National Women's Annual Clinical Report 2010

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Disclaimer

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

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It is my pleasure to present the 2010 National Women's Annual Clinical Report. This year we have again made additions to the data contained in our report, specifically by including severe maternal morbidity data and socioeconomic deprivation data.

The process of publishing and presenting our report is one of the ways we maintain our focus on continuous quality improvement. This allows us to feedback our results, both those we are proud of and those where we have room for improvement, to our staff, colleagues and consumers and receive their feedback. Feedback from those with whom we share our Report is greatly valued and each year we use this feedback to inform our continuous quality improvement processes.

The quality of service we provide is thanks to our valued staff and again my thanks go to all members of staff who strive to ensure the best possible service for all women and babies who are cared for at National Women's. A very special thank you goes to those members of staff whose enthusiasm, dedication and focus result in this our comprehensive Annual Clinical Report. Thank you for sharing this with us.

Kirsty Walsh
Acting General Manager, Clinical Services
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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. It also includes benchmarking of NW maternity data with Women's Hospitals Australasia (WHA) clinical indicators.

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 2010, 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 2010.

Chapter 11: Maternal mortality and morbidity
This chapter provides data on maternal deaths and severe maternal morbidities among women giving birth at NW during 2010.

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 mothers 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 2010 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 2010 calendar year. This includes babies transferred from other units or home.

1.4 Data sources

Data for this report have been extracted from the NW maternity clinical database (Healthware iSoft) and from stand-alone databases for neonatology, perinatal mortality, Fertility Plus, Epsom Day Unit, gynaecologic oncology, 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 non-NW 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.

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

For the 2004 -2010 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.

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).

1.5 Data quality

1.5.1 Maternity data quality

Specific cleaning queries were used and discrepancies identified were checked and corrected prior to analysis of the data for the 2010 NW Annual Clinical Report. These queries are listed 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 2010 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. Colposcopy data were obtained from tables within the Healthware database. 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 database 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.

1.7 Clinical indicators

We have for some years contributed maternity data to the WHA (Women's Hospitals Australasia) benchmarking initiative. This year we have presented our 2010 data compared to WHA mean data for maternity units with level 3 neonatal intensive care units for the three year intervals from July 2007 - June 2010. We have also calculated rates for public care women in 2010. NW public care includes mothers who had a NW LMC (community and high risk medical clinics), transfers in late pregnancy or labour from other DHBs and unbooked mothers. The clinical indicators are presented as a summary table in the summary statistics chapter and also in the chapter throughout the report to which they pertain.

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

- Gestational and pre-existing diabetes in pregnancy services to WDHB and to CMDHB as requested.
- Pre-pregnancy counselling for diabetic and 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 from 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 for a 6 -12 week rotation.
- 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 211 admissions in 2010. 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 1444 referrals in 2010, consistent with previous years. 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 83 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 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 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 the care of 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 weekly 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.

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 general gynaecology, gynaecologic oncology and breast surgery. It also provides care to women with early pregnancy complications and medical terminations of pregnancy up to 20 weeks gestation.

- 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
- Colposcopy
- Gynaecologic Oncology
- Pre admissions clinic

2.3.4 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.

2.3.5 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.

2.3.6 Fertility Plus

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

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.

2.3.7 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).

2.3.8 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.

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 Practice programme at Masters level and the Neonatal Nursing course, also positioned at Masters level. Both courses attract students locally and nationally.

In 2010 the Neonatal Science and Clinical Care of the Neonate 2 paper was transitioned from passive to active learning modules with students synthesizing cases with guidance from web-supported content application and study forums with clinical experts. This hybrid paper supports clinical questioning, critical review of the literature & application of evidence-based practice for advanced neonatal nursing content. Further review of the Neonatal Science 1 paper and the Neonatal Practicum paper will occur in 2011.

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. There is a range of LMC models of care available in New Zealand. At National Women's the following models are available:

1 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.

2 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.

3 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.

4 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.

5 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
All incidents (minor and major) reported are reviewed on a fortnightly basis by senior management and clinical teams at Women's Health to ensure high level overview and to identify and manage any emerging issues or risks.

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 two 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 meeting. Meetings with the family occur to ensure that they are fully updated on the outcome of all investigations. The challenge for the organisation is to ensure that learning from incidents is disseminated to the appropriate areas.

There were 457 incidents reported in 2010, including seven serious events requiring investigation by Root Cause Analysis.

2.8 Service development

Perineal Tear Clinic

The Perineal Tear Clinic started in October 2010, after concern about the poor follow up of patients having suffered a third degree tear at the time of birth. The clinic is ACC funded and was designed as a follow up clinic for all women with a third degree tear/anal sphincter injury. The aim is to see women at six weeks post birth and again at four months. Since starting the clinic we have also agreed to see any women with complicated perineal injuries following vaginal birth, including pudendal nerve injury and paraurethral tears. Women with incontinence, faecal or urinary, or uterovaginal prolapse post birth and not covered by ACC are still referred to the Urogynaecology Clinic. The clinic is run by a gynaecologist and a physiotherapist on alternate Friday afternoons. If required, women are also referred to a psychologist. Since October, 72 women have been seen at the clinic. Although most have healed well and been discharged many have needed further appointments either for physiotherapy or assistance with painful scars, faecal or urinary incontinence or sexual problems. A small minority have needed referral to a psychologist or Colorectal Surgeon.

2.9 District annual plan objectives

The Auckland District Health Board prepares a list of objectives each year in a District Annual Plan and this is signed off by the Ministry of Health. Some but not all of the objectives signed off for the Auckland DHB in 2010 which relate to the provision of maternity services are discussed below.

2.9.1 Increasing breastfeeding rates, (Baby Friendly Hospital Initiative)

The Baby Friendly Hospital Initiative (BFHI) is a joint World Health Organisation and UNICEF project aimed at promoting, protecting and supporting breastfeeding throughout the world and the implementation of the Ten Steps to Successful Breastfeeding within all maternity services. During 2010 83% of mothers achieved "exclusive breastfeeding" on discharge from NW.

2.9.2 National Immunisation Register (NIR)

Maternity data, along with well child provider and LMC name, collected in Healthware (iSoft maternity database) provide core data to the NIR. The NIR was developed by the Ministry of Health through the Public Health Service, and aims to collect and maintain the immunisation status of all children in NZ. GPs populate the NIR with vaccination details through Med Tech software. The NIR sends reminder letters when vaccinations are due. Maintenance of this software, NIR upgrades and cleaning of data require a considerable amount of time from the Maternity Service.

2.9.3 Smoking and better help for smokers to quit

The introduction of the Health Target – Better Help for Smokers to Quit- by the Ministry of Health has placed greater emphasis on documentation of the ABC of smoking cessation for all inpatients. All patients are asked about their smoking status and smokers are given brief advice and offered cessation support. The number of smoking cessation referrals to ADHB Smokefree Pregnancy Service from all NW services continues to increase.

2.10 Issues

A range of issues always affects the provision of any service throughout a year and in 2010 NW has had the following issues to work through:

- In 2010 National Women's was unable to recruite midwives to its DOMINO midwifery service and hence the service was closed in June 2010. Many other DHBs throughout NZ also ended their continuity of midwifery schemes.
- There has been a restructure of some of the senior midwifery positions which resulted in a number of positions being vacated and they remained empty for most of the year.
- The position of Midwifery Clinical Leader was disestablished and Ann Yates left ADHB after 10 years in this role.
- In March 2010, Dr Denys Court resigned from the role of clinical leader of Women's Health, and this position has not as yet been filled.

Chapter 3

SUMMARY STATISTICS

3 SUMMARY STATISTICS

3.1 Mother and baby numbers: NW 2010

Table 1: Mother and baby numbers: National Women's 2010

Total number of mothers birthing at National Women's	7688
Mothers birthing before arrival (BBA)	21
Total number of mothers	**7709**
Total number of babies born at National Women's	7845
Babies born before arrival (BBA)	21
Total number of babies	**7866**

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.

Five women gave birth twice during the calendar year 2010 and are therefore counted twice in the above table and throughout this report.

Table 2: Contribution of multiple births to mother and baby numbers: National Women's 2010

		Mothers	Babies
National Women's births	Singletons	7535	7535
	Twins	149	298
	Triplets	4	12
Totals (not including BBA)		**7688**	**7845**
BBA	Singletons	21	21
	Twins	0	0
	Triplets	0	0
Totals (including BBA)		**7709**	**7866**

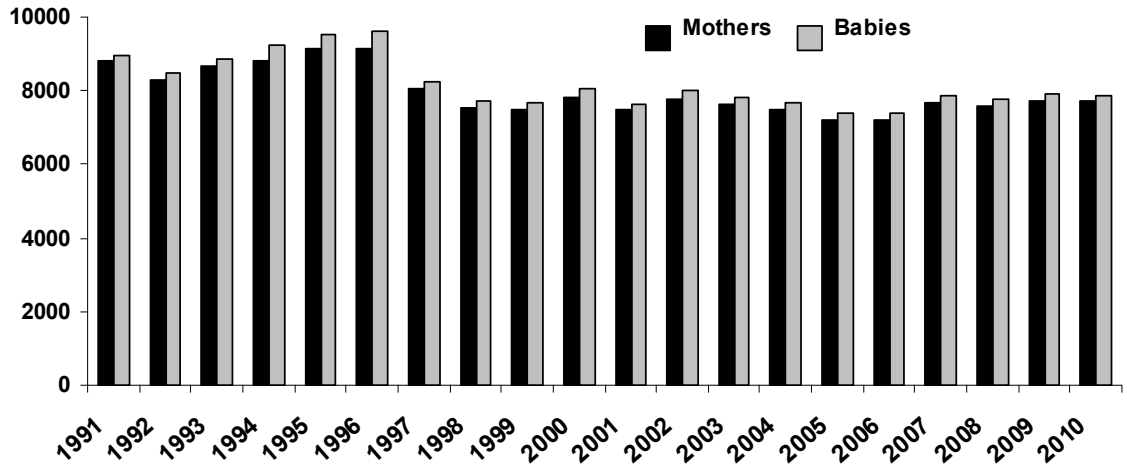

Figure 1: Numbers of women birthing and babies born at National Women's (1991-2010)

3.2 Summary of maternal outcomes 2010

Table 3: Mode of onset of birth

	Birthing Mothers n=7709	
	n	%
Spontaneous onset of labour	4007	52.0
Iatrogenic	3702	48.0
CS elective	1222	15.9
Emergency CS before onset of labour	266	3.5
Induction of labour	2214	28.7

Table 4: Mode of birth

	Birthing mothers n=7709		Nullipara n=3650		Multipara n=4059	
	n	%	n	%	n	%
Spontaneous vertex birth	4217	54.7	1650	45.2	2567	63.2
Vaginal breech birth	59	0.8	25	0.7	34	0.8
Operative vaginal birth	942	12.2	752	20.6	190	4.7
Forceps	355	4.6	283	7.8	72	1.8
Ventouse	587	7.6	469	12.8	118	2.9
Caesarean section	2491	32.3	1223	33.5	1268	31.2
CS elective	1226	15.9	383	10.5	843	20.8
CS emergency	1265	16.4	840	23.0	425	10.5

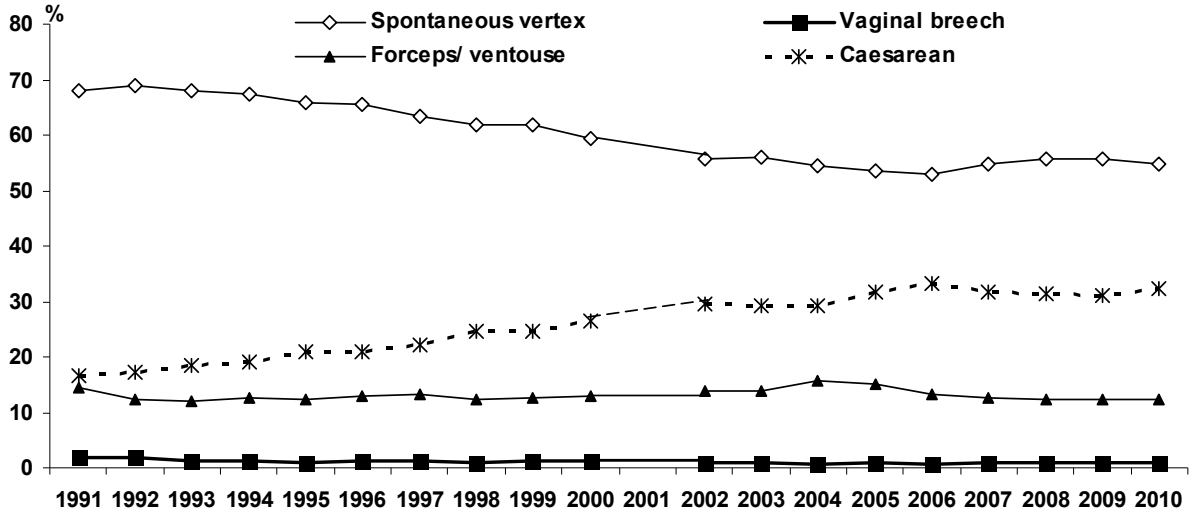

Figure 2: Mode of birth (1998-2010)

Table 5: Maternal postpartum outcomes

	Birthing mothers	n	%
PPH ≥1000mls	7709	695	9.0
SVB	4276	219	5.1
Instrumental vaginal birth	942	84	8.9
Caesarean section	2491	392	15.7
Episiotomy among vaginal births	5218	1252	24.0
Third/ fourth degree tears among vaginal births	5218	120	2.3
Postpartum blood transfusions	7709	190	2.5
Infant Feeding at discharge from NW facility (excludes babies admitted to NICU)			
Exclusive breastfeeding	6971	5736	82.3
Fully breastfeeding	6971	260	3.7
Partial breastfeeding	6971	755	10.8
Artificial feeding	6971	190	2.7

3.2.1 Maternal deaths

In 2010 there were no maternal deaths of women who birthed at National Women's.

3.3 Summary of neonatal outcomes 2010

Table 6: Neonatal outcomes among babies born at National Women's in 2010

	Babies born n=7866	
	n	%
Gender*		
Male	4013	51.0
Female	3852	49.0
Preterm birth	792	10.1
20-27 weeks	124	1.6
28-31 weeks	121	1.5
32-36 weeks	547	7.0
Term birth	7073	89.9
37-41 weeks	6940	88.2
42+ weeks	133	1.7
Apgar at 5 min <7**	213	2.7
Preterm	140	1.8
Term	73	0.9
SGA (by Customised Centile)	910	11.6
Preterm	223	2.8
At term	687	8.7
Admission to NICU	794	10.1
Preterm	451	5.7
Term	343	4.4

*1 baby had indeterminate sex **numerator excludes fetal deaths

Table 7: Perinatal related mortality 2010

	Babies born n=7866	Rate
	n	
Fetal deaths (stillbirths &TOPs)	83	10.6/1000 births
Early neonatal deaths	26	3.3/1000 live births
Late neonatal deaths	8	1.0 / 1000 live births
Neonatal deaths	34	4.3 / 1000 live births
Perinatal deaths (fetal & early neonatal)	109	13.9 / 1000 births
Perinatal related deaths (fetal & all neonatal)	117	14.9 / 1000 births

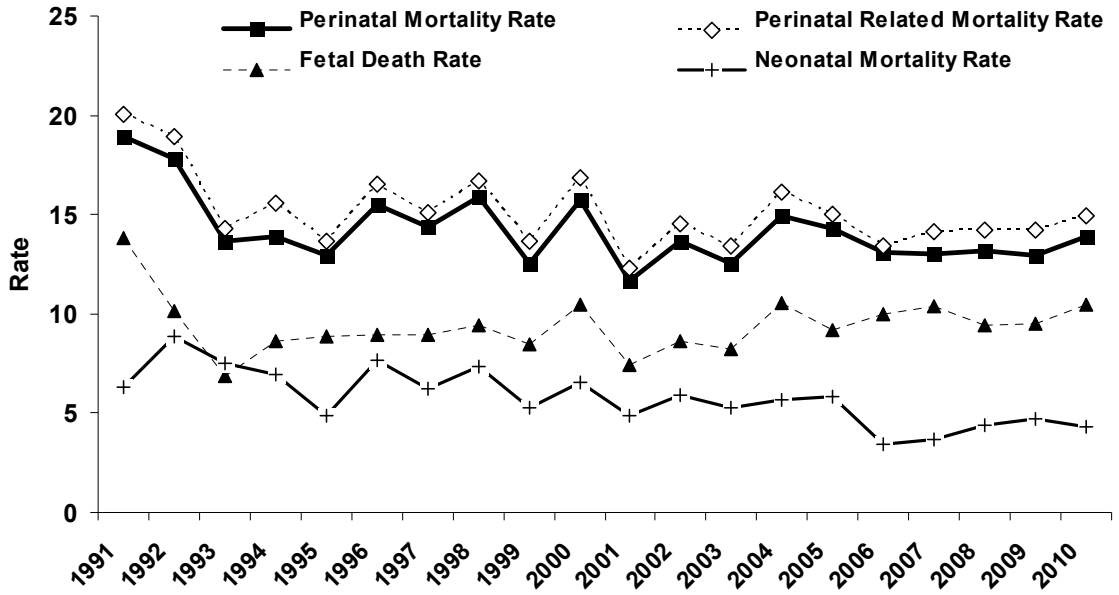

Figure 3: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate 1991-2010 (all rates expressed as deaths/1000 births)

3.4 Maternal and perinatal clinical indicators

Methods

The tables present National Women's data for the 2007-2010 calendar years compared to WHA (Women's Hospitals Australasia) means for contributing New Zealand and Australian maternity units with level 3 neonatal intensive care units. Below are figures representing the 2010 total NW data with 95% confidence intervals compared to WHA 2009-2010 data.

Table 8: Benchmarking against WHA perinatal indicators (units with level 3 NICU) (2007-2010)

Perinatal indicators	Definition	WHA mean 2007-2008 %	WHA mean 2008-2009 %	WHA mean 2009-2010 %	NW 2007 n=7875 %	NW 2008 n=7753 %	NW 2009 n=7897 %	2010 Public* only n=2413 %	NW 2010 n=7866 %
Preterm birth	Babies born before 37 weeks/Inborn babies	11.9	11.7	11.9	11.5	10.9	9.7	17.1	10.1
	Babies born before 32 weeks/Inborn babies	3.4	3.46	3.21	3.0	3.3	2.7	7.3	3.1
Perinatal Mortality	Fetal death and neonatal death up to 28 days/Inborn babies	1.28			1.41	1.42	1.42	2.90	1.49
	Neonatal deaths up to 7 days (ENND)/Inborn babies	0.331			0.254	0.34	0.345	0.75	0.33
	Neonatal deaths up to 28 days (ENND+LNND)/Inborn babies	0.408			0.368	0.44	0.473	0.99	0.43
	Fetal deaths/Inborn babies	0.874			1.041	0.98	0.95	1.91	1.06
Five minute Apgar of ≤4	Babies with 5 minute Apgar<=4/Total liveborn, singleton term babies	0.265			0.10	0.13	0.24	0.36	0.23
Five minute Apgar of ≤6	Babies with 5 minute Apgar<=6/Total liveborn, singleton term babies	1.22	1.54	1.33			0.884	1.64	0.93
Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3	Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3/Inborn babies	0.103	0.104	0.865	0.10	0.039	0.063	0.082	0.063
Breastfeeding	Exclusive breastfeeding/Live born singleton term births	77.0			73.3	76.7	80.1	71.7	81.6

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.

Table 9: Benchmarking against WHA maternity indicators (units with level 3 NICU) (2007-2010)

		WHA mean 07-08	WHA mean 08-09	WHA mean 09-10	NW 2007 n= 7695	NW 2008 n= 7589	NW 2009 n= 7735	2010 Public only* n=2329	NW 2010 n= 7709
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Caesarean section	Mothers birthing by Caesarean section/Mothers giving birth	28.0	29.6	29.4	31.7	31.3	31.2	33.3	32.3
VBAC	P1 previous Caesarean/mothers giving birth	7.87	9.13	8.8	10.7	10.6	10.0	10.8	10.1
	Prelabour repeat Caesarean/P1 previous Caesarean	60.0	55.1	57.8	59.4	57.9	56.8	51.0	59.7
	VBAC/induced or spontaneous labour P1 previous Caesarean	49.3		49.6	52.4	58.8	61.7	56.6	65.5
	VBAC/P1 previous Caesarean	19.7	19.7	20.8	21.3	21.5	22.5	22.3	21.3
Peripartum hysterectomy	Hysterectomy at same admission as birth/Mothers giving birth	0.102			0.117	0.18	0.155		0.091
Instrumental vaginal birth	Forceps births/All vaginal births	5.2	6.57	7.4	4.2	4.9	5.7	4.7	6.8
	Ventouse births/All vaginal births	9.01	10.1	10.6	13.0	12.1	11.4	8.8	11.3
	Double instrumental/All vaginal births	0.841			1.3	1.0	0.68	0.5	1.0
Maternal age	Age 35 or more/Mothers giving birth	23.4	23.8	23.4	30.7	31.1	30.5	25.1	31.1
	Age 40 or more/Mothers giving birth	4.57	4.31	4.4	5.9	6.0	5.8	6.1	6.0
Vaginal birth with regional anaesthesia	Any regional anaesthetic/All vaginal births	27.2	28.0	29.1	43.9	43.7	43.4	35.2	43.7
General anaesthesia for Caesarean section	General anaesthetic for Caesarean section/All Caesarean sections	8.9	8.18	8.1	7.6	6.8	6.4	10.3	6.3
Episiotomy	Mothers having an episiotomy/Mothers giving birth vaginally	17.8	18.0	18.6	21.5	20.5	22.3	14.9	24.0
Third and fourth degree tears	3rd and 4th degree tears/Mothers giving birth vaginally	2.76	3.11	3.5	3.1	3.1	2.2	2.1	2.3
Postpartum haemorrhage	Blood loss >=1000ml and <1500ml/All vaginal births	1.91	2.43	2.4			2.6	4.0	3.1
	Blood loss >=1500ml/ All vaginal births	1.35	1.69	1.7	1.12	2.4	2.6	4.0	2.7
	Blood loss >=500ml and <1500ml/Mothers giving birth by Caesarean	49.4			69.2	72.2	72.2	74.6	67.0
	Blood loss >=1000ml and <1500ml/Mothers giving birth by Caesarean		5.46	5.8				13.3	11.0
	Blood loss >=1500ml/Mothers giving birth by Caesarean	2.71	2.68	2.9	3.32	5.2	5.0	6.3	4.7
Blood transfusion	Postpartum blood transfusion/Mothers giving birth	1.63	1.78	2.1	2.2	2.8	3.0	3.8	2.5
Maternal admission to intensive care unit	Admitted to intensive care unit during same hospital admission as birth/Mothers giving birth	0.203			0.23	0.16	0.310		0.26

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.
P1=parity 1, only previous birth by Caesarean section

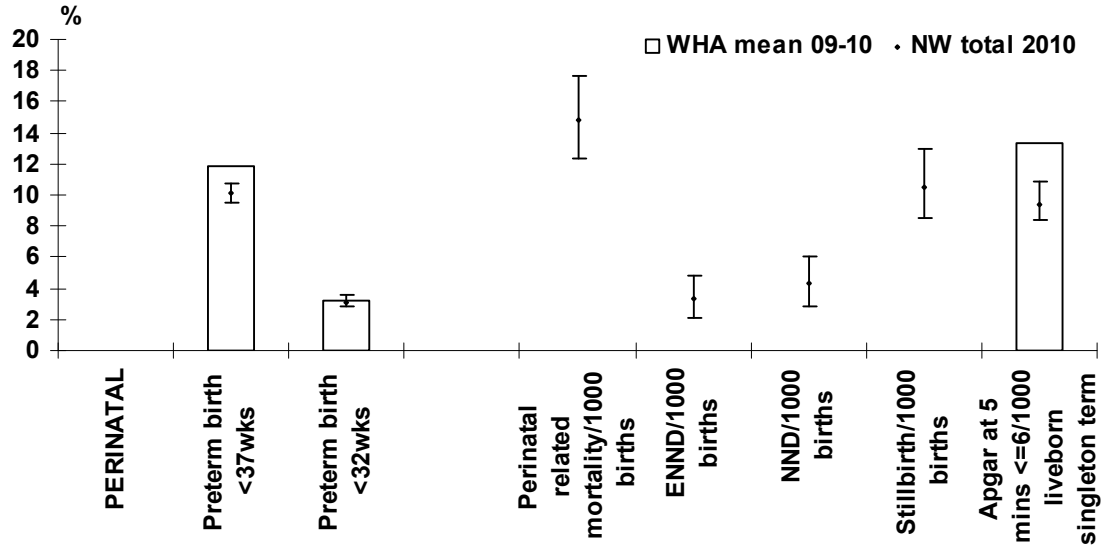

Figure 4: National Women's Perinatal Clinical Indicators 2010 with 95% confidence intervals benchmarked against WHA mean data 2009-2010 (note there are no WHA benchmark data for perinatal related mortality in 2009-2010)

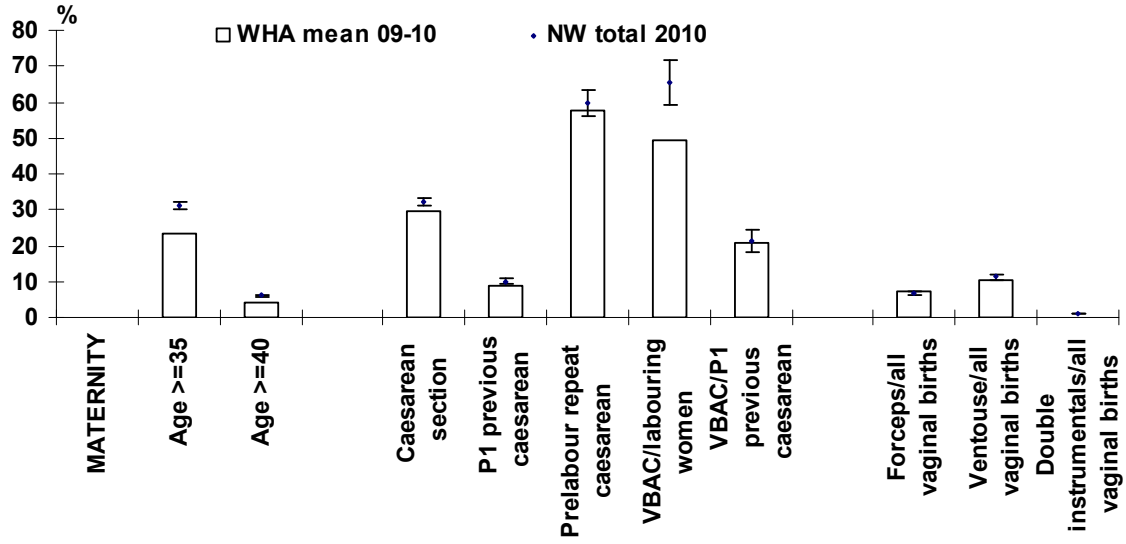

Figure 5: National Women's Maternity Clinical Indicators 2010 with 95% confidence intervals benchmarked against WHA mean data 2009-2010: maternal age, operative birth.

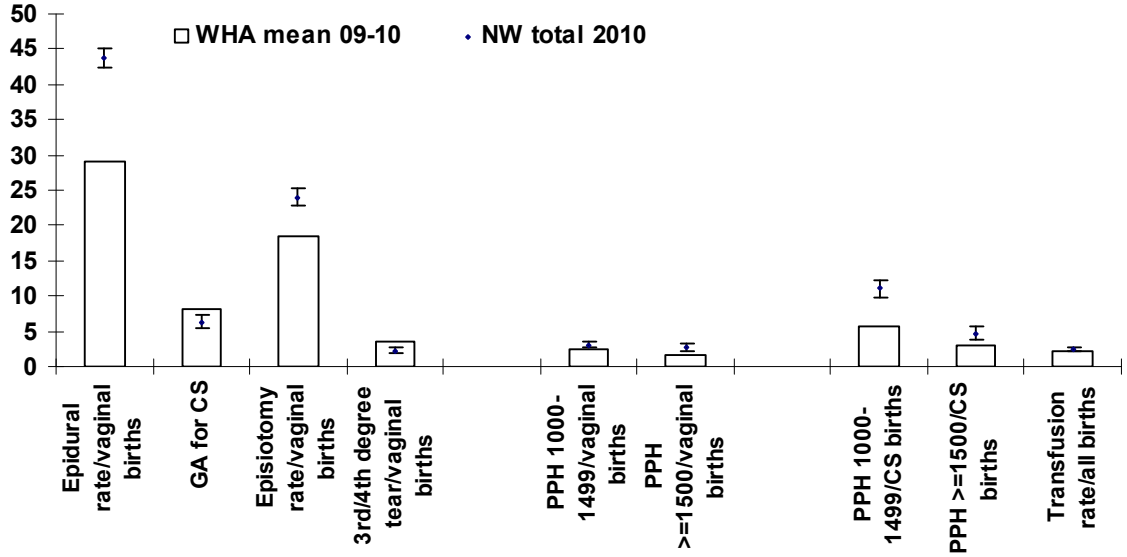

Figure 6: National Women's Maternity Clinical Indicators 2010 with 95% confidence intervals benchmarked against WHA mean data 2009-2010: anaesthesia, perineal trauma, postpartum haemorrhage.

Conclusions from the simple comparison of benchmark data should be drawn with caution. Data reliability may vary and case-mix differences such as ethnicity, socio-economic status, age and BMI may effect rates. For example, the proportion of our maternity population over the age of 35 years is significantly greater (31.1% in 2010) than the mean for WHA contributing hospitals (23.4%). Nonetheless benchmarking allows us to compare rates with other maternity services and to identify areas where we may wish to further analyse our own data or conduct clinical audit in the future.

The overall Caesarean section rate at NW remains above the WHA mean. NW has a higher rate of women with one previous CS amongst those who have had one previous birth, so in order to keep the CS rate stable in future the VBAC rate will need to at least remain stable or increase. Fewer women undergo a trial of labour at NW than the mean, however of those who do, the chance of success is greater. The hospital team is attempting to improve advice for women who have had a Caesarean birth.

The episiotomy rate in the public sector is lower than the WHA mean but higher overall due to high rates of episiotomy among independent LMCs. The rate of third and fourth degree perineal tears was lower than the WHA mean in 2010.

The postpartum haemorrhage rates at NW continue to lie above the WHA means, while the postpartum transfusion rate is not significantly above the WHA mean in 2010. It is possible that the excess of haemorrhage is related to ascertainment, as a lot of work has been done at NW to ensure good collection of blood loss data.

Chapter 4

MATERNAL DEMOGRAPHY

4 MATERNAL DEMOGRAPHY

This chapter describes the demographic characteristics of the women giving birth at NW in 2010. Additional data pertaining to this chapter can be found in Appendix 3.

4.1 Maternal domicile

In 2010, 72% 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 5 years. Some mothers from outside ADHB catchment area require tertiary services, but a substantial proportion of the 28% of our clientele from other DHBs are making a personal choice to birth at NW.

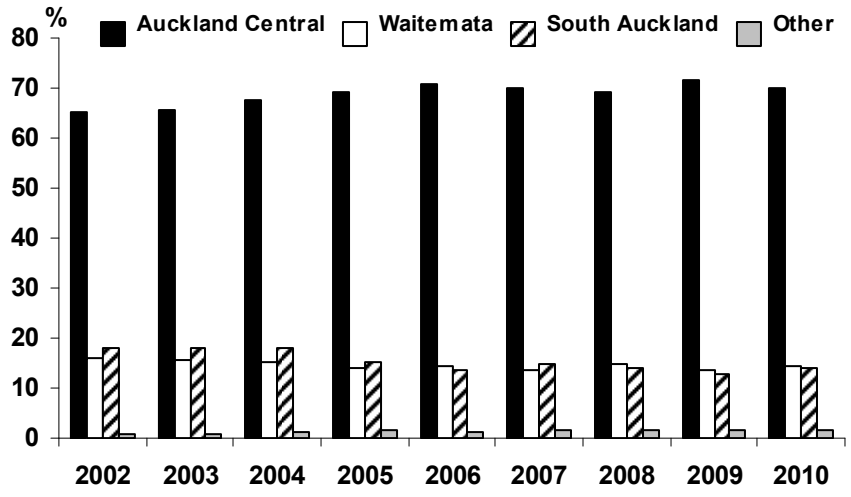

Figure 7: Domicile (DHB of residence) of women birthing at NW (2002-2010)

4.2 Maternal age, parity, and ethnicity

WHA Maternity Indicators		WHA mean 07-08	NW 2007	NW 2008	NW 2009	NW 2010	2010 Public only*
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Maternal age	Age 35 or more/Mothers giving birth	21.9	30.7	31.1	30.5	31.1	25.1
	Age 40 or more/Mothers giving birth	4.35	5.9	6.0	5.8	6.0	6.1

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.
Bolded rates for NW 2009 are significantly different from WHA mean

4.2.1 Maternal Age

The population of women giving birth at National Women's is significantly older than the average for women giving birth in units with level 3 facilities in Australasia. The proportion of our population under 21 years of age or over 40 has remained very stable. The most consistent change has been the steady rise over the last 20 years in the proportion of women aged 36 to 40 and more recently women aged 26 to 30. This shift towards women delivering at an older age has implications for service provision and intervention rates.

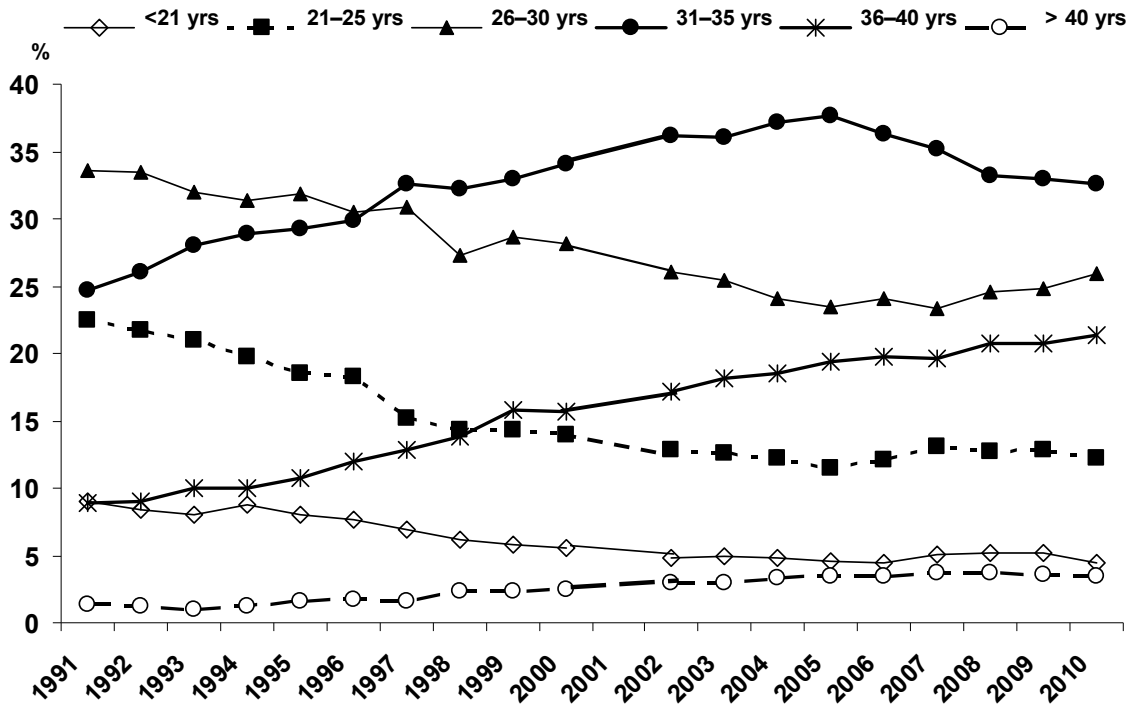

Figure 8: Maternal age distribution (1991-2010)

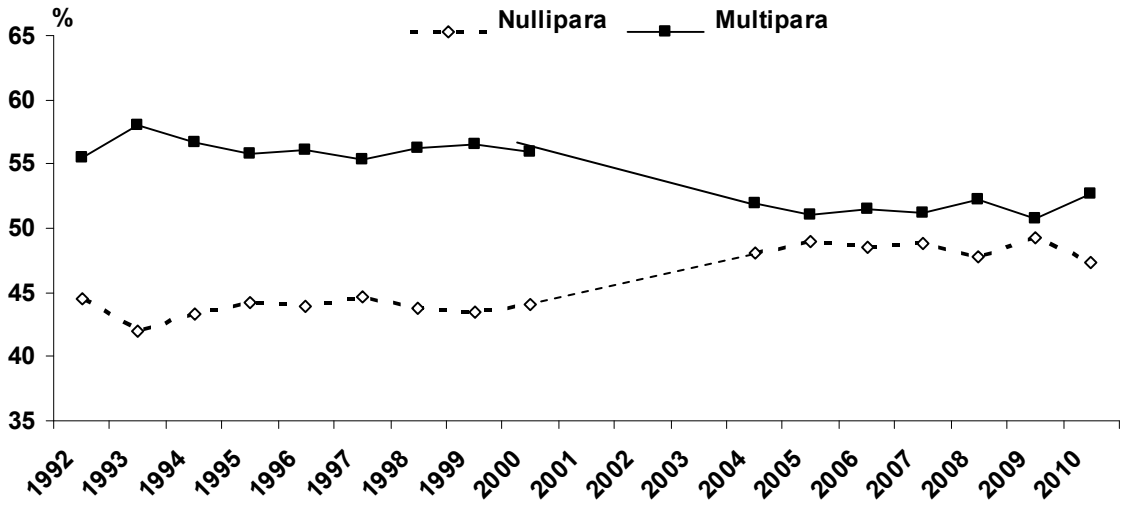

Figure 9: Parity distribution (1992-2010)

The ratio of nulliparous to multiparous women has remained fairly constant over recent years, but is markedly closer to 1:1 than it was 10 years ago. It is too early to be sure that the apparent change in this ratio in the 2010 report represents a consistent trend.

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 2010, 7.5% of mothers giving birth at NW were prioritised as Māori, 14.1% Pacific peoples, 7.0% Indian, 19.1% Other Asian, 11.1% Other European, 37.6% NZ European, and 3.5% Other.

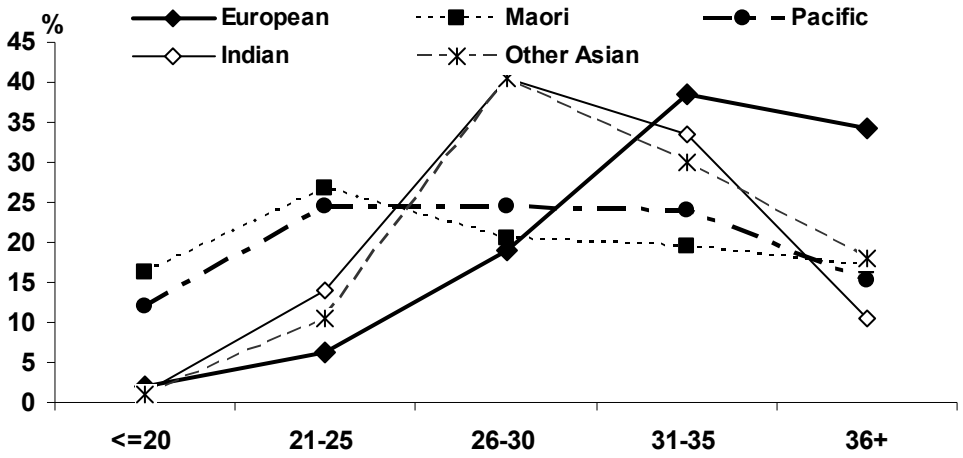

Figure 10: Maternal age among European, Māori, Pacific, Other Asian and Indian ethnicities

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 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.

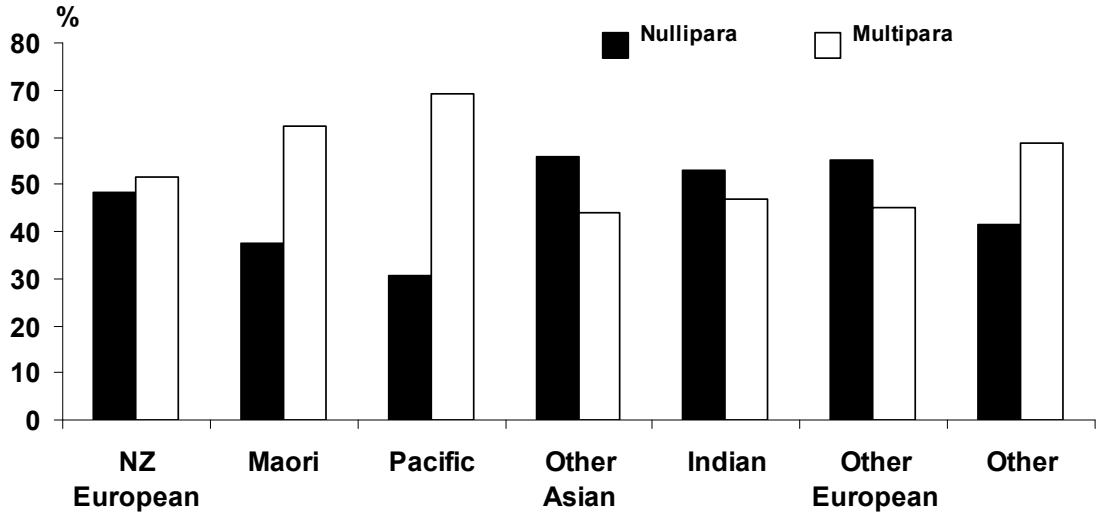

Figure 11: Parity distribution by maternal ethnicity (2010)

While 50% or more Asian and European mothers giving birth at NW are having their first baby, only 37% of Pacific mothers and 41% of Māori mothers are giving birth to their first baby. Parity needs to be considered in analyses of obstetric interventions by ethnicity.

4.3 Smoking

Table 10: Smoking status of women at booking

Smoking status	Smoking at booking N=7709		Smoking at birth N=7709	
	n	%	n	%
Yes	601	7.8	472	6.1
No	7061	91.6	7060	91.6
Missing data	47	0.6	177	2.3

In 2010, smoking data were missing at booking for only 0.6% of mothers. Of all women 7.8% reported to smoking at booking.

At birth, 2.3% of mothers had missing smoking status data. This is a huge improvement over missing data in 30% in 2009. At birth, 6.1% of all women reported smoking.

Twenty two percent of smokers at booking reported not smoking at birth; while 25 (0.4%) of non smokers at booking reported current smoking at birth.

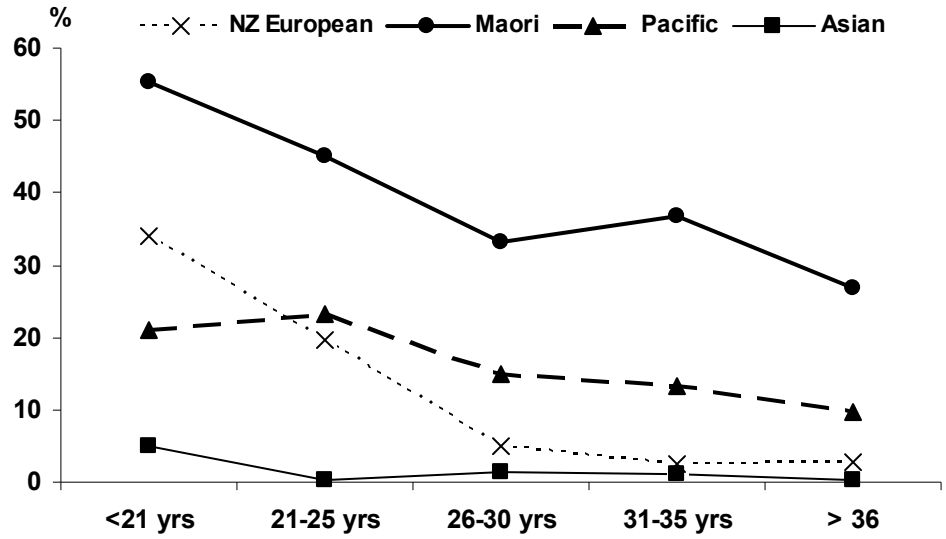

Figure 12: Smoking rates at booking by age and ethnicity

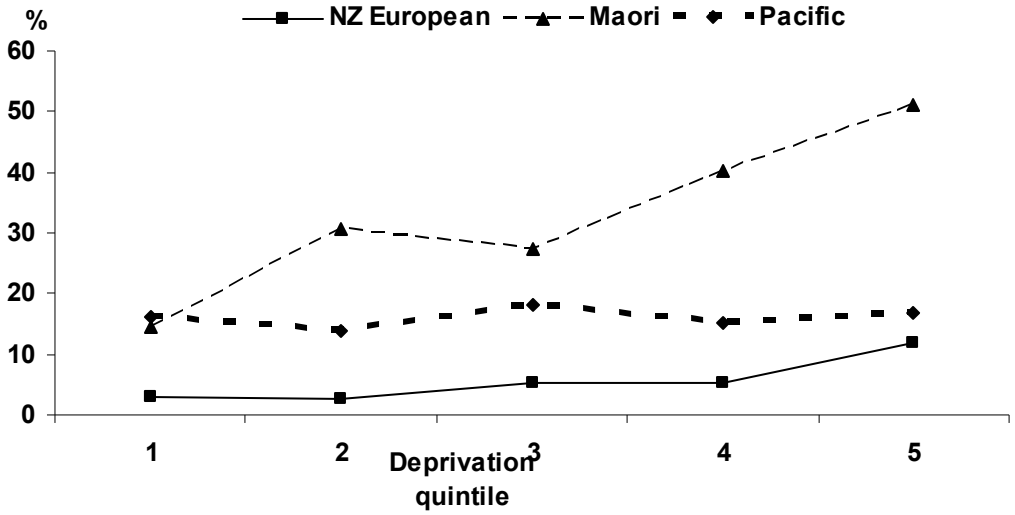

Figure 13: Smoking at booking by deprivation quintile and maternal ethnicity

Smoking rates remain substantially different by ethnic group with the rates among Māori women 41% overall compared to 6.6% for NZ European women. Smoking rates among young NZ European women are high. Young mothers, other than Asian mothers, are more likely to smoke than older mothers. The figure above demonstrates that at least among Māori and NZ European mothers, smoking increases with increased socioeconomic deprivation. For future service planning, the dramatically 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.

4.4 Smoking cessation services

The ADHB Smokefree Pregnancy Services, set up in 2008, provided data on women referred to their service. These data were matched with Healthware data to define a dataset of women who gave birth in 2010 and were seen by Smokefree Pregnancy Services at the hospital. Some women may have used, and/or been seen by, services outside the hospital. These data were not available for analysis.

The data in the table below describe the 322 pregnant women seen during the current pregnancy who birthed at NW in 2010 and had at least one appointment at Smokefree Pregnancy Services. In 2009, 201 women had at least one appointment at Smokefree Pregnancy Services during their pregnancy. The data on smoking at birth were obtained from the National Women's maternity database (Healthware). This is the first year we have had data to evaluate objectively the efficacy of smoking cessation services at NW.

Table 11: Combined analysis of Smokefree Pregnancy Service and Healthware data on women seen at the Smokefree Pregnancy Service.

	Mothers seen by ADHB Smokefree Pregnancy Services					
	Total N=322		Smoking at booking N=287		Not smoking at booking N=34	
	n	%	n	%	n	%
Smoking at birth						
Yes	240	75	235	82	5	15
No	74	23	44	15	29	85
Missing	8	2	8	3	0	

Of the 322 women seen by the service, 287 (89%) were recorded in the maternity database as smokers at booking. Some women are referred who have recently quit and request support for maintenance

Overall, of women seen by the service, 73/322 (23%) were recorded as non-smoking at birth. A Cochrane systematic review (2009) of randomised controlled trials of interventions for promoting smoking cessation in pregnancy found a significant reduction of 6% in smoking in late pregnancy.

Among mothers smoking at booking who were not seen at Smokefree Pregnancy Services, at least 29% reported not smoking at birth, significantly more than the 15% among smokers referred to the Smokefree Pregnancy Service. There are a number of possible reasons for this. Women who are motivated to quit on their own are more likely to have a successful quit attempt. Those seeking support or referred for support find it harder to quit and are more likely to have cut down than quit.

When an intervention is studied in an observational trial (such as in practice), compared to a randomised trial, it is common to see a paradoxical effect. This is because caregivers are most likely to treat or to refer for treatment the most in need and these people are the most likely to fail. In other words, it is not surprising to see a poorer quit rate among the smokers seen at Smokefree Pregnancy Services as the women referred are the least likely to succeed.

We do not systematically collect data on alcohol or other drug use in pregnancy.

4.5 Body mass index

Thirty five percent of the maternity population were overweight in 2010 (BMI >25), 16% obese (BMI >30), and 7% morbidly obese (BMI >35). This has not changed at NW in the three years that reasonably complete data have been available.

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 15 below) making developing effective interventions to reduce the impact of maternal obesity particularly challenging.

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

Table 12: Maternal BMI (missing data excluded)

	2006[1]		2007[2]		2008[3]		2009[4]		2010[5]	
BMI	n=5660		n=6909		n=7117		n=7735		n=7709	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
<19	304	5.4	388	5.6	405	5.7	442	6.0	443	5.7
19-25	3329	58.8	4129	59.8	4180	58.7	4344	58.5	4404	57.1
26-30	1113	19.7	1315	19.0	1368	19.2	1441	19.4	1418	18.4
31-35	512	9.1	625	9.1	630	8.9	686	9.2	684	8.9
36-40							303	4.1	328	4.3
41-45	402	7.1	452	6.5	534	7.5	118	1.6	133	1.7
>45							92	1.2	80	1.0

1 Missing data in 2006=21.5%
2 Missing data in 2007 =10.2%
3 Missing data in 2008 = 6.2%
4 Missing data in 2009= 4.0%
5 Missing data in 2010 = 2.8%

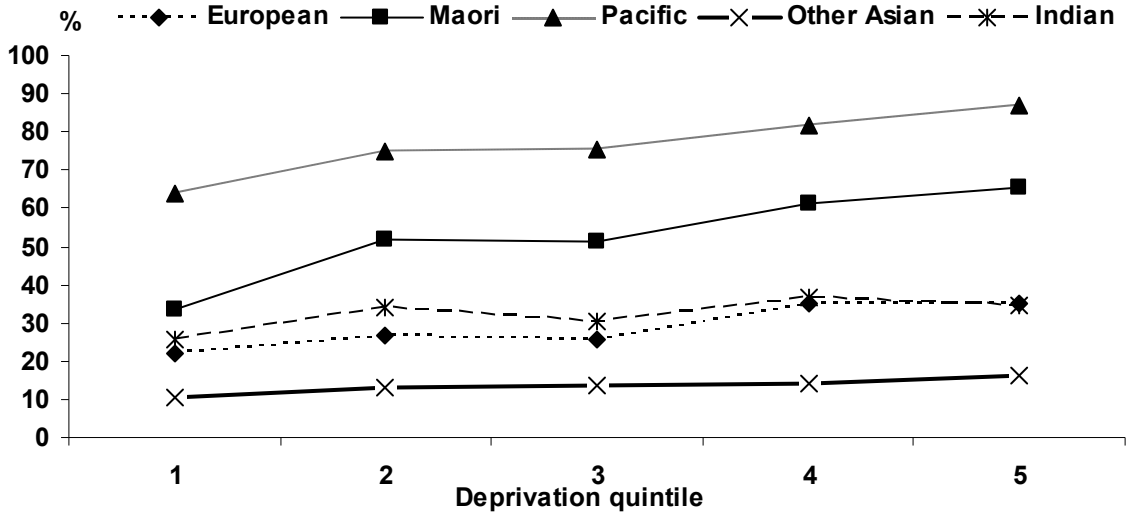

Figure 14: BMI >25 by ethnicity and deprivation quintile

There is a small increase in the rate of overweight (BMI>25) with increasing socioeconomic deprivation (especially among Māori and Pacific mothers) although this is small compared to the difference related to ethnicity.

4.6 Socio Economic status

Socioeconomic status is measured by deprivation score (NZ Dep 06) within Census area units (CAU). The decile score has been compresses to quintiles after the first table. Quintile 1 includes the least deprived two deciles and quintile 5 the most deprived two deciles.

	Women giving birth 2010 n=7709	
Deprivation decile	**n**	**%**
1	556	7.2
2	796	10.3
3	745	9.7
4	678	8.8
5	721	9.4
6	914	11.9
7	826	10.7
8	950	12.3
9	632	8.2
10	890	11.5
missing	1	

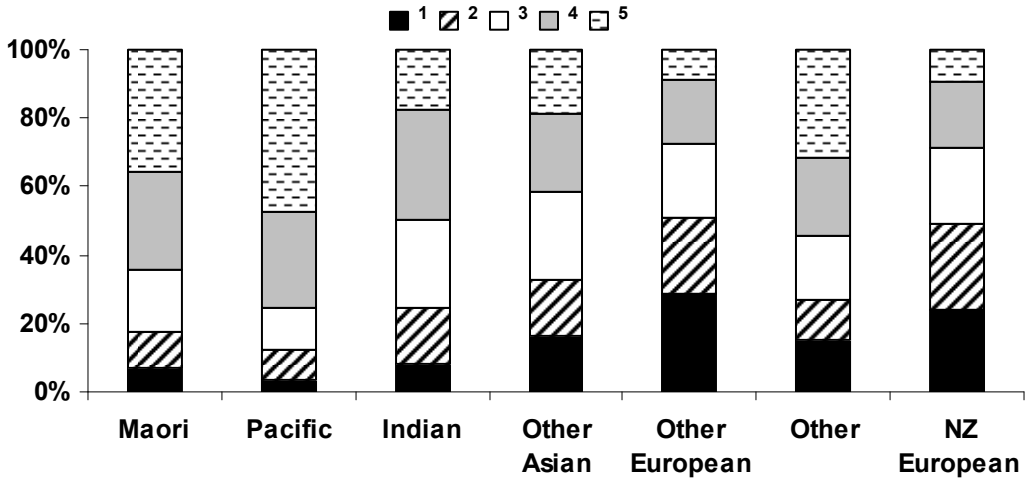

Figure 15: Deprivation quintile and maternal ethnicity

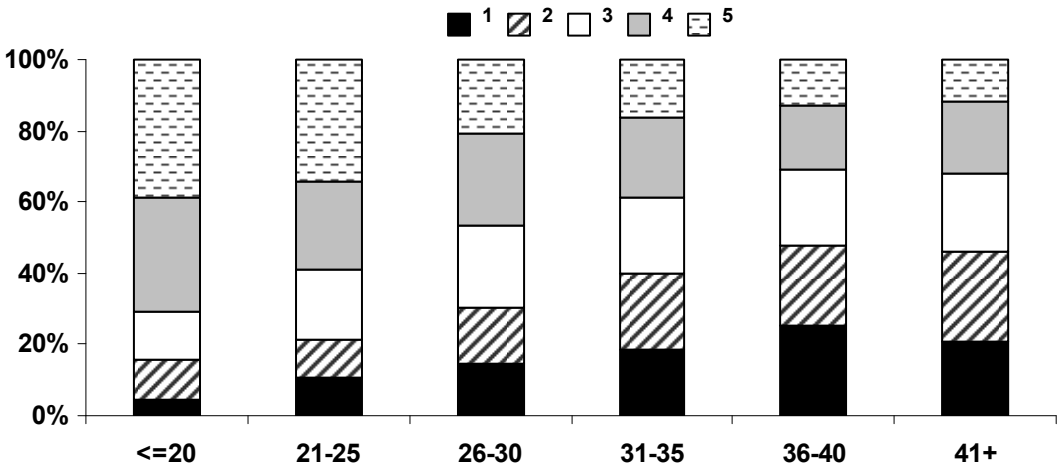

Figure 16: Deprivation quintile and maternal age

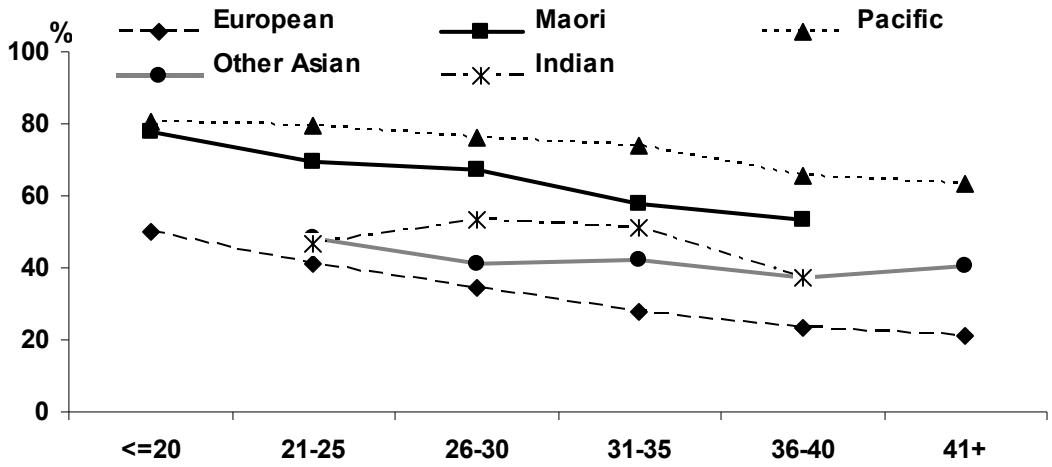

Figure 17: Deprivation (quintile 4 or 5) by age and ethnicity

The figure above suggests that while higher deprivation is associated with younger age, ethnicity remains a strong predictor of deprivation 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 island 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.

4.7 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 2010 46% of women were booked with Independent Midwives, 23% with Private Obstetricians, 20% with National Women's Community clinics, and 9% with National Women's specialist medical and diabetes clinics. During 2010, the Domino service at NW was discontinued due to an inability to recruit midwives. Overall 70% of women who gave birth at NW in 2010 were booked with a private Lead Maternity Carer. Over the last 10 years this proportion has been surprisingly constant with 66% of women booking with a private LMC in 1997. Only 94 women (1.2%) booked with a General Practitioner in 2010.

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

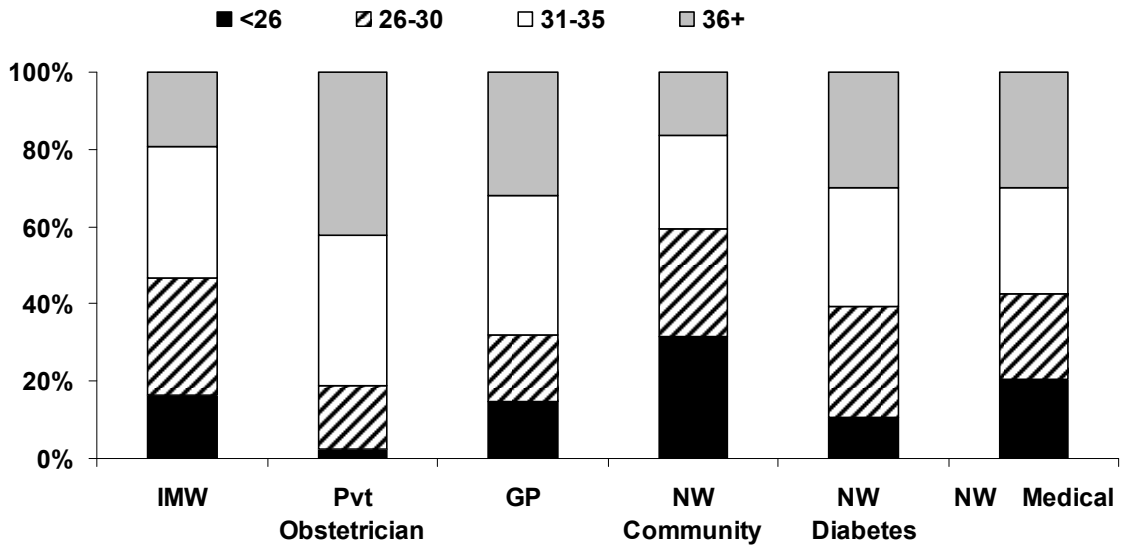

Figure 18: LMC at birth and maternal age

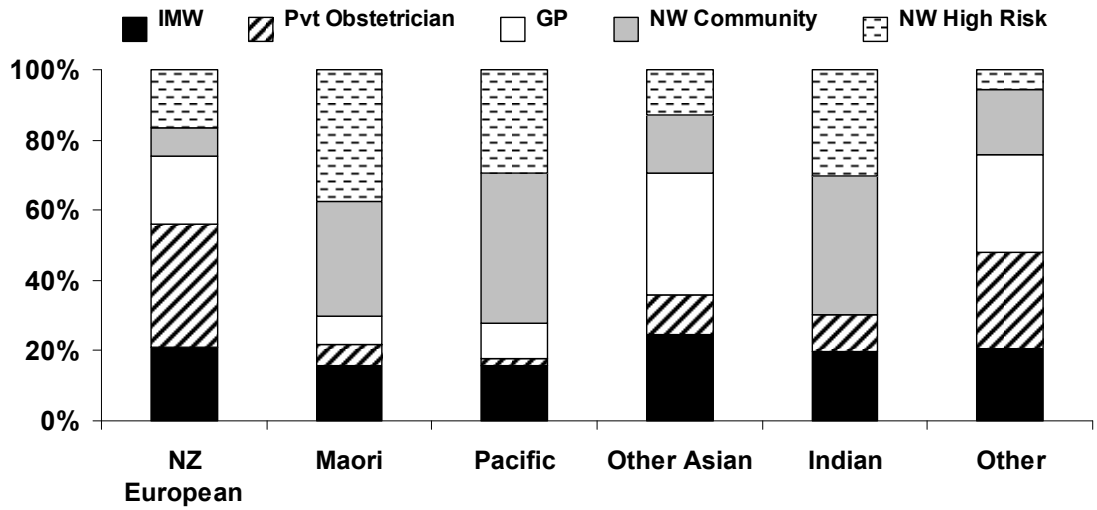

Figure 19: LMC at birth and maternal ethnicity

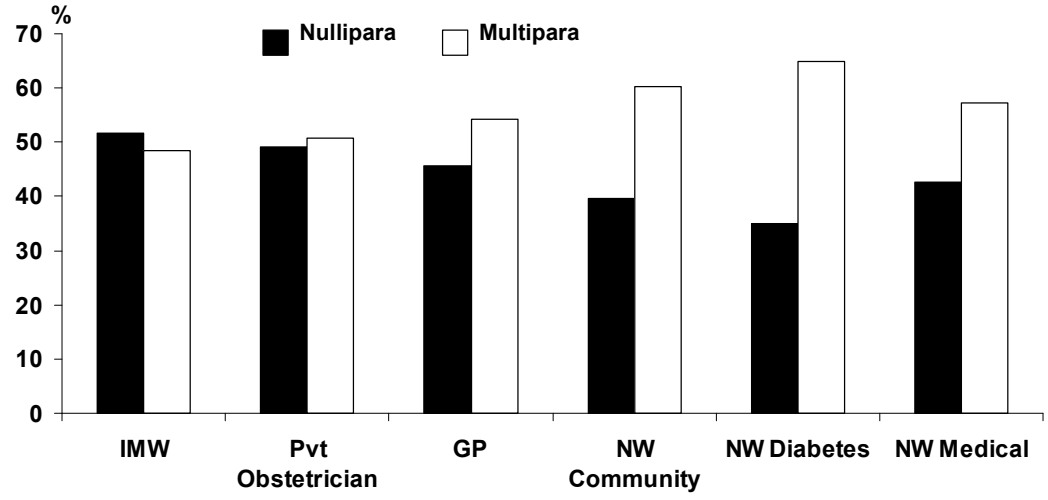

Figure 20: LMC at birth and parity

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 independent 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 and the issues for these women accessing an independent midwife for pregnancy care needs to be considered.

4.8 Standard primipara

The definition for standard primipara is a woman with no prior birth ≥ 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 ≥10th), 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 2010, 33% of primiparous women were defined as standard. Fewer European and Māori primipara are standard primipara compared to Other Asian and Indian women.

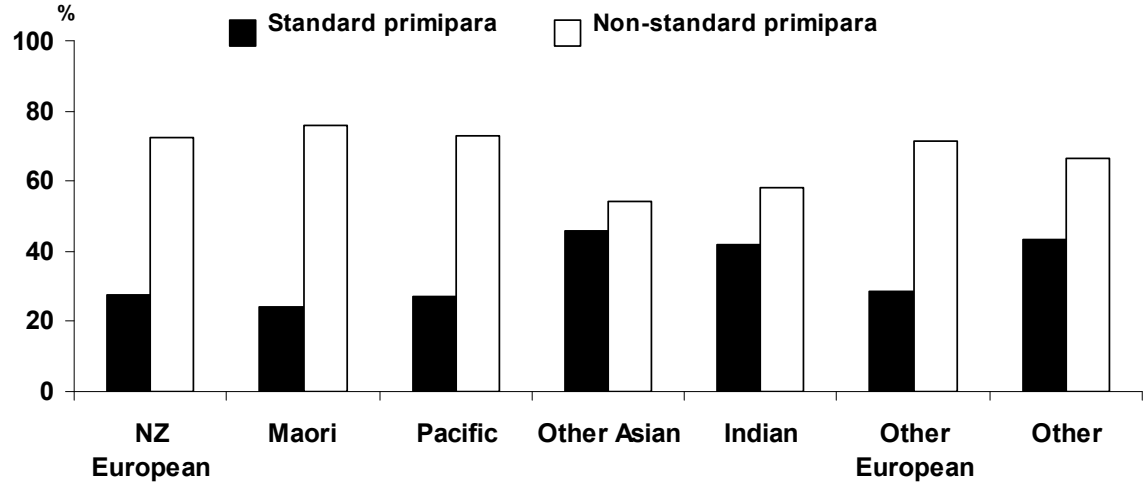

Figure 21: Standard primipara rates by maternal ethnicity

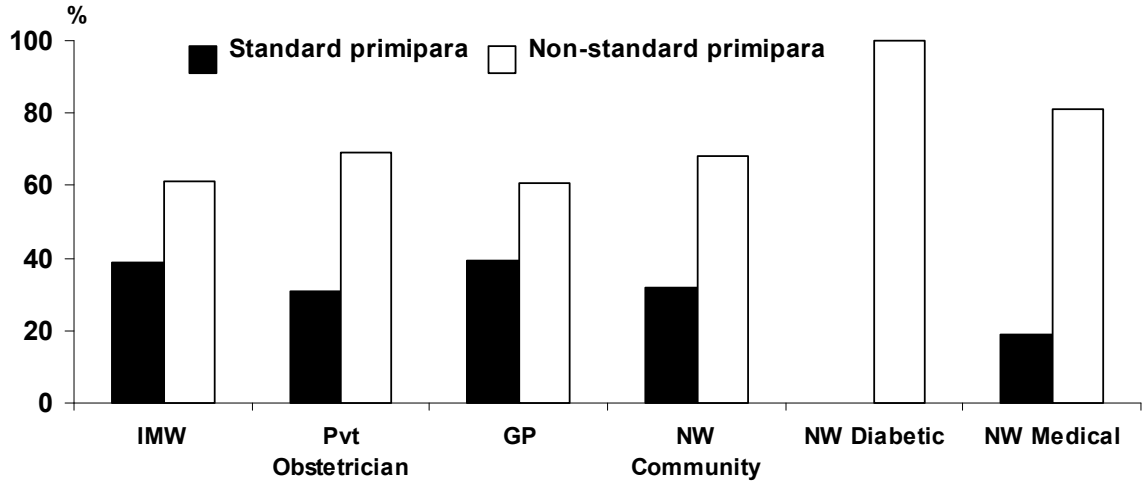

Figure 22: Standard primipara rates by LMC at birth

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. Additional data on these complications can be found in Appendix 4.

