech births, the desire to accommodate this option is such that those obstetricians make themselves available sometimes outside the roster in order to accommodate the wishes of women who make this choice.

6.7.2 External cephalic version

This section reports statistics relating to women who attended the Day Assessment Unit at NW for external cephalic version (ECV) for breech presentation. Data regarding ECV are captured directly into Healthware at the time of the procedure.

Findings

In 2014, a total of 76 ECVs were attempted for 73 women. This compares to attempts for 88 in 2013. Most ECVs were attempted at 37-38 weeks (range 36 to 40 weeks gestation). Most ECVs were attempted by one operator.

Among 73 women, the overall ECV success rate was 42.5%, lower than success rates reported internationally (50-60%).

Table 51: Mode of birth following attempted ECV NWH 2014

	Failed ECV n=42		Successful ECV n=31	
	n	%	n	%
Type of Birth				
Vaginal	5	11.9	25	80.6
SVB	3	7.1	20	64.5
Operative vaginal	2	4.8	5	16.1
CS elective	29	69.0	1	3.2
CS emergency	8	19.0	5	16.1

Descent of the breech into the pelvis is associated with unsuccessful ECV. If there was no descent, the success rate was 60% compared with 6% if there was any descent at all (consistent with previous findings). This is consistent with data published from a NW 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 four women whose ECV was unsuccessful also had a cephalic presentation at birth. Eighty one percent of women who had a successful ECV achieved a vaginal birth, and this is consistent with the range of rates reported internationally (63-85%).

Of 230 women with a singleton term pregnancy who had either a breech presentation at birth or had had an attempted ECV, 32% overall had an attempted ECV.

There was no statistically significant association between ECV among women with singleton breech at term (n=293) and maternal age or BMI. There was a significant difference by LMC at birth with a rate of ECV of 50% among independent midwifery clients compared to 12% of private obstetrician clients and 21% of NWH LMC clients. Only 6% (3/47) of women who had a history of prior Caesarean section and breech presentation at term were referred for ECV compared to 38% (70/183) of women without prior history of Caesarean section. 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 NW, effective in reducing the number of breech presentations at birth and the number of caesareans performed. The findings overall are similar to last year. The challenge still remains to increase the numbers of women undergoing attempted ECV, as only 1 in 3 women with breech presentation at birth had an ECV attempt. It is unlikely contraindications for ECV account for this. Recommendation remains unchanged from previous years that a prospective audit is required to ascertain why women either decline or are not being offered ECV, and that this should be followed by development and implementation of policies and resources to facilitate increased numbers of women attending for ECV.

6.8 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

Table 52: Analgesic use by parity and mode of onset of birth NWH 2014

	Total	Epidural	Entonox	Pethidine	TENS	Water

	N	n	%	n	%	n	%	n	%	n	%
All Women	**7400**	**3849**	**52.0**	**3437**	**46.4**	**418**	**5.6**	**112**	**1.5**	**414**	**5.6**
Mode of onset of birth											
CS elective	1281	708	55.3	28	2.2	8	0.6	1	0.1	1	0.1
CS emergency before onset of labour	281	135	48.0	34	12.1	5	1.8	2	0.7	2	0.7
Labouring women*											
Nullipara	3074	2075	67.5	1937	63.0	266	8.7	81	2.6	287	9.3
Multipara	2764	931	33.7	1438	52.0	139	5.0	28	1.0	124	4.5
Induced labour											
Nullipara	1354	1088	80.4	784	57.9	143	10.6	28	2.1	60	4.4
Multipara	961	495	51.5	460	47.9	55	5.7	5	0.5	17	1.8
Spontaneous labour											
Nullipara	1720	987	57.4	1153	67.0	123	7.2	53	3.1	227	13.2
Multipara	1803	436	24.2	978	54.2	84	4.7	23	1.3	107	5.9

* Excludes elective Caesarean and emergency Caesarean before onset of labour.

Epidurals continue to be the most utilised mode of analgesia for the management of labour pain (67.5% of women in labour), with women having induced labours being the most frequent (68.3% compared with spontaneous labour 40%). Labouring nulliparous patients of private obstetrician LMCs have the highest rate (83.6%). 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 (5.6% in 2014, 7.0% in 2013, 8.9% in 2012, 13.1% in 2011, 15.5% in 2010). This is consistent with Australasian observations with some institutions moving towards removing pethidine from their formularies.

Use of general anaesthesia (GA) for caesarean section remains reasonable based on internationally recommended levels. In 2014 2.0% of women were administered a GA, down a little from last year (3.3%). This number includes all women given a GA, not just those for caesarean sections. The GA rate for true emergency caesarean sections was 5.6%, consistent with international observations of similar health systems.

Table 53: GA use and mode of birth NWH 2014

	Total	GA* only		GA* + epidural		Total GA*	
	N	n	%	n	%	n	%
Total	7400	145	2.0	51	0.7	196	2.6
SVB	3992	42	1.1	10	0.3	52	1.3
Operative vaginal	849	3	0.4	3	0.4	6	0.7
CS elective	1281	28	2.2	9	0.7	37	2.9
CS emergency	1278	72	5.6	29	2.3	101	7.9

*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.

Figure 69: Analgesic use and maternal age among labouring nulliparous women NWH 2014

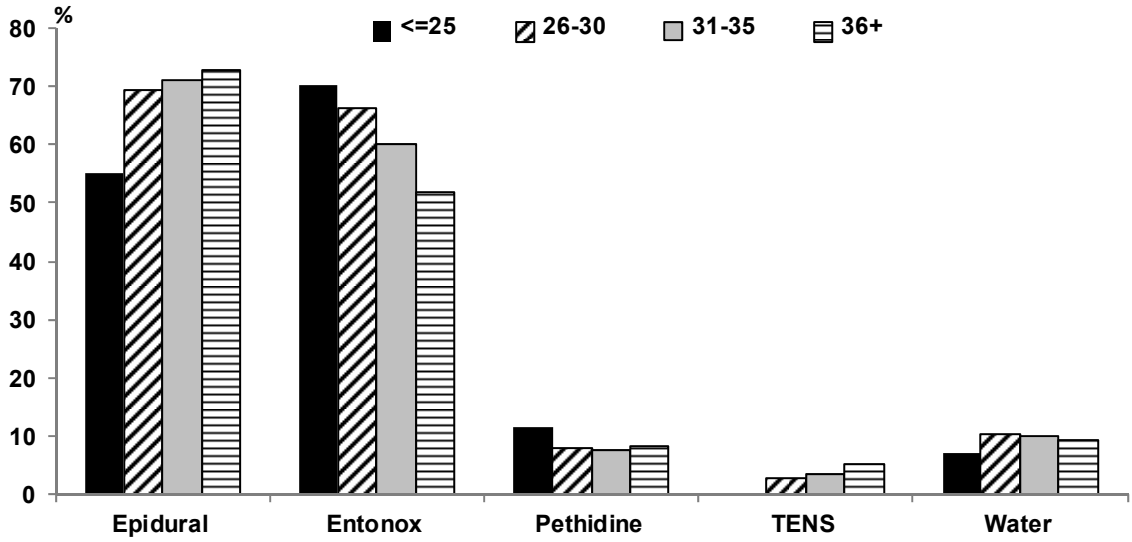


Figure 70: Analgesic use and LMC at birth among labouring nulliparous women NWH 2014

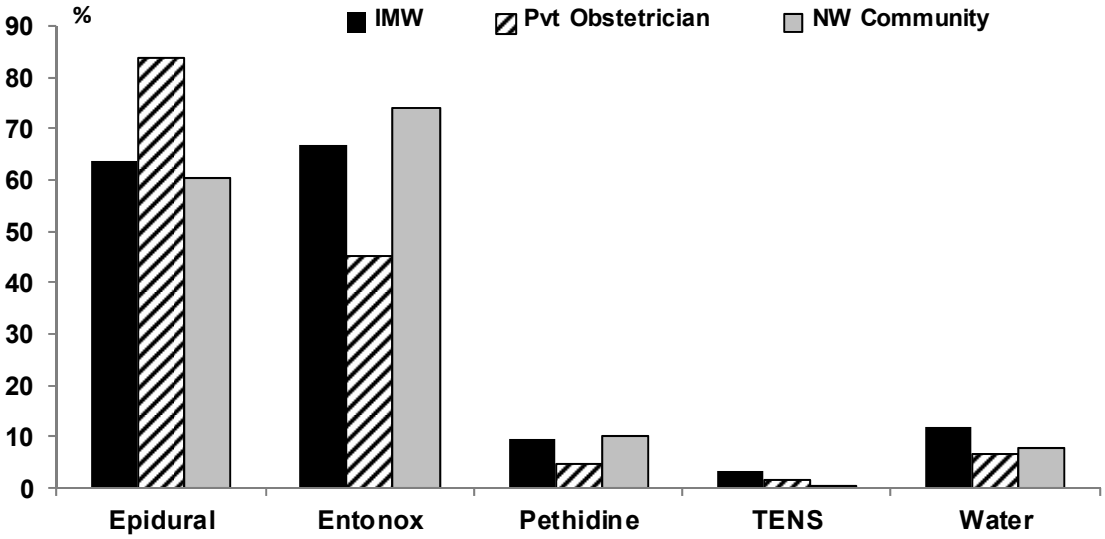
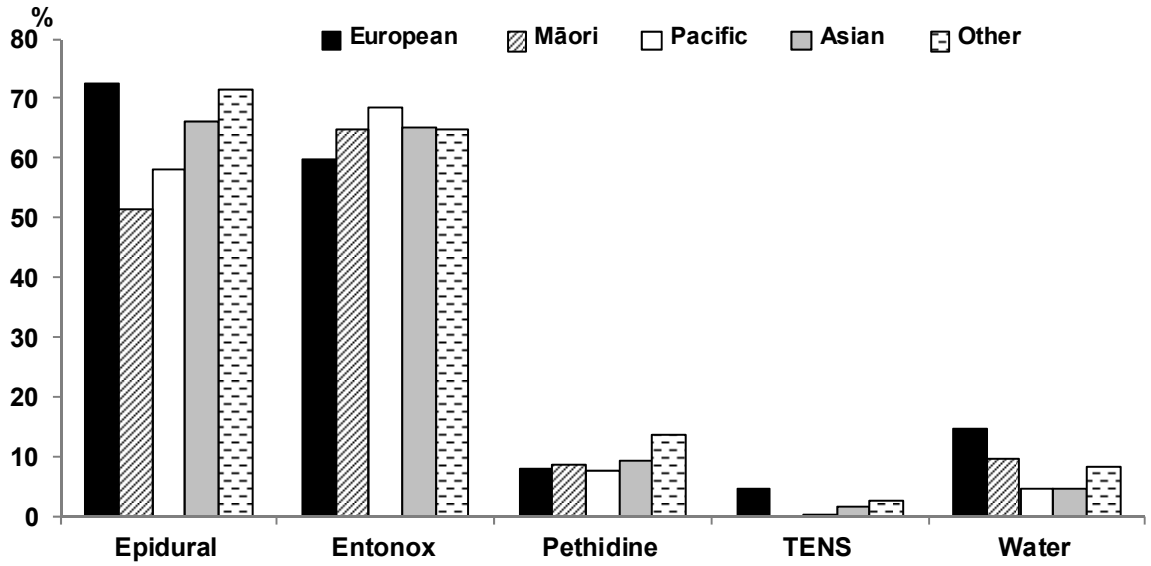


Figure 71: Analgesic use and ethnicity among labouring nulliparous women NWH 2014



6.9 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, physiotherapist services and classes. LMCs have 4 clinic rooms for antenatal assessments and care.

The data for mothers birthing at Birthcare (n=336) during 2014 were provided by Birthcare. The data on mothers transferred to NW in labour and birthing at NW have been obtained from the NW clinical database Healthware.

Findings

Four hundred and twenty one women started labour at Birthcare, and 336 birthed there in 2014. Eighty-five (20%) of women transferred in labour; 68 of nullipara (37%) and 17 of multipara (7%). Therefore 63% of nullipara and 93% of multipara achieved a normal birth at Birthcare."

Exclusive breastfeeding rate on discharge of mothers birthing at Birthcare was 95%, compared to 98% of the women transferred from Birthcare to NW intrapartum. There were 448 births at Birthcare in 2009, 417 in 2010, 451 in 2011,398 in 2012 and 354 in 2013.

Table 54: Demographic characteristics of women labouring at Birthcare by place of birth 2014

	Birth at Birthcare n=336		Intrapartum transfer to NW n=85		Total n=421	
	n	%	n	%	n	%
Parity						
Nullipara	115	34.2	68	80.0	183	43.4
Multipara	221	65.7	17	20.0	238	56.5
Age						
<21	6	1.7	5	5.9	11	2.6
21-25	44	13.0	9	10.6	53	12.5
26-30	96	28.5	24	28.2	120	28.5
31-35	120	35.7	32	37.6	152	36.1
36-40	67	19.9	13	15.3	80	19.0
>40	3	0.8	2	2.4	5	1.1
Ethnicity						
NZ European	177	52.6	30	35.3	207	49.1
Māori	30	8.9	9	10.6	39	9.2
Pacific	36	10.7	5	5.9	41	9.7
Other Asian	27	8.0	12	14.1	39	9.2
Indian	4	1.1	1	1.2	5	1.1
Other European	53	15.77	25	29.4	78	18.5
Other	9	2.6	3	3.5	12	2.8
DHB of Domicile						
Auckland DHB	219	65.1	55	64.7	280	66.5
Counties Manukau DHB	38	11.3	7	8.2	52	12.3
Waitemata DHB	79	23.5	23	27.1	109	25.8
Other	0	0.0	0	0.0	1	0.2

Table 55: Interventions and outcomes among women who commenced labour at Birthcare 2014

	Birth at Birthcare n=336		Intrapartum transfer to NW n=85		Total n=421	
	n	%	n	%	n	%
Intrapartum transfer to NW			85		85	20.1
Mode of birth						
Normal vaginal	336	100.0	40	47.1	376	89.3
Operative vaginal			28	32.9	28	6.6
Emergency caesarean			17	20.0	17	4.0
Perineal trauma						
Episiotomy	15	4.4	31	36.5	46	10.9
Third/fourth degree tear	8	2.3	4	4.7	12	2.9
Vaginal wall tear	2	0.5	5	5.9	7	1.7
2nd degree tear	118	35.1	18	21.2	136	32.3
1st degree tear	82	24.4	10	11.8	92	21.9
Graze	16	4.7	9	10.6	25	5.9
Labial tear	9	2.6	5	5.9	14	3.3
Intact	103	30.6	10	11.8	113	26.8
Blood loss						
≥500 mls	6	1.7	26	30.6	32	7.6
Perinatal outcomes						
Still birth (/1000)	0		0	0.0	0	
Admitted to NICU	4	1.2	2	2.4	6	1.4
Exclusive breastfeeding rate at discharge from the facility	318	94.9	83	97.6	401	95.2

Labour and Birth Summary / Implications

The Caesarean section rate has increased markedly since 2006 although it has been stable since about 2006 in the early to mid-30s (34.6% in 2014). 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.

Women with one previous Caesarean section increasingly opt for elective Caesarean for their next birth. This is despite the fact that many 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 about this option.

There is a marked difference in intervention rates by LMC, with the highest rates of elective Caesarean, emergency Caesarean, and episiotomy seen among women under the care of private obstetricians.

There was a significant increase in double instrumental births in 2014, although at 63 these numbers are small. There was also a small but significant reduction in emergency Caesarean following failed instrumental attempt.

Only one in three women with breech presentation at term had an attempt at ECV. This is despite ongoing prospective audit of ECV showing that almost half of ECVs are successful (even in nulliparous women). More women with breech presentation, if suitable, should be referred for consultation about ECV, and for consideration of vaginal breech birth. A prospective audit is required to ascertain why women either decline or are not being offered ECV.

Chapter 7

LABOUR and BIRTH OUTCOMES

7 LABOUR and BIRTH OUTCOMES

This chapter summarises maternal and neonatal outcomes following labour and birth, including perineal trauma, postpartum haemorrhage, and emergency peripartum hysterectomy. Further data tables can be found in appendix 6.

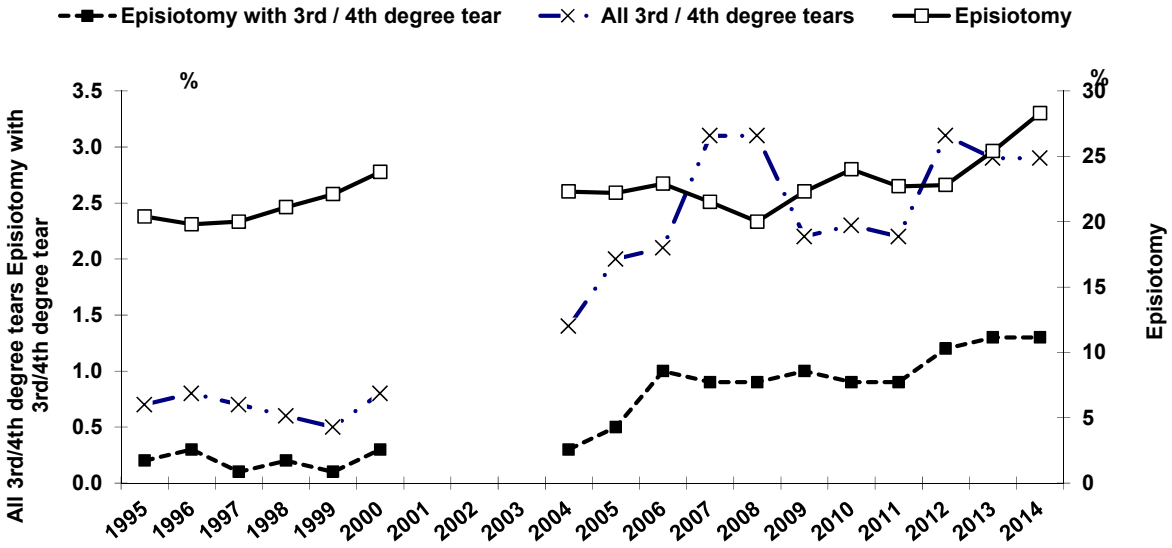
7.1 Perineal trauma

Findings

Table 56: Episiotomy rates among vaginal births NWH 1999-2014

	1999 n= 5661	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
Number of episiotomies	1251	1367	1181	1093	1103	1130	1069	1184	1252	1153	1170	1200	1371
Incidence %	22.1	23.8	22.3	22.2	22.9	21.5	20.5	22.3	24.0	22.7	22.8	25.4	28.3
Episiotomy with 3rd/4th degree tear	5	17	15	23	47	49	46	56	49	46	60	61	61
Incidence %	0.1	0.3	0.3	0.5	1.0	0.9	0.9	1.0	0.9	0.9	1.2	1.3	1.3
All 3rd/4th degree tears	29	47	72	97	103	161	160	116	120	114	158	138	139
Incidence %	0.5	0.8	1.4	2.0	2.1	3.1	3.1	2.2	2.3	2.2	3.1	2.9	2.9

Figure 72: Perineal trauma rates NWH 1995-2014



We reiterate that with an increase in various risk factors, 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.

In the early 2000s there was a dramatic rise in third and fourth degree tear rates which have since stabilised at 2-3%. In 2013 a further small decrease in the 3rd/4th degree tear rate occurred which has been sustained in 2014. The small increase in the episiotomy rate has also persisted. As commented upon in previous reports, causal factors for the increased rate in the early 2000s may have included better diagnosis. Diagnosis of the type of tear and the correct procedure for repair remains a focus and in 2015 a specific documentation form is has been introduced for use in all births involving perineal trauma which improves referral, diagnosis, repair, and follow-up care for these women. It is too early to assess the effectiveness of this change. It has been accompanied by an educational thrust outlined in the previous report.

The perineal tear clinic is well utilised with appropriate referrals being received.

National Maternity Monitoring Group communication indicates that compared to national statistics

NWH does have (non-significantly) lower rates of third and fourth degree tear without episiotomy and generally equivalent rates of third and fourth degree tear with episiotomy.

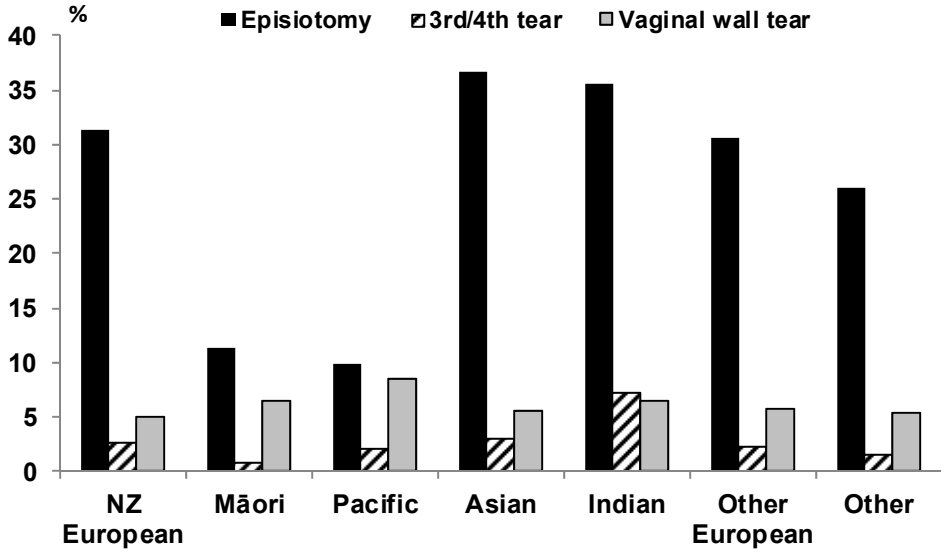
Given the high rate of faecal incontinence from sphincteric injury (with rates of up to 50% being reported) there has been considerable accent in the service in recent years on the avoidance of, diagnosis of, and appropriate surgical repair of anal sphincter damage (third and fourth degree repairs). The episiotomy rate at NWH has increased over recent years. The question that remains unanswered is whether a third and fourth degree tear rate that is almost 20% lower than national average is causally consequent upon and/or justifies an higher episiotomy rate than the national average 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. That said, given the low rate of episiotomy where the LMC is National Women's Health, we cannot conclude that there is any attempt by our practitioners to utilise episiotomy in order to lower the chance of sphincter injury.

The wider context in our practice improvement endeavours has been a focus on appropriate support for a birthing woman through providing a second midwife present 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.

Table 57: Perineal trauma by mode of birth, parity and LMC at birth among all vaginal births NWH 2014

	Total	Episiotomy		3rd/4th tear		Vaginal wall tear	
	N	n	%	n	%	n	%
Total vaginal births	4841	1371	28.3	139	2.9	288	5.9
Mode of birth							
Normal vaginal	3928	706	18.0	88	2.2	231	5.9
Vaginal breech	64	4	6.3	0		2	3.1
Ventouse	530	368	69.4	21	4.0	38	7.2
Forceps	319	293	91.8	30	9.4	17	5.3
Parity							
Nulliparous	2315	1049	45.3	112	4.8	196	8.5
Multiparous	2526	322	12.7	27	1.1	92	3.6
LMC at birth							
Independent Midwife	2697	759	28.1	91	3.4	172	6.4
Private Obstetrician	838	376	44.9	12	1.4	30	3.6
General Practitioner	14	3	21.4	0		2	14.3
NW Community	973	174	17.9	30	3.1	65	6.7
NW Diabetes	110	23	20.9	3	2.7	10	9.1
NW MFM	160	33	20.6	2	1.3	5	3.1
Other DHB	18	1	5.6	0		1	5.6
Unbooked	31	2	6.5	1	3.2	3	9.7
Ethnicity							
New Zealand European	1469	460	31.3	40	2.7	74	5.0
Māori	336	38	11.3	3	0.9	22	6.5
Pacific	686	68	9.9	14	2.0	58	8.5
Asian	1235	452	36.6	38	3.1	68	5.5
Indian	404	144	35.6	29	7.2	26	6.4
Other European	527	161	30.6	12	2.3	30	5.7
Other	184	48	26.1	3	1.6	10	5.4

Figure 73: Perineal trauma rates among vaginal births by ethnicity NWH 2014



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 ecbolic 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 ecbolic and delivery of the placenta by maternal effort.

Findings:

Table 58: Third stage management among vaginal births NWH 2014

	Physiological n=345		Active syntocinon n=2575		Active syntometrine n=1761		Unknown n=160	
	n	%	n	%	n	%	n	%
Primary PPH (≥500mls)	40	11.6	573	22.3	418	23.7	40	25.0
Primary PPH (≥1000mls)	11	3.2	220	8.5	157	8.9	12	7.5
Postpartum blood transfusion	3	0.9	65	2.5	38	2.2	4	2.5

In 2012 a large WHO directed multicentre trial showed the most important component of Active management of the third stage of labour (AMTSL) was the administration of a uterotonic. Controllled cord traction had no impact on reducing haemorrhage but did reduce the length of the third stage. New emphasis from WHO for AMTSL as a prophylactic intervention for reducing PPH is to offer every woman at every delivery a uterotonic. Delayed cord clamping for 1-3 minutes reduces the risk of fetal anaemia and does not alter risk of PPH. CCT may be used and is also encouraged at caesarean delivery. Postpartum vigilance completes the “package”, ensuring the uterus is contracted immediately post-delivery and assessed every 15 minutes for 2 hours subsequently.

In 2014 rates of physiological management of the third stage are unchanged There have been less “other” uterotonics used but more cases when the use of uterotonic is not recorded. Improvement of the estimation of blood loss including the weighing of all blood is now part of labour ward culture.

The primary rate of PPH >500mls is unchanged since 2013, however it is concerning over the past 5 years there is a gradual trend towards increased rates for PPH >1000mls. There has been a marginal reduction in transfusion rate.

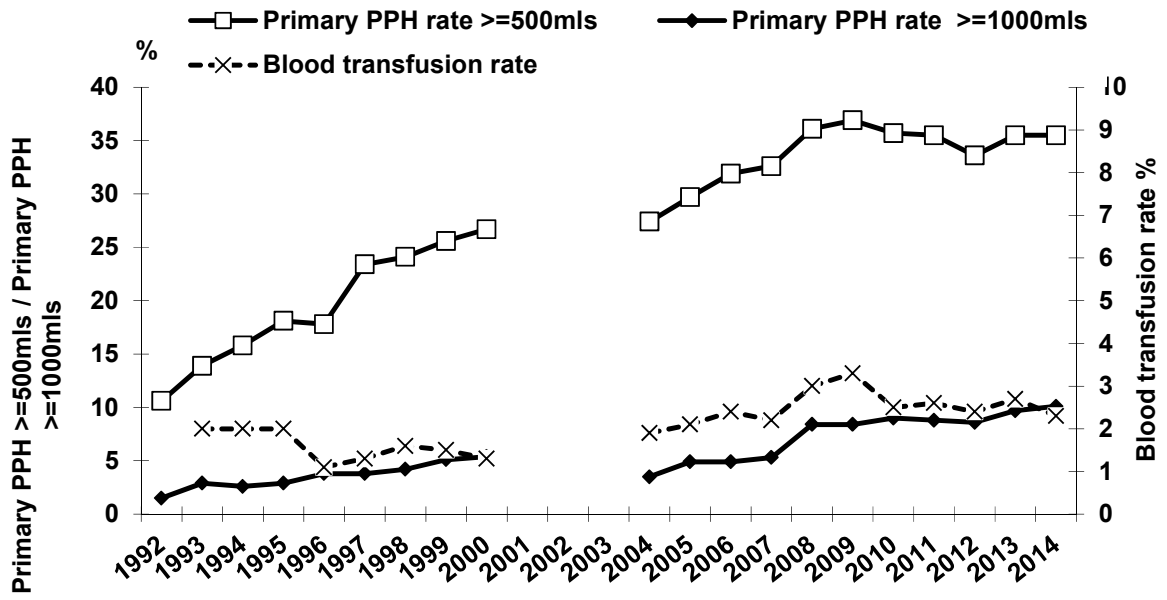
If only 10% of woman have no primary ecbolic and yet PPH rates remain high perhaps a break down in cause of PPH/incidence of tears associated with significant blood loss may help find means to address this not inconsequential source of maternal perinatal morbidity.

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 have not been 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.

Findings

Figure 74: Postpartum haemorrhage and transfusion rates NWH 1992-2014



PPH rates have not changed since 2009.

Table 59: Postpartum haemorrhage rate NWH 1998-2014

	1998	1999	2000	2004	2005*	2006*	2007*	2008	2009	2010	2011	2012	2013	2014
Total Births	7531	7501	7827	7491	7194	7212	7695	7589	7735	7709	7523	7695	7223	7400
Primary PPH (≥500mls)	1818	1921	2088	2056	2139	2302	2507	2736	2850	2753	2674	2587	2563	2628
Incidence %	24.1	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
Primary PPH (≥1000mls)	318	381	423	262	350	351	410	634	651	695	659	662	701	746
Incidence %	4.2	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

*Data corrected in 2005- 2007. See methodology above.

Table 60: Postpartum blood loss by mode of birth NWH 2014

	Spontaneous vaginal birth n=3992		Operative vaginal birth n=849		CS emergency n=1278		CS elective n=1281		Total n=7400	
	n	%	n	%	n	%	n	%	n	%
PPH>=500mls	765	19.2	306	36.0	906	70.9	651	50.8	2628	35.5
PPH>=1000mls	292	7.3	108	12.7	242	18.9	104	8.1	746	10.1
PPH>=1500mls	138	3.5	54	6.4	82	6.4	36	2.8	310	4.2
Postpartum transfusion	73	1.8	37	4.4	43	3.4	19	1.5	172	2.3

Table 61: Postpartum blood loss by onset of birth NWH 2014

	Spontaneous labour n=3566		Induced labour n=2265		CS emergency before onset of labour n=288		CS elective n=1281		Total N=7400	
	n	%	n	%	n	%	n	%	n	%
PPH >=500mls	992	27.8	813	35.9	172	59.7	651	50.8	2628	35.5
PPH>=1000mls	351	9.8	252	11.1	39	13.5	104	8.1	746	10.1
PPH>=1500mls	149	4.2	106	4.7	19	6.6	36	2.8	310	4.2
Postpartum transfusion	79	2.2	60	2.6	14	4.9	19	1.5	172	2.3

With an overall PPH rate of 35.5% the challenge for NW is not to remain stable but to decrease the rate.

The New Zealand maternity clinical indicators for 2009 to 2011 for women requiring a blood transfusion after Caesarean section and after vaginal birth are a concern.

The introduction of iron infusions and improved risk assessment, planning and documentation for third stage may be able to effect some change.

Table 62: Blood transfusion NWH 1999-2014

	1999	2000	2004	2005	2006	2007	2008	2009	2011	2012	2013	2014
Antenatal	4	0	10	12	11	6	6	18	13	5	4	7
Antenatal & intrapartum		0	1	0	0	1	0	0	0	1	1	0
Antenatal & postpartum		1	0	3	0	0	2	2	0	1	2	1
Intrapartum	3	4	2	2	6	1	4	3	3	1	6	2
Intrapartum & postpartur	3	4	4	3	3	4	1	2	1	1	2	1
Postpartum	100	96	128	133	150	165	212	228	193	180	192	170
Total transfusions	110	105	145	153	170	177	225	253	210	189	207	181
Total transfusion rate	1.5	1.3	1.9	2.1	2.4	2.3	3.0	3.3	2.8	2.5	2.9	2.5

7.4 Neonatal outcomes by mode of birth

Methods

The following tables include all babies live born at NW.

Table 63: Neonatal morbidity among live births by mode of birth (all gestations) NWH 2014

	Spontaneous vertex n=3940		Vaginal breech n=47		Forceps birth n=319		Ventouse birth n=534		CS elective n=1342		CS emergency n=1311		Total N=7491	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	45	1.1	17	25.0	8	2.5	11	2.1	22	1.6	56	4.3	159	2.1
1 min Apgar <7	219	5.6	28	59.6	41	12.9	54	10.1	105	7.8	241	18.4	688	9.2
5 min Apgar <7	50	1.3	16	34.0	5	1.6	7	1.3	10	0.7	46	3.5	134	1.8
Admitted to NICU	268	6.8	19	40.4	28	8.8	47	8.8	167	12.5	283	21.6	812	10.8
≥48 hrs in NICU	189	4.8	18	38.3	18	5.6	21	3.9	116	8.7	223	17.0	585	7.8
Neonatal deaths (/1000 live births)	18	4.6	10	213	0		0		3	2	6	5	37	5

Table 64: Neonatal morbidity among live births by mode of onset of birth (all gestations) NWH 2014

	Spontaneous labour n=3540		Induced labour n=2308		CS elective n=1340		CS emergency before onset of labour n=303		Total N=7491	
	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	59	1.7	52	2.3	22	1.6	26	8.6	159	2.1
1 min Apgar <7	265	7.5	224	9.7	105	7.8	94	31.0	688	9.2
5 min Apgar <7	61	1.7	43	1.9	10	0.7	20	6.5	134	1.8
Admitted to NICU	285	8.1	214	9.3	167	12.5	146	48.2	812	10.8
≥48 hrs in NICU	202	5.7	134	5.8	116	8.7	133	43.9	585	7.8
Neonatal deaths (/1000 live births)	18	5	12	5	3	2	4	13	37	5

Table 65: Neonatal morbidity by mode of birth in live born term or post term (≥ 37 weeks) babies NWH 2014

	Spontaneous vertex n=3688		Vaginal breech n=16		Forceps birth n=295		Ventouse birth n=510		CS elective n=1194		CS emergency n=1083		Total N=6786	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	29	0.8	2	12.5	7	2.4	10	2.0	13	1.1	34	3.1	95	1.4
1 min Apgar <7	171	4.6	5	31.3	33	11.2	48	9.4	76	6.4	149	13.8	482	7.1
5 min Apgar <7	29	0.8	2	12.5	5	1.7	7	1.4	6	0.5	30	2.8	79	1.2
Admitted to NICU	161	4.4	1	6.3	16	5.4	40	7.8	75	6.3	107	9.9	400	5.9
≥48 hrs in NICU	89	2.4	1	6.3	6	2.0	17	3.3	33	2.8	55	5.1	201	3.0
Neonatal deaths (/1000 live births)	4	1	0		0		0		2	2	2	2	8	1

Rates of admission to NICU in term babies are significantly higher in those delivered by emergency as well as elective CS compared with spontaneous vertex.

Table 66: Neonatal morbidity in term or post term live born (≥ 37 weeks) babies NWH 2007-2014

	2007 N=6953		2008 N=6902		2009 N=7113		2010 N=7065		2011 N=6889		2012 N=7030		2013 N=6596		2014 N=6786	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min apgar <4	73	1.0	38	0.5	78	1.1	76	1.1	97	1.4	92	1.3	81	1.2	95	1.4
5 min apgar <7	45	0.6	44	0.6	63	0.9	65	0.9	94	1.4	73	1.0	90	1.4	79	1.2
Admitted to NICU	322	4.6	314	4.5	364	5.1	343	4.8	417	6.0	413	5.9	396	6.0	400	5.9
≥2 days in NICU	154	2.2	153	2.2	174	2.4	181	2.6	204	3.0	207	2.9	223	3.4	201	3.0
Neonatal death (/1000 live births)	7	1	8	1	6	1	7	1	4	1	9	1	11	2	8	1

Rates of NICU admission for infants born at term have been stable at approximately 6% since 2011 but there has been an overall increase in admission since 2006 (chi square test for trend, p<0.00001)

Over the same time period there has been a statistically significant increase in the proportion of babies with low apgars at one and 5 minutes (chi square test for trend, p<0.001) however the clinical significance of these findings is uncertain.

Figure 75: NICU admission and low Apgar score rates (% of live born term infants) NWH 2007-2014

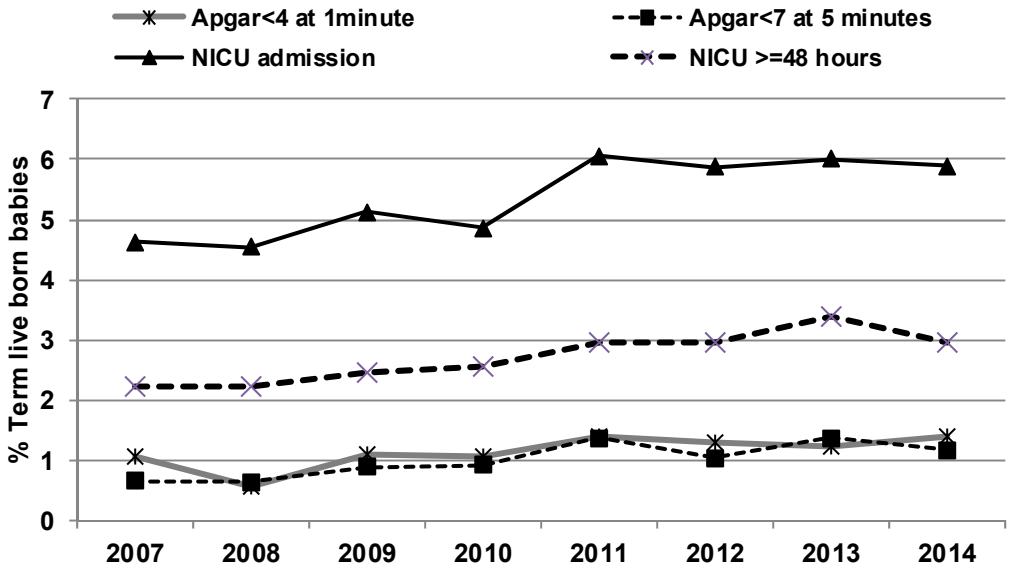
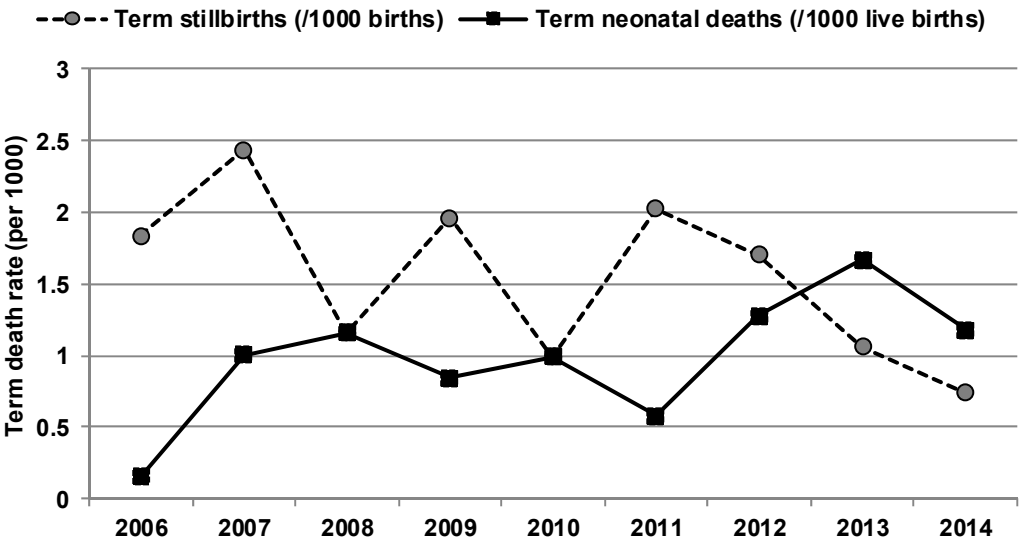


Figure 76: Term stillbirth and neonatal death rate NWH 2006-2014



There is a trend to reduced numbers of term stillbirths at NWH between 2006-2014 (chi square test for trend, p=0.05) whereas there is a trend to an increased number of term neonatal deaths over the same time period (chi square test for trend, p=0.05). In 2014, 5 of 8 neonatal deaths and 2 of 6 stillbirths at term were due to congenital abnormalities.

Chapter 8

POSTNATAL CARE

8 POSTNATAL CARE

This chapter provides information on infant feeding and postnatal admissions. Further data tables can be found in Appendix 7.

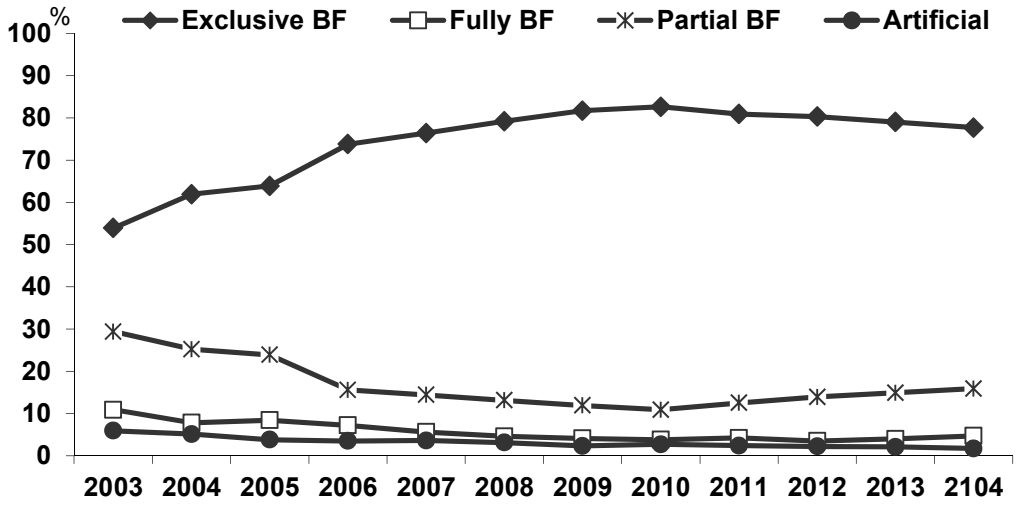
8.1 Infant feeding

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 some this is following 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 Homecare discharge for those women and babies who have midwifery post discharge care provided by the National Women's Community Team. This is at discharge at approximately 4-6 weeks post birth.

Findings

Figure 77: Method of infant feeding at discharge from NWH 2005-2014



In 2014, the exclusive breastfeeding rate on discharge from hospital following birth was 78%, 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 population 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) by a variety of modalities including on-line courses, quiz dinners, audit projects, skilled midwives, with several undertaking additional LC qualifications, and adherence to the WHO "Ten Steps to Successful Breastfeeding".

Figure 78: Exclusive breastfeeding at discharge from NWH by mode of birth 2005-2014

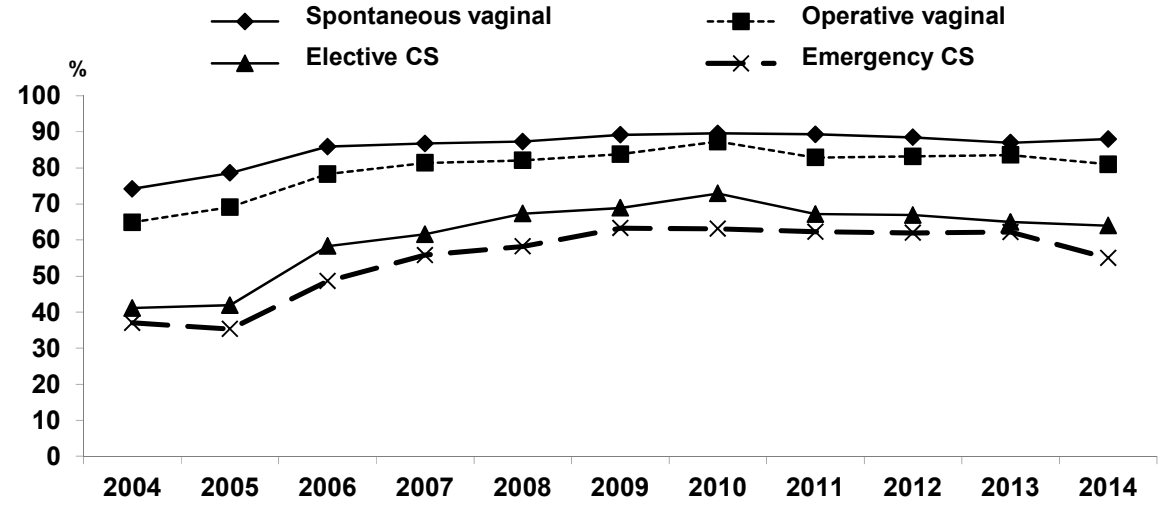


Figure 79: Exclusive breastfeeding rates at discharge from NWH by maternal age 2005-2014

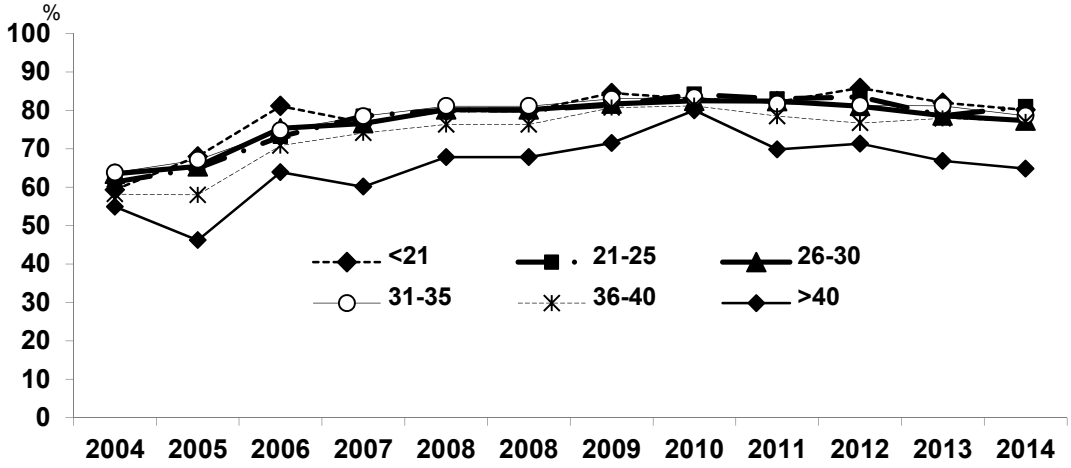
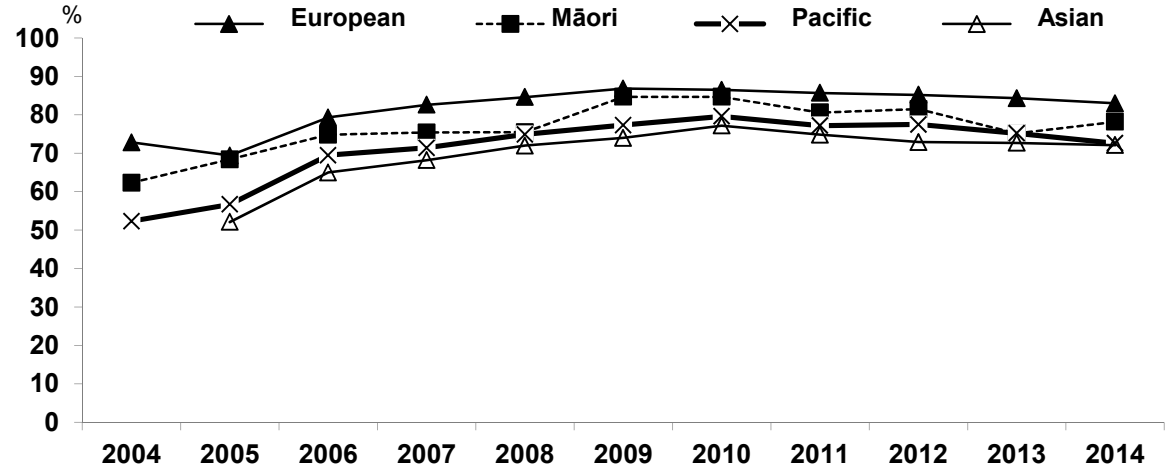
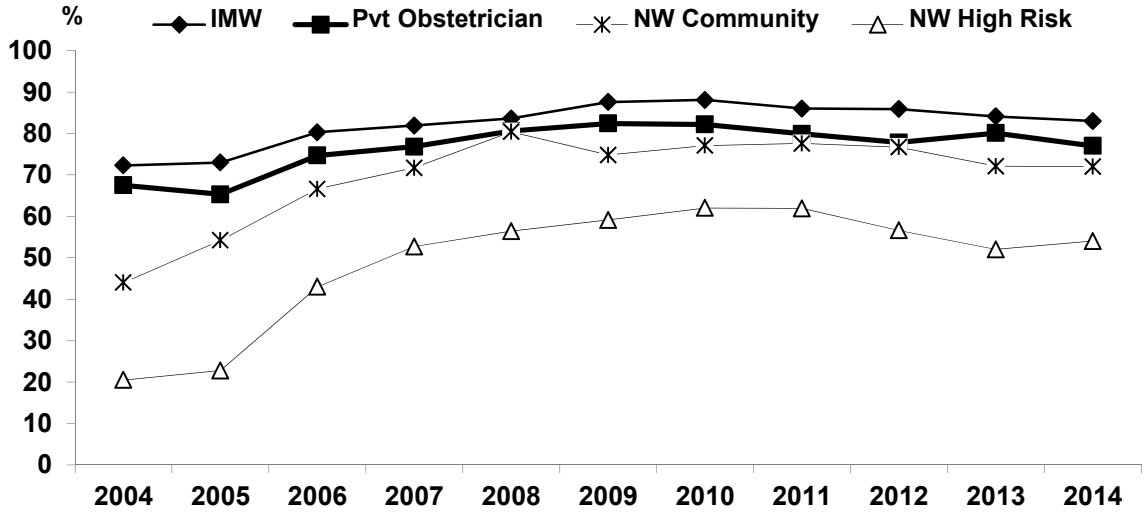


Figure 80: Exclusive breastfeeding rates at discharge from NWH by ethnicity 2005-2014



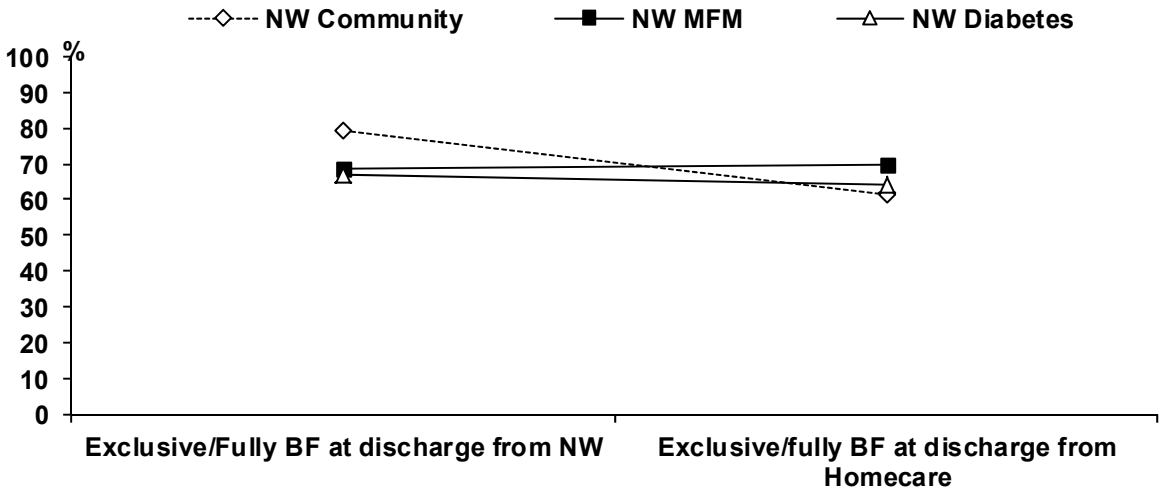
Breastfeeding rates for NZ European mothers remain stable at over 83%, rates for Asian mothers are unchanged at 72% and those for Maori and Pacific mothers are 75%.

