National Women's Annual Clinical Report 2009

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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 2009 National Women's Annual Clinical Report. This year we have again made additions to the data contained in our Report, including referrals to the Smokefree Pregnancy service, external cephalic version (ECV), second trimester termination of pregnancy, and expanded data from the gynaecologic oncology service.

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.

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 to 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.

Kay Hyman
General Manager, Clinical Services
Women's Health

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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 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 in 2009, 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.

Chapter 11: Gynaecology
This chapter provides information on fertility services, termination of pregnancy, 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 2009 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 2009 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 admissions), 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 for birth numbers. On a monthly basis, cleaning of place and mode of birth and reconciliation with Birthcare numbers was undertaken.

For the 2004 -2008 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, so that there are 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 2009 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 2009 data for further analysis should be aware that areas not mentioned may not have been cleaned. For further advice please contact the NW 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 aided 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 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 2009 data compared to WHA mean data for maternity units with level 3 neonatal intensive care units for June 2007-June 2008. We have also calculated rates for public care women in 2009. NW public care includes mothers who had a NW LMC (community, DOMINO, 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 section and also in the sections 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 manages Pacific Island pregnant women with cardiac disease.
- 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 (service started 2009). These cases previously were transferred to Brisbane for care.
- 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.

Midwifery

In 2009 National Women's and AUT School of Midwifery again ran a postgraduate certificate in complex midwifery care. Midwives on the programme received tutorials in patho-physiology and hands on skills from senior medical and midwifery staff at National Women's and nursing staff in DCCM at Auckland City Hospital.

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 waterbirth.
- Care is provided to women by a multidisciplinary team of midwives, 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 manages approximately 200 admissions per year. Forty percent of these are for hypertensive disease, and 25% for excessive blood loss. Other reasons for admission include sepsis and cardiac conditions. 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 provide 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 1500 referrals in 2009, consistent with numbers in 2008. 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 and DOMINO clinics are held at Green Lane Clinical Centre, along with antenatal clinics in 14 General Practice facilities in the ADHB catchment area.
- DOMINO midwives provide continuity of midwifery care to low risk women.
- 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 and DOMINO 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.

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 major 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

2.3.5 Early Pregnancy Assessment Unit (EPAU)

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

2.3.6 Epsom Day Unit (EDU)

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

2.3.7 Fertility Plus

Fertility Plus offers a range of secondary and tertiary reproductive endocrinology, infertility and sub-fertility services to the women of the Northern Region. Fertility Plus is one of 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.

2.3.8 Gynaecologic Oncology

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

2.3.9 Women's Assessment Unit (WAU)

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

2.4 University of Auckland

NW has close associations with the University of Auckland, including involvement in research, clinical teaching, and particular projects. The Obstetrics and Gynaecology Department, in association with the School of Population Health Division of Epidemiology

and Biostatistics, run a programme teaching Trainee Interns (doctors in their sixth year of training) to undertake clinical audit. Some of these projects are undertaken at NW, and these are of value to the students, clinicians and hospital services.

2.5 Newborn Service

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

2.5.1 Regional and District Services

The Newborn Service is contracted to provide:

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

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

2.5.2 The Newborn Services support services

The Newborn Service includes the following:-

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

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 September 2009 Dr Malcolm Battin was appointed as the Clinical Director of the Newborn Service. Dr Battin had a joint appointment with the University and the Newborn Services for 11 years, prior to the fulltime Clinical Director role.

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 DOMINO Midwives. DOMINO (Domicillary midwives in and out) midwives are employed by the hospital to provide continuity of antenatal, intrapartum and postnatal care. Secondary care is provided in conjunction with the hospital specialist.

5 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.

6 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 eg 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

2.7.1 Consumer feedback

ADHB and Women's Health are required, like all health services, to provide a mechanism for consumer feedback. This is done via patient survey mechanisms and the complaints process. Surveys are both a self selected process (forms available on the wards and clinical areas/clinics) and a planned process with selected women sent a nationally consistent patient satisfaction survey. The DHB is required by the Health and Disability Code of Consumer Rights to provide a transparent mechanism for the reporting and timely management of complaints. Additionally the Health and Disability Standards require the hospital to have an easily accessed, fair and responsive complaints process and to keep a complaints register which includes actions taken. The ADHB Consumer Liaison staff ensures the management of complaint investigation is efficient and appropriate to patients and ADHB staff. On receipt of a complaint, Consumer Liaison staff will ensure the appropriate staff are involved in thoroughly investigating the issues that have been raised. ADHB sends written acknowledgement of a complaint within 5 working days of receipt and aims to investigate the complaint within a further 10 working days of

acknowledgement. Following the investigation a written response is sent to the complainant. Sometimes meetings are arranged between the complainant and the appropriate staff. In 2009 there were 77 complaints received. The number of complaints received in the past 4 years has been relatively stable.
Some of the changes which have occurred as a result of the complaints process include:

1. Change in Labour and Birthing dressing pack and processes to reduce risk of retained swabs.
2. Development of a new policy for third degree tears with full details on management and follow up of these tears, alongside the introduction of a new clinic designated for third degree tear follow up.
3. Change in venue to ensure appropriate environment for stillbirth follow up
4. Mastitis Policy review and update.

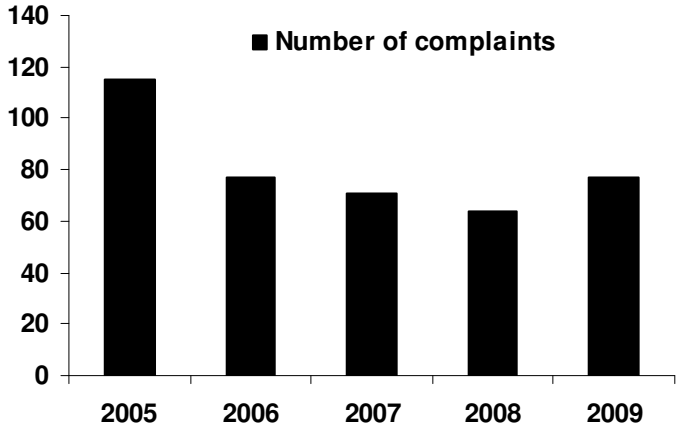

Figure 1: Number of complaints received by Women's Health at ADHB 2005-2009

2.7.2 Reportable events

The management of reportable events, in particular those that are classed as adverse events or sentinel events, was streamlined by the Ministry of Health in 2009. All events reported in the reportable events management database are given a severity assessment code (SAC) score which provides a standardised, objective measure of severity for each event. Those events that are scored SAC 1 or SAC 2 are investigated using a standardised methodology (such as Root Cause Analysis) which focuses on system review. Root Cause Analysis is a systematic iterative process where the factors which contribute to an incident are identified by reconstructing the sequence of events. A series of "why" questions are asked until the underlying root causes (contributing factor/hazards) have been identified.

In 2009 six events in Women's Heath were investigated using these methodologies. The outputs of these investigations provided a catalyst for the following:-

1 Review of processes surrounding adoption
2 Improvement in social work triage, logging and allocation of referrals
3 Development of guidelines for use of scalp lactate in labour and guidelines for blood gas analysis
4 Review of transfer processes between labour and birthing suite and Birthcare
5 Review of use of Misoprostol after birth
6 Implementation of standard processes for administration of clexane and removal of epidural catheters

2.8 Service development

In 2009 the Vulnerable Pregnant Women's multidisciplinary team was set up to provide 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 involved 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 delivery; 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.

2.9 District annual plan objectives

The 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 2009 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 2009 82% of mothers achieved "exclusive breastfeeding" on discharge from NW.

2.9.2 Family Violence Intervention

ADHB recognises that Family Violence (partner and child abuse) is a major health issue and has committed resources within ADHB to address it. ADHB is contracted by the Ministry of Health to implement a family violence intervention programme (FVIP). Since 2002, ADHB has successfully introduced and sustained partner abuse routine screening across Women's and Children's Health services. The child abuse prevention programme is managed by Te Puaruruhau (ADHB Child & Adolescent Abuse Assessment Service) and the ADHB Child Protection Coordinator. Te Puaruruhau is a specialist service comprised of paediatricians, nurse specialist and social workers. The Partner Abuse Intervention Team is co- located with Te Puaruruhau in Puawaitahi. The Partner Abuse Intervention Team is a small but committed team made up of ADHB staff, and Shine staff (Safer Homes in New Zealand Everyday). Shine is a national organisation, offering a helpline, training and consultancy throughout New Zealand, and is now the largest single family violence prevention service in New Zealand. It is a non governmental organisation and receives some funding from ADHB. Together these services implement the FVIP within ADHB.

2.9.3 Immunisation

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.

2.9.4 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.

2.9.5 Clinical Governance

The provision of appropriate clinical governance structures is crucial to ensuring clinical involvement in continuous quality improvement initiatives and the delivery of quality care. NW has convened a clinical governance group for the service as a whole. There is also a Clinical Governance Group providing governance within the Labour and Birthing Suite.

2.9.6 Body Mass Index

National Women's and its access holders have put considerable energy into collecting accurate BMI data for the maternity population. Data were available for 95% of birthing mothers in 2009.

2.9.7 GP Liaison

Dr Diana Good has worked with National Women's as a General Practitioner Liaison during 2009. The role of GP Liaison is focussed on improving the information flow between primary and secondary care.

2.10 Issues

A range of issues always affects the provision of any service throughout a year and in 2009 NW has had the following issues to work through:

Midwifery shortage

The midwifery workforce in New Zealand has an average age of 47 years which creates challenges when midwives are indicating a desire to work fewer nights and weekends in a service with a workflow which is constant throughout the hours of the day and days of the week. National Women's has been engaged in recruitment and retention activities including international recruiting. Wherever possible these initiatives are conducted in conjunction with our regional DHB partners.

Theatre Space

A shortage of theatre space in 2007-2009 means delays for women booked for elective gynaecologic surgery. From mid-2007 NW was no longer able to provide an elective service for the surgical management of women with a miscarriage. This service has been contracted out to a private provider. In February 2010 a new theatre will open and this will result in increased capacity for these women to be seen at ACH.

Chapter 3

SUMMARY STATISTICS

3 SUMMARY STATISTICS

3.1 Mother and baby numbers: NW 2009

Table 1: Mother and baby numbers: National Women's 2009

Total number of mothers birthing at National Women's	7711
Mothers birthing before arrival (BBA)	24
Total number of mothers	**7735**
Total number of babies born at National Women's	7873
Babies born before arrival (BBA)	24
Total number of babies	**7897**

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.

Nine women gave birth twice during the calendar year 2009 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 2009

		Mothers	Babies
National Women's births	Singletons	7552	7552
	Twins	156	312
	Triplets	3	9
Totals (not including BBA)		**7711**	**7873**
BBA	Singletons	7576	7576
	Twins	156	312
	Triplets	3	9
Totals (including BBA)		**7735**	**7897**

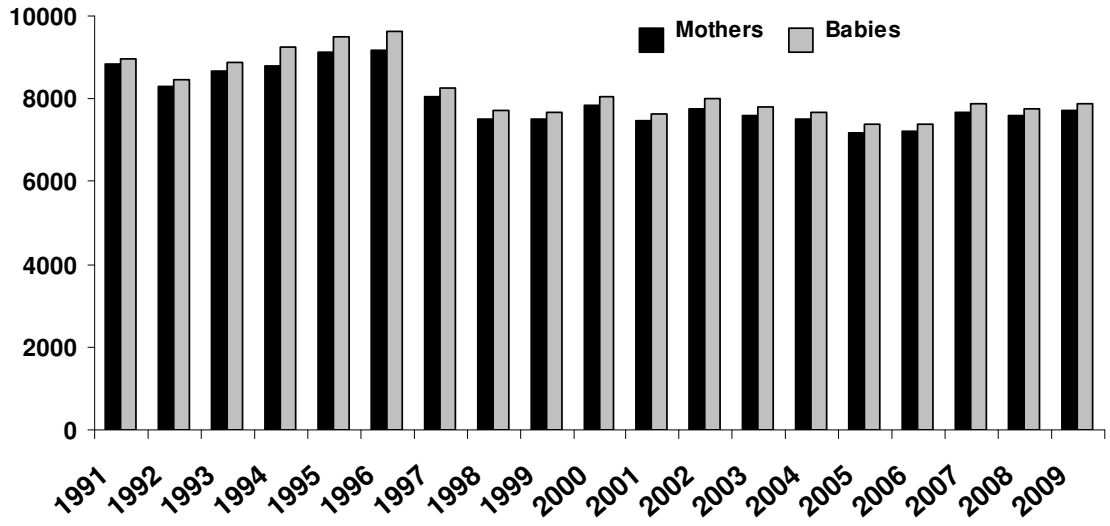

Figure 2: Numbers of women birthing and babies born at National Women's (1991-2009)

3.2 Summary of maternal outcomes 2009

Table 3: Mode of onset of birth

	Birthing Mothers n=7735	
	n	%
Spontaneous onset of labour	4125	53.3
Iatrogenic	3610	46.7
CS elective	1132	14.6
Emergency CS before onset of labour	240	3.1
Induction of labour	2238	28.9

Table 4: Mode of birth

	Birthing mothers n=7735		Nullipara n=3811		Multipara n=3924	
	n	%	n	%	n	%
Spontaneous vertex birth	4313	55.8	1821	47.8	2492	63.5
Vaginal breech birth	61	0.8	18	0.5	43	1.1
Operative vaginal birth						
Forceps	339	4.4	257	6.7	82	2.1
Ventouse	608	7.9	496	13.0	112	2.9
Caesarean section						
CS elective	1132	14.6	340	8.9	792	20.2
CS emergency	1282	16.6	879	23.1	403	10.3

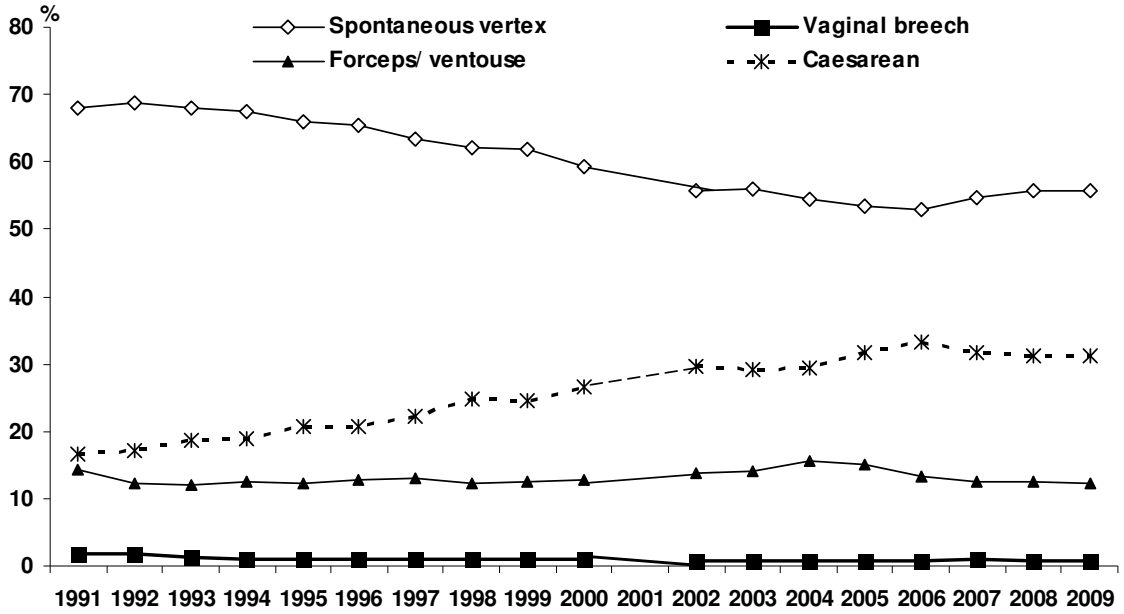

Figure 3: Mode of birth (1998-2009)

Table 5: Maternal postpartum outcomes

	Birthing mothers	n	%
PPH ≥1000mls	7735	651	8.4
SVB	4374	218	5.0
Instrumental vaginal birth	947	59	6.2
Caesarean section	2414	374	15.5
Episiotomy among vaginal births	5321	1184	22.3
Third/ fourth degree tears among vaginal births	5321	116	2.2
Postpartum blood transfusions	7735	232	3.0
Infant Feeding at discharge from NW facility (excludes babies admitted to NICU)			
Exclusive breastfeeding	6928	5650	81.6
Fully breastfeeding	6928	287	4.1
Partial breastfeeding	6928	824	11.9
Artificial feeding	6928	158	2.3

3.2.1 Maternal deaths

In 2009 there were 8 maternal deaths. Three women died from complications from H1N1. A further five women died from medical complications, two women died in the antenatal period and three women died in the postnatal period. Details of these deaths have been sent to the National Perinatal and Maternal Mortality Review Committee (PMMRC)

3.3 Summary of neonatal outcomes 2009

Table 6: Neonatal outcomes among babies born at National Women's in 2009

	Babies born n=7897	
	n	%
Gender*		
Male	4116	52.1
Female	3780	47.9
Preterm birth	769	9.7
20-27 weeks	116	1.5
28-31 weeks	98	1.2
32-36 weeks	555	7.0
Term birth	7128	90.3
37-41 weeks	6979	88.4
42+ weeks	149	1.9
Apgar at 5 min <7**	107	1.4
Preterm	44	0.6
Term	63	0.8
SGA (by Customised Centile)	945	12.0
Preterm	688	8.7
At term	257	3.3
Admission to NICU	820	10.4
Preterm	456	5.8
Term	364	4.6

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

Table 7: Perinatal related mortality 2009

	Babies born n=7897	Rate
Number of fetal deaths (stillbirths &TOPs)	75	9.5/1000 births
Number of early neonatal deaths	27	3.5/1000 livebirths
Number of late neonatal deaths	10	1.3/1000 livebirths
Neonatal deaths	37	4.7/1000 livebirths
Perinatal deaths	102	12.9/1000 births
Perinatal related deaths	112	14.2/1000 births

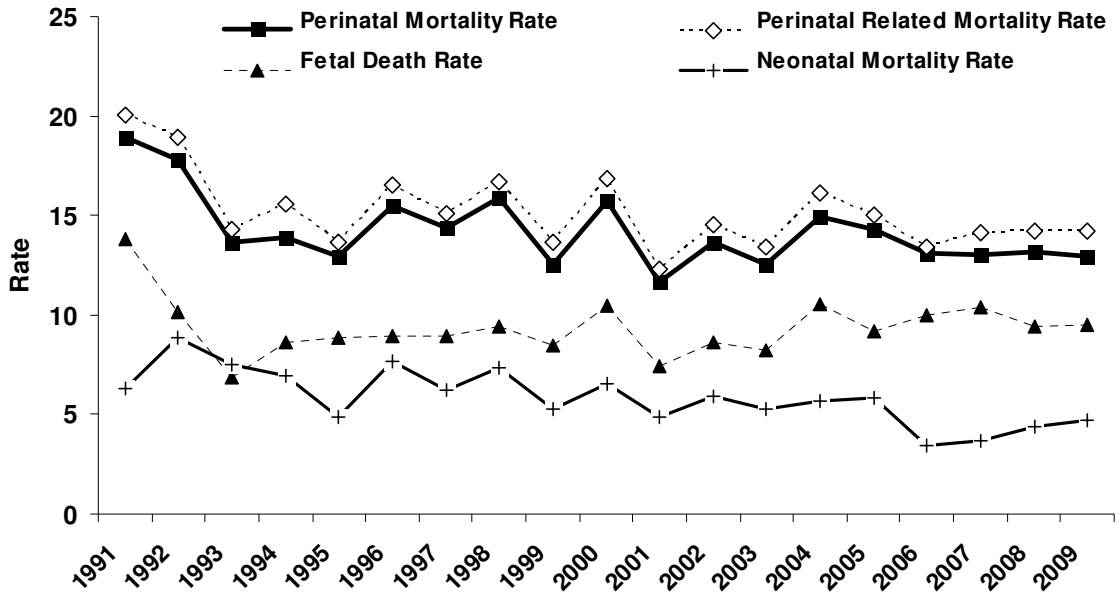

Figure 4: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate 1991-2009 (all rates expressed as deaths/1000 births)

3.4 Maternal and perinatal clinical indicators

Methods

The tables present National Women's data for the 2007-2009 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 for June 2007 -June 2008. WHA. Below are figures representing the 2009 total NW data with 95% confidence intervals compared to WHA 2007-2008 data.

Table 8: Benchmarking against WHA maternity indicators (units with level 3 NICU)

		WHA mean 07-08	NW 2007 n=7695	NW 2008 n=7589	NW 2009 n=7735	2009 Public only* n=2480
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Caesarean section	Mothers birthing by Caesarean section/Mothers giving birth	28.0	31.7	31.3	**31.2**	30.9
VBAC	P1 previous Caesarean/mothers giving birth	7.87	10.7	10.6	**10.0**	10.4
	Prelabour repeat Caesarean/P1 previous Caesarean	60.0	59.4	57.9	56.8	48.5
	VBAC/induced or spontaneous labour P1 previous Caesarean	49.3	52.4	58.8	**59.0**	63.6
	VBAC/P1 previous Caesarean	19.7	21.3	21.5	22.5	29.1
Peripartum hysterectomy	Hysterectomy at same admission as birth/Mothers giving birth	0.102	0.117	0.18	0.155	ND
Instrumental vaginal birth	Forceps births/All vaginal births	5.2	4.2	4.9	5.7	4.1
	Ventouse births/All vaginal births	9.01	13.0	12.1	**11.4**	9.0
	Double instrumental/All vaginal births	0.841	1.3	1.0	0.68	0.58
Maternal age	Age 35 or more/Mothers giving birth	23.4	30.7	31.1	**30.5**	24.3
	Age 40 or more/Mothers giving birth	4.57	5.9	6.0	**5.8**	5.9
Vaginal birth with regional anaesthesia	Any regional anaesthetic/All vaginal births	27.2	43.9	43.7	**43.4**	34.5
General anaesthesia for Caesarean section	General anaesthetic for Caesarean section/All Caesarean sections	8.9	7.6	6.8	**6.4**	10.1
Episiotomy	Mothers having an episiotomy/Mothers giving birth vaginally	17.8	21.5	20.5	**22.3**	15.3
Third and fourth degree tears	3rd and 4th degree tears/Mothers giving birth vaginally	2.76	3.1	3.1	**2.2**	2.7
Postpartum haemorrhage	Blood loss >=1000ml and <1500ml/All vaginal births	1.91			**2.6**	3.9
	Blood loss >=1500ml/ All vaginal births	1.35	1.12	2.4	**2.6**	3.6
	Blood loss >=500ml and <1500ml/Mothers giving birth by Caesarean	49.4	69.2	72.2	**72.2**	74.9
	Blood loss >=1500ml/Mothers giving birth by Caesarean	2.71	3.32	5.2	**5.0**	7.4
Blood transfusion	Postpartum blood transfusion/Mothers giving birth	1.63	2.2	2.8	**3.0**	4.8
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	ND

*Includes women for whom NW is the LMC at birth, transfers from other DHBs, and unbooked women.
Bolded rates for NW in 2009 are significantly different from WHA mean
NA=Data not available ND not given as numbers small
P1=parity 1, only previous birth by Caesarean section

Table 9: Perinatal indicators benchmarked against WHA 2007-2008

Perinatal indicators	Definition	WHA mean 2007-2008	NW 2007 n=7875	NW 2008 n=7753	NW 2009 n=7897	2009 Public only n=2572
		%	%	%	%	%
Preterm birth	Babies born before 37 weeks/Inborn babies	11.9	11.5	10.9	**9.7**	16.2
	Babies born before 32 weeks/Inborn babies	3.4	3.0	3.3	**2.7**	5.6
Perinatal Mortality	Fetal death and neonatal death up to 28 days/Inborn babies	1.28	1.41	1.42	1.42	2.72
	Neonatal deaths up to 7 days (ENND)/Inborn babies	0.331	0.254	0.34	0.345	0.672
	Neonatal deaths up to 28 days (ENND+LNND)/Inborn babies	0.408	0.368	0.44	0.473	1.03
	Fetal deaths/Inborn babies	0.874	1.041	0.98	0.95	1.71
Five minute Apgar of ≤4	Babies with 5 minute Apgar<=4/Total liveborn, singleton term babies	0.265	0.10	0.13	0.242	0.287
Five minute Apgar of ≤6	Babies with 5 minute Apgar<=6/Total liveborn, singleton term babies	1.22			0.884	1.34
Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3	Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3/Inborn babies	0.103	0.10	0.039	0.063	ND
Breastfeeding	Exclusive breastfeeding/Live born singleton term births	77.0	73.3	76.7	**80.1**	69.7

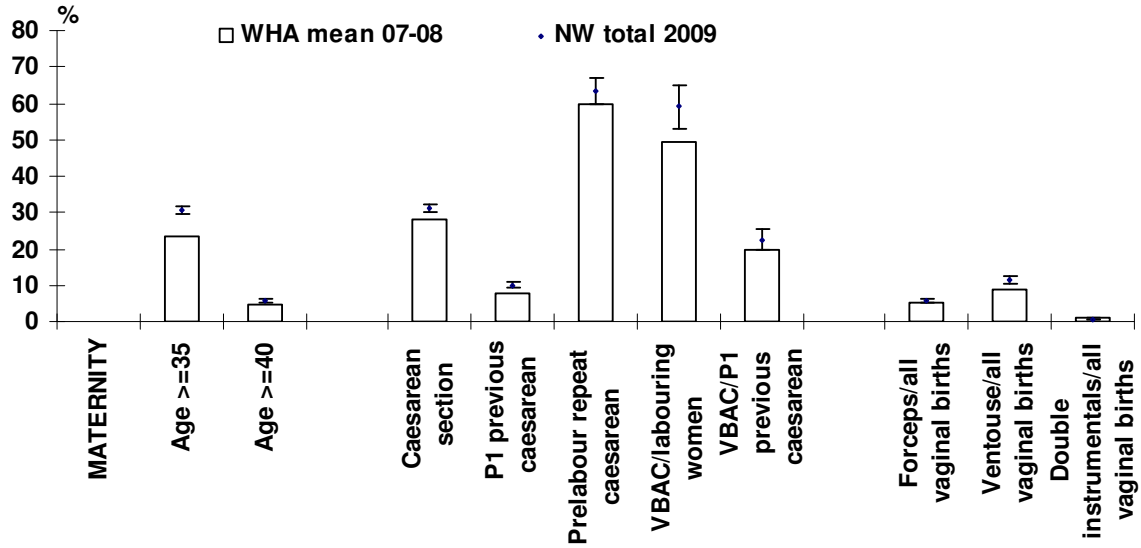

Figure 5: National Women's Maternity Clinical Indicators 2009 with 95% confidence intervals benchmarked against WHA mean data 2007-2008: maternal age, operative birth.

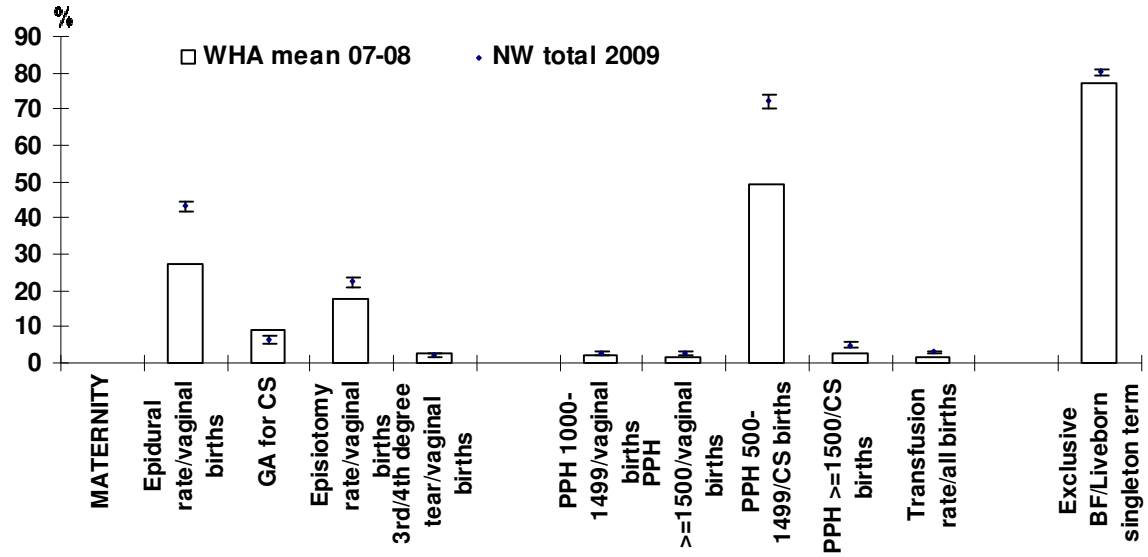

Figure 6: National Women's Maternity Clinical Indicators 2009 with 95% confidence intervals benchmarked against WHA mean data 2007-2008: anaesthesia, perineal trauma, postpartum haemorrhage, breastfeeding.

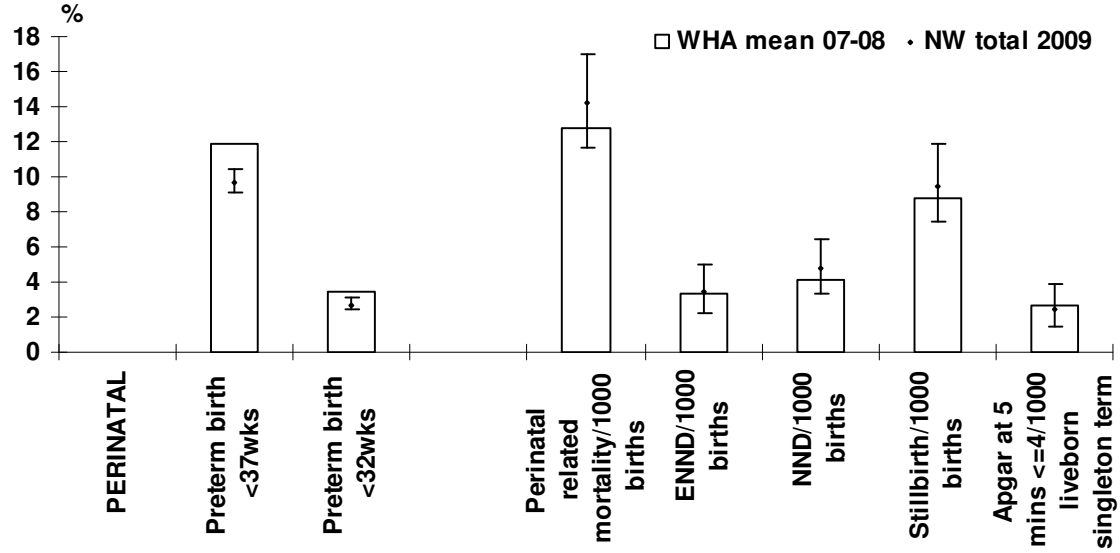

Figure 7: National Women's Perinatal Clinical Indicators 2009 with 95% confidence intervals benchmarked against WHA mean data 2007-2008

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 (30.5% in 2009) 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. More women undergo a trial of labour at NW than the mean, and 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.

As in previous years, the overall Ventouse rate is high, but this year in the public sector it is consistent with the WHA mean. The episiotomy rate in the public sector is lower than the mean but higher overall due to high rates of episiotomy among independent LMCs.

The overall rate of third and fourth degree perineal tears was lower than the WHA mean in 2009, but this rate is higher among public mothers than independent LMC mothers.

Of greatest concern is the postpartum haemorrhage rate which remains above the mean, although there is some evidence of stabilisation of rates in 2009. Postpartum transfusion is also high. In 2009 a further audit was undertaken in this area, including audit of adherence to the new guideline for management of postpartum haemorrhage. Outcomes of this audit include a checklist for management of haemorrhage $\geq$ 500mls, which will be introduced in 2010, and highlighting of the inappropriate use of misoprostol in prophylaxis for postpartum haemorrhage.

In terms of perinatal outcome, the public service has a high rate of preterm birth and it is likely that this is associated with the higher perinatal death rate. Five minute Apgar scores and HIE rates are also comparable to the WHA means which is reassuring in terms of labour management.

Chapter 4

MATERNAL DEMOGRAPHY

4 MATERNAL DEMOGRAPHY

This chapter describes the demographic characteristics of the women giving birth at NW in 2009. Additional data pertaining to this chapter can be found in Appendix 3.

4.2 Maternal domicile

In 2009, 72% of women giving birth at National Women's were from the Auckland District Health Board area. There has been a gradual increase from 65% in 2002 in the proportion of local births. This increase has been accompanied by a gradual decrease in births among women from Counties Manukau DHB area. Some mothers from outside ADHB catchment area require tertiary services, but many exercise personal choice to birth at NW.

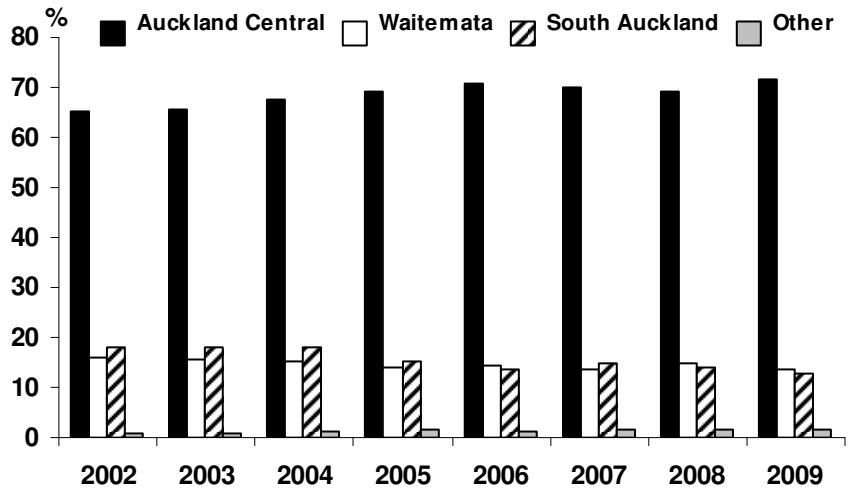

Figure 8: Domicile (DHB of residence) of women birthing at NW (2002-2009)

4.3 Maternal age, parity, and ethnicity

WHA Maternity Indicators		WHA mean 07-08	NW 2007	NW 2008	NW 2009	2009 Public only*
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Maternal age	Age 35 or more/Mothers giving birth	21.9	30.7	31.1	**30.5**	24.3
	Age 40 or more/Mothers giving birth	4.35	5.9	6.0	**5.8**	5.9

*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

4.3.1 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 age structure of the population of birthing mothers has been relatively stable in the past couple of years. There has been a slight shift back towards a yonger population of mothers. The age structure of the maternity population has implications for services and intervention rates.