5.1 Preterm birth

WHA Maternity Indicator for Preterm birth		WHA mean 05-06	NW 2007 n=7875	NW 2008 n=7753	NW 2009 n=7897	NW 2010 n=7866	2010 Public only* n=2413
Indicator	**Definition**	**%**	**%**	**%**	%	**%**	**%**
Preterm birth	Babies born before 37 weeks/Inborn babies	13.3	11.5	10.9	9.7	8.9	17.1
	Babies born before 32 weeks/Inborn babies	4.04	3.0	3.3	2.7	3.1	7.3

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.

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.

Table 13: Rates of preterm birth <37 completed weeks (1997 – 2010)

	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010
Total number of women	8055	7492	7501	7827	7491	7194	7212	7695	7589	7735	7709
Women birthing preterm	906	852	850	912	756	685	716	796	733	658	689
Incidence %	†	11.4	11.3	11.7	10.1	9.5	9.9	10.3	9.7	8.5	8.9
Spontaneous <37 weeks			350	385	372	323	335	397	293	275	312
Incidence %			4.7	4.9	5.0*	4.5	4.6	5.2	3.9	3.6	4.0
Iatrogenic <37 weeks			500	527	384	362	381	399	440	383	377
Incidence %			6.7	6.7	5.1*	5.0	5.3	5.2	5.8	5.0	4.9
Total babies <37 weeks	1047	991	984	1062	886	806	836	904	843	769	793

† Note denominators pre-1998 include postnatal transfers and therefore incidence has not been calculated
* 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.

There has been little change in overall rates of preterm birth in the last five years. An overall rate of birth <37 weeks of 8.9% is comparable to other similar units and is expected from our population in terms of demographic and risk. National Women's has a higher proportion of iatrogenic preterm births than some other units but this is 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. Reassuringly the rate of iatrogenic preterm birth appears to be remaining stable at approximately 5% despite a possible increase in the number of more complicated births seen with increasing BMI and advancing maternal age. A previously noted trend towards a reduction in spontaneous preterm births has not been sustained.

The fall in rates in 2008 and 2009 is more likely to have represented a normal variation in data rather than significant reduction.

Women over 40 yrs (12.5%) and up to age 20 (11.6%) have higher risks of preterm birth compared to women aged 26-40 (8.1-9.2%). Women over 40 have higher rates of iatrogenic birth (8.4%) with no increase in spontaneous preterm birth (4.0%). Women up to 20 yrs of age have a higher rate of spontaneous preterm birth. Another population at high risk of preterm birth is smokers. A rate of preterm birth approaching 15% is contributed to by both spontaneous preterm birth (6.8%) and iatrogenic preterm birth (7.5%). Reducing rates of smoking in pregnancy are very likely to make a significant contribution to reducing overall rates of preterm birth.

Table 14: Rates of preterm birth <32 completed weeks (1996–2010)

	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010
Total number of women	9157	8055	7492	7501	7827	7491	7194	7212	7695	7695	7735	7709
Women birthing <32 weeks	241	207	212	229	244	220	211	212	212	222	185	212
Incidence %	†	†	2.8	3.1	3.1	2.9	2.9	2.9	2.8	2.9	2.4	2.8
Spontaneous <32 weeks				86	107	106	93	96	105	105	91	94
Incidence %				1.1	1.4	1.4*	1.3	1.3	1.4	1.4	1.2	1.2
Iatrogenic <32 weeks				143	137	114	118	116	107	117	94	118
Incidence %				1.9	1.8	1.5*	1.6	1.6	1.4	1.5	1.2	1.5
Total babies <32 weeks				271	287	250	247	245	237	253	214	246

† Note denominators pre-1998 include postnatal transfers and therefore incidence has not been calculated
* 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%. Again these rates may be a little higher than expected from a general 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. Birth <32 weeks only makes a small contribution to all births at National Women's but these infants are likely to have the largest impact on neonatal mortality and severe morbidity as well as use of NICU facilities and resources. We should aim to reduce complications that lead to very early iatrogenic preterm birth and aim to predict and prevent for those at very high risk of spontaneous preterm birth.

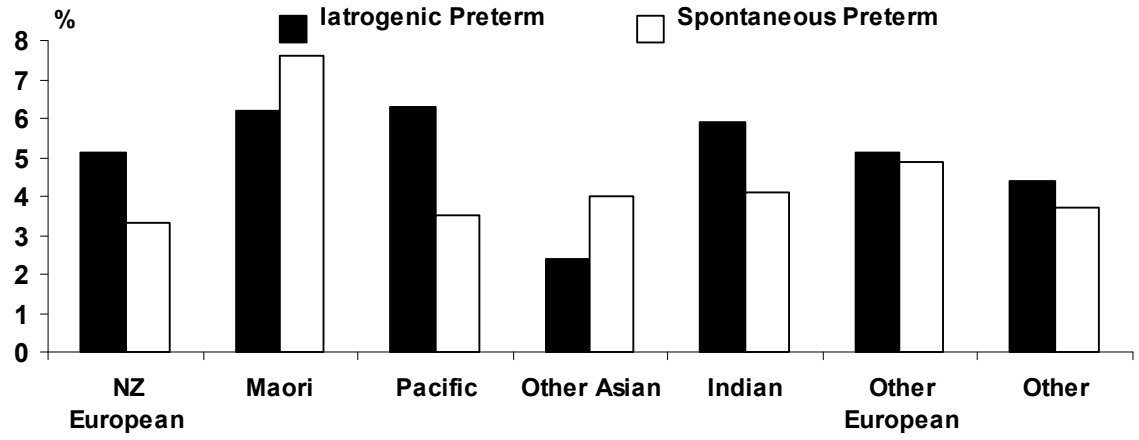

Figure 23: Spontaneous and iatrogenic preterm birth rates (<37 weeks) by ethnicity

Ethnic differences in rates of preterm birth are similar to those seen in previous years. The highest overall rate is for Māori women. It is likely that confounders such as smoking and other sociodemographic factors contribute to this risk rather than ethnicity itself.

Table 15: Perinatal outcome of preterm births by gestation (n=793)

Gestation	Births	Fetal deaths	Live births	% Live born	Neonatal death	% of live births surviving ≥28 days
19	1	0	1	100	1	0
20	15	14	1	7	1	0
21	15	12	3	20	3	0
22	12	7	5	42	5	0
23	7	4	3	43	3	0
24	18	5	13	72	1	92
25	17	2	15	88	3	80
26	16	6	10	63	2	80
27	24	4	20	83	1	95
28	16	1	15	94	0	100
29	33	5	28	85	1	96
30	32	3	29	91	1	97
31	40	1	39	98	1	97
32	27	2	25	93	0	100
33	62	2	60	97	0	100
34	106	3	103	97	3	97
35	104	1	103	99	1	99
36	248	3	245	99	0	100
Totals	793	75	718	91	27	96

Perinatal outcome for premature babies is excellent with survival rates of all livebirths from 27 weeks approaching those expected at term. Long term morbidity for these premature babies should also be considered and is discussed in Chapter 9.

Summary and Implications

Prematurity continues to be the major cause of neonatal morbidity and mortality. Being born preterm has life-long implications for the infant with increasing evidence suggesting effects on long term risk of cardiovascular disease and diabetes including an increased risk even at late preterm gestations of 34-37 weeks.

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 these rates. This includes simple measures such as avoiding late preterm births by limiting all elective CS to gestations ≥39 weeks, continued smoke change advice to all smoking pregnant women, and continued involvement in preventative clinical trials. These include trials such as PROGRESS (PROGesterone after previous preterm birth for prevention of neonatal RESpiratory Syndrome) and EPPI (Enoxaparin for the Prevention of Preeclampsia and IUGR) in attempts to reduce spontaneous and iatrogenic preterm birth respectively.

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 (Journal of Paediatrics & Child Health. 1996:32:512-8), which was largely derived from Caucasian births. Customised birth weight centiles have now been developed for New Zealand women (McCowan et al, Aust N Z J Obstet Gynaecol 2004:44:428-31). These adjust size at birth for gestation, gender, maternal ethnicity, height, booking weight, and parity. The resulting definition of SGA reclassifies as normal many 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 16: Rates of SGA and LGA as defined by customised birthweight centiles (compared to AGA) by demographic characteristics (n=babies)

	Total Babies	Customised birthweight <10th% (SGA)		Customised birthweight ≥10th% & ≤ 90th % (AGA)		Customised birthweight > 90th % (LGA)	
	N	n	%	n	%	n	%
Total	**7866**	**910**	**11.6**	**6216**	**79.0**	**740**	**9.4**
Maternal Age							
≤ 20	339	51	15.0	262	77.3	26	7.7
21-25	959	138	14.4	735	76.6	86	9.0
26-30	2035	230	11.3	1627	80.0	178	8.7
31-35	2570	271	10.5	2036	79.2	263	10.2
36-40	1684	182	10.8	1339	79.5	163	9.7
>40	279	38	13.6	217	77.8	24	8.6
Ethnicity							
NZ European	2967	296	10.0	2361	79.6	310	10.4
Māori	603	93	15.4	445	73.8	65	10.8
Pacific	1104	145	13.1	857	77.6	102	9.2
Other Asian	1493	204	13.7	1206	80.8	83	5.6
Indian	543	66	12.2	430	79.2	47	8.7
Other European	877	86	9.8	713	81.3	78	8.9
Other	279	20	7.2	204	73.1	55	19.7
Parity							
Multipara	4146	420	10.1	3307	79.8	419	10.1
Primipara	3720	490	13.2	2909	78.2	321	8.6

There are significant differences in age, ethnicity and parity between mothers of SGA and AGA infants. These differences are most striking for young women and women of Māori ethnicity. This elevated risk may not be directly related to either maternal age or ethnicity but could be explained by other factors. Young women and Māori women are more likely to smoke in pregnancy. Fifty-nine percent of Māori women with SGA infants were smoking at booking compared with 34% of Māori women with non SGA babies and 55%

of women under 20 with SGA babies smoked in pregnancy compared to 27% of women under 20 with non SGA babies.

With regard to the apparent higher rate of SGA babies and lower rate of LGA babies observed in Asian women in this report, we are currently updating the New Zealand customised birthweight centile coefficients with data from a larger cohort of births. The coefficient for Chinese ethnicity has reduced since the last version of the calculator which is likely to reduce the proportion of Asian SGA babies and increase the proportion of Asian LGA in future reports (Anderson et al personal communication).

Table 17: Rates of SGA and LGA as defined by customised birthweight centiles (compared to AGA) by demographic characteristics continued (n=babies)

	Total Babies	Customised birthweight <10th% (SGA)		Customised birthweight ≥10th% & ≤ 90th % (AGA)		Customised birthweight > 90th % (LGA)	
	N	n	%	n	%	n	%
Total	**7866**	**910**	**11.6**	**6216**	**79.0**	**740**	**9.4**
Smoking at booking							
Currently smoking	615	129	21.0	445	72.4	41	6.7
No or not smoking in last month	7203	774	10.7	5734	79.6	695	9.6
Unknown	48	7	14.6	37	77.1	4	8.3
BMI							
<19	445	59	13.3	359	80.7	27	6.1
19-25	4496	459	10.2	3614	80.4	423	9.4
26-30	1454	192	13.2	1140	78.4	122	8.4
31-35	697	95	13.6	534	76.6	68	9.8
>35	552	70	12.7	407	73.7	75	13.6
Missing data	222	35	15.8	162	73.0	25	11.3
Plurality							
Singleton	7556	802	10.6	6019	79.7	735	9.7
Multiple	310	108	34.8	197	63.5	5	1.6

The increased risk of SGA among over-weight and obese women is likely explained by the higher rate of hypertensive disease among these women (approximately 15% have chronic or pregnancy induced hypertension compared with 6% of women with normal BMI). Customised centiles are designed to be used in singleton pregnancies so the finding that 34.8 % of infants from multiple pregnancies are SGA needs to be interpreted with some caution although it is well recognised that SGA is more common in multiple pregnancies.

Consistent with international literature women who smoke have an elevated (two-fold) risk of SGA infants. Further exploration of independent risk factors for SGA infants will require multivariate analysis and is planned as part of ongoing research.

The only group who appear to have an increased risk of LGA infants are women with BMI >35. Maternal obesity is a known risk factor for LGA babies and the associated increased rate of gestational and type 2 diabetes will also contribute to this increased risk.

Table 18: Interventions and outcomes among SGA, LGA and appropriately grown (AGA) babies (n=babies)

	Customised birthweight <10th% (SGA) n=910	Customised birthweight ≥10th% & ≤ 90th % (AGA) n=6216	Customised birthweight > 90th % (LGA) n=740
	n %	n %	n %
Median birth weight (IQR) g	2622.5(2230-2885)	3420(3125-3700)	4132.5(3842.5-4380)
Gestation at birth			
Term	687 75.5	5726 92.1	660 89.2
Preterm	223 24.5	490 7.9	80 10.8
Preterm <32 wks	101 11.1	126 2.0	19 2.6
Median gestation (IQR) weeks	38(37-40)	39(38-40)	39(38-40)

One quarter of SGA infants were born preterm and 11% were born < 32 weeks.

Table 19: Interventions and outcomes among SGA, LGA and AGA babies born preterm <37 weeks

	Customised birthweight <10th% (SGA) n=223		Customised birthweight ≥10th% & ≤ 90th % (AGA) n=490		Customised birthweight >90th % (LGA) n=80	
	n	%	n	%	n	%
Onset of birth – preterm						
Spontaneous labour	58	26.0	249	50.8	32	40.0
Induction and pre labour CS	165	74.0	241	49.2	48	60.0
NICU admission						
Any stay	137	61.4	276	56.3	36	45.0
≥2 days	133	59.6	269	54.9	36	45.0
Apgar at 5 mins <7	69	30.9	55	11.2	16	20.0
Fetal death (n/ 1000)	49	219.7	17	34.7	9	112.5
Neonatal death(n/1000 live births)	11	49.3	13	26.5	3	37.5

Iatrogenic preterm birth was more common among SGA babies compared with AGA or LGA babies. This is likely because of an association with preeclampsia, diagnosis of SGA in pregnancy or other causes of "placental insufficiency" recognised prior to birth. Preterm SGA infants were approximately 4 times more likely to be stillborn or to die in the neonatal period compared with preterm AGA babies. This information should be incorporated into the antenatal counselling for parents with a known growth restricted fetus.

Table 20: Interventions and outcomes among SGA, LGA and AGA babies at term

	Customised birthweight <10th% (SGA) n=687		Customised birthweight ≥10th% & ≤ 90th% (AGA) n=5726		Customised birthweight >90th % (LGA) n=660	
	n	%	n	%	n	%
Onset of birth						
Spontaneous labour	301	43.8	3086	53.9	313	47.4
Induction and pre labour CS	386	56.2	2640	46.1	347	52.6
NICU admission						
Any stay	64	9.3	243	4.2	36	5.5
≥2 days	53	7.7	188	3.3	27	4.1
Apgar at 5 mins <7	16	2.3	52	0.9	5	0.8
Fetal death (n/ 1000)	4	5.8	6	1.0	1	1.5
Neonatal death(n/1000 live births)	3	4.4	4	0.7	0	0.0

Perinatal deaths in term SGA infants were less common than in preterm SGA infants but were several fold higher compared with rates in AGA infants. These term SGA infants were twice as likely to be admitted to the neonatal unit compared with their AGA counterparts. The LGA babies did not appear to have elevated risk of admission or prolonged neonatal unit stay compared with AGA babies.

Summary / Implications

These 2010 data again confirm that babies who are SGA by customised centiles have higher rates of morbidity and mortality than their AGA counterparts. This applies both to babies born at term and preterm. Women who smoke clearly have higher rates of SGA than non smokers. Local data have now established that women who become smoke free by 15 weeks (and preferably stop smoking by the end of the first trimester) have rates of SGA comparable to non smokers. Cessation early in pregnancy with appropriate support should be the goal for all pregnant smokers.

5.3 Multiple pregnancy

This section describes the characteristics and outcomes of mothers who gave birth to twins and triplets at NW during 2010 and the outcomes of their babies.

Findings

Table 21: Multiple pregnancy rates

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total number of multiple pregnancies	210	182	172	218	179	208	191	188	187	162	177	160	159	153
Incidence %		2.4	2.2	2.7	2.3	2.6	2.4	2.4	2.5	2.2	2.3	2.1	2.1	2.0
Number of twin pregnancies	204	176	166	207	175	201	184	188	184	157	174	156	156	149
Number of triplet pregnancies	6	5	6	11	4	7	7	0	3	5	3	4	3	4
Number of quadruplet pregnancies	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Table 22: Fetal/neonatal outcomes of multiple pregnancies

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total number of babies born in a multiple pregnancy	426	371	350	447	362	423	389	376	377	329	357	324	321	310
Incidence %		4.8	4.6	5.3	4.7	5.3	4.9	4.9	5.1	4.5	4.5	4.2	4.1	3.9
Number of multiple pregnancies where one or more babies died	20	12	12	14		26	11	15	13	8	9	12	9	13
Incidence % (no. of multiple pregnancies where a baby died/number of multiple pregnancies)	9.5	6.6	7.0	6.4		12.5	5.8	8.0	7.0	4.9	5.1	7.5	5.8	8.5
Number of babies who died in a multiple pregnancy	30	25	22	23				23	17	12	11	16	13	16
Total number of babies born in a twin pregnancy	408	352	332	414	350	402	368	376	368	314	348	312	321	298
Twin perinatal deaths (≤ 7days)	28	20	22	20				23	16	11	10	13	12	15
Twin perinatal mortality rate*	68.6	56.8	62.5	48.3				61.2	43.4	35.0	28.7	41.7	37.4	50.3

*Perinatal twin deaths/1000 twin babies born

The rate of multiple pregnancy remains stable over the last six years, with triplet pregnancies following this trend. Triplet pregnancies include all women from ADHB and WDHB area as the ADHB Maternal-Fetal Medicine Unit provide care to women from WDHB. The majority of triplet pregnancies are spontaneous.

The perinatal mortality rate is higher than singletons (13.4/1000 births) as expected. It is uncertain what proportion of twins are monochorionic and dichorionic, which have different perinatal mortality rates in the literature.

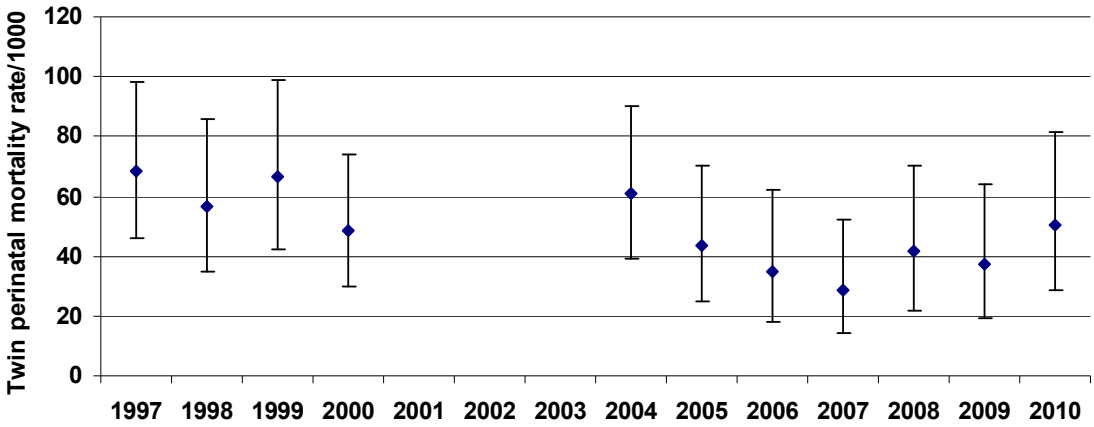

Figure 24: Twin perinatal mortality 1997-2010 with 95% confidence intervals

Table 23: Mode of onset of birth among twin pregnancies

	Preterm births N=192		Term births N=106	
	n	%	n	%
Mode of onset of birth				
CS elective	78	40.6	38	35.8
CS emergency before labour	38	19.8	12	11.3
Induction of labour	26	13.5	48	45.3
Spontaneous labour	50	26.0	8	7.5

As expected the majority of twin pregnancies are preterm. For those where term is reached there is no clear guidance on the best gestation at which to deliver twins and NWH are part of a multicentre study which aims to answer this question.

One third of twin pregnancies result in both twins being delivered vaginally compared with 54% in 2000, which is a statistically significant reduction and indicates that Caesarean Section is now the norm. Of the 50 women having a first twin born vaginally, only one woman had a Caesarean Section for the second twin. A 0.5% chance of Caesarean Section for the second twin is very low and should be stressed to women considering vaginal birth for twins. This may be due to a number of factors including case selection and specialist attendance at delivery.

Table 24: Mode of birth among twin pregnancies

	Twin pregnancies													
	2000 n=207		2004 n=188		2005 n=184		2006 n=157		2007 n=174		2008 n=156		2009 n=156		2010 n=149	
			n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vaginal birth/vaginal breech both twins	84	41	52	28	53	29	38	24	47	27	52	33	48	31	36	24
Spontaneous vaginal birth 1st twin, operative vaginal 2nd twin	7	3	4	2	8	4	7	4	3	2	2	1	2	1	2	1
Operative vaginal 1st twin, spontaneous vaginal 2nd twin	9	4	8	4	5	3	5	3	6	3	4	3	7	4	7	5
Instrumental vaginal birth both twins	11	5	7	4	7	4	3	2	11	6	4	3	9	6	4	3
Spontaneous vaginal birth 1st twin, Caesarean section 2nd twin	4	2	4	2	1	1	1	1	2	1	3	2	1	1	1	1
Operative vaginal birth 1st twin, Caesarean section 2nd twin	2	1	5	3	0		0		0		0		0		0	
CS elective both twins	90	43	48	26	52	28			46	29	51	33	37	24	58	39
CS emergency both twins			60	32	58	31			57	36	39	25	52	33	41	28

Table 25: Fetal/newborn outcomes of twin babies

		Twin babies n=298	
	N	n	%
Apgar <7 at 5 minutes	213	24	8.1
Admission to NICU ≥ 2 days	706	125	41.9
≤34 weeks	104	91	87.5
35-36	88	30	34.1
≥37 weeks	106	4	3.8

Table 26: Perinatal-related deaths in twin pregnancies by gestation

	Twin pregnancies			
	One twin died n=9		Both twins died n=6	
Gestation (weeks)	**n**	**Outcome**	**n**	**Outcome**
19 – 23			6	2FD/4ENND
24 – 27	5	2FD/3ENND		
28 – 31				
32 – 36	3	2FD/ENND		
37 – 40	1	FD		

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

There were 15 perinatal deaths. In 5 of these spontaneous preterm birth contributed to the loss. In two cases there was antepartum bleeding and in three of the latest losses there was a congenital anomaly or specific perinatal event. Most losses occur before 28 weeks. In all losses where both twins died this occurred prior to 24 weeks. If a twin pregnancy with no complications/ congenital anomalies proceeds to 28 weeks, the outlook is good for both babies.

Summary / Implications

Multiple pregnancy rates are steady. These are high risk pregnancies and should be managed in conjunction with an Obstetrician. Where there are Monochorionic twins the risks are higher and closer monitoring is needed.

As expected more babies are born preterm and 41% will spend some time in NICU. Timing of delivery is uncertain but 3.8% of twins born after 37 weeks spend time in NICU suggesting that routine delivery at 37 weeks should be considered carefully. Women with uncomplicated twin pregnancy at term should have the Timing of Twins study discussed.

If vaginal birth is being considered there is a very low chance of Caesarean section for the second twin at NWH.

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 2010. 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 LMC, and women with no Diabetes Clinic input. It does not include women cared for by the Diabetes Clinic who birthed prior to 20 weeks or who birthed elsewhere.

Findings

In addition to these data the diabetes service had 56 referrals for pre-pregnancy counselling. We saw 38 of the pre-pregnancy referrals, but 18 remain unseen because we have not had the capacity to review them. Also 30 other women were booked into clinic but their data are not shown as they either miscarried or transferred elsewhere for birthing.

The ongoing rise in women with GDM probably reflects an increased uptake of testing for GDM plus the change in population demographics with increased rates of obesity and type 2 diabetes at younger ages.

Last year we commented that new international guidelines for testing for diabetes in pregnancy had been published, which would lead to more women being diagnosed with GDM, as the recommendations had a lower glucose cut off for the diagnosis of GDM than current NZ criteria. In Auckland, we have not changed to the new criteria, as we are struggling to provide adequate care for women who are diagnosed by our current criteria. We have continued to work on developing models of care so that some women can be cared for in community clinics in the future. Education and training of clinicians to provide this care is a priority. Hopefully, we can then have discussions about whether to adopt the new criteria over the next 12 months.

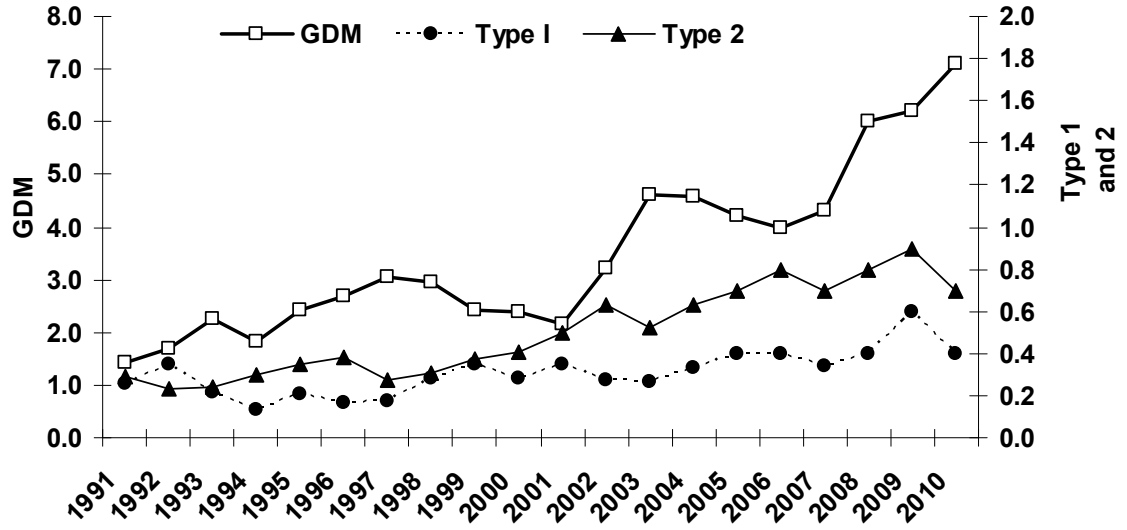

Figure 25: Incidence of diabetes (% of all inborn and BBA births) (1991-2010)

5.4.1 Demographic characteristics of women with diabetes

It can be seen that the non-European ethnicities have the highest rates of GDM. We would expect our Polynesian women to have the highest rates of GDM overall, as they have the highest rates of type 2 diabetes. It is not clear whether Polynesian women are less likely to perform testing for GDM or whether they have more false negative results. We want to look at this issue in more detail.

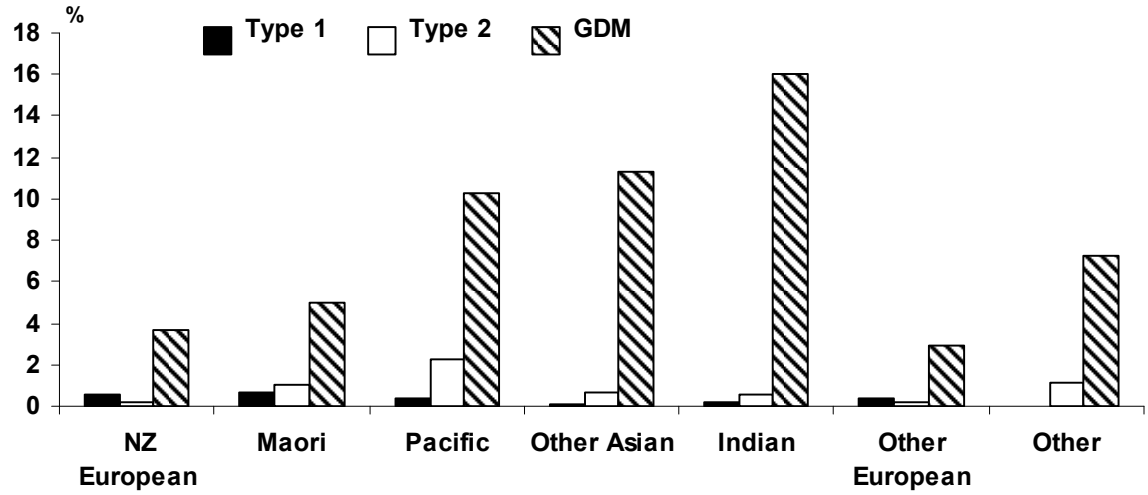

Figure 26: Incidence of diabetes by ethnic group (2010)

5.4.2 Outcomes of pregnancies complicated by diabetes

Maternal outcomes

Mode of birth is stable and the Caesarean section rate has not significantly increased over the past ten years.

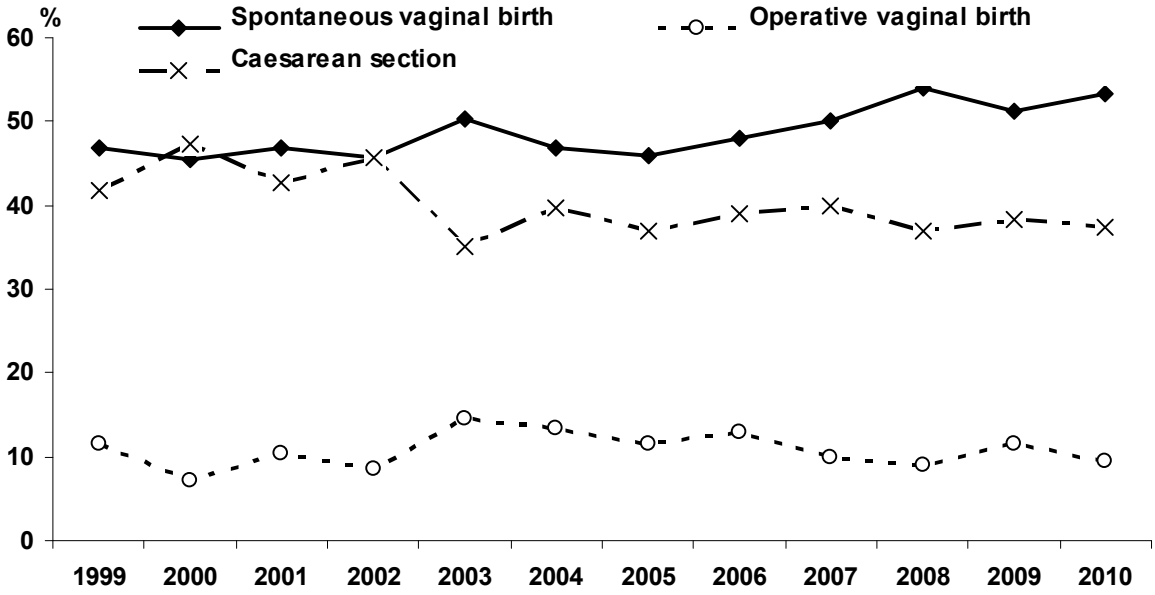

Figure 27: Mode of birth among women with GDM (1999-2010)

5.4.3 Maternal postpartum glucose tolerance testing

Table 27: Rates of postnatal glucose tolerance testing (GTT) among women with GDM (2000-2010)

	2001 n=163		2002 n=253		2003 n=352		2004 n=342		2005 n=304		2006 n=286		2007 n=331		2008 n=457		2009 n=480		2010 n=548	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Postnatal GTT	132	81	171	68	260	74	260	76	238	78	206	72	249	75	313	68	324	68	369	67
No post-natal GTT	31	19	82	32	92	26	82	24	66	22	80	28	82	25	144	32	156	32	179	33

We continue to have very high rates of glucose intolerance/diabetes postpartum in women with GDM. This is related to our higher cut off levels for diagnosing GDM during pregnancy compared with most other countries, plus the high rates of obesity and diabetes in our community.

Table 28: Results of postnatal glucose tolerance testing (GTT) among women with GDM (2000-2010)

	2001 n=130		2002 n=169		2003 n=260		2004 n=260		2005 n=238		2006 n=206		2007 n=249		2008 n=313		2009 n=324		2010 n=369	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Normal	90	69	116	69	196	75	194	75	190	80	158	77	175	70	236	75	264	82	266	72
IFG/ IGT*	23	18	37	22	39	15	49	19	34	14	39	19	50	20	58	19	42	13	80	22
Type 2	17	13	16	9	25	10	17	7	14	6	9	4	24	10	19	6	18	5	23	6

*IFG =Impaired fasting glucose
IGT= Impaired glucose tolerance

5.4.4 Neonatal outcomes among babies of women with diabetes in pregnancy

The neonatal outcomes for women with GDM are comparable with outcomes for women with no diabetes (where data are available), which is an aim of treating women with GDM. The rates of LGA in women with type 1 diabetes remains high, reflecting the difficulty in achieving tight glucose control after meals. We continue to see increased rates of SGA as well as LGA in women with type 2 diabetes, as they often have additional risk factors for SGA.

Table 29: Neonatal outcomes among babies of women with diabetes

	Type I n=30		Type 2 n=56		GDM n=532		Postnatally diagnosed Type 2 n=21		No diabetes n=7227	
	n	%	n	%	n	%	n	%	n	%
Birthweight (Median(IQR))	3795 (3395-3990)		2985 (2395-3427.5)		3195 (2862.5-3590)		3410 (3100-3620)		3410 (3050-3755)	
<1500g	0	0.0	3	5.4	12	2.3	0	0.0	211	2.9
<2500g	2	6.7	17	30.4	49	9.2	1	4.8	589	8.1
SGA <10th Percentile	0	0.0	15	26.8	56	10.5	0	0.0	839	11.6
LGA >90th Percentile	19	63.3	9	16.1	61	11.5	7	33.3	644	8.9
Admission to NICU										
Any admission	8	26.7	17	30.4	69	13.0	3	14.3	697	9.6
≥2 days	7	23.3	16	28.6	63	11.8	2	9.5	618	8.6
Hypoglycaemia <2.3 mmol/l	8	26.7	14	25.0	62	11.7	5	23.8	ND	
Hypoglycaemia <2.3–<2.6 mmol/l	4	13.3	4	7.1	51	9.6	1	4.8	ND	
IV Dextrose	4	13.3	9	16.1	21	3.9	2	9.5	ND	
Perinatal related losses (/1000)	0	0.0	2	35.7	8	15.0	0	0.0	107	14.8

ND=Not documented

5.4.5 Perinatal losses

Diabetes Diagnosis	Perinatal death	Gestation at birth	Customised growth	PSANZ-PDC	PSANZ-NDC
Type 2	Stillbirth	21	SGA	Maternal condition	
Type 2	Stillbirth	30	SGA	Maternal condition	
GDM	ENND	19	SGA	Antepartum haemorrhage	Extreme prematurity
GDM	Stillbirth	21	SGA	Fetal abnormality	
GDM	Stillbirth	23	SGA	Maternal condition	
GDM	Stillbirth	24	SGA	Specific Perinatal condition	
GDM	Stillbirth	34	SGA	Fetal abnormality	
GDM	ENND	34	LGA	Fetal abnormality	Fetal abnormality
GDM	LNND	38	SGA	Fetal abnormality	Fetal abnormality
GDM	ENND	39	AGA	No obstetric antecedent	Neurological

There were 10 perinatal losses among women with diabetes in 2010; 2 among type 2 diabetics and 8 among women with GDM. Two of the losses prior to 24 weeks were in women diagnosed with GDM, but type 2 diabetes was confirmed postpartum. The losses in women with type 2 diabetes were related to suboptimal diabetes control, late presentation and other medical co-morbidities. The perinatal related mortality rate was higher among women with Type 2 diabetes and the same among women with GDM as among non-diabetics.

Metformin use

Last year we reported that we were auditing our use of metformin as routine treatment of GDM. We have looked at the outcomes of women treated in our clinic over a three year period from 2006-2009. Outcomes in women treated with metformin, plus additional insulin if required, were similar to women treated with dietary measures, despite being more obese and with higher diagnostic OGTTs. Outcomes were better than in women treated with insulin alone, but this may be because of other factors, for example, we do not offer metformin to women with a suspected SGA fetus. These data have been accepted for publication: Goh J, Sadler L, Rowan J. Metformin for GDM in routine clinical practice. Diabet Med 2011 (in press).

Summary

The key issue for our service is the same as last year, being able to provide effective care for the increasing numbers of women diagnosed with GDM. We are continuing to work on this, knowing that women benefit from treatment and that it is cost-effective to treat women with GDM.

Recommendations

The recommendations from last year are still relevant:

1. Provide education to other clinicians to help provide care for the increasing numbers of women with GDM.
2. Develop a model of care that will continue to cope with further increases in numbers.
3. Set up discussions about the new guidelines for the diagnosis of GDM.

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 30: Antepartum haemorrhage incidence

	1995	1996	1997	1998	1999	2000	2005	2006	2007	2008	2009	2010
Total APH	460	451	453	451	484	594	398	411	533	424	438	438
Incidence %	5.0	4.9	5.6	6.0	6.5	7.6	5.5	5.7	6.9	5.6	5.7	5.7
Proven abruption	101	96	115	82	49	54	41	44	58	36	39	50
Proven placenta praevia	86	67	94	91	74	69	81	68	94	73	66	58
APH (uncertain origin)	273	287	281	278	361	471	276	299	381	315	333	330

In 2010, 438 women (5.7% of the total pregnant population) had an antepartum haemorrhage or placenta praevia without bleeding. This figure has not changed significantly from year to year and there have been no trends in incidence over time.

In our population placenta praevia is significantly more common with increasing maternal age: there was an incidence of 0.5% (16 of 3276 women) in women aged 30 or under rising to 0.9% in women aged >=30 (42 of 4433 women). The incidence of placenta praevia in women with a previous Caesarean section was 1.3% (16 of 1197 women) compared to 0.6% (18/2862) among multipara without previous Caesarean consistent with previous Caesarean section being a risk factor for placenta praevia. The incidence of the more serious diagnosis of placenta accreta and percreta should be recorded. Many studies have shown these problems to be associated with previous Caesarean section. Smoking status, BMI and hypertensive disease were not associated with placenta praevia.

Table 31: Maternal outcomes of pregnancies complicated by antepartum haemorrhage

	Placenta praevia n=58		Placental abruption n=50		APH uncertain origin n=330		No APH n=7271	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	0	0.0	11	22.0	176	53.3	4089	56.2
Operative vaginal	0	0.0	5	10.0	40	12.1	897	12.3
CS elective	37	63.8	2	4.0	39	11.8	1144	15.7
CS emergency	21	36.2	32	64.0	75	22.7	1141	15.7
Maternal transfusion	9	15.5	6	12.0	15	4.5	173	2.4

Women with a placenta praevia had a significant requirement for blood products with 16% of women requiring transfusion during pregnancy or birth.

A confirmed placental abruption is a less common diagnosis with an incidence of 0.6% in 2010. There was no difference in incidence with maternal age, BMI or previous Caesarean section. Smoking is a significant risk factor with an incidence of 1.7% compared to 0.6% in non-smokers. Pre-eclampsia may also be a significant risk factor with an incidence of 2.6% in this group compared to 0.6% in normotensive women.

Placental abruption is associated with significant maternal morbidity with 64% requiring birthing by emergency section and 12% being transfused. Fetal morbidity is also significant with a median birth weight of 2550g and an incidence of SGA of 30%. Half of these babies were admitted to NICU and there were two perinatal deaths amongst 50 babies in this group (40/1000 births).

The higher rates of preterm birth, emergency Caesarean section, an increased requirement for blood transfusion and a perinatal mortality rate six times higher than women with no antepartum haemorrhage suggest that 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 (330 of 438 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 32: Fetal/neonatal outcomes of pregnancies complicated by antepartum haemorrhage (babies)

	Placenta praevia n=58		Placental abruption n=50		APH uncertain origin n=330		No APH n=7271	
	n	%	n	%	n	%	n	%
Gestation at birth								
<37 weeks	13	22.4	31	62.0	103	31.2	646	8.9
<32 weeks	6	10.3	12	24.0	54	16.4	174	2.4
Birthweight								
Median (IQR)	3075 (2870-3450)		2550 (1880-3160)		3245 (2590-3665)		3410 (3050-3750)	
<2500g	9	15.5	24	48.0	82	24.8	543	7.5
<1500g	5	8.6	10	20.0	41	12.4	170	2.3
Small for gestational age	2	3.4	15	30.0	50	15.2	843	11.6
Perinatal deaths (n /1000)	1	17.2	2	40.0	26	78.8	87	12.0
Admission to NICU	13	22.4	25	50.0	70	21.2	686	9.4
≥2 days in NICU	12	20.7	25	50.0	64	19.4	605	8.3

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 patient 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 2009. It still remains a very common medical disorder in pregnancy. Chronic hypertension is more common in the multiparous population, with gestational hypertension and preeclampsia being predominant in nulliparous women. Women with increased BMI had higher rates of hypertensive disease in pregnancy, especially if their BMI was greater than 40. Thirty-five percent of women with a BMI over 45 had hypertensive disease in pregnancy.

There was 1 reported case of eclampsia in 2010 (0.2% of hypertensive pregnancies) and this occurred postpartum.

Table 33: Hypertensive disease in pregnancy (2010)

	All women N=7709		Nullipara n=3650		Multipara n=4059	
	n	%	n	%	n	%
Any hypertensive disease	653	8.5	362	9.9	291	7.2
Gestational hypertension	234	3.0	145	4.0	89	2.2
Chronic hypertension	164	2.1	56	1.5	108	2.7
Chronic hypertension with superimposed preeclampsia	24	0.3	8	0.2	16	0.4
Preeclampsia	231	3.0	153	4.2	78	1.9
Eclampsia	1	0.01	0		1	0.02

Hypertensive disease is associated with an increase in interventions to interrupt pregnancy. Fifty six percent of normotensive women went into labour spontaneously, compared with only 26%, 13% and 31% 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 (57%, 36% and 63% respectively).

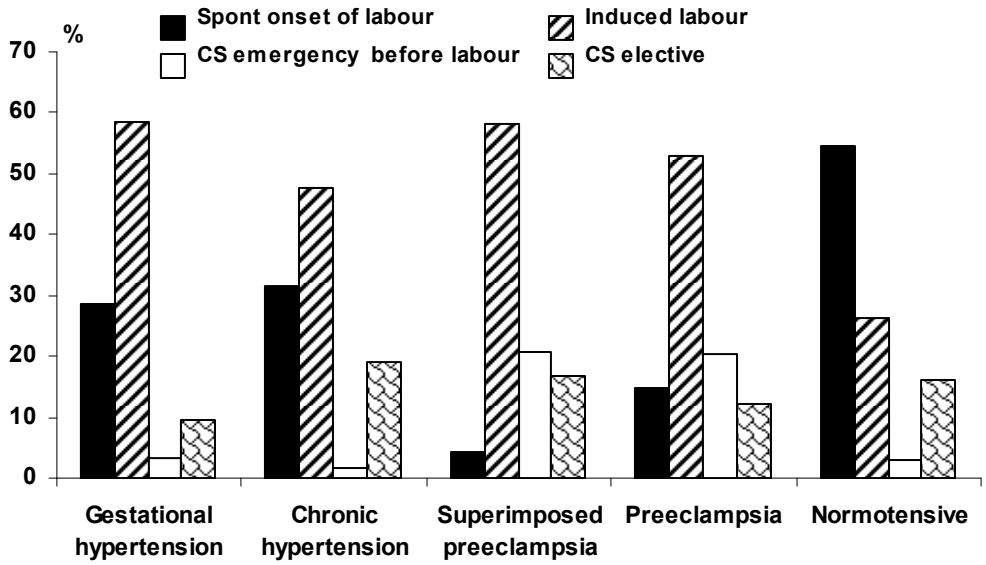

Figure 28: Onset of birth and hypertensive disorders of pregnancy

Table 34: Mode of birth for women with hypertensive disease

	Gestational hypertension n=234		Chronic hypertension n=164		Superimposed preeclampsia n=24		Preeclampsia n=231		Normotensive n=7056	
	n	%	n	%	n	%	n	%	n	%
Mode of birth										
Normal vaginal	120	51.3	85	51.8	6	25.0	69	29.9	3996	56.6
Operative vaginal	40	17.1	20	12.2	3	12.5	31	13.4	848	12.0
CS elective	22	9.4	31	18.9	4	16.7	28	12.1	1137	16.1
CS emergency	52	22.2	28	17.1	11	45.8	103	44.6	1075	15.2
Epidural	166	70.9	110	67.1	20	83.3	186	80.5	4173	59.1
General Anaesthetic	15	6.4	4	2.4	0	0.0	15	6.5	200	2.8

Table 35: Perinatal outcomes and hypertensive complications of pregnancy (n=babies)

	Gestational hypertension n= 237		Chronic hypertension n=167		Superimposed preeclampsia n=24		Preeclampsia n=248		Normotensive n=7190	
	n	%	n	%	n	%	n	%	n	%
Gestation at birth										
<37 weeks	19	8.0	22	13.2	10	41.7	82	33.1	660	9.2
<32 weeks	2	0.8	8	4.8	6	25.0	18	7.3	212	2.9
SGA	38	16.0	25	15.0	10	41.7	63	25.4	774	10.8
NICU Admission	24	10.1	21	12.6	6	25.0	72	29.0	671	9.3
≥2 days in NICU	23	9.7	19	11.4	6	25.0	69	27.8	589	8.2
Apgars <7 at 5 mins	4	1.7	6	3.6	2	8.3	12	4.8	189	2.6
Perinatal deaths (n/1000)	0	0.0	6	35.9	3	125.0	2	8.1	109	15.2

Hypertensive disease in pregnancy is associated with a range of adverse perinatal complications. Very preterm birth (<32 weeks) is more common in women who have superimposed preeclampsia or preeclampsia (25% and 7.3% of births respectively, compared to 2.9% 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 mortality rates given may not reflect the true risk, because of the small numbers in each hypertensive group. There were 11 perinatal deaths in the hypertensive group, the same number as 2009.

Summary / Implications

Occurring at a rate of 8.5%, antenatal hypertensive disease continues to be the most common medical complication associated with pregnancy at NW. Gestational hypertension alone is not associated with significant adverse maternal or perinatal outcomes. The negative pregnancy outcomes associated with the other hypertensive conditions are again reflected in the 2010 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.

Findings

Table 36: Maternal BMI 2006-2010 (missing data excluded)

	2006 [1]		2007 [2]		2008 [3]		2009 [4]		2010 [5]	
	n=5660		n=6909		n=7117		n=7426		n=7490	
	n	%	n	%	n	%	n	%	n	%
<19	304	5.4	388	5.6	405	5.7	442	6.0	443	5.9
19-25	3329	58.8	4129	59.8	4180	58.7	4344	58.5	4404	58.8
26-30	1113	19.7	1315	19.0	1368	19.2	1441	19.4	1418	18.9
31-35	512	9.1	625	9.1	630	8.9	686	9.2	684	9.1
36-40							303	4.1	328	4.4
41-45	402	7.1	452	6.5	534	7.5	118	1.6	133	1.8
>45							92	1.2	80	1.1

1 Missing data in 2006 = 21.5%
2 Missing data in 2007 = 10.2%
3 Missing data in 2008 = 6.2%
4 Missing data in 2009 = 4.0%
5 Missing data in 2010 = 2.8%

It is surprising but also somewhat reassuring to see that the rates of morbid obesity have remained similar over the last 5 years. Data collection has improved with less than 3% missing data in 2010 compared with more than 20% missing data in 2006.

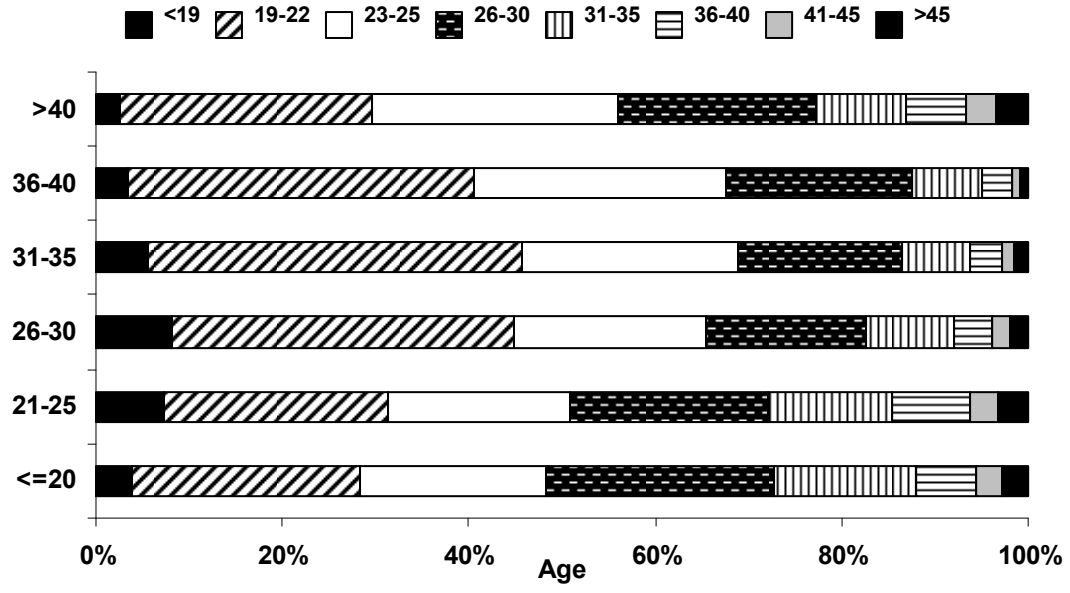

Figure 29: Distribution of BMI by maternal age

The relationship between BMI and age is “U shaped” with an excess of high BMI categories in young (<25 years) and the older (>40) mothers. Higher rates of obesity in younger pregnant women are associated with higher rates of socio economic deprivation and with ethnicity.

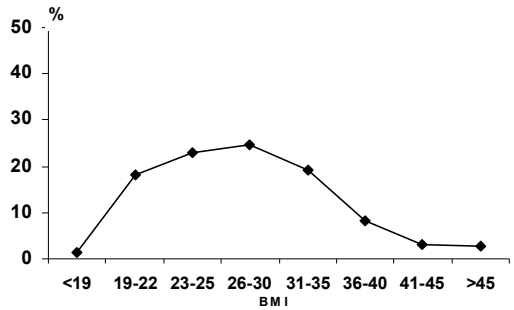

Figure 30: Distribution of BMI among Māori women

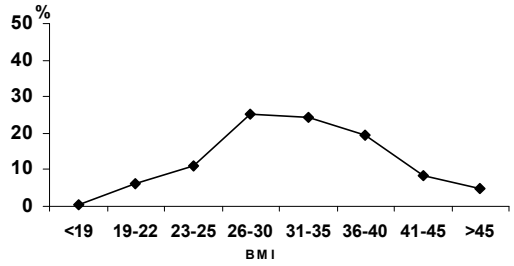

Figure 31: Distribution of BMI among Pacific women

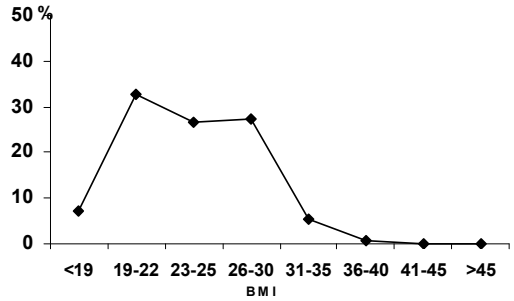

Figure 32: Distribution of BMI among Indian women

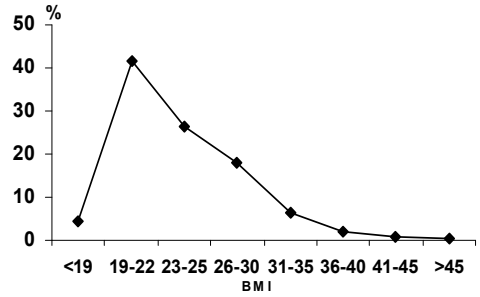

Figure 33: Distribution of BMI among European women

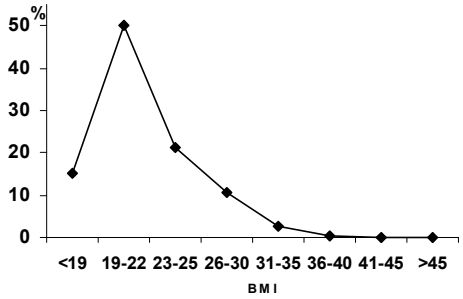

Figure 34: Distribution of BMI among Other Asian women

Māori and especially Pacific women are over represented amongst the obese groups (33.2% and 56.9% respectively). Also of concern 33.4% of Indian women have BMI $\geq$ 26 which is in the overweight/obese range for women of Indian ethnicity. Obesity is more common amongst parous women, perhaps partly reflecting weight gained during pregnancy and not lost post partum, as well as increasing age. The prevalence of smoking is also increased 2.4-fold amongst obese women compared with those with normal BMI. This is also likely to contribute to pregnancy complications in these women.

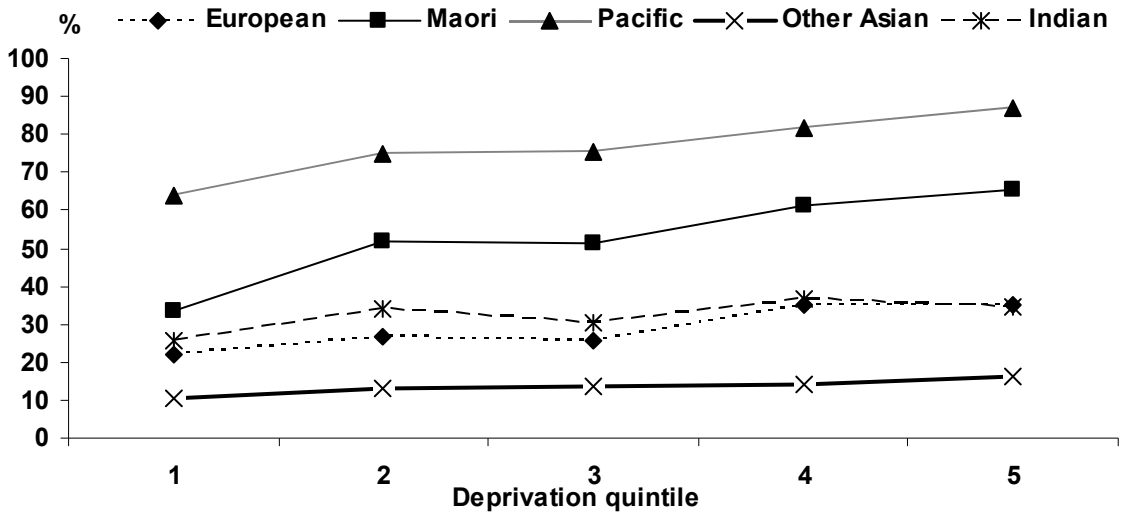

Figure 35: BMI >25 by ethnicity and deprivation quintile

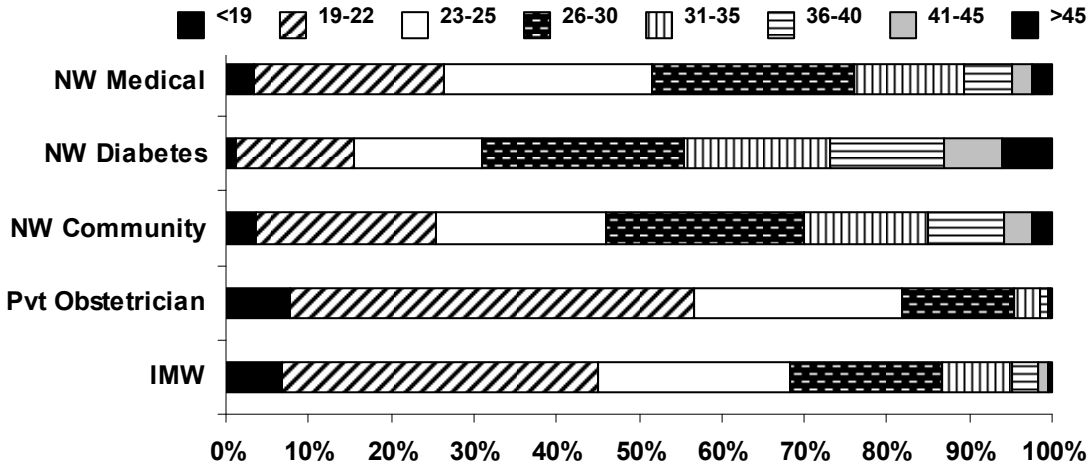

Figure 36: Distribution of BMI by LMC at birth

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

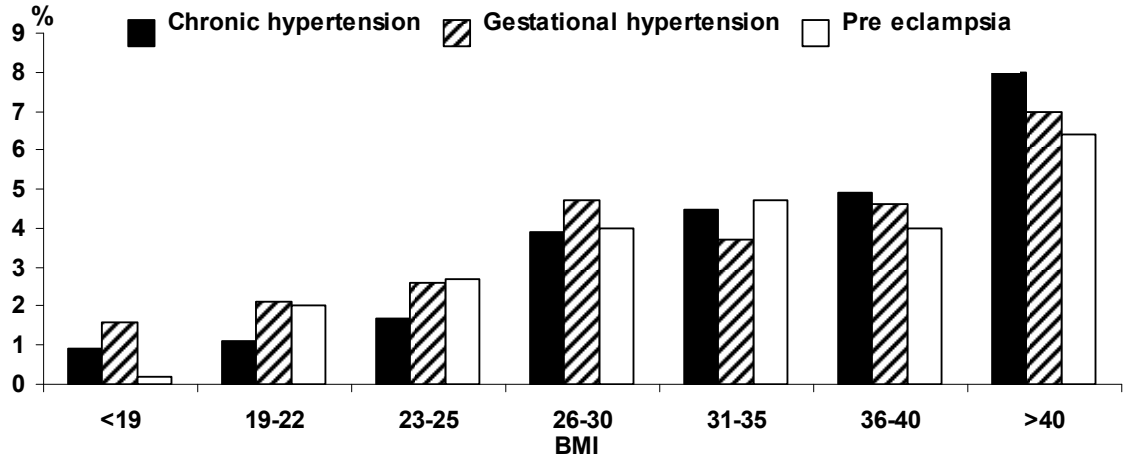

Figure 37: Rates of hypertensive diseases by maternal BMI (Chronic hypertension includes superimposed pre-eclampsia)

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

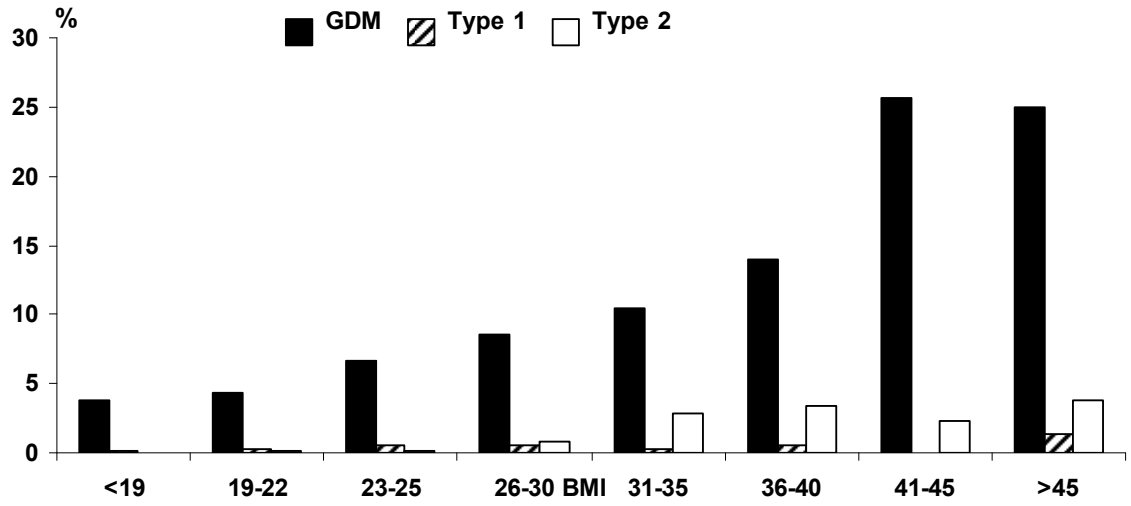

Figure 38: Rates of diabetes by maternal BMI

Increasing rates of GDM and type 2 diabetes are also seen with increasing BMI.

As National Women's BMI data accumulates in future years, ethnic specific BMI values should be used, especially for Indian and Asian women, who have been shown to have higher rates of GDM and preeclampsia at lower BMI values. Asian women are considered obese by ethnic specific BMI criteria with BMI ≥27 and Māori and Pacific with BMI ≥32.

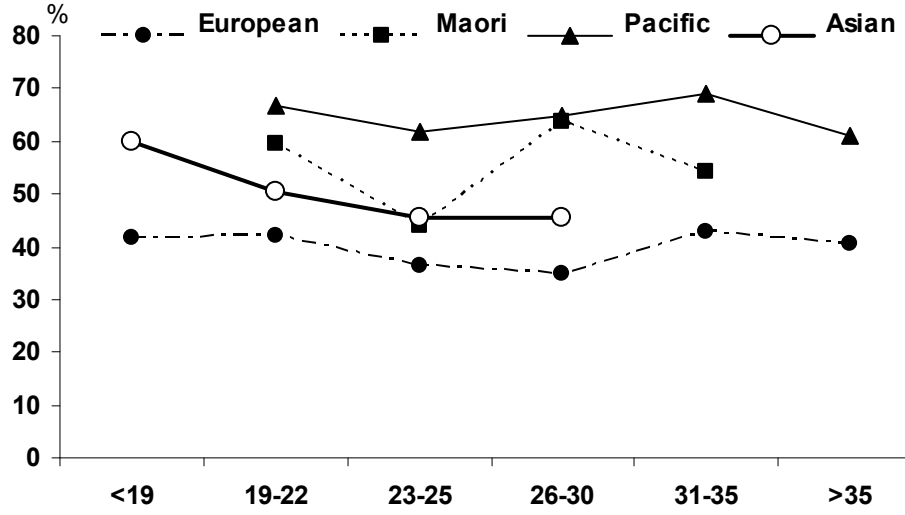

Figure 39: Spontaneous vaginal birth rate by BMI and by ethnicity among nulliparous mothers
(no data point plotted if denominator < 30)

These data show that nulliparous Māori and Pacific women have on average higher rates of spontaneous vaginal births compared with European and Asian women. However there are a number of confounding factors, such as maternal age (European women are older than Māori and Pacific mothers), mode of onset of labour, smoking and pregnancy complications, that need to be adjusted for in multivariate models before conclusions can be drawn from these data. This is currently the subject of ongoing research. These same comments also apply to the figure below re:Caesarean section.

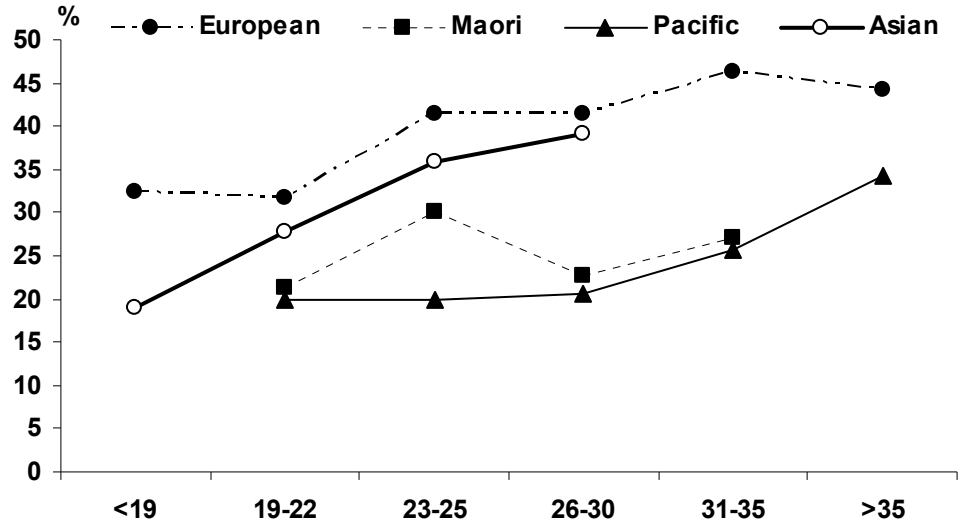

Figure 40: Caesarean section rate by BMI and by ethnicity among nulliparous mothers (no data point plotted if denominator < 30)

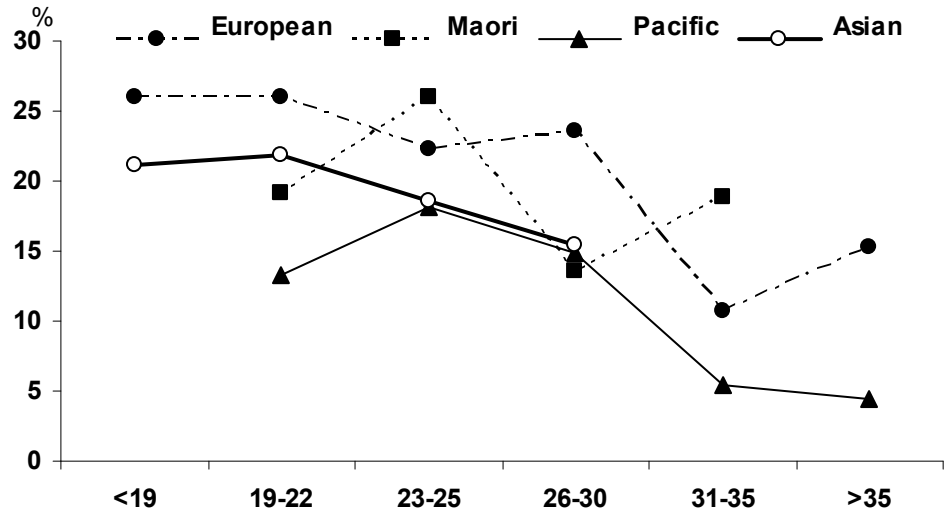

Figure 41: Operative vaginal birth rate by BMI and by ethnicity among nulliparous mothers (no data point plotted if denominator < 30)

Operative vaginal birth rates in nulliparous women are generally lower in obese women compared with those with normal BMI due to higher rates of Caesarean section, however differences between ethnicities are also present (e.g. lower operative vaginal birth rates in obese Pacific nulliparous women who also have a lower Caesarean section rate and higher spontaneous vaginal birth rate than women who are obese in other ethnicities). Further multivariate analyses are needed before conclusions can be drawn.

The data in the three preceding figures can be used to provide some guidance to women and carers about the likely mode of birth in nulliparous women according to BMI categories. The mode of birth will be influenced by mode of onset of labour and presence of pregnancy complications as well as other factors e.g. obese women have elevated rates of induction of labour including indications such as diabetes, hypertensive disease, and possibly prolonged pregnancy.

