National Women's Annual Clinical Report 2012

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The project team would like to thank the many people who have assisted in the production of this publication.

Special thanks to all who provide, enter and check data used in this Annual Clinical Report, especially to Julie Porfiriadis, Coralee Jones, Claire Hunter, Joanna Chua, Denny Wood, Sophie Jillings, Steffi Richter, Louise Grey, Praveen Singh, Coila Bevan, Hedwig van Asten, Simone Pook, Dr Elaine Fyfe and Sian Dawes.

Thanks also to those who have provided data and chapter comments, especially Dr Janet Rowan, Dr Lesley McCowan, Dr Emma Parry, Dr Jenny McDougall, Dr Mahesh Harilall, Dr Martin Sowter, Dr Lucille Wilkinson, Dr Martin Minehan, Pauline Fakalata, Janice Taylor, Sandra Smith, Ines Blaj, Dr Katie Groom, Dr Michelle Wise, Dr Lois Eva, Dr Malcolm Battin, Dr Claire McClintock, Dr Mairi Wallace, Dr Katherine McKenzie, Dr Paul MacPherson, Dr Elaine Fyfe, Dr Liz Curr, Juliette Wotton, Margaret Berry, Dr C Farquhar.

ISSN 1175-6667
This document is available on the National Women's Health website
http://nationalwomenshealth.adhb.govt.nz

I am delighted to present the 2012 National Women's Annual Clinical Report.

As you will see in the report National Women's continues to provide an excellent service and I am proud to share in the celebration of our achievements. I also acknowledge that there are some areas where there are opportunities for further improvement and this report provides a vehicle for us to openly critique and review how we can achieve this. We would welcome your feedback in relation to this report as this is an important part of our quality improvement processes.

The Maternity Quality and Safety Programme has enabled us to strengthen our monitoring and overall governance processes and good progress has been made in meeting the National standards. The Clinical Governance framework has now been in place for over a year and it is a pleasure to have a section in the report noting the progress made in this area.

It is noted that the Healthware upgrade has created some challenges in the development of this report with the need to merge two different data sets; equally changes to the Colposcopy database has only allowed for 6 months of data to report on.

Lastly, I wish to acknowledge the work and commitment of our staff who continue to provide an excellent service to our women and babies in an environment where there are acknowledged constraints and challenges. Special thanks to those staff who have worked to put the annual report together. It has been a privilege for me to lead such a committed team of people.

Karin Drummond
General Manager – National Women's

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Chapter 1

INTRODUCTION

1 INTRODUCTION

1.1 Purpose of this report

The purpose of the National Women's (NW) Annual Clinical Report is:

- To chronicle maternity, neonatal, and gynaecologic care and outcomes of care during the calendar year.
- To demonstrate trends in the population, service provision, interventions and outcomes over time.
- To stimulate enquiry and improvement in services provided by NW.
- To encourage external commentary and critique of care provided at NW.
- To provide a benchmark for obstetric and neonatal care in New Zealand against which other services might compare themselves.

1.2 Report structure

The chapters in this report contain figures and commentary with limited data tables. The similarly numbered appendices contain the comprehensive data tables relevant to the commentary in each chapter. The report is divided into the following chapters:

Chapter 1: Introduction

This chapter provides background information, describes the data sources and relevant methodology.

Chapter 2: Service provision

This chapter gives background or context to the provision of Maternity, Gynaecology and Newborn Services at National Women's.

Chapter 3: Summary statistics

This chapter provides, for the obstetric and neonatal population at NW, summary data on principal outcomes.

Chapter 4: Maternal demography

This chapter provides information on domicile, age, ethnicity, parity, smoking behaviour, BMI, deprivation and LMC for the women who birthed at NW. It also provides data on the characteristics of standard primipara at NW.

Chapter 5: Antenatal complications

This chapter focuses on the following antenatal complications: diabetes, preterm birth, multiple pregnancy, antepartum haemorrhage, SGA (small for gestational age), and hypertensive disease. It also includes an analysis of interventions and outcomes by maternal BMI; and data from the Maternal Fetal Medicine Service.

Chapter 6: Labour and birth

This chapter focuses on induction of labour, mode of birth, and neonatal and maternal outcomes associated with birthing. It also provides data on outcomes of women labouring at Birthcare Auckland.

Chapter 7: **Labour and birth outcomes**

This chapter includes perineal trauma, postpartum haemorrhage, emergency peripartum hysterectomy, and neonatal outcomes.

Chapter 8: Postnatal care

This chapter focuses on postnatal care, including infant feeding and postpartum admission and re-admission.

Chapter 9: Newborn services

This chapter describes interventions and outcomes for the babies cared for in the Neonatal Intensive Care Unit who were born in 2012, including benchmarking with the Australian and New Zealand Neonatal Network (ANZNN). It includes a report of activity of the Child Development Unit.

Chapter 10: Perinatal mortality

This chapter provides information and analyses about fetal and neonatal deaths of babies born at NW in 2012.

Chapter 11: Maternal mortality and morbidity

This chapter provides data on maternal deaths and severe maternal morbidities among women giving birth at NW during 2012.

Chapter 12: Gynaecology

This chapter provides information on fertility services, termination of pregnancy services, gynaecology inpatient surgeries, colposcopy and gynaecologic oncology services.

Appendices

The appendices provide additional detailed statistical tables and the data populating many of the figures for the chapters, along with abbreviations and definitions.

1.3 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 NW during the 2012 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 in the Newborn section pertain to all babies admitted to and cared for at the NW Neonatal Intensive Care Unit if born during the 2012 calendar year. This includes babies transferred from other units or home.

The gynaecology section includes information on women provided care by fertility, termination of pregnancy and colposcopy outpatient services, and on women provided inpatient gynaecologic surgical care.

1.4 Data sources

Data for this report have been extracted from the NW maternity clinical database (Healthware CSC) and from stand-alone databases for neonatology, perinatal mortality, Fertility Plus, Epsom Day Unit, gynaecologic oncology, colposcopy, and gynaecologic surgeries. Data from the ATLAS database (ICD-10 coded data on hospital discharges), supported by the Decision Support Unit (DSU), and from the PIMS-theatre database were used to check the accuracy of other data sources used.

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.

1.4.1 Healthware

The majority of booking data on mothers with self-employed lead maternity caregivers (LMCs) were entered into Healthware by one Healthware administrator. Booking data for NW bookings, and all antenatal, birth, and postnatal data were entered by clerks and NW midwives.

1.4.2 Neonatology database

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).

1.4.3 Colposcopy database

In June 2012, a new database (Solutions Plus) was introduced to the colposcopy service. This database is used in a number of units in New Zealand and facilitates internal audit and provision of data to the National Cervical Screening Program.

1.5 Data quality

1.5.1 Maternity data quality

Data cleaning was undertaken daily prior to extraction of the birthlist for Births, Deaths and Marriages (BDM). On a monthly basis, cleaning of place and mode of birth and reconciliation with Birthcare numbers was undertaken.

For the 2004 -2012 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 focussed 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 and in Appendix 1.

NW acknowledge 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 in the appendix.

Services or individuals wishing to use the 2012 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.

1.5.2 Neonatal data quality

Additional checks of the accuracy of the data were made in preparing the annual report and prior to sending the data to ANZNN. The clinical records and some original radiology 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.

The introduction of comprehensive computerised clinical records (CRIS, 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.

1.5.3 Gynaecologic data quality

As noted under 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 ATLAS. Gynaecologic oncology and general gynaecologic surgery data were cleaned against the ATLAS and PIMS theatre databases, and by clinical review of individual cases where complications occurred. ATLAS data were searched for completeness of the databases as well as for complications of surgery. Missing, inconsistent and out of range data were also checked against clinical records.

1.6 Analytical and statistical methods

The data have been analysed using Access, Excel, and STATA9. Tables are formatted with either column or row percentages as indicated.

Chapter 2

SERVICE PROVISION

2 SERVICE PROVISION

2.1 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 NW.

2.1.1 National Services

Maternal

- Management of major maternal cardiac disease – pregnant women who are likely to require bypass or valve surgery during pregnancy. NW 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. NW 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 training centre for obstetricians training in maternal fetal medicine in New Zealand.

2.1.2 Regional Services

Maternal

- Pre-existing diabetes in pregnancy services to WDHB and to CMDHB as requested.
- 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.

2.2 Wards and clinics in the maternity service

The following wards and clinics make up the maternity service:

2.2.1 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, staff 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.

2.2.2 High Dependency Unit (HDU)

- HDU is a level 1 Intensive Care Unit with some level 2 facilities. It managed 179 admissions in 2012. 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.

2.2.3 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 1095 referrals 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.

2.2.4 Antenatal and Postnatal Wards

- There are 77 (83 in 2011) 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.

2.2.5 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.

2.2.6 Community Services

- Community clinics are held at Green Lane Clinical Centre, along with antenatal clinics in 14 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 publicly funded 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.
- The Vulnerable Pregnant Women's multidisciplinary team provides a midwifery-lead fortnightly forum for midwifery, maternal mental health and health social workers to plan and coordinate clinical and social care for a client group of pregnant women described as vulnerable. This forum grew out of an urgent need to coordinate the care of women with complex social needs, at times placing them and their babies at high risk. This risk inevitably involves 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 clinic was started in February 2011 in an attempt to address the low rate of attempted VBAC at NW highlighted in previous annual clinical reports. 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

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

2.3 Gynaecology service

The general gynaecology service provides care to women residing within the ADHB catchment of Central Auckland (population - approximately 400,000). NW is also a tertiary referral centre for Gynaecologic Oncology, Urogynaecology and Fertility.

The service is comprised of:

- One inpatient ward (Ward 97) at Auckland City Hospital (ACH)
- Women's Assessment Unit (WAU) at ACH for gynaecology
- Day surgery at Greenlane Clinical Centre (GCC)
- Outpatient services at GCC including:-
    - General and Specialty Gynaecology Clinics
    - Fertility services
    - Early Pregnancy Assessment Unit
    - Epsom Day Unit providing a first trimester termination service
    - Colposcopy

2.3.1 District Services

- Secondary gynaecology, including menstrual disorders, pelvic floor dysfunction, endometriosis, pelvic pain and sterilisation
- Colposcopy and treatment of cervical and vulvo-vaginal epithelial abnormalities
- Management of miscarriage and pregnancy failure
- Complex hormone replacement therapy and family planning
- Vasectomy consultation and procedures

2.3.2 Regional Services

- First and second trimester termination of pregnancy
- Urogynaecology services to Waitemata District Health Board (WDHB)
- Fertility services – Fertility Plus is one of three providers in the Auckland region. Service includes reproductive endocrinology.
- Recurrent pregnancy loss diagnosis and management
- Gynaecologic Oncology
- Vulval clinic provides an "extended regional service" for all vulval disorders. Three centres provide this type of care in New Zealand – Auckland, Wellington and Christchurch
- Female Multidisciplinary Clinics offer 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.

Wards and Clinics in the Gynaecology Service

2.3.3 Inpatient Services – Ward 97, Auckland City Hospital

- Ward 97 is a 22 bed ward providing care for women with acute gynaecology problems, preoperative and postoperative 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 like fibroid embolisation, management of AV malformation, diagnostic biopsy are part of the Gynaecology caseload.
- In preparation for a major surgery we accept referrals for administration of preoperative blood transfusion and iron infusion.
- 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.

2.3.4 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
- Pre admissions clinic
- ESSURE Hysteroscopic Tubal Sterilization

2.3.5 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.

2.3.6 Epsom Day Unit (EDU)

Epsom Day Unit (EDU) is the Auckland Regional Service for first trimester terminations (up to 12 weeks and 6 days on day of referral) of pregnancy. The boundary for the Auckland region is from Mercer in the south to Warkworth in the north.

2.3.7 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 two 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.

2.3.8 Gynaecologic Oncology

NW is the regional service provider for surgical gynaecologic oncology, providing services to CMDHB, WDHB and Northland. An extended regional surgical service is offered to Gisborne, Waikato and the Bay of Plenty. This service has a close association with Blood and Cancer Services at ACH (chemotherapy and radiation therapy services).

2.3.9 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 University of Auckland

NW has close associations with the University of Auckland, including involvement in research, clinical teaching, and particular projects. The Obstetrics and Gynaecology Department, in association with the School of Population Health Division of Epidemiology and Biostatistics, run a programme teaching Trainee Interns (doctors in their sixth year of training) to undertake clinical audit. Some of these projects are undertaken at NW, and these are of value to the students, clinicians and hospital services.

2.5 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.

2.5.1 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.
- Level 2 neonatal care to Central Auckland area – 32 cots.

  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.
- 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 (quaternary services)

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.

2.5.2 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).

2.5.3 University Links

There are close research links with the School of Medicine. Senior medical staff, University medical staff and the neonatal fellows are involved in clinical research and audit. Newborn Services are fortunate that recent fellows have been able to obtain external research funding for their postgraduate degrees and, whilst not employed by the service, have remained valued members of the Department and have contributed to both research and clinical care. There are also links with the Liggins Institute with clinical applications of their research being developed for specific research studies of newborn babies. The Newborn Service is active in both local and international studies, being involved in multi-centre international randomised trials of neonatal interventions.

There continues to be a joint appointment between the Newborn Service and Massey University for the Neonatal Nursing Programme. This includes the co-ordination of the Neonatal Nurse Specialist – Advanced Neonatal Practice programme at Masters level and the Neonatal Nursing course, also positioned at Masters level. Both courses attract students locally and nationally.

2.6 Lead Maternity Carer services

The provision of health 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.
- 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.
- Community Midwives. These midwives are employed by the hospital and provide continuity of antenatal and postnatal care. Labour care is provided by the hospital Labour and Birthing Suite core midwives. Secondary care is provided by the hospital specialists.
- High Risk Medical and Diabetic 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. The woman has a named midwife from this service who is her LMC and who provides continuity of antenatal and postnatal care. Labour care is provided by the hospital core midwives in Labour and Birthing Suite

2.6.1 Funding of Maternity Services

Funding for Maternity services underwent significant changes in 2009. Funding for primary maternity care from independent midwives, General Practitioners and private obstetricians is still 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.

Outpatient maternity clinics based at either Greenlane Clinical Centre or Auckland City Hospital are funded through "purchase units" from the Ministry of Health. This means a fee for each outpatient visit with the payment dependent on the clinician providing the service e.g. midwife, obstetrician or physician. Midwifery home visits are also funded via purchase units. Inpatient care is funded on case mix based funding, as are inpatient visits in other hospital services.

In New Zealand women can choose where they wish to birth their baby. There are no geographical boundaries for provision of primary maternity care in hospital. However geographical boundaries exist for women who require secondary and tertiary care; and these women will be cared for by a secondary or tertiary facility according to their place of usual residence.

National Women's is a tertiary level hospital and as such receives referrals from the top of the North Island, which includes referrals from Northland and Waitemata District Health Board. National Women's also provides some specific national services as outlined in section 2.1.1.

Birthcare Auckland is a primary maternity unit which holds a contract with ADHB to provide postnatal facilities to well women and well babies born at NW and also birthing facilities for women who choose to birth there.

2.7 Quality Department

The Women's Health service is supported by a clinical effectiveness advisor (0.2FTE) whose role is to provide advice, facilitation and support to clinicians and managers, for a range of clinical quality improvement activities. In Women's Health this consists of the coordination of investigations into incidents which have serious adverse outcome; support for clinical governance and clinical effectiveness meetings and activities; and assistance to meet certification standards.

Reportable events

With the implementation of the clinical governance structure, incident review occurs as part of the level 3 maternity and gynaecology, and fetal medicine clinical governance meetings. Currently the over-arching level 2 Women's Health clinical governance meeting is receiving a monthly report on all Women's Health reported incidents.

The management of incidents with adverse outcome is consistent with processes in place in DHBs throughout New Zealand, and involves the scoring of each incident using nationally approved criteria. An investigation team uses one of three methodologies for in-depth analysis of incidents meeting criteria for investigation. The report and recommendations from these investigations are presented to the ADHB adverse events review meeting. Meetings with the patient and family occur to ensure that they are fully updated on the outcome of all investigations.

There were 524 incidents reported in 2012, including seven serious events requiring investigation using one of the in-depth review methodologies.

2.8 Clinical Governance

2.8.1 Clinical governance structure

During 2012 a structured Clinical Governance (CG) framework was implemented in Women's Health at National Women's Hospital (NWH). The purpose of the CG framework is to ensure clinical and process accountability at all levels within Women's Health. The CG structure includes both Women's Health, Healthcare Service Group and Birthcare Auckland, the primary birthing facility contracted by ADHB.

Level 4 Clinical Governance groups (CGG) address directly the issues relevant to the clinical areas they are aligned to. Membership consists primarily of clinicians and charge midwives and nurses. The level 4 Clinical Governance Groups are accountable to and report up to the level 3 Maternity and Gynaecology CGGs. The chair persons of the level 4 CGGs form part of the membership of the maternity and gynaecology level 3 groups. The maternity level 3 CGG is chaired by the Clinical Director Maternity and the Level 3 Midwife Advisor whilst the gynaecology level 3 CGG is chaired by the Clinical Director Gynaecology and the ward charge nurse. The level 3 CGGs are accountable to and report to the level 2 CGG that provides broad oversight and direction for the clinical governance of the Women's Health service.

The structure of the Women's Health Clinical Governance Groups is shown below

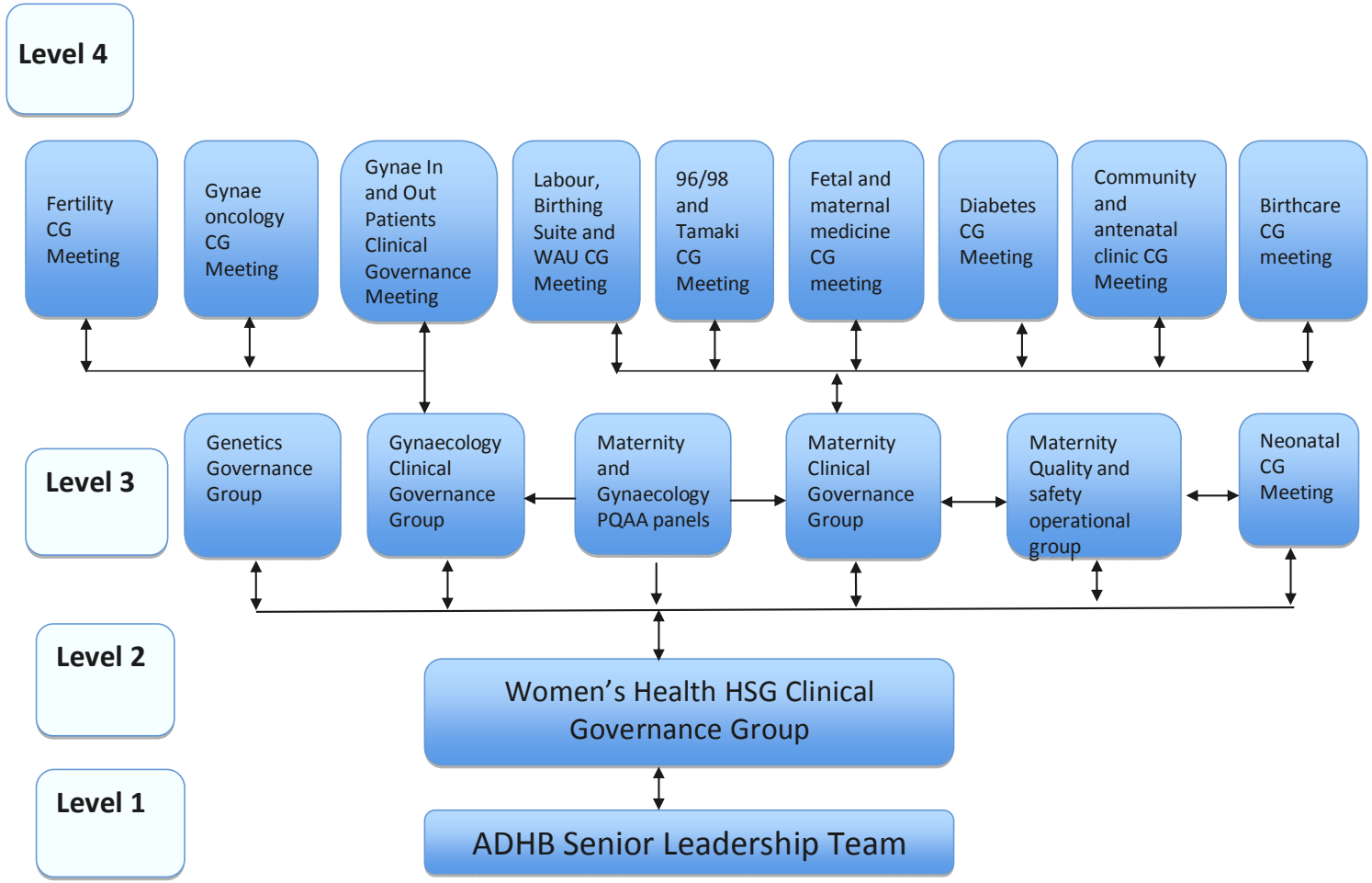

Figure 1 : Women's Health Clinical Governance Structure

The level 2 Clinical Governance Group is chaired by the newly appointed Women's Health Medical Director and Director of Midwifery. Membership includes a representative from all providers of maternity services and includes: Women's Health Clinical Directors, Level 3 Midwifery Advisor, Planning and Funding representative, consumer representatives, Maori and Pacific representatives, a private obstetrician, Chair of perinatal mortality meeting, an LMC representative, a General Practitioner, as well as representatives from anaesthesia, neonatology, clinical epidemiology. This wide range of participants reflects in part the tertiary nature of activity performed within National Women's.

The following issues and topics fall under the Clinical Governance umbrella at ADHB:

- clinical incidents
- risk management
- identification, ratification and implementation of policies
- reporting on and implementing findings from research and clinical audits
- changes to clinical practice as a result of perinatal and maternal mortality and morbidity meetings
- clinical effectiveness
- issues arising from implementation of the maternity standards and clinical indicators
- consumer feedback
- complaints

2.8.2 Consumer Input

Consumer representatives were engaged following a request for nominations process sent to known women's advocacy or consumer interest groups. Consumer representation is present at both Level 2 and 3 Maternity CG Groups. Consumers are paid a meeting attendance fee to support their attendance.

Input from consumers is also sought by other means including formal thematic review of complaints and (to a lesser extent) compliments. The on line Reo-Ora – Healthvoice is also utilised at all levels of Clinical Governance. Gathering input from Reo Ora needs further refinement.

Consumer feedback, both positive and negative, is reviewed at Level 4 meetings with themes and actions escalated. This enables the Women's Health Service Group to have an over arching view of issues that matter to the consumer, which helps guide service delivery and change.

The NW website is also managed daily and responds to the many consumer requests for maternity information and feedback about service provision.

2.8.3 Roles supporting clinical governance

The Director of Midwifery consulted on and implemented the new clinical governance framework during 2012. A MQ&SP administrator was appointed in June 2012 and a MQ&SP coordinator is currently being recruited. ADHB has a strong history of data analysis and the data intelligence team has incorporated the MQ&SP reporting into their work load. Other senior roles, including the newly appointed Medical Director of Women's Health have been allocated time to ensure the MQ&SP is fully implemented at ADHB.

2.8.4 Achievements of the clinical governance groups

Inaugural meeting of the Level 2 Clinical Governance group.

The initial meeting of the Level 2 Clinical Governance group (February 2012) agreed the new clinical governance structure set out in the consultation document; this included membership of Level 2, 3 and 4 groups.

The level 2 clinical governance group took accountability for the implementation of the level 3 and 4 groups which are now operational within their Terms of Reference; there is still work to be done to embed the Level 4 groups in some areas.

The agendas for all meetings were standardised to facilitate a clear reporting mechanism; the work programme has been detailed below to reflect the standing agenda items.

Review of new and outstanding SAC (Severity Assessment Code) 1 and 2 Root Cause Analyses (RCAs)

New and outstanding SAC 1 and 2 RCAs are reviewed with the clinical effectiveness coordinator providing an update. Issues are referred to the Level 2 group for implementation. Actions resulting from these have included:

- Discussion regarding the most appropriate clinicians to undertake the RCAs and ensuring that correct process is followed. Cultural support for the families involved has been discussed.
- Review of the implementation of the Early Warning Score in gynaecology and a recommendation that it be implemented in the maternity service.
- Provision of training for junior medical staff and gynaecology nurses in recognising the deteriorating patient which includes experience in the Department of critical care.
- Identification of lack of appropriate services within the mental health service and of the need for all services to work in partnership.

It is anticipated that with the appointment of the clinical governance coordinator there will be a more concentrated focus on 'closing the loop' in all cases.

Review of new and outstanding complaints

Any unresolved issues from the Level 3 groups are reported to the level 2 group, along with recommendations from the HDC and Coroners. Actions discussed as a result of this include:

- An extensive multi-disciplinary review of ADHBs "safe sleep" policy following two neonatal deaths, one at Birthcare and one on the National Women's neonatal unit. This policy has undergone extensive consultation, reviewed by experts and is currently being implemented.
- Discussion regarding a report on complaints received by the HDC highlighted that a high proportion of complaints were for 'poor attitude'. The HDC commissioner was invited to attend specially organised staff meetings.

Review of risk register and the identification of new risks

- There has been considerable discussion about a RANZCOG recommendation that ADHB staff a second maternity theatre resulting in this risk being added to the ADHB risk register.

Policies and guidelines

- The Level 2 CGG has been very successful in leading a drive to update the maternity and gynaecological policies.
- Discussion has occurred regarding the requirement for a policy on caring for obese women in maternity and work will commence on this.
- Consultation on implementation of the national Small for Gestational Age policy has occurred through the level 2 CGG with discussion on raising awareness of its importance.

- The adoption policy is currently being consulted on and discussed at the Level 2 CGG.

Changes to practice identified through perinatal and maternal mortality and morbidity meetings

The following are examples of recommendations that have been endorsed as a result of perinatal meetings:

- Reinforce the need for MSU when booking women and during 1st trimester assessment, particularly in diabetic women.
- Women diagnosed as septic (and other serious conditions) should remain in DU under close surveillance with regular senior review.
- All antenatal admissions to have a consultant/registrar review depending on symptoms.
- The maternal pulse must be recorded in the maternal records and on the CTG trace during monitoring of the fetal heart. The date on CTG trace must be checked against the CTG monitor as accurate.
- The implementation of the national sexual health policy.

Report on the findings of clinical audit and research and implementation of recommendations

The following is an example of clinical audits undertaken; there is still work to be done to establish a process for the implementation of clinical audit and research.

- The findings of the ADHB recertification audit were discussed resulting in the purchase of neonatal blenders.
- An audit of the number of gynaecological women discharged with discharge summaries from the ward identified a failing in the process; this is currently being resolved via the Level 3 gynaecology CGG.
- As a result of a discussion at this group all research undertaken by staff is now available on the ADHB website.

Outstanding issues arising from the implementation of the MQ&SP and the maternity standards

The Ministry of Health launched the Maternity Quality and Safety Programme (MQ&SP) in 2011 as part of it's Maternity Quality Initiative; this included the launch of the National Maternity Standards and Clinical Indicators. The Level 2 CGG has led the process of reviewing NW's maternity service against both the maternity standards and the required actions resulting form the MQ&SP action plan. It has done this through establishing a monitoring group, chaired by the Director of Midwifery that reports to the Level 2 CGG, and this process is currently under review.

2.8.5 Performance against New Zealand Maternity Clinical Indicators

Table 1: ADHB NZ Maternity Clinical Indicators 2009-2011 (Facility rates)

No	Indicator	NWH 2009	NZ 2009	NWH 2010	NZ 2010	NWH 2011	NZ 2011	Comment
1	Standard primigravida who have a spontaneous vaginal birth	62	64.8	64.2	65.5	65.1	65.6	stable, maybe improving
2	Standard primigravida who undergo an instrumental birth	19.3	16.3	16.7	15.8	15.7	16	stable
3	Standard primigravida who undergo Caesarean section	18.5	17.9	19	17.9	19.2	17.9	stable, within confidence limits
4	Standard primigravida who undergo induction of labour	8.8	5.9	5.2	4.4	4.8	4.8	continues to improve, postdates project expected to achieve further improvement
5	Standard primigravida with an intact lower genital tract	16.3	28.8	14.4	28.4	18.2	27.3	concern but probably improving
6	Standard primigravida undergoing episiotomy and no 3rd or 4th degree tears	28.8	22.5	32.2	22.3	32.4	22.1	stable rate, may be linked to low rate of 3/4 tears
7	Standard primigravida sustaining a 3rd or 4th degree tear and no episiotomy	2.1	3.3	2.3	3.2	2.3	3.2	excellent
8	Standard primigravida undergoing episiotomy and sustaining a 3rd or 4th degree tear	1.9	1.4	1	1.1	1.4	1.3	excellent
9	Women having a general anaesthetic for caesarian section	7.3	9	6.6	9.1	6	8.3	excellent
10	Women requiring a blood transfusion with caesarian section	4.3	3.8	3.2	3.3	3.8	3.3	concern, measures in place eg iron project, still within confidence limits
11	Women requiring a blood transfusion with vaginal birth	2.1	1.8	1.9	1.9	2.3	1.8	concern, measures in place eg iron project
12	Premature births (between 32 and 36 wks gestation)	6.8	6.7	6.7	6.4	7.3	6.7	case mix, tertiary centre (rate low in the DHB)

Key to shading:	Concern	Moderate concern	No concern	Excellent

In 2010, National Women's Health performed very well overall but were outliers on indicators 5 and 6: intact lower genital tract and episiotomy without 3rd or 4th degree tear. This is balanced by the third and fourth degree tears rates, which were lower than the national average. Although it is likely that episiotomy may provide some protective benefit, the CGGs have looked carefully at ways in which the intact perineum rate can be increased. Predictors of episiotomy in our population are: private LMC or obstetrician and use of forceps. Feedback is now being provided to individual clinicians against a number of indicators including 3rd/4th degree tears and episiotomy. The impact is being monitored by the CGG.

2.8.6 Current Quality Improvement Initiatives at ADHB

Increased attention to family violence screening (FVS)

An analysis demonstrated that FVS levels were low in women's health. This information was feed back to the FVS service and as a result, the FVS team have increased their focus on screening women in hospital. An increase in coverage has been demonstrated.

Reducing rates of blood transfusion

Higher than expected transfusion rates were identified on our analysis of 2011 data. As a result of this and subsequent analysis, the ADHB Post Partum Haemorrhage Guidelines have been updated.

Our rates of transfusion after vaginal birth have risen. This was recognized and has been addressed with a comprehensive approach including the more aggressive use of iron antenatally.

Diabetes management

In 2011, following analysis of increasing diabetes clinic referral rates, ADHB agreed with WDHB to 'repatriate' services closer to the woman's home. As a result WDHB women with Gestational Diabetes Mellitus (GDM) are now seen in their local area by WDHB staff. This change in place of service provision has been received positively by LMCs and women.

Vaginal Birth after Caesarean Section

Following analysis of vaginal birth after caesarean (VBAC) rates, ADHB established a PBAC clinic (Positive birth after CS) to support women to trial labour. Evidence has shown that trialling labour has been effective in increasing VBAC rates.

Perineal trauma

Although our rates of 3rd and 4th degree tear are below the national average we recognize the serious consequence such trauma can have on long term perineal function. In 2010 we established the OASIS clinic to follow up women with significant perineal trauma.

Virtual Post Dates Clinics

In 2012 we embedded virtual clinics for post dates pregnancies. This has followed an investigation into the lengthy delays to a post dates clinic and an overuse of the acute assessment unit. The feedback from LMCs and women has been overwhelmingly positive.

Processes for reviewing policies

A robust process developed for reviewing policies and ensuring ADHB policies are updated and in line with recommended best practice. The policies have been streamlined and the requirement for prioritization of new policies established. Consumer feedback is now incorporated into policies.

Implementation of perinatal and maternal morbidity meeting recommendations

A pathway has been developed for ensuring recommendations from the perinatal and maternal morbidity meetings are implemented. Recent examples of this include: recommendations for blood pressure monitoring post partum; puerperal sepsis recommendations identified and implemented; the need for an Early Warning Score was identified from case reviews.

Complaints Processes

An improved process for identifying actions from complaints has been implemented, for example the process for Jadelle insertion has been reviewed (a working group developed and the process implemented for Jadelle insertion, which required further training of staff and a guideline to be developed).

Adverse Events Processes

The themes of clinical incidents identified through the risk pro system have been fed back to the level 4 clinical governance groups to enable themes to be addressed and actioned. For example our high error rate with Guthrie cards was addressed and the policy amended.

The recommendations and feedback from Route Cause Analysis of adverse events are reviewed at level 2 and cascaded down to level 4 clinical governance groups and put on the intranet for all staff / LMCs to access.

Safe Sleep Policy

A safe sleep policy was developed within our CG structure. Work is progressing around informing women and families about best 'safe sleep' practice. This policy development was in response to serious events in National Women's.

Electronic Medical Record

NW has implemented a partial electronic record. This was put in place in response to the issues which occur from working across a split site. There has been positive feedback from the community about this initiative and it has resulted in better access to clinical information. Previously LMCs failed to receive timely communication from NW when women went to the assessment unit or to a specialist antenatal clinic. The electronic maternity record now allows for electronic messaging directly to LMCs' fax or Healthlink accounts. This has greatly increased the speed at which LMCs receive vital communication

The electronic maternity record has facilitated the use of the GROW chart which is embedded in the programme. We have also developed an electronic fetal ultrasound biometry chart. Self employed LMC scans are plotted on this chart as well as employed LMC scans. This chart is being rolled out in paper across all of the private scanning services as well as the neighbouring DHBs. This will allow for better plotting of data and consistency of reporting. In addition, LMCs are now able to access the NW clinical systems from home via VPN and terminal server.

Gynaecology

Ward 97 was proudly part of many quality projects including Releasing Time to Care, Enhancing Recovery after Surgery and Management Operating System. We anticipate seeing positive outcomes with implementation of these projects which will be outlined in future annual reports.

2.8.7 Planned Quality Improvement Initiatives

Induction of labour (IOL)

IOL rates in National Women's are high. More detailed analysis and further work in this area will be undertaken during 2013/2014. The rationale for undertaking this work is that any procedure undertaken unnecessarily may result in poorer outcomes for mother and or baby. National Women's aims to deliver the best outcomes for every women and baby cared for by them. Unnecessary interventions also use resources which could be better directed into other activities to improve outcomes for women and babies.

Gestation at booking with the ADHB employed midwifery team

Analysis by ethnicity, deprivation and other factors will be monitored and actions proposed to increase the number of women booking by 12 weeks. At this time we are aware of the value of improving access to early antenatal care, but are less certain how to target efforts. Undertaking this analysis will help us better target efforts at women in most need to improved systems and care.

Review of pregnancy and parenting education in line with MoH service specifications (to be released) and RFP for providers

This will be a joint project with Waitemata.

Improve access to maternal/perinatal mental health services for pregnant and postpartum women

The perinatal and infant mental project report has been completed and this is now a regional mental health action for next year and part of the regional health plan. The details of how this action plan will be implemented have yet to be agreed but it will become an implementation project in July 2013.

2.8.8 Communications forums and regional work

ADHB recognises that we still need to build stronger communication forums or networks to more effectively engage stakeholders.

- We have an email system to transmit information to LMCs. At a recent LMC forum discussion about different forms of communication, all LMCs present preferred the email method from the LMC co-ordinator. There are also regular LMC meeting forums.
- We have a Women's Health GP liaison and hope to build stronger relationships with primary care over the next year.
- We have a liaison staff member who is the conduit for managing issues with LMCs. This relationship is well established and effective.

As a DHB we have been working to improve the quality of feedback we get from the community. This is being achieved through Reo Ora – an on-line consumer feedback mechanism. This does not reach all consumers.

We have also strengthened aspects of the relationship and interface with Birthcare with new terms of reference for the Primary Maternity Steering Group prepared in 2013 and for the Primary Maternity Facilities Providers Committee in 2012. Birthcare representatives also sit on both Level 2 and Level 3 of the Clinical Governance Groups.

ADHB participates in a regional women's health forum with Waitemata and Counties Manukau DHBs. This is a long standing forum which includes Clinical Directors, General Managers, Midwifery leaders along with Planning and Funding. Discussions include whether there are opportunities for regional service improvements across women's health. More recently, ADHB and WDHB have agreed to collaboration around planning for maternity services across a ten year horizon for both districts. CMDHB participates in this group as does a consumer representative.

More detail can be found in the maternity quality and safety programme (MQ&SP) annual report which can be viewed on the National Women's Health website.

Chapter 3

SUMMARY STATISTICS

3 SUMMARY STATISTICS

3.1 Mother and baby numbers: NWH 2012

Table 2: Mother and baby numbers: NWH 2012

Total number of mothers birthing at National Women's	7664
Mothers birthing before arrival (BBA)	31
Total number of mothers	**7695**
Total number of babies born at National Women's	7832
Babies born before arrival (BBA)	31
Total number of babies	**7863**

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.

Three women gave birth twice during the calendar year 2012 and are therefore counted twice in the above table and throughout this report.

Table 3: Contribution of multiple births to mother and baby numbers: NWH 2012

		Mothers	Babies
National Women's births	Singletons	7506	7514
	Twins	156	312
	Triplets	2	6
Totals (not including BBA)		**7664**	**7832**
BBA	Singletons	31	31
	Twins	0	0
	Triplets	0	0
Totals (including BBA)		**7695**	**7863**

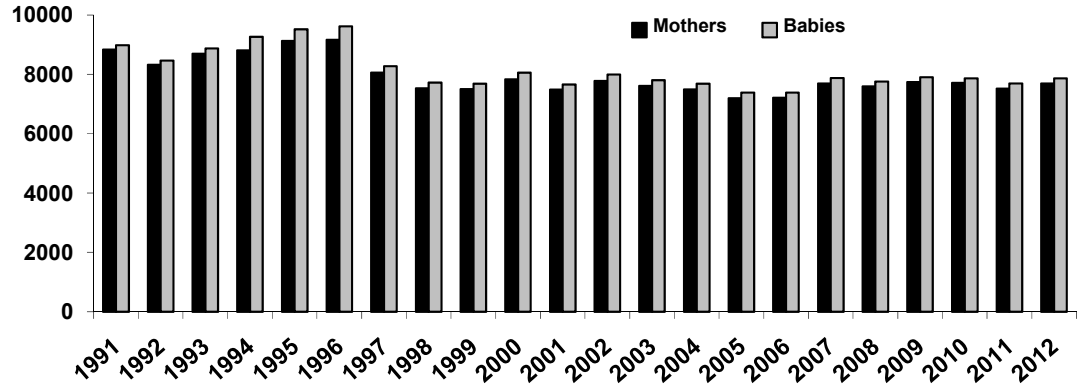

Figure 2: Numbers of women birthing and babies born at NWH (1991-2012)

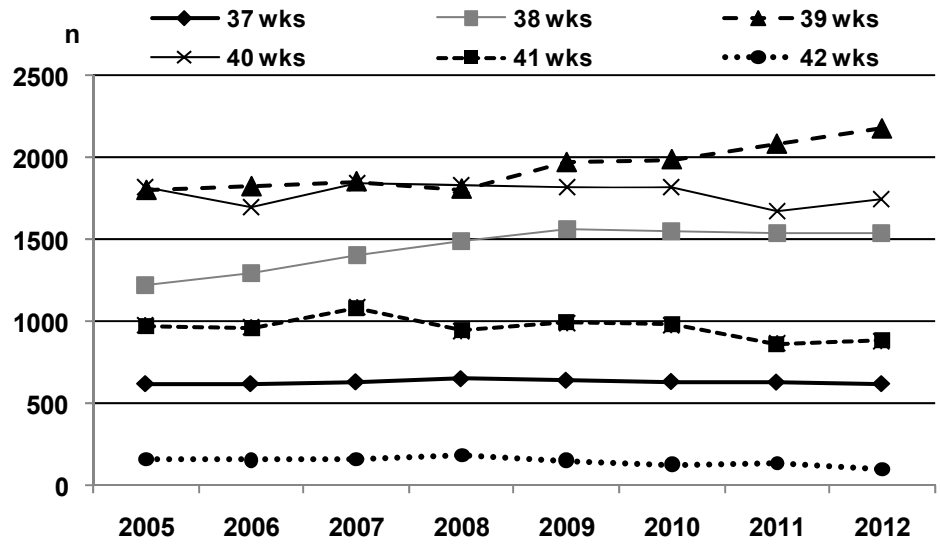

Figure 3: Term births by gestation NWH (2005-2012)

3.2 Summary of maternal outcomes 2012

Table 4: Mode of onset of birth NWH 2012

	Birthing Mothers n=7695	
	n	%
Spontaneous onset of labour	3666	47.6
Iatrogenic onset of birth	4029	52.4
CS Elective	1278	16.6
Emergency CS before onset of labour	268	3.5
Induction of labour	2483	32.3

Table 5: Mode of birth by parity NWH 2012

	Birthing Mothers n=7695		Nullipara n=3778		Multipara n=3917	
	n	%	n	%	n	%
Spontaneous Vertex Birth	4173	54.2	1731	45.8	2442	62.3
Vaginal Breech Birth	45	0.6	15	0.4	30	0.8
Operative Vaginal Birth	907	11.8	744	19.7	163	4.2
Forceps	299	3.9	250	6.6	49	1.3
Ventouse	608	7.9	494	13.1	114	2.9
Caesarean Section	2570	33.4	1288	34.1	1282	32.7
CS Elective	1278	16.6	409	10.8	869	22.2
CS Emergency	1292	16.8	879	23.3	413	10.5

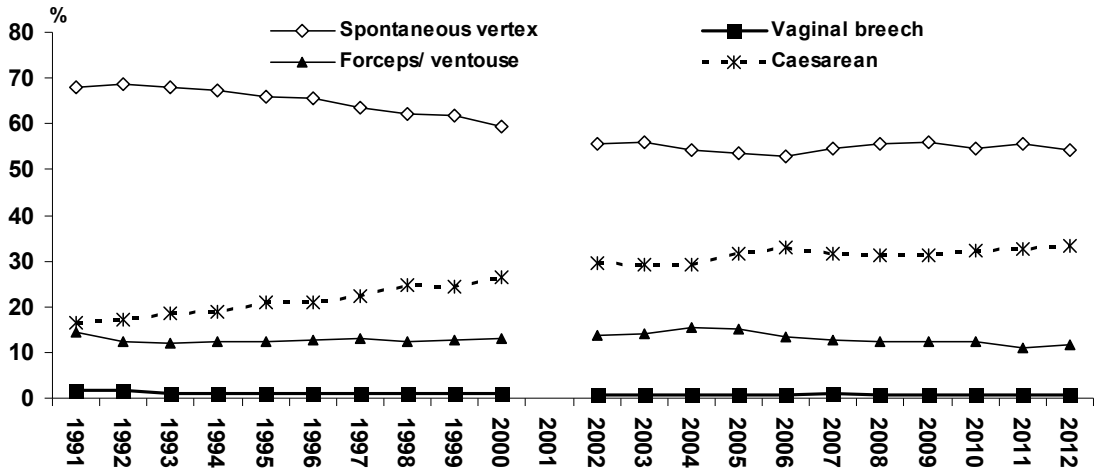

Figure 4: Mode of birth NWH (1991-2012)

Table 6: Maternal postpartum outcomes NWH 2012

	Birthing mothers	n	%
PPH ≥1000mls	7695	659	8.8
SVB	4218	268	6.4
Instrumental vaginal birth	907	84	9.3
Caesarean section	2570	310	12.7
Episiotomy among vaginal births	5125	1170	22.8
Third/ fourth degree tears among vaginal births	5125	158	3.1
Postpartum blood transfusions	7695	182	2.4
Infant Feeding at discharge from NW facility (excludes babies admitted to NICU)			
Exclusive breastfeeding	6862	5508	80.3
Fully breastfeeding	6862	243	3.6
Partial breastfeeding	6862	957	13.9
Artificial feeding	6862	154	2.2

3.2.1 Maternal deaths

In 2012 there were no maternal deaths.

3.3 Summary of neonatal outcomes 2012

Table 7: Neonatal outcomes among babies born at NWH in 2012

	Babies born n=7863	
	n	%
Gender		
Male	4061	51.6
Female	3798	48.3
Indeterminate/unknown	4	0.1
Preterm birth		
20-27 weeks	121	1.5
28-31 weeks	107	1.4
32-36 weeks	592	7.5
Term birth		
37-41 weeks	6944	88.3
42+ weeks	98	1.2
Apgar at 5 min <7**		
Preterm	77	0.9
Term	73	0.9
SGA (by Customised Centile)		
Preterm	262	3.3
Term	639	8.1
Admission to NICU		
Preterm	479	6.1
Term	413	5.3

**numerator excludes fetal deaths

Table 8: Perinatal related mortality NWH 2012

	Babies born n=7863	Rate
Fetal deaths	77	9.8/1000 births
Early neonatal deaths	37	4.7/1000 live births
Late neonatal deaths	9	1.1/1000 live births
Neonatal death	46	5.9/1000 live births
Perinatal deaths (fetal & early neonatal)	114	14.5/1000 births
Perinatal related deaths (fetal & all neonatal)	123	15.6/1000 births

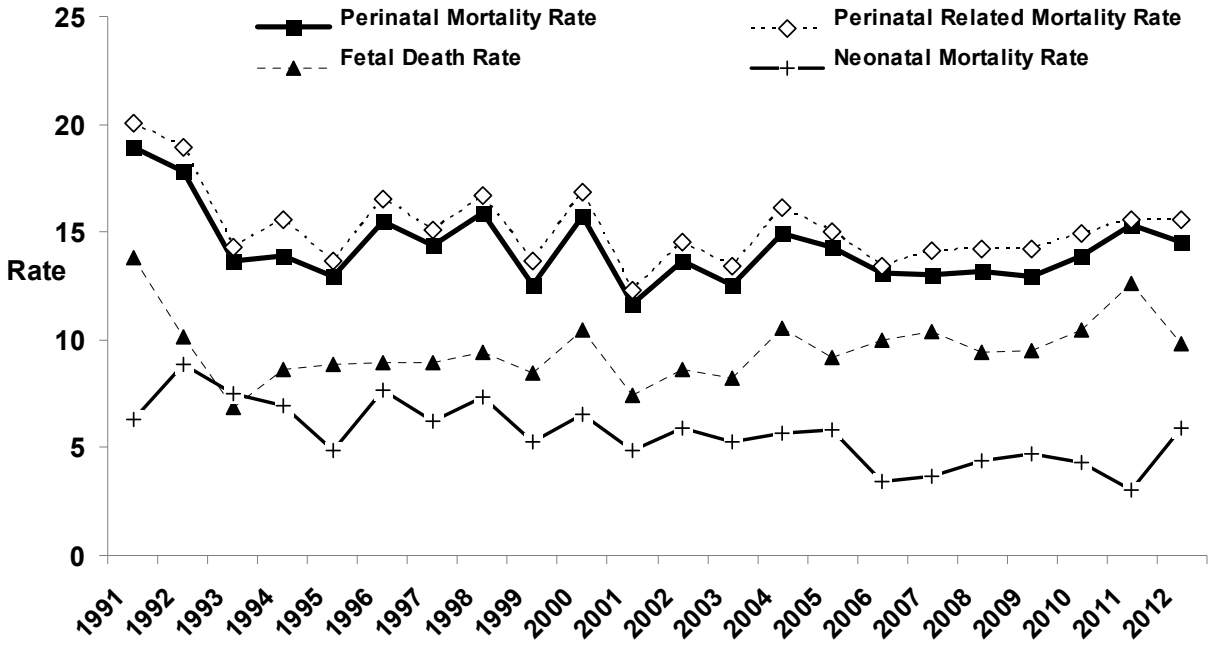

Figure 5: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate NWH (1991-2012) (all rates expressed as deaths/1000 births)

Chapter 4

MATERNAL DEMOGRAPHY

4 MATERNAL DEMOGRAPHY

This chapter describes the demographic characteristics of the women giving birth at NW in 2012. Additional data pertaining to this chapter can be found in Appendix 3.

4.1 Maternal domicile

In 2012, 69% 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. Some mothers from outside ADHB catchment area require tertiary services, but a substantial proportion of the 31% of our clientele from other DHBs are making a personal choice to birth at NW.

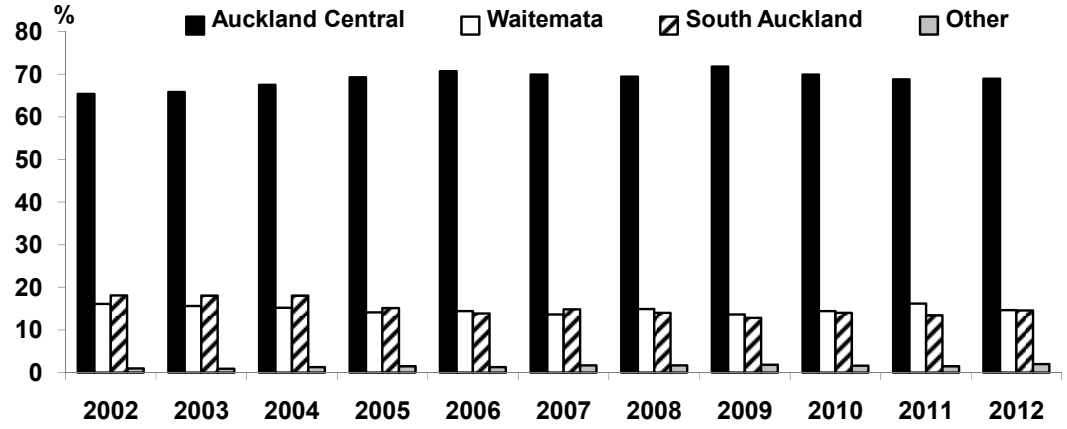

Figure 6: Domicile (DHB of residence) of women birthing at NWH (2002-2012)

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 Womens over the last 20 years continues. This is most apparent for women over 40 who now make up 4.4% of births, This group have increased in numbers by well over 50% over the last decade and although still a small proportion of our total maternity population this group will contribute to a gradually increasing demand for medical services within the department.

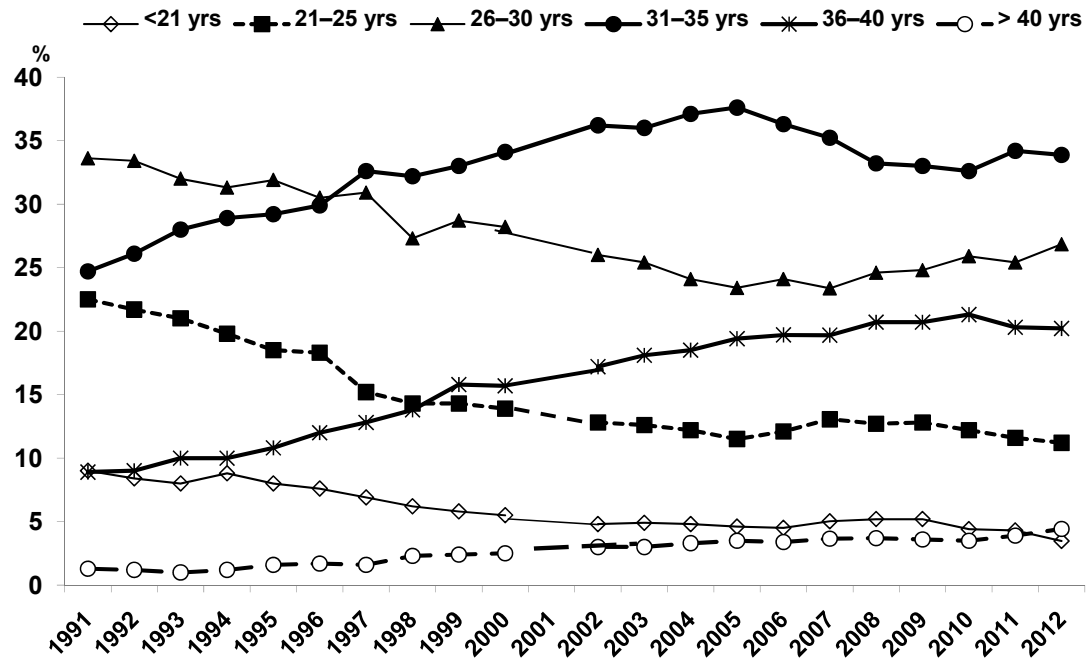

Figure 7: Maternal age distribution among women birthing at NWH (1991-2012)

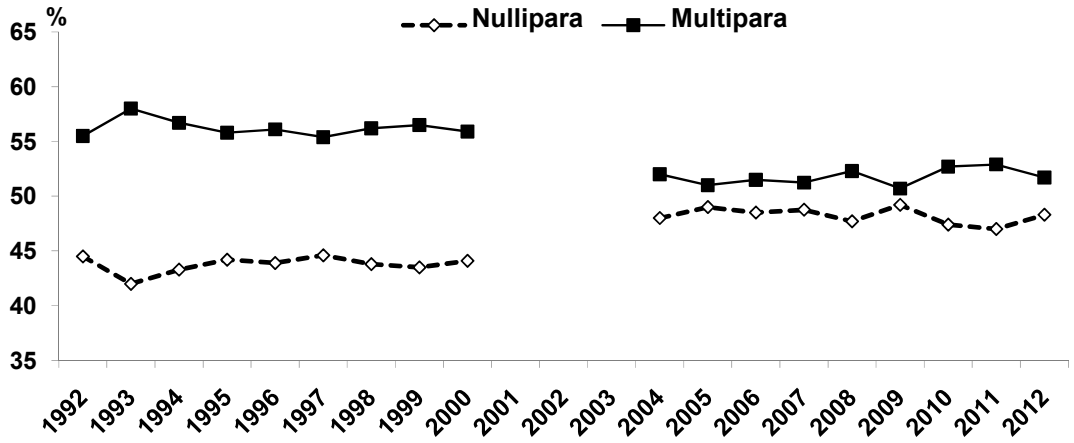

Figure 8: Parity distribution among women birthing at NWH (1992-2012)

The ratio of nulliparous to multiparous women has remained fairly constant over recent years, but is markedly closer to 1:1 than it was 15 years ago.

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 2012, 6.9% of mothers giving birth at NW were prioritised as Māori, 13.3% Pacific peoples, 7.2% Indian, 22.9% Other Asian, 11.0% Other European, 35.0% NZ European, and 3.7% Other. The proportion of women birthing at National Women's of Chinese and other Asian origin has increased from 15.6% to 22.8% in six years and this may have implications for how our antenatal services are provided and how patient information is provided.

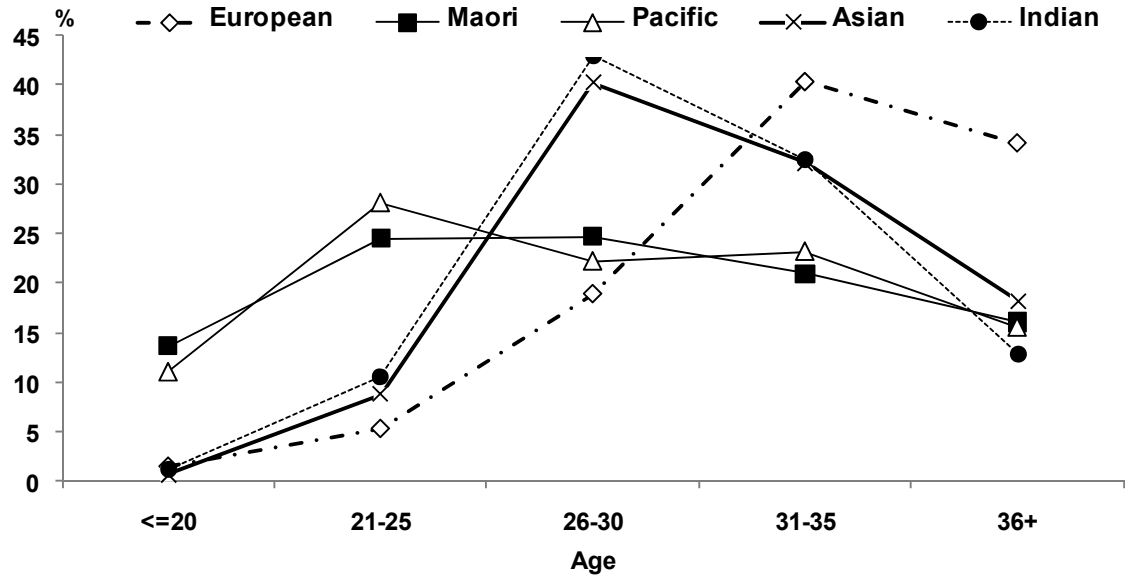

Figure 9: Maternal age among European, Māori, Pacific, Other Asian and Indian ethnicities NWH 2012

Ethnic differences in maternal age at birth have been apparent over many years, with older European mothers and younger Pacific and Māori mothers. Māori and Pacific women are more than five times more likely than European, Asian and Indian women to have had their first baby by 21 years of age. These figures highlight the importance of providing specific services that can support the needs of this group of young mothers so that they and their children can be given the best start in life.

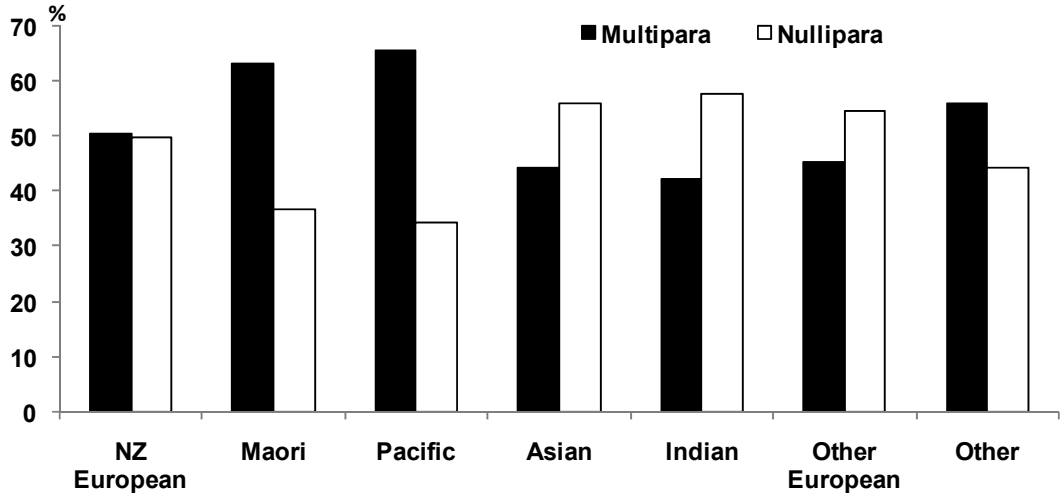

Figure 10: Parity distribution by maternal ethnicity NWH 2012

While more than 50% of Asian and European mothers giving birth at NW are having their first baby, fewer than 40% of Māori and 30% of Pacific Island mothers are giving birth to their first baby. Parity needs to be considered in analyses of obstetric interventions by ethnicity.

4.3 Smoking

Table 9: Smoking status of women at booking and at birth NWH 2012

Smoking Status	Smoking at booking n=7695		Smoking at birth n=7695	
	n	%	n	%
Yes	443	5.8	382	5.0
No	7251	94.2	7132	92.7
Missing data	1	0.0	181	2.4

Of all women, 5.8% reported smoking at booking falling to 5.0% at birth. This is a relatively small change and may either represent under-reporting at booking or suggest that we should be reviewing how we develop our smoking cessation programmes.

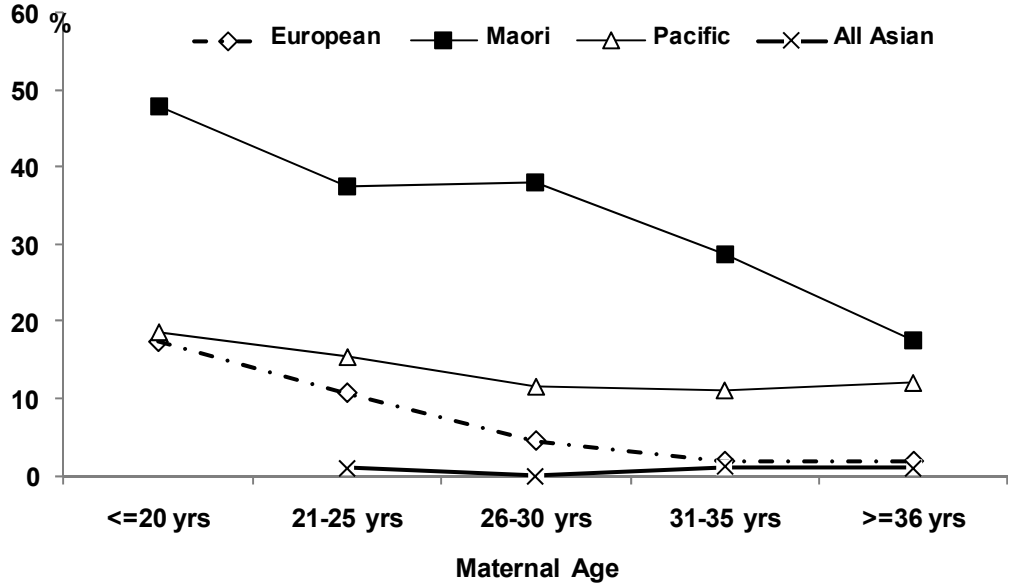

Figure 11: Smoking rates at booking by age and ethnicity NWH 2012

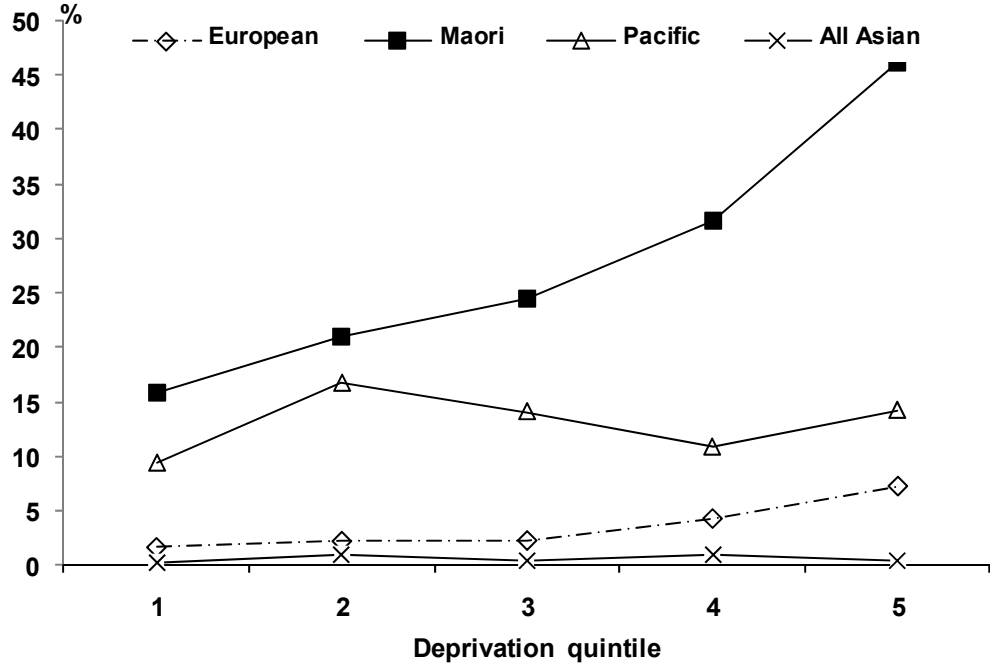

Figure 12: Smoking at booking by deprivation quintile and maternal ethnicity NWH 2012

Smoking rates remain substantially different by ethnic group, maternal age and deprivation score (NZDep2006). For future service planning, the significantly higher smoking rates amongst older Māori and Pacific Island women when compared to other ethnic groups suggest that resources should be focused on these women. Smoking rates by deprivation score highlight some of the challenges of providing an effective smoking cessation programme: amongst European women in the lowest two deprivation quintiles fewer than 3% smoke but this rises to 50% of Maori women in the highest deprivation quintile.

4.4 Body mass index

Forty percent of our maternity population were overweight in 2012 (BMI ≥25), 18% obese (BMI ≥30), and 8% morbidly obese (BMI ≥35). Interestingly, despite a general concern that obesity rates are increasing relentlessly, these rates have not changed over the last five years.

As well as being an independent risk factor for a number of complications of pregnancy and poor outcomes, obesity is associated with deprivation (see figure below). It is also strongly associated with ethnicity with over 60% of Maori and 70% of Pacific Island women being overweight or obese. This may make developing effective interventions to reduce the impact of maternal obesity particularly challenging and interventions should take account of the problems of accessing health care amongst women in economically deprived circumstances.

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

Table 10: Maternal BMI NWH 2008-2012

	2008		2009		2010		2011		2012	
	n=7589		n=7735		n=7709		n=7523		n=7695	
	n	%	n	%	n	%	n	%	n	%
<18.5	402	5.3	445	5.8	442	5.7	440	5.8	481	6.3
18.5-24.99	3694	48.8	3868	50.0	3916	50.8	3798	50.4	3949	51.3
25-29.99	1654	21.9	1763	22.0	1721	22.3	1646	21.8	1678	21.8
30-34.99	724	9.6	783	10.1	792	10.3	795	10.5	771	10.0
35-39.99	356	4.7	373	4.8	360	4.7	370	4.9	354	4.6
>=40	264	3.5	251	3.3	265	3.4	309	4.1	289	3.8
Missing	471	6.2	308	4.0	221	2.9	185	2.5	173	2.3

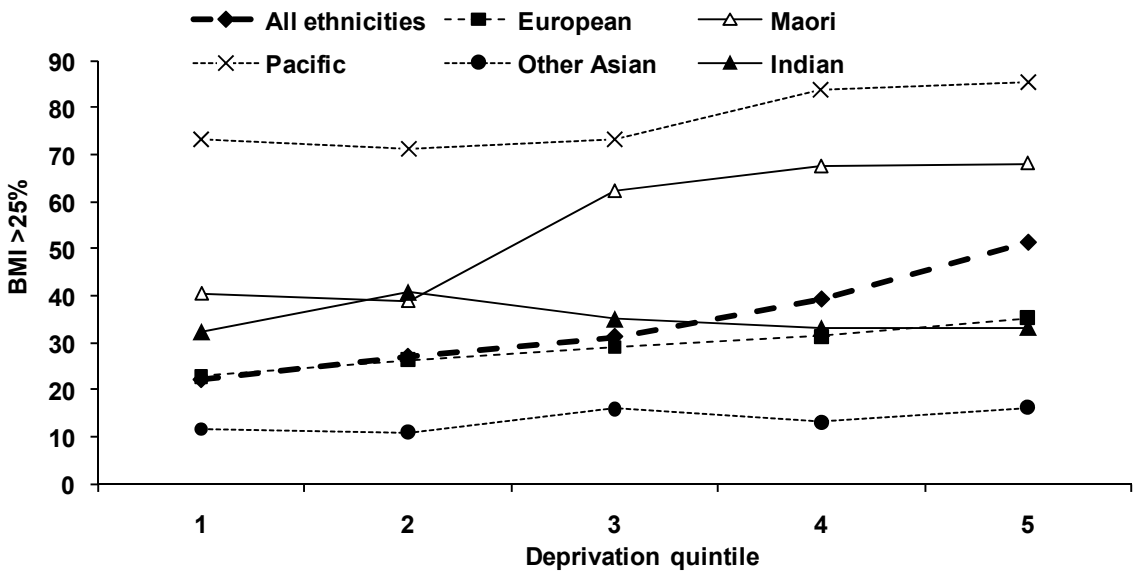

Figure 13: BMI >25 by ethnicity and deprivation quintile NWH 2012

The figure above shows the strong association between ethnicity and prevalence of overweight (BMI>25). It also suggests that while there is a definite association (represented by the dotted line) between increasing deprivation and overweight, this is probably confounded by ethnicity. There is little change in the prevalence of overweight with increasing deprivation within women of the same ethnicity.

4.5 Socio Economic status

Socioeconomic 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 11: Deprivation decile (NZDep2006) among women birthing at NWH 2012

	Women giving birth in 2012	
	n=7695	
Deprivation decile	**n**	**%**
1	523	6.8
2	834	10.8
3	775	10.1
4	618	8.0
5	729	9.5
6	912	11.9
7	816	10.6
8	922	12.0
9	677	8.8
10	873	11.3
missing	16	0.2

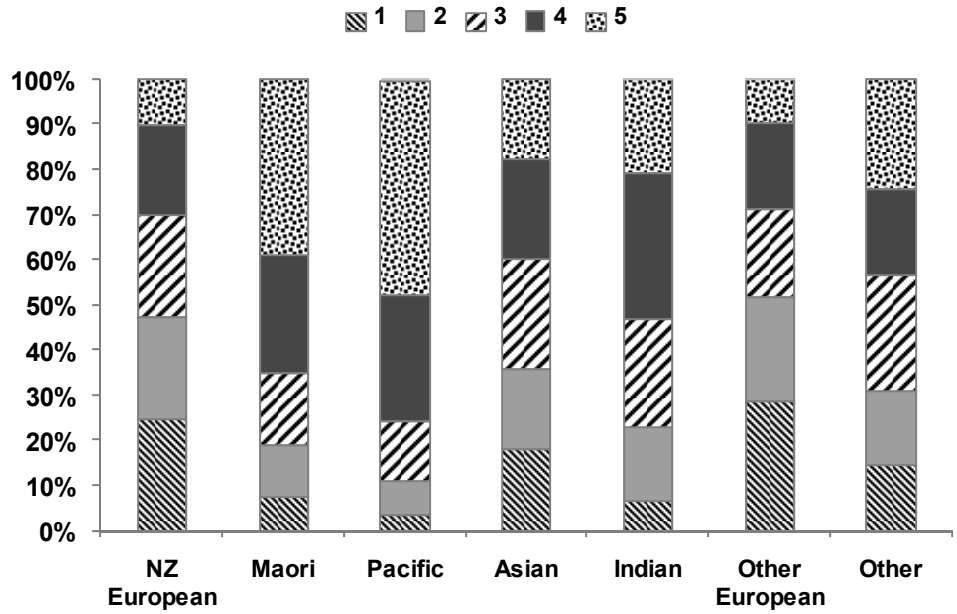

Figure 14: Deprivation quintile (1-5) by maternal ethnicity NWH 2012

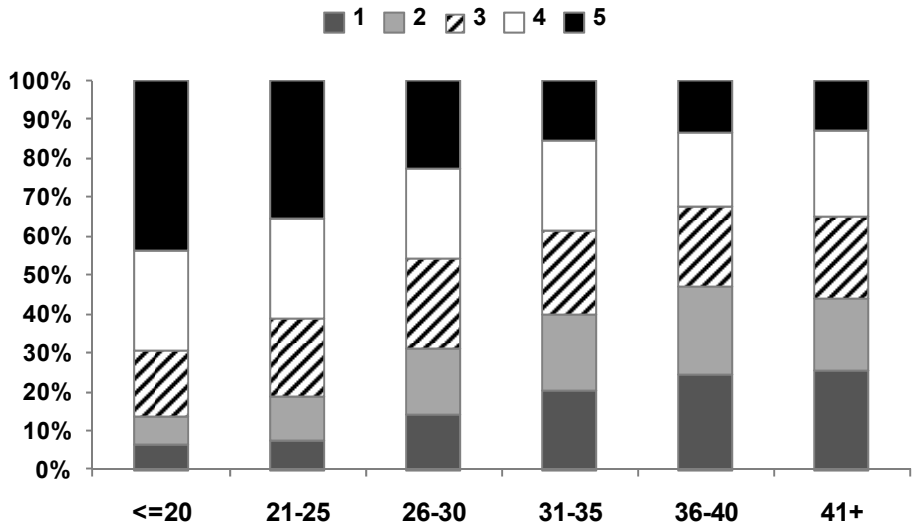

Figure 15: Deprivation quintile (1-5) by maternal age NWH 2012

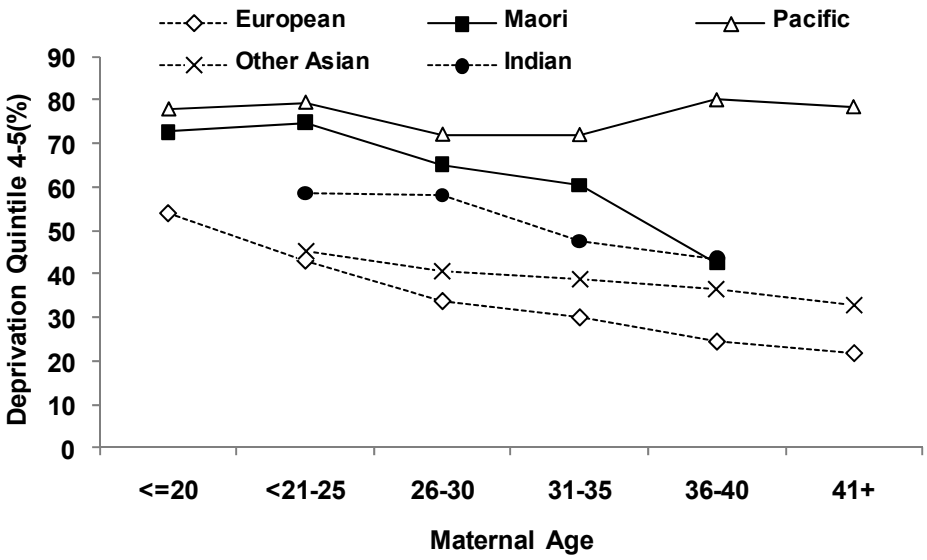

Figure 16: Deprivation (quintile 4 or 5) by age and ethnicity

Figure 14 suggests that while higher deprivation is associated with younger age, ethnicity remains a stronger predictor of deprivation and is independent of this association.