Figure 81: Exclusive breastfeeding rate at discharge from NWH by LMC at birth 2005-2014



The rates for exclusive breastfeeding remain consistent across all LMC groups. The lower rate among high risk women is statistically significant.

Figure 82: Breastfeeding rates (exclusive and fully breastfeeding) at hospital discharge and at discharge from NWH Homecare (4-6 weeks) (n=1165) 2014



This figure demonstrates the extent to which fully and exclusive breastfeeding rates drop 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 65%.

National Women's is proud to continue achieving the Baby Friendly Hospital Initiative standards for the third consecutive time since 2008. This is due to the on-going commitment of lactation consultants, midwives and all members of the health care team.

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 77.7% in 2014. The number of women choosing artificial feeding has fallen progressively from 3.8% in 2005 to 1.7% in 2014. From 2010 to 2014 there is an upward trend of more women selecting to or having to do partial breastfeeding in preference to exclusive breastfeeding.

To maintain a high breastfeeding rate there is a need to remain aware and supportive of the multitude of factors that 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 78% 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 Postnatal admissions

Primary postnatal care is provided at Birthcare Auckland (under contract). Women requiring secondary care or closer observation for themselves or their babies receive postnatal care at National Women's.

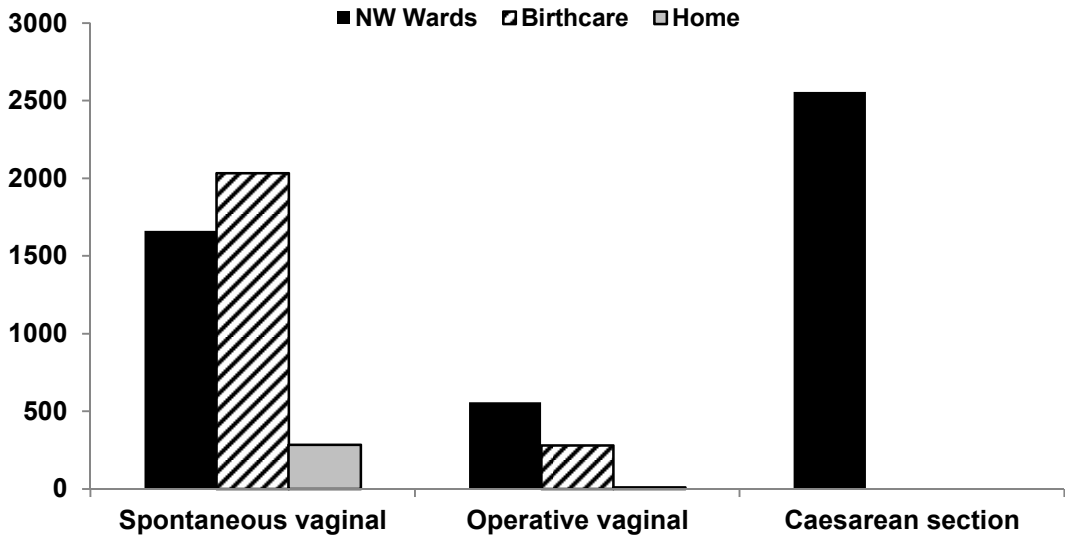
Findings

Table 67: Maternal destination immediately after birth NWH 2008-2014

	2008 N = 7589		2009 N = 7735		2010 N = 7709		2011 N =7523		2012 N=7695		2013 N=7223		2014 N=7400	
	N	%	n	%	N	%	n	n	n	%	n	%	n	%
NW Wards	4493	59.2	4557	58.9	4661	60.5	4730	62.9	4797	62.3	4617	63.9	4777	64.6
Birthcare	2551	33.6	2637	34.1	2543	33.0	2357	31.3	2469	32.1	2251	31.2	2313	31.3
Home	526	6.9	517	6.7	481	6.2	414	5.5	407	5.5	336	4.6	293	4.0
Other Units	19	0.3	24	0.3	24	0.3	22	0.3	22	0.3	19	0.3	17	0.2

There has been very little change over the past years in the number of women transferring to NW wards, Birthcare or to home.

Figure 83: Maternal destination immediately after birth by mode of birth NWH 2014



As expected, mothers are admitted initially to the NW 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 NW.

Figure 84: Postnatal destination immediately after birth by LMC at birth NWH 2014

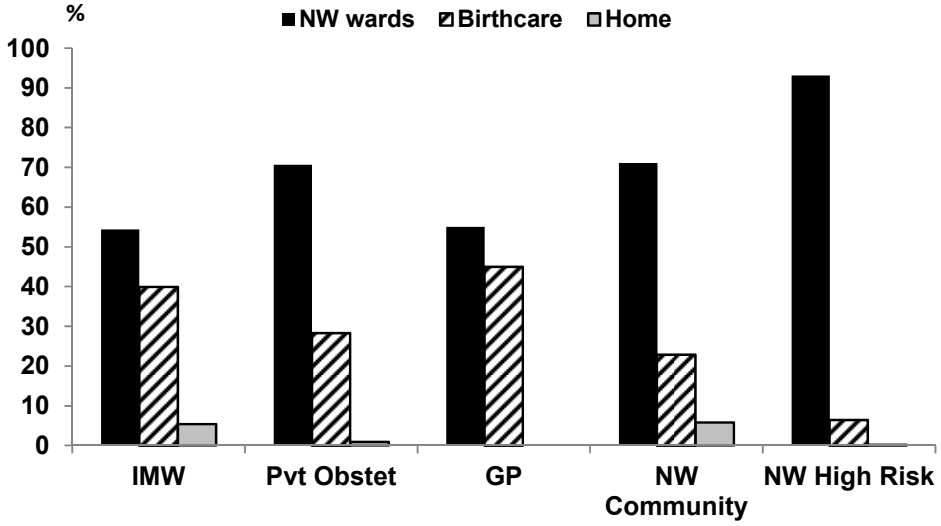
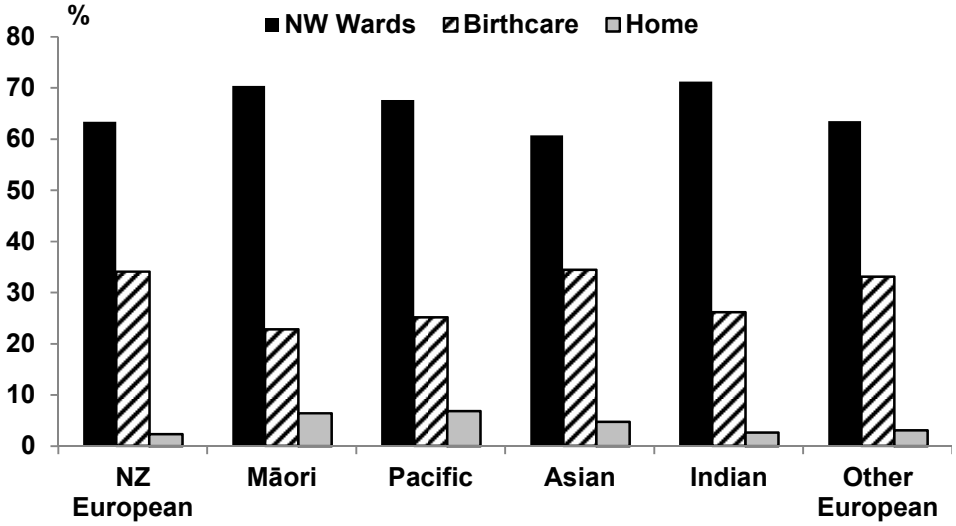


Figure 85: Postnatal destination immediately after birth by ethnicity NWH 2014



Māori, Pacific and Indian women remain underrepresented among women transferring to Birthcare immediately postpartum.

Admission to NW 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 68: Reason for admission to NWH postnatal wards among women having a spontaneous vaginal birth 2014

	N=1662	
	n	%
Neonatal reason*	669	40.3
Postpartum haemorrhage	345	20.8
Diabetes	156	9.4
Hypertensive disorder	65	3.9
Perineal trauma	126	7.6
Retained placenta/products	60	3.6
Fainting /dizziness	16	1.0
Other listed reasons†	225	13.5

*includes admission to NICU, low birth weight (<2500g), requiring paediatrician care, stillbirth, neonatal death.
†includes epidural complications, infection, tubal ligation, psychiatric disorders, social reasons, previous history of PPH and lack of beds at Birthcare.

Table 69: Discharge destination by mode of birth among initial admissions to NW wards

	N=4780	
	n	%
Caesarean section birth - discharged to home	1996	41.8
Caesarean section birth - transferred to Birthcare	450	9.4
Caesarean section birth - discharged to other destinations	113	2.4
Operative vaginal birth - discharged to home	273	5.7
Operative vaginal birth - transferred to Birthcare	262	5.5
Operative vaginal birth - discharged to other destinations	24	0.5
Spontaneous vaginal birth - discharged to home	1128	23.6
Spontaneous vaginal birth - transferred to Birthcare	437	9.1
Spontaneous vaginal birth - discharged to other destinations	97	2.0

8.2.1 Postnatal readmissions

In 2014 we are unable to provide this data 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.

8.2.2 Admissions to postnatal wards of women who birthed elsewhere

There were 110 admissions in 2014 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.

Table 70: Reason for postnatal admission by place of birth for women who birthed elsewhere NWH 2014

	Total		Birthcare		Home		CMDHB*		North Shore		Waitakere		Other	
	N=110		n=26		n=6		n=11		n=22		n=29		n=16	
	N	%	n	%	n	%	n	%	n	%	n	%	n	%
Neonatal admission	65	59.1	5	19.2	3	50.0	9	81.8	18	81.8	19	65.5	11	68.8
Infection	7	6.4	1	3.8	0	0.0	1	9.1	0	0.0	2	6.9	3	18.8
Breast	9	8.2	2	7.7	1	16.7	1	9.1	1	4.5	4	13.8	0	0.0
Postpartum haemorrhage	4	3.6	4	15.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Obstetric trauma	3	2.7	2	7.7	1	16.7	0	0.0	0	0.0	0	0.0	0	0.0
Retained placenta/products	4	3.6	2	7.7	1	16.7	0	0.0	0	0.0	1	3.4	0	0.0
Other	18	16.4	10	38.5	0	0.0	0	0.0	3	13.6	3	10.3	2	12.5

* All 11 from Middlemore hospital

Chapter 9

NEWBORN SERVICES

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 in appendix 8 Data in the Newborn section pertain to all babies admitted to and cared for at the NW Neonatal Intensive Care Unit if born during the 2014 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 2014 calendar year. Occupancy data relate to the unit occupancy for each day in 2014.

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 2014 and admitted to the Auckland City Hospital (ACH) NICU, (2) inborn (ACH) babies and (3) babies born in 2014 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.

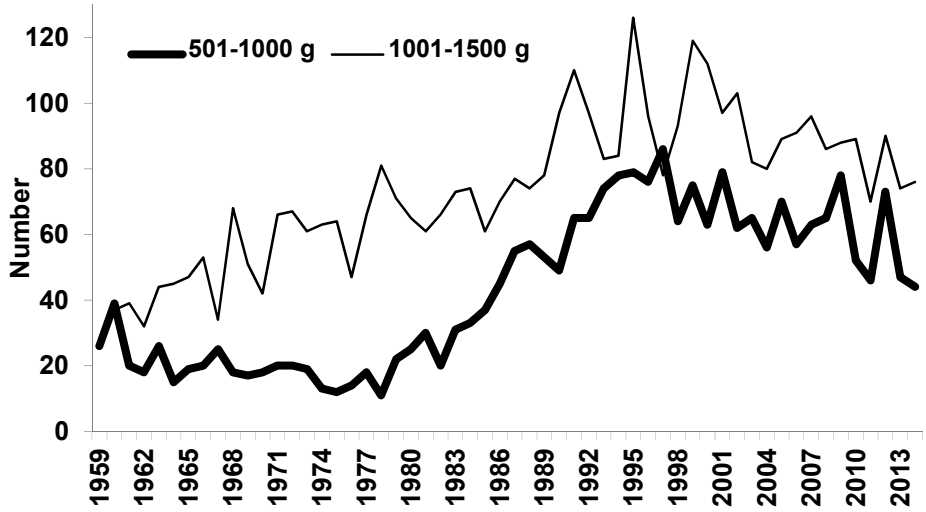
Table 71: Characteristics of <32 week or <1500g babies cared for at NWH NICU by ANZNN status 2014

	<32 weeks or <1500g					
	Total N=172		ANZNN n=165		Non ANZNN n=7	
Gestation (weeks)	**n**	**%**	**n**	**%**	**n**	**%**
<24	0		0		0	
24-25	23	13.4	20	12.1	3	42.9
26-27	29	16.9	28	17.0	1	14.3
28-29	28	16.3	28	17.0	0	
30-31	71	41.3	68	41.2	3	42.9
32-36	21	12.2	21	12.7	0	
Weight (g)						
<500	1	0.6	1	0.6	0	
500-749	22	12.8	20	12.1	2	28.6
750-999	25	14.5	24	14.6	1	14.3
1000-1249	38	22.1	37	22.4	1	14.3
1250-1499	45	26.2	44	26.7	1	14.3
1500-1999	38	22.1	36	21.8	2	28.6
2000-2499	3	1.7	3	1.8	0	
Birthplace						
National Women's	156	90.7	156	94.5	0	
Northland	2	1.2	2	1.2	0	
Waitemata DHB	5	2.9	5	3.0	0	
Counties Manukau DHB	2	1.2	0		2	28.6
Other	7	4.1	2	1.2	5	71.4

9.1 Inborn live birth at National Women's 1959-2014

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 86: Number of inborn live births ≤1500g NWH 1959-2014 (excludes BBAs).



9.2 NICU occupancy

The 2014 occupancy of 14070 bed days is approximately equivalent to a mean of 38.5 babies per day. Although this is slightly lower than last year, it represents a high occupancy of just over 95%. 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.

Table 72: Occupancy (baby days) on NICU 2001– 2014

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Baby days	20108	20551	19249	14958	14541	14212	15228	15296	15236	14982	14877	14461	14296	14070

Figure 87: Occupancy (baby days per year) of NICU by gestational age 1999-2014

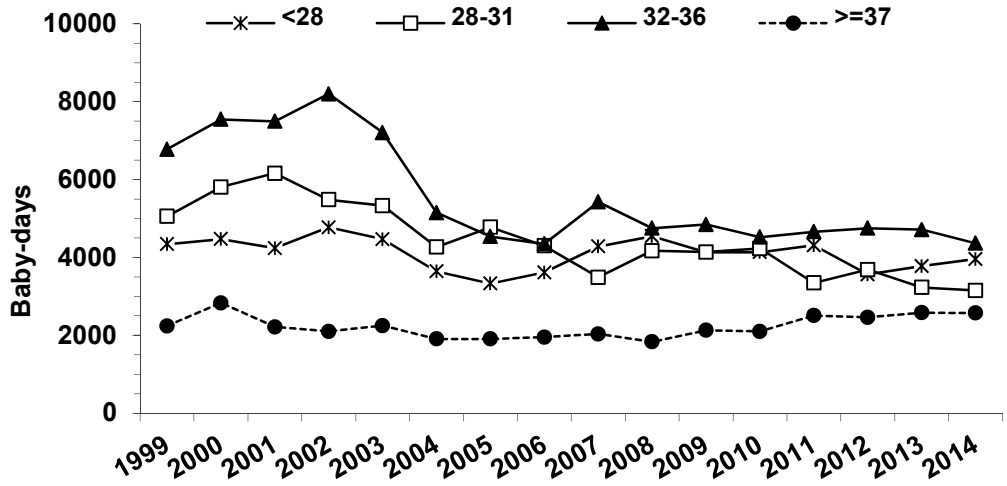
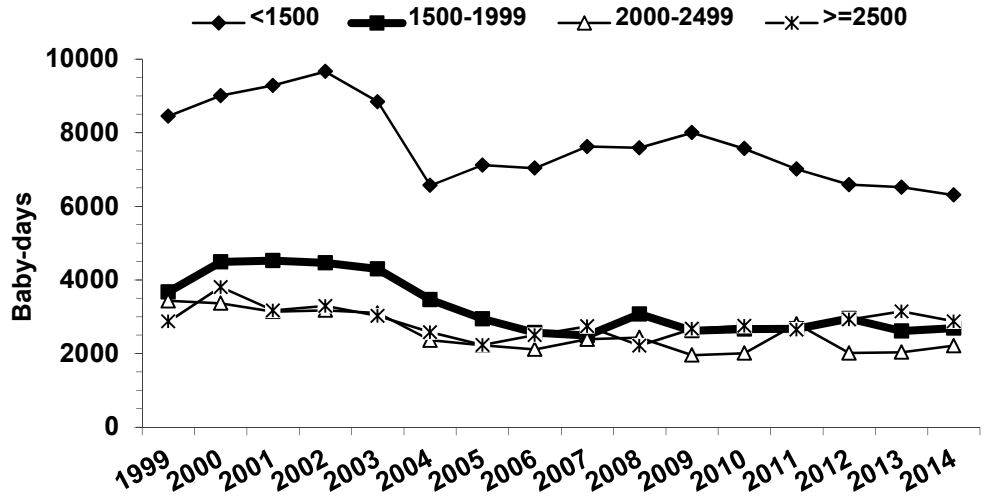


Figure 88: Occupancy (baby days per year) of NICU by birth weight 1999-2014



9.3 Admissions to NICU

Total admissions were 910 for the 2014 calendar year and have remained circa 900-1000 since moving to the Auckland site. Auckland City Hospital continues to be the level 3 referral unit for the two Waitemata hospitals and for Northland Base Hospital. ACH NICU also provides regional neonatal intensive care services for infants undergoing surgical procedures in the newborn period and care for babies with antenatally diagnosed congenital cardiac disease likely to require intervention soon after birth. The neonatal units at North Shore and Waitakere Hospitals admit babies >1500g and >31 weeks gestation and provide Level 2 care including CPAP.

Figure 89: Admissions to NICU 1981-2014

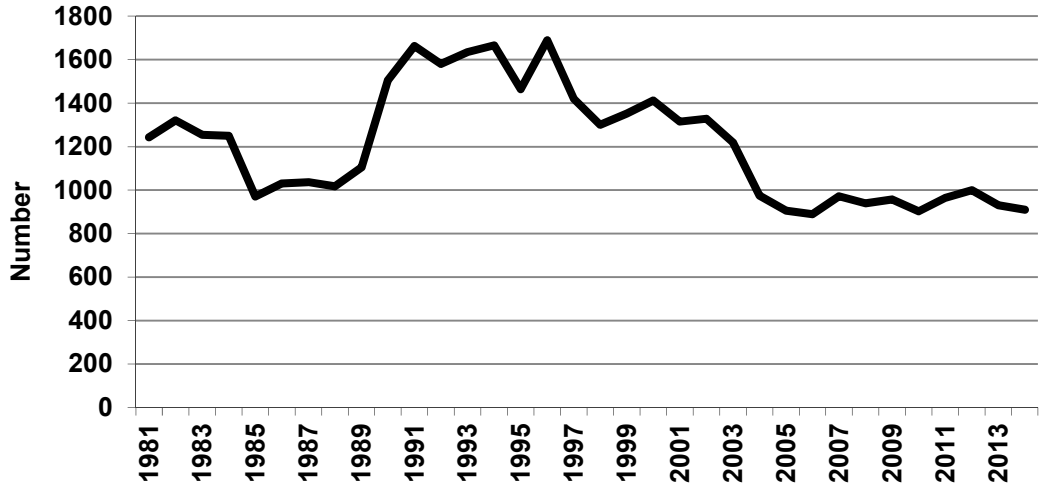


Table 73: NICU admissions by year 1998-2014

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number	1352	1412	1312	1331	1220	975	906	890	972	939	957	902	963	1000	930	910

9.3.1 Admissions to NICU by gestation and birth weight

For 2014, the number of babies admitted between 32 and 36 weeks gestation appears to have decreased again and is now approximately half of 600 per year seen in 2000. However, the level 3 infants born below 32 weeks remain fairly constant at around 200 per year. The opening of the Waitemata units caused a significant decrease in admissions of term babies and those 32-36 weeks gestation from 2004. Of note, from 2008 until 2011 there was a steady rise in term infant admissions,

which also appears to have plateaued over the last 4 years. These babies are likely to have a mixture of problems but the two most common (see Appendix) are respiratory distress and congenital abnormality, which includes cardiac anomalies.

Figure 90: Admissions to NICU (total) by gestational age 1999-2014

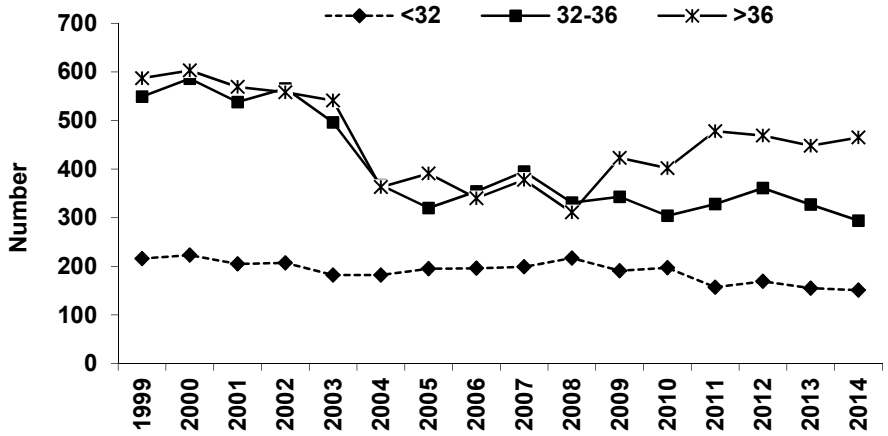


Figure 91: Admissions to NICU (total) by birth weight 2000-2014

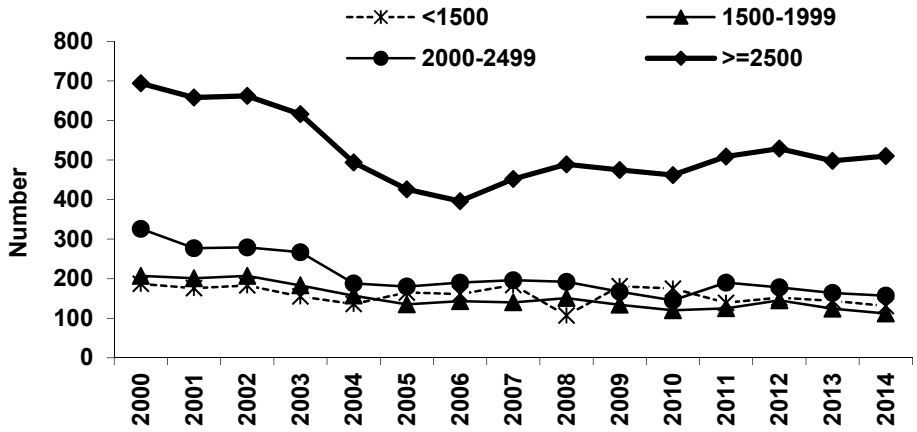
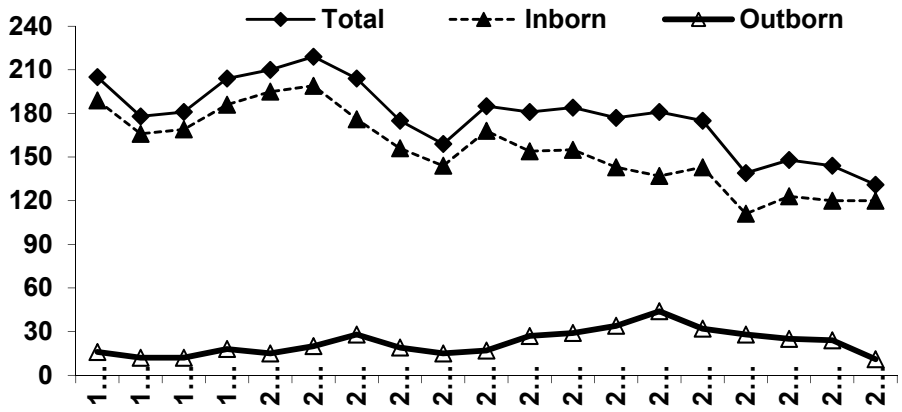


Figure 92: Admissions to NICU of <1500g babies (VLBW) by place of birth 1996-2014 (outborn includes BBAs).



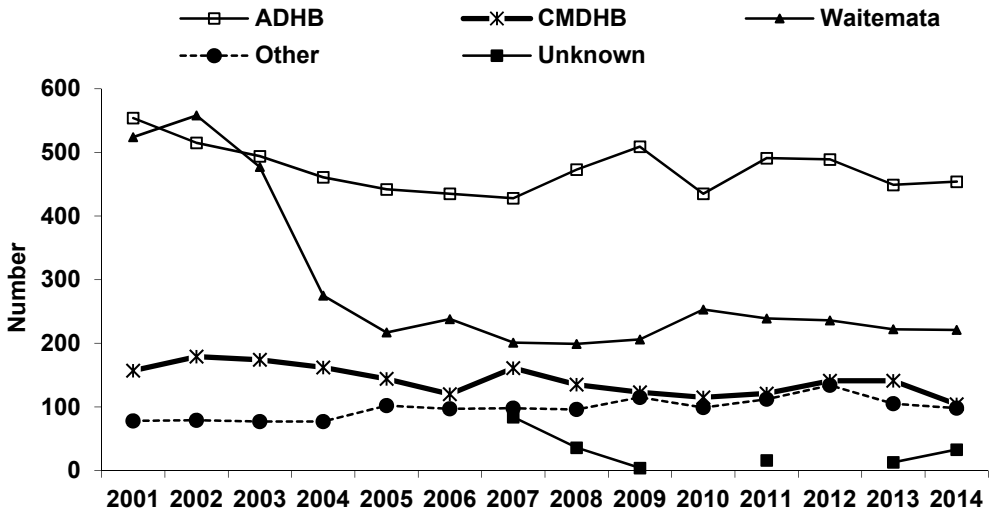
The total number of outborn VLBW infants admitted to the NICU has remained low in 2014. This group of infants includes transfers from level 2 units for level 3 care and those infants who are transferred from Middlemore Hospital NICU for surgical care so are a significant group. As a general principle, 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

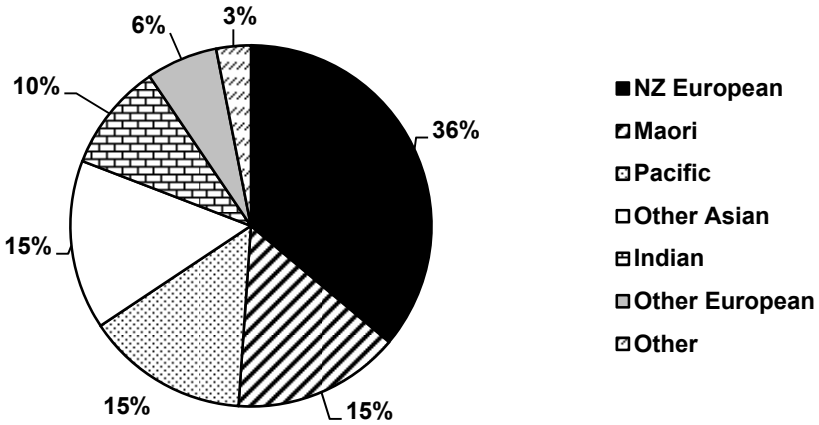
As previously noted there was a decline in admissions of babies whose mothers are domiciled in the Waitemata DHB with the opening of their two level 2 units in the early 2000s. The modest increase in the number of babies admitted to NICU whose mothers were domiciled in the ADHB region in 2008 and 2009 is considered due to better allocation, with a drop in unknowns. In the last year there was a slight drop off in admission numbers from "other" and CMDHB. The reasons for that are not fully elucidated but it could be that these units were less prone to being full due to the modest drop in birth rates.

Figure 93: Admissions to NICU by maternal domicile 2001-2014



9.3.3 Admissions to NICU by ethnicity of baby

Figure 94: Admissions to NICU by ethnicity of baby 2014

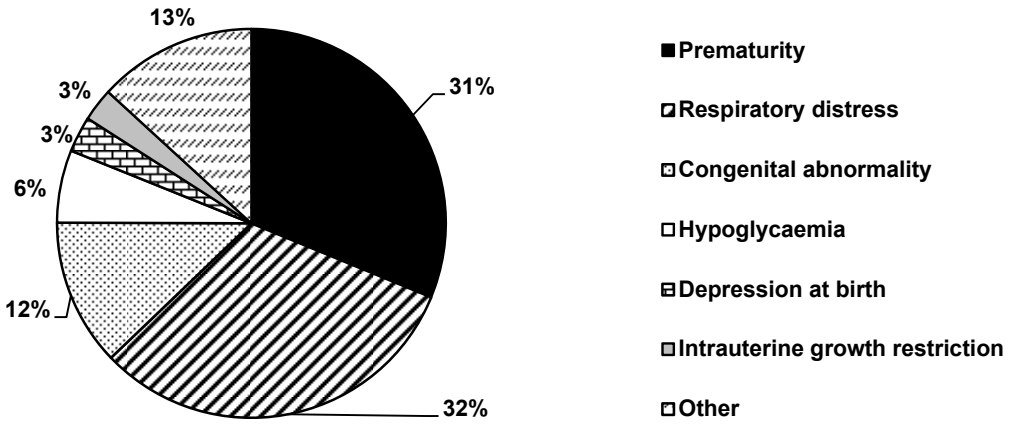


The most frequent ethnicity of NICU admissions was NZ European with 36.2% overall, including 37.6% of preterm and 34.3% of term infants respectively. The second largest single ethnic group overall was Other Asian with 15.2% compared with Maori at 15% and Pacific at 14.6%. There are differences in rates between term and preterm infants, notably Maori have a higher rate for preterm admissions at 16.8% (details are given in the appendix). Indian were represented a 9.7% of overall admissions. 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 95: Reasons for admissions to NICU 2014

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 the fourth most common cause, including 45 term infants. 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 the Appendix

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 2014, 94% 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 96: Any antenatal corticosteroids at 24-27 weeks 1995-2014

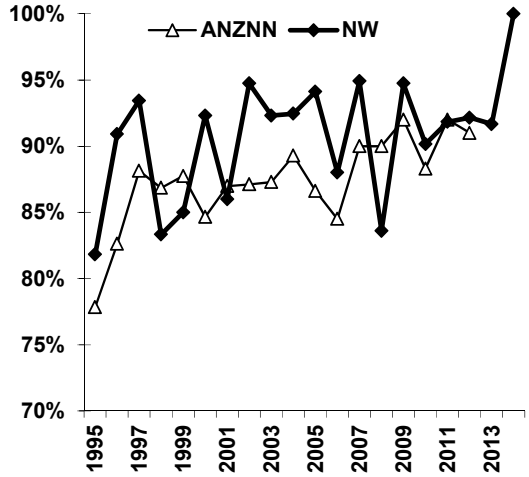
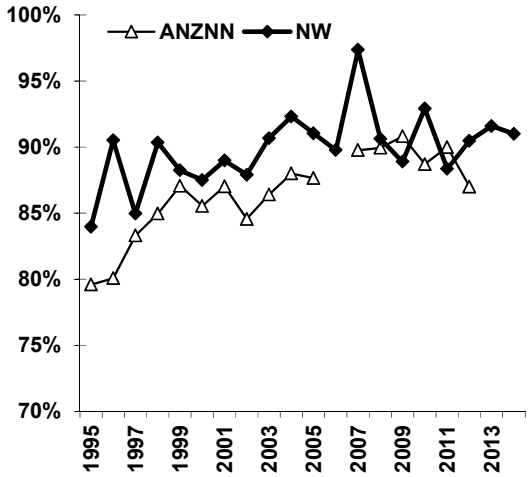


Figure 97: Any antenatal corticosteroids at 28-31 weeks 1995-2014



9.4 Care and complications

9.4.1 Infection (inborn admissions)

In 2014, there were 9 early-onset culture proven septicaemias, which is similar to the previous five years (5-10 cases per year). The organisms were E coli (3) and Group B Streptococcus (4) plus one each Enterococcus and Streptococcus bovis. Two of the Group B Streptococcus infection cases presented with suspected chorioamnionitis and were managed with intravenous antibiotics and emergency Caesarean section, one of these pregnancies had been concealed and so received no antenatal care. In the other two cases intrapartum antibiotics were not given either due to negative swabs or no evidence of having antenatal swabs performed for group B streptococcus. In the three cases with E. coli infection the mother had been treated with either erythromycin (2) or penicillin (1). One child had proven associated CSF infection but in the others CSF was sampled later in the illness and was sterile.

There were 38 episodes of late-onset septicaemia, sometimes with more than one organism. This is higher than the 22-34 seen over the previous five years. For late onset sepsis the most common organism was Staphylococcus epidermidis / coagulase negative Staphylococcus with 32 samples identified as one of these organisms. In view of the apparent increase in rates of late onset infection with these organisms and the potential association with neonatal longlines a working group was set up in the NICU to investigate and make suggestions for management.

9.4.2 Hypoxic ischaemic encephalopathy (all admissions)

Five inborn babies developed significant stage 2 or 3 hypoxic ischaemic encephalopathy (HIE) in 2014, giving an incidence of 0.7/1000 term live births. The incidences were between 0.26 and 1.6/1000 term live births for the years between 2003 and 2014.

Table 74: Details of inborn hypoxic ischaemic encephalopathy (HIE) Stages 2 or 3.

	Gestation	Birth Weight	HIE stage	Apgar 1/5	Comment
Theatre	35	3620	3	3/4	Critically ill mother, cooled, seizures but reassuring MRI
Theatre	38	2830	3	4/6	Fetal distress, cooled, no seizures and reassuring MRI
Theatre	39	3440	2	2/4	Placental abruption, cooled, no seizures and reassuring MRI
Theatre	41	3150	2	2/5	Absent fetal movements, early seizures, MRI very severe abnormality - died
Theatre	37	2440	2	1/2	Maternal pyrexia, cooled, seizures and moderate changes on MRI

9.4.3 Intraventricular haemorrhage in very low birth weight infants admitted to NICU 1985-2014

Figure 98: Intraventricular haemorrhage in <1250g infants admitted to NICU 1985-2014

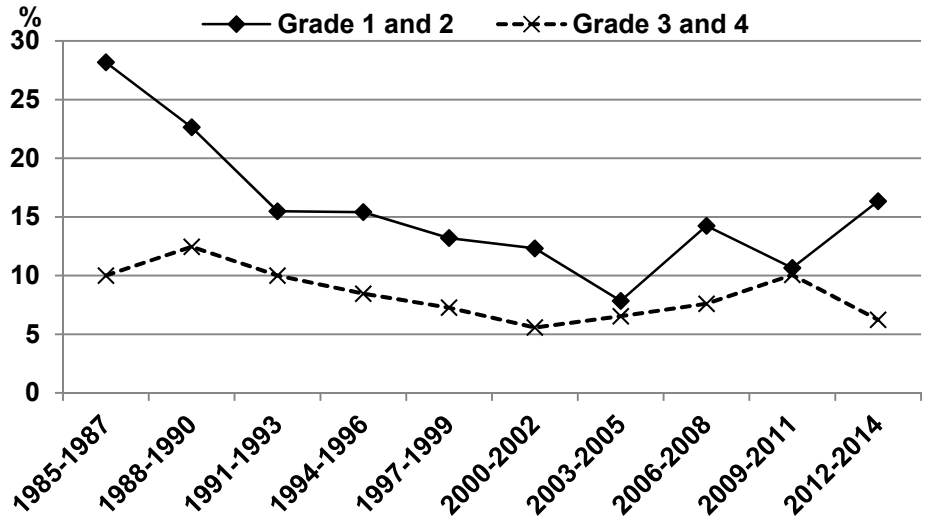


Figure 98 demonstrates the historical trend in IVH rates over the last 20 years. However, there have

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 2 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 (Fig 89-92) 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 tables in appendix)

Figure 99: Any IVH at 24-27 weeks 1995-2014

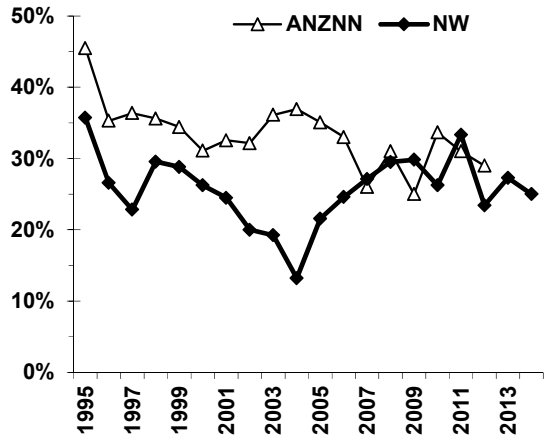


Figure 100: Severe (G3-4) IVH at 24-27 weeks 1995-2014

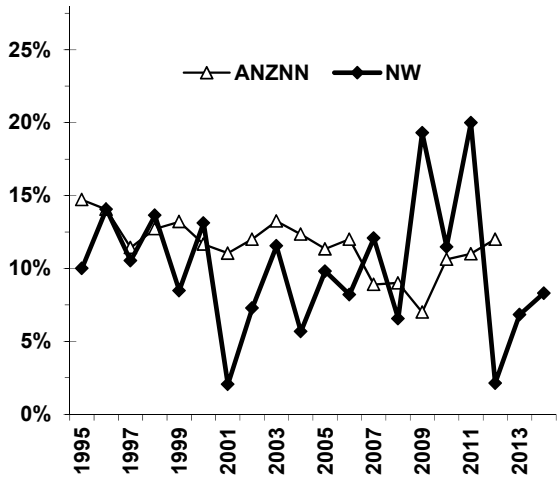


Figure 101: Any IVH at 28-31 weeks 1995-2014

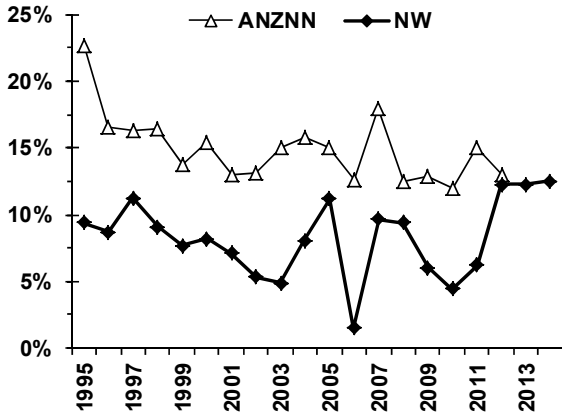
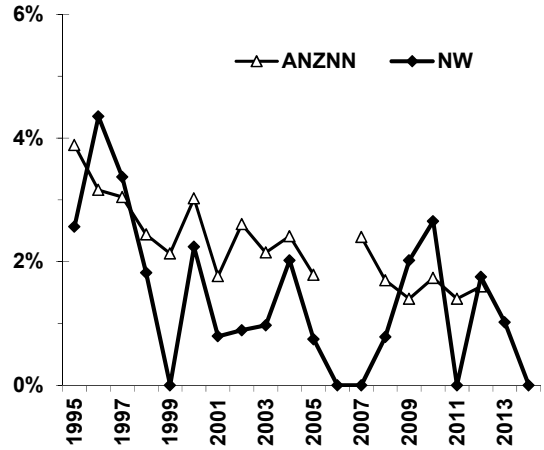


Figure 102: Severe (G3-4) IVH at 28-31 weeks 1995-2014



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. In 2014 there were only four 24-27 week infants with severe (G3-4) IVH compared with three in the previous year. The number of 28-31 week gestation infants with severe IVH remains low.

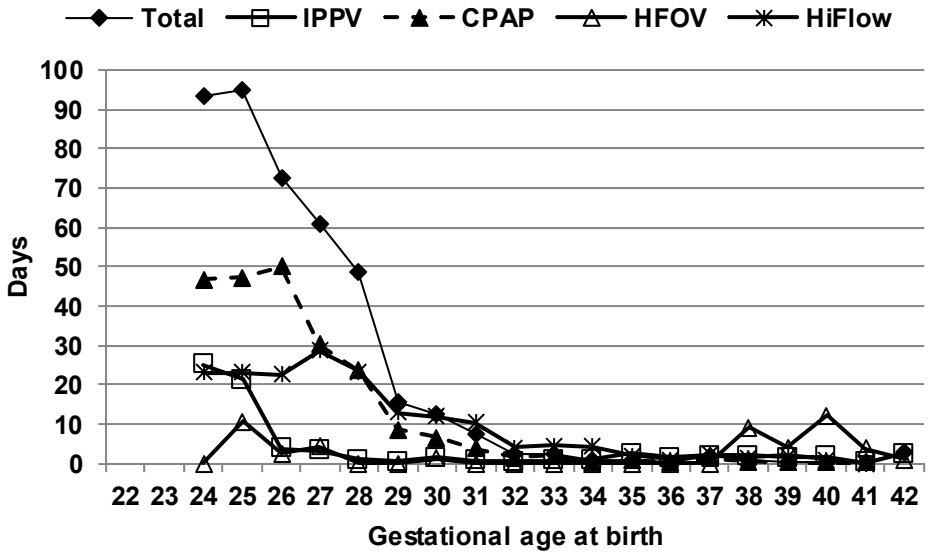
9.4.5 Assisted ventilation (all admissions)

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 this year 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 three years ago but has increased in use and now represents a significant proportion of our respiratory support. Data has also been added on this modality for 2011 and 2012. In addition, we have recalculated the IPPV and CPAP data for these two years as the last two reports had included respiratory support for outborn infants. Although this accurately reflected total work load it was not helpful for assessment of trends in respiratory support use

Table 75: Number of babies on assisted ventilation (inborn) NWH 2003-2014

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Any ventilation	404	402	395	384	444	446	455	453	469	482	501	501
IPPV	109	123	140	96	141	145	134	184	154	154	154	149
CPAP	388	388	367	374	419	415	423	418	427	441	443	462
HFOV				11	18	21	22	11	17	20	19	19
HiFlow									63	125	121	170

Figure 103: Median ventilation days by gestational age among (ventilated) inborn survivors NWH 2014



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 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. This year use has increased again and it 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 as use increases.

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)

Figure 104: Median days on IPPV NWH 1995-2014

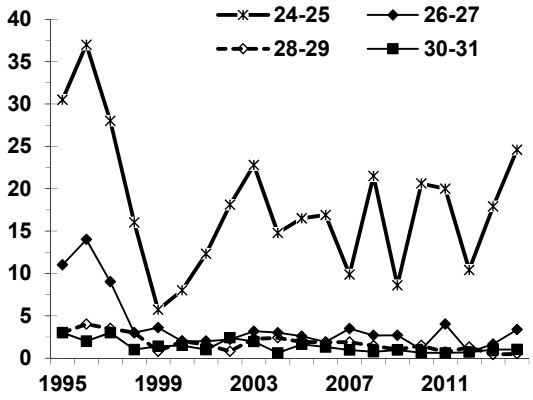
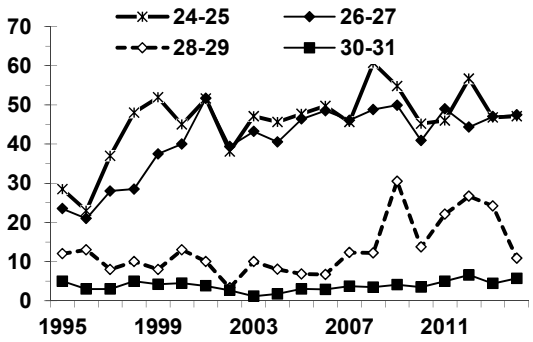


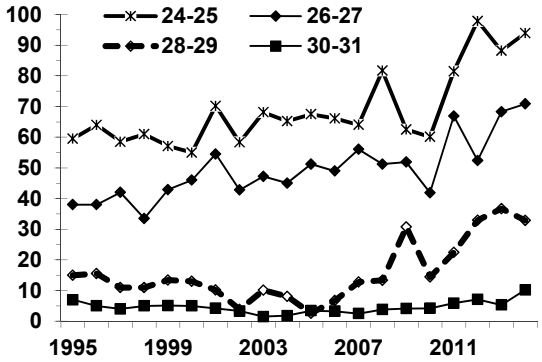
Figure 105: Median days on CPAP NWH 1995-2014



HiFlow High flow air oxygen
HFOV High frequency oscillatory ventilation
IPPV Intermittent positive pressure ventilation

CPAP Continuous positive airway pressure

Figure 106: Median days on any ventilation NWH 1995-2014



These figures illustrate median days on respiratory support for inborn survivors. This group may be considered a more homogeneous population than the outborn.

As documented in previous reports, the shift in 1997 to a CPAP-based approach was associated with a dramatic decrease in the time ventilated for infants under 28 weeks gestation. The graph has been updated for 2014 and shows that for 24 -25 week gestation infants the current median duration is over 21 days but this varies each year due to small numbers.

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 in 2014.