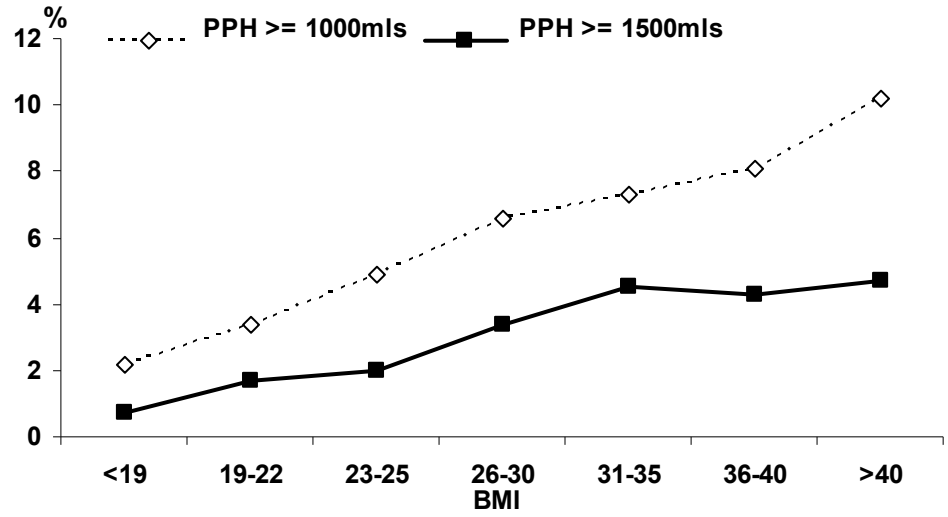

Figure 42: Postpartum haemorrhage rate by BMI among spontaneous vaginal births

Rates of major PPH are increased in women with high BMI who have spontaneous vaginal births. The reasons for this are likely to be multifactorial including increased rates of induction of labour, prolonged labour and larger infant size.

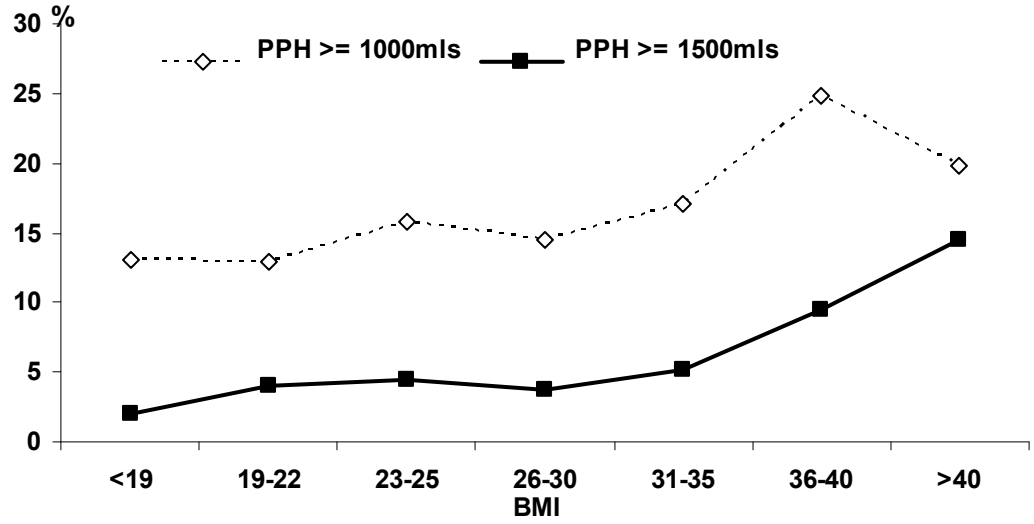

Figure 43: Postpartum haemorrhage rate by BMI among Caesarean sections

Similar factors are likely to be involved in the increased rates of major post partum haemorrhage in obese women who have Caesarean section but will also include factors such as increased operation time and greater operative difficulty.

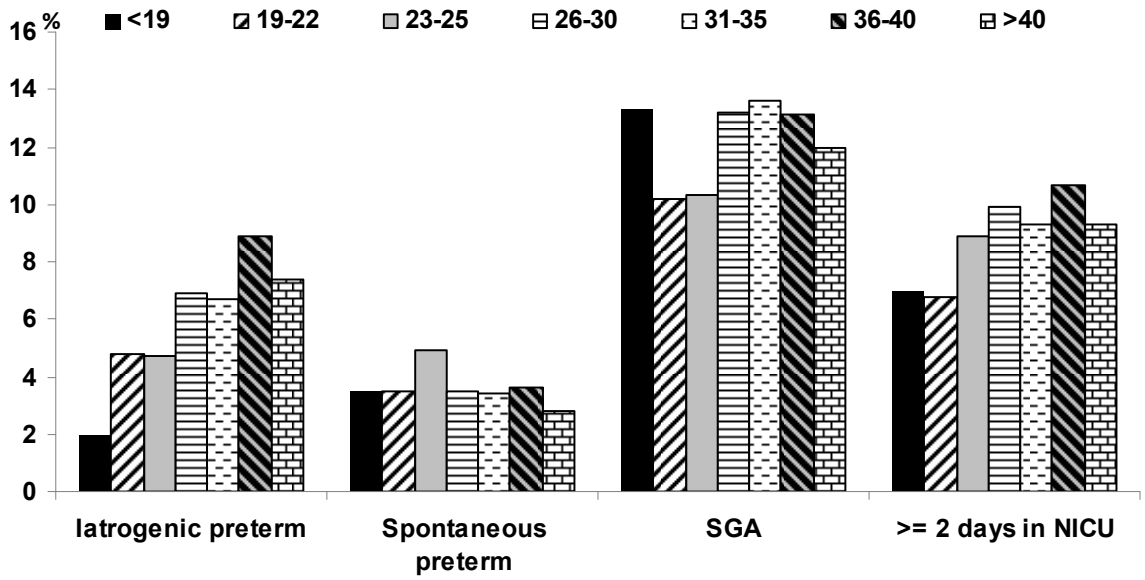

Figure 44: Neonatal outcomes and BMI

Rates of neonatal complications may be increased amongst the very obese including increased preterm birth and neonatal unit admission ≥2 days. This is due to increased rates of iatrogenic preterm birth due to preeclampsia and diabetes rather than spontaneous preterm births.

5.8 Fetal Medicine Unit

Methods

The data included in this section have been extracted from the MFM Viewpoint database for 2010. These include only numbers of cases this year, but in future will include more detail and it will be possible to merge these data with the Healthware maternity data and neonatal data. This will allow us to report outcome data on women reviewed by the MFM service who go on to birth at NW or have care within our ADHB neonatal intensive care service.

Findings

In 2010, the service provided care for 738 women/pregnancies, including care for 662 singleton pregnancies, 68 twin pregnancies, and 8 triplet pregnancies.

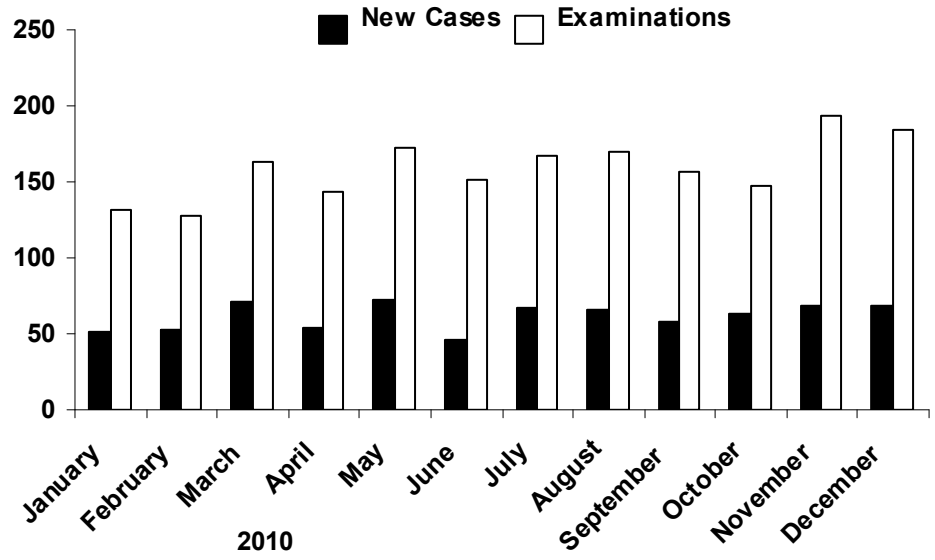

Figure 45: Number of new Fetal medicine cases and examinations performed in 2010

There were on average 62 new cases per month and 169 examinations performed.

Table 37: Number of procedures performed in fetal medicine service (2000-2010)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Amniocentesis											142
CVS											43
Echocardiogram											257
Intrauterine transfusion (mothers)	6	9	6	1	2	*	2	11	5	10	7
Intrauterine transfusion (procedures)	24	24	14	3	2	*	3	21	8	21	11
Other procedures (mothers)	16	23	19	11	3	*	36	40	37	24	22
Other procedures (procedures)	16	32	32	11	3	*	44	49	39	26	25

Amniocentesis,CVS and Echocardiogram data not available for 2000-2009

Table 38: Mothers with babies diagnosed with fetal abnormalities (2010)

	Fetal abnormalities N=251	
	n	%
Heart	51	20.3
Kidneys	38	15.1
Brain	33	13.1
Extremities	28	11.2
Abdominal wall	24	9.6
Face	16	6.4
GIT	16	6.4
Head	15	6.0
Thorax	13	5.2
Spine	10	4.0
Neck/Skin	7	2.8
Skeleton	0	0.0
Genitalia	0	0.0

Comment

Babies with Cardiac anomalies constitute the most common anomaly seen. The Fetal Cardiac Service which is run in conjunction with the Paediatric Cardiology Service, sees all babies with a cardiac anomaly diagnosed in New Zealand and from Tahiti and the Cook Islands. This results in an over-representation of these babies. In general all other anomalies are from Northland, WDHB, CMDHB and the ADHB regions.
The Fetal Medicine Unit also provides a Fetal Therapy Service for some rarely performed procedures for women across New Zealand. This results in a small number of referrals from outside the usual regions covered.

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. However, the possibility remains that the numbers given *under*-represent the true induction rate. 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

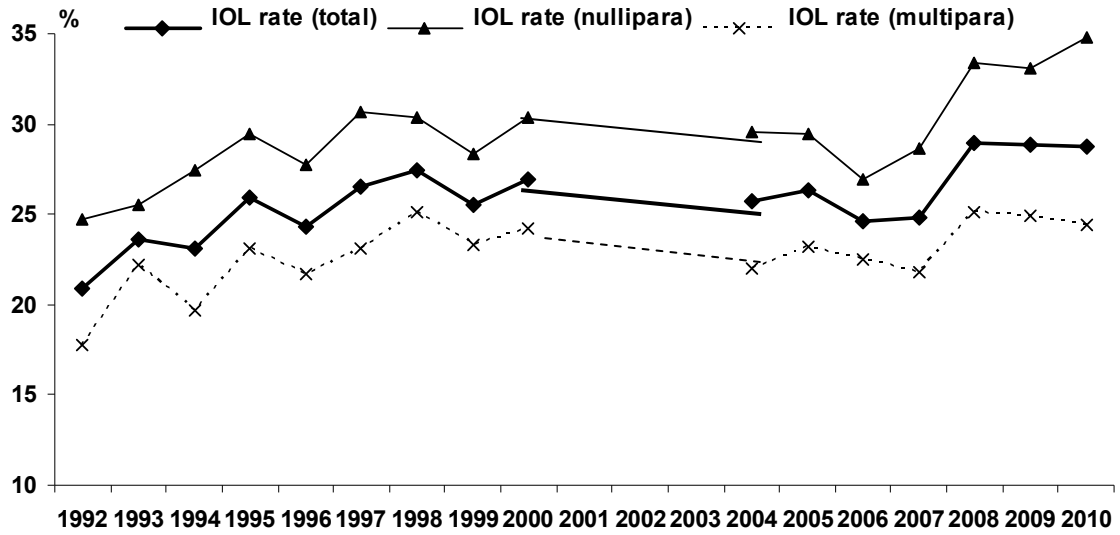

Figure 46 : Induction of labour rates (1992-2010)

More than one in three nulliparous women had induction of labour in 2010. There was a significant rise in overall induction rate in 2008, in part due to accurate identification of inductions performed in Labour and Birthing Suite. The rate has not changed significantly since then.

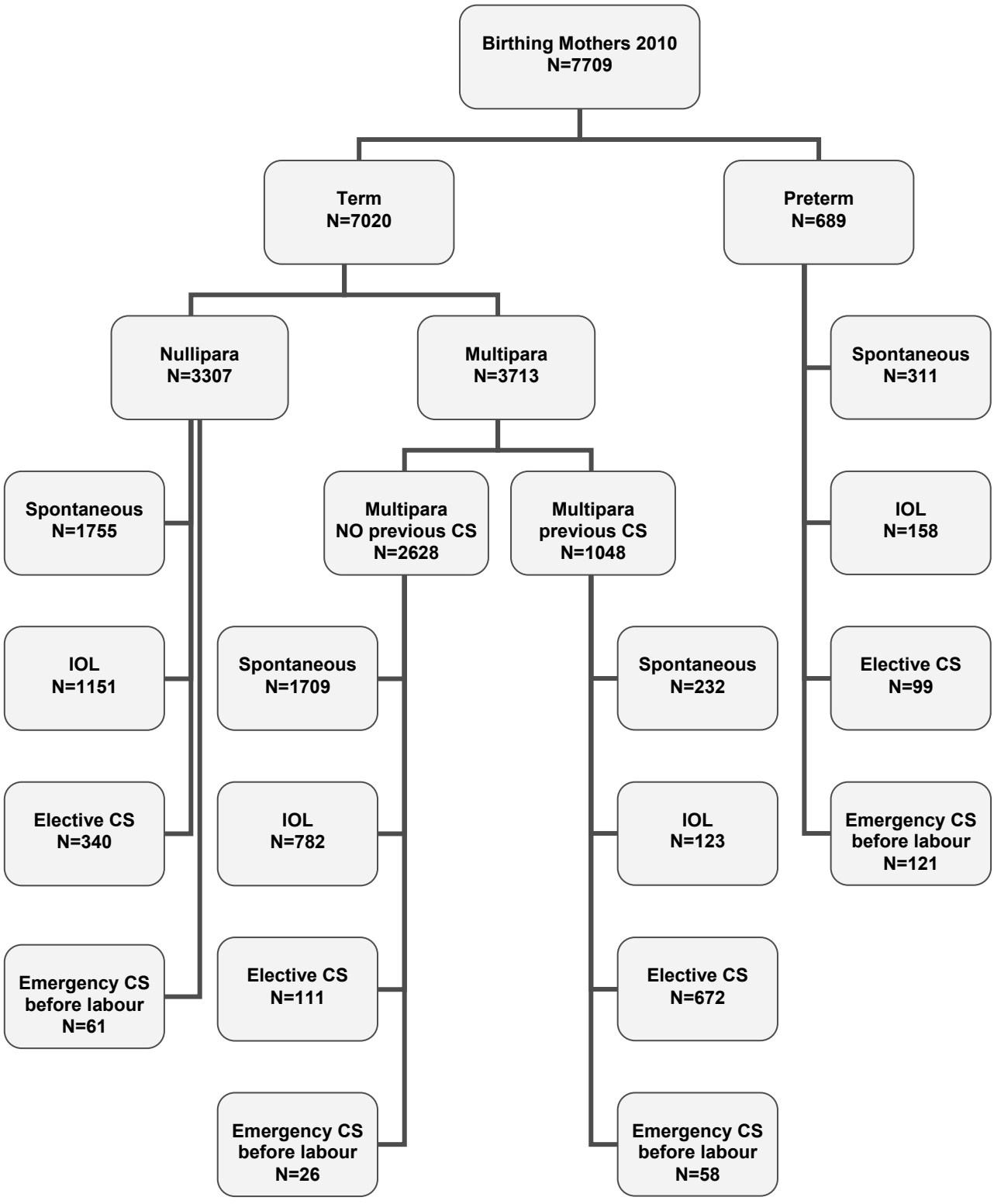

Figure 47: Pathways to birth by gestation and parity

Nulliparous women were more often induced at term than multiparous women without previous caesarean (35 vs 30%). The proportion of multipara with previous caesarean being induced was 11.7% (similar to previous years).

Table 39: Maternal demographic characteristics by onset of birth at term

	Total	Spontaneous labour		Induced labour		CS elective		CS emergency before labour	
	N	n	%	n	%	n	%	n	%
Total	7020	3696	52.7	2056	29.3	145	2.1	1123	16.0
Maternal age									
≤ 20	296	207	69.9	77	26.0	9	3.0	3	1.0
21-25	847	574	67.8	221	26.1	39	4.6	13	1.5
26-30	1834	1086	59.2	535	29.2	182	9.9	31	1.7
31-35	2312	1207	52.2	686	29.7	368	15.9	51	2.2
36-40	1492	577	38.7	428	28.7	445	29.8	42	2.8
41+	239	45	18.8	109	45.6	80	33.5	5	2.1
Ethnicity									
NZ European	2652	1234	46.5	783	29.5	575	21.7	60	2.3
Māori	499	292	58.5	158	31.7	44	8.8	5	1.0
Pacific	982	609	62.0	277	28.2	73	7.4	23	2.3
Asian	1381	859	62.2	331	24.0	170	12.3	21	1.5
Indian	485	230	47.4	180	37.1	63	13.0	12	2.5
Other European	770	349	45.3	253	32.9	156	20.3	12	1.6
Other	251	123	49.0	74	29.5	42	16.7	12	4.8
BMI									
<19	419	265	63.3	96	22.9	56	13.4	2	0.5
19-25	4069	2186	53.7	1126	27.7	678	16.7	79	1.9
26-35	1897	926	48.8	611	32.2	314	16.6	46	2.4
>35	482	219	45.4	187	38.8	63	13.1	13	2.7
Missing	153	100	65.4	36	23.5	12	7.8	5	3.3
LMC at birth									
IMW	3363	2161	64.3	884	26.3	261	7.8	57	1.7
Private Obstetrician	1589	508	32.0	486	30.6	553	34.8	42	2.6
GP	90	56	62.2	22	24.4	11	12.2	1	1.1
NW Community	1401	800	57.1	380	27.1	191	13.6	30	2.1
NW Medical	260	97	37.3	108	41.5	51	19.6	4	1.5
NW Diabetes	263	31	11.8	166	63.1	57	21.7	9	3.4
Other DHB	14	11	78.6	3	21.4	0	0.0	0	0.0
Unbooked	40	31	77.5	7	17.5	0	0.0	2	5.0

There is an increase in rate of elective caesarean as maternal age increases, with a doubling in rate from 16% at age 31-35 to 30% at age 36-40. European women are twice as likely to have elective caesarean than 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 (35%) and lowest among independent midwives (8%). Women under the care of medical clinic have a 1.5-fold increased rate of induction of labour (42%) compared to community women (27%), and women under diabetes clinic have a 2.3-fold increased rate (63%).

Indication for induction

Nulliparous women were more often induced than multiparous women (33 vs 25%). The proportion of multipara with previous caesarean being induced was 11.2% in 2009 compared to 9.2% in 2007 and 12.5% in 2008. There has not been the expected rise in induction among these women due to the availability of the cervical ripening balloon.

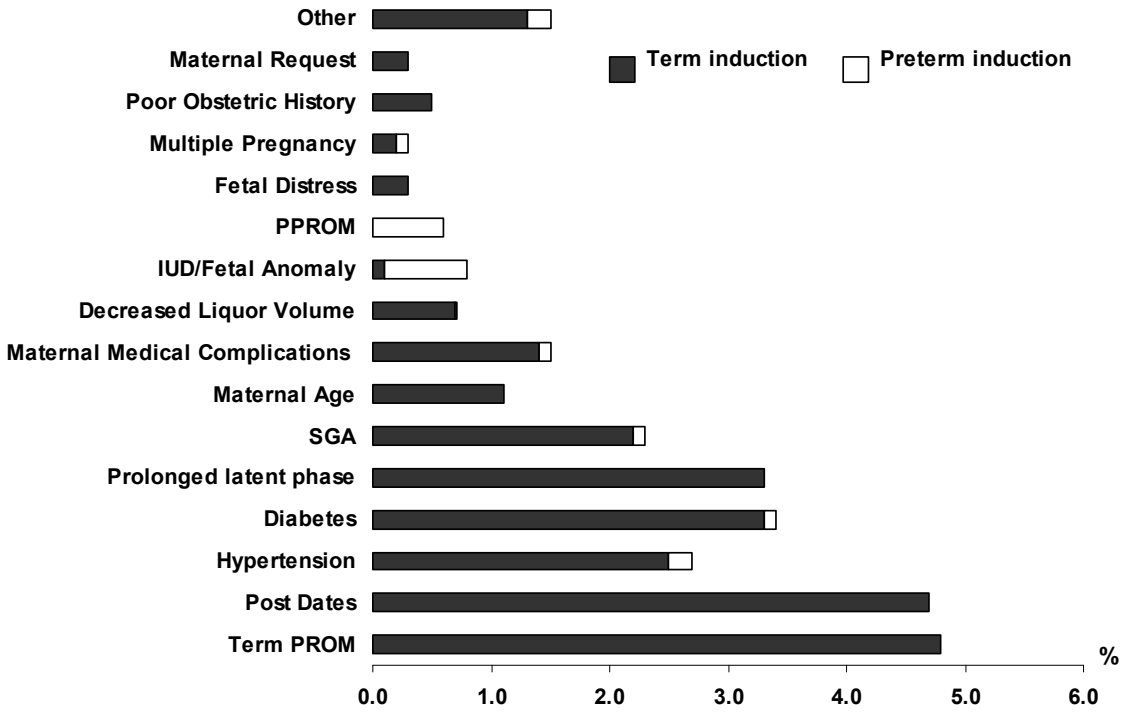

Figure 48: Primary indication for induction by gestation (as a percentage of all births)

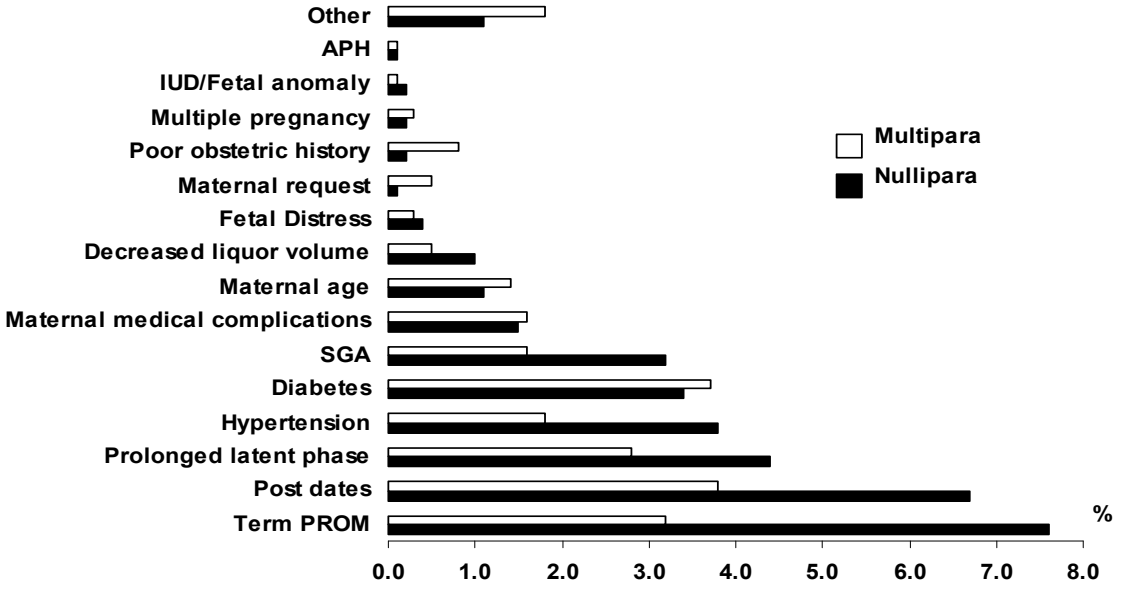

Figure 49: Primary indication for induction at term by parity (as a percentage of term births)

Table 40: Gestation at birth among women whose primary indication for induction was 'post dates'

Gestation at birth	Total n=362		Age <35 n=260		Age ≥35 n=102	
	n	%	n	%	n	%
39	5	1.4	2	0.8	3	2.9
40 – 40[6]	35	9.7	18	6.9	17	16.7
41 – 41[6]	245	67.7	177	68.1	68	66.7
42 – 42[6]	74	20.4	61	23.5	13	12.8
43	3	0.8	2	0.8	1	1.0

Post dates pregnancy and term PROM were the most common primary reasons given for induction of labour in 2010, similar to 2009.

When post-dates was the primary indication for induction, 11% occurred prior to 41 weeks and 21% occurred at or beyond 42 weeks.

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

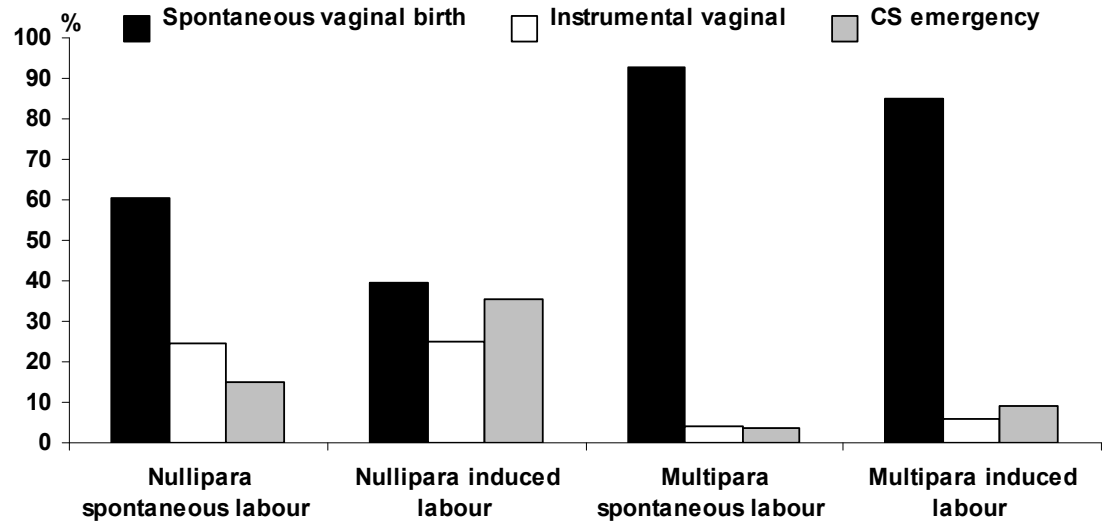

Figure 50: Mode of birth among intended vaginal births at term by parity and onset of labour (excludes previous Caesarean)

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 2-fold increase in risk of emergency caesarean (from 15% to over 30%). While induction may contribute to this, some of the difference is due to the indication for induction.

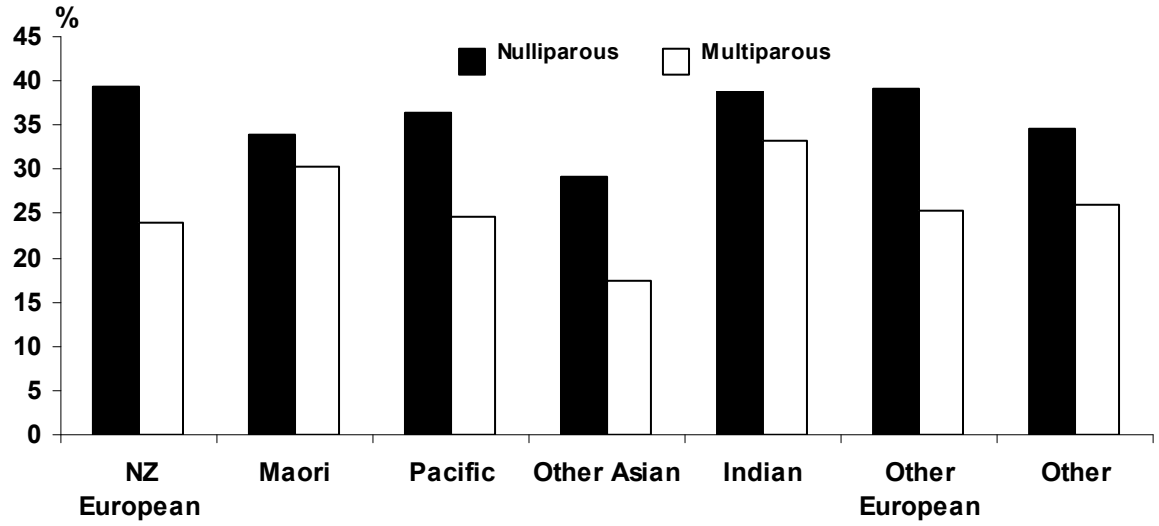

Figure 51: Induction rate by ethnicity and parity at term

Indian women appear to have the highest rate of induction of labour, whilst Other Asian women have the lowest rate. This probably reflects different levels of clinical risk in these populations.

6.2 Use of syntocinon

Table 41: Use of syntocinon by onset of labour and parity

	Total births	Syntocinon	
	N	n	%
Total	7709	2576	33.4
Induced labour			
Nullipara	1226	966	78.8
Multipara	988	629	63.7
Spontaneous labour			
Nullipara	1924	753	39.1
Multipara	2084	222	10.7

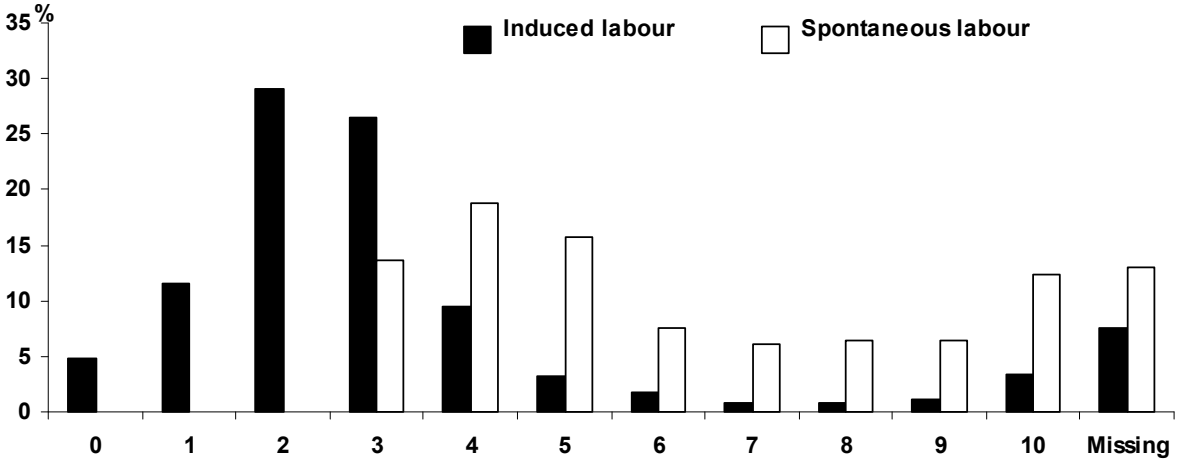

Figure 52: Dilatation at commencement of syntocinon infusion among labouring women by induction status

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

Syntocinon was used to augment spontaneous labour for 39% of nulliparous and 11% of multiparous women.

Summary / Implications

There is concern that the rate of induction is still too high, and increasing among nullipara. However, for the top two reasons for induction (term PROM and post-dates), there is high quality research evidence suggesting benefit for induction of labour compared to expectant management. The rate of induction for term PROM may increase in 2011 as NWH guidelines are updated. There is also good evidence suggesting benefit for induction for women with fetal growth restriction and for women with gestational hypertension and mild pre-eclampsia. Thus many of these inductions are not inappropriate. Unfortunately there is a 2-fold increase in caesarean rate in labour in nulliparous women who are induced compared to spontaneous labour, and this unintended consequence was not found in the randomised controlled trials on term PROM, post-dates and hypertension. This may reflect differences between practice at NWH and study methodology in (1) diagnosing ruptured membranes (2) dating pregnancies (3) method of induction (4) timing of ARM and Syntocinon, and (5) indications for emergency caesarean. Future audit could ensure that if reason for induction is “post-dates,” women are not booked prior to 41 weeks and that earliest ultrasound scan be included with referral. We could consider adding other tests to diagnose pre-labour ruptured membranes. We could consider expectant management for women with diabetes with good sugar control and normally grown babies. Future projects could look at the processes for booking inductions, and management of induction.

6.3 Mode of birth

Findings

Table 42: Mode of birth trends (1996-2010) (n = mothers)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of births	9157	8055	7531	7501	7827	7452	7775	7611	7491	7194	7212	7695	7589	7735	7709
	%	%	%	%	%		%	%	%	%	%	%	%	%	%
Spontaneous vertex	65.5	63.5	62.0	61.8	59.4		55.7	56.1	54.4	53.5	52.9	54.7	55.6	55.8	54.7
Vaginal breech	1.1	1.1	1.0	1.1	1.1		0.8	0.8	0.7	0.8	0.7	0.9	0.8	0.8	0.8
Forceps/ ventouse	12.8	13.1	12.3	12.6	12.9		13.9	14.0	15.6	14.2	13.3	12.6	12.4	12.2	12.2
Caesarean	20.8	22.3	24.7	24.5	26.6		29.6	29.2	29.3	31.6	33.1	31.7	31.3	31.2	32.3
Elective									10.4	11.6	12.8	13.4	14.4		15.9
Emergency									18.8	20.0	20.3	18.3	16.9		16.4

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.

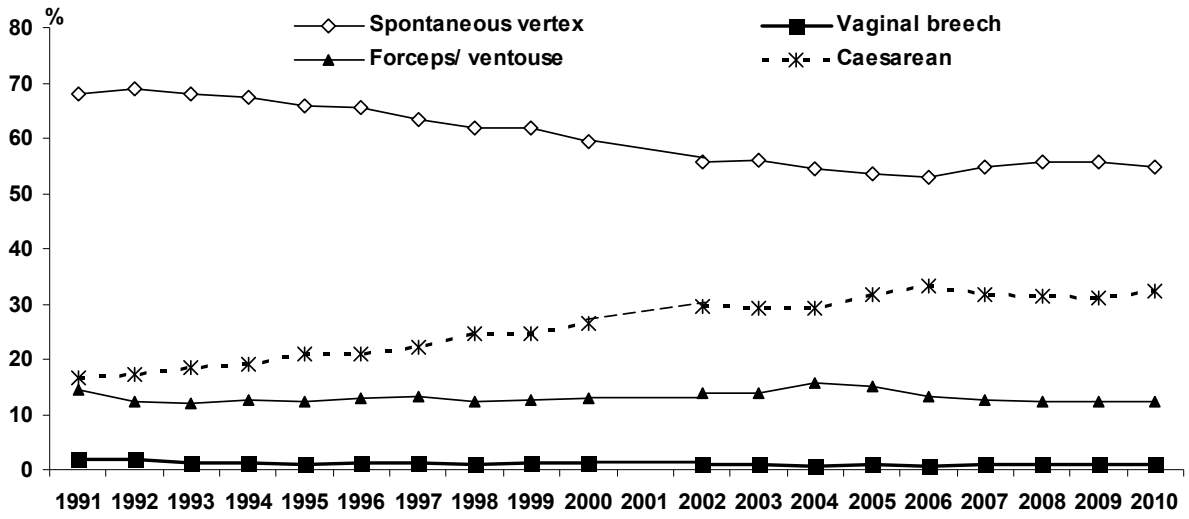

Figure 53: Mode of birth (1991–2010)

In the mid-90s, the overall Caesarean section rate at NW was around 20%. In the last couple of years we have put a lot of effort into reducing the Caesarean section rate, however it remains high at 32%. The low rate of spontaneous vertex birth is still disappointing.

The changing ratio between elective and emergency Caesareans is probably largely due to clarification of the definitions used and associated cleaning of the data prior to analysis.

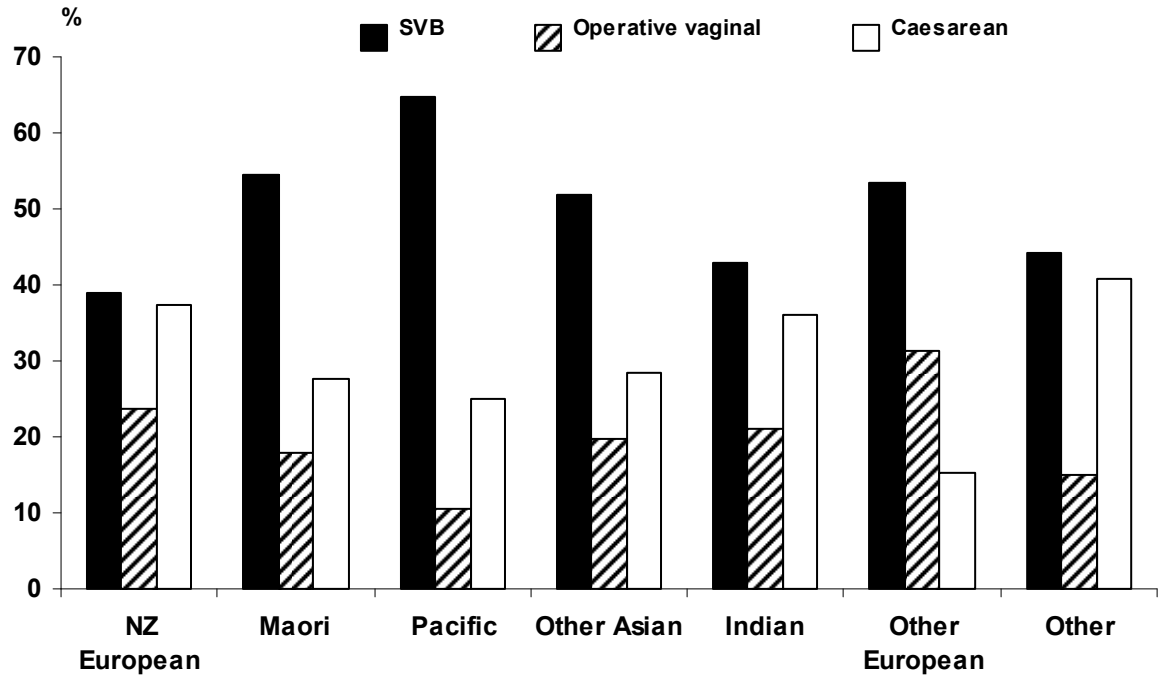

Figure 54: **Mode of birth by ethnicity among nullipara**

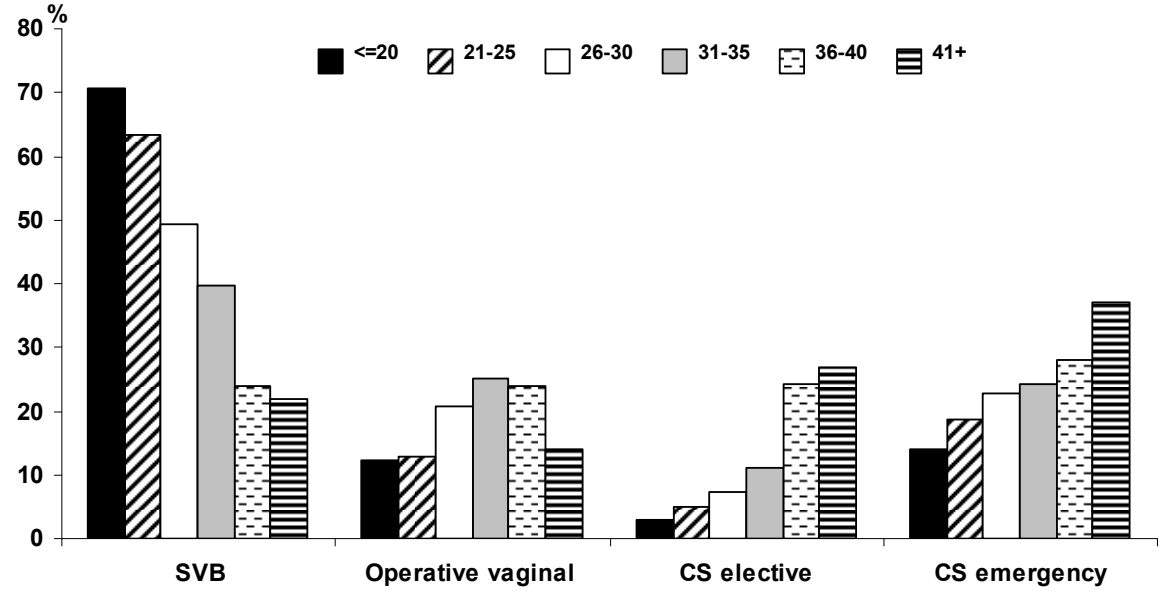

Figure 55: Mode of birth by maternal age among nulliparous women

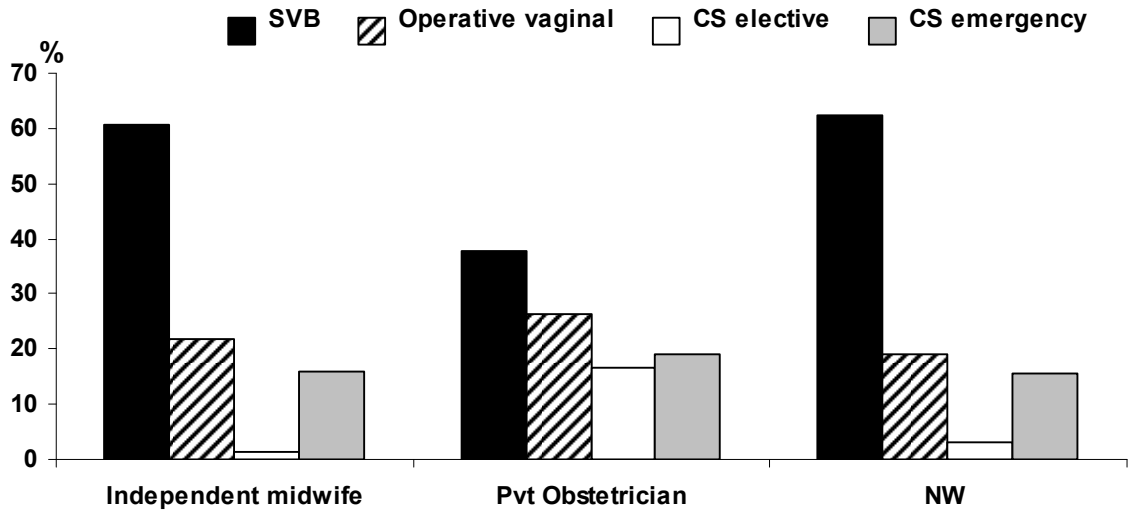

Figure 56: Mode of birth at term by LMC at birth among standard primipara

The outstanding feature of the figure above is the outcome for standard primipara under private specialist obstetrician care. It is possible that some of the elective Caesarean sections are done for convenience (on the part of both women and obstetricians). However, it is also possible that the women who attend private obstetricians are more likely to have clinical or demographic factors associated with elective caesarean, or that women who wish elective caesarean for no medical indication choose to see a private obstetrician who can provide this service.

6.4 Spontaneous vaginal birth

Table 43: Spontaneous vaginal birth rates (2004-2010)

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

The spontaneous vaginal birth rate has remained relatively stable overall over the past 7 years. There has been a small decrease in spontaneous vaginal birth rate among nullipara since last year.

6.4.1 Waterbirth

Twenty nine babies were recorded in the database as having been born in water in 2010. Nine of these were under the care of NW LMC service, eighteen under the care of an independent midwife, one cared for by a general practitioner and one by a private obstetrician. There may be some under counting of waterbirths.

All were livebirths. One baby had an Apgar score of <7 at 1 minute but none had an Apgar score <7 at 5 minutes. No babies were admitted to NICU.

6.5 Caesarean section

WHA Maternity Indicator for Caesarean section		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	2010 Public* only
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Caesarean section	Mothers birthing by Caesarean section/Mothers giving birth	28.0	29.4	31.7	31.3	31.2	32.3	33.3

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.

Methods

Since 2004, we have collected data on elective and emergency Caesarean. An elective Caesarean is defined as a Caesarean which was scheduled in advance and performed either prior to, or after, the onset of labour. An emergency Caesarean is defined as an unscheduled Caesarean section that is performed 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 has remained the same as the last several years (32.3%). The most common reason for Caesarean section among multipara, and in fact the leading contributor to total Caesarean section rate, is repeat Caesarean. This is followed closely by nullipara having Caesarean before labour or for failed induction. The Caesarean section rate in multipara (31.2%) is almost the same as in nullipara (33.5%).

Clinical experience and research evidence suggests that repeated Caesarean sections are associated with adverse maternal outcomes, such as abnormal placentation and postpartum haemorrhage, which may not as yet be reflected in the data. The care of women immediately after their Caesarean section is the subject of a project this year (2011), and will include advice at the time of index Caesarean, followed by de-briefing postpartum, and then again early in the next pregnancy.

Table 44: Caesarean section rates (1996-2010)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total births (mothers)	**9157**	**8055**	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**
Caesarean sections	1905	1797	1851	1837	2084	*	2301	2219	2193	2273	2390	2438	2372	2414	2491
Incidence %	20.8	22.3	24.7	24.5	26.6	*	29.6	29.2	29.3	31.6	33.1	31.7	31.3	31.2	32.3
Total nullipara	**4018**	**3591**	**3263**	**3262**	**3454**	*	*	*	**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**
Caesarean	888	912	900	898	1047	*	*	*	1118	1178	1253	1225	1152	1219	1223
Incidence %	22.1	25.4	27.6	27.5	30.3	*	*	*	31.1	33.4	35.8	32.6	31.8	32.0	33.5
Total elective									233	249	296	310	313	340	383
Elective %	*	*	*	*	*	*	*	*	6.5	7.1	8.5	8.3	8.6	8.9	10.5
Total emergency									885	929	957	915	839	879	840
Emergency %	*	*	*	*	*	*	*	*	24.6	26.4	27.4	24.4	23.2	23.1	23.0
Total multipara	**5139**	**4464**	**4229**	**4239**	**4372**	*	*	*	**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**
Caesarean	1017	885	951	939	1037	*	*	*	1075	1095	1137	1213	1220	1195	1268
Incidence %	19.8	19.8	22.5	22.2	23.7	*	*	*	27.6	29.8	30.6	30.8	30.8	30.5	31.2
Total elective									548	584	628	720	780	792	843
Elective %	*	*	*	*	*	*	*	*	14.1	15.9	16.9	18.3	19.7	20.2	20.8
Total emergency									527	511	509	493	440	403	425
Emergency %	*	*	*	*	*	*	*	*	13.5	13.9	13.7	12.5	11.1	10.2	10.5

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

Robson 10-group classification 2005-2010

Table 45: Robson 10-Group Classification 2005-2010 (All NW births)

	2005			2006			2007			2008			2009			2010			
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**	**Contribution to CS rate**
	n	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**%**
Totals	2273	7194	31.6	2390	7212	33.1	2438	7695	31.7	2372	7589	31.3	2414	7735	31.2	2491	7709	32.3	
1 Nullip, singleton, cephalic, term, spontaneous labour	359	1892	19.0	396	1920	20.6	353	2004	17.6	279	1809	15.4	281	1950	14.4	251	1736	14.5	10.1
2 Nullip, singleton, cephalic, term, induced or CS before labour	479	1080	44.4	495	1024	48.3	515	1132	45.5	581	1275	45.6	647	1393	46.4	648	1384	46.8	26.0
3 Multip, singleton, cephalic, no previous CS, term, spontaneous labour	76	1607	4.7	79	1601	4.9	57	1690	3.4	62	1640	3.8	55	1599	3.4	53	1693	3.1	2.1
4 Multip, singleton, cephalic, no previous CS, term, induced or CS before labour	108	700	15.4	127	714	17.8	123	735	16.7	119	806	14.8	144	839	17.2	159	856	18.6	6.4
5 Previous CS, singleton, cephalic, term	638	895	71.3	677	936	72.3	748	1008	74.2	741	1017	72.9	698	967	72.2	757	1005	75.3	30.4
6 Nullip, singleton, breech	175	192	91.1	187	205	91.2	183	208	88.0	166	195	85.1	164	174	94.3	177	199	88.9	7.1
7 Multiip, singleton, breech (incl prev CS)	114	136	83.8	106	123	86.2	121	143	84.6	135	151	89.4	132	161	82.0	115	141	81.6	4.0
8 All multiple (incl prev CS)	113	187	60.4	108	162	66.7	110	177	62.1	97	160	60.6	93	159	58.5	104	153	68.0	4.2
9 All abnormal lie (incl prev CS)	44	53	83.0	27	29	93.1	26	27	96.3	29	32	90.6	55	63	87.3	62	69	89.9	2.5
10 All preterm singleton cephalic (incl prev CS)	167	452	36.9	188	498	37.8	202	571	35.4	163	504	32.3	145	430	33.7	165	473	34.9	6.6

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.

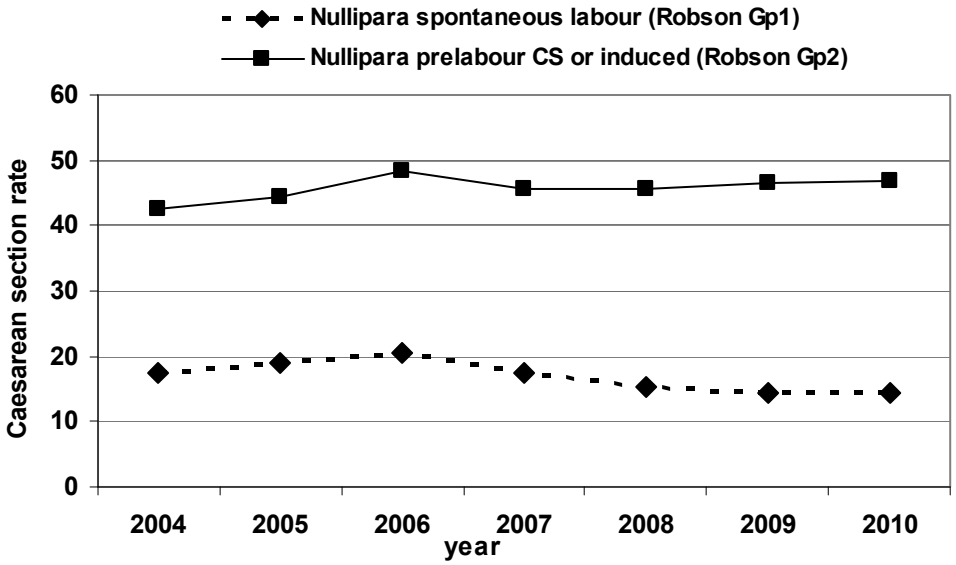

Figure 57: Robson groups 1&2: Nulliparous Caesarean section rates among singleton cephalic term pregnancies by onset of labour (2004-2010)

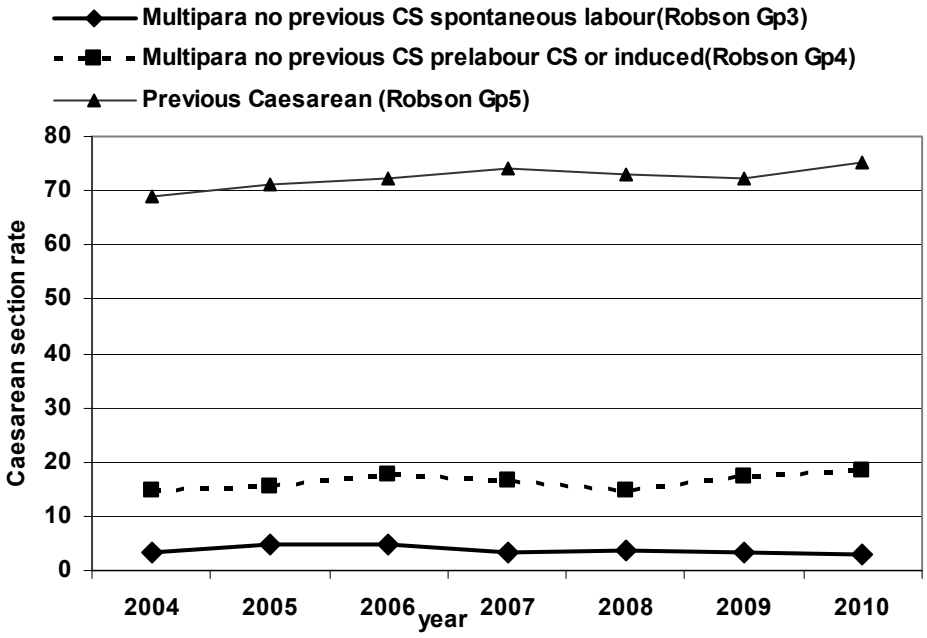

Figure 58: Robson groups 3-5: Multiparous Caesarean section rates among singleton cephalic term pregnancies by onset of labour and previous Caesarean status (2004-2010)

6.5.1 Indication for elective and pre labour Caesarean section

Thirty-nine 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".

6.5.2 Indication for in labour emergency Caesarean section

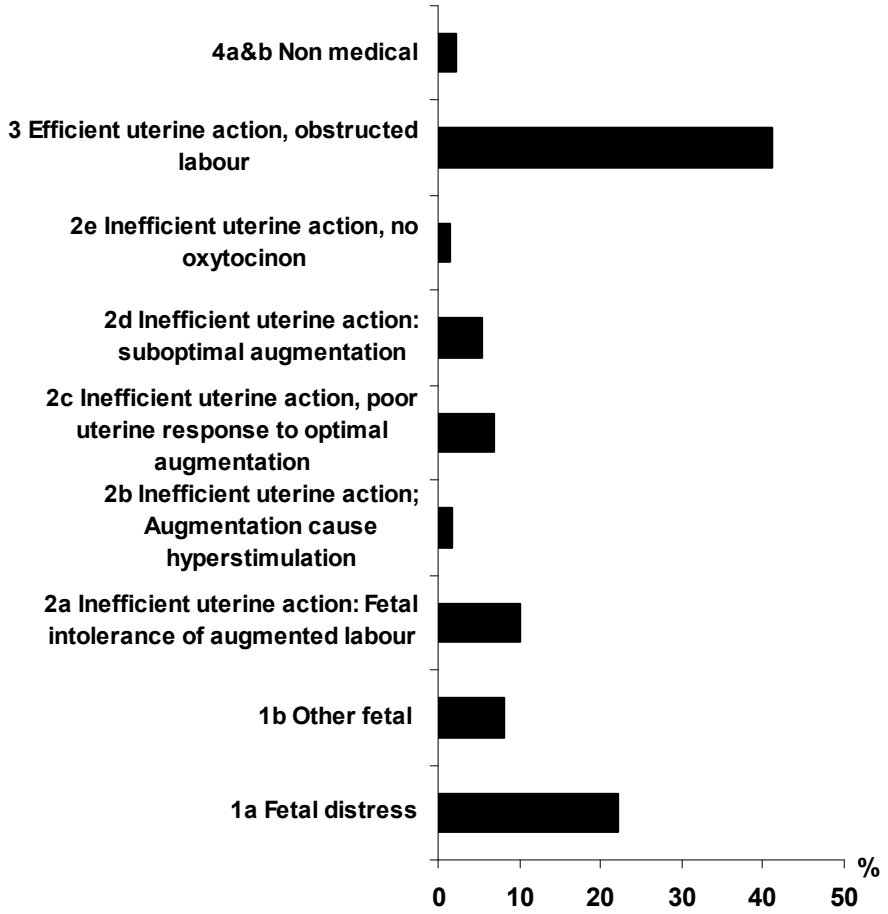

Figure 59: Indication for in labour emergency Caesarean section

The figure above shows the reasons for emergency Caesarean section in labour, of which the most frequent are obstructed labour and "fetal distress". The data suggest effective use of oxytocin in labour.

6.5.3 Vaginal birth after Caesarean section

WHA Maternity Indicator for VBAC		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	2010 Public only*
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
VBAC	P1 previous Caesarean/mothers giving birth	7.87	8.8	10.7	10.6	10.0	10.1	10.8
	Prelabour repeat Caesarean/P1 previous Caesarean	60.0	57.8	59.4	57.9	56.8	59.7	51.0
	VBAC/induced or spontaneous labour P1 previous Caesarean	49.3	49.6	52.4	58.8	. 61.7	65.5	56.6
	VBAC/P1 previous Caesarean	19.7	20.8	21.3	21.5	22.5	21.3	22.3

Data presented for NW are for elective Caesarean
*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.

Of all women giving birth at NW in 2010, 10% had previously had only one birth where that one birth was a Caesarean section, significantly more than the mean for level 3 units in Australasia (WHA). Further, 15.5% of all women and 29.5% of multipara giving birth at NW in 2010, had a history of previous Caesarean section. Given this knowledge, it is not surprising that the Caesarean section rate among multipara almost equals that of nullipara.

Sixty percent of para 1 women with one prior Caesarean had an elective repeat Caesarean. The rate of elective repeat Caesarean for public booked women at NW was lower than the overall rate (51%) and similar to last year (48%).

For women who had a trial of labour, 66% had a vaginal birth, which is not significantly higher than last year (62%) but is higher than WHA average (50%). Thus the overall rate of vaginal birth among all para 1 women with a history of one Caesarean section (21%) is similar to previous years and to WHA average.

The vaginal birth rate in women who had trial of labour varied significantly by onset of labour, from 71% if labour started spontaneously to 54% if labour was induced. The vaginal birth rate also varied by LMC, from 64% in women with IMW, to 47% in women with NW midwives. These data could inform how we counsel women antenatally about the decision to have trial of labour or elective repeat Caesarean section. The NWH guideline on VBAC was updated in May 2011.

In 2010, among women who had one prior birth where that birth was a Caesarean, 252/775 (32.6%) underwent a trial of labour.

Table 46: VBAC: Mode of birth among parity 1 prior Caesarean pregnancies by mode of onset of birth (n=775)

Parity 1, previous Caesarean, all gestations									
	Spontaneous labour n=172		Induced labour n=80		CS elective n=463	CS emergency before onset of labour n=60	Total n=775	
	n	%	n	%	n	n	n	%
Vaginal birth	82	47.7	23	28.8	0	0.0	0	0.0	105	13.5
Operative vaginal birth	40	23.3	20	25.0	0	0.0	0	0.0	60	7.7
CS elective	0	0.0	0	0.0	463		0	0.0	463	59.7
CS emergency	50	29.1	37	46.3	0	0.0	60		147	19.0

Table 47: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by mode of onset of birth (n=657)

Parity 1, previous Caesarean, singleton, cephalic, term										
	Spontaneous labour n=154		Induced labour n=71		CS elective n=395		CS emergency before onset of labour n=37	Total n=657	
	n	%	n	%	n		n	%	n	%
Vaginal birth	70	45.5	17	23.9	0	0.0	0	87	13.2
Operative vaginal birth	40	26.0	20	28.2	0	0.0	0	60	9.1
CS elective	0	0.0	0	0.0	395		0	395	60.1
CS emergency	44	28.6	34	47.9	0	0.0	37	115	17.5

Table 48: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by LMC at birth (n=657)

	IMW n=189		Pvt Obstetrician n=262		GP n=5		NW* n=201	
	n	%	n	%	n	%	n	%
Vaginal birth	48	25.4	12	4.6	0	0.0	27	13.4
Operative vaginal birth	24	12.7	15	5.7	2	40.0	19	9.5
CS elective	77	40.7	212	80.9	3	60.0	103	51.2
CS emergency	40	21.2	23	8.8	0	0.0	52	25.9

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

An audit of 455 women having trial of labour in 2009 showed one woman with complete scar rupture, consistent with a recent Australian study where rate of scar rupture was 3/1000.

In 2010, 227 women had 2 or more prior Caesarean sections. Of these, 181 were at term with singleton baby and cephalic presentation and 177 (97%) of these women went on to have a further Caesarean section.

6.6 Instrumental vaginal birth

WHA Maternity Indicator for Instrumental Vaginal Birth		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	2010 Public only*
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Instrumental vaginal birth	Forceps births/All vaginal births	5.2	7.4	4.2	4.9	5.7	6.8	4.7
	Ventouse births/All vaginal births	9.01	10.6	13.0	12.1	11.4	11.3	8.8
	Double instrumental/All vaginal births	0.841		1.3	1.0	0.68	1.0	0.5

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.

The rate of instrumental birth has varied little since 1992 and this remains the case for 2010 with a rate of 12.2% of all births. The individual rates for nulliparous and multiparous women remain very similar to recent years at 21% and 5% respectively. The ventouse was the instrument of choice in the majority of these cases, irrespective of parity or maternal ethnicity.

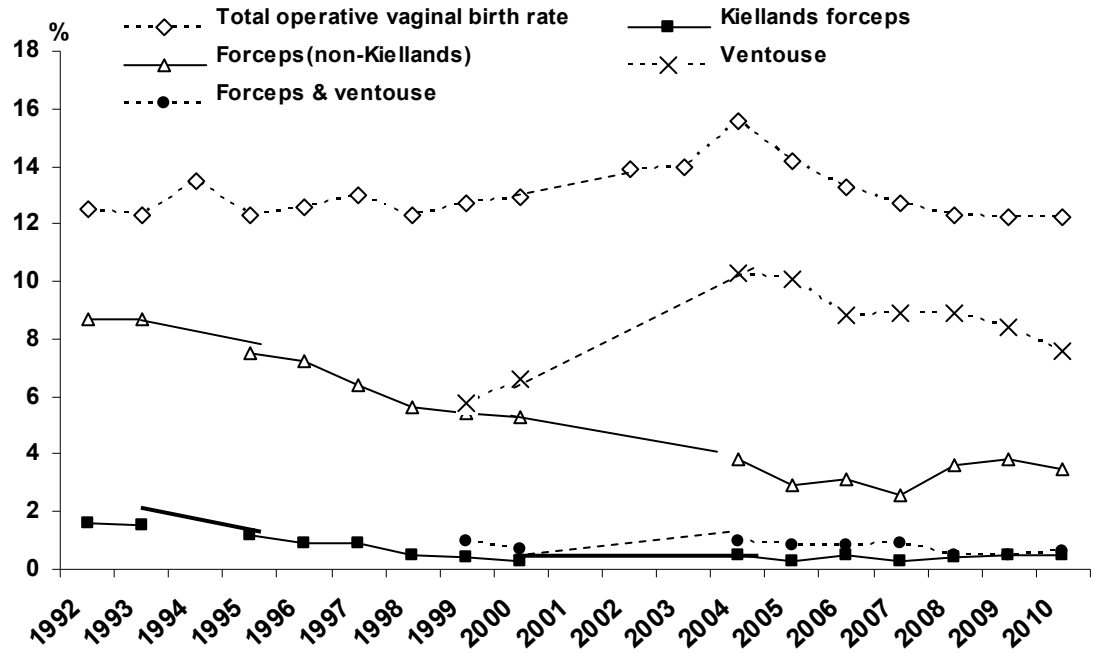

Figure 60: Operative vaginal birth (1992-2010)

6.7 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 at NW in 2010 was 0.7%. Fifty-three mothers/babies had two instruments applied (ventouse and forceps or more than one type of forceps) prior to vaginal instrumental birth. Forty seven mothers had an attempted vaginal instrumental birth prior to emergency Caesarean section.

Table 49: Maternal outcomes following double instrumental vaginal birth compared to single instrumental vaginal birth.

	Single instrument n=889		Double instrument n=53	
	n	%	n	%
Third or fourth degree tear	50	5.6	7	13.2
PPH>=1000mls	78	8.8	6	11.3
Transfusion	31	3.5	3	5.7

Table 50: Neonatal outcomes following double instrumental vaginal birth compared to single instrumental vaginal birth.

	Single instrument n=893		Double instrument n=53	
	n	%	n	%
Apgar score 1min <4	14	1.6	1	1.9
Apgar score 1min <7	116	13.0	11	20.8
Apgar score 5min <5	6	0.7	0	0.0
Apgar score 5min <7	14	1.6	0	0.0
Neonatal Death rate (/1000 livebirths)	0		0	

Third or fourth degree tear was significantly more frequent after double instrumental vaginal birth than after single instrumental vaginal birth. Fortunately there were no babies with 5 min Apgar < 7 following double instrumental vaginal birth.

Maternal and neonatal complications were similar between women and babies who were delivered by emergency caesarean after attempted operative vaginal birth, compared to those delivered by emergency caesarean alone.

Table 51: Maternal outcomes following attempted instrumental vaginal birth prior to emergency Caesarean section compared to emergency Caesarean section.

	Emergency Caesarean n=1218		Instrumental vaginal attempt prior to emergency Caesarean n=47	
	n	%	n	%
Episiotomy	1	0.1	1	2.1
PPH>=1000mls	245	20.1	9	19.2
Transfusion	59	4.8	1	2.1

Table 52: Neonatal outcomes following attempted instrumental vaginal birth prior to emergency Caesarean section compared to emergency Caesarean section

	Emergency Caesarean n=1266		Instrumental vaginal attempt prior to emergency Caesarean n=47	
	n	%	n	%
Apgar score 1min <4	61	4.8	2	4.3
Apgar score 1min <7	244	19.3	9	19.2
Apgar score 5min <5	17	1.3	1	2.1
Apgar score 5min <7	59	4.7	1	2.1
Neonatal Death rate (/1000 livebirths)	5	3.9	0	

6.8 Breech birth

Table 53: Mode of birth by breech presentation (singletons)

	N	Total breech	% Breech /total singleton birth	Breech & CS	% CS/ total breech
Total singleton births	7556	340	4	292	86
20-24 weeks	58	27	46	2	7
25-31 weeks	123	32	26	21	66
32-36 weeks	408	43	11	39	91
≥37 weeks	6967	238	3	230	97

The influence of the Term Breech Trial (TBT) published in 2000 is evident in our figures, with almost all breech births at term occurring by Caesarean section. Among breech births at 32-36 weeks the percentage of Caesarean section births is 91%, suggesting a possible extrapolation of the TBT trial results to this population, without the evidence to support this practice.

Both RANZCOG and RCOG have added a statement to their guidelines on breech births to the effect that women should be treated as individuals and that a vaginal birth can be safe. The NWH guideline on mode of birth for breech presentation will be updated in 2011.

6.9 Breech presentation: 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.

Findings
In 2010, a total of 104 ECVs were attempted for 95 women. Most ECVs were attempted at 36-37 weeks (range 35 to 39 weeks gestation). Most ECVs were attempted by one operator.

Among 95 women, the overall ECV success rate was 47%, consistent with last year and with success rates reported internationally (50-60%).

Descent of the breech into the pelvis is associated with unsuccessful ECV. If there was no descent, the success rate was 62% compared with 4% if there was any descent at all (again consistent with 2009 findings). This is also consistent with data published from a NW study (2008) reporting an unengaged presenting part to be the strongest predictor for successful ECV.

Eighty eight percent of successful ECVs remained cephalic at the time of birth, and 5 women whose ECV was unsuccessful also had a cephalic presentation at birth. Seventy four 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%).

Table 54: Mode of birth following attempted ECV (n=95)

	Failed ECV n=52		Successful ECV n=43	
Type of birth	**n**	**%**	**n**	**%**
Vaginal	2	4	32	74
SVB	2	4	25	58
0perative vaginal	0		7	16
CS elective	40	77	3	7
CS emergency	10	19	8	19

There was one ECV complication, requiring a crash emergency Caesarean section for fetal bradycardia following successful ECV at 37 weeks.

Of 283 women with a singleton term pregnancy who had either a breech presentation at birth or had had an attempted ECV, 34% had an attempted ECV. There was no statistically significant association between ECV among women with singleton breech at term (n=283) and maternal age or BMI. There was a significant difference by LMC at birth with a rate of ECV of 48% among independent midwifery clients compared to 10% of private obstetrician clients and 27% of NWH LMC clients. ECV was significantly less frequent among Europeans than other ethnicities. Only 8% (4/50) of women who had a history of prior Caesarean section and breech presentation at term were referred for ECV compared to 39% (91/233) 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 is a safe procedure at NW, effective in reducing the number of breech presentations at birth and the number of caesareans performed. The challenge is to increase the numbers of women undergoing attempted ECV, as only 1 out of every 3 women with breech presentation at birth had an ECV attempt. It is unlikely contraindications for ECV account for this. A prospective audit is required to ascertain why women either decline or are not being offered ECV, and this needs to be followed by development and implementation of policies to facilitate increased numbers of women attending for ECV. A discussion is required with regard to use of ECV for women with a history of previous CS.