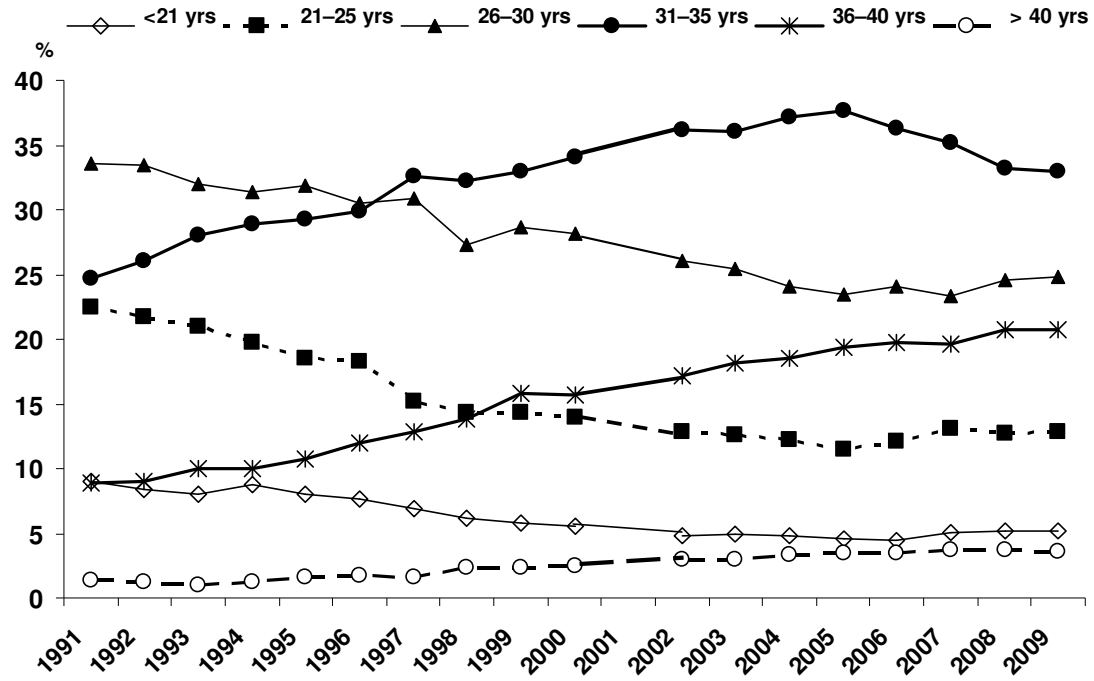

Figure 9: Maternal age distribution (1991-2009)

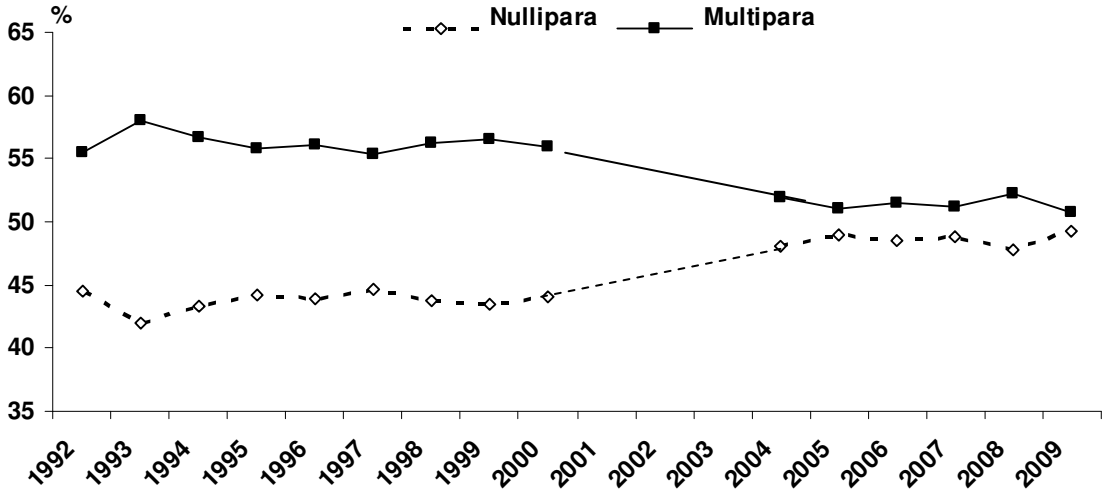

Figure 10: Parity distribution (1992-2009)

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. This ratio has potential implications on service requirements.

4.3.2 Maternal ethnicity

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

In 2009, 8.7% of mothers giving birth at NW were prioritised as Maori, 14.4% Pacific peoples, 6.7% Indian, 19.1% Other Asian, 9.1% Other European, 38.4% NZ European, and 3.6% Other.

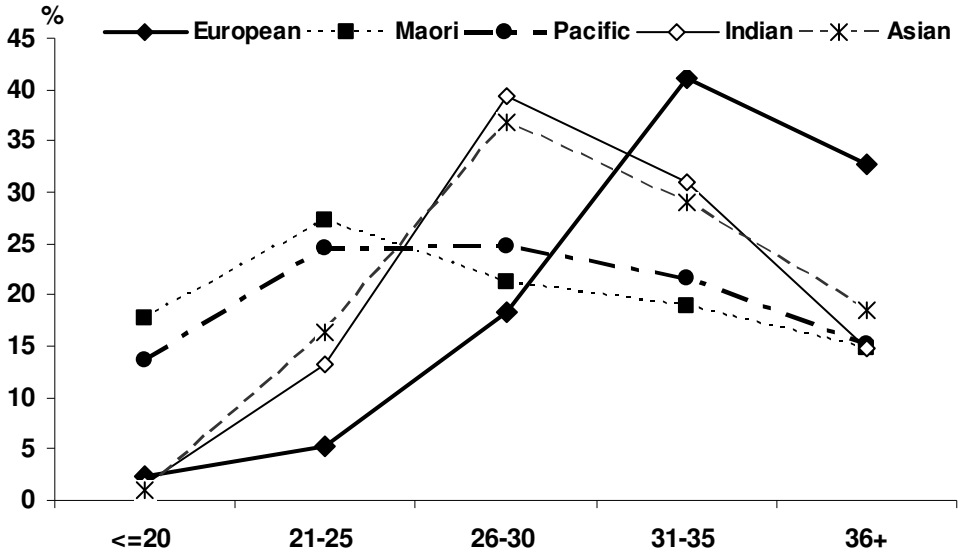

Figure 11: Maternal age among European, Maori, Pacific, Asian and Indian ethnicities

Ethnic differences in maternal age at birth have been apparent over many years, with older European mothers and younger Pacific and Maori mothers. This reflects both the age at which different ethnic populations have their babies and the underlying differences in the age structure of the populations.

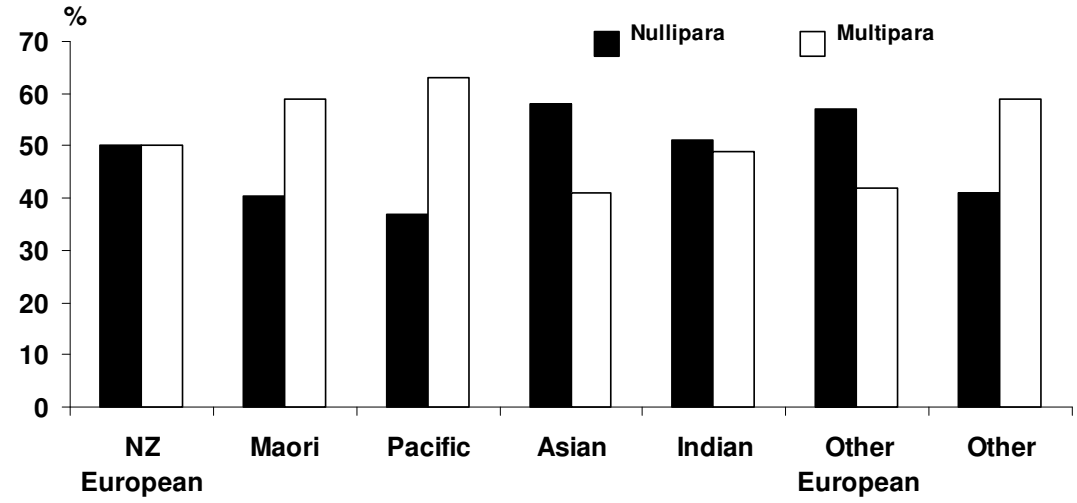

Figure 12: Parity distribution by maternal ethnicity (2009)

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 Maori mothers are giving birth to their first baby. Therefore parity must be accounted for in analyses of obstetric interventions by ethnicity.

4.4 Smoking

Table 10: Smoking status of women at booking

	Mothers giving birth 2009 N=7735	
	n	%
Smoking at booking	739	9.6
No or not in past month	6544	84.6
Missing smoking data	452	5.8

In this report, measures of smoking status almost always use data collected at booking. Changes to the collection of smoking data were made again during 2009. This included a move away from smoking status "within the past month" back to a yes/no question regarding smoking status "at" booking.

In 2009, smoking data were missing at booking for only 5.8% of mothers. Not surprisingly, missing data are most frequent among transfers. Only around 1% of community clinic and DOMINO mothers had missing smoking data at booking. However, missing data were fewer than 10% in all LMC groups. Again in 2009 30% of mothers had missing smoking status at birth; although missing data were more common among women who were non smokers at booking. The former increased the apparent rate of smoking compared to the latter.

Among women with smoking data available, 10.1% were smoking at booking. This is fewer than the 12.1% in 2008, however in 2008 the smoking variable included women who had quit smoking within the month prior to booking. Nine percent of mothers with smoking data at booking in 2007 were current smokers.

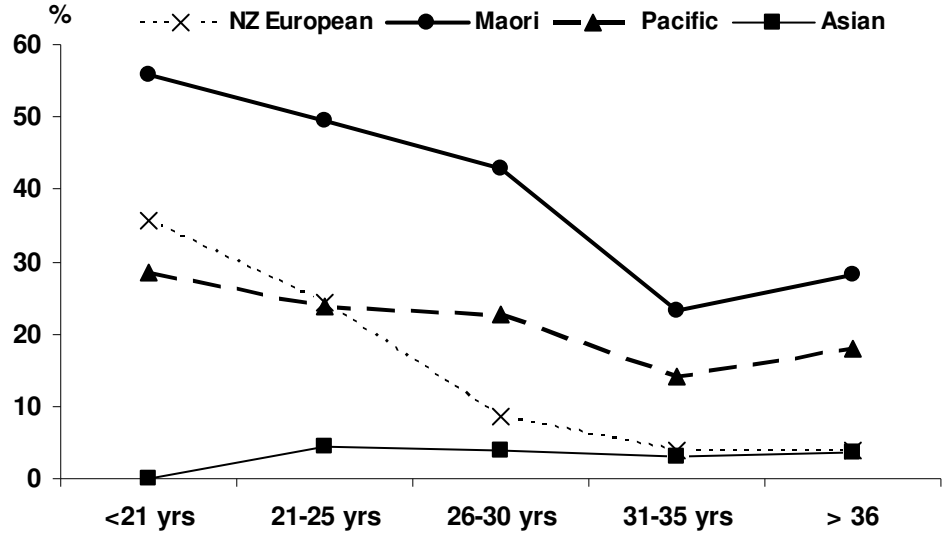

Figure 13: Smoking rates at booking by age and ethnicity

Smoking rates remain substantially different by ethnic group with the rates among Maori women 41% overall compared to 6.6% for NZ European women. Smoking rates among NZ European young women are high. Young mothers, other than Asian mothers, are more likely to smoke than older mothers.

4.5 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 2009 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 201 mothers who birthed at NW in 2009 and had at least one appointment at Smokefree Pregnancy Services. 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=201		Smoking at booking N=187		Not smoking at booking or within past month N=14	
	n	%	n	%	n	%
Smoking at birth						
Yes	142	71	139	74	3	21
No or not in past month	33	16	24	13	9	64
Missing	26	13	24	13	2	14

Of the 201 women seen by the service, 187 (93%) 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, 16% were recorded as non-smoking or non-smoking for at least one month at birth. Unfortunately, data on smoking status were unavailable for 13%. 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 27% reported not smoking at birth, significantly more than 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 practise), compared to a randomised trial, it is common to see a paradoxical effect. This is because caregivers are most likely 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.

4.6 Body mass index

Thirty five percent of the maternity population were overweight in 2009, 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. 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]	
BMI	**n=5660**		**n=6909**		**n=7117**		**n=7735**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
<19	304	5.4	388	5.6	405	5.7	442	6.0
19-25	3329	58.8	4129	59.8	4180	58.7	4344	58.5
26-30	1113	19.7	1315	19.0	1368	19.2	1441	19.4
31-35	512	9.1	625	9.1	630	8.9	686	9.2
36-40							303	4.1
41-45	402	7.1	452	6.5	534	7.5	118	1.6
>45							92	1.2

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%

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 2009 44% of women were booked with Independent Midwives, 22% with Private Obstetricians, 18% with National Women's Community clinics, 4% with National Women's DOMINO midwives and 9% with National Women's specialist medical and diabetes clinics. Overall 68% of women who gave birth at NW in 2009 were booked with a private Lead Maternity Carer. Over the last 10 years these proportions have been surprisingly constant with 66% of women booking with a private LMC in 1997. Fewer than two percent of women booked with a General Practitioner in 2009.

Fewer than one percent of mothers were unbooked, and almost all of these women were Maori or Pacific.

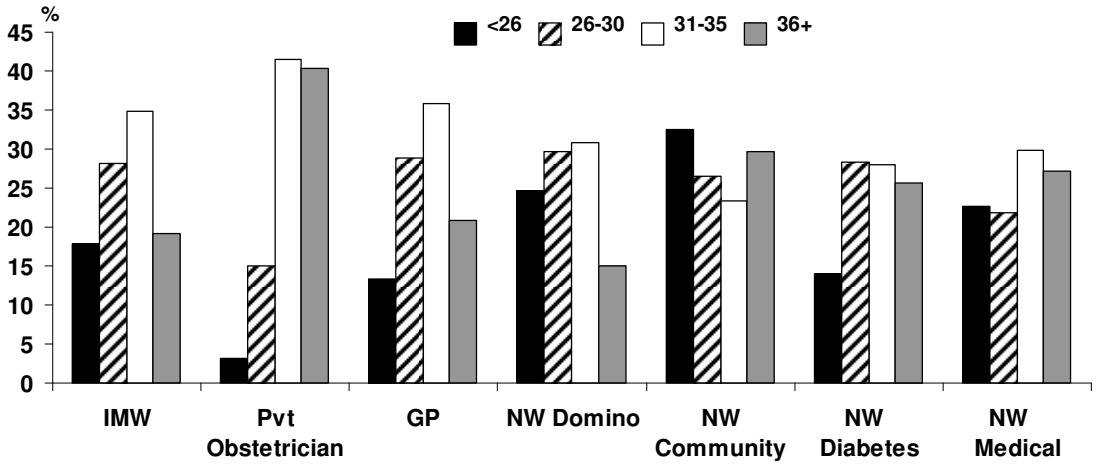

Figure 14: LMC at birth and maternal age

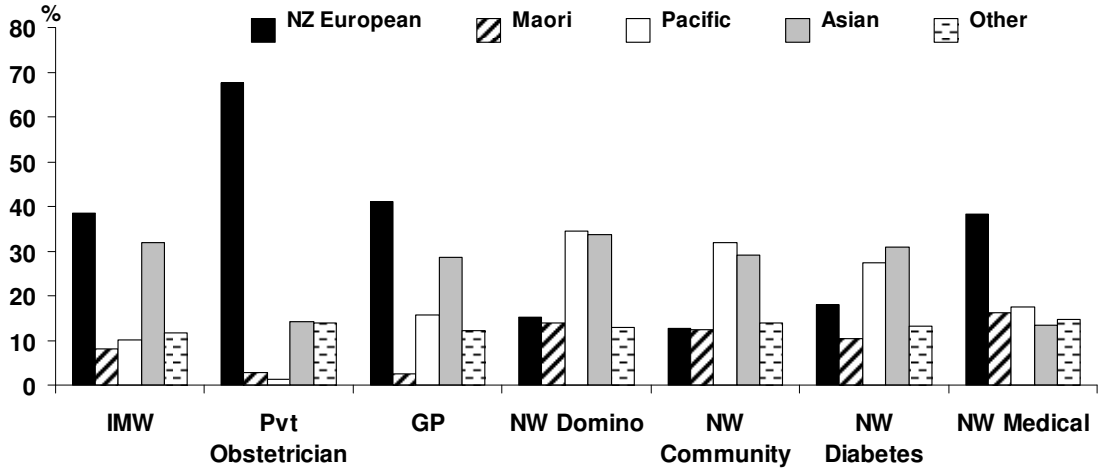

Figure 15: LMC at birth and maternal ethnicity

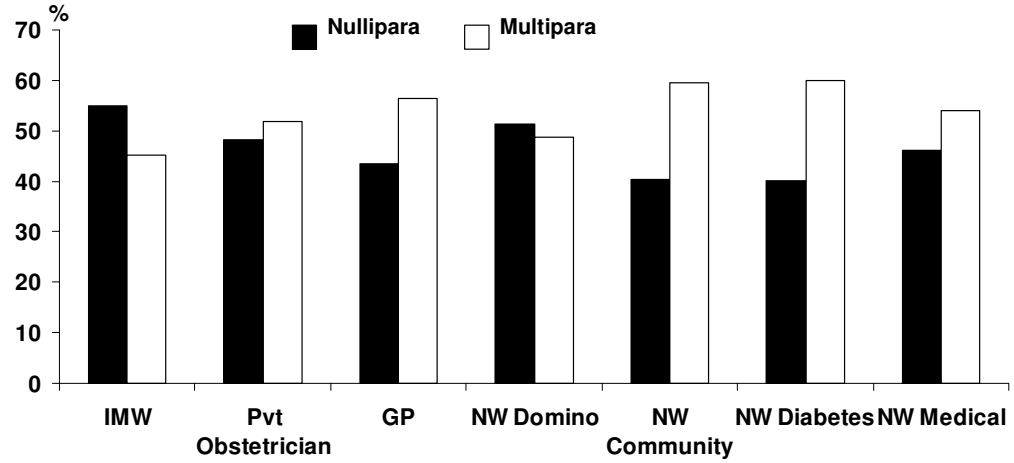

Figure 16: LMC at birth and parity

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 have significantly fewer Maori and Pacific women booking with them compared to public LMCs. These two demographic characteristics, along with parity and BMI, are highly correlated.

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 2009, 35% of primiparous women were defined as standard. Fewer European and Maori primipara are standard primipara compared to Asian and Indian women

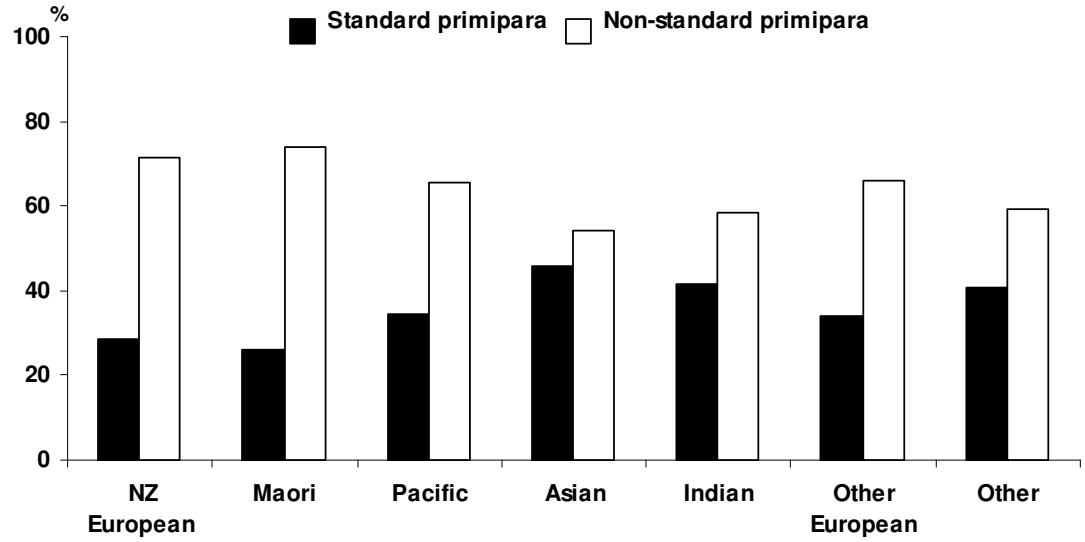

Figure 17: Standard primipara rates by maternal ethnicity

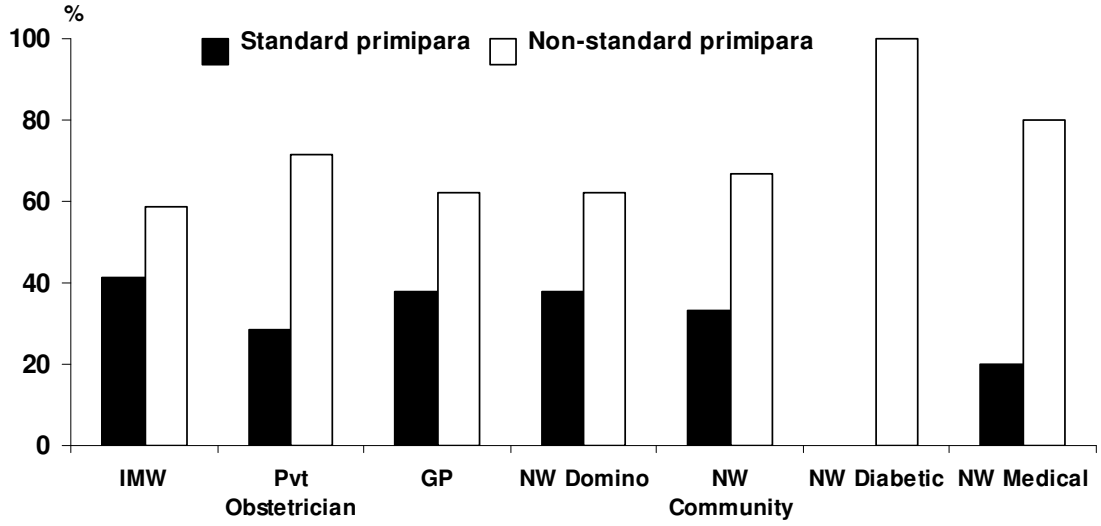

Figure 18: Standard primipara rates by LMC at birth

Chapter 5

ANTENATAL COMPLICATIONS

5 ANTENATAL COMPLICATIONS

This chapter provides data and analyses on the complications that affect some women in the antenatal period, namely preterm birth, growth restriction, multiple pregnancy, antepartum haemorrhage, diabetes and hypertensive disease. 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	2009 Public only* n=2572
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Preterm birth	Babies born before 37 weeks/Inborn babies	13.3	11.5	10.9	**9.7**	16.2
	Babies born before 32 weeks/Inborn babies	4.04	3.0	3.3	**2.7**	5.6

*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

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 (1996 – 2009)

	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009
Total number of women	9157	8055	7492	7501	7827	7491	7194	7212	7695	7589	7735
Women birthing preterm	911	906	852	850	912	756	685	716	796	733	658
Incidence %	†	†	11.4	11.3	11.7	10.1	9.5	9.9	10.3	9.7	8.5
Spontaneous <37 weeks				350	385	372	323	335	397	293	275
Incidence %				4.7	4.9	5.0*	4.5	4.6	5.2	3.9	3.6
Iatrogenic <37 weeks				500	527	384	362	381	399	440	383
Incidence %				6.7	6.7	5.1*	5.0	5.3	5.2	5.8	5.0
Total babies <37 weeks	1085	1047	991	984	1062	886	806	836	904	843	769

† 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 a small decline in the rate of preterm birth among births at NW over the period from 1998 to 2009. The rate in 2009 was 8.5%. It is hard to interpret this as NW is a tertiary referral hospital and so the rate of preterm birth is highly dependent on transfers prior to birth. The rate of preterm birth in NZ overall has changed little from 7.2% in1999 to 7.0% in 2008. The rate of iatrogenic preterm birth has remained unchanged since new definitions were adopted at NWH in 2004. The drop in overall preterm birth rate has been due to a reduction in spontaneous preterm birth.

The rate of iatrogenic preterm birth at NW is relatively high. As a Tertiary Referral Centre with a high risk population women are more likely to require early intervention and so high rates of iatrogenic early birth are to be expected. In addition our data for iatrogenic preterm birth includes all women undergoing induction of labour and therefore is likely to include some women with PPROM. Conventionally PPROM, which occurs spontaneously, would be recorded as spontaneous preterm birth. Indications for induction of labour in

preterm births can be found in Appendix 5.1. Of 383 iatrogenic preterm births in 2009, 57 were due to PPROM. Removing these would reduce the iatrogenic preterm birth rate to 4.2%, and increase the spontaneous preterm birth rate to 4.3%.

The trend towards fewer spontaneous preterm births may reflect the success of other antenatal interventions such as the Smokechange Programme. Becoming smoke free is one of the few interventions proven to be effective in reducing the risk of spontaneous preterm birth. Data from Auckland women in the SCOPE Study have demonstrated that women who stop smoking by 15 weeks gestation have rates of spontaneous preterm birth and SGA babies comparable to non-smokers.

Table 14: Rates of preterm birth <32 completed weeks (1995–2009)

	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009
Total number of women	9125	9157	8055	7492	7501	7827	7491	7194	7212	7695	7695	7735
Women birthing <32 weeks	245	241	207	212	229	244	220	211	212	212	222	185
Incidence %	†	†	†	2.8	3.1	3.1	2.9	2.9	2.9	2.8	2.9	2.4
Spontaneous <32 weeks					86	107	106	93	96	105	105	91
Incidence %					1.1	1.4	1.4*	1.3	1.3	1.4	1.4	1.2
Iatrogenic <32 weeks					143	137	114	118	116	107	117	94
Incidence %					1.9	1.8	1.5*	1.6	1.6	1.4	1.5	1.2
Total babies <32 weeks					271	287	250	247	245	237	253	214

† 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 a small change in the rate of early preterm birth <32 weeks in recent years. These babies represent those most likely to have neonatal complications, and additional difficulties extending through childhood with lasting impacts on adult health and welfare. The overall rate of 2.4% may be higher than most populations but again is likely to represent the higher risk women seen in a Tertiary Referral Centre.

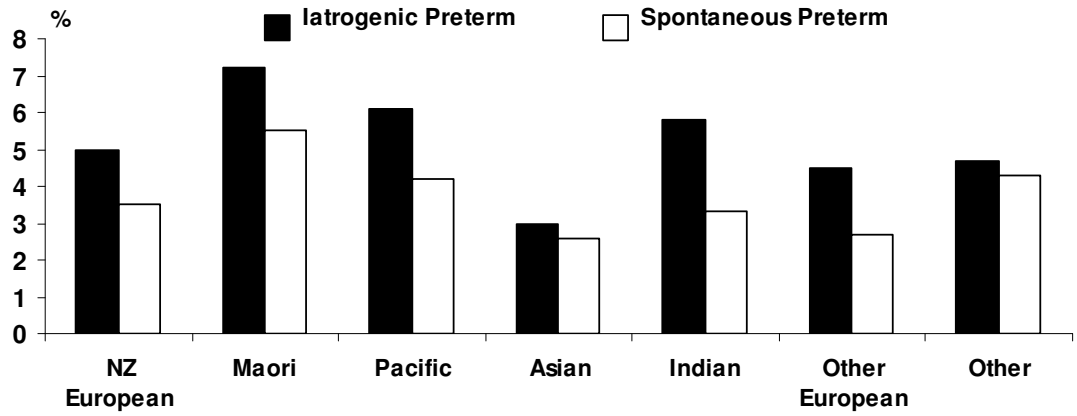

Figure 19: Spontaneous and iatrogenic preterm birth rates (<37 weeks) by ethnicity

Iatrogenic preterm birth is more common than spontaneous preterm birth in all ethnic groups. The highest overall rate of preterm birth is amongst Maori mothers. There are likely to be a number of confounding factors contributing to this elevated risk, such as: smoking during pregnancy, and level of antenatal care,

Table 15: Perinatal outcome of preterm births by gestation (n=769)

Gestation	Births	Fetal deaths	Live births	% Live born	Neonatal death	% of live births surviving >28 days
19	2	0	2	100	2	0
20	9	7	2	22	2	0
21	12	8	4	33	4	0
22	11	9	2	18	2	0
23	9	6	3	33	3	0
24	20	8	12	60	7	42
25	12	1	11	92	2	82
26	19	3	16	84	5	69
27	22	2	20	91	0	100
28	18	4	14	78	0	100
29	25	1	24	96	0	100
30	23	0	23	100	0	100
31	32	2	30	94	0	100
32	45	2	43	96	1	98
33	69	2	67	97	1	99
34	78	1	77	99	1	99
35	130	0	130	100	1	99
36	233	4	229	98	0	100
Totals	769	60	709	92	31	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.

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	**7897**	**945**	**12.0**	**6258**	**79.2**	**694**	**8.8**
Maternal Age							
≤ 20	410	66	16.1	314	76.6	30	7.3
21-25	1016	142	14.0	795	78.3	79	7.8
26-30	1946	226	11.6	1563	80.3	157	8.1
31-35	2603	308	11.8	2043	78.5	252	9.7
36-40	1641	171	10.4	1311	79.9	159	9.7
>40	281	32	11.4	232	82.6	17	6.1
Ethnicity							
NZ European	3043	303	10.0	2435	80.0	305	10.0
Maori	683	95	13.9	521	76.3	67	9.8
Pacific	1140	179	15.7	872	76.5	89	7.8
Asian	1496	181	12.1	1229	82.2	86	5.8
Indian	527	67	12.7	414	78.6	46	8.7
Other European	725	85	11.7	576	79.5	64	8.8
Other	283	35	12.4	211	74.6	37	13.1
Parity							
Multipara	4016	467	11.6	3163	78.8	386	9.6
Primipara	3881	478	12.3	3095	79.8	308	7.9

Young women and women of Maori and Pacific ethnicity appear to have increased rates of SGA infants. This risk may not be directly related to either maternal age or ethnicity but could be explained by other factors. Young women and Maori women are more likely to smoke in pregnancy e.g. 62% of Maori women with SGA infants were smoking at booking compared with 30% of Maori women with non SGA babies.

The increased rate of SGA infants among Pacific women may be related to higher rates of smoking and /or high rates of obesity and the associated increased risk of hypertensive disorders among these women.

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	**7897**	**945**	**12.0**	**6258**	**79.2**	**694**	**8.8**
Smoking at booking							
Currently smoking	755	147	19.5	555	73.5	53	7.0
No or not smoking in last month	6678	735	11.0	5337	79.9	606	9.1
Unknown	464	63	13.6	366	78.9	35	7.5
BMI							
<19	444	55	12.4	362	81.5	27	6.1
19-25	4432	443	10.0	3596	81.1	393	8.9
26-30	1473	196	13.3	1149	78.0	128	8.7
31-35	700	106	15.1	532	76.0	62	8.9
>35	525	74	14.1	383	73.0	68	13.0
Missing data	323	71	22.0	236	73.1	16	5.0
Plurality							
Singleton	7576	803	10.6	6080	80.3	693	9.2
Multiple	321	142	44.2	178	55.5	1	0.3

The increased risk of SGA among women with BMI >31 is likely explained by the high rate of hypertensive disease among these women (approximately a quarter have chronic or pregnancy induced hypertension). Customised centiles are designed to be used in singleton pregnancies so the finding that 44% of infants from multiple pregnancies are SGA needs to be interpreted with some caution.

Further exploration of independent risk factors for SGA infants will require multivariate analysis which may be possible in future reports.

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=945	Customised birthweight ≥10th% & ≤ 90th % (AGA) n=6258	Customised birthweight > 90th % (LGA) n=694
	n %	n %	n %
Median birth weight (IQR) g	2610(2120-2880)	3420(3130-3700)	4140(3850-4405)
Gestation at birth			
Term	688 72.8	5803 92.7	637 91.8
Preterm	257 27.2	455 7.3	57 8.2
Preterm <32 wks	98 10.4	109 1.7	7 1.0
Median gestation (IQR) weeks	38(36-40)	39(38-40)	39(38-40)

One quarter of SGA infants were born preterm and 10% were born < 32 weeks.

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

	Customised birthweight <10th% (SGA) n=257		Customised birthweight ≥10th% & ≤ 90th % (AGA) n=455		Customised birthweight >90th % (LGA) n=57	
	n	%	n	%	n	%
Onset of birth – preterm						
Spontaneous labour	75	29.2	217	47.7	28	49.1
Induction and pre labour CS	182	70.8	238	52.3	29	50.9
NICU admission						
Any stay	186	72.4	240	52.8	30	52.6
≥2 days	181	70.4	236	51.9	30	52.6
Apgar at 5 mins <7	61	23.7	37	8.1	6	10.5
Fetal death (n/ 1000)	35	136	19	42	3	53
Neonatal death(n/1000 live births)	18	81	11	25.2	2	37

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 3 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=688		Customised birthweight ≥10th% & ≤ 90th% (AGA) n=5803		Customised birthweight >90th % (LGA) n=637	
	n	%	n	%	n	%
Onset of birth						
Spontaneous labour	308	44.8	3249	56.0	298	46.8
Induction and pre labour CS	380	55.2	2554	44.0	339	53.2
NICU admission						
Any stay	76	11.1	253	4.4	35	5.5
≥2 days	71	10.3	199	3.4	29	4.6
Apgar at 5 mins <7	19	2.8	53	0.9	6	0.9
Fetal death (n/ 1000)	5	7.3	10	1.7	0	
Neonatal death(n/1000 live births)	1	1.5	4	0.7	1	1.6

Perinatal deaths in term SGA infants were less common than in preterm SGA infants but were again increased compared with rates in AGA infants. These term SGA infants were 3 times more 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 data again suggest 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 and women who stop smoking in pregnancy. 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 2009 and the outcomes of their babies.

Findings

Table 21: Multiple pregnancy rates

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total number of multiple pregnancies	194	210	182	172	218	179	208	191	188	187	162	177	160	159
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
Number of twin pregnancies	187	204	176	166	207	175	201	184	188	184	157	174	156	156
Number of triplet pregnancies	7	6	5	6	11	4	7	7	0	3	5	3	4	3
Number of quadruplet pregnancies	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Table 22: Fetal/neonatal outcomes of multiple pregnancies

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total number of babies born in a multiple pregnancy	395	426	371	350	447	362	423	389	376	377	329	357	324	321
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
Number of multiple pregnancies where one or more babies died	23	20	12	12	14		26	11	15	13	8	9	12	9
Incidence % (no. of multiple pregnancies where a baby died/number of multiple pregnancies)	11.9	9.5	6.6	7.0	6.4		12.5	5.8	8.0	7.0	4.9	5.1	7.5	5.8
Number of babies who died in a multiple pregnancy	36	30	25	22	23				23	17	12	11	16	13
Total number of babies born in a twin pregnancy	374	408	352	332	414	350	402	368	376	368	314	348	312	321
Twin perinatal deaths (≤ 7days)		28	20	22	20				23	16	11	10	13	12
Twin perinatal mortality rate*		68.6	56.8	62.5	48.3				61.2	43.4	35.0	28.7	41.7	37.4

*Perinatal twin deaths/1000 twin babies born

The rate of multiple pregnancy remains stable. In 2009 there was a 5.8% risk of one perinatal death per multiple pregnancy indicating these pregnancies are higher risk than singleton pregnancies. The data cannot be extracted for monochorionic versus dichorionic pregnancies. In international data monochorionic twins have a higher risk compared to dichorionic. Much of this excess risk is secondary to Twin to Twin Transfusion Syndrome. This occurs in 10-15% of monochorionic twins and has 90-100% mortality. In severe cases the best treatment is Selective Fetoscopic Laser Photocoagulation to communicating vessels in the shared placenta. In 2009 this treatment was offered in New Zealand for the first time. Seven cases were performed in Auckland City Hospital in 2009.