9.4.7 Trends in the use of assisted ventilation among all infants born in NW. (≥24 weeks gestation)

Figure 107: Number on IPPV NWH 1995-2014

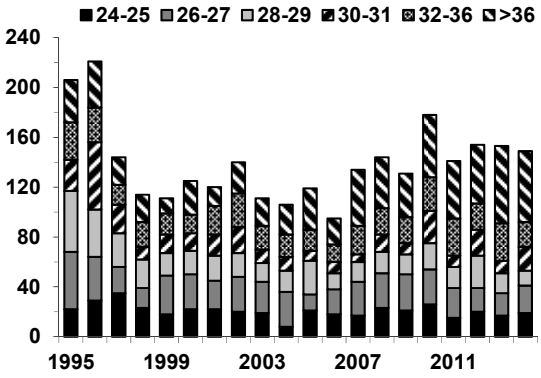


Figure 108: Number on HFOV NWH 2014

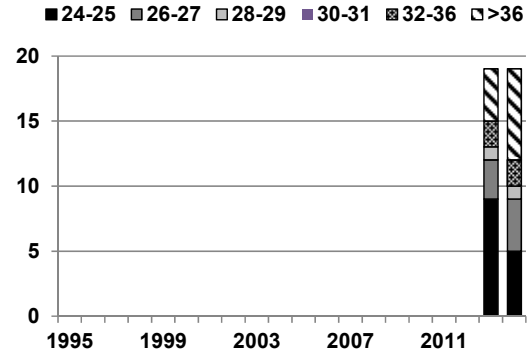


Figure 109: Number on any ventilation NWH 1995-2014

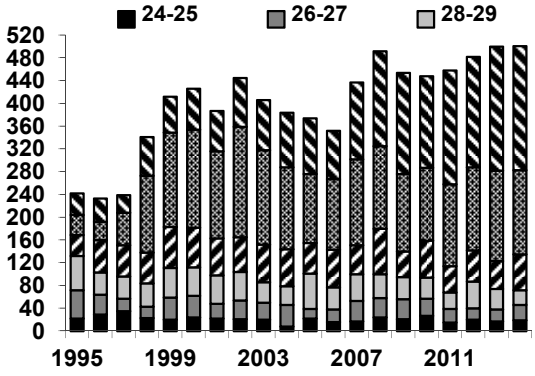


Figure 110: Number on CPAP NWH 1995-2014

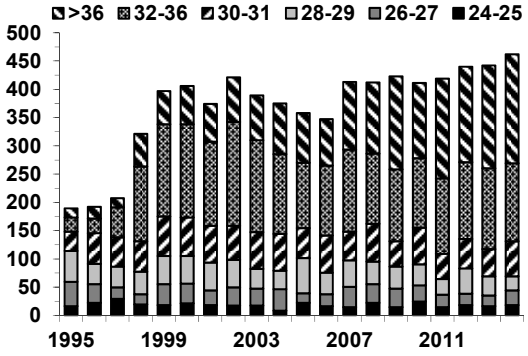
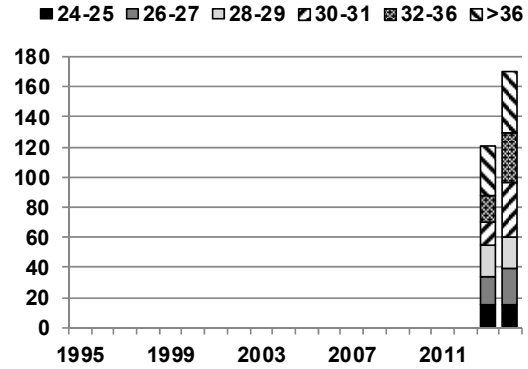


Figure 111: Number on HiFlow NWH 2014



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 NW and across Australia and New Zealand at 24-27 weeks gestation (ANZNN benchmarking)

These data compare the use of IPPV and CPAP in NW and across the Australia and New Zealand Neonatal Network. The Network collects standardised data from all NICU in Australia and New Zealand.

The median data presented here are for all babies ventilated (ie babies not ventilated are excluded).

Figure 112: Percentage on IPPV (24-27 wks ANZNN assigned) NWH 1995-2014

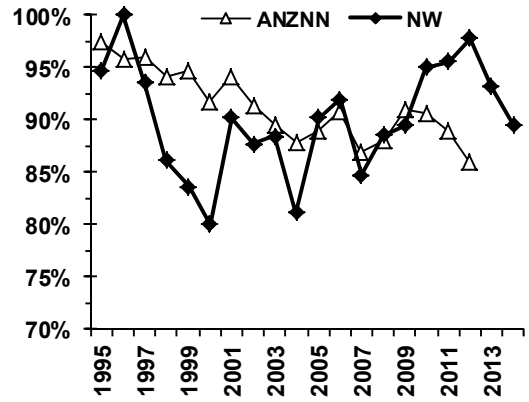


Figure 113: Percentage on CPAP (24-27 wks ANZNN assigned) NWH 1995-2014

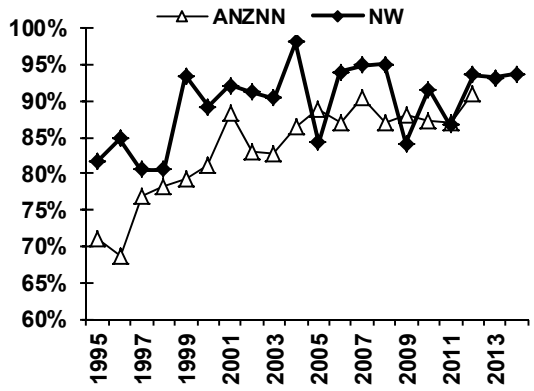


Figure 114: Median days on IPPV (24-27 wks ANZNN assigned) NWH 1995-2014

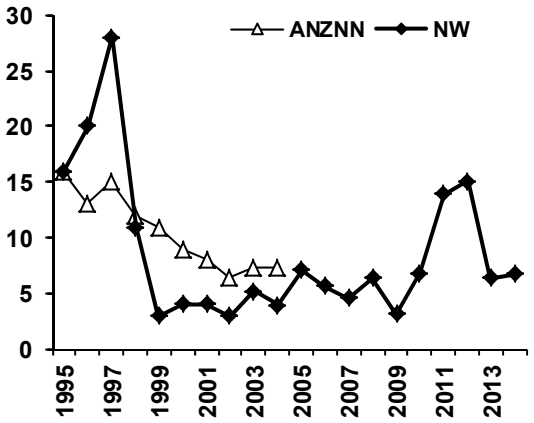
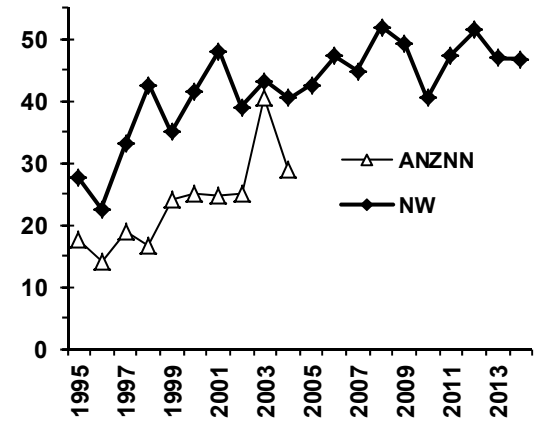


Figure 115: Median days on CPAP (24-27 wks ANZNN assigned) NWH 1995-2014



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 116: Percentage on IPPV (28-31 wks ANZNN assigned) NWH 1995-2014

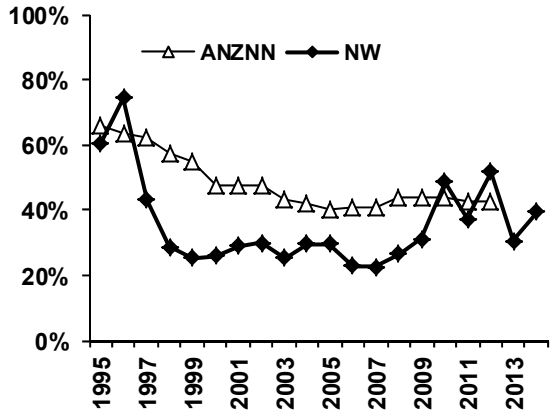


Figure 117: Median days on IPPV (28-31 wks ANZNN assigned) NWH 1995-2014

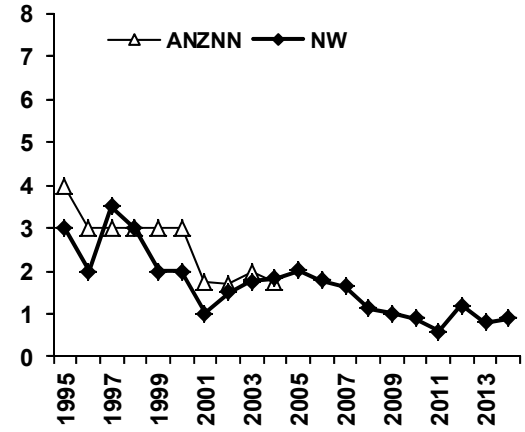


Figure 118: Percentage on CPAP (28-31 wks ANZNN assigned) NWH 1995-2014

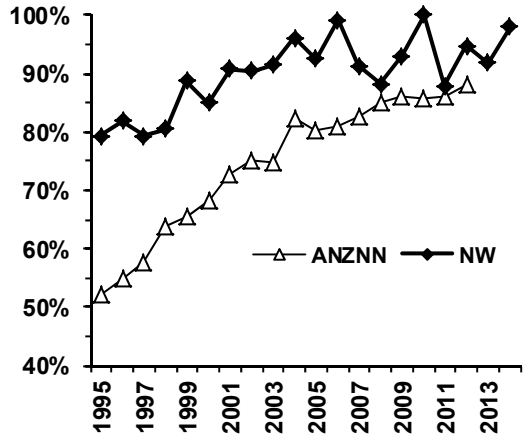
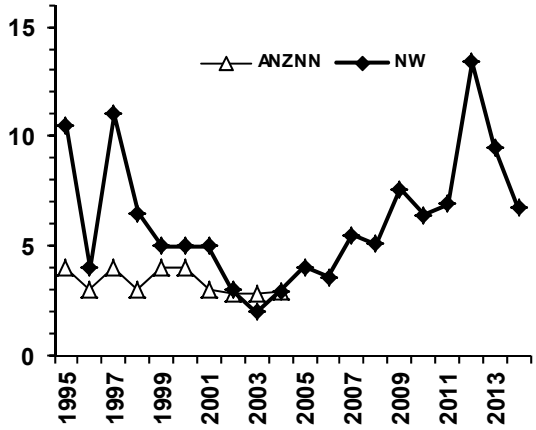


Figure 119: Median days on CPAP (28-31 wks ANZNN assigned) NWH 1995-2014



The pattern of respiratory support in NW babies of 28-31 weeks gestation parallels that seen in the less mature babies. The decrease in median days on CPAP in 2013-14 is probably offset by use of HiFlow and this will be reviewed over the next couple of years.

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, mortality in these infants tends to be high. However, for any given modality, there does appear to be a lower survival in the infants <28 weeks gestation compared with those >37 weeks gestation. Numbers are small for the gestational groups in between these two limits.

Table 76: HFOV and inhaled nitric oxide (iNO) use and survival NWH 2014

	HFOV		iNO		HFOV + iNO	
	Treated n	Survivors n(%)	Treated n	Survivors n(%)	Treated n	Survivors n(%)
Total	**20**	**12(60)**	**17**	**12(71)**	**10**	**7(70)**
<28 weeks	10	5(50)	3	1(33)	3	1(33)
28-31 weeks	3	1(33)	2	1(50)	1	1(100)
32-36 weeks	0		1	1(100)	0	
≥37 weeks	7	6(86)	11	9(82)	6	5(83)

Figure 120: HFOV at 24-27 weeks (ANZNN assigned babies) NWH 1995-2014

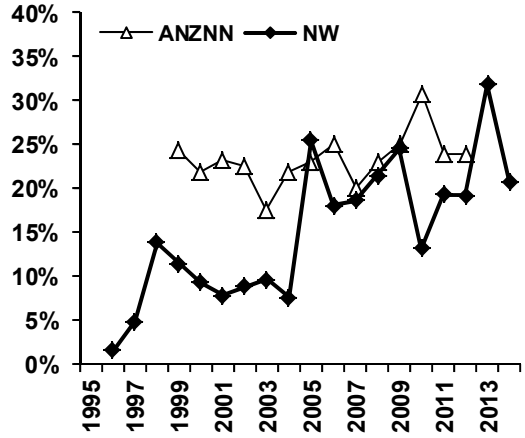
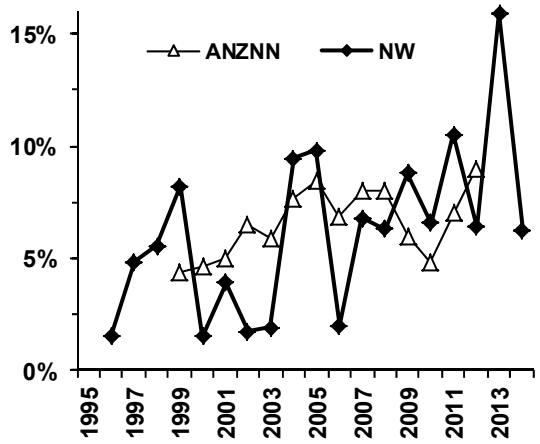


Figure 121: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies) NWH 1995-2014

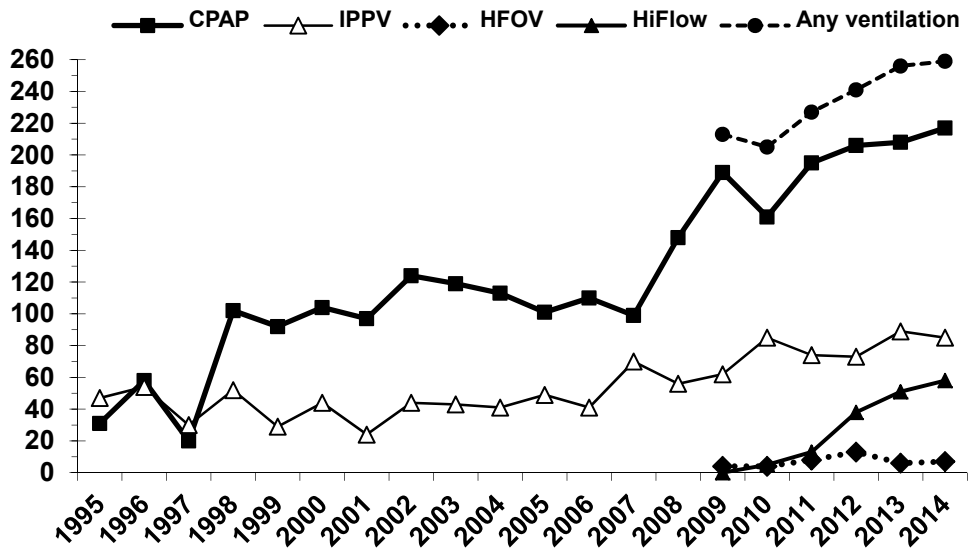


These two figures compare the use of HFOV and iNO at ACH with use across the ANZNN. Generally, the use of these interventions in preterm infants has increased since 2003, in 2013 use appeared to be rising steeply for both HFOV and nitric oxide but this probably reflected the small number of babies and use in 2014 is comparable with ANZNN data.

9.4.11 Term/post-term infants on assisted ventilation from 1995 to 2014

This figure shows the number of term infants ventilated or treated with CPAP. Inborn and outborn infants are included. In the late 1990s there has been 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 have revised the figure to include data for HFOV and HiFlow and included an indication of total respiratory support (i.e. all modes combined). For 2014 there is 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 122: Number of term and post term babies needing respiratory support (IPPV,HFOV, CPAP and HiFlow) NWH 1995-2014

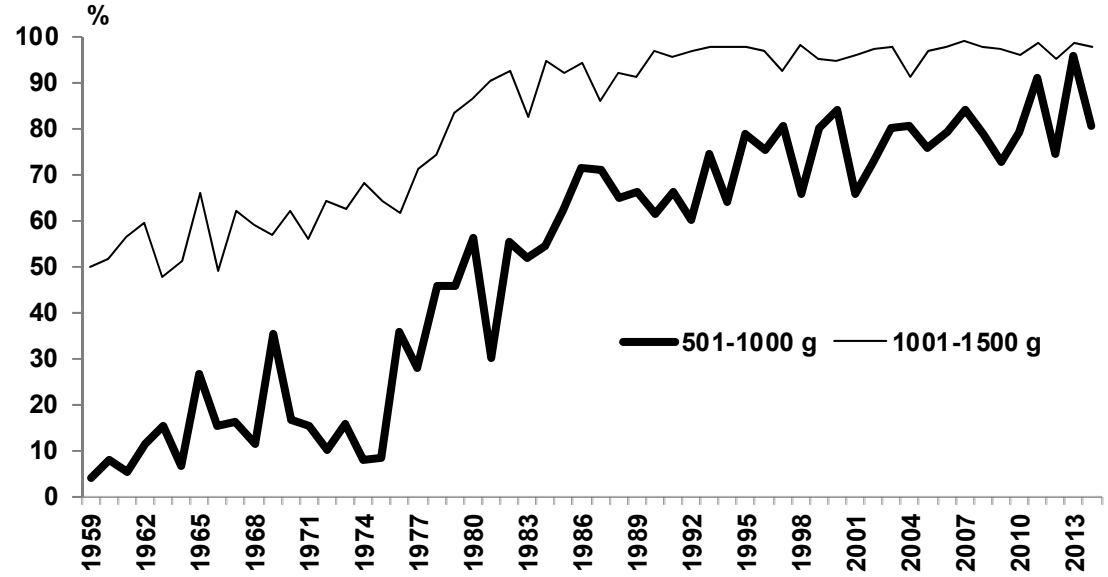


In 2014, TTN/RDS, meconium / PPHN, infection, congenital anomalies, support for surgery, neonatal encephalopathy and "other", which could include a neuromuscular problem, were the reasons for ventilation in term infants).

9.5 Outcomes

9.5.1 Survival of NW inborn babies by birth weight

Figure 123: Neonatal survival (0-28 days) of ≤1500g inborn live births NWH 1959-2014



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 124: Numbers of live inborn babies 23 to 31 weeks gestation NWH 2003-2014 (n=1912)

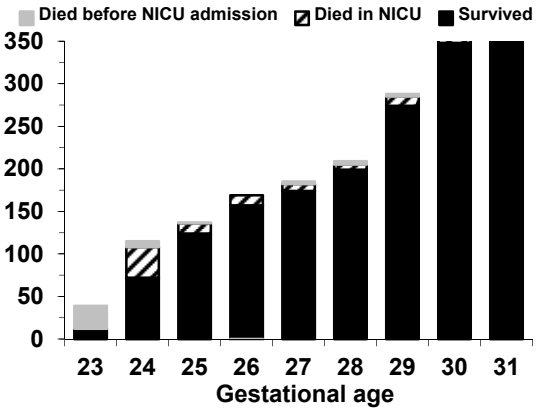


Figure 125: Survival of live inborn babies 23-31 weeks NWH 2003-2014 (n =1912)

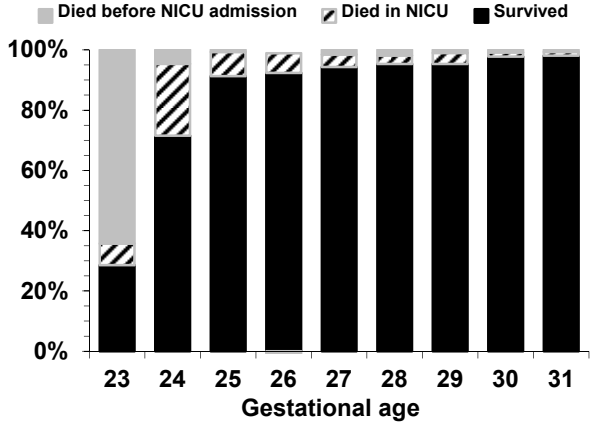
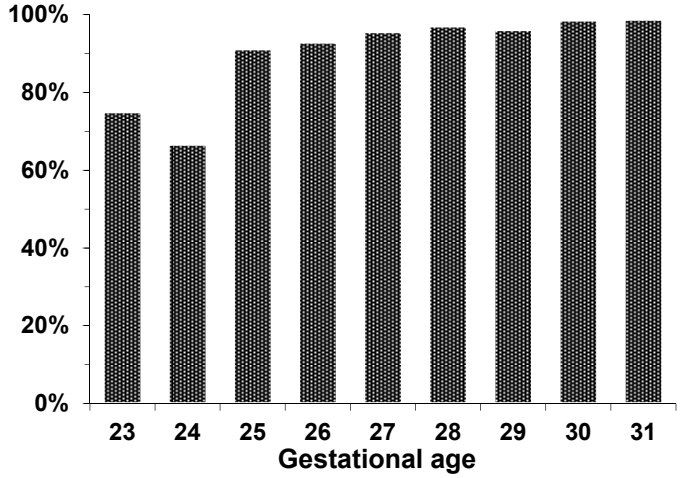


Figure 126: Survival of live inborn babies admitted to NICU 2003-2014 (n =1837)



There is a gradient in the survival rates between 23 and 27 weeks gestational age at birth. 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. The data are useful in informing our guidelines on management at borderline viability. The ACH 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 127: Survival at 24-25 weeks gestation compared with ANZNN data NWH 1995-2014

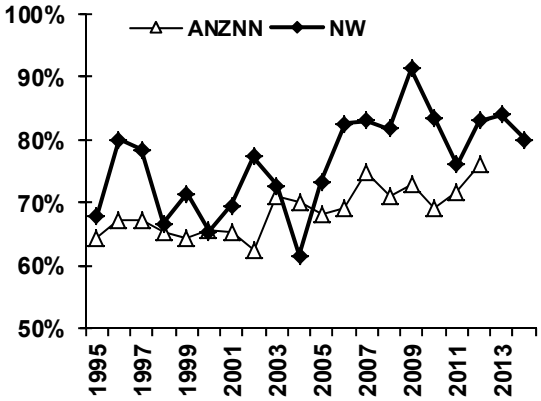
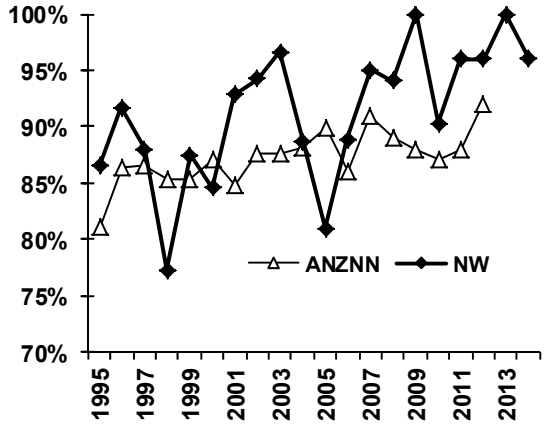


Figure 128: Survival at 26-27 weeks compared with ANZNN data NWH 1995-2014



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 2014 there was one 25 week gestation baby who demonstrated bilateral punctate areas of white matter echogenicity consistent with periventricular white matter injury at one month. Although this was classified as periventricular leukomalacia at the time of scanning, follow up images did not demonstrate any cystic change and examination at term corrected age was reported to be within normal limits. Thus there were no babies reported to have developed classic PVL for 2014

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 were decreased for 2014 and are comparable to the ANZNN data. Importantly there were no cases of stage 4 ROP. However, two babies born at 24 and 25 weeks respectively received laser treatment for bilateral Stage 3 ROP. No infant received intravitreal Bevacizumab injection in 2014

Figure 129: Stage 3-4 ROP at 24-27 weeks NWH 1995-2014

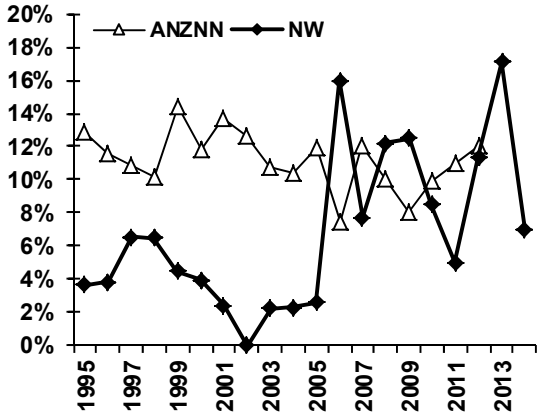
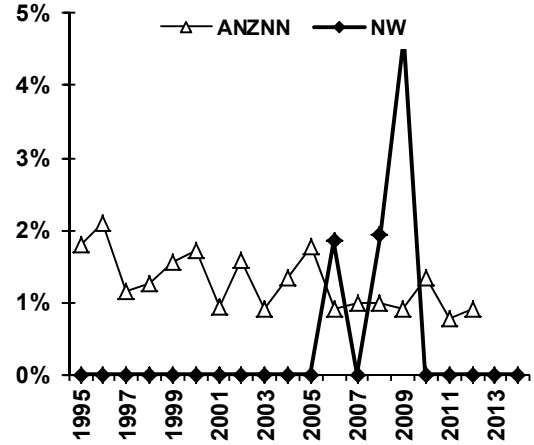


Figure 130: Stage 3-4 ROP at 28-31 weeks NWH 1995-2014



9.5.6 Chronic lung disease (CLD) benchmarked with ANZNN

The last few years have seen a dramatic change in chronic lung disease as defined by the use of support or oxygen at 36 weeks corrected gestation. ANZNN has also reported an increased rate but this is not as noteworthy as our local figures.

It has previously been recognised that some major changes in rates have been the result of altered clinical practice. As the definition of CLD was based on the requirement for support at a corrected age of 36 weeks, BPD was defined by the treatment being given. So 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 with only minor differences in year to year variability. Furthermore, the local rates were broadly similar to those reported by ANZNN.

Figure 131: Chronic lung disease at 24-27weeks NWH 1995-2014

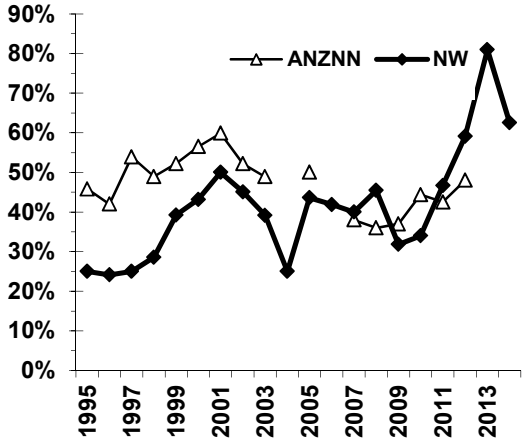
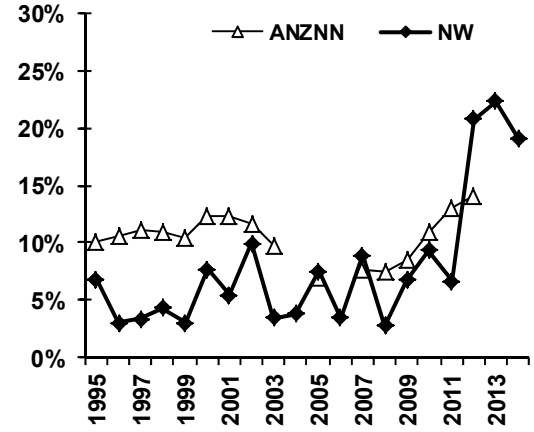


Figure 132: Chronic lung disease at 28-31weeks NWH 2014



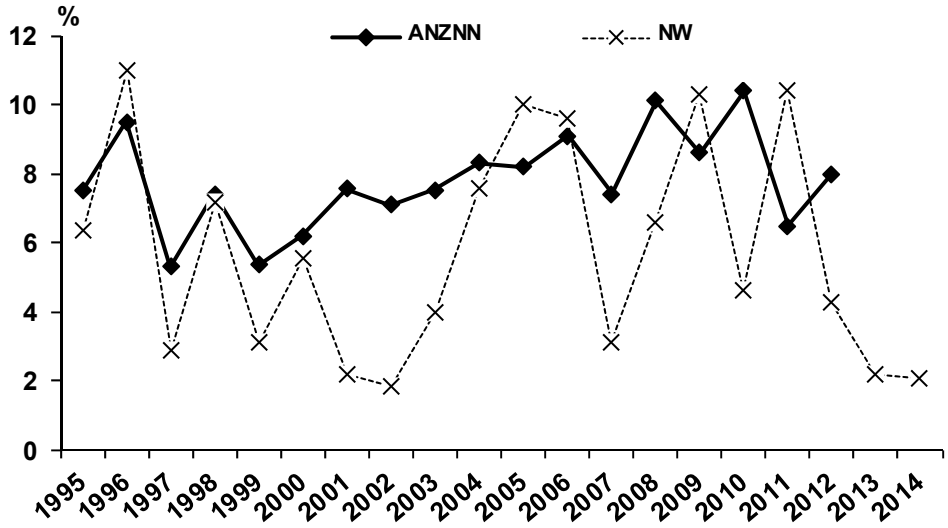
Since 2012 there has been a rise in the rate of support at 36 weeks, it is possible that this again is due to practice changes such as greater use of overnight oxygen saturation recording rather than “spot” saturation to direct weaning of support and / or oxygen. In addition the use of Hi Flow, which tends to be more slowly weaned than CPAP may have made a contribution. Certainly some of the babies who were designated as CLD were receiving only high flow air at the lower end of the range. Other New Zealand centres, who use nasal flow systems, have also reported a rise in CLD rates so this is being monitored closely. However, the rates are concerning and these will be investigated further.

The ANZNN has had a working party to review methods of diagnosing CLD and it is important to observe any changes that this may have on the classification and rate of chronic lung disease.

9.5.7 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 the appendix and it is notable that for the last three years the rate has been circa 1-2 % for infants <32 weeks gestation.

Figure 133: Necrotising enterocolitis (NEC) in ANZNN assigned babies under 28 weeks gestation compared with the incidence in ANZNN 1995-2014



9.5.8 Patent Ductus Arteriosus (all babies)

In 2014, 21 infants below 1500g or 32 weeks gestation were treated medically for a symptomatic PDA. In five cases a second course was given. Clinicians used Indomethacin in preference to Ibuprofen. In 2014, two inborn (ANZNN assigned) NICU infants had surgical ligation of their PDA. This number is similar to previous years. All infants who received treatment for a symptomatic PDA associated with prematurity (i.e. did not have a congenital cardiac anomaly) were less than 1500g and the majority below 1000g.

9.5.9 Pneumothorax needing drainage (all babies)

In total 8 babies developed a pneumothorax that needed drainage in 2014. Seven of these infants were preterm (<28 weeks gestation). The low number of term infants is typical of the distribution pattern seen but in contrast to 2013 when seven term infants required drainage. Although there were no major changes in practice to account for the unusual data in 2013 it is reassuring to note the low rate and more typical gestational distribution in 2014..

9.5.10 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 2014, 11 inborn infants below 28 weeks gestation received postnatal steroids for chronic lung disease. The number treated varied with gestational age with 44% of infants at 24-25 weeks gestation received steroids but none of those born at 30-31 weeks gestation were treated with postnatal steroids. The numbers are small and the lower rate of use in 24-25 week gestation probably reflects case acuity rather than any policy change. Nevertheless, there is an intention to use steroids rationally and at the lowest required dose.

Figure 134: Percentage receiving postnatal dexamethasone by gestational age (ANZNN alive at one week <32wks) NWH 1995-2014

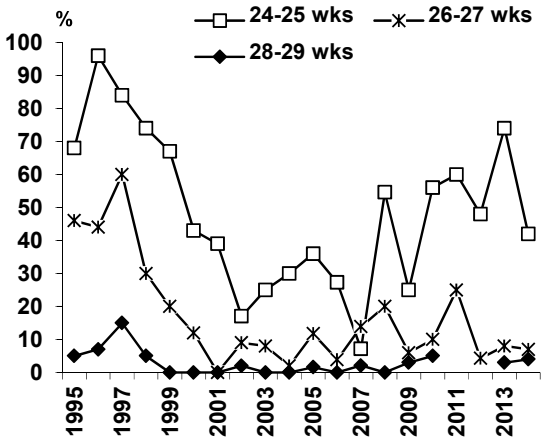
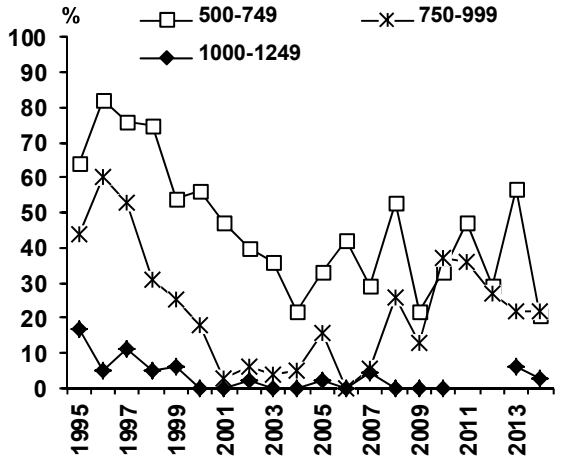


Figure 135: Percentage receiving postnatal dexamethasone by birth weight (ANZNN alive at one week <1500g) NWH 1995-2014



9.6 Immunisation

9.6.1 Hepatitis B

In 2014, 11 infants admitted to NICU were identified as potentially exposed to hepatitis B in the perinatal period due to positive maternal serology. All inborn infants received immunoglobulin and vaccination in labour and birthing suite, the neonatal unit, or at their base hospital.

9.6.2 BCG

In 2014 there was one baby who were given BCG vaccination whilst in the neonatal unit. These numbers are reduced compared to previous years due to changes in criteria to be eligible to receive the BCG brought in by the Ministry of Health in the most recent immunisation schedule and a process of immunisation in the community.

9.6.3 Infrarix Hexa and Prevanar at 6 weeks

There were 89 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. Eighty-six babies (97%) had their immunisation at the routine time. One baby was delayed until day 43, which was after transfer to their local hospital and two families declined immunisations.

9.6.4 Infrarix Hexa and Prevanar at 3 months

There were 19 babies 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 immunisation.

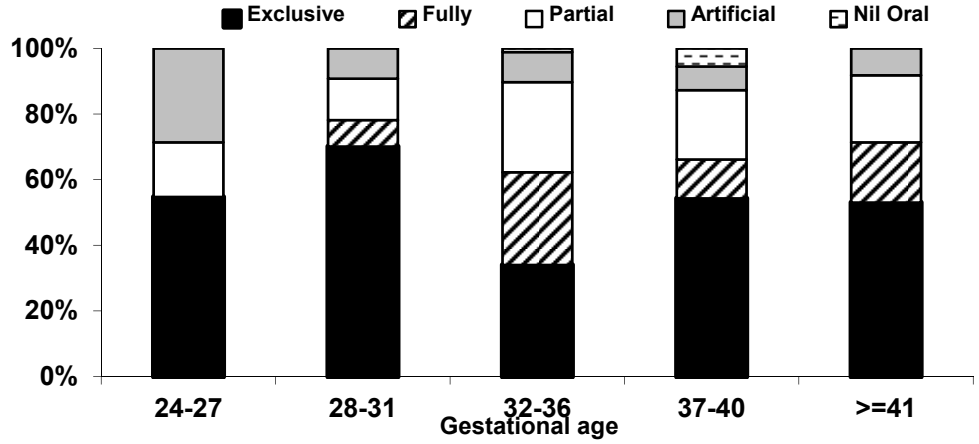
Eighteen of these received immunisation at the routine time but in one case it was delayed by a day to allow transfer back to the local hospital.

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.

The data for 2014 show that 70% of infants at 24-27 weeks' gestation and nearly 90% of NICU infants below 28 weeks receive breast milk to some degree. It is noted that for both of these groups over 50% were fully or exclusively fed breast milk. Overall these data are consistent with the high rates of breast milk feeding reported previously. However there are some differences in proportion of partial/full/exclusive in the 24-27 gestational age groups, which may reflect the relatively small numbers in these groups

Figure 136: Method of feeding at discharge from NICU by gestational age 2014



The newborn service strives to achieve a high rate of breast feeding across the range of gestational age groups. However, there are ongoing 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. Finally, for some term infants admitted to NICU for a short period the aim may be to get the baby back with mother and establish feeding on the ward

9.8 Neonatal deaths prior to NICU discharge among babies admitted to NICU

For 2014 there were 12 neonatal deaths occurring in inborn infants who had been admitted to the NICU plus another 4 deaths in outborn infants admitted to the NICU. 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. In 2014 there were no deaths in the community following referral to the palliative care team for ongoing management.

9.9 Child Development Unit

9.9.1 Follow up at 2 years (corrected) of children under 1500 grams born in 2011

One hundred and twenty-five infants who weighed <1500 grams survived to discharge from the Newborn Service.

One infant had congenital abnormalities and died after discharge. One child was diagnosed with Autistic Spectrum Disorder and was excluded from the following tables

No data was obtained from 38 children. Of these children, ten were from other centres in New Zealand, six lived overseas, and four did not attend scheduled appointments. A further 16 families declined follow up. Data were obtained for 87 children (70%). Of these children, 29 (33%) weighed <1000 grams at birth.

Eighty seven children received individual assessment at the Child Development Unit, or when this was not possible (mainly because of distance from home to National Women's), one report was obtained from paediatricians, psychologists and other professionals monitoring the child's progress.

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 the table below.

Table 77: 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.

The next table below presents the results, using these outcome categories, for the 87 children tested at 2 years of age (corrected).

Table 78: Outcome categories at 2 years (corrected) for children under 1500g born in 2011 (n=83) NWH

	Number	Description
Category I	5 (6%)	1 child with impaired vision requiring glasses and cognitive score more than 2 standard deviations below the mean.4 children with Cognitive scores more than 2 standard deviations below the mean.
Category II	9 (10%)	4 children with mild-moderate cerebral palsy. 1 child with impaired vision requiring glasses. 1 child Cognitive and Motor scores between 1 and 2 standard deviations below the mean. 3 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	71 (82%)	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 3) and by birthweight (Table 4)

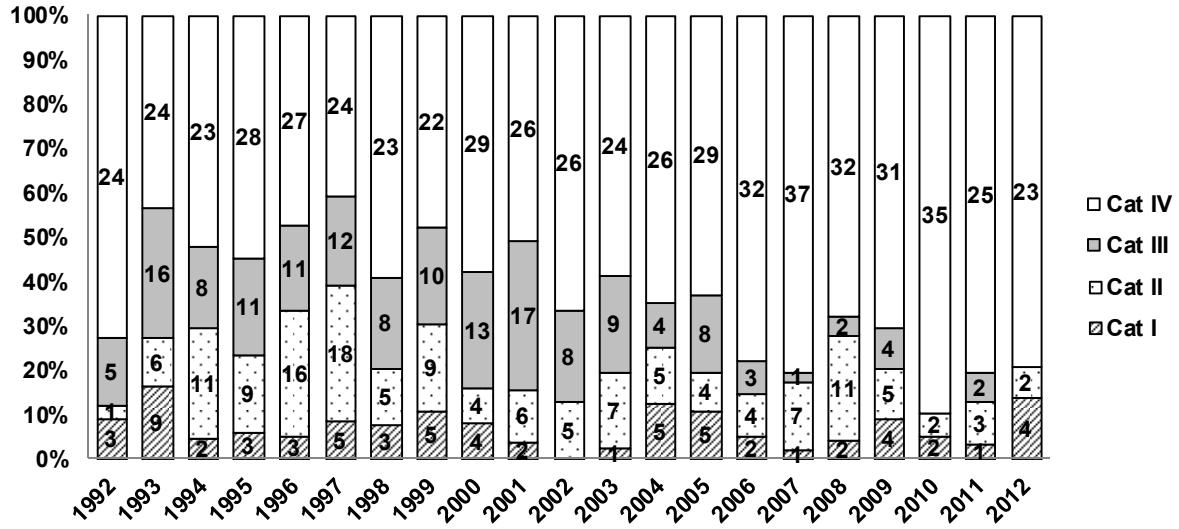
Table 79: Outcome of children <1500g born in 2011 at 2 years (corrected) by gestational age groups (n=83) NWH

	Gestational age (weeks)					
Outcome	23 - 28 weeks n=44		29 - 35 weeks n=43		Total n=87	
Category	n	%	n	%	n	%
I	3	7	2	5	5	6
II	3	7	6	13	9	10
III	0		2	5	2	2
IV	38	86	33	77	71	82

Table 80: Outcome of children <1500g born in 2011 at 2 years (corrected) by birthweight groups (n=83) NWH

	Birthweight (grams)					
Outcome	<1000g n=29		1000 – 1499g n=58		Total n=87	
Category	n	%	n	%	n	%
I	4	14	1	2	5	6
II	2	7	7	12	9	10
III	0	0	2	3	2	2
IV	23	79	48	83	71	82

Figure 137: Outcome at 24 months (corrected age) of children <1000g birthweight born 1992-2012 NWH



9.9.2 Development at 4 years of children under 1500g born in 2010

One hundred and fifty-two children born in 2010 who weighed less than 1500 grams were cared for in the Newborn Service and survived to hospital discharge.

Seven children had congenital abnormalities and two received non-accidental injuries resulting in brain damage. One further child was diagnosed with Autistic Spectrum Disorder. These children were not included in the analyses of data. Three infants were known to have died after discharge from National Women's.

At four years chronological age, data were obtained for 98 children. Of these children 38 (39%) weighed less than 1000g at both. Of the 41 not assessed 18 (44%) were overseas or in other centres in New Zealand. Twenty-three families (56%) declined or could not be traced.

At four years a registered psychologist interviewed parents, administered standardised tests and carried out clinical assessments with the children on an individual basis. Accordingly they were

placed in Outcome Categories as set out in the following tables.

Table 81: 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) (ii)	Mild-moderate cerebral palsy 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.

Table 82: Outcome categories at 4 years for children under 1500g born 2010 (n =98)

	Number	Description
Category I	4 (4%)	2 children with a Full-Scale IQ scores more than 2 standard deviations below the mean. 2 children with Global Developmental Delay, cerebral palsy and visual impairments.
Category II	8 (8%)	1 child with left hemiplegia and low Full-Scale IQ score (between 1 and 2 standard deviations below the mean. 7 children with Full-Scale IQ 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.
Category IV	84 (86%)	

Summary

Babies weighing less than 1500 grams at birth are at risk for developmental problems. Data obtained from the follow-up of 87 children born in 2012, and at age two years (corrected) when assessed, showed that 6% had severe disability. A further 12% had a mild to moderate disability. Four of the five children with severe disability weighed less than 1000 grams at birth. Eighty-two percent of the total cohort was within the average range for cognition and motor development.

For 98 children born in 2010 who were assessed at four years of age, 4% had severe disability and a further 10% had a mild to moderate disability. For the total cohort 86% were within the average range for cognitive and motor abilities.

Chapter 10

PERINATAL RELATED MORTALITY

10 PERINATAL RELATED MORTALITY

This chapter provides information on perinatal related deaths. Further data tables can be found in Appendix 9.

NW has pregnancy loss counselling 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.

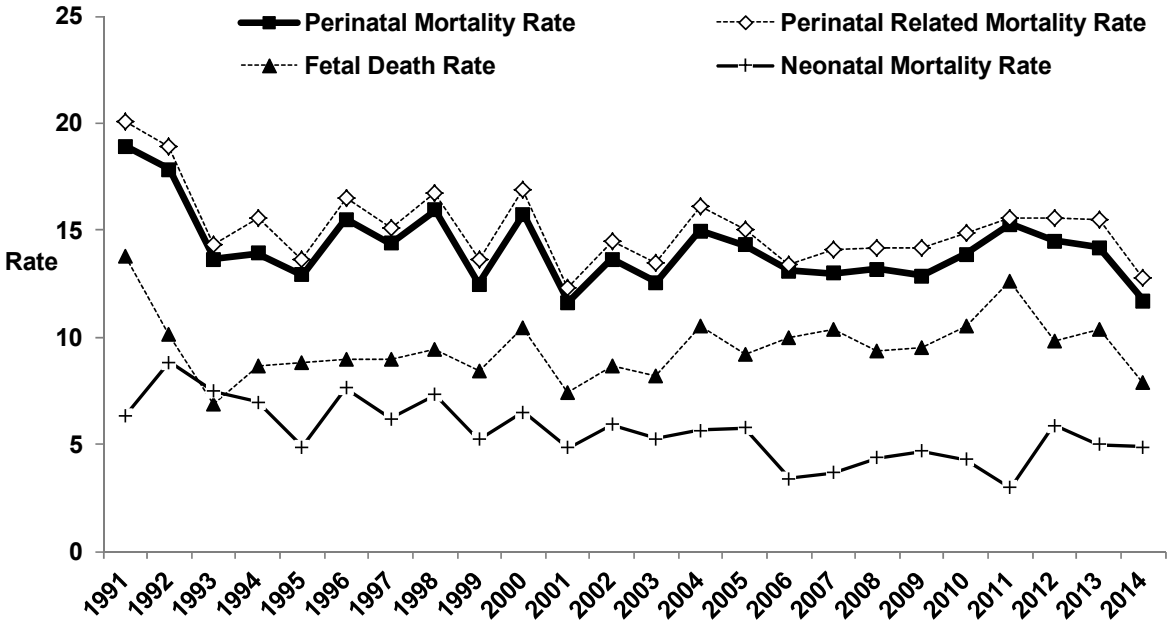
All perinatal related deaths are reviewed monthly by a multidisciplinary team comprising an obstetrician (MFM subspecialist and perinatal mortality meeting convenor), neonatologist, midwife, perinatal pathologist and administrator. This group classifies the cause of death and summarises recommendations for management if there is a future pregnancy. They also complete the documentation for the 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

Table 83: Inborn and BBA deaths NWH 2001-2014

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fetal deaths	20-22 wks	20	30	23	25	26	24	24	29	24	33	41	33	24	25
	23-24 wks	10	10	8	18	11	12	15	11	14	9	16	11	18	8
	25-26 wks	2	4	6	3	3	6	7	4	4	8	5	9	6	11
	27-28 wks	1	2	1	10	6	3	5	8	6	5	2	4	4	2
	29-38 wks	15	17	24	13	17	24	19	21	19	24	26	13	20	13
	>38 wks	9	6	2	13	5	5	12	3	8	4	7	7	5	1
Total fetal deaths		**57**	**69**	**64**	**82**	**68**	**74**	**82**	**76**	**75**	**83**	**97**	**77**	**77**	**60**
Neonatal deaths	Early neonatal deaths (≤7 days)	32	40	34	33	38	23	20	26	27	26	21	37	28	28
	Late neonatal deaths (8-28 days)	5	7	7	9	5	2	9	8	10	8	2	9	9	9
Total neonatal deaths		**37**	**47**	**41**	**42**	**43**	**25**	**29**	**34**	**37**	**34**	**23**	**46**	**37**	**37**
Total deaths		94	116	105	124	111	99	111	110	112	117	120	123	114	97
Perinatal mortality rate/1000		11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2	12.9	13.9	15.3	14.5	14.2	11.7
Perinatal related mortality rate/1000		12.3	14.5	13.5	16.2	15.0	13.4	14.1	14.2	14.2	14.9	15.6	15.6	15.5	12.8
Perinatal related mortality rate (excluding lethal & terminated fetal abnormalities)		8.4	9.4	8.9	12.4	9.9	8.4	8.0	9.8	10.3	10.5	10.1	9.2	9.8	7.5

Figure 138: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate NWH 1991-2014 (all rates expressed as deaths/1000 births).



Perinatal mortality at NWH has remained relatively stable over the last 3 years.

Table 84: Perinatal related loss and DHB of residence NWH 2014

DHB of residence	TOP n=37		Stillbirth n=30		Neonatal death n=30		Perinatal related death n=97	
	n	%	n	%	n	%	n	%
Auckland	22	59	17	57	14	47	53	55
Counties Manukau	7	19	6	20	4	13	17	18
Waitemata	5	14	6	20	8	27	19	20
Other	3	8	1	3	4	13	8	8

*due to rounding not all % columns add to 100

Forty five 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 ADHB area and giving birth at National Women's in 2014 was (53/5068) 10.5/1000 total births which is similar to the rate last year of 11.8/1000 total births.

10.2 Gestational age and perinatal related mortality

Table 85: Gestational age and perinatal related mortality NWH 2014

	Births N=7551		Fetal deaths n=60			Neonatal deaths n=37		Total perinatal related deaths n=97		
	n	%	n	%	FD risk*	n	%	NND rate **	n	%	Perinatal related mortality risk***
<24 weeks	47	0.6	30	50.0	4.0	17	45.9	1000.0	47	48.5	6.2
24-27 weeks	62	0.8	14	23.3	1.9	5	13.5	104.2	19	19.6	2.5
28-31 weeks	96	1.3	7	11.7	0.9	2	5.4	22.5	9	9.3	1.2
32-36 weeks	554	7.3	3	5.0	0.4	5	13.5	9.1	8	8.2	1.1
37-40 weeks	5901	78.1	6	10.0	0.9	7	18.9	1.2	13	13.4	1.9
≥41 weeks	891	11.8	0	0.0	0.0	1	2.7	1.1	1	1.0	1.1

* 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

As in 2013 there were no post term stillbirths.

10.3 Multiple births and perinatal related mortality

Table 86: Multiple births and perinatal related mortality NWH 2014

	Births N=7551		Fetal deaths n=60			Neonatal deaths n=37			Total perinatal related deaths n=97		
	n	%	n	%	FD rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Singleton	7253	96.1	54	90.0	7.4	33	89.2	4.6	87	89.7	12.0
Multiple	298	3.9	6	10.0	20.1	4	10.8	13.7	10	10.3	33.6

* 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

In multiple pregnancies the perinatal related mortality rate remains much 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 5.3. The perinatal mortality in multiples in 2014 (33.6/1000) is similar to what it was in 2013 (52.5/1000).