Labour and Birth Summary / Implications

The Caesarean section rate has remained stable at 32.3%. The leading contributors to total caesarean rate are multipara having repeat Caesarean, and nullipara having caesarean before labour or for failed induction.

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 2 out of 3 women who try for VBAC will have a vaginal birth. 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 should be referred for consultation about ECV.

Although not all women are equally suitable for a trial of labour or for an ECV, it is likely that with increased promotion of an attempt at VBAC, and an attempt at ECV, there would be a decrease in the overall Caesarean birth rate at National Women's.

6.10 Obstetric analgesia

WHA Maternity Indicator for Obstetric Anaesthesia		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	2010 Public only*
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Vaginal birth with regional anaesthesia	Any regional anaesthetic/All vaginal births	27.2	29.1	43.9	43.7	43.4	43.7	35.2
General anaesthesia for Caesarean section	General anaesthetic for Caesarean section/All Caesarean sections	8.9	8.1	7.6	6.8	6.4	6.3	10.3

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.

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 55: Analgesic use by parity and mode of onset of birth

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
All women	**7709**	**4655**	**60.4**	**3201**	**41.5**	**1191**	**15.5**	**85**	**1.1**	**515**	**6.7**
Mode of onset of birth											
CS elective	1222	1190	97.4	13	1.1	4	0.3	0	0.0	0	0.0
CS emergency before onset labour	266	222	83.5	11	4.1	8	3.0	1	0.4	0	0.0
Labouring women*											
Nullipara	3150	2122	67.4	1730	54.9	762	24.2	64	2.0	351	11.1
Multipara	3071	1121	36.5	1447	47.1	417	13.6	20	0.7	164	5.3
Induced labour											
Nullipara	1226	1029	83.9	560	45.7	327	26.7	23	1.9	71	5.8
Multipara	988	528	53.4	446	45.1	146	14.8	4	0.4	28	2.8
Spontaneous labour											
Nullipara	1924	1093	56.8	1170	60.8	435	22.6	41	2.1	280	14.6
Multipara	2083	593	28.5	1001	48.1	271	13.0	16	0.8	136	6.5

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

Entonox and epidural analgesia are used more than other methods of pain relief in labour. The epidural rate among labouring women was 52% in 2010 compared with 60% in 2009 and 52% in 2008. As expected, the rates are higher in nulliparous women than in multiparous women, and in women with induced labour than women in spontaneous labour.

An interesting observation is that the use of epidural analgesia correlates with increasing age of the mother, although this is obviously not a causal relationship. Along the same lines, women whose LMC at birth is a private obstetrician also have higher epidural use. Analgesia use rates also vary widely among ethnic groups.

Epidural rates in women having vaginal births (44%), though lower than in many OECD countries, are much higher than the WHA mean (29%). It is important to note that these numbers are not reflective of the New Zealand population in general as National Women's is a tertiary referral centre. The comparatively high rate of general anaesthesia in women having caesareans (6%) (though lower than the WHA mean of 8%) reflects the tertiary care aspect of our patients with coagulopathies, neurologic, cardiac and other co-morbidities and abnormal placentation all contributing.

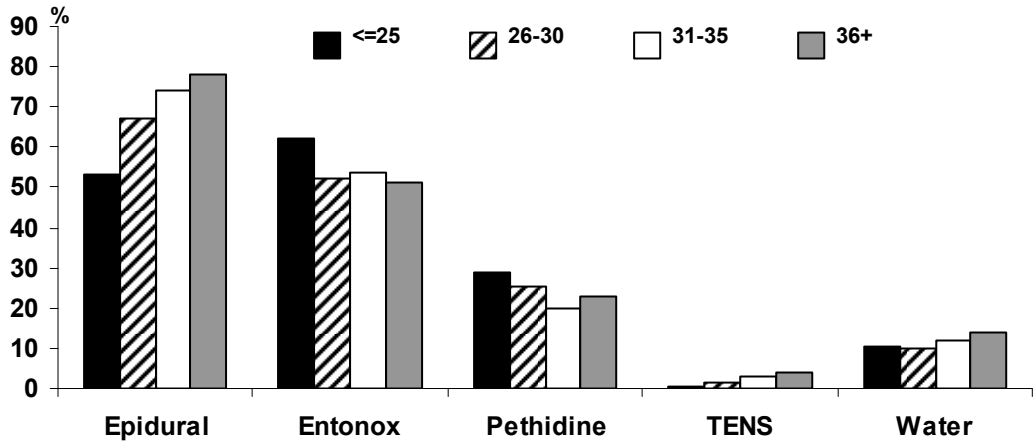

Figure 61: Analgesic use and maternal age among nulliparous labours

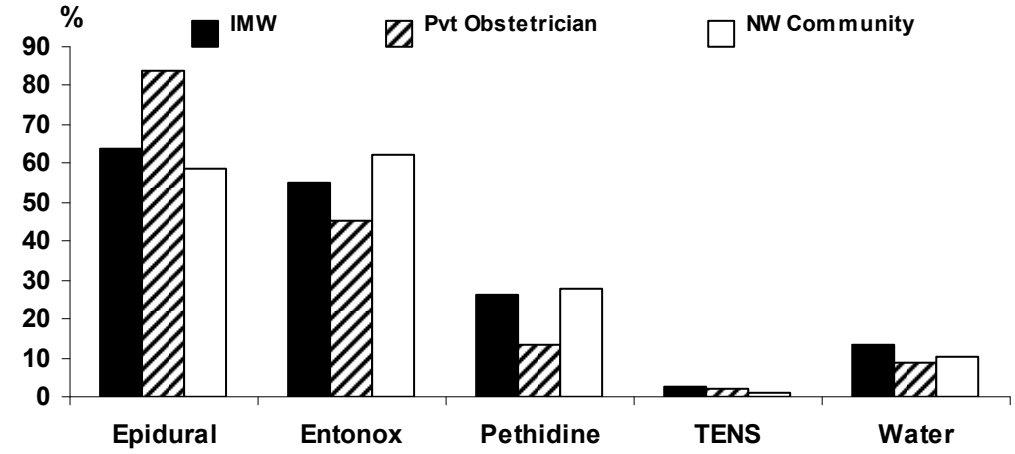

Figure 62: Analgesic use and LMC at birth among nulliparous labours

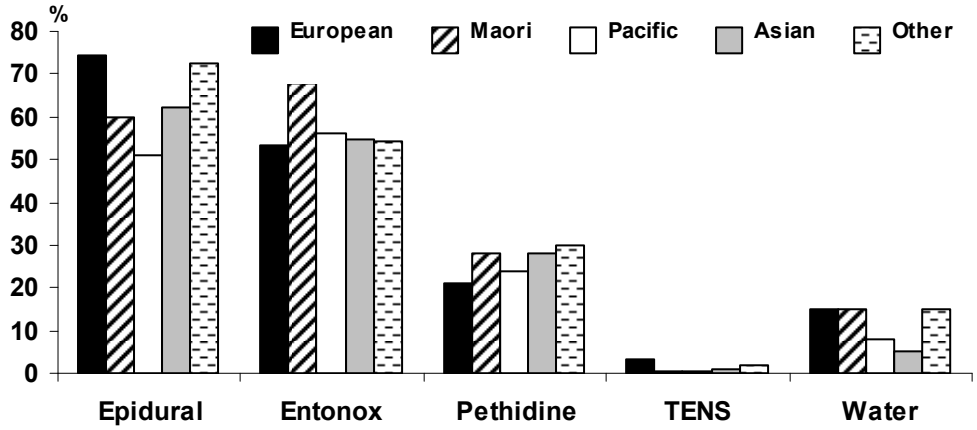

Figure 63: Analgesic use and ethnicity among nulliparous labours

Table 56: GA use and mode of birth

	Total	GA* only		GA* + epidural		Total GA*	
	N	n	%	n	%	n	%
Total	7709	173	2.2	61	0.8	234	3.0
Spont vaginal birth	4276	53	1.2	9	0.2	62	1.4
Operative vaginal	942	4	0.4	11	1.2	15	1.6
CS elective	1226	32	2.6	9	0.7	41	3.3
CS emergency	1265	84	6.6	32	2.5	116	9.2

*General anaesthetics 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.

6.11 Labour and birth at Birthcare Auckland

Birthcare Auckland is a Level 1 obstetric facility located close to Auckland City Hospital. It is able to provide labour and birth care and postnatal care in normal pregnancies and labours. It does not have anaesthetists or obstetricians available and so does not provide for epidurals or operative births.

In April 2009 Birthcare started an initiative to give more women the opportunity of birthing in a primary maternity unit within the central Auckland area, and to give midwives the opportunity of providing LMC services within a supported environment. This has resulted in an increase in the number of births which occur at Birthcare.

Methods

The data for mothers birthing at Birthcare (n=417) during 2010 were provided by Birthcare. The data on mothers transferred to NW in labour and birthing at NW and for mothers transferred to NW after birthing at Birthcare have been obtained from the NW clinical database Healthware.

Findings

Five hundred and seventy seven women started labour at Birthcare Auckland and 129 (22%) transferred to NW in labour (36% of nullipara and 10% if multipara).

Table 57: Demographic characteristics of women labouring at Birthcare by place of birth

	Birth at Birthcare n= 448		Intrapartum transfer to NW n= 129		Total N= 577	
	n	%	n	%	n	%
Parity						
Nullipara	176	39.3	99	76.7	275	47.7
Multipara	272	60.7	30	23.3	302	52.3
Age						
<21	17	3.8	3	2.3	20	3.5
21-25	55	12.3	20	15.5	75	13
26-30	111	24.8	43	33.3	154	26.7
31-35	174	38.8	46	35.7	220	38.1
36-40	88	19.6	15	11.6	103	17.9
>40	3	0.7	2	1.6	5	0.9
Ethnicity						
NZ European	209	46.7	57	44.2	266	46.1
Māori	44	9.8	9	7	53	9.2
Pacific	57	12.7	10	7.8	67	11.6
Other Asian	42	9.4	12	9.3	54	9.4
Indian	13	2.9	5	3.9	18	3.1
Other European	76	17	32	24.8	108	18.7
Other	7	1.6	4	3.1	11	1.9
DHB of Domicile						
Auckland DHB	295	65.8	79	61.2	374	64.8
Counties Manukau DHB	55	12.3	19	14.7	74	12.8
Waitemata DHB	96	21.4	31	24.0	127	22
Other DHB	2	0.4	0		2	0.3

Table 58: Interventions and outcomes by parity among women who commenced labour and birthed at Birthcare and women who commenced labour at Birthcare and birthed at NW. (129 intra partum transfers to NW)*

	Nullipara n= 275		Multipara n= 302	
	n	**%**	**n**	**%**
Intrapartum transfer to NW	99	36	30	9.9
Analgesia				
Epidural	82	29.8	17	5.6
Pethidine	40	14.5	17	5.6
Entonox	119	43.3	72	23.8
TENS	4	1.5	3	1.0
Water	62	22.5	47	15.6
Syntocinon	68	24.7	6	2
Mode of birth				
Normal vaginal	216	78.5	293	97
Operative vaginal	28	10.2	6	2
Emergency caesarean	31	11.3	3	1
Perineal trauma				
Episiotomy	38	13.8	12	4
Third/fourth degree tear	4	1.5	0	
Vaginal wall tear	5	1.8	4	1.3
Blood Loss				
≥500 mls	53	19.3	16	5.3
Perinatal outcomes				
Still birth	0		0	

* Many of these interventions occurred at National Women's

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

WHA Maternity Indicators for Perineal Trauma		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	2010 Public only*
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Episiotomy	Mothers having an episiotomy/Mothers giving birth vaginally	17.8	18.6	21.5	20.5	22.3	24.0	14.9
Third and fourth degree tears	3rd and 4th degree tears/Mothers giving birth vaginally	2.76	3.5	3.1	3.1	2.2	2.3	2.1

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.

Table 59: Episiotomy rates (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
Number of episiotomies	1252	1195	1251	1367	1181	1093	1103	1130	1069	1184	1252
Incidence %	20.0	21.1	22.1	23.8	22.3	22.2	22.9	21.5	20.5	22.3	24.0
Episiotomy with 3rd/4th degree tear	8	9	5	17	15	23	47	49	46	56	49
Incidence %	0.1	0.2	0.1	0.3	0.3	0.5	1.0	0.9	0.9	1.0	0.9
All 3rd/4th degree tears	41	35	29	47	72	97	103	161	160	116	120
Incidence %	0.7	0.6	0.5	0.8	1.4	2.0	2.1	3.1	3.1	2.2	2.3

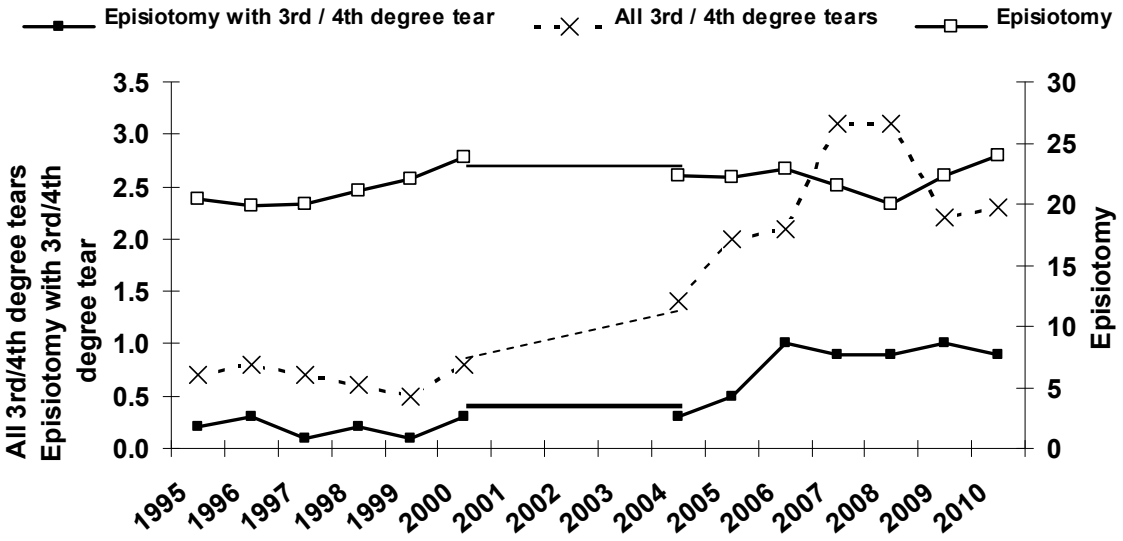

Figure 64: Perineal trauma rates

About one in four women who have a vaginal birth at National Women's have an episiotomy. This episiotomy rate of 24% remains significantly higher than the mean for those hospitals with level 3 NICU who benchmark with Women's Hospitals of Australasia (WHA). The incidence of 3rd and 4th degree tears (2.3%) was significantly lower than the WHA average in

2010. Private obstetricians have the highest episiotomy rates but the lowest 3rd and 4th degree tear rates.

Last year's report highlighted the fact that the internationally published incidence for 3rd and 4th degree tears is up to 6% of all vaginal births[1]. However, up to 40% of women who sustain an anal sphincter injury report problems with anal incontinence six months after birth[2] and approximately 10% of those may need a secondary repair of their anal sphincter[1].

[1] Uustal Fornell E et al. Obstetric anal sphincter injury ten years after: subjective and objective long term effects. Br J Obstet Gynaecol 2005; 112: 312-316
[2] Fornell EK et al. Clinical consequences of anal sphincter rupture during vaginal birth. J Am Coll Surg 1996; 183: 553-558

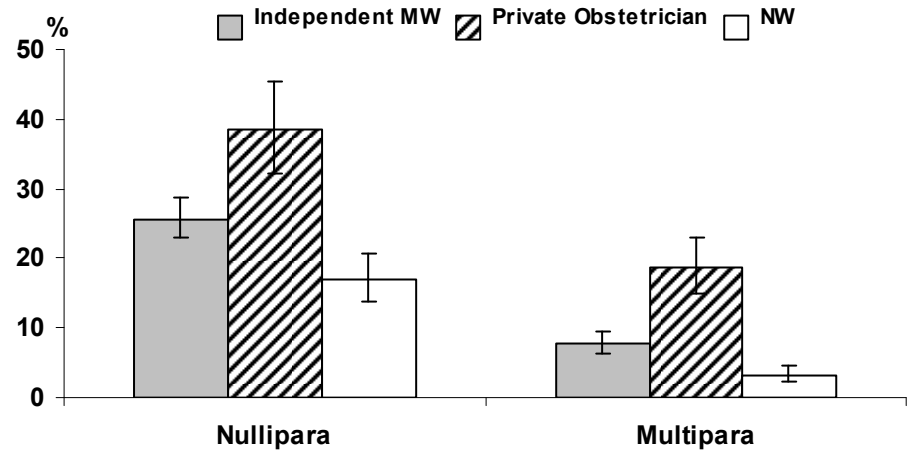

Figure 65: Episiotomy rate in spontaneous cephalic vaginal birth by LMC at birth and parity (with 95% confidence intervals)

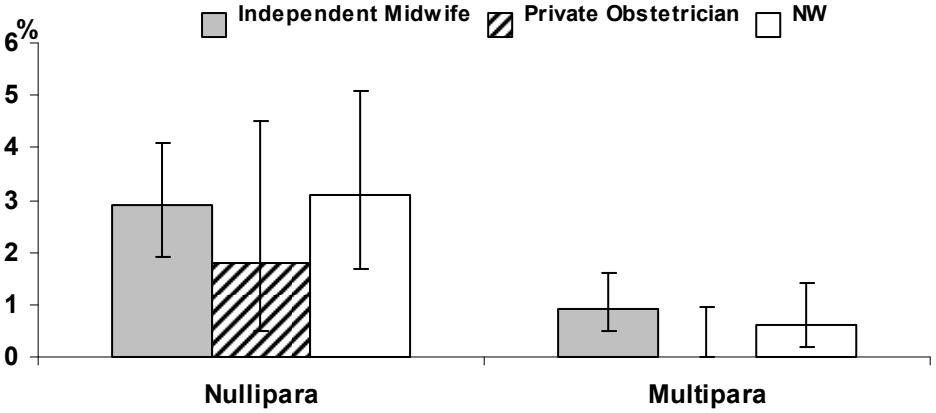

Figure 66: 3rd and 4th degree tear rate in spontaneous vaginal birth by LMC at birth and parity (with 95% confidence intervals)

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 and delivery of the placenta by maternal effort.

Findings:

Table 60: Third stage management among vaginal births

	Physiological n=447		Active syntocinon n=2688		Active syntometrine n=1969		Other n=46		Unknown n=171	
	n	%	n	%	n	%	n	%	n	%
Primary PPH (≥500mls)	38	8.5	514	19.1	396	20.1	9.0	19.6	28	16.4
Primary PPH (≥1000mls)	12	2.7	142	5.3	112	5.7	2.0	4.3	9	5.3
Postpartum blood transfusion	5	1.1	62	2.3	49	2.5	2.0	4.3	7	4.1

In 2010, active management of third stage was used in at least 88% of vaginal births. This is supported by randomised controlled trials that have shown that active management of the third stage reduces the risk of postpartum haemorrhage by a half. In addition, the WHO advises that all women in childbirth attended by a trained accoucheur receive active management of the third stage.

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 the paradox in observational studies of interventions where caregivers choose the appropriate 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. Women with BMI>35, a history of Caesarean section, hypertension or multiple pregnancy almost always received active management at NW in 2010. (see appendix 6)

7.3 Postpartum haemorrhage

WHA Maternity Indicators for PPH		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	2010 Public only*
Maternal indicator	**Definition**	**%**	**%**		**%**	**%**	**%**	**%**
Postpartum haemorrhage	Blood loss 1000-1499 ml/All vaginal births	1.91	2.4				3.1	4.0
	Blood loss ≥1500ml/ All vaginal births	1.35	1.7	1.12	2.4	2.6	2.7	4.0
	Blood loss 1000-1499 ml/Mothers birthing by Caesarean		5.8				11.0	13.3
	Blood loss ≥1500ml/Mothers birthing by Caesarean	2.71	2.9	3.32	5.2	5.0	4.7	6.3
Blood transfusion	Postpartum blood transfusion/Mothers giving birth	1.63	2.1	2.2	2.8	3.0	2.5	3.8

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.

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

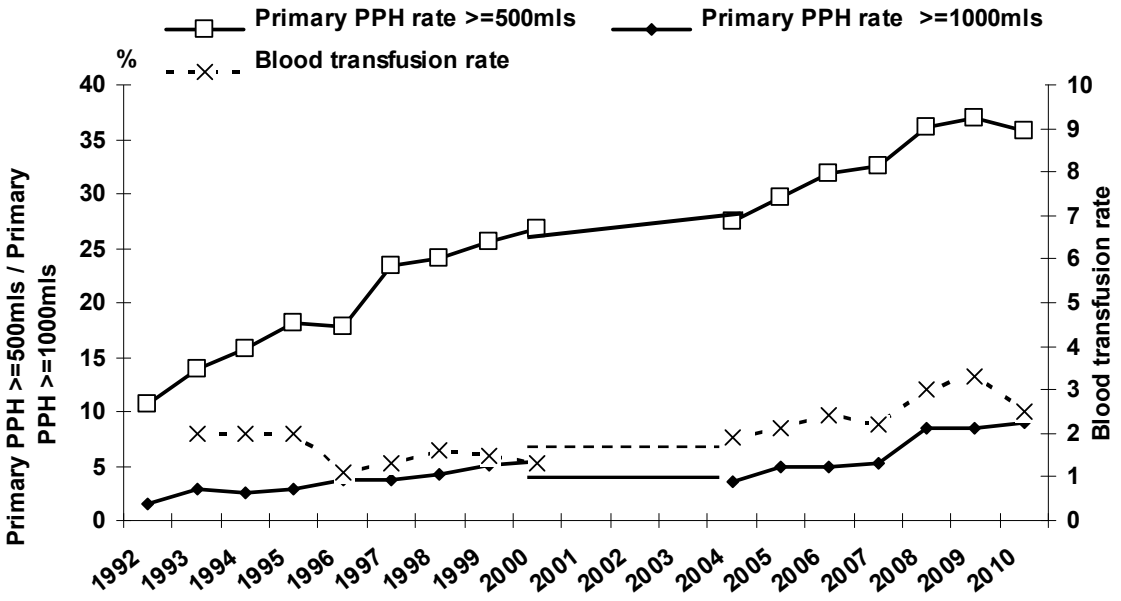

Figure 67: Postpartum haemorrhage and transfusion rates (1992-2010)

Table 61: Postpartum haemorrhage rate (1995-2010)

	1995	1996	1997	1998	1999	2000	2004	2005*	2006*	2007*	2008	2009	2010
Total Births	9125	9157	8055	7531	7501	7827	7491	7194	7212	7695	7589	7735	7709
Primary PPH (≥500mls)	1655	1633	1882	1818	1921	2088	2056	2139	2302	2507	2736	2850	2753
Incidence %	18.1	17.8	23.4	24.1	25.6	26.7	27.4	29.7	31.9	32.6	36.1	36.9	35.7
Primary PPH (≥1000mls)	267	344	303	318	381	423	262	350	351	410	634	651	695
Incidence %	2.9	3.8	3.8	4.2	5.1	5.4	3.5	4.9	4.9	5.3	8.4	8.4	9.0

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

Table 62: Postpartum blood loss by mode of birth

	Spontaneous vaginal birth n=4276		Operative vaginal birth n=942		CS emergency n=1265		CS elective n=1226		Total N=7709	
	n	%	n	%	n	%	n	%	n	%
PPH ≥500mls	700	16.4	266	28.2	991	78.3	796	64.9	2753	35.7
PPH ≥1000mls	219	5.1	84	8.9	254	20.1	138	11.3	695	9.0
PPH ≥1500mls	109	2.6	32	3.4	86	6.8	31	2.5	258	3.4
Post partum transfusion	72	1.7	34	3.6	60	4.7	24	2.0	190	2.5

Table 63: Postpartum blood loss by onset of birth

	Spontaneous labour n=4007		Induced labour n=2214		CS emergency before onset of labour n=266		CS elective n=1222		Total N=7709	
	n	%	n	%	n	%	n	%	n	%
PPH ≥500mls	1001	25.0	765	34.6	194	72.9	793	64.9	2753	35.7
PPH ≥1000mls	283	7.1	224	10.1	50	18.8	138	11.3	695	9.0
PPH ≥1500mls	121	3.0	87	3.9	19	7.1	31	2.5	258	3.4
Post partum transfusion	81	2.0	66	3.0	19	7.1	24	2.0	190	2.5

Of all women giving birth, the overall primary PPH rate (≥ 500mls) was 36%. It varied by mode of birth, from 16% for spontaneous vaginal birth to 78% for emergency caesarean. It also varied by onset of birth, from 25% in spontaneous onset to 35% in induced labour. The rate of blood loss ≥ 1500mls for women having a vaginal birth remained stable in 2010 at 2.7%, and for women having a caesarean has slightly decreased over the last few years to 4.7% in 2010. Only 2.5% of all mothers giving birth received a blood transfusion post-partum, with little variation by onset of birth.

The introduction of new guidelines for PPH late in 2009 were expected to result in an increased use of syntometrine for prevention of PPH in women at risk, together with a more consistent approach to calling for help. Although we did not analyze PPH rates in the subset of women at risk, we did see an overall reduction in the blood transfusion rate from 3.3% in 2009 to 2.6% in 2010 which may be in part due to the new guidelines. The introduction of a new checklist for PPH in 2010, combined with a hospital-wide promotion of reassessing the need for a second unit of blood, may result in a further reduction in overall transfusion rate next year.

Table 64: Blood transfusion (1995-2010)

	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010
Antenatal	9	4	2	4	4	0	10	12	11	6	6	18	12
Antenatal & intrapartum		1	0	0		0	1	0	0	1	0	0	0
Antenatal & postpartum						1	0	3	0	0	2	2	0
Intrapartum	11	7	3	3	3	4	2	2	6	1	4	3	1
Intrapartum & postpartum		1	3	6	3	4	4	3	3	4	1	2	1
Postpartum	152	90	94	110	100	96	128	133	150	165	212	228	189
Total transfusions	172	103	102	123	110	105	145	153	170	177	225	253	203
Total transfusion rate	2.0	1.1	1.3	1.6	1.5	1.3	1.9	2.1	2.4	2.3	3.0	3.3	2.6

7.4 Emergency peripartum hysterectomy

WHA Maternity Indicator for Peripartum Hysterectomy		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Peripartum hysterectomy	Hysterectomy at birth admission/Mothers giving birth	0.102		0.117	0.184	0.155*	0.91

*WHA definition includes only peripartum hysterectomy during birth admission (excludes 2 cases in 2009)

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.

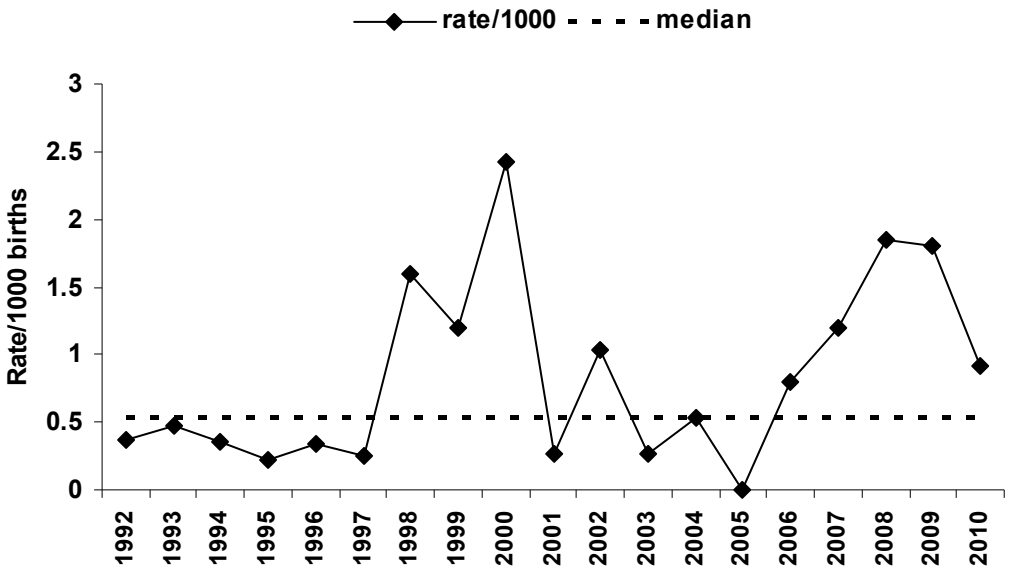

Figure 68: Emergency peripartum hysterectomy rates/1000 births (1992-2010) (horizontal dotted line represents median rate for 1992-2010)

Findings

There were 7 emergency peripartum hysterectomies in 2010. This includes two semi-elective caesarean hysterectomies (despite the definition above) as these were prophylactic or intraoperative decisions for placental implantation abnormalities that had been diagnosed prior to birth. This is a rate of 0.91/1000 births, which is consistent with rates before and following the period from 1998-2000, and is consistent with international rates. There is no significant difference from the median rate (represented by the dotted line) over this time period.

7.5 Neonatal outcomes by mode of birth

WHA Perinatal Indicator		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	2010 Public only*
Perinatal indicators	Definition	%	%	%	%	%	%	%
Five minute Apgar of <=4	Babies with 5 minute Apgar<=4/Total liveborn, singleton term babies	0.265		0.10	0.13	0.242	0.23	0.36

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.

Methods

The following tables include all live born babies born at NW.

Table 65: Neonatal morbidity among live births by mode of birth (all gestations)

	Spontaneous vertex n=4217		Vaginal breech n=32		Forceps birth n=354		Ventouse birth n=590		CS elective n=1280		CS emergency n=1310		Total N=7783	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	34	0.8	10	31.3	5	1.4	8	1.4	18	1.4	60	4.6	135	1.7
1 min Apgar <7	197	4.7	22	68.8	45	12.7	80	13.6	93	7.3	250	19.1	687	8.8
5 min Apgar <7	37	0.9	9	28.1	6	1.7	6	1.0	15	1.2	57	4.4	130	1.7
Admitted to NICU	287	6.8	13	40.6	41	11.6	37	6.3	150	11.7	266	20.3	794	10.2
≥2 days in NICU	253	6.0	12	37.5	37	10.5	28	4.8	131	10.2	245	18.7	706	9.1
Neonatal deaths (/1000 live births)	22	5.2	5	156	0		0		2	1.6	5	3.9	34	4.3

Table 66: Neonatal morbidity among live births by mode of onset of birth (all gestations)

	Spontaneous labour n=4017		Induced labour n=2195		CS elective n=1276		CS emergency before onset of labour n=295		Total N=7783	
	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	57	1.4	33	1.5	18	1.4	27	9.2	135	1.7
1 min Apgar <7	292	7.3	199	9.1	92	7.2	104	35.3	687	8.8
5 min Apgar <7	52	1.3	38	1.7	15	1.2	25	8.5	130	1.7
Admitted to NICU	332	8.3	181	8.3	149	11.7	132	44.8	794	10.2
≥2 days in NICU	287	7.1	160	7.3	130	10.2	129	43.7	7.6	9.1
Neonatal deaths (/1000 live births)	22	0.6	7	0.3	2	0.2	3	1.0	34	0.4

Table 67: Neonatal morbidity by mode of birth in live born term or post term (≥ 37 weeks) babies

	Spontaneous vertex n=3940		Vaginal breech n=15		Forceps birth n=333		Ventouse birth n=571		CS elective n=1144		CS emergency n=1064		Total N=7065	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	17	0.4	3	20.0	4	1.2	8	1.4	11	1.0	33	3.1	76	1.1
1 min Apgar <7	135	3.4	8	53.3	41	12.4	76	13.3	135	3.4	148	13.9	476	6.7
5 min Apgar <7	16	0.4	2	13.3	5	1.5	6	1.1	9	0.8	27	2.5	65	0.9
Admitted to NICU	138	3.5	1	6.7	27	8.2	33	5.8	66	5.8	78	7.3	343	4.9
≥2 days in NICU	111	2.8	0		23	7.0	24	4.2	49	4.3	61	5.7	268	3.8
Neonatal deaths (/1000 live births)	5	1.3	0		0		0		0		2	1.9	7	1.0

Table 68: Neonatal morbidity in term or post term live born (≥ 37 weeks) babies (2000-2010)

	2000 N=6915		2004 N=6793		2005 N=6578		2006 N=6543		2007 N=6971		2008 N=6910		2009 N=7128		2010 N=7065	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min apgar <4	106	1.5	68	1.0	69	1.0	66	1.1	73	1.1	46	0.7	78	1.1	76	1.1
1 min apgar <7	553	8.0	507	7.5	454	6.9	468	7.2	454	6.5	454	6.6	518	7.3	476	6.7
Admitted to NICU	405	5.9	349	5.1	346	5.3	283	4.3	322	4.6	314	4.5	364	5.1	343	4.9
≥2 days in NICU	*		254	3.7	275	4.2	226	3.5	271	3.9	241	3.5	299	4.2	268	3.8

* The definition for length of stay in NICU changed following 2000 and so previous data are not comparable with data since 2001. Length of stay data are obtained from Healthware.

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 infant feeding status of infants born at National Women's is collected at the time of discharge from the hospital, irrespective of whether this is immediately postpartum from Labour and Birthing Suite, or 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 admissions 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 National Women's. This is at discharge at approximately 5-6 weeks post birth.

Findings

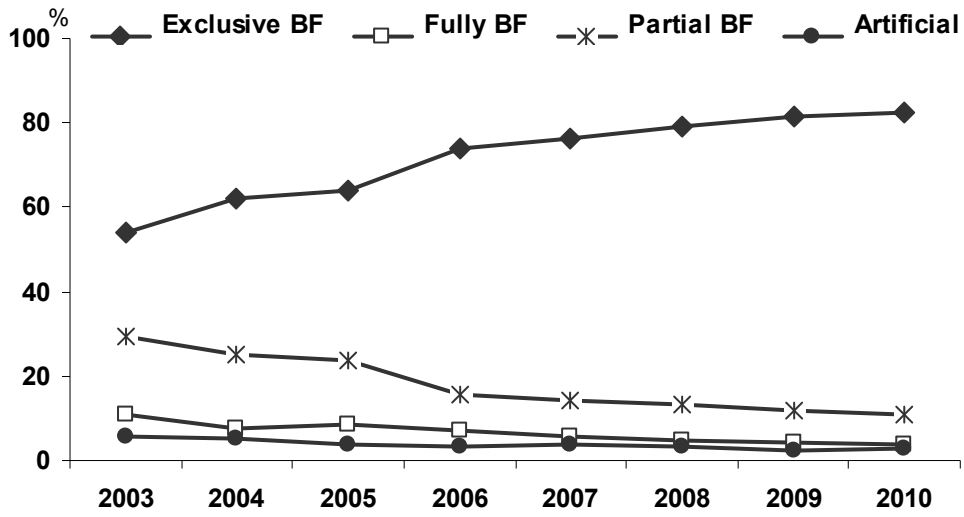

Figure 69: Method of infant feeding at discharge from NW (2003-2010)

In 2010, the exclusive breastfeeding rate on discharge from hospital following birth was 83% which exceeded the Ministry of Health target of 75%. There has been a steady increase in exclusive breastfeeding rates since 2003. In association with this has been an equivalent fall in partial breastfeeding rates.

The improvement in exclusive breastfeeding rates has been associated with hard work from the service, including the employment of extra lactation consultancy staff, education of all staff involved with postnatal women (as wide reaching as ancillary staff) by a variety of modalities including e-learning, audit projects, and adherence to the "Ten steps to successful breastfeeding".

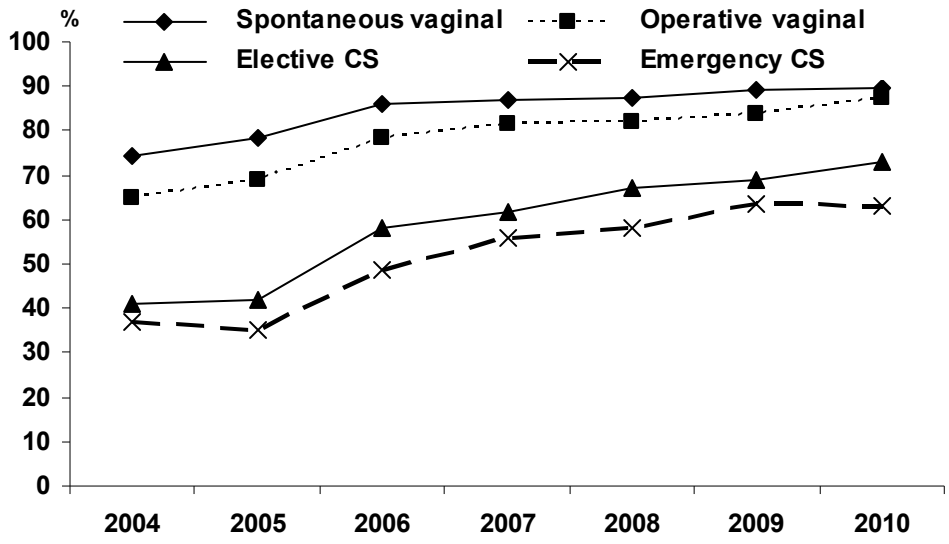

Figure 70: Exclusive breastfeeding at discharge from NW by mode of birth (2004-2010)

The increase in exclusive breastfeeding is demonstrated across all modes of birth and reflects the culture of early initiation of breastfeeding. A reduction in the use of supplements during the short recovery stage has contributed to the increase in exclusive breastfeeding for women having an elective Caesarean section.

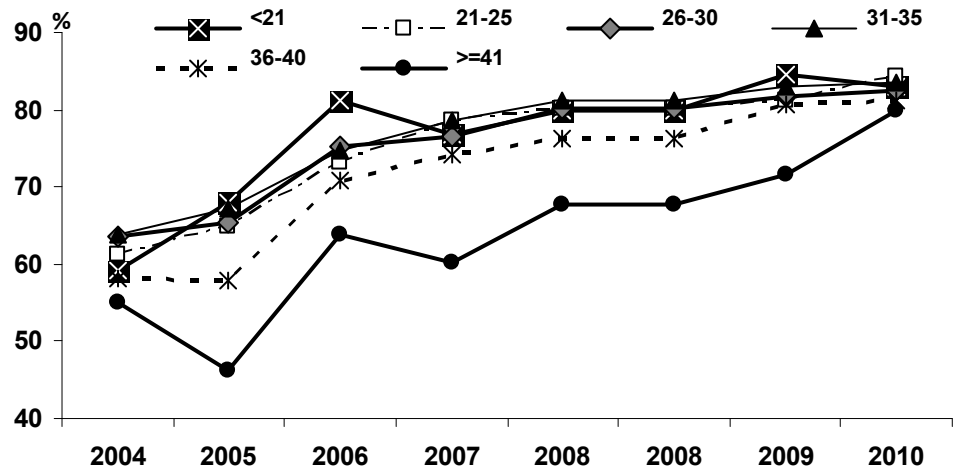

Figure 71: Exclusive breastfeeding rates at discharge from NW by maternal age (2004-2010)

It is encouraging to see that in all age groups there is an increase in exclusive breastfeeding rates.

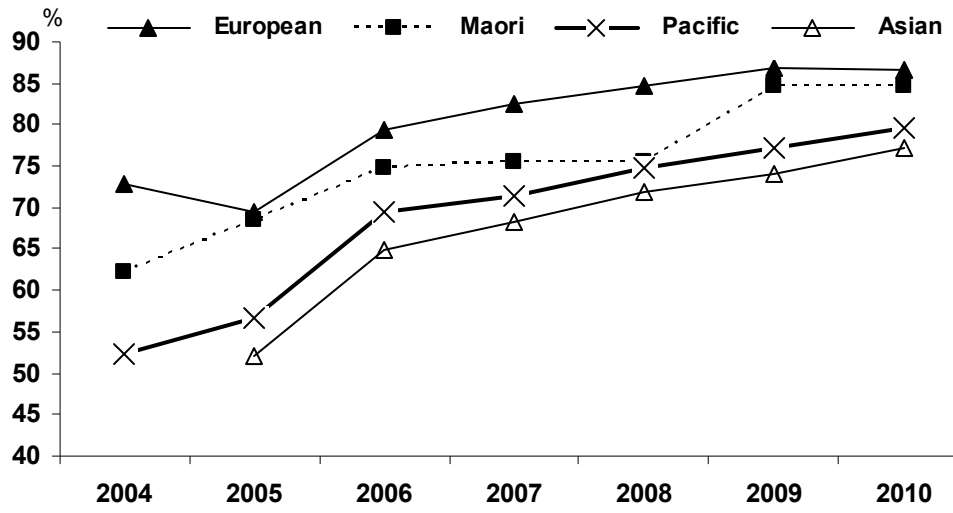

Figure 72: Exclusive breastfeeding rates at discharge from NW by ethnicity (2004-2010)

The increase in exclusive breastfeeding is apparent for all ethnicities; and this is in line with the Government's focus on improving breastfeeding among Māori and Pacific mothers. It is disappointing however that exclusive breastfeeding rates among Pacific and Asian mothers are lower than those among European and Māori mothers.

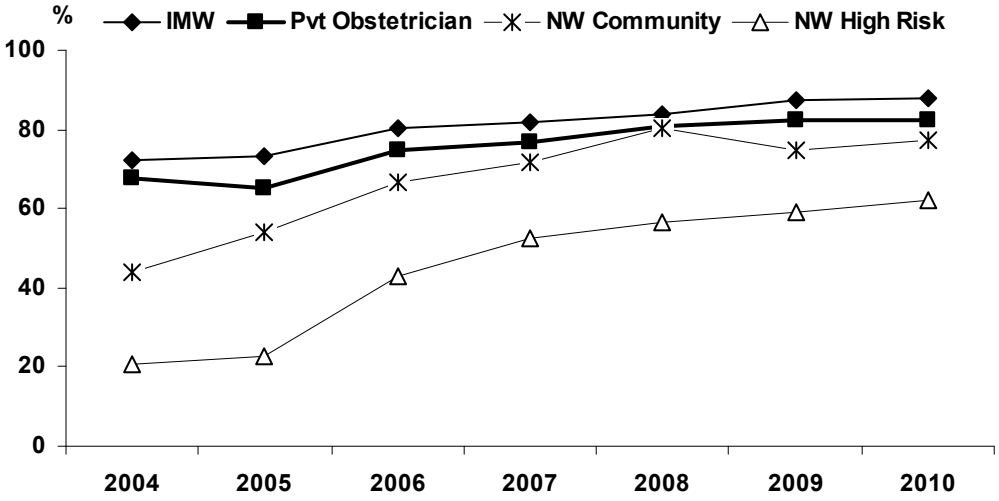

Figure 73: Exclusive breastfeeding rate at discharge from NW by LMC at birth (2004-2010)

Since 2004 almost all LMC groups have consistently increased their exclusive breastfeeding rates, but the biggest gains have been among NW LMC clients.

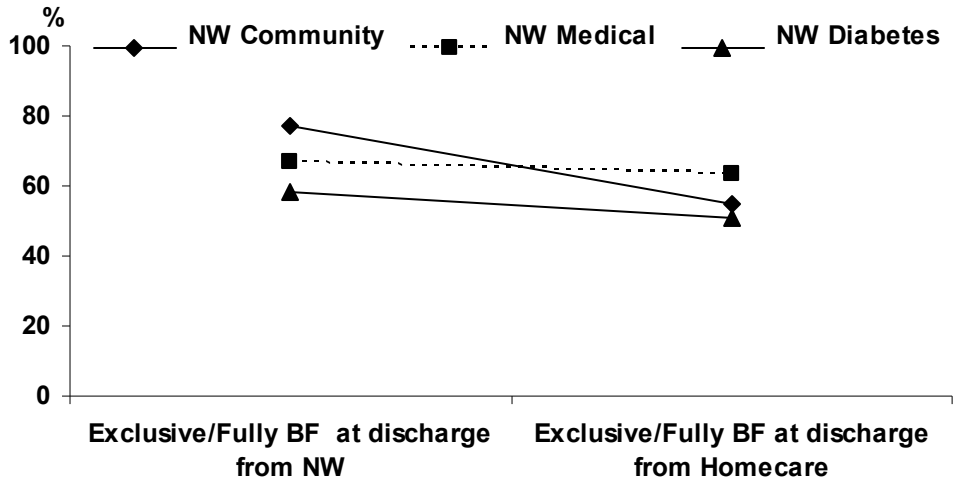

Figure 74: Change in combined exclusive and fully breastfeeding rate from hospital discharge to Homecare by NW LMC (4-6 weeks) (n=1212)

This figure demonstrates the extent to which fully and exclusive breastfeeding rates drop by the time of Homecare discharge at 5-6 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 overall rate of exclusive breastfeeding at discharge from Homecare was 55%. The rate in 2009 was 57.5%.

Summary

National Women's are proud to continue achieving 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 Breast Milk Substitutes Room remains locked and access to bottles and teats is restricted to prevent the inappropriate use of supplements or bottles and teats. The WHO Code on the Marketing of Breast Milk Substitutes is fully implemented at National Women's. Following the aims of the Baby Friendly Hospital Initiative, women who for various reasons decide to artificially feed their babies are also given the information they need to make an informed decision, informed of the risks of formula use and how to safely prepare formula to reduce the risks of contamination.

The 83% exclusive breastfeeding rate on discharge from the National Women's facility demonstrates the dedication to achieving best practice and care provision for mothers and our future generation. We need now to encourage women to continue to breastfeed until their babies are six months of age, as recommended by the World Health Organisation.

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 69: Maternal destination immediately after birth

	2004 N = 7491		2005 N = 7194		2006 N = 7212		2007 N = 7695		2008 N = 7589		2009 N = 7735		2010 N = 7709	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
NW Wards	4618	61.6	4286	61.6	4384	60.8	4590	59.6	4493	59.2	4557	58.9	4661	60.5
Birthcare	2245	30.0	2354	29.9	2322	32.2	2493	32.4	2551	33.6	2637	34.1	2543	33.0
Home	539	7.2	510	7.2	483	6.7	587	7.6	526	6.9	517	6.7	481	6.2
Other Units	89	1.2	44	1.2	23	0.3	25	0.3	19	0.3	24	0.3	24	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.

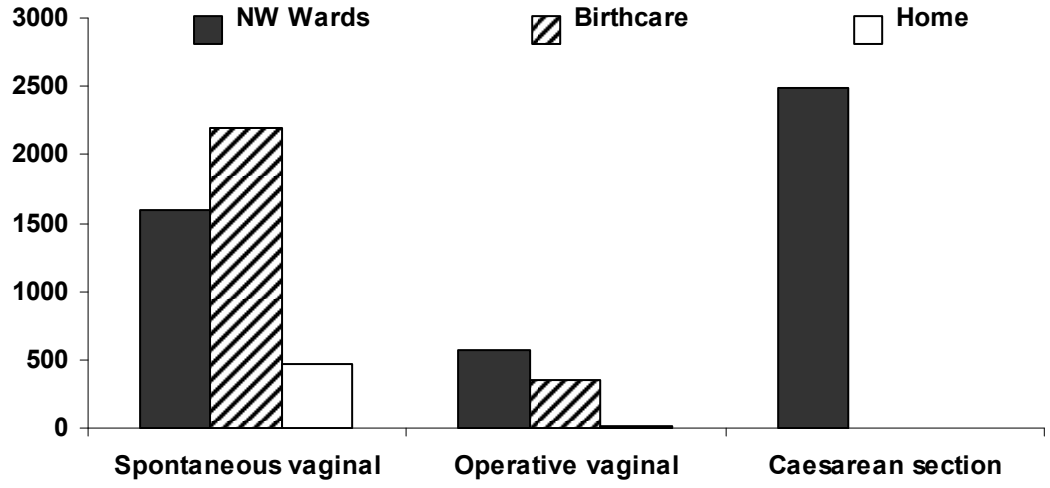

Figure 75: Maternal destination immediately after birth by mode of birth

As expected, mothers are admitted initially to the NW wards after Caesarean section. 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 heavy workload on the postnatal wards at NW.

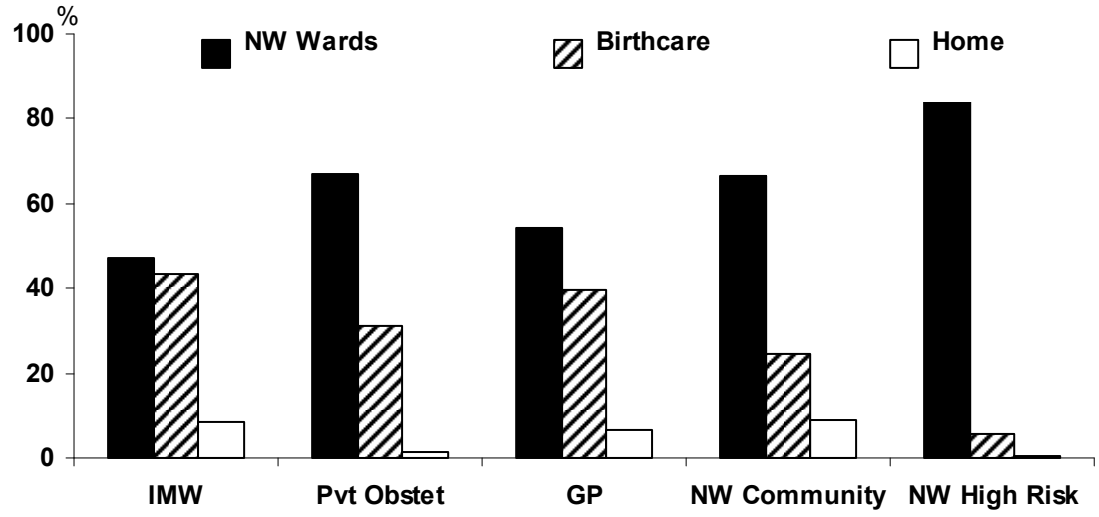

Figure 76: Postnatal destination immediately after birth by LMC at birth

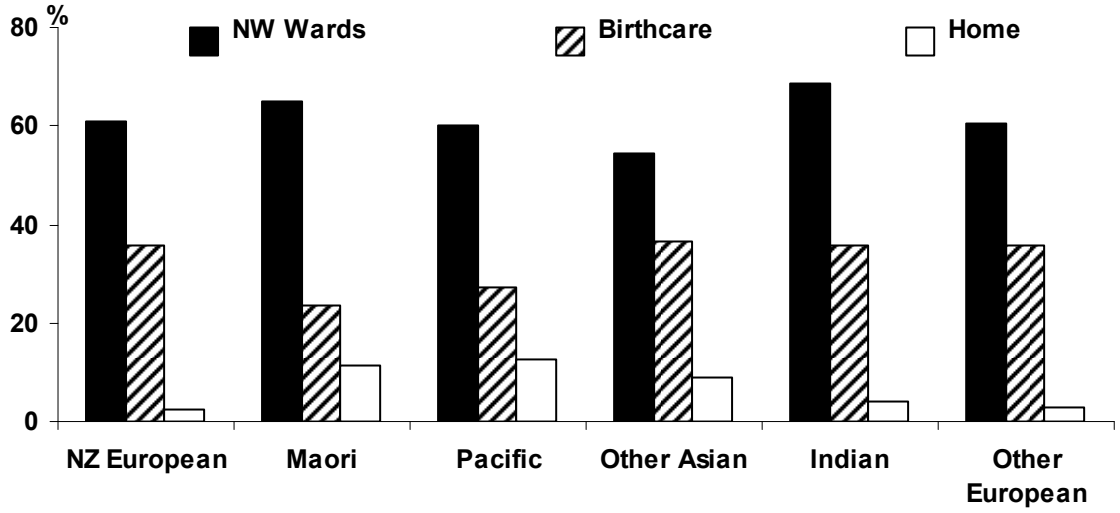

Figure 77: Postnatal destination immediately after birth by ethnicity

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 70: Reason for admission to NW postnatal wards among women having a spontaneous vaginal birth

	N=1593	
	n	%
Neonatal reason*	661	41.5
Postpartum haemorrhage	285	17.9
Diabetes	150	9.4
Hypertensive disorder	63	4.0
Perineal trauma	87	5.5
Retained placenta/products	55	3.5
Fainting /dizziness	20	1.3
Other listed reasons†	272	17.1

* 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 71: Length of stay by mode of birth among initial admissions to NW wards

	N=4661*		Length of stay Days†
	n	%	Median
Caesarean section birth - discharged to home	2158	46.3	4(4-5)
Caesarean section birth - transferred to Birthcare	195	4.2	1(1-2)
Caesarean section birth - transferred to other destinations	90	1.9	4.5(3-6)
Operative vaginal birth - discharged to home	307	6.6	3(2-4)
Operative vaginal birth - transferred to Birthcare	247	5.3	1(0-1)
Operative vaginal birth - transferred to other destinations	15	0.3	3(2-6)
Spontaneous vaginal birth - discharged to home	1194	25.6	2(1-3)
Spontaneous vaginal birth - transferred to Birthcare	280	6.0	1(0-1)
Spontaneous vaginal birth - transferred to other destinations	86	1.8	3(2-4)

*89 women with unknown destination have been excluded
†a day is defined as 24 hours

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.

In 2010, 356 (4.6%) women of the 7709 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. There were 373 readmissions: 339 women had one readmission and 17 women had two readmissions. The median length of stay for women who had a postnatal readmission was 21 hours.

Table 72: Reasons for readmission

	N=373	
	n	%
Neonatal admission*	82	22.0
Infection †	53	14.2
Breast‡	60	16.1
Wound breakdown§	10	2.7
Postpartum haemorrhage	44	11.8
Hypertensive disorder	16	4.3
Retained products	13	3.5
Epidural complications	2	0.5
Other¶	91	24.4

* 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.

The most frequent indications for readmission in 2010 were again neonatal admission and breast problems.

8.2.2 Admissions to postnatal wards of women who birthed elsewhere

There were 136 admissions in 2010 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 73: Reason for postnatal admission by place of birth for women who birthed elsewhere

	Total N= 136		Birthcare n=19		Home n=8		CMDHB* n=25		North Shore n=23		Waitakere n=26		Other n=35	
	N	%	n	%	n	%	n	%	n	%	n	%	n	%
Neonatal admission	88	65	3	16	3	38	19	76	21	91	17	65	25	71
Infection	5	4	1	5	0		1	4			3	12	0	
Breast	11	8	3	16	2	25	2	8			0		4	11
Wound	3	2	0		0		0				2	8	1	3
PPH	13	10	7	37	3	38	0				2	8	1	3
Obstetric trauma	3	2	3	16	0		0				0			
Retained placenta	2	1	2	11	0		0				0			
Hypertension	3	2	0		0		1	4	1	4	0		1	3
Other	8	6	0		0		2	8	1	4	2	8	3	9

* 22 Middlemore, 1 Pukekohe, 1 Papakura and 1 Botany Downs Maternity Unit

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 2010 calendar year. Occupancy data relate to the unit occupancy for each day in 2010.

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 2010 and admitted to the ACH NICU, (2) inborn (ACH) babies and (3) babies born in 2010 assigned to ACH by the Australia New Zealand Neonatal Network (ANZNN).

Australia New Zealand Neonatal Network (ANZNN)

ANZNN collects standardised data from all level 3 NICUs in Australia and New Zealand. A dataset is collected for each baby admitted to a NICU who is:

- <1500g birth weight
- <32 weeks gestation
- requires assisted ventilation (IPPV, CPAP or HFOV)
- has major surgery (defined as opening of a body cavity)
- babies who were cooled as a treatment for neonatal encephalopathy

Each infant is assigned to the 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 is 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 74: Characteristics of <32 week or <1500g babies cared for at NW NICU by ANZNN status

	<32 weeks or <1500g					
	Total N=212		ANZNN n=190		Non ANZNN n=22	
Gestation (weeks)	**n**	**%**	**n**	**%**	**n**	**%**
<24	1	0.5	1	0.5	0	
24-25	36	17.0	30	15.8	6	27.3
26-27	40	18.9	31	16.3	9	40.9
28-29	49	23.1	42	22.1	7	31.8
30-31	71	33.5	71	37.4	0	
32-36	15	7.1	15	7.9	0	
Weight (g)						
<500	3	1.4	2	1.1	1	
500-749	28	13.2	25	13.2	3	13.6
750-999	40	18.9	31	16.3	9	40.9
1000-1249	47	22.2	41	21.6	6	27.3
1250-1499	57	26.9	55	29.0	2	9.1
1500-1999	34	16.0	33	17.4	1	4.6
2000-2499	2	0.9	2	1.1	0	
Birthplace (DHB)						
National Women's	180	84.9	180	94.7	0	
Northland	6	2.8	5	2.6	1	4.5
Waitemata DHB	3	1.4	3	1.6	0	
Counties Manukau DHB	16	7.5	0		16	72.7
Other	7	3.3	2	1.0	5	22.7

9.1 Inborn live birth at National Women's 1959-2010

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 in that way since 1959, initially by Professor Ross Howie.

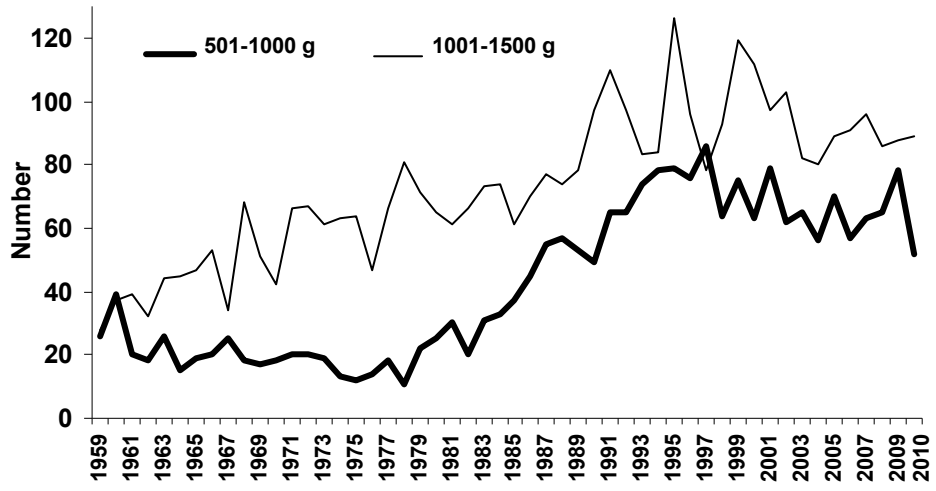

Figure 78: Number of inborn live-births ≤1500g from 1959 to 2010 (excludes BBAs).

9.2 NICU occupancy

For 2010 the very high occupancy that was observed for 2007-9 has continued. The occupancy of 14982 bed days is equivalent to a mean of 41 babies per day. It is worth noting that for 2010 the occupancy for infants born at 28 to 31 weeks gestation is approximately the same as that for infants born 32 to 36 weeks gestation. 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. However 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 75: Occupancy (baby days) on NICU (2000– 2010)

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

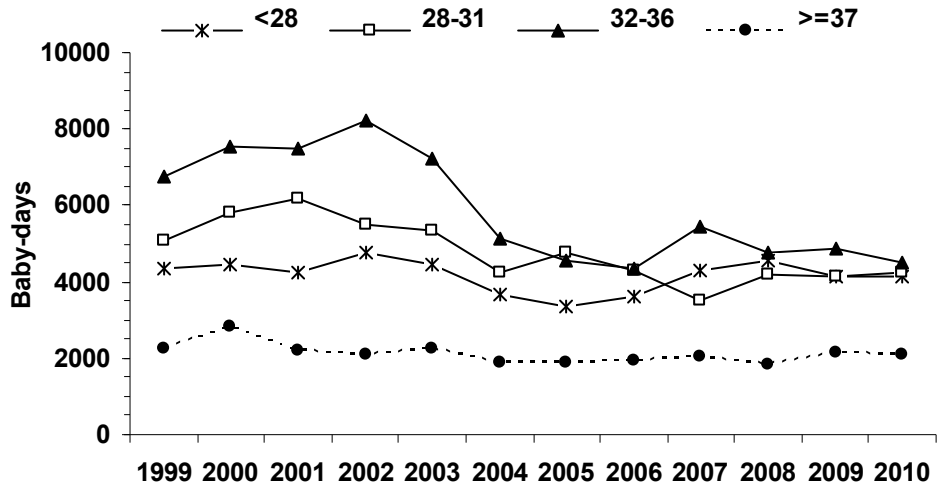

Figure 79: Occupancy (baby days per year) of NICU by gestational age

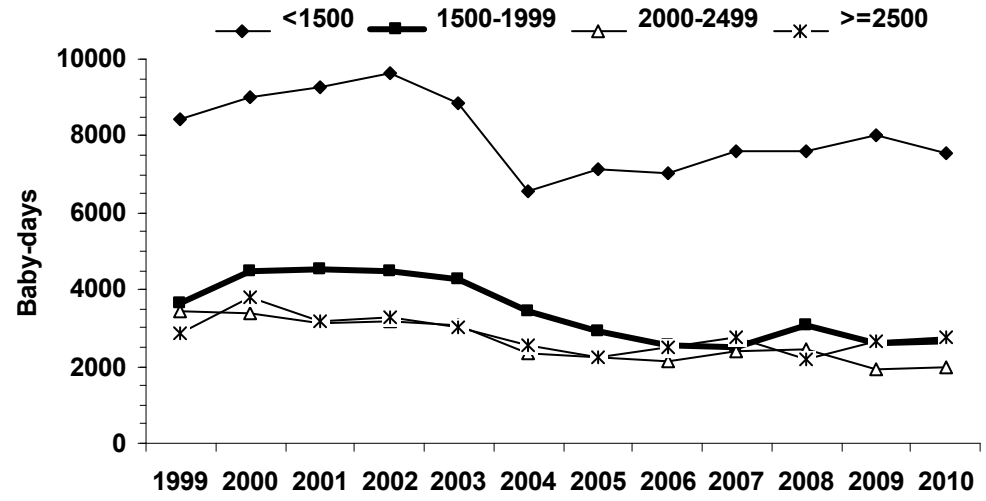

Figure 80: Occupancy (baby days per year) of NICU by birth weight

9.3 Admissions to NICU

Total admissions to ACH NICU peaked in the mid 1990s prior to a fall that coincided with the opening of the two local Level 2 neonatal units. The North Shore Hospital Neonatal Unit opened in October 2003 and Waitakere Hospital in July 2004. These two Waitemata units admit babies >1500g and >31 weeks gestation and will administer 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.

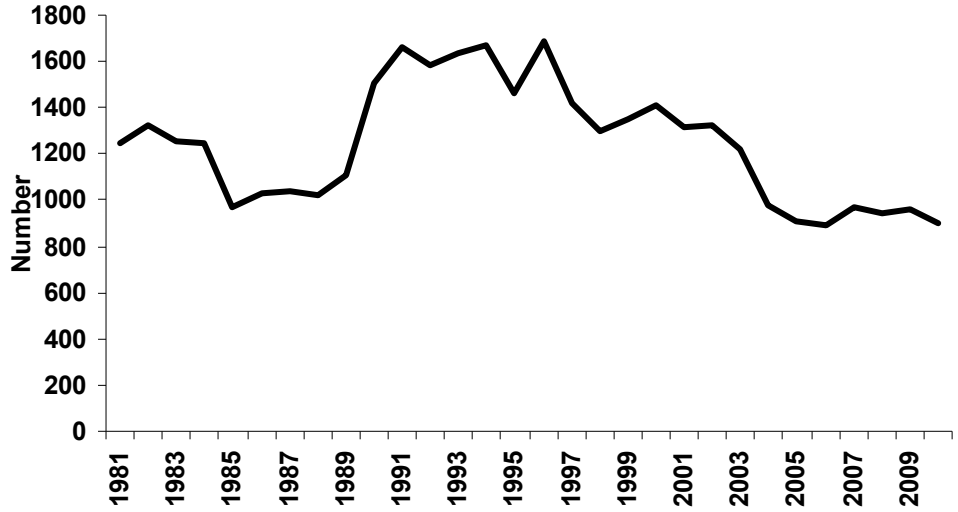

Figure 81: Admissions to NICU 1981-2010

Table 76: NICU admissions by year

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number	1690	1420	1300	1352	1412	1312	1331	1220	975	906	890	972	939	957	902

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. Although there was a significant decrease in admissions of babies ≥32 weeks gestation from 2004 it is noteworthy that 2009 saw a rise in term infant admissions that has only slightly decreased in 2010. These babies are likely to have a mixture of problems but the two most common (see Appendix 228) are respiratory distress and congenital abnormality, which includes cardiac anomalies.

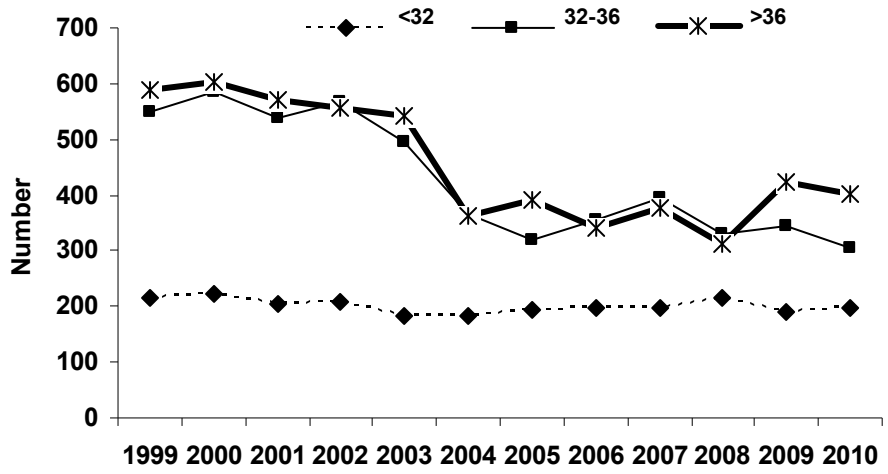

Figure 82: Admissions to NICU by gestational age

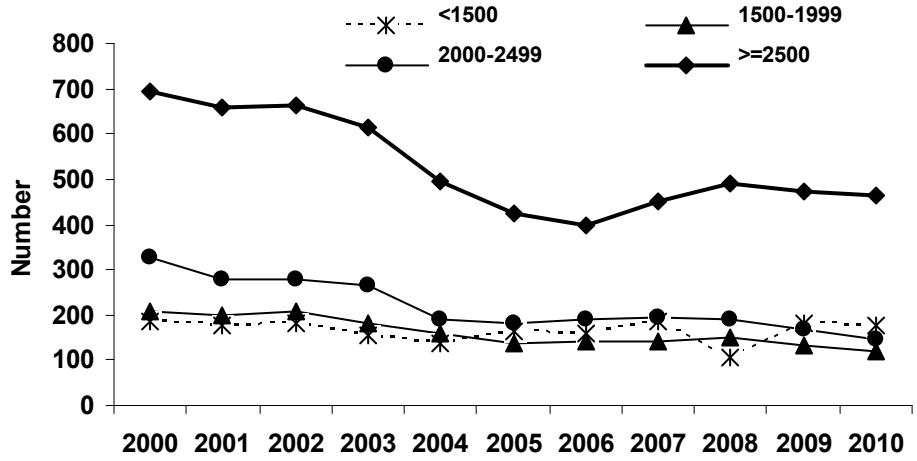

Figure 83: Admissions to NICU by birth weight

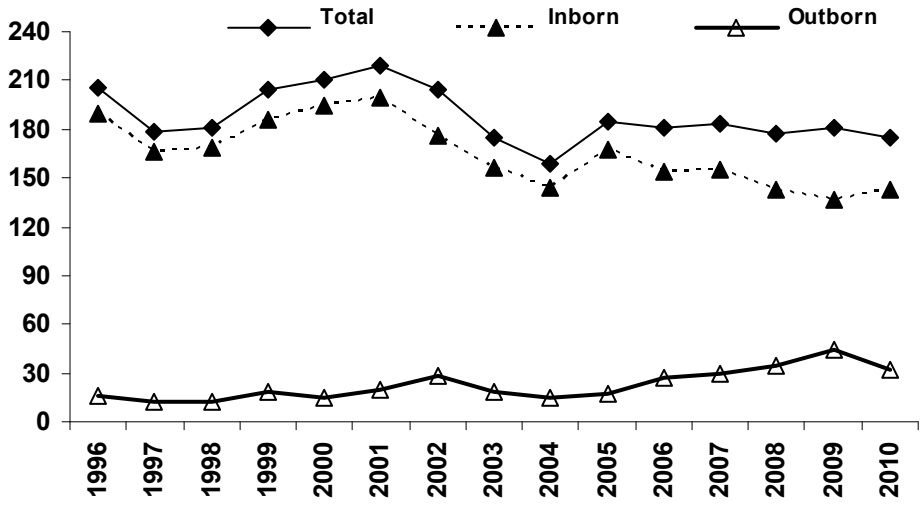

Figure 84: Admissions to NICU of <1500g babies (VLBW) by place of birth (outborn includes BBAs).