Social deprivation is strongly associated with poor outcomes in pregnancy. Women in the highest socio-economic deprivation quintile (quintile 5) are considerably more likely to experience problems related to vulnerability and social exclusion. Māori and Pacific mothers are four to five times more likely to be in the most deprived socio-economic quintile (5) when compared to European New Zealanders. Programmes to reduce barriers to care in these groups need to be supported. Higher levels of deprivation are also found in the group labelled as “other”. This group will include new-migrants, refugees, and women who do not speak English. Some of these women will also experience poor pregnancy outcomes related to social exclusion. Attempts to tackle social exclusion in maternity care in the UK have narrowed the gap in maternal mortality between women in the highest and lowest socio-economic quintiles over the last decade. These are issues that New Zealand also needs to address.

4.6 Lead Maternity Carer (LMC) at birth

The data given throughout this report for LMC relate to LMC at birth. Few women at NW change their type of LMC during pregnancy.

In 2012, 47% of women had Independent Midwives at birth, 24% Private Obstetricians, 19% National Women’s Community clinic services, and 8% National Women’s specialist medical and diabetes clinic services. Overall 71% of women who gave birth at NW in 2011 were under the care of a private or independent Lead Maternity Carer. Over the last 10 years this proportion has been little changed with 66% of women booking with a private LMC in 1997. Only 45 women (0.6%) booked with a General Practitioner in 2012, continuing a downward trend. It seems unlikely that any intervention to encourage GPs back into obstetrics will have much impact on service provision in Auckland.

Fewer than one percent (50 women) of mothers were unbooked, and eighty percent of these women were Māori or Pacific Islanders.

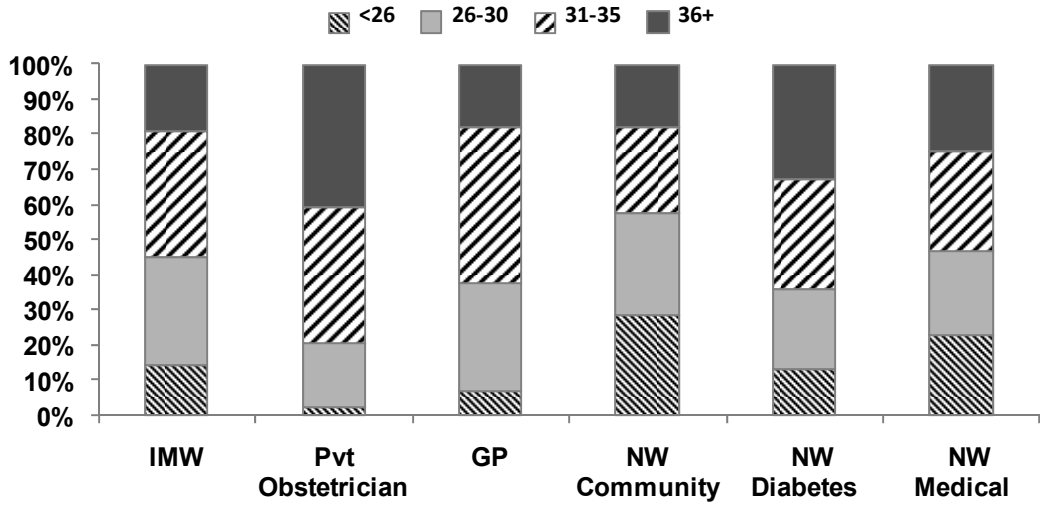

Figure 17: LMC at birth and maternal age NWH 2012

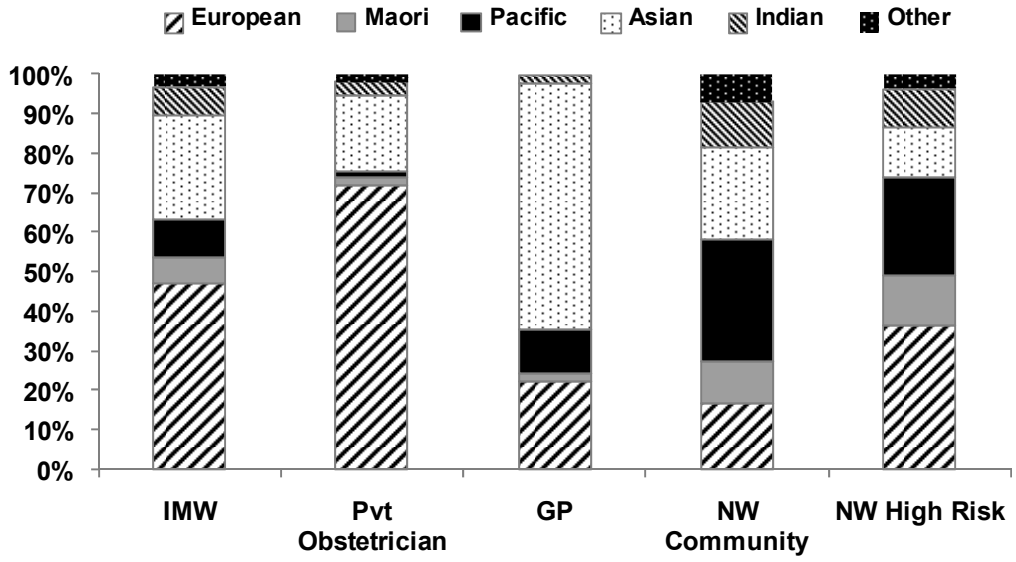

Figure 18: LMC at birth and maternal ethnicity NWH 2012

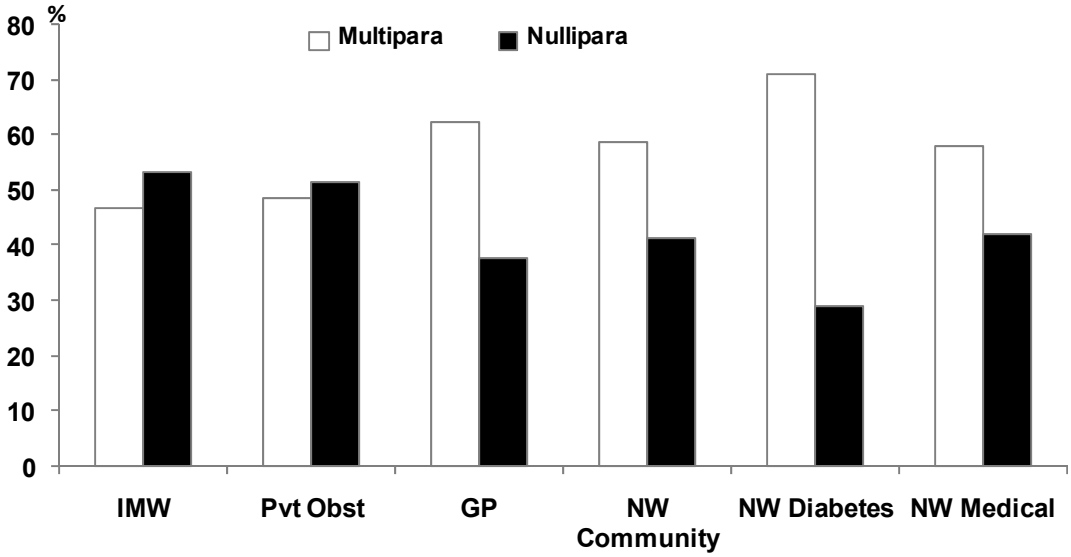

Figure 19: LMC at birth and parity NWH 2012

Women booked with a private obstetrician were more likely to be older, particularly over 35 years; compared to women booked with other LMCs. Private LMCs (both self employed midwives and obstetricians) have significantly fewer Māori and Pacific women booking with them compared to public LMCs. The importance of public LMCs in the provision of antenatal care for Māori and Pacific Island women should be acknowledged. Reasons why these women are less likely to access an independent midwife for pregnancy should be explored.

4.7 Standard primipara

The definition for standard primipara is 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 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. The objective of reporting outcomes for this tightly defined sub-group is to permit comparison between individual caregivers within National Women's and to compare outcomes with those in other institutions.

In 2012, 35% of primiparous women were defined as standard. Outcomes for standard primipara are given in section 6.

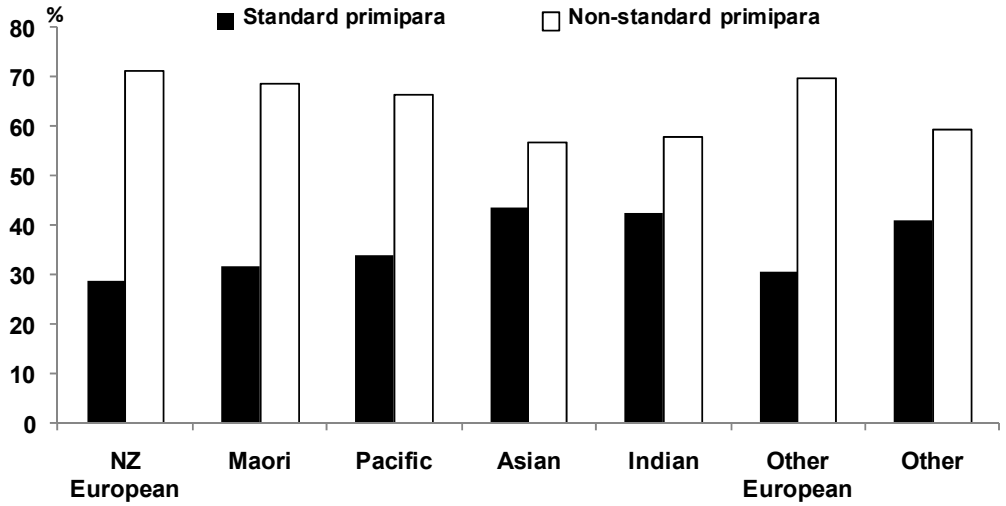

Figure 20: Standard primipara by maternal ethnicity NWH 2012

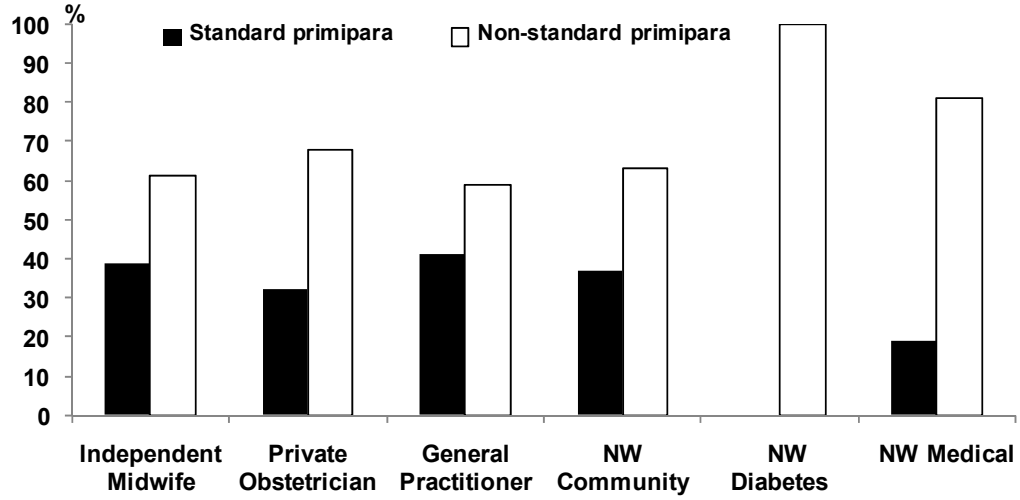

Figure 21: Standard primipara by LMC at birth NWH 2012

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

Methods

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. Prior to 2001, elective Caesareans were not defined at data entry but derived based on a definition of Caesarean section before the onset of contractions.

Findings

Table 12: Rates of preterm birth <37 completed weeks NWH 1999 – 2012

	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total number of women	**7501**	**7827**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**
Women birthing preterm	850	912	756	685	716	796	733	658	689	684	709
Incidence %	11.3	11.7	10.1	9.5	9.9	10.3	9.7	8.5	8.9	9.1	9.2
Spontaneous <37 weeks	350	385	372	323	335	397	293	275	312	279	284
Incidence %	4.7	4.9	5.0*	4.5	4.6	5.2	3.9	3.6	4.0	3.7	3.7
Iatrogenic <37 weeks	500	527	384	362	381	399	440	383	377	405	425
Incidence %	6.7	6.7	5.1*	5.0	5.3	5.2	5.8	5.0	4.9	5.4	5.4
Total babies <37 weeks	984	1062	886	806	836	904	843	769	793	787	820

* Changes in rates of spontaneous and iatrogenic preterm births from the 1999-2000 data are likely to be related to definition and data collection changes rather than real differences. See methods above.

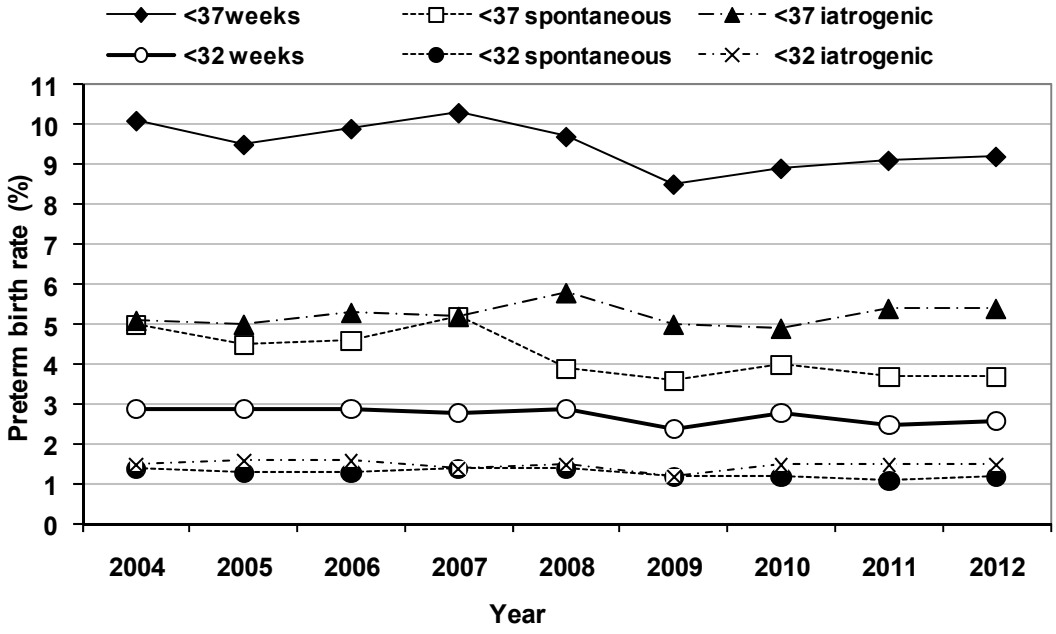

Figure 22: Preterm birth rate NWH 2004-2012

There has been a significant drop in preterm birth rate (<37 weeks) from 2004 to 2012 due to a reduction in spontaneous preterm birth, but no change in preterm birth at <32 weeks (figure 20). An overall rate of birth <37 weeks of approximately 9% is comparable to other similar units and may be expected from our population in terms of demographic and risk. The inclusion of multiple pregnancies in overall figures elevates rates of preterm birth as these pregnancies are much more likely to be delivered preterm; for singleton pregnancies the overall rate of preterm birth was 8.0%, 4.7% iatrogenic and 3.3% due to spontaneous preterm birth. As with previous annual reports, the rate of iatrogenic preterm birth exceeds that of spontaneous preterm birth. Our higher rates of iatrogenic preterm birth are likely to reflect the tertiary level of care provided by National Women's dealing with high risk pregnancies and in-utero transfers of care in those requiring early birthing on fetal and/or maternal grounds.

The highest rates of preterm birth are in women at risk for other pregnancy complications, most specifically in women ≤20 years of age (15%), Maori women (16.1%) and in those currently smoking (14.7%). In younger women the main increase in preterm birth relates to spontaneous deliveries whereas for Maori women and those that currently smoke there are increases in both spontaneous and iatrogenic preterm birth. Continued efforts to help women become smoke-free in pregnancy are likely to reduce preterm birth rates. It is very likely that there are additional confounding factors that contribute to risk for Maori and young women. Investigation of these may reveal modifiable risk factors and so further potential to reduce rates of preterm birth.

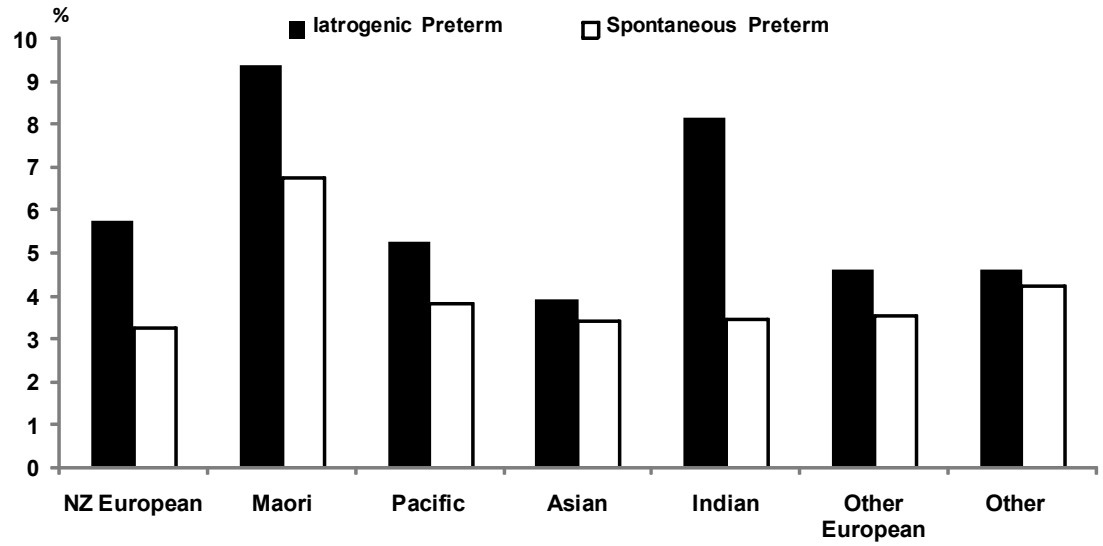

Figure 23: Iatrogenic and spontaneous preterm birth rates <37 weeks by ethnicity NWH 2012

Table 13: Rates of preterm birth <32 completed weeks NWH 1999–2012

	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total number of women	**7501**	**7827**	**7491**	**7194**	**7212**	**7695**	**7695**	**7735**	**7709**	**7523**	**7695**
Women birthing <32 weeks	229	244	220	211	212	212	222	185	212	190	203
Incidence %	3.1	3.1	2.9	2.9	2.9	2.8	2.9	2.4	2.8	2.5	2.6
Spontaneous <32 weeks	86	107	106	93	96	105	105	91	94	79	90
Incidence %	1.1	1.4	1.4*	1.3	1.3	1.4	1.4	1.2	1.2	1.1	1.2
Iatrogenic <32 weeks	143	137	114	118	116	107	117	94	118	111	113
Incidence %	1.9	1.8	1.5*	1.6	1.6	1.4	1.5	1.2	1.5	1.5	1.5
Total babies <32 weeks	271	287	250	247	245	237	253	214	246	214	228

- Changes in rates of spontaneous and iatrogenic preterm births from the 1999-2000 data are likely to be related to definition and data collection changes rather than real differences. See methods above.

The rates of birth <32 weeks gestation have remained very stable in the last 10 years at just under 3%. Our rates are higher than our national population but reflect the high risk nature of National Women's population and in-utero transfers from other centres without NICU facilities able to care for infants <32 weeks gestation.

Over the last year there has been little new evidence to significantly change our practice for the prevention and treatment of preterm birth. However, we remain committed to reducing rates of preterm birth and the subsequent complications of prematurity by active involvement in clinical research. In 2012, we remained involved in recruitment to international multicentre randomised trials such as the ASTEROID study (Australasian antenatal Study To Evaluate the Role Of Intramuscular Dexamathasone versus betamethasone prior to preterm birth to increase survival free of childhood neurosensory disability) and the EPPI Trial (Enoxaparin for the Prevention of Preeclampsia and IUGR) and have now commenced recruitment to the MAGENTA study (MAGnesium sulphate at 30-34 weeks GEstational age; Neuroprotection TriAl).

In addition, we are developing and trialling a Preterm Birth Clinic in the Fetal Medicine Unit. This will provide screening and treatment for women with significant risk factors for preterm birth, however, as yet we still have no reliable prediction tests or therapies for the majority of those that go on to preterm birth (i.e. nulliparous women).

Table 14: Perinatal outcome of preterm births by gestation NWH 2012 (n=820)

Gestation	Births	Fetal deaths	Live births	% Liveborn	Neonatal Death	% of live births surviving >=28 days
20	22	17	5	23	5	0
21	12	7	5	42	5	0
22	12	9	3	25	3	0
23	15	10	5	33	5	0
24	11	1	10	91	3	70
25	20	6	14	70	1	93
26	10	3	7	70	0	100
27	19	3	16	84	1	94
28	18	1	17	94	2	88
29	31	0	31	100	2	94
30	25	1	24	96	0	100
31	33	0	33	100	2	94
32	37	0	37	100	0	100
33	54	4	50	93	4	92
34	105	1	104	99	0	100
35	132	1	131	99	1	99
36	264	1	263	100	1	100
Totals	**820**	**65**	**755**	**92**	**35**	**95**

Perinatal outcome for premature babies remains excellent with survival rates of all livebirths from 26 weeks approaching those expected at term. Accumulated data on survival of preterm infants can be found in chapter 9 (Newborn). Long term morbidity for these premature babies should also be considered and is also discussed in Chapter 9.

Summary and Implications

Prematurity continues to be a major cause of neonatal morbidity and mortality. Being born preterm has life-long implications for the infants. Reassuringly National Women's preterm birth rates have not increased in recent years. 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 preterm birth. This includes simple measures such as avoiding late preterm births by limiting all elective CS to gestations $\geq$39 weeks, continued smoke change advice to all smoking pregnant women and continued involvement in relevant clinical trials.

5.2 Small and large for gestational age babies

Methods

Until 2004, the NW Annual Clinical Reports defined small for gestational age (SGA) according to a nomogram of population birthweight centiles published by Beeby et al which was largely derived from Caucasian births. Customised birth weight centiles are now used which adjust size at birth for gestation, gender, maternal ethnicity, height, booking weight, and parity. The resulting definition of SGA reclassifies as normal a proportion of babies with low rates of morbidity who are born to small mothers and reclassifies as small a group of babies with high morbidity and mortality who are born to overweight women. Customised centiles are thought to more reliably identify babies with growth restriction than population centiles.

SGA is defined as birthweight <10th customised centile. LGA (large for gestational age) is defined as birthweight >90th customised centile.

Findings

Table 15: Rates of SGA and LGA as defined by customised birthweight centiles (compared to AGA) by demographic characteristics NWH 2012

	Total Babies	Customised Birthweight <10th%(SGA)		Customised Birthweight >=10th% & <=90th% (AGA)		Customised Birthweight >90th%(LGA)	
	N	n	%	n	%	n	%
Total*	**7863**	**901**	**11.5**	**6302**	**80.1**	**653**	**8.3**
Maternal Age							
<=20	273	50	18.3	206	75.5	17	6.2
21-25	880	91	10.3	729	82.8	60	6.8
26-30	2098	251	12.0	1691	80.6	156	7.4
31-35	2651	282	10.6	2141	80.8	228	8.6
36-40	1599	174	10.9	1273	79.6	152	9.5
>40	355	53	14.9	262	73.8	40	11.3
Ethnicity							
NZ European	2760	269	9.7	2206	79.9	285	10.3
Maori	552	80	14.5	425	77.0	47	8.5
Pacific	1043	159	15.2	821	78.7	63	6.0
Asian	1785	203	11.4	1477	82.7	105	5.9
Indian	559	79	14.1	430	76.9	50	8.9
Other European	864	76	8.8	710	82.2	78	9.0
Other	293	35	11.9	233	79.5	25	8.5
Parity							
Multipara	3996	430	10.8	3197	80.0	369	9.2
Primipara	3860	471	12.2	3105	80.4	284	7.4
Smoking at booking							
Currently smoking	448	92	20.5	341	76.1	15	3.3
Not smoking	7407	809	10.9	5960	80.5	638	8.6
Unknown	1	0		1	100.0	0	
BMI							
<19	487	45	9.2	399	81.9	43	8.8
19-25	4524	473	10.5	3660	80.9	391	8.6
26-30	1423	169	11.9	1143	80.3	111	7.8
31-35	681	90	13.2	543	79.7	48	7.0
>35	560	88	15.7	427	76.3	45	8.0
Missing data	181	36	19.9	130	71.8	15	8.3
Plurality							
Singleton	7529	786	10.4	6099	81.0	644	8.6
Multiple	327	115	35.2	203	62.1	9	2.8

* customised centile was not assigned for 7 babies for whom birth weight was unknown or gestation at death was greater than one week prior to birth

There are differences in age, ethnicity and parity between mothers of 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. Maori, Pacific and Indian mothers have an increased risk of SGA which was also found in last year's report. In Maori 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 pregnancy complications such as hypertensive disorders. The independent risk factors for SGA in our 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 (14.3% (177/1241) is clinically relevant as it is more difficult to detect these SGA infants before birth. Recent data from National Women's show that this increased risk of SGA in obese women (adjusted odds ratio 1.24 (1.11-1.39) is 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 very high rate of SGA is again noted in multiple pregnancies.

Table 16: Interventions and outcomes among SGA, LGA and appropriately grown (AGA) babies (n=babies) NWH 2012

	Customised Birthweight <10th%(SGA) n=907		**Customised Birthweight >=10th% & <=90th%(AGA) n=6302**		**Customised Birthweight >90th%(LGA) n=653**	
	n	**%**	**n**	**%**	**n**	**%**
Median birth weight(IQR) g	2622.5(2230-2885)		3420(3125-3700)		4132.5(3842.5-4380)	
Gestation at birth						
Term	642	70.8	5807	92.1	593	90.8
Preterm	262	29.1	495	7.9	60	9.2
Preterm <32 wks	98	10.8	115	2.0	15	2.3
Median gestation (IQR) weeks	38(37-40)		39(38-40)		39(38-40)	

Consistent with findings in previous years more than one quarter of SGA infants were born preterm and 10.8% were born < 32 weeks. Rates of preterm delivery were not substantially higher in LGA infants compared with AGA.

Table 17: Interventions and outcomes among SGA, LGA and AGA babies born preterm <37 weeks NWH 2012

	Customised Birthweight <10th%(SGA) n=262		Customised Birthweight >=10th% & <=90th%(AGA) n=495		Customised Birthweight >90th%(LGA) n=60	
	n	%	n	%	n	%
Onset of birth - preterm						
Spontaneous labour	54	20.6	238	48.1	29	48.3
Induction and pre labour CS	208	79.4	257	51.9	31	51.7
NICU admission						
Any stay	177	67.6	268	54.1	36	60.0
>= 2 days	174	66.4	258	52.1	34	56.7
Apgar at 5 mins < 7	29	11.1	43	8.7	5	8.3
Fetal death (n/1000 births)	39	148.9	18	36.4	4	66.7
Neonatal death (n/1000 live births)	20	76.3	13	26.3	3	50.0

Iatrogenic preterm birth appeared 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 approximately 4 times more likely to be stillborn or to die in the neonatal period compared with preterm AGA and LGA babies

Table 18: Interventions and outcomes among SGA, LGA and AGA babies at term NWH 2012

	Customised Birthweight <10th%(SGA) n=639		Customised Birthweight >=10th% & <=90th%(AGA) n=5807		Customised Birthweight >90th%(LGA) n=593	
	n	%	n	%	n	%
Onset of birth - preterm						
Spontaneous labour	224	35.1	2921	50.3	239	40.3
Induction and pre labour CS	415	64.9	2886	49.7	354	59.7
NICU admission						
Any stay	58	9.1	309	5.3	47	7.9
>= 2 days	50	7.8	264	4.5	44	7.4
Apgar at 5 mins < 7	9	1.4	59	1.0	5	0.8
Fetal death (n/1000 births)	1	1.6	8	1.4	0	
Neonatal death (n/1000 live births)	4	6.3	5	0.9	1	1.7

Perinatal deaths in term SGA infants were less common than in preterm SGA infants but were approximately three fold higher compared with rates in AGA infants. Both term SGA and LGA infants were more likely to be admitted to the neonatal unit and to have prolonged nursery stays compared with their AGA counterparts.

Summary / Implications

These 2012 data again confirm that babies who are SGA by customised centiles have higher rates of morbidity and mortality than their AGA and LGA counterparts. This applies both to babies born at term and preterm. 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.

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5.3 Multiple pregnancy

This section describes the characteristics and outcomes of mothers who gave birth to twins and triplets at NW during 2012 and the outcomes of their babies.

Findings

Table 19: Multiple pregnancy rates NWH 1999-2012

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total number of multiple pregnancies	172	218	179	208	191	188	187	162	177	160	159	153	163	162
Incidence %	2.2	2.7	2.3	2.6	2.4	2.4	2.5	2.2	2.3	2.1	2.1	2.0	2.2	2.1
Number of twin pregnancies	166	207	175	201	184	188	184	157	174	156	156	149	159	156
Number of triplet pregnancies	6	11	4	7	7	0	3	5	3	4	3	4	4	6
Number of quadruplet pregnancies	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 20: Fetal/neonatal outcomes of multiple pregnancies NWH 1999-2012

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total number of babies born in a multiple pregnancy	350	447	362	423	389	376	377	329	357	324	321	310	330	330
Incidence %	4.6	5.3	4.7	5.3	4.9	4.9	5.1	4.5	4.5	4.2	4.1	3.9	4.3	4.2
Number of multiple pregnancies where one or more babies died	12	14		26	11	15	13	8	9	12	9	13	17	11
Incidence % (no. of multiple pregnancies where a baby died/number of multiple pregnancies)	7.0	6.4		12.5	5.8	8.0	7.0	4.9	5.1	7.5	5.8	8.5	10.4	6.8
Number of babies who died in a multiple pregnancy	22	23				23	17	12	11	16	13	16	26	18
Total number of babies born in a twin pregnancy	332	414	350	402	368	376	368	314	348	312	321	298	318	312
Twin perinatal deaths (≤ 7days)	20	22	20				23	16	11	10	13	12	23	15
Twin perinatal mortality rate*	56.8	62.5	48.3				61.2	43.4	35.0	28.7	41.7	37.4	72.3	48.1

*Perinatal twin deaths/1000 twin babies born

The rate of multiple pregnancy has been stable over the last nine years. There has been no increase in triplet pregnancies cared for as yet with the MFM unit now caring for all triplet pregnancies in the WDHB region in addition to those in the ADHB region.

The perinatal mortality rate is higher in twins than singletons (48.1/1000 births versus 12.8/1000 births). The rate in 2011 appeared higher but was not statistically significant and the 2012 data appears to confirm this was not an evolving trend with a lower rate.

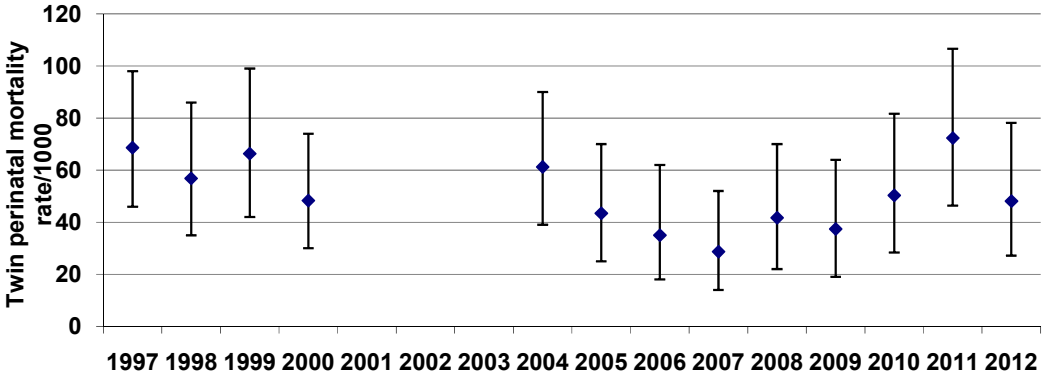

Figure 24: Twin perinatal mortality rate (per 1000 twin babies) NWH 1997-2012 with 95% confidence intervals

Table 21: Mode of onset of birth among twin pregnancies by gestation at birth NWH 2012

	Preterm births n=200		Term births n=112	
	n	%	n	%
Mode of onset of birth				
CS elective	72	36	56	50
CS emergency before labour	29	15	2	2
Induction of labour	34	17	46	41
Spontaneous labour	65	33	8	7

Sixty-four percent of twins are born preterm making preterm birth the norm.

Sixty-eight percent of twin pregnancies are delivered abdominally. As noted in previous reports caesarean section has become the norm. In 2012 four women had a vaginal birth for the first twin and caesarean section for the second twin. Examination of the cases has not revealed any particular pattern and all deliveries had a consultant present to make the decision.

A large randomised controlled trial of mode of delivery in uncomplicated twins has been conducted in a number of countries coordinated by a group from Canada. This has run over many years and the results have been eagerly awaited. The results were presented at the Society of Maternal Fetal in San Fransisco in February 2013 and showed that there was no benefit to routine caesarean section for twins. The full paper is not yet published.

This suggests that vaginal delivery should be encouraged in women with an uncomplicated twin pregnancy.

Table 22: Mode of birth among twin pregnancies NWH 2005-2012

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

Table 23: Fetal/newborn outcomes of twin babies NWH 2012

	Singletons N=7533		Twins N=312	
	n	%	n	%
Apgar <7 at 5 minutes	136	1.8	10	3.2
Admission to NICU ≥ 2 days	675	9.0	131	42.0
≤ 34 weeks	228 / 307	74.3	86 / 100	86.0
35-36	101 / 296	34.1	34 / 100	34.0
≥ 37 weeks	346 / 6930	5.0	11 / 112	9.8

Table 24: Perinatal-related deaths in twin pregnancies by gestation at birth NWH 2012

	Twin pregnancies			
	One twin died n=9		Both twins died n=6	
Gestation (weeks)	n	Outcome	n	Outcome
20 – 23	2	2FD	4	2ENND/2FD
24 – 27	1	FD	2	2FD
28 – 31	1	ENND		
32 – 36				
37 – 40	5	3FD/2ENND		

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

There were 15 perinatal related deaths of twins and 3 of triplets. In a set of triplets spontaneous preterm birth contributed to the loss. In three cases there was antepartum bleeding and in five there was a congenital abnormality. In all losses where all babies in a pregnancy died this occurred prior to 26 weeks.

Summary / Implications

Multiple pregnancy rates are steady. These 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.

A recent randomised controlled trial has shown that vaginal delivery is safe in an uncomplicated twin pregnancy.

As expected more babies from multiple pregnancies are born preterm and 42% will spend two or more days in NICU.

5.4 Diabetes

Methods

The data in this section relate to women with a diagnosis of pre-existing or gestational diabetes who birthed at National Women's in 2012. It 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 63 women seen by the Diabetes service for pre-pregnancy counselling or who birthed prior to 20 weeks or who birthed elsewhere.

Findings

There is a small decrease in numbers of women attending the National Women's diabetes clinic. This is likely to relate to the fact that Waitemata started to see women with GDM in their area, although higher risk women are still transferred to National Women's. Also, some LMCs are providing initial care for women with GDM and only referring them to the diabetes service if medication is required.

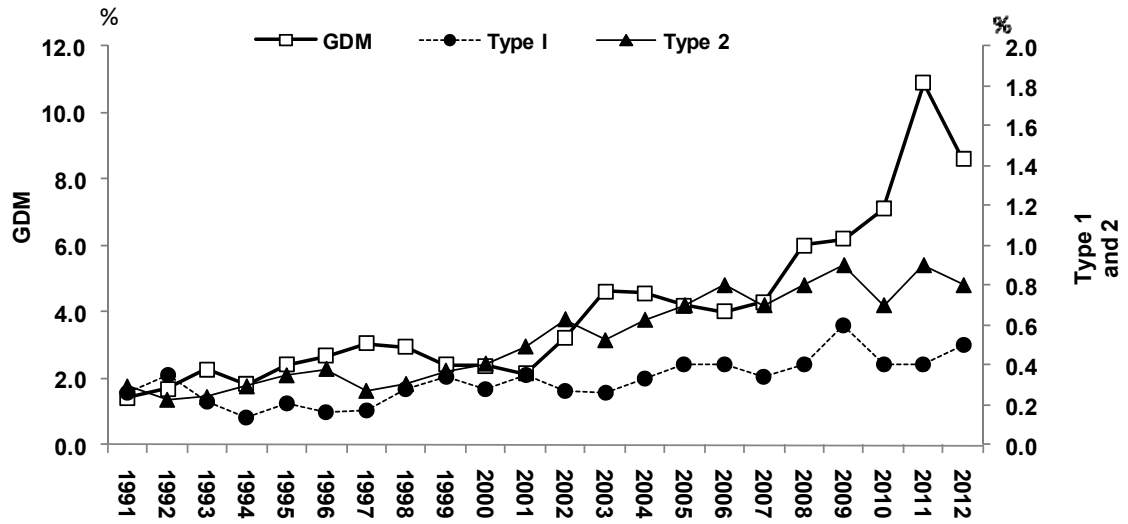

Figure 25: Incidence of diabetes (% of all inborn and BBA births) NWH 1991-2012

5.4.1 Demographic characteristics of women with diabetes NWH 2012

The risk of GDM is more than 10% once a woman has a BMI >25kg/m². GDM or type 2 diabetes is diagnosed in 25% of women with a BMI >35kg/m². In women >40 years of age, 18% have GDM or type 2 diabetes. The ethnic groups with the highest rates of GDM are Indian (15.6%) and Pacific (12.5%). We are probably still missing diagnosing some Pacific women with GDM, as they have the highest rates of type 2 diabetes, so we would expect them to have the highest rates of GDM.

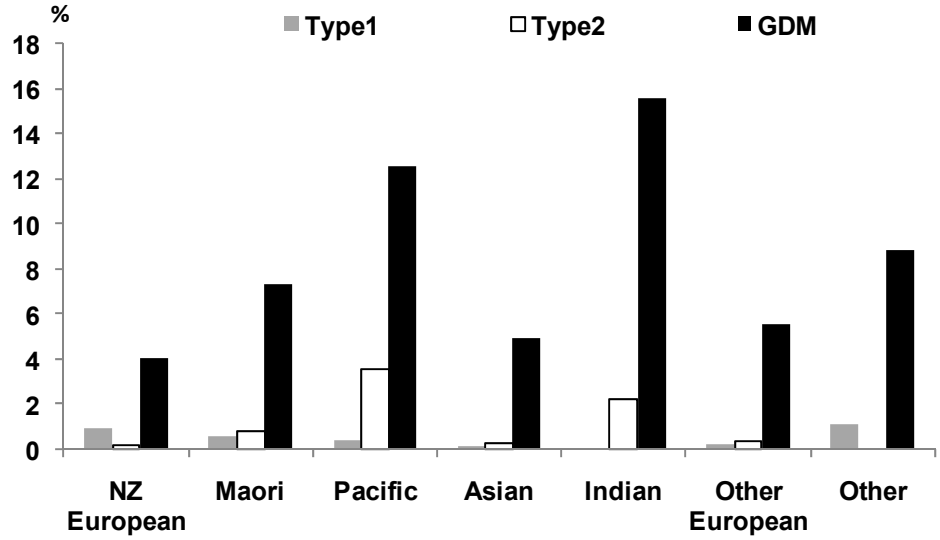

Figure 26: Incidence of diabetes by ethnic group NWH 2012

5.4.2 Outcomes of pregnancies complicated by diabetes

Maternal outcomes

The background rate of caesarean section at National Women's has been increasing, but rates in the diabetes service are stable.

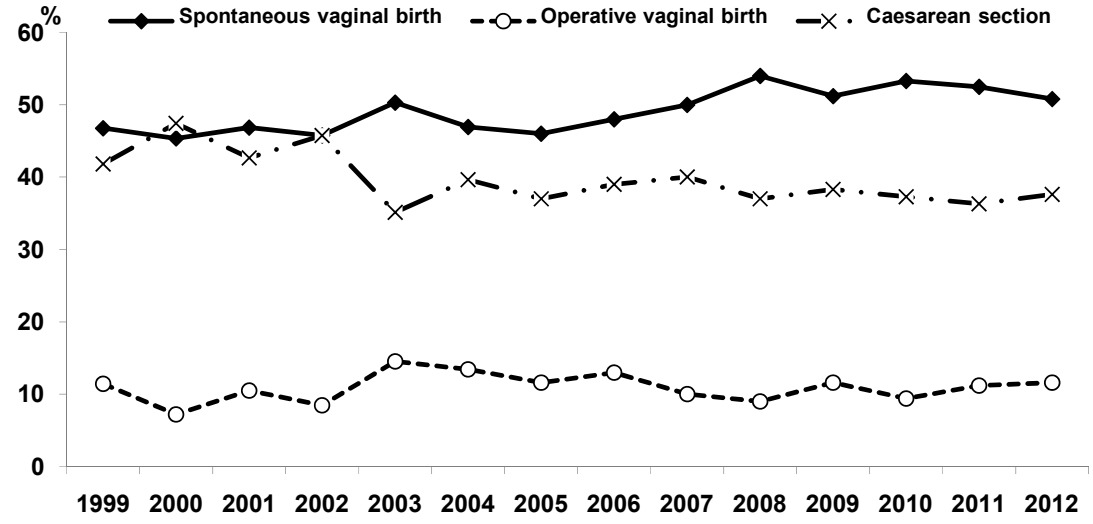

Figure 27: Mode of birth among women with GDM NWH 1999-2012

5.4.3 Maternal postpartum glucose tolerance testing

Table 25: Rates of postnatal glucose tolerance testing (GTT) among women with GDM NWH 2002-2012

	2004 n=342		2005 n=304		2006 n=286		2007 n=331		2008 n=457		2009 n=480		2010 n=548		2011 n=821		2012 n=662	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Postnatal GTT	260	76	238	78	206	72	249	75	313	68	324	68	369	67	480	58	401	51
No post-natal GTT	82	24	66	22	80	28	82	25	144	32	156	32	179	33	341	42	261	39

During 2012, we began to introduce alternative postpartum testing with an HbA1c measurement in women who were unlikely to do an OGTT. Some of the reduction in OGTTs probably relates to this (plus women who restart medication for obvious type 2 diabetes before they leave the hospital).

In 2013, we have moved to doing postnatal HbA1c at 10-12 weeks postpartum in all women, instead of OGTT as, in NZ, HbA1c (+/- fasting glucose) is being used to diagnose glucose intolerance/diabetes in the community. The GP is asked to follow up the result with the woman and perform annual screening for diabetes and other cardiovascular risk factors if the initial result is normal. We hope to be able to report these data next year, though there may be some overlap with some women performing OGTTs at the beginning of 2013. We recognise HbA1c may be less sensitive than OGTT in the first few months postpartum, however, we believe we will have better long-term follow up with this strategy. Adding a fasting glucose improves sensitivity, so that is an option for clinicians.

Similar to previous years, in women who perform postnatal testing, almost 30% have glucose intolerance or diabetes.

Table 26: Results of postnatal glucose tolerance testing (GTT) among women with GDM NWH 2002-2012

	2004 n=260		2005 n=238		2006 n=206		2007 n=249		2008 n=313		2009 n=324		2010 n=369		2011 n=480		2012 n=401	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Normal	194	75	190	80	158	77	175	70	236	75	264	82	266	72	375	78	287	72
IFG/ IGT*	49	19	34	14	39	19	50	20	58	19	42	13	80	22	90	19	92	23
Type 2	17	7	14	6	9	4	24	10	19	6	18	5	23	6	14	3	21	5
Type 1															1	0.1	1	0.2

*IFG =Impaired fasting glucose IGT= Impaired glucose tolerance

5.4.4 Neonatal outcomes among babies of women with diabetes in pregnancy

Outcomes are similar to previous years. Outcomes in women with postnatally diagnosed type 2 diabetes appear to be improved compared with previous years, but numbers are small. During 2012 we have provided clear written recommendations to LMCs about screening high risk women for unrecognised diabetes by requesting an HbA1c with booking bloods, and referring if above the non-pregnant reference range (>40mmol/mol). It is possible this practice could lead to earlier recognition of these women and better outcomes. We will try to audit this over the next few years.

Table 27: Neonatal outcomes among babies of women with diabetes NWH 2012

	Type 1 n=42		Type2 n=67		GDM n=651		Postnatally diagnosed Type 2 n=21		No diabetes n=7081	
	n	%	n	%	n	%	n	%	n	%
Birthweight (Median(IQR)	3415 (2640-3860)		3030 (2540-3600)		3260 (2895-3570)		3220 (2840-3410)		3390 (3030-3745)	
<1500g	3	7.1	6	9.0	11	1.7	0		193	2.7
<2500g	8	19.0	16	23.9	65	10.0	2	9.5	611	8.6
SGA <10th percentile	3	7.1	16	23.9	71	10.9	1	4.8	810	11.4
LGA >90th percentile	15	35.7	9	13.4	65	10.0	2	9.5	562	7.9
Admission to NICU										
Any admission	20	47.6	18	26.9	102	15.7	2	9.5	749	10.6
>= 2 days	18	42.9	17	25.4	92	14.1	2	9.5	691	9.8
Hypoglycaemia < 2.3 mmol/l	12	28.6	16	23.9	76	11.7	3	14.3	ND	
Hypoglycaemia 2.3 - 2.5 mmol/l	2	4.8	6	9.0	44	6.8	1	4.8	ND	
IV Dextrose	6	14.3	11	16.4	21	3.2	2	9.5	ND	
Perinatal related losses (/1000)	3	7.1	4	59.7	3	4.6	0		113	16.0

There was one postnatally diagnosed Type 1 whose baby was admitted to NICU for >=2 days, ND=not documented

5.4.5 Perinatal losses

There were 10 perinatal related losses in 8 pregnancies (three multiple pregnancies) of women with diabetes in 2012. Both twins in a woman who presented in labour at 21 weeks, probably due to cervical incompetence, a further pair of twins with TTTS whose mother developed severe preeclampsia at 22 weeks. Another four losses were associated with severe congenital anomalies and medical termination of pregnancy: 2 severe cardiac anomalies in women with type 1 diabetes and HbA1cs of 65mmol/mol and 57 mmol/mol periconceptually. A further one had multiple anomalies associated with an inherited chromosomal mutation. The fourth was in a woman with type 2 diabetes who did not attend clinic. She had an HbA1c at conception of 105mmol/mol, and presented at 19 weeks with ruptured membranes and the fetus had multiple anomalies.

A further loss was in a woman who had a triplet pregnancy, of which one baby resorbed and one was noted to be demised at approximately 12 weeks. As this baby was delivered at 38 weeks with its healthy triplet, it was registered as a perinatal death.

The final loss was in a woman transferred from another centre a week before delivery, as the baby had a cardiac anomaly. The baby died at 11 days of age.

Summary

- The number of women with diabetes in pregnancy is likely to continue to increase. Outcomes are continuing to be good, though the clinical impression is that these women have increasing co-morbidities.
- During 2012 Waitemata has started its GDM clinic, which has temporarily reduced our numbers.
- We have initiated screening high risk women for unrecognised diabetes at booking by measuring HbA1c. An HbA1c >40mm/mol can be referred directly to the diabetes service without other testing. An HbA1c of 50mmol/mol or more is consistent with previously unrecognised diabetes.
- We are moving to measuring HbA1c at 10-12 weeks postpartum instead of an OGTT. This is less sensitive, but easier to do and is likely to be associated with better uptake of ongoing screening. It is important to note that 6 weeks postpartum is thought to be too early, as the drop in HbA1c during pregnancy and with treatment of GDM would still be reflected in a test at 6 weeks.

Recommendations

1. Continue to develop models of care with community clinics and hopefully GPs to cope with the increasing numbers. This will require intensive education to ensure the level of care for women is not compromised.
2. There is a NZ guidelines group currently reviewing the evidence around diagnosing and treating GDM. Already a number of areas have been identified where more evidence is required to inform best practice and National Women's should be actively involved with this research, as we have large numbers of women in the service each year.

5.5 Antepartum Haemorrhage

Methods

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 involved 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 28: Antepartum haemorrhage incidence NWH 1997-2012

	1997	1998	1999	2000	2005	2006	2007	2008	2009	2010	2011	2012
Total APH	453	451	484	594	398	411	533	424	438	438	455	511
Incidence %	5.6	6.0	6.5	7.6	5.5	5.7	6.9	5.6	5.7	5.7	6.0	6.6
Proven abruption	115	82	49	54	41	44	58	36	39	50	54	47
Proven placenta praevia	94	91	74	69	81	68	94	73	66	58	60	63
APH (uncertain origin)	281	278	361	471	276	299	381	315	333	330	341	401

In 2012, 511 women (6.6% of the total pregnant population) had an antepartum haemorrhage or placenta praevia without bleeding. This figure has not changed significantly from year to year over the last decade. The underlying causes have remained unchanged with APH of uncertain origin the most frequent “cause” over the last 15 years, 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 our population placenta praevia is significantly more common with increasing maternal age: there was an incidence of 0.5% (15 of 3194 women) in women aged 30 or under rising to 1.1% in women aged >30 (48 of 4501 women). The incidence of placenta praevia in women with a previous Caesarean section was 1.2% (14 of 1189 women) compared to 0.6% (17 of 2728 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 29: Maternal outcomes of pregnancies complicated by antepartum haemorrhage NWH 2012

	Placenta praevia		Placental abruption		APH uncertain		No APH	
	n=63		n=47		n=401		n=7184	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	1	1.59	15	31.9	224	55.9	3978	55.4
Operative vaginal	1	1.59	4	8.5	47	11.7	855	11.9
CS elective	43	68.3	6	12.8	48	12.0	1181	16.4
CS emergency	18	28.6	22	46.8	82	20.4	1170	16.3
Maternal transfusion	12	19.0	4	8.5	19	4.7	154	2.1

Women with a placenta praevia had a significant requirement for blood products with 19% (12 of 63 women) of these women requiring transfusion during pregnancy or birth. However, it is reassuring that 81% were managed without resort to blood transfusion. The use of cell saver technology and changing attitudes to the use of blood products may all be contributing to this, though we do not currently collect these data.

A confirmed placental abruption is a less common diagnosis with an incidence of 0.6% in 2012 (47 of 7695 women). There was no difference in incidence with maternal age, BMI or previous Caesarean section. Smoking is a significant risk factor with an incidence of 1.8% compared to 0.5% in non-smokers. Pre-eclampsia may also be a significant risk factor with an incidence of 2.4% (4 of 165 women) in this group compared to 0.6% (41 of 7136 women) in normotensive women.

Placental abruption is associated with significant maternal morbidity with 56.8% requiring birthing by emergency Caesarean section and 8.5% being transfused. Fetal morbidity is also significant with a median birth weight of 2580g and an incidence of SGA of 28.6%. 53.1% of these babies were admitted to NICU and there were six perinatal deaths amongst 49 babies in this group (122/1000 births).

The management of women with an antepartum haemorrhage of unknown origin remains challenging. They have a higher rate of preterm birth, emergency Caesarean section, an increased requirement for blood transfusion and a perinatal related mortality rate six times higher than women with no antepartum haemorrhage. Women with APH of uncertain origin should be treated as a high risk group. The NZ Perinatal and Maternal Mortality Review Committee (PMMRC) (2009) has also drawn attention to the importance of monitoring women with antepartum haemorrhage of uncertain origin.

Women with an APH of uncertain origin make up the largest proportion of women presenting with antepartum haemorrhage (401 of 511 women). Placenta praevia can be confirmed or excluded reliably by ultrasonography and it is likely that many of these women with no firm diagnosis had unconfirmed small abruptions. The associations with BMI, smoking and hypertensive disease would support this assumption.

Table 30: Fetal/neonatal outcomes of pregnancies complicated by antepartum haemorrhage (babies) NWH 2012

	Placenta praevia		Placental abruption		APH uncertain origin		No APH	
	n=64		n=49		n=412		n=7338	
	n	%	n	%	n	%	n	%
Gestation at birth								
<37 weeks	22	34.4	30	61.2	127	30.8	641	8.7
<32 weeks	6	9.4	16	32.7	70	17.0	136	1.9
Birthweight								
Median(IQR)	3105 (2725-3450)		2580 (1545-3140)		3140 (2404-3490)		3390 (3040-3750)	
<2500g	14	21.9	22	44.9	112	27.2	554	7.5
<1500g	4	6.3	12	24.5	58	14.1	139	1.9
Small for gestation age	6	9.4	14	28.6	60	14.6	821	11.2
Perinatal related deaths (n/1000)	1	15.6	6	122.4	29	70.4	87	11.9
Admission to NICU	15	23.4	26	53.1	103	25.0	751	10.2
>=2 days in NICU	15	23.4	25	51.0	100	24.3	684	9.3

5.6 Hypertensive disease

Methods

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, data collected at birth and coded data from the Decision Support Unit.

Findings

The overall rate of hypertensive disease in pregnancy (8.5%) is similar to the rate in 2011. 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. Hypertensive disease in pregnancy becomes more common with increasing maternal age. Women with increased BMI had higher rates of hypertensive disease in pregnancy, especially if their BMI was greater than 40. Twenty-eight percent of women with a BMI over 45 had hypertensive disease in pregnancy.

There were no reported cases of eclampsia in 2012

Table 31: Hypertensive disease in pregnancy NWH 2012

	All women n=7695		Nullipara n=3778		Multipara n=3917	
	n	%	n	%	n	%
Any hypertensive disease	559	7.3	309	8.2	250	6.4
Gestational hypertension	247	3.2	154	4.1	93	2.4
Chronic hypertension	125	1.6	37	1.0	88	2.2
Superimposed pre-eclampsia	22	0.3	8	0.2	14	0.4
Pre-eclampsia	165	2.1	110	2.9	55	1.4

Hypertensive disease is associated with an increase in interventions to interrupt pregnancy. Fifty percent of normotensive women went into labour spontaneously, compared with only 17%, 11% and 18% of the women with gestational hypertension, pre-eclampsia or chronic hypertension respectively. A diagnosis of preeclampsia, chronic hypertension or superimposed preeclampsia is associated with a high risk of Caesarean section birth (53%, 45% and 68% respectively).

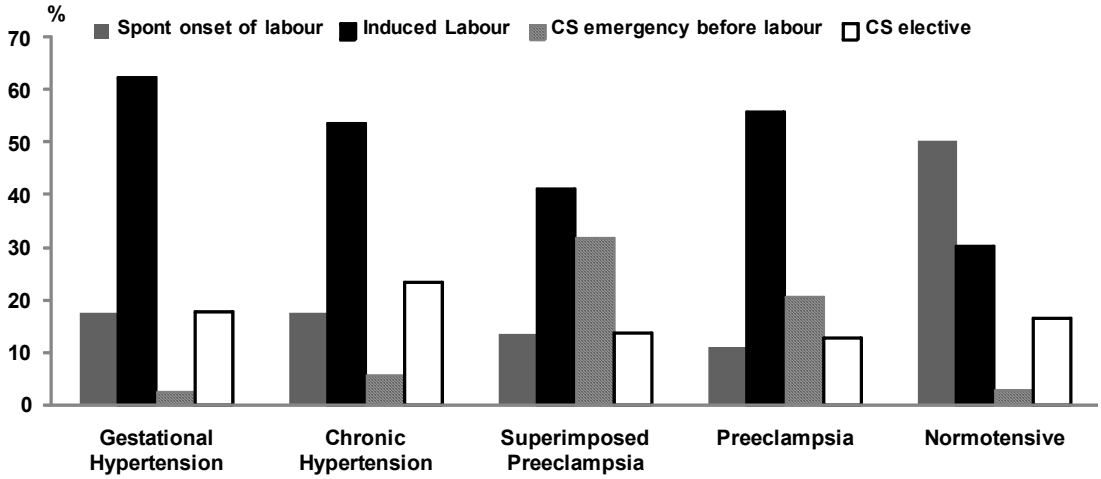

Figure 28: Onset of birth and hypertensive disorders of pregnancy NWH 2012

Table 32: Mode of birth among women with hypertensive disease NWH 2012

	Gestational hypertension n=247		Chronic hypertension n=125		Superimposed preeclampsia n=22		Pre-eclampsia n=165		Normotensive n=7136	
	n	%	n	%	n	%	n	%	n	%
Mode of birth										
Normal vaginal	110	44.5	54	43.2	7	31.8	52	31.5	3995	56.0
Operative vaginal	42	17.0	15	12.0	0	0	25	15.2	825	11.6
CS elective	44	17.8	29	23.2	3	13.6	21	12.7	1181	16.5
CS emergency	51	20.6	27	21.6	12	54.5	67	40.6	1135	15.9
Epidural	174	70.4	97	77.6	19	86.4	124	75.2	4227	59.2
General Anaesthetic	6	2.4	2	1.6	2	9.1	9	5.5	135	1.9

Table 33: Perinatal outcomes and hypertensive disease (babies) NWH 2012

	Gestational hypertension n=255		Chronic hypertension n=126		Superimposed preeclampsia n=24		Preeclampsia n=182		Normotensive n=7276	
	n	%	n	%	n	%	n	%	n	%
Gestation at birth										
<37 weeks	33	12.9	19	15.1	16	66.7	84	46.2	668	9.2
<32 weeks	6	2.4	0		5	20.8	17	9.3	200	2.7
SGA	39	15.3	22	17.5	12	50.0	12	6.6	770	10.6
NICU Admission	39	15.3	20	15.9	11	45.8	75	41.2	747	10.3
>=2 days in NICU	37	14.5	17	13.5	11	45.8	66	36.3	690	9.5
Apgar <7 at 5 minutes	2	0.8	4	3.2	1	4.2	5	2.7	138	1.9
Perinatal related deaths (n/1000)	2	7.8	1	7.9	3	125.0	1	5.5	116	15.9

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 (21% and 9.3% of births respectively, compared to 2.7% of normotensive pregnancies).

SGA is also increased in pre-eclamptic and chronically hypertensive groups, as is NICU admission and prolonged NICU stay. This is most pronounced in the pre-eclamptic group, 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 seven perinatal related deaths in the hypertensive group, two fewer than in 2011.

Summary / Implications

Occurring at a rate of 8.5%, antenatal hypertensive disease is one of the most common medical complications associated with pregnancy at NW. Gestational or chronic hypertension alone is less often associated with significant adverse maternal or perinatal outcomes. The negative pregnancy outcomes associated with the other hypertensive conditions are again reflected in the 2012 data. This reemphasises the need to adequately monitor hypertensive pregnancies and ensure timely referral for specialist level care.

5.7 Body Mass Index

Methods

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. In 2012, the WHO classification of BMI has been used to update this chapter.

Findings

Table 34: Maternal BMI NWH 2008-2012

	2008		2009		2010		2011		2012	
	n=7589		n=7735		n=7709		n=7523		n=7695	
	n	%	n	%	n	%	n	%	n	%
<18.5	402	5.3	445	5.8	442	5.7	440	5.8	481	6.3
18.5-24.99	3694	48.8	3868	50.0	3916	50.8	3798	50.4	3949	51.3
25-29.99	1654	21.9	1763	22.0	1721	22.3	1646	21.8	1678	21.8
30-34.99	724	9.6	783	10.1	792	10.3	795	10.5	771	10.0
35-39.99	356	4.7	373	4.8	360	4.7	370	4.9	354	4.6
>=40	264	3.5	251	3.3	265	3.4	309	4.1	289	3.8
Missing	471	6.2	308	4.0	221	2.9	185	2.5	173	2.3

Rates of obesity, including morbid obesity (BMI≥35) have remained similar over the last 5 years. Over time, data collection has improved with fewer than 2.5% missing data in 2012 compared with more than 20% missing data in 2006. We do not collect data enabling comparison of what proportion of height and weight data are measured (strongly recommended) versus self-reported.

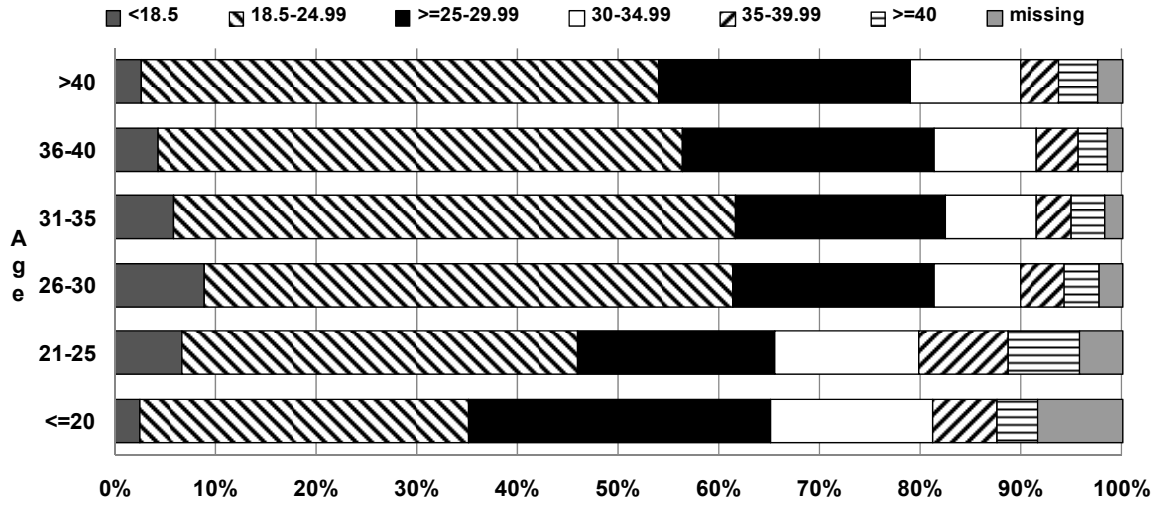

Figure 29: Distribution of BMI by maternal age NWH 2012

As observed in previous years, the relationship between BMI and age is "U shaped" with a large proportion of overweight and obesity in younger (<25 years, 49%) and older (>40 years, 44%) mothers. Higher rates of obesity in younger pregnant women are associated with higher rates of socio-economic deprivation and also with ethnicity.

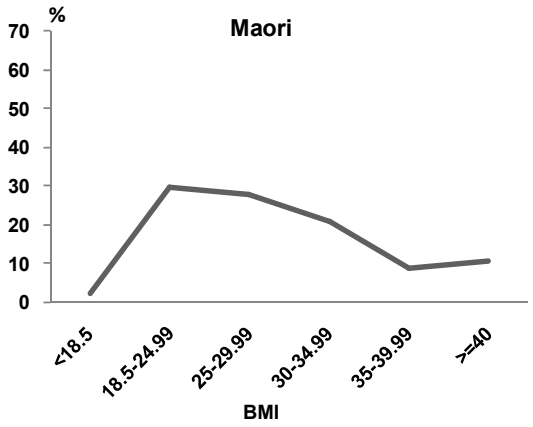

Figure 30: Distribution of BMI among Māori women NWH 2012

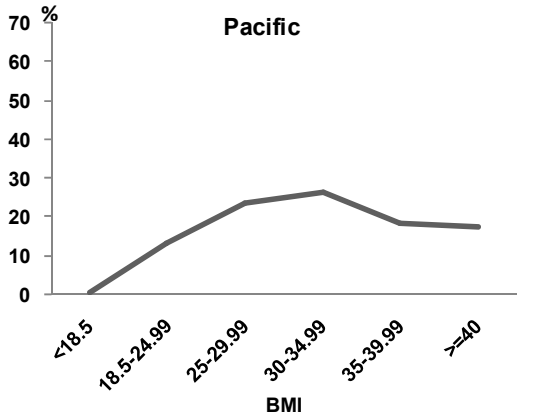

Figure 31: Distribution of BMI among Pacific women NWH 2012

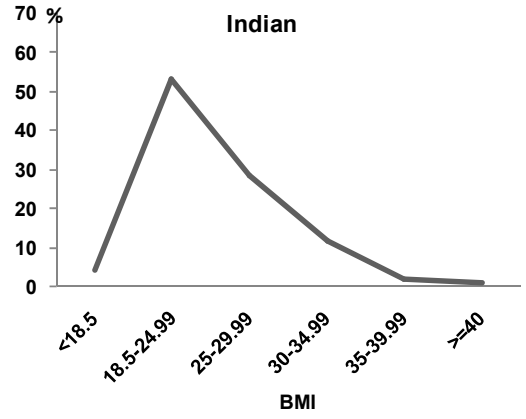

Figure 32: Distribution of BMI among Indian women NWH 2012

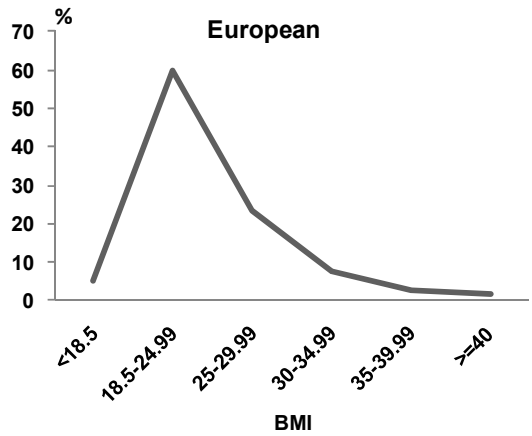

Figure 33: Distribution of BMI among European women NWH 2012

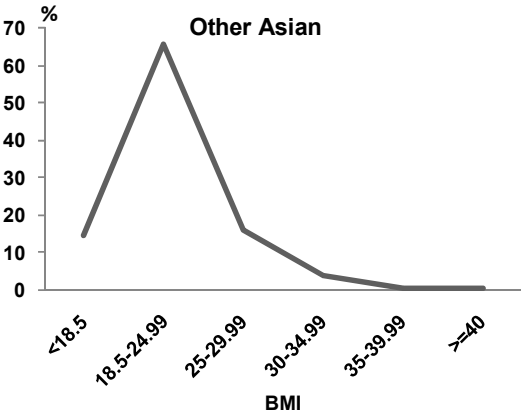

Figure 34: Distribution of BMI among Other Asian women NWH 2012

Māori and especially Pacific women are over represented amongst the obese groups (40% and 62% respectively). Obesity is more common amongst parous women, perhaps partly reflecting weight gained during a previous pregnancy and not lost post partum, as well as increasing age. The prevalence of smoking is also increased 3.5-fold amongst obese women (smoking rate 13.3% in obese, 6.6% in overweight and 3.8% 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)

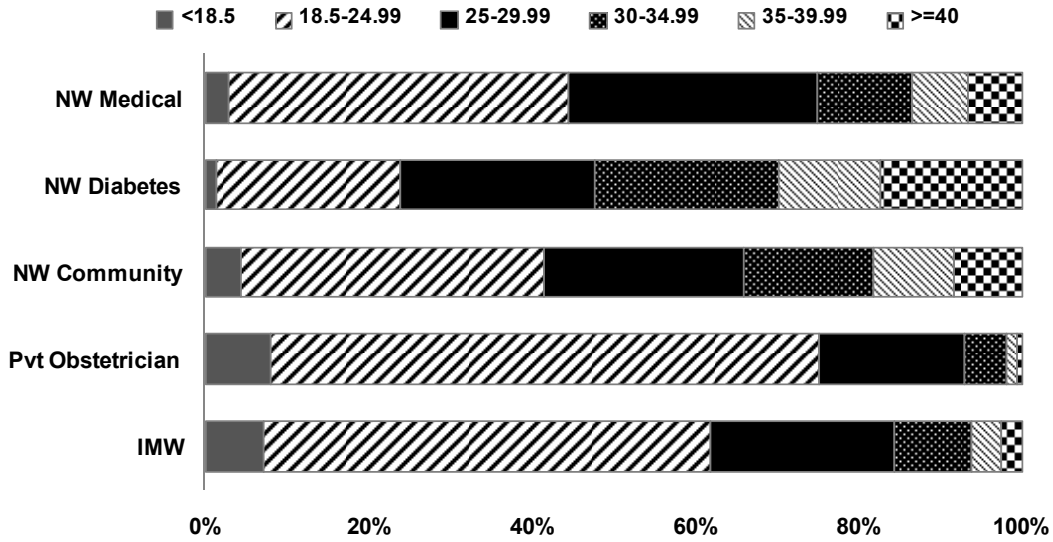

Figure 35: Distribution of BMI by LMC at birth NWH 2012

As expected, rates of obesity are highest in the NW diabetes clinic and lowest amongst patients booked with private obstetricians and independent midwives.

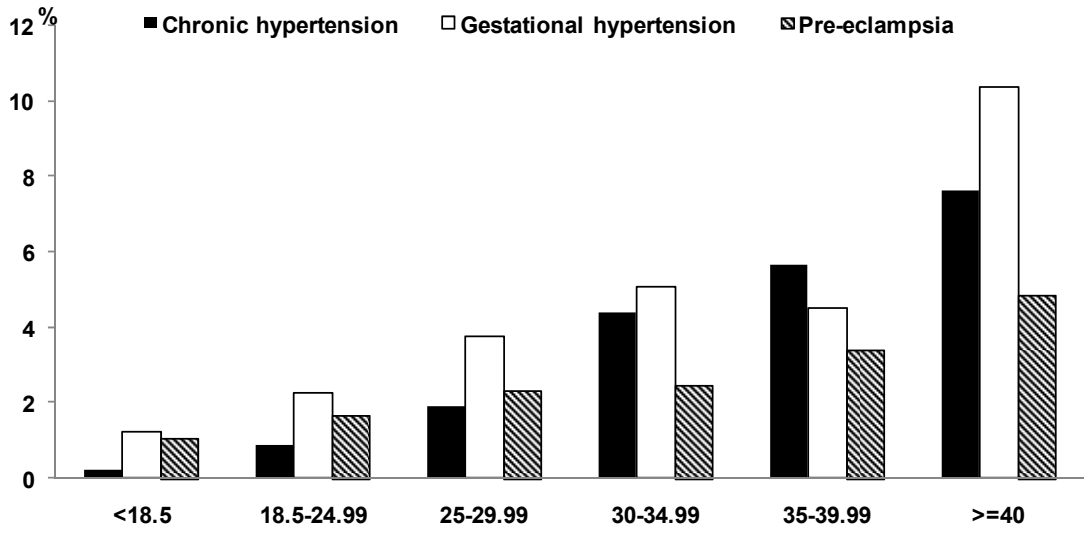

Figure 36: Rates of hypertensive diseases by maternal BMI NWH 2012 (Chronic hypertension includes superimposed pre-eclampsia)

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

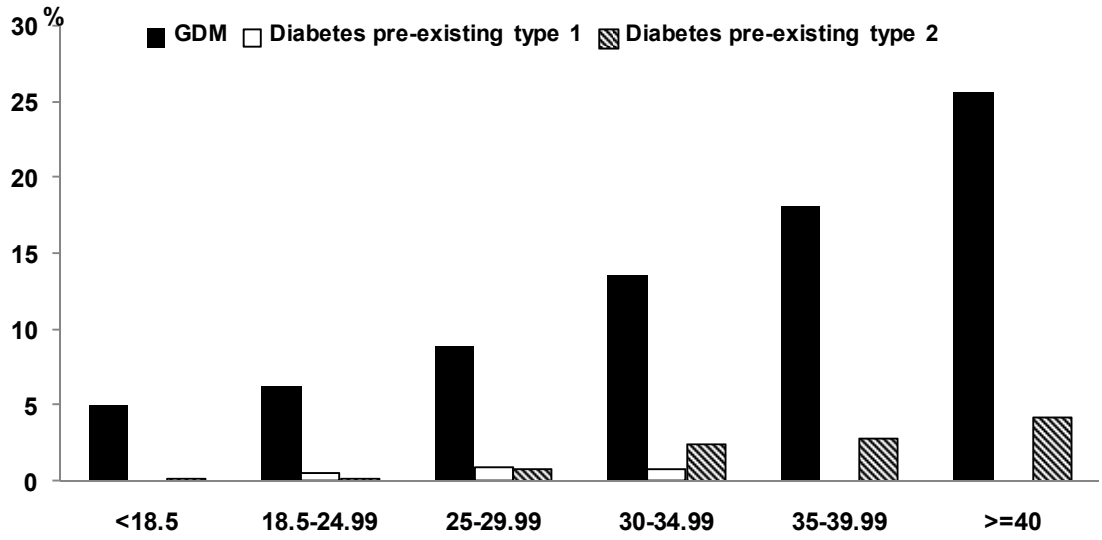

Figure 37: Rates of diabetes by maternal BMI NWH 2012

Increasing maternal BMI is also strongly associated with increasing rates of GDM and Type 2 diabetes as shown above. GDM is diagnosed in 13% of overweight or obese women, and a quarter 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 followup testing is crucial.