10.4 Lead maternity carer (LMC) and perinatal related mortality

Table 87: LMC at birth and perinatal related mortality NWH 2014

	Births N=7551		Fetal deaths n=60			Neonatal deaths n=37			Total perinatal related deaths n=97		
	N	%	n	%	FD rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Independent Midwife	3587	47.5	29	48.3	8.1	14	37.8	3.9	43	44.3	12.0
Private Obstetrician	1896	25.1	8	13.3	4.2	3	8.1	1.6	11	11.3	5.8
G.P.	20	0.3	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
NW Community	1449	19.2	6	10.0	4.1	2	5.4	1.4	8	8.2	5.5
NW Diabetes	219	2.9	0	0.0	0.0	1	2.7	4.6	1	1.0	4.6
NW MFM	302	4.0	14	23.3	46.4	11	29.7	38.2	25	25.8	82.8
Other DHB	41	0.5	1	1.7	24.4	4	10.8	100.0	5	5.2	122.0
Unbooked	37	0.5	2	3.3	54.1	2	5.4	57.1	4	4.1	108.1

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

There are 3 outlying groups in the above table, namely 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 (108/1000) reflecting acute transfers often at very preterm gestations.

Perinatal deaths among mothers attending the MFM clinics also include deaths in the fetal medicine service. Seven of the 25 deaths (28%) were terminations of pregnancy. The commonest causes of perinatal related death among women attending the MFM clinics were: congenital abnormality 10 (40%) and specific perinatal conditions 5 (20%). The remainder died from fetal growth restriction (1), antepartum haemorrhage (2), hypertension (2), unexplained antepartum death (2), and maternal conditions (3).

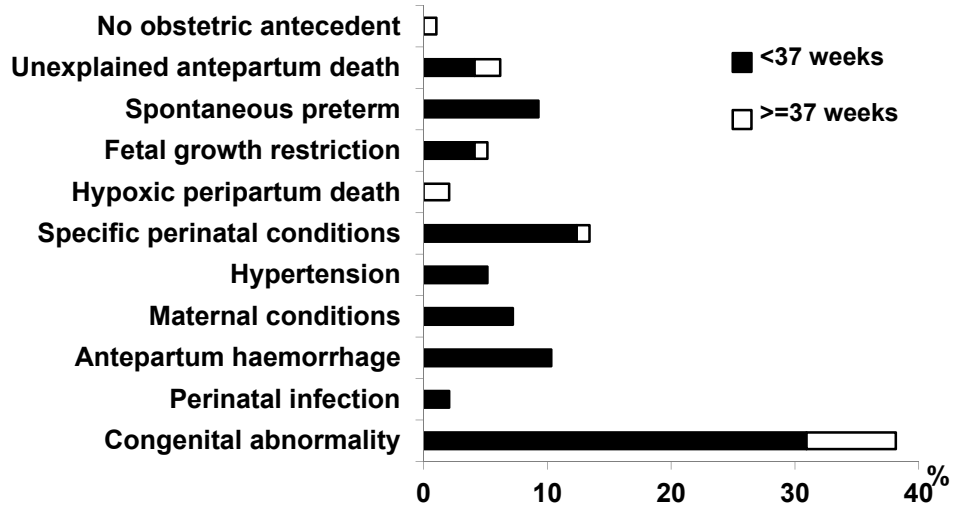
10.5 Classification (PSANZ-PDC) of perinatal related deaths

Table 88: Perinatal death by Perinatal Death Classification (PSANZ-PDC) NWH 2014

	Fetal deaths n=60			Neonatal deaths n=37			Total n=97		
	n	%	Rate*	n	%	Rate**	n	%	Rate*
Congenital abnormality	24	40	3.2	13	35	1.7	37	38	4.9
Perinatal infection	1	2	0.1	1	3	0.1	2	2	0.3
Antepartum haemorrhage	3	5	0.4	7	19	0.9	10	10	1.3
Maternal conditions	4	7	0.5	3	8	0.4	7	7	0.9
Hypertension	4	7	0.5	1	3	0.1	5	5	0.7
Specific perinatal conditions	9	15	1.2	4	11	0.5	13	13	1.7
Hypoxic peripartum death	1	2	0.1	1	3	0.1	2	2	0.3
Fetal growth restriction	5	8	0.7	0	0	0.0	5	5	0.7
Spontaneous preterm	3	5	0.4	6	16	0.8	9	9	1.2
Unexplained antepartum death	6	10	0.8	0	0	0.0	6	6	0.8
No obstetric antecedent				1	3		1	1	0.8

* Rate: per 1000 births (n=7377 in 2013) ** Rate: per 1000 live births (n=7300 in 2013)

Figure 139: Contribution to perinatal related death by obstetric antecedent cause (PSANZ-PDC) and gestation at birth NWH 2014



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 140: Perinatal related mortality risks (/1000 ongoing pregnancies) by gestation 2006-2014

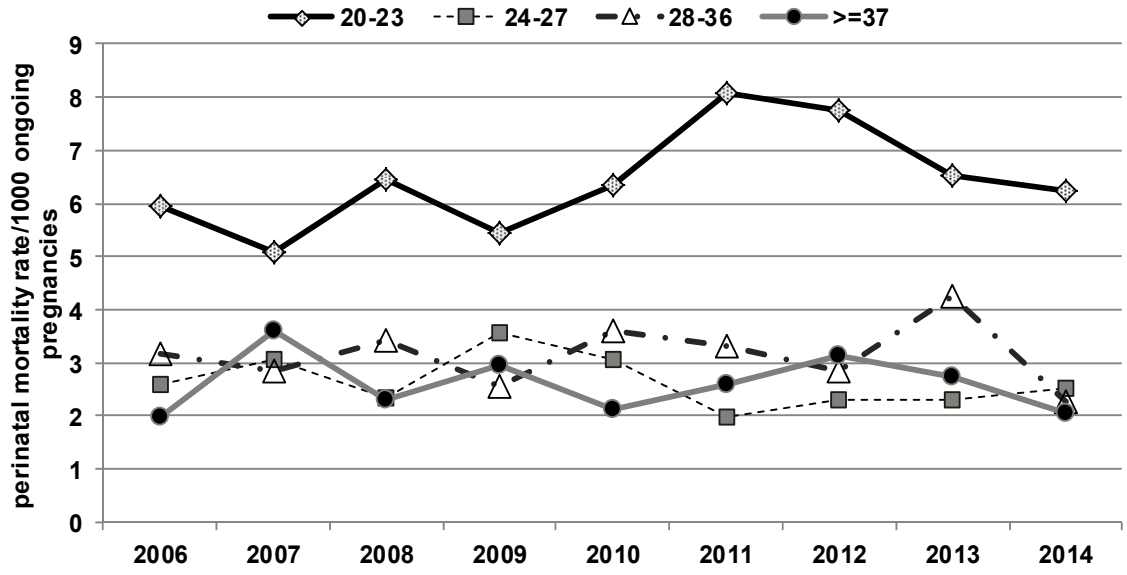
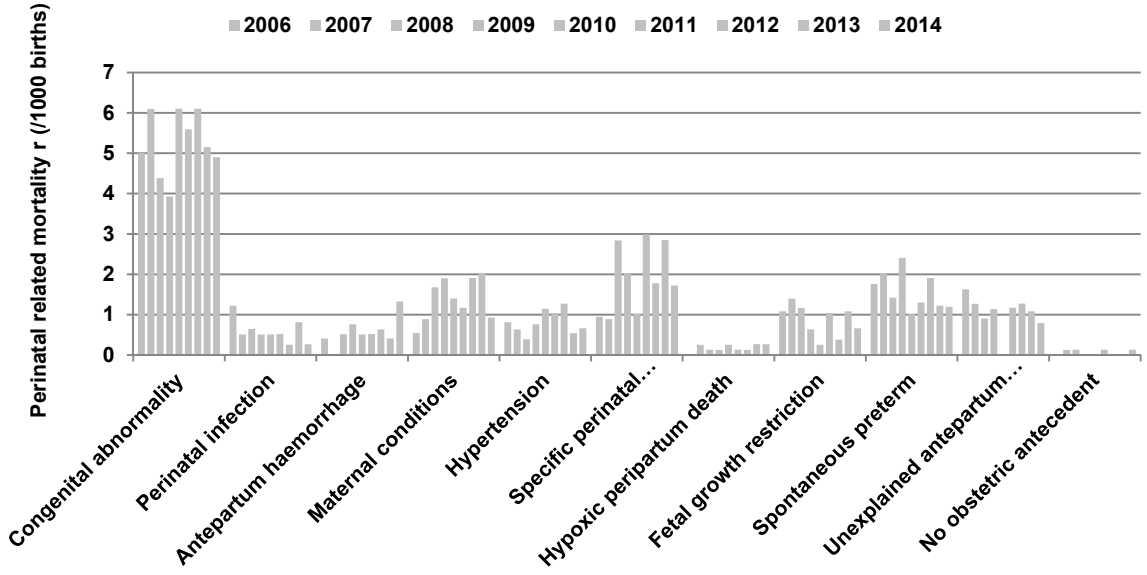


Figure 141: PSANZ-PDC specific perinatal related mortality rates 2006-2014



10.6 Neonatal deaths

Table 89: Neonatal deaths by neonatal classification (PSANZ-NDC) and gestational age at birth NWH 2014

	Total neonatal deaths		< 37 weeks		≥ 37 weeks	
	N	%	n	%	n	%
Total	37		29		8	
Extreme prematurity	15	41	15	52	0	0
Congenital abnormality	15	41	10	34	5	63
Infection	1	3	1	3	0	0
Gastrointestinal	1	3	1	3	0	0
Neurological	2	5	0	0	2	25
Cardio-respiratory disorders	1	3	1	3	0	0
Other	2	5	1	3	1	13

Deaths due to congenital abnormality (41%) and extreme prematurity (41%) were the commonest causes of neonatal death in 2014.

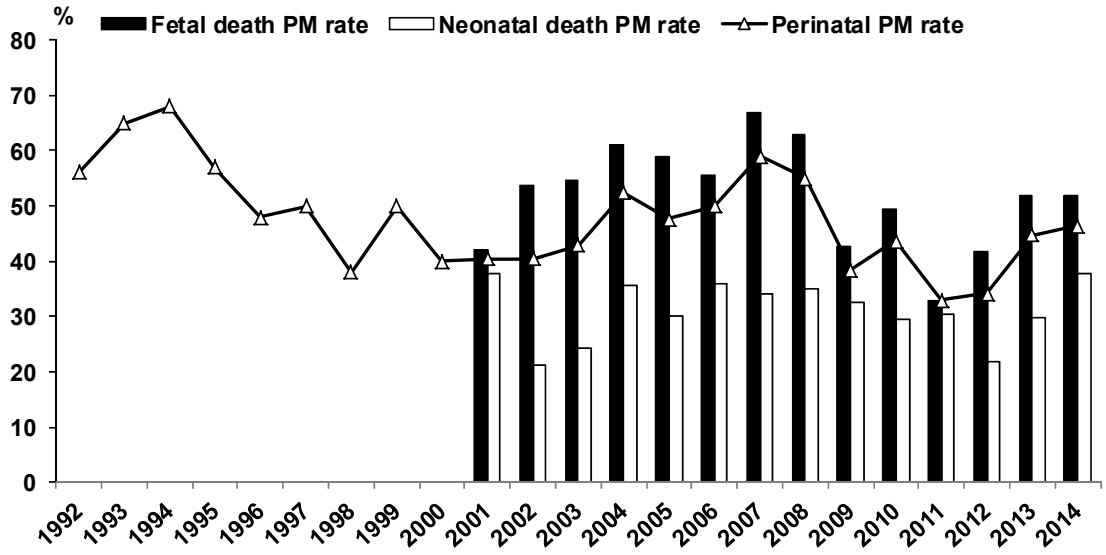
Fetal Growth Restriction and Perinatal Related Death

Fetal growth restriction (FGR) was the primary perinatal death classification assigned for five of the 97 deaths in 2014. 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), 11/30 (37%) of stillbirths and 6/20 (30%) 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 or when death occurred prior to 20 weeks.

10.7 Postmortem

11 Figure 142: Postmortem rates NWH 1992-2014



Postmortem 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 46% in 2014, less than ideal for a tertiary referral centre.

Chapter 11

SEVERE MATERNAL MORBIDITY

12 MATERNAL MORTALITY AND SEVERE MORBIDITY

This chapter provides data on maternal deaths and severe maternal morbidities among women giving birth at NW during 2014.

11.1 Maternal Mortality

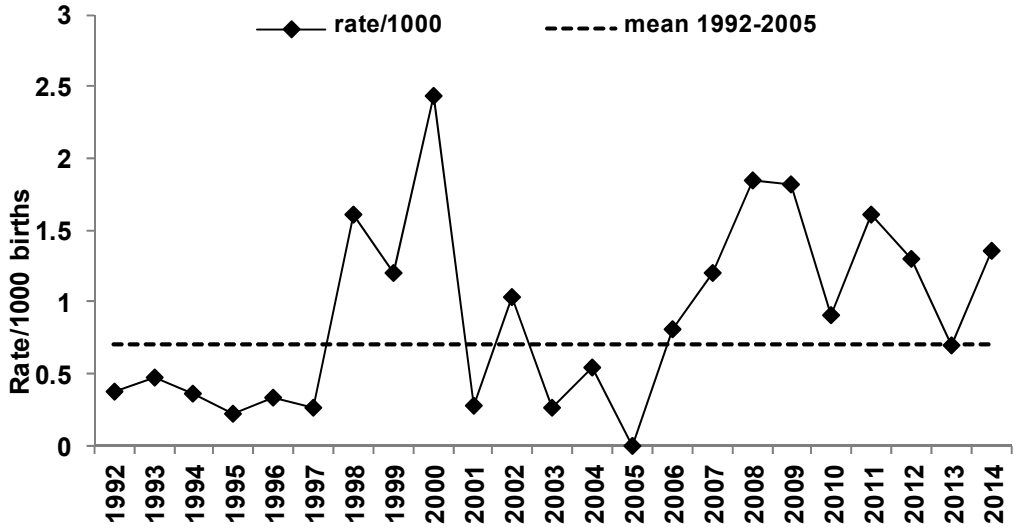
In 2014 there were no maternal deaths among women who birthed or booked to birth at National Women's.

11.2 Emergency peripartum hysterectomy

Methods

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 NW at or beyond 20 weeks gestation. Semi-elective cases are excluded.

Figure 143: Emergency peripartum hysterectomy rates/1000 births NWH 1992-2014



Findings

There were 10 emergency peripartum hysterectomies in 2013 (1.35/1000 births).This includes planned Caesarean hysterectomy for morbidly adherent placentae but does not include hysterectomy for malignancy.

There are small absolute numbers per year and so the rate is highly variable. However, the run chart in figure 141 indicates that there has been a significant increase in rate from the mean in 1992-2005 with nine data points at or above the mean line.

11.3 Other Severe Maternal Morbidity

11.3.1 AMOSS reportable severe maternal morbidities

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.

The current set of reportable conditions includes amniotic fluid embolism, rheumatic heart disease in pregnancy, gestational breast cancer, and massive transfusion for obstetric bleeding (five or more units of red cells within four hours for obstetric haemorrhage). The conditions collected may vary from year to year. Data collection started in NZ in January 2010.

Rheumatic heart disease is defined as all pregnant women with rheumatic heart disease (RHD) diagnosed before or during the index pregnancy, using the following criteria:

- Pregnant and confirmed rheumatic heart disease RHD on echo *or*
- Pregnant and an historic echo diagnosis of definite RHD where recent echo details are not available

Table 90: Incidence (rate or ratio) of AMOSS reportable severe maternal morbidities NWH 2012-2014

	Women birthing 2012 n=7695		Women birthing 2013 n=7223		Women birthing 2014 n=7400	
Diagnosis	**n**	**/1000**	**n**	**/1000**	**n**	**/1000**
Antenatal pulmonary embolism	1	0.1	ND		ND	
Amniotic fluid embolism	0		1	0.14	1	0.14
Eclampsia	0		3	0.42	2	0.27
Placenta accreta/percreta/increta	11	1.4	ND		ND	
Rheumatic heart disease	ND		20	2.8	17	2.29

ND=not collected in specified year

11.3.2 Admission to Intensive Care (Critical care or cardiovascular intensive care)

In 2014, there were 26 admissions of pregnant or postpartum women to the department of critical care medicine (DCCM) or the cardiovascular intensive care unit (CVICU) at Auckland City Hospital, of whom 22 birthed or miscarried at NWH. Five women were admitted antenatally, 3 due to pre-existing medical conditions, and two urosepsis. Pre-existing medical disease was most often severe cardiac disease and admission to CVICU was elective. Of the 21 admitted after birth, two women were admitted due to shock from bleeding in early pregnancy, two following complications of antepartum haemorrhage, seven due to pre-existing medical conditions, one with preeclampsia for hypertension management, three with obstetric sepsis, two with H1N1, three related to postpartum haemorrhage, and one case of venous thromboembolism.

The DCCM/CVICU admission ratio in 2014 was 3.0/1000 births. In 2011 there were 19 admissions of mothers who gave birth at Auckland City Hospital (2.5/1000 births), in 2012 there were 20 (2.2/1000 births) and in 2013 20 (2.8/1000 births).

Chapter 12

GYNAECOLOGY

13 GYNAECOLOGY

This chapter provides data and commentary on fertility (*Fertility PLUS)*, termination of pregnancy, inpatient gynaecologic surgery, (including in depth analysis of hysterectomy, urogynaecology, and laparoscopic procedures), colposcopy and gynaecologic oncology services.

12.1 Fertility PLUS

These are the 2014 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 91: **Fertility Plus IVF cycle outcomes 2014**

	IVF cycles started N=605	
	n	**%**
Number of cycles started	**605**	
Number of cycles stopped	**50**	**8**
ANZARD Benchmark for % cycles stopped (2012)		**9**
Reasons for stopped cycles		
1) Over response	5	1
2) Poor response	38	6
3) Other (including patient choice)	7	1
Number of cycles reaching oocyte pick up (OPU)	**555**	**92**
Number of cycles reaching embryo transfer	**437**	**72**
ANZARD Benchmark for cycles started / with transfer (2012)		**73**
Reasons for no transfer		
1) Freeze all cycle	95	16
- Egg vitrification	7	
- Elevated progesterone	30	
- OHSS risk	25	
- Endometrial (needing surgery)	11	
- Agonist trigger	22	
2) No eggs	5	1
3) No fertilisation	14	2
4) Other	4	1
Pregnancy		
Clinical pregnancy/cycle started	138	23
ANZARD Benchmark for pregnancy rate/cycle started (2012)		22
Clinical pregnancy rate/OPU	138/555	25
ANZARD Benchmark for pregnancy rate/OPU (2012)		24
Clinical pregnancy rate/embryo transfer	138/437	32
ANZARD Benchmark for pregnancy rate / embryo transfer (2012)		30
IVF/ICSI cycles Single Embryo Transfer (SET)		
SET – all ages	358/437	82
ANZARD Benchmark for women having SET - all ages (2012)		72
Clinical pregnancy rate for Day 5 SET		43
Twinning	**11/138**	**8**
From DET	9/138	6.5
From SET (monozygotic)	2/138	1.5
RTAC Guidelines		<10
Thaw cycles		
Clinical pregnancy rate per thawed embryo replacement	48/177	27
ANZARD Benchmark for pregnancy rate per thawed embryo replacement (2012)		24
Clinical pregnancy rate per thawed blastocyst replacement	39/124	31
ANZARD Benchmark for pregnancy rate per thawed blastocyst replacement (2012)		30
% which were SET thaw cycles	163/177	92
ANZARD Benchmark for % SET thaw cycles		83
Twinning rate from embryo thaw cycles	0/48	0

The data collection for all accredited fertility clinics is exhaustive, meticulous and ultimately 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 2014 data, we have been able to use the data from the ANZARD Report for 2012 (the most recently published ANZARD data). It must be noted that our live birth data – the most important outcome for patients undergoing fertility treatment – are not yet available for 2014 (although Australasian live birth data for 2012 are available in ANZARD).

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%.

First safety, and second success, are paramount in the treatment of infertility. Whilst stopped cycles are, to some extent, undesirable (both in terms of patient frustration and 'wasted' resources), in some cases they are unavoidable on safety grounds. However only five of our 605 started cycles had to be stopped owing to over-response, implying that we considered these women at too high a risk of severe ovarian hyperstimulation syndrome (OHSS) to even have an egg collection. Our 1.0% rate of hospitalisation for OHSS in 2014 (6 from 605 started cycles) compares with the 2012 ANZARD benchmark of 0.7% per egg collection.

The vast majority of the cycles that we stopped were consequent upon poor response (38 from 50 stopped cycles). Sometimes this is because women simply have no response to stimulation with FSH injections and sometimes because they have an under-response (and it is judged in the woman's best interests to stop the cycle and start again on a new cycle with a different stimulation protocol designed to give a better response). In most cases, such under-response is based on poor ovarian reserve and in some cases there is nothing that can be done to improve response. Egg donation is often considered for women who have consistent 'poor response' (usually defined as collection of three or fewer eggs) and unsuccessful outcome.

We now have more refined policies to predict response and optimise women's response to stimulation in IVF/ICSI cycles. This involves more reliable assessment of ovarian reserve – and serum anti-mullerian hormone (AMH) measurement has added to the accuracy of this assessment for some women. Nonetheless we still occasionally do see women who have an unexpected under- or over-response.

No embryo transfer

Whilst our 72% of cycles reaching embryo transfer is similar to the 73% ANZARD benchmark, it should be noted that the seven egg vitrification ('egg freezing') cycles were all undertaken for women due to undergo treatment that could impair their fertility, usually oncology treatment, and embryo transfer was never part of this treatment.

Of the 95 'freeze-all' cycles, the commonest reason overall was women deemed to be at risk for severe OHSS – this included 22 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' acknowledges the role that becoming pregnant plays in the development and perpetuation of severe OHSS. Interestingly, 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] Although there is also a reduced pregnancy rate on this fresh cycle with a GnRH agonist trigger (OR 0.70, 95% CI 0.54 to 0.91; 11 studies, 1198 women),[1] it is more the risk of OHSS than the reduction in chance of pregnancy that leads to the decision to freeze all the embryos.

Elevated progesterone in the lead in to 'triggering' for egg collection has been an increasing reason for which we have recommended freeze-all. 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 have now elected to increase our threshold for recommending freeze all from progesterone ≥5 nmol/L to ≥6 nmol/L, this being a marker for more sustained progesterone elevation. Higher progesterone levels tend to occur in higher responses and the chance of successful embryo implantation in such circumstances, although reduced, may

remain acceptably high; this in women who are likely to also have other frozen embryos, so it does mean that a choice remains for women in this situation as to whether they prefer freeze-all or fresh embryo transfer (although we certainly do sometimes recognise women with much higher progesterone levels clearly representing an abnormal premature progesterone rise).

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.

Whilst we remain committed to securing a fresh embryo transfer for women undergoing IVF when possible, we need to be mindful of the emerging literature showing the benefits of replacing a 'thawed' or 'warmed' cryopreserved embryo. Growing evidence from non-randomised studies is tending to suggest that replacement of thawed/warmed embryos that have been cryopreserved (compared to fresh embryo transfer) is associated with lower perinatal morbidity (RR 0.68, 95% CI 0.48-0.96; 6 studies, n= 5,546 versus 17,424), small for gestational age babies (RR 0.45, 95% CI 0.30-0.66; two studies, n=1,933 versus 3,141), preterm delivery <37 weeks (RR 0.84, 95% CI 0.78-0.90; nine studies, n= 10,017 versus 27,686), low birth weight <2.5kg (RR 0.69, 95% CI 0.62-0.76; 9 studies, n=8,536 versus 25,800) and antepartum haemorrhage (RR 0.67, 95% CI 0.55-0.81; two studies, n= 3875 versus 7000).[2]

Nineteen women of the 555 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 14 women who encountered 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

Whilst we are generally satisfied with our 'pregnancy rates', that bear favourable comparison to the ANZARD 2012 benchmark for both fresh embryo transfer and embryo thaw cycles, it is becoming increasingly clear that comparative statistics from year to year, as well as comparisons between clinics in meaningless league tables (in which comparisons are as notoriously reliable as those of apples with oranges) are not particularly helpful, as the demographics of populations in different clinic settings can be powerful determinants of outcome. Certainly it will be of interest how the different clinics providing fertility services for the Northern Region through public funding fare now that the allocation of public patients is likely to become much more equitable under the control of a relatively independent governing body if the allocation of patients is 'randomised'.

For the reasons highlighted above – and more – the outcome of the fresh embryo transfer cycle, the traditionally expressed standard outcome measure, is assuming less relevance as a key performance indicator. Of much more relevance in the future will be the cumulative live birth rate per woman undergoing IVF stimulation, of healthy singleton babies at term, when all embryos obtained from the stimulation cycle have been transferred. We believe that an important hallmark of a good fertility service in the future will be first the ability to present clinic outcome data in this way (we have the capacity to do this at Fertility Plus and we are working on developing the best way to present our data in this way for the National Women's Annual Clinical report in 2016) and second the demonstration of 'success' in this way, along with a multiple pregnancy rate as low as possible (see below).

Single embryo transfer

We are committed to single embryo transfer at Fertility Plus.[3] We believe that it is in the best interests of all women to always have a single embryo transfer. Not only does this spread the opportunity for each embryo over as many cycles as possible – there are many factors, still poorly understood that influence endometrial receptivity and to 'waste' multiple embryos by transferring more than one embryo on an occasion when the endometrium might not be optimal does not seem wise. Is it also too obvious to state that mandatory single embryo transfer avoids all 'avoidable' multiple pregnancies? We recognize that monozygotic twinning is commoner in IVF pregnancies, but this we would regard as unavoidable (assuming the IVF itself is unavoidable).

Nonetheless, in spite of our commitment to single embryo transfer, we had a multiple pregnancy rate in 2014 of 8% no lower than that of the ANZARD 2012 benchmark, when the live multiple birth rate was 6.5%. It is noteworthy that double embryo transfers were responsible for 6.5% of our pregnancies being multiple and monozygotic twinning form single embryo transfer contributed a further 1.5% to our overall multiple pregnancy rate. Having piloted a mandatory single embryo

transfer policy in the latter half of 2014 and having introduced this formally at the beginning of 2015 (other than for patients whose cycles were already underway and who retained their desire for double embryo transfer following discussion), double embryo transfer should be absent from our causes of multiple pregnancy in 2015 and beyond. IVF is a technology with the potential to have a multiple pregnancy rate comparable with the multiple pregnancy rate of naturally conceived pregnancies and, rather than <10% being the target standard for the percentage of multiple pregnancies, we believe it should be <2% (which allows for the increased percentage of monozygotic twins associated with this treatment).

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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.

Miller L, Wong T, Hodgson R, et al. Single embryo transfer for all? ANZJOG, submitted 2015.

12.2 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 NWH, 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 involves the use of medications and is performed without the need for surgery and involves two appointments two days apart. The first appointment includes psychosocial, medical, legal certification and contraceptive education before the first medication is taken. Women return to EDU 24-48hrs later to take the second medication before going home to complete the process at home. Overnight, women can contact an after-hours on-call EDU nurse if they need assistance. Criteria for medical termination must be met.

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 in 2013 were resident in Counties Manukau DHB area, 30% from within ADHB and 30% from Waitemata DHB area. Interpreters were required by 5% of women accessing the service.

In their 2014 report, the Abortion Supervisory Committee (ASC)* have recognised the challenge women in the Greater Auckland area have to access a termination service. The largest group of women having terminations at EDU are residents of South Auckland. They are identified as having the most significant burden as two appointments on separate days are the norm for most woman accessing the service. Counties Manukau DHB have a regional agreement with ADHB to manage first trimester pregnancy terminations but ASC have encouraged development of a more localised service for these women.

Table 92: Number of terminations NWH 2003-2014

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total number of terminations	5960	5809	5598	5548	5558	5550	5391	5049	4949	4535	4213	3842

Table 93: Number of counselling sessions NWH 2003-2014

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	n	N	n	n	n	n	n	n	n	n	n	n
Post op counselling	10	22	35	33	23	25	22	33	32	18	41	33
Pregnancy option counselling	70	92	89	87	86	99	102	84	76	64	84	66
Declines %	2.1	2.5	2.4	2.8	2.2	2.5	2.7	2.8	3.0	2.9	2.9	3.4

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. This reflects the trend nationally and has been most marked since long acting subdermal hormonal implants were licenced 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 our nursing staff. In 2014, 59% of women who had a termination chose a long acting reversible contraceptive, of which 18% were Jadelle implants inserted before leaving the clinic.

In addition, intrauterine contraceptive devices inserted immediately post procedure, improved community education and family planning access are likely to have contributed to the encouraging decline in abortion numbers.

Due to the decline in the number of terminations, EDU is widening its scope to provide other general gynaecology services such as providing ESSURE hysteroscopy and the Abnormal Uterine Bleeding (AUB) clinics. The ESSURE hysteroscopy clinic runs at Colposcopy Clinic but with EDU nurses and the AUB clinic runs from EDU.

Figure 144: Ethnicity of women having a first trimester termination of pregnancy NWH 2014

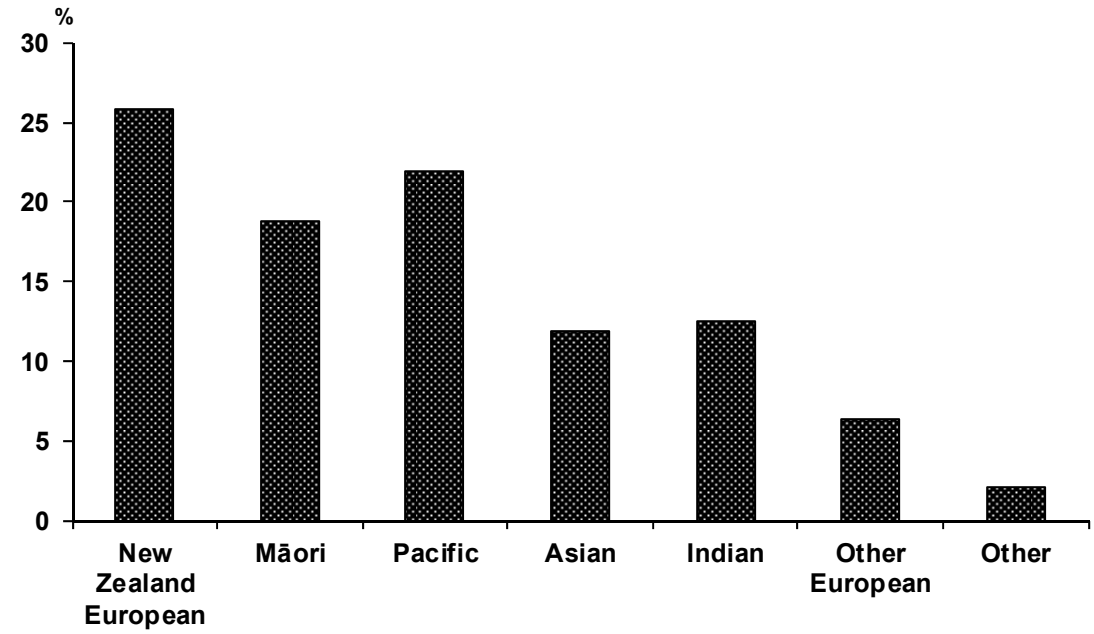
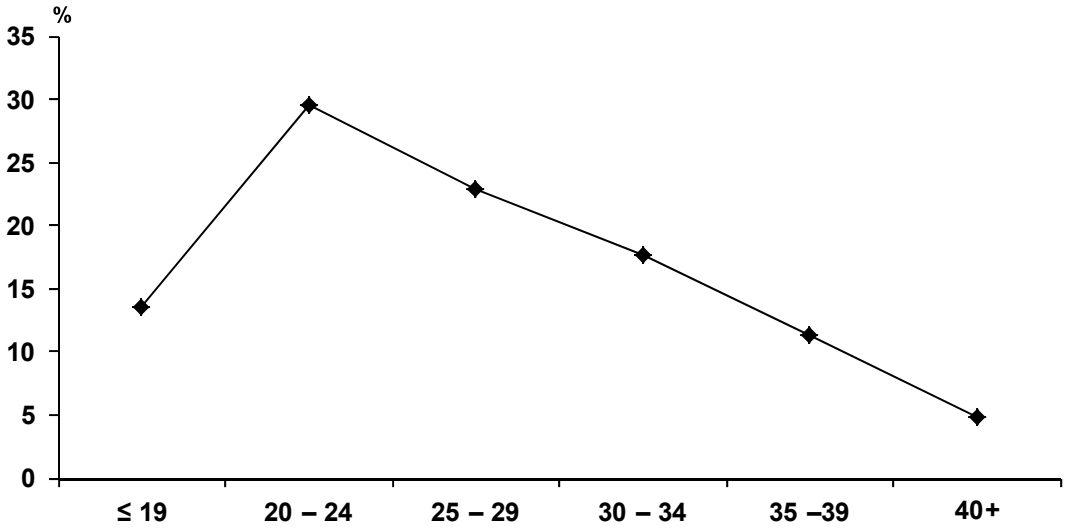


Figure 145: Age of women having a first trimester termination of pregnancy NWH 2014



*Report of the Abortion Supervisory Committee 2014

12.3 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:

Table 94: Characteristics of women undergoing second trimester medical termination of pregnancy NWH 2009-2014

DHB of residence	2009 N=59		2010 N=46		2011 N=69		2012 N=52		2013 N=40		2014 N=51	
	n	%	n	%	n	%	n	%	n	%	n	%
Auckland	53	90	37	80	56	81	44	85	32	80	43	84
Counties Manukau	4	7	3	7	9	13			6	15	2	4
Waikato	2	3	0				3	6			1	2
Waitemata			3	7	3	4	3	6	2	5	5	10
Other			3	7	1	1	2	4				
Indication for termination of pregnancy												
Fetal anomaly	16	27	21	16	24	35	27	52	14	35	24	47
Intrauterine death	16	27	7	15	19	28	8	15	8	20	13	25
Maternal mental health	17	29	14	30	20	29	10	19	13	33	8	16
Spontaneous rupture of membranes	10	17	4	9	6	9	7	13	5	13	6	12
Gestation (wks)												
12					1	1	1	2				
13			3	7	4	6					7	14
14	9	15	5	11	13	19	3	6	4	10	6	12
15	4	7	1	2	6	9	6	12	4	10	5	10
16	11	19	12	26	12	17	10	19	10	25	9	18
17	11	19	4	9	11	16	11	21	1	3	15	29
18	14	24	10	22	8	12	8	15	10	25	5	10
19	10	17	11	24	12	17	13	25	11	28	4	8
20					1	1						
21					1	1						

Fifty one women had a medical termination of pregnancy/induction of labour between 13 and 19 weeks in 2014.

Table 95: Clinical details and outcomes of second trimester medical termination NWH 2009-2014

	2009 N=59		2010 N=46		2011 N=69		2012 N=52		2013 N=40		2014 N=51	
	n	%	n	%	n	%	n	%	n	%	n	%
Mifegynae	47	80	44	96	64	93	46	88	36	90	48	94
Vaginal misoprostol	55	93	45	98	68	99	50	96	38	95	45	88
Buccal misoprostol											4	8
Oral misoprostol												
Not given	12	20	4	9	23	33	8	15	6	15	17	50
1 dose	19	32	20	43	26	38	19	37	22	55	17	50
2 dose	13	22	11	24	9	13	10	19	4	10	11	32
3 doses	9	15	5	11	5	7	9	20	3	8	2	6
≥ 4 doses	6	10	6	13	6	9	6	12	5	13	4	12
Syntocinon infusion	9	15	7	15	6	9	5	10	4	10	4	8
Manual removal of placenta	6	10	7	15	3	4	3	6	3	8	2	4
Retained products of conception	1	2	3	7	4	6	6	12	4	10	2	4
Transfusion	1	2	3	7	0		0		2	5	3	6
Nights in hospital												
0	19	32	13	28	39	57	24	46	23	58	30	59
1	33	56	27	59	26	38	24	46	13	33	17	33
2-3	6	10	4	9	4	6	3	6	3	8	4	8
>3	1	2	4	9			1	2	1	3		

In 2014 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 2014 we started to administer smaller doses for selected cases. The results are encouraging but the numbers are too small at this stage to make a useful conclusion.

Also following international studies, we occasionally administer Misoprostol buccally instead of vaginally. 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% ($p=0.02$). The drop in the proportion of women who needed to go to theatre for manual removal of the placenta is significant.

Ninety-two percent of women were managed either as a day stay or required one night in hospital.

Three women needed blood transfusions; one woman experienced ruptured membranes at 19 weeks and had a significant bleed prior to delivery requiring two units of blood; two women required manual removal for retained placenta and needed blood transfusions due to excessive blood loss intraoperatively.

12.4 General Gynaecology inpatient surgery

The data presented in this section pertain largely to inpatient gynaecologic surgeries from Ward 97, excluding those performed by the Gynaecologic Oncology team (whose data are collected in a separate database and presented in Section 12.9). In 2014, there are 62 surgeries undertaken at the Greenlane Surgical Unit (GSU) (of 1269 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 this procedure are included, however for summary tables, the first procedure entered into the database has been used to represent the primary surgical episode.

Findings:

In 2014, there were 1663 admissions to Ward 97 for general gynaecologic surgery; 1607 (96.6%) of these were for primary procedures, 50 (3.0%) were admissions for repeat surgery as a result of complications of surgery at ACH and 6 (0.4%) 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.

Table 96: Primary indication for primary inpatient gynaecologic surgery NWH 2009-2014

	2010 N=1569		2011 N=1628		2012 N=1528		2013 N=1606		2014 N=1607	
	n	%	n	%	n	%	n	%	n	%
Primary indication for surgery										
Abnormal bleeding, non-pregnant	280	17.9	379	23.3	384	25.1	359	22.4	338	21.0
Miscarriage / Termination	419	26.7	343	21.1	301	19.7	333	20.7	354	22.0
Urogynaecology / prolapse	205	13.1	203	12.5	202	13.2	218	13.6	207	12.9
Ovarian cyst	139	8.9	165	10.1	123	8.1	126	7.9	126	7.8
Abscess	73	4.7	72	4.4	60	3.9	45	2.8	53	3.3
Pain, cause unknown	70	4.5	95	5.8	82	5.4	88	5.5	86	5.4
Cancer / Pelvic mass	68	4.3	72	4.4	94	6.2	63	3.9	91	5.7
Endometriosis	116	7.4	98	6.0	94	6.2	77	4.8	74	4.6
Ectopic pregnancy	68	4.3	101	6.2	63	4.1	84	5.2	83	5.2
Infertility	33	2.1	21	1.3	21	1.4	42	2.6	26	1.6
Sterilisation	20	1.3	6	0.4	384	25.1	3	0.2	0	
Other, please specify	78	4.9	73	4.5	301	19.7	168	10.5	169	10.5

Abnormal bleeding in the non-pregnant patient remains the most common cause for gynaecologic surgery in 2014. Pregnancy related procedures have reduced as a proportion of the total, which may be related to increased use of medical management, and most procedures being done electively at GSU.

In 2014, 16% 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 0.6%.

Almost one in five patients having elective gynaecologic surgery at ADHB are domiciled outside the ADHB area.

Table 97: Demographic details of women having inpatient gynaecologic primary surgery NWH 2009-2014

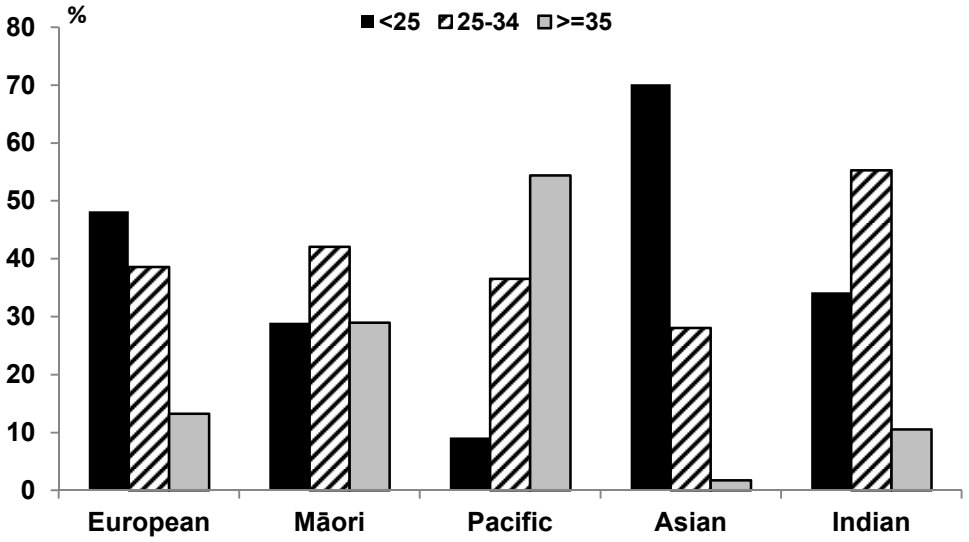
	2010 N=1569		2011 N=1628		2012 N=1528		2013 N=1606		2014 N=1607	
	n	%	n	%	n	%	n	%	n	%
Ethnicity										
NZ European	590	37.6	615	37.8	578	37.8	635	39.5	619	38.5
Māori	174	11.1	167	10.3	154	10.1	168	10.5	189	11.8
Pacific	263	16.8	286	17.6	260	17.0	246	15.3	261	16.2
Other Asian	174	11.1	220	13.5	174	11.4	194	12.1	184	11.4
Indian	125	8.0	124	7.6	137	9.0	132	8.2	124	7.7
Other European	187	11.9	164	10.1	159	10.4	173	10.8	171	10.6
Other	47	3.0	44	2.7	57	3.7	51	3.2	52	3.2
Not stated	9	0.6	8	0.5	9	0.6	7	0.4	7	0.4
Age										
≤20	114	7.3	94	5.7	84	5.5	85	5.3	103	6.4
21-30	356	22.7	361	22.2	312	20.4	340	21.2	345	21.5
31-40	473	30.1	478	29.4	432	28.3	446	27.8	452	28.1
41-50	305	19.4	342	21.0	357	23.4	375	23.4	331	20.6
51-60	146	9.3	191	11.9	170	11.1	179	11.2	180	11.2
>60	175	11.2	161	9.9	170	11.1	179	11.2	196	12.2
Missing			1		3	0.2	2	0.1		
BMI										
<19	47	3.0	59	3.6	44	2.9	66	4.1	65	4.0
19-25	589	37.5	648	39.8	636	41.6	681	42.4	626	38.9
26-30	311	19.8	335	20.6	350	22.9	360	22.4	346	21.5
31-35	178	11.3	196	12.0	203	13.3	197	12.3	165	10.3
>35	239	15.2	287	17.6	251	16.4	258	16.1	306	19.0
Missing	205	13.1	103	6.3	44	2.9	44	2.7	99	6.2
Smoking status										
Currently smoking	260	16.6	288	17.7	267	17.5	237	14.8	252	15.7
Past smoker	177	11.3	215	13.2	185	12.1	173	10.8	154	9.6
Never	988	63.0	1121	68.9	1074	70.3	1192	74.2	1192	74.1
Unknown	144	9.2	4	0.3	2	0.1	4	0.2	9	0.6
DHB of residence										
Auckland	1231	78.5	1346	82.7	1236	80.9	1308	81.4	1273	79.2
Counties Manukau	117	7.5	114	7.0	118	7.7	120	7.5	132	8.2
Waitemata	163	10.4	135	8.3	123	8.1	132	8.2	151	9.4
Other	58	3.7	33	2.0	51	3.3	38	2.4	46	2.9
Unknown							8	0.5	5	0.3

BMI and smoking status are predictors of post-surgical morbidity and mortality.

Table 98: Primary surgical procedure and timing of surgery among inpatient primary surgeries NWH 2014

		Timing of surgery			
	Total	Acute		Elective	
	N	n	%	n	%
Total	1607	366	22.8	1241	77.2
Ovarian and /or tubal surgery	167	85	50.9	82	49.1
Hysteroscopy	225	12	5.3	213	94.7
Evacuation retained products conception	104	71	68.3	33	31.7
Surgical termination of pregnancy	168	2	1.2	166	98.8
Urogynaecology procedure	173	3	1.7	170	98.3
Hysterectomy	164	3	1.8	161	98.2
Diagnostic laparoscopy	161	59	36.6	102	63.4
Endometriosis surgery	48	0	0.0	48	100.0
Other vulval procedure	62	32	51.6	30	48.4
Other uterine/cervical	222	66	29.7	156	70.3
Fibroid embolization	5	1	20.0	4	80.0
Other	108	32	29.6	76	70.4

Figure 146: BMI by ethnicity among women having inpatient gynaecology surgery NWH 2014



Fifty percent of our elective surgical population in 2014 had a BMI above the normal range. There is the suggestion of a trend towards a shift in distribution of BMI into the > 35 category, with nearly 1 in 5 patients having primary surgery in this group. Note is made however that data for height and weight were unavailable for 6.2% of patients in 2014.

Table 99: Intra operative injury at primary surgery NWH 2012-2014

	2012 N=1528		2013 N=1606		2014 N=1607	
	n	%	n	%	n	%
Bladder	7	0.5	10	0.6	5	0.3
Bowel	4	0.3	6	0.4	3	0.2
Other	2	0.13	2	0.1	1	0.1

Injury rates remain well below 1% overall, and improved from the slight increase in 2013. Rates of injury at hysterectomy and for urogynaecology procedures are higher than the overall rate (see sections 12.6 and 12.7). There have been no ureteric injuries at laparoscopic hysterectomy for the past seven years. Overall complication and readmission rates remain stable, with marginal improvements in all categories except failure to complete. However the blood transfusion rate remains well above outlier range by ACHS standards. Readmission data is difficult to interpret and is the subject of an improvement project for 2015.

ACHS Gynaecology Indicators: Injury to major viscus		ACHS					NWH					
Year		**09**	**10**	**11**	**12**	**13**	**09**	**10**	**11**	**12**	**13**	**2014**
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to major viscus, with repair, during or up to 2 weeks post operation	0.32	0.32	0.40	0.38	0.42	0.98	0.25	0.67	0.85	1.12	9/1607= 0.56
Denominator	Gynaecological surgeries											

Table 100: Postoperative complications among primary inpatient surgeries by PRIMARY surgical procedure NWH 2014

	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	1607	198	12.3	30	1.9	9	0.6	46	2.9	16	1.0	20	1.2	99	6.2	9	0.6	2	0.1	13	0.8	8	0.5
Ovarian and /or tubal surgery	167	27	16.2	4	2.4	0	0.0	11	6.6	2	1.2	4	2.4	6	3.6	0	0.0	0	0.0	2	1.2	2	1.2
Hysteroscopy	225	18	8.0	4	1.8	0	0.0	3	1.3	0	0.0	0	0.0	11	4.9	3	1.3	0	0.0	0	0.0	0	0.0
Urogynaecology procedure	173	32	18.5	5	2.9	5	2.9	3	1.7	7	4.0	4	2.3	21	12.1	3	1.7	0	0.0	3	1.7	1	0.6
Hysterectomy	164	44	26.8	4	2.4	4	2.4	10	6.1	6	3.7	6	3.7	25	15.2	0	0.0	2	1.2	5	3.0	3	1.8
Endometriosis surgery	48	7	14.6	2	4.2	0	0.0	0	0.0	0	0.0	0	0.0	5	10.4	0	0.0	0	0.0	0	0.0	0	0.0
Fibroid embolisation	5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Surgical termination of pregnancy	168	7	4.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	4.2	0	0.0	0	0.0	0	0.0	0	0.0
Evacuation retained products of conception	104	15	14.4	0	0.0	0	0.0	7	6.7	0	0.0	2	1.9	7	6.7	1	1.0	0	0.0	1	1.0	0	0.0
Diagnostic laparoscopy†	161	15	9.3	7	4.3	0	0.0	2	1.2	0	0.0	1	0.6	4	2.5	1	0.6	0	0.0	0	0.0	1	0.6
Other vulval procedure	62	5	8.1	0	0.0	0	0.0	1	1.6	0	0.0	0	0.0	2	3.2	1	1.6	0	0.0	1	1.6	0	0.0
Other uterine/cervical	222	17	7.7	3	1.4	0	0.0	5	2.3	0	0.0	2	0.9	8	3.6	0	0.0	0	0.0	0	0.0	0	0.0
Other	108	11	10.2	1	0.9	0	0.0	4	3.7	1	0.9	1	0.9	3	2.8	0	0.0	0	0.0	1	0.9	1	0.9

† Includes cases that progressed from diagnostic laparoscopy to therapeutic procedure but where the primary procedure was entered in the database as diagnostic laparoscopy.

Definitions of complications:

Intra operative injury to internal organs: Injury to bladder, bowel, ureter, major blood vessel.

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. Includes planned readmission.

Other significant complications: Includes gastrointestinal complications (ileus, bowel obstruction), fistulae.

Table 101: Complications of surgery by timing of surgery NWH 2014

	Acute admission N=366		Elective admission N=1241	
	n	%	n	%
Any complication	**51**	**13.9**	**147**	**11.8**
Failure to complete planned procedure	1	0.3	29	2.3
Intra operative injury to internal organs	0	0	9	0.7
Significant post op infection	1	0.3	15	1.2
Anaesthetic complication	1	0.3	8	0.6
Other significant complication	3	0.8	10	0.8
Thromboembolic complication	0	0	2	0.2
Unplanned return to theatre in 6 weeks	8	2.2	12	1.0
Admission to DCCM	3	0.8	5	0.4
Readmission in 6 weeks (postop complication or planned)	14	3.8	85	6.8
Transfusion	27	7.4	19	1.5

12.5 Gynaecology laparoscopic procedures

As in all sections 12.4-12.7, procedures performed by the gynaecologic oncology team are excluded.