The number of VLBW infants admitted to ACH peaked in 2001 and then fell over the next three years before a plateau over the last five years. The admissions in this group have again remained stable in 2010. Although the proportion of outborn infants is low there was a steady increase 2004-9 then a slight decrease for 2010. This group of infants includes transfers for level 3 care and those infants who are transferred from Middlemore Hospital NICU for surgical intervention.

9.3.2 Admissions to NICU by domicile of mother

As expected, since 2004, there has been a decline in admissions of babies whose mothers are domiciled in the Waitemata District Health Board area. In 2008 and 2009 there was a modest increase in the number of babies admitted to NICU whose mothers were domiciled in the Auckland District Health Board region. This trend was considered due to better allocation, with a drop in unknowns, but was identified to be observed and there was a slight decrease for 2010.

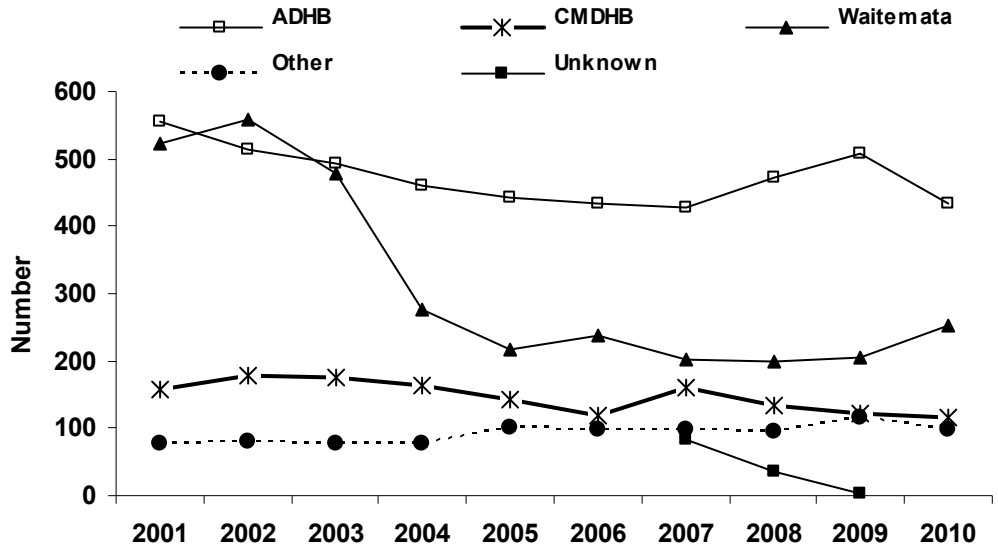

Figure 85: Admissions to NICU by maternal domicile

9.3.3 Admissions to NICU by ethnicity of baby

The most frequent ethnicity of NICU admissions was NZ European with 41.2% overall, including 36.6% of preterm and 47.0% of term infants respectively. Due to changes in reporting infant ethnicity made in 2007 we have not reported long term changes in infant ethnicity over time. However, the difference between the rates for NZ Europeans in the two groups, with term infants having a larger representation than preterm infants is of interest.

The second largest single ethnic group is Maori with an overall rate of 16.5% compared to 15.3 % for Pacific people. For both Maori and Pacific there are higher rates in the preterm group than the term group (17.4% Vs 15.4% and 15.8 % Vs 14.7% respectively). Asian and Indian were the two other major groups represented with 11.3% and 6.2% of admissions respectively. The number of Asian admissions has increased reflecting the increase in births to Chinese families in Auckland over the last 5 years.

9.3.4 Reasons for admission to NICU

Prematurity (36.5%) and respiratory distress (26.3%) remain the commonest reasons for admission to NICU. However, 110 babies (12.2%) were admitted because of congenital anomalies. This has increased from 70 (8.8%) in 2006. Forty babies (4.4%) including 34 term infants were admitted primarily for hypoglycaemia. 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 2010 over 90% of ACH babies <32 weeks gestation received some antenatal corticosteroids before birth and 57% received a course starting between 24 hours and seven days before birth. Unfortunately recent data from ANZNN are not yet available for comparison but to date local data have compared favourably.

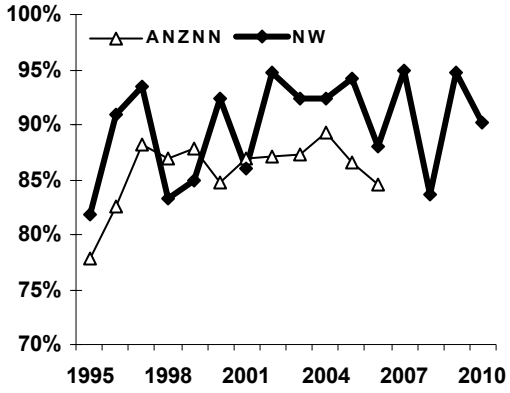

Figure 86: Any antenatal corticosteroids at 24-27 weeks

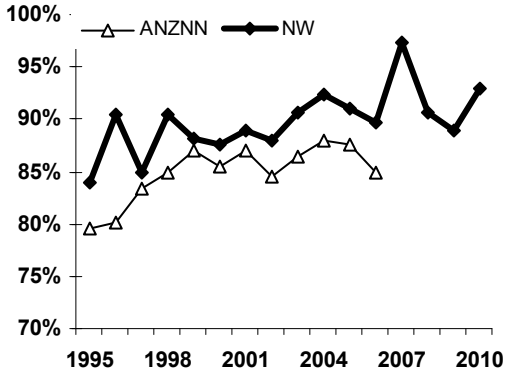

Figure 87: Any antenatal corticosteroids at 28-31 weeks

9.4 Care and complications

9.4.1 Infection (all admissions)

In 2010 there were 7 early-onset culture proven septicaemias compared with 10 in 2009 and 6 in both 2008 and 2007. The major organisms were Group B Streptococcus (4) and E Coli (3). There were 27 episodes of late-onset septicaemia, which compared very favourably with 33, 31 and 34 episodes in the three previous years. For late onset sepsis the most common organism was *Staphylococcus epidermidis* / coagulase negative *Staphylococcus,* which made up about 37%.

9.4.2 Hypoxic ischaemic encephalopathy (all admissions)

Five inborn babies developed significant stage 2 or 3 hypoxic ischaemic encephalopathy (HIE) in 2010, giving an incidence of 0.65/1000 term live births. The incidences were 0.5, 0.6, 1.6, 0.5, 0.9, 1 and 0.4/1000 term live births for the years between 2003 and 2009. In previous years there have been infants from planned home births who had significant HIE but in 2010 there were none.

Table 77: Details of Hypoxic Ischaemic Encephalopathy Stages 2 or 3.

Born at	Gestation	Birth Weight	HIE stage	Apgar 1/5	Comment
Northland	39	3305g	2	2 / 4	Em C. section for fetal bradycardia
ACH	39	3560g	3	0 /2	Placental abruption, forceps
ACH	37	3480g	3	0 / 0	Em C. section for placental abruption
Waitakere	40	3900g	2	0 / 3	Meconium liquor, nuchal cord
Waitakere	36	2200g	2	0 / 4	Cord prolapse
ACH	38	3280g	3	0 / 0	Em C. section for fetal distress
ACH	40	4240g	2	2 / 4	Ventouse for fetal distress
ACH	31	1830g	3	1 / 3	Em C. section for fetal distress
North Shore	39	2850g	2	0 / 0	Em C. section for placental abruption
North Shore	38	3030g	2	5 / 6	Maternal fever, fetal distress, forceps
Waitakere	40	3500g	3	0 / 0	Fetal distress
Waitakere	39	3920g	3	1/ 2	Em C. section for fetal distress
North Shore	37	2740g	3	2 / 4	Fetal bradycardia, ventouse, forceps
North Shore	40	3340g	2	3 / 3	Fetal distress

Em C= Emergency Caesarean

The care of all babies with significant HIE is reviewed confidentially to try to identify factors that may have contributed to the poor outcome and to attempt to improve care. Educational feedback is given to individual clinicians and to the units involved, as appropriate.

9.4.3 Intraventricular haemorrhage in very low birth weight infants admitted to NICU from 1985 to 2010

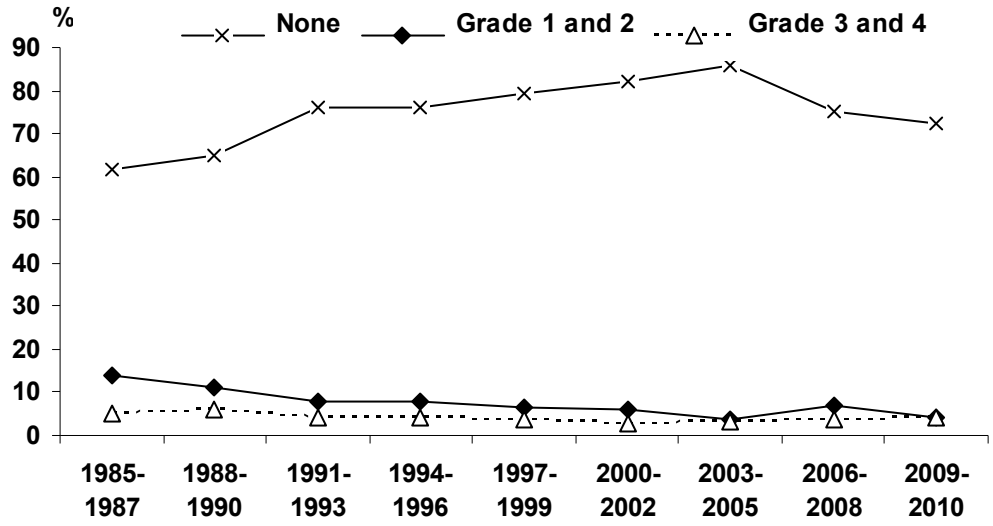

Figure 88: Intraventricular haemorrhage in <1250g infants admitted to NICU from 1985 to 2010
(Babies with unknown IVH status have been removed from the denominator.)

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, 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). 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 have not changed greatly in the last decade (see figure above) despite advances in neonatal care. This may reflect the active treatment of extremely premature babies; included in this 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 compare favourably with ANZNN data (Fig 89-92). However, there is some variation year to year reflecting the small number of infants in each gestational age group.

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

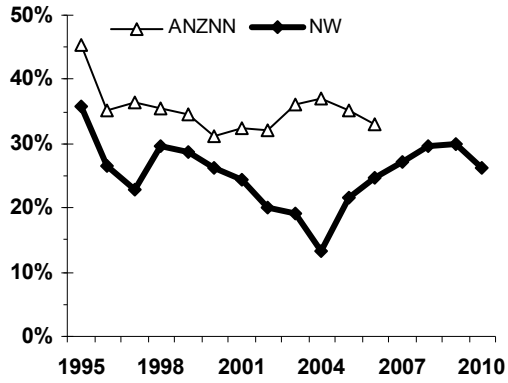

Figure 89: Any IVH at 24-27 weeks

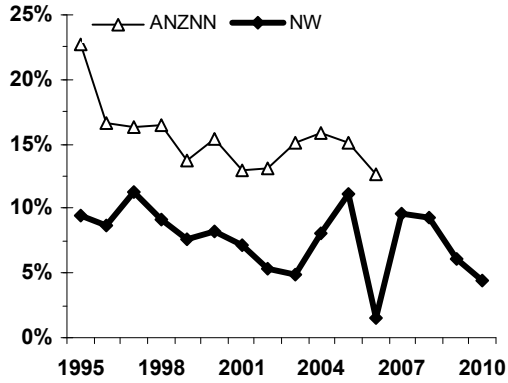

Figure 91: Any IVH at 28-31 weeks

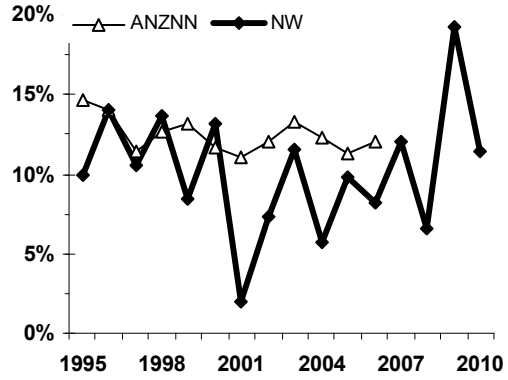

Figure 90: Severe (G3-4) IVH at 24-27 weeks

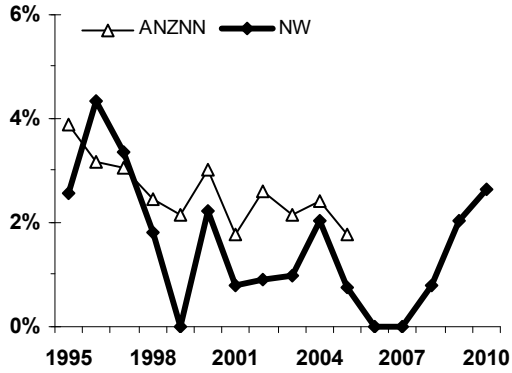

Figure 92: Severe (G3-4) IVH at 28-31 weeks

The increase in severe IVH at 24-27 weeks in 2009 represented an increase from 4 to 13 cases but for 2010 the number decreased to a more typical 7 cases (12%). Severe IVH at 28-31 weeks was only 3 cases, including one retrieval baby, which was equal to 2009. However, the apparent minor increase is due to a small decrease in the denominator. 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). Thus figure 91&92 is represented differently to the previous years. 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)

9.4.6 Use and duration of assisted ventilation

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 from 132 to

246 for 2010. This number is higher than at any time for the last decade and reflects the increased acuity of current workload. Significantly 68 of the ventilated babies were outborn.

Table 78: Number of babies on assisted ventilation

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CPAP or IPPV	393	446	404	402	395	453	442	442	423	448
IPPV	126	140	109	123	140	152	139	144	132	246
CPAP	379	421	388	388	367	428	418	412	423	478

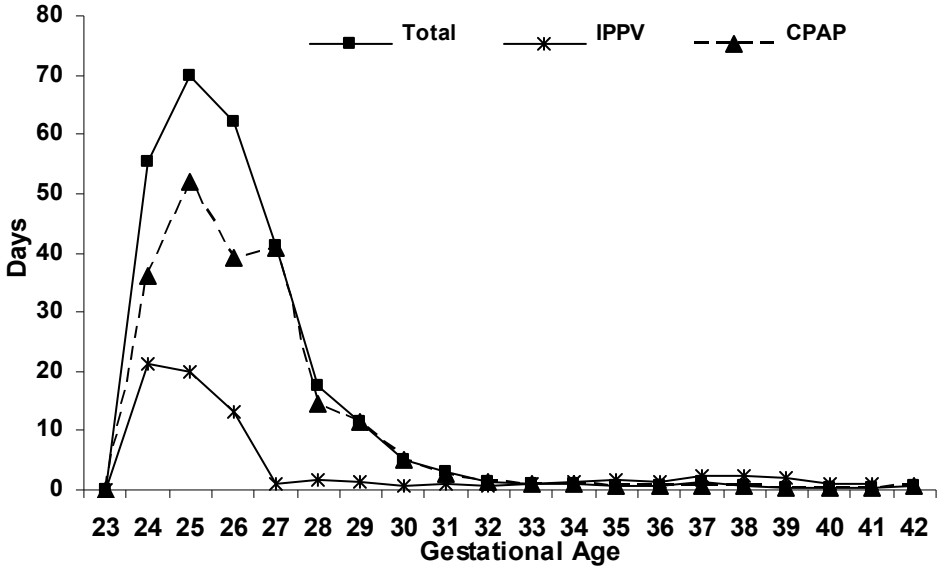

Figure 93: Median ventilation days on IPPV and CPAP and IPPV+CPAP by gestational age among (ventilated) survivors in 2010

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.

For 2010, as stated above, there has been a significant increase in the number of babies receiving IPPV, including 68 outborn babies transferred in to ACH and ventilated. Thirty two of these babies (47%) were born at term and required support for depression at birth, neurological problems or congenital anomalies. In addition, 25 (37%) were born below 32 weeks gestation and required support for prematurity, respiratory distress and “other”, which includes surgery. Two thirds of these babies are from Auckland and are transferred from Counties Manukau (28%) or Waitemata (38%) hospitals but one third are from other centres in both the North and South Island. Typically these babies require tertiary or quaternary services, including surgery, and so may be different in their requirement for respiratory support. This difference is in part responsible for the increase in ventilation days shown in Figure 93 compared with a similar graph for 2009, which recorded a median duration below 10 days for 25 and 26 weeks gestation.

There is a clear pattern of decreasing need for CPAP with increasing gestation and reduction in use from 28 weeks onwards. At present we do not use humidified high flow air/oxygen as a primary respiratory support but it is used as a method of weaning off CPAP particularly after 34 weeks gestation.

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

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

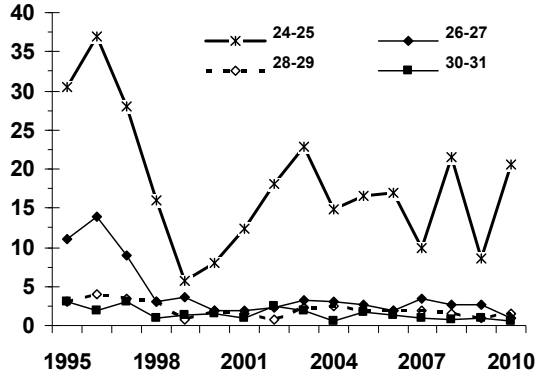

Figure 94: Median days on IPPV

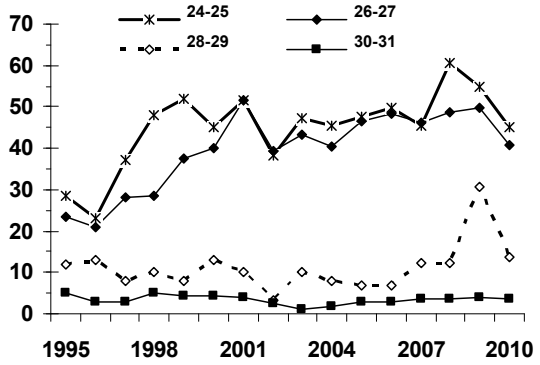

Figure 95: Median days on CPAP

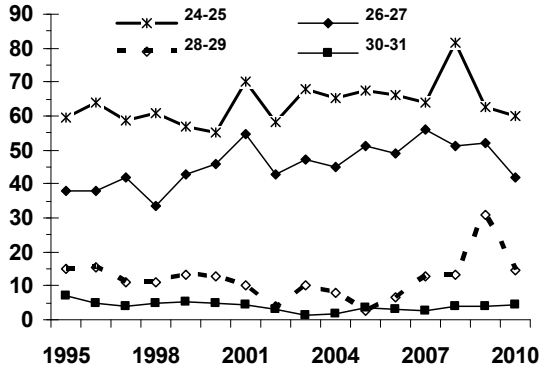

Figure 96: Median days on CPAP + IPPV

The figures here illustrate median days on respiratory support for inborn survivors, who may be considered a more homogenous population thus more likely to reflect unit philosophy on respiratory support than those outborn.

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 are small so this may reflect normal variation rather than any change in practice.

The introduction of CPAP also resulted in a decline in the median number of days on IPPV for infants 26-27 weeks gestation. Since 1999 this has remained fairly constant 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. In 2009, there was a peak in use for more mature infants at 28-29 weeks gestation but this was not sustained in 2010. The cause of this is uncertain but could reflect changes in the method of weaning from CPAP, particularly with a shift from the practice of “cycling off” CPAP to use of high flow humidified Air / Oxygen.

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

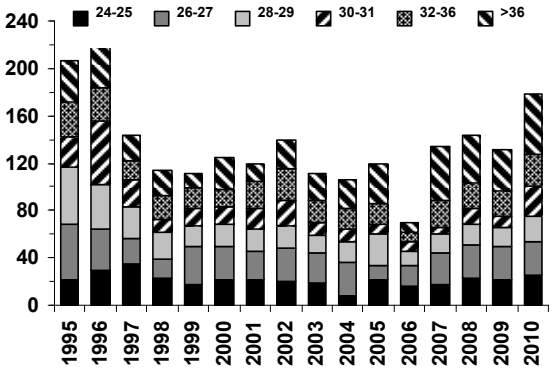

Figure 97: Number on IPPV

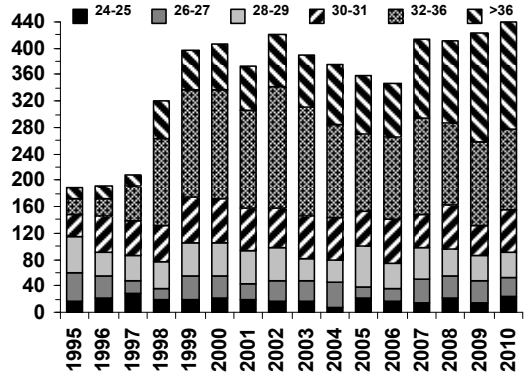

Figure 98: Number on CPAP

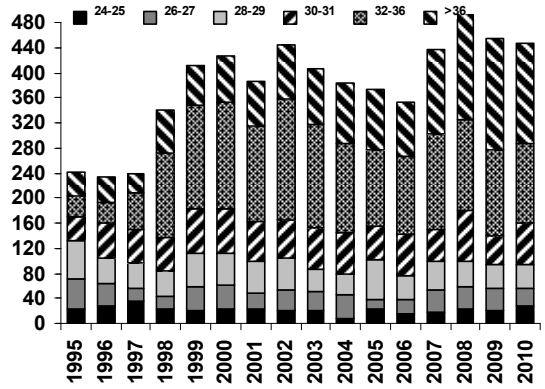

Figure 99: Number on CPAP + IPPV

These figures show the number of babies requiring respiratory support at ACH over the last 14 years. For 2010 there was an increase in ventilation, which has been a trend since 2006 and reflects work load acuity.

The effect of introducing double short-pronged Hudson® CPAP in 1997 is clear with a reduction in number receiving intubation and assisted ventilation.

Head-box oxygen administration was also phased out and all babies requiring oxygen were placed on CPAP. There was a concomitant increase in the use of CPAP, particularly in babies from 32-36 weeks gestation.

From 2011 we will also report data on the use of High Flow Humidified Air / Oxygen, which has been introduced as a method of weaning infants from CPAP. Some units use this as mode of primary respiratory support but at present the ACH NICU only utilise it for weaning. Note also that at present ACH does not use any method of non invasive ventilation such as Nasal IPPV.

9.4.9 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).

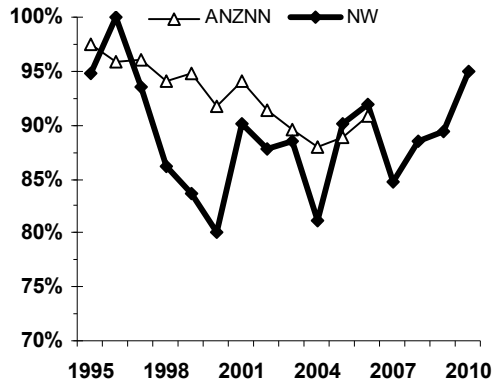

Figure 100: Percentage on IPPV (24-27 wks ANZNN assigned)

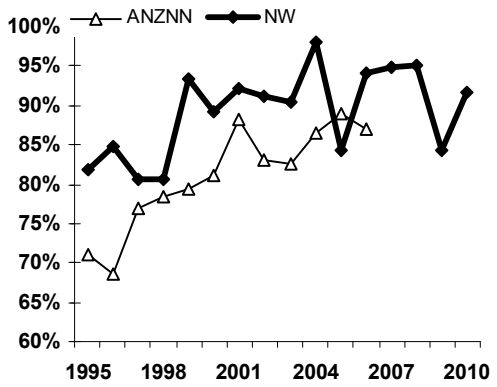

Figure 101: Percentage on CPAP (24-27 wks ANZNN assigned)

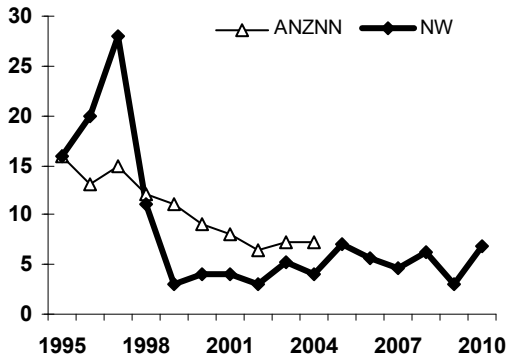

Figure 102: Median days on IPPV (24-27 wks ANZNN assigned)

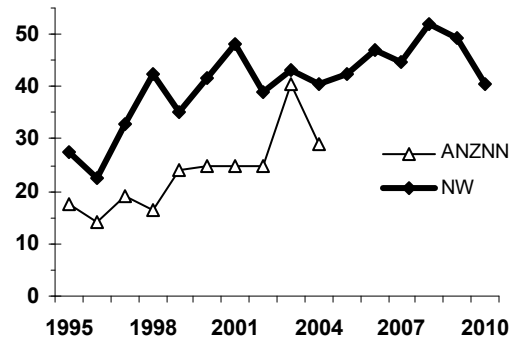

Figure 103: Median days on CPAP (24-27 wks ANZNN assigned)

Since ACH changed its 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. Current ACH data are consistent with previous years but contemporary ANZNN data are not as yet available for comparison.

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

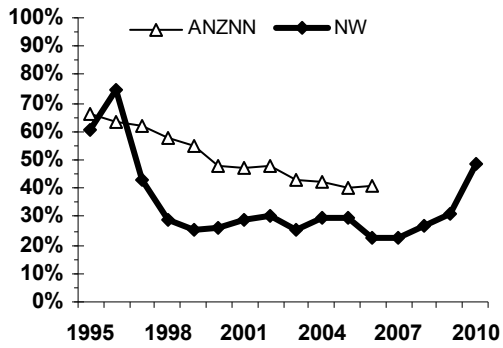

Figure 104: Percentage on IPPV (28-31 wks ANZNN assigned)

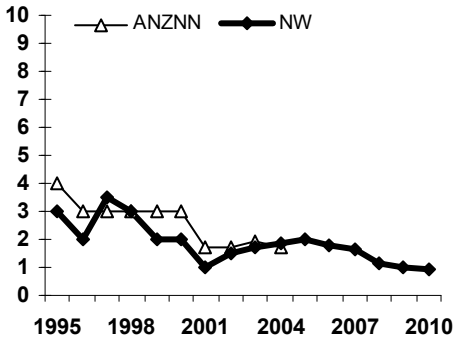

Figure 105: Median days on IPPV (28-31 wks ANZNN assigned)

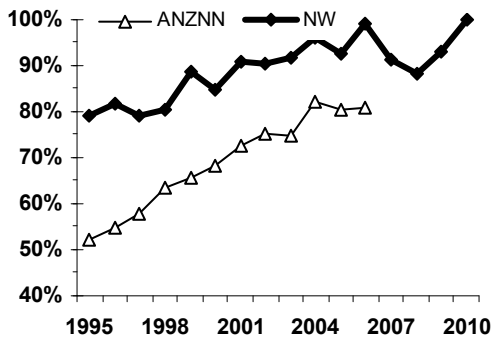

Figure 106: Percentage on CPAP (28-31 wks ANZNN assigned)

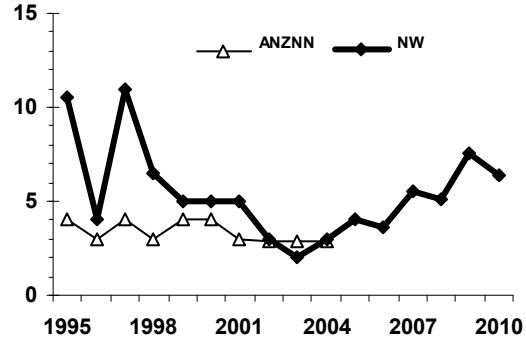

Figure 107: Median days on CPAP (28-31 wks ANZNN assigned)

The pattern of respiratory support in NW babies of 28-31 weeks gestation parallels that seen in the less mature babies. Again recent ANZNN data are not currently available for comparison.

9.4.11 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 2010 the survival following use of both HFOV and iNO was 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 79: HFOV and inhaled nitric oxide (iNO) use and survival (2010)

	HFOV		iNO		HFOV + iNO	
	Treated n	Survivors n(%)	Treated n	Survivors n(%)	Treated n	Survivors n(%)
Total	**28**	**21(80)**	**36**	**32(89)**	**15**	**12(80)**
<28 weeks	18	12(67)	9	7(78)	7	5(71)
28-31 weeks	3	3(100)	5	3(60)	2	2(100)
32-36 weeks	3	2(67)	4	4(100)	2	1(50)
≥37 weeks	4	4(100)	18	18(100)	4	4(100)

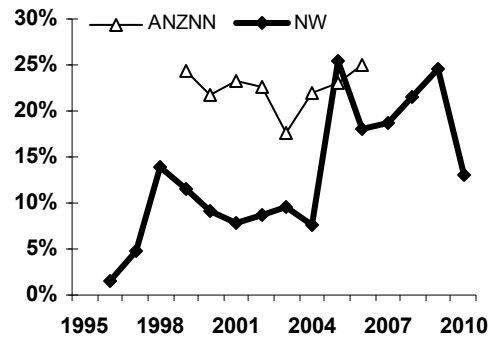

Figure 108: HFOV at 24-27 weeks (ANZNN assigned babies)

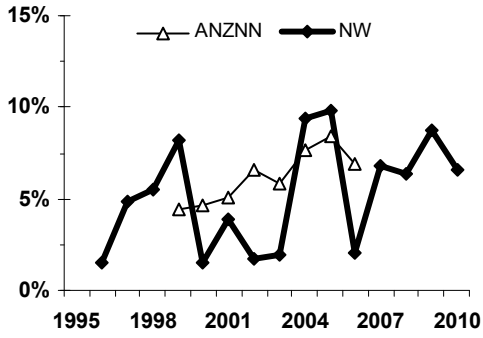

Figure 109: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies)

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. Although HFOV use has increased since 2003 it was used less in 2010.

9.4.12 Term/post-term infants on assisted ventilation from 1995 to 2010

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 and in both 2008 and 2009 there was a steep increase in numbers receiving CPAP followed by a slight decrease in 2010.

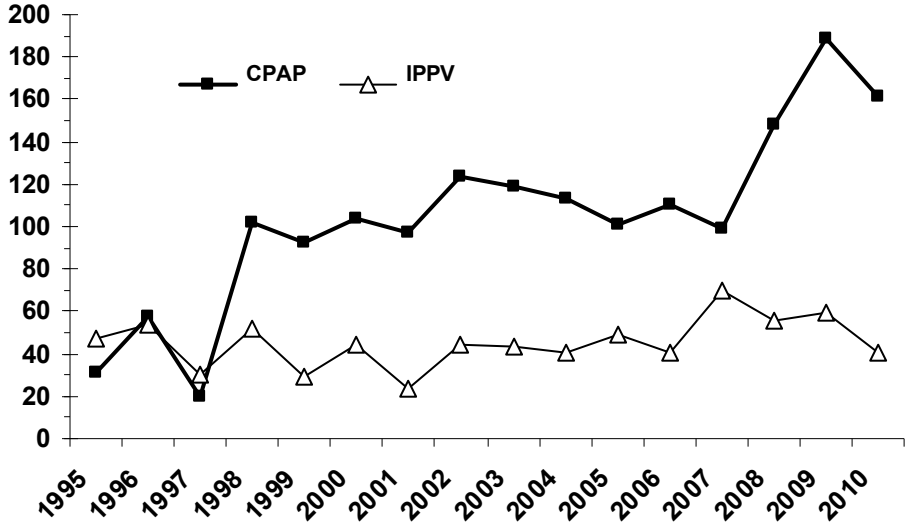

Figure 110: Number of term and post term babies needing assisted ventilation

In previous years the most common reasons for ventilating term infants were meconium aspiration or persistent pulmonary hypertension of the newborn (PPHN) In 2010, TTN/RDS, meconium/ PPHN, congenital anomalies, support for surgery, neonatal encephalopathy and "other", which could include a neuromuscular problem were the reasons for ventilation (see Appendix 8). Prior to the move to the current site some of these infants would have been transferred early to Starship Hospital but now they stay in NICU with input from visiting paediatric and surgical specialists.

In 2010, the most common reason for using CPAP was transient tachypnoea of the newborn with 88 babies on CPAP (>50% of CPAP use at term), followed by other, meconium aspiration and infection (Appendix 8).

9.5 Outcomes

9.5.1 Survival of NW inborn babies by birthweight

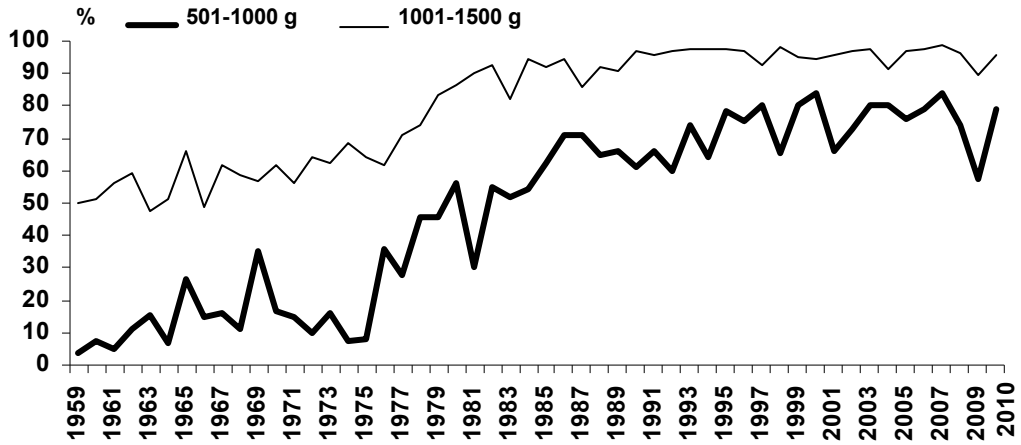

Figure 111: Neonatal survival (0-28 days) of ≤1500g inborn live births from 1959 to 2010

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 ventilatory support 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

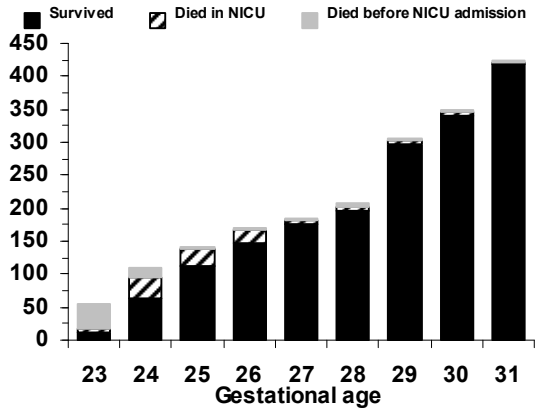

Figure 112: Numbers of live inborn babies 23 to 31 weeks gestation in 2000-2010

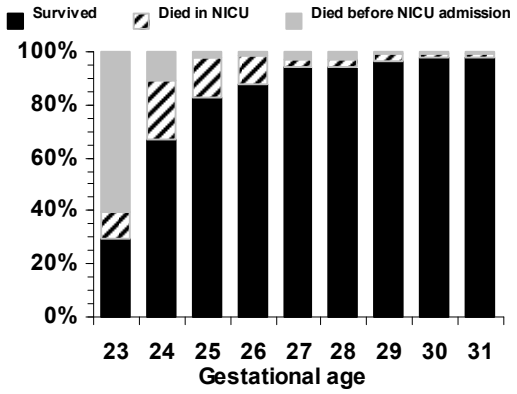

Figure 113: Survival of live inborn babies 23-31 weeks 2000-2010 (n = 1606)

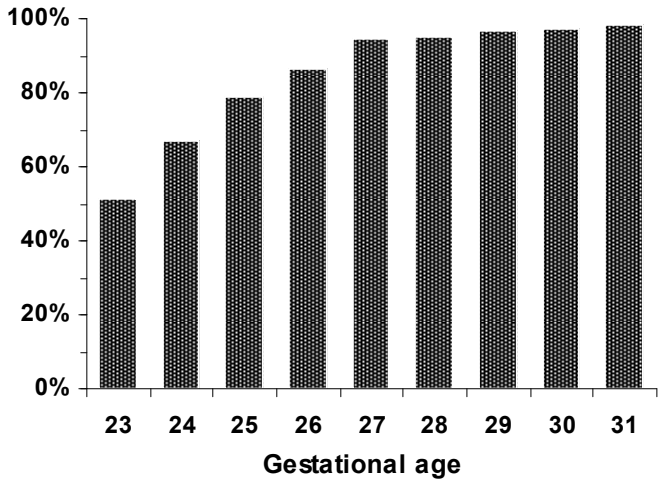

Figure 114: Survival of live inborn babies admitted to NICU from 1995 to 2010 (n =2597)

The number of infants born at 23 weeks gestation who survive in a single year is low. However, there is a steep increase in survival 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 and present survival rates are not significantly different to those of earlier years.

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

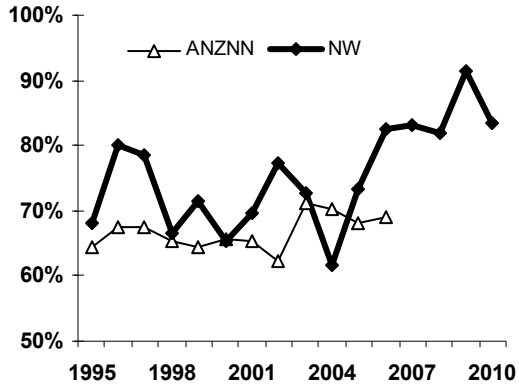

Figure 115: Survival at 24-25 weeks gestation compared with ANZNN data

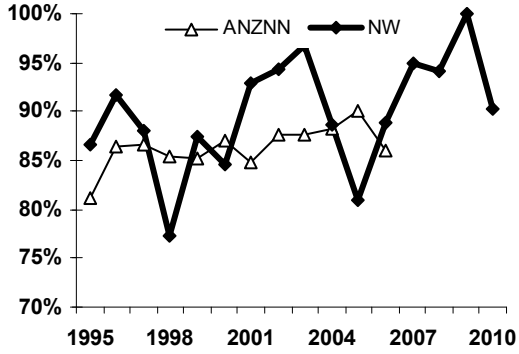

Figure 116: Survival at 26-27 weeks compared with ANZNN data

Survival at ACH at these immature gestations is consistently good. The relatively small numbers at 24-25 weeks gestation account for the year to year variation at ACH. Over the 12 years, there were between 21 and 37 babies per year. 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 2010 two inborn babies developed cystic PVL. One baby who was inborn at ACH (600g and 24 wks gestation) had a complex course including severe intraventricular haemorrhage and developed cystic PVL on the 28 day ultrasound scan. Another inborn baby (1650g and 31 wks gestation) was born following a pregnancy complicated by antepartum haemorrhage and was initially hypotensive. Early ultrasound scan on day 5 showed bilateral periventricular echogenicity, which evolved to right sided cystic change on day 12.

9.5.5 Retinopathy of prematurity benchmarked with ANZNN

Although changes in the screening technique and the appointment of a new ophthalmologist in 2006 were associated with an increased incidence of ROP, 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. For the past 5 years: 60% (2010); 42% (2009); 51% (2008); 41% (2007); and 58% (2006) of infants screened had Stage 1 or 2 ROP, compared with 4% and 6% in 2005 and 2004 respectively. Likewise, the rates of significant (Stage 3 or 4) ROP were 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 2010, 7 inborn babies received laser therapy for advanced ROP compared with 11, 8, 6 and 4 for years 2006-9 respectively.

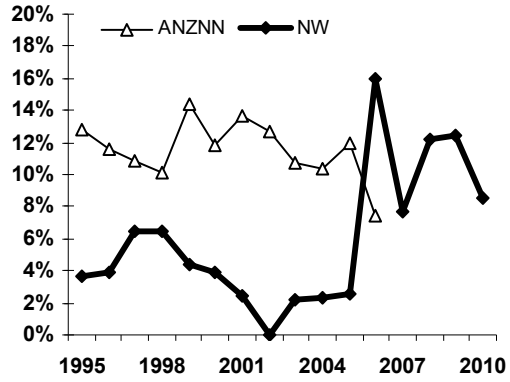

Figure 117: ROP at 24-27 weeks

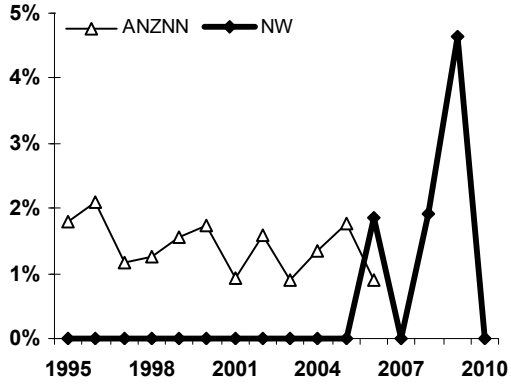

Figure 118: ROP at 28-31 weeks

9.5.6 Chronic lung disease benchmarked with ANZNN

The ANZNN definition of chronic lung disease is used: *CLD is the requirement for oxygen or any form of respiratory support (CPAP or IPPV) at 36 weeks post menstrual age.* In some publications, the definition is only a requirement for supplemental oxygen. Including respiratory support in the definition increases the incidence.

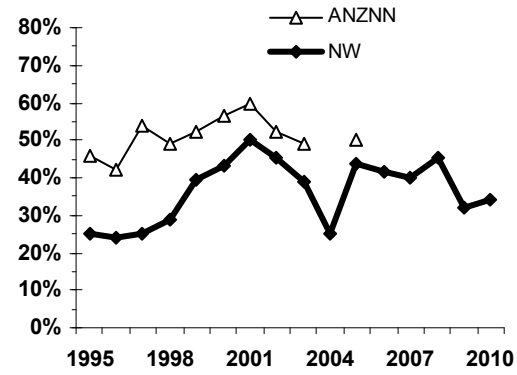

Figure 119: Chronic lung disease at 24-27weeks

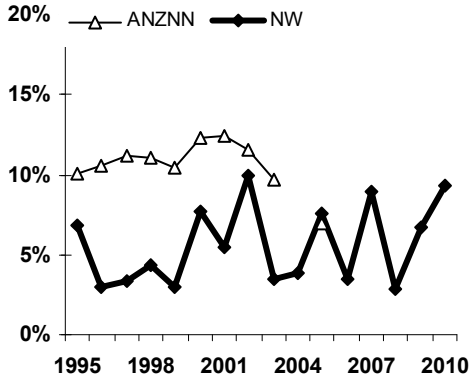

Figure 120: Chronic lung disease at 28-31weeks

Overall ANZNN data demonstrate that for infants 24-27 weeks gestation there was an increase in the rate of CLD in the late 1990s. ACH data seem to mirror this pattern and the subsequent relative decrease in CLD that occurred up to 2003. However, both in this group and in 28-31 week gestation infants the incidence of CLD at ACH compares favourably with the Network data overall. Unfortunately comparison with ANZNN data for subsequent years is not possible due to changes in reporting and unavailable data.

The definition of CLD is not entirely satisfactory, as the condition is defined by the treatment being given. Changes in the target oxygen saturation levels increased in the late 1990s, which was associated with an increase in rates of CLD in the late 1990s only then to fall in 2002 with the presentation of the BOOST trial of oxygen saturation in CLD. For 2010 the guidelines for targeting were unchanged.

9.5.7 Necrotising enterocolitis benchmarked with ANZNN

In 2010, 8 inborn infants (5% <32 week gestation infants) developed proven NEC. Although the incidence was low overall, there has been a pattern of variability with an increase in the incidence 2002 to 2005 and again 2007 to 2009 in infants under 28 weeks gestation. Rates were lower in 2010, but not statistically significantly lower, so the variation can be attributed to random variation.

An additional nine infants with suspected or proven NEC were transferred in from other hospitals. Infants with NEC, particularly severe NEC, may have long periods of stay in the neonatal unit due to short bowel syndrome and complex nutritional needs.

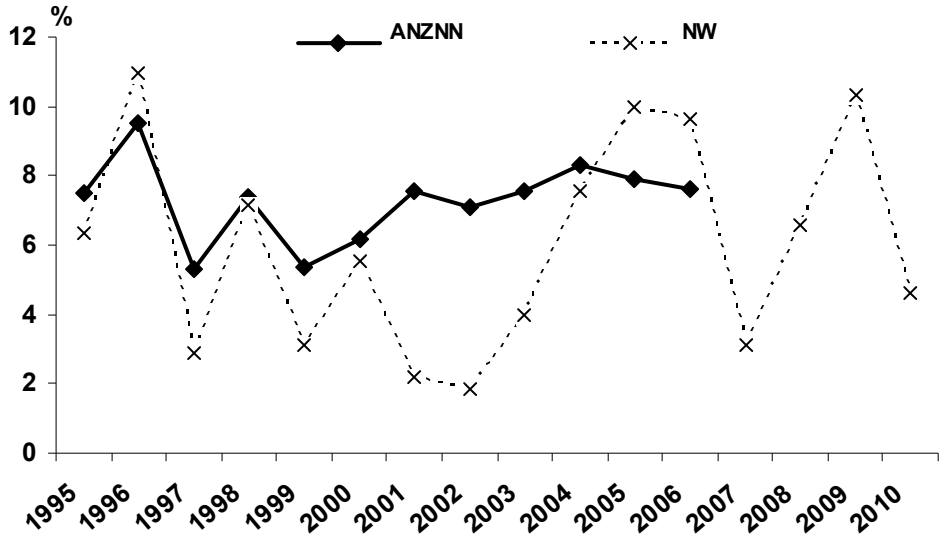

Figure 121: NEC in ANZNN assigned babies under 28 weeks gestation compared with the incidence in ANZNN 1995-2010

9.5.8 Patent Ductus Arteriosus (ANZNN babies)

In 2010, 28 inborn infants were treated medically for a symptomatic PDA. One of these babies was part of the INDUCE trial, a randomised controlled pilot trial examining medical treatment of the duct. In February, Indomethacin which had been the standard first line treatment became unavailable so was replaced with Ibuprofen as the primary treatment for 22 infants. Later in the year a limited supply of Indomethacin became available for use as a second line treatment and this was used in three babies. In 2010, two inborn (ANZNN benchmarked) NICU infants had surgical ligation of their PDA. 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 (ANZNN babies)

In total fifteen babies developed a pneumothorax that needed drainage in 2010. An additional 16 babies were found to have a small pneumothorax that did not require a procedure and resolved spontaneously. Of the infants who required drainage of a pneumothorax, five were outborn. Although the majority of babies requiring drainage of pneumothorax were preterm with respiratory distress syndrome, three were not and had meconium aspiration, tracheo-oesophageal atresia and infection as their primary diagnoses. In 2010, two inborn (ANZNN benchmarked) NICU infants had drainage of a pneumothorax.

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 2010, the overall rate for postnatal steroid use was 12% for the group of babies benchmarked with ANZNN. The rates of those treated varied from 56% for infants 24-25 weeks gestation to 0% for 30-31 weeks gestation.

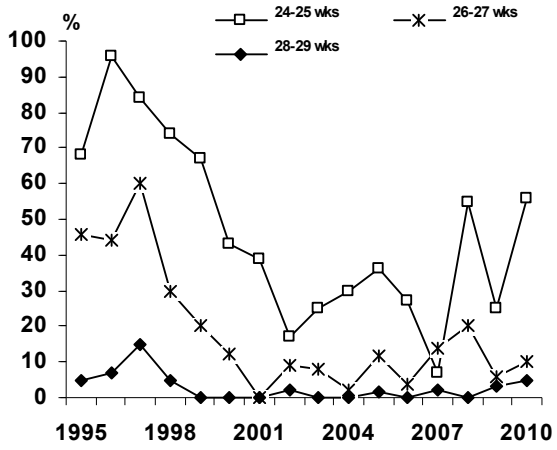

Figure 122: Percentage receiving postnatal dexamethasone by gestational age (ANZNN alive at one week <32wks)

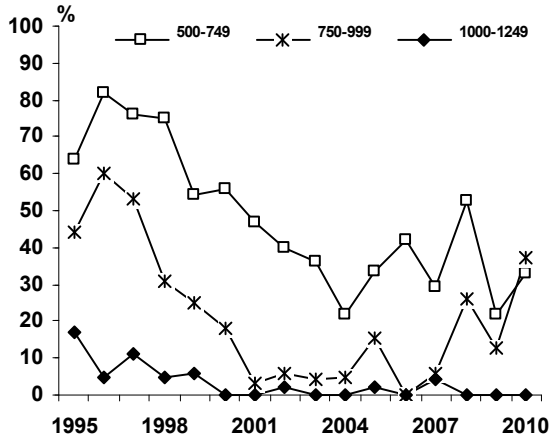

Figure 123: Percentage receiving postnatal dexamethasone by birth weight (ANZNN alive at one week <1500g)

9.6 Immunisation

9.6.1 Hepatitis B

In 2010, 15 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. One other baby received immunisation and Hep B immunoglobulin as the maternal serology was unknown at the time of NICU admission.

9.6.2 BCG

In 2010 there were 92 babies who were given BCG vaccination whilst in the neonatal unit.

9.6.3 Infrarix Hexa and Prevanar at 6 weeks

There were 110 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. One hundred and three babies (93.7%) had their immunisation at the routine time. Of the seven babies who did not have immunisation at the routine time, one infant was palliative care, two infants were transferred to other centres and vaccinated there, and vaccination was delayed in four infants due to clinical considerations including steroid use.

9.6.4 Infrarix Hexa and Prevanar at 3 months

There were 32 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 25 (75%) received these at the routine time. Of the 7 babies who did not have immunisation at the routine time; four were delayed due to treatment with dexamethasone for chronic lung disease, two were transferred in for surgery / cardiac surgery and were vaccinated post procedure, one was delayed due to problems with major sepsis and so the immunisations were given later after recovery.

9.7 Infant Feeding

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 2010 report show that over 80% of infants in the NICU receive breast milk to some degree. It is particularly pleasing to note that 60-70% of infants were fully or exclusively fed breast milk. Overall these data are consistent with the high rates of breast milk feeding reported for 2009. 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.

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.

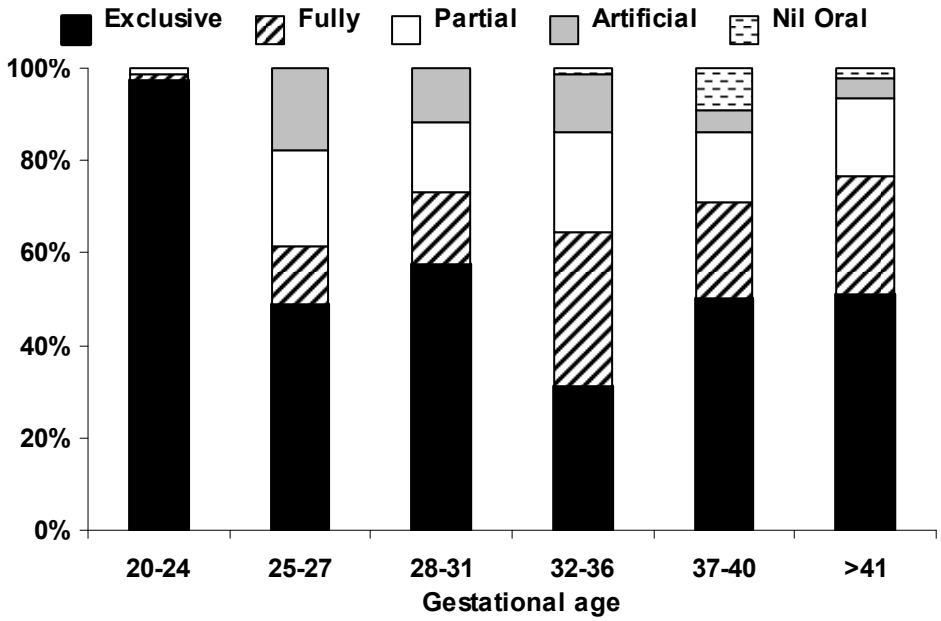

Figure 124: Method of feeding at discharge from NICU by gestational age

9.8 Neonatal deaths prior to NICU discharge among babies admitted to NICU

There were 22 neonatal and infant deaths occurring in inborn infants plus 12 deaths in outborn infants admitted to the NICU during 2010. 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[1]. 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.

In 2009, 12 of the inborn deaths in NICU (54%) occurred in babies of <28 weeks gestation. There were 4 term or late preterm infants who were inborn and died in NICU. Three had significant anomalies including: cardiac disease, multiple congenital anomalies and Trisomy 13. The other had a cardiac anomaly but died from the effects of major sub galeal haemorrhage. There were also three outborn term babies transferred with neonatal encephalopathy who died.

[1] (http://www.adhb.govt.nz/newborn/Guidelines/Admission/BorderlineViability.htm)

9.9 Child Development Unit

9.9.1 Follow up at 2 years (corrected) of Children under 1500 grams born in 2008

One hundred and forty-three infants who weighed <1500 grams, survived to discharge from the Newborn Service. Forty-nine (34%) weighed <1000 grams at birth.

Four infants had congenital abnormalities and were excluded from the following tables. No infants were known to have died after discharge from National Women's. Twelve children were lost to followup – none weighed less than 1000 grams. Six were from other centres in New Zealand, one lived overseas, and five did not attend appointments. Data were obtained for 127 (91%) children.

One hundred and eleven 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), 16 reports were obtained from paediatricians and other professionals monitoring the children's progress.

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

Table 80: 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* Mental Score 2 or more standard deviations below mean)
Category II	**One or more of the following**	
	(i)	Bayley* Mental 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 Mental score within average range)
Category IV	**Normal development**	
	(i)	No apparent tone disorder, and
	(ii)	No apparent developmental delay (Bayley* Mental and Motor Scores within average range or above)

Note: Outcome categories modified from Kitchen et al, 1984, 1987.

* Bayley Scales of Infant & Toddler Development III – all scores adjusted for gestational age.

** Category III is included to signal that a number of preterm infants tested at an early age have minor tone disorders or motor delay. These may improve as the children mature with age and experience.

Table 81: Outcome categories at 2 years for children under 1500g born in 2008 (n=127)

	Number	Description
Category I	4 (3.1%)	1 child with evolving spastic quadriplegia and strabismus 1 child with sensorineural hearing loss with aids, and global delay 1 child with dystonic cerebral palsy and strabismus 1 child with low cognitive, motor and language scores.
Category II	16 (12.6%)	1 child with cerebral palsy and low cognitive and motor scores 3 children with spastic diplegia 4 children with low cognitive, motor and language scores 5 children with low cognitive and language scores 2 children with general delay 1 child with low language scores
Category III	3 (2.4%)	3 children with motor delay
Category IV	104 (81.9%)	

Table 82: Outcome of children <1500g born in 2008 at 2 years by gestational age groups (n=127)

	Gestational age (weeks)					
Outcome	**24 - 28 weeks n=60**		**29 – 34 weeks n=67**		**Total n=127**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	4	6.7	0		4	3.1
II	11	18.3	5	7.5	16	12.6
III	3	5.0	0		3	2.4
IV	42	70.0	62	92.5	104	81.9

Table 83: Outcome of children <1500g born in 2008 at 2 years by birth weight groups (n=127)

	Birthweight (grams)					
Outcome	**<1000g n=47**		**1000 – 1499g n=80**		**Total n=127**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	2	4.3	2	2.5	4	3.1
II	11	23.4	5	6.3	16	12.6
III	2	4.3	1	1.2	3	2.4
IV	32	68.0	72	90.0	104	81.9

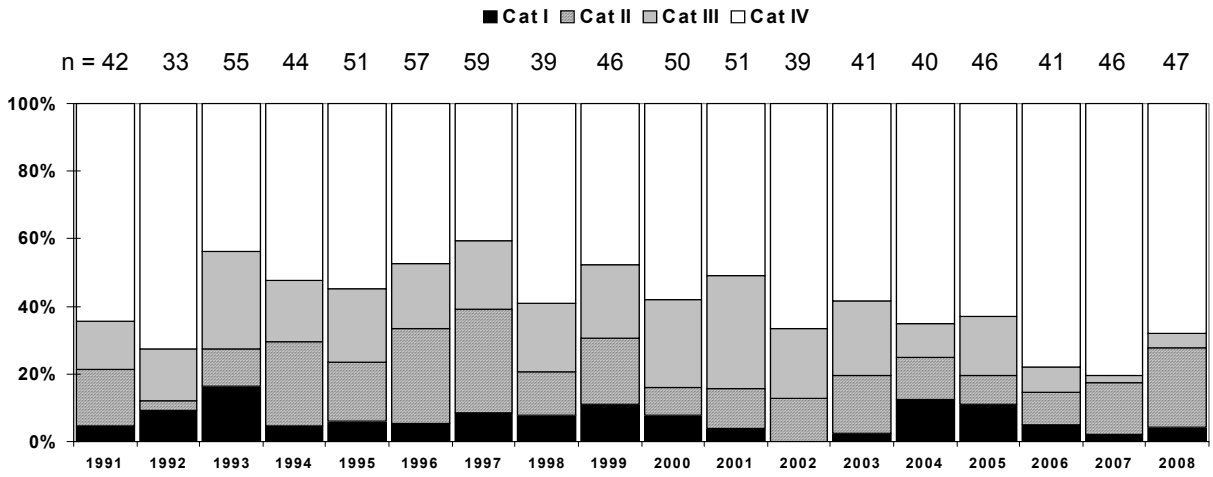

Figure 125: Outcome at 18-24 months of children <1000g birth weight born 1991-2008

9.9.2 Development at 4 years of children under 1500g born in 2006

One hundred and forty-four children born in 2006, who weighed less than 1500 grams, were cared for in the Newborn Service, survived to hospital discharge. There were 46 infants less than 1000grams. Four children had congenital abnormalities and were not included in the analyses of data.

Three infants were known to have died after discharge from National Women's.

At 4 years, data were obtained for 99 children. Of the 38 not assessed 22 (58%) 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 84: Outcome categories at 4 years

Category I	(Severe disability): one or more of the following	
	(i)	Sensorineural deafness (requiring hearing aids)
	(ii)	Bilateral blindness
	(iii)	Severe cerebral palsy
	(iv)	Stanford-Binet* Composite Score (Full Scale IQ) 2 or more standard deviations below mean
Category II	One or more of the following:	
	(i) (ii)	Mild-moderate cerebral palsy Stanford-Binet* Composite Score (Full Scale IQ) between 1 & 2 standard deviations below mean.
Category III		Motor Skills† Standard Score more than one standard deviation below mean
Category IV	Normal development i.e. none of the above	

* *The Stanford-Binet Intelligence Scales 5th edition.*
† *Vineland Adaptive Behavior Scales, 2005* : Motor Skills Domain.

Table 85: Outcome categories at 4 years for children under 1500g born 2006 (n =99)

	Number	Description
Category I	8 (8%)	1 child with severe visual loss – complete retinal detachment R eye and partial detachment L eye. 1 child with low cognitive, language and motor scores, hypotonia, and microcephaly. 1 child with low cognitive, language and motor scores, and Autistic Spectrum Disorder. 1 child with Autistic Spectrum Disorder (Report from Paediatrician). 1 child with low cognitive, language and motor scores. 3 children with low cognitive and language scores.
Category II	6 (6%)	1 child with global developmental delay, shunted hydrocephalus and squint. 1 child with low cognitive, language and motor scores. 1 child with low cognitive and language scores, and auditory dys-synchrony. 1 child with low cognitive and motor scores 1 child with low cognitive and language scores. 1 child with speech/language and behavioural difficulties.
Category III	1 (1%)	1 child with low motor scores.
Category IV	84 (85%)	

Summary

There are dozens of reports that very low birth weight (VLBW) infants are at increased risk for developmental problems, particularly those children who were less than 1000 grams or under 28 weeks gestation. Therefore it is essential that each hospital with a neonatal intensive care unit has a followup programme, at least until the children are five (school age in New Zealand). If developmental difficulties are detected at an early age, the children can be referred for early intervention in the community where they live.

To date, an important feature of our audits of VLBW infants has been the excellent retrieval rate at 2 years. Despite the fact that a number of newborns are drawn from Northland and other centres in New Zealand, follow-up information has been obtained for up to 94% of these high-risk infants.

Only 3% of children <1500 grams born during 2008, and assessed at 2 years corrected age, had severe impairment or disability, while a further 13% had fewer problems. Further, for children born in 2006, and assessed at 4 years, 85% were classified under “normal development”.

Chapter 10

PERINATAL MORTALITY

10 PERINATAL MORTALITY

This chapter provides information on perinatal and maternal 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 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 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 high 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 mortality rates.

Perinatal 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 deaths are reviewed monthly by a multidisciplinary team comprising an obstetrician (MFM subspecialist), neonatologist, midwife, perinatal pathologist and administrator. This group classifies the cause of death and summarises recommendations for management if there is a future pregnancy. There is also a service wide monthly quality meeting. Any issues requiring further investigation in terms of aspects of clinical practice or systems/policies are referred to the Maternal Clinical Review Committee.

10.1 Perinatal and perinatal-related mortality rates

Table 86: Inborn and BBA deaths

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Fetal deaths	20-22 weeks	33	20	30	23	25	26	24	24	29	24	33
	23-24 weeks	12	10	10	8	18	11	12	15	11	14	9
	25-26 weeks	9	2	4	6	3	3	6	7	4	4	8
	27-28 weeks	3	1	2	1	10	6	3	5	8	6	5
	29-38 weeks	27	15	17	24	13	17	24	19	21	19	24
	>38 weeks		9	6	2	13	5	5	12	3	8	4
Total fetal deaths		**84**	**57**	**69**	**64**	**82**	**68**	**74**	**82**	**76**	**75**	**83**
Neonatal deaths	Early neonatal deaths (≤7 days)	43	32	40	34	33	38	23	20	26	27	26
	Late neonatal deaths (8-28 days)	9	5	7	7	9	5	2	9	8	10	8
Total neonatal deaths		**52**	**37**	**47**	**41**	**42**	**43**	**25**	**29**	**34**	**37**	**34**
Total deaths		136	94	116	105	124	111	99	111	110	112	117
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
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
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

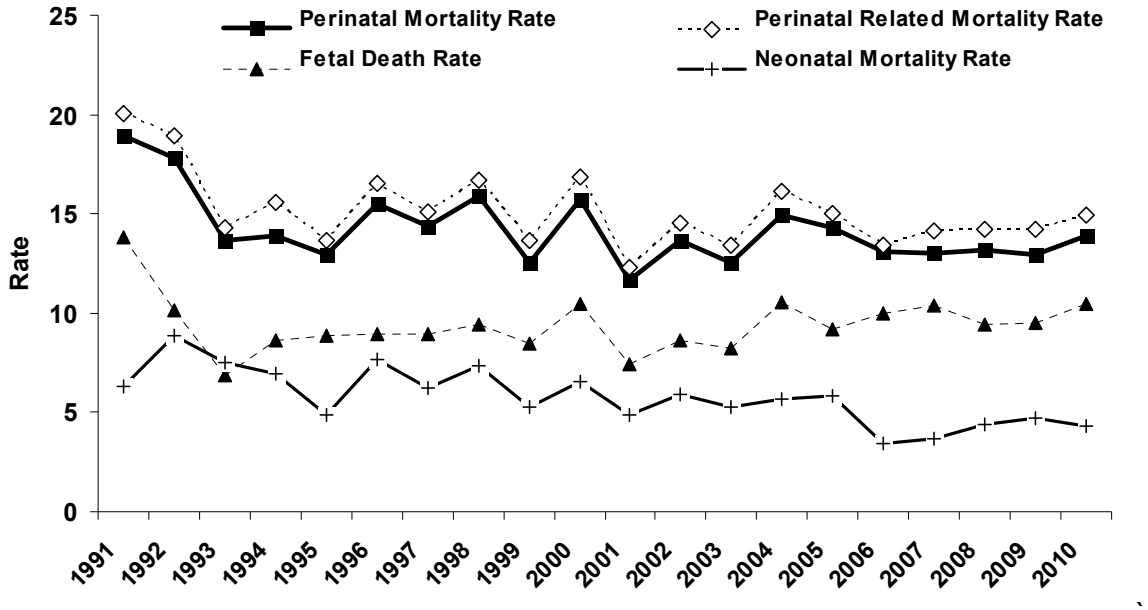

Figure 126: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate (1991-2010) (all rates expressed as deaths/1000 births)

The perinatal mortality, fetal death and neonatal mortality rates have been very stable over the last 3 years.

Table 87: Perinatal related loss and DHB of residence

DHB of residence	TOP n=35		Stillbirth n=48		Neonatal death n=34		Perinatal related death n=117	
	n	%	n	%	n	%	n	%
Auckland	26	74	29	60	17	50	72	62
Counties Manukau	1	3	3	6	3	9	7	6
Waitemata	8	23	12	25	10	29	30	26
Other			4	8	4	12	8	7

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

Thirty eight percent of perinatal deaths occurred in women who did not reside in Auckland DHB area. The majority of these deaths were babies who required transfer to our tertiary centre for care. The perinatal related mortality rate for women resident in ADHB area and giving birth at National Women's in 2010 was 13.1/1000 total births.