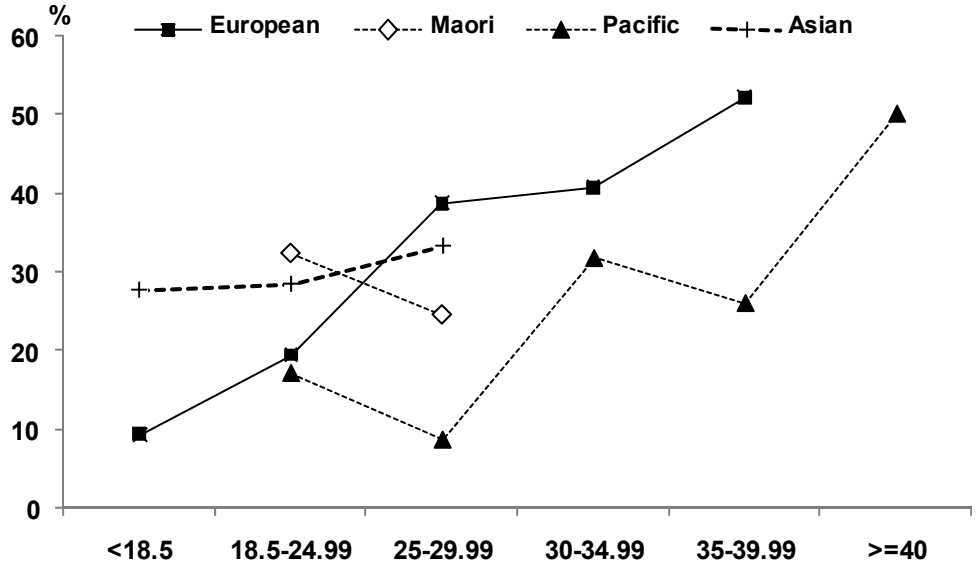

Figure 38: Caesarean section rate by BMI and ethnicity among nulliparous mothers NWH 2012 (no data point plotted if denominator < 30)

The above graph shows that nulliparous European women have on average higher rates of Caesarean section (elective and emergency) than other ethnicities, particularly when compared with Pacific women. However there are a number of confounding factors, such as maternal age (European women are older than Māori and Pacific mothers), smoking and pregnancy complications. Additionally, obese women have elevated rates of induction of labour including indications such as diabetes, hypertensive disease, and possibly prolonged pregnancy that need to be adjusted for in multivariate models before conclusions can be drawn from these data. 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).

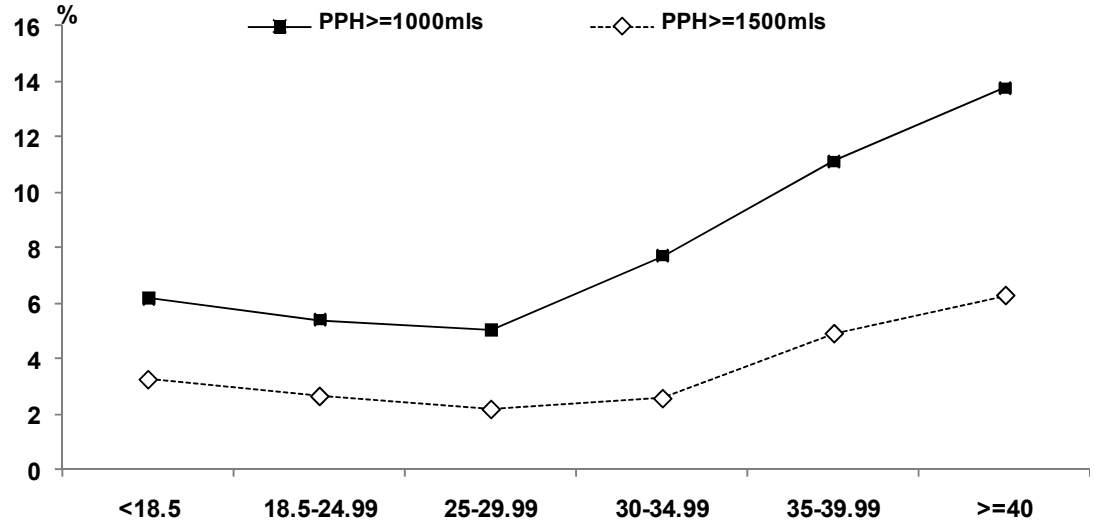

Figure 39: Postpartum haemorrhage rate by BMI among spontaneous vaginal births NWH 2012

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, chronic hypertension 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.

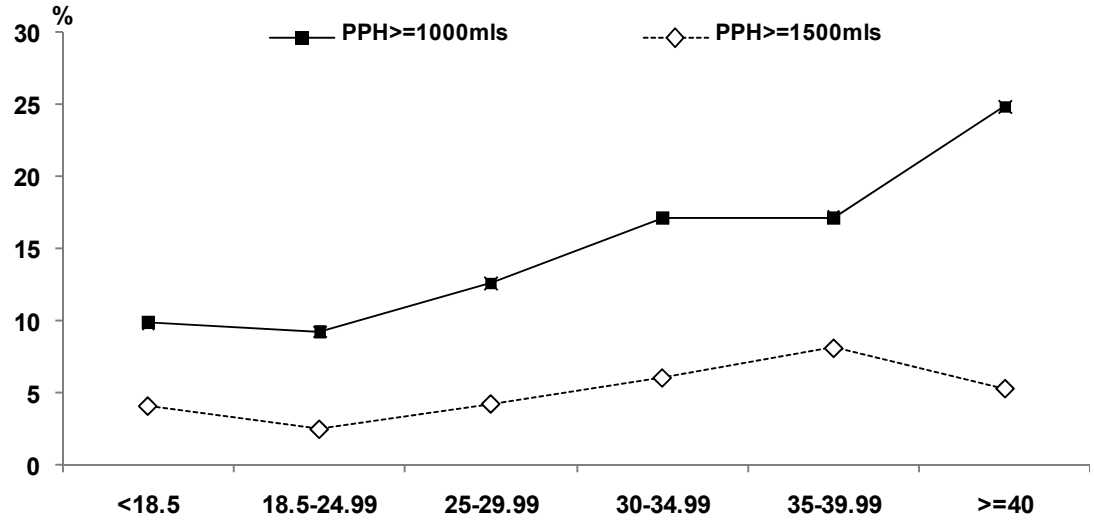

Figure 40: Postpartum haemorrhage rate by BMI among Caesarean sections NWH 2012

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.

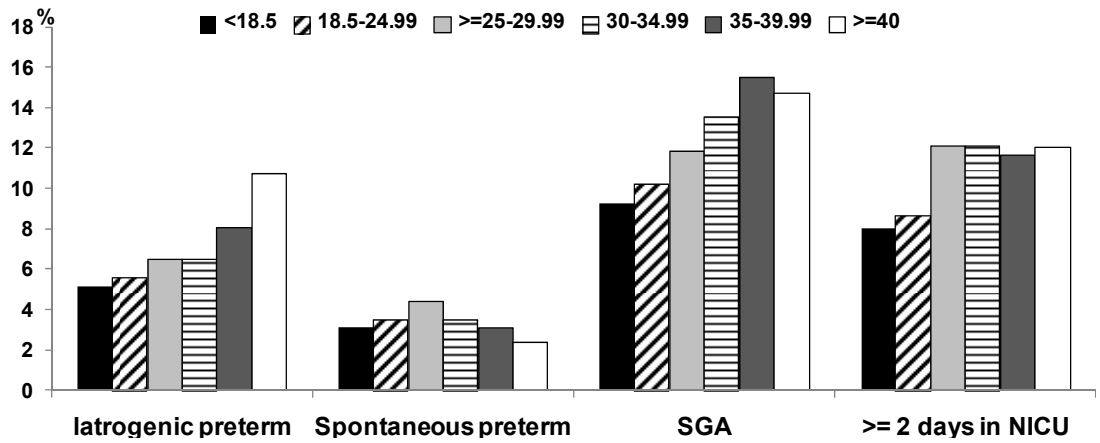

Figure 41: Neonatal outcomes and BMI NWH 2012

Rates of some neonatal complications are increased amongst obese women. 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 or higher rates of iatrogenic preterm birth (possibly due to increased rates of pre-eclampsia and diabetes).

In future years, ethnic-specific BMI categories should be considered when reporting BMI-related outcomes at NWH. Ethnic-specific BMI categories attempt to account for differing lean-body mass and fat percentages between ethnicities by lowering criteria for overweight and obesity in Asian and Indian women, and increasing criteria for Maori and Pacific women. To date there has been one study showing an increased risk of GDM and pre-eclampsia in Chinese women with BMI of 23-25, for whom that level is currently classified as normal by WHO criteria. As no studies comparing obstetric outcomes have been performed for Maori and Pacific ethnicities to date, ethnic-specific BMI criteria cannot be recommended in these groups at this time.

5.8 Fetal Medicine Unit

Methods

The data included in this section have been extracted from the MFM Viewpoint database for 2012.

Findings

In 2012 the service provided care for 961 women/pregnancies, including care for 861 singleton pregnancies, 89 twin pregnancies and 11 triplet pregnancies. 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.

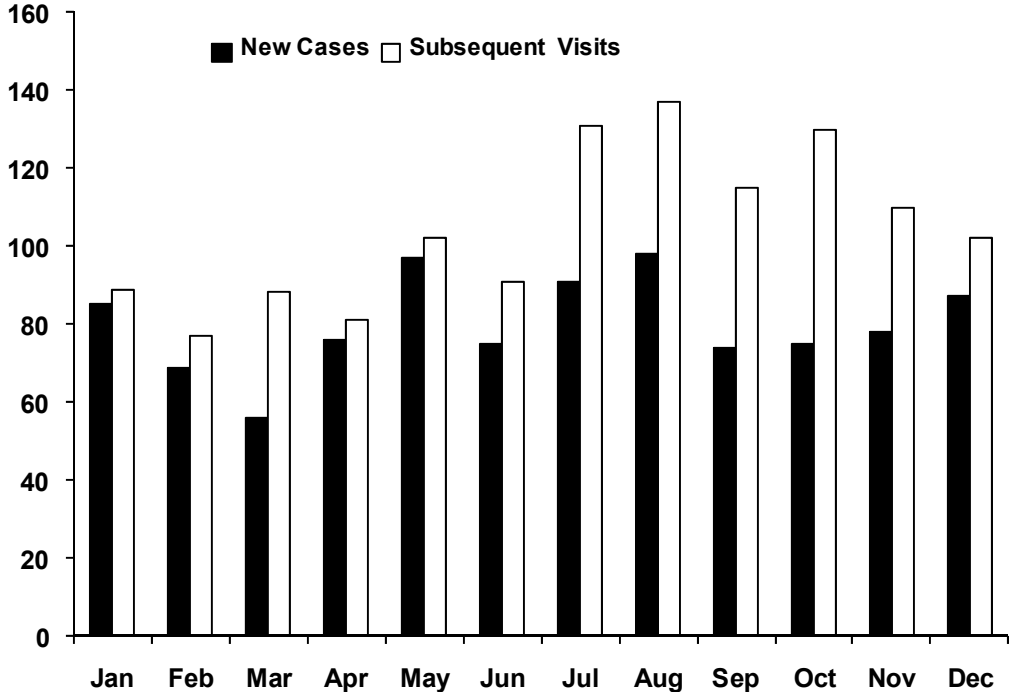

Figure 42: Number of new fetal medicine cases and subsequent visits NWH 2012

There were on average 73 new cases per month and 118 subsequent visits.

Table 35: Number of procedures performed in fetal medicine service NWH 2002-2012

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Amniocentesis									142	156	165
CVS									43	97	89
Echocardiogram									257	366	410
Intrauterine transfusion (mothers)	6	1	2	*	2	11	5	10	7	4	10
Intrauterine transfusion (procedures)	14	3	2	*	3	21	8	21	11	9	25
Other procedures (mothers)	19	11	3	*	36	40	37	24	22	20	26
Other procedures (procedures)	32	11	3	*	44	49	39	26	25	21	26

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

Table 36: Mothers with babies diagnosed with fetal abnormalities NWH 2011-2012

Fetal abnormalities	2011 N=306		2012 N=414	
	n	%	n	%
Heart	72	23.5	78	18.8
Kidneys	33	10.8	50	12.1
Brain	44	14.4	48	11.6
Extremities	20	6.5	34	8.2
Abdominal wall	29	9.5	41	9.9
Face	11	3.6	21	5.1
GIT	9	2.9	21	5.1
Head	2	0.7	1	0.2
Thorax	27	8.8	27	6.5
Spine	13	4.2	13	3.1
Neck/Skin	46	15.0	78	18.8
Skeleton	0		2	0.5
Genitalia	0		0	

Comment

The number of women seen in 2012 has increased by 11%. This is likely to be due to a change in referral base. In April 2012 the Fetal Medicine Unit at Waikato DHB closed due to lack of staffing and all Fetal Medicine referrals were subsequently seen in Auckland. It is likely there will be a further increase in the 2013 data as this will represent the first full year of increased volumes. The number of amniocenteses has also increased and is likely to be for the same reason. The number of complex invasive procedures remains stable, though the Auckland Fetal Medicine Unit is a National provider of these procedures and these figures are not expected to change.
Babies with cardiac anomalies are the most common reason for review. This is due to the prevalence of the condition and the fact that Auckland hosts the National Paediatric Cardiac service. All duct dependent babies are delivered in Auckland if identified prior to birth. Within the combined Fetal Medicine/Paediatric Cardiology group a number of audits and initiatives are under way to improve detection and early review and decision making for these women and their babies.

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 Induction of labour

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. 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

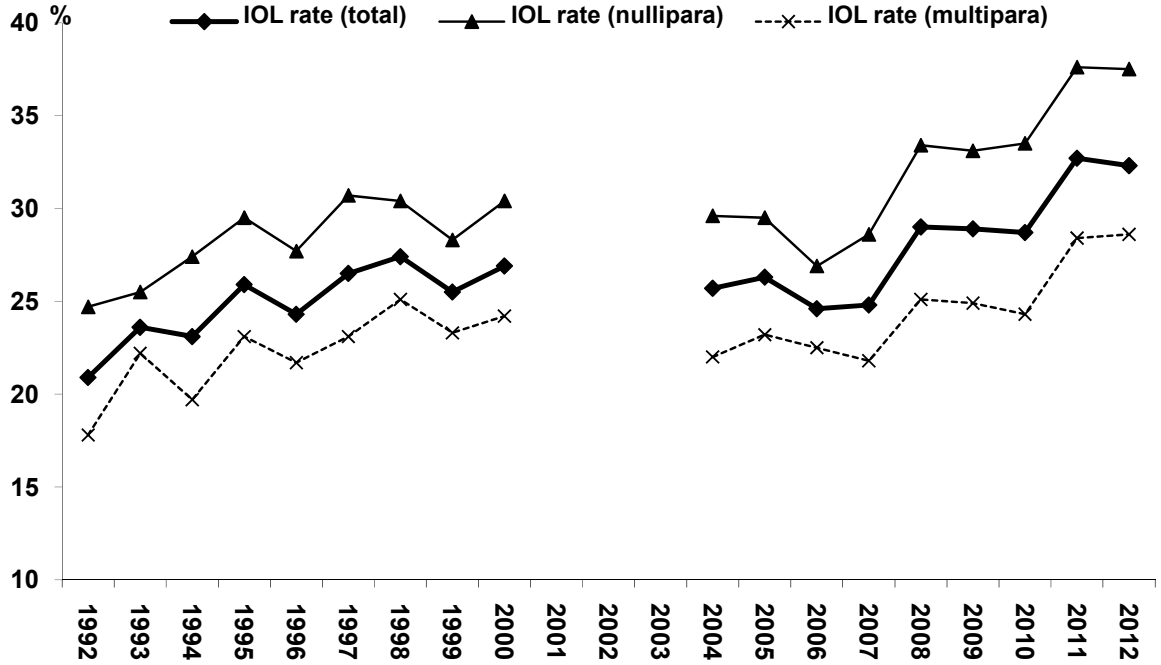

Figure 43 : Induction of labour rates NWH 1992-2012

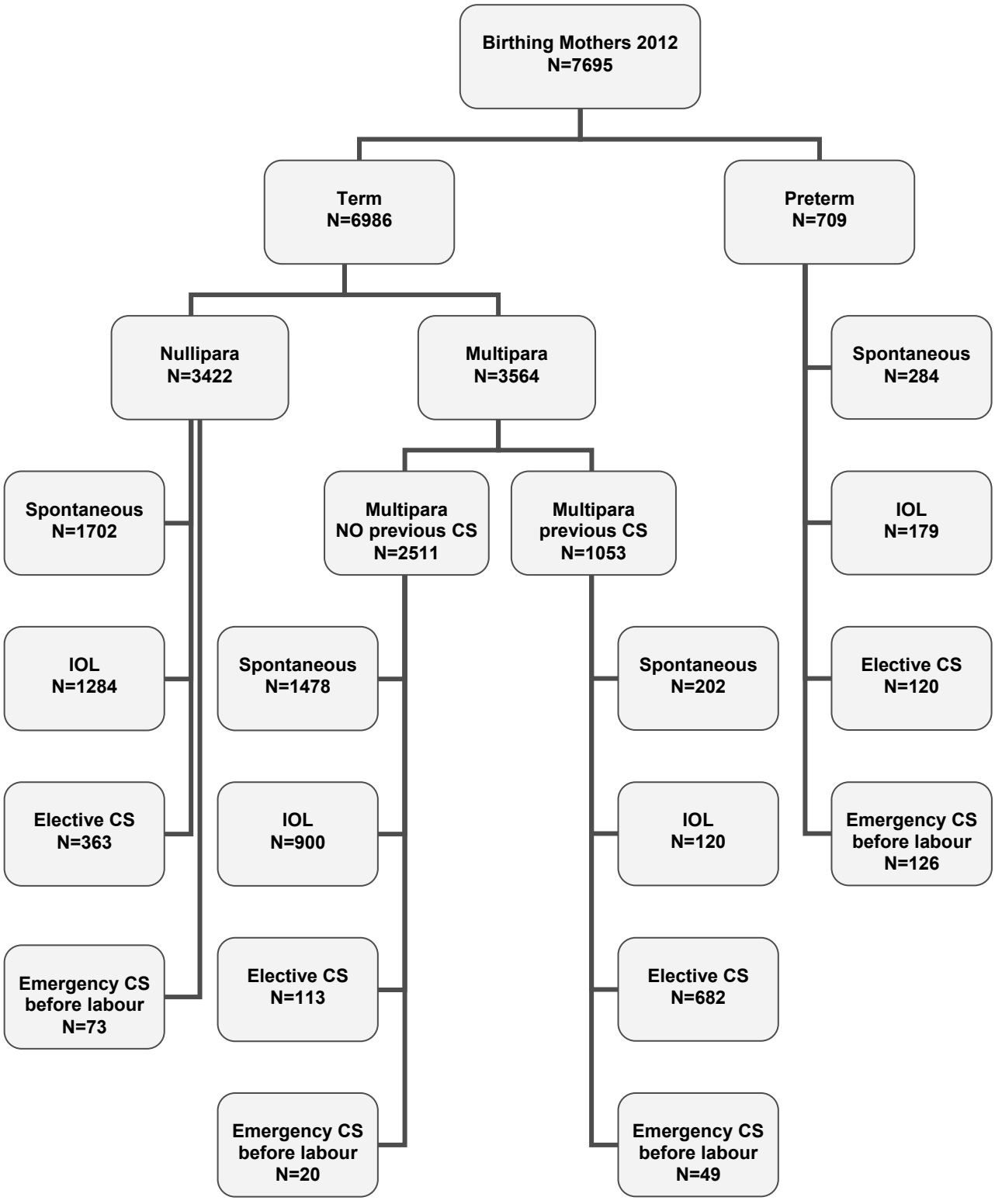

Figure 44: Pathways to birth by gestation and parity NWH 2012

Nulliparous women were more often induced at term than multiparous women without previous caesarean (37.5 vs 35.8%).More than one in three nulliparous women had induction of labour in 2012. The rate has remained stable compared to 2011. Further work is underway by the Labour and Birthing Clinical Governance

Group in the form of a more detailed audit of inductions, and a review of induction of labour processes and methods. Foley catheters are now being used 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.

Table 37: Maternal demographic characteristics by onset of birth at term NWH 2012

	Total	Spontaneous Labour		Induced labour		CS Elective		CS Emergency before labour	
	N	n	%	n	%	n	%	n	%
Total	**6986**	**3382**	**48.4**	**2304**	**33.0**	**1158**	**16.6**	**142**	**2.0**
Maternal Age									
<=20	227	151	66.5	68	30.0	6	2.6	2	0.9
21-25	782	455	58.2	273	34.9	43	5.5	11	1.4
26-30	1899	1062	55.9	609	32.1	200	10.5	28	1.5
31-35	2389	1140	47.7	775	32.4	420	17.6	54	2.3
36-40	1391	523	37.6	456	32.8	375	27.0	37	2.7
41+	298	51	17.1	123	41.3	114	38.3	10	3.4
Ethnicity									
NZ European	2453	1035	42.2	825	33.6	541	22.1	52	2.1
Maori	448	225	50.2	169	37.7	47	10.5	7	1.6
Pacific	930	512	55.1	331	35.6	68	7.3	19	2.0
Asian	1630	913	56.0	458	28.1	226	13.9	33	2.0
Indian	489	221	45.2	187	38.2	69	14.1	12	2.5
Other European	778	347	44.6	250	32.1	165	21.2	16	2.1
Other	258	129	50.0	84	32.6	42	16.3	3	1.2
BMI									
<19	446	269	60.3	116	26.0	53	11.9	8	1.8
19-25	4075	2019	49.5	1260	30.9	708	17.4	88	2.2
26-35	1872	835	44.6	691	36.9	314	16.8	32	1.7
>35	485	185	38.1	219	45.2	72	14.8	9	1.9
missing	108	74	68.5	74	68.5	11	10.2	5	4.6
LMC at Birth									
IMW	3446	2072	60.1	1049	30.4	277	8.0	48	1.4
Private Obstetrician	1656	456	27.5	551	33.3	594	35.9	55	3.3
GP	43	25	58.1	13	30.2	4	9.3	1	2.3
NW Community	1332	690	51.8	420	31.5	194	14.6	28	2.1
NW Medical	236	83	35.2	102	43.2	47	19.9	4	1.7
NW Diabetes	231	24	10.4	162	70.1	41	17.7	4	1.7
Other DHB	10	6	60.0	2	20.0	0	0.0	2	20.0
Unbooked	32	26	81.3	5	15.6	1	3.1	0	0.0

There is an increase in rate of elective caesarean as maternal age increases. European women are twice as likely to have elective caesarean as women of other ethnicities. Pre-labour emergency caesarean and induction of labour increase with increasing BMI. The elective caesarean rate is highest among women attending a private obstetrician (36%) and lowest among those attending an independent midwife (8%). Women under the care of medical clinic have a 1.4-fold increased rate of induction of labour (43%) compared to community women (31.5%), and women under diabetes clinic have a 2.2-fold increased rate (70%).

Indication for induction

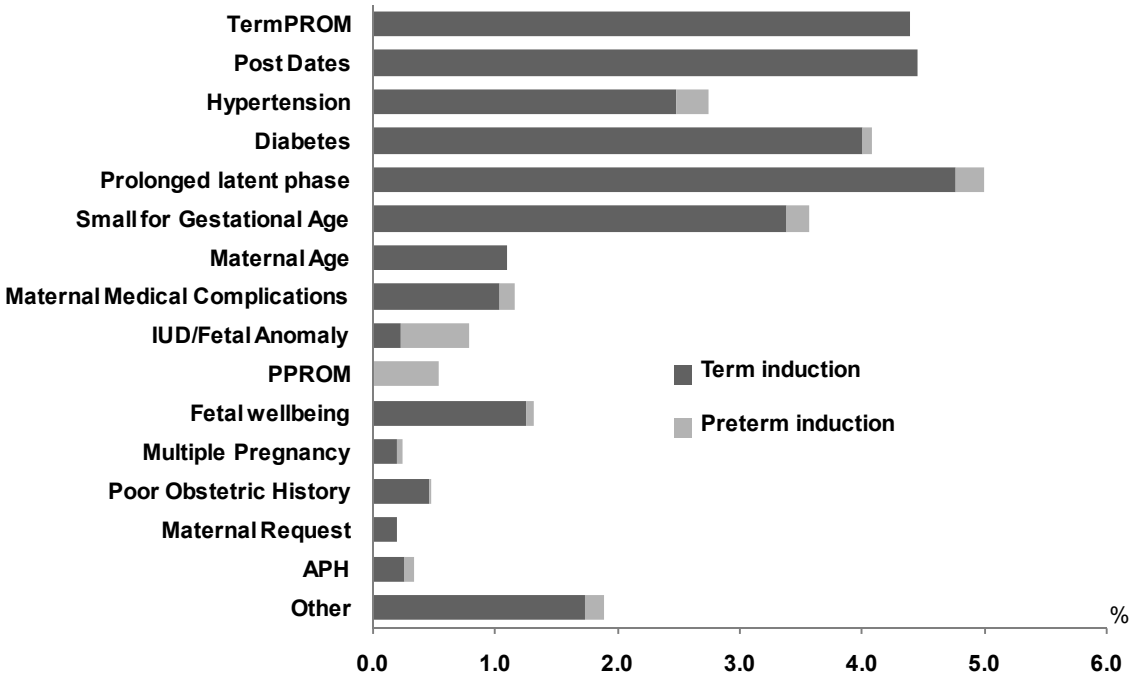

Figure 45: Primary indication for induction by gestation (as a percentage of all births) NWH 2012

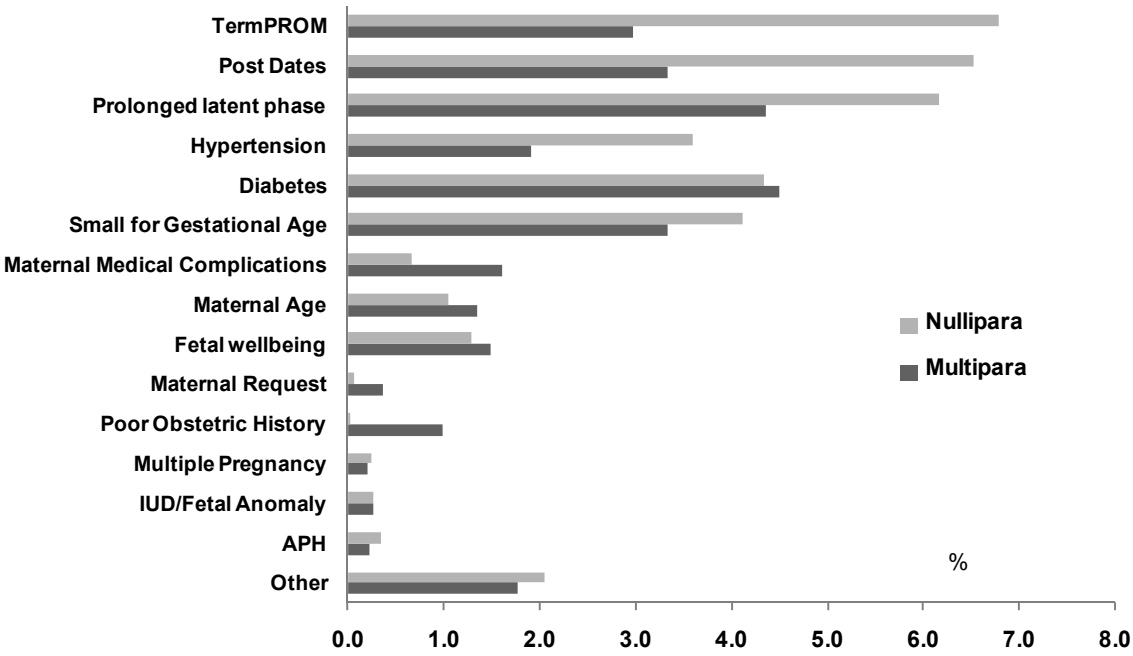

Figure 46: Primary indication for induction at term by parity (as a percentage of term births) NWH 2012

Table 38: Gestation at birth among women whose primary indication for induction was 'post dates' NWH 2012

	Total n=338		Age<35 n=239		Age>=35 n=99	
	n	%	n	%	n	%
40-40[6]	50	14.8	29	12.1	21	21.2
41-41[6]	235	69.5	171	71.5	64	64.6
42-42[6]	51	15.1	37	15.5	14	14.1
43-43[6]	2	0.6	2	0.8	0	0.0

Prolonged latent phase was the most frequent reason for induction of labour in 2012. In previous years the most frequent reasons have been diabetes, term PROM and post-dates pregnancy.

When post-dates was the primary indication for induction, 15% occurred prior to 41 weeks (up from 10% in 2011) and 16% occurred at or beyond 42 weeks (down from 22% in 2011).

The advent of the post dates virtual clinic at the end of 2011 has meant that referrals for postdates induction of labour prior to 41 weeks will not be accepted in women meeting the criteria for a normal birth pathway. LMCs are responsible to refer earlier if there are risk factors.

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

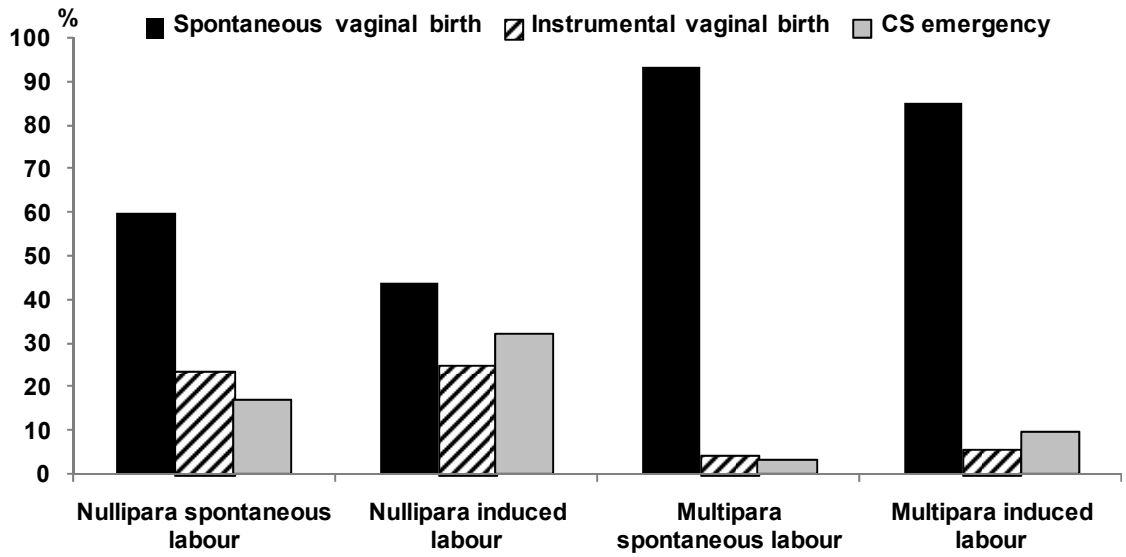

Figure 47: Mode of birth among intended vaginal births at term by parity and onset of labour (excludes previous Caesarean) NWH 2012

The emergency Caesarean section rate following induction is higher than following spontaneous onset of labour, for both nullipara and multipara without previous Caesarean. Among nulliparous women, induction is associated with a slight increase in risk of emergency caesarean (from 17% to 23%). In comparison, the risk of emergency caesarean in nulliparous women having induction in 2011 was 35%.

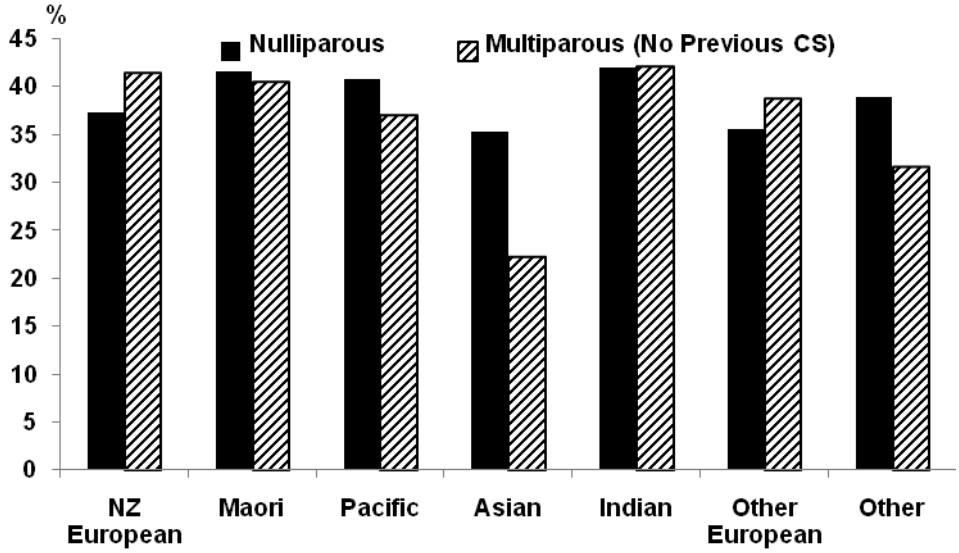

Figure 48: Induction rate by ethnicity and parity at term NWH 2012

Indian women appear to have the highest rate of induction of labour (38.1%), whilst Asian women have the lowest (28.1%). This may reflect different levels of clinical risk in these populations.

6.2 Use of syntocinon

Table 39: Use of syntocinon by onset of labour and parity NWH 2012

	Total birth	Syntocinon	
	N	n	%
Total	7695	2672	34.7
Induced labour			
Nullipara	1382	1071	77.5
Multipara	1101	739	67.1
Spontaneous labour			
Nullipara	1859	708	38.1
Multipara	1807	142	7.9

Figure 49: Dilatation at commencement of syntocinon infusion among labouring women by induction status NWH 2012

Women given syntocinon prior to 3 cm dilatation are assumed to have been induced.

Syntocinon was used to augment spontaneous labour for 38% of nulliparous and 8% of multiparous women (similar rates to 2011).

Summary / Implications

There is concern that the rate of induction is too high. Recommendations from last year's annual clinical report are being implemented, including a review of the overall induction process. An ongoing project is being led by the Labour and Birthing Clinical Governance Group. The rate of induction for term PROM did not increase as anticipated since NWH guidelines were updated to reflect the evidence for a more proactive approach. There is also good evidence suggesting benefit for induction for babies with fetal growth restriction and for women with gestational hypertension and mild pre-eclampsia.Updated guidelines on use of Syntocinon and new national guidelines on the management of small for gestational age babies and on the diagnosis and management of gestational diabetes are both in draft form at the time of this report. Further work is needed especially as regards to timing of cervix priming, ARM and syntocinon.

6.3 Mode of birth

Findings

Table 40: Mode of birth trends NWH 1998-2012 (n = mothers)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of births	7531	7501	7827	7452	7775	7611	7491	7194	7212	7695	7589	7735	7709	7523	7695
	%	%	%		%	%	%	%	%	%	%	%	%	%	%
Spontaneous vertex	62.0	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
Vaginal breech	1.0	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
Forceps/ ventouse	12.3	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
Caesarean	24.7	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
Elective							10.4	11.6	12.8	13.4	14.4	14.6	15.9	15.7	16.6
Emergency							18.8	20.0	20.3	18.3	16.9	16.6	16.4	16.8	16.8

From 1998, data exclude postnatal transfers.
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.
Data for 2001 are not available.

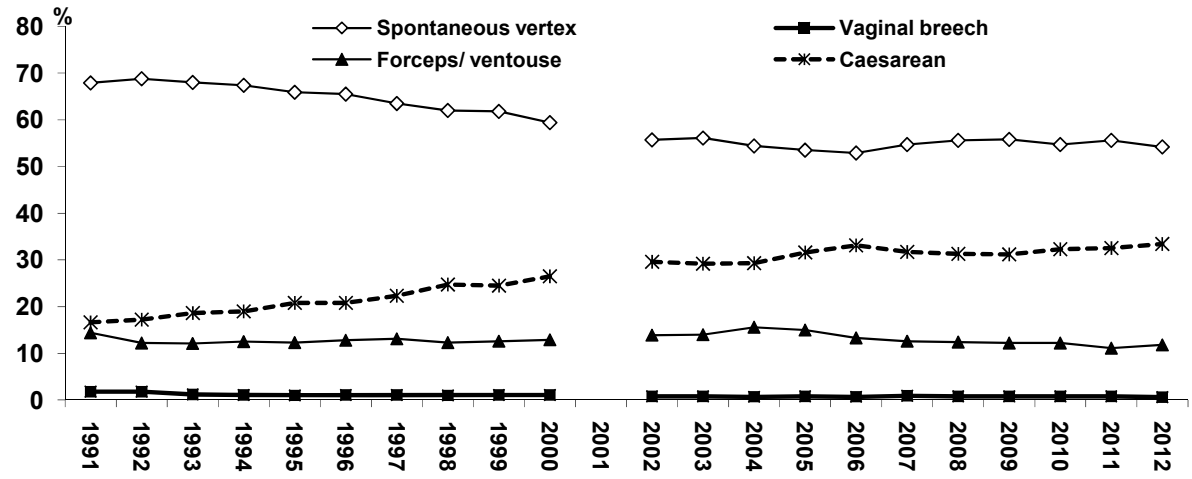

Figure 50: Mode of birth NWH 1991–2012

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 been stable.

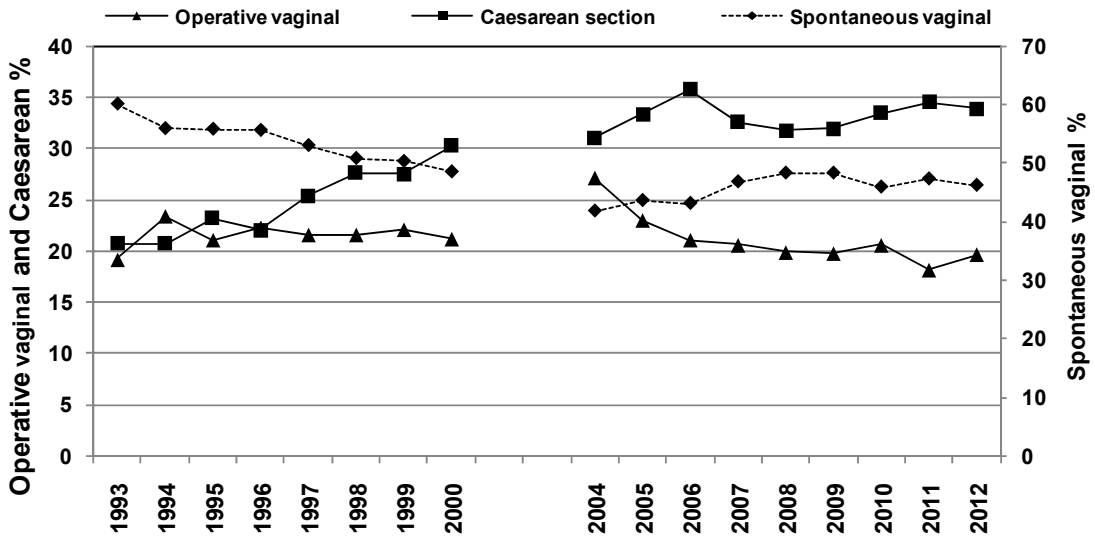

Figure 51: Mode of birth for nullipara NWH 1993-2012

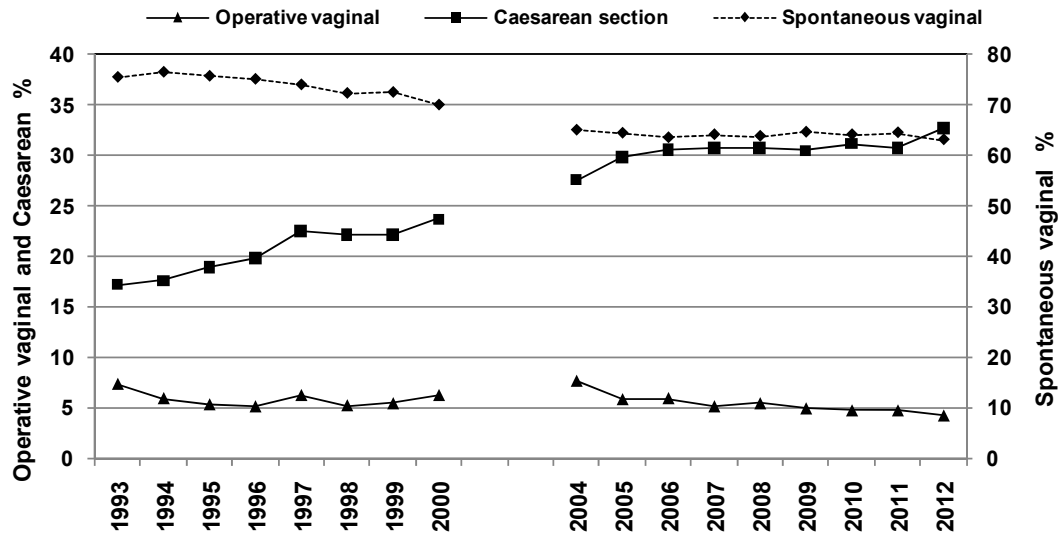

Figure 52: Mode of birth for multipara NWH 1993-2012

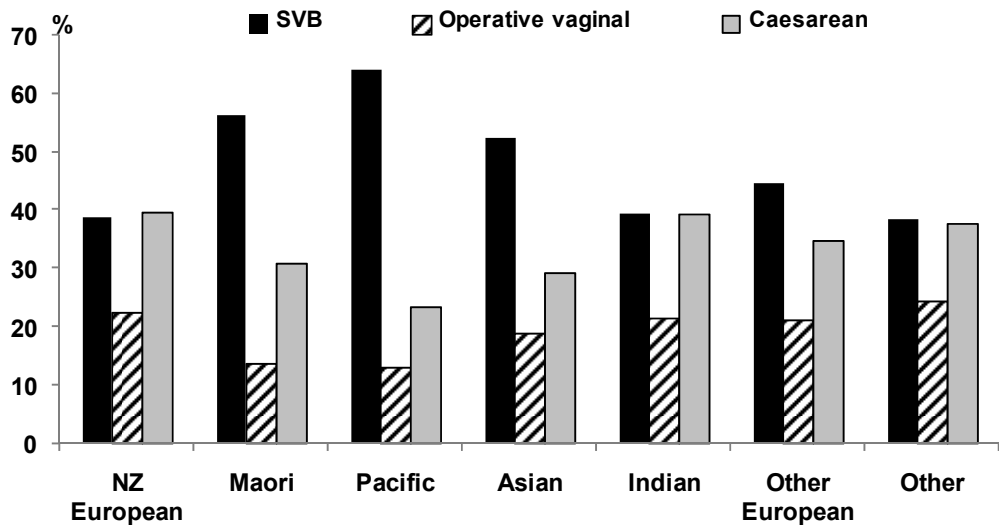

Figure 53: **Mode of birth by ethnicity among nulliparous women NWH 2012**

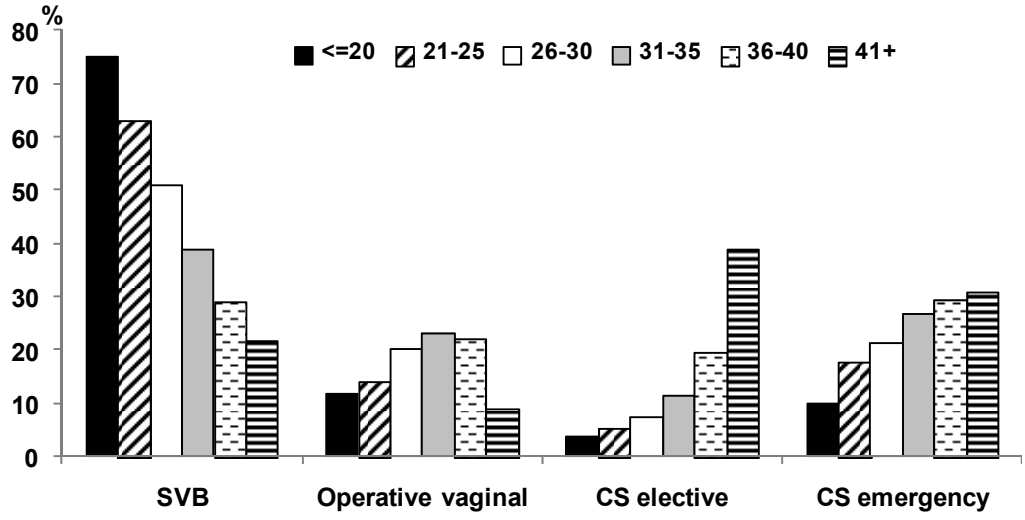

Figure 54: Mode of birth by maternal age among nulliparous women NWH 2012

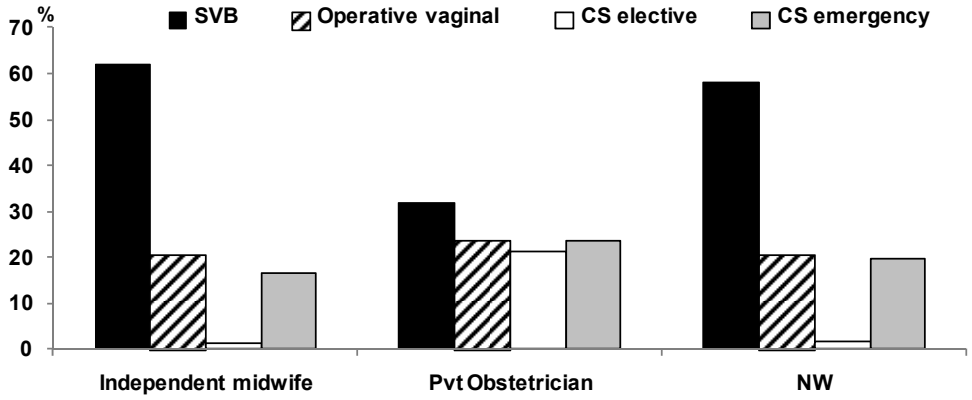

Figure 55: Mode of birth at term by LMC at birth among standard primipara NWH 2012

The outstanding features of the figures above are the SVB and elective CS rates for standard primiparae under private specialist obstetrician care. Although maternal age does seem to be associated with an increased CS rate (all nulliparae), the standard primipara is aged between 20 and 34 years.

6.4 Spontaneous vaginal birth

Table 41: Spontaneous vaginal birth rates NWH 2004-2012

	2004	2005	2006	2007	2008	2009	2010	2011	2012
	n	n	n	n	n	n	n	n	n
Total births (mothers)	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**
Spontaneous vaginal birth	4127	3899	3866	4282	4280	4374	4217	4243	4218
Incidence %	55.1	54.2	53.6	55.6	56.4	56.4	55.5	56.4	54.8
Total nullipara	3597	3522	3499	3752	3623	3811	3650	3539	3778
Spontaneous vaginal birth	1604	1535	1509	1755	1749	1839	1675	1674	1746
Incidence %	44.6	43.6	43.1	46.8	48.3	48.3	45.9	47.3	46.2
Total multipara	3894	3672	3713	3943	3966	3924	4059	3984	3917
Spontaneous vaginal birth	2523	2364	2357	2527	2531	2495	2601	2569	2472
Incidence %	64.8	64.4	63.5	64.1	63.8	63.6	64.1	64.5	63.1

The spontaneous vaginal birth rate has remained consistently low since 2004. SVB 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 65.6% was at the national average in this respect in the latest report, which was for 2011 data, despite wide variations between practitioner groups. All practitioner groups should strive for excellence in care to 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 seven babies were recorded in the database as having been born in water in 2012. Five of these were under the care of NW LMC service and thirty two were under the care of an independent midwife.

All were live births. One baby had an Apgar score of <7 at 1 minute, one baby had an Apgar of <7 at 5 minutes and one baby spent time in NICU.

6.5 Caesarean section

Methods

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

Findings

The Caesarean section rate (33.4%) has not changed significantly since 2006. The most common reason for Caesarean section is repeat Caesarean. This is followed closely by nullipara having Caesarean before labour or following induction of labour. See Robson groups on the following page which shows 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 will be more strictly implemented in 2013 since an audit revealed low compliance.

Table 42: Caesarean section rates NWH 1998-2012

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total births (mothers)	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**
Caesarean sections	1851	1837	2084	*	2301	2219	2193	2273	2390	2438	2372	2414	2491	2448	2570
Incidence %	24.7	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
Total nullipara	**3263**	**3262**	**3454**	*	*	*	**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**	**3778**
Caesarean	900	898	1047	*	*	*	1118	1178	1253	1225	1152	1219	1223	1222	1288
Incidence %	27.6	27.5	30.3	*	*	*	31.1	33.4	35.8	32.6	31.8	32.0	33.5	34.5	34.1
Total elective							233	249	296	310	313	340	383	353	408
Elective %	*	*	*	*	*	*	6.5	7.1	8.5	8.3	8.6	8.9	10.5	10.0	10.8
Total emergency							885	929	957	915	839	879	840	869	880
Emergency %	*	*	*	*	*	*	24.6	26.4	27.4	24.4	23.2	23.1	23.0	24.6	23.3
Total multipara	**4229**	**4239**	**4372**	*	*	*	**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**	**3917**
Caesarean	951	939	1037	*	*	*	1075	1095	1137	1213	1220	1195	1268	1226	1282
Incidence %	22.5	22.2	23.7	*	*	*	27.6	29.8	30.6	30.8	30.8	30.5	31.2	30.8	32.7
Total elective							548	584	628	720	780	792	843	830	868
Elective %	*	*	*	*	*	*	14.1	15.9	16.9	18.3	19.7	20.2	20.8	20.8	22.2
Total emergency							527	511	509	493	440	403	425	396	414
Emergency %	*	*	*	*	*	*	13.5	13.9	13.7	12.5	11.1	10.2	10.5	9.9	10.6

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

Robson 10-group classification 2005-2012

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.
It is pleasing to see the improvement in group 3 which now has a Caesarean section rate of less than 3 % for the first time since 2006.

Table 43: Robson 10-Group Classification NWH 2006-2012

	2006			2007			2008			2009			2010			2011			2012			
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**	**Contribution to CS rate**
	n	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**%**
Totals	**2390**	**7212**	**33.1**	**2438**	**7695**	**31.7**	**2372**	**7589**	**31.3**	**2414**	**7735**	**31.2**	**2491**	**7709**	**32.3**	**2448**	**7523**	**32.5**	**2570**	**7695**	**33.4**	
1 Nullip, singleton, cephalic, term, spontaneous labour	396	1920	20.6	353	2004	17.6	279	1809	15.4	281	1950	14.4	251	1736	14.5	244	1555	15.7	275	1684	16.3	10.7
2 Nullip, singleton, cephalic, term, induced or CS before labour	495	1024	48.3	515	1132	45.5	581	1275	45.6	647	1393	46.4	648	1384	46.8	669	1465	45.7	686	1555	44.1	26.7
3 Multip, singleton, cephalic, no previous CS, term, spontaneous labour	79	1601	4.9	57	1690	3.4	62	1640	3.8	55	1599	3.4	53	1693	3.1	49	1503	3.3	41	1467	2.8	1.6
4 Multip, singleton, cephalic, no previous CS, term, induced or CS before labour	127	714	17.8	123	735	16.7	119	806	14.8	144	839	17.2	159	856	18.6	141	977	14.4	154	957	16.1	6.0
5 Previous CS, singleton, cephalic, term	677	936	72.3	748	1008	74.2	741	1017	72.9	698	967	72.2	757	1005	75.3	752	1016	74.0	757	977	77.5	29.5
6 Nullip, singleton, breech	187	205	91.2	183	208	88.0	166	195	85.1	164	174	94.3	177	199	88.9	151	172	87.8	186	202	92.1	7.2
7 Multiip, singleton, breech (incl prev CS)	106	123	86.2	121	143	84.6	135	151	89.4	132	161	82.0	115	141	81.6	117	142	82.4	132	154	85.7	5.1
8 All multiple (incl prev CS)	108	162	66.7	110	177	62.1	97	160	60.6	93	159	58.5	104	153	68.0	111	163	68.1	112	163	68.7	4.4
9 All abnormal lie (incl prev CS)	27	29	93.1	26	27	96.3	29	32	90.6	55	63	87.3	62	69	89.9	53	56	94.6	40	47	85.1	1.6
10 All preterm singleton cephalic (incl prev CS)	188	498	37.8	202	571	35.4	163	504	32.3	145	430	33.7	165	473	34.9	161	474	34.0	187	489	38.2	7.3

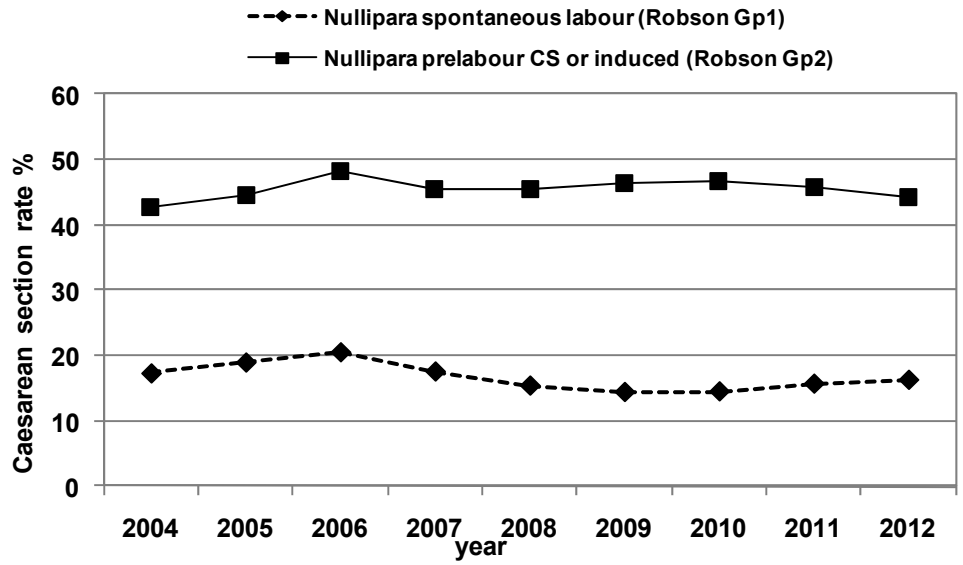

Figure 56: Robson groups 1&2: Nulliparous caesarean section rates among singleton cephalic term pregnancies by onset of labour NWH 2004-2012

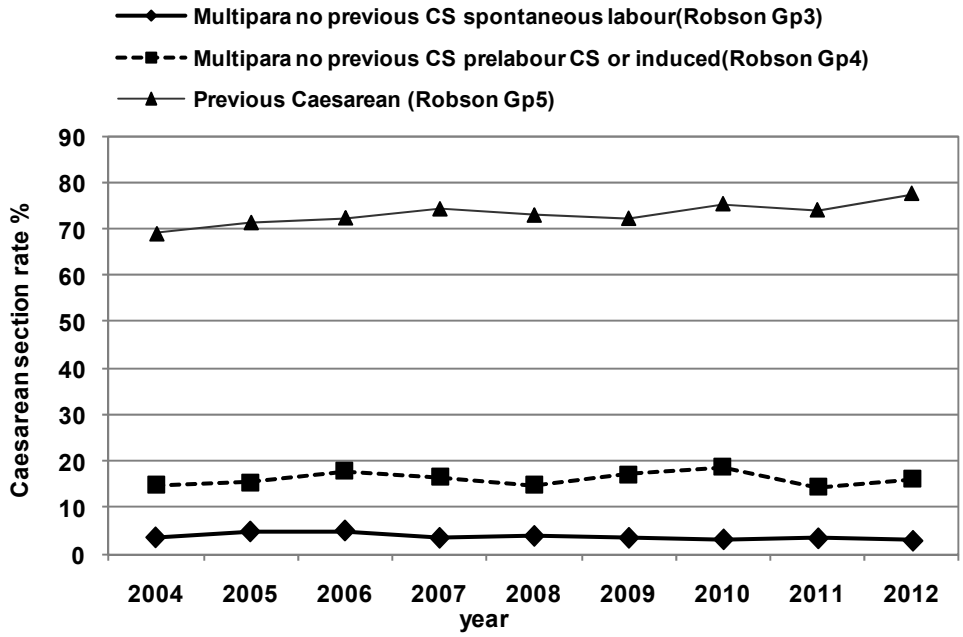

Figure 57: Robson groups 3-5: Multiparous caesarean section rates among singleton cephalic term pregnancies by onset of labour and previous caesarean status NWH 2004-2012

6.5.1 Indication for elective and pre labour Caesarean section

Thirty-eight percent of all elective and pre-labour emergency Caesarean sections were performed for the primary indication of 'repeat Caesarean section'. Specifically among multiparous women, 61% of elective and pre-labour Caesarean sections were performed primarily for "repeat Caesarean". The next most common indication overall for elective or pre-labour Caesarean section was malpresentation at 13%. In nullipara, concerningly, 16% of elective or pre-labour emergency Caesarean section were for maternal request.

6.5.2 Indication for in labour emergency Caesarean section

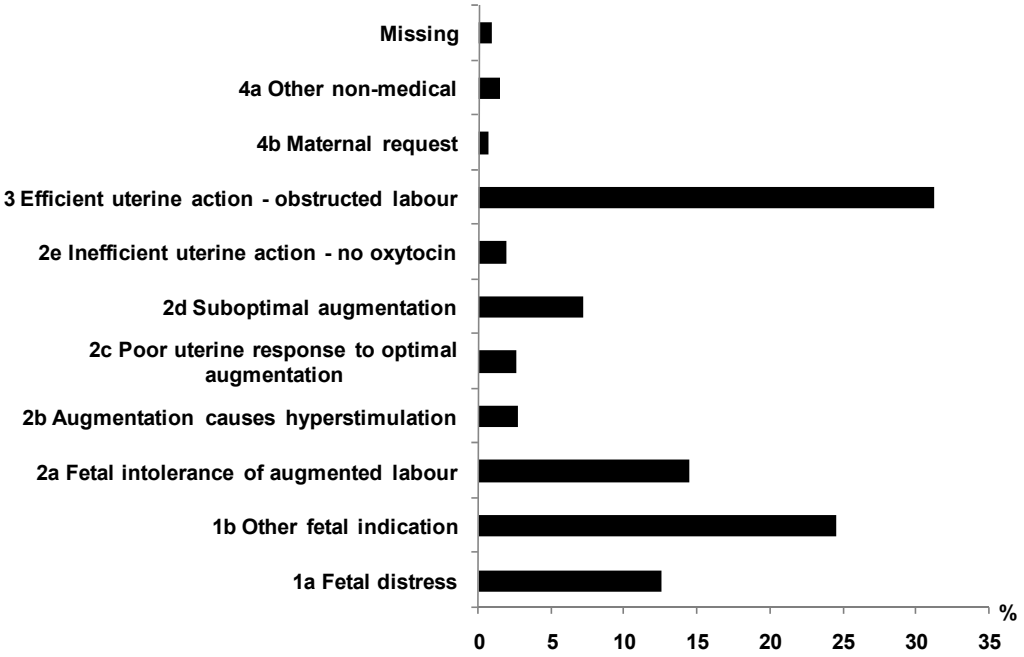

Figure 58: Indication for in labour emergency Caesarean section NWH 2012

The figure above shows the reasons for emergency Caesarean section in labour, of which the most frequent are still "obstructed labour" and "other fetal indications". The data suggest effective use of oxytocin in labour. Caesareans performed for "fetal intolerance" or "fetal distress" without fetal blood sampling in labour are more likely to be unnecessary. 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.

6.5.3 Vaginal birth after Caesarean section

Of all women giving birth at NW in 2012, 10.6% had previously had only one birth where that one birth was a Caesarean section.

Sixty four percent of para 1 women with one prior Caesarean had an elective repeat Caesarean; this rate is stable (63% in 2011). The rate of pre-labour repeat Caesarean for public women booked at NW was 58%, which is higher than last year (50%).

For 298 women who had a trial of labour, 78% had a vaginal birth, which is much higher than last year (60%). However, the overall rate of vaginal birth among all para 1 women with a history of one Caesarean section (17%) is still lower than last year (22%) given how few women had a trial of labour.

The VBAC rate in para 1 women with singleton, cephalic term pregnancies varied by LMC, from 7% in women with private obstetricians, to 20% in women with NW midwives, to 29% in women with IMW. The VBAC rate also varied by onset of labour (68% in spontaneous labour compared to 48% for induced labour). These data could inform how we counsel women antenatally about the decision to plan VBAC or repeat Caesarean section. Of note, the philosophy of the Positive Birth After Caesarean 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.

Table 44: VBAC: Mode of birth among parity 1 prior Caesarean pregnancies by mode of onset of birth (n=799) NWH 2012

Parity 1, previous Caesarean, all gestations										
	Spontaneous labour n=154		Induced labour n=79		CS elective n=501		CS emergency before onset of labour n=65		Total n=799	
	n	%	n	%	n	%	n	%	n	%
SVB	68	44.2	24	30.4	0		0		92	11.5
Operative vaginal birth	33	21.4	14	17.7	0		0		47	5.9
CS elective	0		0		501	100	0		501	62.7
CS emergency	53	34.4	41	51.9	0		65	100	159	19.9

Table 45: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by mode of onset of birth (n=682) NWH 2012

Parity 1, previous Caesarean, singleton, cephalic, term										
	Spontaneous labour n=136		Induced labour n=73		CS elective n=434		CS emergency before onset of labour n=39		Total n=682	
	n	%	n	%	n	%	n	%	n	%
SVB	60	44.1	21	28.8	0		0		81	11.9
Operative vaginal birth	32	23.5	14	19.2	0		0		46	6.7
CS elective	0		0		434	100	0		434	63.6
CS emergency	44	32.4	38	52.1	0		39	100	121	17.7

Table 46: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by LMC at birth (n=682) NWH 2012

Parity 1, previous Caesarean, singleton, cephalic, term										
	IMW n=215		Pvt Obstetrician n=255		GP n=7		NW n=203		Total n=682	
	n	%	n	%	n	%	n	%	n	%
Vaginal birth	40	18.6	15	5.9	2	28.6	23	11.3	81	11.9
Operative vaginal birth	23	10.7	4	1.6	1	14.3	18	8.9	46	6.7
CS elective	111	51.6	211	82.7	3	42.9	109	53.7	434	63.6
CS emergency	41	19.1	25	9.8	1	14.3	53	26.1	121	17.7

* National Women's patients include Community, Domino, Medical and Diabetic

6.6 Instrumental vaginal birth

The rate of instrumental birth dropped in 2011 to below 12% for the first time since 1997, and has remained stable in 2012. The rate for multiparous women has fallen even further than in 2011 and is now approaching 4 %. This is paralleled by a drop in CS rate for multipara with no previous CS and spontaneous labour. Rates of instrumental vaginal birth for nullipara remain stable at around 20%.

The ventouse remains the instrument most used in the majority of these cases, irrespective of parity or maternal ethnicity. This may not reflect best practice however, given that a double instrumental or caesarean delivery is more likely after ventouse than forceps. This must be balanced against the reduced risk of perineal trauma with a successful ventouse delivery.

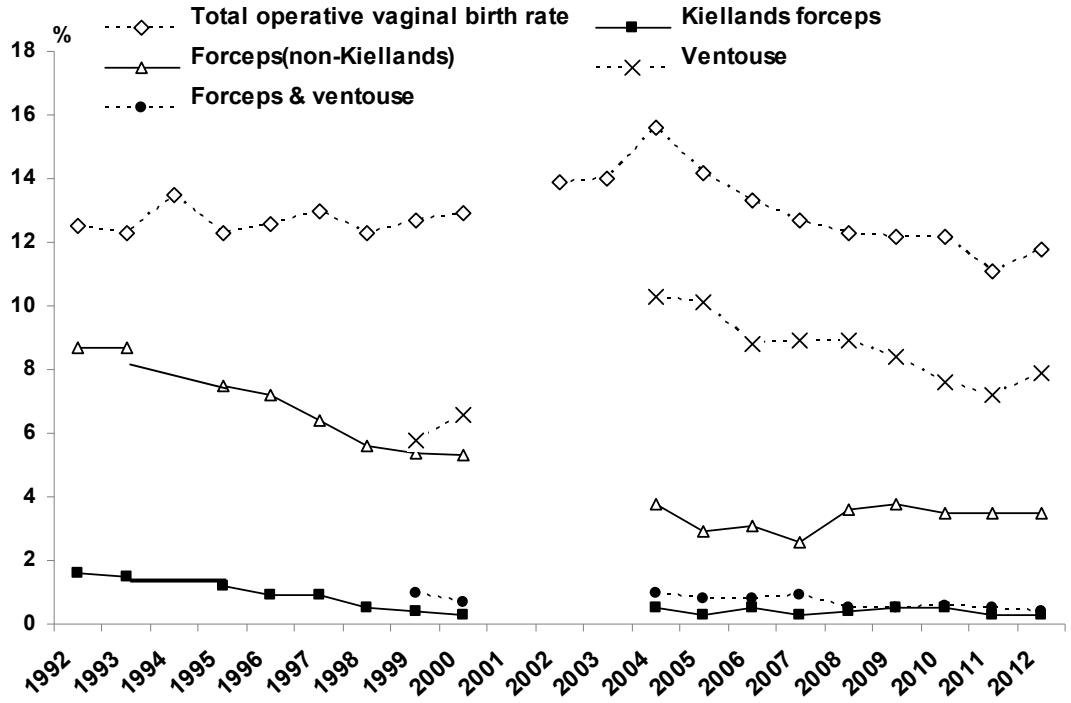

Figure 59: Operative vaginal birth NWH 1992-2012

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 forceps and ventouse, 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 2012 was 0.66% (34 mothers/5125 vaginal births) or 0.55% of mothers who attempted labour (34 mothers/6149 mothers). Forty eight mothers had an emergency Caesarean section after a prior attempt at instrumental birth (0.78% of mothers who attempted labour).

These are rare events but are associated with more severe outcomes for both mother and baby. (*references: 1. Cochrane review 2008 Trial of Instrumental Delivery in Theatre vs immediate caesarean section, by Majoko and Gardener; 2. Failed individual and sequential instrumental vaginal delivery, by Al-Kadri et al. Acta Obstet Gynecol Scand 2003*). We should

strive to understand the reasons for failed instrumental delivery in our hospital so that the risk may be reduced.

Table 47: 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 2012

	Single instrument (vaginal birth) n=873		Double instrument (vaginal birth) n=34		Emergency Caesarean with prior instrumental attempt n=48		Emergency Caesarean in labour without prior instrumental n= 975	
	n	%	n	%	n	%	n	%
Episiotomy	544	62.3	31	91.2	2	4.2	1	0.1
Third or fourth degree tear	58	6.6	5	14.7	n/a	n/a	n/a	n/a
PPH>=1000mls	78	8.9	6	17.7	11	22.9	163	16.7
Transfusion	31	3.6	4	11.8	5	10.4	28	2.9

Table 48: 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 2012

	Single instrument (vaginal birth) n=877		Double instrument (vaginal birth) n=34		Emergency Caesarean with prior instrumental attempt n=48		Emergency Caesarean in labour without prior instrumental n= 1000	
	n	%	n	%	n	%	n	%
Apgar score 1min <4	13	1.5	0		2	4.3	52	5.2
Apgar score 1min <7	95	10.8	7	20.6	4	8.5	141	14.1
Apgar score 5min <5	6	0.7	0		1	2.1	9	0.9
Apgar score 5min <7	13	1.5	1	2.9	1	2.1	38	3.8
NICU admission	93	10.6	6	17.7	6	12.8	164	16.4
Neonatal Death rate (/1000 livebirths)	2	2.3	0		0		3	3.1

6.7 Breech presentation

6.7.1 Breech birth

Table 49: Mode of birth by breech presentation (singletons) NWH 2012

	N	Total breech	% Breech/total singleton birth	Breech & CS	% CS/total breech
Total singleton births	7533	356	5	318	89
20-24 weeks	61	23	38	1	4
25-31 weeks	116	26	22	23	88
32-36 weeks	425	55	13	49	89
>=37 weeks	6931	252	4	245	97

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.

Caesarean section for breech presentation contributes 12% to the total caesarean section rate.

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 2012, a total of 130 ECVs were attempted for 124 women. Most ECVs were attempted at 37-38 weeks (range 36 to 40 weeks gestation). Most ECVs were attempted by one operator.

Among 124 women, the overall ECV success rate was 33%, lower than success rates reported internationally (50-60%).

Table 50: Mode of birth following attempted ECV (n=124) NWH 2012

	Failed ECV n=83		Successful ECV n=41	
	n	%	n	%
Type of Birth				
Vaginal	7	8.4	28	68.3
SVB	7	8.4	19	46.3
Operative vaginal	0		9	22.0
CS elective	53	63.9	4	9.8
CS emergency	23	27.7	9	22.0

Descent of the breech into the pelvis is associated with unsuccessful ECV. If there was no descent, the success rate was 47.4% compared with 6.1% 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 five percent of successful ECVs remained cephalic at the time of birth, and seven women whose ECV was unsuccessful also had a cephalic presentation at birth. Sixty eight 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 300 women with a singleton term pregnancy who had either a breech presentation at birth or had had an attempted ECV, 41% had an attempted ECV. There was no statistically significant association between ECV among women with singleton breech at term (n=300) and maternal age or BMI. There was a significant difference by LMC at birth with a rate of ECV of 59% among independent midwifery clients compared to 19% of private obstetrician clients and 35% of NWH LMC clients. Only 11% (6/54) of women who had a history of prior Caesarean section and breech presentation at term were referred for ECV compared to 48% (118/246) 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.

Labour and Birth Summary / Implications

The Caesarean section rate has remained stable at 32.5%. The leading contributors to total Caesarean rate are multipara having repeat Caesarean, and nullipara having Caesarean before labour or following induction of labour. Prolonged latent phase has eclipsed all other reasons for induction of labour in 2012, and more work is required to optimise the care provided to these women.

The mode of birth in women with one previous Caesarean section continues to be predominantly by elective Caesarean (regardless of reason for first Caesarean). This is despite the fact that 78% of 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.

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.

Although not all women are equally suitable for a trial of labour, it is likely that with increased promotion of an attempt at VBAC, there would be a decrease in the overall Caesarean birth rate at National Women's. That being said, we should really be focusing on reducing the rate of primary Caesarean. There may be room to do so in the group of women having a caesarean for fetal indication by increasing the use of fetal blood sampling.

6.8 Obstetric analgesia

Methods

Data on use of analgesia and anaesthesia for birth are collected by staff in Labour and Birthing Suite. These data include method of analgesia, time and dilatation at indication for epidural. Data below exclude elective Caesarean section and emergency Caesarean before labour where appropriate.