Findings

In 2014, there were 392 laparoscopic procedures, 261 elective and 131 acute procedures. Fifty nine percent of gynaecologic laparoscopic surgeries in 2014 were for endometriosis, ovarian cysts or ectopic pregnancy.

Table 102: Primary surgery performed, and timing of surgery among women having inpatient primary laparoscopic procedures NWH 2014

Primary procedure	Surgery in 2014	Acute admission		Elective admission	
	N	n	%	n	%
Total	**392**	**131**	**33.4**	**261**	**66.6**
Ovarian/tubal	120	72	60.0	48	40.0
Diagnostic laparoscopy	153	54	35.3	99	64.7
Endometriosis surgery	48	0	0	48	100
Hysterectomy	31	0	0	31	100
Other uterine/cervical procedure	11	0	0	11	100
Hysteroscopy	14	2	14.3	12	85.7
Urogynaecology	3	0	0	3	100
Fibroid embolisation	1	1	100	0	0
Other	11	2	18.2	9	81.8

Table 103: Primary indication for surgery by timing of surgery among women having primary inpatient laparoscopic procedures NWH 2014

Primary indication	Surgery in 2014 N=392	Acute admission		Elective admission	
	n	n	%	n	%
Total	**392**	**131**	**33.4**	**261**	**66.6**
Endometriosis	67	0	0.0	67	100
Ovarian cyst	89	30	33.7	59	66.3
Ectopic pregnancy	77	76	98.7	1	1.3
Pain, cause unknown	72	21	29.2	51	70.8
Abnormal bleeding	36	1	2.8	35	97.2
Infertility	21	0	0	21	100
Cancer/pelvic mass	8	0	0	8	100
Urogynaecology	5	0	0	5	100
Other	17	3	2.3	14	5.4

ACHS Gynaecology Indicators: Injury to MAJOR VISCUS during a laparoscopic procedure							
Numerator	Injury to major viscus during laparoscopic procedure, with repair, during or up to 2 weeks post operation	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Denominator	Laparoscopic procedures	**%**	**%**	**%**	**%**	**%**	**%**
	ACHS	**0.59**	**0.51**	**0.62**	**0.68**	**0.75**	
	NW	**1.6**	**0**	**0.95**	**0.29**	**1.6**	**1/392= 0.3 (0-1.4)**

Table 104: Complications of primary inpatient gynaecologic laparoscopic surgery NWH 2014

	Total N=391	
	n	%
ANY COMPLICATION	44	11.2
Blood transfusion	7	1.8
Intra operative injury	1	0.3
Failure to complete procedure	11	2.8
Anaesthetic complications	1	0.3
Significant post-operative infection	1	0.3
Unplanned return to theatre	3	0.8
Admission to DCCM	2	0.5
Readmission to hospital	31	7.9
Post op complications	16	4.1
Planned re admission	2	0.5
Other	13	3.3
Other significant complications	2	0.5

In 2014 there were the following complications:

Seven women required a blood transfusion. All cases presented with a large haemoperitoneum. Six women had ruptured ectopic pregnancies and one woman had a haemorrhage from a corpus luteal cyst.

There was one case of intraoperative injury to a uterine artery during laparoscopic hysterectomy. Estimated blood loss was one litre and transfusion was not required.

There were eight cases of failure to complete the procedure. Three of these cases had cervical stenosis resulting in 1/ failure to complete hysteroscopy 2/ failure to insert a Mirena and 3/ failure to perform dye study. Three cases categorised as “failure to complete” had severe endometriosis and due to advanced stage were referred on to minimal access surgery. Similarly two further cases had extensive bowel adhesions therefore the planned surgery was not able to be completed at the time of initial laparoscopy.

Two cases had unplanned returns to theatre, one due to an oversight in port site closure and one due to possible ectopic pregnancy after an evacuation of retained products (no evidence of ectopic and later found to have gestational trophoblastic disease).

Both admissions to DCCM occurred prior to surgery and were unrelated to the procedure.

There were 29 readmissions for postoperative complications following surgery (7.4%). The majority (18) were related to pain, 4 of whom were seen and discharged from Women’s Assessment Unit (WAU) and 2 from the Emergency Department. There were 7 cases where infection was a feature, 3 of these were port site infections (one with a haematoma), two vault infections with haematoma, and one pyelonephritis.

Readmission with pain remains the single most common cause of readmission after laparoscopic surgery. Planning for surgery, particularly for those with chronic pain conditions, should include discharge planning and wrap-around support particularly in the early post operative period. The Enhanced Recovery After Surgery programme was well established in 2014. Now that it is part of usual practice on the ward, detailed audit of compliance may provide insight into reasons for readmission.

12.6 Hysterectomy

This section does not include hysterectomies performed by the Gynaecology Oncology team, or hysterectomy cases done from another hospital ward or under the care of other services (eg urology).

Findings

Table 105: Characteristics of women undergoing hysterectomy as primary surgery (excluding gynaecologic oncology) NWH 2012-2014

	2012 N=175		2013 N=205		2014 N=176	
	n	%	n	%	n	%
Age						
≤20	0		1	2.5	1	0.6
21-30	1	0.6	1	2.5	1	0.6
31-40	37	21.7	26	12.7	20	11.4
41-50	85	48.6	100	48.8	90	51.1
51-60	28	16.0	45	22.0	40	22.7
>60	24	13.7	31	15.1	24	13.6
Unknown			1	0.5		
Ethnicity						
NZ European	62	35.4	75	36.6	70	39.8
Māori	16	9.1	23	11.2	23	13.1
Pacific	28	16.0	36	17.6	31	17.6
Other Asian	23	13.1	26	12.7	23	13.1
Indian	22	12.6	25	12.2	17	9.7
Other European	21	12.0	16	7.8	9	5.1
Other	2	1.1	2	1.0	3	1.7
Not Stated	1	0.6	2	1.0	0	
District Health Board of residence						
Auckland	158	90.3	194	94.6	153	86.9
Counties Manukau	6	3.4	2	1.0	7	4.0
Waitemata	7	4.0	6	2.9	8	4.5
Other	4	2.3	2	1.0	7	4.0
Unknown			1	0.5	1	0.6
BMI						
<18.5	2	1.1	7	3.4	1	0.6
18.5-24.99	51	29.1	50	24.4	51	29.0
25-29.99	54	30.9	62	30.2	45	25.6
30-34.99	37	21.1	42	20.5	39	22.2
35-39.99	19	10.9	30	14.6	12	6.8
>=40	12	6.7	14	6.8	26	14.8
Missing	0				2	1.1
Smoking						
Currently smoking	29	16.6	32	15.6	30	17.0
Past smoker	23	13.1	18	8.8	18	10.2
Never smoked	123	70.3	155	75.6	128	72.7
Unknown	0		0			

There were 29 fewer women undergoing hysterectomy in 2014 than in 2013. The ethnicity of the women undergoing hysterectomy in 2014 does not reflect the ethnicity of the population who reside within the AHDB region. The proportion of women who underwent hysterectomy who are NZ European is lower (40%) compared to 52% in the ADHB region. This may be due to higher proportions of NZ European women seeking private medical care. In 2014 69% of women who underwent hysterectomy had a BMI ≥ 25 and 22% had a BMI ≥35. There were six women who had a hysterectomy who were aged under 35 and the reasons were failed medical treatment in two women, two gender change requests, one woman with endometriosis, and one woman with a pelvic mass. There were nine women with a BMI > 35 who had complications; 3 had a return to theatre with bleeding, another required a ureteric stent, one had a pulmonary embolus, and one had pneumonia.

Table 106: Surgical details of hysterectomies (excluding gynaecologic oncology) NWH 2010-2014

	2010 N=173		2011 N=166		2012 N=175		2013 N=205		2014 N=176	
	n	%	n	%	n	%	n	%	n	%
Approach										
Laparotomy	90	52.0	107	64.5	107	61.1	105	51.2	96	54.5
Total laparoscopic hysterectomy	20	11.6	15	9.0	24	13.7	34	16.6	19	10.9
Laparoscopic assisted vaginal	15	8.7	12	7.2	8		8	3.9	13	7.4
Laparoscopic converted to laparotomy	2	1.2	3	1.8	6	3.4	2	1.0	2	1.1
Vaginal	46	26.6	29	17.5	30	17.1	56	27.3	46	26.3
Timing of surgery										
Elective	170	98.3	164	98.8	173	98.9	198	96.6	173	98.2
Acute	3	1.7	2	1.2	2	1.1	7	3.4	3	1.8
Primary indication for surgery										
Abnormal bleeding, non-pregnant	76	43.9	75	45.2	84	48.0	98	47.8	87	49.4
Cancer /pelvic mass	37	21.4	37	22.3	43	24.6	40	19.5	34	19.3
Urogynaecology / prolapse	41	23.7	25	15.1	21	12.0	36	17.6	33	18.8
Pain, cause unknown	2	1.2	6	3.6	8	4.6	6	2.9	4	2.3
Endometriosis	9	5.2	5	3.0	5	2.9	5	2.4	5	2.8
Ovarian cyst	3	1.7	12	7.2	6	3.4	6	2.9	5	2.8
Other	5	2.9	6	3.6	8	4.6	14	6.8	8	4.6
ASA rating										
1	58	33.5	57	34.3	65	37.1	66	32.2	38	21.6
2	72	41.6	81	48.8	86	49.1	98	47.8	72	40.9
3	24	13.9	20	12.1	17	9.7	35	17.1	19	10.8
5	0		0		0		0		1	0.6
Missing	19	11.0	8	4.8	7	4.0	6	2.9	46	26.1
LENGTH OF STAY	**Median(IQR)**		**Median(IQR)**		**Median(IQR)**		**Median(IQR)**		**Median(IQR)**	
All hysterectomies	4	(3-5)	4	(3-5)	3	(3-4)	3	(2-4)	3	(2-4)
By approach:										
Laparotomy	4	(3-5)	4	(4-5)	3	(3-4)	3	(3-4)	3	(2-4)
Laparoscopy	3	(2-4)	3	(3-5)	3	(2-3.5)	2	(2-2)	2	(2-3)
Vaginal	3	(3-4)	3	(2-3)	3	(2-4)	3	(2-3)	3	(2-3)

There were 10 fewer vaginal hysterectomies performed in 2014 compared to 2013 but the overall proportion was the same (26.3%). The primary indication for surgery was similar between 2013 and 2014.

Table 107: Route of hysterectomy among hysterectomies performed by general gynaecologists NWH 2005-2014

	2005 N=161		2006 N=131		2007 N=189		2008 N=150		2009 N=162		2010 N=173		2011 N=166		2012 N=175		2013 N=205		2014 N=176	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Abdominal	86	53	81	61.8	109	57.7	88	58.7	109	67	92	53.2	110	66.3	113	64.6	107	52.2	98	55.7
Vaginal	54	34	36	27.5	67	35.4	45	30.0	37	23	46	26.6	29	17.5	30	17.1	56	27.3	46	26.1
Laparoscopic	21	13.0	14	10.7	13	6.9	17	11.3	16	10	35	20.2	27	16.3	32	18.3	42	20.5	32	18.2

Figure 147: Route of hysterectomy among hysterectomies performed by general gynaecologists NWH 2000-2014

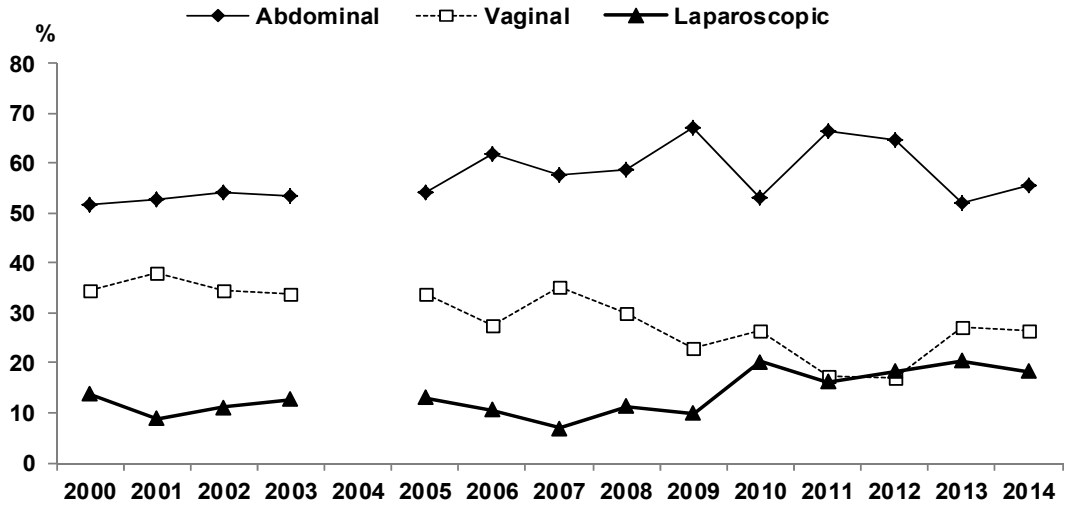


Table 108: Complications of surgery among women undergoing hysterectomy (excluding gynaecologic oncology) NWH 2010-2014

	2010 N=173		2011 N=166		2012 N=175		2013 N=205		2014 N=176	
	n	%	n	%	n	%	n	%	n	%
Any complication	**45**	**26.0**	**48**	**28.9**	**50**	**28.6**	**58**	**28.3**	**46**	**26.1**
Blood transfusion	18	10.4	14	8.4	19	10.9	18	8.8	10	5.7
Intraoperative injury	2	1.2	7	4.2	4	2.3	6	2.9	5	2.8
Anaesthetic complications	2	1.2	1	0.6	2	1.1	1	0.5	0	0.0
Significant postoperative infection	5	2.9	5	3.0	2	1.1	12	5.9	6	3.4
Other significant complications	11	6.4	8	4.8	6	3.4	11	5.4	5	2.8
Unplanned return to theatre	7	4.1	8	4.8	3	1.7	9	4.4	6	3.4
Admission to DCCM	2	1.2	2	1.2	2	1.1	2	1.0	3	1.7
Readmission to hospital for post-op complications	19	11.0	29	17.5	30	17.1	28	13.7	25	14.2
Failed to complete planned surgery	1	0.6	2	1.2	3	1.7	1	0.5	4	2.3

ACHS Gynaecology Indicators: Injury to URETER during a LAPAROSCOPIC HYSTERECTOMY								
Numerator	Injury to ureter during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Denominator	Laparoscopic hysterectomy procedures	**%**	**%**	**%**	**%**	**%**	**%**	**%**
	ACHS	**0.57**	**0.23**	**0.18**	**0.066**	**0.32**	**0.16**	
	NW	**0/17**	**0/16**	**0**	**0/27**	**0/32**	**0/42**	**0/32**
ACHS Gynaecology Indicators: Injury to BLADDER during a LAPAROSCOPIC HYSTERECTOMY								
Numerator	Injury to bladder during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Denominator	Laparoscopic hysterectomy procedures	**%**	**%**	**%**	**%**	**%**	**%**	**%**
	ACHS	**0.48**	**0.78**	**0.64**	**0.27**	**1.0**	**0.40**	
	NW	**0/17**	**0/16**	**0**	**0/27**	**0/32**	**1/42 =2.4**	**0**

There were no cases of bladder injury in 2014 and no cases of ureteric injury reported in the past seven years of laparoscopic hysterectomy.

The blood transfusion rate has decreased slightly from 8.8% in 2013 to 5.7% in 2014. Of the ten women who had a blood transfusion only 3 had a BMI ≥35. The proportion of women with any complications has not changed over the past four years. The proportion of women with an intraoperative injury was similar in 2014 to 2013. There were three fewer women with an unplanned return to theatre. Three women were admitted to the Department of Critical Care, two were planned admissions and one was for significant intraoperative bleeding.

Summary / Implications

The proportion of vaginal hysterectomy remains unchanged for the past two years. Blood transfusion rates have decreased slightly from 2013 to 2014. The length of stay has declined in all women undergoing hysterectomy for benign causes over the past three years.

12.7 Urogynaecology

As in previous annual clinical reports, the section on urogynaecology will concentrate on operative procedures, rather than clinic throughput or urodynamic investigations.

From 2012, urogynaecology procedures were categorised as: procedures including hysterectomy; incontinence tape procedures; prolapse repairs using synthetic mesh augmentation; 'other' prolapse repairs.

Findings

Table 109: Demography of women undergoing primary inpatient urogynaecology surgery NWH 2012-2014

	2012 N=212		2013 N=235		2014 N=212	
	n	%	n	%	n	%
Age						
≤ 30	1	0.5	5	2.1	2	0.9
31-40	12	5.7	15	6.4	20	9.4
41-50	40	18.9	58	24.7	46	21.7
51-60	61	28.8	60	25.5	54	25.5
>60	98	46.2	97	41.3	90	42.5
Ethnicity						
NZ European	115	54.3	133	56.6	107	50.5
Maori	17	8.0	20	8.5	20	9.4
Pacific	17	8.0	20	8.5	19	9.0
Other Asian	13	6.1	12	5.1	17	8.0
Indian	8	3.8	20	8.5	20	9.4
Other European	32	15.1	26	11.1	24	11.3
Other	9	4.3	4	1.7	5	2.4
Not stated	1	0.5			0	0.0
District Health Board of residence						
Auckland	175	82.6	201	85.5	181	85.4
Counties Manukau	11	5.2	6	2.6	3	1.4
Waitemata	13	6.1	10	4.3	14	6.6
Other	13	6.1	18	7.7	13	6.1
Missing					1	0.5
BMI						
<18.5	2	0.9	2	0.9	3	1.4
18.5-24.99	65	30.7	64	27.2	50	23.6
25-29.99	70	33.0	81	34.5	80	37.7
30-34.99	50	23.6	52	22.1	38	17.9
35-39.99	11	5.2	23	9.8	23	10.8
>=40	14	6.6	13	5.5	16	7.5
Missing					2	0.9
Smoking						
Currently smokes	19	9.0	23	9.8	21	9.9
Past smoker	31	14.6	31	13.2	24	11.3
Never smoked	162	76.4	181	77.0	167	78.8
Length of stay Median (IQR)	2	(1-3)	2	(1-3)	2	(1-3)

In 2014, 212 women had an urogynaecology procedure as a primary admission. A further fourteen urogynaecology procedures were performed as post discharge procedures which occurred at ACH.

Of the 212 primary admissions, there were 85 tension free vaginal tape (TVT)s, 3 mesh repairs, 133 prolapse repairs, and 48 other urogynaecology procedures. Many women will have had two or more urogynaecology procedures at primary surgery.

Thirty-nine women also had a hysterectomy at the time of their primary admission for urogynaecology surgery.

ACHS Gynaecology Indicators: Injury to MAJOR VISCUS during a pelvic floor repair procedure								
Numerator	Injury to major viscus during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	2008	2009	2010	2011	2012	2013	2014
Denominator	Pelvic floor repair procedures*	%	%	%	%	%	%	%
	ACHS	1.03	0.81	0.85	0.80	1.0	1.3	
	NW	1.2	2.3	0.5	0.9	3.3	2.1	6/212= 2.8 (1.0-6.1)

* includes isolated incontinence procedures

ACHS Gynaecology Indicators: Injury to URETER during a pelvic floor repair procedure								
Numerator	Injury to ureter during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	2008	2009	2010	2011	2012	2013	2014
Denominator	Pelvic floor repair procedures*	%	%	%	%	%	%	%
	ACHS	0.55	0.046	0.037	0.16	0.15	0.096	
	NW	0	0	0	0	0.9	0	0

* includes isolated incontinence procedures

ACHS Gynaecology Indicators: Injury to BLADDER during a pelvic floor repair procedure								
Numerator	Injury to bladder during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	2008	2009	2010	2011	2012	2013	2014
Denominator	Pelvic floor repair procedures*	%	%	%	%	%	%	%
	ACHS	0.94	0.37	0.48	0.40	0.53	0.38	
	NW	0.6	2.3	0.5	0.9	1.9	2.1	4/212= 1.9 (0.5-4.8)

* includes isolated incontinence procedures

Table 110: Complications of primary urogynaecologic surgery procedures NWH 2014

	N=212	
	n	%
Total complications	42	19.8
Blood transfusion	4	1.9
Intra-operative injury to internal organs	6	2.8
Failure to complete planned surgery	5	2.4
Anaesthetic complications	4	1.9
Significant postoperative infection	8	3.8
Other significant complications	4	1.9
Unplanned return to theatre	6	2.8
Admission to DCCM	1	0.5
Readmission to hospital	31	14.6
Postoperative complication	20	9.4
Planned re-admission	9	4.2
Other	2	0.9

The complications summarised in the table above were seen in a total of 42 women who underwent urogynaecological surgery. As the figures indicate, some patients had more than

one complication recorded.

The urogynaecology casemix has been similar to previous years. Following the controversy around the world with regard to vaginally placed mesh for prolapse the Urogynaecology team at Auckland Hospital have continued to be very careful in the selection of patients requiring vaginal mesh. This year there have only been three cases down from nine last year. There were two vaginally placed meshes and one abdominal. All procedures were on patients where previous surgery had failed. Vaginal mesh procedures are not considered in the Urogynaecology unit as a primary or first line prolapse surgery, and is only offered as an option when previous surgical procedures have failed after discussion with the patient with regard to the additional risks involved.

It is hard to know whether this significant decrease in the number of vaginal mesh procedures, either abdominal or vaginal, is due to success of the teams native tissue repair procedures by placing more emphasis on apical or upper vaginal support, or, whether future years statistics may show a slight increase in the use of vaginal mesh.

The operative complications have been analysed. There has been a numerical increase in injuries to intra-abdominal organs from five to six this year. There were two bowel injuries and four bladder injuries. Four out of the six patients with injuries had had previous surgery in the same compartment and one had also had a previous bladder injury which was likely to have impacted on risk of further injury. There were no ureteric or urethral injuries.

There were only three patients having prolapse repairs that required a blood transfusion, down from five last year. One also required an admission to DCCM or the Department of critical care medicine, but this was for pre-existing cardiac reasons, rather than blood loss alone.

Returns to theatre have increased at 6 up from 5 last year. Two required their incontinence tape released, four had issues with pain, and one was found to have an issue unrelated to her surgery.

Readmission rate remained similar at 31 patients compared to 33 in 2013. However eight were planned admissions for trial of catheter removal and one was bought back for an arranged post-operative review on Women's Assessment Unit rather than being seen in clinic. Twenty readmissions were with surgery related issues. There were eleven admitted for treatment of infection, six with pain, one with bleeding and one with voiding dysfunction and one with nausea. A further two were admitted with constipation represented in the other group.

In summary whereas there has been improvement in some areas such as blood transfusion rate there has been no improvement in our returns to theatre or major viscus injury rates or re admission rates. With regard to our readmission rate, in the next year we have plans to refer more of our women requiring discharge from hospital with a urinary catheter to the district nurse service for trial of catheter removal as we feel people will more likely be successful voiding in their own homes. In the other areas where our complication rates are stable we will continue to endeavour to decrease out complication rate and will be looking hard at ways that this can be achieved.

12.8 Colposcopy

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 1357 initial colposcopies in 2014. Follow up colposcopies are not included in the data analysis below, although there were a total of 2125 total (2075 cervical) colposcopies performed within the department in 2014.

Table 111: Demographic details of women having an initial colposcopic examination in NWH 2009-2014

	Initial colposcopy in 2009 N=993		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	
	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity												
NZ European	427	43.0	543	44.7	569	44.1	305	40.2	682	48.5	619	45.6
Maori	95	9.6	113	9.3	121	9.4	51	6.7	105	7.5	88	6.5
Pacific	104	10.5	109	9.0	126	9.8	83	10.9	131	9.3	133	9.8
Indian	37	3.7	63	5.2	56	4.3	45	5.9	56	4.0	232	17.1
Other Asian	158	15.9	198	16.3	198	15.4	112	14.8	198	14.1	40	2.9
Other European	131	13.2	145	11.9	180	14.0	139	18.3	173	12.3	182	13.4
Other	20	2.0	16	1.3	14	1.1	24	3.2	61	4.3	63	4.6
Not stated	21	2.1	27	2.2	25	1.9	0		0		0	
Age (yrs)												
≤20	28	2.8	29	2.4	40	3.1	10	1.3	7	0.5	6	0.4
21-25	422	42.5	422	34.8	535	41.5	312	41.1	281	20.0	247	18.2
26 -30									271	19.3	278	20.5
31-40	245	24.7	389	32.0	374	29.0	199	26.2	447	31.8	407	30.0
41-50	195	19.6	218	18.0	189	14.7	128	16.9	216	15.4	239	17.6
51-60	76	7.7	106	8.7	108	8.4	87	11.5	136	9.7	117	8.6
>60	27	2.7	50	4.1	43	3.3	23	3.0	48	3.4	63	4.6
Smoking status												
Currently smoking	228	23.0	266	21.9	279	21.6	64	8.4	131	9.3	97	7.1
Not currently smoking	757	76.2	943	77.7	981	76.1	174	22.9	467	33.2	465	34.3
Unknown	8	0.8	5	0.4	29	2.3	521	68.6	808	57.5	795	58.6
Referral to smoking cessation	223	22.5	255	21.0	259	20.1	NA	NA	NA	NA	NA	NA
DHB of residence												
Auckland	927	93.4	1131	93.2	1188	92.2	709	93.4	1317	93.7	1272	93.7
Counties Manukau	18	1.8	25	2.1	22	1.7	14	1.8	27	1.9	19	1.4
Waitemata	33	3.3	39	3.2	48	3.7	25	3.3	38	2.7	45	3.3
Other	15	1.5	19	1.6	31	2.4	11	1.4	24	1.7	21	1.5

NA=not available

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 six 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 referrals from outside ADHB reflect the tertiary referral status of the unit, and are often those patients who require input from the gynaecological oncologists. Although this only makes up 6.2% of the total new referrals, generally these are divided between 2 clinicians and with follow ups, make up a significant proportion of these clinics. Long term strategic planning is in progress.

The smoking data are still incomplete and reflect that this is not a mandatory field in the database. As mentioned in the 2013 Annual Clinical Report, an upgrade of the database should have addressed this by the end of 2014, however this did not occur, and unfortunately progress remains slow at the time of writing (mid-2015).

Colposcopy Standards: Documentation of adequacy of examination		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013	NW 2014
	Definition	%	%	%	%	%	%	%	%
Numerator	Documented that entire squamo-columnar junction is seen and whether the upper limit of any cervical lesion is seen	100	97	99.9	93	95.7	100	100	100
Denominator	All colposcopic examinations								

Table 112: Documentation of adequacy of colposcopic examination by type of colposcopic visit NWH 2014

Satisfactory Colp	Total		Follow up visit		Initial visit		Other		Post treatment	
	N=	2075	n=	103	n=	1357	n=	602	n=	13
Yes	1760	84.8	70	68.0	1169	86.1	510	84.718	11	84.61538
No	281	13.5	23	22.3	176	13.0	80	13.3	2	15.38462
NA	34	1.6	10	9.7	12	0.9	12	2.0	0	0

This standard has been met following the introduction of mandatory fields in electronic data collection.

Table 113: Clinical characteristics of women presenting for initial colposcopy NWH 2014

	Initial visit N=1357	
	n	%
Referral reason		
Abnormal Screening Smear	681	50.2
Abnormal Smear After Colposcopy	339	25.0
Positive High risk HPV test	274	20.2
Unusual Appearing Cervix	30	2.2
Bleeding	21	1.5
Other	7	0.5
Clinically Suspicious Cervix	5	0.4
Referral smear cytology		
Invasive	6	0.4
High grade	333	24.5
Low grade	934	68.8
Atypical Glandular	14	1.0
Unsatisfactory	2	0.1
Other	2	0.1
Normal	58	4.3
No smear Taken	8	0.6

Referrals for positive high risk HPV test (HrHPV) “test of cure” remain unchanged from last year at 20%.

Table 114: Histology of biopsy at initial examination NWH 2014

	Initial visit biopsies N=1357	
	n	%
Invasive	0	
High Grade	211	15.5
Low grade	244	18.0
Dysplasia NOS	34	2.5
HPV	108	8.0
Inflammation	97	7.1
Insufficient sample	12	0.9
Normal	146	10.8
No biopsy taken	505	37.2

Colposcopy Standards: Biopsy rate in women with high grade cytology		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013	NW 2014
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Biopsy taken	>95	76	76	80	82	83.3	79.9	86.0
Denominator	Women referred with high grade cytology for initial colposcopy examination								

Table 115: Histological diagnosis (biopsy at initial colposcopy) by referral smear cytology NWH 2014

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	**1357**	**503**	**37.1**	**2**	**0.1**	**211**	**15.5**	**244**	**18.0**	**34**	**2.5**	**97**	**7.1**	**108**	**8.0**	**12**	**0.9**	146	10.8
Invasive	6	4	66.7	0	0.0	**2**	**33.3**	**0**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**0.0**	0	
High grade	333	46	13.8	1	0.3	154	46.2	53	15.9	17	5.1	19	5.7	16	4.8	3	0.9	24	7.2
Low grade	934	402	43.0	0		53	5.7	183	19.6	16	1.7	68	7.3	90	9.6	8	0.9	114	12.2
Atypical glandular	14	5	35.7	0		1	7.1	2	14.3	0		4	28.6	0		1	7.1	1	7.1
Unsatisfactory	2	2	100	0		0		0	0.0	0		0		0		0		0	
Other	2	2	100	0		0		0	0.0	0		0		0		0		0	
Normal	58	39	67.2	0		1	1.7	4	6.9	1	1.7	6	10.3	2	3.4	0		5	8.6
No Smear	8	3	37.5	1	12.5	0	0.0	2	25.0	0	0.0	0	0.0	0	0.0	0		2	25.0

The “no biopsy” rate shows a trend to reducing over the last 3 years, initially 45%, then 41%, now 37%. Overall this means the biopsy rate is now 63%. This has increased slightly from last year, as has the biopsy rate in women with high grade cytology, however the later does still not meet the standard, as it has not for the last seven years.

Overall, 86% of women referred with a high grade smear had a biopsy.

A review of the 46 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. Half (23) of these patients had a normal colposcopy with either a normal or low grade smear on repeat smear at that visit. After review at MDM, three patients had a diagnostic LLETZ, two a cone biopsy. Six patients were pregnant. Two patients declined biopsies initially but did have biopsies later. Four patients had initial biopsies in the private sector and were being seen for followup visits. Four had inadequate colposcopies with no abnormality seen and had followup or treatment as advised by MDM, often after local estrogen treatment. One patient had “low grade” impression at colposcopy, then a biopsy at a followup visit after discussion at MDM. The remaining patient had a smear with abnormal endometrial cells rather than a cervical cell abnormality and had appropriate investigations for this.

A similar discussion occurred in the 2013 Annual Clinical Report - this does seem to be one standard that is consistently not reached, but where, on review,

clinical management is still found to be appropriate. If one excludes women who were pregnant (and had a colposcopic impression of 'no invasion', in whom biopsy is not indicated) plus women who already had biopsies in the private sector, the rate increases to 89%, and is a more accurate representation of the data.

The patients with suspected invasion on smear went forward for EUA and biopsy/cone biopsy.

Colposcopy Standard: Predictive value of a colposcopic high grade diagnosis		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013	NW 2014
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	High grade histology	65	65	55	56	52	58	62	58
Denominator	Initial satisfactory colposcopies where colposcopic diagnosis is high grade								

Table 116: Cervical histology findings by colposcopic diagnosis (at initial colposcopy if satisfactory) NWH 2014

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	**1345**	**491**	**36.5**	**2**	**0.1**	**211**	**15.7**	244	18.1	**34**	**2.5**	**97**	**7.2**	**108**	**8.0**	**12**	**0.9**	**146**	**10.9**
Invasive	5	1	20.0	1	20.0	3	60.0	0		0		0		0		0		0	
High grade	241	8	3.3	0		139	57.7	40	16.6	7	2.9	16	6.6	12	5.0	0		19	7.9
Low grade	639	90	14.1	0		66	10.3	191	29.9	18	2.8	68	10.6	88	13.8	8	1.3	110	17.2
Condyloma/ inflammation	17	4	23.5	0		1	5.9	5	29.4	2	11.8	2	11.8	1	5.9	1	5.9	1	5.9
Other	59	37	62.7	1	1.7	2	3.4	3	5.1	5	8.5	3	5.1	4	6.8	0		4	6.8
Normal	384	350	91.1	0		0		5	1.3	2	0.5	9	2.3	3	0.8	3	0.8	12	3.1

Colposcopic prediction of high grade disease still does not meet the standard and has fallen slightly. It is suggested that this is another area for colposcopists to self-audit. With clinical photographs now taken routinely it should be relatively easy to compare colposcopic appearance and histology when entering the results and all colposcopists should be encouraged to do this routinely where colposcopic impression and histology are dissimilar. The use of photographs at MDM has been helpful for educational purposes. There was some initial difficulty in achieving well-focussed photographs, but a good clinical photograph to present at MDM has become a matter of pride among some colposcopists!

The two patients with invasive disease and no biopsy went straight to staging EUA and biopsy.

There were 8 patients who had high grade colposcopic appearances and no biopsy. Five women were pregnant; of these, two had followup at AHDB and had biopsies postpartum, 3 were referred to other DHBs for followup. Two patients went straight to cone biopsy, one for suspected AIS, one for inadequate colposcopy. One patient declined to have a biopsy in clinic and subsequently had a general anaesthetic and biopsy.

Table 117: Histological diagnosis (biopsy at initial colposcopy) by referral reason NWH 2014

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	**1357**	**503**	**37.1**	**2**	**0.0**	**211**	**15.5**	**244**	**18.0**	**34**	**2.5**	**97**	**7.1**	**108**	**8.0**	**12**	**0.9**	146	10.8
Abnormal Screening Smear	681	191	28.0	1	0.1	162	23.8	137	20.1	20	2.9	44	6.5	39	5.7	8	1.2	79	11.6
Abnormal Smear After Colposcopy	339	163	48.1	0		26	7.7	47	13.9	9	2.7	27	8.0	35	10.3	1	0.3	31	9.1
Positive High risk HPV test	274	110	40.1	0		22	8.0	50	18.2	4	1.5	21	7.7	33	12.0	3	1.1	31	11.3
Unusual Appearing Cervix	30	21	70.0	1	3.3	1	3.3	1	3.3	1	3.3	2	6.7	0		0		3	10.0
Bleeding	21	13	61.9	0		0		5	23.8	0		2	9.5	0		0		1	4.8
Other	7	2	28.6	0		0		3	42.9	0		1	14.3	1	14.3	0		0	
Clinically Suspicious Cervix	5	3	60.0	0		0		1	20.0	0		0		0		0		1	20.0

In July 2013, the NCSP changed the guidelines for referral of women with ‘abnormal cervix / post coital bleeding / normal smear’, and recommended that these patients are referred to gynaecology clinic and do not necessarily require colposcopy. Therefore for the last two years most patients who are referred to colposcopy with these issues have been redirected to general gynaecology clinic at triage and are not routinely offered colposcopy.

Of the total of 63 patients who were seen in colposcopy clinic for ‘unusual appearing/suspicious cervix’, ‘bleeding’ or ‘other’, 19 had abnormal smears, with one smear suggestive of invasion. Only in this patient was the cause for symptoms or appearance sinister. This would suggest that the change in triaging process is not resulting in missing important pathology, however an audit of outcomes from those referred to general gynaecology clinic with “abnormal cervix / bleeding / normal smear” would be necessary to assess this more completely.

Table 118: Cervical treatments NWH 2009 - 2014

	2009 N=199		2010 N=198		2011 N=236		July-Dec 2012 N=133		2013 N=339		2014 N=286	
	n	%	n	%	n	%	n	%	n	%	n	%
LLETZ	187	94.0	185	92.9	220	93.2	118	88.7	298	87.9	262	91.6
Cold knife cone	9	4.5	11	5.6	16	6.8	11	8.3	29	8.6	21	7.3
Diathermy	1	0.5	0		0				0			
Hysterectomy	1	0.5	2	1.0	0		1	0.8	11	3.2	3	1.0
Laser ablation	1	0.5	1*	0.5	0				0		0	
Laser cone	0		0		0				0		0	
Other							3	2.3	1	0.3		

Seventy six percent of LLETZ treatments were performed under a local anaesthetic in clinic, which is unchanged from 76% last year, lower than 87% in 2012, and does not meet the standard of 80%.

An audit of all records for patients who had a LLETZ in theatre was performed.

There were 62 LLETZ treatments done under general anaesthesia and a further 2 done in theatre under spinal anaesthesia.

For the majority of patients having a general anaesthesia (24/62) the reason was 'patient request'. The next most common indication was 'large transformation zone' (22/62). For only one patient the reason was 'difficult access', and in this case the BMI was not stated. There were 6 patients having co-procedures under general anaesthesia. 'Fainting during LLETZ discussion' was the indication for one patient's general anaesthetic, and one further patient had excessive bleeding during the punch biopsy. In the remaining seven cases, no indication for general anaesthesia was given.

It had been hypothesised that "rising BMI" (with consequent difficult access) was the likely reason for our general anaesthetic rates being too high. The above audit strongly suggests this is not the case. Whilst there will be some patients for whom a 'patient request' general anaesthetic is entirely appropriate (intolerance of initial colposcopy and biopsy being an obvious example), it is likely that this is a lower number than is currently seen. Patient education and reassurance could go some way toward meeting the standard. Consideration could also be given to doing the procedure under local anaesthesia with sedation (in theatre) for some women.

The number of women under 25 being treated has fallen to 45. The PRINCess trial is recruiting slowly, but it is hoped that this will reduce the treatment rates further. A total of 14 patients were recruited to the trial at NWH in 2014.

12.8.1 Post treatment follow up

Colposcopy Standard: Follow up after treatment		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Follow up visit no later than 8 months following treatment	>90	88	88	81	92	87	80
Denominator	All treatments							

This standard has slipped slightly, however 100% of women were offered an appointment within the time frame (including all of those who were seen after 8 months).

Table 119: Timing of follow up colposcopy (ACH) after treatments (2007-2010, 2012-2013)

	2007 N=191		2008 N=213		2009 N=199		2010 N=198		2012 N=133		2013 N=339	
	n	%	N	%	n	%	n	%	n	%	n	%
≤ 8 months	168	88	182	86	162	81	182	92	115	87	271	80
> 8 months	3	2	3	1	4	2	2	1	11	8	25	7
No follow up	20	11	28	13	33	17	14	7	7	5	43	13

Among the 43 women with no attendance at follow up, 22 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. In circumstances of serial non-attendance (six cases), a discharge letter was sent to the referrer and the patient recommending a repeat smear. Five patients had follow up through the Gynaecology Oncology service due to invasive disease. Two patients arranged follow up through the private sector, and a further two patients declined follow up. One patient is deceased from unrelated pathology. Four patients had a hysterectomy with recommendation on discharge for a vault smear in one year in Primary Care. In the remaining case, the indication for treatment (cone biopsy) was an endocervical smear abnormality and when there was no dysplasia on cone biopsy or uterine curettings the patient was discharged to Primary Care with a recommendation for a smear test in one year.

Colposcopy Standards: Dyskaryosis* after treatment		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Treated women with no dyskaryosis* following treatment	>90%	90	92	76	81†	81†	83†
Denominator	All treatments							

*HSIL or LSIL on cytology

† excludes ASCUS

Table 120: Cytology and histology findings post cervical treatment NWH 2013

	2013 treatments N=339	
	N	%
Cytology findings at post treatment follow up		
Normal	222	65.5
High grade	14	4.1
Low grade	45	13.3
Atypical glandular	1	0.3
Unsatisfactory	6	1.8
No cytology	8	2.4
None attendance	43	12.7
Histology findings at post treatment follow up		
No biopsy taken	259	76.4
High grade	3	0.9
Low grade	5	1.5
Dysplasia NOS	6	1.8
HPV	6	1.8
Inflammation	4	1.2
Normal	13	3.8
None attendance	43	12.7

The standard regarding no dyskaryosis in follow up smears after LLETZ treatment has remained constant, although is still outside of the standard.

There were fourteen patients who had high grade dysplasia on cytology at post-treatment followup.

Three smears were down-graded to normal or low grade at MDM. A further three patients had MDM discussions and the recommended followup colposcopies yielded normal or low grade

smears. Three patients underwent a repeat LLETZ, with all having subsequent normal post treatment cytology. Two patients elected to have hysterectomy for persistent high grade dysplasia, rather than a repeat LLETZ. Reassuringly, all five initial treatments were done by different practitioners (three consultants, two senior registrars), suggesting that each individual's outcomes probably fall within the standard.

In two cases, the persisting high grade dysplasia was in the vagina (VAIN), both had recurring vaginal lesions, one had a previous LLETZ with no dysplasia identified. This illustrates the importance of careful vaginoscopy where high grade dysplasia is suspected on smear but not identified at colposcopy.

In the remaining case, the patient moved overseas and followup has been recommended.

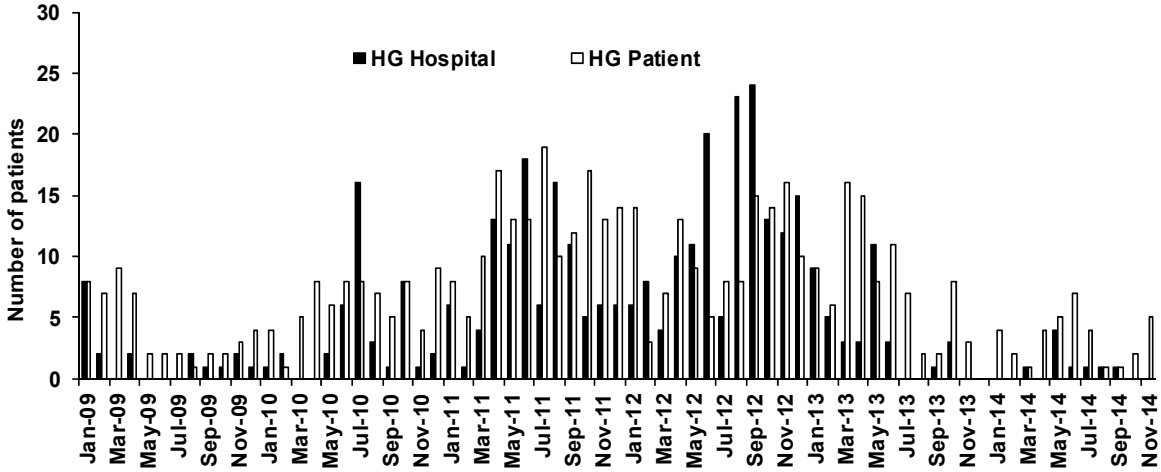
With respect to high grade or invasive histology post treatment, one patient had invasive disease on the treatment specimen and proceeded directly to hysterectomy, one patient had a repeat LLETZ and normal post treatment cytology after the second LLETZ and for one patient her cone biopsy treatment was during pregnancy and she proceeded to postpartum hysterectomy.

Colposcopy Standard: Primary haemorrhage after treatment		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Treated women who require treatment for primary haemorrhage	<5%	1	0.5	0	1.7	0.75	0.6
Denominator	All treatments							

Two cases of primary haemorrhage occurred in 2013, which is well within the target. Neither patient required return to theatre, with both having haemostasis achieved at colposcopy clinic but being transferred to ACH Grafton site for observation.

12.8.2 Waiting times for first appointment/DNA rates (Data from NSU monthly data reports) NWH 2009-2014

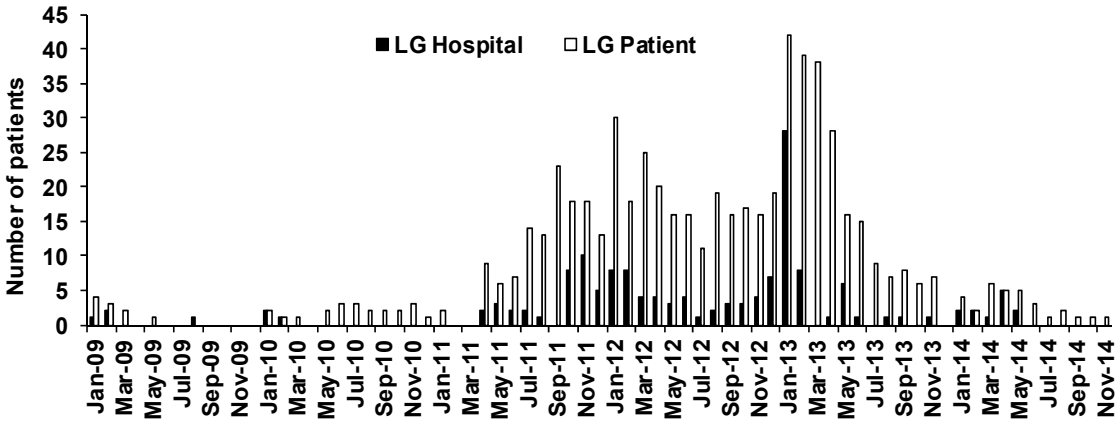
Figure 148: High grade referrals outside NSU Targets NWH 2009-2014: Hospital vs patient related delays



NSU National Screening Unit
HG high grade

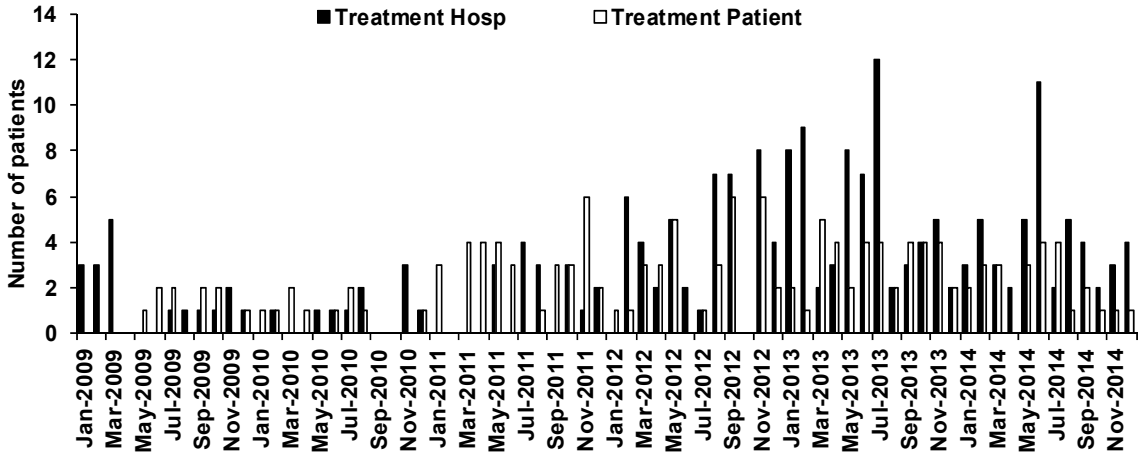
Waiting times for initial colposcopy continue to be within the standard, with the majority of delays being due to patient-related factors.

Figure 149: Low grade referrals outside NSU Targets NWH 2009-2014: Hospital vs patient related delays



NSU National Screening Unit
LG Low Grade

Figure 150: Treatments outside NSU Targets NWH 2009-2014: Hospital vs patient related delays



There are relatively large fluctuations in numbers of patients experiencing delay in treatment due to hospital factors. An audit regarding this is planned. It is hypothesised that this may be due to delays for patients not having treatments under local anaesthesia (and therefore waiting for a theatre list spot to be available).

Summary

Reasons for referral and patient demographics remain similar to 2013. We are yet to see a fall in referrals from HPV vaccination, however the number of women under 25 being treated for high grade dysplasia has fallen. This may in part be due to recruitment for the PRINCess trial.

Smoking status is still not being captured effectively and we continue to hope that the Solutions Plus upgrade will address this.

Many patients with the referral criteria of “abnormal cervix/bleeding, normal smear” were seen in General Gynaecology clinic as per the revised NCSP recommendations. Whilst data from those who were seen in Colposcopy clinic is reassuring, an audit of those seen in General Gynaecology clinic would be helpful to provide complete data.

The ‘no biopsy’ rate is declining, and audit of those cases where no biopsy was done has again shown appropriate clinical management.

Colposcopic prediction of high grade dysplasia is still below standard, and individual colposcopists are asked to audit their data as part of their CQUIP accreditation.

The ‘no dyskaryosis after treatment’ rate remains below standard, however the number of patients requiring a second treatment remains low and is not practitioner-dependant.

The number of women having a LLETZ under local anaesthesia remains outside of the standard and an audit of this has shown that ‘patient request’ is the most common reason. Whilst there are some women for whom this may be appropriate, clinicians need to ensure that all women requesting a general anaesthetic for a LLETZ are fully informed regarding this decision. Most women can and should be reassured that if they tolerated the initial colposcopy and biopsy then they are likely to tolerate a LLETZ quite adequately. Conversely, in only one case was a LLETZ commenced but unable to be completed under local anaesthesia, suggesting that clinician selection of cases for local anaesthesia is almost always appropriate.