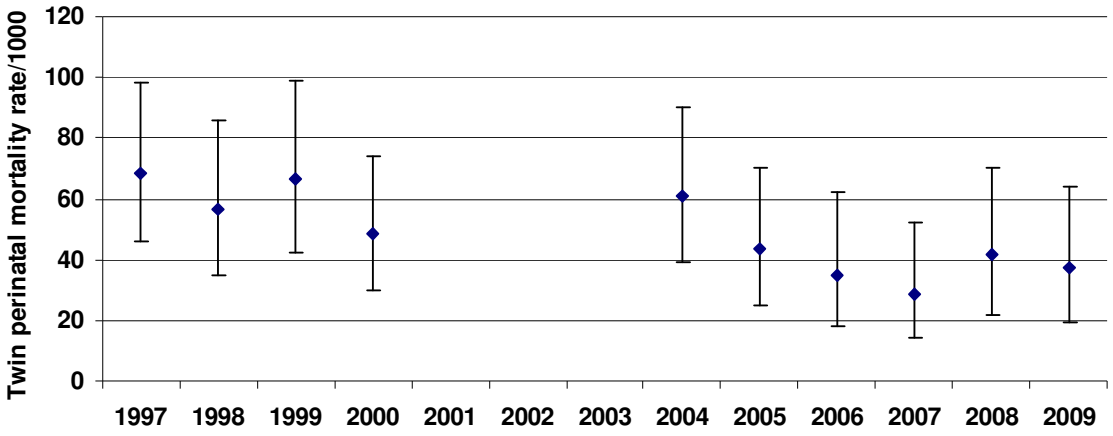

Figure 20: Twin perinatal mortality 1997-2009 with 95% confidence intervals

Table 23: Mode of onset of birth among twin pregnancies

	Preterm births N=210		Term births N=102	
	n	%	n	%
Mode of onset of birth				
CS elective	44	21.0	30	29.4
CS emergency before labour	40	19.1	0	
Induction of labour	40	19.1	62	60.8
Spontaneous labour	86	41.0	10	9.8

Preterm birth is the 'norm' for twins at NW with two thirds being born preterm. Preterm births are more likely to be spontaneous and result in an emergency Caesarean section.

For those multiple pregnancies that proceed to term more than half are induced. There is no clear guidance on the best gestation at which to birth twins and NW are part of a multicentre study which aims to answer this question.

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	
	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
Spontaneous vaginal birth 1st twin, operative vaginal 2nd twin	7	3	4	2	8	4	7	4	3	2	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
Instrumental vaginal birth both twins	11	5	7	4	7	4	3	2	11	6	4	3	9	6
Spontaneous vaginal birth 1st twin, Caesarean section 2nd twin	4	2	4	2	1	1	1	1	2	1	3	2	1	1
Operative vaginal birth 1st twin, Caesarean section 2nd twin	2	1	5	3	0		0		0		0		0	
CS elective both twins	90	43	48	26	52	28			46	29	51	33	37	24
CS emergency both twins			60	32	58	31			57	36	39	25	52	33

Vaginal birth is achieved for both twins in 42% of twin pregnancies. This rate has been stable over the last few years. Of the 65 women having a vaginal birth for the first twin, 3 had a Caesarean section for the second twin (4.6%). The rate has been relatively stable over the last few years around 2-5%. This is useful local information for counselling.

Table 25: Fetal/newborn outcomes of twin babies

		Twin babies n=312	
	N	**n**	**%**
Apgar <7 at 5 minutes	312	19	6.1
Admission to NICU ≥ 2 days	312	161	51.6
≤34 weeks	126	111	88.1
35-36	84	40	47.6
≥37 weeks	10	102	9.8

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

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

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

There were 17 perinatal losses in association with multiple pregnancy. Four pregnancies accounted for 8 of those losses. In three pregnancies both babies died as a result of Twin to Twin Transfusion Syndrome (TTTS). In the fourth dual loss there was an abruption following a planned fetocide in a DCDA twin pregnancy. A further two babies were lost secondary to a TTTS process, but the co-twin survived.
The remaining losses were secondary to growth restriction and preterm labour.

Overall 10 (59%) of the perinatal losses were in monochorionic twin pregnancies which highlights the more risky nature of this type of twinning given that monochorionic twins generally represent only 25% of twins.

Summary / Implications

Twin pregnancies are associated with a higher rate of increased antenatal complications, including preterm birth. The birth itself can be complex and fetal/neonatal outcomes are worse than for singletons. Half of all twin babies spend some time in the neonatal unit, and this should be discussed with parents expecting twins.

It is not clear whether dedicated antenatal clinics for multiple pregnancies are useful, but all twins should have an obstetrician involved in their care and monchorionic twins are at higher risk. All twins should be scanned prior to 14 weeks to determine chorionicity and then two weekly from 16 weeks if monochorionicity is identified.

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 2009. 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 52 referrals for pre-pregnancy counselling, similar to the previous year. Also 21 other women were booked into clinic but their data are not shown as they either miscarried or transferred elsewhere for birthing.

The figure below demonstrates a further increase in numbers of women with GDM and type 2 diabetes diagnosed prepregnancy. There were also more women with type 1 diabetes who birthed during 2009.

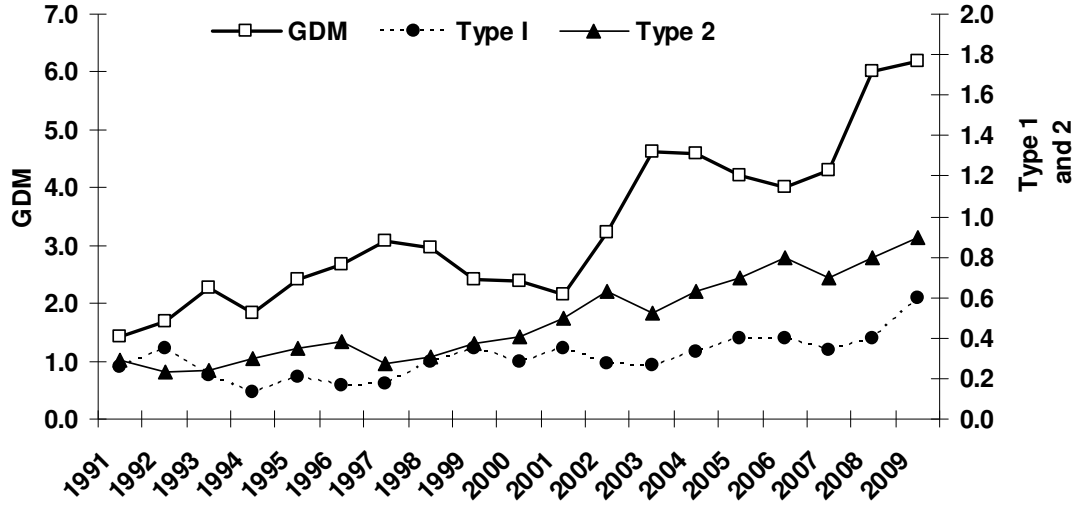

Figure 21: Incidence of diabetes (% of all inborn and BBA births) (1991-2009)

5.4.1 Demographic characteristics of women with diabetes

The demographics again demonstrate the increased rates of GDM in non-European ethnicities. These rates are seen within the current diagnostic pathway, which recommends a 50g glucose screening test and in women with an elevated result or high risk clinically, a 75 g diagnostic glucose tolerance test (OGTT). The diagnosis is made if either a fasting glucose is ≥ 5.5mmol/l or two hour glucose is ≥9.0mmol/l. New international recommendations for the diagnosis of GDM have been published. In addition to recommendations for testing for GDM, they advise early testing for diabetes in women who have significant risk of underlying undiagnosed glucose intolerance. When early testing is normal and for all other pregnant women, they recommend a single step 75g OGTT at 24-28 weeks' gestation (i.e. no 50g glucose screen). The diagnosis of GDM is made with either a fasting plasma glucose ≥ 5.1mmol/l, one hour ≥ 10.0mmol/l or 2 hour ≥ 8.5mmol/l. In New Zealand we are discussing whether to implement these

recommendations and may offer just a fasting and one hour OGTT be done, as not many additional cases are identified by including the 2 hour result. This will have enormous implications for the model of care of women diagnosed with GDM, as it may affect 15-20% of the pregnant population. It is anticipated that the diagnosis will be used as a risk marker for many women leading to appropriate additional assessment of their pregnancy. Not all women will require referral to diabetes clinic and clinic numbers may not change substantially. This will require careful discussion and education prior to any changes being made. The diabetes team already has recommendations about testing early in high risk women and these are included in the diabetes guidelines on the hospital intranet.

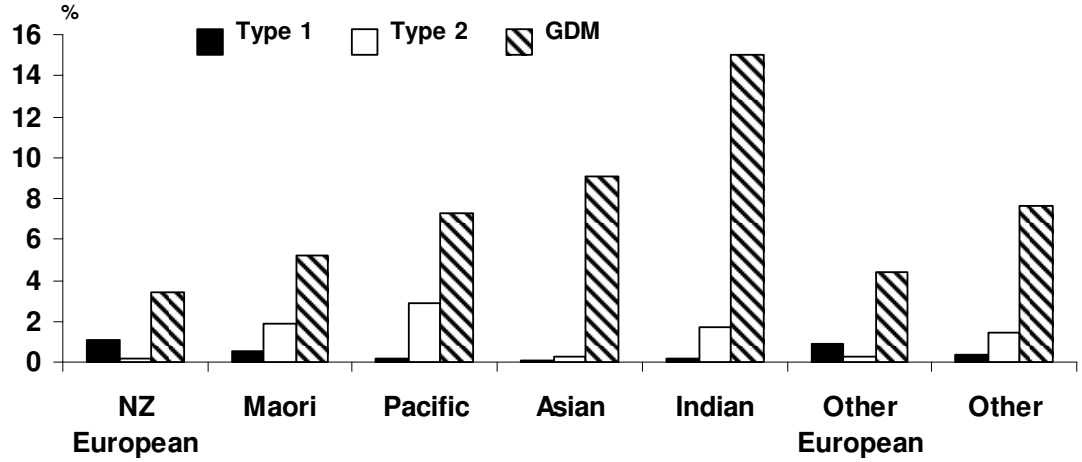

Figure 22: Incidence of diabetes by ethnic group (2009)

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.

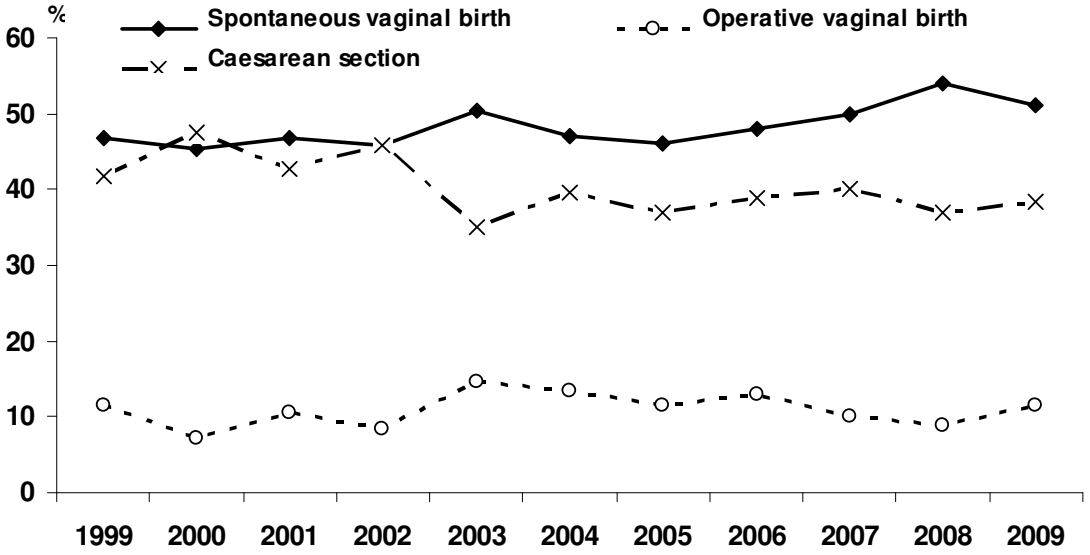

Figure 23: Mode of birth among women with GDM (1999-2009)

5.4.3 Maternal postpartum glucose tolerance testing

Table 27: Rates of postnatal glucose tolerance testing (GTT) among women with GDM (2000-2009)

	2000 n=180		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	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Postnatal GTT	121	67	132	81	171	68	260	74	260	76	238	78	206	72	249	75	313	68	324	68
No post-natal GTT	59	33	31	19	82	32	92	26	82	24	66	22	80	28	82	25	144	32	156	32

The rate of postpartum type 2 diabetes is underrepresented in these tables, as a number of women with GDM are recognised to have undiagnosed type 2 diabetes following birth. They are discharged on medication and therefore they do not have a postpartum glucose tolerance test.

Table 28: Results of postnatal glucose tolerance testing (GTT) among women with GDM (2000-2009)

	2000 n=121		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	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Normal	89	74	90	69	116	69	196	75	194	75	190	80	158	77	175	70	236	75	264	82
IFG/ IGT*	17	14	23	18	37	22	39	15	49	19	34	14	39	19	50	20	58	19	42	13
Type 2	15	12	17	13	16	9	25	10	17	7	14	6	9	4	24	10	19	6	18	5

*IFG =Impaired fasting glucose
IGT= Impaired glucose tolerance

5.4.4 Neonatal outcomes among babies of women with diabetes in pregnancy

Neonatal outcomes are similar to other years, suggesting consistent practice.

Table 29: Neonatal outcomes among babies of women with diabetes

	Type I n=47		Type 2 n=70		GDM n=471		Postnatally diagnosed Type 2 n=18		No diabetes n=7291	
	n	%	n	%	n	%	n	%	n	%
Birthweight (Median(IQR))	3370(3020-3640)		3185(2750-3630)		3170(2865-3540)		3045(2490-3420)		3405(3040-3750)	
<1500g	1	2.3	4	5.6	7	1.5	1	5.6	194	2.7
<2500g	3	6.4	11	15.7	47	10.0	5	27.8	577	7.9
SGA <10th Percentile	2	4.3	14	19.7	46	9.8	6	33.3	877	12.0
LGA >90th Percentile	15	31.9	12	16.9	61	13.0	2	11.1	604	8.3
Admission to NICU										
Any admission	13	27.7	19	27.1	65	13.8	6	33.3	717	9.8
≥2 days	11	23.4	18	25.7	56	11.9	6	33.3	655	9.0
Hypoglycaemia <2.3 mmol/l	16	34.0	20	28.6	60	12.7	4	22.2	ND	
Hypoglycaemia <2.3–<2.6 mmol/l	5	10.6	8	11.4	39	8.3	0		ND	
IV Dextrose	9	19.2	15	21.4	39	8.3	3	16.7	ND	
Perinatal related losses (/1000)	1	21.3	1	14.3	2	4.2	0		108	14.8

ND=Not documented

5.4.5 Perinatal losses

One woman with excellent control of her type 1 diabetes had an unexplained stillbirth at 27 weeks. She had no diabetes complications and a prepregnancy BMI of 24kg/m². Another woman was diagnosed at 28 weeks with GDM and had an HbA1c of 7.1%, reflecting undiagnosed type 2 diabetes. Her fetus had a recognised cardiac anomaly and died 2 weeks postpartum. The woman had previous GDM in 2003, but there was no record of testing for diabetes prior to pregnancy or in early pregnancy. The third loss was in a woman who was recognised to have cervical incompetence and a suture was placed at 12 weeks. She presented at 20 weeks with a dilated cervix and was admitted to the ward until 28 weeks. She had underlying PCOS and GDM was diagnosed when admitted and controlled with insulin. At 29 weeks she presented with an IUD that was due to a fetal-maternal haemorrhage, which is not associated with a diagnosis of diabetes.The fourth loss was in a 41 year old obese woman with PCOS who presented at 19 weeks with preterm rupture of membranes. Gestational diabetes was diagnosed at presentation. The woman birthed at 24 weeks and the baby died from complications of extreme prematurity.

Metformin use

Since mid 2007, when the MiG trial was published we have been offering metformin or insulin treatment to women with GDM. We are currently auditing this practice and will be able to present these data in the annual report next year.

Summary

The epidemic of obesity and diabetes is continuing to influence the numbers seen in the diabetes clinic. The challenge for the future will be how we manage the further increase in workload associated with increasing rates of obesity and potentially new diagnostic criteria for diagnosis of GDM. The diabetes service will need to provide direct care for the higher risk women and provide an “umbrella” of care for lower risk women. In preparation for this we have been updating our clinic protocols and educational resources. Most of these are ready to go online so they can be readily accessed through a single site, with a table of contents providing links to relevant documents. The aim is to have a diabetes in pregnancy computer “folder” that can be used and updated regularly.

Recommendations

1. Plan for further increases in numbers of women with GDM and type 2 diabetes. The diabetes service needs to provide education to enable expansion of the service as the top priority.
2. Test the online diabetes folder to ensure it provides a relevant education/resource tool for the care of women with diabetes in pregnancy.
3. Continue current multidisciplinary care.
4. 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

	1994	1995	1996	1997	1998	1999	2000	2005	2006	2007	2008	2009
Total APH	515	460	451	453	451	484	594	398	411	533	424	438
Incidence %	5.6	5.0	4.9	5.6	6.0	6.5	7.6	5.5	5.7	6.9	5.6	5.7
Proven abruption	94	101	96	115	82	49	54	41	44	58	36	39
Proven placenta praevia	61	86	67	94	91	74	69	81	68	94	73	66
APH (uncertain origin)	365	273	287	281	278	361	471	276	299	381	315	333

In 2009 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 0.3% (10 of 3308 women) in women aged 30 or under rising to 1.8% in women aged 36 to 40 (29 of 1600 women) and 2.5% (7 of 275 women) in women over 40. No woman under 25 had a placenta praevia. (See appendix 4.4). The incidence of placenta praevia in women with a previous Caesarean section was 1.6% (19 of 1166 women) compared to 0.5% (13/2758) among multipara without previous Caesarean consistent with previous Caesarean section being a risk factor for placenta praevia. For the future, recording the incidence and outcomes associated with 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=66		Placental abruption n=39		APH uncertain origin n=333		No APH n=7297	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	0		11	28.2	181	54.4	4182	57.3
Operative vaginal	0		0		45	13.5	902	12.4
CS elective	48	72.7	2	5.1	34	10.2	1048	14.4
CS emergency	18	27.3	26	66.7	73	21.9	1165	16.0
Maternal transfusion	15	22.7	6	15.4	24	7.2	208	2.9

Women with a placenta praevia had a significant requirement for blood products with 23% of women requiring transfusion during pregnancy or birth. 27% were birthed by emergency section, a similar proportion to previous years. Planning birthing is clearly a difficult aspect of the management of placenta praevia. A study of women requiring an emergency Caesarean section for placenta praevia and the morbidity associated with

birth would be useful to determine how well we are managing these women. Thirty percent of women with a placenta praevia are birthed prior to 37 weeks gestation suggesting that reducing the proportion of women birthed as an emergency will be difficult.

A confirmed placental abruption is a less common diagnosis with an incidence of 0.5% in 2009 (39 women out of 7735). There was no difference in incidence with maternal age, BMI or previous Caesarean section. Smoking may be a significant risk factor with an incidence of 1.0% (7 of 739 women) compared to 0.4% (29 out of 6544 women) in non-smokers. Pre-eclampsia may also be a significant risk factor with an incidence of 2.0% in this group (5 out of 244 women) compared to 0.4% (31 of 7054 women) in normotensive women.

Placental abruption is associated with significant maternal morbidity with 67% requiring birthing by emergency section and 15% being transfused. Fetal morbidity is also significant with a median birth weight of 2790g and an incidence of SGA of 30%. Nearly half of these babies were admitted to NICU and with six perinatal deaths amongst 40 babies in this group (150/1000), the perinatal mortality rate is fifteen times higher than in women with no history of antepartum haemorrhage (78 out of 7440 babies (10.5/1000))..

The higher rates of preterm birth, emergency Caesarean section, an increased requirement for blood transfusion and a perinatal mortality rate eight 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 most recent report by the NZ Perinatal and Maternal Mortality Review Committee (PMMRC) (2009) has also drawn attention to the importance of monitoring women with antepartum haemorrhage of unknown origin.

Women with an APH of uncertain origin make up the largest proportion of women presenting with antepartum haemorrhage (333 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. A higher rate amongst smokers (7.0% vs. 3.9%) and women with pre-eclampsia and chronic hypertension (5.5% vs. 4.1%) would support this assumption.

Table 32: Fetal/neonatal outcomes of pregnancies complicated by antepartum haemorrhage (babies)

	Placenta praevia n=67		**Placental abruption n=40**		**APH uncertain origin n=350**		**No APH n=7440**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Gestation at birth								
<37 weeks	20	29.9	14	35.0	109	31.1	626	8.4
<32 weeks	1	1.5	10	25.0	60	17.1	143	1.9
Birthweight								
Median (IQR)	2970(2760-3440)		2790(1960-3440)		3105(2300-3105)		3410(3045-3745)	
<2500g	12	17.9	15	37.5	95	27.1	521	7.0
<1500g	1	1.5	8	20.0	55	15.7	143	1.9
Small for gestational age	7	10.5	12	30.0	71	20.3	855	11.5
Perinatal deaths (n /1000)	0		6	150	28	80	78	10.5
Admission to NICU	17	25.4	17	42.5	92	26.3	694	9.3
≥2 days in NICU	16	23.9	15	37.5	89	25.4	626	8.4

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 (8.8%) is similar to the rate in 2008. 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.

There were 2 reported cases of eclampsia in 2009 (0.3% of hypertensive pregnancies).

Table 33: Hypertensive disease in pregnancy (2009)

	All women N=7735		Nullipara n=3811		Multipara n=3924	
	n	%	n	%	n	%
Any hypertensive disease	681	8.8	394	10.3	287	7.3
Gestational hypertension	249	3.2	167	4.4	82	2.1
Chronic hypertension	157	2.0	49	1.3	108	2.8
Chronic hypertension with superimposed preeclampsia	31	0.4	10	0.3	21	0.5
Preeclampsia	244	3.2	168	4.4	76	1.9

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 (50%, 40% and 55% respectively).

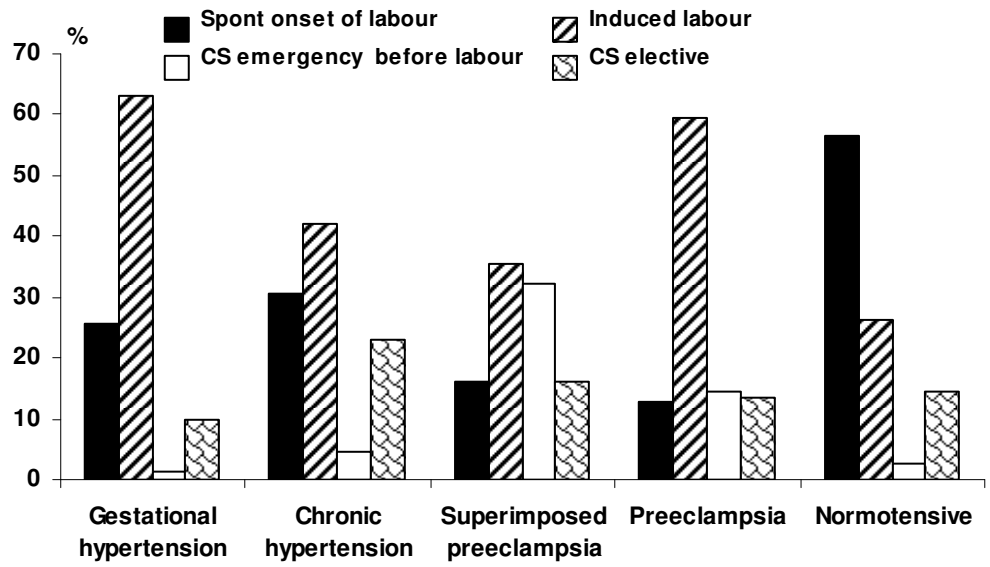

Figure 24: Onset of birth and hypertensive disorders of pregnancy

Table 34: Mode of birth for women with hypertensive disease

	Gestational hypertension n=249		Chronic hypertension n=157		Superimposed preeclampsia n=31		Preeclampsia n=244		Normotensive n=7054	
	n	%	n	%	n	%	n	%	n	%
Mode of birth										
Normal vaginal	128	51.4	81	51.6	12	38.7	88	36.1	4065	57.6
Operative vaginal	43	17.3	13	8.3	2	6.5	34	13.9	855	12.1
CS elective	25	10.0	36	22.9	5	16.1	33	13.5	1033	14.6
CS emergency	53	21.3	27	17.2	12	38.7	89	36.5	1101	15.6
Epidural	182	73.1	108	68.8	26	83.9	186	76.2	4112	58.3
General Anaesthetic	1	0.4	5	3.2	1	3.2	19	7.8	209	3.0

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

	Gestational hypertension n=249		Chronic hypertension n=157		Superimposed preeclampsia n=31		Preeclampsia n=244		Normotensive n=7054	
	n	%	n	%	n	%	n	%	n	%
Gestation at birth										
<37 weeks	20	8.0	29	18.5	9	29.0	87	35.7	624	8.8
<32 weeks	2	0.8	6	3.8	4	12.9	19	7.8	183	2.6
SGA	33	13.3	29	18.5	11	35.5	72	29.5	800	11.3
NICU Admission	27	10.8	25	17.8	11	35.5	82	33.6	675	9.6
≥2 days in NICU	25	10.0	23	14.6	10	32.3	75	30.7	613	8.7
Apgars <7 at 5 mins	5	2.0	6	3.8	0		8	3.3	163	2.3
Perinatal deaths (n/1000)	2	8	3	19	0		6	24.6	101	14.3

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 (12.9 and 7.8% of births respectively, compared to 2.6% 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, 3 more than in 2008.

Summary / Implications

Occurring at a rate of 8.8%, antenatal hypertensive disease continues to be the most common medical complication associated with pregnancy at NW. The negative pregnancy outcomes associated with hypertensive conditions are again reflected in the 2009 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 2006-2009 (missing data removed)

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

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%

It is surprising but also somewhat reassuring to see that the rates of morbid obesity have remained stable over the last 3 years.

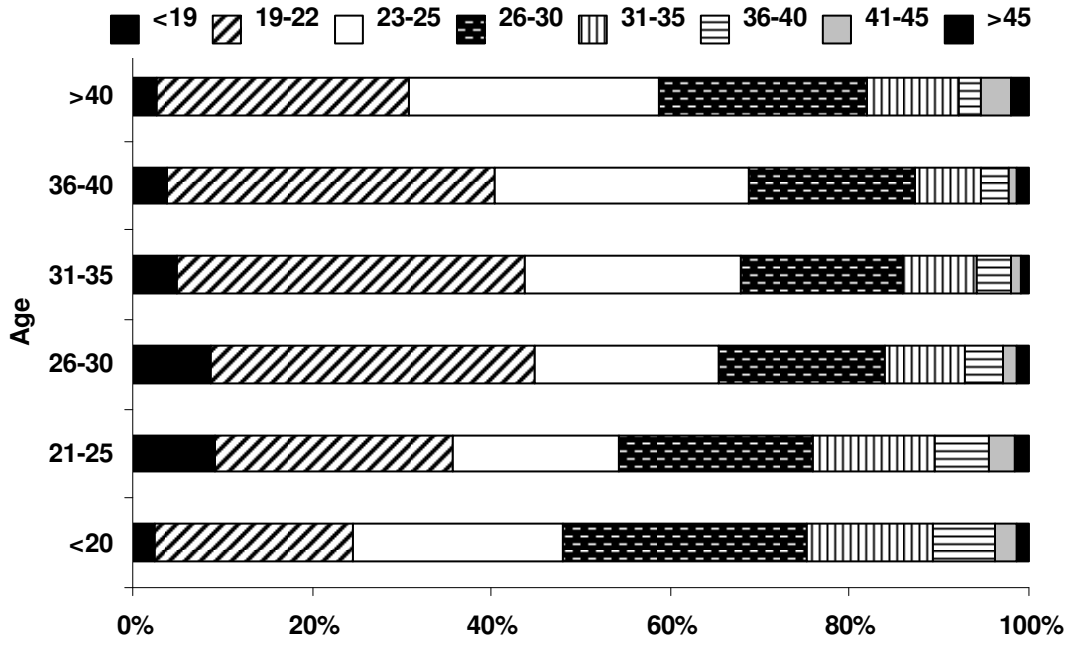

Figure 25: Distribution of BMI by maternal age

The relationship between BMI and age is "U shaped" with an excess of high BMI categories in the young (<25 years) and the old (>40). These data are concerning because the high rates of obesity in young women are likely to contribute to higher rates of pregnancy complications in future births in years to come.

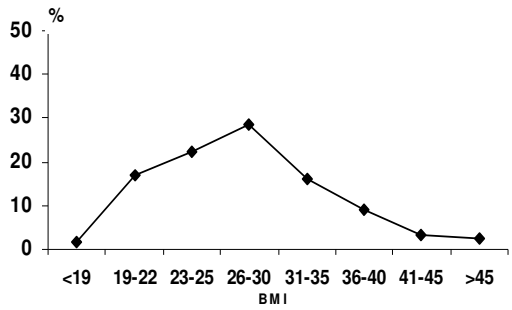

Figure 26: Distribution of BMI among Maori women

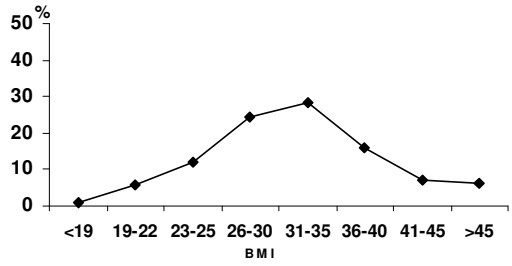

Figure 27: Distribution of BMI among Pacific women

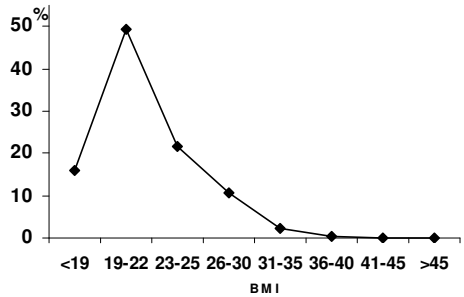

Figure 30: Distribution of BMI among Asian women

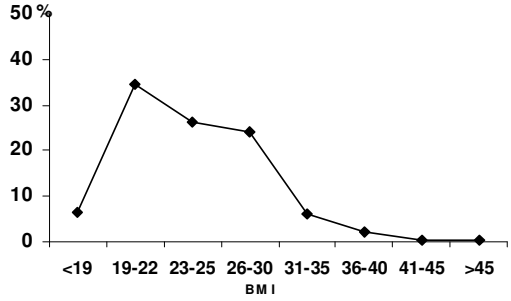

Figure 28: Distribution of BMI among Indian women

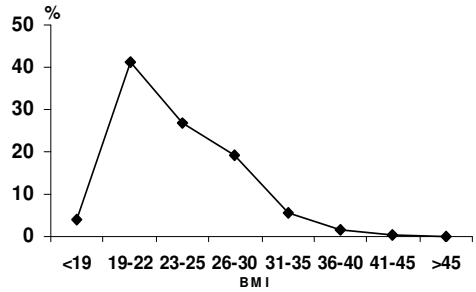

Figure 29: Distribution of BMI among European women

Maori and especially Pacific women are over represented amongst the obese groups (33% and 56.4% respectively). Also of concern 37.2% of Indian women have BMI $\geq$ 26 which is in the overweight/obese range for women of Indian ethnicity. As discussed in previous sections 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 approximately 3 fold amongst obese women compared with those with ideal BMI. This is also likely to contribute to pregnancy complications in these women.

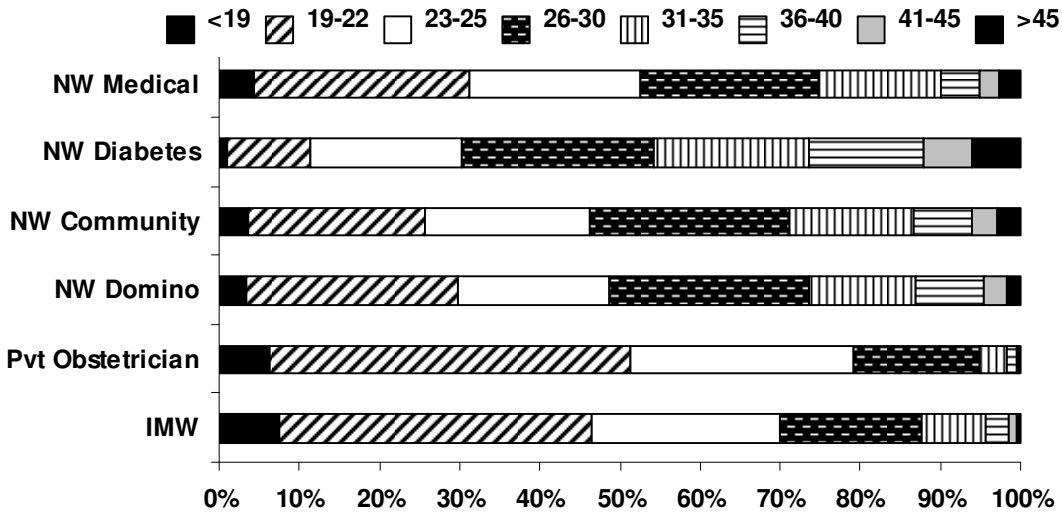

Figure 31: Distribution of BMI by LMC at birth

Not surprisingly the rates of obesity are greatest in the diabetes clinic and low amongst patients booked with private obstetricians and independent midwives.