Findings

Table 51: Analgesic use by parity and mode of onset of birth NWH 2012

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
All Women	**7695**	**4641**	**60.3**	**3454**	**44.9**	**688**	**8.9**	**83**	**1.1**	**457**	**5.9**
Mode of onset of birth											
CS elective	1276	1071	83.9	19	1.5	7	0.5	0	0.0	1	0.1
CS emergency before onset of labour	268	219	81.7	22	8.2	4	1.5	0	0.0	2	0.7
Labouring women*											
Nullipara	3242	2221	68.5	1949	60.1	440	13.6	61	1.9	333	10.3
Multipara	2909	1130	38.8	1464	50.3	237	8.1	22	0.8	121	4.2
Induced labour											
Nullipara	1383	1142	82.6	733	53.0	213	15.4	24	1.7	62	4.5
Multipara	1102	638	57.9	515	46.7	86	7.8	8	0.7	27	2.5
Spontaneous labour											
Nullipara	1859	1079	58.0	1216	65.4	227	12.2	37	2.0	271	14.6
Multipara	1807	492	27.2	949	52.5	151	8.4	14	0.8	94	5.2

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

Epidurals continue to be the most used mode of analgesia for the management of labour pain (54.6% of women in labour), with women having induced labours being the most frequent utilisers (71.6% compared with spontaneous labour 42.8%). Among labouring nulliparous women other demographic factors linked to highest use of epidurals are: private obstetrician (82.2%), European ethnicity (73.7%) and age > 30 years (72.9%).

Use of parenteral pethidine continues to decline year on year (8.9% in 2012, 13.1% in 2011, 15.5% in 2010) in keeping with international trends. This will most likely fall even further following the ratification of a proposal by the NZ Medical Council to allow other opiates to be administered by midwives.

Use of general anaesthesia for caesarean section is low overall (elective CS 1.5%, emergency CS 4.1%) and this compares very favourably to internationaly recommended levels. The number of cases commenced under regional anaesthesia requiring peri-operative conversion to general anaesthesia is also satisfactory or better than international standards(1.1-1.2% depending on urgency of surgery).

Table 52: GA use and mode of birth NWH 2012

	Total	GA* only		GA* + epidural		Total GA*	
	N	n	%	n	%	n	%
Total	7695	115	1.5	39	0.5	154	2.0
SVB	4218	40	0.9	4	0.1	44	1.0
Operative vaginal	907	3	0.3	5	0.6	8	0.9
CS elective	1276	19	1.5	14	1.1	33	2.6
CS emergency	1294	53	4.1	16	1.2	69	5.3

*General anaesthesia administered to women who had vaginal births were given postpartum for management of retained placenta, postpartum haemorrhage or for women whose epidural pain relief was inadequate for an operative vaginal birth.

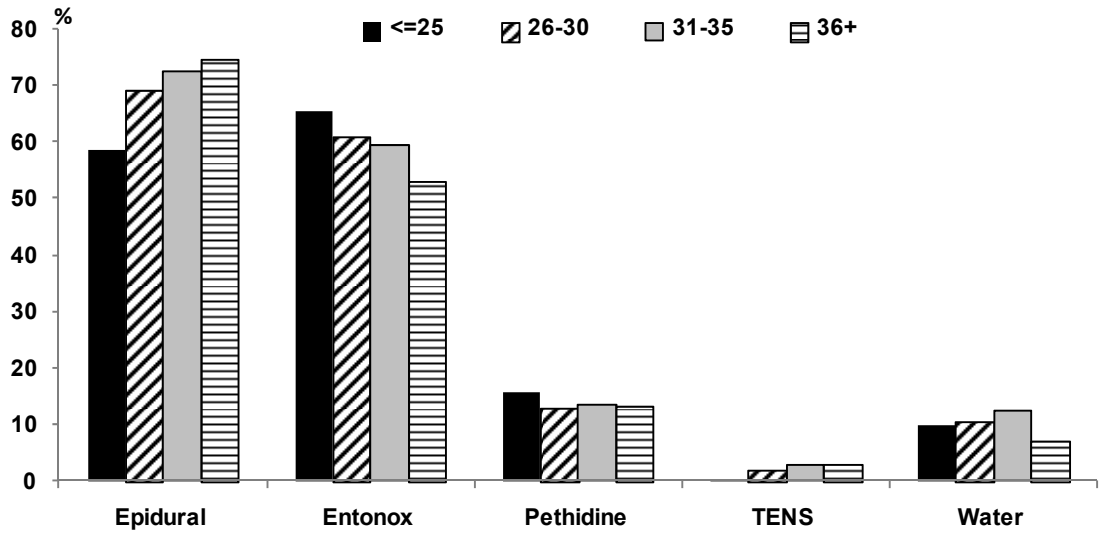

Figure 60: Analgesic use and maternal age among labouring nulliparous women NWH 2012

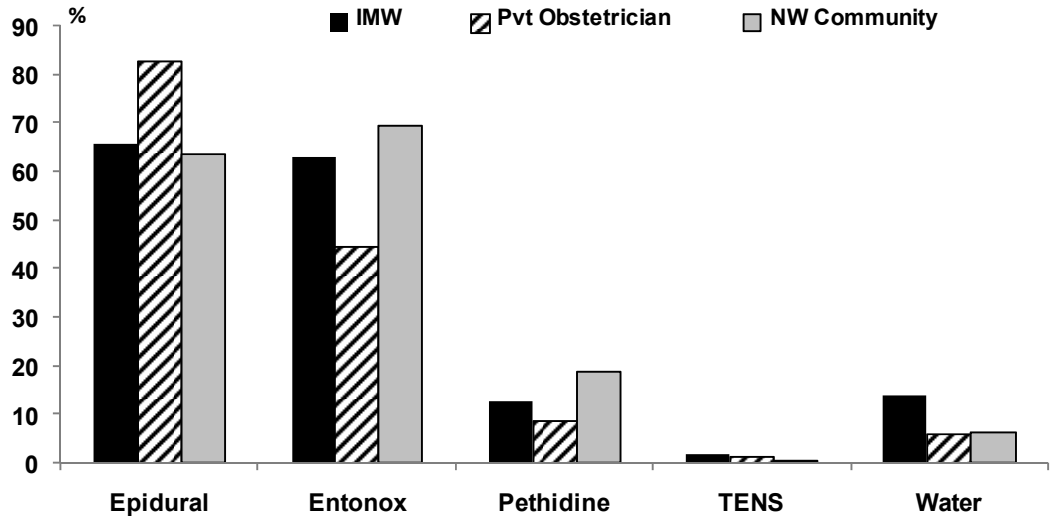

Figure 61: Analgesic use and LMC at birth among labouring nulliparous women NWH 2012

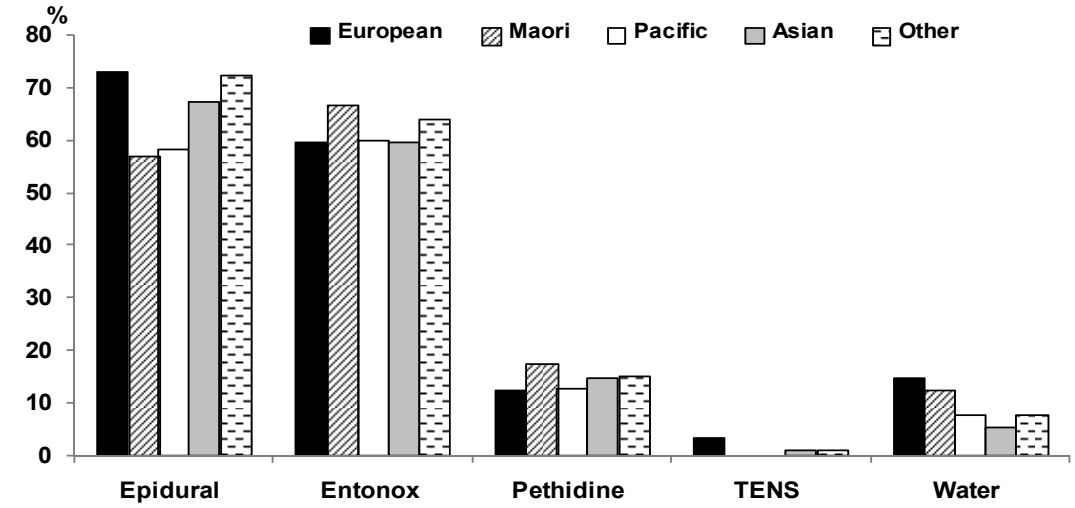

Figure 62: Analgesic use and ethnicity among labouring nulliparous women NWH 2012

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 labour and birth care and postnatal care for primary women and their families/whanau. Birthcare is a midwifery lead facility, supporting LMCs to provide labour and birth care. Birthcare provides postnatal care for the women that birth at Auckland City Hospital. Birthcare also provides free childbirth education classes, lactation consultant services, Paediatric services, physiotherapist services and classes.

Methods

The data for mothers birthing at Birthcare (n=398) during 2012 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

Five hundred and twenty seven women started labour at Birthcare. One hundred and twenty nine women transferred in labour, one hundred and twenty seven to NW and two women to other DHBs.

Of these transfers, one hundred and ten were nullipara and seventeen were multipara. Among women birthing at Birthcare, 61% had a physiological 3rd stage. Birthcare had an 86% exclusive breastfeeding rate on discharge. Women transferred to NW intrapartum had a similarly high rate of breastfeeding at discharge of 90%.

There were 448 births at Birthcare in 2009, 417 in 2010, and 451 in 2011.

Table 53: Demographic characteristics of women labouring at Birthcare by place of birth 2012

	Birth at Birthcare n=398		Intrapartum transfer to NW n=127		Total N=525	
	n	%	n	%	n	%
Parity						
Nullipara	161	40.5	110	86.6	271	51.6
Multipara	237	59.5	17	13.4	254	48.3
Age						
<21	10	2.5	4	3.2	14	2.7
21-25	45	11.3	9	7.1	54	10.3
26-30	121	30.4	48	37.8	169	32.2
31-35	144	36.2	52	40.9	196	37.3
36-40	75	18.8	13	10.2	88	16.8
>40	3	0.8	1	0.8	4	0.8
Ethnicity						
NZ European	166	41.7	49	38.6	215	41.0
Māori	48	12.1	6	4.7	54	10.3
Pacific	50	12.6	7	5.5	57	10.9
Other Asian	38	9.5	20	15.8	58	11.0
Indian	6	1.5	7	5.5	13	2.5
Other European	76	19.1	35	27.6	111	21.1
Other	14	3.5	3	2.4	17	3.2
DHB of Domicile						
Auckland DHB	262	65.8	93	73.2	355	67.6
Counties Manukau DHB	46	11.6	18	14.2	64	12.2
Waitemata DHB	89	22.4	14	11.0	104	19.8
Other	1		2	1.6	2	0.4

Table 54: Interventions and outcomes among women who commenced labour at Birthcare 2012 (includes 127 intra partum transfers to NW)

	Birth at Birthcare n=398		Intrapartum transfer to NW n=127		Total N=525	
	n	%	n	%	n	%
Intrapartum transfer to NW					127	24.2
Mode of birth						
Normal vaginal	398	100	55	43.3	453	86.3
Operative vaginal			40	31.5	40	7.6
Emergency caesarean			32	25.2	32	6.1
Perineal trauma						
Episiotomy	21	5.3	45	35.4	66	12.6
Third/fourth degree tear	9	2.3	5	3.9	14	2.7
Vaginal wall tear	2	0.5	3	3.2	5	1.0
2nd degree tear	101	25.4	15	15.8	116	22.1
1st degree tear	99	24.9	14	14.7	113	21.5
Graze	23	5.8	8	4.2	31	5.9
Labial tear	2	0.5	0		2	0.4
Intact	140	35.2	8	8.4	148	28.2
Blood loss						
≥500 mls	7	1.8	52	40.9	59	11.2
Perinatal outcomes						
Still birth (/1000)	0		1	7.9	1	1.9
Exclusive breastfeeding rate	342	85.9	114	89.8	456	86.9

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

Table 55: Episiotomy rates NWH 1997-2012 (Denominator is vaginal births)

	1997 n= 6253	1998 n= 5676	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
Number of episiotomies	1252	1195	1251	1367	1181	1093	1103	1130	1069	1184	1252	1153	1170
Incidence %	20.0	21.1	22.1	23.8	22.3	22.2	22.9	21.5	20.5	22.3	24.0	22.7	22.8
Episiotomy with 3rd/4th degree tear	8	9	5	17	15	23	47	49	46	56	49	46	60
Incidence %	0.1	0.2	0.1	0.3	0.3	0.5	1.0	0.9	0.9	1.0	0.9	0.9	1.2
All 3rd/4th degree tears	41	35	29	47	72	97	103	161	160	116	120	114	158
Incidence %	0.7	0.6	0.5	0.8	1.4	2.0	2.1	3.1	3.1	2.2	2.3	2.2	3.1

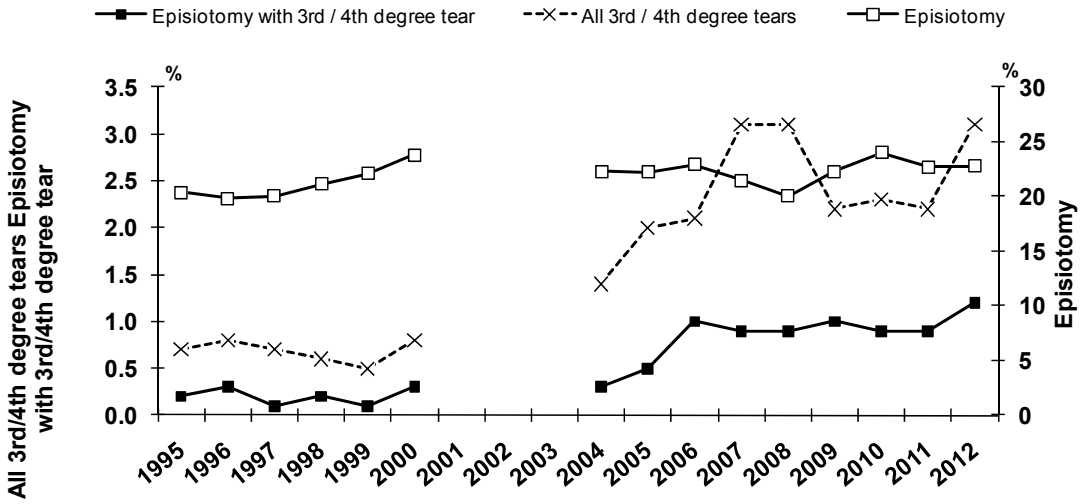

Figure 63: Perineal trauma rates NWH 1995-2012

Table 56: Perineal trauma by mode of birth, parity and LMC at birth among all vaginal births NWH 2012

	Total	Episiotomy		3rd/4th tear		Vaginal wall tear	
	N	n	%	n	%	n	%
Total vaginal births	5125	1170	22.8	158	3.1	387	7.6
Mode of birth							
Normal vaginal	4173	589	14.1	95	2.3	303	7.3
Vaginal breech	45	6	13.3	0		0	
Ventouse	608	326	53.6	33	5.4	55	9.0
Forceps	299	249	83.3	30	10.0	29	9.7
Parity							
Nulliparous	2490	897	36.0	126	5.1	288	11.6
Multiparous	2635	273	10.4	32	1.2	99	3.8
LMC at birth							
Independent Midwife	2814	664	23.6	112	4.0	219	7.8
Private Obstetrician	845	302	35.7	7	0.8	34	4.0
General Practitioner	37	11	29.7	2	5.4	7	18.9
NW Community	992	142	14.3	28	2.8	98	9.9
NW Diabetes	167	21	12.6	3	1.8	12	7.2
NW Medical	204	24	11.8	5	2.5	15	7.4
Other DHB	18	3	16.7	1	5.6	1	5.6
Unbooked	48	3	6.3	0	0	1	2.1
Ethnicity							
New Zealand European	1639	437	26.7	40	2.4	108	6.6
Māori	385	27	7.0	5	1.3	25	6.5
Pacific	787	56	7.1	11	1.4	78	9.9
Asian	1255	372	29.6	61	4.9	96	7.6
Indian	338	92	27.2	28	8.3	24	7.1
Other European	538	144	26.8	10	1.9	42	7.8
Other	183	42	23.0	3	1.6	14	7.7

In the early 2000s there was a dramatic rise in third and fourth degree tear rates and since then they've stabilised at 2-3%. This could be due to any of many factors. There will be an apparent increased rate of third degree tears with increased awareness and better diagnosis. "Hands off policy" and lack of support of the perineum and an inadequate episiotomy will actually increase a patient's risk of suffering an anal sphincter injury. At the end of 2012 there was an education campaign in DU to help increase awareness of third degree tear with the aim of increasing diagnosis and reducing the incidence. The main areas of potential improvement was encouraging midwives and doctors to support the perineum at the time of birth of the head and if an episiotomy is cut to ensure it is both medio-lateral and of an adequate depth. With continuing education it will be interesting to see if the incidence, whether actual or perceived changes at all. Episiotomy and instrumental delivery rates have remained stable for the last few years.

The Perineal Tear Clinic has continued to run, on alternate Fridays, from Greenlane Clinical Centre. Besides the Physiotherapist and Consultant there is now also a registrar attached to the clinic. There was no audit performed for 2012 however there is a sense in the clinic that the standard of repairs has improved. This is perhaps due to the increased numbers of doctors attending perineal tear repair workshops. The clinic is still dominated by the presence of Indian and Asian women. Doctors still need to be aware of the increased risk of anal sphincter injuries in these women and perhaps have a higher threshold for doing a forceps delivery and discuss the options of caesarean versus instrumental delivery with them.

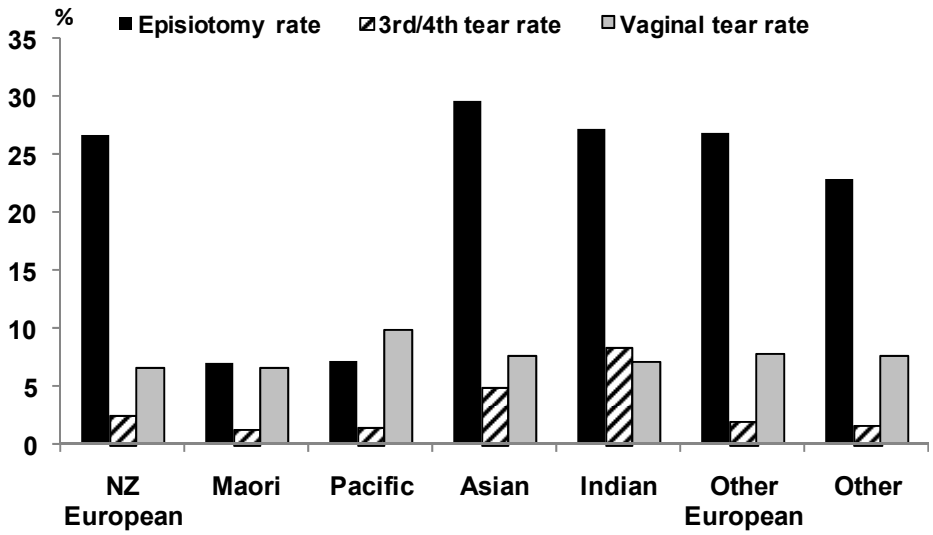

Figure 64: Perineal trauma rates among vaginal births by ethnicity NWH 2012

7.2 Third stage management

Methods:

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 57: Third stage management among vaginal births NWH 2012

	Physiological n=394		Active syntocinon n=2653		Active syntometrine n=1952		Other n=7		Unknown n=119	
	n	%	n	%	n	%	n	%	n	%
Primary PPH (≥500mls)	45	11.4	525	19.8	376	19.3	0		24	20.2
Primary PPH (≥1000mls)	17	4.3	195	7.4	129	6.6	0		11	9.2
Postpartum blood transfusion	6	1.5	61	2.3	48	2.5	0		5	4.2

In 2012 the management of the third stage of labour has changed insignificantly from 2011. Physiological management of the third stage remains unchanged. There has been a very slight increase in the use of syntometrine as the first line ecbolic with an equal increase of blood loss over 1000mls.

2012 saw the introduction of all blood loss being weighed rather than the use of practitioner estimation which is well known to be inaccurate. It has not changed the overall rate of PPH. It may have resulted in a slight increase in the volume of loss in the different categories

Post-partum transfusion rate remains unchanged.

The primary postpartum haemorrhage (PPH) and blood transfusion rates were higher among the actively managed than among physiologically managed mothers. Randomised controlled trials have shown a halving of the postpartum haemorrhage rate with active management. The higher rates of primary PPH and transfusion among actively managed women are most likely due to caregivers appropriately choosing active management according to patient and clinician identified risk.

At NW, physiological management of third stage is supported in low risk women, and with informed consent.

7.3 Postpartum haemorrhage

Methods

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 PPH rate in those years. In 2008 and 2009, the data have been cleaned extensively. This cleaning has included a comparison of blood loss 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

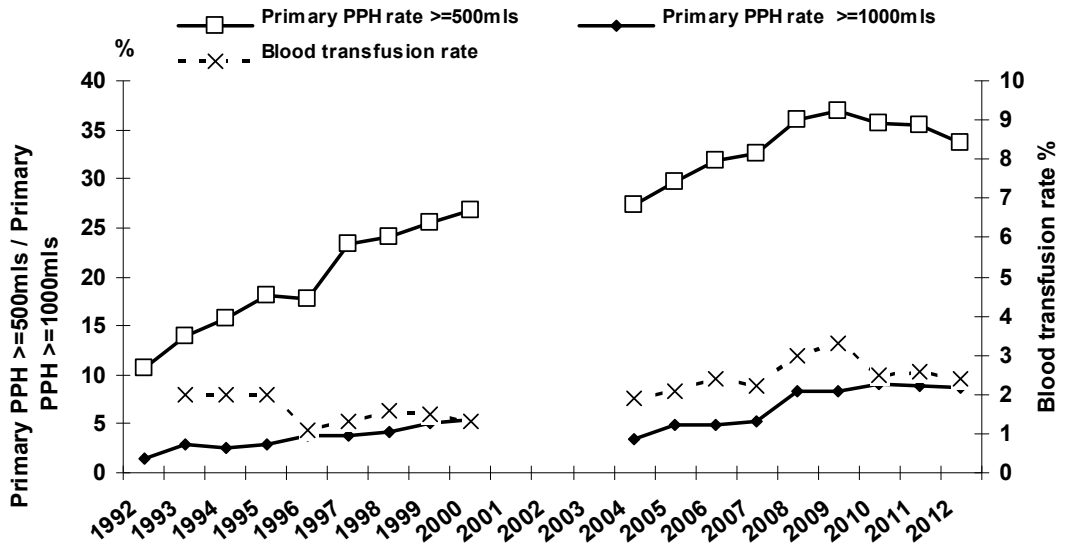

Figure 65: Postpartum haemorrhage and transfusion rates NWH 1992-2012

Table 58: Postpartum haemorrhage rate NWH 1997-2012

	1997	1998	1999	2000	2004	2005*	2006*	2007*	2008	2009	2010	2011	2012
Total Births	8055	7531	7501	7827	7491	7194	7212	7695	7589	7735	7709	7523	7695
Primary PPH (≥500mls)	1882	1818	1921	2088	2056	2139	2302	2507	2736	2850	2753	2674	2587
Incidence %	23.4	24.1	25.6	26.7	27.4	29.7	31.9	32.6	36.1	36.9	35.7	35.5	33.6
Primary PPH (≥1000mls)	303	318	381	423	262	350	351	410	634	651	695	659	662
Incidence %	3.8	4.2	5.1	5.4	3.5	4.9	4.9	5.3	8.4	8.4	9.0	8.8	8.6

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

Table 59: Postpartum blood loss by mode of birth NWH 2012

	Spontaneous vaginal birth n=4218		Operative vaginal birth n=907		CS emergency n=1292		CS elective n=1278		Total N=7695	
	n	%	n	%	n	%	n	%	n	%
PPH>=500mls	693	16.4	277	30.5	927	71.7	690	54.0	2587	33.6
PPH>=1000mls	268	6.4	84	9.3	198	15.3	112	8.8	662	8.6
PPH>=1500mls	122	2.9	37	4.1	58	4.5	39	3.1	256	3.3
Post partum transfusion	85	2.0	35	3.9	42	3.3	20	1.6	182	2.4

Table 60: Postpartum blood loss by onset of birth NWH 2012

	Spontaneous labour n=3666		Induced labour n=2483		CS emergency before onset of labour n=268		CS elective n=1278		Total N=7695	
	n	%	n	%	n	%	n	%	n	%
PPH >=500mls	915	25.0	815	32.8	167	62.3	690	54.0	2587	33.6
PPH>=1000mls	283	7.7	243	9.8	24	9.0	112	8.8	662	8.6
PPH>=1500mls	120	3.3	89	3.6	8	3.0	39	3.1	256	3.3
Post partum transfusion	89	2.4	62	2.5	11	4.1	20	1.6	182	2.4

With an overall vaginal PPH rate of 24% 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 affect some change.

Table 61: Blood transfusion NWH 1998-2012

	1998	1999	2000	2004	2005	2006	2007	2008	2009	2011	2012
Antenatal	4	4	0	10	12	11	6	6	18	13	5
Antenatal & Iintrapartum	0		0	1	0	0	1	0	0	0	1
Antenatal & postpartum			1	0	3	0	0	2	2	0	1
Intrapartum	3	3	4	2	2	6	1	4	3	3	1
Intrapartum & postpartum	6	3	4	4	3	3	4	1	2	1	1
Postpartum	110	100	96	128	133	150	165	212	228	193	180
Total transfusions	123	110	105	145	153	170	177	225	253	210	189
Total transfusion rate	1.6	1.5	1.3	1.9	2.1	2.4	2.3	3.0	3.3	2.8	2.5

7.4 Neonatal outcomes by mode of birth

Methods

The following tables include all babies live born at NW.

Table 62: Neonatal morbidity among live births by mode of birth (all gestations) NW 2012

	Spontaneous vertex n=4167		Vaginal breech n=32		Forceps birth n=301		Ventouse birth n=608		CS elective n=1348		CS emergency n=1330		Total N=7786	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	49	1.2	10	31.3	4	1.3	9	1.5	21	1.6	70	5.3	163	2.1
1 min Apgar <7	217	5.2	19	59.4	36	12.0	66	10.9	90	6.7	217	16.3	645	8.3
5 min Apgar <7	50	1.2	11	34.4	3	1.0	11	1.8	18	1.3	57	4.3	150	1.9
Admitted to NICU	294	7.1	15	46.9	37	12.3	62	10.2	184	13.6	303	22.8	895	11.5
≥2 days in NICU	270	6.5	14	43.8	33	11.0	55	9.0	167	12.4	285	21.4	824	10.6
Neonatal deaths (/1000 live births)	23	5.5	11	343.8	1	3.3	1	1.6	4	3.0	6	4.5	46	5.9

Table 63: Neonatal morbidity among live births by mode of onset of birth (all gestations) NWH 2012

	Spontaneous labour n=3688		Induced labour n=2469		CS elective n=1348		CS emergency before onset of labour n=281		Total N=7786	
	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	80	2.2	46	1.9	21	1.6	16	5.7	163	2.1
1 min Apgar <7	295	8.0	188	7.6	90	6.7	72	25.6	645	8.3
5 min Apgar <7	80	2.2	34	1.4	18	1.3	18	6.4	150	1.9
Admitted to NICU	335	9.1	243	9.8	184	13.6	133	47.3	895	11.5
≥2 days in NICU	314	8.5	214	8.7	167	12.4	129	45.9	824	10.6
Neonatal deaths (/1000 live births)	24	6.5	15	6.1	4	3.0	3	10.7	46	5.9

Table 64: Neonatal morbidity by mode of birth in live born term or post term (≥ 37 weeks) babies NWH 2012

	Spontaneous vertex n=3895		Vaginal breech n=11		Forceps birth n=278		Ventouse birth n=587		CS elective n=1184		CS emergency n=1075		Total N=7030	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	26	0.7	2	18.2	3	1.1	7	1.2	11	0.9	43	4.0	92	1.3
1 min Apgar <7	151	3.9	5	45.5	30	10.8	61	10.4	52	4.4	121	11.3	420	6.0
5 min Apgar <7	24	0.6	2	18.2	2	0.7	11	1.9	6	0.5	28	2.6	73	1.0
Admitted to NICU	153	3.9	3	27.3	21	7.6	52	8.9	75	6.3	110	10.2	414	5.9
≥2 days in NICU	134	3.4	2	18.2	17	6.1	45	7.7	63	5.3	97	9.0	358	5.1
Neonatal deaths (/1000 live births)	5	1.3	0	0.0	0	0.0	1	1.7	1	0.8	3	2.8	10	1.4

Table 65: Neonatal morbidity in term or post term live born (≥ 37 weeks) babies NWH 2004-2012

	2004 N=6793		2005 N=6578		2006 N=6543		2007 N=6971		2008 N=6910		2009 N=7128		2010 N=7065		2011 N=6889		2012 N=7030	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min apgar <4	68	1.0	69	1.0	66	1.1	106	1.5	73	1.1	46	0.7	78	1.1	97	1.4	92	1.3
1 min apgar <7	507	7.5	454	6.9	468	7.2	553	8.0	454	6.5	454	6.6	518	7.3	496	7.2	420	6.0
Admitted to NICU	349	5.1	346	5.3	283	4.3	405	5.9	322	4.6	314	4.5	364	5.1	417	6.1	414	5.9
≥2 days in NICU	254	3.7	275	4.2	226	3.5	*		271	3.9	241	3.5	299	4.2	349	5.1	358	5.1

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

Methods

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 post natal 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 home care 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

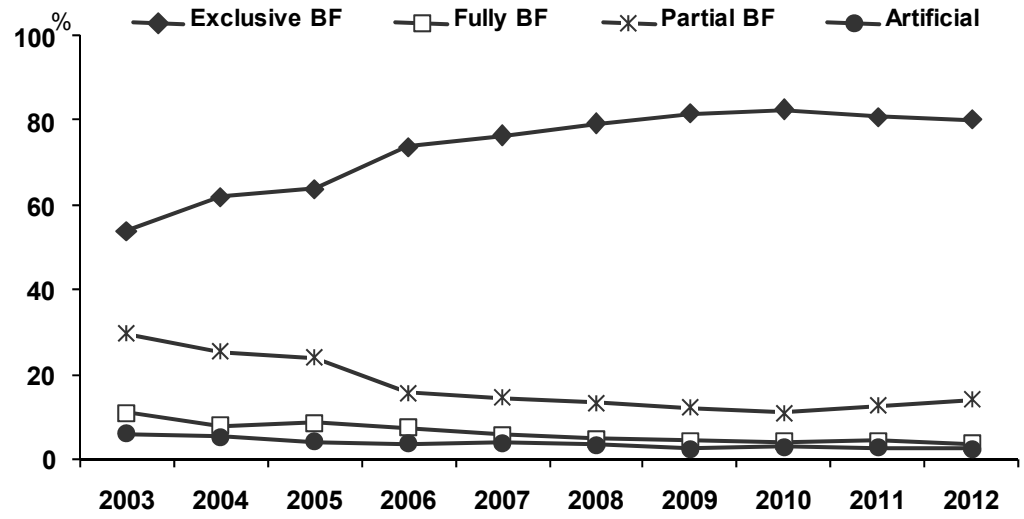

Figure 66: Method of infant feeding at discharge from NWH 2003-2012

In 2012, the exclusive breastfeeding rate on discharge from hospital following birth was 80%, exceeding the NZ Breastfeeding Authority (NZBFA) target of 75%. This rate has not increased from 2011, and 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 postnatal women (as wide reaching as ancillary staff) by a variety of modalities including e-learning, audit projects, skilled midwives, with several undertaking additional LC qualifications, and adherence to the WHO "Ten Steps to Successful Breastfeeding".

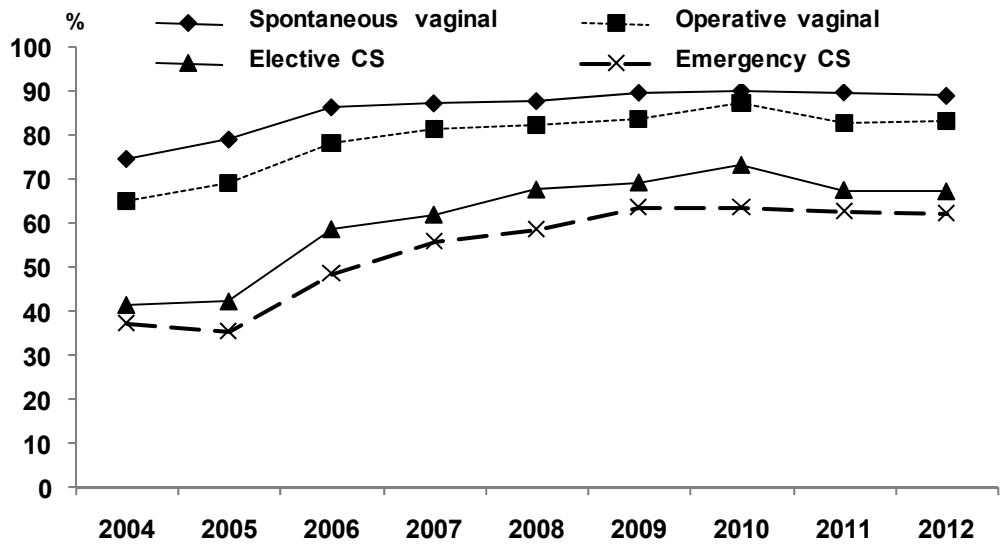

Figure 67: Exclusive breastfeeding at discharge from NWH by mode of birth 2004-2012

There is a need to remain vigilant in the appropriate use of supplements during the post-operative recovery period.

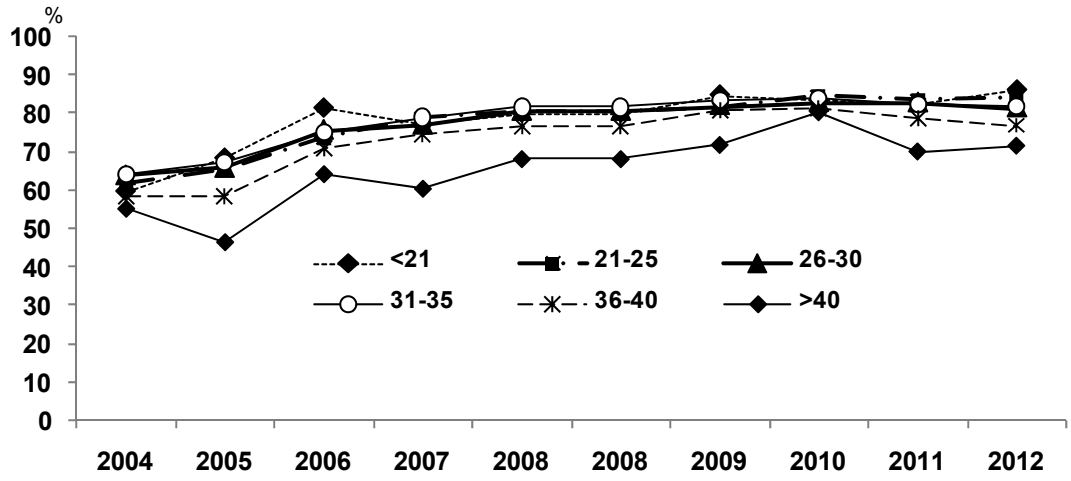

Figure 68: Exclusive breastfeeding rates at discharge from NWH by maternal age 2004-2012

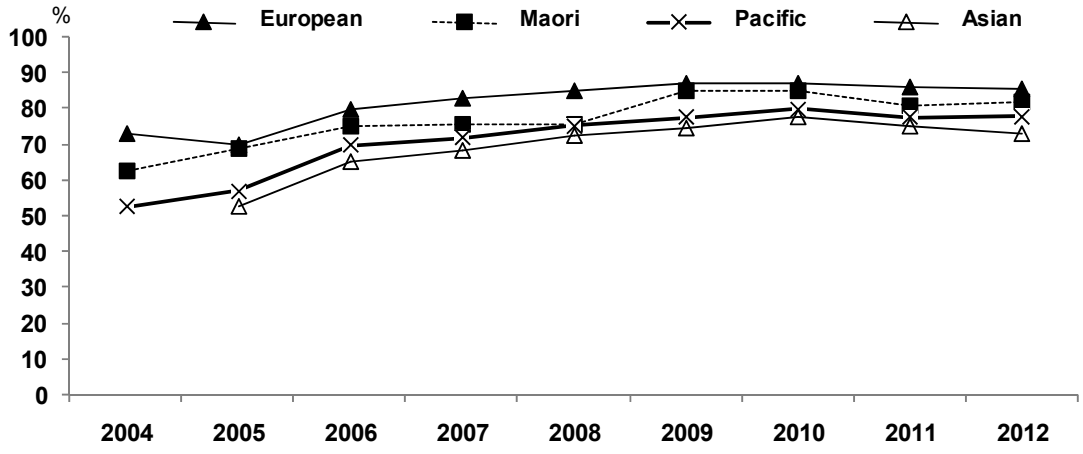

Figure 69: Exclusive breastfeeding rates at discharge from NWH by ethnicity 2004-2012

The rates for European and Māori mothers remain stable at over 80%, rates for Pacific mothers are unchanged at 77% and those for Asian mothers have dropped slightly from 75% to 73%.

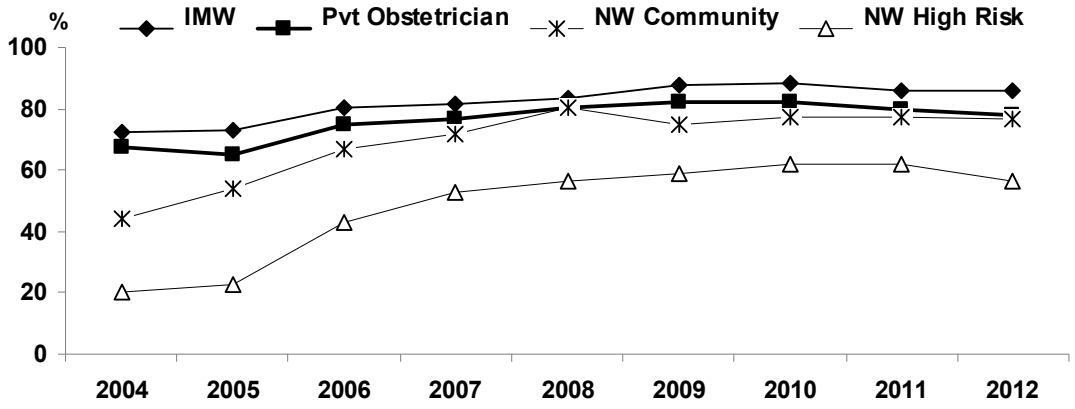

Figure 70: Exclusive breastfeeding rate at discharge from NWH by LMC at birth 2004-2012

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

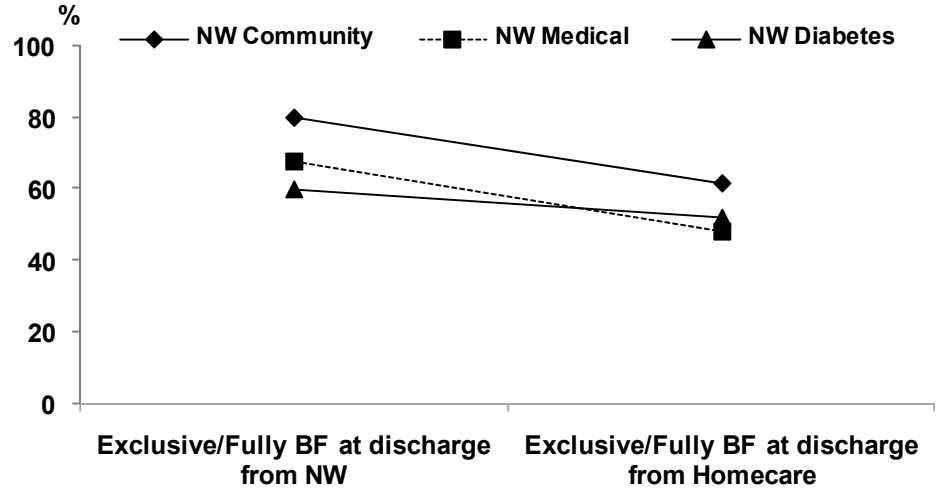

Figure 71: Change in combined exclusive and fully breastfeeding rate from hospital discharge to Homecare by NWH LMC (4-6 weeks) (n=1119) 2012

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 only includes those women cared for by NW midwives and with data at both time points. These are the only breastfeeding data available to us after discharge from hospital. The exclusive/fully breastfeeding rates have decreased among both NW medical and diabetes women from 2011. The overall rate of exclusive breastfeeding at discharge from Homecare was 52%, showing a reduction from the 2011 rate of 58%.

Summary

National Women's is proud to continue achieving the Baby Friendly Hospital Initiative standards. This is due to the ongoing commitment of lactation consultants, midwives and all members of the health care team.

The 2012 rates are stable, but to maintain this achievement 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 80% 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

Methods

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 66: Maternal destination immediately after birth NWH 2006-2012

	2006 N = 7212		2007 N = 7695		2008 N = 7589		2009 N = 7735		2010 N = 7709		2011 N =7523		2012 N=7695	
	N	%	n	%	n	%	n	%	n	%	n	%	n	%
NW Wards	4384	60.8	4590	59.6	4493	59.2	4557	58.9	4661	60.5	4730	62.9	4797	62.3
Birthcare	2322	32.2	2493	32.4	2551	33.6	2637	34.1	2543	33.0	2357	31.3	2469	32.1
Home	483	6.7	587	7.6	526	6.9	517	6.7	481	6.2	414	5.5	407	5.5
Other Units	23	0.3	25	0.3	19	0.3	24	0.3	24	0.3	22	0.3	22	0.3

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

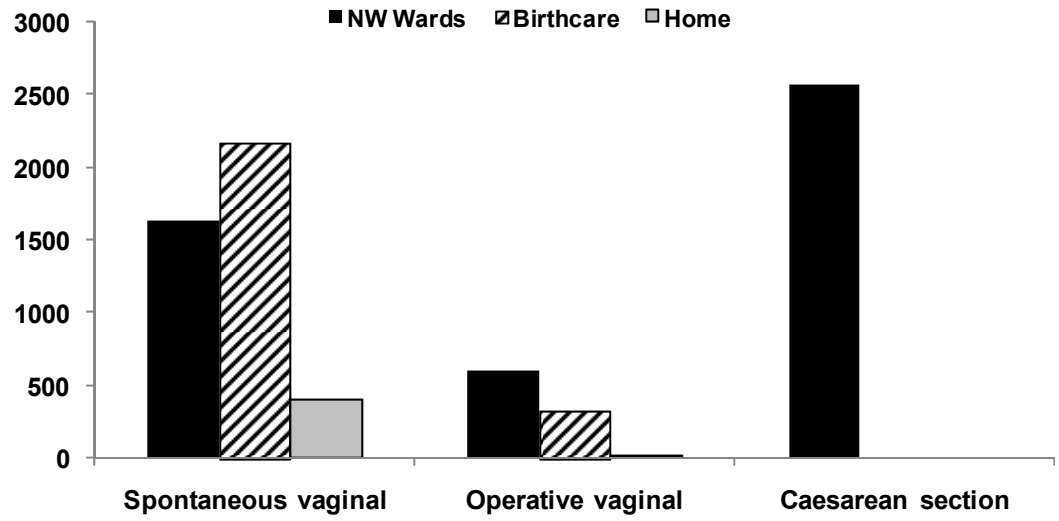

Figure 72: Maternal destination immediately after birth by mode of birth NWH 2012

As expected, mothers are admitted initially to the NW wards after Caesarean section. As in 2012, fifty-one percent of women having a spontaneous vaginal birth are admitted directly to Birthcare Auckland following birth. This figure is a reminder of the high acuity on the postnatal wards at NW.

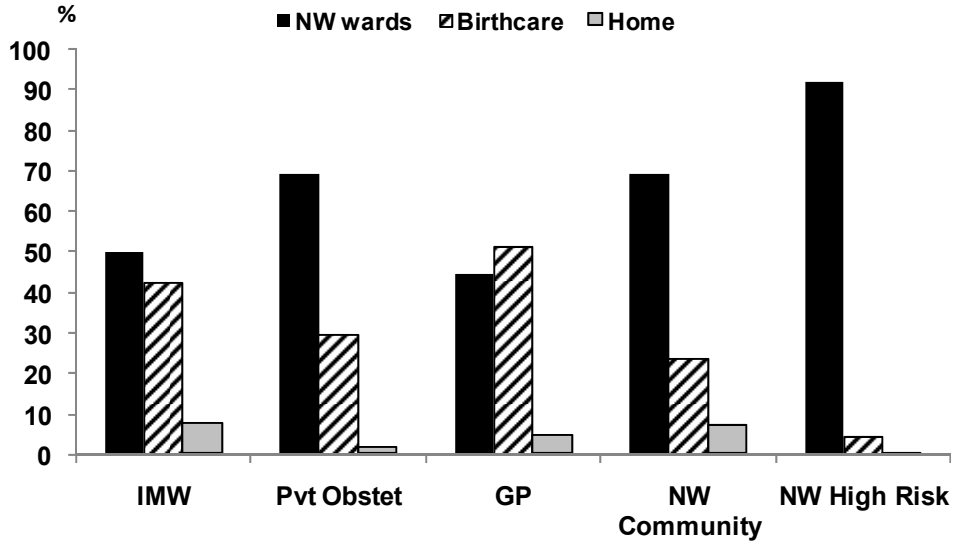

Figure 73: Postnatal destination immediately after birth by LMC at birth NWH 2012

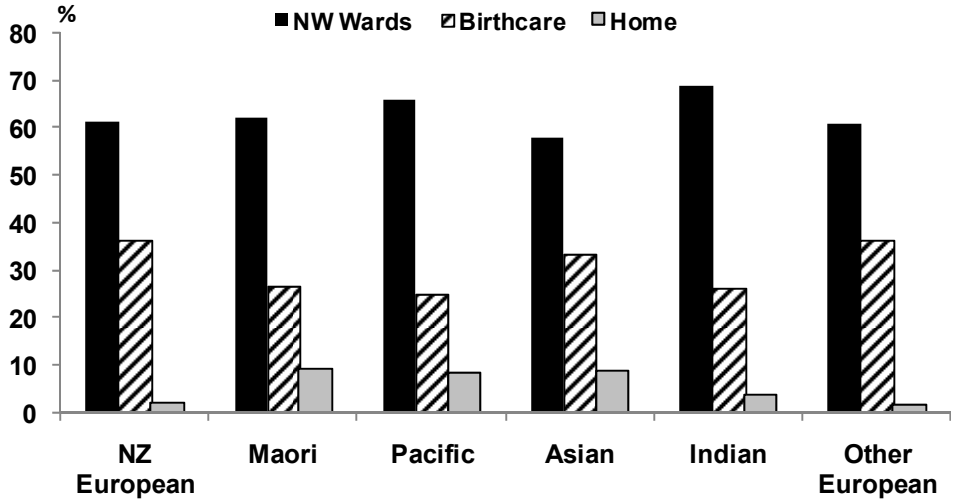

Figure 74: Postnatal destination immediately after birth by ethnicity NWH 2012

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 67: Reason for admission to NWH postnatal wards among women having a spontaneous vaginal birth 2012

	N=1632	
	n	%
Neonatal reason*	668	40.9
Postpartum haemorrhage	270	16.5
Diabetes	171	10.5
Hypertensive disorder	30	1.8
Perineal trauma	84	5.1
Retained placenta/products	65	4.0
Fainting /dizziness	13	0.8
Other listed reasons†	331	20.3

*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 68: Discharge destination by mode of birth among initial admissions to NW wards

	N=4847	
	n	%
Caesarean section birth - discharged to home	2199	45.4
Caesarean section birth - transferred to Birthcare	275	5.7
Caesarean section birth - transferred to other destinations	100	2.1
Operative vaginal birth - discharged to home	324	6.7
Operative vaginal birth - transferred to Birthcare	260	5.4
Operative vaginal birth - transferred to other destinations	23	0.5
Spontaneous vaginal birth - discharged to home	1178	24.3
Spontaneous vaginal birth - transferred to Birthcare	396	8.2
Spontaneous vaginal birth - transferred to other destinations	92	1.9

*2 women with unknown destination have been excluded

In the table above “other destinations” includes units within ADHB, such as Starship Hospital where an infant might require further treatment, as well as other external facilities. As expected, more complicated births are associated with longer hospital stays.

8.2.1 Postnatal readmissions

Any visit of less than 3 hours duration was considered a postnatal assessment and is not included in this section.

Table 69: Reasons for readmission NWH 2012

	N=412	
	n	%
Neonatal Admission*	66	16.0
Infection†	40	9.7
Breast‡	79	19.2
Postpartum Haemorrhage	29	7.0
Hypertensive disorder	17	4.1
Retained Products	22	5.3
Wound breakdown§	13	3.2
Epidural Complications	3	0.7
Other¶	143	34.7

* includes babies requiring admission to NICU and babies admitted to the wards for phototherapy or feeding problems
† includes infected Caesarean section wound, urinary tract infection and other conditions where infection is suspected/diagnosed eg endometritis
‡ includes mastitis, breast abscess or other conditions of the breast requiring hospital admission
§ breakdown of Caesarean section or perineal wound requiring further medical intervention
¶ other reasons for readmission include abdominal pain, anaemia, psychiatric reasons, deep vein thrombosis, other maternal conditions e.g. cardiac complications, asthma.

In 2012, 412 (4.7%) women of the 7695 women who gave birth at National Women's had postnatal readmissions, either after their initial postnatal stay or after being discharged to home or other postnatal facilities. Of the 412 readmissions: 317 women had one readmission, 32 women had two readmissions, 9 women had 3 readmissions and 1 woman had 4 readmissions.

The most frequent indications for readmission in 2012 were breast problems, followed by neonatal admissions.

8.2.2 Admissions to postnatal wards of women who birthed elsewhere

There were 111 admissions in 2012 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 2012

	Total		Birthcare		Home		CMDHB*		North shore		Waitakere		Other	
	N=111		n=30		n=6		n=17		n=15		n=18		n=25	
	N	%	n	%	n	%	n	%	n	%	n	%	n	%
Neonatal admission	69	62	8	27	2	33	14	82	14	93	12	67	19	76
Infection	5	5	1	3	1	17	0		0		2	11	1	4
Breast	5	5	0	0	1	17	1	6	0		3	17	0	
PPH	11	10	7	23	1	17	1	6	0		0		2	8
Obstetric trauma	5	5	4	13	1	17	0		0		0		0	
Retained placenta/products	5	5	3	10	0		0		0		1	6	1	4
Other	11	10	7	23	0		1	6	1	7	0		2	8

* 15 Middlemore, 1 Pukekohe, 1 Papakura

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.

Admissions and all other data in this chapter except occupancy relate to babies born in the 2012 calendar year. Occupancy data relate to the unit occupancy for each day in 2012.

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 2012 and admitted to the ACH NICU, (2) inborn (ACH) babies and (3) babies born in 2012 assigned to ACH by the Australia New Zealand Neonatal Network (ANZNN).

9.1.1 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 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 NW NICU by ANZNN status 2012

	<32 weeks or <1500g					
	Total N=188		ANZNN n=178		Non ANZNN n=10	
Gestation (weeks)	**n**	**%**	**n**	**%**	**n**	**%**
24-25	25	13.3	23	12.9	2	0.2
26-27	27	14.4	24	13.5	3	0.3
28-29	56	29.8	54	30.3	2	0.2
30-31	61	32.4	60	33.7	1	0.1
32-36	18	9.6	16	9.0	2	0.2
>36	1	0.5	1	0.6	0	
Weight (g)						
<500	2	1.1	1	0.6	1	0.1
500-749	18	9.6	14	7.9	4	0.4
750-999	30	16.0	29	16.3	1	0.1
1000-1249	42	22.3	40	22.5	2	0.2
1250-1499	56	29.8	55	30.9	1	0.1
1500-1999	39	20.7	38	21.3	1	0.1
2000-2499	1	0.5	1	0.6	0	
Birthplace						
BBA	7	3.7	7	3.9	0	
National Women's	153	81.4	153	86.0	0	
Northland	6	3.2	6	3.4	0	
Waitemata DHB	8	4.3	8	4.5	0	
Counties Manukau DHB	6	3.2	0		6	0.6
Other	8	4.3	4	2.2	4	0.4

9.1 Inborn live birth at National Women's 1959-2012

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.

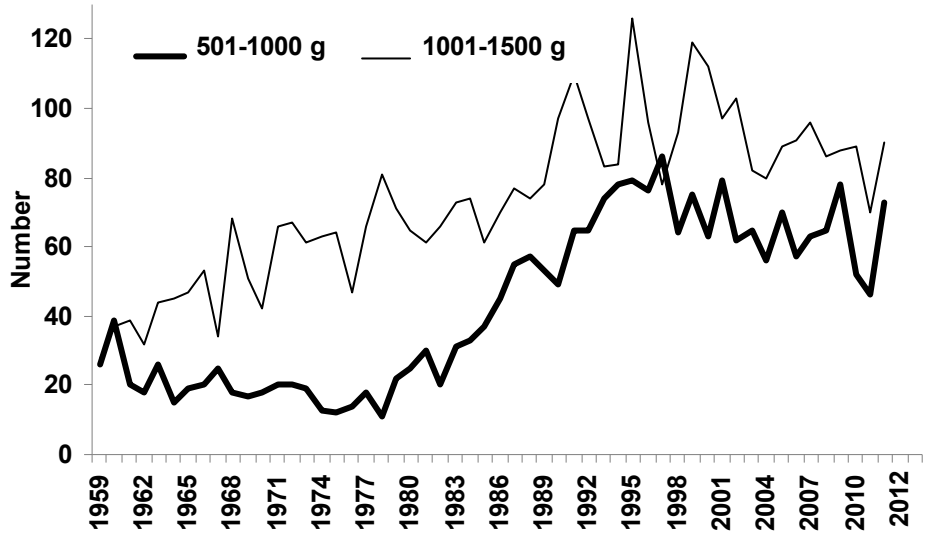

Figure 75: Number of inborn live births ≤1500g NWH 1959-2012 (excludes BBAs).

9.2 NICU occupancy

The 2012 occupancy of 14461 bed days is equivalent to a mean of 39.6 babies per day, which is consistent with the high occupancy seen since 2007. Trends for the occupancy by gestational age groups and birth weight are given in the figures below. Although the number of births increases with an increasing gestational age the duration of stay decreases, as the infants require less time to achieve maturity. Immature babies have a more complex course and with the two Waitemata units caring for their level 2 babies the overall acuity of the ACH unit has risen for a given occupancy.

Table 72: Occupancy (baby days) on NICU 2000– 2012

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Baby days	20652	20108	20551	19249	14958	14541	14212	15228	15296	15236	14982	15122	14461

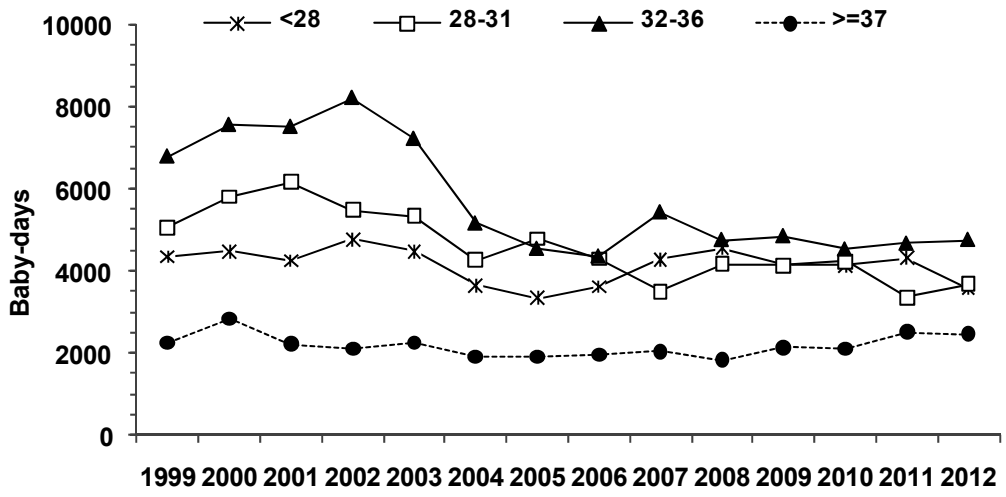

Figure 76: Occupancy (baby days per year) of NICU by gestational age 1999-2012

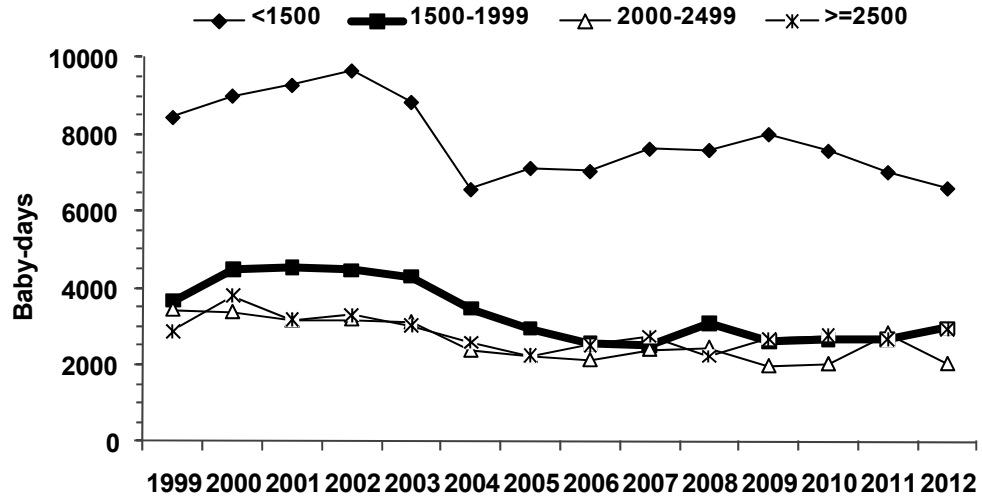

Figure 77: Occupancy (baby days per year) of NICU by birth weight 2012

9.3 Admissions to NICU

Total admissions were 1000 for the 2012 calendar year. Admissions to ACH NICU peaked in the mid 1990s prior to the opening of the two Waitemata neonatal units. The North Shore Hospital Neonatal Unit opened in 2003 and Waitakere Hospital in 2004. These two Waitemata units admit babies >1500g and >31 weeks gestation and will administer Level 2 care including CPAP.

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.

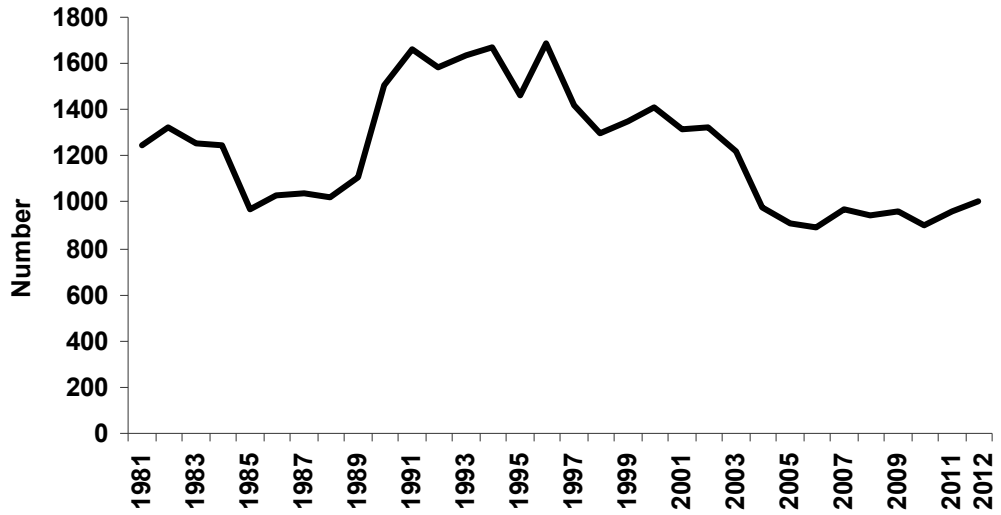

Figure 78: Admissions to NICU 1981-2012

Table 73: NICU admissions by year 1997-2012

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number	1420	1300	1352	1412	1312	1331	1220	975	906	890	972	939	957	902	963	1000

9.3.1 Admissions to NICU by gestation and birth weight

The rate of admission for babies below 32 weeks gestation or below 1500g birth weight has been fairly constant, at around 200 per year, over the last decade. The opening of the Waitemata units caused a significant decrease in admissions of term babies and those 32-36 weeks gestation from 2004 but since 2008 there has been an ongoing increase in term infant admissions to ACH. 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.

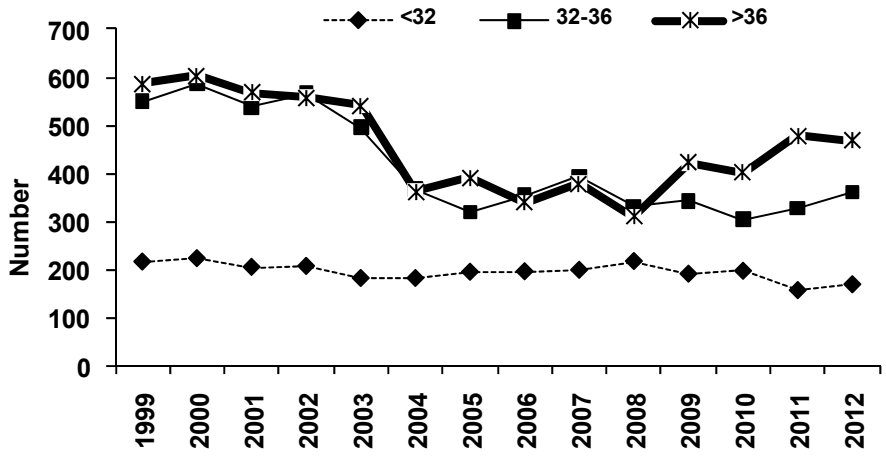

Figure 79: Admissions to NICU by gestational age 1999-2012

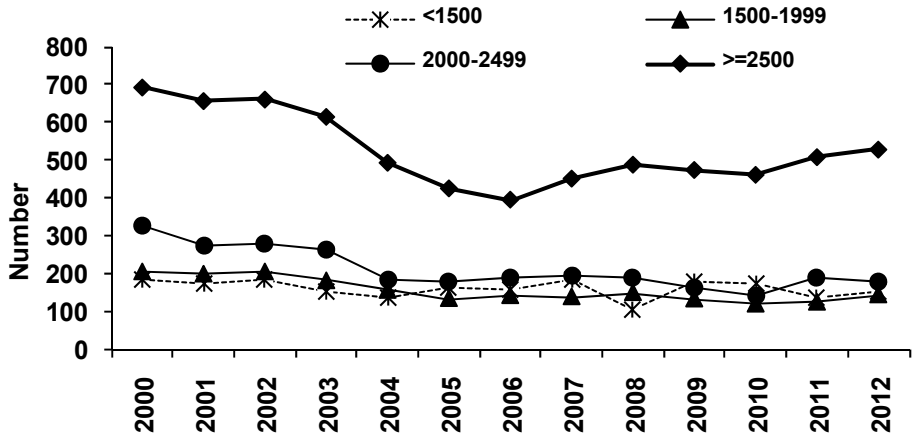

Figure 80: Admissions to NICU by birth weight 2000-2012

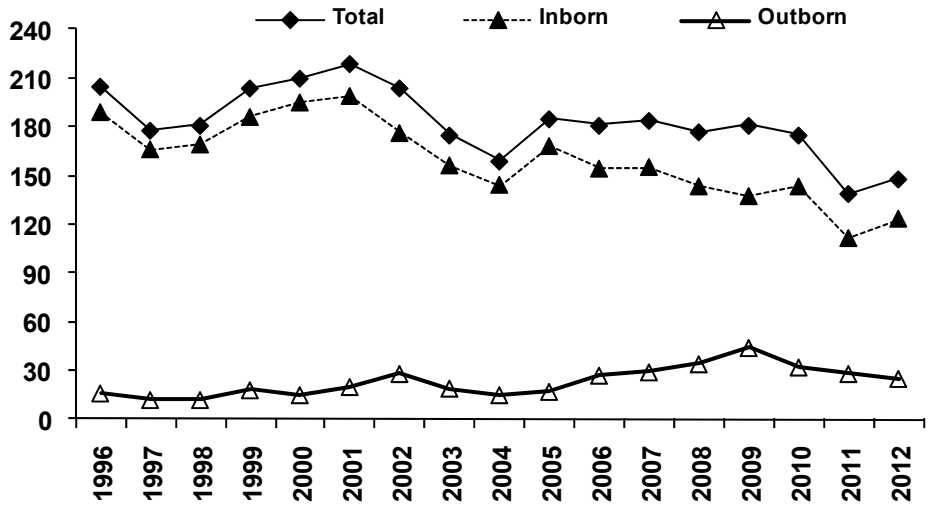

Figure 81: Admissions to NICU of <1500g babies (VLBW) by place of birth 1996-2012 (outborn includes BBAs).

The total number of VLBW infants admitted to the NICU has remained fairly stable over the last decade. The number of outborn VLBW infants has remained low in 2012. 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. 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 expected 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. The modest increase in the number of babies admitted to NICU whose mothers were domiciled in the ADHB region in 2008 and 2009 was considered due to better allocation, with a drop in unknowns. However, there was also a small increase observed in 2011 and 2012 was very similar to the proceeding year.

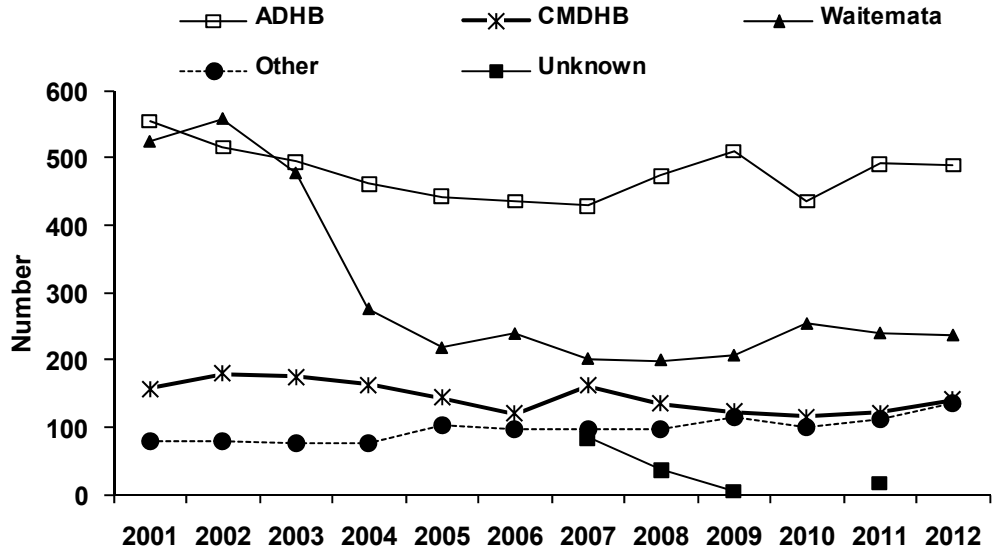

Figure 82: Admissions to NICU by maternal domicile 2001-2012

9.3.3 Admissions to NICU by ethnicity of baby

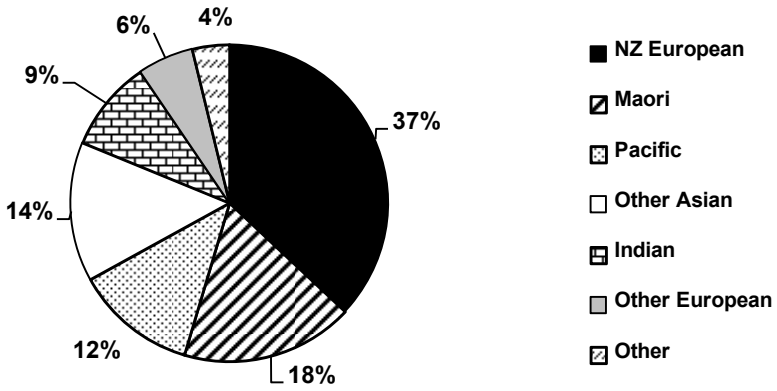

Figure 83: Admissions to NICU by ethnicity of baby 2012

The most frequent ethnicity of NICU admissions was NZ European with 37% overall, including 34.6% of preterm and 40.3% of term infants respectively. 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 should be noted.

The second largest single ethnic group is Maori with an overall rate of 17.6% compared to 12.4% for Pacific people. Asian and Indian were the two other major groups represented with 14.2% and 9.3% of admissions respectively. Note the number of Asian admissions has increased over the last 5 years and this year was greater than the Pacific admissions.

9.3.4 Reasons for admission to NICU

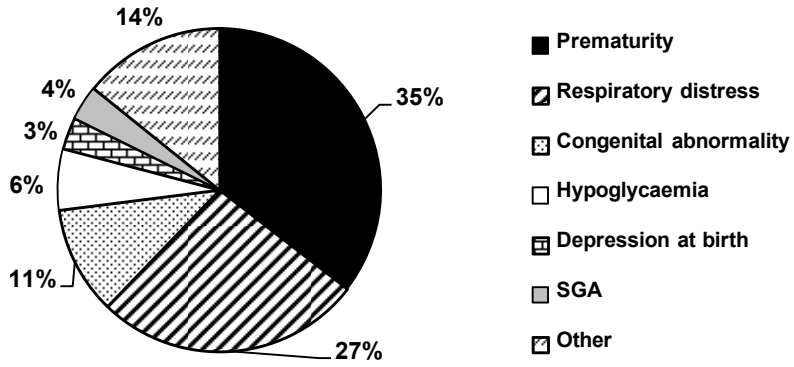

Figure 84: Reasons for admissions to NICU 2012
Other reason for admission includes; cyanotic episode, suspected infection, neurological problem, haemolytic disease, feeding difficulty, bile stained vomiting, jaundice

Prematurity (35.5%), respiratory distress (26.7%) and congenital anomalies (10.8%) remain the three commonest reasons for admission to NICU and had rates very similar to last year. Sixty one babies (6.1%), including 43 term infants, were admitted primarily for hypoglycaemia. Prevention of this using glucose gel is going to be the subject of a major research project over the next few years. The full list is presented in Appendix 8.

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 2012, 90% of ACH babies <32 weeks gestation received some antenatal corticosteroids before birth and 68% 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.

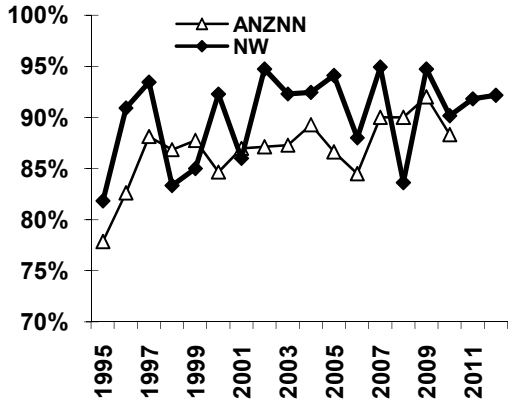

Figure 85: Any antenatal corticosteroids at 24-27 weeks 1995-2012

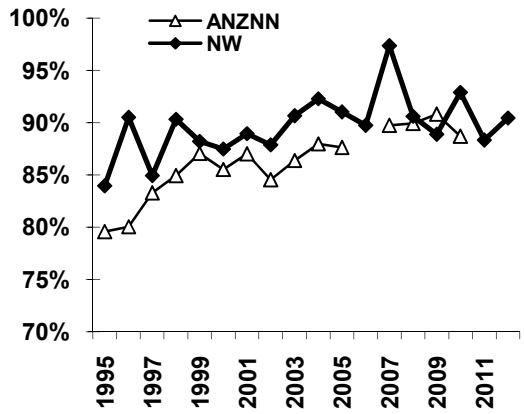

Figure 86: Any antenatal corticosteroids at 28-31 weeks 1995-2012

9.4 Care and complications

9.4.1 Infection (all admissions)

In 2012, there were 9 early-onset culture proven septicaemias compared with 9 in 2011, 7 in 2010, 10 in 2009 and 6 in both 2008 and 2007. The major organism was Group B Streptococcus (5). There were 28 episodes of late-onset septicaemia, compared with 34, 27, 33, 31 and 34 episodes in the five previous years. For late onset sepsis the most common organism was *Staphylococcus epidermidis* / coagulase negative *Staphylococcus.*

9.4.2 Hypoxic ischaemic encephalopathy (all admissions)

Two inborn babies developed significant stage 2 or 3 hypoxic ischaemic encephalopathy (HIE) in 2012, giving an incidence of 0.26/1000 term live births. The incidences were between 0.4 and 1.6/1000 term live births for the years between 2003 and 2011.

Table 74: Details of Hypoxic Ischaemic Encephalopathy Stages 2 or 3.