Most women who have no follow up after treatment have moved area. All had adequate attempts at contacting the patient and their referrer. All patients were offered an appointment within an 8 month time frame.

The ‘primary haemorrhage’ after treatment rate remains very low, with conservative management being sufficient in both cases.

Waiting times for initial appointments are within the national standard. Treatment waiting times are highly variable and sometimes outside of the standard. An audit of the latter is planned.

Non-attendance rates remain stable, varying on a monthly basis between 6-14%.

12.9 Gynaecologic oncology surgical services

Findings

Table 121: Primary site of Gynaecologic Oncology cases, including MDM (Multidisciplinary meeting) reviewed cases and surgical cases NWH 2010-2014

	Total 2010 N=707		Total 2011 N=681		Total 2012 N=749		Total 2013 N=803		Total 2014 N=849	
	n	%	n	%	n	%	n	%	n	%
Primary site										
Ovary	194	27.4	204	30	185	24.7	229	28.5	246	29.0
Uterus	78	11	31	4.6	46	6.1	35	4.4	52	6.1
Endometrium	192	27.2	170	25	190	25.4	225	28.0	191	22.5
Cervix	81	11.5	83	12.2	114	15.2	97	12.1	91	10.7
Vulva	46	6.5	48	7.1	53	7.1	50	6.2	55	6.5
Placenta	116	16.4	57	8.4	70	9.4	55	6.8	89	10.5
Vagina			17	2.5	8	1.1	9	1.1	14	1.7
Fallopian tube			10	1.5	6	0.8	11	1.4	18	2.1
Mullerian			6	0.9	12	1.6	24	3.0	24	2.8
Prophylactic gynae			13	1.9	3	0.4	10	1.2	2*	0.1
Unknown			9	1.3	16	2.1	4	0.5	25	2.9
Non gynae cancer			31	4.6	40	5.3	54	6.7	42	5.0
Other/not			2	0.3	6	0.8	0		0	

*some included as ovary

These data are pulled from several different databases and therefore there are minor discrepancies, as some capture registrations, which differ from referrals. Also if referrals are not made using the official templates then not all data are captured. A single database would improve data entry and accuracy.

Table 122: ADHB Gynaecologic Oncology MDM: New referrals and MDM discussions 2007 – 2014

Year	2007	2008	2009	2010	2011	2012	2013	2014
New referrals	448*	494*	611	756	788	840	923	969
Total MDM discussions			1000	1348	1577	1700	1893	2075

* molar pregnancies not included

If all the databases are combined this gives a total of 969 patients, and 2075 individual MDM episodes, which is a 5% increase in referrals from the previous year and a 10% increase in MDM discussions, indicating the complexity of the patient referrals. The data in most of the clinical tables pertain to those patients with data in the gynaecology oncology clinical database.

The rise in ovarian numbers is partly explained by a change in referral pattern from Waikato in mid-2014. All high risk ovarian masses, with a risk of malignancy index of greater than 200, are now referred in, recognising that there is a potential survival advantage if this surgery is performed in a tertiary centre by a gynaecological oncologist.

Table 123: DHB of residence, age, and prioritised ethnicity by primary site among MDM reviewed cases NWH 2014

	Total N=849		Ovarian n=248		Endometrium /Uterus n=243		Cervix n=91		Vulva n=55		Other n=212	
	n	%	n	%	n	%	n	%	n	%	n	%
DHB												
Auckland	195	23.0	49	19.8	57	23.5	23	25.3	12	21.8	54	25.5
Counties	248	29.2	73	29.4	81	33.3	17	18.7	13	23.6	64	30.2
Waitemata	173	20.4	52	21.0	44	18.1	17	18.7	3	5.5	57	26.9
Northland	46	5.4	12	4.8	15	6.2	5	5.5	3	5.5	11	5.2
Bay of Plenty	65	7.7	22	8.9	22	9.1	10	11.0	4	7.3	7	3.3
Waikato	53	6.2	20	8.1	5	2.1	4	4.4	13	23.6	11	5.2
Other	66	7.8	19	7.7	19	7.8	15	16.5	5	9.1	8	3.8
Missing	3	0.4	1	0.4		0		0	2	3.6		0
Age (yrs)												
≤25	47	5.5	16	6.5	3	1.2	6	6.6	3	5.5	19	9.0
26-35	104	12.2	28	11.3	9	3.7	14	15.4	3	5.5	50	23.6
36-45	131	15.4	38	15.3	31	12.8	30	33.0	3	5.5	29	13.7
46-55	166	19.6	58	23.4	49	20.2	13	14.3	8	14.5	38	17.9
56-65	174	20.5	49	19.8	74	30.5	11	12.1	12	21.8	28	13.2
66-75	126	14.8	33	13.3	48	19.8	10	11.0	12	21.8	23	10.8
>75	99	11.7	25	10.1	29	11.9	7	7.7	13	23.6	25	11.8
missing	2	0.2	1	0.4	0		0		1	1.8	0	
Ethnicity												
NZ European	352	41.5	106	42.7	90	37.0	37	40.7	35	63.6	84	39.6
Maori	121	14.3	21	8.5	42	17.3	19	20.9	8	14.5	31	14.6
Pacific	145	17.1	49	19.8	57	23.5	10	11.0	1	1.8	28	13.2
Other Asian	82	9.7	31	12.5	13	5.3	11	12.1	2	3.6	25	11.8
Indian	28	3.3	5	2.0	8	3.3	2	2.2	0	0.0	13	6.1
Other European	89	10.5	26	10.5	21	8.6	9	9.9	8	14.5	25	11.8
Other/not stated	30	3.5	9	3.6	12	4.9	3	3.3	1	1.8	5	2.4
Missing	2	0.2	1	0.4	0		0		0		1	0.5

12.9.1 Reporting to Gynaecologic Oncology Key Performance Indicators (KPI)

Key Performance Indicators were agreed with regional service partners as part of the regional service provision project in 2007. The goals were set based on internal audit of current practice and specialist advice with regard to agreed best practice.

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, and so these KPIs are now outdated and will need to be revised in the next year. Given the timeframe of the new targets is much tighter than the existing KPIs, with current resources we are failing to meet these targets. This has been confirmed by data provided by the Northern Cancer Network and work is underway to address some of the underlying issues.

Table 124: Key Performance Indicator: Time from referral to first multidisciplinary meeting (MDM) or clinic (includes new referrals and referrals for new site or recurrence. Excludes referrals for molar pregnancy and consideration of prophylactic surgery).

Goal: 90% in less than 14 days. NWH 2008-2014

	2008 N=494		2009 N=497		2010 N=580		2011 N=563		2012 N=625		2013 N=708		2014 N=748	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<14 days	284	57.5	351	70.6	426	73.4	413	73.4	519	83.1	653	92.2	708	95.0
=14 days	21	4.3	28	5.6	34	5.9	30	5.3	39	6.2	17	2.4	6	0.8
>14 days	172	34.8	113	22.7	118	20.3	115	20.4	67	10.7	38	5.4	34	4.5
Missing data	17	3.4	5	1.0	2	0.3	1							
Deceased							4							

More than 95% of cases are discussed at MDM or seen in clinic within 2 weeks of referral, and this indicator has improved steadily year by year and meets the KPI.

Of the 35 outliers, 11 were delayed due to shutdown at Christmas, albeit by 2 days, but in light of the FCT targets, the Christmas period working practices need to be reconsidered.

Of the remainder, 7 had already been seen in another clinic e.g. Vulval/radiation oncology/private, 1 patient was on holiday and declined the appointment, 6 had been treated elsewhere and referred for a follow up appointment outside of the 2 week target, 3 had been referred for risk reducing or completion surgery as non-urgent, and these patients should be excluded from the analysis. Five patients do not appear to have a reason for missing the 2 week target.

This would mean that only 2% of patients did not have a timely appointment or MDM discussion. This is partly due to the final realisation of a single joint MDM, midway through 2014, which has allowed us to streamline processes to be as efficient as possible, and allows us to triage urgent cases to be seen in clinic within 24 hours of MDM discussion.

Table 125: Key Performance Indicator: Time from MDM or clinic to first surgery (new referrals of patients with malignancy who had surgery in 2014) Goal: 90% within 56 days. NWH 2008-2014

	2008 N=164		2009 N=233		2010 N=228		2011 N=173		2012 N=190		2013 N=213		2014 N=220	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
≤ 56 days	115	70	165	71	188	82	139	80.4	165	86.8	166	77.9	174	79.1
≤30 days									101	53.2	79	37.1	76	34.5
31-56 days									64	33.7	87	40.8	98	44.5
> 56 days	43	26	65	28	40	18	34	19.7	25	13.2	47	22.1	46	20.9
Missing data	6	4	3	1										

Surgical numbers of malignant cases are relatively stable; however the waiting time to get to surgery has increased. This is a reflection of the department working at capacity and extra surgical FTE is now required. The patients waiting >56 days remains stable and this probably relates to medical work up for complex preoperative patients, or cases electively deferred, such as completion, interval debulking or risk reducing surgeries.

The increasing co-morbidities, in particular the rising obesity rate, directly affects both anaesthetic and surgical time, thereby reducing our theatre capacity. This also increases the need for specialist medical input from other services in the pre-operative work up of patients, which can lead to delay in scheduling surgery.

Table 126: Time from MDM or clinic to first surgery (new referrals of patients with gynaecologic malignancy who had surgery in 2014) by primary site. NWH 2014

	Total	≤ 56 days		>56 days	
	n	n	%	n	%
Totals	**220**	**174**	**79.1**	**46**	**20.9**
Cervix	29	22	75.9	7	24.1
Endometrium/Uterus	80	67	83.8	13	16.3
Ovary	67	54	80.6	13	19.4
Vulva	16	12	75.0	4	25.0
Other	28	19	67.9	9	32.1

Other factors affecting the patients not meeting the timelines include patients initially refusing treatment, delay for fertility treatment prior to surgery or planned pre-operative chemotherapy or radiotherapy.

The FCT targets state that the timeline from decision to treat to first treatment, should be within 31 days and currently we are struggling to meet that. The data presented is MDM decision to surgery, whereas the Ministry of Health definition is the date the patient agrees to surgery (which is often a week or so after the MDM decision) and so this data is probably skewed against the target. However from the patient perspective we need to streamline the time between the MDM and patient decision as far as possible, but we also will need to change the way this data is collected for future reports.

The increase of the ovarian patients requiring surgery from Waikato has added to workload and adds weight to our business case for further SMO FTE in Gynae-oncology.

12.9.2 Gynaecologic oncology surgeries

This section describes the surgery and short term outcomes of women undergoing inpatient surgery in 2014 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.

Table 127: Ethnicity and cancer status of women undergoing gynaecologic oncology inpatient surgery NWH 2012-2014

	2012 N=406		2013 N=463		2014 N=431	
	n	%	n	%	n	%
Ethnicity						
NZ European	200	49.3	200	43.2	200	46.4
Maori	50	12.3	86	18.6	75	17.4
Pacific	64	15.8	62	13.4	62	14.4
Other Asian	30	7.4	32	6.9	35	8.1
Indian	13	3.2	23	5.0	9	2.1
Other European	44	10.8	55	11.9	45	10.4
Other	5	1.2	2	0.4	1	0.2
Not stated			3	0.6	4	0.9
Status at time of surgery						
Benign	15	3.7	21	4.5	17	3.9
Pre malignant	52	12.8	62	13.4	61	14.2
Malignant	229	56.4	275	59.4	260	60.3
Prophylactic	4	1	8	1.7	4	0.9
Unknown prior to surgery	106	26.1	97	21.0	89	20.7

Table 128: Debulking rates in ovarian malignancy NWH 2012 - 2014

	2012 N=52		2013 N=78		2014 N=80	
	n	%	n	%	n	%
Residual disease						
None	42	80	53	69	67	84
< 1cm	8	15	9	11	6	7.5
≥ 1cm	2	4	16	20	7	5
Bowel surgery						
Yes	6	12	11	14	11	13.8
No	44	85	67	86	67	84
NA	2	4	0	0	2	2.5

Surgical activity is at capacity for the current SMO workforce. Service workforce planning estimates that annual workload for one SMO is approximately 80 major oncology cases per year. In 2014 our average was 144 cases per SMO, although not all of these will be major cases, given that we are also responsible for the preinvasive service and 60 of the cases were premalignant, which would bring the average down to 124 cases. A business case has been developed to recruit more gynaecological oncologists.

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. Use of day stay for minor procedures and a separate brachytherapy list would improve the efficiency of the limited main theatre resource, but also requires additional personnel, as well as list space.

The optimal debulking rates have risen, although bowel resection rates have stayed stable, which reflects a more aggressive approach to interval debulking surgery, with more upper abdominal resections being performed. Whether this approach has correlated in increased survival is unknown, as we do not have the ability to collect long term outcome data, which is a major disappointment.

No patient needed to return to theatre and there were no perioperative deaths in 2014, which was the first year this has been achieved. There were no urological injuries and major vessel/viscus injury rate is approximately 1%. The febrile morbidity and wound infection rates continue to fall, despite the increase in BMI of patients. Changes in surgical technique may have contributed to this.

The transfusion rate remains stable, although the majority are not due to acute surgical blood loss and reflect the anaemia of disease. The overall complication rate has fallen this year, despite more radical surgery, which is reassuring. The readmission rate has also dropped, but this is likely to be under reported as two thirds of the patients are from outside of ADHB's catchment area and therefore likely to be readmitted locally after discharge. We have encouraged local units to inform us of complications and readmissions, although there is no robust system is place and resource is not available for collection of follow up data.

Table 129: Key Performance Indicator: Clinical outcomes among inpatient surgeries in malignant cases by gynaecologic oncology team 2008-2014. Goal: Comparative year to year data.

	2008 N=246*		2009 N=259*		2010 N=353*		2011 N=299*		2012 N=297*		2013 N=350*		2014 N=326*	
Complication	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Transfusion	19	8	30	12	40	11	32	11	35	12	37	11	35	11
Febrile morbidity	11	4	32	12	28	8	19	6	20	7	12	3	3	1
Wound infection	-		22	8	20	6	14	5	11	4	9	3	4	1
Thromboembolism	2	1	3	1	2	1	2	1	0	0	2	1	2	1
Cardiovascular	2	1	6	2	3	1	3	1	3	1	5	1	3	1
Gastro-intestinal	7	3	17	7	12	3	11	4	14	5	13	4	17	5
Urinary retention	-		12	5	12	3	8	3	11	4	13	4	17	5
Return to theatre within 6 wks	6	2	14	5	18	5	8	3	9	3	3	1	0	0
Readmission with complications within 6 weeks	17	7	25	10	24	7	15	5	26	9	21	6	12	4
Death	2	1	2	1	5	1	1	0	2	1	1	0	0	
Intraoperative complications*									21	7	23	7	19	6
>1000ml blood loss									12	4	12	3	14	4
Bowel injury									2	1	6	2	3	1
Bladder injury									1	0	1	0	0	0
Ureteric injury									2	1	1	0	0	
Anaesthetic problem									1	0	1	0	0	
Other									3	1	4	1	3	1

* Complications are not mutually exclusive; missing data are all assumed to be “no”

Summary/Implications

The major event in 2014 for the department was the establishment of a single combined MDM, which now has live teleconference links to referring clinicians in Northland, Waitemata, Middlemore, Waikato, Bay of Plenty, Lakes and Tairawhiti. This is the culmination of more than 5 years’ work towards this goal and is a significant achievement. Thanks to all the members of the departments who rearranged many timetables for this to be possible.

The development of teams at each of the referring DHBs, with single point of contact in the form of Unit Leads, has streamlined referral processes and improved communication and engagement. This has directly led to faster better coordination and informed care for patients. Dr Keith Allenby and Dr Anand Gangji, Unit Leads at Middlemore and Whangarei, in particular, deserve mention for their level of involvement in making this process successful, with excellent support from their Clinical Nurse Specialist (CNS) colleagues and taking the lead within their own Units to improve pathways.

Funding was secured in 2013 from the Ministry of Health for a project to map the pathways across the 8 DHBs accessing regional Gynae oncology services at Auckland Hospital. This project commenced in the last quarter of 2014 and is due to report in July 2015. This will identify bottlenecks along the patient journey and allow improved service planning. A second part of the project will explore the need for a centralised database, which will allow direct electronic access and streamline workflow, as well as enabling collection of short and long term follow up data.

Work on the Faster Cancer Treatment pathways has been achieved by good cooperation with our colleagues at the referring DHBs and is leading to more streamlined care. Cancer care coordinators are instrumental in this process and are present in most DHBs, but sadly still lacking within gynaecology at ADHB. It is important to distinguish between the tertiary level regional Gynae-Oncology service which we provide, and the access and service for patients with high suspicion of cancer or a confirmed diagnosis within the secondary general gynaecology service for ADHB patients.

Achieving the 62 day target is challenging for gynaecological cancers as there are different pathways for the different primary tumour sites and these pathways have complex interactions between secondary and tertiary services. Development of rapid access clinics and robust primary

and secondary care pathways improve our chance of meeting Ministry targets, as if the time to diagnosis is reduced, then sufficient time is available for treatment planning and delivery. Members of the MDM have collaborated with the Northern Cancer network for their Regional Review of Standards and the Network report is expected in 2015.

As in previous years, Pathology remains a significant high risk area and with the increasing workload year by year; this situation is not going to resolve and needs to be addressed. Pathology review is the cornerstone of the MDM and delays will impact on our ability to meet the 62 day target and delay in reporting of operative specimens can impact timing of adjuvant therapy.

The Ministry decision on Service Configuration has been delayed, but it is likely that ADHB will continue to provide services for the upper North Island for the foreseeable future, with increasing workload from Waikato referrals and expansion within the department is underway, with the business case made for further SMO and CNS FTE, with the intention of becoming a College Gynaecologic Oncology training centre within a few years. The department has a single nurse specialist, who is beyond capacity, and urgent expansion of the nursing workforce is needed. Recent New Zealand Gynaecologic Cancer Group (NZGCG) follow up guidelines have included the use of nurse led follow up clinics and survivorship programmes, which sadly we are not in a position to implement, but is absolutely something that we should aspire to.

The numbers of oncology patients within this chapter does not take into account the total workload of the Gynaecologic Oncology department, as pre-invasive referrals seen in the vulval and colposcopy clinics are not included, nor are molar pregnancies and genetic referrals, which account for approximately 100 first specialist appointments (FSA) per year.

The department needs to undergo expansion to meet demand. It is hoped a new SMO will be appointed in 2015, and we had one trainee accepted in 2014 for subspecialty training in Australia, which is a vital step for succession planning for the department. However there is still a risk of losing trainees overseas and we need to be able to train our own.

Increased FTE will allow us to develop the academic side of the department and advance surgical techniques and training, in order to provide a sustainable modern oncological surgical service, which hopefully will improve outcomes for our patients.

The department is currently participating in the PRINCESS study of conservative management of CIN2 and the ANZGOG study of sentinel nodes in vulval cancer.

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 2014 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 2014.

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 - 2014 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 2014 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

Gynaecologic 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 (1) an ACCESS database recording gynaecologic oncology referrals; (2) an EXCEL spreadsheet of the oncology surgical waiting list; and (3) 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 STATA9. 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 a 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 $\geq$ 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. SUMMARY STATISTICS

Maternity and Neonatal Summary statistics

Table 130: Mother and baby numbers: NWH 2014

Total number of mothers birthing at National Women's	7353
Mothers birthing before arrival (BBA)	47
Total number of mothers	**7400**
Total number of babies born at National Women's	7504
Babies born before arrival (BBA)	47
Total number of babies	**7551**

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 131: Contribution of multiple births to mother and baby numbers: NWH 2014

		Mothers	Babies
National Women's births	Singletons	7253	7253
	Twins	143	286
	Triplets	4	12
Totals (not including BBA)			
BBA	Singletons	47	47
	Twins	0	0
	Triplets	0	0
Totals (including BBA)		**7400**	**7551**

Table 132: Mode of onset of birth NWH 2014

	Birthing Mothers n=7400	
	n	%
Spontaneous onset of labour	3523	47.6
Iatrogenic onset of birth	3877	52.4
CS Elective	1281	17.3
Emergency CS before onset of labour	281	3.8
Induction of labour	2315	31.3

Table 133: Mode of birth by parity NWH 2014

	Birthing Mothers n=7400		Nullipara n=3604		Multipara n=3796	
	n	%	n	%	n	%
Spontaneous Vertex Birth	3928	53.1	1578	43.8	2350	61.9
Vaginal Breech Birth	64	0.9	25	0.7	39	1.0
Operative Vaginal Birth	849	11.5	712	19.8	137	3.6
Forceps	319	4.3	267	7.4	52	1.4
Ventouse	530	7.2	445	12.3	85	2.2
Caesarean Section	2559	34.6	1289	35.8	1270	33.5
CS Elective	1281	17.3	379	10.5	902	23.8
CS Emergency	1278	17.3	910	25.2	368	9.7

Table 134: Neonatal outcomes among babies born at NWH in 2014

	Babies born n=7551	
	n	%
Gender		
Male	3902	51.7
Female	3649	48.3
Preterm birth		
20-27 weeks	109	1.4
28-31 weeks	96	1.3
32-36 weeks	554	7.3
Term birth		
37-41 weeks	6718	89.0
42+ weeks	74	1.0
SGA (by Customised Centile)		
Preterm	265	3.5
Term	807	10.7
Admission to NICU		
Preterm	412	5.5
Term	400	5.3
	Live births	
Apgar at 5 min <7	**n**	**%**
Preterm	55	0.7
Term	74	1.0
	Live births excluding admissions to NICU	
Infant Feeding at discharge from NW facility	**n**	**%**
Exclusive breastfeeding	5175	77.7
Fully breastfeeding	312	4.7
Partial breastfeeding	1056	15.9
Artificial feeding	113	1.7

Table 135: Perinatal related mortality NWH 2014

	Babies N	n	Rate
Fetal deaths	7551	60	7.9/1000 births
Early neonatal deaths	7491	28	3.7/1000 live births
Late neonatal deaths	7491	9	1.2/1000 live births
Neonatal death	7491	37	4.9/1000 live births
Perinatal deaths (fetal & early neonatal)	7551	88	11.7/1000 births
Perinatal related deaths (fetal & all neonatal)	7551	97	12.8/1000 births

Table 136: Maternal postpartum outcomes NWH 2014

	Birthing mothers	n	%
PPH ≥1000mls	7400	746	10.1
SVB	3928	292	7.3
Instrumental vaginal birth	849	108	12.7
Caesarean section	2559	346	13.5
Episiotomy among vaginal births	4841	1371	28.3
Third/ fourth degree tears among vaginal births	4841	139	2.9
Postpartum blood transfusions	7400	172	2.3

Table 137: Numbers of mothers and babies 2005-2014

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Mothers	7194	7212	7695	7589	7735	7709	7523	7695	7223	7400
Babies	7384	7379	7875	7753	7897	7866	7690	7863	7377	7551

Table 138: Mode of birth NWH 1998-2014

	Total births	Spontaneous vertex birth		Vaginal breech		Operative vaginal		Caesarean section	
Year	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**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

Table 139: Term births by gestation NWH 2005-2014

Gestation	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
37 wks	616	616	628	648	638	630	626	616	608	643
38 wks	1216	1291	1405	1488	1565	1546	1539	1536	1550	1595
39 wks	1794	1817	1847	1802	1965	1983	2078	2172	2055	2078
40 wks	1811	1699	1841	1827	1813	1810	1664	1744	1575	1585
41 wks	971	958	1083	943	992	977	864	877	754	818
>=42 wks	170	162	167	182	150	133	132	98	61	73

NWH Staffing

Table 140: Number of staff and total FTE by occupational group (National Women's Health)

Occupational Group	Staff members	Total FTE
Administration	51	38.7
Allied Health	16	9.7
Nursing	134	113.9
Registered medical officer	39	37.0
Senior medical officer	57	35.3
Technical	9	6.6
Midwifery	157	115.1
Total	**463**	**356.3**

Table 141: Ethnicity of NWH staff by occupational group

	Total Staff	Māori		Pacific		European		Asian		Other		Not Stated	
Occupational		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Administration	51			7	13.7	24	47.1	11	21.6	6	11.8	3	5.9
Allied Health	16	1	6.3			11	68.8	3	18.8			1	6.3
Nursing	134	9	6.7	14	10.5	59	44.0	31	23.1	5	3.7	16	11.9
Midwifery	157	4	2.6	3	1.9	114	72.6	16	10.2	2	1.3	18	11.5
RMO	39			3	7.7	19	48.7	11	28.2	1	2.6	5	12.8
SMO	57	1	1.8			29	50.9	5	8.8	2	3.5	20	35.1
Technical	9					6	66.7	1	11.1			2	22.2
Total	**463**	**15**	**3.2**	**27**	**5.8**	**262**	**56.6**	**78**	**16.9**	**16**	**3.5**	**65**	**14.0**

Table 142: 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	37	3	8	4	11	2	5	10	27	7	19	8	22	3	8
Allied Health	12	1	8	3	25	2	17	2	17	2	17	2	17		
Midwifery	149	19	13	35	24	27	18	24	16	19	13	17	11	8	5
Nursing	125	3	2	15	12	11	9	34	27	33	26	17	14	12	10
SMO	49	4	8	3	6	6	12	12	25	8	16	13	27	3	6
Technical	8	2	25			2	25	1	13	2	25	1	13		
Total	380	32	8	60	16	50	13	83	22	71	19	58	15	26	7

Table 143: Number of staff and total FTE by occupational group (NICU)

Occupational Group	Staff members	Total FTE
Administration	7	4.2
Nursing	136	109.8
Registered medical officer	8	8.0
Senior medical officer	11	0.6
Allied Health	2	0.6
Total	164	130.9

Table 144: 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	1	14	2	29			2	29			1	14	1	14
Allied Health	2					1		1							
Nursing	130	9	7	20	15	14	11	32	25	15	12	30	23	10	8
SMO	5					2		1		1				1	
Total	144	10	7	22	15	17	12	36	25	16	11	31	22	12	8

Table 145: Ethnicity of NICU staff by occupational group

	Total Staff	Māori		Pacific		European		Asian		Other		Not Stated	
Occupational Group		n	%	n	%	n	%	n	%	n	%	n	%
Administration	7					5	5	2	6				
Nursing	136	1	50	3	75	72	79	30	88	3	100	27	90
Registered medical officer	8					7	8					1	3
Senior medical officer	11			1	25	6	7	2	6			2	7
Allied Health	2	1	50			1	1						
Total	164	2		4		91		34		3		30	

APPENDIX 3. MATERNAL DEMOGRAPHY

Table 146: DHB of domicile of mothers giving birth at National Women's 2005-2014

	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	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
North	93	1.3	69	1.0	73	0.9	71	0.9	79	1.0	64	0.8
South	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	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	5176	68.8	5302	68.9	4937	68.4	4979	67.3
Waitemata	1220	16.2	1126	14.6	1057	14.6	1070	14.5
Counties	1009	13.4	1113	14.5	1079	14.9	1208	16.3
Northland	40	0.5	39	0.5	38	0.5	38	0.5
North Island	52	0.7	91	1.2	88	1.2	76	1.0
South Island	18	0.2	14	0.2	13	0.2	15	0.2
Overseas	6	0.1	10	0.1	11	0.2	14	0.2

*2 Women of unknown DHB

Table 147: Maternal age distribution NWH 2000-2014

		≤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

Table 148: Maternal age and parity NWH 2014

	Total		**<=20 yrs**		**21-25 yrs**		**26-30 yrs**		**31-35 yrs**		**36-40 yrs**		**>40 yrs**	
	N=7400		**n=**	**227**	**n=**	**783**	**n=**	**189**	**n=**	**282**	**n=**	**139**	**n=**	**285**
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Nullipara	36	48.7	18	82.	46	59.	109	57.7	132	47.0	43	31.6	91	31.
Multipara	37	51.3	39	17.	31	40.	800	42.3	149	53.0	95	68.4	19	68.

Table 149: Time trends in nulliparity and multiparity NWH 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of	7194	7212	7695	7589	7735	7709	7523	7695	7223	7400
Nullipara	3522	3499	3752	3623	3811	3650	3539	3778	3441	3604
%	49.0	48.5	48.8	47.7	49.3	47.3	47.0	49.1	47.6	48.7
Multipara	3672	3713	3943	3966	3924	4059	3984	3917	3782	3796
%	51.0	51.5	51.2	52.3	50.7	52.7	52.9	50.9	52.4	51.3

*Does not include 39 BBA's

Table 150: Prioritised ethnicity of women giving birth at National Women's 2014 (for information on assigning ethnicity and prioritising ethnicity, see Appendix 12)

	2014 n=7400	
	n	%
New Zealand European	2421	32.7
Chinese	1146	15.5
Other European	746	10.1
Māori	483	6.5
Indian	643	8.7
Samoan	298	4.0
Tongan	304	4.1
Other Asian	414	5.6
Southeast Asian	217	2.9
European NFD	106	1.4
Middle Eastern	131	1.8
Cook Island Māori	117	1.6
African	70	0.9
Niuean	76	1.0
Asian NFD	65	0.9
Fijian	60	0.8
Latin American	68	0.9
Other Pacific Peoples	18	0.2
Tokelauan	5	0.1
Other Ethnicity	12	0.2

Table 151: Maternal ethnicity and age NWH 2014

	Total	NZ		Māori		Pacific		Other		Indian		Other		Other	
Age	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	7400	2421	32.7	483	6.5	878	11.9	1842	24.9	643	8.7	852	11.5	281	3.8
<=20	227	37	16.3	66	29.1	96	42.3	10	4.4	3	1.3	6	2.6	9	4.0
21-25	783	119	15.2	121	15.5	238	30.4	171	21.8	64	8.2	33	4.2	37	4.7
26-30	1891	497	26.3	113	6.0	226	12.0	582	30.8	255	13.5	127	6.7	91	4.8
31-35	2824	1021	36.2	105	3.7	174	6.2	794	28.1	249	8.8	391	13.8	90	3.2
36-40	1390	623	44.8	58	4.2	116	8.3	237	17.1	67	4.8	242	17.4	47	3.4
>40	285	124	43.5	20	7.0	28	9.8	48	16.8	5	1.8	53	18.6	7	2.5

Table 152: Maternal ethnicity and parity NW 2014

		NZ European		Māori		Pacific		Other Asian		Indian		Other European		Other	
		n=2421		n=483		n=878		n=1842		n=643		n=852		n=281	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Nullipara	3604	1193	49.3	181	37.5	294	33.5	978	53.1	383	59.6	440	51.6	135	48.0
Multipara	3796	1228	50.7	302	62.5	584	66.5	864	46.9	260	40.4	412	48.4	146	52.0

Table 153: Ethnicity of women birthing at NWH 2007-2014

	2007 n=7695		2008 n=7589		2009 n=7735		2010 n=7709		2011 n=7523		2012 n=7695		2013 n=7223		2014 n=7400	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
NZ European	3161	41.1	2995	39.5	2967	38.4	2898	37.6	2712	36.0	2696	35.0	2548	35.3	2421	32.7
Other European	695	9.0	713	9.4	707	9.1	856	11.1	851	11.3	847	11.0	776	10.7	852	11.5
Māori	641	8.3	641	8.4	670	8.7	579	7.5	597	7.9	534	6.9	532	7.4	483	6.5
Niuean	105	1.4	111	1.5	94	1.2	96	1.2	95	1.3	74	1.0	82	1.1	76	1.0
Cook Islander	157	2.0	137	1.8	135	1.7	112	1.5	112	1.5	123	1.6	105	1.5	117	1.6
Samoan	372	4.8	433	5.7	400	5.2	422	5.5	380	5.1	368	4.8	319	4.4	298	4.0
Tongan	347	4.5	349	4.6	394	5.1	378	4.9	342	4.5	346	4.5	312	4.3	304	4.1
Fijian	81	1.1	58	0.8	57	0.7	46	0.6	59	0.8	73	0.9	51	0.7	60	0.8
Other Pacific Islands	38	0.5	44	0.6	35	0.5	34	0.4	29	0.4	39	0.5	35	0.5	23	0.3
Chinese	881	11.4	874	11.5	995	12.9	950	12.3	984	13.1	1171	15.2	962	13.3	1146	15.5
Indian	521	6.8	505	6.7	520	6.7	539	7.0	548	7.3	553	7.2	620	8.6	643	8.7
Other Asian	473	6.1	478	6.3	440	5.7	526	6.8	545	7.2	588	7.6	614	8.5	696	9.4
Other	223	2.9	251	3.3	321	4.1	273	3.5	269	3.6	283	3.7	267	3.7	281	3.8

Table 154: Smoking status at booking by prioritised ethnicity and maternal age NWH 2014

		Smoking at booking		Not currently smoking	
	N	n	%	n	%
Total	**7400**	**375**	**5.1**	**7022**	**94.9**
Ethnicity					
NZ European	2421	74	3.1	2346	96.9
Māori	483	148	30.8	334	69.0
Pacific	878	125	14.2	752	85.7
Asian	1842	7	0.4	1835	99.6
Indian	643	4	0.6	639	99.4
Other European	852	13	1.5	839	98.5
Other	281	4	1.4	277	98.6
Age					
<=20	227	55	24.2	172	75.8
21-25	783	90	11.5	691	88.3
26-30	1891	103	5.4	1788	94.6
31-35	2824	77	2.7	2746	97.2
>=36	1675	50	3.0	1625	97.0

Missing data (n=3)

Table 155: Smoking status at booking by LMC at birth NWH 2014

	Independent midwife n=3561		Private Obstetrician n=1843		GP n=20		NWH Community n=1408		NWH High Risk n=495		Other DHB n=36	
	n	%	n	%	n	%	n	%	n	%	n	%
Smoking at booking	119	3.3	2	0.1	0		186	13.2	48	9.7	6	16.7
Not smoking	3441	96.6	1840	99.8	20	100	1222	86.8	0		30	83.3
Missing data	1	0	1	0.1	0		0	0.0	447	90.3	0	

NWH High Risk includes women booked under the Diabetes and Medical teams.

Table 156: BMI >25 by deprivation quintile and prioritised maternal ethnicity NWH 2014

	All ethnicities			European*			Māori			Pacific		
Dep quintile	Total	BMI>25		Total	BMI>25		Total	BMI>25		Total	BMI>25	
	N	n	%	N	n	%	N	n	%	N	n	%
1	1314	362	27.5	819	235	28.7	30	10	33.3	35	24	68.6
2	1413	415	29.4	790	208	26.3	56	32	57.1	71	57	80.3
3	1540	513	33.3	676	191	28.3	80	46	57.5	126	106	84.1
4	1606	712	44.3	625	244	39.0	117	80	68.4	220	186	84.5
5	1513	790	52.2	358	131	36.6	198	144	72.7	418	355	84.9
Missing*	14	5	35.7	3	0	0.0	0	0	0.0	7	4	57.1
Total	**7400**	**2797**	**37.8**	**3271**	**1009**	**30.8**	**481**	**312**	**64.9**	**877**	**732**	**83.5**

	Other Asian			Indian		
Dep quintile	Total	BMI>25		Total	BMI>25	
	N	n	%	N	n	%
1	349	58	16.6	49	22	44.9
2	350	67	19.1	96	33	34.4
3	430	76	17.7	169	68	40.2
4	387	86	22.2	194	87	44.8
5	322	78	24.2	134	50	37.3
Missing*	4	1	25.0	0	0	0.0
Total	**1842**	**366**	**19.9**	**642**	**260**	**40.5**

* Includes NZ European and Other European
*Missing quintiles had addresses overseas

Table 157: Deprivation Quintile (NZ Dep06) by prioritised maternal ethnicity NWH 2014

	NZ European		Other European		Māori		Pacific		Other Asian		Indian		Other	
	n=2421		n=852		N=483		n=878		n=1842		n=643		n=281	
Quintile	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	581	24.0	239	28.1	30	6.2	35	3.3	349	18.9	49	7.6	31	11.0
2	595	24.6	196	23.0	56	11.6	71	8.1	350	19.0	96	14.9	49	17.4
3	504	20.8	172	20.2	80	16.6	126	14.4	430	23.3	169	26.3	59	21.0
4	479	19.8	146	17.1	117	24.2	221	25.2	387	21.0	195	30.3	61	21.7
5	260	10.7	98	11.5	200	41.4	418	47.6	322	17.5	134	20.8	81	28.8
Missing*	2		1		0		7		4		0		0	

*Missing quintiles had addresses overseas

Table 158: Smoking and socio economic deprivation (NZ Dep06) NWH 2014

Deprivation decile	Total	Smoking at booking	
	7400	**n=**	**375**
	N	**n**	**%**
1	520	7	1.3
2	794	13	1.6
3	809	17	2.1
4	604	21	3.5
5	679	14	2.1
6	861	35	4.1
7	746	34	4.6
8	860	58	6.7
9	603	44	7.3
10	910	132	14.5
Missing*	14	0	0.0

* These women lived overseas

Table 159: Deprivation Quintile (NZ Dep06) and maternal age NWH 2014

	<=20		21-25		26-30		31-35		36-40		>40	
	n=227		n=783		n=1891		n=2824		n=1390		n=285	
Deprivation quintile	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
1	10	4.4	59	7.5	280	14.8	546	19.3	343	24.7	76	26.7
2	14	6.2	90	11.5	350	18.5	609	21.6	283	20.4	67	23.5
3	39	17.2	147	18.8	411	21.7	593	21.0	296	21.3	54	18.9
4	51	22.5	189	24.1	416	22.0	631	22.3	269	19.4	50	17.5
5	113	49.8	296	37.8	430	22.7	440	15.6	197	14.2	37	13.0
Missing*	0	0.0	2	0.3	4	0.2	5	0.2	2	0.1	1	0.4

* These women lived overseas

Table 160: Deprivation decile (NZ Dep 06) by LMC NWH 2014

Deprivation decile	Independent Midwife		Private Obstetrician		General Practitioner		NWH Community		NWH Diabetes		NWH Medical		Other DHB		Unbooked	
	n=3561		n=1843		n=20		n=1408		n=214		n=281		n=36		n=37	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
1	186	5.2	258	14.0	1	5.0	53	3.8	9	4.2	11	3.9	2	5.6	0	2.7
2	347	9.7	334	18.1	2	10.0	63	4.5	13	6.1	29	10.3	5	13.9	1	2.7
3	383	10.8	288	15.6	4	20.0	95	6.7	15	7.0	23	8.2	1	2.8	0	0
4	277	7.8	198	10.7	2	10.0	90	6.4	11	5.1	23	8.2	1	2.8	2	5.4
5	358	10.1	193	10.5	2	10.0	78	5.5	18	8.4	26	9.3	4	11.1	0	0.0
6	444	12.5	167	9.1	6	30.0	168	11.9	31	14.5	32	11.4	4	11.1	9	24.3
7	413	11.6	152	8.2	0	0.0	128	9.1	23	10.7	29	10.3	0	0.0	1	2.7
8	448	12.6	105	5.7	1	5.0	213	15.1	41	19.2	40	14.2	6	16.7	6	16.2
9	305	8.6	75	4.1	1	5.0	165	11.7	21	9.8	25	8.9	8	22.2	3	8.1
10	397	11.1	70	3.8	1	5.0	354	25.1	32	15.0	38	13.5	5	13.9	13	35.1
Missing*	3		3				1				5				2	

* These women lived overseas

Table 161: LMC at birth NWH 2007-2014

	2007 n=7695		2008 n=7589		2009 n=7735		2010 n=7709		2011 n=7523		2012 n=7695		2013 n=7223		2014 n=7400	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
IMW	2923	38.0	3150	41.5	3422	44.2	3552	46.1	3522	46.8	3654	47.5	3446	47.7	3561	48.1
Pvt Obst	1830	23.8	1759	23.2	1718	22.2	1734	22.5	1672	22.2	1823	23.7	1862	25.8	1843	24.9
GP	137	1.8	128	1.7	115	1.5	94	1.2	56	0.7	45	0.6	17	0.2	20	0.3
NW Community	2035	26.4	1734	22.8	1702	22.0	1505	19.5	1387	18.4	1447	18.8	1336	18.5	1408	19.0
NW Diabetes	235	3.1	293	3.9	304	3.9	325	4.2	422	5.6	280	3.6	201	2.8	214	2.9
NW MFM	378	4.9	389	5.1	377	4.9	379	4.9	377	5.0	354	4.6	300	4.2	281	3.8
Other DHB	106	1.4	86	1.1	39	0.5	63	0.8	50	0.7	42	0.5	33	0.5	36	0.5
Unbooked	51	0.7	50	0.7	58	0.7	57	0.7	37	0.5	50	0.6	28	0.4	37	0.5

Table 162: LMC at birth and maternal age NWH 2014

	Total	<=20		21-25		26-30		31-35		36-40		>40	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	7400	227	3.1	783	10.6	1891	25.6	2824	38.2	1390	18.8	285	3.9
Independent Midwife	3561	75	2.1	404	11.3	1012	28.4	1450	40.7	553	15.5	67	1.9
Private Obstetrician	1843	1	0.1	33	1.8	356	19.3	792	43.0	524	28.4	137	7.4
General Practitioner	20	0	0.0	2	10.0	3	15.0	10	50.0	4	20.0	1	5.0
NW Community	1408	120	8.5	277	19.7	384	27.3	374	26.6	206	14.6	47	3.3
NW Diabetes	214	5	2.3	18	8.4	54	25.2	79	36.9	49	22.9	9	4.2
NW MFM	281	17	6.0	32	11.4	62	22.1	104	37.0	44	15.7	22	7.8
Other DHB	36	6	16.7	5	13.9	10	27.8	10	27.8	4	11.1	1	2.8
Unbooked	37	3	8.1	12	32.4	10	27.0	5	13.5	6	16.2	1	2.7

Table 163: LMC at birth and parity NWH 2014

	Total	Nullipara		Multipara	
	N	n	%	n	%
Total	7400	3604	48.7	3796	51.3
Independent Midwife	3561	1803	50.6	1758	49.4
Private Obstetrician	1843	965	52.4	878	47.6
General Practitioner	20	5	25.0	15	75.0
NW Community	1408	589	41.8	819	58.2
NW Diabetes	214	90	42.1	124	57.9
NW MFM	281	118	42.0	163	58.0
Other DHB	36	17	47.2	19	52.8
Unbooked	37	17	45.9	20	54.1

Table 164: LMC at birth and prioritised maternal ethnicity NWH 2014

	Total	NZ European		Māori		Pacific		Other Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7380	2421	32.8	483	6.5	875	11.9	1827	24.8	642	8.7	851	11.5	281	3.8
Independent Midwife	3561	1088	30.6	213	6.0	335	9.4	1048	29.4	316	8.9	444	12.5	117	3.3
Private Obstetrician	1843	999	54.2	36	2.0	19	1.0	413	22.4	82	4.4	253	13.7	41	2.2
General Practitioner	20	0		0		3	15.0	15	75.0	1	5.0	1	5.0	0	
NW Community	1408	190	13.5	151	10.7	389	27.6	294	20.9	180	12.8	99	7.0	105	7.5
NW Diabetes	214	33	15.4	23	10.7	54	25.2	40	18.7	44	20.6	12	5.6	8	3.7
NW MFM	281	95	33.8	36	12.8	57	20.3	29	10.3	18	6.4	39	13.9	7	2.5
Other DHB	36	14	38.9	10	27.8	5	13.9	2	5.6	1	2.8	4	11.1	0	0.0
Unbooked	37	2	5.4	14	37.8	16	43.2	1	2.7	1	2.7	0	0.0	3	8.1

Table 165: Demographic characteristics of standard and non-standard primipara NWH 2014

	Total primipara	Standard primipara		Non-standard primipara	
	N	n	%	n	%
Total	**3604**	**1261**	**35.0**	**2343**	**65.0**
Age					
<=20	188	26	13.8	162	86.2
21-25	467	229	49.0	238	51.0
26-30	1091	519	47.6	572	52.4
31-35	1328	487	36.7	841	63.3
36-40	439	0		439	100
>40	91	0		91	100
Ethnicity (prioritised)					
NZ European	1193	343	28.8	850	71.2
Māori	181	47	26.0	134	74.0
Pacific	294	93	31.6	201	68.4
Asian	978	450	46.0	528	54.0
Indian	383	155	40.5	228	59.5
Other European	440	122	27.7	318	72.3
Other	135	51	37.8	84	62.2
LMC at Birth					
Independent Midwife	1803	694	38.5	1109	61.5
Private Obstetrician	965	321	33.3	644	66.7
General Practitioner	5	2	40.0	3	60.0
NWH Community	589	220	37.4	369	62.6
NWH Diabetes	90	0	0.0	90	100
NWH MFM	118	17	14.4	101	85.6
Other DHB	17	2	11.8	15	88.2
Unbooked	17	5	29.4	12	70.6
Smoking					
Smoking at booking	124	29	23.4	95	76.6
No or not smoking in last month	3479	1231	35.4	2248	64.6
Missing	1	1	100	0	

APPENDIX 4. ANTENATAL COMPLICATIONS

4.1 Preterm birth

Table 166: Preterm birth and maternal demographic characteristics NWH 2014

	Total	Total preterm		Iatrogenic		Spontaneous	
	N	n	%	n	%	n	%
Total	7400	647	8.7	381	5.1	266	3.6
Age							
<=20	227	28	12.3	12	5.3	16	7.0
21-25	783	70	8.9	39	5.0	31	4.0
26-30	1891	153	8.1	77	4.1	76	4.0
31-35	2824	232	8.2	147	5.2	85	3.0
36-40	1390	124	8.9	74	5.3	50	3.6
41+	285	40	14.0	32	11.2	8	2.8
Ethnicity							
NZ European	2419	212	8.8	138	5.7	74	3.1
Māori	481	70	14.6	40	8.3	30	6.2
Pacific	877	82	9.4	46	5.2	36	4.1
Asian	1842	128	6.9	58	3.1	70	3.8
Indian	642	66	10.3	42	6.5	24	3.7
Other European	852	72	8.5	47	5.5	25	2.9
Other	279	15	5.4	10	3.6	5	1.8
Parity							
Nulliparous	3604	345	9.6	198	5.5	147	4.1
Multiparous	3796	302	8.0	183	4.8	119	3.1
Plurality							
Singleton	7253	539	7.4	295	4.1	244	3.4
Twins	143	104	72.7	83	58.0	21	14.7
Triplets	4	4	100.0	3	75.0	1	25.0
Smoking at booking							
Currently smoking	375	51	13.6	26	6.9	25	6.7
No or not in past month	7022	596	8.5	355	5.1	241	3.4
Unknown	0	0		0		0	
BMI							
<18.5	313	18	5.8	10	3.2	8	2.6
18.5-24.99	4106	328	8.0	184	4.5	144	3.5
25-29.99	1565	137	8.8	84	5.4	53	3.4
30-34.99	696	73	10.5	42	6.0	31	4.5
35-39.99	357	38	10.6	29	8.1	9	2.5
>=40	234	21	9.0	12	5.1	9	3.8
Missing	129	32	24.8	20	15.5	12	9.3
Deprivation quintile (NZ Dep 06)							
1	1314	117	8.9	70	5.3	47	3.6
2	1413	130	9.2	79	5.6	51	3.6
3	1540	118	7.7	73	4.7	45	2.9
4	1606	134	8.3	79	4.9	55	3.4
5	1513	144	9.5	78	5.2	66	4.4

4.2 Diabetes

Table 167: Women with diabetes birthing at NWH at or beyond 20 weeks gestation 1993-2014

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Type I	19	12	19	15	14	21	26	22	26	21	20
Type 2	21	26	32	35	22	23	28	32	37	49	40
GDM	197	160	221	245	247	221	181	186	161	251	352
Total	237	198	272	295	283	265	235	240	224	321	412
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Type I	25	31	33	26	31	47	30	33	40	29	42
Type 2	47	52	57	54	63	71	55	70	64	69	86
GDM	343	304	286	331	457	480	545	821	662	613	725
Total	415	387	376	411	551	598	630	924	766	711	853

Table 168: Perinatal deaths (1995 – 2014) among births complicated by diabetes

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total number of perinatal related losses	3	6	3	6	1	2	2	3	6	0	2
Perinatal related loss rate /1000	11	20	11	21	4	8	9	9	9	0	5
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**		
Total number of perinatal related losses	8	9	1	4	10	5	10	6	9		
Perinatal related loss rate /1000	21	22	2	7	16	5	13	16	11		