10.2 Gestational age and perinatal-related loss

Table 88: Gestational age and perinatal related mortality

	Births		Fetal deaths			Neonatal deaths			Total perinatal related deaths		
	n	%	n	%	FD risk*	n	%	NND risk **	n	%	Perinatal related mortality risk***
<24 weeks	50	0.6	37	44.6	4.7	13	38.2	1000	50	42.7	6.4
24-27 weeks	75	1.0	17	20.5	2.2	7	20.6	120.6	24	20.5	3.1
28-31 weeks	121	1.5	10	12.0	1.3	3	8.8	27.0	13	11.1	1.7
32-36 weeks	547	7.0	11	13.3	1.4	4	11.8	7.5	15	12.8	2.0
37-40 weeks	5962	75.8	7	8.4	1.0	6	17.6	1.0	13	11.1	1.8
≥41 weeks	1111	14.1	1	1.2	0.9	1	2.9	0.9	2	1.7	1.8
Total	7866		83		10.5	34		4.4	117		14.9

* Fetal death risk = number of fetal deaths per 1000 babies remaining in utero
** NND risk = 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 mortality

Table 89: Multiple births and perinatal related mortality

	Births		Fetal deaths			Neonatal deaths			Total perinatal related deaths		
	n	%	n	%	FD rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Singleton	7556	96.1	75	90.3	9.9	26	76.5	3.5	101	86.3	13.4
Multiple	310	3.9	8	9.6	25.8	8	23.5	26.5	16	13.7	51.6
Total	7866		83		10.6	34		4.4	117		14.9

* 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 continues to be 4 times higher than the rate for singleton pregnancies, confirming the high risk nature of these pregnancies especially in monochorionic twin pregnancies. Details regarding the causes of deaths in multiple pregnancies are found in section 5.3.

10.4 Lead maternity carer (LMC) and perinatal mortality

Table 90: LMC at birth and perinatal related mortality

	Births		Fetal deaths			Neonatal deaths			Total perinatal related deaths		
	n	%	n	%	FD rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Independent Midwife	3574	45.4	23	27.7	6.4	6	17.6	1.7	29	24.8	8.1
Private Obstetrician	1785	22.7	13	15.7	7.3	4	11.8	2.3	17	14.5	9.5
G.P.	94	1.2	1	1.2	10.6	0	0.0	0.0	1	0.9	10.6
NW Community	1547	19.7	11	13.3	7.1	4	11.8	2.6	15	12.8	9.7
NW Diabetes	328	4.2	3	3.6	9.1	2	5.9	6.2	5	4.3	15.2
NW Medical	409	5.2	25	30.1	61.1	16	47.1	41.7	41	35.0	100.2
Other DHB	72	0.9	4	4.8	55.6	0	0.0	0.0	4	3.4	55.6
Unbooked	57	0.7	3	3.6	52.6	2	5.9	37.0	5	4.3	87.7
Total	7866		83		10.6	34		4.4	117		14.9

* 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 mortality (87.7/1000).
Deaths attributed to women attending the medical clinic also includes deaths in the fetal medicine service. Ten of the 41 deaths (25%) were terminations of pregnancy. The commonest causes of death in this group were congenital abnormality 17 (41%), preterm birth 6 (15%), antepartum haemorrhage 6 (15%) specific perinatal condition (largely twin to twin transfusion syndrome (7%)

10.5 Causes of perinatal-related deaths

Table 91: Fetal and neonatal death by Perinatal Death Classification (PSANZ-PDC) 2010

	Fetal deaths n=83			Neonatal deaths n=34			Total n=117		
	n	%	Rate*	n	%	Rate**	n	%	Rate*
Congenital abnormality	36	43.4	4.6	12	35.3	1.5	48	41.0	6.1
Perinatal infection	4	4.8	0.5	0	0.0	0.0	4	3.4	0.5
Antepartum haemorrhage	5	6.0	0.6	6	17.6	0.8	11	9.4	1.4
Maternal conditions	8	9.6	1.0	1	2.9	0.1	9	7.7	1.1
Hypertension	4	4.8	0.5	0		0.0	4	3.4	0.5
Specific perinatal conditions	8	9.6	1.0	1	2.9	0.1	9	7.7	1.1
Hypoxic peripartum death	1	1.2	0.1	1	2.9	0.1	2	1.7	0.3
Fetal growth restriction	2	2.4	0.3	0		0.0	2	1.7	0.3
Spontaneous preterm	5	6.0	0.6	13	38.2	1.7	18	15.4	2.3
Unexplained antepartum death	10	12.0	1.3	0		0.0	10	8.5	1.3

* Rate: per 1000 births (n=7866 in 2010) ** Rate: per 1000 live births (n=7783 in 2010)

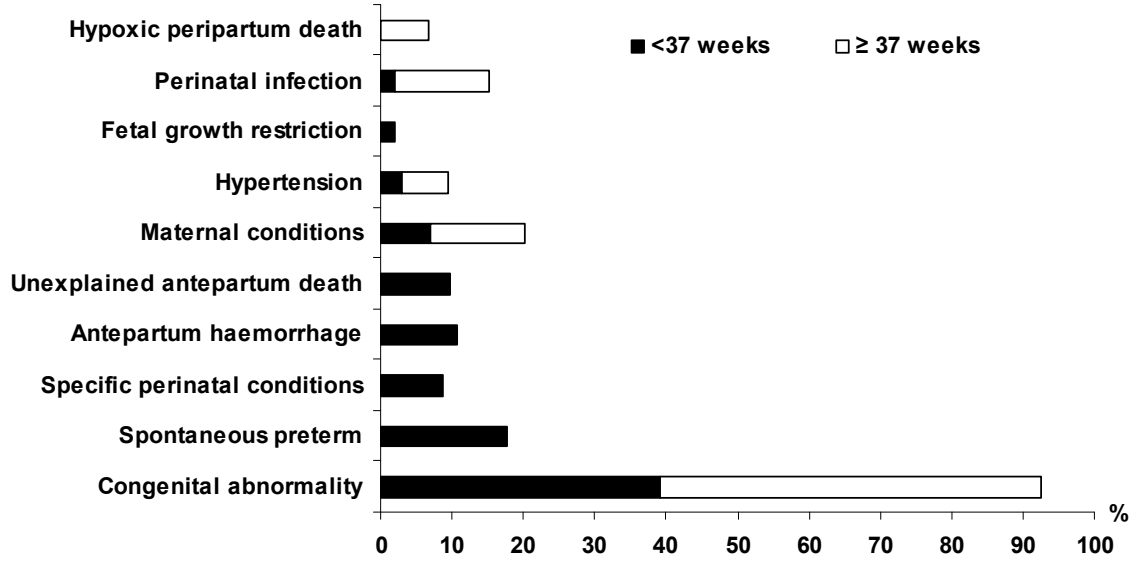

Figure 127: Contribution to perinatal related death by obstetric antecedent cause (PSANZ-PDC) and gestation at birth

The commonest cause of perinatal related deaths is congenital anomalies, which is in keeping with data from previous years.

10.6 Neonatal deaths

Table 92: Neonatal deaths by neonatal classification (PSANZ-NDC) and gestational age

	Total neonatal deaths		< 37 weeks		≥ 37 weeks	
	N	%	n	%	n	%
Total	34		27		7	
Extreme prematurity	14	41	14	52	0	
Congenital abnormality	12	35	6	22	6	86
Infection	0		0		0	
Gastrointestinal	4	12	4	15	0	
Neurological	1	3	0		1	14
Cardio-respiratory disorders	3	9	3	11	0	

10.7 Necropsy

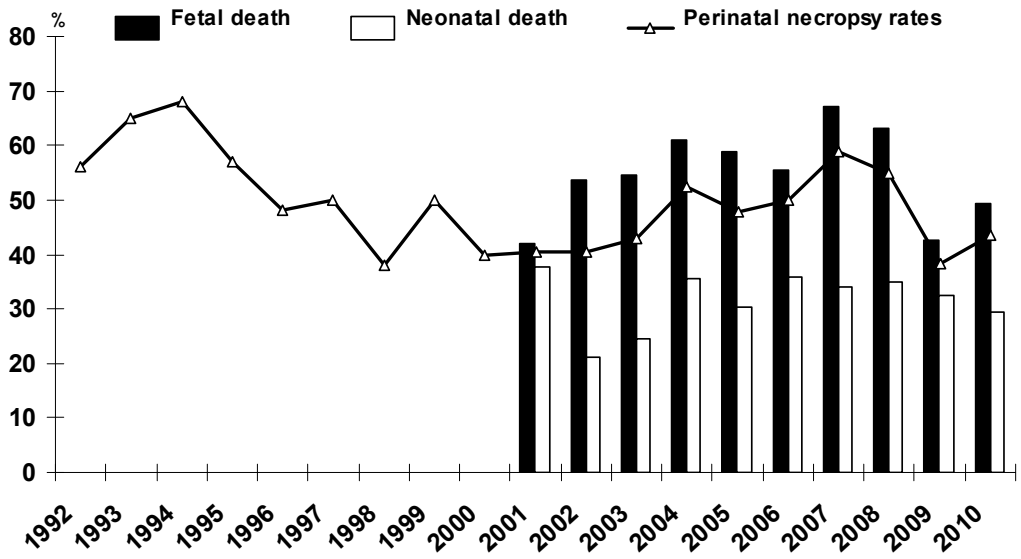

Figure 128: Necropsy rates (1991-2010)

Post-mortem is the gold standard investigation for perinatal death. NW is fortunate to have access to a world-class perinatal pathology service provided by Dr Jane Zuccollo. The post-mortem rate fell to 38% in 2009, and is similar in 2010, much lower than ideal for a tertiary referral centre.

Small for Gestational Age and Perinatal Death

Fetal growth restriction was the primary perinatal death classification assigned for two of the 117 deaths in 2010. However, 56 percent of all perinatal deaths in 2010 were found to be SGA defined as birthweight <10th customised centile; comprising 65 percent of fetal deaths and 41 percent of neonatal deaths. National data from the PMMRC shows that less than a quarter of SGA infants who are stillborn after 24 weeks of gestation were known to be SGA before birth. Customised antenatal growth charts (GROW a free down load from www.gestation.net) were developed as a tool to increase detection of SGA infants before birth. Recent audit data from National Women's Community Clinic has shown increased antenatal detection of SGA infants in those women who had GROW charts in their notes. Generating a GROW chart at the booking visit has also been recommendation for several years in the PMMRC annual reports as current evidence suggests this tool may help to increase antenatal detection of SGA infants.

Chapter 11

SEVERE MATERNAL MORBIDITY

11 SEVERE MATERNAL MORBIDITY

This chapter provides data on maternal deaths and severe maternal morbidities among women giving birth at NW during 2010.

11.1 Maternal Mortality

In 2010 there were no maternal deaths among women who birthed at National Women's.

11.2 Severe Maternal Morbidity

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 AMOSS (the Australasian maternity outcomes surveillance system) under the auspices of the PMMRC (Perinatal and Maternal mortality review committee). 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, eclampsia, peripartum hysterectomy, placenta accreta/percreta/increta, influenza requiring admission to ICU, and BMI>50. The conditions collected may vary from year to year. Data collection started in NZ in January 2010.

Table 93: Incidence of AMOSS reportable severe maternal morbidities at NW 2010

	Women giving birth at NW 2010 n=7709	
Diagnosis	**n**	**per 1000**
Antenatal pulmonary embolism	0	
Amniotic fluid embolism	0	
Eclampsia	1	0.13
Peripartum hysterectomy	7	0.91
Placenta accreta/percreta/increta	14	1.82
Influenza requiring ICU admission	3	0.39

There were 20 admissions of pregnant or postpartum (within 6 weeks) mothers to intensive care or cardiac critical care unit in 2010 (2.6/1000 mothers giving birth).

Chapter 12

GYNAECOLOGY

12 GYNAECOLOGY

This chapter provides data and commentary on fertility (*Fertility PLUS)*, termination of pregnancy, inpatient gynaecologic surgery (specifically hysterectomy, urogynaecology, and laparoscopic procedures) and gynaecologic oncology services.

During 2010, 1117 patients had 1143 gynaecology visits to the Short Stay Surgical Unit at Greenlane Clinical Centre.

12.1 Fertility PLUS

This section documents the IVF and ICSI clinical outcomes from Fertility PLUS in 2010 and a discussion on recent advances in the service.

Table 94: Fertility PLUS IVF/ICSI clinical outcomes

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of cycles started	132	125	289	309	306	316	398	440	458	470	496	468
Number of cycles stopped						41	41	67	63	49	36	30
Percent cycles stopped						13%	10%	15%	12%	10%	7.3%	6.4%
NPSU 2000 benchmark for cycles stopped		10%	10%	10%	10%	10%	10%	10%	10%*	10%*	10%	10%
Number of Cycles reaching Oocyte pick up (OPU)	100	115	230	247	246	275	357	373	405	421	460	438
Number of cycles reaching embryo replacement	80	99	189	201	206	237	304	313	364	369	407	397
Percent cycles reaching embryo replacement						86%	85%	84%	90%	88%	88%	91%
NPSU 2002 benchmark for replacement				87%	87%	87%	87%	87%	83%*	83%*	83%	83%
Number of clinical pregnancies	23	24	57	65	67	83	96	124	130	129	138	141
Clinical pregnancy rate/cycle started						26%	24%	28%	28%	27%	28%	30%
NPSU 2000 benchmark for clinical pregnancy rate/cycle started		24%	24%	24%	24%	24%	24%	24%	24%*	24%	24%	24%
Clinical pregnancy rate/OPU	23%	21%	25%	26%	27%	30%	27%	33%	32%	31%	30%	32%
NPSU 2002 benchmark clinical pregnancy rate /OPU				26%	26%	26%	26%	26%	27%*	26%*	28%	28%
Clinical pregnancy rate/embryo replacement	29%	24%	30%	32%	33%	35%	32%	40%	36%	35%	34%	36%
Clinical pregnancy rate/embryo replacement (women ≤35yrs with FSH<9)						45%	36%	42%	41%	39%	41%	39%
Clinical pregnancy rate/ER in women having single blastocyst transfer.								56%	52%	41%	47%	44%
NPSU 2002 benchmark clinical pregnancy rate/embryo replacement				31%	31%	31%	31%	31%	32%*	31%*	31%	31%
Twin pregnancy rate						20%	12.5%	9.6%	10%	5%	9.5%	11%
NPSU 2002 benchmark twin pregnancy rate				<20%	<20 %	<20 %	<20%	<20%	<12%*	<10%	<10%	10%
Clinical pregnancy rate per thawed embryo replacement										32%	23%	33%
NPSU benchmark for thawed embryo replacements 2007										23%	23%	23%
Twin pregnancy rate after thawed embryo transfer												1%
NPSU benchmark for Twin pregnancy rate after thawed embryo transfer												10%

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

Fertility Plus is delighted that in 2010, it has maintained a busy throughput of patients, achieved very good results and minimised poor outcomes for its patients.

The percentage of IVF/ICSI cycles stopped remains at a low of 6.4%. Despite cancelling fewer cycles, the pregnancy rate per cycle started has remained high at 30% when **all** cycles are included, irrespective of the woman's age. Cancelled cycles have a significant impact on the service, the staff and the patients. Cancellations usually occur after 3 or more weeks of medications and are a financial loss to the service from expensive drugs used. For patients, the discontinuation is emotionally stressful and disturbs their confidence. For the staff it creates a challenge to manage the aftershocks of this turmoil.

In order to reduce the cancellation rates, Fertility Plus has the following strategies -

- Improved identification of potential poor responders and adjusting their drug stimulation.
- Continuing IVF cycles where there are 3 or fewer developed follicles. Our pregnancy rates for such poor responders are lower than average, but still worthwhile. Women who had 3 or fewer eggs recovered still had a clinical pregnancy rate of 34% per embryo transfer.

We adhere to, and champion, the goal of minimising the twin pregnancy rate by encouraging women to replace only one embryo. The twinning rate in 2010 was 11.3% of all fresh embryo transfer pregnancies and 1.4 % in thawed embryo transfers. This gave an overall twinning rate for all ART transfers of 7.7%. One of these twin pregnancies was the result of a single embryo splitting in half after transfer which gave rise to identical twins.

We encourage women to have a single embryo transferred and we culture the embryos to the blastocyst stage whenever possible. The criteria for this is 3 or more good quality embryos on day 3. This extra time in culture does not improve the quality of the embryos, but rather helps the embryologist choose the embryo that has continued to develop well and formed a blastocyst with many cells. The choice is made by morphology- i.e. the appearance of the embryo down the microscope. In the future we hope to be able to use the metabolism of the embryo to help choose the most viable embryo. This will be done by analyzing the medium that the embryo has been cultured in to assess the viability of the embryo. Worldwide there is research into the glucose, pyruvate and amino acid metabolism of embryos in culture to see if this gives information on the most viable embryos.

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 a two-day service. On day one, assessment is undertaken, including psychosocial, medical, legal certification, contraceptive prescription and education. The women will meet with a social worker, community doctor and staff nurse. 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 2010 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 95: Number of terminations

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

Table 96: Number of counselling sessions

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

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.

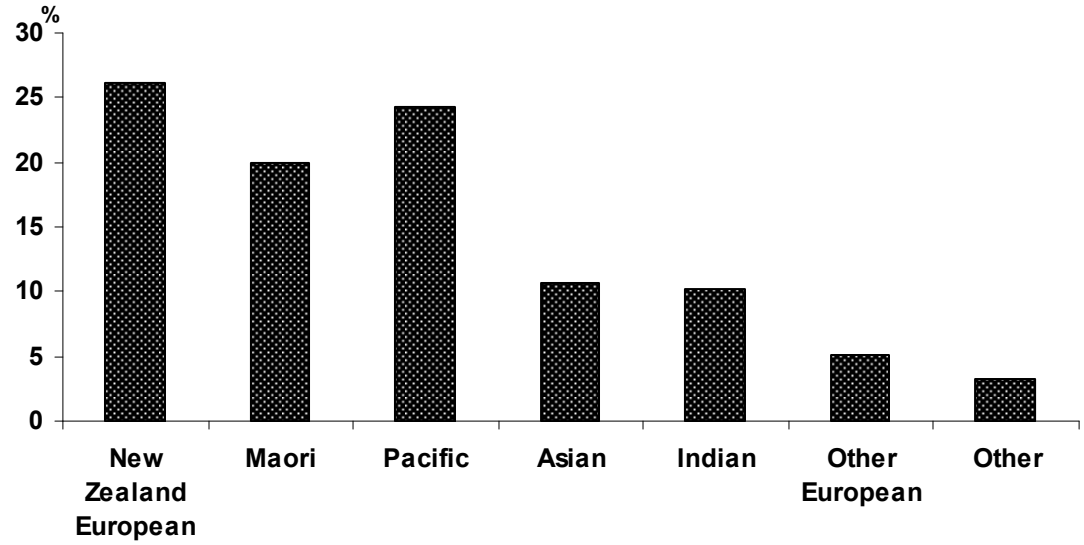

Figure 129: Ethnicity of women having a first trimester termination of pregnancy in 2010

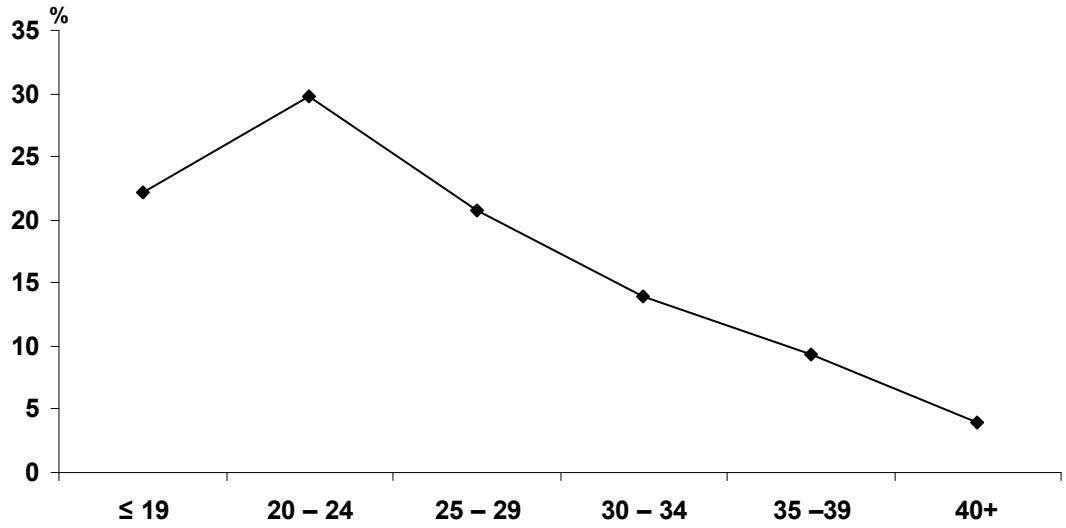

Figure 130: Age of women having a first trimester termination of pregnancy in 2010

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 97: Characteristics of women undergoing second trimester medical termination of pregnancy in 2009-2010

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

Table 98: Clinical details and outcomes of second trimester medical termination 2009-2010

	2009		2010	
	N=59		N=46	
	n		n	%
Mifegynae	47	80	44	96
PV misoprostol	55	93	45	98
Oral misoprostol				
Not given	12	20	4	9
1 dose	19	32	20	43
2 dose	13	22	11	24
3 doses	9	15	5	11
≥ 4 doses	6	10	6	13
Syntocinon infusion	9	15	7	15
Manual removal of placenta	6	10	7	15
Retained products of conception	1	2	3	7
Transfusion	1	2	3	7
Nights in hospital				
0	19	32	13	28
1	33	56	27	59
2-3	6	10	4	9
>3	1*	2	4	9

Forty six women in 2010 had a medical termination of pregnancy between 13 and 19 weeks. The most common indications for this procedure were fetal anomaly and intrauterine death. The number of women requiring manual removal of the placenta following birth was 15% (16% in 2008 and 10% in 2009).

In mid 2011 we introduced the administration of iv Oxytocin 10IU post delivery of the fetus to advance delivery of placenta. We are looking forward to reviewing 2011 data to see if introduction of this new protocol will lessen the number of women requiring manual removal of the placenta following medical TOP.

In 2010 28% of women were managed as day stay cases. We find this somewhat disappointing because in 2009 32% of women were managed as a day stay and we expected to see an increase to 50%. Unfortunately, with limited bed availability we were not in a position to admit these women to hospital early in the morning, which causes delays in delivery and results in overnight stays. We are still working on improving management of these patients and are hoping for better results in 2011.

Three women needed blood transfusion due to significant blood loss in the post partum period. All of these patients required manual removal of a retained placenta.

12.4 Gynaecology inpatient surgery

Methods:

The data presented in this section are collected in a surgical audit 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.) 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.

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 surgical episode.

Findings:

In 2010, there were 1610 admissions to Ward 97 for general gynaecologic surgery. 1569 (97%) of these were for primary procedures, 23 (1.4%) were admissions for repeat surgery as a result of complications of surgery at ACH and 18 (1.1%) 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 99: Primary indication for inpatient gynaecologic surgery

	2008 N=1256*		2009 N=1224		2010 N=1569	
	n	%	n	%	n	%
Primary indication for surgery						
Abnormal bleeding, non pregnant	272	21.7	241	19.7	280	17.9
Miscarriage / Termination	269	21.4	246	20.1	419	26.7
Urogynaecology / prolapse	163	13.0	170	13.9	205	13.1
Ovarian cyst	118	9.4	114	9.3	139	8.9
Abscess	69	5.5	56	4.6	73	4.7
Pain, cause unknown	67	5.3	61	5.0	70	4.5
Cancer / Pelvic mass	65	5.2	59	4.8	68	4.3
Endometriosis	61	4.9	100	8.2	116	7.4
Ectopic pregnancy	56	4.5	74	6.1	68	4.3
Infertility	26	2.1	21	1.7	33	2.1
Post operative complication	13	1.0			2	0.1
Sterilisation	13	1.0	8	0.7	20	1.3
Other, please specify	64	5.1	74	6.1	76	4.8

* includes admissions for repeat surgery for complications

Bleeding, either associated with or related to a pregnancy, was the most frequent indication for gynaecologic surgery at ACH in 2010.

Table 100: Surgical approach and timing of surgery among inpatient surgeries in 2010 by PRIMARY surgical procedure

		Timing of surgery			
	Total	Acute		Elective	
	N	n	%	n	%
Total	**1569**	**348**	**22.2**	**1221**	**77.8**
Ovarian and /or tubal surgery	249	98	39.4	151	60.6
Hysteroscopy	214	12	5.6	202	94.4
Evacuation retained products conception	247	124	50.2	123	49.8
Surgical termination of pregnancy	177	2	1.1	175	98.9
Urogynaecology procedure	172	1	0.6	171	99.6
Hysterectomy	163	3	1.8	160	98.2
Diagnostic laparoscopy	120	25	20.8	95	79.2
Endometriosis surgery	78	1	1.3	77	98.7
Other vulval procedure	74	9	12.1	65	87.8
Other uterine/cervical	51	7	13.7	44	86.3
Vaginal procedure	11	4	36.4	7	63.6
Other	13	6	46.2	7	53.9

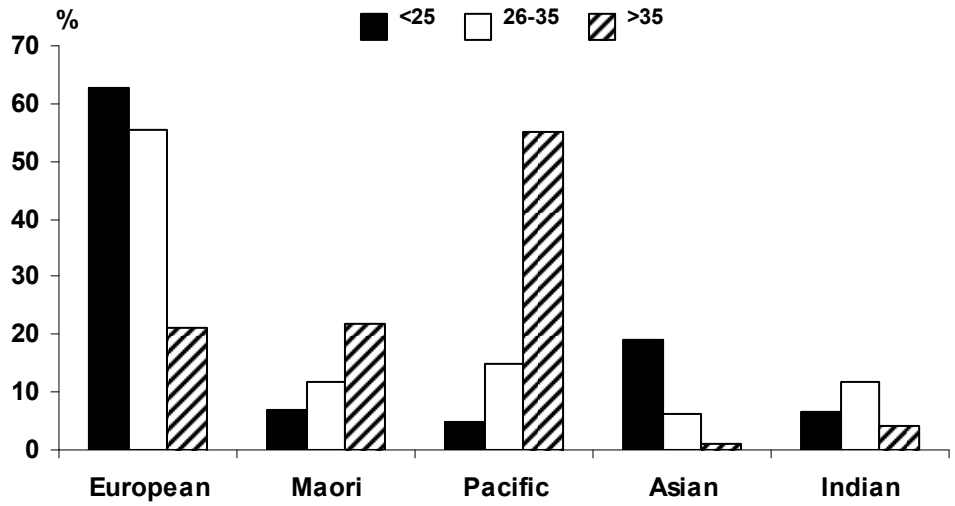

Figure 131: BMI by ethnicity among women having inpatient gynaecology surgery (2010) (missing data removed)

At least forty-six percent of our surgical population in 2010 were overweight, and 15% were morbidly obese (BMI>35). Height and/or weight data were missing from the database for 13% of surgeries, a considerable improvement from 2009 data. BMI is strongly associated with ethnicity as shown in the figure above. Surgical and anaesthetic complications are directly related to obesity.

Table 101: Demographic details of women having inpatient gynaecology surgery (2008-2010)

	2008 N=1256		2009 N=1224		2010 N=1569	
	n	%	n	%	n	%
Ethnicity						
NZ European	456	36.3	478	39.1	590	37.6
Maori	136	10.8	133	10.9	174	11.1
Pacific	232	18.5	221	18.1	263	16.8
Other Asian	146	11.6	122	10.0	174	11.1
Indian	101	8.0	95	7.8	125	8.0
Other European	112	8.9	129	10.5	187	11.9
Other	54	4.3	36	2.9	47	3.0
Not stated	19	1.5	10	0.8	9	0.6
Age						
≤20	79	6.3	76	6.2	114	7.3
21-30	256	20.4	235	19.2	356	22.7
31-40	372	29.6	400	32.7	473	30.1
41-50	266	21.2	259	21.2	305	19.4
51-60	136	10.8	127	10.4	146	9.3
>60	147	11.7	127	10.4	175	11.2
BMI						
<19	24	1.9	27	2.2	47	3.0
19-25	325	25.9	356	29.1	589	37.5
26-30	228	18.2	221	18.1	311	19.8
31-35	143	11.4	114	9.3	178	11.3
>35	169	13.5	204	16.7	239	15.2
Missing	367	29.2	302	24.7	205	13.1
Smoking status						
Currently smoking	208	16.6	179	14.6	260	16.6
Past smoker	110	8.8	118	9.6	177	11.3
Never	689	54.9	675	55.2	988	63.0
Unknown	249	19.8	252	20.6	144	9.2
DHB of residence						
Auckland	1005	80.0	961	78.5	1231	78.5
Counties Manukau	88	7.0	89	7.3	117	7.5
Waitemata	131	10.4	143	11.7	163	10.4
Other	32	2.5	31	2.5	58	3.7

In 2010, 17% of patients having gynaecologic surgery were current smokers and a further 11% were past smokers. Smoking rates vary markedly by ethnicity (figure below). Nine percent of smoking status data are missing from the database - a marked improvement compared to 2008 and 2009 data. Smoking is an important risk factor for anaesthetic and postoperative complications.

Approximately 20% (one in five) of patients having gynaecologic surgery at ADHB are domiciled outside ADHB catchment area.

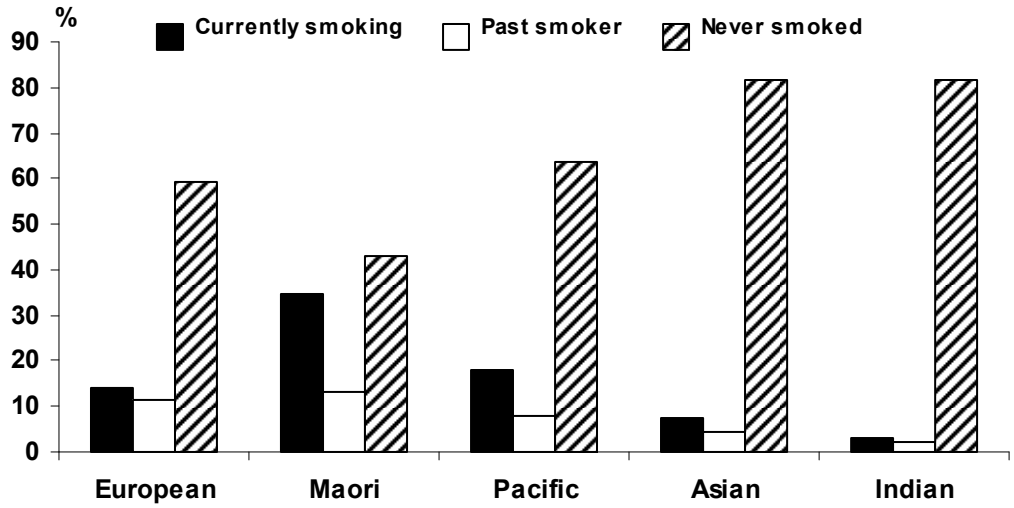

Figure 132: Smoking status by ethnicity among women having inpatient gynaecology surgery (2010)

Table 102: Intra operative injury (2010)

	N=10	
	n	%
Bladder	2	20
Bowel	1	10
Other (5 uterine, 1 vaginal, 1 ovarian)	7	70

The two bladder injuries (one at hysterectomy and one during a urogynaecology procedure) were repaired at the primary procedure. The bowel injury occurred during a hysterectomy and was repaired by small bowel resection and reanastomosis at the primary procedure.

One vaginal perforation at laparoscopy was repaired laparoscopically. There were five uterine perforations, only one of which was repaired surgically. There was an ovarian injury causing bleeding, which resulted in oophorectomy.

The overall complication rate was 12% among women having inpatient gynaecologic surgery in 2010, significantly fewer then the 15% in 2008 and 2009 (p=0.04). There were small reductions in most categories described.

Of the 5 admissions to the department of critical care medicine (DCCM),

1. Co-incidental perforated gastro-duodenal ulcer which occurred 2 days post laparotomy for a large pelvic tumor.
2. Segmental bowel resection associated with excision of pelvic endometrioma.
3. Monitoring following pelvic clearance for pelvic tumor in a patient with multiple cardiac co-morbidities.
4. Intraoperative cardiac arrest during pelvic clearance for a pelvic cancer.
5. Airway support post removal of bilateral large ovarian masses in a pregnant patient with co-morbidities.

ACHS Gynaecology Indicators: Injury to major viscous		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**% (95% CI)**
Numerator	Injury to major viscous, with repair, during or up to 2 weeks post operation	0.42	0.38	0.32	0.32	0.98	4/1569=0.25
Denominator	Gynaecological surgeries						

Table 103: Postoperative complications among primary inpatient surgeries in 2010 by PRIMARY surgical procedure (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	**1569**	**191 12.2**	**24 1.5**	**10 0.6**	**60 3.8**	**12 0.8**	**20 1.3**	**98 6.3**	**12 0.8**	**24 1.4**	**5 0.3**
Ovarian and /or tubal surgery	249	39 15.7	7 2.8	3 1.2	12 4.8	4 1.6	2 0.8	18 7.2	3 1.2	3 1.2	2 0.8
Hysteroscopy	214	19 8.9	5 2.3	2 0.9	4 1.9	1 0.5	0	13 6.1	2 0.9	0	0
Urogynaecology procedure	172	16 9.3	1 0.6	1 0.6	0	0	0	14 8.1	2 1.2	5 2.9	0
Hysterectomy	163	44 27.0	1 0.6	2 1.2	18 11.0	5 3.1	5 3.1	19 11.7	2 1.2	12 7.4	2 1.2
Surgical termination of pregnancy	177	3 1.7	0	0	0	0	0	3 1.7	0	0	0
Evacuation retained products conception	247	27 10.9	0	0	17 6.9	1 0.4	0	11 4.4	1 0.4	0	0
Diagnostic laparoscopy†	120	17 14.2	6 5.0	2 1.7	0	0	0	13 10.8	0	0	0
Endometriosis surgery	78	5 6.4	1 1.3	0	0	0	0	3 3.9	1 1.3	0	0
Other Vulval procedure	74	1 1.4	0	0	0	1 1.4	0	1 1.4	0	0	0
Vaginal procedure	11	1 9.1	0	0	1 9.1	0	0	3 25.0	0	0	0
Other	13	6 46.2	1 7.7	0	3 23.1	0	2 14.3	3 21.4	0	2 15.4	1 7.1
Other Uterine/cervical	51	13 25.5	2 3.9	0	5 9.8	0	1 2.0	8 16.3	1 2.0	2 3.9	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. Also includes uterine perforation.

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.

There were twenty five women who had “other” significant complications.

Other significant complications 2010 included:

1. Five cases following urogynaecology which are discussed in the urogynaecology section 12.7.
2. Six cases of post surgical ileus following major abdominal surgery.
3. Four cases of large haematoma.
4. One neuropraxia following prolonged procedure.
5. Suspected pulmonary embolus (not confirmed) following a laparoscopic case.

During 2010, the gynaecology clinical review panel (PQAA) met on six occasions and reviewed 24 cases. Cases of unplanned return to theatre, visceral injury, excessive blood loss, and unplanned admission to DCCM are referred for review. Clinicians involved in the case are invited to the review and recommendations from the panel are circulated to the department. Summaries from this PQAA activity are sent to the Sentinel Events Review Panel.

Table 104: Complications of surgery by timing of surgery

	Acute admission N=348		Elective admission N=1221	
	n	**%**	**n**	**%**
Any complication	62	17.8	130	10.7
Failure to complete planned procedure	4	1.2	20	1.6
Intra operative injury to internal organs	1	0.3	9	0.7
Significant postop infection	3	0.9	17	1.4
Anaesthetic complication	2	0.6	10	0.8
Other significant complication	1	0.3	23	1.9
Unplanned return to theatre in 6 weeks	0		9	0.7
Admission to DCCM	0		5	0.4
Readmission in 6 weeks	29	8.3	70	5.7
Significant post-op Infection	1	0.3	0	
Transfusion	31	8.9	29	2.4

Elective surgery is safer than acute/emergency surgery.

12.5 Gynaecologic 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 105: Primary surgery performed, and timing of surgery among women having inpatient laparoscopic procedures in 2010

	Surgery in 2010 N=384		Acute admission		Elective admission	
	n	%	n	%	n	%
Total	**384**		**90**	**23.4**	**294**	**76.6**
Ovarian/tubal	155	40.4	66	42.6	89	57.4
Diagnostic laparoscopy	114	29.7	22	19.3	92	80.7
Endometriosis surgery	75	19.5	1	1.3	74	98.7
Hysterectomy	34	8.9	0		34	100
Other uterine/cervical procedure	3	0.8	0		3	100
Hysteroscopy	2	0.5	0		2	100

Table 106: Primary indication for surgery by timing of surgery among women having inpatient laparoscopic procedures in 2010

	Surgery in 2010 N=384		Acute admission		Elective admission	
	n	%	n	%	n	%
Total	**384**		**90**	**23.4**	**294**	**76.6**
Endometriosis	103	26.8	0		103	100
Ovarian cyst	76	19.8	16	21.1	60	79.0
Ectopic pregnancy	54	14.1	50	92.6	4	7.4
Pain, cause unknown	54	14.1	17	31.5	37	68.5
Abnormal bleeding	40	10.4	1	2.5	39	97.5
Infertility	21	5.5	0		21	100
Cancer/pelvic mass	12	3.1	2	16.7	10	83.3
Sterilisation	13	3.4	0		13	100
Abscess	2	0.5	2	100	0	
Urogynaecology / prolapse	2	0.5	0		2	100
Other	7	1.8	2		5	

Among women undergoing gynaecologic laparoscopic surgery in 2010, the most common indications were endometriosis, ovarian cysts, ectopic pregnancy, and pain of unknown cause.

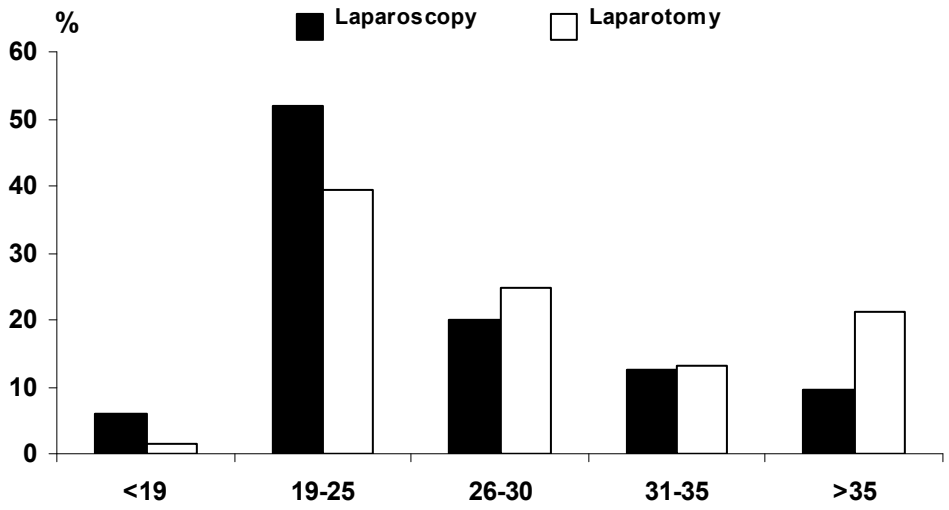

Figure 133: Distribution of BMI by surgical approach

BMI appears to influence surgical approach with a higher proportion of laparoscopic procedures among women with BMI under 30.

ACHS Gynaecology Indicators: Injury to MAJOR VISCOUS during a laparoscopic procedure		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to major viscous during laparoscopic procedure, with repair, during or up to 2 weeks post operation	1.08	0.67	0.56	5/315=1.6	5/315=1.6	0
Denominator	Laparoscopic procedures						

Table 107: Complications of inpatient gynaecologic laparoscopic surgery

	Total N=384	
	n	**%**
ANY COMPLICATION	43	11.2
Blood transfusion	6	1.6
Intra operative injury	3	0.8
Failure to complete procedure	9	2.3
Anaesthetic complications	4	1.0
Significant post-operative infection	0	
Unplanned return to theatre	0	
Admission to DCCM	0	
Readmission to hospital	22	5.7
Post op complications	12	3.1
Planned re admission	1	0.3
Other	9	2.3
Other significant complications	3	0.8

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 was obtained.

Findings

Table 108: Characteristics of women undergoing hysterectomy (excluding gynaecologic oncology) during 2010

	N=173	
	n	%
Age		
≤20	0	
21-30	0	
31-40	22	12.7
41-50	83	48.0
51-60	29	16.7
>60	39	22.5
Ethnicity		
NZ European	64	37.0
Maori	19	11.0
Pacific	30	17.3
Other Asian	22	12.7
Indian	20	11.6
Other European	12	6.9
Other	5	2.9
Not Stated	1	0.6
District Health Board of residence		
Auckland	155	89.6
Counties Manukau	4	2.3
Waitemata	12	6.9
Other	2	1.2
BMI		
<19	1	0.6
19-25	60	34.7
26-30	46	26.6
31-35	32	18.5
>35	31	17.9
Missing	3	1.7
Smoking		
Currently smoking	22	12.7
Past smoker	15	8.7
Never smoked	132	76.3
Unknown	4	2.3

Table 109: Surgical details of hysterectomies (excluding gynaecologic oncology) 2008-2010

	2008 N=150		2009 N=162		2010 N=173	
	n	%	n	%	n	%
Approach						
Laparotomy	86	57	104	63	90	52.0
Total laparoscopic hysterectomy	5	3	9	6	20	11.6
Laparoscopic assisted vaginal	12	8	7	4	15	8.7
Laparoscopic converted to laparotomy	2	1	5	3	2	1.2
Vaginal	45	30	37	23	46	26.6
Timing of surgery						
Elective	145	97	155	96	170	98.3
Acute	5	3	7	4	3	1.7
Primary indication for surgery						
Abnormal bleeding, non pregnant	64	43	72	44	76	43.9
Cancer /pelvic mass	37	25	40	24	37	21.4
Urogynaecology / prolapse	35	23	24	15	41	23.7
Pain, cause unknown	5	3	4	2	2	1.2
Endometriosis	3	2	6	4	9	5.2
Ovarian cyst	2	1	9	6	3	1.7
Post operative complication	1	1	0		0	
Other	3	2	7	4	5	2.9
ASA rating						
0	20	13	9	6	0	
1	45	30	51	31	58	33.5
2	67	45	71	44	72	41.6
3	17	11	9	6	24	13.9
5	1	1	0		0	
Missing			22	14	19	11.0
Length of stay	**Median**	**(IQR)**	**Median**	**(IQR)**	**Median**	**(IQR)**
All hysterectomies	4	(3-5)	4	(3-5)	4	(3-5)
By approach:						
Laparotomy	4	(4-5)	4	(4-5)	4	(3-5)
Laparoscopy	3	(3-3)	3	(2-3)	3	(2-4)
Vaginal	3	(3-4)	3	(3-4)	3	(3-4)

Table 110: Route of hysterectomy among non-malignant hysterectomies (2001-2010)

	2001 N=170		2002 N=208		2003 N=187		2005 N=161		2006 N=131		2007 N=189		2008 N=150		2009 N=162		2010 N=173	
			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Abdominal	90	52.9	113	54.3	100	53.5	86	53	81	61.8	109	57.7	88	58.7	109	67	92	53.2
Vaginal	65	38.2	72	34.6	63	33.7	54	34	36	27.5	67	35.4	45	30.0	37	23	46	26.6
Laparoscopic	15	8.8	23	11.1	24	12.8	21	13.0	14	10.7	13	6.9	17	11.3	16	10	35	20.2

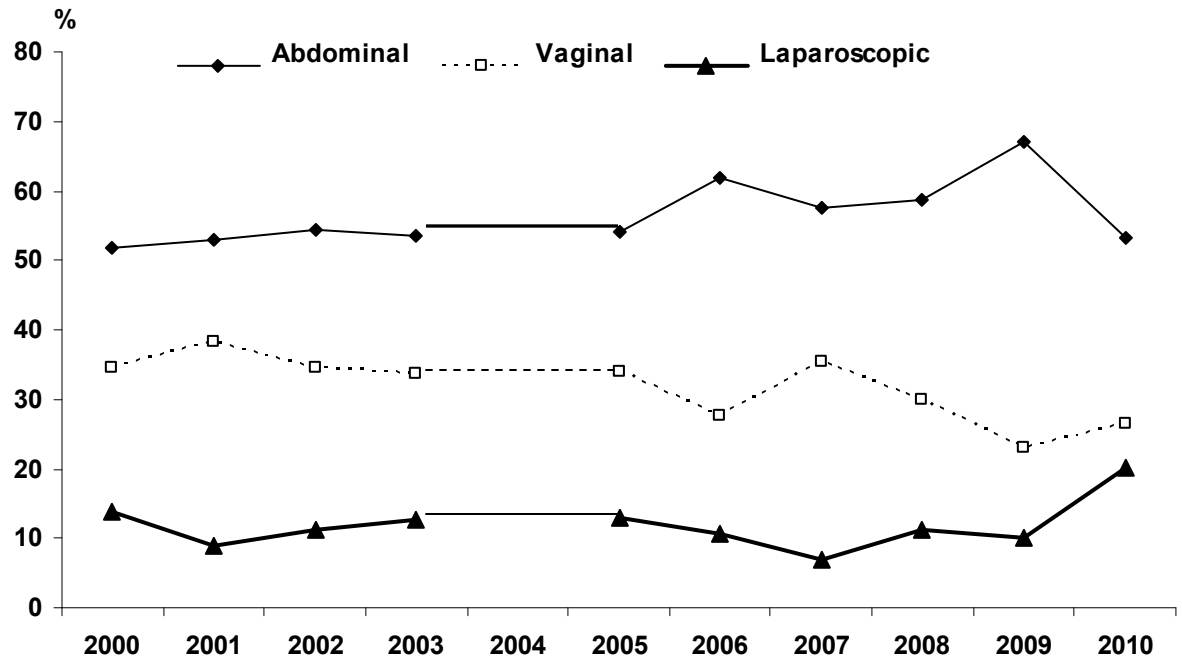

Figure 134: Route of hysterectomy among non malignant hysterectomies (2000-2010)

ACHS Gynaecology Indicators: Injury to URETER during a LAPAROSCOPIC HYSTERECTOMY		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010
Indicator	**Definition**	**%**	**%**		**%**	**%**	**%**
Numerator	Injury to ureter during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	0.17	0.57	0.23	0/17	0/16	0
Denominator	Laparoscopic hysterectomy procedures						

ACHS Gynaecology Indicators: Injury to BLADDER during a LAPAROSCOPIC HYSTERECTOMY		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010
Indicator	**Definition**	**%**	**%**	**%**		**%**	**%**
Numerator	Injury to bladder during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	1.13	0.48	0.78	0/17	0/16	0
Denominator	Laparoscopic hysterectomy procedures						

Table 111: Complications of surgery among women undergoing hysterectomy (excluding gynaecologic oncology) during 2010

	2009 N=162		2010 N=173	
	n	%	n	%
Any complication	**46**	**28**	**45**	**26.0**
Blood transfusion	20	12	18	10.4
Intraoperative injury	4	2	2	1.2
Anaesthetic complications	2	1	2	1.2
Significant postoperative infection	7	4	5	2.9
Other significant complications	5	3	11	6.4
Unplanned return to theatre	5	3	7	4.1
Admission to DCCM	2	1	2	1.2
Readmission to hospital	29	18	19	11.0
Failed to complete planned surgery	3	2	1	0.6

There were 18 (10%) peri-operative blood transfusions for benign hysterectomy in the service in 2010. The rate was similar in each of vaginal, laparoscopic and abdominal hysterectomy. All of the transfusions in abdominal hysterectomy were in women having surgery for complex multi-fibroid disease. In two of the abdominal hysterectomy group, the pre-operative Haemoglobin was <90 associated with known large fibroids. Better peri-operative planning may have prevented these transfusions.

Summary / Implications

Vaginal hysterectomy rates remain low in this institution at 27%. Following on from last year's annual report, a research project is underway to look prospectively at the public service pathways to hysterectomy and for management of abnormal uterine bleeding. A case review of all abdominal hysterectomy procedures in 2009 revealed most were appropriately selected to be done via that route.

Laparoscopic hysterectomy rates have doubled over the last year at Auckland Hospital from 11% in 2008 and 10% in 2009 to 20% in 2010.

RANZCOG trainees must be trained and skilled at performing the most appropriate surgical technique. Low hysterectomy rates put pressure on trainees to achieve clinical competencies by the end of their training period. The College and trainees will need to be innovative in their approach to this situation.

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, urogynaecological procedures have been identified using the surgical audit forms submitted for each operative case. Developments in data coding have enabled us to further categorise operative urogynaecological procedures. Sub-categories available are: procedures including hysterectomy; incontinence tape procedures; prolapse repairs using synthetic mesh augmentation; 'other' prolapse repairs. The data for this year's report, however, were collated using the previous system which grouped all urogynaecology procedures together.

As with general gynaecology the service is piloting direct data entry by surgeon at the time of procedure. If successful this will be introduced fully during 2011 and should improve data accuracy.

Table 112: Demography of women undergoing inpatient urogynaecology surgery during 2010

	2010 N=209	
	n	%
Age		
≤ 30	3	1.5
31-40	15	7.2
41-50	50	23.9
51-60	45	21.5
>60	96	45.9
Ethnicity		
NZ European	120	57.4
Maori	12	5.7
Pacific	11	5.3
Other Asian	11	5.3
Indian	12	5.7
Other European	32	15.3
Other	9	4.3
Not stated	2	1.0
District Health Board of residence		
Auckland	167	79.9
Counties Manukau	6	2.9
Waitemata	21	10.1
Other	15	7.2
BMI		
<19	4	1.9
19-25	68	32.5
26-30	69	33.0
31-35	39	18.7
>35	25	12.0
Missing	4	1.9

Demography of women undergoing inpatient urogynaecology surgery during 2010	2010 N=209
	n %
Smoking	
Currently smokes	18 8.6
Past smoker	33 15.8
Never smoked	151 72.3
Unknown	7 2.4
Length of stay Median (IQR)	2 (1-3)

Over two hundred women underwent a urogynaecology procedure during 2010. The majority of women coming forward for surgery were older than 50, with more than 40% exceeding 60 years of age. As is the case with most other areas of hospital practice, obesity is prevalent in this group of patients. Thirty percent of women operated on were obese or morbidly obese while another one third were classified as overweight.

Twenty percent of cases were referred from outside ADHB, reflecting the tertiary level of work undertaken within the service.

Median length of stay for inpatient urogynaecology procedures was 2 days with an interquartile range of 1 day to 3 days.

Forty women had a hysterectomy in 2010 at the same operation as their urogynaecology procedure.

ACHS Gynaecology Indicators: Injury to MAJOR VISCOUS during a pelvic floor repair procedure		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010
Indicator	**Definition**	**%**	**%**	**%**	**% (95%CI)**	**% (95%CI)**	**% (95%CI)**
Numerator	Injury to major viscous during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	0.64	1.03	0.81	2/163=1.2 (0.1-4.4)	4/173=2.3 (0.6-5.8)	1/209=0.5 (0.01-2.6)
Denominator	Pelvic floor repair procedures*						

ACHS Gynaecology Indicators: Injury to URETER during a pelvic floor repair procedure		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to ureter during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	0.057	0.55	0.046	0	0	0
Denominator	Pelvic floor repair procedures*						

ACHS Gynaecology Indicators: Injury to BLADDER during a pelvic floor repair procedure		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010
Indicator	**Definition**		**%**	**%**	**%**	**%**	**%**
Numerator	Injury to bladder during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	0.40	0.94	0.37	1/163=0.6 (0.02-3.4)	2.3 (0.6-5.8)	1/209=0.5 (0.01-2.6)
Denominator	Pelvic floor repair procedures*						

* includes isolated incontinence procedures

Table 113: Complications of surgery among women undergoing urogynaecology procedures during 2010

	2010 N=209	
	n	%
Total complications	**22**	**10.5**
Blood transfusion	2	1.0
Intraoperative injury to internal organs	1	0.5
Failure to complete planned surgery	1	0.5
Anaesthetic complications	2	1.0
Significant postoperative infection	2	1.0
Other significant complications	8	3.8
Unplanned return to theatre	7	3.4
Admission to DCCM	0	
Readmission to hospital	19	9.1

The complications summarised in the table above were seen in a total of 22 women who underwent urogynaecology surgery. As the figures indicate, some individuals had more than one complication recorded. In particular, if a complication meant that hospital re-attendance or readmission was required then two coded 'episodes' were generated.

Details of some of the complications are as follows:

The bladder injury occurred during dissection for an anterior mesh placement. Having recognised the injury, it was repaired and the mesh placed as planned. The catheter remained in for seven days and the bladder healed without incident.

In one case the placement of an incontinence tape could not proceed due to a vaginal wall cyst being present over the urethra. This was excised and the tape procedure re-scheduled.

The anaesthetic complications comprised one case of laryngospasm on emergence from anaesthesia and one broken tooth, noticed the following day.

The definition of significant postoperative is evidence of wound dehiscence or collection, pelvic abscess or fever >39C occurring as a result of surgery. The two cases recorded were both infective complications arising from vaginal vault haematomata. They both required operative procedures to drain the collections. One was admitted for eight days while the second case needed two further procedures and one month of hospitalisation.

The 'other significant' complications were most often related to post-operative urinary retention problems. Management of this varied; from extended foley catheterisation to the use of supra pubic catheterisation and in three cases, the release of a transvaginal tape to improve voiding function. The other recorded complications were a uterine artery bleed following a hysterectomy, a case where the use of a vaginal support pessary following a mesh repair had to be curtailed due to severe discomfort and one where a painful vault haematoma required admission for analgesia.

Cases requiring a return to theatre were all due to one or other of the complications outlined above. The timing of the second procedure varied, depending on the reason.

The issue of post-operative hospital re-attendance has been looked at in some detail during the year. In many cases there was a relatively minor problem that led to a woman re-presenting to the women's assessment unit. The quality of both post-operative analgesia and discharge advice have been looked at in order to avoid some of these hospital presentations.

It is anticipated that the ongoing refinements to both data collection and categorisation of surgical procedures within urogynaecology will result in more reliable data with which to assess our surgical outcomes.

12.8 Colposcopy

Methods:

The data presented in this section were collected on paper forms in the Colposcopy Clinic and entered into the Healthware database by the service's team support. The only cleaning undertaken routinely is part of a process to ensure women with high grade histology are treated in a timely fashion. Some further cleaning has occurred in an ad hoc fashion during analysis. There may therefore be some inaccuracies in the data presented here.

The standards used in this section are taken from the BSCCP guidelines/NHS Cancer Screening Program (Publication 20, April 2004, updated May 2010).

Findings:

Table 114: Demographic details of women having an initial colposcopic examination in 2010

	Initial colposcopy in 2008 N=1224		Initial colposcopy in 2009 N=993		Initial colposcopy in 2010 N=1214	
	n	%	n	%	n	%
Ethnicity						
NZ European	519	42.4	427	43.0	543	44.7
Maori	112	9.2	95	9.6	113	9.3
Pacific	126	10.3	104	10.5	109	9.0
Other Asian	205	16.8	158	15.9	198	16.3
Indian	37	3.0	37	3.7	63	5.2
Other European	110	9.0	131	13.2	145	11.9
Other	76	6.2	20	2.0	16	1.3
Not stated	39	3.2	21	2.1	13	13
Age (yrs)						
≤20	53	4.3	28	2.8	29	2.4
21-30	545	44.5	422	42.5	422	34.8
31-40	295	24.1	245	24.7	389	32.0
41-50	203	16.6	195	19.6	218	18.0
51-60	97	7.9	76	7.7	106	8.7
>60	31	2.5	27	2.7	50	4.1
Smoking status						
Currently smoking	312	25.5	228	23.0	266	21.9
Not currently smoking	851	69.5	757	76.2	943	77.7
Unknown	911	74.4	8	0.8	5	0.4
Referral to smoking cessation			223	22.5	255	21.0
DHB of residence						
Auckland	1124	91.8	927	93.4	1131	93.2
Counties Manukau	29	2.4	18	1.8	25	2.1
Waitemata	43	3.5	33	3.3	39	3.2
Other	28	2.3	15	1.5	49	4.0

Documentation of smoking data has improved.

Despite recommendations that screening start at age 20 we are still getting teenage referrals.

The referrals from outside ADHB reflect the tertiary referral status in relation to gynaecologic oncology and the expertise at NW in managing vaginal and vulval neoplasia.

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

Table 115: Documentation of adequacy of colposcopic examination by type of colposcopic visit (2010)

	Total N=1731		Follow up visit N=393		Initial visit N=1214		Post treatment N=122	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Satisfactory examination	1068	61.7	214	64.5	794	65.4	59	48.4
Unsatisfactory examination	544	31.4	123	31.3	363	29.9	58	47.5
Not documented	119	6.9	56	14.3	57	4.7	5	4.1

Documentation has been less than satisfactory this year. This may be due to a change in data entry systems and will be reviewed.

Table 116: Clinical characteristics of women presenting for initial colposcopy in 2010

	Initial visit N=1214	
	n	**%**
Referral reason		
Abnormal smear	952	78.4
Irregular bleeding (intermenstrual)	14	1.2
Irregular bleeding (postcoital)	111	9.0
Suspicious cervix	89	7.3
Other referral reason	47	3.9
Vaginal discharge	1	0.1
Referral smear cytology		
Normal	190	15.7
Low grade	686	56.5
High grade	256	21.1
Unsatisfactory	10	0.8
Inconclusive	2	0.2
No referral smear	13	1.1
Other	10	0.8
Inflammation	5	0.4
Not documented	42	3.5

Table 117: Histology of biopsy at initial examination 2010

	Initial visit biopsies N=1214	
	n	%
No Biopsy taken	577	47.5
High grade (includes HSIL, AIS, invasive)	149	12.3
LSIL	108	8.9
Dysplasia NOS	3	0.3
HPV	144	11.9
Condylomata / inflammation	41	3.4
Inconclusive	4	0.3
Insufficient sample	1	0.1
Normal	187	15.4

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

Table 118: Histologic diagnosis (biopsy at initial colposcopy) by referral smear cytology (2010)

Referral smear cytology	Total Colpo-scopies	Histologic diagnosis													
		No biopsy /UK*		High grade		LSIL		Dysplasia		HPV		Condyloma/ inflammn		Normal	
	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1214**	**583**	**47.9**	**150**	**12.3**	**108**	**8.9**	**3**	**0.2**	**144**	**11.8**	**41**	**3.4**	**187**	**15.4**
High grade	256	51	19.9	104	40.6	30	11.7	3	1.2	27	10.6	7	2.7	34	13.3
Low grade	686	332	48.4	41	6.0	72	10.5	0		104	15.2	28	4.1	109	15.9
Other†	27	19	70.4	1	3.7	0		0		1	3.7	1	3.7	5	18.5
No referral smear/UK	55	33	60.0	3	5.5	3	5.5	0		4	7.3	2	3.6	10	18.2
Normal	190	147	77.4	0		3	1.6	0		8	4.2	3	1.6	29	15.3

*Includes 1 with insufficient sample and 3 with inconclusive histology
† Includes condyloma, inflammation, inconclusive, unsatisfactory and other referral smear
UK=unknown
Inflammn=inflammation

There has been an improvement in biopsy rates this year. Further analysis of reasons for deviation from the standard is required. In previous years, some of the non-biopsied cases have included patients referred following private colposcopy and biopsy as well as cases where ECC has been performed or the lesion has indicated biopsy from other lower genital tract locations.

Colposcopy Standard: Predictive value of a colposcopic high grade diagnosis		**Standard**	**NW 2008**	**NW 2009**	**NW 2010**
Indicator	**Definition**	**%**	**%**	**%**	**%**
Numerator	High grade histology	65	65	55	56
Denominator	Initial satisfactory colposcopies where colposcopic diagnosis is high grade				

The prediction of high grade lesions colposcopically has fallen by 10% in the past 2 years, but this relates to data collection. As previously discussed, the data collection method excludes biopsies from other sites. Therefore if patients with high grade smears and vaginal, endocervical and endometrial lesions were included then this percentage is likely to increase by more than 10%.

Table 119: Cervical histology findings by colposcopic diagnosis (at initial colposcopy if satisfactory) (2010)

Colposopic diagnosis	Total Colpo-scopies	Histologic diagnosis									
		No biopsy		High grade		LSIL*		HPV		Condyloma inflammn		Normal	
	n	n	%	n	%	n	%	n	%	n	%	n	%
Total	794	234	29.4	138	17.4	99	12.5	129	16.2	37	4.7	154	19.4
High grade	138	8	5.8	77	55.8	11	7.9	17	12.3	3	2.2	22	15.9
Low grade	345	22	6.4	52	15.1	72	20.9	77	22.3	26	7.5	93	27.0
Condyloma/ inflammation	20	3	15.0	0		8	40.0	3	15.0	3	15.0	3	15.0
Inconclusive	16	1	6.3	3	18.8	2	12.5	5	31.3	0		5	31.3
Other	66	27	40.9	3	4.6	4	6.1	15	22.7	2	3.0	14	21.2
Normal	208	173	83.2	2	1.0	2	1.0	12	5.8	3	1.4	16	7.7

* Includes 3 women with dysplasia NOS

Table 120: Histologic diagnosis (biopsy at initial colposcopy) by referral reason (2010)

Referral reason	Total Colposcopies	Histologic diagnosis											
		No biopsy /unknown*		High grade		LSIL		HPV		Condyloma inflammn		Dysplasia		Normal	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	1214	581	47.9	149	12.3	108	8.9	144	11.9	41	3.4	3	0.3	187	15.4
Abnormal smear	952	394	41.4	144	15.1	96	10.1	132	13.9	34	3.6	3	0.3	149	15.7
Irregular bleeding (Intermenstrual/NOS)	24	12	50.0	2	8.3	4	16.7	3	12.5	1	4.2	0		2	8.3
Irregular bleeding (postcoital)	101	15	14.9	1	1.0	6	5.9	6	5.9	2	2.0	0		71	70.3
Suspicious cervix	89	69	77.5	1	1.1	1	1.1	2	2.3	3	3.4	0		13	14.6
Other referral reason	48	36	75.0	1	2.1	1	2.1	1	2.1	1	2.1	0		8	16.7

* Includes one with insufficient sample and 4 with inconclusive histology

Table 121: Cervical treatments 2007-2010

	2007 N=191		2008 N=212		2009 N=199		2010 N=198	
	n	%	n	%	n	%	n	%
LLETZ	182	95.3	197	92.9	187	94.0	185	92.9
Cold knife cone	6	3.1	11	5.2	9	4.5	11	5.6
Diathermy	0		2	1.0	1	0.5	0	
Hysterectomy	3	1.6	1	0.5	1	0.5	2	1.0
Laser ablation	0		0		1	0.5	1*	0.5
Laser cone	0		1	0.5	0		0	

* One woman had LLETZ and laser ablation at a single procedure

The number of treatments and percentage that are LLETZ has remained fairly constant. LLETZ has been shown to have less morbidity than other forms of treatment, and should be the treatment of choice. All methods are excisional and therefore provide histology, and ablative treatments are not performed. The diathermy included in the table was not for treatment of cervical neoplasia, but treatment of a bleeding ectropion. Eighty-five percent of LLETZ were performed in the clinic and under local anaesthesia.

In 2009 no patient under the age of 20 underwent treatment for abnormal smears. One woman was treated under the age of 20 in 2010 and 31 women under the age of 25 were treated. Conservative management after MDM review of women under the age of 25 presenting with biopsy proven CIN2 is expected standard management at NW. The policy also requires discussion at a Multidisciplinary Meeting and compulsory pathology review of all patients considered for treatment under the age of 20.

As there is increasing evidence that even one treatment can have a detrimental effect on future pregnancies, review of all cases under the age of 25 should be considered. This is reasonable considering WHO recommendations that screening should start at 25, given the low prevalence of cervical cancer before this age.

12.8.1 Post treatment follow up

Colposcopy Standard: Follow up after treatment		Standard	NW 2008	NW 2009	NW 2010
Indicator	**Definition**	**%**	**%**	**%**	**%**
Numerator	Follow up visit no later than 8 months following treatment	>90	88	88	81
Denominator	All treatments				

Table 122: Timing of follow up colposcopy after treatments (2007-2009)

	2007 N=191		2008 N=213		2009 N=199	
	n	%	n	%	n	%
≤ 8 months	168	88.0	182	85.5	162	81.4
> 8 months	3	1.6	3	1.4	4	2.0
No follow up	20	10.5	28	13.2	33	16.6

There has been a drop in this indicator in 2010. Those cases outside the recommended indicator will be reviewed.

Colposcopy Standards: Dyskaryosis* after treatment		Standard	NW 2008	NW 2009	NW 2010
Indicator	**Definition**	**%**	**%**	**%**	**%**
Numerator	Treated women with no dyskaryosis* following treatment	>90%	90	92	76
Denominator	All treatments				

*HSIL or LSIL on cytology

The decline in this indicator is of concern to the service and will be reviewed.

Table 123: Post treatment follow up findings

	2009 treatments N=166	
	n	%
Cytology findings at post treatment follow up		
No smear taken	4	2.4
Normal	120	72.3
High grade	11	6.6
Low grade/ASCUS	29	17.5
Unsatisfactory	1	0.6
Other	1	0.6
Histology findings at post treatment follow up		
No biopsy taken	146	88.0
HG	1	0.6
HPV	6	3.6
Condyloma/inflammation	2	1.2
Normal	11	6.6

Colposcopy Standard: Primary haemorrhage after treatment		Standard	NW 2008	NW 2009	NW 2010
Indicator	**Definition**	**%**	**%**	**%**	**%**
Numerator	Treated women who require treatment for primary haemorrhage	<5%	1	0.5	0
Denominator	All treatments				

No cases were reported of primary haemorrhage in 2010, however the data were poorly captured in 2010. This will be resolved in the future when direct entry of data, with inclusion of mandatory fields, is in place.