	Gestation	Birth Weight	HIE stage	Apgar 1/5	Comment
North Shore	40	2960	2	1/1	Antepartum haemorrhage, cooled, Follow up MRI reassuring
North Shore	40	3005	2	0/4	Fetal distress, emergency section, cooled, Follow up MRI reassuring
ADHB	38	2630	2	1/2	Associated meconium aspiration syndrome, multi-organ failure, died
ADHB	36	2930	3	2/4	Unexpectedly poor condition at birth,cooled Follow up MRI reassuring
Waitakere	41	3910	3	3/6	Fetal distress, emergency section, cooled, Pulmonary hypertension, died

All babies with stage 2 or 3 encephalopathy were cooled using whole body technique but the outborn babies received a period of passive cooling during transfer from a peripheral centre.

9.4.3 Intraventricular haemorrhage in very low birth weight infants admitted to NICU 1985-2012

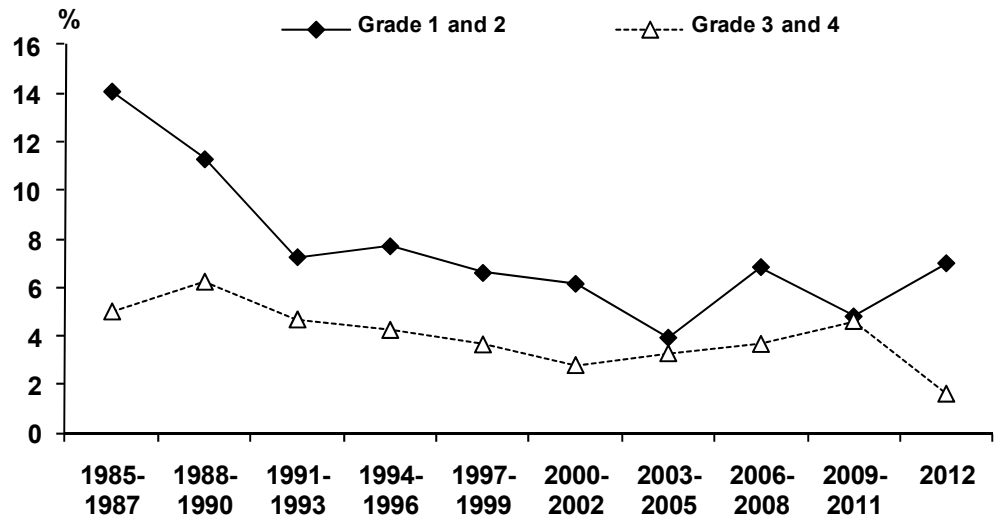

Figure 87: Intraventricular haemorrhage in <1250g infants admitted to NICU 1985-2012

Since 2005, the criteria for routine cerebral ultrasound scanning at ACH has been <30 weeks or <1250g. This was changed from <32 weeks or <1500g due to the very low incidence of significant abnormalities in the larger more mature infants. Previously results were reported for 28-31 weeks to be consistent with ANZNN and pre 2005 data. However, 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). Since 2000, the absolute number of cases of IVH has remained fairly constant.

Over the years the percentage of babies with no IVH has remained high at between 70 and 80%. The rates of severe IVH (Grade 3 & 4) are low but may have significant neurodevelopmental consequences. Included in this group are a consistent but small number of outborn babies who have not had tertiary level antenatal care.

On the whole, ACH data for rates of IVH are comparable with ANZNN data (Fig 89-92). However, there is much more year-to-year variation in the ACH data reflecting the smaller number of infants in each gestational age group.

9.4.4 IVH (Benchmarked with ANZNN) (see tables in appendix)

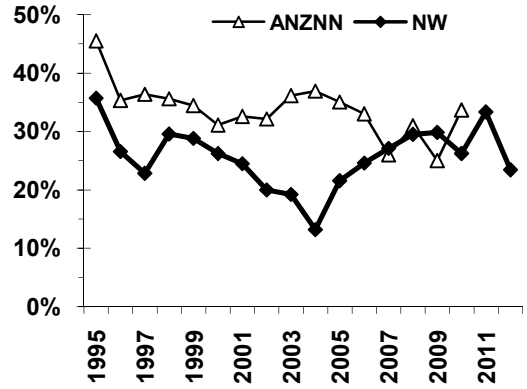

Figure 88: Any IVH at 24-27 weeks 1995-2012

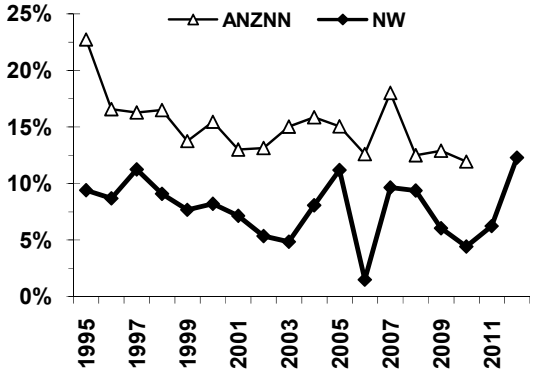

Figure 90: Any IVH at 28-31 weeks 1995-2012

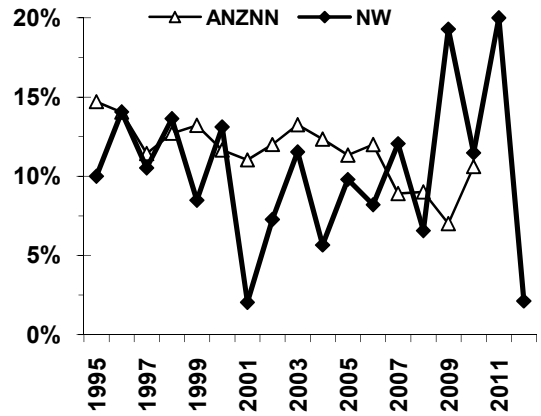

Figure 89: Severe (G3-4) IVH at 24-27 weeks 1995-2012

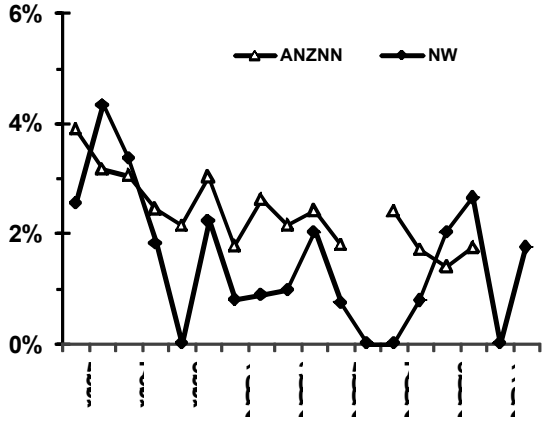

Figure 91: Severe (G3-4) IVH at 28-31 weeks 1995-2012

The rate of severe IVH at 24-27 weeks appears to have dropped compared to the period 2009-11. This rate is expressed as a percentage so variation could reflect modest changes in either numerator or denominator numbers. However, for 2012 there was only one 24-27 week infant with severe (G3-4) IVH compared with 9, 7, 11 and 4 in the previous 4 years.

Note that in 2005 there was a change in policy with routine imaging no longer being performed for clinically stable babies greater than 30 weeks gestation. Previously results were reported for 28-31 weeks to be consistent with ANZNN and pre 2005 data. However, for 2010 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). This rationale is supported by previous data on IVH for this age group and the fact that clinically unstable infants still have an ultrasound performed.

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 although the total number of admissions has plateaued, the total number of babies receiving IPPV has increased dramatically to 219 for 2012. This number is higher than at any time for the last decade.

Table 75: Number of babies on assisted ventilation NWH 2002-2012

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
CPAP or IPPV	446	404	402	395	453	442	442	423	448	526	571
IPPV	140	109	123	140	152	139	144	132	178	196	219
CPAP	421	388	388	367	428	418	412	423	411	470	514
HiFlow											29

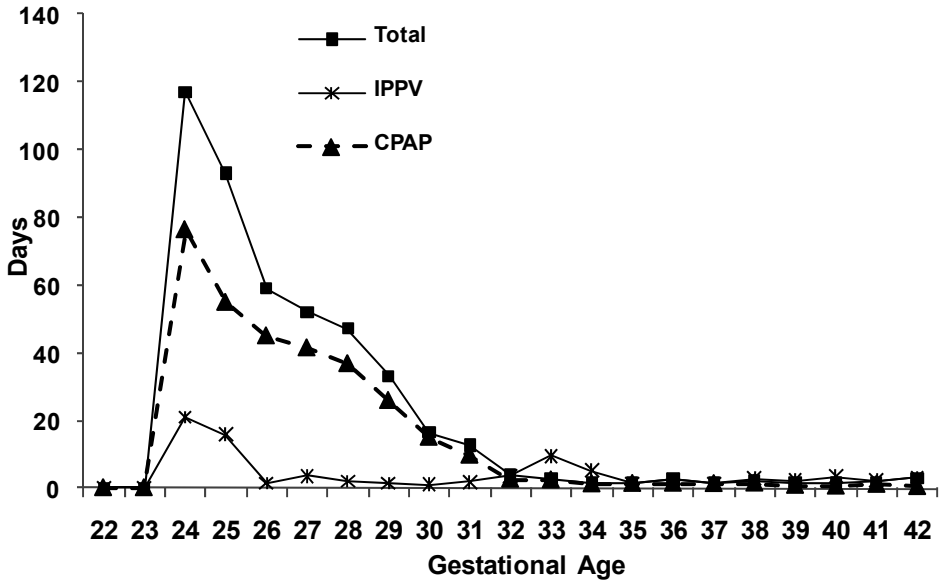

Figure 92: Median ventilation days on IPPV and CPAP and IPPV+CPAP by gestational age among (ventilated) survivors NWH 2012

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, as stated above, there has been a significant and ongoing increase in the number of babies receiving IPPV. The most common reasons for this requirement were: respiratory distress, meconium aspiration, congenital anomalies, support for encephalopathy, surgery and “other”, which includes metabolic disease. Note 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.

There is a pattern of decreasing need for CPAP with increasing gestation and reduction in use from 28 weeks onwards. From 2010 we have used humidified high flow air/oxygen as a method of weaning off CPAP, particularly after 34 weeks gestation, but not as a primary respiratory support. This system offers advantages in the ease of care during neuro-developmentally appropriate activities and softer interface with the baby but with only a couple of years experience with use there is a need to observe the respiratory outcomes and duration of respiratory support.

9.4.6 Trends in use of assisted ventilation among <32 week inborn survivors

9.1.2 **(Note that medians apply only to babies ventilated; babies not ventilated are NOT included in the calculations)**

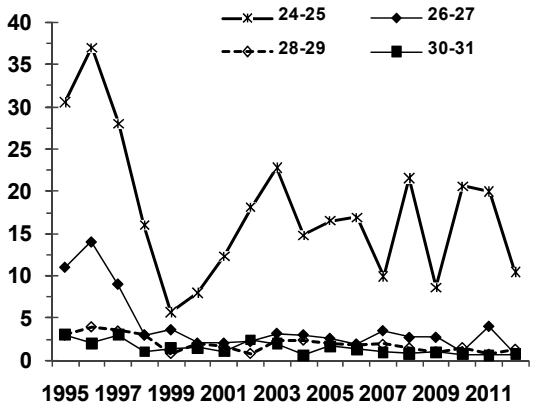

Figure 93: Median days on IPPV NWH 1995-2012

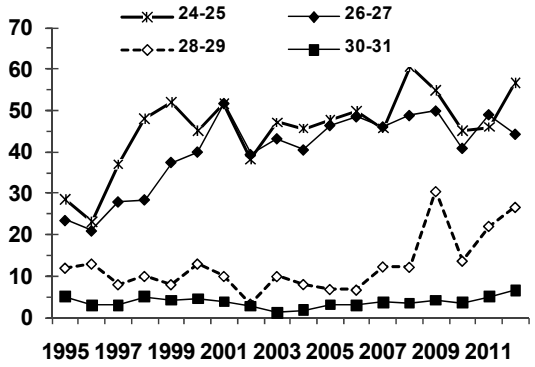

Figure 94: Median days on CPAP NWH 1995-2012

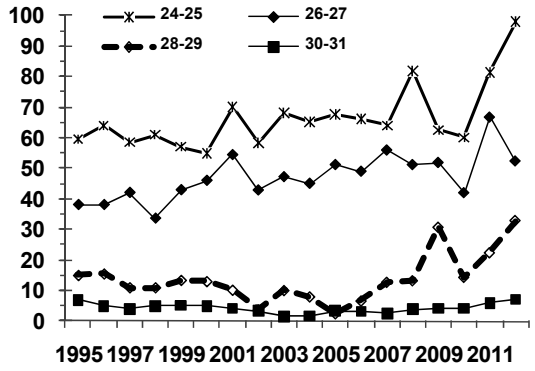

Figure 95: Median days on CPAP + IPPV NWH 1995-2012

The figures illustrate median days on respiratory support for inborn survivors. This group may be considered a more homogenous population than the outborn population, reflecting the unit philosophy on respiratory support.

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. For babies of 24 and 25 weeks gestation, this fell from a median of 37 days to just 6 days by 1999. However the next 4 years saw a gradual increase in median number of days on IPPV to 23 days in 2003. Since then there has been a fluctuation in median duration of IPPV; however, it should be noted that the number of babies in the gestational age band is small. The graph has been updated for 2012 and shows the current median duration is approximately 10 days.

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.

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 more mature infants at 28-29 weeks gestation. The cause of this is uncertain but could reflect changes in the method of weaning from CPAP. A rise is also seen in duration of CPAP for the very small infants but this is probably due to the survival of a small number of infants who required very long periods of CPAP support beyond term.

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

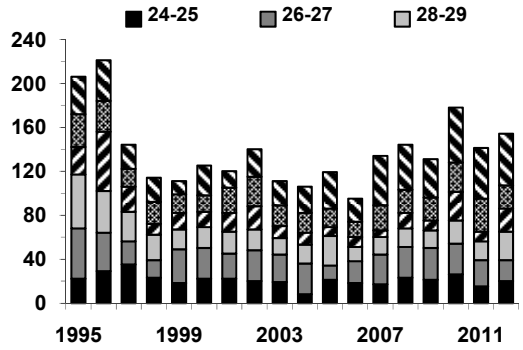

Figure 96: Number on IPPV NWH 1995-2012

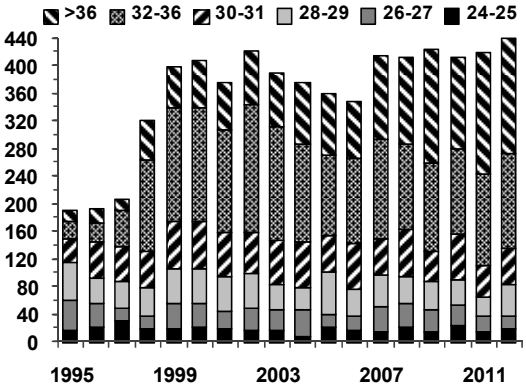

Figure 97: Number on CPAP NWH 1995-2012

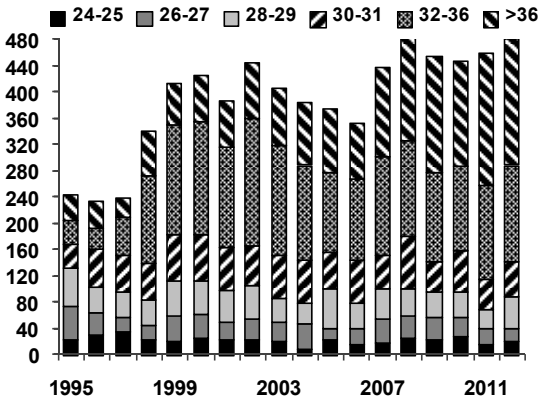

Figure 98: Number on CPAP + IPPV NWH 1995-2012

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. As Head-box oxygen was also phased out with all babies requiring oxygen being placed on CPAP, there was a concomitant increase in the use of CPAP, particularly in babies from 32-36 weeks gestation.

From 2011 onward we have collected information on the use of High Flow Humidified Air / Oxygen. In 2012 this technique was used in 29 babies as a method of weaning infants from CPAP. The median duration was 4 (1-28) days. This use would be in addition to the CPAP. Although some units use this as a mode of primary respiratory support, at ACH use is mainly for weaning. Note also that ACH does not use any method of non invasive ventilation such as Nasal IPPV.

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).

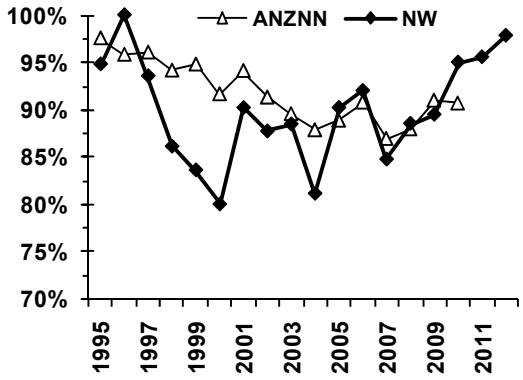

Figure 99: Percentage on IPPV (24-27 wks ANZNN assigned) NWH 1995-2012

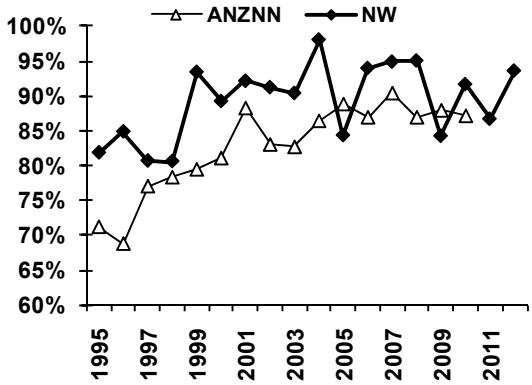

Figure 100: Percentage on CPAP (24-27 wks ANZNN assigned) NWH 1995-2012

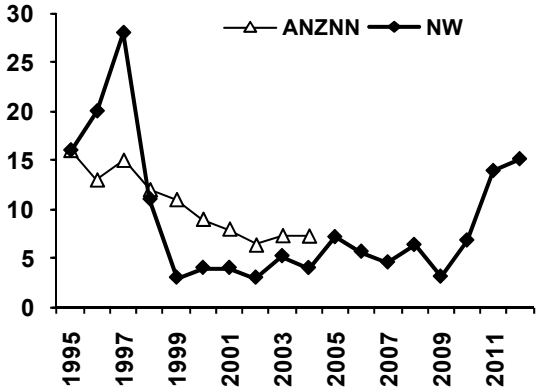

Figure 101: Median days on IPPV (24-27 wks ANZNN assigned) NWH 1995-2012

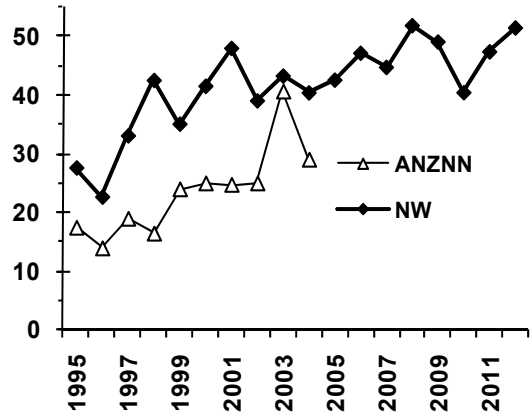

Figure 102: Median days on CPAP (24-27 wks ANZNN assigned) NWH 1995-2012

Since the change in policy on ventilatory support in 1997 the use of CPAP has been high and IPPV use and duration has tended to be lower relative to ANZNN. However, as other ANZNN units have adopted CPAP the network and hospital data have become more similar.

9.4.9 Positive pressure ventilation and CPAP use in NW and across Australia and New Zealand at 28-31 weeks gestation (ANZNN benchmarking)

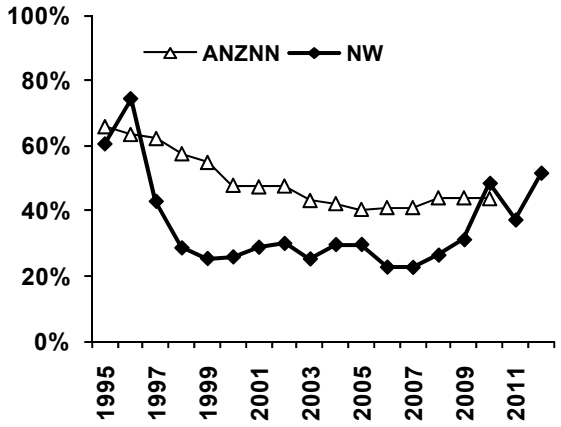

Figure 103: Percentage on IPPV (28-31 wks ANZNN assigned) NWH 1995-2012

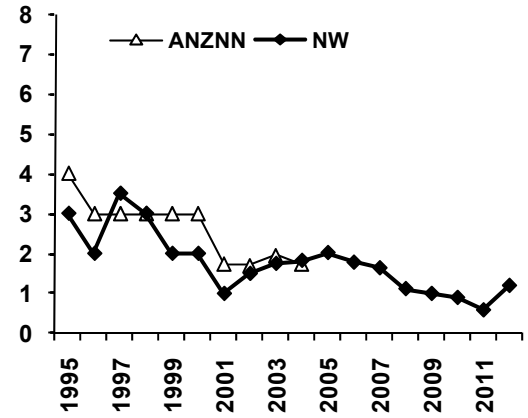

Figure 104: Median days on IPPV (28-31 wks ANZNN assigned) NWH 1995-2012

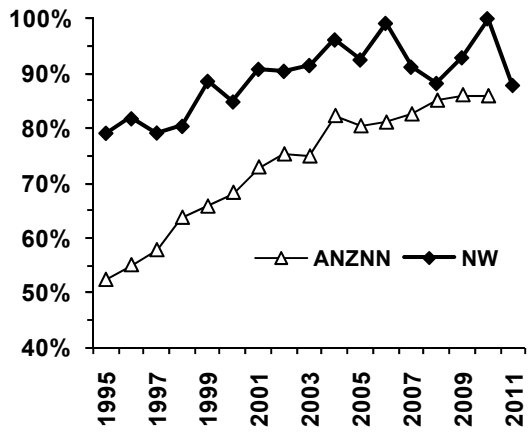

Figure 105: Percentage on CPAP (28-31 wks ANZNN assigned) NWH 1995-2012

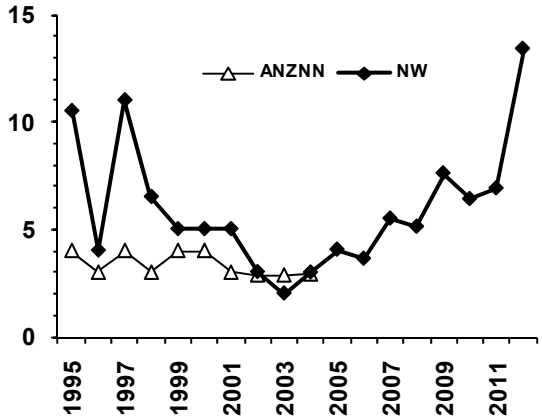

Figure 106: Median days on CPAP (28-31 wks ANZNN assigned) NWH 1995-2012

The pattern of respiratory support in NW babies of 28-31 weeks gestation parallels that seen in the less mature babies. It is a little unclear what is responsible for the increase in median days on CPAP in 2012 and this will require watching 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. In 2012 the survival following use of both HFOV (72%) and iNO (79%) was considerably higher than our experience for the previous decade, which was approximately 60%, 67% and 57% survival following treatment with HFOV, iNO or HFOV + iNO respectively.

Table 76: HFOV and inhaled nitric oxide (iNO) use and survival NWH 2012

	HFOV		iNO		HFOV + iNO	
	Treated n	Survivors n(%)	Treated n	Survivors n(%)	Treated n	Survivors n(%)
Total	**29**	**21(72)**	**33**	**26(79)**	**19**	**15(79)**
<28 weeks	10	6(60)	4	2(50)	4	2(50)
28-31 weeks	5	3(60)	4	3(75)	3	3(100)
32-36 weeks	1	1(100)	0	0	0	0
≥37 weeks	13	11(85)	25	21(84)	12	10(83)

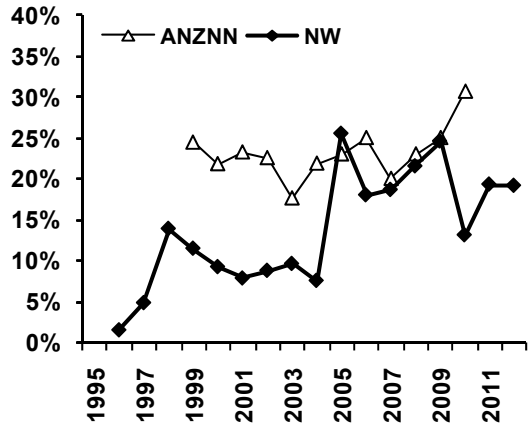

Figure 107: HFOV at 24-27 weeks (ANZNN assigned babies) NWH 1995-2012

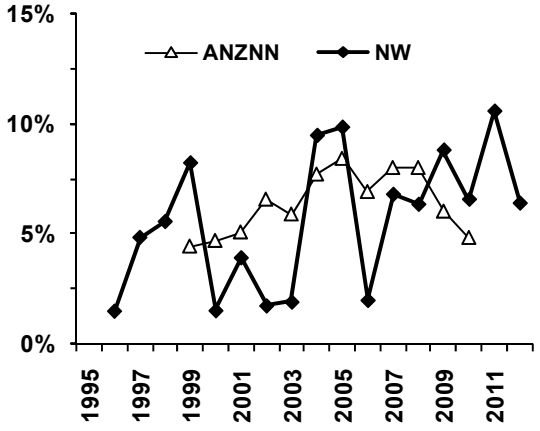

Figure 108: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies) NWH 1995-2012

These two figures compare the use of HFOV and iNO at ACH with use across the ANZNN. Note that the Network only presents data on preterm infants, despite both treatments being more commonly used in term babies. Generally, the use of these interventions in preterm infants has been lower than ANZNN but HFOV use has increased since 2003.

9.4.11 Term/post-term infants on assisted ventilation from 1995 to 2012

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. For 2007 there was a moderate increase in the number of term infants receiving IPPV. Since 2008 there has been an increase in numbers receiving CPAP.

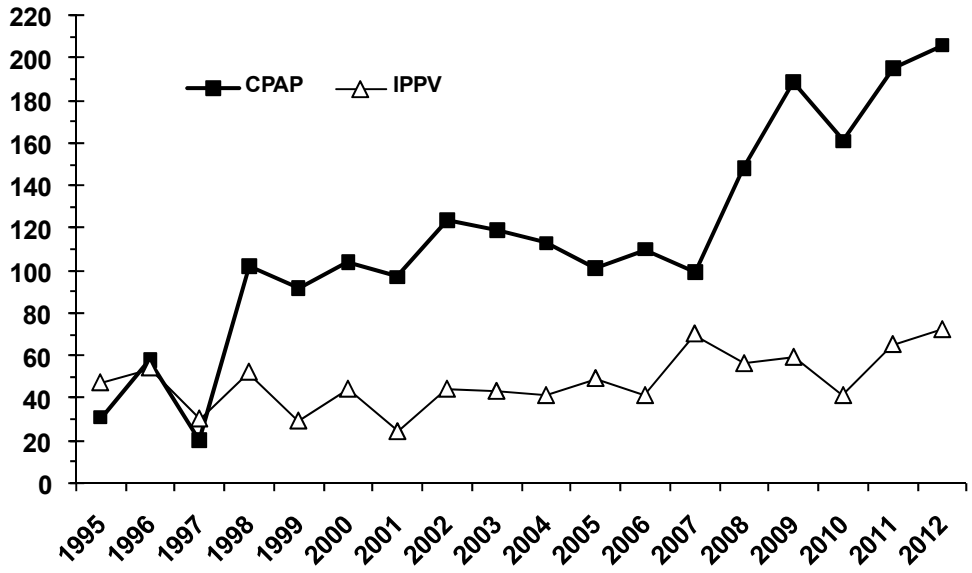

Figure 109: Number of term and post term babies needing assisted ventilation NWH 1995-2012

In previous years the most common reasons for ventilating term infants were meconium aspiration or persistent pulmonary hypertension of the newborn (PPHN). In 2012, 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 (see Appendix). Prior to the move to ACH site some of these infants would have been transferred early to Starship Hospital.

9.5 Outcomes

9.5.1 Survival of NW inborn babies by birthweight

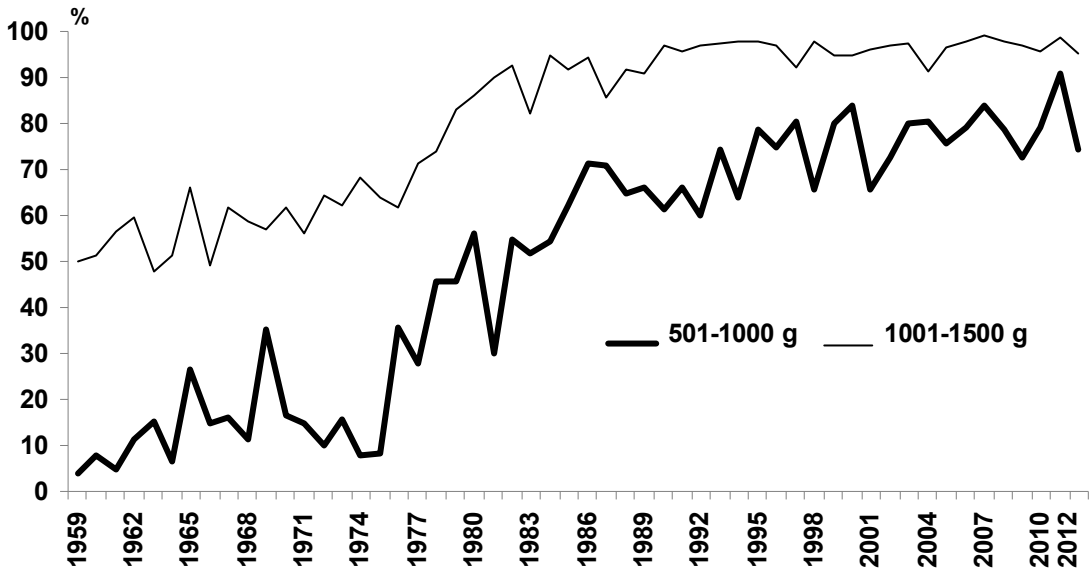

Figure 110: Neonatal survival (0-28 days) of ≤1500g inborn live births NWH 1959-2012

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).

There has been an enormous improvement in the results of perinatal and neonatal intensive care over this time period. In the first three years (1959-61) only 5/85 (6%) ELBW babies survived to 28 days compared to a current survival of around 70-80%.

Significant improvements in neonatal care started with the introduction of techniques for ventilation and the development of modern intensive care in the late 1970s and early 1980s. Antenatal steroids plus the introduction of surfactant replacement treatment in 1990 and more recent refinement of respiratory support with patient triggered modes of ventilation and increasing use of CPAP have also had an impact.

Although there have not been such dramatic changes in survival rates over the last decade, 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

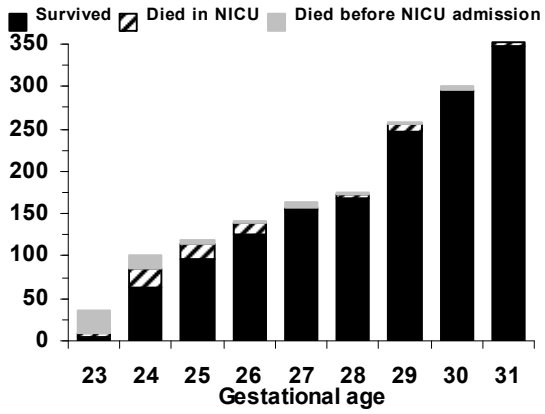

Figure 111: Numbers of live inborn babies 23 to 31 weeks gestation NWH 2003-2012

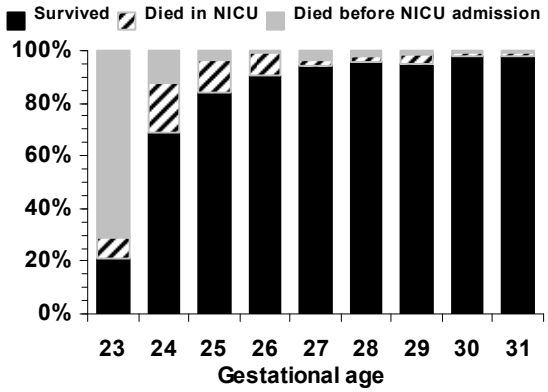

Figure 112: Survival of live inborn babies 23-31 weeks NWH 2003-2012 (n = 1650)

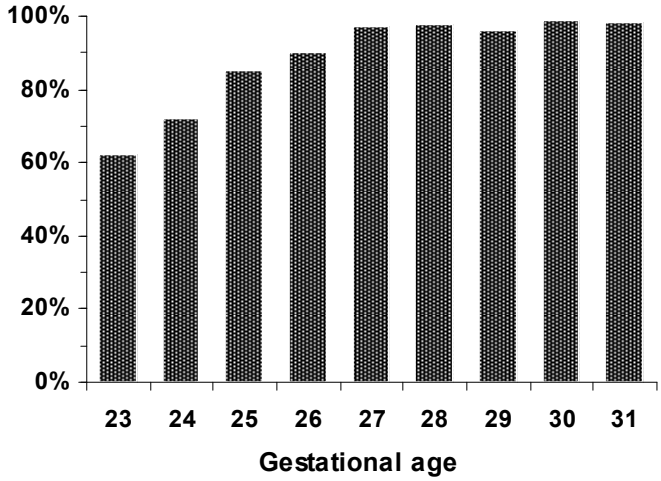

Figure 113: Survival of live inborn babies admitted to NICU 2003-2012 (n =1583)

There is a gradient in the survival rates between 23 and 27 weeks gestational age at birth. 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.

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 with ACH survival rates generally higher than ANZNN.

9.5.3 Survival of 24-27 week babies admitted to NICU (benchmarked with ANZNN)

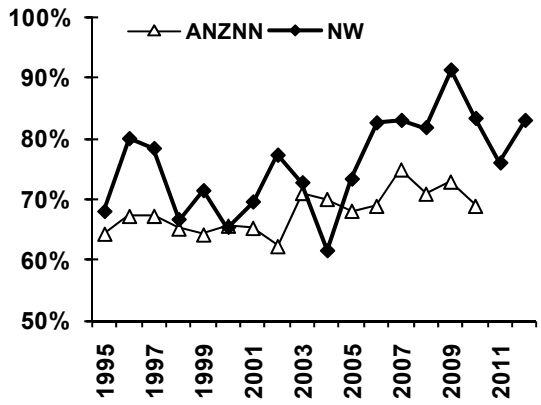

Figure 114: Survival at 24-25 weeks gestation compared with ANZNN data NWH 1995-2012

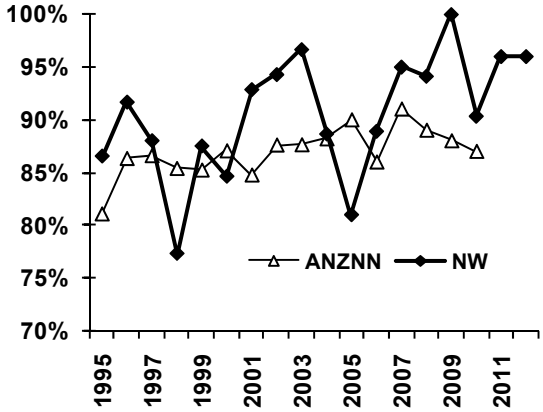

Figure 115: Survival at 26-27 weeks compared with ANZNN data NWH 1995-2012

Survival rates for 24-27 weeks gestation are consistently good at ACH. The relatively small numbers at 24-25 weeks gestation account for the year to year variation. Over the last 15 years, there were between 18 and 37 babies per year in this age group. 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 2012 one inborn baby developed cystic PVL. He was an unusual case with massive intracranial haemorrhage that was presumed to have occurred antenatally. The neonatal course was complex including a requirement for ventricular shunting.

9.5.5 Retinopathy of prematurity benchmarked with ANZNN

Rates of stage 3-4 ROP compare reasonably with ANZNN data and have remained fairly constant over the last 5 years. 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 in below 1500g infants were 4 % in 2012, 2% in 2011, 3% in 2010, 5.7% in 2009, 4.7% in 2008, 5% in 2007 and 6% in 2006 compared to 1% in both 2005 and 2004. In 2012, 4 inborn babies received laser therapy for advanced ROP, which is similar to 3 to 11 per year for the previous 5 years. In addition one baby received treatment with intravitreal Bevacizumab injection.

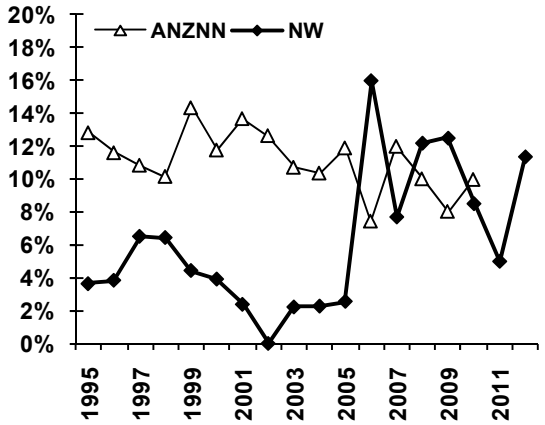

Figure 116: Stage 3-4 ROP at 24-27 weeks NWH 1995-2012

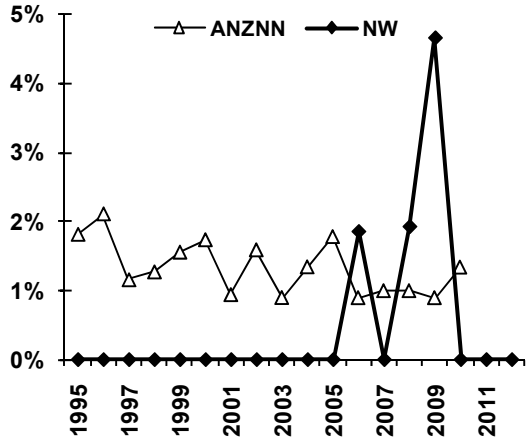

Figure 117: Stage 3-4 ROP at 28-31 weeks NWH 1995-2012

9.5.6 Chronic lung disease (CLD) benchmarked with ANZNN

The ANZNN definition of chronic lung disease is used: *The baby received any respiratory support (oxygen, IPPV, CPAP or high flow) for a chronic pulmonary disorder when reaching 36 weeks post menstrual age.* In some older publications, the definition is only a requirement for supplemental oxygen and in some newer publications a physiological definition is used. However, continuing to use the ANZNN definition allows longitudinal comparison.

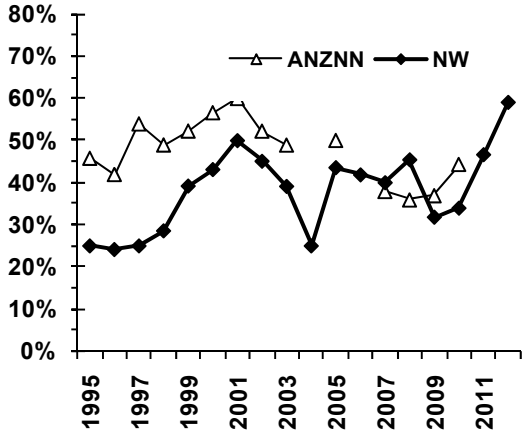

Figure 118: Chronic lung disease at 24-27weeks NWH 1995-2012

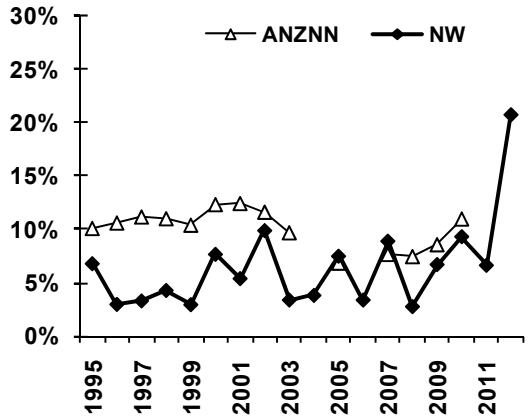

Figure 119: Chronic lung disease at 28-31weeks NWH 2012

Between 2005 and 2011 there were no discernable major trends in the incidence of chronic lung disease at NWH / ACH with only minor differences in year to year variability. Furthermore, these rates were broadly similar to those reported by ANZNN. In 2012 there was a rise in the rate of support at 36 weeks, it is possible that this reflected the use of High Flow and this will need to be followed over the next couple of years.

Interestingly, over time there have been previous changes in rates that reflect clinical practice. The ANZNN data demonstrate that for infants 24-27 weeks gestation there was an increase in the rate of CLD in the late 1990s. NWH / ACH data seem to mirror this pattern and also with the subsequent relative decrease in CLD that occurred up to 2003. However, the definition of CLD was based on the requirement for support at a corrected age of 36 weeks. Hence BPD was defined by the treatment being given and 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.

Oxygen targeting levels are unlikely to change in the near future but the introduction of "physiological testing" may prove a more robust method of diagnosis of BPD. Using this method infants receiving less than 30 % oxygen at 36 weeks are weaned and closely monitored for desaturation to formally test their oxygen requirement.

9.5.7 Necrotising enterocolitis benchmarked with ANZNN

In 2012, 3 inborn infants (3% <32 week gestation infants) developed proven or probable NEC. The benchmarking figure below compares rates for babies below 28 weeks gestation from ACH and the ANZNN. Moderate variability in rate is demonstrated at ACH, which can be accounted for by the smaller numbers with year to year differences attributed to random variation rather than any major change in practices.

An additional three infants with suspected or proven NEC were transferred in from other hospitals. The Auckland units have recently been using probiotics as a routine in very low birth weight infants. Although this practice may protect against NEC, there may also be variation in rates from year-to-year so the encouraging trend needs to be followed closely.

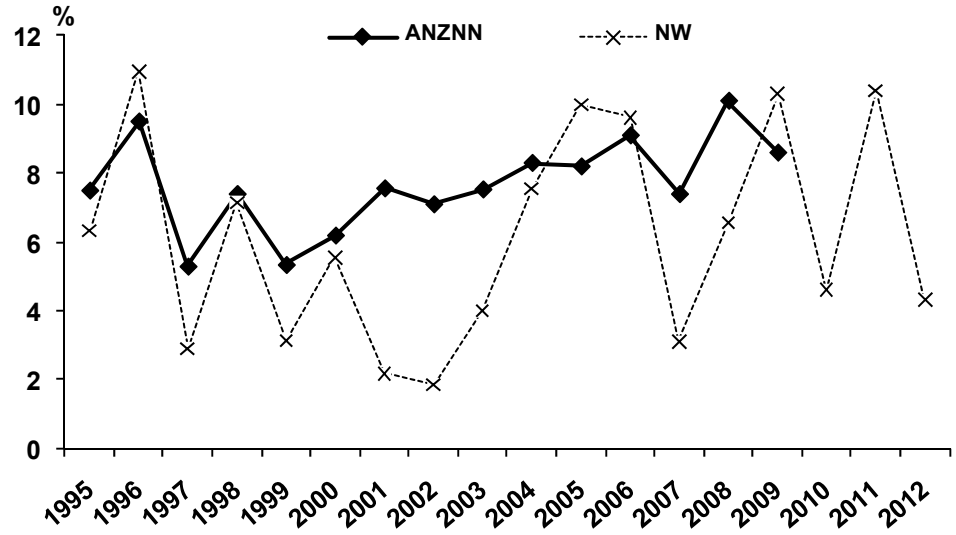

Figure 120: Necrotising enterocolitis (NEC) in ANZNN assigned babies under 28 weeks gestation compared with the incidence in ANZNN NWH 1995-2012

9.5.8 Patent Ductus Arteriosus (all babies)

In 2012, 16 infants were treated medically for a symptomatic PDA. There were two medical treatment regimens used. Indomethacin, which had been the longstanding first line treatment was unavailable in 2010 so Ibuprofen was introduced. In 2012 Indomethacin was available again and so was used in all but one course of treatment. Three babies had two or more (max 3) courses of medical treatment. In 2012, two inborn (ANZNN benchmarked) 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 five babies developed a pneumothorax that needed drainage in 2012. Three of these had respiratory system anomalies including pulmonary hypoplasia, diaphragmatic hernia and a congenital cystic adenomatoid malformation (CCAM). In addition, 29 babies had a small pneumothorax that did not require a procedure and resolved spontaneously. No infant <32 weeks or <1500 g had a pneumothorax that required drainage.

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 the mid-1990s, dexamethasone became an accepted and proven treatment to lessen the severity of CLD. However, use then declined when concerns were raised as to whether dexamethasone may increase the rate of cerebral palsy in survivors. In the last few years it has become clearer which babies may benefit from postnatal dexamethasone. With this, the use of dexamethasone has increased slightly. However, there has been a consistent move to use both smaller doses and shorter courses leading to a smaller cumulative dose of postnatal steroid.

In 2012, eleven inborn infants below 28 weeks gestation received postnatal steroids for chronic lung disease. The number treated varied with gestational age such that 40% of infants at 24-25 weeks gestation received steroids but none of those born at 30-31 weeks gestation were treated with postnatal steroids.

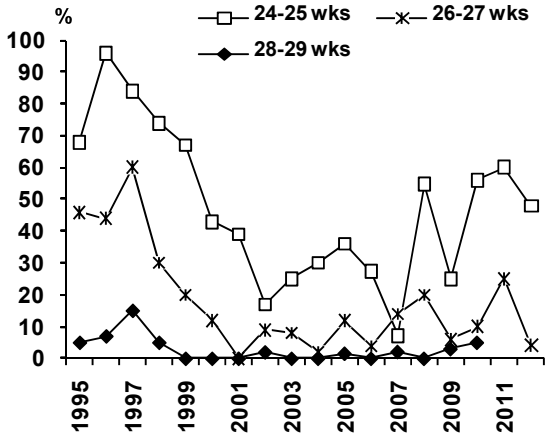

Figure 121: Percentage receiving postnatal dexamethasone by gestational age (ANZNN alive at one week <32wks) NWH 1995-2012

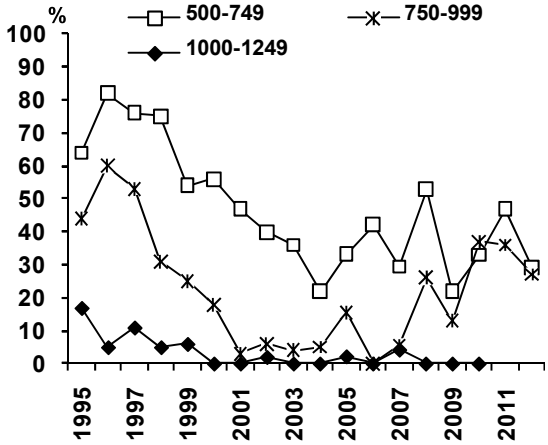

Figure 122: Percentage receiving postnatal dexamethasone by birth weight (ANZNN alive at one week <1500g) NWH 1995-2012

9.6 Immunisation

9.6.1 Hepatitis B

In 2012, 12 infants admitted to NICU were identified as potentially exposed to hepatitis B in the perinatal period due to positive maternal serology. They all received immunisation and Hep B immunoglobulin in labour and birthing suite or the neonatal unit.

9.6.2 BCG

In 2011 there were 15 babies 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.

9.6.3 Infrarix Hexa and Prevanar at 6 weeks

There were 71 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. Fifty nine babies (83%) had their immunisation at the routine time. Of the 12 babies who did not have immunisation at the routine time, one infant was receiving steroids and died without immunisation, one infant was immunised day 44, nine infants were transferred to other centres and underwent vaccination there (median day 53) and one family declined permission and arranged for vaccination after NICU discharge.

9.6.4 Infrarix Hexa and Prevanar at 3 months

There were 17 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. Of these 15 (88%) received these at the routine time. One baby who did not have immunisation at the routine time was discharged back to another centre and received vaccination there. The other baby had the vaccination delayed due to poor condition and died at 100 days.

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 breast feeding rates by gestation for 2012 report show that approximately 80% of NICU infants below 28 weeks gestation receive breast milk to some degree. It is particularly pleasing to note that around 60% were fully or exclusively fed breast milk. Overall these data are consistent with the high rates of breast milk feeding reported for 2009-11. However there are some differences in proportion of partial/full/exclusive in the 20-24 and 25-27 gestational age groups, which may reflect the relatively small numbers in these groups.

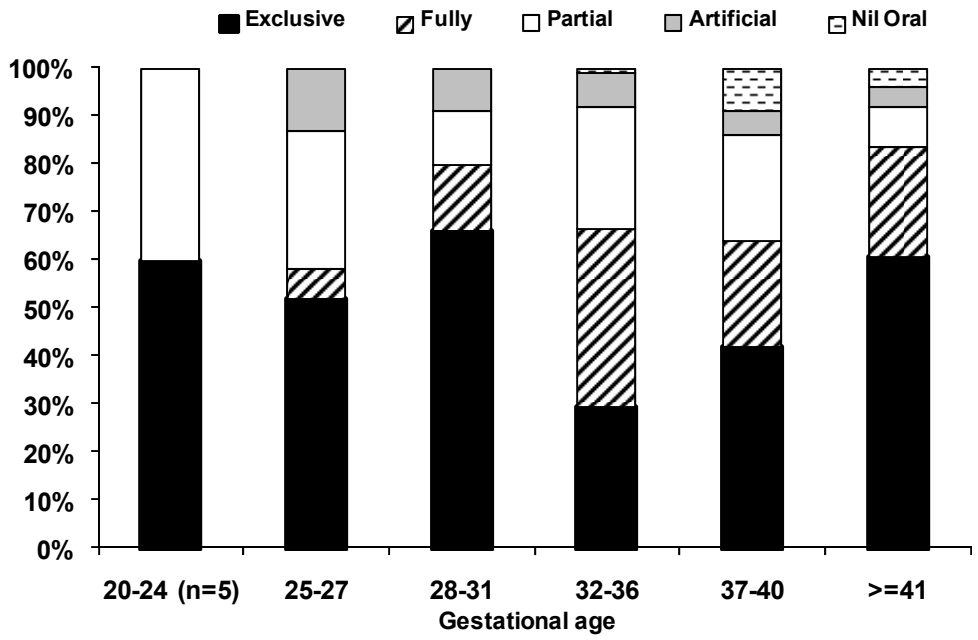

Figure 123: Method of feeding at discharge from NICU by gestational age 2012

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

There were 23 neonatal and infant deaths occurring in inborn infants in the NICU plus another 8 deaths in outborn infants admitted to the NICU during 2012. These include deaths before 28 days or up to NICU discharge (whichever is the greater).

At NW, parents who are expected to deliver very preterm are counselled about the likelihood of survival and long term problems. The guidelines used to counsel parents are available on the Newborn website. Parents are advised that the outcomes of babies at 23 weeks gestation are poor, both in terms of a low chance of survival and high chance of survivors having significant developmental problems. It is recommended that such babies are not actively treated. Treatment is not offered at 22 weeks gestation. At 24 weeks gestation the outcomes are better and most parents elect to have their baby actively treated at birth.

9.9 Child Development Unit

9.9.1 Follow up at 2 years (corrected) of children under 1500g born in 2010

One hundred and forty-eight infants who weighed <1500 grams survived to discharge from the Newborn Service.

Nine infants had congenital abnormalities, none of whom died. These were excluded from the following tables. Four further babies died after discharge from National Women's.

No information was obtained for 32 children: eleven children were lost to follow up, thirteen were from other centres in New Zealand, seven lived overseas, and one did not attend appointments. Data were therefore obtained for 103 (76%) children. Of these children, 39 (38%) weighed <1000grams at birth.

Eighty-six children received individual assessment at the Child Development Unit and when this was not possible (mainly because of distance from home to National Women's), 17 reports were obtained from paediatricians and other professionals monitoring the children's progress.

The *Bayley Scales of Infant and Toddler Development-III* was administered by a registered psychologist as close as possible to the child reaching 2 years (corrected age). Neurological examinations were carried out by paediatricians. Children were placed in outcome categories as set out in Table 1 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.

** Previously known as "Mental Scores"

*** 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 table below presents the results, using these outcome categories, for the 103 children tested at 2 years of age (corrected).

Table 78: Outcome categories at 2 years (corrected) for children under 1500g born in 2010 (n=103) NWH

	Number		Description
Category I	3	(3%)	1 child with Grade 4 IVH, porencephalic cysts and severe visual impairment. 1 child with right hemiplegia and global developmental delay. 1 child with global developmental delay.
Category II	4	(4%)	1 child with mild-moderate cerebral palsy and normal development. 3 children with Bayley Cognitive scores 1 – 2 standard deviations below the mean.
Category III	2	(2%)	2 children with low Bayley Motor scores but Cognitive score within the average range.
Category IV	94	(91%)	

The distribution of the children within each category is presented by gestational age and by birthweight in the tables below.

Table 79: Outcome of children <1500g born in 2010 at 2 years (corrected) by gestational age groups (n=103) NWH

	Gestational age (weeks)					
Outcome	**24 - 28 weeks n= 59**		**29 – 35 weeks n= 44**		**Total n=103**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	3	5.1	0	0.0	3	2.9
II	2	3.4	2	4.5	4	3.9
III	0	0.0	2	4.5	2	2.0
IV	54	91.5	40	91.0	94	91.2

Table 80: Outcome of children <1500g born in 2010 at 2 years (corrected) by birthweight groups (n=103) NWH

	Birthweight (grams)					
Outcome	**<1000g n=39**		**1000 – 1499g n=64**		**Total n=103**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	2	5.1	1	1.6	3	2.9
II	2	5.1	2	3.1	4	3.9
III	0	0.0	2	3.1	2	2.0
IV	35	89.8	59	92.2	94	91.2

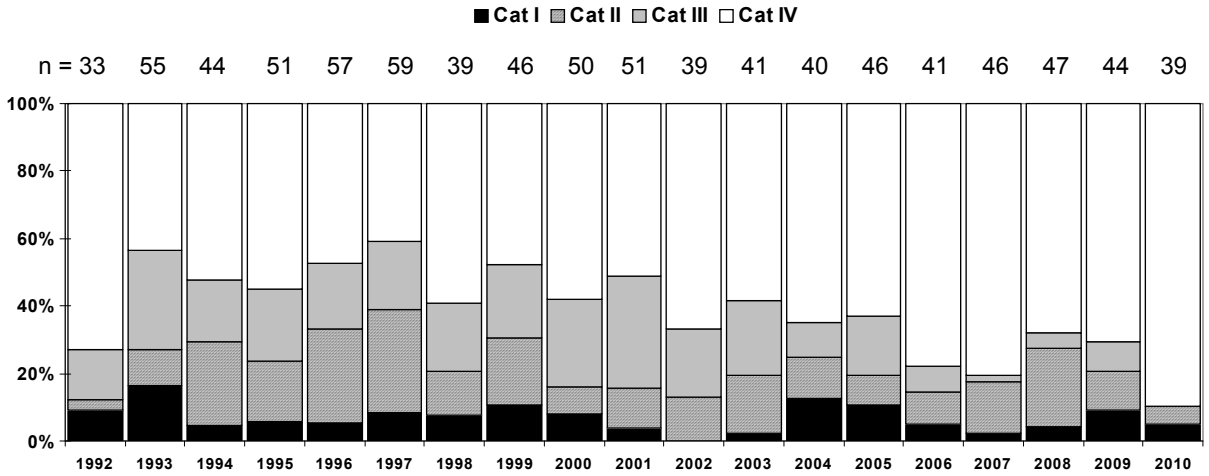

Figure 124: Outcome at 24 months (corrected age) of children <1000g birthweight born 1992-2010 NWH

9.9.2 Development at 4 years of children under 1500g born in 2008 NWH

One hundred and forty-three children born in 2008, who weighed less than 1500 grams, were cared for in the Newborn Service and survived to hospital discharge. There were 49 infants weighing less than 1000grams.

Four children had congenital abnormalities and were not included in the analyses of data. One further infant was known to have died after discharge from National Women's.

At 4 years chronological age, data were obtained for 106 children. Of the 37 not assessed 16 (43%) were overseas or in other centres in New Zealand.

At 4 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 next table.

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)	Mild-moderate cerebral palsy
	(ii)	Stanford-Binet* Composite Score (Full Scale IQ) between 1 & 2 standard deviations below mean.
Category III		Motor Skills† Standard Score more than one standard deviation below mean
Category IV	Normal development i.e. none of the above	

* *The Stanford-Binet Intelligence Scales 5th edition.*

† *Vineland Adaptive Behavior Scales, 2005* : Motor Skills Domain.

Table 82: Outcome categories at 4 years for children under 1500g born 2008 (n =106)

	Number	Description
Category I	6 (5%)	1 child with right Grade 4 IVH with porencephalic cyst, mild left hemiplegia and global developmental delay 1 child with mild left hemiplegia and shunted hydrocephalus 1 child with low cognitive scores and sensorineural hearing loss with aids 1 child with moderate motor delays, attentional problems and low cognitive scores 2 children with global developmental delays
Category II	20 (19%)	1 child with low cognitive scores and left hemiplegia 1 child with conductive hearing loss, spectacles and global developmental delay 3 children with spastic diplegia 1 child with spectacles and low cognitive scores 5 children with low cognitive and motor scores 9 children with low cognitive scores
Category III	6 (5%)	6 children with low motor scores.
Category IV	74 (70%)	

Summary

Babies weighing less than 1500 grams at birth are at risk for developmental problems. Data obtained from the follow up of 103 children born in 2010, and at age 2 years (corrected) when assessed, showed that 3% had severe disability. Ninety-four percent of this population was within the average range for cognition and motor development.

For children born in 2008, and assessed at age 4 years, 5% had severe disability. Seventy per cent were within the average range for cognitive and motor disabilities.

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 a Bereavement Team whose members care for women with pregnancy loss, including 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-PDC (PSANZ Perinatal Death Classification) is used to identify the single most important factor which led to the chain of events that resulted in the death. PSANZ-NDC (PSANZ Neonatal Death Classification) 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 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 liveborn baby 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 liveborn baby of any gestation and weight 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 lethal abnormalities and terminations for fetal abnormalities. This is calculated by excluding fetal deaths where the primary PDC classification was congenital abnormality and neonatal deaths where the primary 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, midwifery leader, 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 PMMRC including assignment of contributing factors and potentially avoidable death.

10.1 Perinatal and perinatal related mortality rates

Table 83: Inborn and BBA deaths NWH 2000-2012

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Fetal deaths	20-22 weeks	33	20	30	23	25	26	24	24	29	24	33	41	33
	23-24 weeks	12	10	10	8	18	11	12	15	11	14	9	16	11
	25-26 weeks	9	2	4	6	3	3	6	7	4	4	8	5	9
	27-28 weeks	3	1	2	1	10	6	3	5	8	6	5	2	4
	29-38 weeks	27	15	17	24	13	17	24	19	21	19	24	26	14
	>38 weeks		9	6	2	13	5	5	12	3	8	4	7	7
Total fetal deaths		**84**	**57**	**69**	**64**	**82**	**68**	**74**	**82**	**76**	**75**	**83**	**97**	**77**
Neonatal deaths	Early neonatal deaths (≤7 days)	43	32	40	34	33	38	23	20	26	27	26	21	37
	Late neonatal deaths (8-28 days)	9	5	7	7	9	5	2	9	8	10	8	2	9
Total neonatal deaths		**52**	**37**	**47**	**41**	**42**	**43**	**25**	**29**	**34**	**37**	**34**	**23**	**46**
Total deaths		136	94	116	105	124	111	99	111	110	112	117	120	123
Perinatal mortality rate/1000		15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2	12.9	13.9	15.3	14.5
Perinatal related mortality rate/1000		16.9	12.3	14.5	13.5	16.2	15.0	13.4	14.1	14.2	14.2	14.9	15.6	15.6
Perinatal related mortality rate (excluding lethal & terminated fetal abnormalities)		12	8.4	9.4	8.9	12.4	9.9	8.4	8.0	9.8	10.3	10.5	10.1	72/7810 =9.2

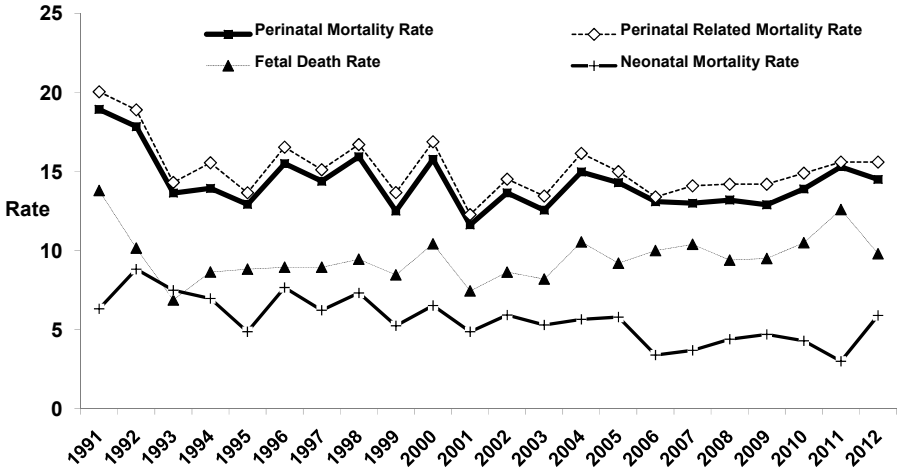

Figure 125: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate NWH 1991-2012 (all rates expressed as deaths/1000 births).

Consistent with New Zealand and international data the perinatal mortality rate at NWH has not shown any reduction over the last 3 years. In 2012 there was a small increase in neonatal mortality which was due to an increase in deaths due to congenital abnormality and extreme prematurity.

Table 84: Perinatal related loss and DHB of residence NWH 2012

DHB of residence	TOP n=39		Stillbirth n=44		Neonatal death n=40		Perinatal related death n=123	
	n	%	n	%	n	%	n	%
Auckland	23	59	32	73	21	53	76	62
Counties Manukau	6	15	2	5	4	10	12	10
Waitemata	8	21	8	18	11	28	27	22
Other	2	5	2	5	4	10	8	7

*due to rounding not all % columns add to 100 percent

Thirty nine percent of all perinatal 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 2012 was (76/5381) 14.1/1000 total births which is unchanged compared to the rate last year of 13.3/1000 or 2010 of 13.1/1000 total births.

10.2 Gestational age and perinatal related mortality

Table 85: Gestational age and perinatal related mortality NWH 2012

	Births		Fetal deaths N=83		Neonatal deaths N=40		Total perinatal related deaths n=123	
	n	%	n	% FD risk*	n	% NND rate **	n	% Perinatal related mortality risk***
<24 weeks	62	0.8	43	56 5.5	18	45 947	61	50 7.8
24-27 weeks	60	0.8	13	17 1.7	5	13 106	18	15 2.3
28-31 weeks	107	1.4	2	3 0.3	7	18 66.7	9	7 1.2
32-36 weeks	592	7.5	7	9 0.9	6	15 10.3	13	11 1.7
37-40 weeks	6067	77.2	10	13 1.4	9	23 1.5	19	15 2.7
≥41 weeks	975	12.4	2	3 2.1	1	3 1.0	3	2 3.1
Total	7863		83		40		123	15.4

* 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

10.3 Multiple births and perinatal related mortality

Table 86: Multiple births and perinatal related mortality NWH 2012

	Births		Fetal deaths		Neonatal deaths		Total perinatal related deaths	
	n	%	n	% FD rate*	n	% NND rate‡	n	% Perinatal related mortality rate†
Singleton	7533	95.8	67	87 8.9	38	83 5.1	105	85 13.9
Multiple	330	4.2	10	13 30.3	8	17 25.0	18	15 54.5
Total	7863		77	9.8	46	5.7	123	15.4

* 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 continues to be several times higher than the rate for singleton pregnancies, confirming the high risk nature of these pregnancies especially in monochorionic diamniotic twin pregnancies. Details regarding the causes of deaths in multiple pregnancies are found in section 5.3. The perinatal mortality in multiples in 2012 is comparable to what it was in 2011.

10.4 Lead maternity carer (LMC) and perinatal related mortality

Table 87: LMC at birth and perinatal related mortality NWH 2012

	Births		Fetal deaths			Neonatal deaths			Total perinatal related deaths		
	N	%	n	%	FD rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Independent Midwife	3676	46.8	26	34	7.1	10	22	2.7	36	29	9.8
Private Obstetrician	1879	23.9	7	9	3.7	6	13	3.2	13	11	6.9
G.P.	45	0.6	0			0			0		
NW Community	1482	18.9	11	14	7.4	8	17	5.4	19	15	12.8
NW Diabetes	287	3.7	4	5	13.9	2	4	7.1	6	5	20.9
NW Medical	396	5.0	23	30	58.1	17	37	45.6	40	33	101.0
Other DHB	46	0.6	1	1	21.7	0			1	0.8	21.7
Unbooked	52	0.7	5	7	96.2	3	7	63.8	8	7	153.8
Total	7863		77		9.8	46		6.0	123		15.6

* 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

There are 2 outlying groups in the above table, namely unbooked women and those attending the medical clinic. As has been found in other reports, unbooked women have high perinatal related mortality (153.8/1000).

Perinatal deaths among mothers attending the medical clinic also include deaths in the fetal medicine service. Sixteen of the 40 deaths (40%) were terminations of pregnancy. The commonest causes of perinatal related death among women attending the Medical clinic were: congenital abnormality 17 (43%), spontaneous preterm 8 (20%), and specific perinatal conditions 5 (13%).

This year there were 6 deaths in women attending the diabetes in pregnancy service and these are considered in detail in chapter 5.4.

10.5 Causes of perinatal related deaths

Table 88: Fetal and neonatal death by Perinatal Death Classification (PSANZ-PDC) NWH 2012

	Fetal deaths n=77			Neonatal deaths n=46			Total n=123		
	n	%	Rate*	n	%	Rate**	n	%	Rate*
Congenital abnormality	28	36	3.6	20	43	2.6	48	39	6.1
Perinatal infection	1	1	0.1	1	2	0.1	2	2	0.3
Antepartum haemorrhage	7	9	0.9	8	17	1.0	15	12	1.9
Maternal conditions	6	8	0.8	4	9	0.5	10	8	1.3
Hypertension	5	6	0.6	0			5	4	0.6
Specific perinatal conditions	12	16	1.5	2	4	0.3	14	11	1.8
Hypoxic peripartum death	1	1	0.1	0			1	1	0.1
Fetal growth restriction	1	1	0.1	2	4	0.3	3	2	0.4
Spontaneous preterm	6	8	0.8	9	20	1.2	15	12	1.9
Unexplained antepartum death	10	13	1.3	0			10	8	1.3

* Rate: per 1000 births (n=7863 in 2012) ** Rate: per 1000 live births (n=7863 in 2012)

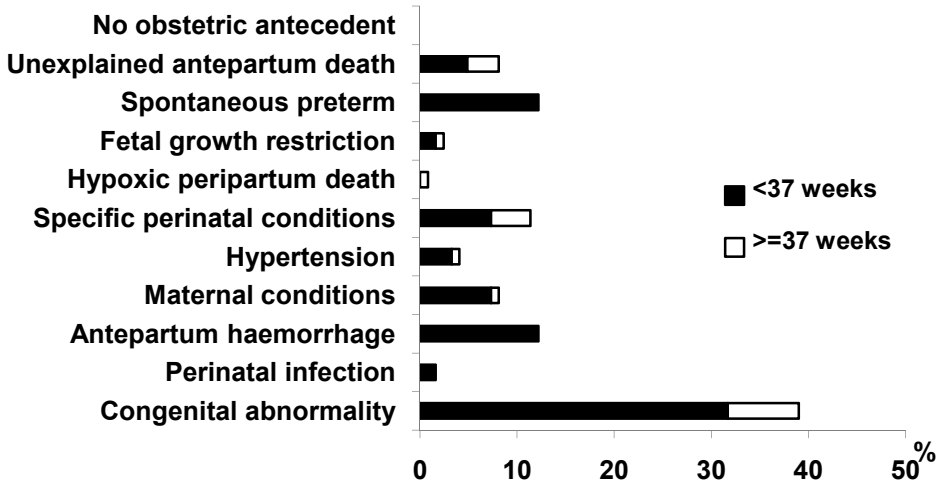

Figure 126: Contribution to perinatal related death by obstetric antecedent cause (PSANZ-PDC) and gestation at birth NWH 2012

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 2011.

10.6 Neonatal deaths

Table 89: Neonatal deaths by neonatal classification (PSANZ-NDC) and gestational age NWH 2012

	Total neonatal deaths		< 37 weeks		≥ 37 weeks	
	N	%	n	%	n	%
Total	46		36		10	
Extreme prematurity	17	37	17	47	0	
Congenital abnormality	22	48	13	37	9	90
Infection	1	2	1	3	0	
Gastrointestinal	2	4	2	6	0	
Neurological	2	4	1	3	1	10
Cardio-respiratory disorders	1	2	1	3	0	
Other	1	2	1	3	0	

The large majority of neonatal deaths (48%) are due to congenital abnormality with the second commonest classification being extreme prematurity (37%). There was an increase in deaths due to extreme prematurity in 2012- 6 babies in 2011 and 17 babies in 2012.

10.7 Necropsy

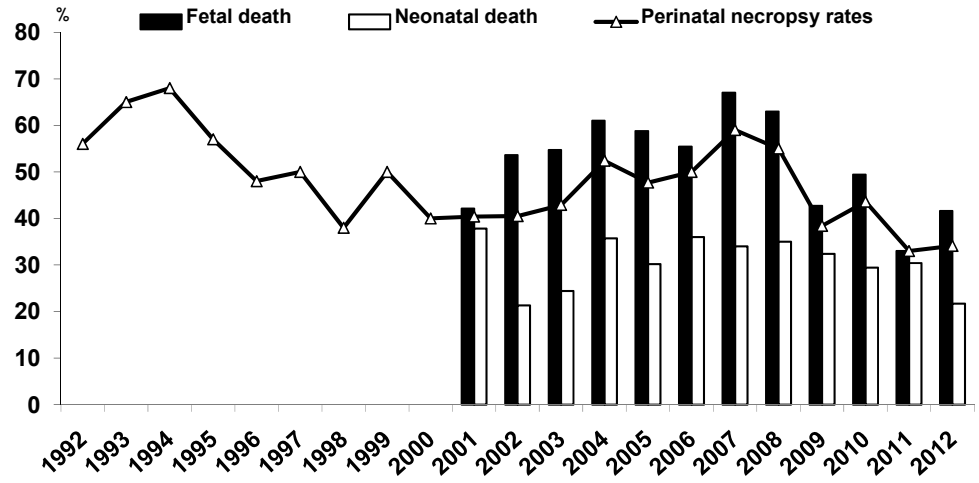

Figure 127: Necropsy rates NWH 1992-2012

Post-mortem is the gold standard investigation for perinatal related death. NWH is fortunate to have access to a world-class perinatal pathology service provided by Drs Kate Bartlett, Kate Strachan and Jane Zuccollo. The post-mortem rate was 34% in 2012, much lower than ideal for a tertiary referral centre.

Small for Gestational Age and Perinatal Related Death

Fetal growth restriction (FGR) was the primary perinatal death classification assigned for only three of the 123 deaths in 2012. This classification is used when there is antenatal diagnosis of FGR or where pre-specified pathological criteria for FGR are identified.

However, 52 percent of all perinatal related deaths in 2012 were found to be SGA at birth defined as birthweight <10th customised centile; comprising 52 percent of fetal deaths and 52 percent of neonatal deaths.

National data from the PMMRC show that fewer than a quarter of non-anomalous SGA infants who are stillborn after 24 weeks of gestation were recognised to be SGA before birth. These data are not available for National Women's. Customised antenatal growth charts (GROW, a free download from www.gestation.net) were developed as a tool to increase detection of SGA infants before birth. A customised antenatal growth chart is now automatically generated for women booked at NWH and fundal heights and estimated fetal weights from any growth scans are automatically recorded on the GROW chart. A recent publication from Adelaide reported that utilisation of GROW in routine practice doubled antenatal detection of SGA infants. (Roex A et al; Aust NZ J Obstet Gynaecol 2012) Antenatal detection has to be accompanied by careful surveillance and timely delivery in order to improve outcomes and a Guideline for management of SGA at NWH and nationally is soon to be released. The recently published RCOG Greentop Guideline on management of SGA also recommends plotting fundal height on a customised growth chart (RCOG Greentop Guideline number 31, February 2013).