Table 3: Demographic characteristics of women with diabetes NWH 2014

		Type 1		Type 2		GDM		No Diabetes	
		n=42		n=86		n=725		N=6547	
	N	n	%	n	%	n	%	n	%
Age									
<=20	227	4	1.8	0		5	2.2	218	96.0
21-25	783	5	0.6	8	1.0	48	6.1	722	92.2
26-30	1891	11	0.6	21	1.1	186	9.8	1673	88.5
31-35	2824	18	0.6	29	1.0	291	10.3	2486	88.0
36-40	1390	4	0.3	21	1.5	159	11.4	1206	86.8
41+	285	0		7	2.5	36	12.6	242	84.9
Ethnicity									
NZ European	2421	23	1.0	6	0.3	118	4.9	2273	93.9
Māori	483	4	0.8	12	2.5	29	6.0	439	90.7
Pacific	878	4	0.5	41	4.7	93	10.6	740	84.3
Asian	1842	2	0.1	12	0.7	287	15.6	1541	83.7
Indian	643	1	0.2	11	1.7	135	21.0	496	77.1
Other European	852	8	0.9	2	0.2	37	4.3	805	94.5
Other	281	0	0.0	2	0.7	26	9.3	253	90.0
BMI									
<18.5	313	0	0.0	0	0.0	27	8.6	286	91.4
18.5-24.99	4106	19	0.5	9	0.2	327	8.0	3751	91.4
>=25-29.99	1565	10	0.6	15	1.0	171	10.9	1369	87.5
30-34.99	696	8	1.1	28	4.0	99	14.2	561	80.6
35-39.99	357	3	0.8	17	4.8	50	14.0	287	80.4
≥40	234	2	0.9	17	7.3	49	20.9	166	70.9
Missing	129	0	0.0	0	0.0	2	1.6	127	98.4
Smoking									
Smoking at booking	375	3	0.8	12	3.2	19	5.1	341	90.9
Not currently smoking	7022	39	0.6	74	1.1	706	10.1	6203	88.3
Missing	3	0	0.0	0	0.0	0	0.0	3	100.0

4.3 Antepartum haemorrhage

Table 169: Characteristics of pregnancies complicated by antepartum haemorrhage NWH 2014

		Placenta praevia n=54		Placental abruption n=37		APH uncertain origin n=378		No APH n=6931	
	Total	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Maternal ethnicity									
NZ European	2421	24	1.0	12	0.5	99	4.1	2286	94.4
Maori	483	2	0.4	3	0.6	28	5.8	450	93.2
Pacific	878	3	0.3	7	0.8	60	6.8	808	92.0
Asian	1842	15	0.8	5	0.3	111	6.0	1711	92.9
Indian	643	2	0.3	4	0.6	34	5.3	603	93.8
Other European	852	8	0.9	6	0.7	34	4.0	804	94.4
Other	281	0	0.0	0	0.0	12	4.3	269	95.7
Maternal age									
<=20	227	0		0		18	7.9	209	92.1
21-25	783	5	0.6	6	0.8	42	5.4	730	93.2
26-30	1891	6	0.3	9	0.5	96	5.1	1780	94.1
31-35	2824	18	0.6	14	0.5	141	5.0	2651	93.9
36-40	1390	20	1.4	6	0.4	63	4.5	1301	93.6
>40	285	5	1.8	2	0.7	18	6.3	260	91.2
Parity									
Nulliparous	3604	19	0.5	20	0.6	191	5.3	3374	93.6
Multip previous CS	1225	22	1.8	8	0.7	64	5.2	1131	92.3
Mullip no previous CS	2571	13	0.5	9	0.4	123	4.8	2426	94.4
Multiple pregnancy									
Multiple	147	0		1	0.7	7	4.8	139	94.6
Singleton	7253	54	0.7	36	0.5	371	5.1	6792	93.6
Smoking status at booking									
Currently smoking	375	3	0.8	4	1.1	25	6.7	343	91.5
Not currently smoking	7022	51	0.7	33	0.5	353	5.0	6585	93.8
Unknown	3	0		0		0		3	100
BMI									
<18.5	313	2	0.6	0	0.0	15	4.8	296	94.6
18.5-24.99	4106	33	0.8	19	0.5	188	4.6	3866	94.2
>=25-29.99	1565	15	1.0	9	0.6	81	5.2	1460	93.3
30-34.99	696	3	0.4	4	0.6	53	7.6	636	91.4
35-39.99	357	0		2	0.6	18	5.0	337	94.4
>=40	234	0		3	1.3	12	5.1	219	93.6
Missing	129	1	0.8	0		11	8.5	117	90.7
Hypertensive disease									
Gestational hypertension	235	0		2	0.9	12	5.1	221	94.0
Chronic hypertension	149	2	1.3	2	1.3	8	5.4	137	91.9
Chronic hypertension with superimposed preeclampsia	16	0		0		1	6.3	15	93.8
Preeclampsia	161	1	0.6	1	0.6	12	7.5	147	91.3
Nil	6839	51	0.7	32	0.5	345	5.0	6411	93.7

4.4 Hypertensive disease

Table 170: Onset of birth among women with hypertensive disease NWH 2014

	Gestational hypertension		Chronic hypertension		Superimposed preeclampsia		Preeclampsia		Normotensive	
	n= 235		n=149		n=16		n=161		n=6839	
	n	%	n	%	n	%	n	%	n	%
Spontaneous onset of labour	48	20.4	37	24.8	2	12.5	21	13.0	3415	49.9
Induced labour	132	56.2	61	40.9	6	37.5	80	49.7	2036	29.8
CS emergency before onset of labour	9	3.8	7	4.7	5	31.3	35	21.7	225	3.3
CS elective	46	19.6	44	29.5	3	18.8	25	15.5	1163	17.0

Table 171: Demographic characteristics of women with hypertensive disease NWH 2014

	N=7400	Gestational hypertension n=235		Chronic hypertension n=149		Superimposed preeclampsia n=16		Preeclampsia n=161		Normotensive n=6839	
	Total	n	%	n	%	n	%	n	%	n	%
Ethnicity (prioritised)											
NZ European	2421	101	4.2	56	2.3	4	0.2	48	2.0	2212	91.4
Māori	483	19	3.9	13	2.7	1	0.2	21	4.3	429	88.8
Pacific	878	32	3.6	34	3.9	4	0.5	33	3.8	775	88.3
Asian	1842	28	1.5	22	1.2	5	0.3	24	1.3	1763	95.7
Indian	643	16	2.5	7	1.1	1	0.2	16	2.5	603	93.8
Other European	852	28	3.3	15	1.8	1	0.1	13	1.5	795	93.3
Other	281	11	3.9	2	0.7	0	0.0	6	2.1	262	93.2
Maternal age (nullipara)											
<=20	188	8	4.3	0	0.0	0	0.0	8	4.3	172	91.5
21-25	467	15	3.2	5	1.1	0	0.0	23	4.9	424	90.8
26-30	1091	42	3.8	5	0.5	1	0.1	27	2.5	1016	93.1
31-35	1328	50	3.8	27	2.0	2	0.2	39	2.9	1210	91.1
36-40	439	18	4.1	13	3.0	4	0.9	13	3.0	391	89.1
41+	91	3	3.3	1	1.1	0	0.0	5	5.5	82	90.1
Maternal age (multipara)											
<=20	39	1	2.6	1	2.6	0	0.0	0	0.0	37	94.9
21-25	316	6	1.9	4	1.3	0	0.0	5	1.6	301	95.3
26-30	800	19	2.4	7	0.9	3	0.4	6	0.8	765	95.6
31-35	1496	32	2.1	41	2.7	2	0.1	18	1.2	1403	93.8
36-40	951	34	3.6	34	3.6	3	0.3	12	1.3	868	91.3
41+	194	7	3.6	11	5.7	1	0.5	5	2.6	170	87.6
Smoking											
Currently smoking	375	12	3.2	8	2.1	2	0.5	11	2.9	342	91.2
Not currently smoking	7022	223	3.2	141	2.0	14	0.2	150	2.1	6494	92.5
Unknown	3	0	0.0	0	0.0	0	0.0	0	0.0	3	100.0
BMI											
<18.5	313	3	1.0	1	0.3	0	0.0	1	0.3	308	98.4
18.5-24.99	4106	91	2.2	48	1.2	1	0.0	71	1.7	3895	94.9
25-29.99	1565	62	4.0	33	2.1	6	0.4	36	2.3	1428	91.2
30-34.99	696	39	5.6	25	3.6	2	0.3	22	3.2	608	87.4
35-39.99	357	22	6.2	21	5.9	5	1.4	14	3.9	295	82.6
>=40	234	15	6.4	21	9.0	2	0.9	12	5.1	184	78.6
Missing	129	3	2.3	0	0.0	0	0.0	5	3.9	121	93.8

4.5 Body Mass Index

Table 172: LMC at birth and BMI NWH 2014

	Total	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	7271	n=313		n=4106		n=1565		n=696		n=357		n=234	
Totals	**n**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
IMW	3495	175	5.0	2066	59.1	743	21.3	301	8.6	140	4.0	70	2.0
Pvt Obst	1837	81	4.4	1300	70.8	325	17.7	94	5.1	27	1.5	10	0.5
NWH Comm	1391	51	3.7	555	39.9	356	25.6	195	14.0	132	9.5	102	7.3
NWH Diabetes	214	2	0.9	53	24.8	50	23.4	51	23.8	26	12.1	32	15.0
NWH MFM	274	4	1.5	104	38.0	78	28.5	44	16.1	27	9.9	17	6.2
GP	20	0	0.0	15	75.0	2	10.0	3	15.0	0	0.0	0	0.0
Other DHB	27	0	0.0	10	37.0	6	22.2	5	18.5	4	14.8	2	7.4
Unbooked	13	0	0.0	3	23.1	5	38.5	3	23.1	1	7.7	1	7.7

Table 173: Demographic characteristics and BMI NWH 2014 (excludes missing data)

	Total	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	7271	n=313		n=4106		n=1565		n=696		n=357		n=234	
Totals	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Ethnicity													
NZ European	2385	69	2.9	1523	63.9	515	21.6	169	7.1	72	3.0	37	1.6
Māori	460	4	0.9	141	30.7	143	31.1	96	20.9	49	10.7	27	5.9
Pacific	852	6	0.7	110	12.9	177	20.8	221	25.9	180	21.1	158	18.5
Asian	1819	168	9.2	1269	69.8	307	16.9	59	3.2	14	0.8	2	0.1
Indian	638	30	4.7	340	53.3	188	29.5	61	9.6	17	2.7	2	0.3
Other European	841	25	3.0	579	68.8	163	19.4	54	6.4	13	1.5	7	0.8
Other	276	11	4.0	144	52.2	72	26.1	36	13.0	12	4.3	1	0.4
Age													
<=20	210	4	1.9	76	36.2	55	26.2	45	21.4	23	11.0	7	3.3
21-25	761	48	6.3	315	41.4	168	22.1	101	13.3	76	10.0	53	7.0
26-30	1856	104	5.6	1076	58.0	348	18.8	186	10.0	86	4.6	56	3.0
31-35	2795	106	3.8	1724	61.7	590	21.1	210	7.5	100	3.6	65	2.3
36-40	1369	47	3.4	767	56.0	330	24.1	128	9.3	54	3.9	43	3.1
>40	280	4	1.4	148	52.9	74	26.4	26	9.3	18	6.4	10	3.6
Parity													
Nullipara	3526	183	5.2	2210	62.7	689	19.5	270	7.7	114	3.2	60	1.7
Multipara	3745	130	3.5	1896	50.6	876	23.4	426	11.4	243	6.5	174	4.6
Smoking status at booking													
Smoking*	357	4	1.1	100	28.0	94	26.3	63	17.6	59	16.5	37	10.4
Not currently smoking	6912	309	4.5	4005	57.9	1470	21.3	633	9.2	298	4.3	197	2.9

*smoking status missing for two women

Table 174: Pregnancy complications and BMI NWH 2014

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n=313		n=4106		n=1565		n=696		n=357		n=234	
Totals	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Diabetes												
GDM	27	8.6	327	8.0	171	10.9	99	14.2	50	14.0	49	20.9
Type 1	0	0.0	19	0.5	10	0.6	8	1.1	3	0.8	2	0.9
Type 2	0	0.0	9	0.2	15	1.0	29	4.2	17	4.8	17	7.3
No diabetes*	286	91.4	3751	91.4	1369	87.5	560	80.5	287	80.4	166	70.9
Hypertension												
Chronic hypertension	1	0.3	48	1.2	33	2.1	25	3.6	21	5.9	21	9.0
Gestational hypertension	3	1.0	91	2.2	62	4.0	39	5.6	22	6.2	15	6.4
Pre-eclampsia	1	0.3	71	1.7	36	2.3	22	3.2	14	3.9	12	5.1
Superimposed pre-eclampsia	0	0.0	1	0.0	6	0.4	2	0.3	5	1.4	2	0.9
No hypertension	308	98.4	3895	94.9	1428	91.2	608	87.4	295	82.6	184	78.6

*includes women who have not had diabetes screening in pregnancy

Table 175: Postpartum haemorrhage associated with spontaneous vaginal birth (N=3916) by BMI NWH 2014

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n	170	n	2178	n	814	n	397	n	223	n	134
Totals	n	%	n	%	n	%	n	%	n	%	n	%
PPH>=1000mls	7	4.1	137	6.3	61	7.5	36	9.1	26	11.7	17	12.7
PPH>=1500mls	1	0.6	62	2.8	30	3.7	17	4.3	13	5.8	12	9.0

Table 176: Postpartum haemorrhage associated with Caesarean section (N=2522) by BMI NWH 2014

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n	94	n	1368	n	590	n	269	n	114	n	87
Totals	n	%	n	%	n	%	n	%	n	%	n	%
PPH>=1000mls	5	5.3	154	11.3	82	13.9	45	16.7	21	18.4	31	35.6
PPH>=1500mls	4	4.3	49	3.6	31	5.3	13	4.8	6	5.3	11	12.6

Table 177: Neonatal outcomes by BMI NWH 2014

	TOTAL		<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	N=7419*		n=317		n=4189		n=1594		n=715		n=368		n=236	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Preterm	724	9.8	22	6.9	390	9.3	158	9.9	89	12.4	43	11.7	22	9.3
Iatrogenic preterm	447	6.0	14	4.4	228	5.4	102	6.4	56	7.8	34	9.2	13	5.5
Spontaneous preterm	277	3.7	8	2.5	162	3.9	56	3.5	33	4.6	9	2.4	9	3.8
Term	6695	90.2	295	93.1	3799	90.7	1436	90.1	626	87.6	325	88.3	214	90.7
Iatrogenic term	3470	46.8	129	40.7	1856	44.3	791	49.6	358	50.1	193	52.4	143	60.6
Spontaneous term	3225	43.5	166	52.4	1943	46.4	645	40.5	268	37.5	132	35.9	71	30.1
SGA	1043	14.1	42	13.2	505	12.1	259	16.2	117	16.4	72	19.6	48	20.3
≥2 48 hrs in NICU	555	7.5	21	6.6	275	6.6	123	7.7	71	9.9	40	10.9	25	10.6
Perinatal deaths (n/1000)	92	12.4	0	0.0	44	10.5	23	14.4	13	18.2	9	24.5	3	12.7

* BMI of mother missing for 132 babies

Table 178: Maternal interventions and birth outcomes by BMI NWH 2014

	BMI<18.5		BMI 18.5-24.99		BMI >=25-29.99		BMI 30-34.99		BMI 35-39.99		BMI >=40	
	n=	313	n=	4106	n=	1565	n=	696	n=	357	n=	234
	n	%	n	%	n	%	n	%	n	%	n	%
Onset of birth												
Spontaneous labour	174	55.6	2085	50.8	697	44.5	299	43.0	140	39.2	80	34.2
Induced labour	85	27.2	1169	28.5	493	31.5	256	36.8	144	40.3	103	44.0
Emergency CS before labour	8	2.6	132	3.2	73	4.7	28	4.0	13	3.6	14	6.0
Elective CS	46	14.7	720	17.5	302	19.3	113	16.2	60	16.8	37	15.8
Mode of birth												
Spontaneous vaginal birth	170	54.3	2178	53.0	814	52.0	397	57.0	223	62.5	134	57.3
Operative vaginal	49	15.7	560	13.6	161	10.3	30	4.3	20	5.6	13	5.6
Elective CS	46	14.7	720	17.5	302	19.3	113	16.2	60	16.8	37	15.8
Emergency CS	48	15.3	648	15.8	288	18.4	156	22.4	54	15.1	50	21.4

APPENDIX 5. LABOUR AND BIRTH

5.1 Induction of labour

Table 179: Induction of labour rates 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Births	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**
Women	1894	1776	1906	2203	2238	2214	2463	2483	2438	2315
Incidence (%)	**26.3**	**24.6**	**24.8**	**29.0**	**28.9**	**28.7**	**32.7**	**32.3**	**33.8**	**31.3**
Total	3522	3499	3752	3623	3811	3650	3539	3778	3441	3604
Nullipara	1042	940	1047	1207	1260	1226	1330	1382	1337	1354
Incidence (%)	**29.6**	**26.9**	**27.9**	**33.3**	**33.1**	**33.5**	**37.6**	**36.5**	**38.9**	**37.5**
Total	3672	3713	3943	3966	3924	4059	3984	3917	3782	3796
Multipara	852	836	859	996	978	988	1133	1101	1101	961
Incidence (%)	**23.2**	**22.5**	**21.8**	**25.1**	**24.9**	**24.3**	**28.4**	**28.1**	**29.1**	**25.3**

Table 180: Indication for induction by gestation NWH 2014

	Preterm		Term		Total	
	n=	647	n=	6753	N=7400	
	n	%	n	%	n	%
Total	149	23.0	2166	32.1	2315	31.3
TermPROM	1	0.2	404	6.0	405	5.5
Diabetes	7	1.1	352	5.2	359	4.9
Small for Gestational Age	14	2.2	322	4.8	336	4.5
Post Dates	0	0.0	317	4.7	317	4.3
Hypertension	12	1.9	161	2.4	173	2.3
Prolonged latent phase	2	0.3	127	1.9	129	1.7
Fetal wellbeing	2	0.3	121	1.8	123	1.7
Other	4	0.6	97	1.4	101	1.4
Maternal Age	0	0.0	98	1.5	98	1.3
Maternal Medical Complications	7	1.1	50	0.7	57	0.8
IUD/Fetal Anomaly	40	6.2	14	0.2	54	0.7
PPROM	41	6.3	2	0.0	43	0.6
Maternal Request	0	0.0	40	0.6	40	0.5
Poor Obstetric History	0	0.0	34	0.5	34	0.5
APH	3	0.5	20	0.3	23	0.3
Multiple Pregnancy	16	2.5	7	0.1	23	0.3

Table 181: Indication for induction by parity (term births) NWH 2014

	Nullipara		Multipara		Total	
	n=	3259	n=	3494	n=6753	
	n	%	n	%	n	%
Total	**1275**	**39.1**	**891**	**25.5**	**2166**	**32.1**
Term PROM	290	8.9	114	3.3	404	6.0
Diabetes	174	5.3	178	5.1	352	5.2
Small for Gestational Age	180	5.5	142	4.1	322	4.8
Post Dates	217	6.7	100	2.9	317	4.7
hypertension	101	3.1	60	1.7	161	2.4
Prolonged latent phase	92	2.8	35	1.0	127	1.9
Fetal wellbeing	71	2.2	50	1.4	121	1.8
Maternal Age	39	1.2	59	1.7	98	1.5
Other	56	1.7	41	1.2	97	1.4
Maternal Medical Complications	16	0.5	34	1.0	50	0.7
Maternal Request	15	0.5	25	0.7	40	0.6
Poor Obstetric History	1	0.0	33	0.9	34	0.5
APH	13	0.4	7	0.2	20	0.3
IUD/Fetal Anomaly	5	0.2	9	0.3	14	0.2
Multiple Pregnancy	3	0.1	4	0.1	7	0.1
PRROM	2	0.1	0	0.0	2	0.0

Table 182: Rates of induction by age and ethnicity (prioritised) among term nullipara and multipara (excluding previous Caesarean) NWH 2014

	Term Nullipara	Induction of labour		Term	Induction of labour	
	N	n	%	N	n	%
Total	**3259**	**1275**	**39.1**	**3494**	**891**	**25.5**
Age						
<=25	585	194	33.2	327	64	19.6
26-30	1003	393	39.2	735	183	24.9
31-35	1206	492	40.8	1386	333	24.0
>=35	465	196	42.2	1046	311	29.7
Ethnicity						
NZ European	1073	434	40.4	1136	290	25.5
Māori	155	55	35.5	257	71	27.6
Pacific	255	101	39.6	540	171	31.7
Asian	906	332	36.6	808	163	20.2
Indian	345	150	43.5	232	66	28.4
Other European	399	153	38.3	381	93	24.4
Other	126	50	39.7	140	37	26.4

Table 183: Mode of birth at term by onset of birth and parity (excluding women with prior CS) among intended vaginal births NWH 2014

	Nullipara				Multipara (no prev CS)			
	Spontaneous labour n=1573		Induced labour n=1275		Spontaneous labour n=1684		Induced labour n=891	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB	936	59.5	515	40.4	1512	89.8	731	82.0
Operative vaginal	364	23.1	310	24.3	79	4.7	51	5.7
CS emergency in labour	273	17.4	288	22.6	93	5.5	58	6.5
CS emergency not in labour*	0	0.0	162	12.7	0	0.0	51	5.7
Epidural	923	58.7	1043	81.8	410	24.3	458	51.4

*failed induction rate at term

Table 184: Mode of birth at term among nullipara by indication for induction NWH 2014

	Post dates n=217		Term PROM n=290		Hypertension n=101		Prolonged latent phase n=92		Diabetes n=174		SGA n=180		Other n=216	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	77	35.5	119	41.0	41	40.6	32	34.8	63	36.2	95	52.8	86	39.8
Operative vaginal	41	18.9	75	25.9	22	21.8	25	27.2	47	27.0	43	23.9	56	25.9
CS emergency in labour	65	30.0	76	26.2	20	19.8	27	29.3	37	21.3	17	9.4	45	20.8
CS emergency not in labour*	34	15.7	20	6.9	18	17.8	8	8.7	27	15.5	25	13.9	29	13.4
Epidural	184	84.8	252	86.9	79	78.2	87	94.6	129	74.1	135	75.0	167	77.3

*failed induction rate at term

Table 185: Mode of birth at term among multiparous (excluding previous Caesarean) women by indication for induction NWH 2014

	Post dates n=85		TermPROM n=96		Hypertension n=54		Prolonged n=28		Diabetes n=146		SGA n=132		Other n=236	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	73	85.9	82	85.4	45	83.3	24	85.7	134	91.8	119	90.2	205	86.9
Operative	3	3.5	8	8.3	4	7.4	1	3.6	4	2.7	7	5.3	12	5.1
CS emergency in	9	10.6	5	5.2	5	9.3	2	7.1	5	3.4	1	0.8	12	5.1
CS emergency	0	0.0	1	1.0	0	0.0	1	3.6	3	2.1	5	3.8	7	3.0
Epidural	32	37.6	51	53.1	22	40.7	15	53.6	52	35.6	64	48.5	142	60.0

*failed induction rate at term

Table 186: Dilatation at start of syntocinon infusion among labouring women by induction status NWH 2014

	Induced labour n=1549		Spontaneous labour n=753	
Dilatation	n	%	n	%
0	87	5.6	0	0
1	150	9.7	4	0.5
2	383	24.7	4	0.5
3	406	26.2	102	13.5
4	175	11.3	159	21.1
5	54	3.5	99	13.1
6	16	1.0	63	8.4
7	15	1.0	50	6.6
8	9	0.6	51	6.8
9	13	0.8	44	5.8
10	16	1.0	71	9.4
Missing	225	14.5	106	14.1

5.2 Mode of birth

Table 187: Mode of birth by parity and previous Caesarean section status NWH 2014

	Nullipara preterm n=345		Nullipara term n=3259		Multipara no prev CS preterm n=186		Multipara no prev CS term n=2385		Multipara prev CS preterm n=116		Multipara prev CS term n=1109	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	129	37.4	1449	44.5	99	53.2	2052	86.0	23	19.8	176	15.9
Vaginal breech	23	6.7	2	0.1	21	11.3	14	0.6	3	2.6	1	0.1
Operative vaginal birth	38	11.0	674	20.7	3	1.6	87	3.6	4	3.4	43	3.9
Ventouse	19	5.5	426	13.1	2	1.1	58	2.4	0	0.0	25	2.3
Forceps	19	5.5	248	7.6	1	0.5	29	1.2	4	3.4	18	1.6
Caesarean section	155	44.9	1134	34.8	63	33.9	232	9.7	86	74.1	889	80.2
Emergency	105	30.4	805	24.7	46	24.7	117	4.9	46	39.7	159	14.3
Elective	50	14.5	329	10.1	17	9.1	115	4.8	40	34.5	730	65.8

Table 188: LMC by parity and previous Caesarean section status NWH 2014

	IMW n=3561		Pvt Obstetrician n=1843		GP n=20		NWH n=1903		Other DHB n=36		Unbooked n=37	
	n	%	n	%	n	%	n	%	n	%	n	%
Primipara	1803	50.6	965	52.4	5	25.0	797	41.9	17	47.2	17	45.9
Standard primip	694	19.5	321	17.4	2	10.0	237	12.5	2	5.6	5	13.5
Multipara	1758	49.4	878	47.6	15	75.0	1106	58.1	19	52.8	20	54.1
Previous CS	374	10.5	451	24.5	4	20.0	717	37.7	4	11.1	3	8.1
No prev CS	1384	38.9	427	23.2	11	55.0	389	20.4	15	41.7	17	45.9

Table 189: Mode of birth by LMC at birth (term nullipara) NWH 2014

	IMW n=1672		Pvt Obstetrician n=877		GP n=5		NWH n=689		Other DHB n=3		Unbooked n=13	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	833	49.8	243	27.7	3	60.0	357	51.8	2	66.7	11	84.6
Vaginal breech	1	0.1	0		0		1	0.1	0		0	
Forceps	135	8.1	72	8.2	0		41	6.0	0		0	
Ventouse	244	14.6	110	12.5	0		72	10.4	0		0	
CS elective	69	4.1	216	24.6	1	20.0	43	6.2	0		0	
CS emergency	390	23.3	236	26.9	1	20.0	175	25.4	1	33.3	2	15.4

Table 190: Mode of birth at term by LMC at birth (standard primipara) NWH 2014

	IMW n=694		Pvt Obstetrician n=321		GP n=2		NWH n=237		Other DHB n=2		Unbooked n=5	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	397	57.2	114	35.5	1	50.0	147	62.0	1	50.0	5	100.0
Vaginal breech	0		0		0		0		0		0	
Forceps	51	7.3	34	10.6	0		14	5.9	0		0	
Ventouse	97	14.0	38	11.8	0		25	10.5	0		0	
CS elective	10	1.4	61	19.0	0		9	3.8	0		0	
CS emergency	139	20.0	74	23.1	1	50.0	42	17.7	1	50.0	0	

Table 191: Mode of birth at term by LMC at birth (multipara, no previous CS) NWH 2014

	IMW n=1309		Pvt Obstetrician n=398		GP n=11		NWH n=652		Other DHB n=3		Unbooked n=12	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	1161	88.7	310	77.9	9	81.8	560	85.9	3	100.0	9	75.0
Vaginal breech	7	0.5	1	0.3	0		5	0.8	0		1	8.3
Forceps	19	1.5	2	0.5	1	9.1	7	1.1	0		0	
Ventouse	23	1.8	19	4.8	0		16	2.5	0		0	
CS elective	41	3.1	43	10.8	0		31	4.8	0		0	
CS emergency	58	4.4	23	5.8	1	9.1	33	5.1	0		2	16.7

Table 192: Mode of birth at term by LMC at birth (multipara, previous CS) NWH 2014

	IMW n=342		Pvt Obstetrician n=420		GP n=4		NWH n=340		Other DHB n=1		Unbooked n=2	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	87	25.4	21	5.0	0	0.0	67	19.7	0	0.0	1	50.0
Vaginal breech	0	0.0	0	0.0	0	0.0	1	0.3	0	0.0	0	0.0
Forceps	8	2.3	3	0.7	0	0.0	7	2.1	0	0.0	0	0.0
Ventouse	14	4.1	2	0.5	1	25.0	7	2.1	0	0.0	1	50.0
CS elective	179	52.3	359	85.5	2	50.0	189	55.6	1	100.0	0	0.0
CS emergency	54	15.8	35	8.3	1	25.0	69	20.3	0	0.0	0	0.0

Table 193: Mode of birth by ethnicity NWH 2014

	NZ European n=2421		Māori n=483		Pacific n=878		Other Asian n=1842		Indian n=643		Other European n=852		Other n=281	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1144	47.3	299	61.9	635	72.3	1002	54.4	301	46.8	396	46.5	151	53.7
Vaginal breech	25	1.0	4	0.8	11	1.3	7	0.4	8	1.2	6	0.7	3	1.1
Forceps	114	4.7	13	2.7	13	1.5	90	4.9	31	4.8	47	5.5	11	3.9
Ventouse	186	7.7	20	4.1	27	3.1	136	7.4	64	10.0	78	9.2	19	6.8
CS elective	550	22.7	55	11.4	77	8.8	276	15.0	88	13.7	187	21.9	48	17.1
CS emergency	402	16.6	92	19.0	115	13.1	331	18.0	151	23.5	138	16.2	49	17.4

Table 194: Mode of birth by ethnicity (nullipara) NWH 2014

	NZ European n=1193		Māori n=181		Pacific n=294		Other Asian n=978		Indian n=383		Other European n=440		Other n=135	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	458	38.4	103	56.9	192	65.3	440	45.0	150	39.2	175	39.8	60	44.4
Vaginal breech	11	0.9	0	0.0	1	0.3	3	0.3	5	1.3	3	0.7	2	1.5
Forceps	99	8.3	9	5.0	9	3.1	75	7.7	29	7.6	37	8.4	9	6.7
Ventouse	158	13.2	13	7.2	20	6.8	118	12.1	56	14.6	64	14.5	16	11.9
CS elective	174	14.6	8	4.4	9	3.1	85	8.7	29	7.6	61	13.9	13	9.6
CS emergency	293	24.6	48	26.5	63	21.4	257	26.3	114	29.8	100	22.7	35	25.9

Table 195: Mode of birth by ethnicity (multipara) NWH 2014

	NZ European n=1228		Māori n=302		Pacific n=584		Other Asian n=864		Indian n=260		Other European n=412		Other n=146	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	686	55.9	196	64.9	443	75.9	562	65.0	151	58.1	221	53.6	91	62.3
Vaginal breech	14	1.1	4	1.3	10	1.7	4	0.5	3	1.2	3	0.7	1	0.7
Forceps	15	1.2	4	1.3	4	0.7	15	1.7	2	0.8	10	2.4	2	1.4
Ventouse	28	2.3	7	2.3	7	1.2	18	2.1	8	3.1	14	3.4	3	2.1
CS elective	376	30.6	47	15.6	68	11.6	191	22.1	59	22.7	126	30.6	35	24.0
CS emergency	109	8.9	44	14.6	52	8.9	74	8.6	37	14.2	38	9.2	14	9.6

Table 196: Mode of birth by maternal age (nullipara) NWH 2014

	<=20 n=188		21-25 n=467		26-30 n=1091		31-35 n=1328		36-40 n=439		>40 n=91	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	139	73.9	290	62.1	501	45.9	509	38.3	128	29.2	11	12.1
Vaginal breech	0	0.0	2	0.4	6	0.5	13	1.0	4	0.9	0	0.0
Forceps	4	2.1	24	5.1	84	7.7	104	7.8	44	10.0	7	7.7
Ventouse	16	8.5	34	7.3	151	13.8	174	13.1	62	14.1	8	8.8
CS elective	4	2.1	19	4.1	82	7.5	148	11.1	91	20.7	35	38.5
CS emergency	25	13.3	98	21.0	267	24.5	380	28.6	110	25.1	30	33.0

Table 197: Mode of birth by maternal age (multipara) NWH 2014

	<=20 n=39		21-25 n=316		26-30 n=800		31-35 n=1496		36-40 n=951		>40 n=194	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	29	74.4	255	80.7	547	68.4	937	62.6	498	52.4	84	43.3
Vaginal breech	1	2.6	3	0.9	11	1.4	15	1.0	8	0.8	1	0.5
Forceps	0	0.0	5	1.6	14	1.8	21	1.4	11	1.2	1	0.5
Ventouse	0	0.0	5	1.6	13	1.6	34	2.3	28	2.9	5	2.6
CS elective	3	7.7	28	8.9	137	17.1	356	23.8	303	31.9	75	38.7
CS emergency	6	15.4	20	6.3	78	9.8	133	8.9	103	10.8	28	14.4

5.3 Operative births

Table 198: Primary indication for elective or pre labour emergency Caesarean section (all gestations) NWH 2014

	Total N=1792		Nullipara n=698		Multipara n=1094	
	n	%	n	%	n	%
Abruption/APH	34	1.9	13	1.9	21	1.9
Diabetes	13	0.7	5	0.7	8	0.7
Disproportion	9	0.5	8	1.1	1	0.1
Failed Induction	80	4.5	65	9.3	15	1.4
Fetal Distress	184	10.3	138	19.8	46	4.2
Hypertension	25	1.4	20	2.9	5	0.5
Malpresentation	171	9.5	121	17.3	50	4.6
Maternal Age	25	1.4	24	3.4	1	0.1
Maternal Medical Condition	65	3.6	39	5.6	26	2.4
Maternal Request	212	11.8	129	18.5	83	7.6
Multiple Pregnancy	34	1.9	27	3.9	7	0.6
Obstetric History	34	1.9	10	1.4	24	2.2
Placenta Praevia with or without bleeding	40	2.2	17	2.4	23	2.1
Repeat Caesarean Section	725	40.5		0.0	725	66.3
Small for Gestational Age	44	2.5	28	4.0	16	1.5
Other (please specify)	97	5.4	54	7.7	43	3.9

Table 199: Indication for in labour emergency Caesarean section all gestations (spontaneous or induced onset of labour) (n=767) NWH 2014

	n=767	
	n	%
1a Fetal distress	81	10.6
1b Other fetal indication	358	46.7
2a Fetal intolerance of augmented labour	92	12.0
2b Augmentation causes hyperstimulation	21	2.7
2c Poor uterine response to optimal augmentation	38	5.0
2d Suboptimal augmentation	20	2.6
2e Inefficient uterine action - no oxytocin	21	2.7
3 Efficient uterine action - obstructed labour	127	16.6
4b Maternal request	2	0.3
4a Other non-medical	6	0.8
Missing	1	0.1

Table 200: Operative vaginal birth rates 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total births (mothers)	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**	**7400**
Total operative vaginal births	1022	956	975	937	947	942	832	907	833	849
Incidence %	14.2	13.3	12.7	12.3	12.2	12.2	11.1	11.8	11.5	11.5
Total nullipara	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**	**3778**	**3441**	**3604**
Operative vaginal births	809	737	772	722	753	752	643	744	674	712
Nulliparous operative vaginal birth rate (%)	23.0	21.1	20.6	19.9	19.8	20.6	18.2	19.7	19.6	19.8
Total multipara	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**	**3917**	**3782**	3796
Operative vaginal births	213	219	203	215	194	190	189	163	159	137
Multiparous operative vaginal birth rate (%)	5.8	5.9	5.1	5.4	4.9	4.7	4.7	4.2	4.2	3.6

Table 201: Type of operative vaginal birth 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total births	**7194**	**7212**	**7695**	**7589**	**7753**	**7709**	**7523**	**7695**	**7223**	**7400**
Total operative vaginal births	1022	956	975	937	947	942	832	907	833	849
% of all births	14.2	13.3	12.7	12.3	12.2	12.2	11.1	11.8	11.5	11.5
Total forceps alone	234	256	222	301	339	308	288	267	256	259
% of all births	3.3	3.5	2.9	4.0	4.0	4.0	3.8	3.5	3.5	3.5
Kiellands forceps	22	33	22	29	42	38	25	22	31	13
% of all births	0.3	0.5	0.3	0.4	0.5	0.5	0.3	0.3	0.4	0.2
Other forceps	212	223	200	272	297	270	263	245	225	246
% of all births	2.9	3.1	2.6	3.6	3.8	3.5	3.5	3.2	3.1	3.3
Ventouse or forceps +ventouse	788	700	753	677	650	634	544	640	577	588
% of all births	11.0	9.7	9.8	8.9	8.4	8.3	7.2	8.3	8.0	7.9
Ventouse alone	728	639	686	636	608	584	509	606	540	527
% of all births	10.1	8.9	8.9	8.4	7.8	7.6	6.8	7.9	7.5	7.1
Forceps+ventouse	60	61	67	41	35	50	35	34	37	61
% of all births	0.8	0.8	0.9	0.5	0.5	0.6		0.4	0.5	0.8

5.4 Breech Birth

Table 202: Breech birth 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total babies born	7384	7379	7875	7753	7897	7866	7690	7863	7377	7551
Total breech births	432	419	449	439	335	434	406	463	401	367
Percent of total births	5.9	5.7	5.7	5.7	4.2	5.5	5.2	5.9	5.4	4.9
Total singleton babies	7007	7050	7518	7427	7576	7556	7360	7533	7072	7253
Total singleton breech	328	328	351	346	335	340	310	356	319	294
Percent of singletons	4.7	4.7	4.7	4.7	4.4	4.3	4.2	4.7	4.5	4.1
Total multiple babies	377	329	357	324	321	310	330	330	305	298
Total multiple breech	104	91	98	93	89	94	96	107	82	73
Percent of multiple births	27.6	27.7	27.5	28.7	27.7	30.3	34.3	32.4	26.9	24.5

Table 203: Mode of birth by type of breech (singletons only) NWH 2014

	Extended leg n=132		Flexed leg n=103		Unspecified n=58		Total breech n=293	
	n	%	n	%	n	%	n	%
Vaginal breech	18	13.6	17	16.5	11	19.0	46	15.7
Caesarean	114	86.4	86	83.5	47	81.0	247	84.3
CS emergency	31	23.5	28	27.2	16	27.6	75	25.6
CS elective	83	62.9	58	56.3	31	53.4	172	58.7

Table 204: Mode of birth by type of breech (multiples only) NWH 2014

	Extended leg n=25		Flexed leg n=27		Unspecified n=19		Total breech n=71	
	n	%	n	%	n	%	n	%
Vaginal breech	7	28.0	10	37.0	4	21.1	21	29.6
Caesarean	18	72.0	17	63.0	15	78.9	50	70.4
CS emergency	8	32.0	3	11.1	5	26.3	16	22.5
CS elective	10	40.0	14	51.9	10	52.6	34	47.9

Table 205: Referral for ECV (women at term with singleton breech presentation or attempted ECV) by demographic and clinical characteristics NWH 2014

	Singleton breech at term or attempted ECV N=230	ECV n=73		No ECV n=157	
		n	%	n	%
Age (years					
≤ 20	3	1	33	2	67
21-30	62	22	35	40	65
31-40	157	47	30	110	70
≥ 41	8	3	38	5	63
Ethnicity (prioritised)					
NZ/Other European	121	37	31	84	69
Māori/ Pacific Island	38	11	29	27	71
Other Asian	48	18	38	30	63
Indian	17	4	24	13	76
Other	6	3	50	3	50
BMI					
<18.5	8	3	38	5	63
18.5-24.99	142	47	33	95	67
>=25-29.99	46	15	33	31	67
30-34.99	14	5	36	9	64
35-39.99	7	2	29	5	71
>=40	11	1	9	10	91
missing	2	0	0	2	100
LMC at birth					
Independent MW	106	53	50	53	50
NWH Community	38	10	26	28	74
NWH Diabetes/Medical	14	1	7	13	93
Private Obstetrician	69	8	12	61	88
Previous CS					
Yes	47	3	6	44	94
No	183	70	38	113	62

5.5 Obstetric Analgesia

Table 206: Epidural use among women with spontaneous and induced labour 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of births	7194	7212	7695	7589	7753	7709	7523	7695	7223	7400
Number women with spontaneous labour	4246	4256	4490	4070	4125	4007	3628	3666	3270	3523
Spontaneous labour and epidural	2138	2168	2057	1743	1717	1686	1483	1571	1297	1423
%	50.4	50.9	45.8	42.8	41.6	42.1	40.9	42.9	39.7	40.4
Number of women with induced labour	1894	1776	1906	2203	2238	2214	2463	2485	2438	2315
Induced labour and epidural	1373	1269	1326	1550	1599	1557	1707	1780	1709	1583
%	72.5	71.5	69.6	70.4	71.4	70.3	69.3	71.6	70.1	68.3

Table 207: Analgesic use and LMC at birth among labouring nulliparous women NWH 2014

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
IMW	1678	1067	63.6	1123	66.9	164	9.8	58	3.5	198	11.8
Pvt Obstetrician	670	560	83.6	302	45.1	30	4.5	22	1.3	44	6.6
GP	519	314	60.5	385	74.2	52	10.0	1	0.2	40	7.7
NWH_Community	76	53	69.7	47	61.8	8	10.5	0		3	3.9
NWH_Diabetes	100	66	66.0	59	59.0	4	4.0	0		2	2.0
NWH_Medical	11	7	63.6	7	63.6	3	27.3	0		0	
Other DHB	16	5	31.3	11	68.8	4	25.0	0		0	
Unbooked	1678	1067	63.6	1123	66.9	164	9.8	58	3.5	198	11.8

Table 208: Analgesic use and ethnicity (prioritised) among labouring nulliparous women NWH 2014

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
NZ European	967	707	73.1	578	59.8	73	7.5	34	3.5	137	14.2
Māori	165	85	51.5	107	64.8	14	8.5	0	0.0	16	9.7
Pacific	279	162	58.1	191	68.5	21	7.5	1	0.4	13	4.7
Asian	851	555	65.2	548	64.4	70	8.2	15	1.8	37	4.3
Indian	336	229	68.2	224	66.7	40	11.9	3	0.9	17	5.1
Other European	357	252	70.6	212	59.4	32	9.0	25	7.0	57	16.0
Other	119	85	71.4	77	64.7	16	13.4	3	2.5	10	8.4

Table 209: Analgesic use and maternal age among labouring nulliparous women NWH 2014

Maternal age	Total	Epidural		Entonox		Pethidine		TENS		Water	
(years)	N	n	%	n	%	n	%	n	%	n	%
<=20	180	87	48.3	133	73.9	19	10.6	0	0.0	17	9.4
21-25	434	251	57.8	298	68.7	52	12.0	1	0.2	27	6.2
26-30	987	683	69.2	652	66.1	79	8.0	25	2.5	99	10.0
31-35	1114	793	71.2	669	60.1	87	7.8	37	3.3	111	10.0
36-40	316	233	73.7	164	51.9	26	8.2	17	5.4	30	9.5
>40	43	28	65.1	21	48.8	3	7.0	1	2.3	3	7.0

APPENDIX 6. LABOUR and BIRTH OUTCOMES

6.1 Perineal trauma

Table 210: Episiotomy rates in vaginal births, all gestations by LMC at birth and parity NWH 2014

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	2315	1049	45.3	2526	322	12.7
Independent Midwife	1306	588	45.0	1391	171	12.3
Private Obstetrician	461	289	62.7	377	87	23.1
General Practitioner	3	0	0.0	11	3	27.3
National Women's	545	172	31.6	747	61	8.2

Table 211: Episiotomy rates in spontaneous (non operative) vertex (not breech) birth, all gestations by LMC at birth and parity NWH 2014

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1578	460	29.2	2350	246	10.5
Independent Midwife	900	253	28.1	1308	129	9.9
Private Obstetrician	261	134	51.3	348	78	22.4
General Practitioner	3	0	0.0	9	1	11.1
National Women's	414	73	17.6	685	38	5.5

Table 212: 3rd and 4th degree tears in spontaneous (non operative) vertex birth by LMC at birth and parity NWH 2014

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1578	65	4.1	2350	23	1.0
Independent Midwife	900	43	4.8	1308	16	1.2
Private Obstetrician	261	6	2.3	348	0	0.0
GP	3	0	0.0	9	0	0.0
National Women's	414	16	3.9	685	7	1.0

6.2 Postpartum haemorrhage

Table 213: Postpartum transfusion rates by recorded blood loss at birth NWH 2014

	Total	Postpartum transfusion	
		n	%
Total	**7400**	**172**	**2.3**
Blood loss <500	4771	6	0.1
PPH 500-999	1882	25	1.3
PPH 1000-1499	436	28	6.4
PPH 1500-2499	248	67	27.0
PPH >=2500	62	46	74.2
Blood loss unknown	1	0	0.0

Table 214: Third stage management by PPH risk among vaginal births NWH 2014

	Total	Physiological		Active syntocinon		Active syntometrine		Unknown	
	n	n	%	n	%	n	%	n	%
TOTAL	**4841**	**345**		**2575**		**1761**		**160**	
Spontaneous vaginal birth	3992	340	8.5	2076	52.0	1439	36.0	137	3.4
Operative vaginal birth	849	5	0.6	499	58.8	322	37.9	23	2.7
BMI									
<18.5	219	18	8.2	126	57.5	70	32.0	5	2.3
18.5-24.99	2738	216	7.9	1433	52.3	1013	37.0	76	2.8
>=25-29.99	975	61	6.3	527	54.1	344	35.3	43	4.4
30-34.99	427	24	5.6	236	55.3	150	35.1	17	4.0
35-39.99	243	13	5.3	134	55.1	90	37.0	6	2.5
>=40	147	3	2.0	67	45.6	68	46.3	9	6.1
missing	92	10	10.9	52	56.5	26	28.3	4	4.3
Previous CS	250	6	2.4	143	57.2	91	36.4	10	4.0
Hypertension									
No hypertension	4556	338	7.4	2327	51.1	1738	38.1	153	3.4
Gestational Hypertension	133	2	1.5	118	88.7	8	6.0	5	3.8
Chronic hypertension	77	4	5.2	65	84.4	8	10.4	0	0.0
Superimposed preeclampsia	4	0	0.0	4	100.0	0	0.0	0	0.0
Preeclampsia	71	1	1.4	61	85.9	7	9.9	2	2.8
Singleton	4792	344	7.2	2550	53.2	1739	36.3	159	3.3
Multiple	49	1	2.0	25	51.0	22	44.9	1	2.0

APPENDIX 7. POSTNATAL CARE

7.1 Infant Feeding

Table 215: Method of Infant feeding at discharge from NWH 2005-2014

	2005 n = 5765		2006 n = 6158		2007 n = 6570		2008 n = 6636		2009 n = 6928		2010 n =6941	
	n	%	n	%	n	%	n	%	n	%	n	%
Exclusive breastfeeding	3686	63.9	4546	73.8	5064	77.1	5254	79.2	5659	81.7	5736	82.6
Fully breastfeeding	485	8.4	441	7.2	348	5.3	304	4.6	287	4.1	260	3.8
Partial breastfeeding	1375	23.9	958	15.6	929	14.1	871	13.1	824	11.9	755	10.9
Artificial feeding	219	3.8	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	
	n	%	n	%	n	%	n	%
Exclusive breastfeeding	5439	80.9	5508	80.3	5094	79.0	5175	77.7
Fully breastfeeding	285	4.2	243	3.5	256	4.0	312	4.7
Partial breastfeeding	841	12.5	957	13.9	963	14.9	1056	15.9
Artificial feeding	158	2.4	154	2.2	138	2.1	113	1.7

*1 Infant was missing breastfeeding method at discharge

Table 216: Infant feeding on discharge from NWH by mode of birth, LMC and maternal age NWH 2014

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total *	**6656**	**5175**	**77.7**	**312**	**4.7**	**1056**	**15.9**	**113**	**1.7**
Mode of birth									
Spontaneous vaginal	3679	3230	87.8	92	2.5	297	8.1	60	1.6
Operative vaginal	778	628	80.7	30	3.9	113	14.5	7	0.9
Elective CS	1171	750	64.0	74	6.3	319	27.2	28	2.4
Emergency CS	1028	567	55.2	116	11.3	327	31.8	18	1.8
LMC at birth									
IMW	3284	2731	83.2	129	3.9	387	11.8	37	1.1
Private Obstetrician	1708	1308	76.6	74	4.3	299	17.5	27	1.6
GP	19	14	73.7	1	5.3	4	21.1	0	0.0
NWH Community	1287	924	71.8	73	5.7	253	19.7	37	2.9
NWH MFM	156	88	56.4	18	11.5	40	25.6	10	6.4
NWH Diabetes	170	88	51.8	16	9.4	64	37.6	2	1.2
Unbooked	26	20	76.9	1	3.8	5	19.2	0	0.0
Other DHB	6	2	33.3	0	0.0	4	66.7	0	0.0
Maternal age									
≤ 20	191	153	80.1	17	8.9	16	8.4	5	5.8
21-25	691	560	81.0	27	3.9	89	12.9	15	2.2
26-30	1706	1319	77.3	99	5.8	264	15.5	24	1.8
31-35	2562	2014	78.6	112	4.4	398	15.5	38	1.7
36-40	1259	969	77.0	47	3.7	217	17.2	26	3.1
>40	247	160	64.8	10	4.0	72	29.1	5	4.9

Table 217: Infant feeding on discharge from NWH by prioritised maternal ethnicity, gestation, birthweight and among standard primipara NWH 2014