12.8.2 Waiting times for first appointment/DNA rates (Data from NSU monthly data reports) 2009 & 2010

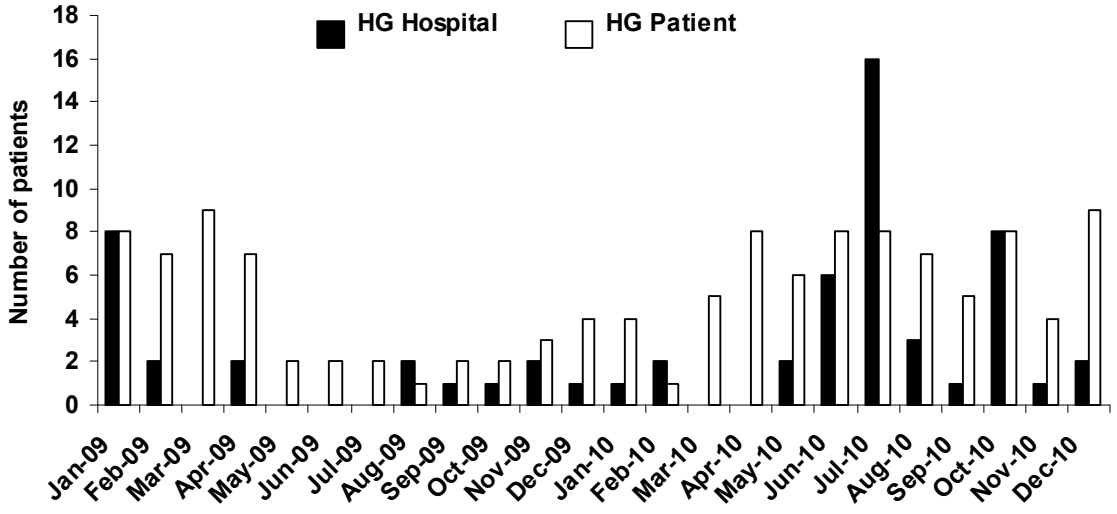

Figure 135: High grade referrals outside NSU Targets 2009 & 2010: Hospital vs patient related delays

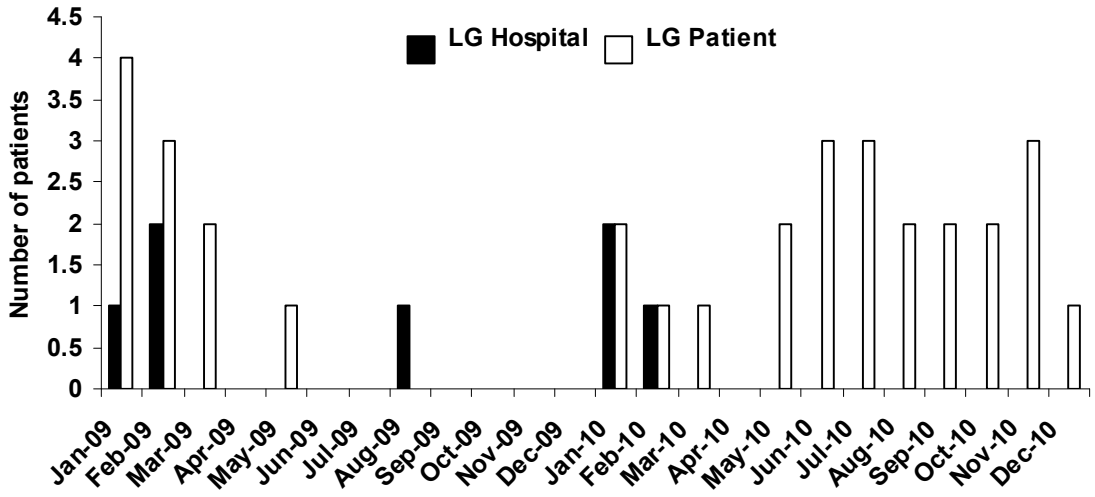

Figure 136: Low grade referrals outside NSU Targets: Hospital vs patient related delays

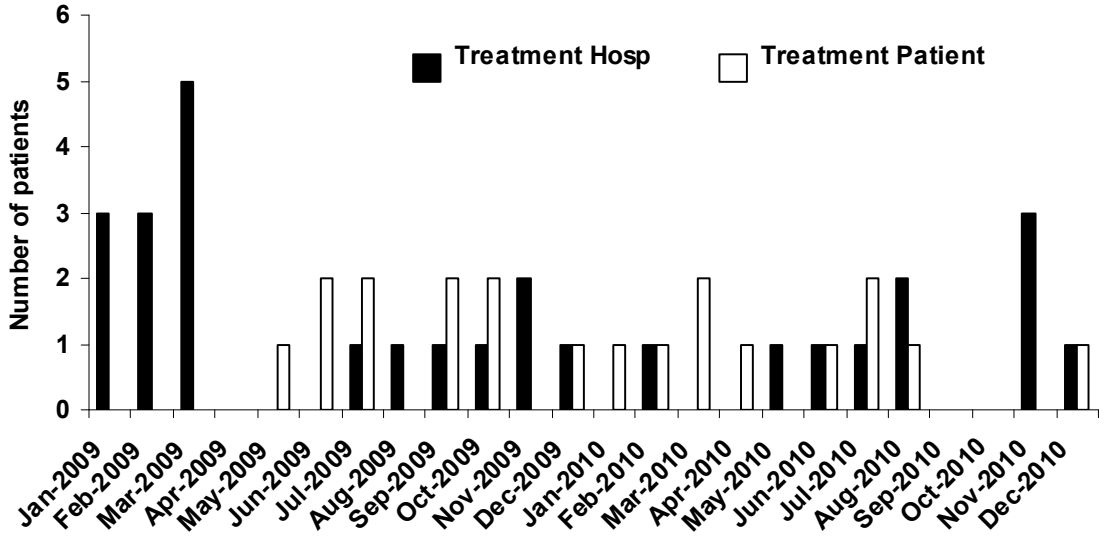

Figure 137: Treatments outside NSU Targets: Hospital vs patient related delays

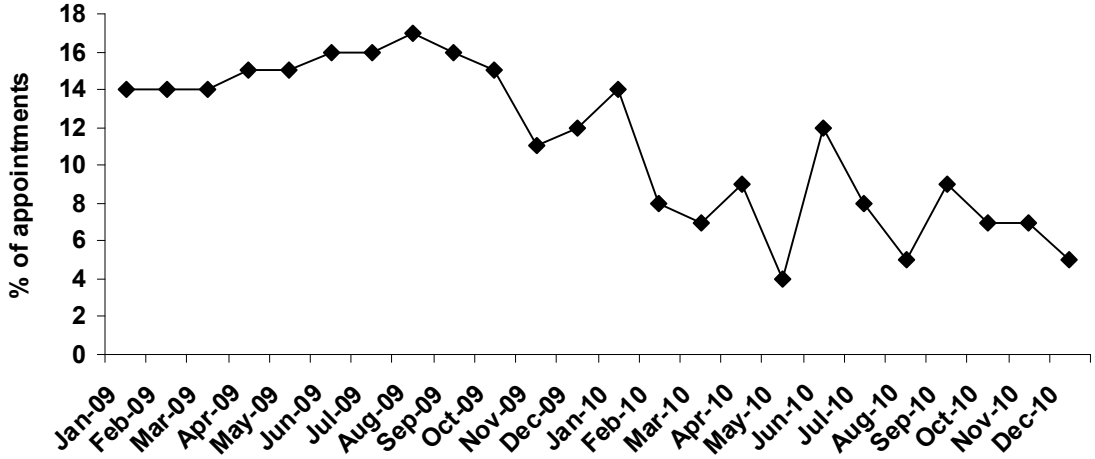

Figure 138: Patient did not attend (DNA) Rate

Every month the waiting times, number of patients seen and treated, and the number of patients who do not attend their appointments is audited, and the results returned to the NSU.

Summary

Virtually all patients are now seen within the NSU guided timelines and this is reflected in the monthly reports. It is important that this is maintained, and adequate resources are in place to allow for recent introduction of HPV testing - and the impact that this is having on new referrals.

Strategies to reduce the DNA rate are more difficult. Currently all patients are contacted to remind them of appointments and confirm they are attending. However frequently, despite confirmation they still do not arrive. Patient education as to the importance of attending appointments is concentrated upon by our nursing staff, and hopefully the national campaigns by the NSU will improve the DNA rate.

Overall, diagnostic colposcopic accuracy within our unit is adequate. The dyskaryosis rate following treatment is of concern, and case review has been commenced.

Complication rates are low and waiting times are acceptable.

Areas for future improvement should include direct entry method of data collection and introduction of specific software. This would improve data accuracy and efficiency as well as increasing administrative capacity, without the need for increase in human resource.

12.9 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 124: Primary site of MDM (Multidisciplinary meeting) reviewed cases 2009-2010.

	Total 2009 N=611		Total 2010 N=707	
	n	%	n	%
Primary site				
Ovary	182	29.8	194	27.4
Endometrium	132	21.6	192	27.2
Cervix	92	15.1	81	11.5
Uterus	80	13.1	78	11.0
Vulva	35	5.7	46	6.5
Other/not stated/benign	90	14.7	116	16.4

Table 125: DHB of residence, age, and prioritised ethnicity by primary site among MDM reviewed cases 2010.

	Total N=707		Ovarian n=194		Endometrium/Uterus n=270		Cervix n=81		Vulva n=46		Other/not stated/ benign n=116	
	n	%	n	%	n	%	n	%	n	%	n	%
DHB												
Auckland	215	30.4	46	23.7	91	33.7	23	28.4	16	34.8	39	33.6
Counties Manukau	224	31.7	61	31.4	90	33.3	26	32.1	8	17.4	39	33.6
Waitemata	138	19.5	51	26.3	45	16.7	14	17.3	6	13.0	22	19.0
Northland	66	9.3	24	12.4	28	10.4	6	7.4	3	6.5	5	4.3
Bay of Plenty	25	3.5	8	4.1	8	3.0	1	1.2	3	6.5	5	4.3
Other	39	5.5	4	2.1	8	3.0	11	13.6	10	21.7	6	5.2
Age (yrs)												
≤25	34	4.8	11	5.7	17	6.3	2	2.5	1	2.2	3	2.6
26-35	90	12.7	24	12.4	34	12.6	17	21.0	5	10.9	10	8.6
36-45	113	16.0	28	14.4	40	14.8	22	27.2	5	10.9	18	15.5
46-55	115	16.3	37	19.1	34	12.6	14	17.3	8	17.4	22	19.0
56-65	152	21.5	38	19.6	67	24.8	11	13.6	8	17.4	28	24.1
66-75	119	16.8	30	15.5	47	17.4	12	14.8	10	21.7	20	17.2
>75	84	11.9	26	13.4	31	11.5	3	3.7	9	19.6	15	12.9
Ethnicity												
NZ European	288	40.7	91	46.9	82	30.4	29	35.8	30	65.2	56	48.3
Maori	114	16.1	28	14.4	48	17.8	18	22.2	4	8.7	16	13.8
Pacific	125	17.7	29	14.9	68	25.2	8	9.9	1	2.2	19	16.4
Other Asian	48	6.8	11	5.7	19	7.0	11	13.6	3	6.5	4	3.4
Indian	29	4.1	8	4.1	12	4.4	5	6.2	2	4.3	2	1.7
Other European	75	10.6	20	10.3	27	10.0	5	6.2	6	13.0	17	14.7
Other	12	1.7	3	1.5	6	2.2	2	2.5	0	0.0	1	0.9
Not stated	16	2.3	4	2.1	8	3.0	3	3.7	0	0.0	1	0.9

11.9.1 Reporting to Gynaecologic Oncology Key Performance Indicators (KPI)

Key Performance Indicators were agreed with regional service partners as part of the regional service provision project in 2007. The goals were set based on internal audit of current practice and specialist advice with regard to agreed best practice.

Table 126: 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

	2007 N=448		2008 N=494		2009 N=497		2010 N=580	
	n	%	n	%	n	%	n	%
<14 days	291	65	284	57	351	71	426	73
=14 days	22	5	21	4	28	6	34	6
>14 days	135	30	172	35	113	23	118	20
Missing data			17	3	5	1	2	0.3

Table 127: Key Performance Indicator: Time from MDM or clinic to first surgery (new referrals of patients with malignancy who had surgery in 2010) Goal: 90% within 56 days

	2007 N=100		2008 N=164		2009 N=233		2010 N=228	
	n	%	n	%	n	%	n	%
≤ 56 days	75	75	115	70	165	71	188	82
> 56 days	24	24	43	26	65	28	40	18
Missing data	1	1	6	4	3	1		

Reasons for delay beyond 56 days were as follows: borderline tumour (2), co-morbidity (10), patient choice (8), planned delay due to fertility or other treatment prior to surgery (8), no evident reason (4), and re-referral or review of patients first registered more than 6 weeks previously (8). These latter cases should probably not be included in the indicator. Exclusion of these cases would increase the rate of surgery within 56 days to 85%.

Table 128: Time from MDM or clinic to first surgery (new referrals of patients with gynaecologic malignancy who had surgery in 2010) by primary site

	Total	≤ 56 days		>56 days	
	n	n	%	n	%
Totals	**234**	**187**	**80**	**47**	**20**
Cervix	48	40	83	8	17
Endometrium/Uterus	92	75	82	17	18
Ovary	59	45	76	14	24
Vulva	15	13	87	2	13
Other/ Unknown	20	14	70	6	30

11.9.2 Gynaecologic oncology surgeries

This section describes the surgery and outcomes of women undergoing inpatient surgery in 2010 under the care of the gynaecologic oncology team.

Table 129: Ethnicity and cancer status of women undergoing gynaecologic oncology inpatient surgery during 2010

	2010 N=461	
	n	%
Ethnicity		
NZ European	220	48
Maori	77	17
Pacific	71	15
Other Asian	34	7
Indian	15	3
Other European	35	8
Other	9	2
Status		
Benign	66	14
Pre malignant	29	6
Malignant	353	77
Unknown	13	3

Table 130: Debulking rates in 2010 for women with ovarian malignancy

	Ovary N=102	
	n	%
Residual disease		
None	69	68
< 1cm	6	6
≥ 1cm	15	15
Not stated	12	12
Bowel surgery		
Yes	15	15
No	73	72
NA	3	3
Not stated	11	11

Table 131: Key Performance indicator: Clinical Outcomes among inpatient surgeries in malignant cases by gynaecologic oncology team in 2010. Goal: Comparative year to year data (2007-2010)

	2007 N=174*		2008 N=246*		2009 N=259*		2010 N=353*	
Complication	n	%	n	%	n	%	n	%
Transfusion	18	10	19	8	30	12	40	11
Febrile morbidity	16	9	11	4	32	12	28	8
Wound infection	-		-		22	8	20	6
Thromboembolism	2	1	2	1	3	1	2	1
Cardiovascular	2	1	2	1	6	2	3	1
Gastro-intestinal	2	1	7	3	17	7	12	3
Urinary retention	-		-		12	5	12	3
Return to theatre within 6 weeks	5	3	6	2	14	5	18	5
Readmission with complications within 6 weeks	10	6	17	7	25	10	24	7
Death	1	1	2	1	2	1	5	1

* have assumed missing data are all “no”

This analysis includes the 353 inpatient surgeries performed by the Gynaecologic Oncology team in 2010 where a diagnosis of cancer was confirmed. The complications data were checked for accuracy against discharge coding data.

Summary/Implications

The Department of Gynaecologic Oncology workload has increased again in 2010, with a rise in both MDM referral (707 new referrals) and surgical activity (353 inpatient surgeries). The introduction of the MDM based database at the end of 2008 has allowed complete capture of data for all referrals for presumed malignancy for 2010. These figures however do not include all departmental activity as preinvasive referrals seen in the vulval and colposcopy clinics are not included, nor are molar pregancies and genetic referrals. This database has also allowed collection of complete surgical data, including morbidity.

The department is still failing to meet the KPI standards set in 2007. The percentage of patients discussed at MDM/seen in clinic within the 2 week standard has increased, but is still failing to meet the targeted 90%. This delay is due to a combination of inadequate referral information, thus requiring input from the department to chase the relevant investigations, and adequate resources within the ADHB MDM group. It is hoped that the proposed appointment of a formal MDM coordinator will streamline this process and remove unnecessary administrative duties from clinic staff. Some lack of clinical resources, however still needs to be addressed as most deferrals are due to pathological review not done in a timely fashion. The role of the pathologist is crucial to the MDM and appropriate FTE should be allocated to this.

The KPI targets do not capture all of the work within the department; molar pregnancy consultations and follow up, and prophylactic surgery for genetic predisposition, account for approximately 100 referrals a year and are not included in these data. Whether all molar pregnancies need to be seen by a gynaecologic oncologist is currently being reviewed, and it may be more appropriate for patients to be followed up locally.

Even though the KPI from MDM/clinic to surgery shows the targets are not being met in 40 cases, in 16 of those cases delays were either planned due to chemotherapy, radiotherapy or fertility treatments or patients initially declined surgery and changed their minds later. In 10 patients delay was due to needing to optimise patient condition before surgery could be safely carried out. All patients are given a date for surgery in 2-3 weeks at the time they are seen in the gynaecologic oncology clinic. It is always important to endeavour to meet targets but it is more crucial to look into causes for “delay” to look for avenues to improve. This is currently not captured in our data.

The complication rates within the department are acceptable. The transfusion rate at 11% on review is associated with an increase in radicality of surgery. The majority of patients transfused were those undergoing extensive debulking surgery, often in combination with significant bowel resection. However this means our debulking rates are comparable with other units, with 75% of ovarian malignancies, being optimally debulked and 68% with no residual disease.

The increase in theatre resources in 2010 has improved the patient’s wait for surgery. This will also allow the department to increase the services offered. It is hoped that the use of laparoscopic surgery for selected malignancies will increase, and that sentinel nodes for early vulval cancer can be introduced. The department is committed to providing a high quality regional tertiary service and the potential improvement in resources should facilitate this.

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, NW 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 NW 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 NW'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 NW 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 NW LMC)

Discharge Care - Postnatal Admission is NW Homecare (includes Domino, Diabetic etc) but missing Postnatal Homecare Summary or Newborn Discharge Summary

Discharge Care - Postnatal Admission NOT NW, 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 132: Mode of birth (1998-2010)

	1998 n=7492		1999 n=7501		2000 n=7827		2002 n=7775		2003 n=7611	
	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex birth	4645	62	4635	61.8	4650	59.4	4327	55.7	4269	56.1
Vaginal breech	75	1	83	1.1	87	1.1	66	0.8	58	0.8
Operative vaginal	922	12.3	945	12.6	1010	12.9	1081	13.9	1065	14.0
Caesarean	1850	24.7	1838	24.5	2080	26.6	2301	29.6	2219	29.1

	2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex birth	4073	54.4	3845	53.4	3815	52.9	4212	54.7	4218	55.5	4313	55.8
Vaginal breech	54	0.7	54	0.7	51	0.7	70	0.9	62	0.8	61	0.8
Operative vaginal	1171	15.6	1022	14.2	956	13.3	975	12.6	937	12.3	947	12.3
Caesarean	2193	29.3	2273	31.6	2390	33.1	1428	31.7	2372	31.3	2414	31.2

	2010 n=7709	
	n	%
Spontaneous vertex birth	4217	54.7
Vaginal breech	59	0.8
Operative vaginal	942	12.2
Caesarean	2491	32.3

APPENDIX 3. MATERNAL DEMOGRAPHY

Table 133: DHB of domicile of mothers giving birth at National Women's (2003-2010)

	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	
DHB	**n**	**%**
Auckland	5392	69.9
Waitemata	1110	14.4
Counties Manukau	1082	14.0
Northland	43	0.6
North Island Other	64	0.8
South Island	17	0.2
Overseas	1	0.01

Table 134: Maternal age distribution (2000-2010)

		≤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

Table 4: Maternal age and parity (2010)

	≤20 yrs n = 335		21-25 yrs n = 943		26-30 yrs n = 1998		31-35 yrs n = 2516		36-40 yrs n = 1644		>40 yrs n = 273	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Nullipara	270	80.6	522	55.4	1165	58.3	1113	44.2	502	30.5	78	28.6
Multipara	65	19.4	421	44.6	833	41.7	1403	55.8	1142	69.5	195	71.4

Table 135: Time trends in nulliparity and multiparity (Data for 2001-2003 not available) (1992-2010)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010
Number of births	8315	8690	8812	9125	9157	8055	7492*	7501	7827	7491	7194	7212	7695	7589	7735	7709
Nullipara	3700	3649	3814	4037	4018	3591	3263	3262	3455	3597	3522	3499	3752	3623	3811	3650
%	44.5	42.0	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
Multipara	4615	5041	4998	5088	5139	4464	4229	4239	4372	3894	3672	3713	3943	3966	3924	4059
%	55.5	58.0	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

*Does not include 39 BBA's

Table 136: Prioritised ethnicity of women giving birth at National Women's (2010)
(for information on assigning ethnicity and prioritising ethnicity, see Appendix 12)

	2010 n=7709	
	n	%
NZ European	2898	37.6
Chinese	950	12.3
Other European	729	9.5
Maori	579	7.5
Indian	539	7.0
Samoan	422	5.5
Tongan	378	4.9
Other Asian	313	4.1
South East Asian	155	2.0
European NFD	127	1.6
Middle Eastern	126	1.6
Cook Island Maori	112	1.5
Niuean	96	1.2
African	98	1.3
Asian NFD	58	0.8
Fijian	46	0.6
Latin American/ Hispanic	44	0.6
Other Pacific Island	25	0.3
Tokelauan	9	0.1
Other ethnicity	5	0.1

Table 137: Maternal ethnicity and age (2010)

Age	Total	NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7709	2898	37.6	579	7.5	1088	14.1	1476	19.1	539	7.0	856	11.1	273	3.5
≤20	335	65	19.4	94	28.1	130	38.8	13	3.9	7	2.1	9	2.7	17	5.1
21-25	943	182	19.3	155	16.4	266	28.2	157	16.6	75	8.0	53	5.6	55	5.8
26-30	1998	509	25.5	119	6.0	265	13.3	599	30.0	219	11.0	202	10.1	85	4.3
31-35	2516	1145	45.5	113	4.5	262	10.4	441	17.5	181	7.2	304	12.1	70	2.8
36-40	1644	868	52.8	77	4.7	127	7.7	234	14.2	54	3.3	250	15.2	34	2.1
≥41	273	129	47.3	21	7.7	38	13.9	32	11.7	3	1.1	38	13.9	12	4.4

Table 138: Maternal ethnicity and parity (2010)

		NZ European n=2898		Maori n=579		Pacific n=1088		Other Asian n=1476		Indian n=539		Other European n=856		Other n=273	
	N	n	%	n	%	n	%	n	%	n	%	n	%	N	%
Nullipara	3650	1401	48.3	217	37.5	334	30.7	827	56.0	286	53.1	472	55.1	113	41.4
Multipara	4059	1497	51.7	362	62.5	754	69.3	649	44.0	253	46.9	384	44.9	160	58.6

Table 139: Ethnicity of women birthing at NW (2003-2010)

	2003 n=7611		2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735		2010 n=7709	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
NZ European	3224	42.4	2911	38.9	2802	38.9	3034	42.1	3161	41.1	2995	39.5	2967	38.4	2898	37.6
Other European	608	8.0	548	7.3	674	9.4	682	9.5	695	9.0	713	9.4	707	9.1	856	11.1
Maori	486	6.4	509	6.8	545	7.6	597	8.3	641	8.3	641	8.4	670	8.7	579	7.5
Niuean	108	1.4	106	1.4	111	1.5	81	1.1	105	1.4	111	1.5	94	1.2	96	1.2
Cook Islander	159	2.1	140	1.9	106	1.5	113	1.6	157	2.0	137	1.8	135	1.7	112	1.5
Samoan	439	5.8	425	5.7	339	4.7	384	5.3	372	4.8	433	5.7	400	5.2	422	5.5
Tongan	406	5.3	355	4.7	315	4.4	346	4.8	347	4.5	349	4.6	394	5.1	378	4.9
Fijian	42	0.6	47	0.6	62	0.9	60	0.8	81	1.1	58	0.8	57	0.7	46	0.6
Other Pacific Islands	36	0.5	37	0.5	48	0.7	37	0.5	38	0.5	44	0.6	35	0.5	34	0.4
Chinese	811	10.7	871	11.6	769	10.7	707	9.8	881	11.4	874	11.5	995	12.9	950	12.3
Indian	548	7.2	540	7.2	545	7.6	520	7.2	521	6.8	505	6.7	520	6.7	539	7.0
Other Asian	438	5.8	404	5.4	354	4.9	408	5.7	473	6.1	478	6.3	440	5.7	526	6.8
Other	298	3.9	471	6.3	521	7.2	243	3.4	223	2.9	251	3.3	321	4.1	273	3.5
Not Stated	8	0.1	127	1.7	3		0		0	0.0	0	0.0	0	0.0	0	0.0

3.1 Smoking

Table 140: Smoking status at booking by prioritised ethnicity and maternal age (2010)

		Smoking at booking		Not currently smoking		Missing data	
	N	n	%	n	%	n	%
Ethnicity							
NZ European	2898	136	4.7	2749	94.9	13	0.4
Maori	579	226	39.0	344	59.4	9	1.6
Pacific	1088	177	16.3	896	82.4	15	1.4
Other Asian	1476	19	1.3	1453	98.4	4	0.3
Indian	539	5	0.9	533	98.9	1	0.2
Other European	856	28	3.3	823	96.1	5	0.6
Other	273	10	3.7	263	96.3	0	0.0
Age							
≤ 20	335	104	31.0	224	66.9	7	2.1
21-25	943	174	18.5	758	80.4	11	1.2
26-30	1998	125	6.3	1863	93.2	10	0.5
31-35	2516	116	4.6	2389	95.0	11	0.4
≥ 36	1917	82	4.3	1827	95.3	17	0.9

Table 141: Rates of smoking at booking by age and prioritised ethnicity (excludes women with missing smoking data) (2010)

Ethnicity	N	≤20 yrs %	21-25 yrs %	26-30 yrs %	31-35 yrs %	≥ 36yrs %
Total	**7662**	**328**	**932**	**1988**	**2505**	**1909**
NZ European	2885	33.9	19.6	5.1	2.4	2.7
Maori	570	55.4	45.1	33.3	36.9	26.8
Pacific	1073	21.1	23.3	14.8	13.2	18.3
Other Asian	1472	7.7	1.3	1.5	0.4	3.6
Indian	538	0.0	0.0	0.9	1.1	1.9
Other European	851	11.1	11.8	3.5	1.3	4.0
Other	273	17.7	1.8	3.5	4.3	0.0

Table 142: Smoking status at booking by LMC at birth (2010)

	Independent Midwife n=3552		Private Obstetrician n=1734		GP n=94		NW Community n=1505		NW High Risk n=704		Other DHB n=63	
	n	%	N	%	n	%	n	%	n	%	n	%
Smoking at booking	204	5.7	19	1.1	2	2.1	237	0.2	96	13.6	19	30.2
Not smoking	3341	94.1	1715	98.9	92	97.9	1265	84.1	596	84.7	37	58.7
Missing data	7	0.2	0	0.0	0	0.0	3	0.2	12	1.7	7	11.1

NW High Risk includes women booked under the Diabetes and Medical teams.
Unbooked women, data missing for 18 out of 57 women

3.2 Smoking cessation

Table 143: Smoking at birth among women NOT seen at the ADHB Smokefree Pregnancy Services (2010)

	Mothers NOT seen by ADHB Smokefree Pregnancy Services							
	Total N=7387		Smoking at booking N=314		Not smoking at booking N=7027		Missing smoking status data at booking N=46	
	n	%	n	%	n	%	n	%
Smoking at birth								
Yes	232	3	212	68	20	0.3	0	
Not currently smoking	6986	95	91	29	6866	98	29	63
Missing	169	2	11	4	141	2	17	37

3.3 Socio economic deprivation

Table 144: Deprivation Quintile (NZ Dep06)by prioritised maternal ethnicity (2010)

Quintile	NZ European n=2898		Other European n=856		Maori n=579		Pacific* n=1088		Other Asian n=1476		Indian n=539		Other n=273	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	699	24.1	245	28.6	41	7.1	37	3.4	245	16.6	44	8.2	41	15
2	722	24.9	189	22.1	62	10.7	93	8.6	236	16	89	16.5	32	11.7
3	640	22.1	187	21.9	102	17.6	138	12.7	380	25.8	137	25.4	51	18.7
4	571	19.7	160	18.7	167	28.8	305	28	336	22.8	174	32.3	63	23.1
5	266	9.2	75	8.8	207	35.8	514	47.2	279	18.9	95	17.6	86	31.5

*1 woman missing

Table 145: Smoking and socio economic deprivation (NZ Dep06) (2010)

Deprivation Decile	Total n=7709	Smoking at booking n=601	
	N	n	%
1	556	18	3.2
2	796	23	2.9
3	745	27	3.6
4	678	41	6.0
5	721	32	4.4
6	914	64	7.0
7	826	61	7.4
8	950	97	10.2
9	632	72	11.4
10	890	166	18.7

Table 146: Deprivation Quintile (NZ Dep06) and maternal age (2010)

	≤20 n=335		21-25 n=943		26-30 n=1998		31-35 n=2516		36-40 n=1644		>40 n=273	
Deprivation quintile	n	%	n	%	n	%	n	%	n	%	n	%
1	15	4.5	102	10.8	290	14.5	468	18.6	420	25.5	57	20.9
2	37	11.0	99	10.5	314	15.7	540	21.5	365	22.2	68	24.9
3	46	13.7	188	19.9	462	23.1	530	21.1	349	21.2	60	22.0
4	108	32.2	231	24.5	513	25.7	572	22.7	296	18.0	56	20.5
5	129	38.5	323	34.3	419	21.0	405	16.1	214	13.0	32	11.7

Table 147: LMC and socio economic deprivation (NZ Dep06) (2010)

Deprivation Decile	Independent Midwife n=3552		Private Obstetrician n=1734		General Practitioner n=94		NW Community n=1505*		NW Diabetes n=325		NW Medical n=379		Other DHB n=63		Unbooked n=57	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	222	6.3	261	15.1	7	7.4	43	2.9	8	2.5	13	3.4	2	3.2	0	0.0
2	348	9.8	324	18.7	14	14.9	53	3.5	20	6.2	32	8.4	4	6.3	1	1.8
3	348	9.8	254	14.6	9	9.6	85	5.6	19	5.8	27	7.1	3	4.8	0	0.0
4	327	9.2	185	10.7	9	9.6	109	7.2	19	5.8	24	6.3	3	4.8	2	3.5
5	358	10.1	194	11.2	9	9.6	80	5.3	29	8.9	39	10.3	10	15.9	2	3.5
6	446	12.6	177	10.2	7	7.4	191	12.7	36	11.1	45	11.9	7	11.1	5	8.8
7	414	11.7	106	6.1	10	10.6	172	11.4	59	18.2	52	13.7	7	11.1	6	10.5
8	464	13.1	101	5.8	15	16.0	232	15.4	62	19.1	48	12.7	17	27.0	11	19.3
9	254	7.2	76	4.4	6	6.4	204	13.6	35	10.8	46	12.1	3	4.8	8	14.0
10	371	10.4	56	3.2	8	8.5	335	22.3	38	11.7	53	14.0	7	11.1	22	38.6

*One woman missing

3.4 Lead Maternity Carer (LMC) and maternal demographic characteristics

Table 148: LMC at birth (2010)

	n=7709	
	n	%
Independent Midwife	3552	46.1
Private Obstetrician	1734	22.5
General Practitioner	94	1.2
NW Domino	87	1.1
NW Community	1418	18.4
NW Diabetic	325	4.2
NW Medical	379	4.9
Other DHB	63	0.8
Unbooked	57	0.7

Table 149: LMC at birth and maternal age (2010)

	Total	≤20		21-25		26-30		31-35		36-40		>40	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Total	7709	335	4.3	943	12.2	1998	25.9	2516	32.6	1644	21.3	273	3.5
Independent Midwife	3552	123	3.5	463	13.0	1071	30.2	1209	34.0	616	17.3	70	2.0
Private Obstetrician	1734	3	0.2	39	2.2	285	16.4	678	39.1	621	35.8	108	6.2
General Practitioner	94	2	2.1	12	12.8	16	17.0	34	36.2	29	30.9	1	1.1
NW Community	1505	152	10.1	324	21.5	417	27.7	365	24.3	195	13.0	52	3.5
NW Diabetes	325	7	2.2	28	8.6	97	29.8	103	31.7	67	20.6	23	7.1
NW Medical	379	27	7.1	50	13.2	85	22.4	103	27.2	98	25.9	16	4.2
Other DHB	63	13	20.6	10	15.9	15	23.8	15	23.8	9	14.3	1	1.6
Unbooked	57	8	14.0	17	29.8	12	21.1	9	15.8	9	15.8	2	3.5

Table 150: LMC at birth and parity (2010)

	Total	Nullipara		Multipara	
	N	n	%	n	%
Total	7709	3650	47.3	4059	52.7
Independent Midwife	3552	1834	51.6	1718	48.4
Private Obstetrician	1734	853	49.2	881	50.8
General Practitioner	94	43	45.7	51	54.3
NW Community	1505	597	39.7	908	60.3
NW Diabetes	325	114	35.1	211	64.9
NW Medical	379	162	42.7	217	57.3
Other DHB	63	30	47.6	33	52.4
Unbooked	57	17	29.8	40	70.2

Table 151: LMC at birth and prioritised maternal ethnicity (2010)

	Total	NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7709	2898	37.6	579	7.5	1088	14.1	1476	19.1	539	7.0	856	11.1	273	3.5
Independent Midwife	3552	1321	37.2	219	6.2	405	11.4	884	24.9	219	6.2	422	11.9	82	2.3
Private Obstetrician	1734	1089	62.8	40	2.3	27	1.6	196	11.3	57	3.3	285	16.4	40	2.3
General Practitioner	94	33	35.1	3	3.2	7	7.4	33	35.1	0	0.0	16	17.0	2	2.1
NW Community	1505	209	13.9	196	13.0	470	31.2	255	16.9	185	12.3	74	4.9	116	7.7
NW Diabetes	325	62	19.1	30	9.2	93	28.6	68	20.9	47	14.5	11	3.4	14	4.3
NW Medical	379	154	40.6	52	13.7	56	14.8	30	7.9	27	7.1	41	10.8	19	5.0
Other DHB	63	24	38.1	18	28.6	5	7.9	7	11.1	3	4.8	6	9.5	0	0.0
Unbooked	57	6	10.5	21	36.8	25	43.9	3	5.3	1	1.8	1	1.80	0	0.0

3.5 Standard primipara

Table 152: Demographic characteristics of standard and non-standard primipara (2010)

	Total primipara	Standard primipara		Non-standard primipara	
	N	n	%	n	%
Total	**3650**	**1217**	**33.3**	**2433**	**66.7**
Age					
≤ 20	270	30	11.1	240	88.9
21-25	522	235	45.0	287	55.0
26-30	1165	532	45.7	633	54.3
31-35	1113	420	37.7	693	62.3
36-40	502	0	0.0	502	100.0
>40	78	0	0.0	78	100.0
Ethnicity (prioritised)					
NZ European	1401	389	27.8	1012	72.2
Maori	217	52	24.0	165	76.0
Pacific	334	91	27.3	243	72.8
Other Asian	827	380	45.9	447	54.1
Indian	286	120	42.0	166	58.0
Other European	472	136	28.8	336	71.2
Other	113	49	43.4	64	56.6
LMC at Birth					
Independent Midwife	1834	712	38.8	1122	61.2
Private Obstetrician	853	262	30.7	591	69.3
General Practitioner	43	17	39.5	26	60.5
NW Community	597	189	31.7	408	68.3
NW Diabetic	114	0	0.0	114	100.0
NW - Medical	162	31	19.1	131	80.9
Other DHB	30	1	3.3	29	96.7
Unbooked	17	5	29.4	12	70.6
Smoking					
Smoking at booking	222	49	22.1	173	77.9
No or not smoking in last month	3400	1165	34.3	2235	65.7
Missing	28	3	10.7	25	89.3

APPENDIX 4. ANTENATAL COMPLICATIONS

4.1 Preterm birth

Table 153: Preterm birth and maternal demographic characteristics (2010)

	Total	Total preterm birth		Iatrogenic preterm		Spontaneous preterm	
	N	n	%	n	%	n	%
Total	7709	689	8.9	377	4.9	312	4.0
Age							
≤20	335	39	11.6	14	4.2	25	7.5
21-25	943	96	10.2	45	4.8	51	5.4
26-30	1998	164	8.2	80	4.0	84	4.2
31-35	2516	204	8.1	126	5.0	78	3.1
36-40	1644	152	9.2	89	5.4	63	3.8
>40	273	34	12.5	23	8.4	11	4.0
Ethnicity							
NZ European	2898	246	8.5	149	5.1	97	3.3
Maori	579	80	13.8	36	6.2	44	7.6
Pacific	1088	106	9.7	68	6.3	38	3.5
Other Asian	1476	95	6.4	36	2.4	59	4.0
Indian	539	54	10.0	32	5.9	22	4.1
Other European	856	86	10.0	44	5.1	42	4.9
Other	273	22	8.1	12	4.4	10	3.7
Parity							
Nulliparous	3650	343	9.4	174	4.8	169	4.6
Multiparous	4059	346	8.5	203	5.0	143	3.5
Plurality							
Singleton	7556	589	7.8	303	4.0	286	3.8
Twins	149	96	64.4	71	47.7	25	16.8
Triplets	4	4	100.0	3	75.0	1	25.0
Smoking at booking							
Currently smoking	601	86	14.3	45	7.5	41	6.8
No or not in last month	7061	583	8.3	326	4.6	257	3.6
Unknown	47	20	42.6	6	12.8	14	29.8
BMI							
<19	443	24	5.4	8	1.8	16	3.6
19-25	4404	335	7.6	170	3.9	165	3.7
26-30	1418	144	10.2	82	5.8	62	4.4
30-35	684	61	8.9	40	5.8	21	3.0
>35	541	59	10.9	42	7.8	17	3.1
Missing	219	66	30.1	35	16.0	31	14.2
Deprivation quintile (NZ Dep 06)							
1	1352	106	7.8	61	4.5	45	3.3
2	1423	113	7.9	60	4.2	53	3.7
3	1635	145	8.9	82	5.0	63	3.9
4	1776	188	10.6	104	5.9	84	4.7
5	1522	137	9.0	71	4.7	66	4.3

4.2 Diabetes

Table 154: Women with diabetes birthing at NW at or beyond 20 weeks gestation (1991-2010)

	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
Type I	21	20	25	31	33	26	31	47	30
Type 2	49	40	47	52	57	54	63	71	55
GDM	251	352	343	304	286	331	457	480	545
Total	321	412	415	387	376	411	551	598	630

Table 155: Perinatal deaths (1993 – 2010) 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
Total number of perinatal related losses	0	2	8	9	1	4	10
Perinatal related loss rate /1000 births	0	5	21	22	2	7	16

Table 156: DHB of domicile of women with diabetes birthing at NW (2010)

	Type I n=30		Type 2 n=55		GDM n=545		No diabetes n=7079	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	10	33.3	25	45.5	309	56.7	5048	71.3
Waitemata	17	56.7	26	47.3	182	33.4	885	12.5
Counties Manukau	3	10.0	4	7.3	50	9.2	1025	14.5
Other	0	0.0	0	0.0	4	0.7	121	1.7

Table 157: Demographic characteristics of women with diabetes (2010)

		Type I n=30		Type 2 n=55		GDM n=545		No diabetes n=7079	
	N	n	%	n	%	n	%	n	%
Age									
≤ 20	335	1	0.3	0	0.0	9	2.7	325	97.0
21-25	943	4	0.4	6	0.6	36	3.8	897	95.1
26-30	1998	10	0.5	8	0.4	158	7.9	1822	91.2
31-35	2516	12	0.5	17	0.7	169	6.7	2318	92.1
36-40	1644	2	0.1	19	1.2	136	8.3	1487	90.5
>40	273	1	0.4	5	1.8	37	13.6	230	84.2
Ethnicity									
NZ European	2898	17	0.6	6	0.2	106	3.7	2769	95.5
Maori	579	4	0.7	6	1.0	29	5.0	540	93.3
Pacific	1088	4	0.4	25	2.3	112	10.3	947	87.0
Other Asian	1476	1	0.1	10	0.7	167	11.3	1298	87.9
Indian	539	1	0.2	3	0.6	86	16.0	449	83.3
Other European	856	3	0.4	2	0.2	25	2.9	826	96.5
Other	273	0	0.0	3	1.1	20	7.3	250	91.6
BMI									
<19	443	1	0.2	0	0.0	17	3.8	425	95.9
19-25	4404	17	0.4	7	0.2	229	5.2	4151	94.3
26-30	1418	7	0.5	11	0.8	121	8.5	1279	90.2
31-35	684	2	0.3	20	2.9	71	10.4	591	86.4
>35	541	3	0.6	17	3.1	100	18.5	421	77.8
Missing	219	0	0.0	0	0.0	7	3.2	212	96.8
Smoking									
Smoking at booking	601	6	1.0	11	1.8	34	5.7	550	91.5
Not currently smoking	7061	24	0.3	44	0.6	511	7.2	6482	91.8
Missing	47	0	0.0	0	0.0	0	0.0	47	100.0
Weight at booking (kg)									
Median (IQR)		69.3 (67-83.8)		88 (69-108.1)		78 (65.8-96)			

Table 158: Maternal outcomes among women with diabetes (2010)

	Type I n=30		Type 2 n=55		GDM n=523		Postnatally Diagnosed Type 2 n=21		No diabetes n=7080	
	n	%	n	%	n	%	n	%	n	%
Induction of labour	18	60.0	30	54.5	284	54.3	13	61.9	1869	26.4
Mode of birth										
Spontaneous vaginal birth	12	40.0	25	45.5	279	53.3	10	47.6	3950	55.8
Ventouse	2	6.7	2	3.6	25	4.8	0	0.0	558	7.9
Forceps	0	0.0	1	1.8	24	4.6	2	9.5	328	4.6
CS emergency	7	23.3	15	27.3	101	19.3	5	23.8	1141	16.1
CS elective	9	30.0	12	21.8	94	18.0	4	19.0	1103	15.6
Gestation at birth										
<32 weeks	0	0.0	3	5.5	14	2.7	0	0.0	195	2.8
<37 weeks	9	30.0	17	30.9	70	13.4	4	19.0	589	8.3
PPH ≥500 mls	15	50.0	26	47.3	226	43.2	6	28.6	2480	35.0
PPH ≥1000 mls	3	10.0	7	12.7	55	10.5	1	4.8	629	8.9
Postpartum transfusion	1	3.3	1	1.8	11	2.1	0	0.0	190	2.7

4.3 Antepartum haemorrhage

Table 159: Characteristics of pregnancies complicated by antepartum haemorrhage (2010)

		Placenta praevia n=58		Placental abruption n=50		APH uncertain origin n=330		No APH n=7271	
	Total	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Maternal age									
≤20	335	1	0.3	2	0.6	21	6.3	311	92.8
21-25	943	3	0.3	7	0.7	55	5.8	878	93.1
26-30	1998	12	0.6	11	0.6	81	4.1	1894	94.8
31-35	2516	13	0.5	17	0.7	92	3.7	2394	95.2
36-40	1644	26	1.6	13	0.8	73	4.4	1532	93.2
>40	273	3	1.1	0	0.0	8	2.9	262	96.0
Parity									
Nulliparous	3650	24	0.7	21	0.6	160	4.4	3445	94.4
Multip previous CS	1197	16	1.3	7	0.6	60	5.0	1114	93.1
Multip no previous CS	2862	18	0.6	22	0.8	110	3.8	2712	94.8
Smoking status at booking									
Currently smoking	601	4	0.7	10	1.7	41	6.8	546	90.8
Not currently smoking	7061	53	0.8	39	0.6	287	4.1	6682	94.6
Unknown	47	1	2.1	1	2.1	2	4.3	43	91.5
BMI									
<19	443	2	0.5	1	0.2	12	2.7	428	96.6
19-25	4404	33	0.7	31	0.7	164	3.7	4176	94.8
26-30	1418	12	0.8	11	0.8	69	4.9	1326	93.5
31-35	684	6	0.9	2	0.3	34	5.0	642	93.9
>35	541	3	0.6	2	0.4	34	6.3	502	92.8
Missing data	219	2	0.9	3	1.4	17	7.8	197	90.0
Hypertensive disease									
Gestational hypertension	234	0	0.0	2	0.9	17	7.3	215	91.9
Chronic hypertension	164	2	1.2	1	0.6	9	5.5	152	92.7
Chronic hypertension with superimposed preeclampsia	24	1	4.2	0	0.0	1	4.2	22	91.7
Preeclampsia	231	3	1.3	6	2.6	11	4.8	211	91.3
Nil	7056	52	0.7	41	0.6	292	4.1	6671	94.5

4.4 Hypertensive disease

Table 160: Demographic characteristics of women with hypertensive disease (2010)

		Gestational hypertension		Chronic hypertension		Superimposed preeclampsia		Preeclampsia		Normotensive	
	Total	n	%	n	%	n	%	n	%	n	%
Ethnicity (prioritised)											
NZ European	2898	98	3.4	75	2.6	8	0.3	88	3.0	2629	90.7
Maori	579	22	3.8	11	1.9	1	0.2	22	3.8	523	90.3
Pacific	1088	38	3.5	26	2.4	9	0.8	54	5.0	961	88.3
Other Asian	1476	29	2.0	18	1.2	3	0.2	20	1.4	1406	95.3
Indian	539	17	3.2	9	1.7	2	0.4	19	3.5	492	91.3
OtherEuropean	856	27	3.2	22	2.6	1	0.1	17	2.0	789	92.2
Other	273	3	1.1	3	1.1	0	0.0	11	4.0	256	93.8
Maternal age (nullipara)											
≤20	270	12	4.4	0	0.0	0	0.0	16	5.9	242	89.6
21-25	522	20	3.8	5	1.0	2	0.4	27	5.2	468	89.7
26-30	1165	40	3.4	17	1.5	2	0.2	43	3.7	1063	91.2
31-35	1113	45	4.0	21	1.9	3	0.3	43	3.9	1001	89.9
36-40	502	26	5.2	13	2.6	1	0.2	21	4.2	441	87.8
41+	78	2	2.6	0	0.0	0	0.0	3	3.8	73	93.6
Maternal age (multipara)											
≤20	65	2	3.1	0	0.0	0	0.0	2	3.1	61	93.8
21-25	421	9	2.1	6	1.4	2	0.5	6	1.4	398	94.5
26-30	833	14	1.7	13	1.6	0	0.0	15	1.8	791	95.0
31-35	1403	38	2.7	43	3.1	4	0.3	32	2.3	1286	91.7
36-40	1142	23	2.0	40	3.5	7	0.6	13	1.1	1059	92.7
>40	195	3	1.5	6	3.1	3	1.5	10	5.1	173	88.7
Smoking at booking											
Currently smoking	601	20	3.3	9	1.5	3	0.5	24	4.0	545	90.7
Not currently smoking	7061	212	3.0	155	2.2	21	0.3	203	2.9	6470	91.6
Unknown	47	2	4.3	0	0.0	0	0.0	4	8.5	41	87.2
BMI											
<19	443	7	1.6	4	0.9	0	0.0	1	0.2	431	97.3
19-25	4404	101	2.3	54	1.2	5	0.1	101	2.3	4143	94.1
26-30	1418	66	4.7	48	3.4	7	0.5	57	4.0	1240	87.4
31-35	684	25	3.7	28	4.1	3	0.4	32	4.7	596	87.1
36-40	328	15	4.6	13	4.0	3	0.9	13	4.0	284	86.6
41-45	133	3	2.3	8	6.0	2	1.5	9	6.8	111	83.5
>45	80	12	15.0	9	11.3	2	2.5	5	6.3	52	65.0
Unknown	219	5	2.3	0	0.0	2	0.9	13	5.9	199	90.9

Table 161: Onset of birth among women with hypertensive disease (2010)

	Gestational hypertension n=234		Chronic hypertension n=164		Superimposed preeclampsia n=24		Preeclampsia n=231		Normotensive n=7056	
	n	%	n	%	n	%	n	%	n	%
Spontaneous onset of labour	67	28.6	52	31.7	1	4.2	34	14.7	3854	54.6
Induced labour	137	58.5	78	47.6	14	58.3	122	52.8	1863	26.4
CS emergency before onset of labour	8	3.4	3	1.8	5	20.8	47	20.3	202	2.9
CS elective	22	9.4	31	18.9	4	16.7	28	12.1	1137	16.1

4.5 BMI

Table 162: Demographic characteristics and BMI (2010) (excludes missing data)

	Total n=7490	<19 n=443		19-22 n=2679		23-25 n=1725		26-30 n=1418		31-35 n=684		36-40 n=328		41-45 n=133		>45 n=80	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity																	
NZ European	2836	116	4.1	1158	40.8	755	26.6	521	18.4	189	6.7	60	2.1	23	0.8	14	0.5
Maori	518	8	1.5	93	18.0	118	22.8	127	24.5	99	19.1	42	8.1	16	3.1	15	2.9
Pacific	1041	5	0.5	65	6.2	115	11.0	264	25.4	255	24.5	202	19.4	86	8.3	49	4.7
Other Asian	1462	219	15.0	734	50.2	309	21.1	156	10.7	38	2.6	4	0.3	2	0.1	0	0.0
Indian	530	38	7.2	174	32.8	141	26.6	145	27.4	28	5.3	4	0.8	0	0.0	0	0.0
Other European	836	43	5.1	376	45.0	214	25.6	147	17.6	41	4.9	8	1.0	5	0.6	2	0.2
Other	267	14	5.2	79	29.6	73	27.3	58	21.7	34	12.7	8	3.0	1	0.4	0	0.0
Age																	
≤20	307	12	3.9	77	25.1	63	20.5	77	25.1	48	15.6	20	6.5	9	2.9	1	0.3
21-25	889	67	7.5	219	24.6	177	19.9	194	21.8	122	13.7	75	8.4	28	3.1	7	0.8
26-30	1953	162	8.3	723	37.0	406	20.8	341	17.5	183	9.4	83	4.2	37	1.9	18	0.9
31-35	2469	139	5.6	993	40.2	573	23.2	431	17.5	183	7.4	84	3.4	35	1.4	31	1.3
36-40	1608	56	3.5	595	37.0	435	27.1	318	19.8	122	7.6	49	3.0	15	0.9	18	1.1
>40	264	7	2.7	72	27.3	71	26.9	57	21.6	26	9.8	17	6.4	9	3.4	5	1.9
Parity																	
Nullipara	3539	268	7.6	1456	41.1	828	23.4	587	16.6	254	7.2	89	2.5	41	1.2	16	0.5
Multipara	3951	175	4.4	1223	31.0	897	22.7	831	21.0	430	10.9	239	6.0	92	2.3	64	1.6
Smoking status at booking*																	
Smoking	547	20	3.7	102	18.6	96	17.6	135	24.7	105	19.2	51	9.3	21	3.8	17	3.1
Not currently smoking	6937	423	6.1	2575	37.1	1628	23.5	1282	18.5	578	8.3	276	4.0	112	1.6	63	0.9

*Smoking data missing for 6 women

Table 163: BMI by deprivation quintile and prioritised maternal ethnicity (2010)

Deprivation Quintile	Total	BMI >25		European			Maori			Pacific			Other Asian			Indian		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
	7489	**601**		**3672**	**1010**		**518**	**299**		**1040**	**855**		**1462**	**200**		**530**	**177**	
1	1337	288	21.5	935	205	21.9	39	13	33.3	36	23	63.9	243	25	10.3	43	11	25.6
2	1400	405	28.9	899	239	26.6	58	30	51.7	92	69	75.0	234	31	13.2	85	29	34.1
3	1590	463	29.1	809	207	25.6	92	47	51.1	129	97	75.2	378	52	13.8	135	41	30.4
4	1704	710	41.7	699	244	34.9	149	91	61.1	293	240	81.9	328	47	14.3	174	64	36.8
5	1458	776	53.2	330	115	34.8	180	118	65.6	490	426	86.9	279	45	16.1	93	32	34.4

Table 164: LMC at birth and BMI (2010)

	Total n=7490	<19 n=443		19-22 n=2679		23-25 n=1725		26-30 n=1418		31-35 n=684		36-40 n=328		41-45 n=133		>45 n=80	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
IMW	3501	238	6.8	1342	38.3	812	23.2	644	18.4	294	8.4	108	3.1	48	1.4	15	0.4
Pvt Obstetrician	1725	134	7.8	842	48.8	438	25.4	231	13.4	55	3.2	19	1.1	3	0.2	3	0.2
GP	90	3	3.3	41	45.6	25	27.8	17	18.9	3	3.3	1	1.1	0	0.0	0	0.0
NW Community	1469	53	3.6	322	21.9	301	20.5	353	24.0	221	15.0	134	9.1	51	3.5	34	2.3
NW Diabetes	319	4	1.3	45	14.1	50	15.7	78	24.5	56	17.6	44	13.8	23	7.2	19	6.0
NW Medical	337	11	3.3	78	23.1	85	25.2	82	24.3	45	13.4	20	5.9	8	2.4	8	2.4
Other DHB	34	0	0.0	5	14.7	13	38.2	9	26.5	5	14.7	1	2.9	0	0.0	1	2.9
Unbooked	15	0	0.0	4	26.7	1	6.7	4	26.7	5	33.3	1	6.7	0	0.0	0	0.0

Table 165: Pregnancy complications and BMI (2010)

	BMI<19 n=443		BMI 19-22 n=2679		BMI 23-25 n=1725		BMI 26-30 n=1418		BMI 31-35 n=684		BMI 36-40 n=328		BMI>40 n=213	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Diabetes														
GDM	17	3.8	116	4.3	113	6.6	121	8.5	71	10.4	46	14.0	54	25.4
Type 1	1	0.2	8	0.3	9	0.5	7	0.5	2	0.3	2	0.6	1	0.5
Type 2	0	0.0	3	0.1	4	0.2	11	0.8	20	2.9	11	3.4	6	2.8
Non diabetic	425	95.9	2552	95.3	1599	92.7	1279	90.2	591	86.4	269	82.0	152	71.4
Hypertension														
Chronic hypertension	4	0.9	26	1.0	28	1.6	48	3.4	28	4.1	13	4.0	17	8.0
Gestational hypertension	7	1.6	57	2.1	44	2.6	66	4.7	25	3.7	15	4.6	15	7.0
Pre eclampsia	1	0.2	54	2.0	47	2.7	57	4.0	32	4.7	13	4.0	14	6.4
Super imposed preeclampsia	0		3	0.1	2	0.1	7	0.5	3	0.4	3	0.9	4	1.9
Nil	431	97.3	2539	94.8	1604	93.0	1240	87.5	596	87.1	284	86.6	163	76.5

Table 166: Postpartum haemorrhage associated with spontaneous vaginal birth by BMI (2010)

	Total n=4153		BMI<19 n=275		BMI 19-22 n=1456		BMI 23-25 n=890		BMI 26-30 n=768		BMI 31-35 n=427		BMI 36-40 n=210		BMI>40 n=127	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
PPH ≥ 1000mls	212	5.1	6	2.2	50	3.4	44	4.9	51	6.6	31	7.3	17	8.1	13	10.2
PPH ≥ 1500mls	105	2.5	2	0.7	25	1.7	18	2.0	26	3.4	19	4.4	9	4.3	6	4.7

Table 167: Postpartum haemorrhage associated with Caesarean section by BMI (2010)

	Total n=2415		BMI <19 n=99		BMI 19-22 n=807		BMI 23-25 n=615		BMI 26-30 n=503		BMI 31-35 n=217		BMI 36-40 n=105		BMI >40 n=69	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
PPH ≥ 1000mls	376	15.6	13	13.1	104	12.9	97	15.8	73	14.5	37	17.1	26	24.8	26	37.7
PPH ≥ 1500mls	111	4.6	2	2.0	32	4.0	27	4.4	19	3.8	11	5.1	10	9.5	10	14.5

Table 168: Neonatal outcomes and BMI (2010)

	BMI<19 n=445		BMI 19-22 n=2726		BMI 23-25 n=1770		BMI 26-30 n=1454		BMI 31-35 n=697		BMI 36-40 n=336		BMI >40 n=216	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Preterm	25	5.6	226	8.3	169	9.5	169	11.6	71	10.2	42	12.5	22	10.2
Term	420	94.4	2500	91.7	1601	90.5	1285	88.4	626	89.8	294	87.5	194	89.8
SGA	59	13.3	277	10.2	182	10.3	192	13.2	95	13.6	44	13.1	26	12.0
≥ 2 days in NICU	31	7.0	186	6.8	158	8.9	144	9.9	65	9.3	36	10.7	20	9.3
Perinatal deaths (n /1000)	3	6.7	29	10.6	25	14.1	25	17.2	15	21.5	7	20.8	5	23.1

Table 169: Maternal interventions and birth outcomes by BMI (2010)

	BMI<19 n=443		BMI 19-22 n=2679		BMI 23-25 n=1725		BMI 26-30 n=1418		BMI 31-35 n=684		BMI 36-40 n=328		BMI >40 n=213	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Onset of birth														
Spontaneous labour	281	63.4	1480	55.2	871	50.5	663	46.8	346	50.6	155	47.3	81	38.0
Induced labour	102	23.0	707	26.4	494	28.6	438	30.9	216	31.6	115	35.1	94	44.1
Emergency CS before labour	3	0.7	68	2.5	61	3.5	55	3.9	33	4.8	19	5.8	7	3.3
Elective CS	57	12.9	424	15.8	299	17.3	262	18.5	89	13.0	39	11.9	31	14.6
Mode of birth														
Spontaneous vaginal birth	275	62.1	1456	54.3	890	51.6	768	54.2	427	62.4	210	64.0	127	59.6
Operative vaginal	69	15.6	416	15.5	220	12.8	147	10.4	40	5.8	13	4.0	17	8.0
Elective CS	57	12.9	424	15.8	299	17.3	262	18.5	89	13.0	39	11.9	31	14.6
Emergency CS in labour	35	7.9	276	10.3	219	12.7	152	10.7	68	9.9	32	9.8	22	10.3
Emergency CS not in labour	7	1.6	107	4.0	97	5.6	89	6.3	60	8.8	34	10.4	16	7.5

APPENDIX 5. LABOUR AND BIRTH

5.1 Induction of labour

Table 170: Induction of labour rates (1992-2010) No data available on induction rates for 2001-2003

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010
Total Births	8315	8690	8812	9125	9157	8055	7531*	7501	7827	7491	7194	7212	7695	7589	7735	7709
Women Induced	1734	2049	2033	2366	2225	2135	2053	1910	2106	1922	1894	1776	1906	2203	2238	2214
Incidence (%)	**20.9**	**23.6**	**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**
Total Nullipara	3700	3649	3814	4037	4018	3591	3263	3262	3455	3597	3522	3499	3752	3623	3811	4059
Nullipara Induced	914	931	1046	1191	1112	1104	992	923	1049	1064	1042	940	1047	1207	1260	1226
Incidence (%)	**24.7**	**25.5**	**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**	**30.2**
Total Multipara	4615	5041	4998	5088	5139	4464	4229	4239	4372	3894	3672	3713	3943	3966	3924	3650
Multipara Induced	820	1118	987	1175	1113	1031	1061	987	1057	858	852	836	859	996	978	988
Incidence (%)	**17.8**	**22.2**	**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**	**27.1**

*Does not include 39 BBA's

Table 171: Indication for induction by parity (term births) (2010)

	Nullipara n=3307		Multipara n=3713	
	n	%	n	%
Total	1151	34.8	905	24.4
Prolonged latent phase	146	4.4	105	2.8
Post dates	221	6.7	141	3.8
Diabetes	112	3.4	139	3.7
Hypertension	127	3.8	68	1.8
Maternal age	36	1.1	51	1.4
Maternal medical complications	48	1.5	60	1.6
SGA	107	3.2	60	1.6
Term PROM	252	7.6	120	3.2
Decreased liquor volume	33	1.0	17	0.5
Maternal request	2	0.1	18	0.5
Poor obstetric history	7	0.2	28	0.8
Fetal Distress	12	0.4	12	0.3
Multiple pregnancy	6	0.2	12	0.3
IUD/Fetal anomaly	5	0.2	3	0.1
APH	2	0.1	5	0.1
Other	35	1.1	66	1.8

Table 172: Indication for induction by gestation (2010)

	Preterm n=689		Term n=7020	
	n	%	n	%
Total	156	2.1	2049	26.7
Post Dates	0	0.0	362	4.7
Hypertension	15	0.2	195	2.5
Prolonged latent phase	0	0.0	251	3.3
Term PROM	0	0.0	372	4.8
Diabetes	8	0.1	251	3.3
SGA	11	0.1	167	2.2
Maternal Age	0	0.0	87	1.1
Maternal Medical Complications	8	0.1	108	1.4
Decreased Liquor Volume	1	0.01	50	0.7
Maternal Request	0	0.0	20	0.3
PPROM	46	0.6	0	0.0
Multiple Pregnancy	4	0.1	18	0.2
Fetal Distress	0	0.0	24	0.3
Poor Obstetric History	0	0.0	35	0.5
IUD/Fetal Anomaly	50	0.7	8	0.1
Other	13	0.2	101	1.3

Table 173: Rates of induction by age and ethnicity (prioritised) among term nullipara and multipara (excluding previous Caesarean) (2010)

	Term Nullipara	Induction of labour		Term Multipara no prev CS	Induction of labour	
	N	n	%	N	n	%
Total	3307	1151	34.8	2628	782	29.8
Age						
≤25	707	211	29.8	369	73	19.8
26-30	1068	367	34.3	593	141	23.8
31-35	1022	364	35.6	911	278	30.5
>35	510	208	40.8	755	290	38.4
Ethnicity						
NZ European	1282	454	35.4	1370	329	24.0
Maori	186	63	33.9	313	95	30.4
Pacific	295	107	36.3	687	170	24.7
Other Asian	767	224	29.2	614	107	17.4
Indian	257	104	40.5	228	76	33.3
Other European	416	163	39.2	354	90	25.4
Other	104	36	34.6	147	38	25.9

5.2 Outcomes following induction

Table 174: Mode of birth at term by onset of birth and parity (excluding women with prior CS) among intended vaginal births (2010)

	Nullipara				Multipara (no previous CS)			
	Spontaneous labour n=1755		Induced labour n=1151		Spontaneous labour n=1709		Induced labour n=782	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB	1060	60.4	456	39.6	1582	92.6	664	84.9
Operative vaginal	428	24.4	287	24.9	66	3.9	47	6.0
CS emergency in labour	267	15.2	300	26.1	61	3.6	48	6.1
CS emergency not in labour*	0	0.0	108	9.4	0	0.0	23	2.9
Epidural	1015	57.8	983	85.4	536	27.6	493	54.5

*failed induction rate

Table 175: Mode of birth at term among nullipara by indication for induction (2010)

	Post dates n=221		Term PROM n=252		Hypertension n=127		Prolonged latent phase n=146		Diabetes n=112		SGA n=107		Other n=35	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	59	26.7	117	46.4	40	31.5	56	38.4	65	58.0	51	47.7	16	45.7
Operative vaginal	58	26.2	61	24.2	38	29.9	36	24.7	21	18.8	26	24.3	8	22.9
CS emergency in labour	79	35.8	57	22.6	35	27.6	46	31.5	19	17.0	16	15.0	7	20.0
CS emergency not in labour*	25	11.3	17	6.8	14	11.0	8	5.5	7	6.3	14	13.1	4	11.4
Epidural	192	86.9	214	84.9	112	88.2	134	91.8	91	81.3	80	74.8	29	82.9

*failed induction rate

Table 176: Mode of birth at term among multipara (excluding previous Caesarean) women by indication for induction (2010)

	Post dates n=121		Diabetes n=119		SGA n=51		Prolonged latent phase n=86		Term PROM n=105		Hypertension n=60		Other n=240	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	107	88.4	107	89.9	45	88.2	76	88.9	89	84.8	48	80.0	192	80.0
Operative vaginal	6	5.0	3	2.5	1	2.0	6	7.0	4	3.8	6	10.0	21	8.8
CS emergency in labour	6	5.0	7	5.9	3	5.9	3	3.5	8	7.6	5	8.3	16	6.7
CS emergency not in labour*	2	1.7	2	1.7	2	3.9	1	1.2	4	3.8	1	1.7	11	4.6
Epidural	57	47.1	34	28.6	27	52.9	47	54.6	57	54.3	31	51.7	147	61.3

*failed induction rate

5.3 Use of Syntocinon

Table 177: Dilatation at start of syntocinon infusion among labouring women by induction status (2010)

	Induced labour n=1595		Spontaneous labour n=975	
	n	%	n	%
0	77	4.8	0	0.0
1	184	11.5	0	0.0
2	464	29.1	0	0.0
3	422	26.5	133	13.6
4	151	9.5	183	18.8
5	51	3.2	153	15.7
6	29	1.8	74	7.6
7	12	0.8	59	6.1
8	13	0.8	63	6.5
9	19	1.2	62	6.4
10	53	3.3	121	12.4
Missing	120	7.5	127	13.0

5.4 Mode of birth

Table 178: Mode of birth by parity and previous Caesarean section status (2010)

	Nullipara preterm n=343		Nullipara term n=3307		Multipara no prev CS preterm n=234		Multipara no prev CS term n=2628		Multipara prev CS preterm n=112		Multipara prev CS term n=1085	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	137	39.9	1513	45.8	129	55.1	2238	85.2	24	21.4	176	16.2
Vaginal breech	22	6.4	3	0.1	21	9.0	8	0.3	5	4.5	0	
Operative vaginal birth	37	10.8	715	21.6	4	1.7	113	4.3	1	0.9	72	6.6
Ventouse	16	4.7	453	13.7	2	0.9	67	2.6	1	0.9	48	4.4
Forceps	21	6.1	262	7.9	2	0.9	46	1.8	0	0	24	2.2
Caesarean section	147	42.9	1076	32.5	80	34.2	269	10.2	82	73.2	837	77.1
Emergency	106	30.9	734	22.2	61	26.1	158	6.0	42	37.5	164	15.1
Elective	41	12.0	342	10.3	19	8.1	111	4.2	40	35.7	673	62.0

Table 179: LMC by parity and previous Caesarean section status (2010)

	IMW n=3552		Pvt Obstetrician n=1734		GP n=94		NW n=2209		Other DHB n=63		Unbooked n=57	
	n	%	n	%	n	%	n	%	n	%	n	%
Primipara	1834	51.6	853	49.2	43	45.7	873	39.5	30	47.6	17	29.8
Standard primip	712	20.0	262	15.1	17	18.1	220	10.0	1	1.6	5	8.8
Multipara	1718	48.4	881	50.8	51	54.2	1336	60.5	33	52.4	40	70.2
Previous CS	312	8.8	414	23.9	14	14.9	449	20.3	5	7.9	3	5.3
No prev CS	1406	39.6	467	26.9	37	39.4	887	40.2	28	44.4	37	64.9

Table 180: Mode of birth by LMC at birth (term nullipara) (2010)

	IMW n=1716		Pvt Obstetrician n=772		GP n=42		NW n=761		Other DHB n=4		Unbooked n=12	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	881	51.3	202	26.2	20	47.6	398	52.3	3	75.0	9	75.0
Vaginal breech	3	0.2	0		0		0		0		0	
Forceps	140	8.2	68	8.8	4	9.5	50	6.6	0		0	
Ventouse	243	14.2	115	14.9	4	9.5	91	12.0	0		0	
CS elective	88	5.1	196	25.4	2	4.8	56	7.4	0		0	
CS emergency	361	21.0	191	24.7	12	28.6	166	21.8	1	25.0	3	25.0

Table 181: Mode of birth at term by LMC at birth (standard primipara) (2010)

	IMW n=712		Pvt Obstetrician n=262		GP n=17		NW n=220		Unbooked n=5	
	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	432	60.7	99	37.8	12	70.6	137	62.3	3	60.0
Forceps	57	8.0	19	7.3	0		10	4.6	0	
Ventouse	99	13.9	50	19.1	0		32	14.6	0	
CS elective	10	1.4	44	16.8	0		7	3.2	0	
CS emergency	114	16.0	50	19.1	5	29.4	34	15.5	2	40.0

Table 182: Mode of birth at term by LMC at birth (multipara, no previous CS) (2010)

	IMW n=1351		Pvt Obstetrician n=434		GP n=36		NW n=771		Other DHB n=9		Unbooked n=27	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1169	86.5	338	77.9	34	94.4	663	86.0	8	88.9	26	96.3
Vaginal breech	7	0.5	1	0.2	0		0		0		0	
Forceps	25	1.9	8	1.8	0		13	1.7	0		0	
Ventouse	22	1.6	27	6.2	0		17	2.2	0		1	3.7
CS elective	42	3.1	40	9.2	0		29	3.8	0		0	
CS emergency	86	6.4	20	4.6	2	5.6	49	6.4	1	11.1	0	

Table 183: Mode of birth at term by LMC (multipara, previous CS) (2010)

	IMW n=296		Pvt Obstetrician n=383		GP n=12		NW n=392		Other DHB n=1		Unbooked n=1	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	84	28.4	21	5.5	1	8.3	69	17.6	1	100	0	
Vaginal breech	0		0		0		0		0		0	
Forceps	14	4.7	5	1.3	1	8.3	4	1.0	0		0	
Ventouse	14	4.7	11	2.9	1	8.3	22	5.6	0		0	
CS elective	131	44.3	317	82.8	9	85.0	216	55.1	0		0	
CS emergency	53	17.9	29	7.6	0		81	20.7	0		1	100

Table 184: Mode of birth by ethnicity (2010)