Chapter 11

SEVERE MATERNAL MORBIDITY

11 MATERNAL MORTALITY AND SEVERE MORBIDITY

This chapter provides data on maternal deaths and severe maternal morbidities among women giving birth at NW during 2012.

11.1 Maternal Mortality

In 2012 there were no maternal deaths among women who birthed 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.

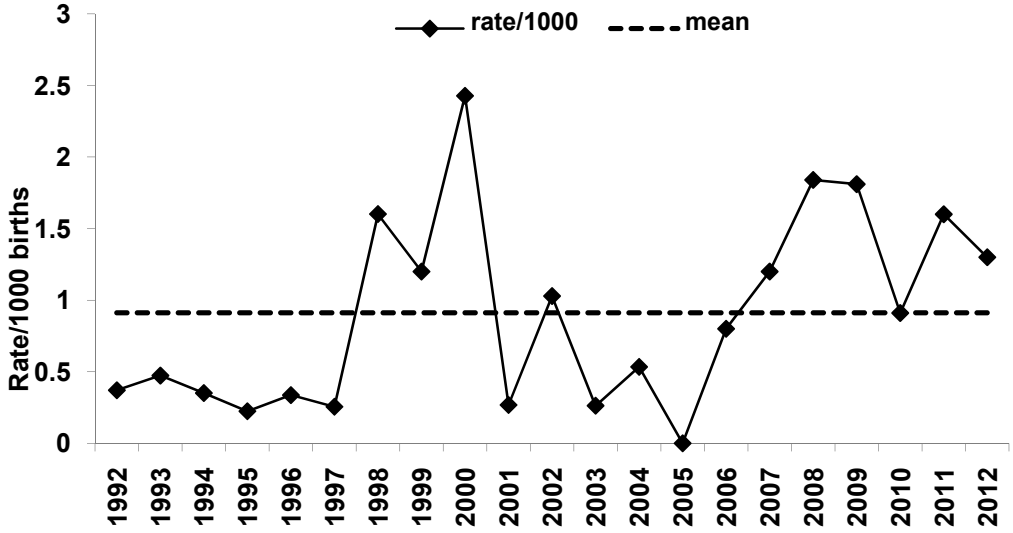

Figure 128: Emergency peripartum hysterectomy rates/1000 births NWH 1992-2012 (horizontal dotted line represents mean rate for 1992-2012)

Findings

There were 11 emergency peripartum hysterectomies in 2012, although one of these occurred prior to 20 weeks so is not included in the 2012 rate (1.3/1000 births), which is consistent with rates over the past 20 years, and is consistent with international rates. In the year 2000, there was a significantly higher rate than in the surrounding years.

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 antenatal pulmonary embolism, amniotic fluid embolism, peripartum hysterectomy, placenta accreta/percreta/increta, rheumatic heart disease in pregnancy, and gestational breast cancer. The conditions collected may vary from year to year. Data collection started in NZ in January 2010.

Table 90: Incidence of AMOSS reportable severe maternal morbidities NWH 2011-2012

	Women birthing 2011 n=7523		Women birthing 2012 n=7695	
Diagnosis	**n**	**per 1000**	**n**	**per 1000**
Antenatal pulmonary embolism	2	0.27	1	0.1
Amniotic fluid embolism	3	0.40	0	
Eclampsia	2	0.27	ND	
Placenta accreta/percreta/increta	10	1.33	11	1.4

ND=not documented

11.3.2 Admission to Intensive Care

In 2012, there were 20 admissions of pregnant (7) and postpartum (within 6 weeks) (13) mothers to the department of critical care medicine (DCCM) or the cardiovascular intensive care unit (CVICU) at Auckland City Hospital. Seventeen of these mothers gave birth at Auckland City Hospital (2.2/1000 mothers). In 2011 there were 19 admissions of mothers who gave birth at Auckland City Hospital (2.5/1000 mothers).

Reasons for admission were pre-existing medical condition (11), postpartum haemorrhage (5), non-obstetric sepsis (2), collapse or seizures (2) and other (2). Of the pre-existing medical conditions, nine were cardiac.

In 2011, there were seven admissions for pre-existing medical condition, six for postpartum haemorrhage, four sepsis, and two other.

Chapter 12

GYNAECOLOGY

12 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

This section documents the IVF and ICSI clinical outcomes from Fertility PLUS in 2012 and a discussion on recent advances in the service.

Table 91: Fertility PLUS IVF/ICSI clinical outcomes NWH 2002-2012

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
mber of cycles started	309	306	316	398	440	458	470	496	468	516	**593**
Number of cycles stopped			41	41	67	63	49	36	30	41	**37**
Percent cycles stopped			13%	10%	15%	12%	10%	7.3%	6.4%	7.9%	**6.2%**
NPSU 2000 benchmark for cycles stopped	10%	10%	10%	10%	10%	10%*	10%*	10%	10%	9%*	**9%***
Number of Cycles reaching Oocyte pick up (OPU)	247	246	275	357	373	405	421	460	438	475	**556**
Number of cycles reaching embryo replacement	201	206	237	304	313	364	369	407	397	433	**486**
Percent cycles reaching embryo replacement			86%	85%	84%	90%	88%	88%	91%	91%	**87%**
NPSU 2002 benchmark for replacement	87%	87%	87%	87%	87%	83%*	83%*	83%	83%	83%*	**83%***
umber of clinical pregnancies	65	67	83	96	124	130	129	138	141	141	**159**
Clinical pregnancy rate/cycle started			26%	24%	28%	28%	27%	28%	30%	27%	**27%**
NPSU 2000 benchmark for clinical pregnancy rate/cycle started	24%	24%	24%	24%	24%	24%*	24%	24%	24%	23%*	**na**
Clinical pregnancy rate/OPU	26%	27%	30%	27%	33%	32%	31%	30%	32%	30%	**29%**
NPSU 2002 benchmark clinical pregnancy rate /OPU	26%	26%	26%	26%	26%	27%*	26%*	28%	28%	26%*	**24%***
Clinical pregnancy rate/embryo replacement	32%	33%	35%	32%	40%	36%	35%	34%	36%	32%	**33%**
Clinical pregnancy rate/embryo replacement (women ≤35yrs with FSH<9)			45%	36%	42%	41%	39%	41%	39%	40%	**37%**
Clinical pregnancy rate/ER in women having single blastocyst transfer.					56%	52%	41%	47%	44%	44%	**44%**
NPSU 2002 benchmark clinical pregnancy rate/embryo replacement	31%	31%	31%	31%	31%	32%*	31%*	31%	31%	31%*	**29%***
Twin pregnancy rate			20%	12.5%	9.6%	10%	5%	9.5%	11%	7.1%	**4.4%**
NPSU 2002 benchmark twin pregnancy rate	<20 %	<20%	<20%	<20%	<20%	<12% *	<10%	<10%	10%	<10%	**<10%**
Clinical pregnancy rate per thawed embryo replacement							32%	23%	33%	27%	**29%**
NPSU benchmark for thawed embryo replacements 2007							23%	23%	23%	24%	**27%***
Twin pregnancy rate after thawed embryo transfer									1%	11%	**3%**
NPSU benchmark for Twin pregnancy rate after thawed embryo transfer									10%	10%	**7.3%**

* All benchmarking figures are from ANZARD and are from the year prior to the clinic data presented

Our outstanding result for 2012 was that Fertility PLUS secured its DHB public contract for fertility treatment. Australian reviewers were asked by the regional DHBs to undertake a review of the Northern Regional Fertility Service (NRFS) and the delivery of fertility services in Auckland for the Northern region. During this review, Fertility PLUS and the two private fertility providers in Auckland were audited and the reviewers' report was used to make a decision about the future provision of public fertility services in Auckland. Fertility PLUS is delighted that the result of this review was that no change would be made to the volume of the Fertility PLUS public contract. The review process was unsettling for staff and it is reassuring to have our good results and processes validated and the dedicated staff made to feel valued.

In 2012 we increased our rate of single embryo transfer (SET) to all ages, in an attempt to further reduce our twinning rate. The Government's SET policy is that all women under 36 years having a first or second publicly funded transfer must only have one good quality embryo transferred. Fertility PLUS strongly recommends SET in all women under 40 having their first embryo transfer. Our twinning rate in 2012 was at a new low level of 4.4% in fresh embryo transfers and 3% in thaw cycles. Fertility PLUS almost always transfers only one embryo in a thaw cycle. This low twinning rate should result in decreased impact on NICU from Fertility PLUS patients.

12.2 Termination of pregnancy

Epsom Day Unit 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 NW, community doctors with a particular interest in family planning, and a small administrative support team.

Epsom Day Unit 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 48hrs later to take the second medication before going home to complete the process at home. 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 2012 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.

The service also offers pregnancy option counselling and post operative termination counselling.

Table 92: Number of terminations NWH 2000-2012

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total number of terminations	5835	5557	5775	5960	5809	5598	5548	5558	5550	5391	5049	4949	4535

Table 93: Number of counselling sessions NWH 2001-2012

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	n	n	n	n	n	n	n	n	n	n	n	n
Post op counselling	51	36	10	22	35	33	23	25	22	33	32	18
Pregnancy option counselling	78	90	70	92	89	87	86	99	102	84	76	64
Declines %	1.9	1.7	2.1	2.5	2.4	2.8	2.2	2.5	2.7	2.8	3.0	2.9

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.

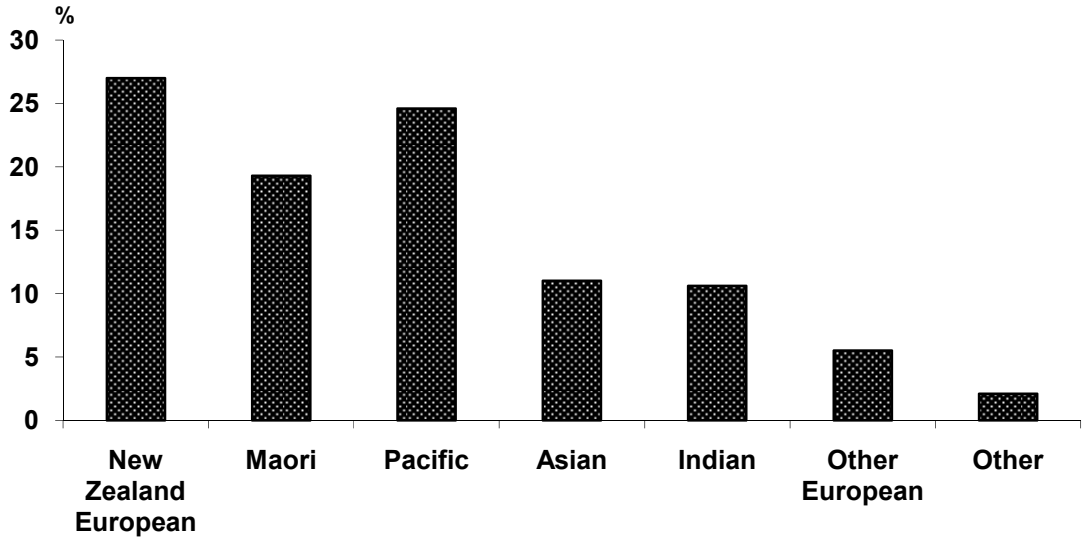

Figure 129: Ethnicity of women having a first trimester termination of pregnancy NWH 2012

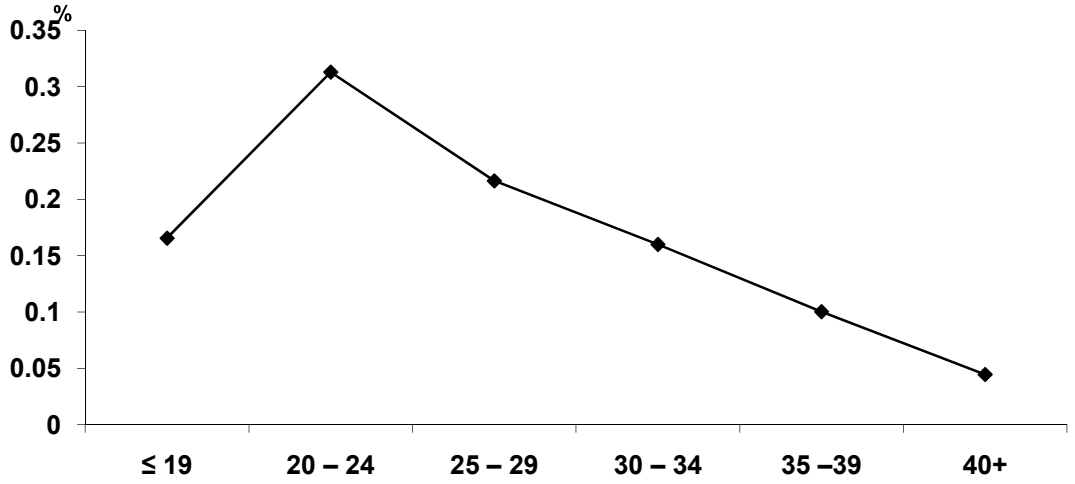

Figure 130: Age of women having a first trimester termination of pregnancy NWH 2012

There has been a 24% reduction in the number of first trimester termination of pregnancy procedures performed at Epsom Day unit over the last 10 years. This reflects either, or a combination of, improved community education and knowledge with respect to planned pregnancy, improved access to family planning services, and subsidised long acting reversible contraceptive methods (including intrauterine devices and sub dermal implant devices). The majority of Jadelle sub dermal implants are inserted at EDU by our nursing staff.

12.3 Second trimester termination of pregnancy

Methods:

This section describes the characteristics and outcomes of women having a second trimester (up to 20 weeks) medical termination of pregnancy.

Findings:

Table 94: Characteristics of women undergoing second trimester medical termination of pregnancy NWH 2009-2012

	2009 N=59		2010 N=46		2011 N=69		2012 N=52	
	n	%	n	%	n	%	n	%
DHB of residence								
Auckland	53	90	37	80	56	81	44	85
Counties Manukau	4	7	3	7	9	13		
Waikato	2	3	0				3	6
Waitemata			3	7	3	4	3	6
Other			3	7	1	1	2	4
Indication for termination of pregnancy								
Fetal anomaly	16	27	21	16	24	35	27	52
Intrauterine death	16	27	7	15	19	28	8	15
Maternal mental health	17	29	14	30	20	29	10	19
Spontaneous rupture of membranes	10	17	4	9	6	9	7	13
Gestation (wks)								
12					1	1	1	2
13			3	7	4	6		
14	9	15	5	11	13	19	3	6
15	4	7	1	2	6	9	6	12
16	11	19	12	26	12	17	10	19
17	11	19	4	9	11	16	11	21
18	14	24	10	22	8	12	8	15
19	10	17	11	24	12	17	13	25
20					1	1		
21					1	1		

Fifty two women had a medical termination of pregnancy between 12 and 19 weeks in 2012.

A decrease in the second trimester service was expected in 2012 as CMDHB established a second trimester termination service for their area.

The most common indications for second trimester medical termination of pregnancy were fetal anomaly and intrauterine death.

Table 95: Clinical details and outcomes of second trimester medical termination NWH 2009-2012

	2009 N=59		2010 N=46		2011 N=69		2012 N=52	
	n	%	n	%	n	%	n	%
Mifegynae	47	80	44	96	64	93	46	88
PV misoprostol	55	93	45	98	68	99	50	96
Oral misoprostol								
Not given	12	20	4	9	23	33	8	15
1 dose	19	32	20	43	26	38	19	37
2 dose	13	22	11	24	9	13	10	19
3 doses	9	15	5	11	5	7	9	20
≥ 4 doses	6	10	6	13	6	9	6	12
Syntocinon infusion	9	15	7	15	6	9	5	10
Manual removal of placenta	6	10	7	15	3	4	3	6
Retained products of conception	1	2	3	7	4	6	6	12
Transfusion	1	2	3	7	0		0	
Nights in hospital								
0	19	32	13	28	39	57	24	46
1	33	56	27	59	26	38	24	46
2-3	6	10	4	9	4	6	3	6
>3	1	2	4	9			1	2

In mid 2011 we introduced the administration of intravenous Oxytocin 10IU post delivery of the fetus to advance delivery of placenta. The drop in the proportion of women who needed to go to theatre for manual removal of the placenta is significant and we will continue monitoring outcomes of this new protocol.

Eighty two percent of women were managed either as a day stay or required one night in hospital.

There were no major complications and no blood transfusions for this patient group in 2012.

12.4 Gynaecology inpatient surgery

Methods:

The data presented in this section are collected in a stand-alone Access database. Data are entered on all 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.) It is the intention of the service that surgical data are entered by the surgeon at point of care, and complications are entered later by the ward clerical staff. The data were compared to data from the PIMS Theatre database and from clinical coding in an attempt to improve accuracy. 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 an 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 2012, there were 1595 admissions to Ward 97 for general gynaecologic surgery; 1528 (95.8%) of these were for primary procedures, 40 (2.5%) were admissions for repeat surgery as a result of complications of surgery at ACH and 27 (1.7%) 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.

Table 96: Primary indication for primary inpatient gynaecologic surgery NWH 2009-2012

	2009* N=1224		2010 N=1569		2011 N= 1628		2012 N=1528	
	n	%	n	%	n	%	n	%
Primary indication for surgery								
Abnormal bleeding, non pregnant	241	19.7	280	17.9	379	23.3	384	25.1
Miscarriage / Termination	246	20.1	419	26.7	343	21.1	301	19.7
Urogynaecology / prolapse	170	13.9	205	13.1	203	12.5	202	13.2
Ovarian cyst	114	9.3	139	8.9	165	10.1	123	8.1
Abscess	56	4.6	73	4.7	72	4.4	60	3.9
Pain, cause unknown	61	5.0	70	4.5	95	5.8	82	5.4
Cancer / Pelvic mass	59	4.8	68	4.3	72	4.4	94	6.2
Endometriosis	100	8.2	116	7.4	98	6.0	94	6.2
Ectopic pregnancy	74	6.1	68	4.3	101	6.2	63	4.1
Infertility	21	1.7	33	2.1	21	1.3	21	1.4
Sterilisation	8	0.7	20	1.3	6	0.4	3	0.2
Other, please specify	74	6.1	78	4.9	73	4.5	101	6.6

* includes admissions for repeat surgery for complications

Abnormal bleeding in the non pregnant patient was the most common cause for gynaecologic surgery again in 2012.

Table 97: Primary surgical procedure and timing of surgery among inpatient primary surgeries NWH 2012

		Timing of surgery			
	Total	Acute		Elective	
	N	n	%	n	%
Total	**1528**	**318**	**20.8**	**1210**	**79.2**
Ovarian and /or tubal surgery	199	87	43.7	112	56.3
Hysteroscopy	325	15	4.6	310	95.4
Evacuation retained products conception	147	115	78.2	32	21.8
Surgical termination of pregnancy	158	1	0.5	157	99.4
Urogynaecology procedure	185	1	0.5	184	99.5
Hysterectomy	171	2	1.2	169	98.8
Diagnostic laparoscopy	96	23	24.0	73	76.0
Endometriosis surgery	80	2	2.5	78	97.5
Other vulval procedure	71	55	77.5	16	22.5
Other uterine/cervical	53	6	11.3	47	88.7
Vaginal procedure	15	2	13.3	13	86.7
Fibroid embolisation	11	0		11	100
Other	17	9	52.9	8	47.1

Table 98: Demographic details of women having inpatient gynaecology surgery NWH 2009-2012

	2009 N=1224		2010 N=1569		2011 N=1628		2012 N=1528	
	n	%	n	%	n	%	N	%
Ethnicity								
NZ European	478	39.1	590	37.6	615	37.8	578	37.8
Maori	133	10.9	174	11.1	167	10.3	154	10.1
Pacific	221	18.1	263	16.8	286	17.6	260	17.0
Other Asian	122	10.0	174	11.1	220	13.5	174	11.4
Indian	95	7.8	125	8.0	124	7.6	137	9.0
Other European	129	10.5	187	11.9	164	10.1	159	10.4
Other	36	2.9	47	3.0	44	2.7	57	3.7
Not stated	10	0.8	9	0.6	8	0.5	9	0.6
Age								
≤20	76	6.2	114	7.3	94	5.7	84	5.5
21-30	235	19.2	356	22.7	361	22.2	312	20.4
31-40	400	32.7	473	30.1	478	29.4	432	28.3
41-50	259	21.2	305	19.4	342	21.0	357	23.4
51-60	127	10.4	146	9.3	191	11.9	170	11.1
>60	127	10.4	175	11.2	161	9.9	170	11.1
Missing							3	0.2
BMI								
<19	27	2.2	47	3.0	59	3.6	44	2.9
19-25	356	29.1	589	37.5	648	39.8	636	41.6
26-30	221	18.1	311	19.8	335	20.6	350	22.9
31-35	114	9.3	178	11.3	196	12.0	203	13.3
>35	204	16.7	239	15.2	287	17.6	251	16.4
Missing	302	24.7	205	13.1	103	6.3	44	2.9
Smoking status								
Currently smoking	179	14.6	260	16.6	288	17.7	267	17.5
Past smoker	118	9.6	177	11.3	215	13.2	185	12.1
Never	675	55.2	988	63.0	1121	68.9	1074	70.3
Unknown	252	20.6	144	9.2	4	0.3	2	0.1
DHB of residence								
Auckland	961	78.5	1231	78.5	1346	82.7	1236	80.9
Counties Manukau	89	7.3	117	7.5	114	7.0	118	7.7
Waitemata	143	11.7	163	10.4	135	8.3	123	8.1
Other	31	2.5	58	3.7	33	2.0	51	3.3

In 2012 18% of patients admitted to currently smoking. Fewer than 1% of smoking status data were missing from the database. It is encouraging to see that data on both BMI and smoking are almost universally collected and are both significant predictors of post surgical complications.
Nineteen percent of patients having gynaecologic surgery are domiciled outside ADHB area.

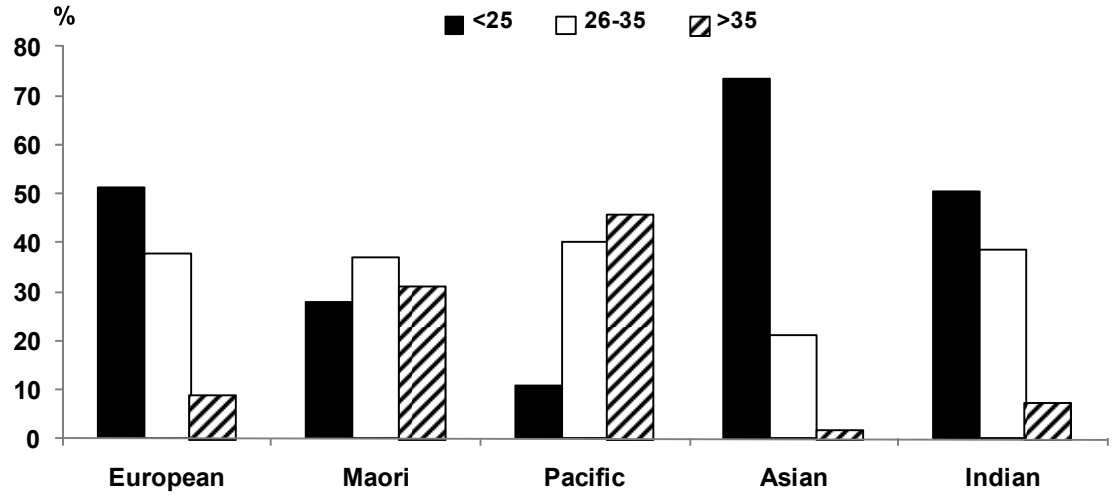

Figure 131: BMI by ethnicity among women having inpatient gynaecology surgery NWH 2012 (missing data removed)

Over 50% of our surgical population in 2012 were over weight and 16% morbidly obese. Data for height and weight were unavailable for only 2.9% of patients in 2012.

Table 99: Intra operative injury NWH 2012

	N=1528	
	n	%
Bladder	7	0.5
Bowel	4	0.3
Ureter	2	0.13
Other	0	

ACHS Gynaecology Indicators: Injury to major viscus		ACHS 2008	ACHS 2009	ACHS 2010	ACHS 2011	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**% (95% CI)**
Numerator	Injury to major viscus, with repair, during or up to 2 weeks post operation	0.38	0.32	0.32	0.40	0.32	0.98	4/1569=0.25	11/1643=0.67	13/1528=0.85 (0.45-1.45)
Denominator	Gynaecological surgeries									

Table 100: Postoperative complications among primary inpatient surgeries by PRIMARY surgical procedure NWH 2012 (note individual complications are not mutually exclusive so do not add to the total in the left-most column)

	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		Other significant complication		Admission to DCCM	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1528**	**177**	**11.6**	**20**	**1.3**	**13**	**0.9**	**43**	**2.8**	**5**	**0.3**	**10**	**0.7**	**94**	**6.2**	**15**	**1.0**	**12**	**0.8**	**3**	**0.2**
Ovarian and /or tubal surgery	199	20	10.1	1	0.5	0		7	3.5	1	0.5	0		11	5.5	0		0		1	0.5
Hysteroscopy	325	19	5.9	8	2.5	0		2	0.6	2	0.6	1	0.3	5	1.5	3	0.9	0		0	
Urogynaecology procedure	185	26	14.1	1	0.5	6	3.2	0		0		3	1.6	12	6.5	3	1.6	5	2.7	0	
Hysterectomy	171	49	28	3	1.8	4	2.3	20	11.7	2	1.2	4	2.3	29	17.0	2	1.2	6	3.5	2	1.2
Surgical termination of pregnancy	158	8	5.1	1	0.6	0		0		0		1	0.6	6	3.8	0		0		0	
Evacuation retained products conception	147	17	11.6	0		0		8	5.4	0		0		8	5.4	3	2.0	0		0	
Diagnostic laparoscopy†	96	13	13.5	1	1.0	2	2.1	2	2.1	0		0		7	7.3	2	2.1	0		0	
Endometriosis surgery	80	7	8.8	1	1.3	0		0		0		0		4	5.0	2	2.5	0		0	
Other vulval procedure	71	5	7.0	1	1.4	0		0		0		0		5	7.0	0		1	1.4	0	
Vaginal procedure	15	2	13.3	0		0		1	6.7	0		0		1	6.7	0		0		0	
Fibroid embolisation	11	1	9.1	0		0		0		0		0		1	9.1	0		0		0	
Other	17	5	29.4	2	11.8	1	5.9	0		0		0		3	17.6	0		0		0	
Other uterine/cervical	53	5	9.4	1	1.9	0		3	5.7	0		1	1.9	2	3.8	0		0		0	

† Includes cases that progressed from diagnostic laparoscopy to therapeutic procedure but where the primary procedure was entered in the database as diagnostic laparoscopy.

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 thrombo-embolic complications (DVT, PE), gastrointestinal complications (ileus, bowel obstruction), fistulae.

Table 101: Complications of surgery by timing of surgery NWH 2012

	Acute admission N=318		Elective admission N=1210	
	n	%	n	%
Any complication	39	12.3	138	11.4
Failure to complete planned procedure	0		20	1.7
Intra operative injury to internal organs	0		13	1.1
Significant post op infection	1	0.3	4	0.3
Anaesthetic complication	2	0.6	13	1.1
Other significant complication	0		12	1.0
Unplanned return to theatre in 6 weeks	0		10	0.8
Admission to DCCM	0		3	0.3
Readmission in 6 weeks	20	6.3	74	6.1
Transfusion	20	6.3	23	1.9

12.5 Gynaecology laparoscopic procedures

Methods

See Gynaecology inpatient surgery, section 12.4. As in all sections 12.4-12.7, procedures performed by the gynaecologic oncology team are excluded.

Table 102: Primary surgery performed, and timing of surgery among women having inpatient primary laparoscopic procedures NWH 2012

Primary procedure	Surgery in 2012 N=341		Acute admission		Elective admission	
	n	%	n	%	n	%
Total	**341**		**85**	**24.9**	**256**	**75.1**
Ovarian/tubal	134	39.3	63	47.0	71	53.0
Diagnostic laparoscopy	85	24.9	19	22.4	66	77.7
Endometriosis surgery	78	22.9	2	2.6	76	97.4
Hysterectomy	31	9.1	0		31	100.0
Other uterine/cervical procedure	2	0.6	0		2	100.0
Hysteroscopy	9	2.6	0		9	100.0
Other	2	0.6	1	50.0	1	50.0

Table 103: Primary indication for surgery by timing of surgery among women having primary inpatient laparoscopic procedures NWH 2012

Primary indication	Surgery in 2012 N=341		Acute admission		Elective admission	
	n	%	n	%	n	%
Total	**341**		**85**	**24.9**	**256**	**75.1**
Endometriosis	85	24.9	3	3.5	82	96.5
Ovarian cyst	66	19.4	18	27.3	48	72.7
Ectopic pregnancy	51	15.0	45	88.2	6	11.8
Pain, cause unknown	69	20.2	16	23.2	53	76.8
Abnormal bleeding	28	8.2	0		28	100
Infertility	16	4.7	0		16	100
Cancer/pelvic mass	14	4.1	1	7.1	13	92.9
Sterilisation	3	0.9	0		3	100.0
Abscess	2	0.6	1	50.0	1	50.0
Urogynaecology / prolapse	2	0.6	0		2	100.0
Other	5	1.5	1	20.0	4	80.0

In 2012, there were 341 laparoscopic procedures, 256 elective and 85 acute procedures. Sixty percent of gynaecologic laparoscopic surgeries in 2012 were for endometriosis, ovarian cysts or ectopic pregnancy.

ACHS Gynaecology Indicators: Injury to MAJOR VISCUS during a laparoscopic procedure		ACHS				NW				
		2008	2009	2010	2011	2008	2009	2010	2011	2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to major viscus during laparoscopic procedure, with repair, during or up to 2 weeks post operation	0.67	0.59	0.51	0.62	1.6	1.6	0	0.95	1/341 =0.29
Denomina tor	Laparoscopic procedures									

Table 104: Complications of primary inpatient gynaecologic laparoscopic surgery NWH 2012

	Total N=341	
	n	%
ANY COMPLICATION	**37**	**10.9**
Blood transfusion	7	2.1
Intra operative injury	1	0.3
Failure to complete procedure	2	0.6
Anaesthetic complications	3	0.9
Significant post-operative infection	0	
Unplanned return to theatre	0	
Admission to DCCM	0	
Readmission to hospital	28	8.2
Post op complications	24	7.0
Planned re admission	3	0.9
Other	1	0.3
Other significant complications	1	0.3

In 2012 there was one major intraoperative injury. This was a day case patient undergoing diagnostic laparoscopy who sustained a stomach puncture by the Verre's needle. The injury was recognised intraoperatively and the stomach was oversewn laparoscopically. The case was reviewed by the gynae review panel who recommended that a naso-gastric tube be considered if there are airway difficulties or prolonged bagging of laparosopic cases.

There were six perioperative blood transfusions (1.8%); two cases with pre-existing anaemia and four associated with haemoperitoneum (three from ruptured ectopic pregnancy and one bleeding from a corpus luteum cyst).

Two cases were not completed as planned; one where a false passage in the cervix was created due to difficult cervical dilatation and as a result a Mirena was not placed, and in the second the case was re-scheduled due to extensive endometriosis with bowel involvement.

There were 29 readmissions following surgery. Twenty of these were related to pain, and the majority of these were seen and discharged from WAU. In three cases, there was a planned review (wound or catheter removal), and in one case seizures were thought to be related to Tramadol. One case represented five days post laparoscopic ovarian cystectomy and omental biopsy with vomiting and abdominal pain and was admitted under the general surgical team. A laparotomy revealed localised infection due to a necrotic pedicle but no bowel injury.

Readmissions are an area where improvement could occur, with enhanced support to patients post discharge from hospital.

12.6 Hysterectomy

Methods

See Gynaecology inpatient surgery, section 12.4.
Hysterectomy data have been obtained from a stand-alone ACCESS database of Ward 97 inpatient gynaecologic surgery procedures. This section does not include hysterectomies performed within the Gynaecologic Oncology team, or hysterectomy cases done from another hospital ward or under the care of other services (eg urology). Hysterectomy cases were cross-referenced against PIMS Theatre and against coding data to ensure a complete set from Ward 97 was obtained.

Findings

Table 105: Characteristics of women undergoing hysterectomy (excluding gynaecologic oncology) NWH 2012

	N=175	
	n	%
Age		
≤20	0	
21-30	1	0.6
31-40	37	21.7
41-50	85	48.6
51-60	28	16.0
>60	24	13.7
Ethnicity		
NZ European	62	35.4
Maori	16	9.1
Pacific	28	16.0
Other Asian	23	13.1
Indian	22	12.6
Other European	21	12.0
Other	2	1.1
Not Stated	1	0.6
District Health Board of residence		
Auckland	158	90.3
Counties Manukau	6	3.4
Waitemata	7	4.0
Other	4	2.3
BMI		
<18.5	2	1.1
18.5-24.99	51	29.1
25-29.99	54	30.9
30-34.99	37	21.1
35-39.99	19	10.9
>=40	12	6.7
Missing	0	
Smoking		
Currently smoking	29	16.6
Past smoker	23	13.1
Never smoked	123	70.3
Unknown	0	

The ethnicity of the women undergoing hysterectomy in 2012 does not reflect the ethnicity of the population who reside within the AHDB. The proportion of women who underwent hysterectomy who are NZ European is lower (35%) compared to 52% in the ADHB region. This may be due to higher proportions of NZ European women who seek private medical care. Seventy percent of women who underwent hysterectomy had a BMI ≥ 25 and 31 women (18%) had a BMI ≥35. There were five women who had a hysterectomy who were aged < 35 and the reasons were failed

medical treatment in three women and one woman with post caesarean section pain syndrome and one woman with gender dysphoria syndrome.

Table 106: Surgical details of hysterectomies (excluding gynaecologic oncology) NWH 2009-2012

	2009 N=162		2010 N=173		2011 N=166		2012 N=175	
	n	%	n	%	n	%	N	%
Approach								
Laparotomy	104	63	90	52.0	107	64.5	107	61.1
Total laparoscopic hysterectomy	9	6	20	11.6	15	9.0	24	13.7
Laparoscopic assisted vaginal	7	4	15	8.7	12	7.2	8	4.6
Laparoscopic converted to laparotomy	5	3	2	1.2	3	1.8	6	3.4
Vaginal	37	23	46	26.6	29	17.5	30	17.1
Timing of surgery								
Elective	155	96	170	98.3	164	98.8	173	98.9
Acute	7	4	3	1.7	2	1.2	2	1.1
Primary indication for surgery								
Abnormal bleeding, non pregnant	72	44	76	43.9	75	45.2	84	48.0
Cancer /pelvic mass	40	24	37	21.4	37	22.3	43	24.6
Urogynaecology / prolapse	24	15	41	23.7	25	15.1	21	12.0
Pain, cause unknown	4	2	2	1.2	6	3.6	8	4.6
Endometriosis	6	4	9	5.2	5	3.0	5	2.9
Ovarian cyst	9	6	3	1.7	12	7.2	6	3.4
Other	7	4	5	2.9	6	3.6	8	4.6
ASA rating								
1	51	31	58	33.5	57	34.3	65	37.1
2	71	44	72	41.6	81	48.8	86	49.1
3	9	6	24	13.9	20	12.1	17	9.7
5	0		0		0		0	
Missing	31	19.1	19	11.0	8	4.8	7	4.0
Length of stay	**Median**	**(IQR)**	**Median**	**(IQR)**	**Median**	**(IQR)**	**Median**	**(IQR)**
All hysterectomies	4	(3-5)	4	(3-5)	4	(3-5)	3	(3-4)
By approach:								
Laparotomy	4	(4-5)	4	(3-5)	4	(4-5)	3	(3-4)
Laparoscopy	3	(2-3)	3	(2-4)	3	(3-5)	3	(2-3.5)
Vaginal	3	(3-4)	3	(3-4)	3	(2-3)	3	(2-4)

Although the preferred route of hysterectomy is vaginal, the rates of abdominal hysterectomy have not declined for the past eleven years. Further audits of the reasons for the high rates of the abdominal approach should be undertaken taking into account the underlying pathology including the size of the uterus.

Table 107: Route of hysterectomy among non-malignant hysterectomies NWH 2002-2012

	2002 N=208		2003 N=187		2005 N=161		2006 N=131		2007 N=189		2008 N=150		2009 N=162		2010 N=173		2011 N=166		2012 N=175	
			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Abdominal	113	54.3	100	53.5	86	53	81	61.8	109	57.7	88	58.7	109	67	92	53.2	110	66.3	113	64.6
Vaginal	72	34.6	63	33.7	54	34	36	27.5	67	35.4	45	30.0	37	23	46	26.6	29	17.5	30	17.1
Laparoscopic	23	11.1	24	12.8	21	13.0	14	10.7	13	6.9	17	11.3	16	10	35	20.2	27	16.3	32	18.3

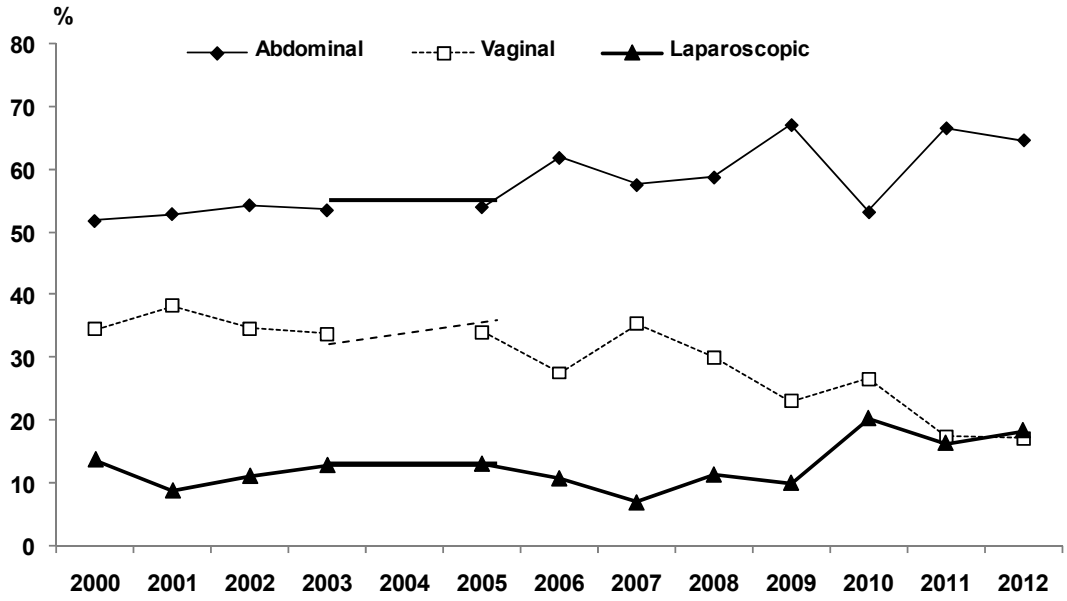

Figure 132: Route of hysterectomy among non malignant hysterectomies NWH 2000-2012

ACHS Gynaecology Indicators: Injury to URETER during a LAPAROSCOPIC HYSTERECTOMY		ACHS				NW				
		2008	2009	2010	2011	2008	2009	2010	2011	2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to ureter during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	0.57	0.23	0.18	0.066	0/17	0/16	0	0/27	0/32
Denominator	Laparoscopic hysterectomy procedures									

ACHS Gynaecology Indicators: Injury to BLADDER during a LAPAROSCOPIC HYSTERECTOMY		ACHS				NW				
		2008	2009	2010	2011	2008	2009	2010	2011	2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to bladder during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	0.48	0.78	0.64	0.27	0/17	0/16	0	0/27	0/32
Denominator	Laparoscopic hysterectomy procedures									

No cases of bladder or ureteric injury were reported in the past five years of laparoscopic hysterectomy.

Table 108: Complications of surgery among women undergoing hysterectomy (excluding gynaecologic oncology) NWH 2010-2012

	2010 N=173		2011 N=166		2012 N=175	
	n	%	n	%	n	%
Any complication	**45**	**26.0**	**48**	**28.9**	**50**	**28.6**
Blood transfusion	18	10.4	14	8.4	19	10.9
Intraoperative injury	2	1.2	7	4.2	4	2.3
Anaesthetic complications	2	1.2	1	0.6	2	1.1
Significant postoperative infection	5	2.9	5	3.0	2	1.1
Other significant complications	11	6.4	8	4.8	6	3.4
Unplanned return to theatre	7	4.1	8	4.8	3	1.7
Admission to DCCM	2	1.2	2	1.2	2	1.1
Readmission to hospital for postoperative complications	19	11.0	29	17.5	30	17.1
Failed to complete planned surgery	1	0.6	2	1.2	3	1.7

The blood transfusion rate in 2012 continues to be high (10.9%) and is not explained by high BMI as only 7 of the 50 hysterectomies had a BMI ≥35 (see below). The proportion of women with any complications has not changed over the past three years. The intraoperative injuries in 2012 included two bowel injuries and two bladder injuries. There were no ureteric injuries in 2012. There were three patients with an unplanned return to theatre. One patient with a BMI of 37 required four returns to theatre for fasciotomy of the calf for an acute compartment syndrome. There were two anaesthetic complications including one patient who required a blood patch for post dural puncture headache. There were three cases where there was a failure to complete the planned surgery; in two women a subtotal hysterectomy was completed instead of a total abdominal hysterectomy and in one women a vaginal hysterectomy was converted to an abdominal hysterectomy.

Of the 175 who underwent hysterectomy in 2012, 31 (18%) had a BMI ≥35. Of women with BMI ≥35, 7 (29%) had a blood transfusion, 1 (3%) had an intraoperative injury, 2 (6%) had an anaesthetic complication, 2 (6%) had an unplanned return to theatre and 6 (25%) had a readmission. The indications for hysterectomy were abnormal bleeding in 8, pelvic mass in 4 and urogynaecology in 3.

Summary / Implications

Further audits of the reasons for the increasing rate of abdominal hysterectomy and the high proportion of women requiring blood transfusion should be undertaken.

12.7 Urogynaecology

Methods

As in previous annual clinical reports, the section on urogynaecology will concentrate on operative procedures, rather than clinic throughput or urodynamic investigations.

From the gynaecology surgical database, urogynaecologic procedures have been identified using the surgical audit forms submitted for each operative case. In 2012, urogynaecology procedures are 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

	N=212	
	n	%
Age		
≤ 30	1	0.5
31-40	12	5.7
41-50	40	18.9
51-60	61	28.8
>60	98	46.2
Ethnicity		
NZ European	115	54.3
Maori	17	8.0
Pacific	17	8.0
Other Asian	13	6.1
Indian	8	3.8
Other European	32	15.1
Other	9	4.3
Not stated	1	0.5
District Health Board of residence		
Auckland	175	82.6
Counties Manukau	11	5.2
Waitemata	13	6.1
Other	13	6.1
BMI		
<18.5	2	0.9
18.5-24.99	65	30.7
25-29.99	70	33.0
30-34.99	50	23.6
35-39.99	11	5.2
>=40	14	6.6
Smoking		
Currently smokes	19	9.0
Past smoker	31	14.6
Never smoked	162	76.4
Length of stay Median (IQR)	2	(1-3)

In 2012, 212 women had a urogynaecology procedure as a primary admission. A further 24 urogynaecology procedures were performed as post discharge procedures, 23 after primary procedures at ACH and 1 after a primary procedure at another hospital.

Of the 212 primary admissions, there were 115 TVTs, 22 mesh repairs, 110 prolapse repairs, and 56 other urogynaecology procedures. Fifty five women had two urogynaecology procedures and 5 had three procedures at primary surgery.

Twenty one 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		ACHS				NW				
		2008	2009	2010	2011	2008	2009	2010	2011	2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**% (95%CI)**
Numerator	Injury to major viscus during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	1.03	0.81	0.85	0.80	1.2	2.3	0.5	0.9	**7/212=3.3 (1.3-6.7)**
Denominator	Pelvic floor repair procedures*									

* includes isolated incontinence procedures

ACHS Gynaecology Indicators: Injury to URETER during a pelvic floor repair procedure		ACHS				NW				
		2008	2009	2010	2011	2008	2009	2010	2011	2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**% (95%CI)**
Numerator	Injury to ureter during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	0.55	0.046	0.037	0.16	0	0	0	0	**2/212=0.9**
Denominator	Pelvic floor repair procedures*									

* includes isolated incontinence procedures

ACHS Gynaecology Indicators: Injury to BLADDER during a pelvic floor repair procedure		ACHS				NW				
		2008	2009	2010	2011	2008	2009	2010	2011	2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**% (95%CI)**
Numerator	Injury to bladder during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	0.94	0.37	0.48	0.40	0.6	2.3	0.5	0.9	**4/212=1.9 (0.5-4.8)**
Denominator	Pelvic floor repair procedures*									

* includes isolated incontinence procedures

Table 110: Complications of primary urogynaecologic surgery procedures NWH 2012

	N=212	
	n	%
Total complications	**33**	**15.6**
Blood transfusion	0	
Intra-operative injury to internal organs	7	3.3
Failure to complete planned surgery	1	0.5
Anaesthetic complications	3	1.4
Significant postoperative infection	2	0.9
Other significant complications	6	2.8
Unplanned return to theatre	6	2.8
Admission to DCCM	1	0.5
Readmission to hospital	29	13.7
Postoperative complication	16	7.5
Planned re-admission	11	5.2
Other	2	0.9

The complications summarised in the table above were seen in a total of 33 women who underwent urogynaecology surgery. As the figures indicate, some individuals had more than one complication recorded.

The urogynaecology case mix has been similar to previous years, however following the controversy in the United States we are now more cautious using mesh for vaginal prolapse surgery.

The operative complications have been analysed.

Intraoperative complications include four patients with cystotomy during dissection. These were all patients who were having repeat surgery for prolapse. All cystotomies were repaired without complication. One patient had a TVT needle perforation which was identified and resited during the procedure without any complication.

There was one case of bowel perforation during a resection which was repaired without further complication.

There were two cases of ureter injury. The first case involved kinking of the ureter which was identified during the check cystoscopy. The sacrospinous sutures were released to restore normal ureteric function. The second case involved ureteric obstruction following removal of anterior mesh which had eroded into the bladder. This required reimplantation.

Haemorrhage was the feature of two cases. One involved a vaginal hysterectomy which was converted to an abdominal hysterectomy. This resulted in a wound infection which required five more operative procedures to change dressings before satisfactory recovery. In the second case the planned anterior repair which was initially to involve mesh was abandoned and a conventional repair using absorbable sutures performed instead. There was no blood transfusion required in either case.

There were three cases of readmission following vaginal hysterectomy, one each for vault haematoma requiring drainage, one for vault infection treated with intravenous antibiotics and one for excision of granulation tissue from the vaginal vault.

There were a further twenty patients seen in Women's Assessment Unit during the post-operative stage which count as readmissions in the statistics. Six of these were

for removal of catheter and 14 for other causes including discharge, pain or constipation.

There were five readmissions for release of tension free vaginal tape procedures due to voiding dysfunction. There were 115 TVT procedures performed during the year giving an approximate release rate of 4.3%. Women are usually counselled of a 5% chance of voiding dysfunction following a tension free vaginal tape procedure, although not all of these will require release of tape.

The one patient who spent time in surgical HDU (DCCM) had a vaginal repair along with hysterectomy for severe endometriosis. The hysterectomy involved an urologist and general surgeon along with the gynaecologist. She was returned to theatre for an exploratory laparotomy, although no specific further surgery was required.

12.8 Enhanced Recovery in Gynaecology (ERAS)

Methods

In April 2012, a multidisciplinary team was convened to explore length of stay for gynaecology elective surgery inpatients, and then to plan implementation of an enhanced recovery or fast track surgery program. It was anticipated that enhanced recovery would improve quality of care and outcomes for gynaecology patients as well as reducing length of stay.

The principles of enhanced recovery include optimization of preoperative preparation; surgical and anaesthetic procedures with an emphasis on nausea and vomiting prophylaxis, regional anaesthesia, and intravenous fluid management; and postoperative care including early mobilization, early oral fluids and food, limited use of narcotic analgesia, laxative therapy and early discharge.

Enhanced recovery was formally commenced on October 1, 2012, in Ward 97 for oncology and general gynaecology elective hysterectomy (all approaches) and laparotomy patients.

Data were collected by questionnaire, clinical record audit and from hospital discharge data to evaluate the impact of enhanced recovery.

Findings

A patient satisfaction survey was completed by 30 patients prior to implementation and 30 patients following implementation. There were no significant changes in patient satisfaction with implementation of enhanced recovery, but there was a significant reduction in the occurrence of difficulty concentrating, hallucinations, and constipation after implementation of ERAS.

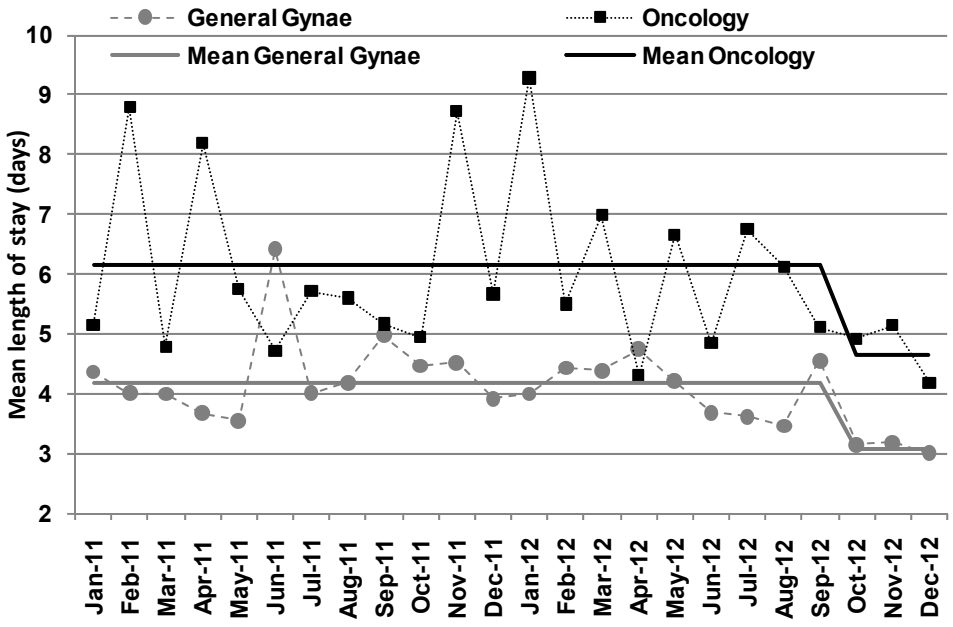

Figure 133: Monthly mean length of stay for elective oncology and general gynaecology hysterectomy and laparotomy patients NWH Ward 97 2011-2012

There was a significant reduction in length of stay of more than one day for general gynaecology and oncology patients from prior to after implementation of ERAS.

There was no significant increase in readmission for any reason in the 6 weeks post surgery.

Implications

Enhanced recovery was successfully implemented in Ward 97. Further work is continuing to customise clinical notes for ERAS in gynaecology (using the template developed by the colo-rectal ERAS team at Auckland City Hospital) and the outcomes continue to be evaluated.

There is interest in implementation of ERAS across other sub-disciplines in gynaecology and for elective Caesarean section.

12.9 Colposcopy

Methods:

The data presented in this section were collected directly into the new Colposcopy database (Solutions Plus). As this database was introduced in July 2012, only data from July – December 2012 are included in this report.

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:

Table 111: Demographic details of women having an initial colposcopic examination in NWH 2009-2012

	Initial colposcopy in 2009 N=993		Initial colposcopy in 2010 N=1214		Initial colposcopy in 2011 N=1289		Initial colposcopy In July-Dec 2012 N=759	
	n	%	n	%	n	%	n	%
Ethnicity								
NZ European	427	43.0	543	44.7	569	44.1	305	40.2
Maori	95	9.6	113	9.3	121	9.4	51	6.7
Pacific	104	10.5	109	9.0	126	9.8	83	10.9
Other Asian	158	15.9	198	16.3	198	15.4	112	14.8
Indian	37	3.7	63	5.2	56	4.3	45	5.9
Other European	131	13.2	145	11.9	180	14.0	139	18.3
Other	20	2.0	16	1.3	14	1.1	24	3.2
Not stated	21	2.1	13	13	25	1.9	0	
Age (yrs)								
≤20	28	2.8	29	2.4	40	3.1	10	1.3
21-30	422	42.5	422	34.8	535	41.5	312	41.1
31-40	245	24.7	389	32.0	374	29.0	199	26.2
41-50	195	19.6	218	18.0	189	14.7	128	16.9
51-60	76	7.7	106	8.7	108	8.4	87	11.5
>60	27	2.7	50	4.1	43	3.3	23	3.0
Smoking status								
Currently smoking	228	23.0	266	21.9	279	21.6	64	8.4
Not currently smoking	757	76.2	943	77.7	981	76.1	174	22.9
Unknown	8	0.8	5	0.4	29	2.3	521	68.6
Referral to smoking cessation	223	22.5	255	21.0	259	20.1	NA	NA
DHB of residence								
Auckland	927	93.4	1131	93.2	1188	92.2	709	93.4
Counties Manukau	18	1.8	25	2.1	22	1.7	14	1.8
Waitemata	33	3.3	39	3.2	48	3.7	25	3.3
Other	15	1.5	49	4.0	31	2.4	11	1.4

NA=not available

The referrals from outside ADHB reflect the tertiary referral status, and are often those who require input from the gynaecological oncologists.

The number of women under 20 appears to have fallen, although it is still disappointing that referrers are not following National Guidelines, which are that screening should not be performed before the age of 20.

The smoking data are incomplete and reflect that this is not a mandatory field in the database and this will be addressed at the next upgrade of the new database at the end of 2013.

Colposcopy Standards: Documentation of adequacy of examination		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012
	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
Denominator	All colposcopic examinations						

Table 112: Documentation of adequacy of colposcopic examination by type of colposcopic visit NWH July-Dec 2012

	Total N=1128		Follow up visit N=291		Initial visit N=759	
	n	%	n	%	n	%
Satisfactory examination	969	85.9	234	80.4	669	88.1
Unsatisfactory examination	131	11.6	41	14	79	10.4
Not applicable	28	2.5	16	5.5	11	1.4
Incomplete documentation	0	0	0	0	0	0

Introduction of the mandatory field in the electronic database has led to complete documentation and for the first time, meets the standard.

Table 113: Clinical characteristics of women presenting for initial colposcopy NWH July-Dec 2012

	Initial visit N=759	
	n	%
Referral reason		
Abnormal Screening Smear	529	69.7
Bleeding	41	5.4
Abnormal Smear After Colposcopy	38	5.0
Unusual Appearing Cervix	53	7.0
Clinically Suspicious Cervix	6	0.8
Positive(+ve) Hr HPV test (LG Reflex/History)	86	11.3
Other	6	0.8
Referral smear cytology		
Invasive	7	0.9
High grade	221	29.1
Low grade	418	55.1
Atypical Glandular	9	1.2
Unsatisfactory	2	0.3
Other	3	0.4
Normal	91	12.0
No smear Taken	8	1.1
Invasive	7	0.9

Table 114: Histology of biopsy at initial examination NWH July-Dec 2012

	Initial visit biopsies N=759	
	n	%
Invasive	2	0.3
High Grade	106	14.0
Low Grade	104	13.7
Dysplasia NOS	21	2.8
HPV	73	9.6
Inflammation	45	5.9
VAIN	4	0.5
Insufficient sample	13	1.7
Normal	83	10.9
No biopsy taken	308	40.6

Colposcopy Standards: Biopsy rate in women with high grade cytology		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Biopsy taken	>95	76	76	80	82	83.3
Denominator	Women referred with high grade cytology for initial colposcopy examination						

Table 115: Histological diagnosis (biopsy at initial colposcopy) by referral smear cytology NWH July-Dec 2012

Referral smear cytology	Total Colposcopies	Histological diagnosis																	
		No biopsy		Invasive		High Grade		Low Grade		Dysplasia NOS		Condyloma/ inflammation		HPV		VAIN		Insufficient Sample		Normal	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**759**	**308**	**40.6**	**2**	**0.3**	**106**	**14.0**	**104**	**13.7**	**21**	**2.8**	**45**	**5.9**	**73**	**9.6**	**4**	**0.5**	**13**	**1.7**	**83**	**10.9**
Invasive	7	4	57.1	0		1	14.3	0		1	14.3	0		0		1	14.3	0		0	
High grade	221	37	16.7	2	0.9	86	38.9	33	14.9	12	5.4	7	3.2	22	10.0	1	0.5	4	1.8	17	7.7
Low grade	418	178	42.6	0		17	4.1	68	16.3	5	1.2	35	8.4	47	11.2	2	0.5	9	2.2	57	13.6
Atypical glandular	9	4	44.4	0		2	22.2	0		0		0		0		0		0		3	33.3
Unsatisfactory	2	2	100	0		0		0		0		0		0		0		0		0	
Other	3	3	100	0		0		0		0		0		0		0		0		0	
Normal	91	74	81.3	0		0		2	2.2	3	3.3	3	3.3	4	4.4	0		0		0	
No Smear	8	6	75.0	0		0		1	12.5	0		0		0				0		1	12.5

The biopsy rate for high grade patients continues to rise, which is encouraging. However on initial analysis it is still short of the 95% target. Detailed analysis of the 37 outliers however does provide an explanation and only 6 patients (2.7%) actually had no documented reason for the lack of biopsy with a high grade referral smear. 4 patients were not biopsied because they were pregnant, 5 had excision biopsy following the colposcopy, 1 had an ECC but was not captured in the initial data, 1 had oestrogen and then biopsy at the next visit and 1 could not tolerate the procedure.

The largest group of 18 patients had normal colposcopies. All of these 18 had repeat smears which were low grade. Seventeen of the 18 initial smears were ASC-H and only 1 was HSIL. One explanation for this is that the initial smears were overcalled.

Colposcopy Standard: Predictive value of a colposcopic high grade diagnosis		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	High grade histology	65	65	55	56	52	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 July-Dec 2012

Colposcopic diagnosis	Total Colposcopies	Histological diagnosis																	
		No biopsy		Invasive		High Grade		Low Grade		Dysplasia NOS		Condyloma/ inflammation		HPV		VAIN		Insufficient Sample		Normal	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**759**	**308**	**40.6**	**2**	**0.3**	**106**	**14.0**	**104**	**13.7**	**21**	**2.8**	**45**	**5.9**	**73**	**9.6**	**4**	**0.5**	**13**	**1.7**	**83**	**10.9**
Invasive	4	0		0		3	75.0	0		1	25.0	0		0		0		0		0	
High grade	116	3	2.6	1	0.9	65	56.0	20	17.2	4	3.4	3	2.6	13	11.2	0		2	1.7	5	4.3
Low grade	329	51	15.5	0		32	9.7	78	23.7	8	2.4	38	11.6	50	15.2	0		9	2.7	63	19.1
Condyloma/ inflammation	10	2	20.0	0		3	30.0	0		1	10.0	0		2	20.0	0		0		2	20.0
Other	56	28	50.0	1	1.8	3	5.4	6	10.7	5	8.9	1	1.8	5	8.9	0		2	3.6	5	8.9
Normal	233	215	92.3	0		0		0		2	0.9	3	1.3	3	1.3	2	0.9	0		8	3.4
Did not perform	2	2	100.0	0		0		0		0		0		0		0		0		0	
Vaginal colposcopy	9	7	77.8	0		0		0		0		0		0		2	22.2	0		0	

Colposcopic prediction of high grade disease has improved compared to the past 3 years, but still does not meet the standard. Also nearly 10% of patients predicted colposcopically to have low grade disease, actually had high grade histology on biopsy. Introduction of the photographic record with the new system will allow for self audit and peer review and hopefully will lead to improved colposcopic accuracy

Table 117: Histological diagnosis (biopsy at initial colposcopy) by referral reason NWH July-Dec 2012

Colposcopic diagnosis	Total Colposcopies	Histological diagnosis																	
		No biopsy		Invasive		High Grade		Low Grade		Dysplasia NOS		Condyloma/ inflammation		HPV		VAIN		Insufficient Sample		Normal	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**759**	**308**	**40.6**	**2**	**2.0**	**106**	**14.0**	**104**	**13.7**	**21**	**2.8**	**45**	**5.9**	**73**	**9.6**	**4**	**0.5**	**13**	**1.7**	**83**	**10.9**
Abnormal Screening Smear	529	174	32.9	2	0.4	100	18.9	76	14.4	16	3.0	32	6.0	60	11.3	3	0.6	8	1.5	58	11.0
Positive HR HPV test	86	40	46.5	0		2	2.3	16	18.6	1	1.2	6	7.0	7	8.1	0		3	3.5	11	12.8
Abnormal Smear After Colposcopy	38	11	28.9	0		4	10.5	6	15.8	1	2.6	3	7.9	3	7.9	0		2	5.3	8	21.1
Unusual Appearing Cervix	53	40	75.5	0		0		1	1.9	1	1.9	3	5.7	3	5.7	0		0		5	9.4
Bleeding	41	35	85.4	0		0		4	9.8	0		1	2.4	0		0		0		1	2.4
Clinically Suspicious Cervix	6	5	83.3	0		0		0		1	16.7	0		0		0		0		0	
Other	6	3	50.0	0		0		1	16.7	1	16.7	0		0		1	16.7	0		0	

Once again the “unusual appearing cervix” is not a good predictor of high grade disease, as most of these referrals were ectropions, cervical polyps or Nabothian follicles. Previously these were given higher priority at triage, but if the smear is normal this is not warranted, and this is now reflected in our triage policies.

Table 118: Cervical treatments NWH 2008-2012

	2008 N=212		2009 N=199		2010 N=198		2011 N=236		2012 N=133	
	n	%	n	%	n	%	n	%	n	%
LLETZ	197	92.9	187	94.0	185	92.9	220	93.2	118	88.7
Cold knife cone	11	5.2	9	4.5	11	5.6	16	6.8	11	8.3
Diathermy	2	1.0	1	0.5	0		0			
Hysterectomy	1	0.5	1	0.5	2	1.0	0		1	0.8
Laser ablation	0		1	0.5	1*	0.5	0			
Laser cone	1	0.5	0		0		0			
Other									3	2.3

Eighty-seven percent of LLETZ were performed under local anaesthetic, which although is just outside of the BSCCP 90% standard, is well within the revised NZ standard of 80%.

However 12.7% of those treated were under the age of 25. It is hoped that this proportion will fall if patients are enrolled into the upcoming PRINCESS study, which is looking at conservative management of CIN2 in women under 25, as is known that up to 2/3rds of these lesions could resolve spontaneously, potentially avoiding the detrimental effects of treatment. However department policy remains that no patient under 25 is treated without MDM review of their histology and cytology.

12.9.1 Waiting times for first appointment/DNA rates (Data from NSU monthly data reports) NWH 2009-2012

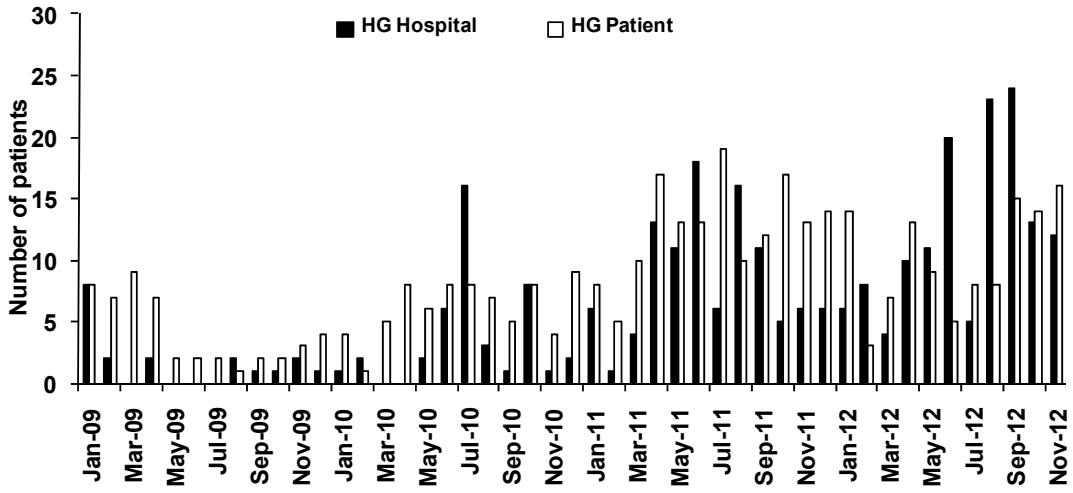

Figure 134: High grade referrals outside NSU Targets NWH 2009-2012: Hospital vs patient related delays

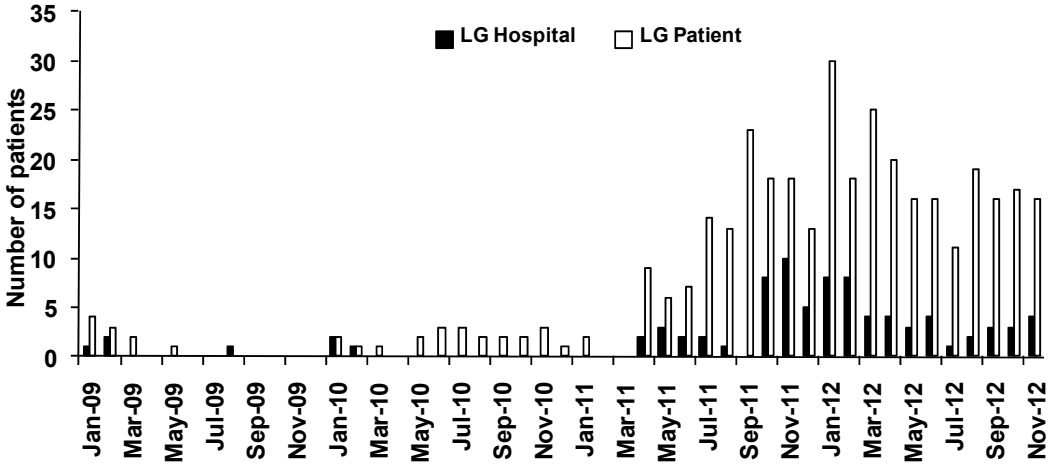

Figure 135: Low grade referrals outside NSU Targets NWH 2009-2012: Hospital vs patient related delays

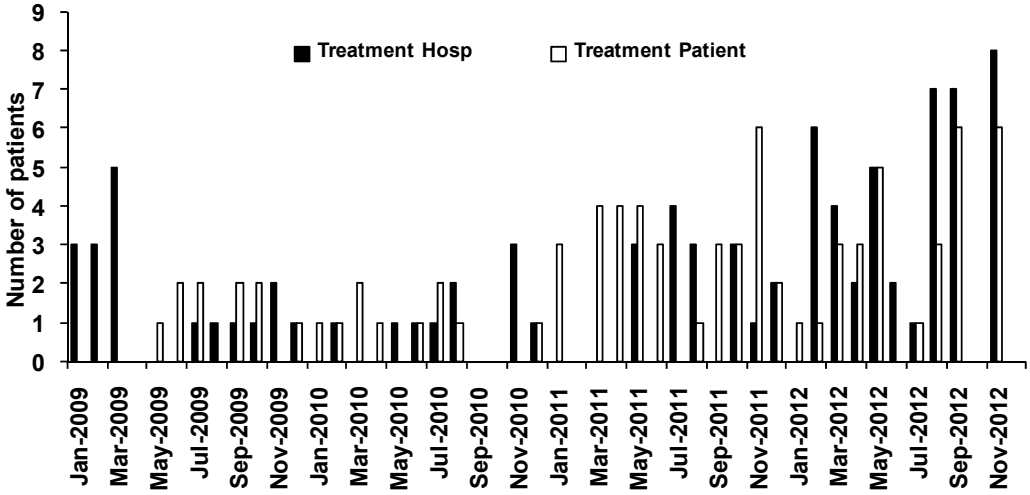

Figure 136: Treatments outside NSU Targets NWH 2009-2012: Hospital vs patient related delays

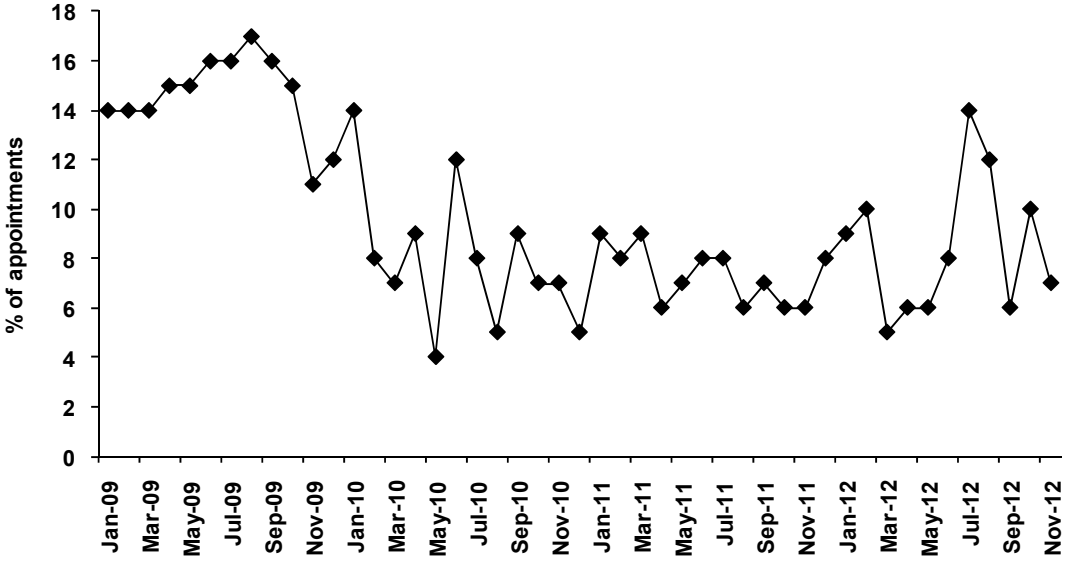

Figure 137: Patient did not attend (DNA) Rate NWH 2009-2012

Summary

The workload of the Colposcopy Unit has increased again this year. Although the low grade waiting times for which the hospital is responsible, have fallen, the high grade and treatment waiting times have increased. This is due to the increase in referrals, the need to initially reduce clinics to allow for the introduction of the database and loss of FTE. In 2013 the FTE will be increased and hopefully these issues will be resolved.

Treatment deadlines can be impacted upon by delay in MDM review, and given the increasing numbers of referrals to the monthly colposcopy MDM, adequate planning in cytology and histopathology FTE is paramount.

The DNA rate has remained stable and is well below the National target of 15%. A recent TI audit has shown the value of the patient liason worker, who successfully returns approximately two-thirds of missing patients to the clinic.

Diagnostic accuracy has improved this year, although is still below the standard. The introduction of a photographic record will allow peer review and facilitate self audit to improve diagnostic accuracy.

The introduction of Solutions Plus was a major step forward for the Colposcopy department and brings ADHB in line with the majority of other DHBs, in whom the system has been active for some time. It provides a failsafe mechanism and enables direct peer review of images. It has already led to an improvement in quality, by identifying some basic flaws, that previously were far more difficult to detect and providing photographic records, which can be viewed at case discussions in MDMs.
By the end of 2013 it is anticipated that all reporting to the NCSP will be electronic via the system, which will greatly reduce the pressure on clerical staff.
It has also provided an audit tool which automates feedback to RANZCOG, via the C-QUIP portal, enabling colposcopists to maintain accreditation without manual collection of data, saving valuable clinical time.
Although many people were responsible for achieving this aim over the past 2 years, in particular I would like to thank Pam Cunningham (Colposcopy FASA), without whom this project would not have succeeded.

Looking forward to 2013 it is hoped that an increase in FTE will help with capacity and bring waiting times back into line. It is hoped that the Auckland arm of the PRINCESS trial will start to recruit. Ethical approval has been granted and is awaiting Maori review. This trial has been active elsewhere in New Zealand over the past 3 years and the addition of ADHB patients will lead to much faster accrual of patients nationwide and answer an important clinical question.

12.10 Gynaecologic oncology surgical services

Methods

The data in this 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.

Table 119: Primary site of Gynaecologic Oncology cases, including MDM (Multidisciplinary meeting) reviewed cases and surgical cases NWH 2010-2012

	Total 2010 N=707		Total 2011 N=681		Total 2012 N=749	
	n	%	n	%	n	%
Primary site						
Ovary	194	27.4	204	30.0	185	24.7
Uterus	78	11.0	31	4.6	46	6.1
Endometrium	192	27.2	170	25.0	190	25.4
Cervix	81	11.5	83	12.2	114	15.2
Vulva	46	6.5	48	7.1	53	7.1
Placenta			57	8.4	70	9.4
Vagina			17	2.5	8	1.1
Fallopian tube			10	1.5	6	0.8
Mullerian			6	0.9	12	1.6
Prophylactic gynae	116	16.4	13	1.9	3	0.4
Unknown			9	1.3	16	2.1
Peritoneal			4	0.6	3	0.4
Non gynae cancer			27	4.0	37	4.9
Other/not stated/benign			2	0.3	6	0.8

In 2012, once again the workload of the department has increased, with a 10% rise in MDM referrals.