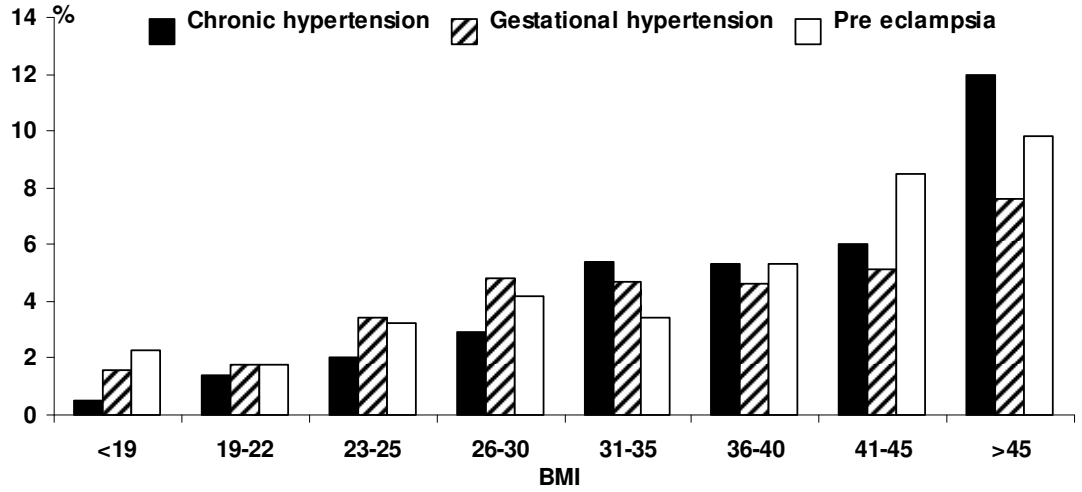

Figure 32: Rates of hypertensive diseases by maternal BMI (Chronic hypertension includes superimposed pre-eclampsia)

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

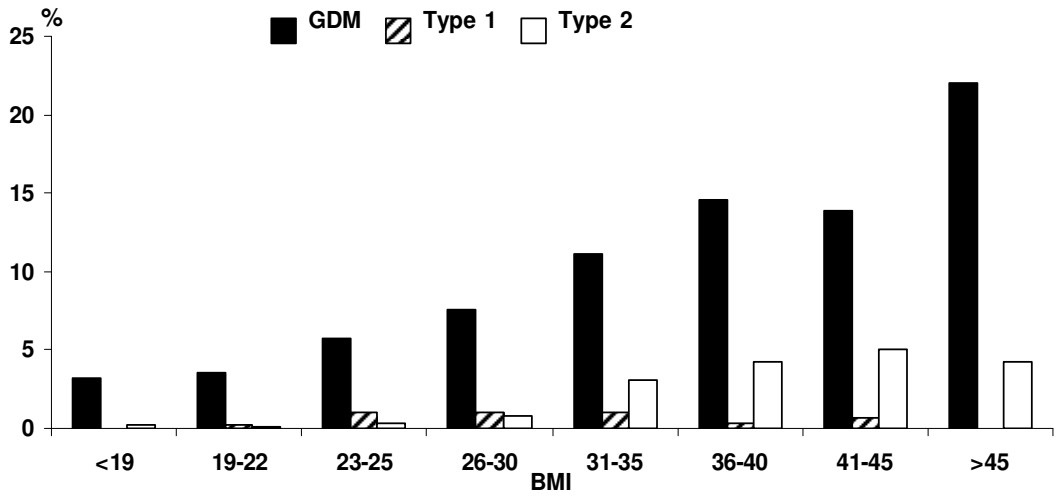

Figure 33: Rates of diabetes by maternal BMI

A similar pattern is seen for GDM and type 2 diabetes as for hypertensive conditions in pregnancy.

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 $\geq$27 and Maori and Pacific with BMI $\geq$ 32.

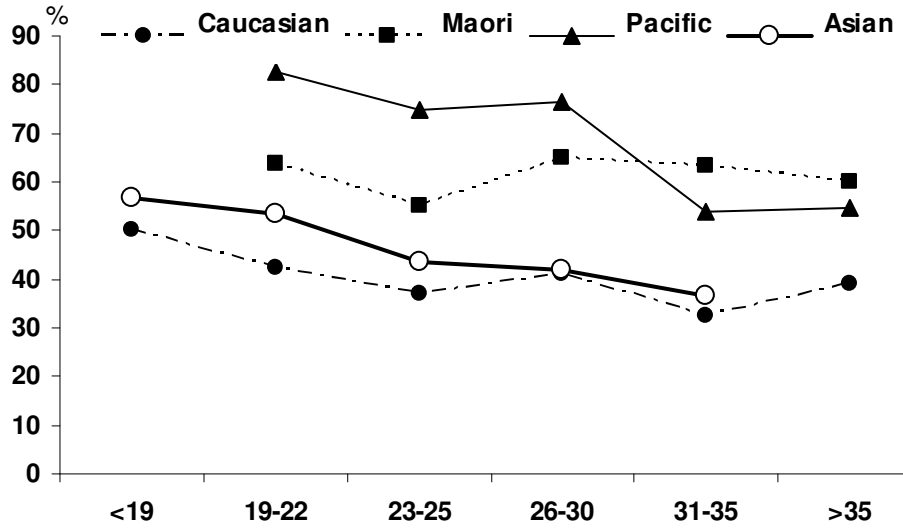

Figure 34: Spontaneous vaginal birth rate by BMI and by ethnicity among nulliparous mothers (no data point plotted if denominator < 30)

These data show that Maori and Pacific women have higher rates of vaginal births compared with Caucasian and Asian women. However there are a number of confounding factors which need to be adjusted for before conclusions can be drawn from these data and this is the subject of an ongoing research project. For example Caucasian women are older than Maori and Pacific mothers. Mode of onset of labour, smoking and pregnancy complications need to be considered in multivariate models. These same comments also apply to the figure below, re Caesarean section.

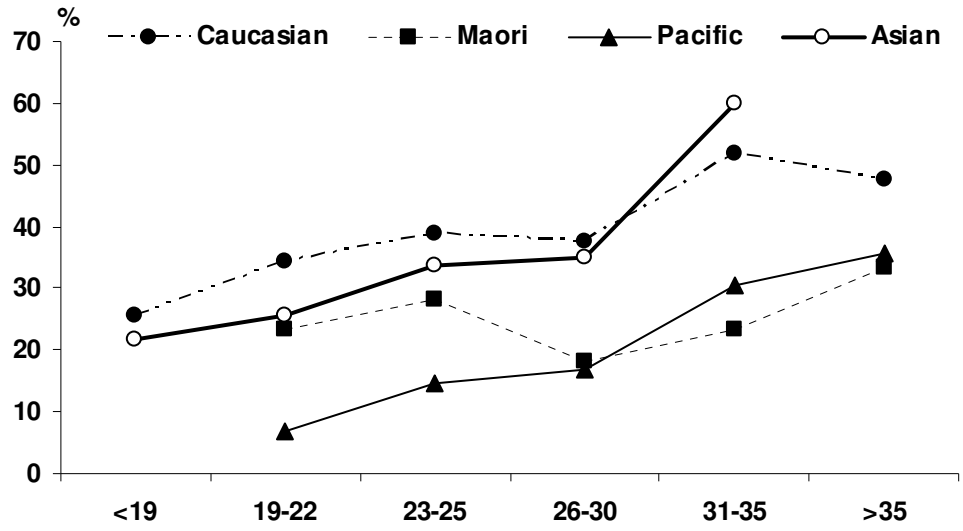

Figure 35: Caesarean section rate by BMI and by ethnicity among nulliparous mothers (no data point plotted if denominator < 30)

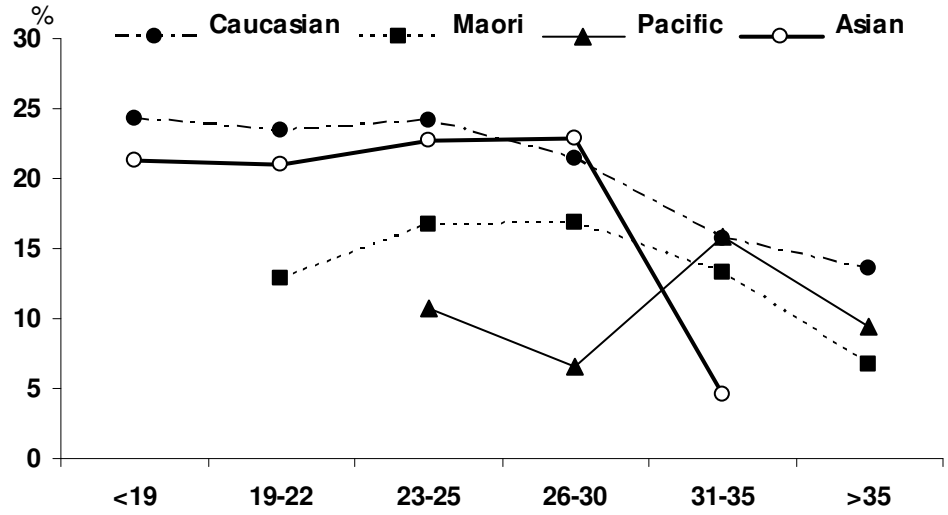

Figure 36: Operative vaginal birth rate by BMI and by ethnicity among nulliparous mothers (no data point plotted if denominator < 30)

The data in the 3 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 pregnancy complications (e.g. diabetes and hypertension) as well as other factors.

Operative vaginal birth rates may be lower in obese (particularly amongst Maori and Pacific) compared with those with normal BMI however further analyses are also needed before conclusions can be drawn.

Obese women have elevated rates of induction of labour. This will include indications such as diabetes, hypertensive disease, and possibly prolonged pregnancy.

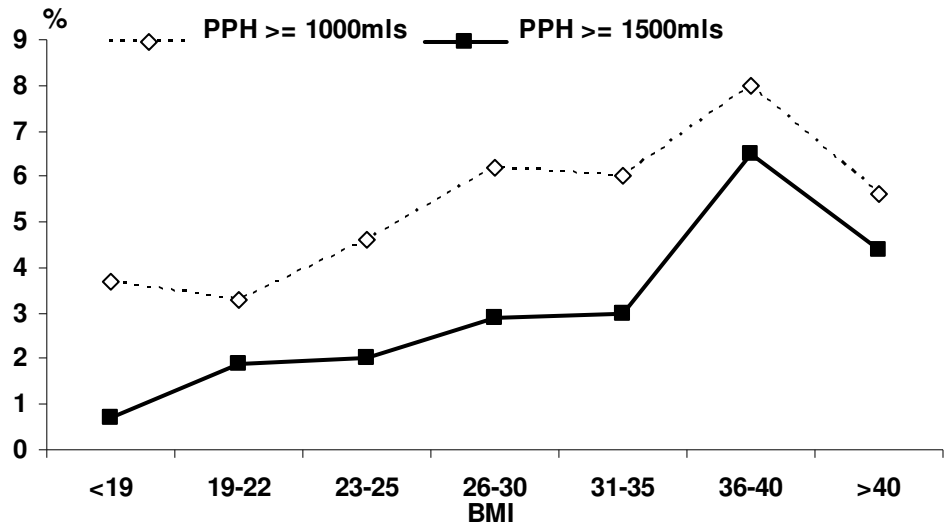

Figure 37: Postpartum haemorrhage rate by BMI among spontaneous vaginal births

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 induction of labour, prolonged labour and larger infant size.

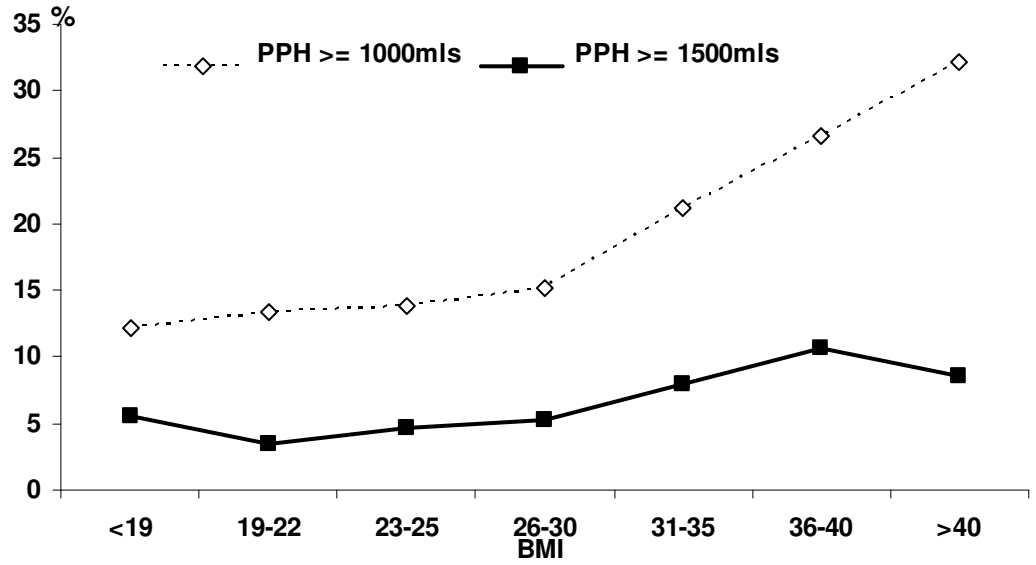

Figure 38: Postpartum haemorrhage rate by BMI among Caesarean sections

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.

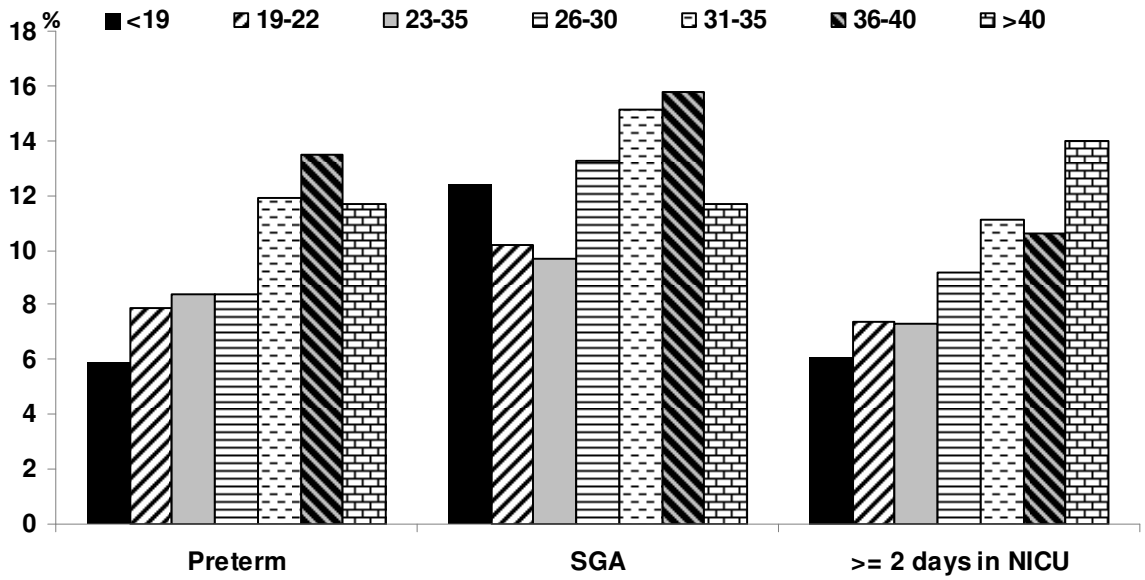

Figure 39: Neonatal outcomes and BMI

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

5.8 Maternal Fetal Medicine

The Maternal Fetal Medicine Service comprises a multidisciplinary service for women who have a high risk pregnancy by virtue of a maternal or fetal condition. The Service has both an outpatient and inpatient component and takes referrals from the local DHB region, midcentral to Northland and for a few cases nationally.

Women who have a serious medical disorder, previous significant pre-eclampsia, preterm birth or other pregnancy complications are seen in the Maternal Medicine Clinics which run twice a week. The clinics are multidisciplinary and have access to high quality on site ultrasound services. The team comprises specialist and sub-specialist obstetricians, obstetric physicians and the senior registrars attached to both disciplines. Each woman is assigned a midwife who specialises in this field but is able to provide continuity of care and a holistic approach with the aim of keeping the pregnancy and birthing process as normal as possible. In addition to these personnel there is a women's health physiotherapist based in the clinic. Other services which are accessed include ADHB Smokefree Pregnancy Services and women's health social workers.

Women with red cell antibodies, a complex multiple pregnancy or a baby with a fetal anomaly are seen in the Fetal Medicine Clinics. Here they are seen by specialist and sub-specialist obstetricians with midwifery support. During the consultation there is usually additional assessment with Ultrasound. When invasive testing is indicated this is also performed. Other services are accessed as required and can include: genetics, orthopaedics, neurosurgery, developmental paediatrics, paediatric cardiology and nephrology. These women are provided with continuity of care at a senior level as they are often complex and experiencing a highly stressful event during what should be a joyful time.

The number of women being referred to the Fetal Medicine Unit has increased over the last two years. During the three-month period from September – November 2007 there were 90 new and 142 return patients seen. In the same time frame in 2009 there were 150 new and 263 return patients seen.

Development of the New Zealand Maternal Fetal Medicine Network (NZMFMN)

In 2009 the NZMFMN was developed with funding from the Ministry of Health. This service was developed to address a number of critical areas: Variable access to tertiary MFM services in different parts of New Zealand, retention and recruitment issues in the MFM subspecialty, a lack of collegiality for MFM sub specialists and a lack of a complete range of fetal therapy services in New Zealand. The NZMFMN was based at ADHB and a comprehensive fetal therapy service started.

During 2009 a second fetal medicine midwife and an administrator have been employed. Fetal medicine updates have continued with an associated network business meeting of the four fetal medicine centre team members (Auckland, Hamilton, Wellington and Christchurch). The fetal medicine update topics were Infection in Pregnancy and Multiple Birth in 2009. Potential MFM sub-specialty trainees have been identified and two are based in Auckland and one in Wellington. A website has been developed with areas for the public and health professionals which is password protected (www.nzmfm.co.nz)

The fetal therapy service undertakes a number of complex invasive procedures including fetal blood sampling, in-utero transfusions, amniodrainage and fetal shunt placement. As part of the funding from the Ministry of Health, the development and implementation of a selective laser photocoagulation service for the treatment of twin to twin transfusion syndrome has commenced. The first case was performed in May 2009 and during 2009 seven procedures were performed. The table below shows the numbers of invasive cases performed over the last few years.

Table 37: Number of referrals and procedures performed in maternal fetal medicine service(1998-2009)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Intrauterine transfusion (no of women)	6	8	6	9	6	1	2	*	2	11	5	10
Intrauterine transfusion (no of procedures)	9	27	24	24	14	3	2	*	3	21	8	21
Other procedures (no of women)	24	14	16	23	19	11	3	*	36	40	37	24
Other procedures (no of procedures)	34	16	16	32	32	11	3	*	44	49	39	26

* no data

In addition to the complex invasive procedures, routine amniocenteses and chorionic villous samplings (CVS) are performed.

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 dilated. Indication for induction is prioritised at data entry to primary and secondary indication. Primary indications are given here.

Findings

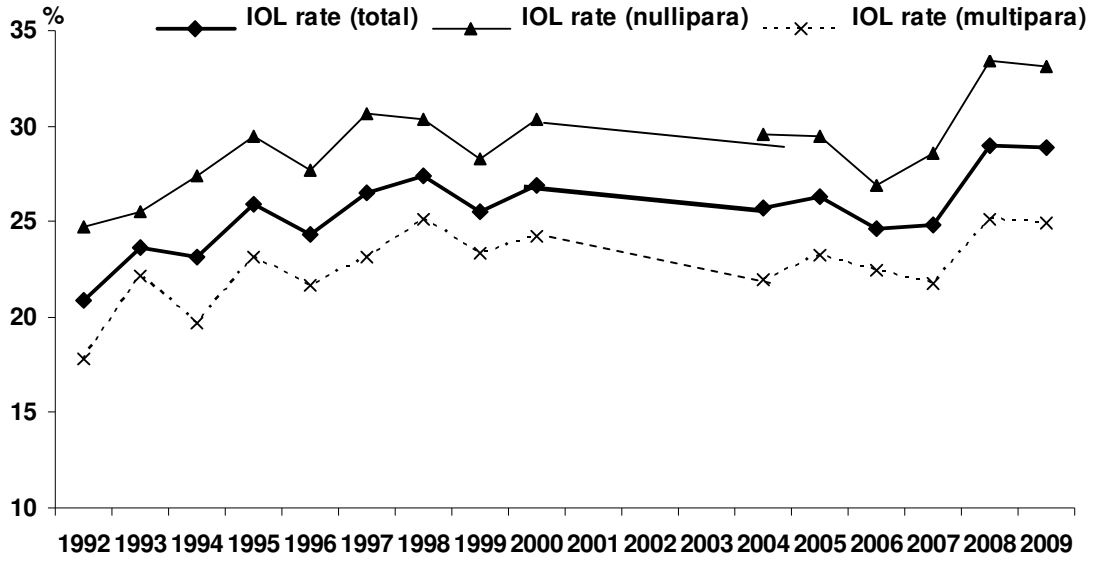

Figure 40 : Induction of labour rates (1992-2009)

There was a significant rise in induction rate in 2008, in part due to accurate identification of inductions performed in Labour and Birthing Suite. The rate has not changed significantly in 2009. At term 45% of pregnancies ended prior to spontaneous onset of labour (29% by induction, 15% elective Caesarean section and 2% by emergency Caesarean section before onset labour).

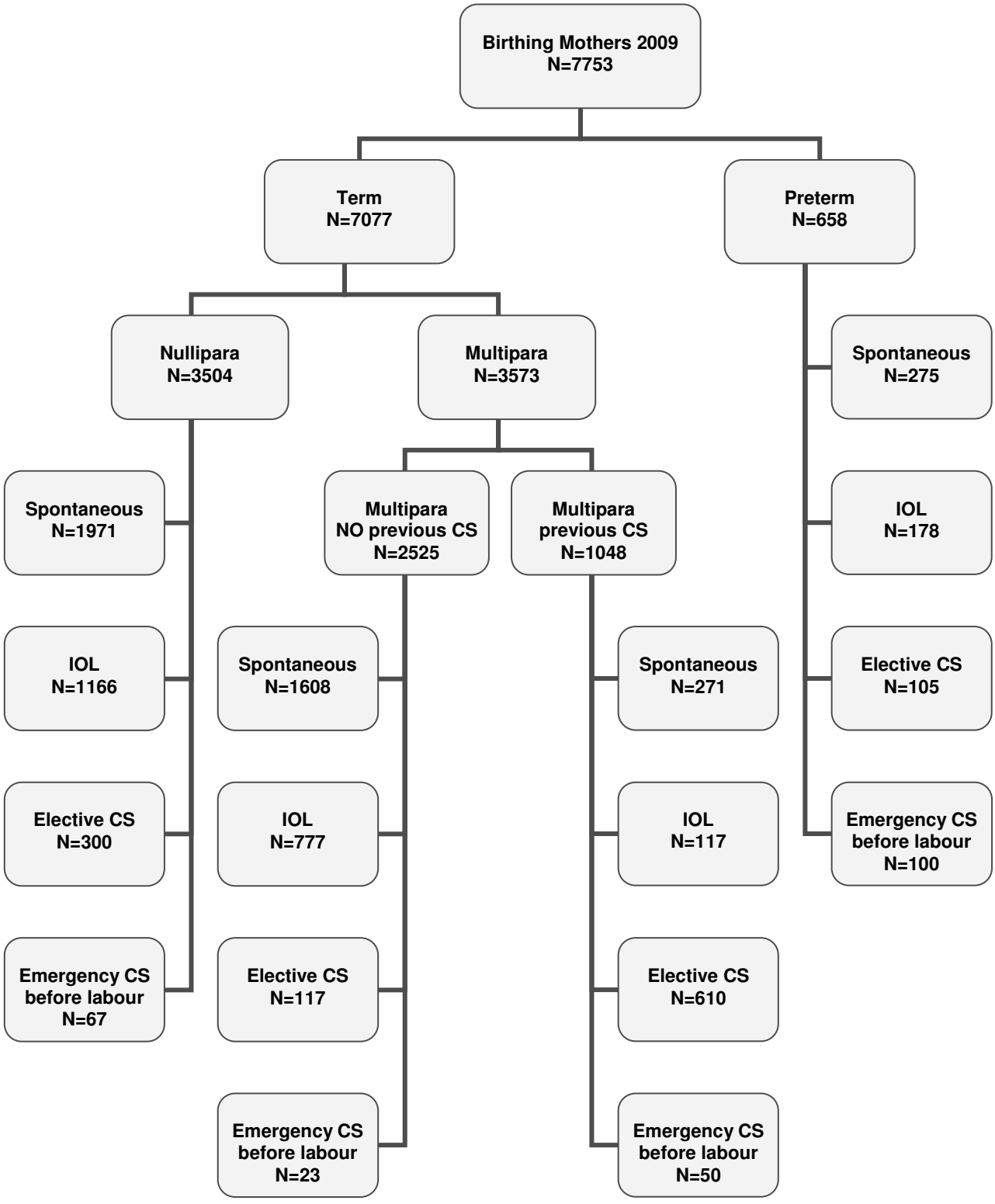

Figure 41: Pathways to birth by gestation and parity

Table 38: 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	7077	3850	54.4	2060	29.1	1027	14.5	140	2.0
Maternal age									
≤ 20	356	255	71.6	91	25.6	6	1.7	4	1.1
21-25	888	602	67.8	215	24.2	56	6.3	15	1.7
26-30	1770	1128	63.7	471	26.6	139	7.9	32	1.8
31-35	2351	1224	52.1	708	30.1	377	16.0	42	1.8
36-40	1471	592	40.2	467	31.7	377	25.6	35	2.4
41+	241	49	20.3	108	44.8	72	29.9	12	5.0
Ethnicity									
NZ European	2716	1257	46.3	891	32.8	520	19.1	48	1.8
Maori	585	346	59.1	164	28.0	66	11.3	9	1.5
Pacific	1000	661	66.1	254	25.4	69	6.9	16	1.6
Asian	1394	889	63.8	316	22.7	154	11.0	35	2.5
Indian	473	239	50.5	151	31.9	71	15.0	12	2.5
Other European	656	315	48.0	214	32.6	115	17.5	12	1.8
Other	253	143	56.5	70	27.7	32	12.6	8	3.2
BMI									
<19	417	266	63.8	101	24.2	41	9.8	9	2.2
19-25	4039	2233	55.3	1123	27.8	607	15.0	76	1.9
26-35	1955	1009	51.6	618	31.6	289	14.8	39	2.0
>35	455	207	45.5	171	37.6	66	14.5	11	2.4
Missing	211	135	64.0	47	22.3	24	11.4	5	2.4
LMC at birth									
IMW	3252	2194	67.5	799	24.6	213	6.5	46	1.4
Private Obstetrician	1589	491	30.9	548	34.5	503	31.7	47	3.0
GP	109	68	62.4	32	29.4	9	8.3	0	0.0
NW Community	1279	742	58.0	313	24.5	194	15.2	30	2.4
NW Domino	299	196	65.6	86	28.8	11	3.7	6	2.0
NW Medical	246	90	36.6	103	41.9	44	17.9	9	3.7
NW Diabetes	252	26	10.3	172	68.3	52	20.6	2	0.8
Other DHB	9	4	44.4	4	44.4	1	11.1	0	0.0
Unbooked	42	39	92.9	3	7.1	0	0.0	0	0.0

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.

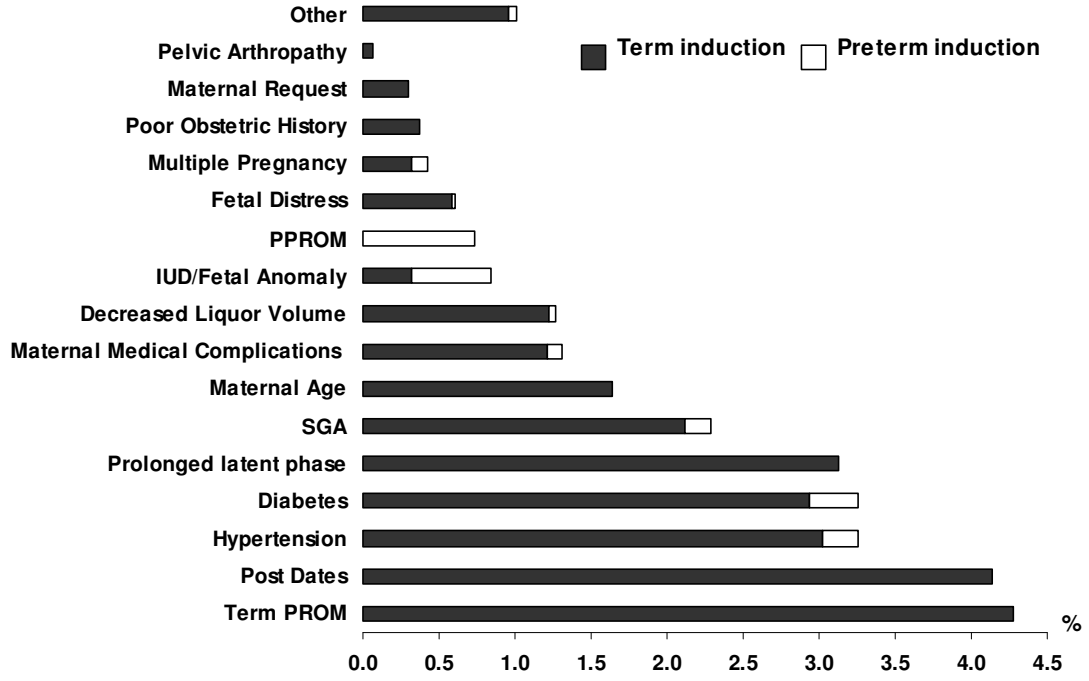

Figure 42: Primary indication for induction as a percentage of all births, including the contribution by gestation (n=inductions/birthing mothers)

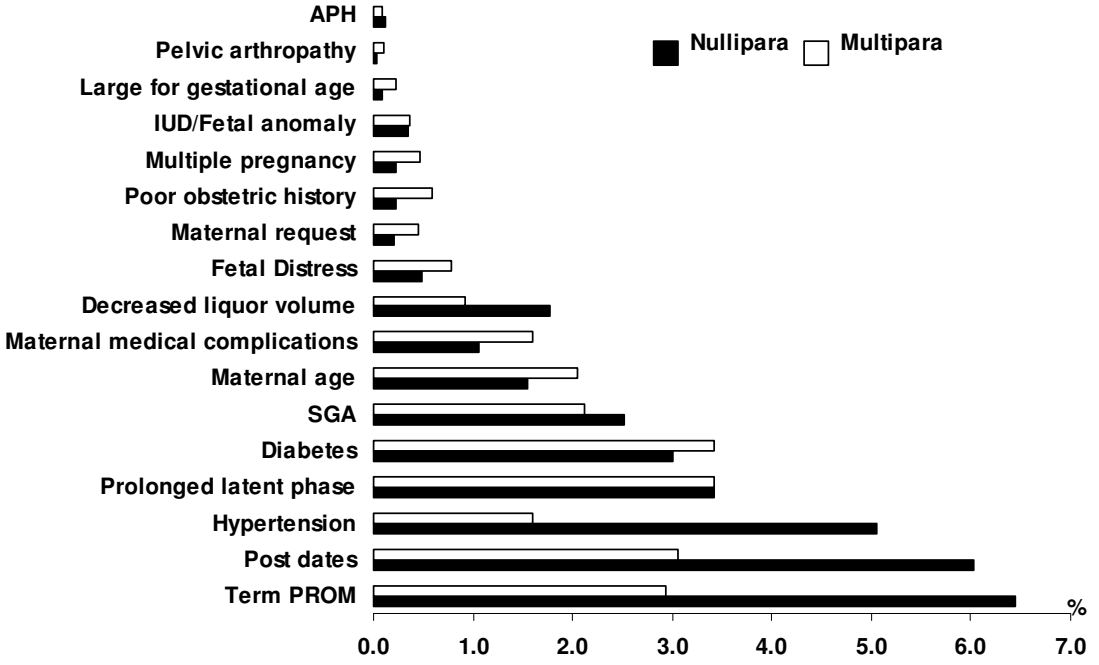

Figure 43: Primary indication for induction at term by parity (as a percentage of term births)

Post dates pregnancy and ruptured membranes at term were the most common primary reason given for induction of labour in 2009. In 2008, prolonged latent phase was the most common reason.

The majority of pregnancies ended between 41 weeks and 41 weeks and 6 days (68%) when post dates was the primary indication for induction.

The rate of induction for term PROM seems high at more than 4% of all births. It seems likely that early induction is the usual management of PROM at NW.

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

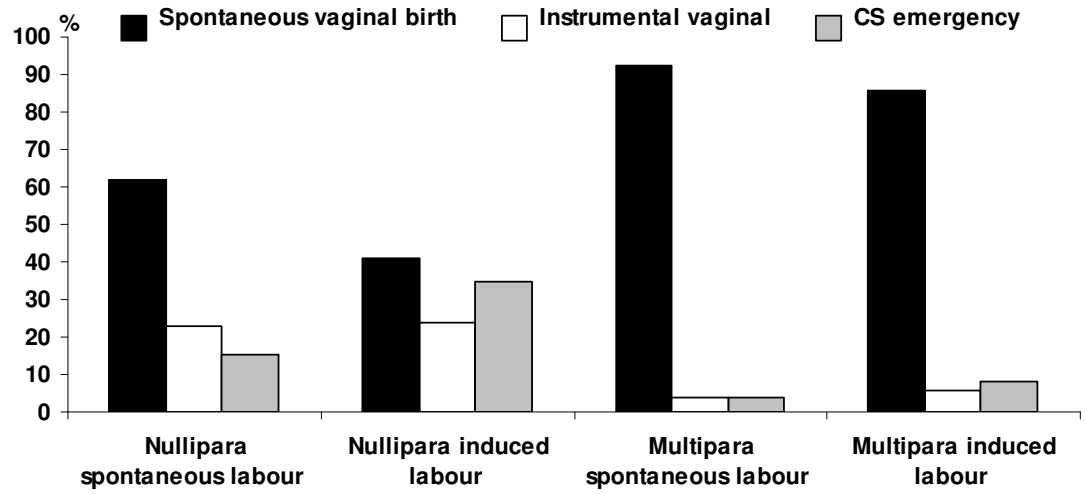

Figure 44: Mode of birth among intended vaginal births at term by parity and onset of labour (excludes previous Caesarean)

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 was associated with a vaginal birth rate of 65% compared with 85% following spontaneous labour. While induction may contribute to this, some of the difference is due to the indication for induction.