	NZ European n=2898		Maori n=579		Pacific n=1088		Other Asian n=1476		Indian n=539		Other European n=856		Other n=273	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1363	47.0	376	64.9	788	72.4	864	58.5	271	50.3	406	47.4	149	54.6
Vaginal breech	17	0.6	6	1.0	14	1.3	13	0.9	2	0.4	6	0.7	1	0.4
Forceps	171	5.9	22	3.8	24	2.2	58	3.9	29	5.4	43	5.0	8	2.9
Ventouse	246	8.5	27	4.7	30	2.8	134	9.1	48	8.9	88	10.3	14	5.1
CS elective	624	21.5	51	8.8	87	8.0	179	12.1	73	13.5	168	19.6	44	16.1
CS emergency	477	16.5	97	16.8	145	13.3	228	15.5	116	21.5	145	16.9	57	20.9

Table 185: Mode of birth by ethnicity (nullipara) (2010)

	NZ European n=1401		Maori n=217		Pacific n=334		Other Asian n=827		Indian n=286		Other European n=472		Other n=113	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	539	38.5	116	53.5	210	62.9	421	50.9	122	42.7	192	40.7	50	44.3
Vaginal breech	7	0.5	2	0.9	6	1.8	7	0.9	1	0.4	60	0.4	0	
Forceps	137	9.8	20	9.2	14	4.2	48	5.8	22	7.7	113	7.4	7	6.2
Ventouse	195	13.9	19	8.8	21	6.3	116	14.0	38	13.3	35	14.8	10	8.9
CS elective	190	13.6	15	6.9	14	4.2	62	7.5	29	10.1	70	12.7	13	11.5
CS emergency	333	23.8	45	20.7	69	20.7	173	20.9	74	25.9	2	23.9	33	29.2

Table 186: Mode of birth by ethnicity (multipara) (2010)

	NZ European n=1497		Maori n=362		Pacific n=754		Other Asian n=649		Indian n=253		Other European n=384		Other n=160	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	824	55.0	260	71.8	578	76.7	443	68.3	149	58.9	214	55.7	99	61.9
Vaginal breech	10	0.7	4	1.1	8	1.1	6	0.9	1	0.4	4	1.0	1	0.6
Forceps	34	2.3	2	0.6	10	1.3	10	1.5	7	2.8	8	2.1	1	0.6
Ventouse	51	3.4	8	2.2	9	1.2	18	2.8	10	4.0	18	4.7	4	2.5
CS elective	434	29.0	36	9.9	73	9.7	117	18.0	44	17.4	108	28.1	31	19.4
CS emergency	144	9.6	52	14.4	76	10.1	55	8.5	42	16.6	32	8.3	24	15.0

Table 187: Mode of birth by maternal age (nullipara) (2010)

	≤20 n=270		21-25 n=522		26-30 n=1165		31-35 n=1113		36-40 n=502		>40 n=78	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	188	69.6	326	62.5	567	48.7	438	39.4	115	22.9	16	20.5
Vaginal breech	3	1.1	5	1.0	7	0.6	4	0.4	5	1.0	1	1.3
Forceps	16	5.9	25	4.8	90	7.7	107	9.6	41	8.5	4	5.1
Ventouse	17	6.3	42	8.1	150	12.9	174	15.6	79	15.7	7	9.0
CS elective	8	3.0	26	5.0	85	7.3	122	11.0	121	24.1	21	26.9
CS emergency	38	14.1	98	18.8	266	22.8	268	24.1	141	28.1	29	37.2

Table 188: Mode of birth by maternal age (multipara) (2010)

	≤20 n=65		21-25 n=421		26-30 n=833		31-35 n=1403		36-40 n=1142		>40 n=195	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	54	83.1	349	82.9	604	72.5	878	62.6	595	52.1	87	44.6
Vaginal breech	2	3.1	6	1.4	8	1.0	10	0.7	6	0.5	2	1.0
Forceps	1	1.5	2	0.5	10	1.2	26	1.9	30	2.6	3	1.5
Ventouse	1	1.5	9	2.1	23	2.8	47	3.4	35	3.1	3	1.5
CS elective	2	3.1	22	5.2	117	14.1	288	20.5	348	30.5	66	33.9
CS emergency	5	7.7	33	7.8	71	8.5	154	11.0	128	11.2	34	17.4

5.5 Operative births

Table 189: Primary indication for elective or pre labour emergency Caesarean section (all gestations) (2010)

	Total N= 1655		Nullipara n=611		Multipara n= 1044	
	n	%	n	%	n	%
Repeat Caesarean	641	38.8	0	0.2	641	61.4
Malpresentation	245	14.8	171	28.0	74	7.1
Maternal request	115	6.9	81	13.1	34	3.3
Obstetric history	74	4.5	8	1.3	66	6.3
Placenta praevia	49	3.0	23	3.8	26	2.5
Maternal medical condition	51	3.1	36	5.9	15	1.4
Maternal age	18	1.1	16	2.6	2	0.2
Fetal distress	107	6.5	69	11.3	38	3.6
Failed Induction	74	4.5	53	8.7	21	2.0
SGA	30	1.8	22	3.6	8	0.8
Disproportion	16	1.0	12	2.0	4	0.4
Hypertension	34	2.1	20	3.3	14	1.3
Multiple pregnancy	37	2.2	17	2.8	20	1.9
Diabetes	29	1.8	7	1.2	22	2.1
APH / abruption	38	2.3	19	3.1	19	1.8
Other	97	5.9	57	9.3	40	3.8

Table 190: Indication for in labour emergency Caesarean section at term (spontaneous or induced onset of labour) (n=836) (2010)

	n=836	
	n	%
Fetal distress	122	14.6
Other fetal indication	89	10.7
Fetal intolerance of augmented labour	118	14.1
Augmentation causes hyperstimulation	43	5.1
Poor uterine response to optimal augmentation	42	5.0
Suboptimal augmentation	112	13.4
Inefficient uterine action, no oxytocin	29	3.5
Efficient uterine action: obstructed labour	247	29.6
Maternal request	8	1.0
Other non medical	23	2.8
Missing	3	0.4

Table 191: Operative vaginal birth rates (1996-2010)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total births (mothers)	**9157**	**8055**	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**
Total operative vaginal births	1156	1051	925	949	1006		1081	1065	1171	1022	956	975	937	947	942
Incidence %	12.6	13.0	12.3	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3	12.2	12.2
Total nullipara	**4018**	**3591**	**3263**	**3262**	**3455**				**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**
Operative vaginal births	895	776	704	722	733				875	809	737	772	722	753	752
Nulliparous operative vaginal birth rate (%)	22.3	21.6	21.6	22.1	21.2				24.3	23.0	21.1	20.6	19.9	19.8	20.6
Total multipara	**5139**	**4464**	**4229**	**4239**	**4372**				**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**
Operative vaginal births	261	275	221	227	273				296	213	219	203	215	194	190
Multiparous operative vaginal birth rate (%)	5.1	6.2	5.2	5.4	6.2				7.6	5.8	5.9	5.1	5.4	4.9	4.7

Table 192: Type of operative vaginal birth: (1996-2010)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total births	**9157**	**8055**	**7492**	**7501**	**7827**	**7471**	**7755**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7753**	**7709**
Total operative vaginal births	1156	1051	925	949	1006		1081	1065	1171	1022	956	975	937	947	942
% of all births	12.6	13.0	12.3	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3	12.2	12.2
Total forceps alone	739	590	464	439	435		391	352	323	234	256	222	301	339	308
% of all births	8.1	7.3	6.2	5.9	5.6		5.0	4.6	4.3	3.3	3.5	2.9	4.0	4.0	4.0
Kiellands forceps	83	73	41	33	21				36	22	33	22	29	42	38
% of all births	0.9	0.9	0.5	0.4	0.3				0.5	0.3	0.5	0.3	0.4	0.5	0.5
Other forceps	656	517	423	406	414				287	212	223	200	272	297	270
% of all births	7.2	6.4	5.6	5.4	5.3				3.8	2.9	3.1	2.6	3.6	3.8	3.5
Ventouse or forceps /ventouse	417	461	461	510	571		690	713	848	788	700	753	677	650	634
% of all births	4.6	5.7	6.2	6.8	7.3		8.9	9.4	11.3	11.0	9.7	9.8	8.9	8.4	8.3
Ventouse alone				436	516				771	728	639	686	636	608	584
% of all births				5.8	6.6				10.3	10.1	8.9	8.9	8.4	7.8	7.6
Forceps/ ventouse				74	55				77	60	61	67	41	35	50
% of all births				1.0	0.7				1.0	0.8	0.8	0.9	0.5	0.5	0.6

Table 193: Breech birth (1996-2010)
Note no data in 2001-2003

	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010
Total babies born	9612	8270	7721	7679	8054	7679	7384	7379	7875	7753	7897	7866
Total breech births	479	434	400	440	484	421	432	419	449	439	335	434
Percent of total births	5.0	5.2	5.2	5.7	6.0	5.5	5.9	5.7	5.7	5.7	4.2	5.5
Total singleton babies				7329	7609	7303	7007	7050	7518	7427	7576	7556
Total singleton breech				341	363	318	328	328	351	346	335	340
Percent of singletons				4.7	4.8	4.4	4.7	4.7	4.7	4.7	4.4	4.3
Total multiple babies				350	445	376	377	329	357	324	321	310
Total multiple breech				99	121	103	104	91	98	93	89	94
Percent of multiple births				28.3	27.2	27.4	27.6	27.7	27.5	28.7	27.7	30.3

Table 194: Mode of birth by type of breech (singletons only) (2010)

	Extended leg n=174		Flexed leg n=95		Unspecified n=71		Total breech n= 340	
	n	%	n	%	n	%	n	%
Vaginal breech	23	13.2	13	13.7	12	16.9	48	14.1
Caesarean section	151	86.8	82	86.3	59	83.1	292	85.9
CS emergency	46	26.4	35	36.8	17	23.9	98	28.8
CS elective	105	60.3	47	49.5	42	59.2	194	57.1

Table 195: Mode of birth by type of breech (multiples only)(2010)

	Extended leg n=31		Flexed leg n=26		Unspecified n=37		Total breech n=94	
	n	%	n	%	n	%	n	%
Vaginal breech	4	12.9	6	23.1	5	13.5	15	16.0
Caesarean section	25	80.6	20	76.9	32	86.5	77	81.9
CS emergency	11	35.5	12	46.2	13	35.1	36	38.3
CS elective	14	45.2	8	30.8	19	51.4	41	43.6

Table 196: Referral for ECV (women at term with singleton breech presentation or attempted ECV) by demographic and clinical characteristics (2010)

	Singleton breech at term or attempted ECV	ECV n=95		No ECV n=188	
	n=283	n	%	n	%
Age (years					
≤ 20	7	2	29	5	71
21-30	83	35	42	48	58
31-40	183	54	30	129	70
≥ 41	10	4	40	6	60
Ethnicity (prioritised)					
NZ/Other European	162	41	25	121	75
Maori/ Pacific Island	44	20	45	24	55
Other Asian	49	23	47	26	53
Indian	17	7	41	10	59
Other	11	4	36	7	64
BMI					
<19	20	6	30	14	70
19-25	175	64	37	111	63
26-30	44	9	20	35	80
31-35	24	9	38	15	63
>35	14	6	43	8	57
LMC at birth					
Independent MW	144	69	48	75	52
NW Community	39	11	28	28	72
NW Diabetes/Medical	20	5	25	15	75
Private Obstetrician	69	7	10	62	90
GP	3	2	67	1	33
Previous CS					
No	229	90	39	139	61
Yes	48	4	8	44	92

5.6 Anaesthesia use

Table 197: Epidural use among women with spontaneous and induced labour (2000-2010)

	2000	2004	2005	2006	2007	2008	2009	2010
Number of births	7827	7491	7194	7212	7695	7589	7753	7709
Number women with spontaneous labour	4820	4817	4246	4256	4490	4070	4125	4007
Spontaneous labour and epidural	2143	2434	2138	2168	2057	1743	1717	1686
%	44.5	50.5	50.4	50.9	45.8	42.8	41.6	42.1
Number of women with induced labour	2002	1922	1894	1776	1906	2203	2238	2214
Induced labour and epidural	1313	1412	1373	1269	1326	1550	1599	1557
%	65.6	73.5	72.5	71.5	69.6	70.4	71.4	70.3

Table 198: Analgesic use and LMC at birth among labouring nulliparous women (2010)

LMC type	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
IMW	1704	1091	64.0	936	54.9	446	26.2	43	2.5	230	13.5
Pvt Obstetrician	601	505	84.0	273	45.4	80	13.3	12	2.0	53	8.8
GP	41	29	70.7	28	68.3	10	24.4	3	7.3	7	17.1
NW Community	543	319	58.8	339	62.4	152	28.0	5	0.9	55	10.1
NW Diabetes	99	75	75.8	65	65.7	30	30.3	0		2	2.0
NW Medical	125	90	72.0	37	53.6	31	24.8	1	0.8	4	3.2
Other DHB	21	7	33.3	12	57.1	7	33.3	0		0	
Unbooked	16	6	37.5	10	62.5	6	37.5	0		0	

Table 199: Analgesic use and ethnicity (prioritised) among labouring nulliparous women (2010)

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
NZ European	1160	870	75.0	637	54.9	246	21.2	38	3.3	171	14.7
Maori	196	117	59.7	133	67.9	55	28.1	1	0.5	29	14.8
Pacific	309	158	51.1	173	56.0	74	24.0	1	0.3	25	8.1
Other Asian	749	450	60.1	416	55.5	216	28.8	5	0.7	38	5.1
Indian	246	169	68.7	129	52.4	64	26.0	3	1.2	15	6.1
Other European	396	290	73.2	191	48.2	79	20.0	14	3.5	59	14.9
Other	94	68	72.3	51	54.3	28	29.8	2	2.1	14	14.9

Table 200: Analgesic use and maternal age among labouring nulliparous women (2010)

Maternal age (years)	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
≤20	256	123	48.1	172	67.2	80	31.3	0		34	13.3
21-25	479	269	56.2	286	59.7	132	27.6	2	0.4	44	9.2
26-30	1056	707	67.0	553	52.4	269	25.5	18	1.7	105	9.9
31-35	953	706	74.1	512	53.7	188	19.7	28	2.9	112	11.8
36-40	354	273	77.1	185	52.3	81	22.9	16	4.5	53	15.0
>40	52	44	84.6	22	42.3	12	23.1	0		3	5.8

APPENDIX 6. LABOUR and BIRTH OUTCOMES

6.1 Perineal trauma

Table 201: Perineal trauma by mode of birth, parity and LMC at birth among all vaginal births (2010)

	Total	Episiotomy		3rd/4th tear		Vaginal wall tear	
	N	n	%	n	%	n	%
Total vaginal births	5218	1252	24.0	120	2.3	297	5.7
Mode of birth							
Normal vaginal	4217	621	14.7	63	1.5	250	5.9
Vaginal breech	59	3	5.1	0	0.0	0	0.0
Ventouse	587	343	58.4	34	5.8	26	4.4
Forceps	355	285	80.3	23	6.5	21	5.9
Parity							
Nulliparous	2427	953	39.3	95	3.9	210	8.7
Multiparous	2791	299	10.7	25	0.9	87	3.1
LMC at birth							
Independent Midwife	2737	673	24.6	70	2.6	162	5.9
Private Obstetrician	862	325	37.7	17	2.0	26	3.0
General Practitioner	66	23	34.9	1	1.5	7	10.6
NW Community	1060	161	15.2	26	2.5	83	7.8
NW Diabetes	186	24	12.9	2	1.1	7	3.8
NW Medical	223	42	18.8	4	1.8	10	4.5
Other DHB	34	0	0.0	0	0.0	0	0.0
Unbooked	50	4	8.0	0	0.0	2	4.0

Table 202: Episiotomy rates in vaginal births, all gestations by LMC at birth and parity (2010)

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	2427	953	39.3	2791	299	10.7
Independent Midwife	1353	530	39.2	1384	143	10.3
Private Obstetrician	424	229	54.0	438	96	21.9
General Practitioner	28	17	60.7	38	6	15.8
National Women's	622	177	28.5	931	54	5.8

Table 203: Episiotomy rates in spontaneous (non operative) vertex (not breech) birth, all gestations by LMC at birth and parity (2010)

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1650	417	25.3	2567	204	8.0
Independent Midwife	948	244	25.7	1297	101	7.8
Private Obstetrician	223	86	38.6	381	71	18.6
General Practitioner	20	9	45.0	36	4	11.1
National Women's	459	78	17.0	853	28	3.3

Table 204: 3rd and 4th degree tears in spontaneous (non operative) vertex birth by LMC at birth and parity (2010)

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1650	46	2.8	2567	17	0.7
Independent Midwife	948	27	2.8	1297	12	0.9
Private Obstetrician	223	4	1.8	381	0	0.0
GP	20	1	5.0	36	0	0.0
National Women's	459	14	3.1	853	5	0.6

Table 205:Third stage management by PPH risk among vaginal births (2010)

	Total n=5218	Physiological n=444		Active syntocinon n=2576		Active syntometrine n=2089		Other n=2		Unknown n=107	
	n	n	%	n	%	n	%	n	%	n	%
Spontaneous vaginal birth	4276	440	10.2	2001	46.8	1750	40.9	2		83	1.9
Operative vaginal birth	942	4	0.4	575	61.0	339	36.0	0	0.0	24	2.5
BMI											
<19	344	44	12.8	169	49.1	126	36.6	0	0.0	5	1.5
19-25	2982	261	8.8	1477	49.5	1187	39.8	1	0.03	56	1.9
26-30	915	82	9.0	456	49.8	354	38.7	1	0.1	22	2.4
31-35	467	26	5.6	222	47.5	210	45.0	0	0.0	9	1.9
>35	367	14	3.8	184	50.1	158	43.1	0	0.0	11	3.0
missing	143	17	11.9	68	47.6	54	37.8	0	0.0	4	2.8
Previous CS	278	11	4.0	136	48.9	123	44.2	0	0.0	8	2.9
Hypertension											
Nil	4844	434	9.0	2272	46.9	2036	42.0	2	0.04	100	2.1
Gestational Hypertension	160	2	1.3	128	80.0	25	15.6	0	0.0	5	3.1
Chronic hypertension	105	5	4.8	80	76.2	19	18.1	0	0.0	1	1.0
Superimposed preeclampsia	9	1	11.1	8	88.9	0	0.0	0	0.0	0	0.0
Preeclampsia	100	2	2.0	88	88.0	9	9.0	0	0.0	1	1.0
Singleton	5169	443	8.6	2557	49.5	2062	39.9	1	0.02	106	2.1
Twins	49	1	2.0	19	38.8	27	55.1	1	2.0	1	2.0

Table 206: Postpartum transfusion rates by recorded blood loss at birth (2010)

	Total	Postpartum transfusion	
		n	%
Total	**7709**	**190**	**2.5**
Blood loss <500mls	4948	4	0.1
PPH 500- 999	2058	35	1.7
PPH 1000 - 1499mls	437	33	7.6
PPH 1500 - 2499mls	202	69	34.2
PPH ≥2500	56	49	87.5
Blood loss unknown	8	0	

APPENDIX 7. POSTNATAL CARE

7.1 Infant Feeding

Table 207: Method of Infant feeding at discharge from NW (2003-2010)

	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	
	n	%	n	%
Exclusive breastfeeding	5659	81.7	5736	82.6
Fully breastfeeding	287	4.1	260	3.8
Partial breastfeeding	824	11.9	755	10.9
Artificial feeding	158	2.3	190	2.7

Table 208: Infant feeding on discharge from NW by mode of birth, LMC and maternal age (2010)

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total	6941	5736	82.6	260	3.8	755	10.9	190	2.7
Mode of birth									
Spontaneous vaginal	3920	3511	89.6	76	1.9	230	5.9	103	2.6
Operative vaginal	861	752	87.3	20	2.3	78	9.1	11	1.3
Elective CS	1122	818	72.9	71	6.3	178	15.9	55	4.9
Emergency CS	1038	655	63.1	93	9.0	269	25.9	21	2.0
LMC at birth									
IMW	3340	2944	88.1	97	2.9	258	7.7	41	1.2
Private Obstetrician	1597	1313	82.2	64	4.0	179	11.2	41	2.6
GP	81	65	80.3	3	3.7	10	12.4	3	3.7
NW Community	1408	1086	77.1	59	4.2	196	13.9	67	4.8
NW Medical	199	133	66.8	10	5.0	36	18.1	20	10.1
NW Diabetes	259	151	58.3	26	10.0	71	127.4	11	4.3
Unbooked	42	30	71.4	1	2.4	4	9.5	7	16.7
Other DHB	15	14	93.3	0	0.0	1	6.7	0	0.0
Maternal age									
≤ 20	277	230	83.0	8	2.9	26	9.4	13	4.7
21-25	836	704	84.2	22	2.6	81	9.7	29	3.5
26-30	1802	1486	82.5	73	4.1	197	10.9	46	2.6
31-35	2296	1914	83.4	89	3.9	244	10.6	49	2.1
36-40	1495	1214	81.2	63	4.2	175	11.7	43	2.9
>40	235	188	80.0	5	2.1	32	13.6	10	4.3

Table 209: Infant feeding on discharge from NW by prioritised maternal ethnicity, gestation, birthweight and among standard primpara (2010)

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Ethnicity									
NZ European	2611	2249	86.1	84	3.2	217	8.3	61	2.3
Māori	483	409	84.7	17	3.5	35	7.3	22	4.6
Pacific	969	771	79.6	36	3.7	102	10.5	60	6.2
Other Asian	1379	1055	76.5	62	4.5	238	17.3	24	1.7
Indian	480	380	79.2	32	6.7	64	13.3	4	0.8
Other European	772	676	87.6	19	2.5	64	8.3	13	1.7
Other	247	196	79.4	10	4.1	35	14.2	6	2.4
Gestation									
< 37 weeks	250	121	48.4	43	17.2	71	28.4	15	6.0
≥37 weeks	6691	5615	83.9	217	3.2	684	10.2	175	2.6
Birth weight									
< 2.5 kgs	178	77	43.3	38	21.4	57	32.0	6	3.4
2.5 - 2.9 kgs	1040	805	77.4	51	4.9	151	14.5	33	3.2
3.0 - 4.4 kgs	5586	4751	85.1	163	2.9	524	9.4	148	2.7
≥ 4.5 kgs	137	103	75.2	8	5.8	23	16.8	3	2.2
Primipara									
Standard	1168	1029	88.1	32	2.7	90	7.7	17	1.5
Non standard	5773	4707	81.5	228	4.0	665	11.5	173	3.0

Table 210: Infant feeding on discharge from NW Homecare (2010)

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Community	1040	570	54.8	72	6.9	256	24.6	142	13.7
Medical	76	48	63.2	3	4.0	17	22.4	8	10.5
Diabetes	96	49	51.0	9	9.4	28	29.2	10	10.4

7.2 Postnatal Admissions

Table 211: Maternal destination following birth by mode of birth (2010)

	Total n=7709	NW Wards		Birthcare Auckland		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Total	**7709**	**4661**	**60.5**	**2543**	**33.0**	**481**	**6.2**	**24**	**0.3**
Spontaneous vaginal	4276	1593	37.3	2192	51.3	471	11.0	20	0.5
Operative vaginal	942	577	61.3	351	37.3	10	1.1	4	0.4
CS Elective	1226	1226	100.0	0	0.0	0	0.0	0	0.0
CS Emergency	1265	1265	100.0	0	0.0	0	0.0	0	0.0

Table 212: Maternal destination following birth by LMC at birth (2010)

	Total n=7709	NW Wards n=4661		Birthcare n=2543		Home n=481		Other Units n=24	
	N	n	%	n	%	n	%	n	%
Total	**7709**	**4661**	**60.5**	**2543**	**33.0**	**481**	**6.2**	**24**	**0.3**
Independent Midwife	3552	1680	47.3	1549	43.6	305	8.6	18	0.5
Private Obstetrician	1734	1166	67.2	543	31.3	21	1.2	4	0.2
General Practitioner	94	51	54.3	37	39.4	6	6.4	0	0.0
NW Community	1505	1003	66.6	365	24.3	136	9.0	1	0.1
NW High Risk	704	658	93.5	40	5.7	5	0.7	1	0.1
Other DHB	63	58	92.1	2	3.2	3	4.8	0	0.0
Unbooked	57	45	79.0	7	12.3	5	8.8	0	0.0

Table 213: Maternal destination following birth by prioritised maternal ethnicity (2010)

	Total	NW Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
NZ European	2898	1769	61.0	1041	35.9	75	2.6	13	0.5
Maori	579	376	64.9	136	23.5	66	11.4	1	0.2
Pacific	1088	656	60.3	295	27.1	136	12.5	1	0.1
Other Asian	1476	804	54.5	537	36.4	132	8.9	3	0.2
Indian	539	369	68.5	149	27.6	21	3.9	0	0.0
Other European	856	519	60.6	306	35.8	25	2.9	6	0.7
Other	273	168	61.5	79	28.9	26	9.5	0	0.0

Table 214: Postnatal readmission reason by maternal destination following birth (2010)

	NW Wards n=255		Birthcare n=102		Home n=16	
	n	%	n	%	n	%
Neonatal admission	5	2.0	8	7.8	0	0.0
Postpartum haemorrhage	32	12.5	11	10.8	1	6.3
Infection	46	18.0	5	4.9	2	12.5
Breast	37	14.5	18	17.6	5	31.3
Wound	8	3.1	2	2.0	0	0.0
Other	127	49.8	58	56.9	8	50.0

Table 215: Place of birth for women admitted postnatally who did not birth at NW (2010)

	n=136	
	n	%
Birthcare	19	14
Home	8	6
Middlemore	22	16
Botany Downs	1	1
Papakura	1	1
Pukekohe	1	1
North Shore	23	17
Waitakere	26	19
Other	35	26

APPENDIX 8. NEWBORN SERVICES

8.1 NICU Occupancy

Table 216: Occupancy (baby-days) for NICU by gestational age (1999-2010)

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

Table 217: Occupancy (baby-days) for NICU by birth weight (1999-2010)

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

8.2 Admissions to NICU

Table 218: Admissions of inborn babies to NICU by gestational age groups (2000-2010)

	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

	2006		2007		2008		2009		2010	
	n	%	n	%			n	%	n	%
Total	791		870		822		820		791	
20-27	44	5.6	58	6.7	58	7.1	57	7.0	58	7.3
28-31	119	15.0	107	12.3	122	14.8	91	11.1	110	13.9
32-36	331	41.8	377	43.3	331	40.3	315	38.4	280	35.3
≥ 37	297	37.5	328	37.7	311	37.8	357	43.5	342	43.2

Table 219: Live births at National Women's by birthweight (includes BBA) (2010)

Birth weight (g)	2010 N=7783	
Total	n	%
<500	8	0.1
500-749	30	0.4
750-999	29	0.4
1000-1499	91	1.2
1500-1999	112	1.4
2000-2499	315	4.0
2500-2999	1170	15.0
3000-3999	5024	64.6
≥4000	1004	12.9

Table 220: Admissions of inborn babies to NICU by birth weight (2000-2010)

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	**1154**	**1104**	**1098**	**1004**	**861**	**825**	**791**	**870**	**822**	**820**	**791**
<500	0	1	1	0	0	0	0	1	0	0	2
500-749	22	23	14	20	11	25	19	19	19	15	23
750-999	41	37	37	32	37	34	24	37	37	42	29
1000-1249	45	47	47	31	38	47	34	47	35	31	39
1250-1499	64	48	56	53	36	42	57	51	52	49	50
1500-1999	193	186	193	164	138	120	130	130	135	126	110
2000-2499	291	243	256	238	177	170	182	188	180	155	135
2500-2999	182	199	184	156	147	119	125	139	118	117	126
3000-3999	239	232	221	237	208	215	183	198	212	246	226
≥4000	77	88	89	73	69	53	37	60	34	39	51

Table 221: Admissions of inborn babies to NICU by gestational age (2000-2010)

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	**1154**	**1104**	**1098**	**1004**	**861**	**825**	**791**	**870**	**822**	**820**	**791**
23	5	7	1	1	0	1	1	5	0	1	0
24	4	10	8	9	3	15	9	4	8	9	13
25	21	12	13	10	8	14	9	13	16	12	15
26	23	12	15	15	18	11	13	18	17	15	10
27	15	14	20	15	24	9	12	18	17	20	20
28	18	21	19	18	18	23	16	21	13	19	16
29	34	29	32	18	19	41	25	26	29	20	21
30	32	36	32	31	35	29	29	27	37	22	36
31	54	42	36	43	32	33	49	33	43	30	33
32	78	58	67	49	42	42	63	46	40	42	29
33	98	77	100	78	65	38	50	63	48	65	59
34	135	125	138	137	79	83	88	114	90	82	90
35	106	116	125	96	84	70	82	82	83	69	55
36	114	112	92	89	79	62	48	72	70	57	51
37	88	77	84	71	61	70	58	59	54	64	58
38	93	101	98	88	86	83	69	81	86	89	93
39	77	88	61	85	68	72	52	68	68	77	67
40	109	106	78	90	84	80	78	74	70	83	78
41	44	55	66	52	51	39	37	39	23	38	41
42	6	6	13	9	5	9	3	6	10	6	6
43	0	0	0	0	0	1	0	1	0	0	0

Table 222: Admissions of outborn babies to NICU by gestational age (2000-2010)

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	**258**	**209**	**228**	**216**	**114**	**81**	**99**	**102**	**117**	**137**	**111**
22	0	0	0	0	0	0	0	0	0	0	1
23	0	1	1	0	0	0	0	0	1	0	0
24	4	1	3	0	3	3	3	5	3	4	4
25	1	1	2	2	0	0	8	6	7	3	4
26	0	3	1	2	1	2	5	5	5	11	3
27	2	5	2	2	1	1	3	6	5	4	7
28	3	2	3	3	3	4	2	3	2	10	7
29	1	1	4	7	2	3	6	5	4	6	5
30	5	8	12	3	4	3	4	1	8	2	2
31	1	3	4	3	5	3	2	3	2	3	0
32	2	8	5	8	4	7	5	2	8	3	3
33	6	3	1	5	4	7	1	4	1	7	4
34	5	10	7	13	10	5	6	4	6	3	3
35	9	7	10	5	6	4	9	4	8	5	4
36	33	19	19	16	6	2	2	4	4	10	5
37	19	17	16	20	6	7	3	9	8	11	9
38	38	28	22	23	13	5	5	10	5	8	12
39	24	21	35	29	13	8	9	9	8	5	9
40	61	42	49	43	19	12	17	9	22	30	17
41	33	27	30	30	10	3	8	9	7	11	11
42	11	2	2	2	3	2	1	4	3	1	1
43+	0	0	0	0	1	0	0	0	0	0	0

Table 223: Admissions of outborn babies to NICU by gestational age groups (2000-2010)

	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	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
20-27	19	19.2	22	21.6	21	17.9	22	16.1	19	17.1
28-31	14	14.1	12	11.8	16	13.7	21	15.3	14	12.6
32-36	23	23.2	18	17.6	27	23.1	28	20.4	19	17.1
≥ 37	43	43.4	50	49.0	53	45.3	66	48.2	59	53.1

Table 224: Admissions of outborn babies to NICU by birth weight (2000-2010)

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	**258**	**209**	**228**	**216**	**114**	**81**	**99**	**102**	**117**	**137**	**111**
<500									1		1
500-749	3	5	3	2	3	2	10	8	7	4	5
750-999	3	6	10	4	4	5	5	11	7	17	11
1000-1249	2	3	4	8	3	4	7	6	13	15	8
1250-1499	7	6	11	5	5	6	5	4	7	8	7
1500-1999	14	15	14	18	18	15	13	10	16	8	10
2000-2499	35	34	21	28	11	10	8	8	12	12	10
2500-2999	37	32	34	29	13	10	15	13	13	12	10
3000-3999	120	87	101	91	43	22	26	33	31	50	37
≥4000	37	21	30	31	14	7	9	9	10	11	12

8.2.1 Admissions to NICU by domicile of mother

Table 225: Domicile of mother of all babies admitted to NICU (2000-2010)

	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	
	n	**%**	**n**	**%**
Northern Region	872	91.1	847	92.1
Auckland	509	58.4	435	48.2
Counties Manukau	123	14.1	115	12.8
Waitemata	206	23.6	253	28.1
Northland	34	3.9	44	4.9
Midland Region	50	5.2	23	2.5
Central Region	15	1.6	16	1.8
Southern Region	16	1.7	15	1.7
Overseas	0	0.0	1	0
Missing	4	0.4	0	

Table 226: DHB of mothers of all babies admitted to NICU (2010)

	2010 n=902			2010 n=902	
DHB	**n**	**%**	**DHB**	**n**	**%**
Auckland	435	48.2	**Wanganui**	4	0.4
Counties Manukau	115	12.8	**Mid-Central**	4	0.4
Waitemata	253	28.1	**Hawkes Bay**	3	0.3
Northland	44	4.9	**Capital & Coast**	3	0.3
Waikato	7	0.8	**Nelson Marlborough**	1	0.1
Bay of Plenty	8	0.9	**Canterbury**	7	0.8
Wairarapa	1	0.1	**Otago**	6	0.7
Tairawhiti	3	0.3	**Southland**	1	0.1
Taranaki	4	0.4	**West Coast**	1	0.1
Lakes	1	0.1	**Overseas**	1	0.1

8.2.3 Admissions to NICU by ethnicity of baby

Table 227: Prioritised ethnicity of babies admitted to NICU (2010)

	Preterm (<37 weeks) N=500		Term N=402		Total N=902	
	n	**%**	**n**	**%**	**n**	**%**
NZ European	183	36.6	189	47.0	372	41.2
Maori	87	17.4	62	15.4	149	16.5
Pacific	79	15.8	59	14.7	138	15.3
Other Asian	65	13.0	37	9.2	102	11.3
Indian	34	6.8	22	5.5	56	6.2
Other European	36	7.2	24	6.0	60	6.7
Other	16	3.2	9	2.2	25	2.8

8.2.4 Reason for admission to NICU

Table 228: Main reason for admission to NICU (2010)

	Preterm N=500		Term N=402		Total N=902	
	n	**%**	**n**	**%**	**n**	**%**
Prematurity	329	65.8	0		329	36.5
Respiratory distress	84	16.8	153	38.1	237	26.3
Congenital abnormality	21	4.2	89	22.1	110	12.2
Hypoglycaemia	6	1.2	34	8.5	40	4.4
Depression at birth	7	1.4	30	7.5	37	4.1
SGA	22	4.4	7	1.7	29	3.2
Cyanotic episode	1	0.2	14	3.5	15	1.7
Suspected infection	5	1.0	12	3.0	17	1.9
Neurological problem	3	0.6	8	2.0	11	1.2
Haemolytic disease	2	0.4	5	1.2	7	0.8
Feeding difficulty	0		2	0.5	2	0.2
Bile stained vomiting	0		4	1.0	4	0.4
Jaundice	1	0.2	3	0.8	4	0.4
Maternal diabetes mellitus	3	0.6	4	1.0	7	0.8
Other	16	3.2	37	9.2	53	5.9

8.2.5 Antenatal corticosteroids

Table 229: Percentage receiving antenatal corticosteroids by birth weight among ANZNN assigned babies (2003-2010)

Birth weight (g)	2003			2004			2005			2006		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	%	%	n	%	%
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		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	%	%
Total	155	55	96	149	54	87	150	53	88
<500	1	100	100	0	0	0	0	0	0
500-749	19	53	84	19	58	79	15	73	87
750-999	37	54	97	38	45	92	42	55	100
1000-1249	47	49	100	38	58	87	39	51	79
1250-1499	51	61	96	54	56	87	54	46	85

Birth weight (g)	2010		
	N	1-7d	Any
	n	n(%)	n(%)
Total	154	93(60)	138(90)
<500	2	2(100)	2(100)
500-749	25	16(64)	22(88)
750-999	31	21(68)	28(90)
1000-1249	41	27(66)	39(95)
1250-1499	55	27(49)	47(85)

Table 230: Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies (2003-2010)

Gestation (weeks)	2003			2004			2005			2006		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	%	%	n	%	%
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

Table 231 (continued): Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies

Gestation (weeks)	2007			2008			2009		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	%	%
Total	165	56	98	189	51	88	157	50	90
<24	5	40	60	0	0	0	1	0	0
24-25	17	53	94	25	36	80	20	70	95
26-27	36	69	100	36	50	86	37	54	95
28-29	47	45	98	45	60	87	45	56	89
30-31	60	60	100	83	52	93	54	37	89

Gestation (weeks)	2010		
	N	1-7d	Any
	n	n(%)	n(%)
Total	175	100(57)	160(91)
<24	1	0	0
24-25	30	17(57)	26(87)
26-27	31	20(65)	29(94)
28-29	42	26(62)	37(88)
30-31	71	37(52)	68(96)

8.3 Care and complications

8.3.1 Infection

Table 232: Organisms causing serious infection in NICU (2010)

Organism	Early Infection	Late Infection
Staph epidermidis + Ecoli	0	1
E Coli	3	1
Staph aureus	0	2
Staph epidermidis	0	8
Coagulase negative *staphylococcus*	0	2
Enterococcus	0	1
Candida	0	2
Citrobacter	0	1
Group B Strep	4	1
Klebsiella	0	2
Unknown	2	6

8.3.2 Intraventricular haemorrhage

8.3.2.1 Intraventricular haemorrhage (benchmarked with ANZNN)

Table 233: Intraventricular haemorrhage by birth weight (2010)

Birth Weight (g)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**190**	**70**	**99**	**6**	**5**	**6**	**4**
<500	2	1	1	0	0	0	0
500-749	25	6	10	4	2	3	0
750-999	31	2	26	0	1	0	2
1000-1249	41	4	31	1	2	2	1
1250-1499	55	34	20	0	0	0	1
1500-1999	33	22	10	1	0	0	0
2000-2499	1	1	0	0	0	0	0

Table 234: Intraventricular haemorrhage by gestation (2010)

Gestation (weeks)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	190	70	99	6	5	6	4
<24	1	1	0	0	0	0	0
24-25	30	4	16	3	2	3	2
26-27	31	4	21	2	2	1	1
28-29	42	7	32	0	1	1	1
30-31	71	40	29	1	1	1	0
32-36	15	14	1	0	0	0	0

8.3.2.2 Intraventricular haemorrhage (all <1250g babies admitted to NICU)

Table 235: Intraventricular haemorrhage in all <1250g babies admitted to NICU (1985-2010)

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

8.3.3 Assisted ventilation

Table 236: High Frequency Oscillatory Ventilation (1998-2010)

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	Total	%
Total	15/29	21/28	150/249	60
<28	8/18	12/18	76/135	56
28-31	2/3	3/3	18/29	62
32-36	3/5	2/3	14/28	50
≥37	2/3	4/4	41/56	73

Table 237: Inhaled Nitric Oxide (iNO) (1998-2010)

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	Total	%
Total	10/20	32/36	180/260	69
<28	2/7	7/9	25/54	46
28-31	0/2	3/4	12/24	50
32-36	2/3	4/5	24/40	60
≥37	6/8	18/18/	119/142	84

Table 238: iNO plus HFOV (1998-2010)

Gestation (weeks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	%
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	71/119	60
<28	0/1	1/4	1/2	0/1	-	-	0/4	2/3	0/1	3/4	2/4	2/6	5/7	16/37	43
28-31	-	0/2	-	-	1/3	-	-	1/1	-	2/3	-	0/1	2/2	6/12	50
32-36	1/2	1/1	2/3	0/2	0/3	-	-	0/1	1/1	1/1	2/2	2/3	1/2	11/21	52
≥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	38/49	78

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 13 years.

Table 239: Reason for ventilation and CPAP in term and post-term infants (1997-2010)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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
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
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
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
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
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
Support for surgery												14/8	10/3	13/6
Other											21/25	6/13	17/36	21/24
Missing reason											3/2		1/0	0/0

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 240: Numbers of survivors by gestational age of babies <32 weeks gestation (2010)

Gestation (weeks)	20	21	22	23	24	25	26	27	28	29	30	31
Born alive in NW	2	3	5	3	13	15	10	20	16	22	36	33
Died at birth in NW	2	3	4	3	0	0	0	0	0	1	0	0
Born alive at NW and admitted to NICU			1	0	13	15	10	20	16	21	36	33
Born alive at NW and survived			0	0	12	12	8	19	16	21	35	32
Outborn admitted					4	4	3	7	7	5	2	0

8.5 Outcomes

8.5.1 Retinopathy of prematurity

Table 241: Retinopathy of prematurity by birth weight in babies surviving to 36 weeks gestation (ANZNN assigned babies) (2010)

Birth Weight(g)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**127**	**36**	**32**	**28**	**27**	**4**	**0**
<500	2	0	1	1	0	0	0
500-749	20	1	2	4	11	2	0
750-999	28	2	6	7	11	2	0
1000-1249	40	15	11	9	5	0	0
1250-1499	31	16	9	6	0	0	0
1500-1999	6	2	3	1	0	0	0

Table 242: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks gestation (ANZNN assigned babies) (2010)

Gestation (wks)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**127**	**36**	**32**	**28**	**27**	**4**	**0**
24-25	25	1	2	6	12	4	0
26-27	28	5	5	9	9	0	0
28-29	42	14	14	11	3	0	0
30-31	27	12	10	2	3	0	0
>31	5	4	1	0	0	0	0

8.5.2 Chronic lung disease

Table 243: Chronic lung disease by birth weight (inborn babies <1500gms) (2010)

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	143	7	136	5	14	6	25	17	18
<500	2	0	2	0	2	0	2	100	100
500-749	23	2	21	2	4	2	8	35	38
750-999	29	3	26	1	5	1	7	24	27
1000-1249	39	1	38	2	1	3	6	15	16
1250-1499	50	1	49	0	2	0	2	4	4

Table 244: Chronic lung disease by gestational age (inborn babies <32weeks) (2010)

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	**164**	**8**	**156**	**7**	**14**	**9**	**30**	**18**	**19**
24-25	28	3	25	1	6	2	9	32	36
26-27	30	3	27	2	2	4	8	27	30
28-29	37	0	37	2	4	0	6	16	16
30-31	69	2	67	2	2	3	7	14	10

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 245: Necrotising enterocolitis (NEC) by birth weight (2002-2010)

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		
	N	n	%	N	n	%	N	n	%
Total	**149**	**4**	**3**	**150**	**6**	**4**	**154**	**7**	**5**
<500	0	0	0	0	0	0	2	0	0
500-749	19	2	11	15	1	7	25	0	0
750-999	38	1	3	42	4	10	31	1	3
1000-1249	38	1	3	39	0	0	41	4	10
1250-1499	54	0	0	54	1	2	55	2	4

Table 246: Necrotising enterocolitis by gestational age (2002-2010)

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		
	N	n	%	N	n	%	N	n	%
Total	**189**	**4**	**2**	**157**	**6**	**4**	**175**	**7**	**4**
<24	0	0	0	1	0	0	1	0	0
24-25	25	3	12	20	1	5	30	0	0
26-27	36	1	3	37	5	14	31	2	7
28-29	45	0	0	45	0	0	42	4	10
30-31	83	0	0	54	0	0	71	1	1

8.5.4 Patent Ductus Arteriosus

Table 247: Patent Ductus Arteriosus by birth weight <1500g (2003-2010)

Indo = treated with indomethacin. Ligate = surgical ligation of PDA. Indo includes all ligated
Indo includes all categories, 1 course, 2 courses, indo, long course, short course, induce, Ibuprofen
Induce is a randomised trial indo vs placebo

Birth weight (g)	2003			2004			2005			2006		
	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate
Total <1500g	**136**	**40**	**7**	**121**	**34**	**2**	**148**	**39**	**0**	**134**	**25**	**2**
<500												
500-749	20	15	6	11	4	1	25	20	0	19	10	2
750-999	32	11	0	37	18	0	34	15	0	24	9	0
1000-1249	31	10	0	38	11	1	47	3	0	34	4	0
1250-1499	53	4	1	35	1	0	42	1	0	57	2	0

Birth weight (g)	2007			2008			2009			2010		
	N	Indo	Ligate	N	Indo	Ligate	N	Indo n	Ligate n	N	Indo n(%)	Ligate n(%)
Total <1500g	**155**	**36**	**2**	**143**		**3**	**137**	**21**	**4**	**143**	**6(4)**	**5(3)**
<500	1	1	0	0	0	0	0	0	0	2	1(50)	0
500-749	19	7	0	19	10	2	15	4	0	23	11(48)	2(9)
750-999	37	17	2	37	10	1	42	9	1	29	23(79)	2(7)
1000-1249	47	8	0	35	5	0	31	6	3	39	2(5)	1(3)
1250-1499	51	3	0	52	2	0	49	2	0	50	1(2)	0

Table 248: Patent Ductus Arteriosus by gestational age (2003-2010)

Gestation (weeks)	2003			2004			2005			2006		
	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate
Total <32wks	**160**	**43**	**7**	**157**	**35**	**2**	**176**	**41**	**1**	**163**	**25**	**2**
<24	1	1	1	0			1	1	0	1	1	0
24-25	19	15	4	11	6	1	29	23	0	18	13	2
26-27	30	13	1	42	19	0	20	8	0	25	9	0
28-29	36	6	0	37	7	1	64	6	0	41	1	0
30-31	74	8	1	67	3	0	62	3	1	78	1	0

Gestation (weeks)	2007			2008			2009			2010		
	N	Indo	Ligate	N	Indo	Ligate	N	Indo n	Ligate n	N	Indo n(%)	Ligate n(%)
Total <32wks	**165**	**36**	**2**	**180**	**28**	**3**	**148**	**22**	**4**	**164**	**6(4)**	**6(4)**
<24	5	3	1	0	0	0	1	0	0	0	0	0
24-25	17	10	0	24	11	2	21	5	1	28	9(32)	3(11)
26-27	36	19	1	34	12	1	35	14	2	30	15(50)	0
28-29	47	4	0	42	1	0	39	1	1	37	3(8)	1(3)
30-31	60	0	0	80	4	0	52	2	0	69	0	2(3)

8.5.5 Pneumothorax

Table 249: Pneumothorax requiring drainage by birth weight (<1500g) (2003-2010)

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		
	N	n	%	N	n	%	N	n	%
Total<1500g	**149**	**7**	**5**	**137**	**6**	**5**	**143**	**2**	**1**
<500	0	0	0	0	0	0	2	0	0
500-749	19	2	11	15	1	7	23	1	4
750-999	38	1	3	42	3	7	29	0	0
1000-1249	38	0	0	31	0	0	39	0	0
1250-1499	54	4	7	49	2	4	50	1	2

Table 250: Pneumothorax requiring drainage by gestation (<32wks) (2003-2010)

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		
	N	n	%	N	n	%	N	n	%
Total <32wks	**189**	**7**	**4**	**148**	**3**	**2**	**164**	**2**	**1**
<24	0	0	0	1	0	0	0	0	0
24-25	25	2	8	21	1	5	28	0	0
26-27	36	1	3	35	2	6	30	0	0
28-29	45	2	4	39	0	0	37	2	5
30-31	83	2	2	52	0	0	69	0	0

Table 251: Inborn babies receiving postnatal corticosteroids by birth weight (babies alive at 1 week and less than 1500gms) (2010)

Birth weight (g)	N	n	%
Total	**139**	**19**	**14**
<500	2	1	50
500-749	21	7	30
750-999	27	10	37
1000-1249	39	0	0
1250-1499	50	1	2

Table 252: Inborn babies receiving postnatal corticosteroids by gestational age (2010)(babies alive at 1 week and less than 32 weeks)

Gestation(weeks)	N	n	%
Total	**160**	**19**	**12**
<24	0	0	0
24-25	25	14	56
26-27	29	3	10
28-29	37	2	5
30-31	69	0	0

Table 253: Method of feeding at discharge from NICU by gestational age and birth weight (2010)

	Total n=777	Exclusive n=347		Fully n=190		Partial n=139		Artificial n=69		Nil Oral n=32	
	n	n	%	n	%	n	%	n	%	n	%
Gestation (weeks)											
20-24	12	10	83	1	1.2	1	1.2	0	0	0	0
25-27	39	19	49	5	12.8	8	20.5	7	17.9	0	
28-31	104	60	57.6	16	15.4	16	15.3	12	11.5	0	0
32-36	283	88	31	95	33.6	61	21.6	35	12.4	4	1.4
37-40*	292	146	50	61	20.8	45	15.4	13	4.5	27	9.2
≥41	47	24	51.1	12	25.5	8	17	2	4.2	1	2.1
Birth weight (gms)											
500-749	2	1	50.0	0		0		1	50.0	0	
750-999	26	15	57.7	4	15.4	6	23.0	1	3.8	0	
1000-1249	38	19	50.0	3	7.9	9	23.7	7	18.4	0	
1250-1499	49	30	61.2	8	16.3	6	12.2	5	10.2	0	
1500-1999	110	46	41.8	38	34.5	17	15.5	7	6.4	2	1.9
2000-2499	134	29	21.6	48	35.8	33	24.6	21	15.7	3	2.2
2500-2999*	125	49	39.2	32	25.6	23	18.4	12	9.6	9	7.2
3000-3999	222	122	55.0	38	17.1	34	15.3	10	4.5	18	8.1
>3999	51	23	45.0	18	35.2	8	15.6	2	3.9	0	

8.6 Details of deaths prior to discharge among outborn babies admitted to NICU

Table 254: Outborn neonatal and post-neonatal deaths prior to discharge (2010)

Born at	Gestational age	Birth Weight	Apgar 1/5	Twin	Age at death (d)	Cause of death
Middlemore Hospital	24	795	3	5	36	Necrotising enterocolitis
Northshore Hospital	24	669	4	7	68	Chronic lung disease
Middlemore Hospital	25	844	6	9	54	Necrotising enterocolitis
Middlemore Hospital	26	1050	2	6	22	Necrotising enterocolitis
Northshore Hospital	34	1920	9	10	1	Sepsis/Persistent pulmonary hypertension
Waitakere Hospital	36	2200	0	4	3	Perinatal asphyxia
Northshore Hospital	37	2740	2	4	5	Perinatal asphyxia
Waitakere Hospital	40	3410	9	10	3	Intracerebral haemorrhage
Waitakere Hospital	40	3500	0	0	5	Hypoxic Ishaemic Encephalopathy

8.7 Details of deaths prior to discharge among inborn babies admitted to NICU

Table 255: Inborn neonatal and post-neonatal deaths prior to discharge from NICU (2010)

Birthplace	Gestational age	Birth weight	Apgar @1 min	Apgar @ 5 min	DOB to DOD (days)	Main Cause
BBA	22	530			0	Extreme prematurity
Delivery suite	24	675	2	4	2	Prematurity
Theatre	25	610	2	3	0	Pulmonary haemorrhage
Theatre	25	640	6	9	11	Necrotising enterocolitis
Delivery suite	25	950	6	8	2	Prematurity
Delivery suite	26	930	5	7	11	Necrotising enterocolitis
Theatre	26	769	8	10	3	Respiratory deterioration of unknown origin
Delivery suite	27	1180	6	8	12	Necrotising enterocolitis
Theatre	30	1280	9	9	10	Necrotising enterocolitis
Theatre	34	3200	7	10	4	Tectocerebellar dysraphia with hydrocephalus
Theatre	36	1700	4	8	29	Metabolic abnormality
Delivery suite	37	3200	1	1	0	Complex congenital anomalies
Theatre	39	2620	6	5	1	Pulmonary lymph malformation
Delivery suite	39	3200	9	10	1	Perinatal asphyxia

APPENDIX 9. PERINATAL MORTALITY

Table 256: Postnatal transfer deaths (these are babies born elsewhere who transferred to NW for postnatal care) (2000-2010)

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Early neonatal deaths	< 7 days	6	1	3	3	3	3	3	5	3	4	5
Late neonatal deaths	8 – 28 days	0	1	0	0	0	3	3	2	3	5	1
Total deaths		6	2	3	3	3	6	6	7	6	9	6

Table 257: Perinatal and perinatal- related deaths (1994 – 2010)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total number of perinatal related losses	147	131	165	128	133	105	136	94	116	105	124	111	99	111	110	112	117
Fetal death	80	84	86	74	73	65	84	57	69	64	82	68	74	82	76	75	83
Early neonatal death	49	39	63	45	50	31	43	32	40	34	33	38	23	20	26	27	26
Late neonatal death	15	7	10	6	6	9	9	5	7	7	9	5	2	9	8	10	8
Perinatal mortality rate /1000	9.3	7.6	10.1	9.4	9.8	12.5	15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2	12.9	14.9
Perinatal related mortality rate /1000	15.6	13.7	16.5	14.7	16.1	13.7	16.9	12.3	14.5	13.5	16.1	16.1	13.4	14.1	14.2	14.2	13.9

Table 258: Perinatal mortality rate (per 1000 births) and perinatal-related mortality rate (per 1000 births) adjusted for lethal and terminated fetal abnormalities* (2000-2010)

	2000 Rate	2001 Rate	2002 Rate	2003 Rate	2004 Rate	2005 Rate	2006 Rate	2007 Rate	2008 Rate	2009 Rate	2010 n	2010 Rate
Perinatal mortality rate	15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2	12.9	117	14.9
Perinatal mortality rate (excluding lethal & terminated fetal abnormalities)	11.5	8.0	8.9	8.2	11.4	9.7	8.4	7.8	9.3	9.4	109-35/ 7866-35	9.4
Perinatal related loss rate	16.9	12.3	14.5	13.5	16.2	15.0	13.4	14.1	14.2	14.2	109	13.9
Perinatal related loss 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	82/7866-35	10.5

*Defined as PDC-major=congenital abnormality for fetal deaths and NDC-major=congenital abnormality for neonatal deaths

Table 259: Maternal characteristics and perinatal related mortality (2010)

	Births n=7866		Stillbirths n=83			Neonatal deaths n=34			Perinatal related deaths n=117		
	n	%	n	%	SB rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Maternal Ethnicity (prioritised)											
NZ European	2030	25.8	27	32.5	13.3	10	29.4	5.0	37	31.6	18.2
Maori	412	5.2	11	13.3	26.7	7	20.6	17.5	18	15.4	43.7
Pacific	871	11.1	18	21.7	20.7	6	17.6	7.0	24	20.5	27.6
Other Asian	941	12.0	10	12.0	10.6	6	17.6	6.4	16	13.7	17.0
Indian	425	5.4	5	6.0	11.8	0	0.0	0.0	5	4.3	11.8
Other European	599	7.6	10	12.0	16.7	4	11.8	6.8	14	12.0	23.4
Other	211	2.7	2	2.4	9.5	1	2.9	4.8	3	2.6	14.2
Parity											
Nullipara	3720	47.3	41	49.4	11.0	14	53.8	3.8	55	47.0	14.8
Multipara	4146	52.7	42	50.6	10.1	20	76.9	4.9	62	53.0	15.0
Maternal Age											
≤25	1298	16.5	23	27.7	17.7	7	26.9	5.5	30	25.6	23.1
26-34	4113	52.3	36	43.4	8.8	13	50.0	3.2	49	41.9	11.9
≥35	2455	31.2	24	28.9	9.8	14	53.8	5.8	38	32.5	15.5
Maternal Smoking											
Currently smoking	615	7.8	13	15.7	21.1	5	14.7	8.3	18	15.4	29.3
No or not smoking in last month	7203	91.6	70	84.3	9.7	29	85.3	4.1	99	84.6	13.7
Missing	48	0.6	0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0
Maternal BMI											
<19	445	5.7	2	2.4	4.5	1	0.2	2.2	3	2.6	6.7
19-25	4496	57.2	39	47.0	8.7	15	0.3	3.3	54	46.2	12.0
26-30	1454	18.5	19	22.9	13.1	6	0.4	4.1	25	21.4	17.2
31-35	697	8.9	10	12.0	14.3	5	0.7	7.2	15	12.8	21.5
>35	552	7.0	7	8.4	12.7	5	0.9	9.1	12	10.3	21.7
Missing	222	2.8	6	7.2	27.0	2	0.9	9.0	8	6.8	36.0

* 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 7: Perinatal full necropsy rates (%) (1991-2010)

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Perinatal necropsy rates (%)	58	56	65	68	57	48	50	38	50

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Perinatal necropsy rates (%)	40	40	41	43	52	48	50	59	55	38	44

Table 260: Cause of perinatal-related death (2003-2004 ANZACPM; 2005-2010 PSANZ-PDC)

Classification*	2003		2004		2005		2006		2007		2008		2009		2010	
	n	%	n	%	n	%	N	%	n	%	n	%	n	%	n	%
Congenital abnormality	36	34	36	34	38	34	37	37	48	43	34	31	31	28	48	41
Perinatal infection	6	6	6	6	11	10	9	9	4	4	5	5	4	4	4	3
Hypertension	4	4	4	4	3	3	3	3	0		4	4	6	5	4	3
Antepartum haemorrhage	5	5	5	5	6	5	4	4	7	6	13	12	15	13	11	9
Maternal conditions	8	7	8	7	8	7	6	6	5	5	3	3	6	5	9	8
Specific perinatal conditions	5	5	5	5	10	9	7	7	7	6	22	20	16	14	8	7
Hypoxic peripartum death	3	3	3	3	4	4	0		2	2	1	1	1	1	2	2
Fetal growth restriction	6	6	6	6	1	1	8	8	11	10	9	8	5	4	2	2
Spontaneous preterm	23	22	23	22	20	18	13	13	16	14	11	10	19	17	8	7
Unexplained antepartum death	9	8	9	8	10	9	12	12	10	9	7	6	9	8	0	
No obstetric antecedent			0		0		0		1	1	1	1	0	0	0	
Total	105		124		111		99		111		110		112		117	

Table 261: Cause of death (PSANZ-PDC) among terminations of pregnancy (2010)

Classification	Termination of pregnancy n=35	
	n	%
Congenital abnormality	27	77.1
Perinatal Infection	2	5.7
Hypertension	2	5.7
Specific perinatal conditions	1	2.9
Maternal condition	2	5.7
Spontaneous preterm	1	2.9

Table 262: Perinatal deaths by cause (PSANZ-PDC) and gestational age (2010)

Classification	Total n=117		< 37 weeks n=102		≥ 37 weeks n=15	
	n	%	n	%	n	%
Congenital abnormality	48	41.0	40	39.2	8	53.3
Perinatal infection	4	3.4	2	2.0	2	13.3
Antepartum haemorrhage	11	9.4	11	10.8	0	0.0
Maternal conditions	9	7.7	7	6.9	2	13.3
Hypertension	4	3.4	3	2.9	1	6.7
Specific perinatal conditions	8	6.8	8	7.8	0	0.0
Hypoxic peripartum death	2	1.7	0	0.0	2	13.3
Fetal growth restriction	2	1.7	2	2.0	0	0.0
Spontaneous preterm	18	15.4	18	17.7	0	0.0
Unexplained antepartum death	10	8.6	10	9.8	0	0.0

APPENDIX 10. GYNAECOLOGY

10.1 Termination of pregnancy

Table 263: Demography and characteristics of women attending EDU (2002-2010)

	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
Ethnicity	%	%	%	%	%	%	%	%	%
New Zealand European	28.6	27.8	27.4	26.5	27.4	27.6	27.7	26.1	25.7
Maori	19.6	18.2	18.4	19.1	20.4	21.2	20.5	19.9	20.4
Pacific	22.9	23.0	22.8	23.2	23.8	24.5	23.1	24.3	24.1
Other Asian	10.9	12.3	11.6	11.2	11.4	10.5	10.8	10.6	10.3
Indian	6.4	7.4	7.7	8.3	8.2	8.3	9.4	10.2	11.7
Other European	5.1	5.1	5.4	5.7	5.0	4.5	4.8	5.1	5.2
Other	6.5	6.3	6.6	6.0	3.8	3.3	2.6	3.3	2.6
Age									
≤ 19	19.3	18.7	19.3	19.8	21.5	22.3	21.7	22.2	20.7
20 – 24	28.5	30.3	28.9	28.5	29.7	29.6	29.0	29.8	30.6
25 – 29	21.3	20.8	20.9	21.1	20.7	20.1	21.6	20.8	19.9
30 – 34	16.4	15.9	16.1	15.7	14.4	14.3	13.3	13.9	14.1
35 –39	10.4	10.2	10.9	10.7	9.5	9.7	10.1	9.3	10.0
≥40	4.1	4.1	3.9	4.3	3.9	4.0	4.3	4.0	4.7
Gestation (weeks) at termination									
6	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
7	1.8	1.2	0.9	0.4	0.2	0.2	0.1	0.6	2.7
8	9.8	8.9	17.2	10.5	11.0	8.8	13.0	18.4	33.7
9	21.5	20.0	23.9	20.9	23.1	20.8	23.9	24.5	23.7
10	23.1	23.8	21.4	22.7	24.0	25.1	25.1	24.3	16.8
11	22.5	23.9	20.6	24.0	23.5	24.1	21.3	18.8	13.0
12	18.5	20.0	14.5	20.0	17.6	20.9	16.7	13.2	10.1
≥13	2.9	2.1	1.4	1.3	0.5	0.0	0.2	0.1	0.0

10.2 Gynaecology Inpatient Surgery

Table 264: BMI by ethnicity (prioritised) among women having inpatient gynaecology surgery (2010) (missing data excluded)

	Total	<19		19-25		26-30		31-35		>35	
	N	n	%	n	%	n	%	n	%	n	%
Total	**1364**	**47**	**3.5**	**589**	**43.2**	**311**	**22.8**	**178**	**13.1**	**239**	**17.5**
NZ European	534	17	3.2	281	52.6	134	25.1	62	11.6	40	7.5
Maori	146	2	1.4	40	27.4	28	19.2	26	17.8	50	34.3
Pacific	225	3	1.3	27	12.0	28	12.4	41	18.2	126	56.0
Other Asian	150	15	10.0	104	69.3	19	12.7	9	6.0	3	2.0
Indian	104	1	1.0	40	38.5	36	34.6	19	18.3	8	7.7
Other European	160	9	5.6	83	51.9	47	29.4	13	8.1	8	5.0
Other	37	0		11	29.7	16	43.2	7	18.9	3	8.1
Not Stated	8	0		3	37.5	1	12.5	1	12.5	1	12.5

13% of BMI data missing in 2010

Table 265: Smoking status by ethnicity (prioritised) among women having inpatient gynaecology surgery (2010)

		Currently smoking		Past smoker		Never smoked		Unknown	
	N	n	%	n	%	n	%	n	%
Total	**1569**	**260**	**16.6**	**177**	**11.3**	**989**	**63.0**	**144**	**9.2**
NZ European	590	97	16.5	85	14.4	359	60.9	49	8.3
Maori	174	60	34.5	23	13.2	75	43.1	16	9.2
Pacific	263	48	18.3	21	8.0	167	63.5	27	10.2
Other Asian	174	13	7.5	8	4.6	142	81.6	11	6.3
Indian	125	4	3.2	3	2.4	102	81.6	16	12.8
Other European	187	32	17.1	31	16.6	102	54.6	22	11.8
Other	47	5	10.6	6	12.8	34	72.3	2	4.3
Not stated	9	1	11.1	0		7	77.8	1	11.1

Table 266: ASA rating among women having inpatient gynaecology surgery (2010)

	Inpatient surgeries 2010 n=1569	
	n	%
ASA Rating		
0	0	
1	760	48.4
2	535	34.1
3	126	8.0
4	8	0.5
Missing	140	8.9

10.3 Gynaecology Laparoscopic Surgery

Table 267: BMI and Surgical approach* (Missing data excluded) (n=206)

	Hysteroscopy n=202		Laparoscopy n=351		Laparotomy n=193		Vaginal n=570		Vulval n=45	
	n	%	n	%	n	%	n	%	n	%
BMI										
<19	5	2.5	21	6.0	3	1.6	14	2.5	4	8.9
19-25	52	25.7	182	51.9	76	39.4	249	43.7	28	62.2
26-30	36	17.8	70	19.9	48	24.9	147	25.8	9	20.0
31-35	26	12.9	44	12.5	25	13.0	79	13.9	4	8.9
>35	83	41.1	34	9.7	41	21.2	81	14.2	0	

*2 woman had a radiologically assisted procedure BMI 19-25

*1 woman had a radiologically assisted procedure BMI 26-30

13% of BMI data missing in 2010

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
BMI	Body mass index	KPI	Key performance indicator
BP	Blood Pressure	LB	Live birth
BPD	Bronchopulmonary dysplasia	Ligate	Surgical ligation of PDA
CDU	Child Development Unit	LLETZ	Large loop excision of the transformation zone
CHD	Congenital Heart Disease	LMP	Last menstrual period
CI	Confidence Interval	LNND	Late neonatal death
CLD	Chronic lung disease	LSCS	Lower segment Caesarean section
CPAP	Continuous positive airways pressure	LSIL	Low-grade squamous intraepithelial lesion
CRIS	Clinical Records Information System	LV	Left ventricle
CS	Caesarean section	MAS	Meconium aspiration syndrome
CVA	Cerebro Vascular Accident	MCDA	Monochorionic diamniotic twin
CVS	Chorionic villus sampling	MCMA	Monochorionic monoamniotic twin
DAU	Day Assessment unit	MDM	Multi disciplinary meeting
DBP	Diastolic blood pressure	N/R	Not resuscitated
DCCM	Department of Critical Care Medicine	NAS	Neonatal abstinence syndrome
DCDA	Dichorionic diamniotic twin	NEC	Necrotising enterocolitis
DHB	District Health Board	NFD	Not further defined
DIC	Disseminated intravascular coagulopathy	NICU	Neonatal Intensive Care Unit
DNA	Did not attend	NIDDM	Non-insulin dependent diabetes mellitus
DORV	Double outlet right ventricle	NW	National Women's
DRG	Diagnosis related groups	NPSU	National perinatal statistics unit (Australia)
ECMO	Extra Corporeal Membrane Oxygenation	NSU	National screening unit
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)
Vaginal bleeding from any cause at or beyond 20 weeks during pregnancy or labour. In places where the term represents antepartum haemorrhage overall, it includes placenta praevia without bleeding.

Augmentation
Describes use of oxytocin or artificial rupture of membranes to accelerate esrablished labour.

Breastfeeding

Exclusive breastfeeding: The infant has never, to the mother's knowledge, had any water, formula or other liquid or solid food. Only breastmilk, from the breast or expressed, and prescribed (as per Medicines Act 1981) medicines have been given from birth.

Fully breastfeeding: The infant has taken breastmilk 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 breastmilk and some infant formula or other solid food in the past 48 hours.

Artificial feeding:The infant has had no breastmilk 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. 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, either because these are a large group in our population and/or 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 268: 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.

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 NW for maternity care. The midwives provide continuity of antenatal and postnatal care to women who live in NW geographical boundary. Labour and birth care is provided by NW 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 woman who live in NW 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 NW 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 Women who present at NW, usually in labour or pre-labour, and who do not have an LMC.

Other DHB. These women are usually transferred to NW in late pregnancy, and remain with their original LMC. This LMC might be another District Health Board LMC or a non-NW access holder (e.g. a private obstetrician or independent midwife without access rights at NW or a homebirth midwife without access rights at NW).

Live birth
Birth of a baby showing signs of life. In this report, live births are only included if $\geq$20 weeks gestation or $\geq$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 liveborn 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 $\geq$500mls blood loss from the genital tract within the first 24 hours of birth.
Secondary PPH is $\geq$500mls blood loss from the genital tract after 24 hours up to 6 weeks postpartum.

Preeclampsia (PE or PET)
Gestational hypertension accompanied by proteinuria measured as ≥2+ protein on one dipstick sample or PCR ≥30 on a spot urine sample, or a 24 hour collection ≥0.3g in 24 hours.

PSANZ-PDC (PSANZ Perinatal Death Classification)
Identifies the single most important factor which led to the chain of events which resulted in the perinatal death.

PSANZ-NDC (PSANZ Neonatal Death Classification)
Used in addition to the PSANZ-PDC to identify the single most important factor in the neonatal period which caused a neonatal death.

Small for gestational age (SGA) (customised)
Birthweight less than 10th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator (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 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