This data is pulled from several different databases and therefore there are minor discrepancies, as some capture registrations, which differs from referrals. Also if referrals are not made using the official templates then not all data is captured. A single database would improve data entry and accuracy.

If all the databases are combined this gives total of 840 patients, and 1700 individual MDM episodes, during 2012, which is a 20% increase in administrative and clinical workload over the past 2 years.

Table 120: DHB of residence, age, and prioritised ethnicity by primary site among MDM reviewed cases NWH 2012

	Total N=749		Ovarian n=185		Endometrium /Uterus n=236		Cervix n=114		Vulva n=53		Other n=161	
	N	%	N	%	n	%	n	%	n	%	n	%
DHB												
Auckland	170	22.7	44	23.8	33	14.0	31	27.2	16	30.2	46	28.6
Counties Manukau	234	31.2	52	28.1	93	39.4	30	26.3	12	22.6	47	29.2
Waitemata	166	22.2	43	23.2	48	20.3	23	20.2	8	15.1	44	27.3
Northland	74	9.9	25	13.5	31	13.1	5	4.4	4	7.6	9	5.6
Bay of Plenty	43	5.7	12	6.5	10	4.2	13	11.4	1	1.9	7	4.4
Other	61	8.2	9	4.9	20	8.5	12	10.5	12	22.6	8	5.0
missing	1	0.1	0		1	0.4	0		0		0	
Age (yrs)												
≤25	39	5.2	14	7.6	2	0.9	10	8.8	0		13	8.1
26-35	99	13.2	24	13.0	10	4.2	17	14.9	3	5.7	45	28.0
36-45	122	16.3	29	15.7	30	12.7	29	25.4	7	13.2	27	16.8
46-55	140	18.7	46	24.9	50	21.2	19	16.7	8	15.1	17	10.6
56-65	157	21.0	26	14.1	69	29.2	21	18.4	13	24.5	28	17.4
66-75	107	14.3	30	16.2	44	18.6	10	8.8	7	13.2	16	9.9
>75	79	10.6	15	8.1	31	13.1	8	7.0	14	26.4	11	6.8
missing	6	0.8	1	0.5	0		0		1	1.9	4	2.5
Ethnicity												
NZ European	331	44.2	83	44.9	86	36.4	47	41.2	38	71.7	83	44.9
Maori	114	15.2	28	15.1	38	16.1	21	18.4	6	11.3	21	13.0
Pacific	132	17.6	20	10.8	74	31.4	13	11.4	2	3.8	23	14.3
Other Asian	54	7.2	17	9.2	10	4.2	13	11.4	2	3.8	12	7.5
Indian	28	3.7	9	4.9	7	3.0	4	3.5	0		8	5.0
Other European	71	9.5	26	14.1	17	7.2	14	12.3	2	3.8	12	7.5
Other/not stated	19	2.5	2	1.1	4	1.7	2	1.8	3	5.7	8	5.0

The total number of cancers has risen, but there has been a particular rise in the number of endometrial and cervical cancers. This has a great impact on resources, particularly theatre time, as the endometrial cancers tend to be obese with multiple co-morbidities, and the cervical cancers often need at least 2 separate surgical episodes. The rise in endometrial cancers is particularly noticeable from CMDHB.
The referral rise from other DHBs reflects the change in referral patterns, particularly from Lakes DHB.

12.10.1 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.

Given the current move to National Standards and Ministry of Health targets, it is likely that these KPIs will be revised in the next year.

Table 121: 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 2008-2012

	2008 N=494		2009 N=497		2010 N=580		2011 N=563		2012 N=625	
	n	%	n	%	n	%	n	%	n	%
<14 days	284	57	351	71	426	73	413	73.4	519	83.1
=14 days	21	4	28	6	34	6	30	5.3	39	6.2
>14 days	172	35	113	23	118	20	115	20.4	67	10.7
Missing data	17	3	5	1	2	0.3	1			
Deceased							4			

There has been a dramatic improvement in this KPI, due to the efforts of the MDM coordinator and we are now 0.7% outside the target, and if the 6 patients that were referred to Gynae Oncology by mistake (instead of vulva/colposcopy clinic), then the target is met. However given the number of referrals this still correlates with a large number of patients that are not being discussed or seen in an acceptable timeframe. Of the 67 outliers, nearly half of these were delayed due to public holiday periods, particularly Christmas, which is a resourcing issue that needs to be addressed.

Eleven patients were deferred due to delays in histology or occasionally radiology, but nearly a third of the outliers had delay in either sending or receiving the referral within the department, with the longest delay being over 5 weeks. This is mainly due to departure from referral protocol with dictated referrals to individual clinicians. If the electronic referral templates were used this problem would largely be eliminated. The draft National Standards for Gynaecological Oncology suggest a named Lead Clinician in all of the referring Units, to coordinate all referrals to the tertiary Centre and this is highly encouraged and would streamline referral pathways.

Table 122: Key Performance Indicator: Time from MDM or clinic to first surgery (new referrals of patients with malignancy who had surgery in 2012) Goal: 90% within 56 days. NWH 2008-2012

	2008 N=164		2009 N=233		2010 N=228		2011 N=173		2012 N=190	
	n	%	n	%	n	%	n	%	n	%
≤ 56 days	115	70	165	71	188	82	139	80.4	165	86.8
≤30 days									101	53.2
31-56 days									64	33.7
> 56 days	43	26	65	28	40	18	34	19.7	25	13.2
Missing data	6	4	3	1						

The number of surgeries included in this indicator is lower after 2010 as patients have been excluded if they were referred to radiation or medical oncology prior to surgery and in some cases where they were re-referred for recurrences.

The proportion of delayed surgery has fallen significantly, although is still not meeting the KPI, although 7 patients had an initial procedure at their referral DHB, and then required further surgical treatment at ADHB and did meet the criteria from the repeat referral.

Three patients should be excluded as they were having completion or recurrent surgery, and the KPI does not apply.

Two patients initially declined surgery, five were delayed due to co-morbidities and medical review, three were awaiting radiological investigations, one was awaiting availability of a 2nd surgeon. One patient was delayed due to prolonged clinical debate between DHBs and networks.

The patients that had no identifiable reason for delay were over the Christmas holidays, which again raises the issue of reduced resources during these periods.

Table 123: Time from MDM or clinic to first surgery (new referrals of patients with gynaecologic malignancy who had surgery in 2011) by primary site. NWH 2012

	Total	≤ 56 days		>56 days	
	n	n	%	n	%
Totals	**190**	**165**	**86.8**	**25**	**13.2**
Cervix	35	30	85.7	5	14.3
Endometrium/Uterus	79	70	88.6	9	11.4
Ovary	35	29	82.9	6	17.1
Vulva	18	16	88.9	2	11.1
Other	23	20	87.0	3	13.0

Endometrial cancers, as in previous years make up the largest group with delayed surgery. This is not surprising given obesity is a risk factor, and these patients often have co-morbidities requiring greater pre operative planning and investigation. However proportionally the risk of delayed surgery is highest for ovarian patients and this reflects the increased need for multidisciplinary input and surgical planning that is required for the increasing radicality of surgery. This is likely to become an increasing issue and needs serious consideration when resource planning.

12.10.2 Gynaecologic oncology surgeries

This section describes the surgery and outcomes of women undergoing inpatient surgery in 2012 under the care of the gynaecologic oncology team.

Table 124: Ethnicity and cancer status of women undergoing gynaecologic oncology inpatient surgery NWH 2012

	2012 N=406	
	n	%
Ethnicity		
NZ European	200	49.3
Maori	50	12.3
Pacific	64	15.8
Other Asian	30	7.4
Indian	13	3.2
Other European	44	10.8
Other	5	1.2
Status at time of surgery		
Benign	15	3.7
Pre malignant	52	12.8
Malignant	229	56.4
Prophylactic	4	1.0
Unknown prior to surgery	106	26.1

Table 125: Debulking rates in ovarian malignancy NWH 2012

	Ovary N=52	
	N	%
Residual disease		
None	42	80
< 1cm	8	15
≥ 1cm	2	4
NA		
Bowel surgery		
Yes	6	12
No	44	85
NA	2	4

The number of procedures has increased slightly from the previous year, and this 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 and list space.
Although the debulking rates appear impressive, the number of ovarian patients having surgery is proportionally quite small and the reasons for this are beyond the scope of this data analysis. An audit of ovarian cancer surgery within the department would be recommended to explore this further. The ovarian referrals are the only tumour stream that are referred without an existing histological diagnosis and triage tools, such as RMI are used to assess whether tertiary level surgery is required. Although referral guidelines use a RMI of 200 as a cut off, this is not always recognised by referrers.

Table 126: Key Performance indicator: Clinical Outcomes among inpatient surgeries in malignant cases by gynaecologic oncology team in 2011. Goal: Comparative year to year data. NWH 2008-2012

	2008 N=246*		2009 N=259*		2010 N=353*		2011 N=299*		2012 N=297*	
Complication	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Transfusion	19	8	30	12	40	11	32	10.7	35	12
Febrile morbidity	11	4	32	12	28	8	19	6.4	20	7
Wound infection	-		22	8	20	6	14	4.7	11	4
Thromboembolism	2	1	3	1	2	1	2	0.7	0	0
Cardiovascular	2	1	6	2	3	1	3	1.0	3	1
Gastro-intestinal	7	3	17	7	12	3	11	3.7	14	5
Urinary retention	-		12	5	12	3	8	2.7	11	4
Return to theatre within 6 weeks	6	2	14	5	18	5	8	3	9	3
Readmission with complications within 6 weeks	17	7	25	10	24	7	15	5	26	9
Death	2	1	2	1	5	1	1	0	2	1
Intraoperative complications									21	7
>1l blood loss									12	4
Bowel injury									2	1
Bladder injury									1	0
Ureteric injury									2	1
Anaesthetic problem									1	0
Other									3	1

* have assumed missing data are all “no”

The significant intraoperative complication rate is low, with blood loss over a litre being the most common and “other” complications being 2 vascular and 1 splenic injury. This analysis includes the 297 inpatient surgeries performed by the Gynaecologic Oncology team in 2012 where a diagnosis of cancer was confirmed. The complications data were checked against discharge coding data to look for missing data.

Summary/Implications

The Department of Gynaecologic Oncology workload increased again this year and the MDM is now significantly stretched and resourcing needs to be addressed urgently. The need for more streamlined data collection with a fulltime dedicated data manager/MDM coordinator is paramount and the Team are participating in efforts to highlight this importance. This was highlighted in last years report but no significant progress has been made. As a consequence of this we are still unable to produce long term morbidity or survival data for the Centre.

The infrastructure of the MDM is under resourced, particularly in pathology and this leads to delay in patient diagnosis and subsequent referral for adjuvant treatment, which will directly impact on the Ministry Faster Cancer Treatment targets which are being introduced.

The introduction of the National Standards should be addressed with early planning, as the workload is increasing with no additional resource. The introduction of a formal hub and spoke network with named Unit Leads and cancer care coordinators would improve the referral process and needs to be implemented by referring DHBs.

Although the surgical targets have improved, data has shown that 56 days to surgery is not deemed an acceptable target by patients, and that we should be aiming for a surgical date within 2 weeks of clinic appointment. This will need both an increase in SMO FTE and theatre time, with the knock on effects of increasing the workload of our colleagues in other departments, particularly pathology.

These figures do not include all departmental activity 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. Molar pregnancies are currently reviewed in the Gynae Oncology clinic, although they rarely need surgical input. Consideration should be given to local follow up via nurse led clinics, as already the case at WDHB. MDM pathology review however is still recommended.

Complication rates are stable and wound infection rates have fallen slightly, which may reflect the introduction of sentinel nodes for vulval cancer, rather than traditional groin dissections, which have been shown to lead to a significant decrease in wound complications.

The department is committed to providing a high quality regional tertiary service and has been at the forefront of the National Planning process. It is hoped that the formal recognition of referral pathways will lead to better communication and process, which will benefit the patients. However there needs to be acknowledgement that this can only be achieved with expansion of the service the department provides, with adequate management and resource.

APPENDIX 1. DATA CLEANING QUERIES

1.1 Data cleaning queries

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.

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.

LMC is Other Please Specify, Null, NWH Obstetrician or charge midwives.

BMI (Body Mass Index) Calculated from earliest weight recorded, as weight (kg)/height(m)^2. If BMI <17 or >40, check height and weight

Antenatal Complications

Medical Conditions: If delivered at NWH HDU (High Dependency Unit), any DCC (Department of Critical Care) or ICU (Intensive Care Unit), then antenatal summary medical conditions is not = missing.

If Antenatal Admission for Hypertension, APH or Diabetes, check AN Summary screen medical conditions is not = missing &/or check data is consistent.

If Induction Indication is Hypertension, APH or Diabetes, check AN Summary screen medical conditions is not = missing &/or check data is consistent.

If Reason for Operative Birth is Hypertension, APH or Diabetes, check AN Summary 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.

Medical History Screen; Previous Medical Conditions = Chronic Hypertension, Diabetes Type 1 or Diabetes Type 2 & AN Summary screen medical conditions is not = missing &/or check data is consistent.

Antenatal Summary - Hypertension Fields can not be Null (Eclampsia, Gestational Hypertension, Pre eclampsia, Other Current Med Surg Cond).

Antenatal Summmary; Current Medications (prior to labour or elective cs) = Antihypertensives then check Hypertension Fields are not Null &/or data is consistent. (Eclampsia, Gestational Hypertension, Pre eclampsia, Other Current Med Surg Cond).

Antenatal Diabetes Screen fields - Hypertension, Chronic HT pre preg or Antihypertensive Treatment pre preg indicate Hypertension, check Antenatal Summary Hypertension fields are not null &/or data is consistent.

Eclampsia = Yes (Boolean in Antenatal Summary).

Diastolic greater than or equal to 90, but no Hypertension entered in AN Summary fields.

Antenatal Summary screen; Reason for Specialist Consultation = Diabetes, check Sugar Tolerance = is not null.
If Antenatal Summary Sugar Tolerance indicates Diabetes check Diabetic Screens AN or PN = missing.

Antenatal Diabetes screen without a PN Diabetes Screen & vice versa.

Newborn Diabetes; Newborn Discharge Summary, check for missing diabetic data.

Induction of Labour

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 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.

Pregnancy/Birth

Homebirths & BBA's (babies born before arrival at hospital when intended birth in hospital) All checked as appropriately classified.

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).

There should be NO onset of contraction time if method of Birth is Elective Caesarean not in labour or Emergency Caesarean not in labour.

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.

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 if failure to progress is the primary indication for operative birth & mode of birth is elective Caesarean.

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 indication for Caesarean is breech or malpresentation, then presentation is NOT cephalic.

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.

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.

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

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 Domino, 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

Smoking Cessation Database cross-referenced with Healthware for smoking & referral to Smokefree Pregnancy service.

APPENDIX 2. SUMMARY STATISTICS

Table 127: Mode of birth NWH 1998-2012

	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

Table 128: Term births by gestation NWH 2005-2012

Gestation	2005	2006	2007	2008	2009	2010	2011	2012
37 wks	616	616	628	648	638	630	626	616
38 wks	1216	1291	1405	1488	1565	1546	1539	1536
39 wks	1794	1817	1847	1802	1965	1983	2078	2172
40 wks	1811	1699	1841	1827	1813	1810	1664	1744
41 wks	971	958	1083	943	992	977	864	877
42 wks	157	153	158	182	150	126	132	96
43 wks	13	8	9			7		2
44 wks		1						

APPENDIX 3. MATERNAL DEMOGRAPHY

3.1 DHB of residence

Table 129: DHB of domicile of mothers giving birth at National Women's 2003-2012

	2003 n=7611		2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	5007	65.8	5055	67.5	4985	69.3	5100	70.7	5382	69.9	5267	69.4	5551	71.8
Waitemata	1138	15	1068	14.3	982	13.7	994	13.8	1043	13.6	1127	14.9	1054	13.6
Counties Manukau	1368	18	1240	16.6	1089	15.1	994	13.8	1136	14.8	1060	14.0	991	12.8
Northland	38	0.5	37	0.5	31	0.4	40	0.6	41	0.5	40	0.5	40	0.5
North Island Other	42	0.6	72	1.0	93	1.3	69	1.0	73	0.9	71	0.9	79	1.0
South Island	13	0.2	12	0.2	9	0.1	13	0.2	14	0.2	18	0.2	15	0.2
Overseas	5	0.1	7	0.1	5	0.1	2	0.03	6	0.1	6	0.1	5	0.1

	2010 n=7709		2011 n=7523		2012 n=7695	
DHB	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	5392	69.9	5176	68.8	5302	68.9
Waitemata	1110	14.4	1220	16.2	1126	14.6
Counties Manukau	1082	14.0	1009	13.4	1113	14.5
Northland	43	0.6	40	0.5	39	0.5
North Island Other	64	0.8	52	0.7	91	1.2
South Island	17	0.2	18	0.2	14	0.2
Overseas	1	0.01	6	0.1	10	0.1

3.2 Maternal Age

Table 130: Maternal age distribution NWH 2000-2012

		≤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

Table 131: Maternal age and parity NWH 2012

	Total		<=20 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	N=7695		n=	267	n=	862	n=	2065	n=	2606	n=	1555	n=	340
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	3917	50.9	223	83.5	507	58.8	1226	59.4	1172	45.0	539	34.7	111	32.6
Multipara	3778	49.1	44	16.5	355	41.2	839	40.6	1434	55.0	1016	65.3	229	67.4

3.3 Parity

Table 132: Time trends in nulliparity and multiparity (Data for 2001-2003 not available)
NWH1993-2012

	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of births	8812	9125	9157	8055	7492*	7501	7827	7491	7194	7212	7695	7589	7735	7709	7523	7695
Nullipara	3814	4037	4018	3591	3263	3262	3455	3597	3522	3499	3752	3623	3811	3650	3539	3778
%	43.3	44.2	43.9	44.6	43.6	43.5	44.1	48.0	49.0	48.5	48.8	47.7	49.3	47.3	47.0	49.1
Multipara	4998	5088	5139	4464	4229	4239	4372	3894	3672	3713	3943	3966	3924	4059	3984	3917
%	56.7	55.8	56.1	55.4	56.4	56.5	55.9	52.0	51.0	51.5	51.2	52.3	50.7	52.7	52.9	50.9

*Does not include 39 BBA's

3.4 Ethnicity

Table 133: Prioritised ethnicity of women giving birth at National Women's 2012
(for information on assigning ethnicity and prioritising ethnicity, see Appendix 12)

	2012	
	n=7695	
	n	%
New Zealand European	2696	35.0
Chinese	1171	15.2
Other European	726	9.4
Maori	534	6.9
Indian	553	7.2
Samoan	368	4.8
Tongan	346	4.5
Other Asian	340	4.4
Southeast Asian	169	2.2
European NFD	121	1.6
Middle Eastern	122	1.6
Cook Island Maori	123	1.6
African	75	1.0
Niuean	74	1.0
Asian NFD	79	1.0
Fijian	73	0.9
Latin American	74	1.0
Other Pacific Island	30	0.4
Tokelauan	9	0.1
Other ethnicity	12	0.2

Table 134: Maternal ethnicity and age NW 2012

	Total	NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
Age	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	**7695**	**2696**	**35.0**	**534**	**6.9**	**1023**	**13.3**	**1759**	**22.9**	**553**	**7.2**	**847**	**11.0**	**283**	**3.7**
<=20	267	47	17.6	73	27.3	113	42.3	12	4.5	7	2.6	5	1.9	10	3.7
21-25	862	150	17.4	131	15.2	287	33.3	155	18.0	58	6.7	37	4.3	44	5.1
26-30	2065	495	24.0	132	6.4	227	11.0	707	34.2	237	11.5	174	8.4	93	4.5
31-35	2606	1065	40.9	112	4.3	237	9.1	565	21.7	180	6.9	362	13.9	85	3.3
36-40	1555	786	50.5	66	4.2	121	7.8	259	16.7	62	4.0	221	14.2	40	2.6
>40	340	153	45.0	20	5.9	38	11.2	61	17.9	9	2.6	48	14.1	11	3.2

Table 135: Maternal ethnicity and parity NW 2012

		NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
		n=2696		n=534		n=1023		n=1759		n=553		n=847		n=283	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Nullipara	3778	1340	49.7	196	36.7	352	34.4	983	55.9	319	57.7	463	54.7	125	44.2
Multipara	3917	1356	50.3	338	63.3	671	65.6	776	44.1	234	42.3	384	45.3	158	55.8

Table 136: Ethnicity of women birthing at NWH 2005-2012

	2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735		2010 n=7709		2011 n=7523		2012 n=7695	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
NZ European	280	38.9	3034	42.1	3161	41.1	2995	39.5	2967	38.4	2898	37.6	2712	36.0	2696	35.0
Other European	674	9.4	682	9.5	695	9.0	713	9.4	707	9.1	856	11.1	851	11.3	847	11.0
Maori	545	7.6	597	8.3	641	8.3	641	8.4	670	8.7	579	7.5	597	7.9	534	6.9
Niuean	111	1.5	81	1.1	105	1.4	111	1.5	94	1.2	96	1.2	95	1.3	74	1.0
Cook Islander	106	1.5	113	1.6	157	2.0	137	1.8	135	1.7	112	1.5	112	1.5	123	1.6
Samoan	339	4.7	384	5.3	372	4.8	433	5.7	400	5.2	422	5.5	380	5.1	368	4.8
Tongan	315	4.4	346	4.8	347	4.5	349	4.6	394	5.1	378	4.9	342	4.5	346	4.5
Fijian	62	0.9	60	0.8	81	1.1	58	0.8	57	0.7	46	0.6	59	0.8	73	0.9
Other Pacific Islands	48	0.7	37	0.5	38	0.5	44	0.6	35	0.5	34	0.4	29	0.4	39	0.5
Chinese	769	10.7	707	9.8	881	11.4	874	11.5	995	12.9	950	12.3	984	13.1	1171	15.2
Indian	545	7.6	520	7.2	521	6.8	505	6.7	520	6.7	539	7.0	548	7.3	553	7.2
Other Asian	354	4.9	408	5.7	473	6.1	478	6.3	440	5.7	526	6.8	545	7.2	588	7.6
Other	521	7.2	243	3.4	223	2.9	251	3.3	321	4.1	273	3.5	269	3.6	283	3.7
Not Stated	3		0		0	0.0	0	0.0	0	0.0	0	0.0	0	0	0	0.0

3.5 Smoking

Table 137: Smoking status at booking by prioritised ethnicity and maternal age NWH 2012

		Smoking at booking		Not currently smoking	
	N	n	%	n	%
Total	**7695**	**443**	**5.8**	**7251**	**94.2**
Ethnicity					
NZ European	2696	82	3.0	2613	96.9
Maori	534	181	33.9	353	66.1
Pacific	1023	136	13.3	887	86.7
Asian	1759	11	0.6	1748	99.4
Indian	553	3	0.5	550	99.5
Other European	847	25	3.0	822	97.0
Other	283	5	1.8	278	98.2
Age					
<=20	267	66	24.7	201	75.3
21-25	862	116	13.5	746	86.5
26-30	2065	106	5.1	1958	94.8
31-35	2606	93	3.6	2513	96.4
>=36	1895	62	3.3	1833	96.7

* Missing data (n=1)

Table 138: Smoking status at booking by LMC at birth NWH 2012

	Independent midwife		Private Obstetrician		GP		NWH Community		NWH High Risk		Other DHB	
	n=3654		n=1823		n=45		n=1447		n=634		n=42	
	n	%	n	%	n	%	n	%	n	%	n	%
Smoking at booking	142	3.9	14	0.8	1	2.2	195	13.5	62	9.8	8	19.0
Not smoking	3512	96.1	1809	99.2	44	97.8	1251	86.5	0	0.0	34	81.0
Missing data	0	0.0	0	0.0	0	0.0	1	0.1	572	90.2	0	0.0

NWH High Risk includes women booked under the Diabetes and Medical teams.

3.6 Socio economic deprivation

Table 139: BMI >25 by deprivation quintile and prioritised maternal ethnicity NWH 2012

		All ethnicities		European*			Maori			Pacific			Other Asian			Indian		
Deprivation quintile	**Total**	**BMI>25**		**Total**	**BMI>25**		**Total**	**BMI>25**		**Total**	**BMI>25**		**Total**	**BMI>25**		**Total**	**BMI>25**	
	N	**n**	**%**	**N**	**n**	**%**	**N**	**n**	**%**	**N**	**n**	**%**	**N**	**n**	**%**	**N**	**n**	**%**
1	1340	297	22.2	890	204	22.9	37	15	40.5	30	22	73.3	308	36	11.7	34	11	32.4
2	1370	371	27.1	794	210	26.4	59	23	39.0	76	54	71.1	308	34	11.0	88	36	40.9
3	1597	500	31.3	764	222	29.1	82	51	62.2	126	92	73.0	424	68	16.0	131	46	35.1
4	1709	671	39.3	683	214	31.3	132	89	67.4	282	236	83.7	380	50	13.2	178	59	33.1
5	1491	765	51.3	346	122	35.3	188	128	68.1	467	399	85.4	314	51	16.2	111	37	33.3
Total	**7522**	**2610**	**34.7**	**3481**	**972**	**27.9**	**499**	**307**	**61.5**	**986**	**806**	**81.7**	**1737**	**240**	**13.8**	**544**	**190**	**34.9**

Includes NZ European and Other European

There are 172 women who had a missing quintile who are not represented in this table

Table 140: Deprivation Quintile (NZ Dep06) by prioritised maternal ethnicity NWH 2012

	NZ European		Other European		Maori		Pacific		Other Asian		Indian		Other	
	n=2696		n=847		N=534		n=1023		n=1759		n=553		n=283	
Quintile	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	655	24.3	242	28.6	38	7.1	32	3.1	315	17.9	34	6.1	41	14.5
2	613	22.7	193	22.8	62	11.6	78	7.6	310	17.6	91	16.5	46	16.3
3	616	22.8	167	19.7	86	16.1	135	13.2	430	24.4	134	24.2	73	25.8
4	536	19.9	160	18.9	139	26.0	286	28.0	385	21.9	178	32.2	54	19.1
5	275	10.2	82	9.7	208	39.0	486	47.5	316	18.0	114	20.6	69	24.4
Missing	1	0.0	3	0.4	1	0.2	6	0.6	3	0.2	2	0.4	0	0.0

Table 141: Smoking and socio economic deprivation (NZ Dep06) NWH 2012

Deprivation decile	Total	Smoking at booking	
	N=7695	n=	443
	N	n	%
1	523	5	1.0
2	834	20	2.4
3	775	24	3.1
4	618	25	4.0
5	729	19	2.6
6	912	45	4.9
7	816	43	5.3
8	922	67	7.3
9	677	48	7.1
10	873	145	16.6
Missing	16	3	

Table 142: Deprivation Quintile (NZ Dep06) and maternal age NWH 2012

Deprivation quintile	<=20		21-25		26-30		31-35		36-40		>40	
	n=267		n=862		n=2065		n=2606		n=1555		n=340	
	n	%	n	%	n	%	n	%	n	%	n	%
1	16	6.0	63	7.3	289	14.0	525	20.1	378	24.3	86	25.3
2	20	7.5	97	11.3	350	16.9	511	19.6	352	22.6	63	18.5
3	45	16.9	172	20.0	472	22.9	560	21.5	320	20.6	72	21.2
4	69	25.8	221	25.6	482	23.3	598	22.9	294	18.9	74	21.8
5	117	43.8	308	35.7	467	22.6	404	15.5	210	13.5	44	12.9
Missing	0	0.0	1	0.1	5	0.2	8	0.3	1	0.1	1	0.3

Table 143: Deprivation decile (NZ Dep 06) by LMC NWH 2012

Deprivation decile	Independent Midwife		Private Obstetrician		General Practitioner		NWH Community		NWH Diabetes		NWH Medical		Other DHB		Unbooked	
	n=3654		n=1823		n=45		n=1447		n=280		n=354		n=42		n=50	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	198	5.4	263	14.4	4	8.9	37	2.6	4	1.4	15	4.2	0	0.0	2	2.7
2	335	9.2	385	21.1	3	6.7	60	4.1	15	5.4	33	9.3	2	4.8	1	2.0
3	349	9.6	276	15.1	5	11.1	99	6.8	16	5.7	24	6.8	5	11.9	1	2
4	316	8.6	168	9.2	2	4.4	92	6.4	14	5.0	23	6.5	1	2.4	2	4.0
5	385	10.5	180	9.9	8	17.8	89	6.2	22	7.9	39	11.0	2	4.8	4	8.0
6	441	12.1	180	9.9	4	8.9	194	13.4	37	13.2	44	12.4	5	11.9	7	14.0
7	445	12.2	131	7.2	5	11.1	133	9.2	53	18.9	44	12.4	1	2.4	4	8.0
8	509	13.9	91	5.0	6	13.3	220	15.2	50	17.9	28	7.9	11	26.2	7	14.0
9	308	8.4	84	4.6	2	4.4	194	13.4	34	12.1	46	13.0	7	16.7	2	4.0
10	363	9.9	64	3.5	6	13.3	326	22.5	35	12.5	52	14.7	7	16.7	20	40.0

3.7 Lead Maternity Carer (LMC)

Table 144: LMC at birth NWH 2012

	N=7695	
	n	%
Independent Midwife	3654	47.4
Private Obstetrician	1823	23.6
General Practitioner	45	0.6
NWH Community	1447	18.8
NWH Diabetic	280	3.6
NWH Medical	354	4.6
Other DHB	42	0.5
Unbooked	50	0.6

Table 145: LMC at birth and maternal age NWH 2012

	Total	<=20		21-25		26-30		31-35		36-40		>40	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Total	**7695**	**267**	**3.5**	**862**	**11.2**	**2065**	**26.8**	**2606**	**33.9**	**1555**	**20.2**	**340**	**4.4**
Independent Midwife	3654	119	3.3	404	11.1	1122	30.7	1319	36.1	604	16.5	86	2.4
Private Obstetrician	1823	1	0.1	35	1.9	342	18.8	702	38.5	590	32.4	153	8.4
General Practitioner	45	1	2.2	2	4.4	14	31.1	20	44.4	6	13.3	2	4.4
NWH Community	1447	98	6.8	315	21.8	421	29.1	354	24.5	204	14.1	55	3.8
NWH Diabetes	280	2	0.7	34	12.1	64	22.9	89	31.8	69	24.6	22	7.9
NWH Medical	354	33	9.3	48	13.6	84	23.7	102	28.8	71	20.1	16	4.5
Other DHB	42	5	11.9	10	23.8	8	19.0	10	23.8	5	11.9	4	9.5
Unbooked	50	8	16.0	14	28.0	10	20.0	10	20.0	6	12.0	2	4.0

Table 146: LMC at birth and parity NWH 2012

	Total	Nullipara		Multipara	
	N	n	%	n	%
Total	**7695**	**3778**	**49.1**	**3917**	**50.9**
Independent Midwife	3654	1944	53.2	1710	46.8
Private Obstetrician	1823	938	51.5	885	48.5
General Practitioner	45	17	37.8	28	62.2
NWH Community	1447	598	41.3	849	58.7
NWH Diabetes	280	81	28.9	199	71.1
NWH Medical	354	149	42.1	205	57.9
Other DHB	42	27	64.3	15	35.7
Unbooked	50	24	48.0	26	52.0

Table 147: LMC at birth and prioritised maternal ethnicity NWH 2012

	Total	NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**7695**	**2696**	**35.0**	**534**	**6.9**	**1023**	**13.3**	**1759**	**22.9**	**553**	**7.2**	**847**	**11.0**	**283**	**3.7**
Independent Midwife	3654	1278	35.0	235	6.4	354	9.7	958	26.2	259	7.1	452	12.4	118	3.2
Private Obstetrician	1823	1054	57.8	40	2.2	24	1.3	349	19.1	65	3.6	256	14.0	35	1.9
General Practitioner	45	7	15.6	1	2.2	5	11.1	28	62.2	1	2.2	3	6.7	0	0.0
NWH Community	1447	166	11.5	149	10.3	451	31.2	334	23.1	167	11.5	78	5.4	102	7.0
NWH Diabetes	280	45	16.1	19	6.8	104	37.1	45	16.1	41	14.6	18	6.4	8	2.9
NWH Medical	354	135	38.1	61	17.2	53	15.0	37	10.5	19	5.4	33	9.3	16	4.5
Other DHB	42	9	21.4	14	33.3	7	16.7	4	9.5	1	2.4	6	14.3	1	2.4
Unbooked	50	2	4.0	15	30.0	25	50.0	4	8.0	0	0.0	1	2.0	3	6.0

3.8 Standard primipara

Table 148: Demographic characteristics of standard and non-standard primipara NWH 2012

	Total primipara	Standard primipara		Non-standard primipara	
	N	n	%	n	%
Total	**3778**	**1321**	**35.0**	**2457**	**65.0**
Age					
<=20	223	36	16.1	187	83.9
21-25	507	247	48.7	260	51.3
26-30	1226	594	48.5	632	51.5
31-35	1172	444	37.9	728	62.1
36-40	539	0	0.0	539	100.0
>40	111	0	0.0	111	100.0
Ethnicity (prioritised)					
NZ European	1340	386	28.8	954	71.2
Maori	196	62	31.6	134	68.4
Pacific	352	119	33.8	233	66.2
Asian	983	427	43.4	556	56.6
Indian	319	135	42.3	184	57.7
Other European	463	141	30.5	322	69.5
Other	125	51	40.8	74	59.2
LMC at Birth					
Independent Midwife	1944	754	38.8	1190	61.2
Private Obstetrician	938	302	32.2	636	67.8
General Practitioner	17	7	41.2	10	58.8
NWH Community	598	220	36.8	378	63.2
NWH Diabetes	81	0	0.0	81	100.0
NWH Medical	149	28	18.8	121	81.2
Other DHB	27	3	11.1	24	88.9
Unbooked	24	7	29.2	17	70.8
Smoking					
Smoking at booking	146	38	26.0	108	74.0
No or not smoking in last month	3631	1283	35.3	2348	64.7
Missing	1	0	0.0	1	100.0

APPENDIX 4. ANTENATAL COMPLICATIONS

4.1 Preterm birth

Table 149: Preterm birth and maternal demographic characteristics NWH 2012

	Total	Total preterm birth		Iatrogenic preterm		Spontaneous preterm	
	N	n	%	n	%	n	%
Total	**7695**	**709**	**9.2**	**425**	**5.5**	**284**	**3.7**
Age							
<=20	267	40	15.0	18	6.7	22	8.2
21-25	862	80	9.3	43	5.0	37	4.3
26-30	2065	166	8.0	109	5.3	57	2.8
31-35	2606	217	8.3	129	5.0	88	3.4
36-40	1555	164	10.5	100	6.4	64	4.1
41+	340	42	12.4	26	7.6	16	4.7
Ethnicity							
NZ European	2696	243	9.0	155	5.7	88	3.3
Maori	534	86	16.1	50	9.4	36	6.7
Pacific	1023	93	9.1	54	5.3	39	3.8
Asian	1759	129	7.3	69	3.9	60	3.4
Indian	553	64	11.6	45	8.1	19	3.4
Other European	847	69	8.1	39	4.6	30	3.5
Other	283	25	8.8	13	4.6	12	4.2
Parity							
Nulliparous	3778	356	9.4	199	5.3	157	4.2
Multiparous	3917	353	9.0	226	5.8	127	3.2
Plurality							
Singleton	7533	603	8.0	353	4.7	250	3.3
Twins	156	100	64.1	68	43.6	32	20.5
Triplets	6	6	100.0	4	66.7	2	33.3
Smoking at booking							
Currently smoking	443	65	14.7	36	8.1	29	6.5
No or not in past month	7251	643	8.9	389	5.4	254	3.5
Unknown	1	1	100.0	0	0.0	1	100.0
BMI							
<19	481	35	7.3	20	4.2	15	3.1
19-25	4431	356	8.0	216	4.9	140	3.2
26-30	1398	132	9.4	76	5.4	56	4.0
31-35	666	60	9.0	41	6.2	19	2.9
>35	546	61	11.2	47	8.6	14	2.6
Missing	173	65	37.6	25	14.5	40	23.1
Deprivation quintile (NZ Dep 06)							
1	1357	135	9.9	82	6.0	53	3.9
2	1393	107	7.7	68	4.9	39	2.8
3	1641	152	9.3	92	5.6	60	3.7
4	1738	158	9.1	91	5.2	67	3.9
5	1550	155	10.0	90	5.8	65	4.2

4.2 Diabetes

Table 150: Women with diabetes birthing at NWH at or beyond 20 weeks gestation 1991-2012

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Type I	23	29	19	12	19	15	14	21	26	22	26
Type 2	26	19	21	26	32	35	22	23	28	32	37
GDM	125	140	197	160	221	245	247	221	181	186	161
Total	174	188	237	198	272	295	283	265	235	240	224

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Type I	21	20	25	31	33	26	31	47	30	33	40
Type 2	49	40	47	52	57	54	63	71	55	70	64
GDM	251	352	343	304	286	331	457	480	545	821	662
Total	321	412	415	387	376	411	551	598	630	924	766

Table 151: Perinatal deaths (1993 – 2012) among births complicated by diabetes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total number of perinatal related losses	3	1	3	6	3	6	1	2	2	3	6
Perinatal related loss rate /1000 births	13	5	11	20	11	21	4	8	9	9	9

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total number of perinatal related losses	0	2	8	9	1	4	10	5	10
Perinatal related loss rate /1000 births	0	5	21	22	2	7	16	5	13

Table 152: DHB of domicile of women with diabetes birthing at NWH 2012

	Type 1 n=40		Type 2 n=64		GDM n=662		No Diabetes n=6929	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	17	42.5	27	42.2	389	58.8	4869	70.27
Waitemata	20	50.0	33	51.6	189	28.5	884	12.8
Counties Manukau	2	5.0	3	4.7	77	11.6	1031	14.9
Other	1	2.5	1	1.6	7	1.1	145	2.1

Table 153: Demographic characteristics of women with diabetes NWH 2012

		Type 1		Type 2		GDM		No Diabetes	
		n=	40	n=	64	n=	662	n=	6929
	N	n	%	n	%	n	%	n	%
Age									
<=20	267	2	0.7	0	0.0	8	3.0	257	96.3
21-25	862	2	0.2	5	0.6	62	7.2	793	92.0
26-30	2065	13	0.6	8	0.4	160	7.7	1884	91.2
31-35	2606	13	0.5	26	1.0	228	8.7	2339	89.8
36-40	1555	10	0.6	20	1.3	148	9.5	1377	88.6
41+	340	0	0.0	5	1.5	56	16.5	279	82.1
Ethnicity									
NZ European	2696	26	1.0	5	0.2	109	4.0	2556	94.8
Maori	534	3	0.6	4	0.7	39	7.3	488	91.4
Pacific	1023	4	0.4	36	3.5	128	12.5	855	83.6
Asian	1759	2	0.1	4	0.2	86	4.9	1525	86.7
Indian	553	0	0.0	12	2.2	86	15.6	455	82.3
Other European	847	2	0.2	3	0.4	47	5.5	795	93.9
Other	283	3	1.1	0	0.0	25	8.8	255	90.1
BMI									
<19	481	0	0.0	1	0.2	24	5.0	456	94.8
19-25	4431	23	0.5	10	0.2	281	6.3	4117	92.9
26-30	1398	13	0.9	15	1.1	143	10.2	1227	87.8
31-35	666	4	0.6	17	2.6	89	13.4	556	83.5
>35	546	0	0.0	19	3.5	125	22.9	402	73.6
Missing	173	0	0.0	2	1.2	0	0.0	171	98.8
Smoking									
Smoking at booking	443	3	0.7	5	1.1	29	6.5	406	91.6
Not currently smoking	7251	37	0.5	59	0.8	633	8.7	6522	89.9
Missing	1	0	0.0	0	0.0	0	0.0	1	100.0

Table 154: Maternal outcomes among women with diabetes NWH 2012

	Type 1		Type 2		GDM		Postnatally Diagnosed Type 2		No diabetes	
	n=	40	n=	64	n=	640	n=	21	n=	6929
	n	%	n	%	n	%	n	%	n	%
Induction of labour	21	52.5	39	60.9	364	56.9	13	61.9	2046	29.5
Mode of Birth										
Spontaneous vaginal birth	9	22.5	31	48.4	328	51.3	7	33.3	3842	55.4
Ventouse	5	12.5	3	4.7	46	7.2	1	4.8	553	8.0
Forceps	3	7.5	2	3.1	29	4.5	1	4.8	264	3.8
CS emergency	12	30.0	14	21.9	109	17.0	9	42.9	1148	16.6
CS elective	11	27.5	14	21.9	128	20.0	3	14.3	1122	16.2
Gestation at birth										
<32 weeks	3	7.5	4	6.3	5	0.8	1	4.8	190	2.7
<37 weeks	15	37.5	16	25.0	67	10.5	4	19.0	607	8.8
PPH >=500mls	18	45.0	38	59.4	238	37.2	14	66.7	2279	32.9
PPH >=1000 mls	2	5.0	13	20.3	62	9.7	2	9.5	583	8.4
Postpartum transfusion	0	0.0	4	6.3	12	1.9	2	9.5	171	2.5

4.3 Antepartum haemorrhage

Table 155: Characteristics of pregnancies complicated by antepartum haemorrhage NWH 2012

		Placenta praevia		Placental abruption		APH uncertain origin		No APH	
		n=	63	n=	47	n=	401	n=	7184
	Total	n	%	n	%	n	%	n	%
Maternal age									
<=20	267	0	0.0	6	2.2	28	10.5	233	87.3
21-25	862	3	0.3	5	0.6	61	7.1	793	92.0
26-30	2065	12	0.6	6	0.3	95	4.6	1952	94.5
31-35	2606	23	0.9	16	0.6	116	4.5	2451	94.1
36-40	1555	17	1.1	10	0.6	81	5.2	1447	93.1
>40	340	8	2.4	4	1.2	20	5.9	308	90.6
Parity									
Nulliparous	3778	32	0.8	19	0.5	217	5.7	3510	92.9
Multip previous CS	1189	14	1.2	12	1.0	53	4.5	1110	93.4
Mullip no previous CS	2728	17	0.6	16	0.6	131	4.8	2564	94.0
Smoking status at booking									
Currently smoking	443	5	1.1	8	1.8	41	9.3	389	87.8
Not currently smoking	7251	58	0.8	39	0.5	359	5.0	6795	93.7
Unknown	1	0	0.0	0	0.0	1	100.0	0	0.0
BMI									
<19	481	4	0.8	3	0.6	28	5.8	446	92.7
19-25	4431	38	0.9	23	0.5	202	4.6	4168	94.1
26-30	1398	11	0.8	11	0.8	71	5.1	1305	93.3
31-35	666	5	0.8	7	1.1	41	6.2	613	92.0
>35	546	1	0.2	2	0.4	38	7.0	505	92.5
Missing data	173	4	2.3	1	0.6	21	12.1	147	85.0
Hypertensive disease									
Gestational hypertension	247	0	0	1	0.4	17	6.9	229	92.7
Chronic hypertension	125	2	1.6	1	0.8	6	4.8	116	92.8
Chronic hypertension with superimposed preeclampsia	22	0	0.0	0	0.0	0	0.0	22	100.0
Preeclampsia	165	1	0.6	4	2.4	9	5.5	151	91.5
Nil	7136	60	0.8	41	0.6	369	5.2	6666	93.4

4.4 Hypertensive disease

Table 156: Onset of birth among women with hypertensive disease NWH 2012

	Gestational hypertension		Chronic hypertension		Superimposed preeclampsia		Preeclampsia		Normotensive	
	n=	247	n=	125	n=	22	n=	165	n=	7136
	n	%	n	%	n	%	n	%	n	%
Spontaneous onset of labour	43	17.4	22	17.6	3	13.6	18	10.9	3580	50.2
Induced labour	154	62.3	67	53.6	9	40.9	92	55.8	2161	30.3
CS emergency before onset of labour	6	2.4	7	5.6	7	31.8	34	20.6	214	3.0
CS elective	44	17.8	29	23.2	3	13.6	21	12.7	1181	16.5

Table 157: Demographic characteristics of women with hypertensive disease NWH 2012

		Gestational hypertension n=247		Chronic hypertension n=125		Superimposed preeclampsia n=22		Preeclampsia n=165		Normotensive n=7136	
	Total	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Ethnicity (prioritised)											
NZ European	2696	115	4.3	47	1.7	4	0.1	62	2.3	2468	91.5
Maori	534	20	3.7	15	2.8	4	0.7	19	3.6	476	89.1
Pacific	1023	35	3.4	30	2.9	6	0.6	36	3.5	916	89.5
Asian	1759	35	2.0	10	0.6	4	0.2	19	1.1	1691	96.1
Indian	553	15	2.7	8	1.4	2	0.4	10	1.8	518	93.7
Other European	847	22	2.6	13	1.5	1	0.1	14	1.7	797	94.1
Other	283	5	1.8	2	0.7	1	0.4	5	1.8	270	95.4
Maternal age (nullipara)											
<=20	223	5	2.2	1	0.4	0	0.0	10	4.5	207	92.8
21-25	507	21	4.1	3	0.6	0	0.0	13	2.6	470	92.7
26-30	1226	40	3.3	1	0.1	4	0.3	29	2.4	1152	94.0
31-35	1172	47	4.0	19	1.6	1	0.1	35	3.0	1070	91.3
36-40	539	36	6.7	12	2.2	3	0.6	18	3.3	470	87.2
41+	111	5	4.5	1	0.9	0	0.0	5	4.5	100	90.1
Maternal age (multipara)											
<=20	44	0	0.0	0	0.0	0	0.0	1	2.3	43	97.7
21-25	355	3	0.8	3	0.8	1	0.3	3	0.8	345	97.2
26-30	839	17	2.0	11	1.3	3	0.4	9	1.1	799	95.2
31-35	1434	29	2.0	31	2.2	8	0.6	25	1.7	1341	93.5
36-40	1016	38	3.7	33	3.2	2	0.2	13	1.3	930	91.5
41+	229	6	2.6	10	4.4	0	0.0	4	1.7	209	91.3
Smoking											
Currently smoking	443	18	4.1	11	2.5	1	0.2	7	1.6	406	91.6
Not currently smoking	7251	229	3.2	114	1.6	21	0.3	158	2.2	6729	92.8
Unknown	1	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
BMI											
<19	481	6	1.2	1	0.2	0	0.0	5	1.0	469	97.5
19-25	4431	109	2.5	37	0.8	3	0.1	76	1.7	4206	94.9
26-30	1398	55	3.9	26	1.9	8	0.6	34	2.4	1275	91.2
31-35	666	33	5.0	29	4.4	4	0.6	17	2.6	583	87.5
36-40	313	14	4.5	13	4.2	4	1.3	11	3.5	271	86.6
41-45	155	15	9.7	8	5.2	1	0.6	10	6.5	121	78.1
>45	78	11	14.1	7	9.0	2	2.6	2	2.6	56	71.8
Unknown	173	4	2.3	4	2.3	0	0.0	10	5.8	155	89.6

4.5 Body Mass Index

Table 158: Demographic characteristics and BMI NWH 2012 (excludes missing data)

	Total	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	7522	n=481		n=3949		n=1678		n=771		n=354		n=289	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity													
NZ European	2648	134	5.1	1555	58.7	637	24.1	199	7.5	81	3.1	42	1.6
Maori	499	11	2.2	149	29.9	139	27.9	104	20.8	43	8.6	53	10.6
Pacific	986	7	0.7	129	13.1	233	23.6	261	26.5	182	18.5	174	17.6
Asian	1737	248	14.3	1142	65.7	274	15.8	62	3.6	7	0.4	4	0.2
Indian	544	22	4.0	290	53.3	154	28.3	63	11.6	10	1.8	5	0.9
Other European	833	45	5.4	533	64.0	169	20.3	61	7.3	15	1.8	10	1.2
Other	275	14	5.1	151	54.9	72	26.2	21	7.6	16	5.8	1	0.4
Age													
<=20	245	7	2.9	87	35.5	80	32.7	43	17.6	17	6.9	11	4.5
21-25	826	58	7.0	339	41.0	168	20.3	124	15.0	76	9.2	61	7.4
26-30	2019	184	9.1	1085	53.7	412	20.4	178	8.8	90	4.5	70	3.5
31-35	2565	155	6.0	1453	56.6	545	21.2	232	9.0	92	3.6	88	3.4
36-40	1535	68	4.4	810	52.8	388	25.3	157	10.2	66	4.3	46	3.0
>40	332	9	2.7	175	52.7	85	25.6	37	11.1	13	3.9	13	3.9
Parity													
Nullipara	3662	267	7.3	2173	59.3	740	20.2	292	8.0	113	3.1	77	2.1
Multipara	3860	214	5.5	1776	46.0	938	24.3	479	12.4	241	6.2	212	5.5
Smoking status at booking													
Smoking*	408	13	3.2	107	26.2	112	27.5	77	18.9	52	12.7	47	11.5
Not currently smoking	7114	468	6.6	3842	54.0	1566	22.0	694	9.8	302	4.2	242	3.4

*Smoking data missing for 1 woman

Table 159: LMC at birth and BMI NWH 2012

	Total	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	7522	n=481		n=3949		n=1678		n=771		n=354		n=289	
	n	n	%	n	%	n	%	n	%	n	%	n	%
IMW	3590	256	7.1	1966	54.8	808	22.5	345	9.6	126	3.5	89	2.5
Pvt Obst	1811	147	8.1	1214	67.0	326	18.0	90	5.0	24	1.3	10	0.6
NWH Comm	1424	2	4.7	24	55.8	15	34.9	2	4.7	0	0.0	0	0.0
NWH Diabetes	280	62	4.4	531	37.3	346	24.3	228	16.0	141	9.9	116	8.1
NWH Medical	337	4	1.4	63	22.5	67	23.9	63	22.5	35	12.5	48	17.1
GP	43	10	3.0	140	41.5	103	30.6	39	11.6	23	6.8	22	6.5
Other DHB	24	0	0.0	9	37.5	8	33.3	3	12.5	1	4.2	3	12.5
Unbooked	13	0	0.0	2	15.4	5	38.5	1	7.7	4	30.8	1	7.7

Table 160: Pregnancy complications and BMI NWH 2012

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n=481		n=3949		n=1678		n=771		n=354		n=289	
	n	%	n	%	n	%	n	%	n	%	n	%
Diabetes												
GDM	24	5.0	247	6.3	149	8.9	104	13.5	64	18.1	74	25.6
Type 1	0	0.0	19	0.5	15	0.9	6	0.8	0	0.0	0	0.0
Type 2	1	0.2	6	0.2	14	0.8	19	2.5	10	2.8	12	4.2
No diabetes*	456	94.8	3677	93.1	1500	89.4	642	83.3	280	79.1	203	70.2
Hypertension												
Chronic hypertension	1	0.2	32	0.8	25	1.5	29	3.8	15	4.2	19	6.6
Gestational hypertension	6	1.2	89	2.3	63	3.8	39	5.1	16	4.5	30	10.4
Pre-eclampsia	5	1.0	66	1.7	39	2.3	19	2.5	12	3.4	14	4.8
Superimposed pre-eclampsia	0	0.0	2	0.1	7	0.4	5	0.6	5	1.4	3	1.0
Nil	469	97.5	3760	95.2	1544	92.0	679	88.1	306	86.4	223	77.2

*includes women who have not had diabetes screening in pregnancy

Table 161: Postpartum haemorrhage associated with spontaneous vaginal birth by BMI NWH 2012

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n=	308	n=	2076	n=	916	n=	428	n=	225	n=	160
	n	%	n	%	n	%	n	%	n	%	n	%
PPH>=1000mls	19	6.2	112	5.4	46	5.0	33	7.7	25	11.1	22	13.8
PPH>=1500mls	10	3.2	55	2.6	20	2.2	11	2.6	11	4.9	10	6.3

Table 162: Postpartum haemorrhage associated with Caesarean section by BMI NWH 2012

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n=	122	n=	1324	n=	565	n=	281	n=	111	n=	113
	n	%	n	%	n	%	n	%	n	%	n	%
PPH>=1000mls	12	9.8	122	9.2	71	12.6	48	17.1	19	17.1	28	24.8
PPH>=1500mls	5	4.1	33	2.5	24	4.2	17	6.0	9	8.1	6	5.3

Table 163: Neonatal outcomes by BMI NWH 2012

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n=	487	n=	4036	n=	1714	n=	785	n=	361	n=	299
	n	%	n	%	n	%	n	%	n	%	n	%
Preterm	40	8.2	365	9.0	186	10.9	78	9.9	40	11.1	39	13.0
Term	447	91.8	3671	91.0	1528	89.1	707	90.1	321	88.9	260	87.0
SGA	45	9.2	411	10.2	203	11.8	106	13.5	56	15.5	44	14.7
≥2 days NICU	39	8.0	349	8.6	207	12.1	95	12.1	42	11.6	36	12.0
Perinatal deaths (n/1000)	3.0	6.2	29.0	10.6	30.0	16.8	30.0	21.1	10.0	14.7	3.0	9.5

Table 164: Maternal interventions and birth outcomes by BMI NWH 2012

	BMI<18.5		BMI 18.5-24.99		BMI >=25-29.99		BMI 30-34.99		BMI 35-39.99		BMI >=40	
	n=	481	n=	3949	n=	1678	n=	771	n=	354	n=	289
	n	%	n	%	n	%	n	%	n	%	n	%
Onset of birth												
Spontaneous labour	284	59.0	1929	48.8	765	45.6	334	43.3	145	41.0	95	32.9
Induced labour	126	26.2	1213	30.7	564	33.6	279	36.2	148	41.8	126	43.6
Emergency CS before labour	11	2.3	130	3.3	54	3.2	29	3.8	13	3.7	13	4.5
Elective CS	60	12.5	677	17.1	295	17.6	129	16.7	48	13.6	55	19.0
Mode of birth												
Spontaneous vaginal birth	308	64.0	2076	52.6	916	54.6	428	55.5	225	63.6	160	55.4
Operative vaginal	51	10.6	549	13.9	197	11.7	62	8.0	18	5.1	16	5.5
Elective CS	60	12.5	677	17.1	295	17.6	129	16.7	48	13.6	55	19.0
Emergency CS in labour	43	8.9	434	11.0	188	11.2	98	12.7	30	8.5	27	9.3
Emergency CS not in labour	19	4.0	213	5.4	82	4.9	54	7.0	33	9.3	31	10.7

APPENDIX 5. LABOUR AND BIRTH

5.1 Induction of labour

Table 165: Induction of labour rates 1994-2012 No data available on induction rates for 2001-2003

	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Births	**8812**	**9125**	**9157**	**8055**	**7531***	**7501**	**7827**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**
Women Induced	2033	2366	2225	2135	2053	1910	2106	1922	1894	1776	1906	2203	2238	2214	2463	2483
Incidence (%)	**23.1**	**25.9**	**24.3**	**26.5**	**27.3**	**25.5**	**26.9**	**25.7**	**26.3**	**24.6**	**24.8**	**29.0**	**28.9**	**28.7**	**32.7**	**32.3**
Total Nullipara	3814	4037	4018	3591	3263	3262	3455	3597	3522	3499	3752	3623	3811	3650	3539	3778
Nullipara Induced	1046	1191	1112	1104	992	923	1049	1064	1042	940	1047	1207	1260	1226	1330	1382
Incidence (%)	**27.4**	**29.5**	**27.7**	**30.7**	**30.4**	**28.3**	**30.4**	**29.6**	**29.6**	**26.9**	**27.9**	**33.3**	**33.1**	**33.5**	**37.6**	**36.5**
Total Multipara	4998	5088	5139	4464	4229	4239	4372	3894	3672	3713	3943	3966	3924	4059	3984	3917
Multipara Induced	987	1175	1113	1031	1061	987	1057	858	852	836	859	996	978	988	1133	1101
Incidence (%)	**19.7**	**23.1**	**21.7**	**23.1**	**25.1**	**23.3**	**24.2**	**22.0**	**23.2**	**22.5**	**21.8**	**25.1**	**24.9**	**24.3**	**28.4**	**28.1**

*Does not include 39 BBA's

Table 166: Indication for induction by gestation NWH 2012

	Preterm		Term	
	n=	709	n=	6986
	n	%	n	%
Total	179	25.2	2304	33.0
Other	12	1.7	133	1.9
APH	6	0.8	20	0.3
Maternal Request	0		15	0.2
Poor Obstetric History	1	0.1	36	0.5
Multiple Pregnancy	4	0.6	15	0.2
Fetal wellbeing	4	0.6	97	1.4
PPROM	41	5.8	1	
IUD/Fetal Anomaly	43	6.1	18	0.3
Maternal Medical Complications	9	1.3	80	1.1
Maternal Age	0		84	1.2
Small for Gestational Age	15	2.1	260	3.7
Prolonged latent phase	18	2.5	366	5.2
Diabetes	6	0.8	308	4.4
Hypertension	20	2.8	191	2.7
Post Dates	0	0.0	342	4.9
TermPROM	0	0.0	338	4.8

Table 167: Indication for induction by parity (term births) NWH 2012

	Multipara		Nullipara	
	n=	3564	n=	3422
	n	%	n	%
Total	1020	28.6	1283	37.5
Other	63	1.8	70	2.0
APH	8	0.2	12	0.4
IUD/Fetal Anomaly	9	0.3	9	0.3
Multiple Pregnancy	7	0.2	8	0.2
Poor Obstetric History	35	1.0	1	0.0
Maternal Request	13	0.4	2	0.1
Fetal wellbeing	53	1.5	44	1.3
Maternal Age	48	1.3	36	1.1
Maternal Medical Complications	57	1.6	23	0.7
Small for Gestational Age	119	3.3	141	4.1
Diabetes	160	4.5	148	4.3
hypertension	68	1.9	123	3.6
Prolonged latent phase	155	4.3	211	6.2
Post Dates	119	3.3	223	6.5
TermPROM	106	3.0	232	6.8

Table 168: Rates of induction by age and ethnicity (prioritised) among term nullipara and multipara (excluding previous Caesarean) NWH 2012

	Term Nullipara	Induction of labour		Term Multipara no prev CS	Induction of labour	
	N	n	%	N	n	%
Total	**3422**	**1285**	**37.6**	**2511**	**901**	**35.9**
Age						
<=25	649	239	36.8	319	91	28.5
26-30	1131	401	35.5	582	182	31.3
31-35	1069	407	38.1	922	323	35.0
>=35	573	238	41.5	688	305	44.3
Ethnicity						
NZ European	1219	455	37.3	803	332	41.3
Maori	161	67	41.6	220	89	40.5
Pacific	309	126	40.8	498	184	36.9
Asian	917	324	35.3	524	117	22.3
Indian	284	119	41.9	138	58	42.0
Other European	419	150	35.8	230	89	38.7
Other	113	44	38.9	98	32	32.7

5.2 Outcomes following induction

Table 169: Mode of birth at term by onset of birth and parity (excluding women with prior CS) among intended vaginal births NWH 2012

	Nullipara				Multipara			
	Spontaneous labour n=1702		Induced labour n=1285		Spontaneous labour n=1478		Induced labour n=901	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB	1015	59.6	561	43.7	1376	93.1	765	84.9
Operative vaginal	398	23.4	314	24.4	56	3.8	49	5.4
CS emergency in labour	289	17.0	296	23.0	46	3.1	55	6.1
CS emergency not in labour*	0		114	8.9	0		32	3.6
Epidural	1007	59.2	1088	84.7	335	22.7	507	56.3

*failed induction rate

Table 170: Mode of birth at term among nullipara by indication for induction NWH 2012

	Post dates n=222		Term PROM n=232		Hypertension n=123		Prolonged latent phase n=211		Diabetes n=148		SGA n=141		Other n=162	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	90	40.5	90	38.8	53	43.1	89	42.2	70	47.3	84	59.6	68	42.0
Operative vaginal	53	23.9	71	30.6	33	26.8	43	20.4	32	21.6	35	24.8	35	21.6
CS emergency in labour	54	24.3	54	23.3	21	17.1	68	32.2	38	25.7	8	5.7	41	25.3
CS emergency not in labour*	25	11.3	17	7.3	16	13.0	11	5.2	8	5.4	14	9.9	18	11.1
Epidural	179	80.6	206	88.8	101	82.1	194	91.9	121	81.8	109	77.3	138	85.2

*failed induction rate

Table 171: Mode of birth at term among multipara (excluding previous Caesarean) women by indication for induction NWH 2012

	Post dates n=99		TermProm n=94		Hypertension n=58		Prolonged latent phase n=133		Diabetes n=142		SGA n=116		Other n=258	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	84	84.8	81	86.2	49	84.5	116	87.2	117	82.4	102	87.9	216	83.7
Operative vaginal	5	5.1	4	4.3	4	6.9	7	5.3	10	7.0	7	6.0	12	4.7
CS emergency in labour	6	6.1	6	6.4	4	6.9	10	7.5	6	4.2	3	2.6	19	7.4
CS emergency not in labour	4	4.0	3	3.2	1	1.7	0	0.0	9	6.3	4	3.4	11	4.3
Epidural	53	53.5	53	56.4	34	58.6	87	65.4	67	47.2	64	55.2	148	57.4

*failed induction rate

5.3 Use of Syntocinon

Table 172: Dilatation at start of syntocinon infusion among labouring women by induction status NWH 2012

	Induced labour n=1812		Spontaneous labour n=850	
Dilatation	n	%	n	%
0	96	5.3	0	
1	208	11.5	0	
2	473	26.1	0	
3	479	26.4	84	9.9
4	204	11.3	181	21.3
5	64	3.5	145	17.1
6	29	1.6	85	10.0
7	17	0.9	57	6.7
8	11	0.6	42	4.9
9	14	0.8	69	8.1
10	36	2.0	106	12.5
Missing	181	10.0	81	9.5

5.4 Mode of birth

Table 173: Mode of birth by parity and previous Caesarean section status NWH 2012

	Nullipara preterm n=356		Nullipara term n=3422		Multipara no prev CS preterm n=217		Multipara no prev CS term n=2511		Multipara prev CS preterm n=136		Multipara prev CS term n=1053	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	157	44.1	1574	46.0	113	52.1	2136	85.1	22	16.2	171	16.2
Vaginal breech	13	3.7	2	0.1	15	6.9	5	0.2	7	5.1	3	0.3
Operative vaginal birth	32	9.0	712	20.8	7	3.2	105	4.2	2	1.5	49	4.7
Ventouse	15	4.2	479	14.0	5	2.3	72	2.9	1	0.7	36	3.4
Forceps	17	4.8	233	6.8	2	0.9	33	1.3	1	0.7	13	1.2
Caesarean section	154	43.3	1134	33.1	82	37.8	265	10.6	105	77.2	830	78.8
Emergency	108	30.3	772	22.6	55	25.3	153	6.1	58	42.6	148	14.1
Elective	46	12.9	362	10.6	27	12.4	112	4.5	47	34.6	682	64.8

Table 174: LMC by parity and previous Caesarean section status NWH 2012

	IMW n=3654		Pvt Obstetrician n=1823		GP n=45		NWH n=2081		Other DHB n=42		Unbooked n=50	
	n	%	n	%	n	%	n	%	n	%	n	%
Primipara	1944	53.2	938	51.5	17	37.8	828	39.8	27	64.3	24	48.0
Standard primip	754	20.6	302	16.6	7	15.6	248	11.9	3	7.1	7	14.0
Multipara	1710	46.8	885	48.5	28	62.2	1253	60.2	15	35.7	26	52.0
Previous CS	332	9.1	412	22.6	10	22.2	426	20.5	5	11.9	4	8.0
No prev CS	1378	37.7	473	25.9	18	40.0	827	39.7	10	23.8	22	44.0

Table 175: Mode of birth by LMC at birth (term nullipara) NWH 2012

	IMW n=1831		PVT Obstetrician n=854		GP n=17		NWH n=700		Other DHB n=8		Unbooked n=12	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	975	53.2	219	25.6	8	47.1	360	51.4	2	25.0	10	83.3
Vaginal breech	2	0.1	0		0		0		0		0	
Forceps	138	7.5	56	6.6	1	5.9	37	5.3	1	12.5	0	
Ventouse	260	14.2	105	12.3	6	35.3	105	15.0	1	12.5	2	16.7
Cs elective	79	4.3	244	28.6	0		40	5.7	0		0	
Cs emergency	377	20.6	230	26.9	2	11.8	158	22.6	4	50.0	0	

Table 176: Mode of birth at term by LMC at birth (standard primipara) NWH 2012

	IMW n=754		PVT Obstetrician n=302		GP n=7		NWH n=248		Unbooked n=7	
	n	%	n	%	n	%	n	%	n	%
SVD	467	61.9	96	31.8	5	71.4	144	58.1	2	66.7
Forceps	0		0		0		0		0	
Ventouse	57	7.6	20	6.6	1	14.3	13	5.2	0	
Cs elective	97	12.9	51	16.9	1	14.3	38	15.3	0	
Cs emergency	8	1.1	64	21.2	0	0.0	4	1.6	0	

Table 177: Mode of birth at term by LMC at birth (multipara, no previous CS) NWH 2012

	IMW n=1308		Pvt Obstetrician n=432		GP n=16		NWH n=737		Other DHB n=2		Unbooked n=16	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	1167	89.2	324	75.0	14	87.5	614	83.3	2	100.0	15	93.8
Vaginal breech	5	0.4	0		0		0		0		0	
Forceps	15	1.1	10	2.3	0		8	1.1	0		0	
Ventouse	25	1.9	27	6.3	1	6.3	18	2.4	0		1	6.3
Cs elective	38	2.9	43	10.0	0		32	4.3	0		0	
Cs emergency	58	4.4	28	6.5	1	6.3	65	8.8	0		0	

Table 178: Mode of birth at term by LMC (multipara, previous CS) NWH 2012

	IMW n=307		Pvt Obstetrician n=370		GP n=10		NWH n=362		Other DHB n=0		Unbooked n=4	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	71	23.1	28	7.6	4	40.0	66	18.2	0		2	50.0
Vaginal breech	1	0.3	0		0		2	0.6	0		0	
Forceps	6	2.0	2	0.5	0		5	1.4	0		0	
Ventouse	18	5.9	3	0.8	1	10.0	14	3.9	0		0	
CS elective	160	52.1	307	83.0	4	40.0	210	58.0	0		1	25.0
CS emergency	51	16.6	30	8.1	1	10.0	65	18.0	0		1	25.0

Table 179: Mode of birth by ethnicity NWH 2012

	NZ European n=2696		Maori n=534		Pacific n=1023		Other Asian n=1759		Indian n=553		Other European n=847		Other n=283	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1272	47.2	338	63.3	716	70.0	1031	58.6	254	45.9	420	49.6	142	50.2
Vaginal breech	8	0.3	10	1.9	8	0.8	9	0.5	1	0.2	5	0.6	4	1.4
Forceps	139	5.2	10	1.9	20	2.0	65	3.7	22	4.0	34	4.0	9	3.2
Ventouse	220	8.2	27	5.1	43	4.2	150	8.5	61	11.0	79	9.3	28	9.9
CS elective	595	22.1	57	10.7	84	8.2	247	14.0	78	14.1	172	20.3	45	15.9
CS emergency	462	17.1	92	17.2	152	14.9	257	14.6	137	24.8	137	16.2	55	19.4

Table 180: Mode of birth by ethnicity (nullipara) NWH 2012

	NZ European n=1340		Maori n=196		Pacific n=352		Other Asian n=983		Indian n=319		Other European n=463		Other n=125	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	514	38.4	107	54.6	223	63.4	511	52.0	126	39.5	203	43.8	47	37.6
Vaginal breech	3	0.2	3	1.5	2	0.6	3	0.3	0		3	0.6	1	0.8
Forceps	118	8.8	7	3.6	15	4.3	55	5.6	19	6.0	28	6.0	8	6.4
Ventouse	177	13.2	19	9.7	30	8.5	129	13.1	49	15.4	68	14.7	22	17.6
CS elective	195	14.6	13	6.6	8	2.3	85	8.6	28	8.8	66	14.3	14	11.2
CS emergency	333	24.9	47	24.0	74	21.0	200	20.3	97	30.4	95	20.5	33	26.4

Table 181: Mode of birth by ethnicity (multipara) NWH 2012

	NZ European n=1356		Maori n=338		Pacific n=671		Other Asian n=776		Indian n=234		Other European n=384		Other n=158	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	758	55.9	231	68.3	493	73.5	520	67.0	128	54.7	217	56.5	95	60.1
Vaginal breech	5	0.4	7	2.1	6	0.9	6	0.8	1	0.4	2	0.5	3	1.9
Forceps	21	1.5	3	0.9	5	0.7	10	1.3	3	1.3	6	1.6	1	0.6
Ventouse	43	3.2	8	2.4	13	1.9	21	2.7	12	5.1	11	2.9	6	3.8
CS elective	400	29.5	44	13.0	76	11.3	162	20.9	50	21.4	106	27.6	31	19.6
CS emergency	129	9.5	45	13.3	78	11.6	57	7.3	40	17.1	42	10.9	22	13.9

Table 182: Mode of birth by maternal age (nullipara) NWH 2012

	<=20 n=223		21-25 n=507		26-30 n=1226		31-35 n=1172		36-40 n=539		>40 n=111	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	162	72.6	318	62.7	618	50.4	455	38.8	155	28.8	23	20.7
Vaginal breech	5	2.2	2	0.4	4	0.3	2	0.2	1	0.2	1	0.9
Forceps	9	4.0	21	4.1	81	6.6	94	8.0	40	7.4	5	4.5
Ventouse	17	7.6	49	9.7	168	13.7	176	15.0	79	14.7	5	4.5
CS elective	8	3.6	27	5.3	92	7.5	134	11.4	105	19.5	43	38.7
CS emergency	22	9.9	90	17.8	263	21.5	311	26.5	159	29.5	34	30.6

Table 183: Mode of birth by maternal age (multipara) NWH 2012

	<=20 n=44		21-25 n=355		26-30 n=839		31-35 n=1434		36-40 n=1016		>40 n=229	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	40	90.9	270	76.1	588	70.1	906	63.2	529	52.1	109	47.6
Vaginal breech	0		4	1.1	7	0.8	11	0.8	7	0.7	1	0.4
Forceps	0		2	0.6	7	0.8	21	1.5	15	1.5	4	1.7
Ventouse	0		8	2.3	28	3.3	38	2.6	35	3.4	5	2.2
CS elective	1	2.3	27	7.6	132	15.7	322	22.5	309	30.4	78	34.1
CS emergency	3	6.8	44	12.4	77	9.2	136	9.5	121	11.9	32	14.0

5.5 Operative births

Table 184: Primary indication for elective or pre labour emergency Caesarean section (all gestations) NWH 2012

	Total N=1728		Nullipara n=656		Multipara n=1072	
	n	%	n	%	n	%
Abruption/APH	17	1.0	6	0.9	11	1.0
Diabetes	17	1.0	6	0.9	11	1.0
Disproportion	11	0.6	11	1.7	0	0.0
Failed Induction	59	3.4	43	6.6	16	1.5
Fetal Distress	109	6.3	73	11.1	36	3.4
Hypertension	23	1.3	15	2.3	8	0.7
Malpresentation	227	13.1	155	23.6	72	6.7
Maternal Age	22	1.3	20	3.0	2	0.2
Maternal Medical Condition	55	3.2	32	4.9	23	2.1
Maternal Request	156	9.0	106	16.2	50	4.7
Multiple Pregnancy	45	2.6	24	3.7	21	2.0
Obstetric History	41	2.4	7	1.1	34	3.2
Placenta Praevia with or without bleeding	62	3.6	30	4.6	32	3.0
Repeat Caesarean Section	658	38.1		0.0	658	61.4
Small for Gestational Age	56	3.2	30	4.6	26	2.4
Other (please specify)	170	9.8	98	14.9	72	6.7