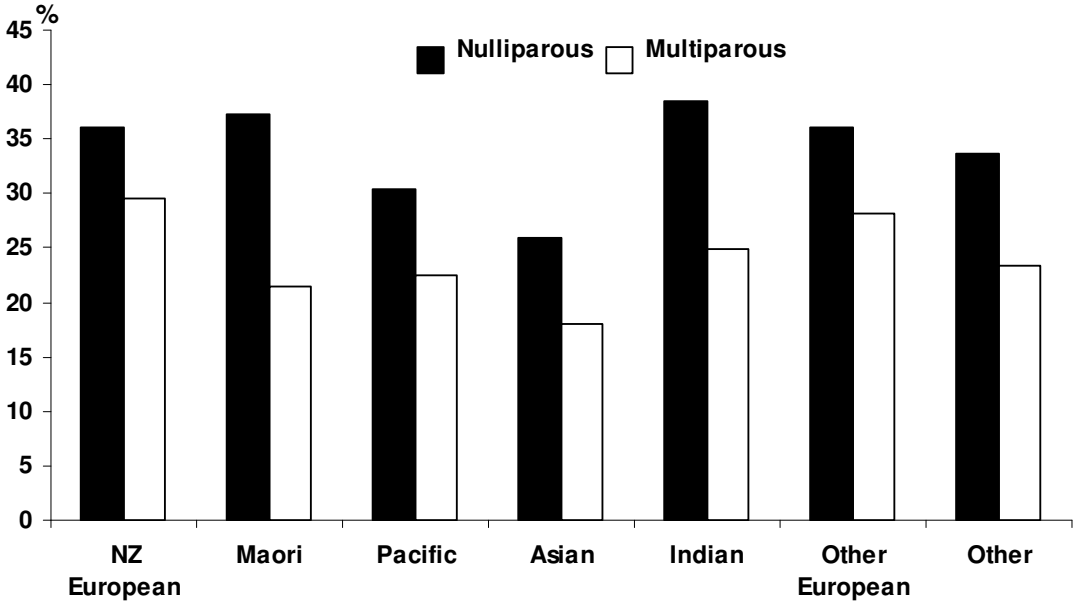

Figure 45: Induction rate by ethnicity and parity at term

Indian nulliparous women appear to have the highest induction of labour rate whilst Asian nullipara and multipara have the lowest rate of induction. This probably reflects different levels of risk in these two populations.

6.2 Use of syntocinon

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

	Total births	Syntocinon	
	N	n	%
Total	7735	2706	35.0
Induced labour			
Nullipara	1260	988	78.4
Multipara	978	684	69.9
Spontaneous labour			
Nullipara	2093	815	38.9
Multipara	2032	207	10.2

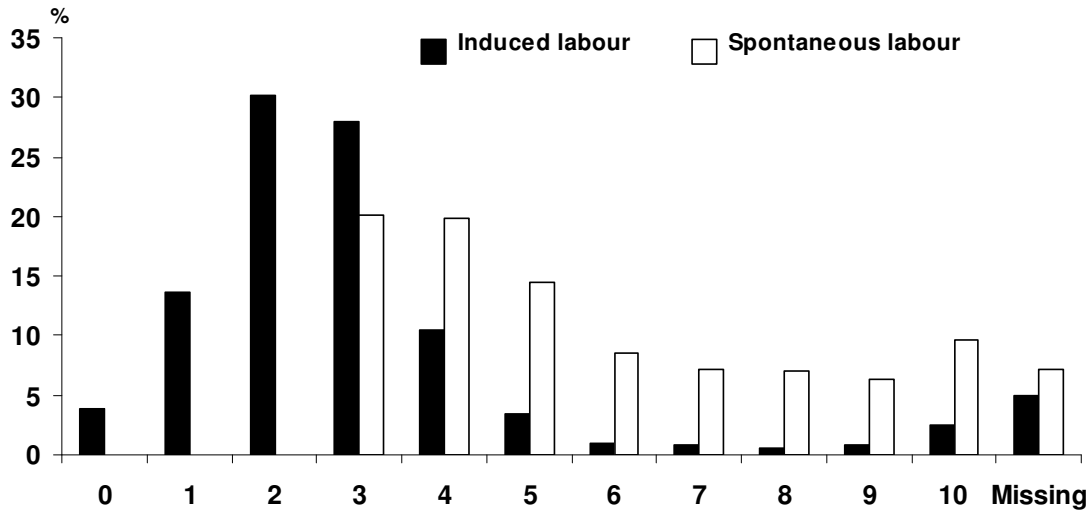

Figure 46: Dilatation at commencement of syntocinon infusion among labouring women by induction status

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 10% of multiparous women.

Summary / Implications

There are concerns around the process of booking women for induction of labour at NW, intervention for post dates and the high rate of syntocinon use in spontaneous multiparous labour.

Fewer than half of pregnancies are planned, dates are doubtful for many women with an ultrasound scan the basis for EDD, and yet induction is arranged with a confident statement of days of gestation without evidence of maternal or fetal compromise.

6.3 Mode of birth

Findings

Table 40: Mode of birth trends (1995-2009) (n = mothers)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of births	9125	9157	8055	7531	7501	7827	7452	7775	7611	7491	7194	7212	7695	7589	7735
	%	%	%	%	%	%		%	%	%	%	%	%	%	%
Spontaneous vertex	65.9	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
Vaginal breech	1.0	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
Forceps/ ventouse	12.3	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
Caesarean	20.8	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
Elective										10.4	11.6	12.8	13.4	14.4	14.6
Emergency										18.8	20.0	20.3	18.3	16.9	16.6

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.

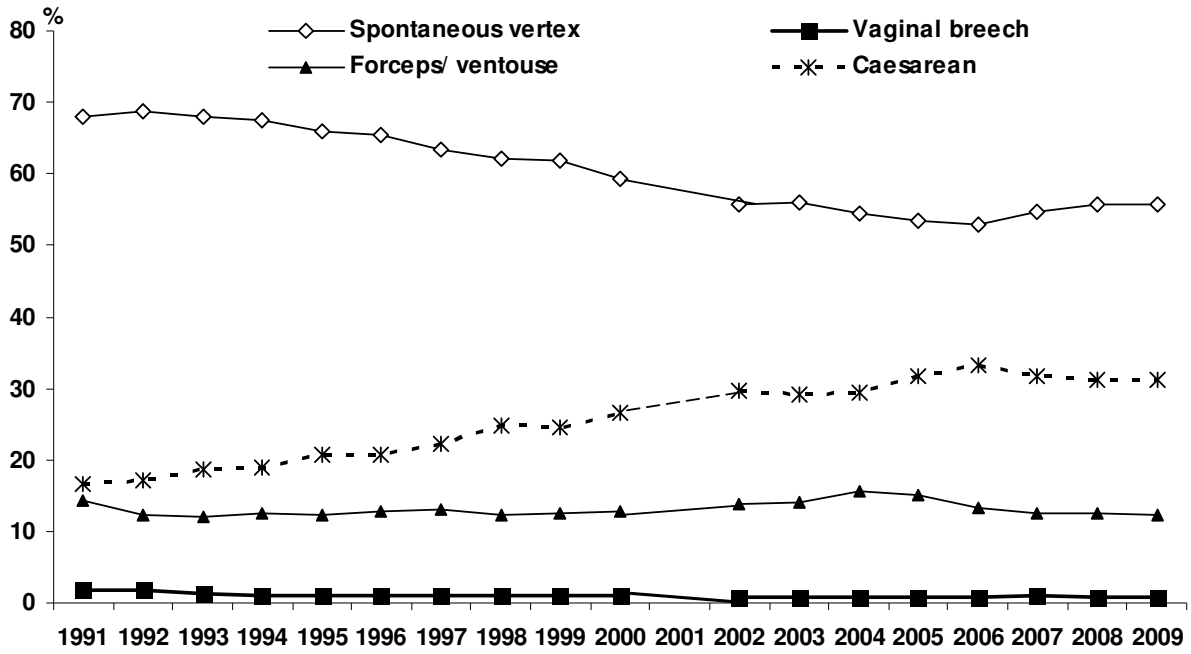

Figure 47: Mode of birth (1991–2009)

In the mid-90s, the total 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, which had risen to above 30%. Despite halting the ongoing rise, and pulling it back a couple of percent, the Caesarean rate remains well above the mid-90s 20%. 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.

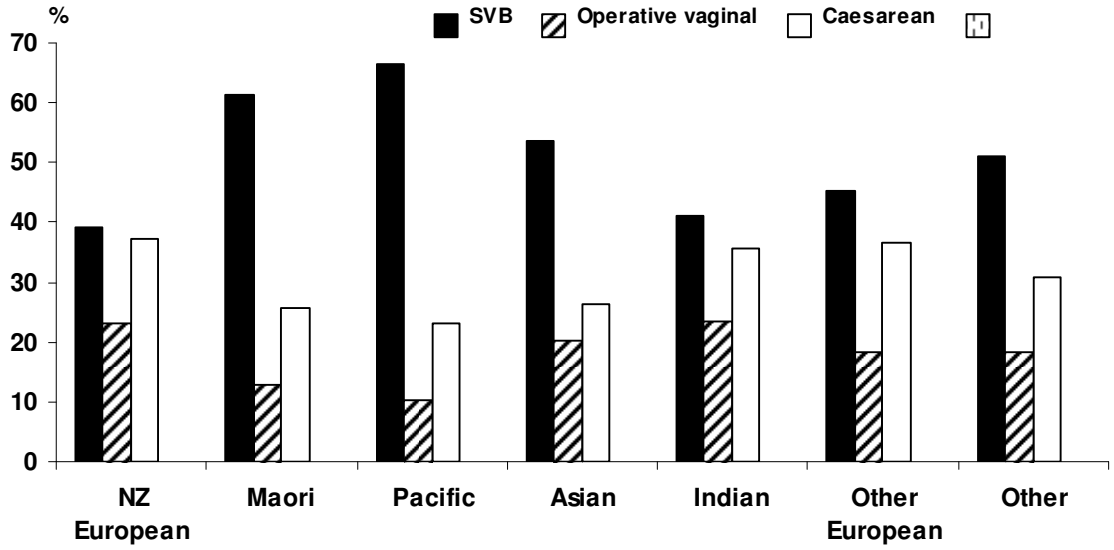

Figure 48: **Mode of birth by ethnicity among nullipara**

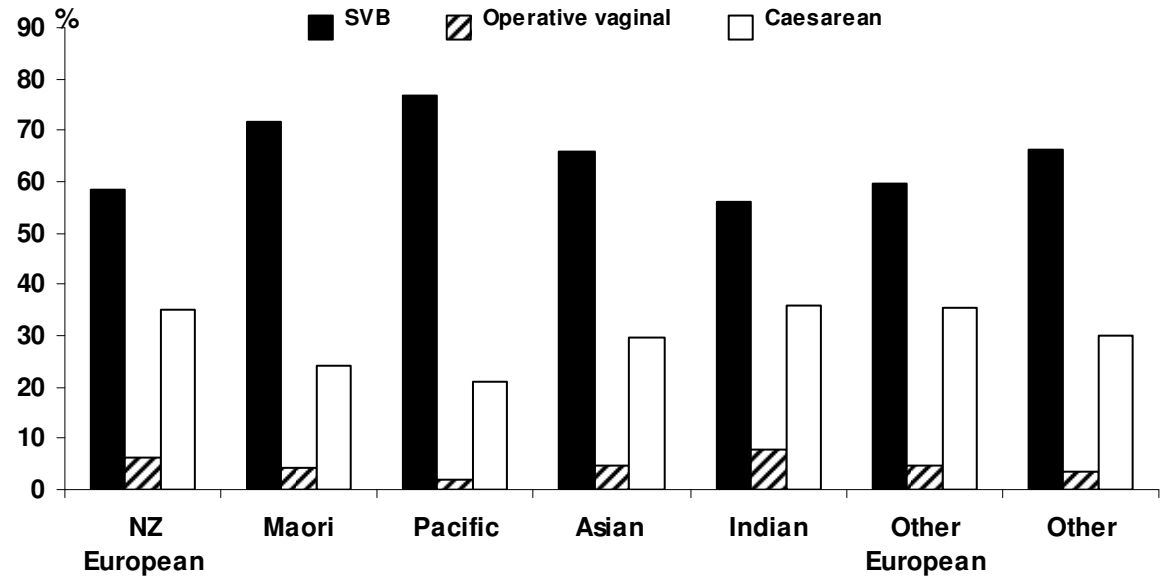

Figure 49: Mode of birth by ethnicity among multipara

Among different ethnic groups, Maori and Pacific Island mothers continue to achieve the highest rates of vaginal birth. It is not possible to say from these data what contribution age and BMI make to this difference and to what extent, if any, the differences relate to maternal expectation.

There is a reduction in spontaneous vaginal birth with increasing maternal age. This correlates closely with increasing rates of Caesarean section, largely of elective Caesareans.

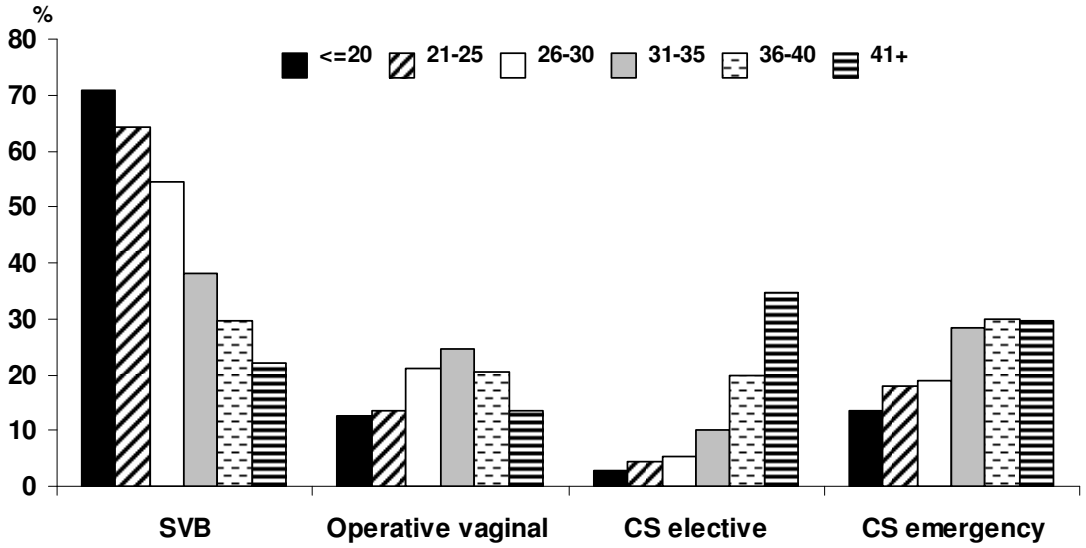

Figure 50: Mode of birth by maternal age among nulliparous women

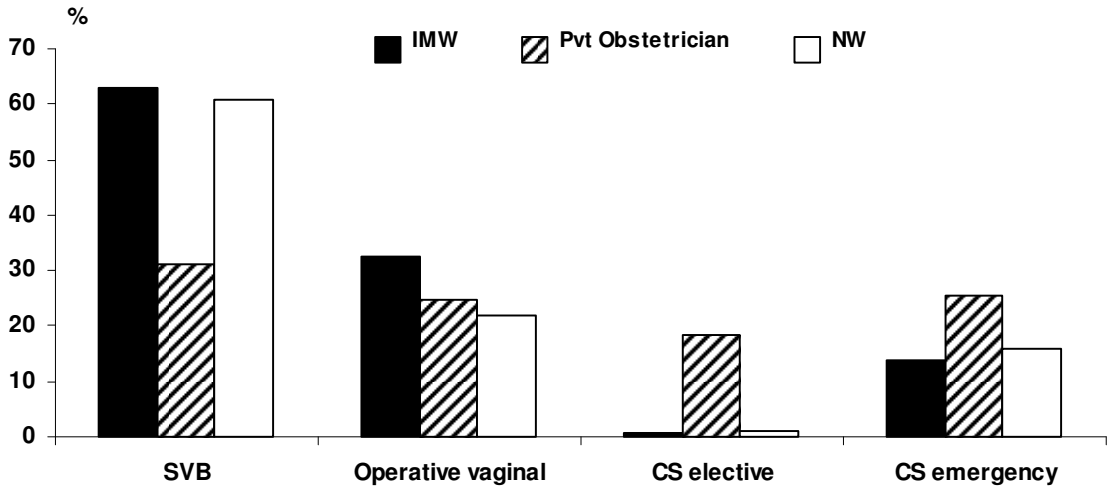

Figure 51: Mode of birth at term by LMC at birth among standard primipara

The outstanding feature of the figure above is the outcome for standard primipara under private specialist obstetrician care. It is tempting to surmise that some of these Caesarean sections are done for convenience which raises the issue of the conflict between autonomy for women (and carers) and the wise use of resources.

6.4 Spontaneous vaginal birth

Table 41: Spontaneous vaginal birth rates (2004-2009)

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

The spontaneous vaginal birth rate has remained relatively stable overall over the past 5 years. There has been a small increase in spontaneous vaginal birth rate among nullipara while the rate among multipara has remained stable.

6.4.1 Waterbirth

Twenty babies were recorded in the database as having been born in water in 2009. Ten of these were under the care of NW community service, and ten under independent midwifery LMCs. There may be some under counting of waterbirths.

All were livebirths. Three babies had an Apgar score of <7 at 1 minute but none had an Apgar score <7 at 5 minutes. Two babies were admitted to NICU briefly.

Two mothers had a PPH of 500mls or more, one of whom lost 2000mls.

6.5 Caesarean section

WHA Maternity Indicator for Caesarean section		WHA mean 07-08	NW 2007	NW 2008	NW 2009	2009 Public* only
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Caesarean section	Mothers birthing by Caesarean section/Mothers giving birth	28.0	31.7	31.3	**31.2**	30.9

*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

Methods

Since 2004, we have collected data on elective and emergency Caesarean. An elective Caesarean is defined as a Caesarean which was scheduled (but not necessarily performed) in advance and prior to the onset of labour. Therefore, Caesarean sections performed after the onset of labour but scheduled electively prior to labour are included with elective Caesareans. Conversely, unscheduled Caesarean section prior to onset of labour has been classified as emergency Caesarean section.

Findings

The Caesarean section rate has remained stable for the past 3 years at 31%. The most common reason for Caesarean section among multipara, and in fact the leading contributor to total Caesarean section rate, is repeat Caesarean. The Caesarean section rate in multipara (30.5%) is almost the same as in nullipara (32.0%).

Clinical experience suggests that repeated Caesarean sections are causing increasing problems, 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 (2010), and will include advice at the time of index Caesarean, followed by de-briefing postpartum, and then again early in the next pregnancy.

Table 42: Caesarean section rates (1995-2009)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total births (mothers)	**9125**	**9157**	**8055**	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**
Caesarean sections	1900	1905	1797	1851	1837	2084	*	2301	2219	2193	2273	2390	2438	2372	2414
Incidence %	20.8	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
Total nullipara	**4037**	**4018**	**3591**	**3263**	**3262**	**3454**	*	*	*	**3597**	**3522**	**3499**	**3752**	**3623**	**3811**
Caesarean	936	888	912	900	898	1047	*	*	*	1118	1178	1253	1225	1152	1219
Incidence %	23.2	22.1	25.4	27.6	27.5	30.3	*	*	*	31.1	33.4	35.8	32.6	31.8	32.0
Total elective										233	249	296	310	313	340
Elective %	*	*	*	*	*	*	*	*	*	6.5	7.1	8.5	8.3	8.6	8.9
Total emergency										885	929	957	915	839	879
Emergency %	*	*	*	*	*	*	*	*	*	24.6	26.4	27.4	24.4	23.2	23.1
Total multipara	**5088**	**5139**	**4464**	**4229**	**4239**	**4372**	*	*	*	**3894**	**3672**	**3713**	**3943**	**3966**	**3924**
Caesarean	964	1017	885	951	939	1037	*	*	*	1075	1095	1137	1213	1220	1195
Incidence %	18.9	19.8	19.8	22.5	22.2	23.7	*	*	*	27.6	29.8	30.6	30.8	30.8	30.5
Total elective										548	584	628	720	780	792
Elective %	*	*	*	*	*	*	*	*	*	14.1	15.9	16.9	18.3	19.7	20.2
Total emergency										527	511	509	493	440	403
Emergency %	*	*	*	*	*	*	*	*	*	13.5	13.9	13.7	12.5	11.1	10.2

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

Robson 10-group classification 2004-2009

Table 43: Robson 10-Group Classification 2004-2009 (All NW births)

	2004			2005			2006			2007			2008			2009			
	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	2193	7491	29.3	2273	7194	31.6	2390	7212	33.1	2438	7695	31.7	2372	7589	31.3	2414	7735	31.2	
Nullip,singleton,cephalic, term, spontaneous labour	338	1955	17.3	359	1892	19.0	396	1920	20.6	353	2004	17.6	279	1809	15.4	281	1950	14.4	11.6
Nullip,singleton cephalic, term, induced or CS before labour	450	1056	42.6	479	1080	44.4	495	1024	48.3	515	1132	45.5	581	1275	45.6	647	1393	46.4	26.8
Multip,singleton,cephalic, no previous CS, term, spontaneous labour	63	1805	3.5	76	1607	4.7	79	1601	4.9	57	1690	3.4	62	1640	3.8	55	1599	3.4	2.3
Multip,singleton,cephalic,no previous CS, term, induced or CS before labour	99	675	14.7	108	700	15.4	127	714	17.8	123	735	16.7	119	806	14.8	144	839	17.2	6.0
Previous CS,singleton,cephalic,term	635	921	68.9	638	895	71.3	677	936	72.3	748	1008	74.2	741	1017	72.9	698	967	72.2	28.9
Nullip,singleton,breech	156	172	90.7	175	192	91.1	187	205	91.2	183	208	88.0	166	195	85.1	164	174	94.3	6.8
Multiip singleton,breech (incl prev CS)	122	146	83.6	114	136	83.8	106	123	86.2	121	143	84.6	135	151	89.4	132	161	82.0	5.5
All multiple (incl prev CS)	117	188	62.2	113	187	60.4	108	162	66.7	110	177	62.1	97	160	60.6	93	159	58.5	3.9
All abnormal lie (incl prev CS)	52	61	85.2	44	53	83.0	27	29	93.1	26	27	96.3	29	32	90.6	55	63	87.3	2.3
All preterm singleton cephalic (incl prev CS)	161	512	31.4	167	452	36.9	188	498	37.8	202	571	35.4	163	504	32.3	145	430	33.7	6.0

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.

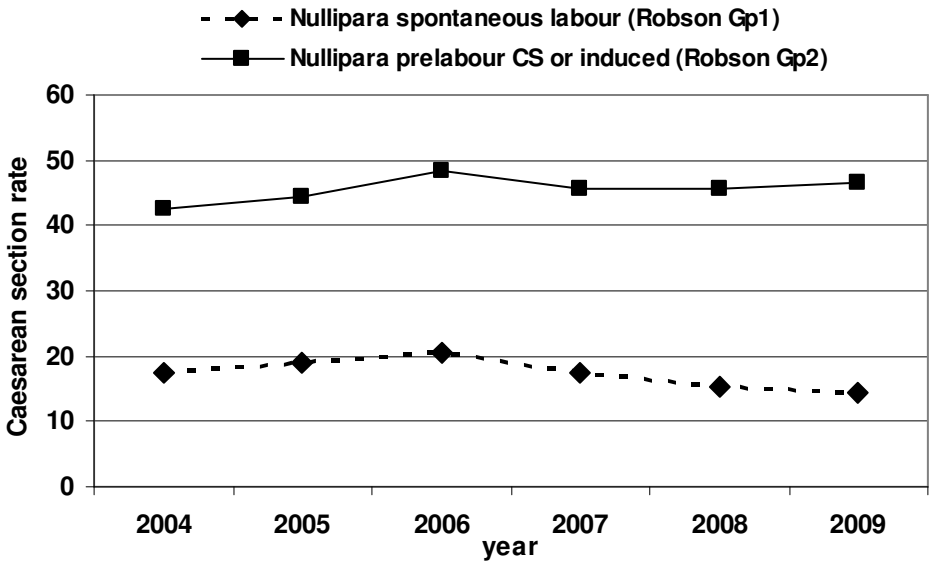

Figure 52: Robson groups 1&2: Nulliparous Caesarean section rates among singleton cephalic term pregnancies by onset of labour (2004-2009)

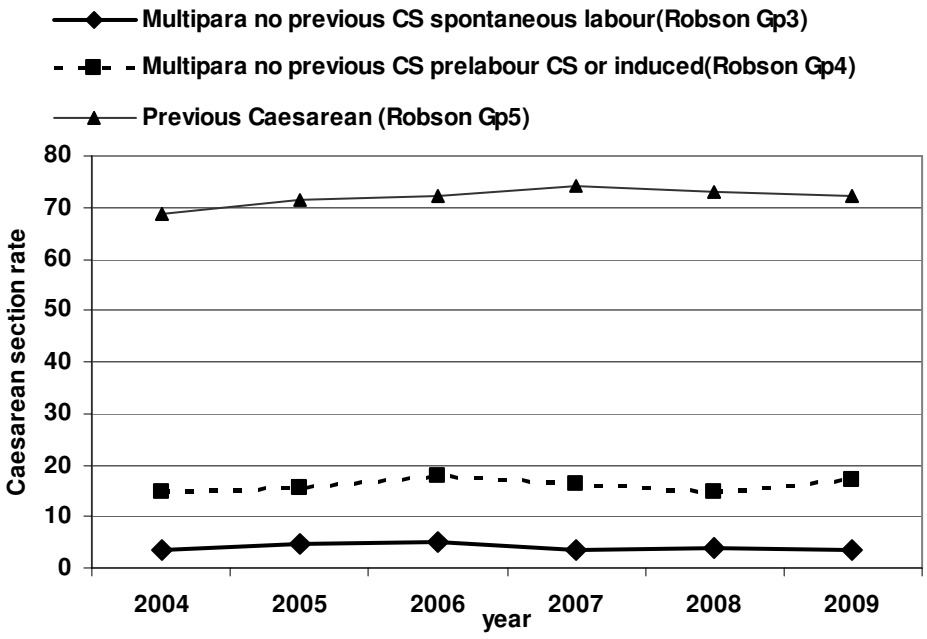

Figure 53: Robson groups 3-5: Multiparous Caesarean section rates among singleton cephalic term pregnancies by onset of labour and previous Caesarean status (2004-2009)

6.5.1 Indication for elective and pre labour Caesarean section

Thirty-nine percent of all elective and prelabour emergency Caesarean sections were performed for the primary indication of 'repeat Caesarean section'. Specifically among multiparous women, 62% of elective and prelabour Caesarean sections were performed primarily for "repeat Caesarean".

6.5.2 Indication for in labour emergency Caesarean section

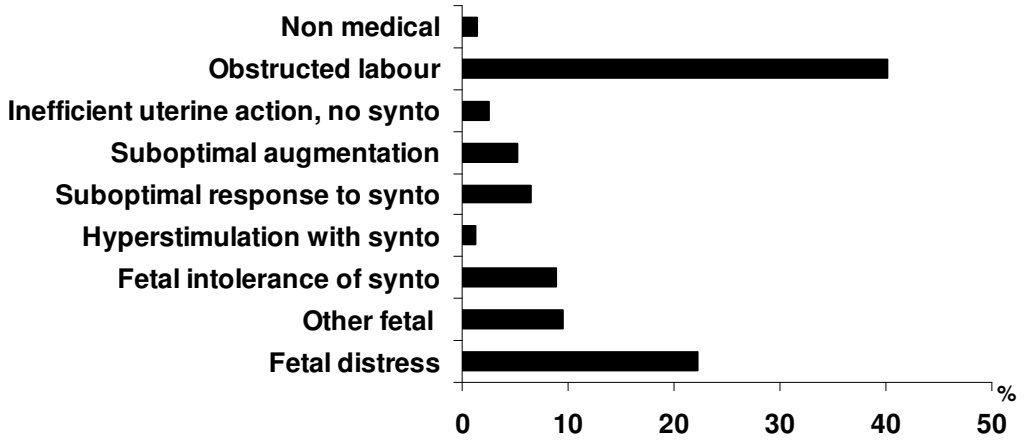

Figure 54: Indication for in labour emergency Caesarean section

The figure above shows the most frequent reasons for emergency Caesarean section in labour 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	NW 2007	NW 2008	NW 2009	2009 Public only*
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
VBAC	P1 previous Caesarean/mothers giving birth	7.87	10.7	10.6	**10.0**	10.4
	Prelabour repeat Caesarean/P1 previous Caesarean	60.0	59.4	57.9	56.8	48.5
	VBAC/induced or spontaneous labour P1 previous Caesarean	49.3	52.4	58.8	**59.0**	63.6
	VBAC/P1 previous Caesarean	19.7	21.3	21.5	22.5	29.1

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.
Bolded rates for NW 2009 are significantly different from WHA mean

Of all women giving birth at NW in 2009, 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, 15.1% of all women and 29.7% of multipara giving birth at NW in 2009, 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.

Fifty-seven percent of women with one prior Caesarean and one prior birth had an elective repeat Caesarean. This is consistent with the rate for level 3 units reported by WHA. The rate of elective repeat Caesarean for public booked women at NW was lower at 48.5%. For women of all gestations with a history of one prior birth by Caesarean section, the rate of vaginal birth was only 22.5%; 66% if labour started spontaneously and 51% if labour was induced. This VBAC rate among women who laboured is significantly higher than the WHA mean rate.

The VBAC rate among labouring women who were public bookings is even higher than the overall rate for women in their first attempted vaginal birth following prior Caesarean. The trial of labour rate is also higher among this group, which would support a more liberal policy towards VBAC to increase the vaginal birth rate among this significant group of mothers. It does not support the suggestion that elective Caesarean is merely performing an inevitable Caesarean at an earlier time.

In 2009, among women who had one prior birth where that birth was a Caesarean, 282/773 (36.5%) underwent a trial of scar. This has not changed from 2008.

Table 44: VBAC: Mode of birth among parity 1 prior Caesarean pregnancies by mode of onset of birth (n=773)

Parity 1, previous Caesarean, all gestations										
	Spontaneous labour n=203		Induced labour n=79		CS elective n=439	CS emergency before onset of labour n=52	Total n=773	
	n	%	n	%	n	n	n	%
Vaginal birth	76	37.4	26	32.9	0	0	102	13.5
Operative vaginal birth	58	28.6	14	17.7	0	0	72	9.3
CS elective	0		0		439	0	439	56.8
CS emergency	69	34.0	39	49.4	0	52	160	20.7

Table 45: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by mode of onset of birth (n=655)

Parity 1, previous Caesarean, singleton, cephalic, term										
	Spontaneous labour n=176		Induced labour n=69		CS elective n=378	CS emergency before onset of labour n=32	Total n=655	
	n	%	n	%	n	n	%	n	%
Vaginal birth	69	39.2	18	26.1	0	0		87	13.3
Operative vaginal birth	54	30.7	14	20.1	0	0		68	10.4
CS elective	0		0		378	0		378	57.7
CS emergency	53	30.1	37	53.6	0	32		122	18.6

Table 46: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by LMC at birth (n=655)

	IMW n=190		Pvt Obstetrician n=252		GP n=9		NW* n=201		Unbooked n=3	
	n	%	n	%	n	%	n	%	n	%
Vaginal birth	34	17.9	13	5.2	2	22.2	37	18.4	1	33.3
Operative vaginal birth	28	14.7	14	5.6	1	11.1	24	11.9	1	33.3
CS elective	78	41.1	198	78.6	6	66.7	96	47.8	0	
CS emergency	50	26.3	27	10.7	0		44	21.9	1	33.3

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

The rate of elective Caesarean section and repeat Caesarean section overall in women with one previous (Caesarean) birth varies widely by LMC.

In 2009, 190 women had 2 or more prior Caesarean sections. Of these, 141 were at term with singleton baby and cephalic presentation and 139 (99%) 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	NW 2007	NW 2008	NW 2009	2009 Public only*
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Instrumental vaginal birth	Forceps births/All vaginal births	5.2	4.2	4.9	5.7	4.1
	Ventouse births/All vaginal births	9.01	13.0	12.1	**11.4**	9.0
	Double instrumental/All vaginal births	0.841	1.3	1.0	0.68	0.58

*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

The rate of instrumental birth has varied little since 1992 and this remains the case for 2009 with a rate of 12.2% of all births. The individual rates for nulliparous and multiparous women remain very similar to recent years at 20% and 5% respectively. The ventouse was the instrument of choice in the majority of these cases, irrespective of parity or maternal ethnicity.

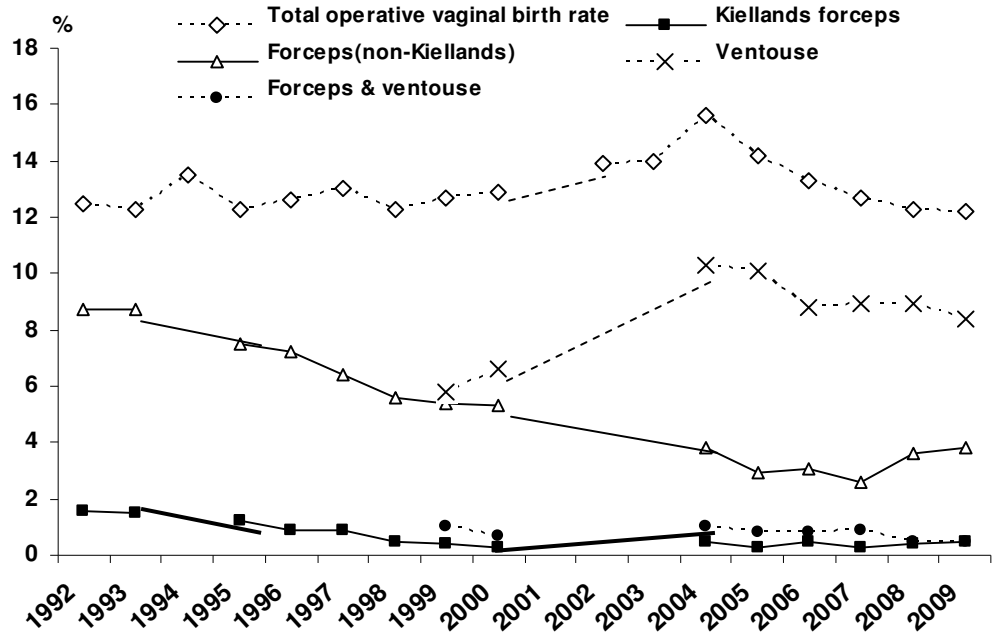

Figure 55: Operative vaginal birth (1992-2009)

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 babies birthed by Caesarean section after an attempted vaginal instrumental birth.

The rate of double instrumental vaginal births at NW is consistent with the WHA average for level 3 units.

Forty mothers/42 babies had two instruments applied (ventouse and forceps or more than one type of forceps) prior to vaginal instrumental birth. Forty two mothers/babies had an attempted vaginal instrumental birth prior to emergency Caesarean section.

Table 47: Maternal outcomes following double instrumental vaginal birth compared to single instrumental vaginal birth.

	Single instrument n=905		Double instrument n=40	
	n	%	n	%
Third or fourth degree tear	49	5.4	9	22.5*
PPH>=1000mls	53	5.9	6	15.0*
Transfusion	31	3.4	3	7.5

*p<0.05

Table 48:Neonatal outcomes following double instrumental vaginal birth compared to single instrumental vaginal birth.

	Single instrument n=916		Double instrument n=42	
	n	%	n	%
Apgar score 1min <4	18	2.0	2	4.8
Apgar score 1min <7	131	14.3	8	19.0
Apgar score 5min <5	6	0.7	2	4.8*
Apgar score 5min <7	9	1.0	2	4.8*
Perinatal related mortality (/1000)	5	5.5	1	23.8

*p<0.05

Third or fourth degree tear, postpartum haemorrhage of 1000mls or more, and low Apgar score at 5 minutes were significantly more frequent after double instrumental vaginal birth than after single instrumental vaginal birth.