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total	6656	5175	77.7	312	4.7	1056	15.9	113	1.7
Ethnicity									
NZ European	2177	1807	83.0	95	4.4	240	11.0	35	1.6
Māori	399	312	78.2	14	3.5	61	15.3	12	3.0
Pacific	767	557	72.6	48	6.3	133	17.3	29	3.8
Other Asian	1714	1236	72.1	73	4.3	383	22.3	22	1.3
Indian	566	410	72.4	46	8.1	108	19.1	2	0.4
Other European	774	645	83.3	26	3.4	92	11.9	11	1.4
Other	259	208	80.3	10	3.9	39	15.1	2	0.8
Gestation									
< 37 weeks	271	85	31.4	74	27.3	106	39.1	6	2.2
≥37 weeks	6385	5090	79.7	238	3.7	950	14.9	107	1.7
Birth weight									
< 2.5 kgs	219	48	21.9	61	27.9	107	48.9	3	1.4
2.5 - 2.9 kgs	1169	831	71.1	78	6.7	238	20.4	22	1.9
3.0 - 4.4 kgs	5137	4209	81.9	164	3.2	680	13.2	84	1.6
≥ 4.5 kgs	131	87	66.4	9	6.9	31	23.7	4	3.1
Primipara									
Standard	1200	996	83.0	39	3.3	157	13.1	8	0.7
Non standard	5456	4179	76.6	273	5.0	899	16.5	105	1.9
Quintile									
1	1182	940	79.5	44	3.7	178	15.1	20	1.7
2	1270	1012	79.7	56	4.4	184	14.5	18	1.4
3	1391	1080	77.6	66	4.7	230	16.5	15	1.1
4	1431	1107	77.4	77	5.4	219	15.3	28	2.0
5	1371	1029	75.1	67	4.9	244	17.8	31	2.3

Table 218: Infant feeding on discharge from NWH Homecare NWH 2014

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Community	940	475	50.5	104	11.1	253	26.9	107	11.4
Medical	59	39	66.1	5	8.5	8	13.6	7	11.9
Diabetes	62	26	41.9	15	24.2	14	22.6	7	11.3

7.2 Postnatal Admissions

Table 219: Maternal destination following birth by mode of birth NWH 2014

	Total	NWH Wards		Birthcare Auckland		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Total	**7400**	**4777**	**64.6**	**2313**	**31.3**	**293**	**3.96**	**17**	**0.2**
Spontaneous vaginal	3992	1662	41.6	2032	50.9	284	7.11	14	0.4
Operative vaginal	849	558	65.7	281	33.1	9	1.06	1	0.1
CS Elective	1281	1280	99.9	0	0	0	0	1	0.1
CS Emergency	1278	1277	99.9	0	0	0	0	1	0.1

Table 220: Maternal destination following birth by prioritised maternal ethnicity NWH 2014

	Total	NWH Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
NZ European	2421	1535	63.4	825	34.1	56	2.3	5	0.2
Maori	483	340	70.4	110	22.8	31	6.4	2	0.4
Pacific	878	594	67.7	221	25.2	60	6.8	3	0.3
Other Asian	1842	1118	60.7	634	34.4	87	4.7	3	0.2
Indian	643	458	71.2	168	26.1	17	2.6	0	0
Other European	852	541	63.5	282	33.1	26	3.1	3	0.4
Other	281	191	68.0	73	26.0	16	5.7	1	0.4

Table 221: Maternal destination following birth by LMC at birth NWH 2014

	Total	NWH Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Total	7400	4777	64.6	2313	31.3	293	4.0	17	0.2
Independent Midwife	3561	1936	54.4	1424	40.0	191	5.4	10	0.3
Private Obstetrician	1843	1302	70.6	522	28.3	17	0.9	2	0.1
General Practitioner	20	11	55.0	9	45.0	0	0.0	0	0
NWH Community	1408	1001	71.1	323	22.9	81	5.8	3	0.2
NWH High Risk	495	461	93.1	32	6.5	1	0.2	1	0.2
Other DHB	36	35	97.2	1	2.8	0	0.0	0	0.0
Unbooked	37	31	83.8	2	5.4	3	8.1	1	2.7

Table 222: Place of birth for women admitted postnatally who did not birth at NWH 2014

	n=110	
	n	%
Birthcare	26	23.6
Home	6	5.5
Middlemore	11	10.0
North Shore	22	20.0
Waitakere	29	26.4
Other	16	14.5

APPENDIX 8. NEWBORN SERVICES

8.1 NICU Occupancy

Table 223: Occupancy (baby-days) for NICU by gestational age 2005-2014

Gestation (weeks)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	14541	14212	15228	15296	15236	14982	14877	14661	14296	14070
<28	3328	3612	4282	4546	4129	4133	4302	3563	3774	3956
28-31	4774	4322	3490	4170	4137	4230	3336	3684	3228	3153
32-36	4535	4326	5423	4750	4844	4519	4736	4752	4713	4362
≥37	1904	1952	2033	1830	2126	2100	2503	2462	2581	2599

Table 224: Occupancy (baby-days) for NICU by birth weight 2005-2014

Weight(g)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	14505	14212	15228	15296	15236	14982	14877	14461	14296	14070
<1500	7115	7034	7618	7584	7996	7563	6988	6583	6517	6302
1500-1999	2942	2568	2489	3071	2620	2662	2658	2951	2606	2687
2000-2499	2221	2111	2384	2432	1953	2005	2592	2009	2031	2209
≥2500	2227	2499	2737	2209	2667	2752	2639	2918	3142	2872

8.2 Admissions to NICU

Table 225: Admissions of inborn babies to NICU by gestational age groups 2005-2014

	2005		2007		2008		2009		2010		2011	
	n	%	n	%	n	%	n	%	n	%	n	%
Total	825		870		822		820		791		839	
20-27	50	6.1	58	6.7	58	7.1	57	7.0	58	7.3	43	5.0
28-31	126	15.3	107	12.3	122	14.8	91	11.1	110	13.9	81	9.7
32-36	295	35.8	377	43.3	331	40.3	315	38.4	280	35.3	305	36.4
≥ 37	354	42.9	328	37.7	311	37.8	357	43.5	342	43.2	410	48.9

	2012		2013		2014	
	n	%	n	%	n	%
Total	872		831		809	
20-27	40	4.6	39	4.7	46	5.7
28-31	102	11.7	88	10.6	89	11.0
32-36	334	38.3	308	37.1	274	33.9
≥ 37	396	45.4	396	47.7	400	49.4

Table 226: Live births at National Women's by birth weight (includes BBA) 2014

Birth weight (g)	2014 N=910	
Total	n	%
<500	1	0.1
500-749	22	2.4
750-999	25	2.8
1000-1499	83	9.1
1500-1999	112	12.3
2000-2499	157	17.3
2500-2999	135	14.8
3000-3999	314	34.5
≥4000	61	6.7

Table 227: Admissions of inborn babies to NICU by birth weight 2005-2014

Birth Weight (g)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	**825**	**791**	**870**	**822**	**820**	**791**	**839**	**872**	**831**	**809**
<500	0	0	1	0	0	2	0	1	0	1
500-749	25	19	19	19	15	23	20	14	13	19
750-999	34	24	37	37	42	29	24	25	32	23
1000-1249	47	34	47	35	31	39	25	35	29	37
1250-1499	42	57	51	52	49	50	42	48	46	40
1500-1999	120	130	130	135	126	110	110	132	112	102
2000-2499	170	182	188	180	155	135	176	169	152	145
2500-2999	119	125	139	118	117	126	129	118	115	121
3000-3999	215	183	198	212	246	226	259	277	270	270
≥4000	53	37	60	34	39	51	54	53	62	51

Table 228: Admissions of inborn babies to NICU by gestational age 2005-2014

Gestation (weeks)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	**825**	**791**	**870**	**822**	**820**	**791**	**839**	**872**	**831**	**809**
23	1	1	5	0	1	0	2	0	1	0
24	15	9	4	8	9	13	8	7	7	12
25	14	9	13	16	12	15	8	13	10	7
26	11	13	18	17	15	10	14	7	13	14
27	9	12	18	17	20	20	11	13	8	13
28	23	16	21	13	19	16	16	16	21	11
29	41	25	26	29	20	21	15	31	15	15
30	29	29	27	37	22	36	22	25	21	37
31	33	49	33	43	30	33	28	30	31	26
32	42	63	46	40	42	29	42	34	43	25
33	38	50	63	48	65	59	44	53	66	46
34	83	88	114	90	82	90	96	96	77	65
35	70	82	82	83	69	55	68	81	62	68
36	62	48	72	70	57	51	55	70	60	70
37	70	58	59	54	64	58	72	61	65	67
38	83	69	81	86	89	93	84	111	92	105
39	72	52	68	68	77	67	107	99	92	98
40	80	78	74	70	83	78	78	76	98	80
41	39	37	39	23	38	41	59	41	46	46
42	9	3	6	10	6	6	10	8	3	4
43	1	0	1	0	0	0	0	0	0	0

Table 229: Admissions of outborn babies to NICU by gestational age 2005-2014

Gestation (weeks)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	**81**	**99**	**102**	**117**	**137**	**111**	**124**	**128**	**99**	**101**
22	0	0	0	0	0	1	0	0	0	0
23	0	0	0	1	0	0	1	0	1	0
24	3	3	5	3	4	4	6	1	1	3
25	0	8	6	7	3	4	1	4	4	1
26	2	5	5	5	11	3	5	3	5	2
27	1	3	6	5	4	7	4	4	2	0
28	4	2	3	2	10	7	3	5	2	1
29	3	6	5	4	6	5	6	4	3	1
30	3	4	1	8	2	2	4	4	4	4
31	3	2	3	2	3	0	3	2	6	4
32	7	5	2	8	3	3	4	3	3	2
33	7	1	4	1	7	4	6	6	1	4
34	5	6	4	6	3	3	4	7	4	5
35	4	9	4	8	5	4	5	4	6	4
36	2	2	4	4	10	5	4	7	5	5
37	7	3	9	8	11	9	8	13	12	6
38	5	5	10	5	8	12	9	17	5	12
39	8	9	9	8	5	9	15	13	13	15
40	12	17	9	22	30	17	19	18	19	18
41	3	8	9	7	11	11	17	12	2	13
42	2	1	4	3	1	1	0	1	1	1
43+	0	0	0	0	0	0	0	0	0	0

Table 230: Admissions of outborn babies to NICU by gestational age groups 2005-2014

	2005 n=81		2006 n=99		2007 n=102		2008 n=117		2009 n=137		2010 n=111	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
20-27	6	7.4	19	19.2	22	21.6	21	17.9	22	16.1	19	17.1
28-31	13	16.0	14	14.1	12	11.8	16	13.7	21	15.3	14	12.6
32-36	25	30.9	23	23.2	18	17.6	27	23.1	28	20.4	19	17.1
≥ 37	37	45.7	43	43.4	50	49.0	53	45.3	66	48.2	59	53.1

	2011 n=124		2012 n=128		2013 n=99		2014 n=101	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
20-27	17	13.7	12	9.4	13	13.1	6	6
28-31	16	12.9	15	11.7	15	15.2	10	10
32-36	23	18.5	27	21.1	19	19.2	20	20
≥ 37	68	54.8	74	57.8	52	52.5	65	64

Table 231: Admissions of outborn babies to NICU by birth weight 2005-2014

Birth Weight (g)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	**81**	**99**	**102**	**117**	**137**	**111**	**124**	**128**	**99**	**101**
<500				1		1	0	1	0	0
500-749	2	10	8	7	4	5	3	4	2	3
750-999	5	5	11	7	17	11	10	5	9	2
1000-1249	4	7	6	13	15	8	10	7	4	1
1250-1499	6	5	4	7	8	7	5	8	9	6
1500-1999	15	13	10	16	8	10	15	13	12	10
2000-2499	10	8	8	12	12	10	14	9	12	11
2500-2999	10	15	13	13	12	10	14	22	16	14
3000-3999	22	26	33	31	50	37	41	50	27	44
≥4000	7	9	9	10	11	12	12	9	8	10

Table 232: Domicile of mother of all babies admitted to NICU 2005-2014

	2005 n=906		2006 n=890		2007 n=972		2008 n=939		2009 n=957		2010 n=902		2011 n=963	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Northern Region	834	91.9	826	92.8	824	84.8	841	89.6	872	91.1	847	92.1	892	92.6
Auckland	441	52.9	435	52.7	428	51.9	473	56.2	509	58.4	435	48.2	491	51.0
Counties Manukau	144	17.3	120	14.5	161	19.5	135	16.1	123	14.1	115	12.8	121	12.6
Waitemata	217	26	237	28.7	201	24.4	199	23.7	206	23.6	253	28.1	239	24.8
Northland	32	3.8	34	4.1	34	4.1	34	4.0	34	3.9	44	4.9	41	4.3
Midland Region	34	3.8	34	3.8	63	6.5	30	3.2	50	5.2	23	2.5	24	2.5
Central Region	23	2.5	17	1.9	0	0.0	13	1.4	15	1.6	16	1.8	12	1.2
Southern Region	8	0.9	12	1.3	0	0.0	19	2.0	16	1.7	15	1.7	15	1.6
Overseas	5	0.6	1	0.1	1	0.1	4	0.4	0	0.0	1	0	0	
Missing	2	0.2	0	0.0	84	8.6	32	3.4	4	0.4	0		20	2.0

	2012 n=1000		2013 n=930		2014 n=910	
	%	n	%	n	n	%
Northern Region	915	91.5	856	92.0	822	90.3
Auckland	489	48.9	449	48.3	454	49.9
Counties Manukau	141	14.1	141	15.2	104	11.4
Waitemata	236	23.6	222	23.9	221	24.3
Northland	49	4.9	44	4.7	43	4.7
Midland Region	33	3.3	24	2.6	30	3.3
Central Region	23	2.3	26	2.8	12	1.3
Southern Region	20	2.0	11	1.2	13	1.4
Overseas	0		0		0	
Missing	9	0.9	13	1.4	33	3.6

Table 233: DHB of mothers of all babies admitted to NICU 2014

	2014 n=910			2014 n=910	
DHB	n	%	**DHB**	n	%
Auckland	460	50.5	**Mid-Central**	2	0.2
Counties Manukau	108	11.9	**Hutt**	3	0.3
Waitemata	234	25.7	**Capital & Coast**	3	0.3
Northland	41	4.5	**Nelson Marlborough**	1	0.1
Waikato	12	11.0	**Canterbury**	8	0.9
Bay of Plenty	8	1.3	**South Canterbury**	1	0.1
Wairarapa	0		**Otago**	2	0.2
Tairawhiti	2	0.2	**Southland**	2	0.2
Taranaki	3	0.3	**West Coast**	0	
Lakes	5	0.5	**Overseas**	1	0.1
Hawkes Bay	2	0.2			

*12 missing DHB

Table 234: Prioritised ethnicity of babies admitted to NICU 2014

	Preterm (<37 weeks) N=511		Term (>=37 weeks) N=399		Total N=910	
	n	%	n	%	n	%
NZ European	192	37.6	137	34.3	329	36.2
Maori	86	16.8	50	12.5	136	15.0
Pacific	69	13.5	64	16.0	133	14.6
Other Asian	75	14.7	63	15.8	138	15.2
Indian	47	9.2	41	10.3	88	9.7
Other European	26	5.1	32	8.0	58	6.4
Other	16	3.1	12	3.0	28	3.1

Table 235: Main reason for admission to NICU 2014

	Preterm N=511		Term N=399		Total N=910	
	n	%	n	%	n	%
Prematurity	284	55.6	0	0.0	284	31.2
Respiratory distress	101	19.8	187	46.9	288	31.6
Congenital abnormality	39	7.6	72	18.0	111	12.2
Hypoglycaemia	10	2.0	45	11.3	55	6.0
Depression at birth	17	3.3	10	2.5	27	3.0
SGA	19	3.7	6	1.5	25	2.7
Cyanotic episode	1	0.2	6	1.5	7	0.8
Suspected infection	4	0.8	20	5.0	24	2.6
Neurological problem	7	1.4	6	1.5	13	1.4
Haemolytic disease	5	1.0	7	1.8	12	1.3
Feeding difficulty	1	0.2	2	0.5	3	0.3
Bile stained vomiting	5	1.0	2	0.5	7	0.8
Jaundice	4	0.8	9	2.3	13	1.4
Other	14	2.7	27	6.8	41	4.5

One unknown at term is included with other

8.3 Antenatal corticosteroids

Table 236: Percentage receiving antenatal corticosteroids by birth weight among ANZNN assigned babies 2005-2014

Birth weight (g)	2005 N n	2005 1-7d %	2005 Any %	2006 N n	2006 1-7d %	2006 Any %	2007 N n	2007 1-7d %	2007 Any %	2008 N n	2008 1-7d %	2008 Any %
Total	148	57	95	134	74	128	155	55	96	149	54	87
<500							1	100	100	0	0	0
500-749	25	52	100	19	12	18	19	53	84	19	58	79
750-999	34	56	94	24	11	23	37	54	97	38	45	92
1000-1249	47	57	98	34	20	34	47	49	100	38	58	87
1250-1499	42	60	90	57	31	53	51	61	96	54	56	87

Birth weight (g)	2009 N n	2009 1-7d %	2009 Any %	2010 N n	2010 1-7d %	2010 Any %	2011 N n	2011 1-7d %	2011 Any %	2012 N n	2012 1-7d %	2012 Any %
Total	150	53	88	154	60	90	121	53	91	139	68	91
<500	0	0	0	2	100	100	0	0	0	1	100	100
500-749	15	73	87	25	64	88	22	54	95	14	64	100
750-999	42	55	100	31	68	90	26	61	92	29	69	90
1000-1249	39	51	79	41	66	95	28	57	89	40	73	95
1250-1499	54	46	85	55	49	85	45	47	89	55	64	85

Birth weight (g)	2013 N n	2013 1-7d n(%)	2013 Any n(%)	2014 N n	2014 1-7d n(%)	2014 Any n(%)
Total	134	56	88	126	80(63)	120 (95)
<500	0			1	1(100)	1(100)
500-749	14	64	100	20	14(70)	20(100)
750-999	36	56	89	24	11(46)	23(96)
1000-1249	31	65	94	37	28(76)	36(97)
1250-1499	53	49	81	44	26(59)	40(91)

Table 237: Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies (2005-2014)

Gestation (weeks)	2005 N n	2005 1-7d %	2005 Any %	2006 N n	2006 1-7d %	2006 Any %	2007 N n	2007 1-7d %	2007 Any %	2008 N n	2008 1-7d %	2008 Any %
Total	176	55	94	163	48	94	165	56	98	189	51	88
<24	1	0	100	1	0	0	5	40	60	0	0	0
24-25	29	55	97	18	56	100	17	53	94	25	36	80
26-27	20	55	100	25	44	100	36	69	100	36	50	86
28-29	64	47	94	41	56	98	47	45	98	45	60	87
30-31	62	40	94	78	45	91	60	60	100	83	52	93
Gestation (weeks)	**2009 N n**	**2009 1-7d %**	**2009 Any %**	**2010 N n**	**2010 1-7d %**	**2010 Any %**	**2011 N n**	**2011 1-7d %**	**2011 Any %**	**2012 N n**	**2012 1-7d %**	**2012 Any %**
Total	157	50	90	175	57	91	139	50	88	161	65	90
<24	1	0	0	1	0	0	3	0	100	0		
24-25	20	70	95	30	57	87	17	29	94	23	57	87
26-27	37	54	95	31	65	94	28	68	89	24	63	96
28-29	45	56	89	42	62	88	37	46	86	54	65	91
30-31	54	37	89	71	52	96	54	54	87	60	70	88
Gestation (weeks)	**2013 N n**	**2013 1-7d %**	**2013 Any %**	**2014 N n**	**2014 1-7d %**	**2014 Any %**						
Total	144	56	90	144	86(60)	135(94)						
<24	2	0	100	0	0	0						
24-25	19	53	89	20	12(60)	20(100)						
26-27	25	40	88	28	20(71)	28(100)						
28-29	40	60	90	28	18(64)	27(96)						
30-31	58	62	91	68	36(53)	60(88)						

8.4 Care and complications

8.4.1 Infection

Table 238: Organisms causing serious infection in NICU 2014

Organism	Early Infection	Late Infection
Staph epidermidis + Ecoli	3	5
E Coli	-	2
Staph aureus	-	21
Staph epidermidis	-	11
Coagulase negative *staphylococcus*	1	-
Enterococcus	-	-
Enetrobacter	-	2
Candida	-	-
Citrobacter	4	2
Group B Strep	-	-
Listeria monocytogenes	-	1
Klebsiella	-	1
Pseudomonas	1	-
Other / Unknown	3	5

8.4.2 Intraventricular haemorrhage

Table 239: Intraventricular haemorrhage by birth weight 2014 (benchmarked with ANZNN)

Birth Weight (g)	N	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**165**	**54**	**85**	**22**	**0**	**0**	**4**
<500	1	0	0	1	0	0	0
500-749	20	1	13	5	0	0	1
750-999	24	3	17	2	0	0	2
1000-1249	37	4	28	4	0	0	1
1250-1499	44	21	18	5	0	0	0
1500-1999	36	23	9	4	0	0	0
2000-2499	3	2	0	1	0	0	0

Table 240: Intraventricular haemorrhage by gestation 2014 (benchmarked with ANZNN)

Gestation (weeks)	N	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**165**	**54**	**85**	**22**	**0**	**0**	**4**
<24	0						
24-25	20	0	13	4	0	0	3
26-27	28	2	21	4	0	0	1
28-29	28	1	24	3	0	0	0
30-31	68	39	20	9	0	0	0
32-36	21	12	7	2	0	0	0
>36	0						

Table 241: Intraventricular haemorrhage in all <1250g babies admitted to NICU 1990-2014

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

8.4.3 Assisted ventilation

Table 242: High Frequency Oscillatory Ventilation 2005-2014

Gestation (wks)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total	%
Total	15/21	12/15	19/23	15/27	15/29	21/28	18/20	21/29	19/25	12/20	166/236	70
<28	9/14	6/9	11/14	9/17	8/18	12/18	11/12	6/10	11/14	5/10	88/136	65
28-31	3/3	2/2	3/4	0/1	2/3	3/3	1/1	3/5	1/2	1/3	19/27	70
32-36	0/1	1/1	1/1	3/4	3/5	2/3	1/1	1/1	2/3	0	14/20	70
≥37	3/3	2/2	4/4	3/5	2/3	4/4	5/6	11/13	5/6	6/7	45/53	85

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 243: Inhaled Nitric Oxide (iNO) 2005-2014

Gestation (wks)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total	%
Total	13/16	8/10	26/29	15/18	10/20	32/36	20/26	26/33	25/29	12/17	187/234	80
<28	2/5	0/1	4/5	3/5	2/7	7/9	4/6	2/4	6/7	1/3	31/52	60
28-31	1/1	1/1	2/3	2/2	0/2	3/4	1/2	3/4	0/1	1/2	14/22	64
32-36	3/3	1/1	5/6	2/2	2/3	4/5	6/6	0/0	3/5	1/1	27/32	84
≥37	7/7	6/7	15/15	8/9	6/8	18/18	9/12	21/25	16/16	9/11	115/128	90

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 244: iNO plus HFOV 2005-2014

Gestation (weeks)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total	%
Total	6/8	3/4	10/12	6/9	5/12	12/15	9/11	15/19	11/14	7/10	84/114	74
<28	2/3	0/1	3/4	2/4	2/6	5/7	4/5	2/4	5/6	1/3	26/43	60
28-31	1/1	-	2/3	-	0/1	2/2	1/1	3/3	0/1	1/1	10/13	77
32-36	0/1	1/1	1/1	2/2	2/3	1/2	1/1	0/0	1/2	0	9/13	69
≥37	3/3	2/2	4/4	2/3	1/2	4/4	3/4	10/12	5/5	5/6	39/45	87

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 245: Reason for ventilation and CPAP in term and post-term infants 2004-2014

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
TTN/RDS	6/61	2/42	3/55	8/76	3/84	8/100	7/88	8/96	9/111	10/108	6/112
Infection	1/12	2/8	2/10	3/7	-/10	1/16	2/9	2/18	3/14	0/11	4/18
Meconium	4/13	7/16	8/15	9/19	4/13	4/15	10/14	13/30	15/32	12/21	11/22
Anomaly	4/6	9/10	7/7	8/6	10/8	6/5	9/8	7/9	5/4	4/6	6/6
PPHN	8/7	4/6	3/3	7/4	5/6	5/6	9/10	4/4	7/4	7/7	5/4
Encephalopathy	8/8	9/4	4/1	8/7	6/2	7/8	11/1	8/5	1/2	13/2	11/4
Support for surgery					14/8	10/3	13/6	9/3	15/4	23/9	13/5
Other				21/25	6/13	17/36	21/24	14/30	17/35	20/43	28/46
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.

8.5 Outcomes

8.5.1 Survival

Table 246: Numbers of survivors by gestational age of babies <32 weeks gestation 2014

Gestation (weeks)	20	21	22	23	24	25	26	27	28	29	30	31
Born alive in NWH	0	0	0	4	14	7	14	13	11	15	37	26
Died at birth in NWH				4	2							
Born alive at NWH and admitted to NICU					12	7	14	13	11	15	37	26
Born alive at NWH and survived					10	7	13	13	10	15	36	26
Outborn admitted					3	1	2	0	1	1	4	4

8.5.2 Retinopathy of prematurity

Table 247: Retinopathy of prematurity by birth weight in babies surviving to 36 weeks gestation (ANZNN assigned babies) 2014

Birth Weight(g)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**112**	**32**	**38**	**25**	**14**	**3**	**0**
<500	1	0	0	0	1	0	0
500-749	18	0	3	7	6	2	0
750-999	21	1	8	6	5	1	0
1000-1249	35	11	16	8	0	0	0
1250-1499	28	16	7	4	1	0	0
1500-1999	9	4	4	0	1	0	0

Table 248: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks gestation (ANZNN assigned babies) 2014

Gestation (wks)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**112**	**32**	**38**	**25**	**14**	**3**	**0**
<24	0						
24-25	16	0	2	5	7	2	0
26-27	27	2	7	11	6	1	0
28-29	27	6	16	5	0	0	0
30-31	29	14	10	4	1	0	0
>31	13	10	3	0	0	0	0

8.5.3 Chronic lung disease

Table 249: Chronic lung disease by birth weight (inborn babies <1500gms) 2014

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	**120**	**6**	**114**	**3**	**15**	**25**	**43**	**36**	**38**
<500	1	0	1	0	0	1	1	100	100
500-749	19	2	17	2	4	8	14	74	82
750-999	23	2	21	0	9	6	15	65	71
1000-1249	37	2	35	1	2	5	8	22	23
1250-1499	40	0	40	0	0	5	5	13	13

Table 250: Chronic lung disease by gestational age (inborn babies <32weeks) 2014

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	**135**	**6**	**129**	**5**	**15**	**25**	**45**	**33**	**35**
24-25	19	3	16	1	7	6	14	74	88
26-27	27	1	26	0	6	9	15	56	58
28-29	26	1	25	2	0	5	7	27	28
30-31	63	1	62	2	2	5	9	14	15

8.5.4 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 251: Necrotising enterocolitis (NEC) by birth weight 2005-2014 ANNZN <1500g

Weight (g)	2005			2006			2007			2008			2009		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**148**	**6**	**4**	**134**	**3**	**2**	**155**	**2**	**1**	**149**	**4**	**3**	**150**	**6**	**4**
<500							1	0	0	0	0	0	0	0	0
500-749	25	4	16	19	2	10	19	1	5	19	2	11	15	1	7
750-999	34	1	3	24	0	0	37	1	3	38	1	3	42	4	10
1000-1249	47	1	2	34	1	3	47	0	0	38	1	3	39	0	0
1250-1499	42	0		57	0		51	0	0	54	0	0	54	1	2

Weight (g)	2010			2011			2012			2013			2014		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**154**	**7**	**5**	**121**	**5**	**4**	**139**	**3**	**2**	**134**	**1**	**1**	**126**	**2**	**2**
<500	2	0	0	0	0	0	1	0	0	0	0	0	1	0	0
500-749	25	0	0	22	2	9	14	1	7	14	0	0	20	1	5
750-999	31	1	3	26	2	8	29	1	3	36	1	3	24	0	0
1000-1249	41	4	10	28	1	4	40	1	3	31	0	0	37	1	3
1250-1499	55	2	4	45	0	0	55	0	0	53	0	0	44	0	0

Table 252: Necrotising enterocolitis by gestational age ANNZN <32wks 2005-2014

Gestation (weeks)	2005			2006			2007			2008			2009		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**175**	**6**	**3**	**162**	**3**	**2**	**165**	**2**	**1**	**189**	**4**	**2**	**157**	**6**	**4**
<24							5	0	0	0	0	0	1	0	0
24-25	29	4	14	18	1	6	17	1	6	25	3	12	20	1	5
26-27	20	0		25	2	8	36	1	3	36	1	3	37	5	14
28-29	64	0		41	0	0	47	0	0	45	0	0	45	0	0
30-31	62	1	2	78	0	0	60	0	0	83	0	0	54	0	0

Gestation (weeks)	2010			2011			2012			2013			2014		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**175**	**7**	**4**	**139**	**6**	**15**	**161**	**3**	**2**	**144**	**1**	**1**	**144**	**3**	**2**
<24	1	0	0	3	1	33	0	0	0	2	1	50	0	0	0
24-25	30	0	0	17	2	12	23	2	9	19	0	0	20	1	5
26-27	31	2	7	28	2	7	24	0	0	25	0	0	28	0	0
28-29	42	4	10	37	1	3	54	1	2	40	0	0	28	0	0
30-31	71	1	1	54	0	0	60	0	0	58	0	0	68	2	3

8.5.5 Pneumothorax (All babies <1500g)

Table 253: Pneumothorax requiring drainage by birth weight (<1500g) 2005-2014

Birth weight (g)	2005			2006			2007			2008			2009		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <1500g	**148**	**8**	**5**	**134**	**1**	**0.7**	**155**	**7**	**5**	**149**	**7**	**5**	**137**	**6**	**5**
<500							1	0	0	0	0	0	0	0	0
500-749	25	1	4	19	0	0	19	1	5	19	2	11	15	1	7
750-999	34	1	3	24	0	0	37	4	11	38	1	3	42	3	7
1000-1249	47	3	6	34	0	0	47	1	2	38	0	0	31	0	0
1250-1499	42	3	7	57	1	2	51	1	2	54	4	7	49	2	4

Birth weight (g)	2010			2011			2012			2013			2014		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <1500g	**143**	**2**	**1**	**139**	**0**	**0**	**148**	**0**	**0**	**144**	**2**	**1**	**131**	**2**	**2**
<500	0	0	0	2	0	0	0	0	0	2	0	0	1	0	0
500-749	15	1	7	23	1	4	23	0	0	18	0	0	22	2	9
750-999	29	0	0	34	0	0	30	0	0	41	1	2	25	0	0
1000-1249	39	0	0	35	0	0	42	0	0	33	0	0	38	0	0
1250-1499	50	1	2	47	0	0	56	0	0	55	1	2	45	0	0

Table 254: Pneumothorax requiring drainage by gestation (all babies <32wks) 2005-2014

Gestation (weeks)	2005			2006			2007			2008			2009		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <32wks	**176**	**11**	**6**	**163**	**1**	**1**	**165**	**7**	**4**	**189**	**7**	**4**	**148**	**3**	**2**
<24	1	0		1	0	0	5	0	0	0	0	0	1	0	0
24-25	29	1	3	18	0	0	17	2	1	25	2	8	21	1	5
26-27	20	3	15	25	0	0	36	2	6	36	1	3	35	2	6
28-29	64	5	8	41	1	2	47	3	6	45	2	4	39	0	0
30-31	62	2	3	78	0	0	60	0	0	83	2	2	52	0	0

Gestation (weeks)	2010			2011			2012			2013			2014		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <32wks	**164**	**2**	**1**	**157**	**1**	**1**	**169**	**0**	**0**	**155**	**2**	**1**	**151**	**3**	**2**
<24	0	0	0	3	0	0	0	0	0	2	0	0	0		
24-25	28	0	0	23	0	0	25	0	0	22	0	0	23	1	4
26-27	30	0	0	34	0	0	27	0	0	28	1	4	29	1	3
28-29	37	2	5	40	0	0	56	0	0	41	0	0	28	0	0
30-31	69	0	0	57	1	2	61	0	0	62	1	2	71	1	1

Table 255: Inborn babies receiving postnatal corticosteroids by birth weight 2014 (babies alive at 1 week and less than 1500g)

Birth weight (g)	N	n	%
Total	**118**	**11**	**9**
<500	1	1	100
500-749	18	4	22
750-999	22	5	23
1000-1249	37	1	3
1250-1499	40	0	

Table 256: Inborn babies receiving postnatal corticosteroids by gestational age 2014 babies alive at 1 week and less than 32 weeks)

Gestation (weeks)	N	n	%
Total	**133**	**11**	**8**
<24	0		
24-25	18	8	44
26-27	27	2	7
28-29	25	1	4
30-31	63	0	

Table 257: Method of feeding at discharge from NICU by gestational age and birth weight 2014 (inborn)

	Total	Exclusive		Fully		Partial		Artificial		Nil Oral	
	N	n	%	n	%	n	%	n	%	n	%
Total	797	391	49.1	134	16.8	176	22.1	74	9.3	22	2.8
Gestation (weeks)											
24-27	42	23	54.8	0	0.0	7	16.7	12	28.6	0	0.0
28-31	87	61	70.1	7	8.0	11	12.6	8	9.2	0	0.0
32-36	273	93	34.1	77	28.2	75	27.5	25	9.2	3	1.1
37-40	346	188	54.3	41	11.8	73	21.1	25	7.2	19	5.5
≥41	49	26	53.1	9	18.4	10	20.4	4	8.2	0	0.0
Birth weight (gms)											
<500	1	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0
500-749	17	8	47.1	0	0.0	4	23.5	5	29.4	0	0.0
750-999	21	13	61.9	2	9.5	2	9.5	4	19.0	0	0.0
1000-1249	35	24	68.6	1	2.9	6	17.1	4	11.4	0	0.0
1250-1499	39	25	64.1	6	15.4	3	7.7	5	12.8	0	0.0
1500-1999	102	41	40.2	28	27.5	24	23.5	9	8.8	0	0.0
2000-2499	143	46	32.2	40	28.0	44	30.8	11	7.7	2	1.4
2500-2999	121	61	50.4	17	14.0	30	24.8	6	5.0	7	5.8
3000-3999	267	149	55.8	31	11.6	51	19.1	24	9.0	12	4.5
>3999	51	23	45.1	9	17.6	12	23.5	6	11.8	1	2.0

8.6 Details of deaths prior to discharge among outborn babies admitted to NICU

Table 258: Outborn neonatal and post-neonatal deaths prior to discharge 2014

Born at	Gestational age	Birth Weight	Apgar @1 min	Apgar @ 5 min	Age at death (d)	Cause of death
MMH	30	1640	4	7	7	Laparotomy - Multi Organ failure
NSH	41	3920	0	0	1	HIE
NSH	41	3605	1	1	0	HIE
NSH	28	850	6	7	3	Severe IVH & pulmonary haemorrhage

8.7 Details of deaths prior to discharge among inborn babies admitted to NICU

Table 259: Inborn neonatal and post-neonatal deaths prior to discharge from NICU 2014

Birthplace	Gestational age	Birth weight	Apgar @1 min	Apgar @ 5 min	Age at death (d)	Main Cause of death
Theatre	38	3050	1	2	1	Hypoxia /cardiac
Theatre	26	1230	4	7	10	Respiratory failure
Theatre	36	1455	7	9	41	Charge syndrome
Theatre	37	2280	6	9	24	Renal failure + Moebius syndrome
Theatre	40	3790	1	7	3	Neurological injury
Theatre	30	1200	7	9	17	NEC
Delivery Suite	37	2180	5	6	1	Pulmonary hypoplasia + cardiac failure
Delivery Suite	24	695	3	6	3	Severe IVH, sepsis, extreme prematurity
Delivery Suite	24	675	5	5	56	Respiratory failure, extreme prematurity
Delivery Suite	24	750	4	7	1	Sepsis, RDS, extreme prematurity
Theatre	28	970	1	4	1	Respiratory failure, pulmonary hypoplasia
Theatre	41	3150	2	5	3	HIE

APPENDIX 9. PERINATAL MORTALITY

Table 260: Postnatal transfer deaths (these are babies born elsewhere who transferred to NWH for postnatal care) 2001-2014

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Early neonatal deaths	< 7 days	1	3	3	3	3	3	5	3	4	5	3	4	2	3
Late neonatal deaths	8 – 28 days	1	0	0	0	3	3	2	3	5	1	0	0	2	1
Total deaths		2	3	3	3	6	6	7	6	9	6	3	4	4	4

Table 261: Maternal characteristics and perinatal related mortality 2014

	Births n=7551		Stillbirths n=60			Neonatal deaths n=37			Perinatal related deaths n=97		
	N	%	n	%	SB rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Maternal ethnicity (prioritised)											
NZ European	2478	32.8	17	28	6.9	9	24	3.7	26	27	10.6
Māori	497	6.6	5	8	10.1	3	8	6.1	8	8	16.2
Pacific	893	11.8	14	23	15.7	5	14	5.7	19	20	21.3
Other Asian	1859	24.6	9	15	4.8	10	27	5.4	19	20	10.2
Indian	653	8.7	8	13	12.3	4	11	6.2	12	12	18.4
Other European	884	11.7	4	7	4.5	5	14	5.7	9	9	10.2
Other	287	3.8	3	5	10.2	1	3	3.4	4	4	13.7
Parity											
Nullipara	3687	48.8	35	58	9.5	17	46	4.7	52	54	14.1
Multipara	3864	51.2	25	42	6.5	20	54	5.2	45	46	11.6
Maternal age											
≤25	1021	13.5	8	13	7.8	7	19	6.9	15	15	14.7
26-34	4309	57.1	34	57	7.9	21	57	4.9	55	57	12.8
≥35	2221	29.4	18	30	8.1	9	24	4.1	27	28	12.2
Maternal smoking at booking											
Currently smoking	384	5.1	5	8	13.0	4	11	10.6	9	9	23.4
Not smoking	7164	94.9	55	92	7.7	33	89	4.6	88	91	12.3
Missing data	3	0.0	0	0		0	0		0	0	
Maternal BMI (WHO)											
<18.5	317	4.2	0	0	0.0	0	0	0.0	0	0	0.0
18.5-24.99	4189	55.5	25	42	6.0	19	51	4.6	44	45	10.5
25-29.99	1594	21.1	16	27	10.0	7	19	4.4	23	24	14.4
30-34.99	715	9.5	6	10	8.4	7	19	9.9	13	13	18.2
35-39.99	368	4.9	6	10	16.3	3	8	8.3	9	9	24.5
>=40	236	3.1	3	5	12.7	0	0	0.0	3	3	12.7
missing	132	1.7	4	7		1	3		5	5	
NZDep 2006 (quintile)											
1	1347	17.8	11	18	8.2	7	19	5.2	18	19	13.4
2	1451	19.2	12	20	8.3	4	11	2.8	16	16	11.0
3	1564	20.7	4	7	2.6	6	16	3.8	10	10	6.4
4	1631	21.6	21	35	12.9	7	19	4.3	28	29	17.2
5	1544	20.4	12	20	7.8	12	32	7.8	24	25	15.5
Missing data	14	0.2	0	0		1	3		1	1	

* 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

Table 262: Perinatal full postmortem rates (%) 1992-2014

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Perinatal postmortem (%)	56	65	68	57	48	50	38	50	40	40	41

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Perinatal postmortem (%)	43	52	48	50	59	55	38	44	33	34	45	46

Table 263: Classification of perinatal-related death (PSANZ-PDC)

Classification (PSANZ-PDC)	2006 N=99		2007 N=111		2008 N=110		2009 N=112		2010 N=117		2011 N=120		2012 N=123		2013 N=114		2014 N=97	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Congenital abnormality	37	37	48	43	34	31	31	28	48	41	43	36	48	39	38	33	37	38
Perinatal infection	9	9	4	4	5	5	4	4	4	3	4	3	2	2	6	5	2	2
Hypertension	3	3	0		4	4	6	5	4	3	4	3	5	4	3	3	5	5
APH	4	4	7	6	13	12	15	13	11	9	9	8	15	12	15	13	10	10
Maternal conditions	6	6	5	5	3	3	6	5	9	8	8	7	10	8	4	4	7	7
Specific perinatal conditions	7	7	7	6	22	20	16	14	9	8	23	19	14	11	21	18	13	13
Hypoxic peripartum death	0		2	2	1	1	1	1	2	2	1	1	1	1	2	2	2	2
Fetal growth restriction	8	8	11	10	9	8	5	4	2	2	8	7	3	2	8	7	5	5
Spontaneous preterm	13	13	16	14	11	10	19	17	18	15	10	8	15	12	9	8	9	9
Unexplained antepartum death	12	12	10	9	7	6	9	8	10	9	9	8	10	8	8	7	6	6
No obstetric antecedent	0		1	1	1	1	0	0	0		1	1	0		0		1	1

Table 264: Classification of death (PSANZ-PDC) among terminations of pregnancy 2014

Classification (PSANZ-PDC)	Termination of pregnancy n=37	
	n	%
Congenital abnormality	24	65
Antepartum haemorrhage	3	8
Perinatal Infection	0	0
Specific perinatal conditions	5	14
Hypertension	1	3
Maternal condition	3	8
Spontaneous preterm	1	8
Fetal growth restriction	0	0

Table 265: Perinatal related deaths by classification (PSANZ-PDC) and gestational age 2014

	Total deaths n=97		Preterm (<37 weeks) n=83		Term (≥ 37 weeks) n=14	
	n	%	n	%	n	%
Congenital abnormality	37	38	30	36	7	50
Perinatal infection	2	2	2	2	0	0
Antepartum haemorrhage	5	5	10	12	0	0
Maternal conditions	10	10	7	8	0	0
Hypertension	7	7	5	6	0	0
Specific perinatal conditions	13	13	12	14	1	7
Hypoxic peripartum death	1	1	0		2	14
Fetal growth restriction	5	5	4	5	1	7
Spontaneous preterm	9	9	9	11	0	0
Unexplained antepartum death	7	7	4	5	2	14
No obstetric antecedent	1	1	0		1	7

APPENDIX 10. GYNAECOLOGY

10.1 Termination of pregnancy

Table 266: Demography and characteristics of women attending EDU NWH 2003-2014

	2003 n=5960	2004 n=5809	2005 n=5598	2006 n=5548	2007 n=5594	2008 n=5550	2009 n=5391	2010 n=5049	2011 n=4949	2012 n=4536	2013 n=4213	2014 n=3842
Ethnicity	%	%	%	%	%	%	%	%	%	%	%	%
New Zealand European	27.8	27.4	26.5	27.4	27.6	27.7	26.1	25.7	27.2	27.0	26.4	25.8
Maori	18.2	18.4	19.1	20.4	21.2	20.5	19.9	20.4	19.5	19.3	19.3	18.8
Pacific	23.0	22.8	23.2	23.8	24.5	23.1	24.3	24.1	22.6	24.6	23.5	21.9
Other Asian	12.3	11.6	11.2	11.4	10.5	10.8	10.6	10.3	10.9	11.0	10.3	11.9
Indian	7.4	7.7	8.3	8.2	8.3	9.4	10.2	11.7	11.7	10.6	12.1	12.5
Other European	5.1	5.4	5.7	5.0	4.5	4.8	5.1	5.2	5.7	5.5	5.6	6.3
Other	6.3	6.6	6.0	3.8	3.3	2.6	3.3	2.6	2.4	2.1	2.8	2.9
Age												
≤ 19	18.7	19.3	19.8	21.5	22.3	21.7	22.2	20.7	17.8	16.6	14.6	13.6
20 – 24	30.3	28.9	28.5	29.7	29.6	29.0	29.8	30.6	30.6	31.3	31.8	29.6
25 – 29	20.8	20.9	21.1	20.7	20.1	21.6	20.8	19.9	21.6	21.7	22.3	22.9
30 – 34	15.9	16.1	15.7	14.4	14.3	13.3	13.9	14.1	15.4	16.0	16.8	17.7
35 –39	10.2	10.9	10.7	9.5	9.7	10.1	9.3	10.0	10.2	10.0	10.4	11.4
≥40	4.1	3.9	4.3	3.9	4.0	4.3	4.0	4.7	4.4	4.5	4.1	4.9
Gestation (weeks) at Termination												
6	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	1.9
7	1.2	0.9	0.4	0.2	0.2	0.1	0.6	2.7	1.4	1.1	4.4	6.1
8	8.9	17.2	10.5	11.0	8.8	13.0	18.4	33.7	30.3	25.3	17.2	20.4
9	20.0	23.9	20.9	23.1	20.8	23.9	24.5	23.7	26.9	27.4	23.9	21.6
10	23.8	21.4	22.7	24.0	25.1	25.1	24.3	16.8	18.4	18.8	22.8	19.4
11	23.9	20.6	24.0	23.5	24.1	21.3	18.8	13.0	12.6	14.4	16.9	15.9
12	20.0	14.5	20.0	17.6	20.9	16.7	13.2	10.1	9.9	11.7	13.6	13.5
≥13	2.1	1.4	1.3	0.5	0.0	0.2	0.1	0.0	0.4	1.2	1.0	1.1

10.2 Gynaecology Inpatient Surgery

Table 267: BMI by ethnicity (prioritised) among women having inpatient gynaecology surgery NWH 2014 (6.1% missing BMI data excluded)

	BMI	<19		19-25		26-30		31-35		>35	
	N	n	%	n	%	n	%	n	%	n	%
Total	**1561**	**67**	**4.3**	**657**	**42**	**356**	**22.8**	**167**	**10.7**	**314**	**20.1**
NZ European	606	31	5.1	288	48	142	23.4	57	9.4	88	14.5
Maori	179	2	1.1	57	32	38	21.2	31	17.3	51	28.5
Pacific	256	1	0.4	32	13	46	18.0	39	15.2	138	53.9
Other Asian	175	20	11.4	111	63	34	19.4	7	4.0	3	1.7
Indian	119	6	5.0	36	30	45	37.8	18	15.1	14	11.8
Other European	166	7	4.2	103	62	32	19.3	10	6.0	14	8.4
Other	53	0	0.0	26	49	17	32.1	5	9.4	5	9.4
Not Stated	7	0	0.0	4	57	2	28.6	0	0.0	1	14.3

Table 268: Smoking status by ethnicity (prioritised) among women having inpatient gynaecology surgery NWH 2014

		Currently smoking		Past smoker		Never smoked		Unknown	
	N	n	%	n	%	n	%	n	%
Total	**1663**	**260**	**15.6**	**158**	**9.5**	**1236**	**74.3**	**9**	**0.5**
NZ European	643	103	16.0	72	11.2	466	72.5	2	0.3
Maori	192	77	40.1	22	11.5	92	47.9	1	0.5
Pacific	265	46	17.4	31	11.7	187	70.6	1	0.4
Other Asian	191	13	6.8	5	2.6	172	90.1	1	0.5
Indian	129	3	2.3	0	0.0	125	96.9	1	0.8
Other European	179	17	9.5	24	13.4	135	75.4	3	1.7
Other	57	0	0.0	3	5.3	54	94.7	0	0.0
Not stated	7	1	14.3	1	14.3	5	71.4	0	0.0

Table 269: ASA rating among women having inpatient gynaecology surgery NWH 2014

	Inpatient surgeries 2014 n=1663	
	n	%
ASA Rating		
1	591	35.5
2	536	32.2
3	154	9.3
4	3	0.2
5	1	0.1
Missing	378	22.7

Table 270: BMI and procedure approach NWH 2014 (Missing data excluded)

	Hysteroscopy n=266		Laparoscopy n=371		Laparotomy n=169		Vaginal n=685		Radiologically n=7		Vulval n=63	
BMI	n	%	n	%	n	%	n	%	n	%	n	%
<19	12	4.5	20	5.4	5	3.0	28	4.1	1	14.29	1	1.6
19-25	68	25.6	202	54.4	59	34.9	289	42.2	4	57.14	35	55.6
26-30	50	18.8	95	25.6	34	20.1	166	24.2	1	14.29	10	15.9
31-35	32	12.0	25	6.7	26	15.4	77	11.2	0	0	7	11.1
>35	104	39.1	29	7.8	45	26.6	125	18.2	1	14.29	10	15.9

6.1% of BMI data missing in 2014

APPENDIX 11. 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 system	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 zone
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 birth)	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 12. 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

Table 263: 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 Maori
7	Samoan
8	Other Pacific Island
9	Pacific Island NFD (Not Further Defined)
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

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.

The most summarised (Level 1) prioritisation is as follows: Maori, 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 born without any signs of life or at least 400 grams birth weight if gestation is unknown.

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 (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31).

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 and 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) in a woman diagnosed as a gestational diabetic (GDM) during pregnancy.

Postpartum haemorrhage (PPH)

Primary PPH is >500mls blood loss from the genital tract within the first 24 hours of birth. Secondary PPH is >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 (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31)

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