Table 185: Indication for in labour emergency Caesarean section all gestations (spontaneous or induced onset of labour) (n=842) NWH 2012

	n=842	
	n	%
1a Fetal distress	105	12.5
1b Other fetal indication	206	24.5
2a Fetal intolerance of augmented labour	121	14.4
2b Augmentation causes hyperstimulation	23	2.7
2c Poor uterine response to optimal augmentation	22	2.6
2d Suboptimal augmentation	60	7.1
2e Inefficient uterine action - no oxytocin	16	1.9
3 Efficient uterine action - obstructed labour	263	31.2
4b Maternal request	6	0.7
4a Other non-medical	12	1.4
Missing	8	1.0

Table 186: Operative vaginal birth rates 1997-2012

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total births (mothers)	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**
Total operative vaginal births	925	949	1006		1081	1065	1171	1022	956	975	937	947	942	832	907
Incidence %	12.3	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3	12.2	12.2	11.1	11.8
Total nullipara	**3263**	**3262**	**3455**				**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**	**3778**
Operative vaginal births	704	722	733				875	809	737	772	722	753	752	643	744
Nulliparous operative vaginal birth rate (%)	21.6	22.1	21.2				24.3	23.0	21.1	20.6	19.9	19.8	20.6	18.2	19.7
Total multipara	**4229**	**4239**	**4372**				**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**	**3917**
Operative vaginal births	221	227	273				296	213	219	203	215	194	190	189	163
Multiparous operative vaginal birth rate (%)	5.2	5.4	6.2				7.6	5.8	5.9	5.1	5.4	4.9	4.7	4.7	4.2

Table 187: Type of operative vaginal birth 1997-2012

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total births	**7492**	**7501**	**7827**	**7471**	**7755**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7753**	**7709**	**7523**	**7695**
Total operative vaginal births	925	949	1006		1081	1065	1171	1022	956	975	937	947	942	832	907
% of all births	12.3	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3	12.2	12.2	11.1	11.8
Total forceps alone	464	439	435		391	352	323	234	256	222	301	339	308	288	267
% of all births	6.2	5.9	5.6		5.0	4.6	4.3	3.3	3.5	2.9	4.0	4.0	4.0	3.8	3.5
Kiellands forceps	41	33	21				36	22	33	22	29	42	38	25	22
% of all births	0.5	0.4	0.3				0.5	0.3	0.5	0.3	0.4	0.5	0.5	0.3	0.3
Other forceps	423	406	414				287	212	223	200	272	297	270	263	245
% of all births	5.6	5.4	5.3				3.8	2.9	3.1	2.6	3.6	3.8	3.5	3.5	3.2
Ventouse or forceps /ventouse	461	510	571		690	713	848	788	700	753	677	650	634	544	640
% of all births	6.2	6.8	7.3		8.9	9.4	11.3	11.0	9.7	9.8	8.9	8.4	8.3	7.2	8.3
Ventouse alone		436	516				771	728	639	686	636	608	584	509	606
% of all births		5.8	6.6				10.3	10.1	8.9	8.9	8.4	7.8	7.6	6.8	7.9
Forceps/ ventouse		74	55				77	60	61	67	41	35	50	35	34
% of all births		1.0	0.7				1.0	0.8	0.8	0.9	0.5	0.5	0.6		0.4

Table 188: Breech birth 1997-2012 Note no data in 2001-2003

	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total babies born	7721	7679	8054	7679	7384	7379	7875	7753	7897	7866	7690	7695
Total breech births	400	440	484	421	432	419	449	439	335	434	406	414
Percent of total births	5.2	5.7	6.0	5.5	5.9	5.7	5.7	5.7	4.2	5.5	5.2	5.4
Total singleton babies		7329	7609	7303	7007	7050	7518	7427	7576	7556	7360	7533
Total singleton breech		341	363	318	328	328	351	346	335	340	310	356
Percent of singletons		4.7	4.8	4.4	4.7	4.7	4.7	4.7	4.4	4.3	4.2	4.7
Total multiple babies		350	445	376	377	329	357	324	321	310	330	162
Total multiple breech		99	121	103	104	91	98	93	89	94	96	58
Percent of multiple births		28.3	27.2	27.4	27.6	27.7	27.5	28.7	27.7	30.3	34.3	35.8

Table 189: Mode of birth by type of breech (singletons only) NWH 2012

	Extended leg n=166		Flexed leg n=131		Unspecificed n=59		Total breech n=356	
	n	%	n	%	n	%	n	%
Vaginal breech	14	8.4	13	9.9	11	18.6	38	10.7
Caesarean	152	91.5	118	90.0	48	81.4	318	89.3
CS emergency	5	3.0	37	28.2	21	35.6	109	30.6
CS elective	101	60.8	81	61.8	27	45.8	209	58.7

Table 190: Mode of birth by type of breech (multiples only NWH 2012

	Extended leg n=35		Flexed leg n=37		Unspecificed n=35		Total breech n=107	
	n	%	n	%	n	%	n	%
Vaginal breech	10	28.5	5	13.5	1	2.9	16	15.0
Caesarean	25	71.4	3	8.1	34	97.1	91	85.0
CS emergency	7	20.0	8	21.6	12	34.2	27	25.2
CS elective	18	51.4	24	64.9	22	62.9	64	59.8

Table 191: Referral for ECV (women at term with singleton breech presentation or attempted ECV) by demographic and clinical characteristics NWH 2012

	Singleton breech at term or attempted ECV	ECV n=124		No ECV n=176	
	n=300	n	%	n	%
Age (years					
≤ 20	5	3	60	2	40
21-30	88	48	55	40	45
31-40	188	69	37	119	63
≥ 41	19	4	21	15	79
Ethnicity (prioritised)					
NZ/Other European	173	71	41	102	59
Maori/ Pacific Island	34	14	41	20	59
Other Asian	65	28	43	37	57
Indian	20	6	30	14	70
Other	8	5	63	3	38
BMI					
<19	17	7	41	10	59
19-25	178	79	44	99	56
26-30	52	19	37	33	63
31-35	23	8	35	15	65
>35	9	4	44	5	56
LMC at birth	12	5	42	7	58
Independent MW	9	2	22	7	78
NWH Community					
NWH Diabetes/Medical	145	85	59	60	41
Private Obstetrician	43	18	42	25	58
Previous CS Yes	20	4	20	16	80
No	92	17	18	75	82

5.6 Obstetric Analgesia

Table 192: Epidural use among women with spontaneous and induced labour 2000-2012

	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of births	7827	7491	7194	7212	7695	7589	7753	7709	7523	7695
Number women with spontaneous labour	4820	4817	4246	4256	4490	4070	4125	4007	3628	3666
Spontaneous labour and epidural	2143	2434	2138	2168	2057	1743	1717	1686	1483	1571
%	44.5	50.5	50.4	50.9	45.8	42.8	41.6	42.1	40.9	42.9
Number of women with induced labour	2002	1922	1894	1776	1906	2203	2238	2214	2463	2485
Induced labour and epidural	1313	1412	1373	1269	1326	1550	1599	1557	1707	1780
%	65.6	73.5	72.5	71.5	69.6	70.4	71.4	70.3	69.3	71.6

Table 193: Analgesic use and LMC at birth among labouring nulliparous women NWH 2012

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
IMW	1812	1190	65.7	1141	63.0	231	12.7	37	2.0	253	14.0
Pvt Obstetrician	630	518	82.2	280	44.4	54	8.6	21	1.2	37	5.9
GP	17	15	88.2	8	47.1	3	17.6	0	0.0	2	11.8
NWH_Community	550	350	63.6	381	69.3	103	18.7	3	0.5	35	6.4
NWH_Diabetes	70	49	70.0	41	58.6	15	21.4	0	0.0	0	0.0
NWH_Medical	121	83	68.6	76	62.8	26	21.5	0	0.0	4	3.3
Other DHB	18	11	61.1	9	50.0	2	11.1	0	0.0	1	5.6
Unbooked	24	5	20.8	13	54.2	6	25.0	0	0.0	1	4.2

Table 194: Analgesic use and ethnicity (prioritised) among labouring nulliparous women NWH 2012

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
NZ European	1095	807	73.7	641	58.5	133	12.1	37	3.4	149	13.6
Maori	173	98	56.6	115	66.5	30	17.3	0	0.0	21	12.1
Pacific	335	195	58.2	201	60.0	43	12.8	0	0.0	26	7.8
Asian	870	574	66.0	516	59.3	132	15.2	10	1.1	47	5.4
Indian	275	195	70.9	168	61.1	36	13.1	1	0.4	13	4.7
Other European	386	274	71.0	239	61.9	50	13.0	12	3.1	69	17.9
Other	108	78	72.2	69	63.9	16	14.8	1	0.9	8	7.4

Table 195: Analgesic use and maternal age among labouring nulliparous women NWH 2012

Maternal age	Total	Epidural		Entonox		Pethidine		TENS		Water	
(years)	N	n	%	n	%	n	%	n	%	n	%
<=20	211	105	49.8	139	65.9	36	17.1	0	0.0	19	9.0
21-25	466	291	62.4	304	65.2	71	15.2	2	0.4	47	10.1
26-30	1104	759	68.8	669	60.6	138	12.5	18	1.6	113	10.2
31-35	992	717	72.3	590	59.5	134	13.5	28	2.8	122	12.3
36-40	410	307	74.9	219	53.4	54	13.2	11	2.7	27	6.6
>40	59	42	71.2	28	47.5	7	11.9	2	3.4	5	8.5

APPENDIX 6. LABOUR and BIRTH OUTCOMES

6.1 Perineal trauma

Table 196: Episiotomy rates in vaginal births, all gestations by LMC at birth and parity NWH 2012

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	2490	897	36.0	2635	273	10.4
Independent Midwife	1449	520	35.9	1365	144	10.5
Private Obstetrician	420	219	52.1	425	83	19.5
General Practitioner	15	8	53.3	22	3	13.6
National Women's	606	150	24.8	823	43	5.2

Table 197: Episiotomy rates in spontaneous (non operative) vertex (not breech) birth, all gestations by LMC at birth and parity NWH 2012

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1731	396	22.9	2442	193	7.9
Independent Midwife	1036	236	22.8	1288	103	8.0
Private Obstetrician	247	101	40.9	377	64	17.0
General Practitioner	8	3	37.5	20	2	10.0
National Women's	440	56	12.7	757	24	3.2

Table 198: 3rd and 4th degree tears in spontaneous (non operative) vertex birth by LMC at birth and parity NWH 2012

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1731	69	4.0	2442	26	1.1
Independent Midwife	1036	50	4.8	1288	18	1.4
Private Obstetrician	247	2	0.8	377	1	0.3
GP	8	0	0.0	20	0	0.0
National Women's	440	17	3.9	757	7	0.9

Table 199:Third stage management by PPH risk among vaginal births NWH 2012

	Total n=5125	Physiological n=399		Active syntocinon n=2650		Active syntometrine n=1950		Other n=7		Unknown n=119	
	n	n	%	n	%	n	%	n	%	n	%
Spontaneous vaginal birth	4218	397	9.4	95	2.3	2122	50.3	5	0.1	95	2.3
Operative vaginal birtl	907	2	0.2	24	2.6	528	58.2	2	0.2	24	2.6
BMI											
<18.5	359	41	11.4	177	49.3	133	37.0	1	0.3	7	1.9
18.5-24.99	2625	220	8.4	1340	51.0	1013	38.6	3	0.1	49	1.9
>=25-29.99	1113	84	7.5	582	52.3	410	36.8	1	0.1	36	3.2
30-34.99	490	23	4.7	282	57.6	171	34.9	1	0.2	13	2.7
35-39.99	243	5	2.1	119	49.0	111	45.7	0	0	8	3.3
>=40	176	2	1.1	97	55.1	75	42.6	1	0.6	1	0.6
missing	119	24	20.2	53	44.5	37	31.1	0	0	5	4.2
Previous CS	254	12	4.7	126	49.6	104	40.9	0		12	4.7
Hypertension											
Nil	4820	389	8.1	2396	49.7	1915	39.7	7	0.1	113	2.3
Gestational Hypertension	152	7	4.6	124	81.6	18	11.8	0		3	2.0
Chronic hypertension	69	1	1.4	54	78.3	13	18.8	0		1	1.4
Superimposed preeclampsia	7	1	14.3	5	71.4	0	0.0	0		1	14.3
Preeclampsia	77	1	1.3	71	92.2	4	5.2	0		1	1.3
Singleton	5074	397	7.8	2628	51.8	1924	37.9	7	0.1	118	2.3
Multiples	51	2	3.9	22		26	44.0	0		1	2.0

Table 200: Postpartum transfusion rates by recorded blood loss at birth NWH 2012

	Total	Postpartum transfusion	
		n	%
Total	**7695**	**182**	**2.4**
Blood loss <500	5089	7	0.1
PPH 500-999	1925	26	1.4
PPH 1000-1499	406	34	8.4
PPH 1500-2499	204	70	34.3
PPH >=2500	52	45	86.5
Blood loss unknown	19	0	0.0

APPENDIX 7. POSTNATAL CARE

7.1 Infant Feeding

Table 201: Method of Infant feeding at discharge from NWH 2003-2012

	2003 n = 5177		2004 n = 5938		2005 n = 5765		2006 n = 6158		2007 n = 6570		2008 n =6636	
	n	%	n	%	n	%	n	%	n	%	n	%
Exclusive breastfeeding	2789	53.9	3673	61.9	3686	63.9	4546	73.8	5064	77.1	5254	79.2
Fully breastfeeding	562	10.9	464	7.8	485	8.4	441	7.2	348	5.3	304	4.6
Partial breastfeeding	1521	29.4	1497	25.2	1375	23.9	958	15.6	929	14.1	871	13.1
Artificial feeding	305	5.9	304	5.1	219	3.8	213	3.5	229	3.5	207	3.1

	2009 n =6928		2010 n =6941		2011 n = 6723		2012 n =6862	
	n	%	n	%	n	%	n	%
Exclusive breastfeeding	5659	81.7	5736	82.6	5439	80.9	5508	80.3
Fully breastfeeding	287	4.1	260	3.8	285	4.2	243	3.5
Partial breastfeeding	824	11.9	755	10.9	841	12.5	957	13.9
Artificial feeding	158	2.3	190	2.7	158	2.4	154	2.2

Table 202: Infant feeding on discharge from NWH by mode of birth, LMC and maternal age NWH 2012

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total	6862	5508	80.3	243	3.5	957	13.9	154	2.2
Mode of birth									
Spontaneous vaginal	3864	3420	88.5	67	1.7	303	7.8	74	1.9
Operative vaginal	809	673	83.2	21	2.6	102	12.6	13	1.6
Elective CS	1164	779	66.9	76	6.5	260	22.3	49	4.2
Emergency CS	1025	636	62.0	79	7.7	292	28.5	18	1.8
LMC at birth									
IMW	3375	2899	85.9	108	3.2	329	9.7	39	1.2
Private Obstetrician	1700	1323	77.8	66	3.9	275	16.2	36	2.1
GP	42	35	83.3	2	4.8	4	9.5	1	2.4
NWH Community	1311	1005	76.7	39	3.0	218	16.6	49	3.7
NWH Medical	179	114	63.7	7	3.9	46	25.7	12	6.7
NWH Diabetes	212	109	51.4	18	8.5	73	34.4	12	5.7
Unbooked	33	20	60.6	2	6.1	6	18.2	5	15.2
Other DHB	10	3	30.0	1	10.0	6	60.0	0	
Maternal age									
≤ 20	204	175	85.8	6	2.9	16	7.8	7	3.4
21-25	764	638	83.5	12	1.6	92	12.0	22	2.9
26-30	1849	1500	81.1	53	2.9	265	14.3	31	1.7
31-35	2352	1913	81.3	90	3.8	303	12.9	46	2.0
36-40	1397	1071	76.7	64	4.6	220	15.7	42	3.0
>40	296	211	71.3	18	6.1	61	20.6	6	2.0

Table 203: Infant feeding on discharge from NWH by prioritised maternal ethnicity, gestation, birthweight and among standard primpara NWH 2012

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Ethnicity									
NZ European	2418	2061	85.2	80	3.3	232	9.6	45	1.9
Māori	421	343	81.5	10	2.4	47	11.2	21	5.0
Pacific	904	701	77.5	35	3.9	125	13.8	43	4.8
Other Asian	1628	1187	72.9	54	3.3	367	22.5	20	1.2
Indian	478	368	77.0	22	4.6	84	17.6	4	0.8
Other European	764	647	84.7	34	4.5	67	8.8	16	2.1
Other	249	201	80.7	8	3.2	35	14.1	5	2.0
Gestation									
< 37 weeks	248	107	43.1	49	19.8	82	33.1	10	4.0
≥37 weeks	6614	5401	81.7	194	2.9	875	13.2	144	2.2
Birth weight									
< 2.5 kgs	180	56	31.1	40	22.2	79	43.9	5	2.8
2.5 - 2.9 kgs	1063	745	70.1	62	5.8	228	21.4	28	2.6
3.0 - 4.4 kgs	5494	4620	84.1	136	2.5	623	11.3	115	2.1
≥ 4.5 kgs	125	87	69.6	5	4.0	27	21.6	6	4.8
Primipara									
Standard	1260	1072	85.1	27	2.1	151	12.0	10	0.8
Non standard	5602	4436	79.2	216	3.9	806	14.4	144	2.6
Quintile									
1	1220	986	80.8	46	3.8	159	13.0	29	2.4
2	1277	1036	81.1	42	3.3	173	13.5	26	2.0
3	1444	1188	82.3	45	3.1	183	12.7	28	1.9
4	1552	1237	79.7	57	3.7	230	14.8	28	1.8
5	1357	1053	77.6	52	3.8	209	15.4	43	3.2

Table 204: Infant feeding on discharge from NWH Homecare NWH 2012

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Community	961	511	53.2	81	8.4	257	26.7	112	11.7
Medical	79	33	41.8	5	6.3	24	30.4	17	21.5
Diabetes	79	32	40.5	9	11.4	28	35.4	10	12.7

7.2 Postnatal Admissions

Table 205: Maternal destination following birth by mode of birth NWH 2012

	Total n=7695	NWH Wards		Birthcare Auckland		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Total	**7695**	**4797**	**62.3**	**2469**	**32.1**	**407**	**5.29**	**22**	**0.3**
Spontaneous vaginal	4218	1632	38.7	2163	51.3	402	9.53	21	0.5
Operative vaginal	907	596	65.7	306	33.7	5	0.55	0	0.0
CS Elective	1278	1277	99.9	0	0.0	0	0.00	1	0.1
CS Emergency	1292	1292	100.0	0	0.0	0	0.00	0	0.0

Table 206: Maternal destination following birth by prioritised maternal ethnicity NWH 2012

	Total	NWH Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
NZ European	2696	1657	61.5	979	36.3	54	2.0	6	0.2
Maori	534	340	63.7	142	26.6	50	9.4	2	0.4
Pacific	1023	680	66.5	252	24.6	85	8.3	6	0.6
Other Asian	1759	1018	57.9	586	33.3	155	8.8	0	0.0
Indian	553	386	69.8	144	26.0	21	3.8	2	0.4
Other European	847	523	61.7	302	35.7	17	2.0	5	0.6
Other	283	193	68.2	64	22.6	25	8.8	1	0.4

Table 207: Maternal destination following birth by LMC at birth NWH 2012

	Total n=7695	NWH Wards n=4797		Birthcare n=2469		Home n=407		Other Units n=22	
	N	n	%	n	%	n	%	n	%
Total	7695	4797	62.3	2469	32.1	407	5.3	22	0.3
Independent Midwife	3654	1826	50.0	1543	42.2	270	7.4	15	0.4
Private Obstetrician	1823	1255	68.8	538	29.5	28	1.5	2	0.1
General Practitioner	45	20	44.4	23	51.1	2	4.4	0	0.0
NWH Community	1447	1008	69.7	336	23.2	102	7.0	1	0.1
NWH High Risk	634	605	95.4	25	3.9	2	0.3	2	0.3
Other DHB	42	42	100.0	0		0		0	
Unbooked	50	41	82.0	4	8.0	3	6.0	2	4.0

Table 208: Postnatal readmission reason by maternal destination following birth NWH 2012

	NWH Wards n=266		Birthcare n=126		Home n=20	
	n	%	n	%	n	%
Neonatal admission	37	13.9	26	20.6	3	15.0
Postpartum haemorrhage	14	5.3	12	9.5	3	15.0
Infection	33	12.4	6	4.8	1	5.0
Breast	38	14.3	35	27.8	6	30.0
Wound	12	4.5	1	0.8	0	
Other	132	49.6	46	36.5	7	35.0

Table 209: Place of birth for women admitted postnatally who did not birth at NWH 2012

	n=111	
	n	%
Birthcare	30	27.0
Home	6	5.4
Middlemore	15	13.5
Papakura	1	0.9
Pukekohe	1	0.9
North Shore	15	13.5
Waitakere	18	16.2
Other	25	22.5

APPENDIX 8. NEWBORN SERVICES

8.1 NICU Occupancy

Table 210: Occupancy (baby-days) for NICU by gestational age 1999-2012

Gestation (weeks)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	18407	20652	20108	20551	19249	14958	14541	14212	15228	15296	15236	14982
<28	4337	4471	4237	4772	4466	3639	3328	3612	4282	4546	4129	4133
28-31	5054	5807	6159	5483	5331	4265	4774	4322	3490	4170	4137	4230
32-36	6776	7543	7496	8198	7204	5150	4535	4326	5423	4750	4844	4519
≥37	2240	2831	2216	2098	2248	1904	1904	1952	2033	1830	2126	2100

Gestation (weeks)	2011	2012
Total	15122	**14661**
<28	4312	3563
28-31	3344	3684
32-36	4659	4752
≥37	2507	2462

Table 211: Occupancy (baby-days) for NICU by birth weight 1999-2012

Weight(g)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	18407	20652	20108	20580	19249	14958	14505	14212	15228	15296	15236	14982
<1500	8444	9003	9281	9658	8837	6563	7115	7034	7618	7584	7996	7563
1500-1999	3669	4485	4526	4460	4295	3457	2942	2568	2489	3071	2620	2662
2000-2499	3427	3362	3135	3173	3097	2360	2221	2111	2384	2432	1953	2005
≥2500	2867	3802	3166	3289	3020	2578	2227	2499	2737	2209	2667	2752

Weight (g)	2011	2012
Total	15122	14461
<1500	7005	6583
1500-1999	2669	2951
2000-2499	2804	2009
≥2500	2644	2918

8.2 Admissions to NICU

Table 212: Admissions of inborn babies to NICU by gestational age groups 2000-2012

	2000		2001		2002		2003		2004		2005	
	n	%	n	%	n	%	n	%	n	%	n	%
Total	1154		1104		1098		1004		861		825	
20-27	68	5.9	55	5.0	57	5.2	50	5.0	53	6.2	50	6.1
28-31	138	12.0	128	11.6	119	10.8	110	11.0	104	12.1	126	15.3
32-36	531	46.0	488	44.2	522	47.3	449	44.7	349	40.5	295	35.8
≥ 37	417	36.1	433	39.2	400	36.2	395	39.3	355	41.2	354	42.9

	2007		2008		2009		2010		2011		2012	
	n	%			n	%	n	%	n	%	n	%
Total	870		822		820		791		839		872	
20-27	58	6.7	58	7.1	57	7.0	58	7.3	43	5.0	40	4.6
28-31	107	12.3	122	14.8	91	11.1	110	13.9	81	9.7	102	11.7
32-36	377	43.3	331	40.3	315	38.4	280	35.3	305	36.4	334	38.3
≥ 37	328	37.7	311	37.8	357	43.5	342	43.2	410	48.9	396	45.4

Table 213: Live births at National Women's by birthweight (includes BBA) 2012

Birth weight (g)	2012 N=7786	
Total	**n**	%
<500	12	0.2
500-749	22	0.3
750-999	29	0.4
1000-1499	88	1.1
1500-1999	133	1.7
2000-2499	351	4.5
2500-2999	1185	15.2
3000-3999	5038	64.7
≥4000	928	11.9

Table 214: Admissions of inborn babies to NICU by birth weight 2000-2012

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	**1154**	**1104**	**1098**	**1004**	**861**	**825**	**791**	**870**	**822**	**820**	**791**	**839**	**872**
<500	0	1	1	0	0	0	0	1	0	0	2	0	1
500-749	22	23	14	20	11	25	19	19	19	15	23	20	14
750-999	41	37	37	32	37	34	24	37	37	42	29	24	25
1000-1249	45	47	47	31	38	47	34	47	35	31	39	25	35
1250-1499	64	48	56	53	36	42	57	51	52	49	50	42	48
1500-1999	193	186	193	164	138	120	130	130	135	126	110	110	132
2000-2499	291	243	256	238	177	170	182	188	180	155	135	176	169
2500-2999	182	199	184	156	147	119	125	139	118	117	126	129	118
3000-3999	239	232	221	237	208	215	183	198	212	246	226	259	277
≥4000	77	88	89	73	69	53	37	60	34	39	51	54	53

Table 215: Admissions of inborn babies to NICU by gestational age 2000-2012

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	**1154**	**1104**	**1098**	**1004**	**861**	**825**	**791**	**870**	**822**	**820**	**791**	**839**	**872**
23	5	7	1	1	0	1	1	5	0	1	0	2	0
24	4	10	8	9	3	15	9	4	8	9	13	8	7
25	21	12	13	10	8	14	9	13	16	12	15	8	13
26	23	12	15	15	18	11	13	18	17	15	10	14	7
27	15	14	20	15	24	9	12	18	17	20	20	11	13
28	18	21	19	18	18	23	16	21	13	19	16	16	16
29	34	29	32	18	19	41	25	26	29	20	21	15	31
30	32	36	32	31	35	29	29	27	37	22	36	22	25
31	54	42	36	43	32	33	49	33	43	30	33	28	30
32	78	58	67	49	42	42	63	46	40	42	29	42	34
33	98	77	100	78	65	38	50	63	48	65	59	44	53
34	135	125	138	137	79	83	88	114	90	82	90	96	96
35	106	116	125	96	84	70	82	82	83	69	55	68	81
36	114	112	92	89	79	62	48	72	70	57	51	55	70
37	88	77	84	71	61	70	58	59	54	64	58	72	61
38	93	101	98	88	86	83	69	81	86	89	93	84	111
39	77	88	61	85	68	72	52	68	68	77	67	107	99
40	109	106	78	90	84	80	78	74	70	83	78	78	76
41	44	55	66	52	51	39	37	39	23	38	41	59	41
42	6	6	13	9	5	9	3	6	10	6	6	10	8
43	0	0	0	0	0	1	0	1	0	0	0	0	0

Table 216: Admissions of outborn babies to NICU by gestational age 2000-2012

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	**258**	**209**	**228**	**216**	**114**	**81**	**99**	**102**	**117**	**137**	**111**	**124**	**128**
22	0	0	0	0	0	0	0	0	0	0	1	0	0
23	0	1	1	0	0	0	0	0	1	0	0	1	0
24	4	1	3	0	3	3	3	5	3	4	4	6	1
25	1	1	2	2	0	0	8	6	7	3	4	1	4
26	0	3	1	2	1	2	5	5	5	11	3	5	3
27	2	5	2	2	1	1	3	6	5	4	7	4	4
28	3	2	3	3	3	4	2	3	2	10	7	3	5
29	1	1	4	7	2	3	6	5	4	6	5	6	4
30	5	8	12	3	4	3	4	1	8	2	2	4	4
31	1	3	4	3	5	3	2	3	2	3	0	3	2
32	2	8	5	8	4	7	5	2	8	3	3	4	3
33	6	3	1	5	4	7	1	4	1	7	4	6	6
34	5	10	7	13	10	5	6	4	6	3	3	4	7
35	9	7	10	5	6	4	9	4	8	5	4	5	4
36	33	19	19	16	6	2	2	4	4	10	5	4	7
37	19	17	16	20	6	7	3	9	8	11	9	8	13
38	38	28	22	23	13	5	5	10	5	8	12	9	17
39	24	21	35	29	13	8	9	9	8	5	9	15	13
40	61	42	49	43	19	12	17	9	22	30	17	19	18
41	33	27	30	30	10	3	8	9	7	11	11	17	12
42	11	2	2	2	3	2	1	4	3	1	1	0	1
43+	0	0	0	0	1	0	0	0	0	0	0	0	0

Table 217: Admissions of outborn babies to NICU by gestational age groups 2000-2012

	2000 n=256		2001 n=209		2002 n=228		2003 n=216		2004 n=114		2005 n=81	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
20-27	7	2.7	11	5.3	9	3.9	6	2.8	5	4.4	6	7.4
28-31	10	3.9	14	6.7	23	10.1	16	7.4	14	12.3	13	16.0
32-36	55	21.3	47	22.5	42	18.4	47	21.8	30	26.3	25	30.9
≥ 37	186	72.1	137	65.6	154	67.5	147	68.1	65	57.0	37	45.7

	2006 n=99		2007 n=102		2008 n=117		2009 n=137		2010 n=111		2011 n=124		2012 n=128	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
20-27	19	19.2	22	21.6	21	17.9	22	16.1	19	17.1	17	13.7	12	9.4
28-31	14	14.1	12	11.8	16	13.7	21	15.3	14	12.6	16	12.9	15	11.7
32-36	23	23.2	18	17.6	27	23.1	28	20.4	19	17.1	23	18.5	27	21.1
≥ 37	43	43.4	50	49.0	53	45.3	66	48.2	59	53.1	68	54.8	74	57.8

Table 218: Admissions of outborn babies to NICU by birth weight 2000-2012

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	**258**	**209**	**228**	**216**	**114**	**81**	**99**	**102**	**117**	**137**	**111**	**124**	**128**
<500									1		1	0	1
500-749	3	5	3	2	3	2	10	8	7	4	5	3	4
750-999	3	6	10	4	4	5	5	11	7	17	11	10	5
1000-1249	2	3	4	8	3	4	7	6	13	15	8	10	7
1250-1499	7	6	11	5	5	6	5	4	7	8	7	5	8
1500-1999	14	15	14	18	18	15	13	10	16	8	10	15	13
2000-2499	35	34	21	28	11	10	8	8	12	12	10	14	9
2500-2999	37	32	34	29	13	10	15	13	13	12	10	14	22
3000-3999	120	87	101	91	43	22	26	33	31	50	37	41	50
≥4000	37	21	30	31	14	7	9	9	10	11	12	12	9

8.2.1 Admissions to NICU by domicile of mother

Table 219: Domicile of mother of all babies admitted to NICU 2002-2012

	2002 n=1331		2003 n=1222		2004 n=975		2005 n=906		2006 n=890		2007 n=972		2008 n=939	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Northern Region	1280	96.2	1177	96.3	934	95.8	834	91.9	826	92.8	824	84.8	841	89.6
Auckland	515	40.2	494	40	461	49.4	441	52.9	435	52.7	428	51.9	473	56.2
Counties Manukau	179	14.0	174	14.8	162	17.3	144	17.3	120	14.5	161	19.5	135	16.1
Waitemata	558	43.6	477	40.5	275	29.4	217	26	237	28.7	201	24.4	199	23.7
Northland	28	2.2	32	2.7	36	3.9	32	3.8	34	4.1	34	4.1	34	4.0
Midland Region	36	2.7	19	1.6	14	1.4	34	3.8	34	3.8	63	6.5	30	3.2
Central Region	8	0.6	9	0.7	16	1.6	23	2.5	17	1.9	0	0.0	13	1.4
Southern Region	6	0.5	13	1.1	7	0.7	8	0.9	12	1.3	0	0.0	19	2.0
Overseas	1	0.1	4	0.3	4	0.4	5	0.6	1	0.1	1	0.1	4	0.4
Missing	0	0.0	0	0.0	0	0.0	2	0.2	0	0.0	84	8.6	32	3.4

	2009 n=957		2010 n=902		2011 n=963		2012 n=1000	
	%	n	%	n	%	n	%	n
Northern Region	872	91.1	847	92.1	892	92.6	915	91.5
Auckland	509	58.4	435	48.2	491	51.0	489	48.9
Counties Manukau	123	14.1	115	12.8	121	12.6	141	14.1
Waitemata	206	23.6	253	28.1	239	24.8	236	23.6
Northland	34	3.9	44	4.9	41	4.3	49	4.9
Midland Region	50	5.2	23	2.5	24	2.5	33	3.3
Central Region	15	1.6	16	1.8	12	1.2	23	2.3
Southern Region	16	1.7	15	1.7	15	1.6	20	2.0
Overseas	0	0.0	1	0	0		0	
Missing	4	0.4	0		20	2.0	9	0.9

Table 220: DHB of mothers of all babies admitted to NICU 2012

	2012 n=1000			2012 n=1000	
DHB	**n**	**%**	**DHB**	**n**	**%**
Auckland	489	48.9	**Wanganui**	1	0.1
Counties Manukau	141	14.1	**Mid-Central**	4	0.4
Waitemata	236	23.6	**Hawkes Bay**	4	0.4
Northland	49	4.9	**Capital & Coast**	12	1.2
Waikato	11	1.1	**Nelson Marlborough**	1	0.1
Bay of Plenty	8	0.8	**Canterbury**	14	1.4
Wairarapa	1	0.1	**Otago**	2	0.2
Tairawhiti	4	0.4	**Southland**	1	0.1
Taranaki	2	0.2	**West Coast**	0	
Lakes	8	0.8	**Overseas**	0	

*9 missing DHB

8.2.3 Admissions to NICU by ethnicity of baby

Table 221: Prioritised ethnicity of babies admitted to NICU 2012

	Preterm (<37 weeks) N=586		Term N=414		Total N=1000	
	n	**%**	**n**	**%**	**n**	**%**
NZ European	203	34.6	167	40.3	370	37.0
Maori	115	19.6	61	14.7	176	17.6
Pacific	67	11.4	57	13.8	124	12.4
Other Asian	81	13.8	61	14.7	142	14.2
Indian	60	10.2	33	8.0	93	9.3
Other European	39	6.7	18	4.4	57	5.7
Other	21	3.6	17	4.1	38	3.8

8.2.4 Reason for admission to NICU

Table 222: Main reason for admission to NICU 2012

	Preterm N=586		Term N=414		Total N=1000	
	n	**%**	**n**	**%**	**n**	**%**
Prematurity	355	60.6	0		355	35.5
Respiratory distress	96	16.4	171	41.3	267	26.7
Congenital abnormality	31	5.3	77	18.6	108	10.8
Hypoglycaemia	18	3.1	43	10.4	61	6.1
Depression at birth	9	1.5	23	5.6	32	3.2
SGA	25	4.3	10	2.4	35	3.5
Cyanotic episode	3	0.5	10	2.4	13	1.3
Suspected infection	5	0.9	14	3.4	19	1.9
Neurological problem	3	0.5	3	0.7	6	0.6
Haemolytic disease	2	0.3	2	0.5	4	0.4
Feeding difficulty	2	0.3	3	0.7	5	0.5
Bile stained vomiting	8	1.4	4	1.0	12	1.2
Jaundice	0	0	7	1.7	7	0.7
Other	20	20	32	7.7	52	5.2

Unknown =20, 6 preterm and 14 term

8.2.5 Antenatal corticosteroids

Table 223: Percentage receiving antenatal corticosteroids by birth weight among ANZNN assigned babies 2003-2012

Birth weight (g)	2003			2004			2005			2006		
	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %
Total	136	42	90	121	54	91	148	57	95	134	74	128
<500												
500-749	20	50	95	11	64	91	25	52	100	19	12	18
750-999	32	47	91	37	59	95	34	56	94	24	11	23
1000-1249	31	52	100	38	58	95	47	57	98	34	20	34
1250-1499	53	30	81	35	40	83	42	60	90	57	31	53

Birth weight (g)	2007			2008			2009			2010		
	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %
Total	155	55	96	149	54	87	150	53	88	154	60	90
<500	1	100	100	0	0	0	0	0	0	2	100	100
500-749	19	53	84	19	58	79	15	73	87	25	64	88
750-999	37	54	97	38	45	92	42	55	100	31	68	90
1000-1249	47	49	100	38	58	87	39	51	79	41	66	95
1250-1499	51	61	96	54	56	87	54	46	85	55	49	85

Birth weight (g)	2011			2012		
	N n	1-7d n(%)	Any n(%)	N n	1-7d n(%)	Any n(%)
Total	121	53	91	139	94(68)	126(91)
<500	0	0	0	1	1(100)	1(100)
500-749	22	54	95	14	9(64)	14(100)
750-999	26	61	92	29	20(69)	26(90)
1000-1249	28	57	89	40	29(73)	38(95)
1250-1499	45	47	89	55	35(64)	47(85)

Table 224: Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies (2003-2012)

Gestation (weeks)	2003			2004			2005			2006		
	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %
Total	160	42	93	157	53	92	176	55	94	163	48	94
<24	1	100	100	0			1	0	100	1	0	0
24-25	19	53	95	11	73	91	29	55	97	18	56	100
26-27	30	47	93	42	57	93	20	55	100	25	44	100
28-29	36	42	97	37	51	95	64	47	94	41	56	98
30-31	74	36	89	67	48	91	62	40	94	78	45	91

(continued): Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies

Gestation (weeks)	2007			2008			2009			2010		
	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %
Total	165	56	98	189	51	88	157	50	90	175	57	91
<24	5	40	60	0	0	0	1	0	0	1	0	0
24-25	17	53	94	25	36	80	20	70	95	30	57	87
26-27	36	69	100	36	50	86	37	54	95	31	65	94
28-29	47	45	98	45	60	87	45	56	89	42	62	88
30-31	60	60	100	83	52	93	54	37	89	71	52	96

Gestation (weeks)	2011			2012		
	N n	1-7d n(%)	Any n(%)	N n	1-7d n(%)	Any n(%)
Total	139	70(50)	123(88)	161	105(65)	145(90)
<24	3	0	3(100)	0		
24-25	17	5(29)	16(94)	23	13(57)	20(87)
26-27	28	19(68)	25(89)	24	15(63)	23(96)
28-29	37	17(46)	32(86)	54	35(65)	49(91)
30-31	54	29(54)	47(87)	60	42(70)	53(88)

8.3 Care and complications

8.3.1 Infection

Table 225: Organisms causing serious infection in NICU 2012

Organism	Early Infection	Late Infection
Staph epidermidis + Ecoli	0	0
E Coli	1	4
Staph aureus	0	2
Staph epidermidis	0	6
Coagulase negative *staphylococcus*	1	6
Enterococcus	0	1
Enetrobacter	0	1
Candida	0	1
Citrobacter	0	0
Group B Strep	5	1
Listeria monocytogenes	0	0
Klebsiella	0	3
Pseudomonas	1	1
Other / Unknown	1	2

8.3.2 Intraventricular haemorrhage

8.3.2.1 Intraventricular haemorrhage

Table 226: Intraventricular haemorrhage by birth weight 2012 (benchmarked with ANZNN)

Birth Weight (g)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**178**	**52**	**101**	**17**	**5**	**1**	**2**
<500	1	0	1	0	0	0	0
500-749	14	0	11	2	1	0	0
750-999	29	2	20	4	2	0	1
1000-1249	40	6	29	3	1	0	1
1250-1499	55	22	25	6	1	1	0
1500-1999	38	22	14	2	0	0	0
2000-2499	1	0	1	0	0	0	0

Table 227: Intraventricular haemorrhage by gestation 2012 (benchmarked with ANZNN)

Gestation (weeks)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**178**	**52**	**101**	**17**	**5**	**1**	**2**
<24	0	0	0	0	0	0	0
24-25	23	0	16	4	2	0	1
26-27	24	0	20	3	1	0	0
28-29	54	5	37	9	1	1	1
30-31	60	35	23	1	1	0	0
32-36	16	11	5	0	0	0	0
>36	1	1	0	0	0	0	0

8.3.2.2 Intraventricular haemorrhage (all <1250g babies admitted to NICU)

Table 228: Intraventricular haemorrhage in all <1250g babies admitted to NICU 1985-2012

Year	Total	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
1985	70	10	33	6	14	5	2
1986	87	11	45	13	9	2	7
1987	98	14	58	9	11	2	4
1988	97	9	51	19	11	3	4
1989	113	18	62	8	9	11	5
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

8.3.3 Assisted ventilation

Table 229: High Frequency Oscillatory Ventilation 1998-2012

Gestation (wks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	8/14	7/18	11/20	3/10	12/25	7/9	5/10	15/21	12/15	19/23	15/27
<28	5/7	2/7	4/8	2/5	2/7	4/5	2/6	9/14	6/9	11/14	9/17
28-31	1/2	2/6	-	1/2	1/3	-	-	3/3	2/2	3/4	0/1
32-36	1/2	1/2	2/3	0/2	0/3	-	0/1	0/1	1/1	1/1	3/4
≥37	1/3	2/3	5/9	0/1	9/12	3/4	3/3	3/3	2/2	4/4	3/5

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 13 years.

Gestation (wks)	2009	2010	2011	2012	Total	%
Total	15/29	21/28	18/20	21/29	189/298	63
<28	8/18	12/18	11/12	6/10	93/157	59
28-31	2/3	3/3	1/1	3/5	22/35	63
32-36	3/5	2/3	1/1	1/1	16/30	53
≥37	2/3	4/4	5/6	11/13	57/75	76

Table 230: Inhaled Nitric Oxide (iNO) 1998-2012

Gestation (wks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	11/22	12/21	16/25	11/16	13/24	6/10	7/13	13/16	8/10	26/29	15/18
<28	0/2	3/6	1/3	1/2	0/1	1/2	1/6	2/5	0/1	4/5	3/5
28-31	0/1	0/3	0/2	2/2	1/3	-	-	1/1	1/1	2/3	2/2
32-36	1/5	2/2	2/3	0/3	1/6	1/1	-	3/3	1/1	5/6	2/2
≥37	10/14	7/10	13/17	8/9	11/14	4/7	6/7	7/7	6/7	15/15	8/9

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 13 years.

Gestation (wks)	2009	2010	2011	2012	Total	%
Total	10/20	32/36	20/26	26/33	226/319	71
<28	2/7	7/9	4/6	2/4	31/64	48
28-31	0/2	3/4	1/2	3/4	16/29	55
32-36	2/3	4/5	6/6	0/0	30/46	65
≥37	6/8	18/18	9/12	21/25	149/179	83

Table 231: iNO plus HFOV 1998-2012

Gestation (weeks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total	2/5	4/10	8/12	0/4	10/18	3/4	2/6	6/8	3/4	10/12	6/9	5/12	12/15	9/11
<28	0/1	1/4	1/2	0/1	-	-	0/4	2/3	0/1	3/4	2/4	2/6	5/7	4/5
28-31	-	0/2	-	-	1/3	-	-	1/1	-	2/3	-	0/1	2/2	1/1
32-36	1/2	1/1	2/3	0/2	0/3	-	-	0/1	1/1	1/1	2/2	2/3	1/2	1/1
≥37	1/2	2/3	5/7	0/1	9/12	3/4	2/2	3/3	2/2	4/4	2/3	1/2	4/4	3/4

Gestation (weeks)	2012	Total	%
Total	15/19	95/149	64
<28	2/4	22/46	48
28-31	3/3	10/16	63
32-36	0/0	12/22	55
≥37	10/12	51/65	78

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 14 years.

Table 232: Reason for ventilation and CPAP in term and post-term infants 1997-2012

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
TTN/RDS	4/7	2/44	4/19	1/24	4/47	2/45	3/46	6/61	2/42	3/55	8/76	3/84	8/100	7/88	8/96	**9/111**
Infection	4/2	4/14	5/27	3/31	1/17	3/17	0/15	1/12	2/8	2/10	3/7	-/10	1/16	2/9	2/18	**3/14**
Meconium	1/5	9/18	4/15	7/21	1/15	6/25	9/20	4/13	7/16	8/15	9/19	4/13	4/15	10/14	13/30	**15/32**
Anomaly	8/0	16/4	8/9	13/9	11/8	14/9	8/5	4/6	9/10	7/7	8/6	10/8	6/5	9/8	7/9	**5/4**
PPHN	7/4	6/4	6/4	9/5	5/6	9/12	3/4	8/7	4/6	3/3	7/4	5/6	5/6	9/10	4/4	**7/4**
Encephalopathy	6/1	7/12	1/4	7/1	2/4	1/1	14/7	8/8	9/4	4/1	8/7	6/2	7/8	11/1	8/5	**1/2**
Support for surgery												14/8	10/3	13/6	9/3	**15/4**
Other											21/25	6/13	17/36	21/24	14/30	**17/35**
Missing reason											3/2		1/0			

Numbers in each cell are IPPV/CPAP. Some babies from 1997 – 2006 with other diagnoses are not included in this table.

8.4.1 Survival

Table 233: Numbers of survivors by gestational age of babies <32 weeks gestation 2012

Gestation (weeks)	20	21	22	23	24	25	26	27	28	29	30	31
Born alive in NWH	5	5	3	5	8	14	7	14	16	32	25	30
Died at birth in NWH	5	5	3	5	1	1	0	1	0	1	0	0
Born alive at NWH and admitted to NICU					7	13	7	13	16	31	25	30
Born alive at NWH and survived					5	11	7	13	15	28	25	28
Outborn admitted					1	4	3	4	5	4	4	2

8.5 Outcomes

8.5.1 Retinopathy of prematurity

Table 234: Retinopathy of prematurity by birth weight in babies surviving to 36 weeks gestation (ANZNN assigned babies) 2012

Birth Weight(g)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**129**	**31**	**55**	**26**	**12**	**5**	**0**
<500	0	0	0	0	0	0	0
500-749	14	1	3	5	4	1	0
750-999	27	2	11	6	4	4	0
1000-1249	37	9	16	10	2	0	0
1250-1499	37	15	19	2	1	0	0
1500-1999	14	4	6	3	1	0	0

Table 235: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks gestation (ANZNN assigned babies) 2012

Gestation (wks)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**129**	**31**	**55**	**26**	**12**	**5**	**0**
<24	0	0	0	0	0	0	0
24-25	22	0	6	6	5	5	0
26-27	23	1	11	7	4	0	0
28-29	48	5	33	9	1	0	0
30-31	26	17	3	4	2	0	0
>31	10	8	2	0	0	0	0

8.5.2 Chronic lung disease

Table 236: Chronic lung disease by birth weight (inborn babies <1500gms) 2012

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	123	7	116	6	13	16	35	28	30
500-749	14	0	14	0	5	6	11	79	79
750-999	25	2	23	3	5	4	12	48	52
1000-1249	35	2	33	0	2	2	4	11	12
1250-1499	48	2	46	3	1	4	8	17	17

Table 237: Chronic lung disease by gestational age (inborn babies <32weeks) 2012

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	**142**	**8**	**134**	**7**	**14**	**17**	**38**	**27**	**28**
<24	0								
24-25	20	2	18	1	8	4	13	65	72
26-27	20	0	20	2	1	4	7	35	35
28-29	47	4	43	2	5	6	13	28	30
30-31	55	2	53	2	0	3	5	9	9

8.5.3 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 238: Necrotising enterocolitis (NEC) by birth weight 2002-2012 ANNZN <1500g

Weight (g)	2002			2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**154**	**2**	**1**	**136**	**3**	**2**	**121**	**4**	**3**	**148**	**6**	**4**	**134**	**3**	**2**	**155**	**2**	**1**
<500																1	0	0
500-749	14	0		20	1	5	11	0	0	25	4	16	19	2	10	19	1	5
750-999	37	1	3	32	1	3	37	3	8	34	1	3	24	0	0	37	1	3
1000-1249	47	1	2	31	0		38	1	3	47	1	2	34	1	3	47	0	0
1250-1499	56	0		53	1	2	35	0		42	0		57	0		51	0	0

Weight (g)	2008			2009			2010			2011			2012		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**149**	**4**	**3**	**150**	**6**	**4**	**154**	**7**	**5**	**121**	**5**	**4**	**139**	**3**	**2**
<500	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0
500-749	19	2	11	15	1	7	25	0	0	22	2	9	14	1	7
750-999	38	1	3	42	4	10	31	1	3	26	2	8	29	1	3
1000-1249	38	1	3	39	0	0	41	4	10	28	1	4	40	1	3
1250-1499	54	0	0	54	1	2	55	2	4	45	0	0	55	0	0

Table 239: Necrotising enterocolitis by gestational age ANNZN <32wks 2002-2012

Gestation (weeks)	2002			2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**174**	**3**	**2**	**160**	**4**	**3**	**157**	**4**	**3**	**175**	**6**	**3**	**162**	**3**	**2**	**165**	**2**	**1**
<24																5	0	0
24-25	21	1	5	20	1	4	11	1	9	29	4	14	18	1	6	17	1	6
26-27	33	0		30	1	3	42	3	7	20	0		25	2	8	36	1	3
28-29	52	1	2	36	1	3	37	0		64	0		41	0	0	47	0	0
30-31	68	1	1	74	1	1	67	0		62	1	2	78	0	0	60	0	0

Gestation (weeks)	2008			2009			2010			2011			2012		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total				**189**	**4**	**2**	**157**	**6**	**4**	**175**	**7**	**4**	**161**	**3**	**2**
<24	0	0	0	1	0	0	1	0	0	3	1	33	0	0	0
24-25	25	3	12	20	1	5	30	0	0	17	2	12	23	2	9
26-27	36	1	3	37	5	14	31	2	7	28	2	7	24	0	0
28-29	45	0	0	45	0	0	42	4	10	37	1	3	54	1	2
30-31	83	0	0	54	0	0	71	1	1	54	0	0	60	0	0

8.5.4 Pneumothorax (All babies <1500g)

Table 240: Pneumothorax requiring drainage by birth weight (<1500g) 2003-2012

Birth weight (g)	2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <1500g	**136**	**3**	**2**	**121**	**1**	**1**	**148**	**8**	**5**	**134**	**1**	**0.7**	**155**	**7**	**5**
<500													1	0	0
500-749	20	2	10	11	0		25	1	4	19	0	0	19	1	5
750-999	32	0		37	0		34	1	3	24	0	0	37	4	11
1000-1249	31	1	3	38	1	3	47	3	6	34	0	0	47	1	2
1250-1499	53	0		35	0		42	3	7	57	1	2	51	1	2

Birth weight (g)	2008			2009			2010			2011			2012		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <1500g	**149**	**7**	**5**	**137**	**6**	**5**	**143**	**2**	**1**	**139**	**0**	**0**	**148**	**0**	**0**
<500	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0
500-749	19	2	11	15	1	7	23	1	4	23	0	0	18	0	0
750-999	38	1	3	42	3	7	29	0	0	34	0	0	30	0	0
1000-1249	38	0	0	31	0	0	39	0	0	35	0	0	42	0	0
1250-1499	54	4	7	49	2	4	50	1	2	47	0	0	56	0	0

Table 241: Pneumothorax requiring drainage by gestation (all babies <32wks) 2003-2012

Gestation (weeks)	2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <32wks	**160**	**3**	**2**	**157**	**3**	**2**	**176**	**11**	**6**	**163**	**1**	**1**	**165**	**7**	**4**
<24	1			0			1	0		1	0	0	5	0	0
24-25	19	2	11	11	0	0	29	1	3	18	0	0	17	2	1
26-27	30	0	0	42	1	2	20	3	15	25	0	0	36	2	6
28-29	36	1	3	37	0	0	64	5	8	41	1	2	47	3	6
30-31	74	0	0	67	2	3	62	2	3	78	0	0	60	0	0

Gestation (weeks)	2008			2009			2010			2011			2012		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <32wks	**189**	**7**	**4**	**148**	**3**	**2**	**164**	**2**	**1**	**157**	**1**	**1**	**169**	**0**	**0**
<24	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0
24-25	25	2	8	21	1	5	28	0	0	23	0	0	25	0	0
26-27	36	1	3	35	2	6	30	0	0	34	0	0	27	0	0
28-29	45	2	4	39	0	0	37	2	5	40	0	0	56	0	0
30-31	83	2	2	52	0	0	69	0	0	57	1	2	61	0	0

Table 242: Inborn babies receiving postnatal corticosteroids by birth weight (babies alive at 1 week and less than 1500gms) 2012

Birth weight (g)	N	n	%
Total	**107**	**18**	**16.8**
<500	0	0	
500-749	19	9	47
750-999	22	8	36
1000-1249	24	1	4.2
1250-1499	42	0	0

Table 243: Inborn babies receiving postnatal corticosteroids by gestational age 2012 babies alive at 1 week and less than 32 weeks)

Gestation(weeks)	N	n	%
Total	**139**	**11**	**8**
<24	0	0	0
24-25	20	8	40
26-27	20	1	5
28-29	45	2	4
30-31	54	0	0

Table 244: Method of feeding at discharge from NICU by gestational age and birth weight 2012 (inborn)

	Total	Exclusive		Fully		Partial		Artificial		Nil Oral	
	n	n	%	n	%	n	%	n	%	n	%
Total	856	353	41.2	225	26.3	184	21.5	55	6.4	37	4.3
Gestation (weeks)											
20-24	5	3	60	0		2	40	0		0	
25-27	31	16	52	2	6	9	29	4	13	0	
28-31	96	63	66	13	14	11	11	9	9	0	
32-36	331	96	29	123	37	84	25	24	7	4	1
37-40*	344	146	42	76	22	74	22	16	5	31	9
≥41	49	59	59	11	22	4	8	2	4	2	4
Birth weight (gms)											
500-749	12	6	50	1	8	3	25	3	25	0	
750-999	23	12	52	2	9	3	13	6	26	0	
1000-1249	33	19	58	4	12	5	15	5	15	0	
1250-1499	46	27	59	9	20	6	13	4	9	0	
1500-1999	130	58	45	32	25	33	25	6	5	1	1
2000-2499	167	46	28	67	40	43	26	10	6	1	1
2500-2999*	117	37	31	40	34	22	19	8	7	10	9
3000-3999	275	132	48	53	19	52	19	14	5	22	8
>3999	53	16	30	17	32	14	26	3	6	3	6

8.6 Details of deaths prior to discharge among outborn babies admitted to NICU

Table 245: Outborn neonatal and post-neonatal deaths prior to discharge 2012

Born at	Gestational age	Birth Weight	Apgar @1 min	Apgar @ 5 min	Age at death (d)	Cause of death
NSH	29	1415	4	7	39	Neurological injury
MMH	25	680	5	9	39	NEC
NSH	28	1455	4	8	4	H. Influenza sepsis
MMH	29	680	9	9	127	NEC
MMH	37	2540	9	10	4	Metabolic disease
Waitakere	41	3910	3	6	0	Sepsis
MMH	26	920	6	9	98	NEC
Kaitaia	27	1100	4		1	Pulmonary Haemorrhage / PPHN

8.7 Details of deaths prior to discharge among inborn babies admitted to NICU

Table 246: Inborn neonatal and post-neonatal deaths prior to discharge from NICU 2012

Birthplace	Gestational age	Birth weight	Apgar @1 min	Apgar @ 5 min	Age at death (d)	Main Cause of death
Theatre	30	895	2	6	10	Neurological
LBS	38	4220	9	9	11	Congenital cardiac anomaly died SSH
LBS	39	3455	9	9	7	Congenital cardiac anomaly died SSH
Theatre	40	3660	7	9	34	Congenital cardiac anomaly died SSH
Theatre	39	3500	3	9	1	Diaphragmatic Hernia Died SSH
LBS	33	2090	1	7	10	Congenital cardiac anomaly died SSH
LBS	38	2830	5	7	12	Congenital cardiac anomaly died SSH
Theatre	28	460	1	5	10	NEC
LBS	24	750	2	5	11	NEC
LBS	38	2630	1	2	3	Hypoxia ischaemic encephalopathy with multi organ failure
LBS	31	1445	3	6	2	Multi organ failure
Theatre	29	1910	2	3	0	Hydrops
Theatre	29	1230	8	9	35	Sepsis
Theatre	37	2010	3	4	1	Pulmonary hypoplasia, polycystic renal disease
Theatre	35	2000	1	5	29	Complex congenital anomalies
LBS	29	1000	5	7	1	Complex congenital anomalies
LBS	33	1660	2	7	23	Complex congenital anomalies
Theatre	31	1480	4	7	13	Complex congenital anomalies
Postnatal ward	24	579			95	Respiratory
Theatre	25	840	4	5	171	Complex congenital anomalies
LBS	25	600	1	3	107	Respiratory
Theatre	35	3302	4	6	1	Complex congenital anomalies
Theatre	40	3572	1	6	1	Complex congenital anomalies

APPENDIX 9. PERINATAL MORTALITY

Table 247: Postnatal transfer deaths (these are babies born elsewhere who transferred to NWH for postnatal care) 2000-2012

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Early neonatal deaths	< 7 days	6	1	3	3	3	3	3	5	3	4	5	3	4
Late neonatal deaths	8 – 28 days	0	1	0	0	0	3	3	2	3	5	1	0	0
Total deaths		6	2	3	3	3	6	6	7	6	9	6	3	4

Table 248: Maternal characteristics and perinatal related mortality 2012

	Births n=7863		Stillbirths n=77			Neonatal deaths n=46		Perinatal related deaths n=123		
	N	%	n	%	SB rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Maternal ethnicity (prioritised)											
NZ European	2763	35.1	16	21	5.8	13	28	4.7	29	24	10.5
Maori	552	7.0	8	10	14.5	10	22	18.4	18	15	32.6
Pacific	1044	13.3	17	22	16.3	8	17	7.8	25	20	23.9
Other Asian	1786	22.7	15	19	8.4	6	13	3.4	21	17	11.8
Indian	560	7.1	7	9	12.5	1	2	1.8	8	7	14.3
Other European	865	11.0	12	16	13.9	2	4	2.3	14	11	16.2
Other	293	3.7	2	3	6.8	6	13	20.6	8	7	27.3
Parity											
Nullipara	3862	49.1	42	55	10.9	14	30	3.7	56	46	14.5
Multipara	4001	50.9	35	45	8.7	32	70	8.1	67	54	16.7
Maternal age											
≤25	1153	14.7	11	14	9.5	14	30	12.3	25	20	21.7
26-34	4267	54.3	44	57	10.3	13	28	3.1	57	46	13.4
≥35	2443	31.1	22	29	9.0	19	41	7.8	41	33	16.8
Maternal smoking at booking											
Currently smoking	448	5.7	4	5	8.9	9	20	20.3	13	11	29.0
Not smoking	7414	94.3	73	95	9.8	37	80	5.0	110	89	14.8
Missing data	1		0			0			0		
Maternal BMI (WHO categories)											
<18.5	487	6.3	2	3	4.1	2	4	4.1	4	3	8.2
18.5-24.99	4036	52.5	35	45	8.7	15	33	3.7	50	41	12.4
25-29.99	1714	22.3	19	25	11.1	17	37	10.0	36	29	21.0
>=30	1445	18.8	15	19	10.4	9	20	6.3	24	20	16.6
Missing	181	2.3	6	8	33.1	3	7	17.1	9	7	49.7
NZDep 2006 (quintile)											
1	1402	17.8	15	19	10.7	9	20	6.5	24	20	17.1
2	1420	18.1	11	14	7.7	5	11	3.5	16	12	11.3
3	1674	21.3	12	16	7.2	6	13	3.6	18	15	10.8
4	1766	22.5	15	19	8.5	7	15	4.0	22	18	12.5
5	1585	20.2	24	31	15.1	18	39	11.5	42	34	26.5
Missing data	16	0.2	0			1	2		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 249: Perinatal full necropsy rates (%) 1991-2012

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Perinatal necropsy (%)	58	56	65	68	57	48	50	38	50	40

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Perinatal necropsy (%)	40	41	43	52	48	50	59	55	38	44	33	34

Table 250: Cause of perinatal-related death (PSANZ-PDC)

Classification*	2005 n	%	2006 n	%	2007 n	%	2008 n	%	2009 n	%	2010 n	%	2011 n	%	2012 N	%
Congenital abnormality	38	34	37	37	48	43	34	31	31	28	48	41	43	36	48	39
Perinatal infection	11	10	9	9	4	4	5	5	4	4	4	3	4	3	2	2
Hypertension	3	3	3	3	0		4	4	6	5	4	3	4	3	5	4
APH	6	5	4	4	7	6	13	12	15	13	11	9	9	8	15	12
Maternal conditions	8	7	6	6	5	5	3	3	6	5	9	8	8	7	10	8
Specific perinatal conditions	10	9	7	7	7	6	22	20	16	14	8	7	23	19	14	11
Hypoxic peripartum death	4	4	0		2	2	1	1	1	1	2	2	1	1	1	1
Fetal growth restriction	1	1	8	8	11	10	9	8	5	4	2	2	8	7	3	2
Spontaneous preterm	20	18	13	13	16	14	11	10	19	17	8	7	10	8	15	12
Unexplained antepartum death	10	9	12	12	10	9	7	6	9	8	0		9	8	10	8
No obstetric antecedent	0		0		1	1	1	1	0	0	0		1	1	0	
Total	111		99		111		110		112		117		120		123	

Table 251: Cause of death (PSANZ-PDC) among terminations of pregnancy 2012

Classification	Termination of pregnancy n=39	
	n	%
Congenital abnormality	23	59
Antepartum haemorrhage	1	3
Perinatal Infection	0	
Specific perinatal conditions	3	8
Hypertension	2	5
Maternal condition	7	18
Spontaneous preterm	3	8
Fetal growth restriction	0	

Table 252: Perinatal related deaths by cause (PSANZ-PDC) and gestational age 2012

Classification	Total n=123		< 37 weeks n=101		≥ 37 weeks n=22	
	n	%	n	%	n	%
Congenital abnormality	48	39	39	39	9	41
Perinatal infection	2	2	2	2	0	
Antepartum haemorrhage	15	12	15	15	0	
Maternal conditions	10	8	9	9	1	5
Hypertension	5	4	4	4	1	5
Specific perinatal conditions	14	11	9	9	5	23
Hypoxic peripartum death	1	1	0		1	5
Fetal growth restriction	3	2	2	2	1	5
Spontaneous preterm	15	12	15	15	0	
Unexplained antepartum death	10	8	6	6	4	18
No obstetric antecedent	0		0		0	

APPENDIX 10. GYNAECOLOGY

10.1 Termination of pregnancy

Table 253: Demography and characteristics of women attending EDU NWH 2002-2012

	2002 n=5775	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
Ethnicity	%	%	%	%	%	%	%	%	%	%	%
New Zealand European	28.6	27.8	27.4	26.5	27.4	27.6	27.7	26.1	25.7	27.2	27.01
Maori	19.6	18.2	18.4	19.1	20.4	21.2	20.5	19.9	20.4	19.5	19.25
Pacific	22.9	23.0	22.8	23.2	23.8	24.5	23.1	24.3	24.1	22.6	24.58
Other Asian	10.9	12.3	11.6	11.2	11.4	10.5	10.8	10.6	10.3	10.9	11.02
Indian	6.4	7.4	7.7	8.3	8.2	8.3	9.4	10.2	11.7	11.7	10.63
Other European	5.1	5.1	5.4	5.7	5.0	4.5	4.8	5.1	5.2	5.7	5.45
Other	6.5	6.3	6.6	6.0	3.8	3.3	2.6	3.3	2.6	2.4	2.07
Age											
≤ 19	19.3	18.7	19.3	19.8	21.5	22.3	21.7	22.2	20.7	17.8	16.6
20 – 24	28.5	30.3	28.9	28.5	29.7	29.6	29.0	29.8	30.6	30.6	31.3
25 – 29	21.3	20.8	20.9	21.1	20.7	20.1	21.6	20.8	19.9	21.6	21.7
30 – 34	16.4	15.9	16.1	15.7	14.4	14.3	13.3	13.9	14.1	15.4	16.0
35 –39	10.4	10.2	10.9	10.7	9.5	9.7	10.1	9.3	10.0	10.2	10.0
≥40	4.1	4.1	3.9	4.3	3.9	4.0	4.3	4.0	4.7	4.4	4.5
Gestation (weeks) at termination											
6	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1
7	1.8	1.2	0.9	0.4	0.2	0.2	0.1	0.6	2.7	1.4	1.1
8	9.8	8.9	17.2	10.5	11.0	8.8	13.0	18.4	33.7	30.3	25.3
9	21.5	20.0	23.9	20.9	23.1	20.8	23.9	24.5	23.7	26.9	27.4
10	23.1	23.8	21.4	22.7	24.0	25.1	25.1	24.3	16.8	18.4	18.8
11	22.5	23.9	20.6	24.0	23.5	24.1	21.3	18.8	13.0	12.6	14.4
12	18.5	20.0	14.5	20.0	17.6	20.9	16.7	13.2	10.1	9.9	11.7
≥13	2.9	2.1	1.4	1.3	0.5	0.0	0.2	0.1	0.0	0.4	1.2

10.2 Gynaecology Inpatient Surgery

Table 254: BMI by ethnicity (prioritised) among women having inpatient gynaecology surgery NWH 2012 (missing data excluded)

	Total	<19		19-25		26-30		31-35		>35	
	N	n	%	n	%	n	%	n	%	n	%
Total	**1528**	**44**	**2.9**	**636**	**41.6**	**350**	**22.9**	**203**	**13.3**	**251**	**16.4**
NZ European	578	15	2.6	288	49.8	144	24.9	69	11.9	52	9.0
Maori	154	2	1.3	41	26.6	34	22.1	23	14.9	48	31.2
Pacific	260	1	0.4	27	10.4	47	18.1	57	21.9	119	45.8
Other Asian	174	12	6.9	116	66.7	30	17.2	7	4.0	3	1.7
Indian	137	7	5.1	62	45.3	36	26.3	17	12.4	10	7.3
Other European	159	3	1.9	71	44.7	45	28.3	21	13.2	14	8.8
Other	57	4	7.0	26	45.6	12	21.1	8	14.0	4	7.0
Not Stated	9	0	0.0	5	55.6	2	22.2	1	11.1	1	1.1

Table 255: Smoking status by ethnicity (prioritised) among women having inpatient gynaecology surgery NWH 2012

		Currently smoking		Past smoker		Never smoked		Unknown	
	N	n	%	n	%	n	%	n	%
Total	**1528**	**267**	**17.5**	**185**	**12.1**	**1074**	**70.3**	**1**	**0.1**
NZ European	578	102	17.7	91	15.7	385	66.6	0	
Maori	154	57	37.0	32	20.8	65	42.2	0	
Pacific	260	69	26.5	24	9.2	167	64.2	0	
Other Asian	174	7	4.0	5	2.9	162	93.1	0	
Indian	137	8	5.8	2	1.5	127	92.7	0	
Other European	159	20	12.6	26	16.4	113	71.1	0	
Other	57	4	7.0	3	5.3	49	86.0	1	1.8
Not stated	9	0	0.0	2	22.2	6	66.7	0	

Table 256: ASA rating among women having inpatient gynaecology surgery NWH 2012

	Inpatient surgeries 2012 n=1528	
	n	%
ASA Rating		
0	0	
1	765	50.1
2	577	37.8
3	130	8.5
4	7	0.5
Missing	49	3.2

10.3 Gynaecology Laparoscopic Surgery

Table 257: BMI and Surgical approach* NWH 2012 (Missing data excluded)

	Hysteroscopy n=305		Laparoscopy n=341		Laparotomy n=214		Vaginal n=597		Radiologically n=12		Vulval n=59	
	n	%	n	%	n	%	%	%	n	%	n	%
BMI												
<19	5	1.6	13	3.8	5	2.3	17	2.9	1	8.3	3	5.1
19-25	92	30.2	180	52.8	80	37.4	250	41.9	6	50.0	28	47.5
26-30	70	23.0	70	20.5	55	25.7	142	23.8	2	16.7	11	18.6
31-35	41	13.4	40	11.7	33	15.4	81	13.6	1	8.3	7	11.9
>35	93	30.5	31	9.1	37	17.3	85	14.2	1	8.3	4	6.8

2.9% of BMI data missing in 2012

APPENDIX 11. GLOSSARY OF ABBREVIATIONS

ABA	American Board of Anaesthesiologists	HMD	Hyaline Membrane Disease
ACL	Anticardiolipin antibody	HPV	Human papilloma virus
ACHS	Australian Council Healthcare Standards	ICH	Intracerebral haemorrhage
AMOSS	Australasian maternity outcomes surveillance system	IDDM	Insulin dependent diabetes mellitus
AMSIS	Auckland Maternity Services Information System	Indo	Treated with indomethacin
ANA	Antinuclear antibody	iNO	Inhaled nitrous oxide
ANZNN	Australia and New Zealand Neonatal Network	IPPV	Intermittent positive pressure ventilation
APH	Antepartum haemorrhage	IOL	Induction of labour
ARM	Artificial rupture of membranes	IUD	Intrauterine death
ASA	American Society of Anaesthesiologists	ICSI	Intracytoplasmic sperm injection
AUT	Auckland University of Technology	IVF	In vitro fertilisation
BBA	(Baby) Born Before Arrival (not a planned home birth)	IVH	Intraventricular haemorrhage
BFHI	Baby Friendly Hospital Initiative	KPI	Key performance indicator
BMI	Body mass index	LB	Live birth
BP	Blood Pressure	Ligate	Surgical ligation of PDA
BPD	Bronchopulmonary dysplasia	LLETZ	Large loop excision of the transformation zone
CDU	Child Development Unit	LMP	Last menstrual period
CHD	Congenital Heart Disease	LNND	Late neonatal death
CI	Confidence Interval	LSCS	Lower segment Caesarean section
CLD	Chronic lung disease	LSIL	Low-grade squamous intraepithelial lesion
CPAP	Continuous positive airways pressure	LV	Left ventricle
CRIS	Clinical Records Information System	MAS	Meconium aspiration syndrome
CS	Caesarean section	MCDA	Monochorionic diamniotic twin
CVA	Cerebro Vascular Accident	MCMA	Monochorionic monoamniotic twin
CVS	Chorionic villus sampling	MDM	Multi disciplinary meeting
DAU	Day Assessment unit	N/R	Not resuscitated
DBP	Diastolic blood pressure	NAS	Neonatal abstinence syndrome
DCCM	Department of Critical Care Medicine	NEC	Necrotising enterocolitis
DCDA	Dichorionic diamniotic twin	NFD	Not further defined
DHB	District Health Board	NICU	Neonatal Intensive Care Unit
DIC	Disseminated intravascular coagulopathy	NIDDM	Non-insulin dependent diabetes mellitus
DNA	Did not attend	NWH	National Women's
DORV	Double outlet right ventricle	NPSU	National perinatal statistics unit (Australia)
DRG	Diagnosis related groups	NSU	National screening unit
ECMO	Extra Corporeal Membrane Oxygenation	NZBFA	NZ Breast Feeding Authority
EDU	Epsom Day Unit	OP	Occiput posterior
ENND	Early neonatal death	OPU	Oocyte pick up
ERPOC	Evacuation of retained products of conception	PCR	Protein Creatinine ratio
FH	Fetal heart	PDA	Patent ductus arteriosis
FTE	Fulltime equivalent	PE/PET	Pre-eclampsia
GA	General anaesthetic	PG	Prostaglandin
GDM	Gestational diabetes mellitus	PIN	Parent Infant Nursery
GH	Gestational hypertension	PM	Postmortem
GLH	Green Lane Hospital	PMMRC	Perinatal & Maternal Mortality Review Committee
GO	Gynaecologic oncology	PMR	Perinatal mortality rate
GP	General Practitioner	PPHN	Persistent pulmonary hypertension of the newborn
GPH	Gestational proteinuric hypertension	PRLR	Perinatal related loss rate
GTT/ OGTT	Oral glucose tolerance test	(P)PROM	(Preterm) prolonged rupture of membranes
Hb	Haemoglobin	PROM	Prolonged rupture of membranes
HbAIc	Glycosylated heamoglobin	PVL	Periventricular leukomalacia
HDU	High Dependency Unit	RDS	Respiratory distress syndrome
HELLP	Hemolysis, Elevated Liver Enzymes, Low Platelets	ROP	Retinopathy of prematurity

HFOV	High frequency oscillatory ventilation	RR	Relative risk
HIE	Hypoxic ischaemic encephalopathy	SBP	Systolic blood pressure
HIV	Human Immunodeficiency Virus	SCBU	Special Care Baby Unit
SGA	Small for gestational age	SLE	Systemic Lupus Erythematosus
SRM	Spontaneous rupture of membranes	US/USS	Ultrasound/ultrasound scan
STOP	Surgical termination of pregnancy	VBAC	Vaginal birth after Caesarean
SVB	Spontaneous vaginal birth	VLBW	Very low birth weight
TCM	Transcutaneous oxygen monitor	VSD	Ventricular septal defect
TGA	Transposition of the great arteries	WAU	Women's Assessment Unit
TIA	Transient Ischaemic Attack	wks	weeks
TOP	Termination of pregnancy	WHO	World Health Organisation
UAC	Umbilical artery catheter		
HMD	Hyaline Membrane Disease		

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
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.

Table 258: 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

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 customised percentile)
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
Vaginal birth in a pregnancy subsequent to one in which birth was by Caesarean section.

Very Low Birth weight
Birth weight less than 1500g