There were 42 mothers/babies who had an attempted operative vaginal birth prior to Caesarean section. There is no evidence of increased morbidity among these mothers or babies in 2009 compared to emergency Caesarean births.

Table 49: Maternal outcomes following attempted instrumental vaginal birth prior to emergency Caesarean section compared to emergency Caesarean section.

	Emergency Caesarean n=1233		Instrumental vaginal attempt prior to emergency Caesarean n=42	
	n	%	n	%
Episiotomy	0		1	2.4
PPH>=1000mls	242	19.6	4	9.5
Transfusion	67	5.4	3	7.1

Table 50: Neonatal outcomes following attempted instrumental vaginal birth prior to emergency Caesarean section compared to emergency Caesarean section.

	Emergency Caesarean n=1287		Instrumental vaginal attempt prior to emergency Caesarean n=42	
	n	%	n	%
Apgar score 1min <4	38	3.0	1	2.4
Apgar score 1min <7	228	17.7	2	4.8
Apgar score 5min <5	16	1.2	0	0
Apgar score 5min <7	43	3.3	1	2.4
Perinatal related mortality (/1000)	13	10.1	0	0

6.8 Breech birth

Table 51: Mode of birth by breech presentation (singletons)

	N	Total breech	% Breech /total singleton births	Breech & CS	% CS/ total breech
Total singleton births	7576	335	4	296	4
20-24 weeks	57	24	42	2	4
25-31 weeks	99	28	28	22	22
32-36 weeks	394	56	14	51	13
≥37 weeks	7026	227	3	221	3

The influence of the term breech trial 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 over 90%, suggesting a possible extrapolation of the term breech trial results to this population, without the evidence to support this practice.

The methodology of the Term Breech Trial was criticised but the findings have had a major effect on clinical practice so that many obstetricians and trainees believe that a Caesarean section is the only way that a baby should be born if the breech presents. It is a simplistic interpretation which may lead to unnecessary surgery. Both the 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.

6.9 Breech presentation: External cephalic version

This section reports statistics relating to women eligible to attend the Day Assessment Unit at NW for external cephalic version (ECV) for breech presentation.

Findings
A total of 123 ECVs were attempted for 111 women. 10 women had 2 ECVs, 3 of which were successful. One woman had 3 unsuccessful attempts. ECVs were attempted between 35 to 41 weeks gestation, most commonly at 36 and 37 weeks. Most ECVs were attempted by one operator.

Among 111 women, the overall ECV success rate was 49%. NW ECV success rates are consistent with those reported internationally (overall approximately 50-60%).

Descent of the breech into the pelvis predicts poor success for ECV. The success rate was 59% if there was no descent compared with 4% if there was any descent at all. This is consistent with data published from a NW study (2008) reporting an unengaged presenting part to be the strongest predictor for successful ECV.

Ninety six percent of successful ECVs remained cephalic at the time of birth and 3 women whose ECV was unsuccessful also had a cephalic presentation at birth. Nearly two thirds of women who had a successful ECV achieved a vaginal birth, and this is consistent with the lower end of the range of rates reported internationally (63-85%). Only 2 women had a spontaneous reversion to breech following successful ECV.

Table 52: Mode of birth following attempted ECV (n=111)

	Failed ECV		Successful ECV	
	n=57		n=54	
Type of birth	**n**	**%**	**n**	**%**
Vaginal	2	4	34	63
SVB	2	4	29	54
0perative vaginal	0	0	5	9
CS elective	43	75	2	4
CS emergency	12	21	18	33

In clinical practice, ECV enabled a reduction in rate of Caesarean section for breech presentation of approximately 12%.

There was one ECV complication, requiring an emergency Caesarean section for unprovoked variable fetal heart decelerations following successful ECV. A live male was born with Apgar scores of 9^{1} and $10^{5.}$ Liquor was clear and there was no cord entanglement or knot seen at time of birth nor any retroplacental clot. This rarity of complications is in accordance with rates reported in the international literature.

Of 283 women with a singleton term pregnancy who had either a breech presentation at birth or had had an attempted ECV, 39% were referred for ECV. There was no statistically significant association between referral for ECV among women with singleton breech at term (n=283) and maternal age, ethnicity, or BMI. There was a significant difference in referral by LMC at birth with independent midwives more likely to refer than all other groups. Only 7% of women who had a history of prior Caesarean section and breech presentation at term were referred for ECV compared to 47% 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. Positive benefits are reduction in Caesarean section rates and consequent lower maternal morbidity. The challenge is to increase the numbers of women undergoing attempted ECV, as 61% of women who presented at birth with a breech presentation did not do so. It is unlikely contraindications for ECV account for this high percentage. 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 mode of birth in women with one previous Caesarean section continues to be predominantly by elective Caesarean. This is despite a successful VBAC rate of more than 50% with spontaneous or induced labour. Although not all cases are equally suitable for a trial of labour, it is likely that with increased promotion of an attempt at VBAC, there would be a decrease in the overall Caesarean birth rate. NW hopes to begin to provide a service to facilitate discussion around next birth after Caesarean.

Ongoing audit of ECV shows this is an effective and safe service at NW and that the practice should be encouraged.

Spontaneous vaginal birth rate among standard primipara is 30% lower for mothers cared for by a private obstetrician.

6.10 Obstetric analgesia

WHA Maternity Indicator for Obstetric Anaesthesia		WHA mean 07-08	NW 2007	NW 2008	NW 2009	2009 Public only*
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Vaginal birth with regional anaesthesia	Any regional anaesthetic/All vaginal births	27.2	43.9	43.7	**43.4**	34.5
General anaesthesia for Caesarean section	General anaesthetic for Caesarean section/All Caesarean sections	8.9	7.6	6.8	**6.4**	10.1

*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

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

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
All women	**7753**	**4614**	**59.5**	**3135**	**40.4**	**1330**	**17.2**	**73**	**0.9**	**510**	**6.6**
Mode of onset of birth											
CS elective	1132	1089	96.2	13	1.1	5	0.4	1	0.1	2	0.2
CS emergency before onset labour	240	209	87.1	14	5.8	4	1.7	0		0	
Labouring women*											
Nullipara	3353	2202	65.7	1771	52.8	858	25.6	51	1.5	390	11.6
Multipara	3010	1114	37.0	1337	44.4	463	15.4	21	0.7	118	3.9
Induced labour											
Nullipara	1260	1050	83.3	547	43.4	301	23.9	21	1.7	74	5.9
Multipara	978	549	56.1	401	41.0	145	14.8	6	0.6	22	2.2
Spontaneous labour											
Nullipara	2093	1152	55.0	1224	58.5	557	26.6	30	1.4	316	15.1
Multipara	2030	565	27.8	936	46.1	318	15.7	15	0.7	96	4.7

* 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 almost 60% in 2009 compared with 52% in 2008. As expected the rates are higher in nulliparous women than in multiparous women. 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.

These rates vary widely among ethnic groups and remain lower than in many OECD countries though higher than the WHA mean. 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 (though lower than the WHA mean) reflects the tertiary care aspect of our patients with coagulopathies, neurologic, cardiac and other co-morbidities and abnormal placentation all contributing.

The introduction of *remifentanil* patient controlled analgesia may have an impact on epidural use in the future.

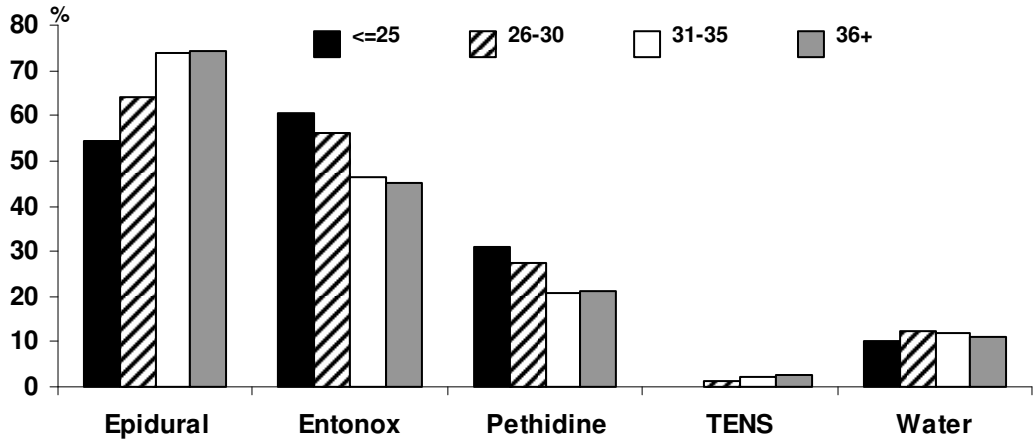

Figure 56: Analgesic use and maternal age among nulliparous labours

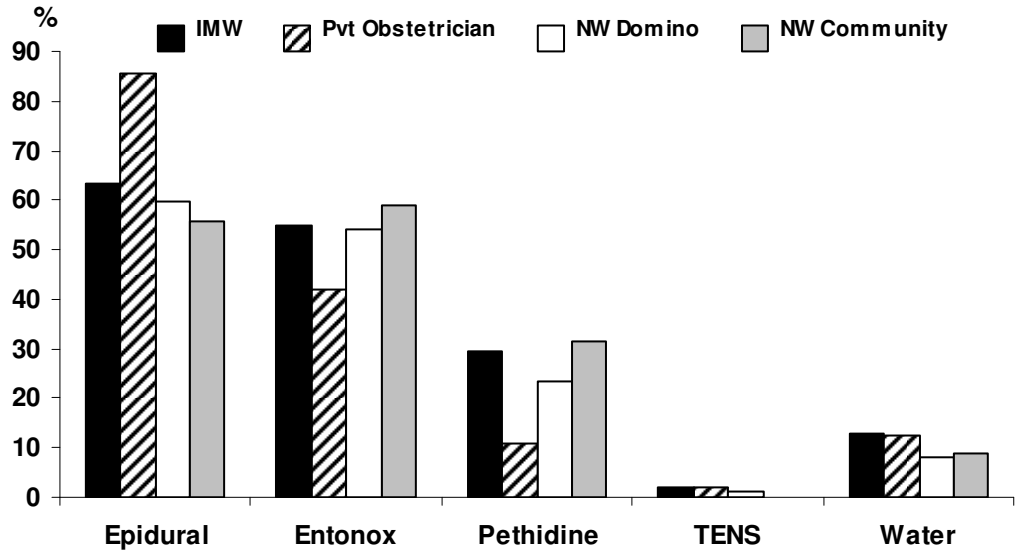

Figure 57: Analgesic use and LMC at birth among nulliparous labours

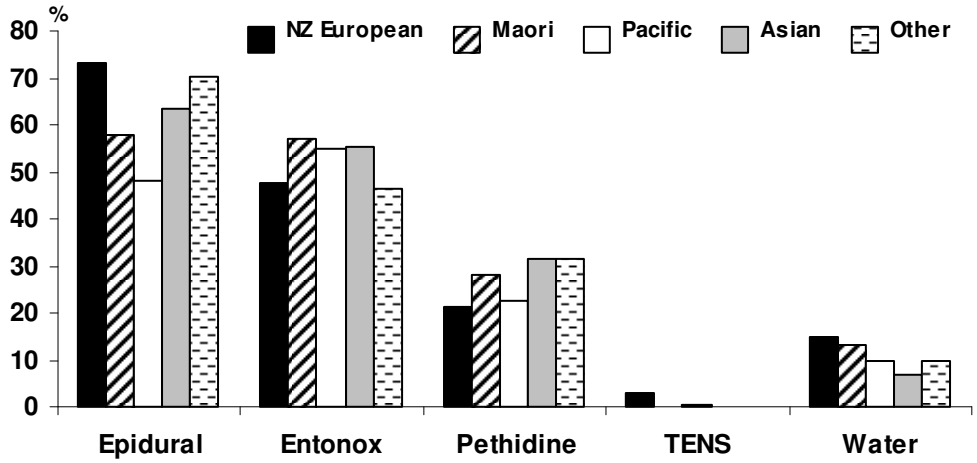

Figure 58: Analgesic use and ethnicity among nulliparous labours

Table 54: GA use and mode of birth

	Total	GA* only		GA* + epidural		Total GA*	
	N	n	%	n	%	n	%
Total	7735	172	2.2	63	0.8	235	3.0
Spont vaginal birth	4303	71	1.7	9	0.2	80	1.9
Operative vaginal	947	3	0.3	7	0.7	10	1.1
CS elective	1132	57	5.0	14	1.2	71	6.3
CS emergency	1282	97	7.6	33	2.6	130	10.1

*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 2009 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.

Five hundred and eleven women started labour at Birthcare Auckland and 94 (18%) transferred to NW in labour (29% of nullipara and 8% if multipara).

Table 55: Demographic characteristics of women labouring at Birthcare by place of birth

	Birth at Birthcare n= 417		Intrapartum transfer to NW n= 94		Total N= 511	
	n	%	n	%	n	%
Parity						
Nullipara	174	41.7	72	76.6	246	48.1
Multipara	243	58.3	22	23.4	265	51.9
Age						
<21	10	2.4	10	10.6	20	3.9
21-25	49	11.8	10	10.6	59	11.5
26-30	133	31.9	37	39.4	170	33.3
31-35	156	37.4	24	25.5	180	35.2
36-40	65	15.6	12	12.8	77	15.1
>40	4	1.0	1	1.1	5	1.0
Ethnicity						
NZ European	219	52.5	52	55.3	271	53.0
Maori	38	9.1	12	12.8	50	9.8
Pacific	46	11.0	9	9.6	55	10.8
Asian	28	6.7	6	6.4	34	6.7
Indian	6	1.4	4	4.3	10	2.0
Other European	67	16.1	9	9.6	76	14.9
Other	13	3.1	2	2.1	15	2.9
DHB of Domicile						
Auckland DHB	296	71.0	70	74.5	366	71.6
Counties Manukau DHB	40	9.6	6	6.4	46	9.0
Waitemata DHB	81	19.4	17	18.1	98	19.2
Other DHB			1	1.1	1	0.2

Table 56: 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. (94 intra partum transfers to NW)*

	Nullipara n= 246		Multipara n= 265	
	n	**%**	**n**	**%**
Intrapartum transfer to NW	72	29.3	22	8.3
Analgesia				
Epidural	56	22.8	10	3.8
Pethidine	43	17.5	7	2.6
Entonox	87	35.4	49	18.5
TENS	0		1	0.4
Water	73	29.7	43	16.2
Syntocinon	43	17.5	6	2.3
Mode of birth				
Normal vaginal	200	81.3	260	98.1
Operative vaginal	27	11.0	1	0.4
Emergency caesarean	19	7.7	4	1.5
Perineal trauma				
Episiotomy	30	12.2	12	4.5
Third/fourth degree tear	5	2.0	0	
Vaginal wall tear	7	2.8	1	0.4
Blood Loss				
≥500 mls	34	13.8	14	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	NW 2007	NW 2008	NW 2009	2009 Public only*
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Episiotomy	Mothers having an episiotomy/Mothers giving birth vaginally	17.8	21.5	20.5	**22.3**	15.3
Third and fourth degree tears	3rd and 4th degree tears/Mothers giving birth vaginally	2.76	3.1	3.1	**2.2**	2.7

*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

Table 57: 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
Number of episiotomies	1252	1195	1251	1367	1181	1093	1103	1130	1069	1184
Incidence %	20.0	21.1	22.1	23.8	22.3	22.2	22.9	21.5	20.5	22.3
Episiotomy with 3rd/4th degree tear	8	9	5	17	15	23	47	49	46	56
Incidence %	0.1	0.2	0.1	0.3	0.3	0.5	1.0	0.9	0.9	1.0
All 3rd/4th degree tears	41	35	29	47	72	97	103	161	160	116
Incidence %	0.7	0.6	0.5	0.8	1.4	2.0	2.1	3.1	3.1	2.2

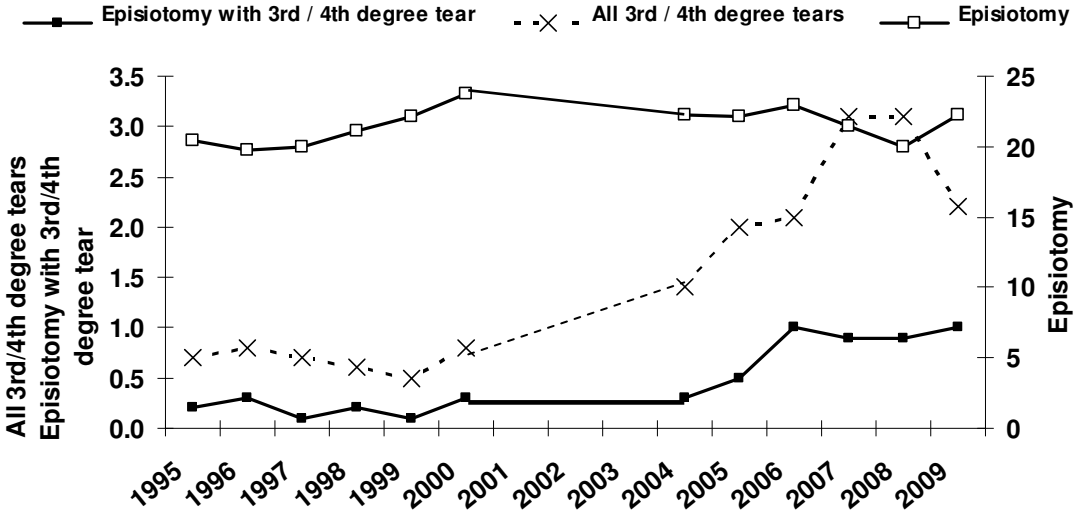

Figure 59: Perineal trauma rates

The episiotomy rate 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 was significantly lower than the WHA average in 2009 at 2.2%.

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

[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 60: Episiotomy rate in with spontaneous cephalic vaginal birth by LMC at birth and parity

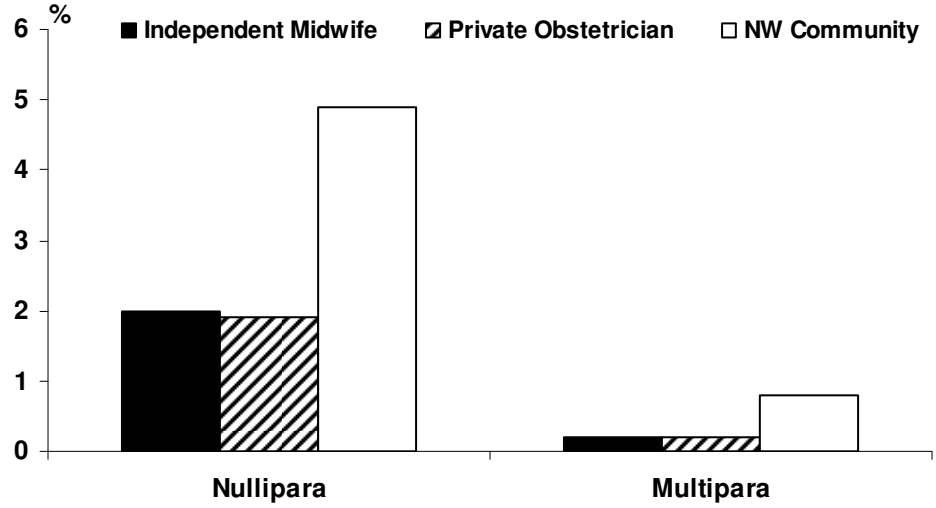

Figure 61: 3rd and 4th degree tear rate in spontaneous vaginal birth by LMC at birth and parity

7.2 Third stage management

Methods:

In 2008, the collection of third stage data was refined to better determine initial management of third stage and subsequent treatment in response to postpartum bleeding. Physiological management of third stage includes not routinely using uterotonic drugs, not clamping the cord, followed by delivery of the placenta by maternal effort.

Findings:

Table 58: 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 2009, active management of third stage was used in at least 87.5% of vaginal births and physiological management in at least 8.4%. The primary postpartum haemorrhage and blood transfusion rates were higher among the actively managed than among physiologically managed mothers. This is perhaps surprising given that randomised controlled trials have shown a halving of the postpartum haemorrhage rate with active management, but is consistent with data reported by the Midwifery and Maternity Provider Organisation, from independent midwifery practice in NZ. This is most likely due to the paradox often seen in observational studies of interventions where caregivers choose the appropriate management according to patient and clinician identified risk. This issue is gaining prominence in maternity circles. A randomised trial of third stage management in low risk women may be indicated in view of the previously reported study findings.

At NW, physiological management of third stage is supported in low risk women, and with informed consent. Women with BMI>35, with a history of Caesarean section, hypertension or multiple pregnancy almost always received active management at NW in 2009. (see table 206 in appendix 6)

7.3 Postpartum haemorrhage

WHA Maternity Indicators for PPH		WHA mean 07-08	NW 2007	NW 2008	NW 2009	2009 Public only*
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Postpartum haemorrhage	Blood loss ≥500ml and <1500ml/All vaginal births		12.9	14.8	**15.9**	20.5
	Blood loss ≥1500ml/ All vaginal births	1.35	1.12	2.4	**2.6**	3.6
	Blood loss ≥500ml and <1500ml/Mothers birthing by Caesarean	49.4	69.2	72.2	**72.2**	74.9
	Blood loss ≥1500ml/Mothers birthing by Caesarean	2.71	3.32	5.2	**5.0**	7.4
Blood transfusion	Postpartum blood transfusion/Mothers giving birth	1.63	2.2	2.8	**3.0**	4.8

*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

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

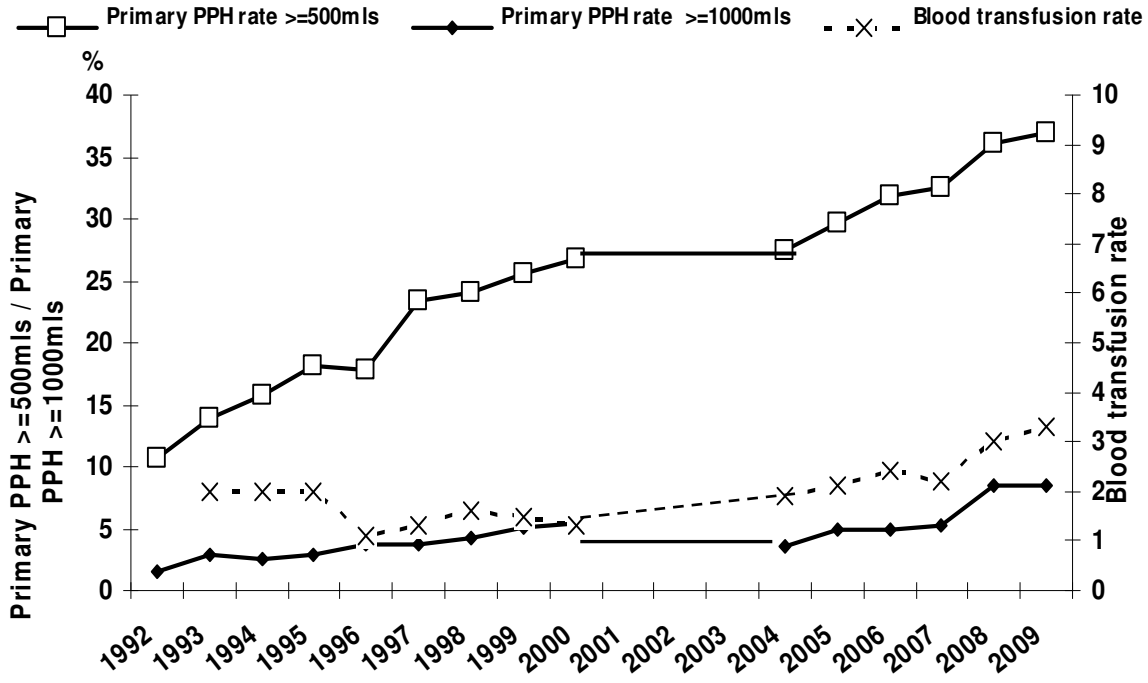

Figure 62: Postpartum haemorrhage and transfusion rates (1992-2009)

There is continuing concern about the apparent rise in PPH and transfusion rates. Although this rise has occurred for all modes of birth, it is in the Caesarean section group (both elective and emergency) that the greatest rise is seen and particularly for PPH ≥ 1000 ml. One reason for this may be the increasing complexity of Caesarean section.

Table 59: Postpartum haemorrhage rate (1994-2008)

	1994	1995	1996	1997	1998	1999	2000	2004	2005*	2006*	2007*	2008	2009
Total Births	8812	9125	9157	8055	7531	7501	7827	7491	7194	7212	7695	7589	7735
Primary PPH (≥500mls)	1390	1655	1633	1882	1818	1921	2088	2056	2139	2302	2507	2736	2850
Incidence %	15.8	18.1	17.8	23.4	24.1	25.6	26.7	27.4	29.7	31.9	32.6	36.1	36.9
Primary PPH (≥1000mls)	227	267	344	303	318	381	423	262	350	351	410	634	651
Incidence %	2.6	2.9	3.8	3.8	4.2	5.1	5.4	3.5	4.9	4.9	5.3	8.4	8.4

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

Table 60: Postpartum blood loss by mode of birth

	Spontaneous vaginal birth n=4374		Operative vaginal birth n=947		CS emergency n=1282		CS elective n=1132		Total N=7735	
	n	%	n	%	n	%	n	%	n	%
PPH ≥500mls	703	16.1	282	29.8	1064	83.0	801	70.8	2850	36.9
PPH ≥1000mls	218	5.0	59	6.2	247	19.3	127	11.2	651	8.4
PPH ≥1500mls	111	2.5	28	3.0	78	6.1	43	3.8	260	3.4
Post partum transfusion	91	2.1	34	3.6	70	5.5	37	3.3	232	3.0

Table 61: Postpartum blood loss by onset of birth

	Spontaneous labour n=4125		Induced labour n=2238		CS emergency before onset of labour n=240		CS elective n=1132		Total N=7735	
	n	%	n	%	n	%	n	%	n	%
PPH ≥500mls	1042	25.3	816	36.5	191	79.6	801	70.8	2850	36.9
PPH ≥1000mls	269	6.5	216	9.7	39	16.3	127	11.2	651	8.4
PPH ≥1500mls	116	2.8	91	4.1	10	4.2	43	3.8	260	3.4
Post partum transfusion	103	2.5	79	3.5	13	5.4	37	3.3	232	3.0

Women who have a spontaneous or induced labour have a lower rate of PPH than those undergoing elective Caesarean section, although postpartum transfusion rates are similar. Emergency Caesarean section prior to labour has the highest rate of PPH, possibly due to placental bleeding and placentation abnormalities in this group.

The introduction of new guidelines for PPH late in 2009 are 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. The effect of these changes will be evaluated.

Table 62: Blood transfusion (1995-2009)

	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009
Antenatal	9	4	2	4	4	0	10	12	11	6	6	18
Antenatal & intrapartum		1	0	0		0	1	0	0	1	0	0
Antenatal & postpartum						1	0	3	0	0	2	2
Intrapartum	11	7	3	3	3	4	2	2	6	1	4	3
Intrapartum & postpartum		1	3	6	3	4	4	3	3	4	1	2
Postpartum	152	90	94	110	100	96	128	133	150	165	212	228
Total transfusions	172	103	102	123	110	105	145	153	170	177	225	253
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

7.4 Emergency peripartum hysterectomy

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

*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.

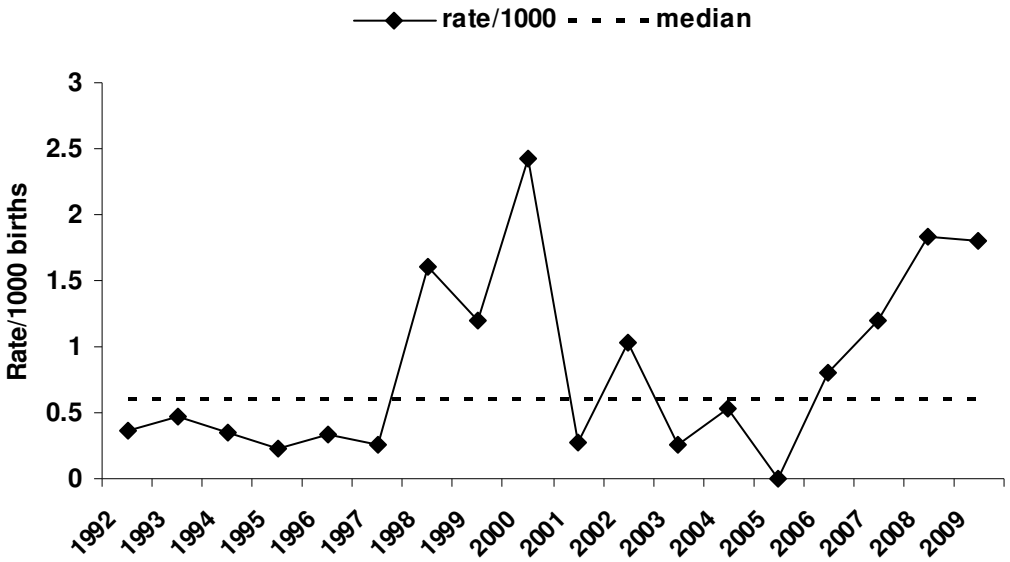

Figure 63: Emergency peripartum hysterectomy rates/1000 births (1992-2009) (horizontal dotted line represents median rate for 1992-2009)

Findings

There were 14 emergency peripartum hysterectomies in 2009. This is a rate of 1.81/1000 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	NW 2007	NW 2008	NW 2009	2009 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	0.287

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

Methods

The following tables include all babies born at NW. However, in counting Apgar scores, fetal deaths are **excluded** from the numerators.

Table 63: Neonatal morbidity overall and by mode of birth (all gestations)

	Spontaneous vertex n=4370		Vaginal breech n=62		Forceps birth n=343		Ventouse birth n=613		CS elective n=1173		CS emergency n=1336		Total N=7987	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	83	1.9	34	54.9	14	4.1	6	1.0	24	2.1	39	2.8	200	2.5
1 min Apgar <7	275	6.3	43	69.4	55	16.0	84	13.7	107	9.1	230	17.2	794	10.1
5 min Apgar <7	80	1.8	33	53.2	8	2.3	3	0.5	14	1.2	44	3.3	182	2.3
Admitted to NICU	284	6.5	20	32.3	45	13.1	41	6.7	164	14.0	266	19.9	820	10.4
≥2 days in NICU	253	5.8	20	32.3	39	11.4	31	5.1	153	13.0	250	18.7	746	9.5
Stillbirths	42	1.0	25	40.3	3	0.9	0		1		4	0.3	75	0.9
Fetal deaths (/1000)	20	4.6	5	80.6	2	5.8	1	1.6	0		9	6.7	37	4.6

Table 64: Neonatal morbidity overall and by mode of onset of birth (all gestations)

	Spontaneous labour n=4175		Induced labour n=2289		CS elective n=1173		CS emergency before onset of labour m=260		Total N=7897	
	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	59	1.4	33	1.4	23	2.0	10	3.9	125	1.6
1 min Apgar <7	331	7.9	218	9.5	106	9.0	64	24.6	719	9.1
5 min Apgar <7	51	1.2	31	1.4	13	1.1	12	4.6	107	1.4
Admitted to NICU	316	7.6	228	10.0	164	14.0	112	43.1	820	10.4
≥2 days in NICU	290	7.0	192	8.4	153	13.0	111	42.7	746	9.5
Stillbirths	24	0.5	50	2.1	1	0.1	0		75	0.9
Fetal deaths (/1000)	24	5.7	7	3.1	0		6	23.1	37	4.6

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

	Spontaneous vertex N=4053		Vaginal breech N=14		Forceps birth N=319		Ventouse birth N=597		CS elective N=1042		CS emergency N=1103		Total N=7128	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	24	0.6	2	14.3	8	2.5	6	1.0	15	1.4	23	2.1	78	1.1
1 min Apgar <7	172	4.2	4	29.6	47	14.7	83	13.9	73	7.0	139	12.6	518	7.3
5 min Apgar <7	20	0.5	1	7.1	3	0.9	3	0.5	10	1.0	26	2.4	63	0.9
Admitted to NICU	139	3.4	4	28.6	29	9.1	37	6.2	67	6.4	88	8.0	364	5.1
≥2 days in NICU	114	2.8	4	28.6	25	7.8	27	4.5	57	5.5	72	6.5	299	4.2
Stillbirths	9	0.2	1	7.1	2	6.3	0		1	0.1	2	0.2	75	1.1
Fetal deaths (/1000)	2	0.5	0		1	3.1	1	1.7	0		2	1.8	37	5.2

Table 66: Neonatal morbidity in term or post term (≥ 37 weeks) babies (2000-2009)

	2000 N=6915		2004 N=6793		2005 N=6578		2006 N=6543		2007 N=6971		2008 N=6910		2009 N=7128	
	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
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
Admitted to NICU	405	5.9	349	5.1	346	5.3	283	4.3	322	4.6	314	4.5	364	5.1
≥2 days in NICU	*		254	3.7	275	4.2	226	3.5	271	3.9	241	3.5	299	4.2

* 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

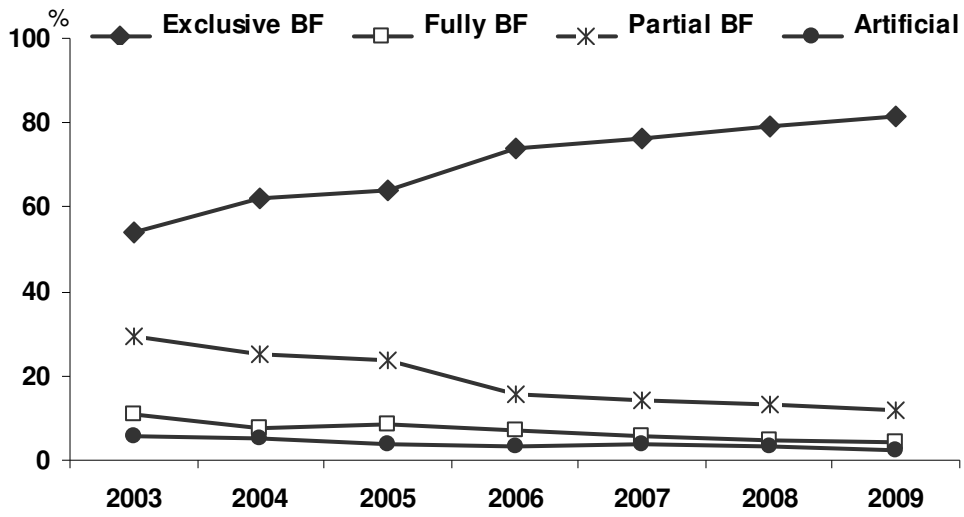

Figure 64: Method of infant feeding at discharge from NW (2003-2009)

In 2009, the exclusive breastfeeding rate on discharge from hospital following birth was 82% 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".

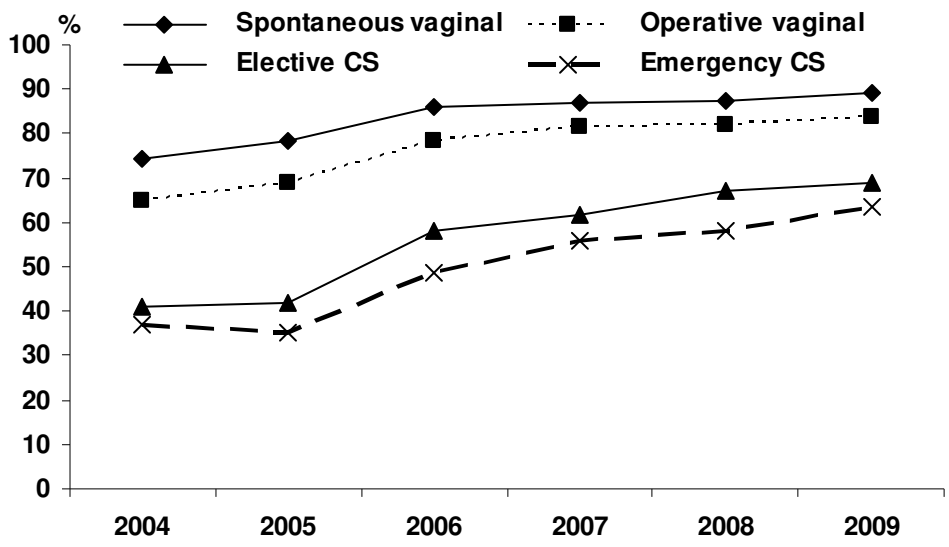

Figure 65: Exclusive breastfeeding at discharge from NW by mode of birth (2004-2009)

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.

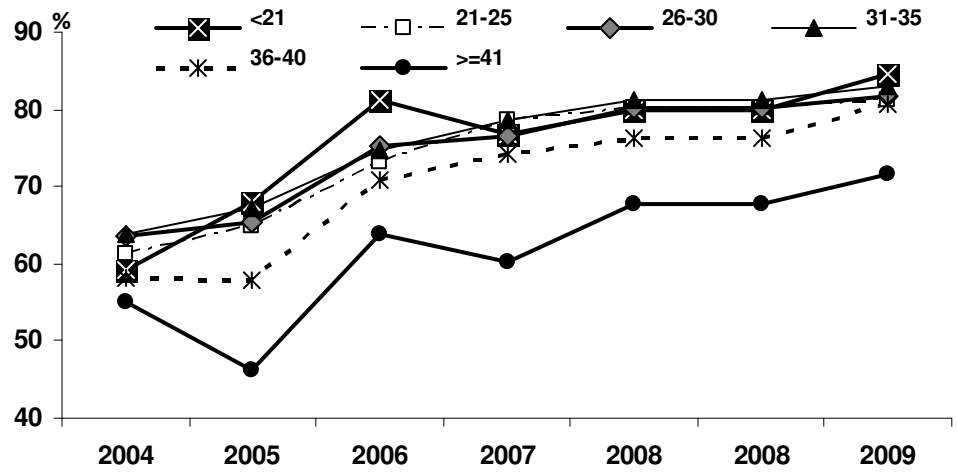

Figure 66: Exclusive breastfeeding rates at discharge from NW by maternal age (2004-2009)

It is encouraging to see that in all age groups there is an increase in exclusive breastfeeding rates. Older mothers have the lowest rate of exclusive breastfeeding, but even these rates are now higher than the rates in all age groups in 2004.

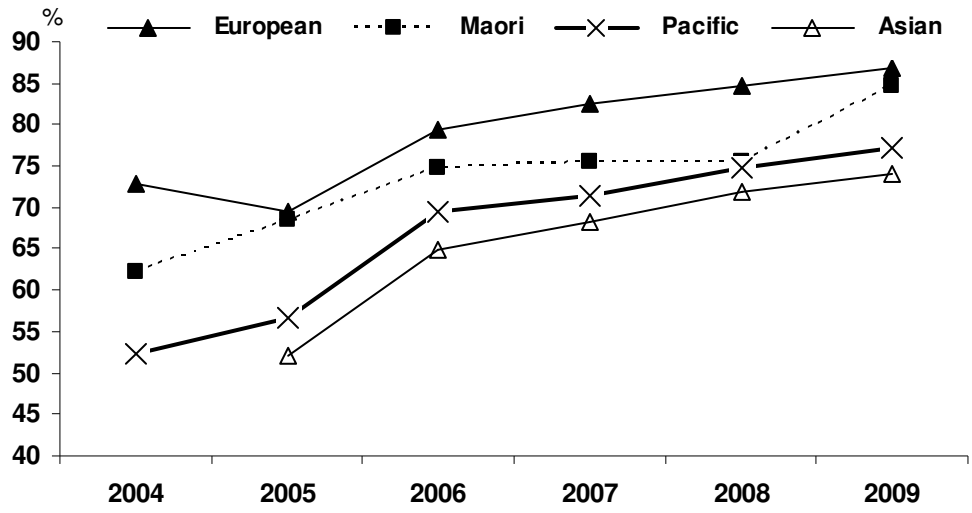

Figure 67: Exclusive breastfeeding rates at discharge from NW by ethnicity (2004-2009)

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

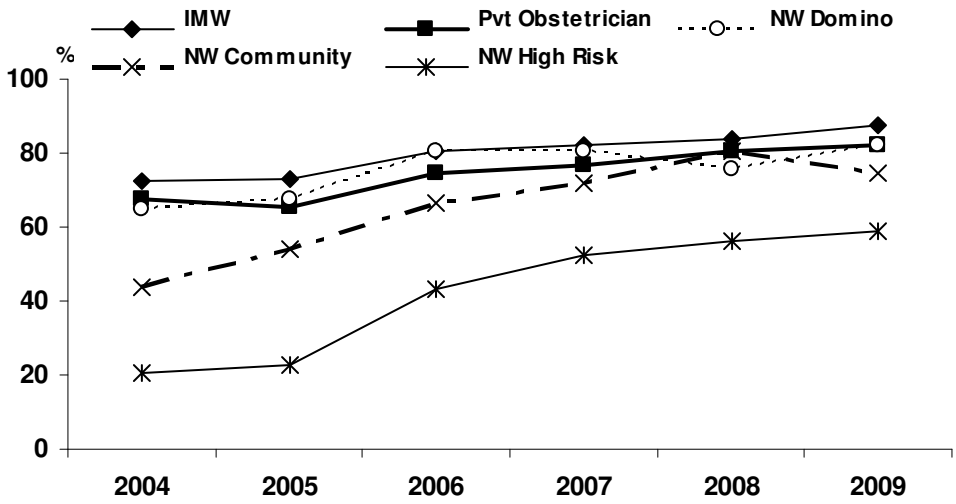

Figure 68: Exclusive breastfeeding rate at discharge from NW by LMC at birth (2004-2009)

Since 2004 almost all LMC groups have consistently increased their exclusive breastfeeding rates.

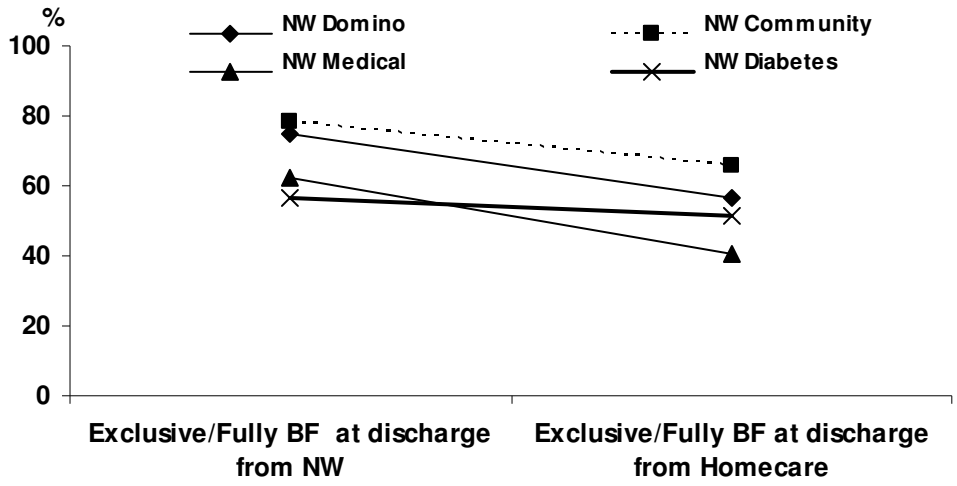

Figure 69: Change in combined exclusive and fully breastfeeding rate from hospital discharge to Homecare by NW LMC (4-6 weeks)

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 57.4%.

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. This work includes staff education, recording community consultation on the Breastfeeding Policy, creating educational displays on breastfeeding, and providing appropriate information in each woman's room to assist with establishing breastfeeding.

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 82% 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 67: Maternal destination immediately after birth

	2004 N = 7491		2005 N = 7194		2006 N = 7212		2007 N = 7695		2008 N = 7589		2009 N = 7735	
	n	%	n	%	n	%	n	%	n	%	n	%
NW Wards	4618	61.6	4286	59.6	4384	60.8	4590	59.6	4493	59.2	4557	58.9
Birthcare	2245	29.9	2354	32.7	2322	32.2	2493	32.4	2551	33.6	2637	34.1
Home	539	7.2	510	7.1	483	6.7	587	7.6	526	6.9	517	6.7
Other Units	89	1.2	44	0.6	23	0.3	25	0.3	19	0.3	24	0.3

There has been an increase in the proportion (and total number) of mothers transferred to Birthcare Auckland in the years from 2004 to 2009.

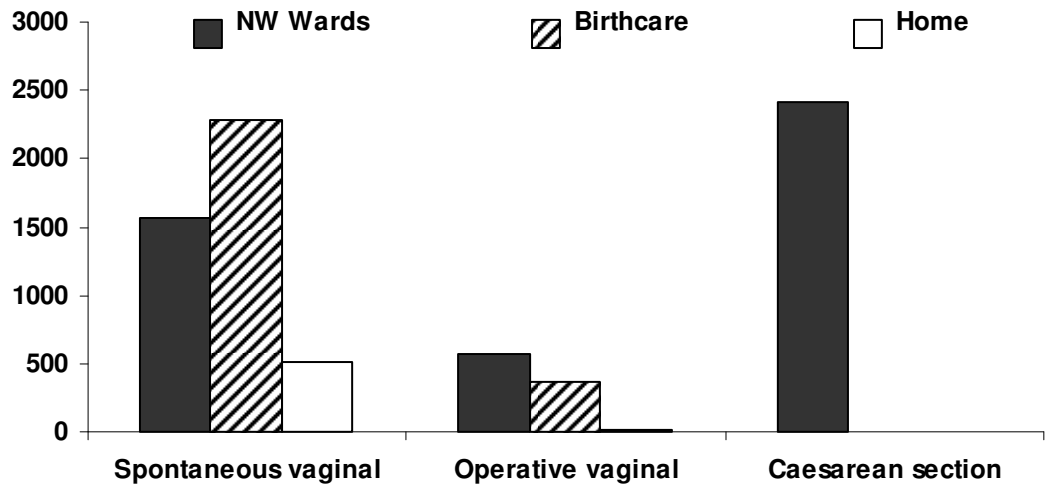

Figure 70: Maternal destination immediately after birth by mode of birth

As expected, mothers tend to be admitted initially to the NW wards after Caesarean section. Fifty-two 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.

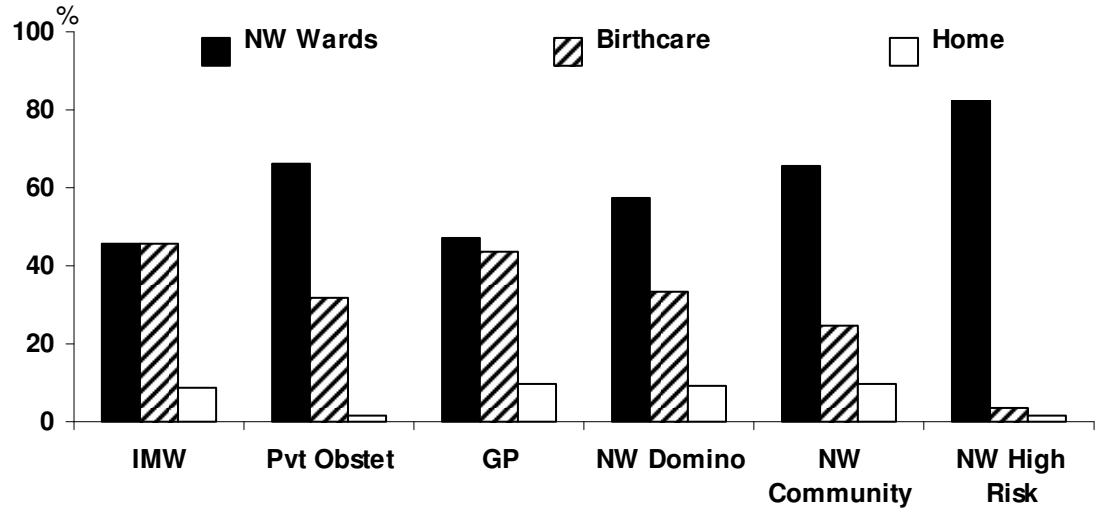

Figure 71: Postnatal destination immediately after birth by LMC at birth

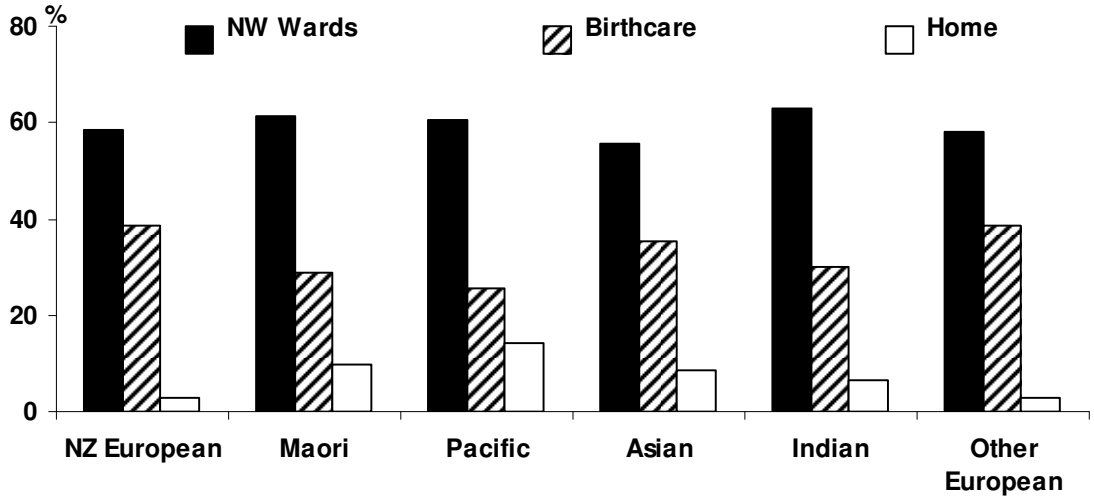

Figure 72: Postnatal destination immediately after birth by ethnicity

Maori, Pacific and Indian women remain underrepresented among women transferring to Birthcare immediately postpartum. Maori, Pacific and Asian women often choose to go home directly after birth.

Admission to NW postnatal ward among women having a spontaneous vaginal birth

The contractual arrangement with Birthcare Auckland is for the provision of postnatal primary care to well women and their babies. Women who have had spontaneous vaginal births and are admitted to National Women's postnatal wards most commonly do so for neonatal care for their baby.

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

	N= 1568	
	n	%
Neonatal reason*	672	42.9
Postpartum haemorrhage	292	18.6
Diabetes	153	9.8
Hypertensive disorder	69	4.4
Perineal trauma	71	4.5
Retained placenta/products	46	2.9
Fainting /dizziness	28	1.8
Other listed reasons†	237	15.1

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

	N= 4557*		Length of stay Days†
	n	%	Median
Caesarean section birth - discharged to home	2026	44.5	4.1
Caesarean section birth - transferred to Birthcare	300	6.6	1.4
Caesarean section birth - transferred to other destinations	71	1.6	4.7
Operative vaginal birth - discharged to home	333	7.3	2.7
Operative vaginal birth - transferred to Birthcare	225	4.9	0.8
Operative vaginal birth - transferred to other destinations	11	0.2	3.4
Spontaneous vaginal birth - discharged to home	1186	26.0	2.1
Spontaneous vaginal birth - transferred to Birthcare	292	6.4	0.8
Spontaneous vaginal birth - transferred to other destinations	74	1.6	3.0

*1 women with unknown destination has 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 2009, 404 (5.2%) women of the 7735 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 428 readmissions: 381 women had one readmission, 22 women had two readmissions and 1 woman had three readmissions. The median length of stay for women who had a postnatal readmission was 1.9 days.

Table 70: Reasons for readmission

	N=428	
	n	%
Neonatal admission*	69	16.1
Infection †	51	11.9
Breast‡	68	15.9
Wound breakdown§	8	1.9
Postpartum haemorrhage	50	11.7
Hypertensive disorder	22	5.1
Retained products	30	7.0
Epidural complications	6	1.4
Other¶	124	29.0

* 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 2009 were again neonatal admission and breast problems.

8.2.2 Admissions to postnatal wards of women who birthed elsewhere

There were 141 admissions in 2009 of mothers who had birthed elsewhere. Most often these births were at Birthcare Auckland, Waitakere or Middlemore. The majority of admissions were because the baby required admission to the neonatal unit.

Table 71: Reason for postnatal admission by place of birth for women who birthed elsewhere

	Total N=141		Birthcare n=29		Home n=7		CMDHB* n=30		North Shore n=20		Waitakere n=26		Other n=27	
	N	%	n	%	n	%	n	%	n	%	n	%	n	%
Neonatal admission	87	62	10	34	3	43	20	67	16	80	17	65	21	78
Infection	2		1	3	0	0	0		0		0		1	4
Breast	6	4	3	10	1	14	1	3	0		0		1	4
Wound	9		0		0		4	13	3	15	2	8	0	
PPH	8	6	2	7	1	14	1	3	1	5	3	12	0	
Obstetric trauma	6	4	4	14	1	14	1	3	0		0		0	
Retained placenta	4	3	4	14	0	0			0		0		0	
Other	19	14	5	17	1	14	3	10	0		4	15	4	15

* 29 Middlemore and 1 Pukekohe

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 2009 calendar year. Occupancy data relate to the unit occupancy for each day in 2009.

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 2009 and admitted to the NW NICU, (2) inborn (NW) babies and (3) babies born in 2009 assigned to NW 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) or
- has major surgery (defined as opening of a body cavity).

From 2009 ANZNN will also collect data on 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 NW 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 NW 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 NW NICU database. The ANZNN data include data from NW.

Table 72: Characteristics of <32 week or <1500g babies cared for at NW NICU by ANZNN status

	<32 weeks or <1500g					
	Total N=218		ANZNN n=183		Non ANZNN n=35	
Gestation (weeks)	**n**	**%**	**n**	**%**	**n**	**%**
<24	1	0.5	1	0.5	0	0.0
24-25	28	12.8	20	10.9	8	22.8
26-27	50	22.9	37	20.2	13	37.1
28-29	55	25.2	45	24.6	10	28.6
30-31	57	26.1	54	29.5	3	8.6
32-36	27	12.4	26	14.2	1	2.9
Weight (g)						
<500	0	0.0		0.0		0.0
500-749	19	8.7	15	8.2	4	11.4
750-999	59	27.1	42	23.0	17	48.6
1000-1249	46	21.1	39	21.3	7	20.0
1250-1499	57	26.1	54	29.5	3	8.6
1500-1999	33	15.1	30	16.4	3	8.6
2000-2499	4	1.8	3	1.6	1	2.9
Birthplace						
National Women's	170	78.0	169	92.3	1	2.9
Northland	3	1.4	3	1.6	0	0.0
Waitemata DHB	7	3.2	7	3.8	0	0.0
Counties Manukau DHB	30	13.8	0	0.0	30	85.7
Waikato	1	0.5	0	0.0	1	2.9
Wellington	2	0.9	0	0.0	2	5.7
Wanganui	1	0.5	1	0.5	0	0.0
Hastings	1	0.5	1	0.5	0	0.0
New Plymouth	2	0.9	1	0.5	1	2.9
Other	1	0.5	1	0.5	0	0.0

9.1 Inborn live birth at National Women's 1959-2009

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.

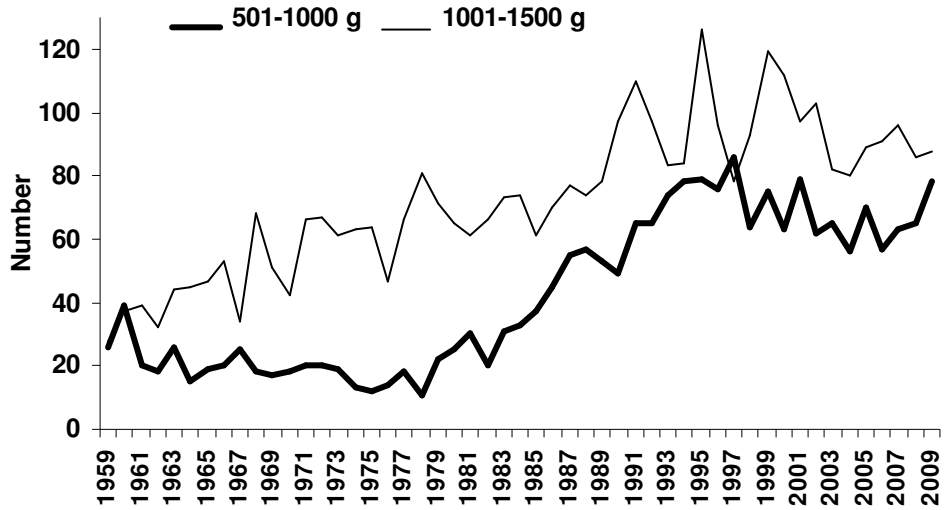

Figure 73: Number of inborn live-births ≤1500g from 1959 to 2009 (excludes BBAs).

9.2 NICU occupancy

For 2009 the increase in occupancy that was observed in 2007 and 2008 has continued with approximate 7 % increase overall since 2006. The associated rise in bed-days for inborn infants born before 28 weeks gestation has plateaued but remains higher than the nadir in 2005. Typically these immature babies are more complex than more mature (32-36 wks) preterm or term babies.

Table 73: Occupancy (baby days) on NICU (2000– 2009)

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

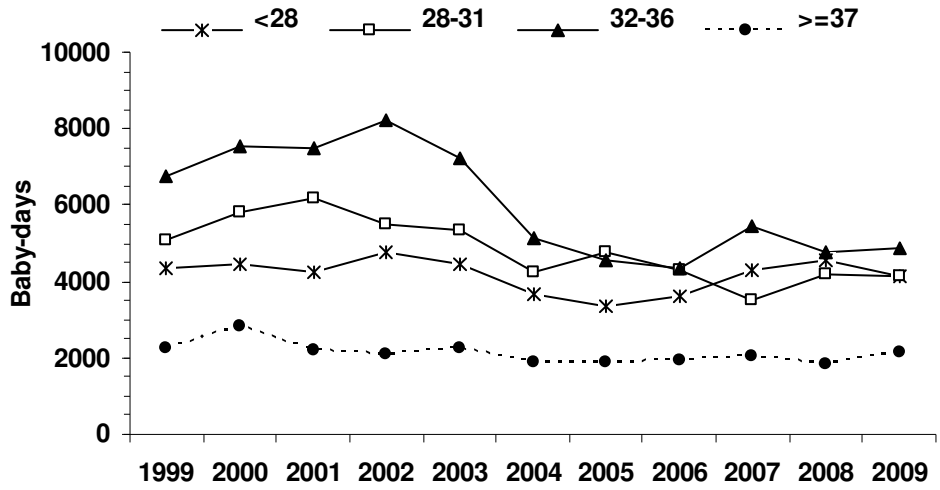

Figure 74: Occupancy (baby days per year) of NICU by gestational age

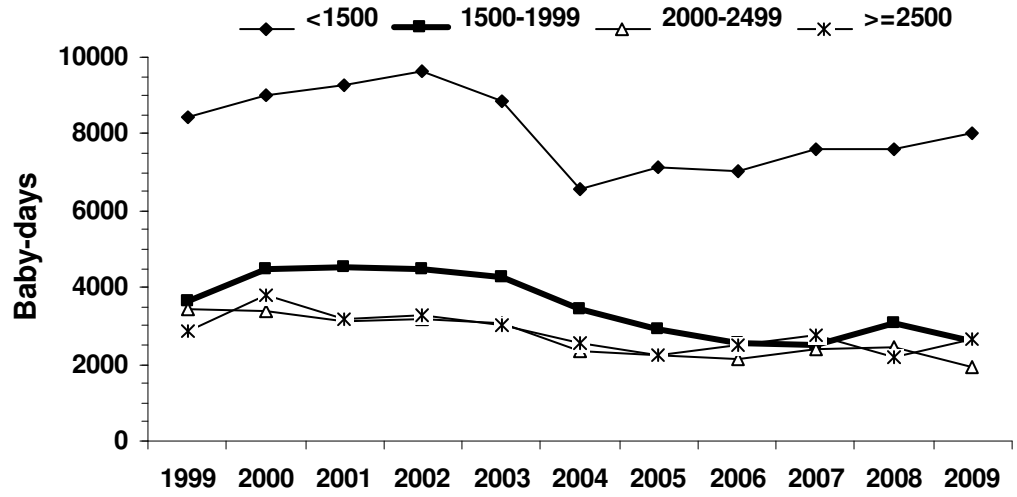

Figure 75: Occupancy (baby days per year) of NICU by birth weight

9.3 Admissions to NICU

Total admissions to NW 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. NW 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.

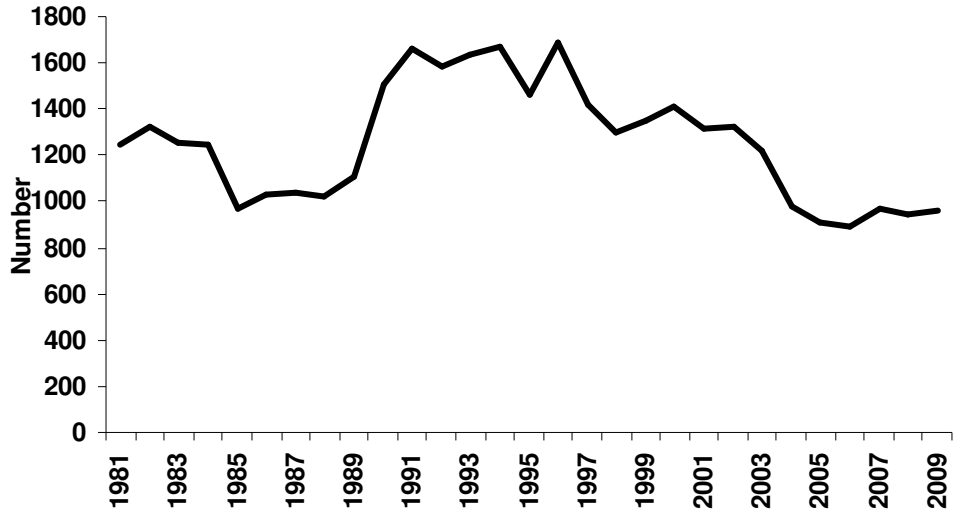

Figure 76: Admissions to NICU 1981-2009

Table 74: NICU admissions by year

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number	1464	1690	1420	1300	1352	1412	1312	1331	1220	975	906	890	972	939	957

9.3.1 Admissions to NICU by gestation and birth weight

From review of admissions by gestational age and birth weight category it is clear that the reduction in total admissions since 2003/4 was largely due to fewer admissions of babies ≥32 weeks gestation. 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.

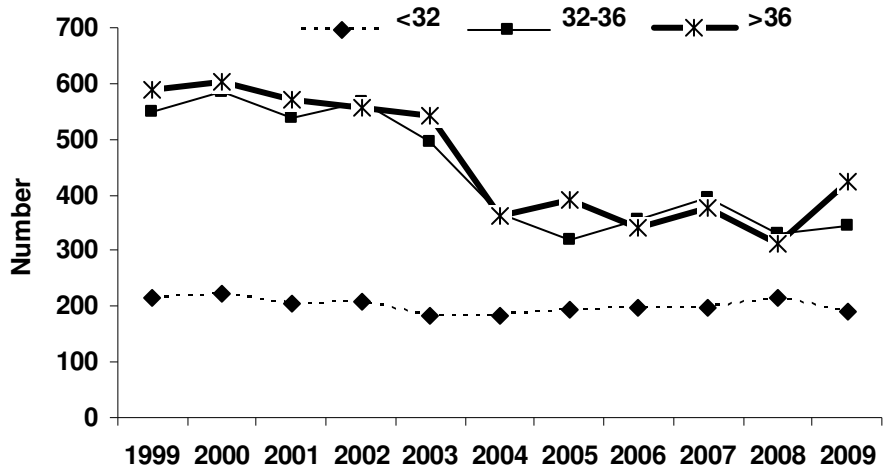

Figure 77: Admissions to NICU by gestational age

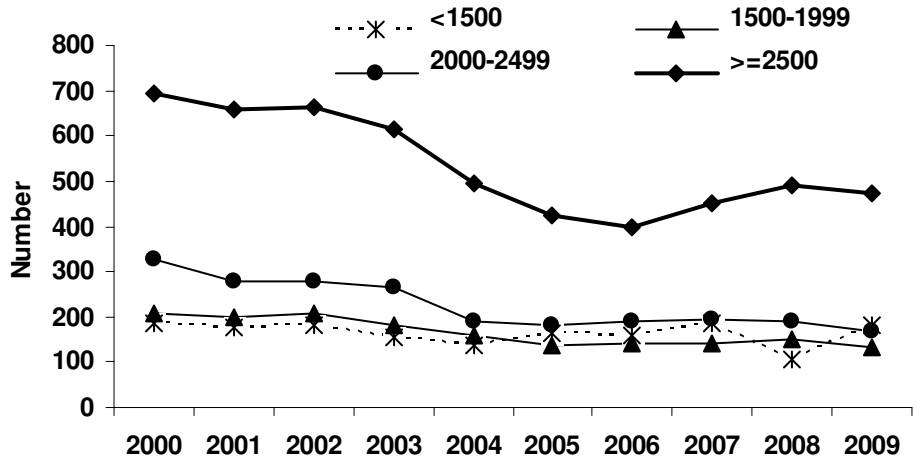

Figure 78: Admissions to NICU by birth weight

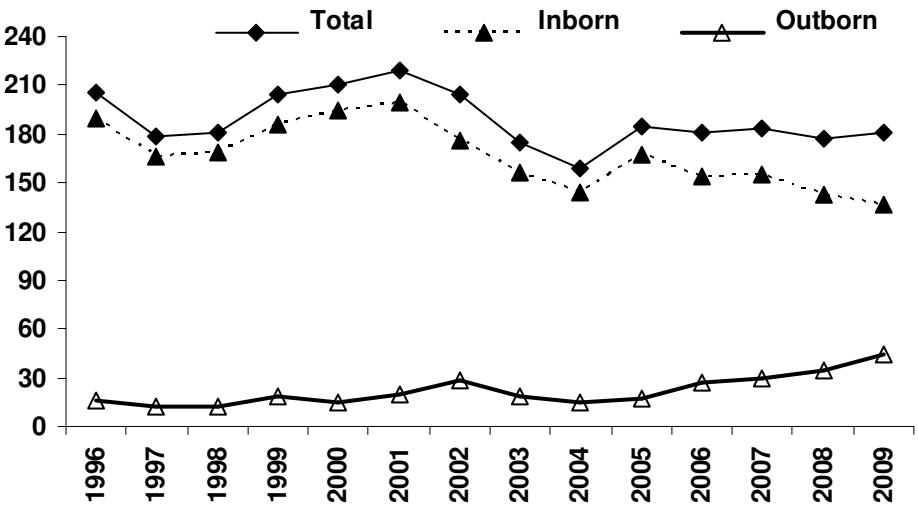

Figure 79: Admissions to NICU of <1500g babies (VLBW) by place of birth (outborn includes BBAs).

The number of VLBW infants admitted to NW peaked in 2001 and then fell over the next three years. However, total admissions in this group have remained stable over the last five years. Although the proportion of outborn infants is low there has been a steady increase since 2004. 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 has also been a modest increase in the number of babies admitted to NICU whose mothers are domiciled in the Auckland District Health Board. This may indicate better allocation, with a drop in unknowns, but could also reflect demographic changes and should be observed.

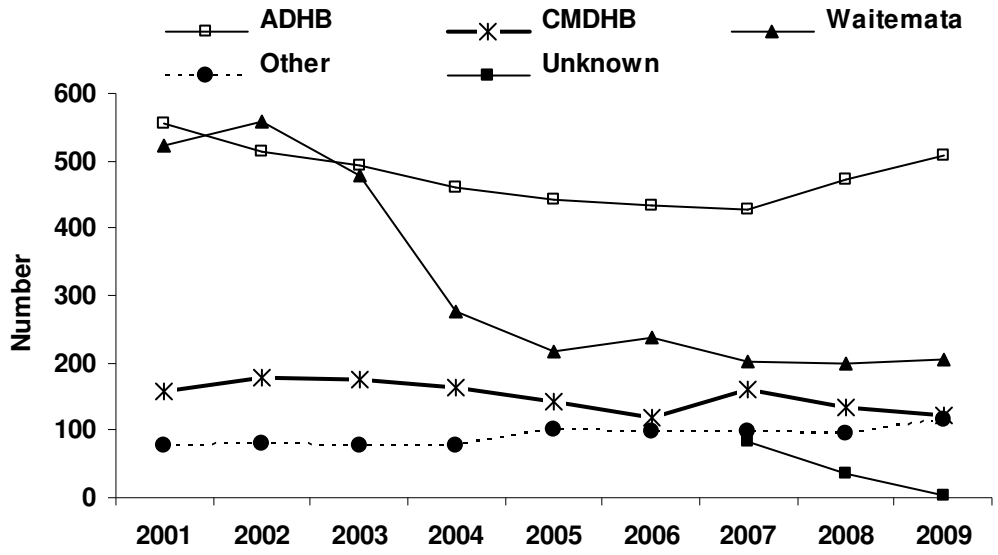

Figure 80: Admissions to NICU by maternal domicile

9.3.3 Admissions to NICU by ethnicity of baby

The most frequent ethnicity of NICU admissions was NZ European with 37.8% overall, including 37.3 % of preterm and 38.5% of term infants respectively. Due to changes in reporting infant ethnicity made in 2007 we have not reported changes in infant ethnicity over time. However, it is worth noting that there has been an overall fall in mothers of NICU admissions indentifying as NZ European from 54% in 2006 to 40.8 % in 2009.

The second largest single ethnic group is Pacific people who for the second year represent a greater percentage than Maori. Overall 17.5% of admissions were Pacific people with 18% of premature and 16.1% of term admissions. Maori were the third most common with 17.2% of admissions. As in previous years, Maori ethnicity is more commonly associated with preterm admission (18.4%) compared with term admission (15.8%). Asian and Indian were the two other major groups represented with 9.5% and 7.2% of admissions respectively.

9.3.4 Reasons for admission to NICU

Prematurity (36.5%) and respiratory distress (28%) remain the commonest reasons for admission to NICU. However, 101 babies (10.6%) were admitted because of congenital anomalies. Thirty-four babies (3.6%) including 22 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 NW over the last five years. In 2009 90% of NW babies <32 weeks gestation received some antenatal corticosteroids before birth and 50% received a course starting between 24 hours and seven days before birth. Over the last 12 years the percentage of neonatal admissions at NW who received antenatal steroids has compared favourably with the ANZNN data. These percentages are slightly down from previous years, which may reflect changes in practice. Unfortunately 2007 and 2008 data from ANZNN are not yet available for comparison.

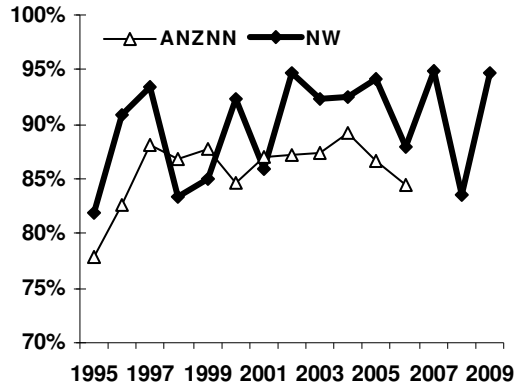

Figure 81: Any antenatal corticosteroids at 24-27 weeks

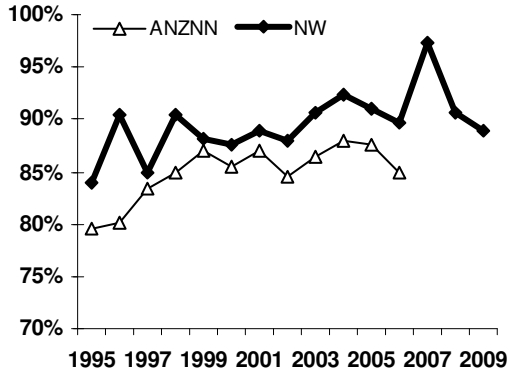

Figure 82: Any antenatal corticosteroids at 28-31 weeks

9.4 Care and complications

9.4.1 Infection (all admissions)

In 2009 there were 10 early-onset culture proven septicaemias compared with 6 and 5 in 2006 and 2007 respectively. There were 39 episodes of late-onset septicaemia in 33 babies, which compared reasonably with 31 and 34 episodes in the two previous years. For early-onset infection (1st 48 hrs) the organisms were Group B strep (5), Listeria (1), *E. coli* (1), *Haemophilus* (1), *Enterococcus* (1) and *Pseudomonas* (1). *Staphylococcus epidermidis* and coagulase negative *Staphylococcus* continue to make up the majority of late onset sepsis (32%). However, there were also 5 cases of late *Staphylococcus aureus* septicaemia including one case of MRSA in an infant known to be colonised and transferred from another unit, the day before, for surgery.

9.4.2 Hypoxic ischaemic encephalopathy (all admissions)

Four inborn babies developed significant stage 2 or 3 hypoxic ischaemic encephalopathy (HIE) in 2009, giving an incidence of 0.5/1000 term live births. The incidences were 0.6, 1.6, 0.5, 0.9, 1 and 0.4/1000 term live births for the years between 2003 and 2008. In 2006 four planned home births had significant HIE. In 2009 there was one planned home birth who developed neonatal encephalopathy and died.

Table 75: Details of Hypoxic Ischaemic Encephalopathy Stages 2 or 3.

Born at	Gestation	Birth Weight	HIE stage	Apgar 1/5	Comment
Waitakere	40	4160	3	4/4	Meconium stained liquor & long 2nd stage. Infant cooled but MRI very severe injury and baby died
Waitakere	41	4790	3	0/0	Shoulder dystocia,major resus with first heart rate at 40 min. Baby cooled but very severe so rewarmed & died
Waitakere	40	3480	3	0/0	Fetal distress. Baby cooled and survived
Waitakere	37	2930	2	2/3	Undiagnosed breech, home birth with head stuck for approximately 35 minutes. Baby cooled but died later
National Women's	41	3275	2	9/9	Presented with seizures day 1
National Women's	41	3000	2	2/6	Emergency CS due to reduced mvts and poor CTG. Cooled with good outcome
National Women's	37	2750	3	1/2	Emergency CS due to reduced mvts Cooled until Trisomy 13 confirmed -died
National Women's	38	1890	2	1/4	SGA infant, cooled with good outcome

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 all very low birth weight infants admitted to NICU from 1985 to 2009

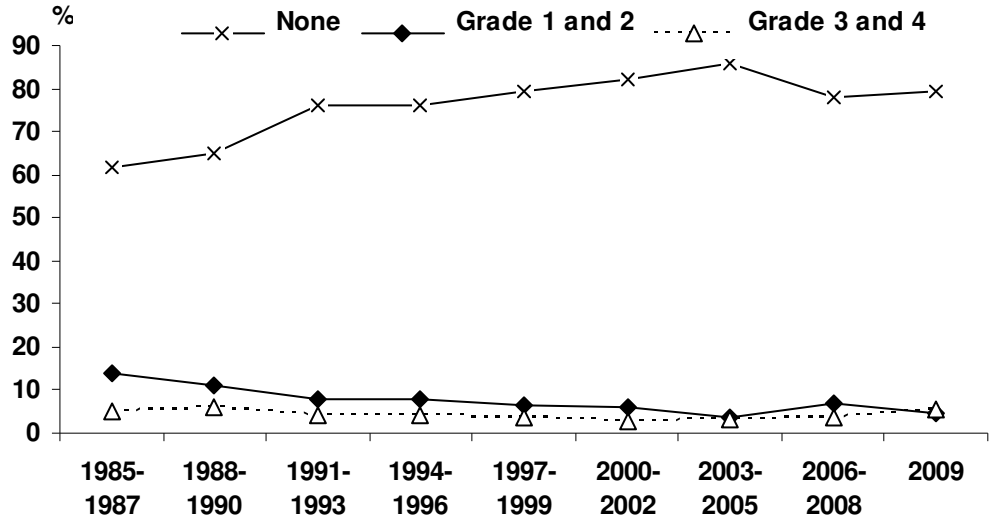

Figure 83: Intraventricular haemorrhage in all <1250g infants admitted to NICU from 1985 to 2009 (Babies with unknown IVH status have been removed from the denominator.)

Since 2005, the criteria for routine cerebral ultrasound scanning at NW 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. This policy may artificially increase the rates of IVH as unscanned babies are excluded from the denominator. 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 (Fig 82) 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, NW data for rates of IVH compare favourably with ANZNN data (Fig 84-87). However, there is some variation year to year that will reflect the smallish number of infants in each gestational age group.

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

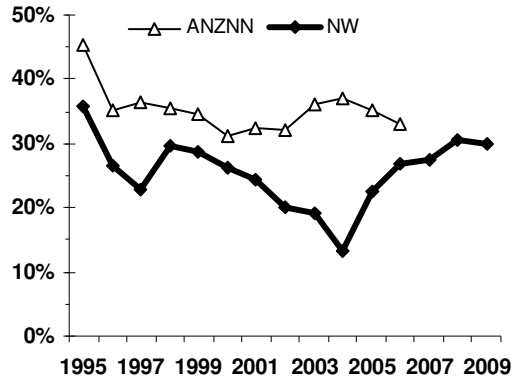

Figure 84: Any IVH at 24-27 weeks

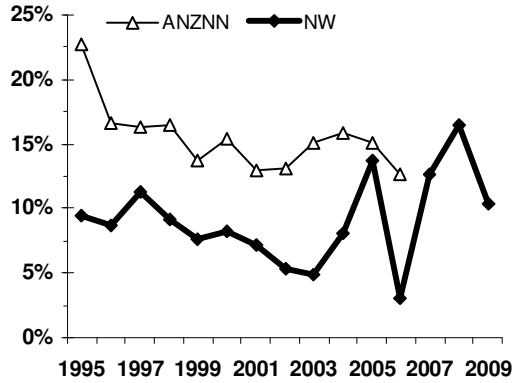

Figure 86: Any IVH at 28-31 weeks

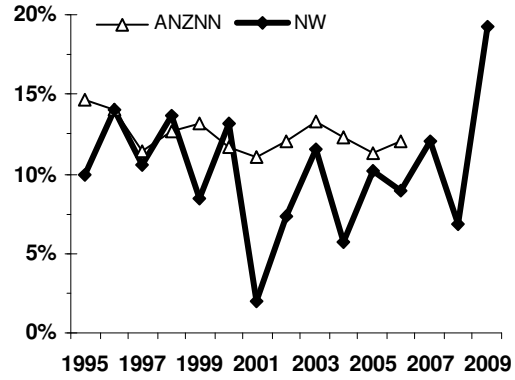

Figure 85: Severe (G3-4) IVH at 24-27 weeks

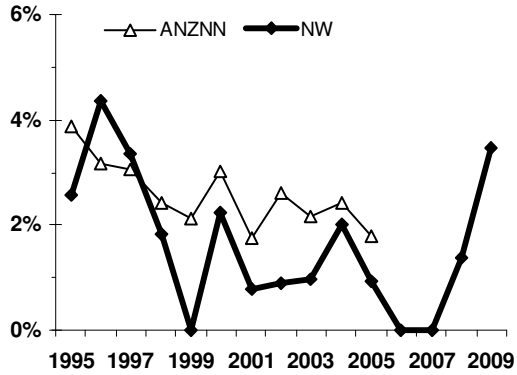

Figure 87: Severe (G3-4) IVH at 28-31 weeks

The increase in severe IVH at 24-27 weeks in 2009 represents an increase from 4 to 13 cases. Although the rate for 2008 was low compared with other years it will be important to examine this trend. The increase in severe IVH at 28-31 weeks is an increase from one to two cases and is likely common cause variation.

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 NW, thus excluding babies transferred to NICU in the postnatal period. This allows more meaningful comparisons of postnatal care at NW over time.

Table 76: Number of babies on assisted ventilation

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

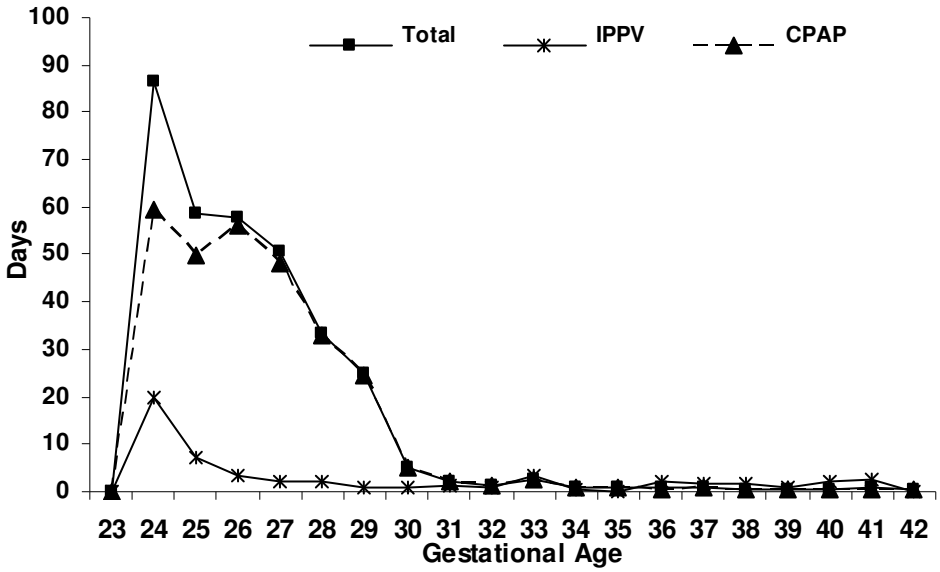

Figure 88: Median ventilation days on IPPV and CPAP and IPPV+CPAP by gestational age among (ventilated) survivors in 2009

The NICU at NW has used CPAP as the primary mode of respiratory support 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. There is a similar pattern in the decreasing use of CPAP with increasing gestation; however for CPAP use the decrease starts later from 28 weeks onwards with a steady reduction from 31 to 35 weeks gestation. These data are important clinically as they inform discussion on timing of birth for mildly preterm babies.

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)

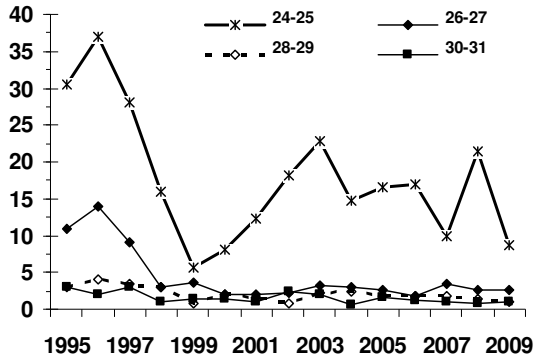

Figure 89: Median days on IPPV

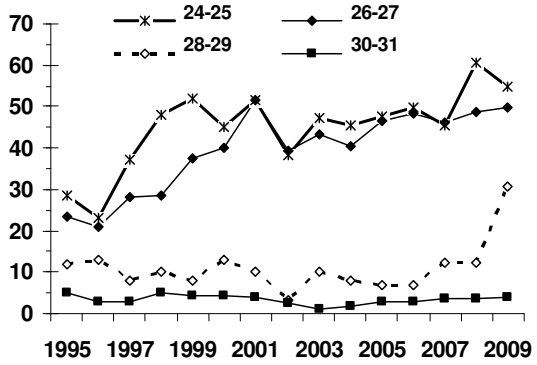

Figure 90: Median days on CPAP

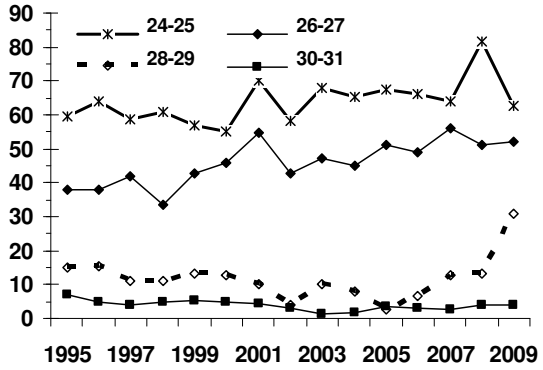

Figure 91: Median days on CPAP + IPPV

The shift in 1997 to a CPAP-based approach heralded 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 gradual trend towards a shorter duration of IPPV down to 10 days for 2007. 2008 saw an increase followed by a decrease for 2009; however, it should be noted that the number of babies in the gestational age band are small so this may reflect clinical 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. Of note the number of infants 25 weeks and below is low, with an average of 22 babies per year which explains some of the year-to-year variation.

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. However, in 2009, there was also noted a significant rise for more mature infants at 28-29 weeks gestation. The cause of this is uncertain but could reflect changes in the practice of weaning from CPAP.

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

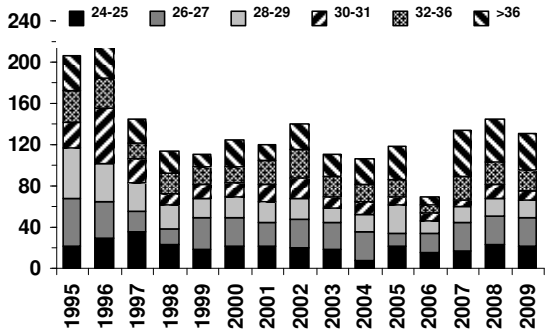

Figure 92: Number on IPPV

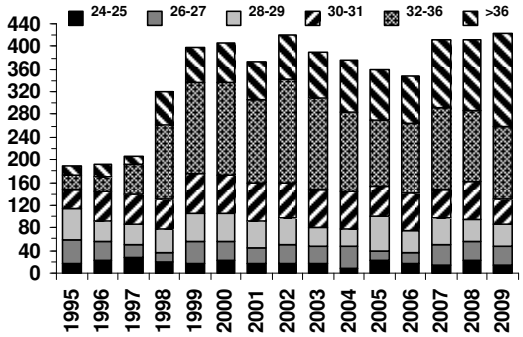

Figure 93: Number on CPAP

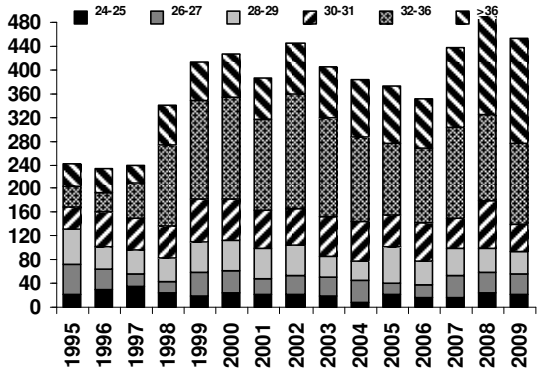

Figure 94: Number on CPAP + IPPV

These figures show the number of babies requiring respiratory support at NW over the last 14 years.

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 2010 we will also report data on the use of High Flow Humidified Oxygen/Air, which has been introduced as a method of weaning infants from CPAP. Some units use this as mode of primary respiratory support but at NW it is only used for weaning. Note also that at present NW 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).

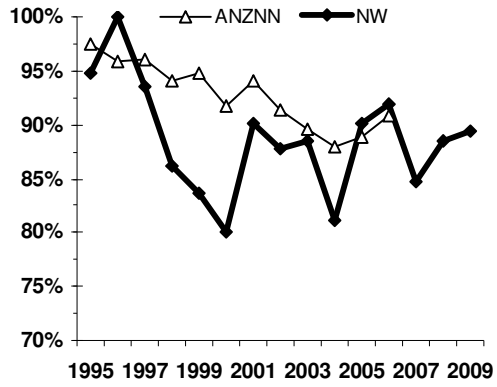

Figure 95: Percentage on IPPV (24-27 wks ANZNN assigned)

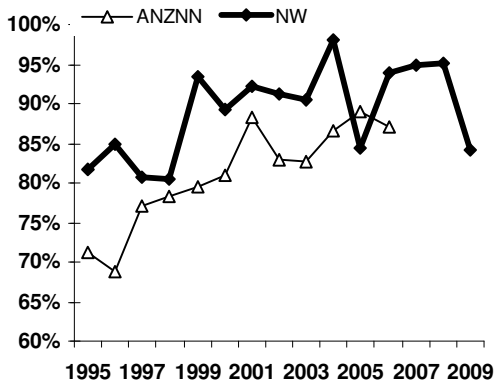

Figure 96: Percentage on CPAP (24-27 wks ANZNN assigned)

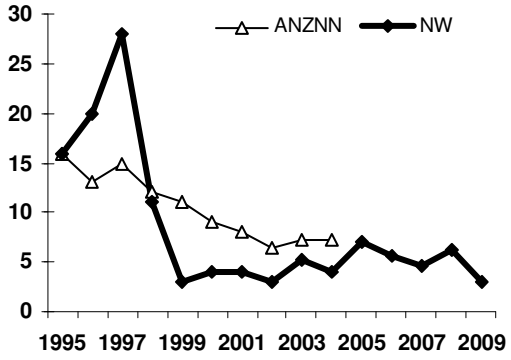

Figure 97: Median days on IPPV (24-27 wks ANZNN assigned)

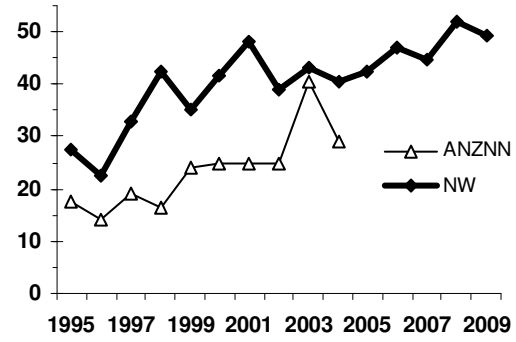

Figure 98: Median days on CPAP (24-27 wks ANZNN assigned)

Since NW 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 NW 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)

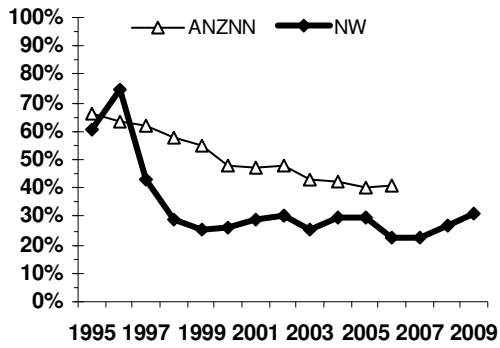

Figure 99: Percentage on IPPV (28-31 wks ANZNN assigned)

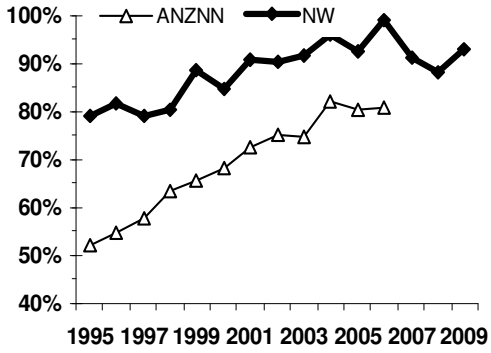

Figure 101: Percentage on CPAP (28-31 wks ANZNN assigned)

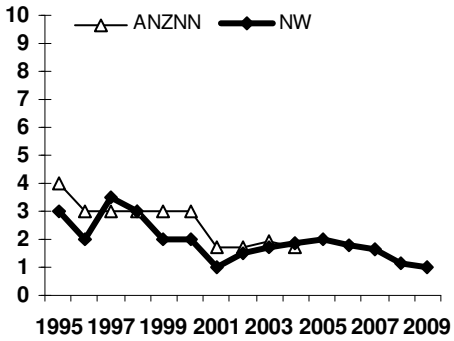

Figure 100: Median days on IPPV (28-31 wks ANZNN assigned)

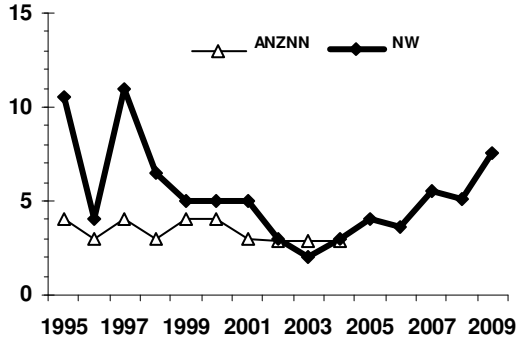

Figure 102: Median days on CPAP (28-31 wks ANZNN assigned)

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 used only for 'rescue' treatment at NW. 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 is high but term babies may be considered to do better than preterm infants.

Table 77: HFOV and inhaled nitric oxide (iNO) use and survival (2009)

	HFOV		iNO		HFOV + iNO	
	n	Survivors n(%)	n	Survivors n(%)	n	Survivors n(%)
Total	**29**	**15(52)**	**20**	**10(50)**	**12**	**5(42)**
<28 weeks	18	8(44)	7	2(29)	6	2(33)
28-31 weeks	3	2(67)	2	0	1	0
32-36 weeks	5	3(60)	3	2(67)	3	2(67)
≥37 weeks	3	2(67)	8	6(75)	2	1(50)

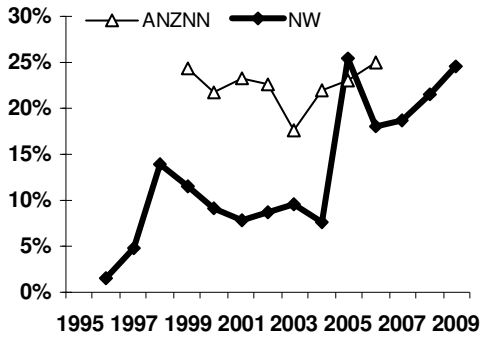

Figure 103: HFOV at 24-27 weeks (ANZNN assigned babies)

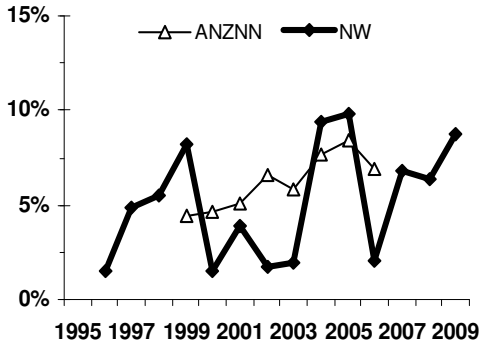

Figure 104: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies)

These two figures compare the use of HFOV and iNO at NW 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, in NW use of these interventions in preterm infants has been low but it has increased since 2003.

9.4.12 Term/post-term infants on assisted ventilation from 1995 to 2009

This figure shows the number of term infants ventilated or treated with CPAP. Inborn and outborn infants are included. There has been a significant increase in CPAP use due to the removal of headbox oxygen as a therapy. For 2007 there was an increase in the number of term infants receiving IPPV and in both 2008 and 2009 there was an increase in numbers receiving CPAP.

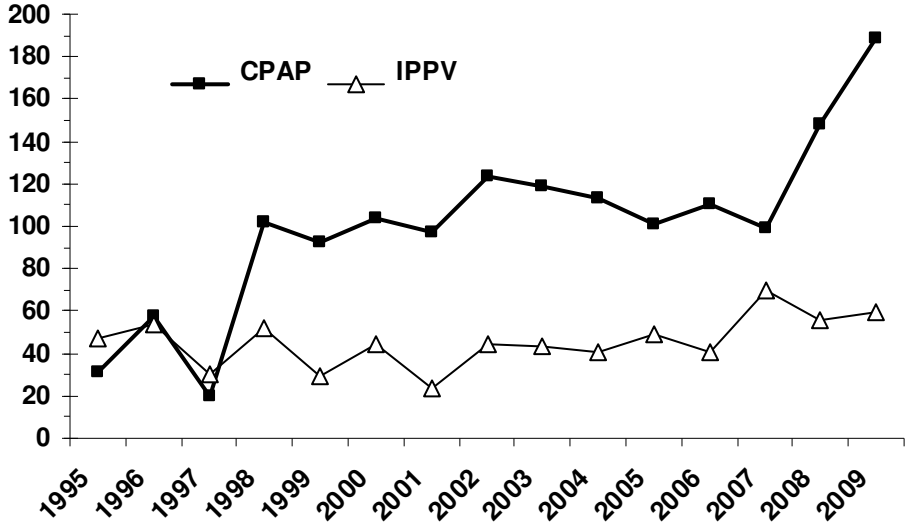

Figure 105: Number of term and post term babies needing assisted ventilation

In previous years the most common reasons for ventilating term infants were meconium aspiration or persistent pulmonary hypertension of the newborn (PPHN) In 2009, TTN/RDS, congenital anomalies, support for surgery, neonatal encephalopathy and “other”, which could include a neuromuscular problem were the most common reasons for ventilation (see table 229 in 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 2009, the most common reason for using CPAP was transient tachypnoea of the newborn with 100 babies on CPAP (>50% of CPAP use at term), followed by other, meconium aspiration and infection (see table 239 in appendix 8).

9.5 Outcomes

9.5.1 Survival of NW inborn babies by birthweight

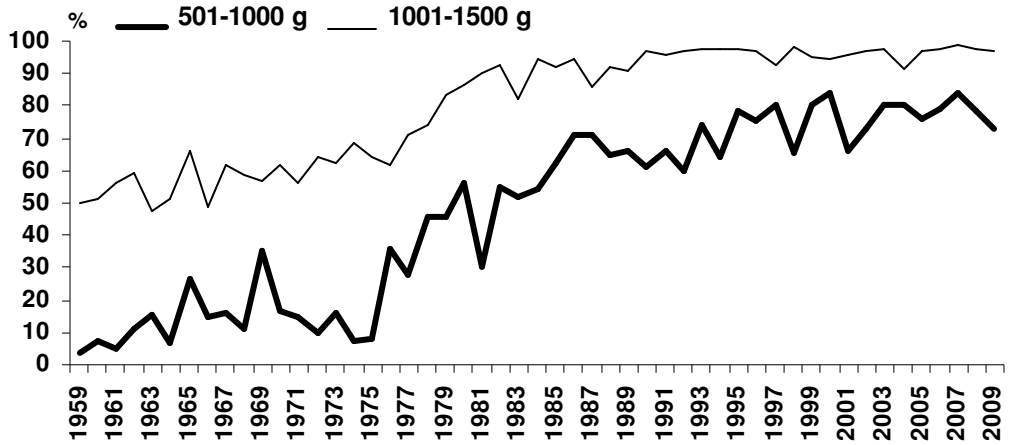

Figure 106: Neonatal survival (0-28 days) of ≤1500g inborn live births from 1959 to 2009

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

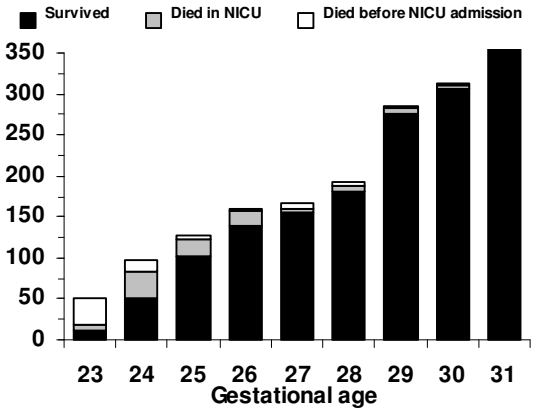

Figure 107: Numbers of live inborn babies 23 to 31 weeks gestation in 2000-2009

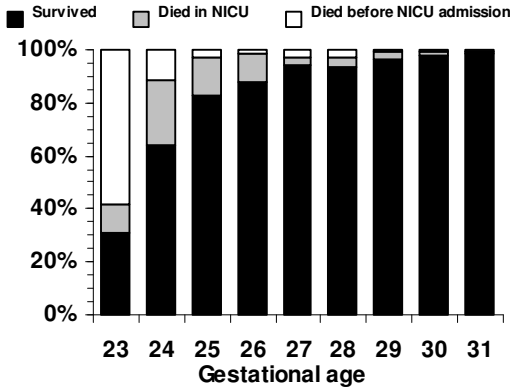

Figure 108: Survival of live inborn babies 23-31 weeks 2000-2009 (n = 1606)

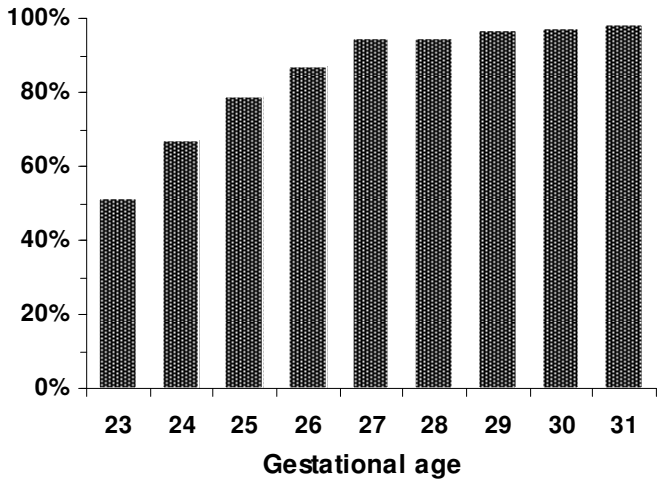

Figure 109: Survival of live inborn babies admitted to NICU from 1995 to 2009 (n =2454)

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 NW 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)

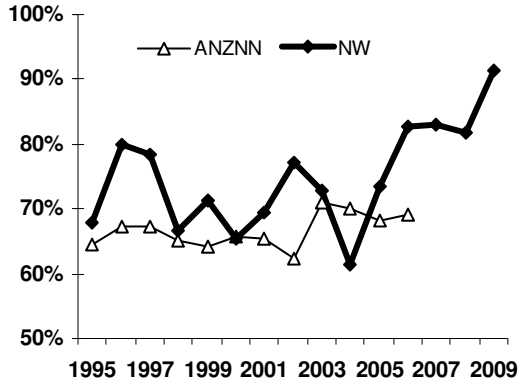

Figure 110: Survival at 24-25 weeks gestation compared with ANZNN data

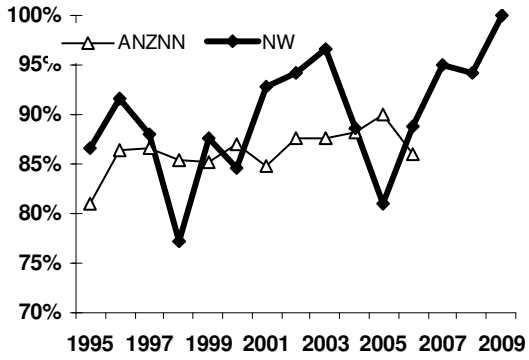

Figure 111: Survival at 26-27 weeks compared with ANZNN data

Survival at NW at these immature gestations is consistently good. The relatively small numbers at 24-25 weeks gestation account for the year to year variation at NW. 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)

One baby who was inborn at NW (975g and 29 wks gestation) developed Cystic PVL in 2009. In addition two babies who were largely cared for at other hospitals and transferred to NW after 6 weeks of life were diagnosed with PVL.

9.5.5 Retinopathy of prematurity benchmarked with ANZNN

Although changes in the screening technique and the appointment of a new ophthalmologist in 2006 was 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 4 years: 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 5.7% in 2009, 4.7% in 2008, 5% in 2007 and 6% in 2006 compared to 1% in both 2005 and 2004. In 2009, 4 inborn babies received laser therapy for advanced ROP.

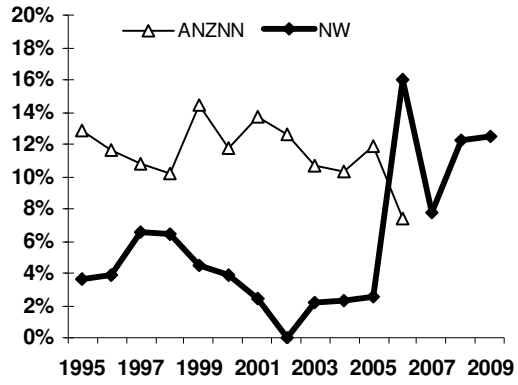

Figure 112: ROP at 24-27 weeks

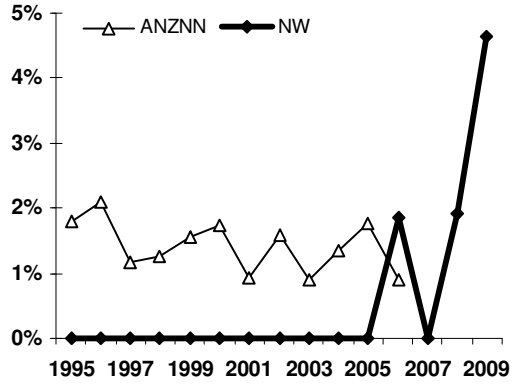

Figure 113: ROP at 28-31 weeks

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.

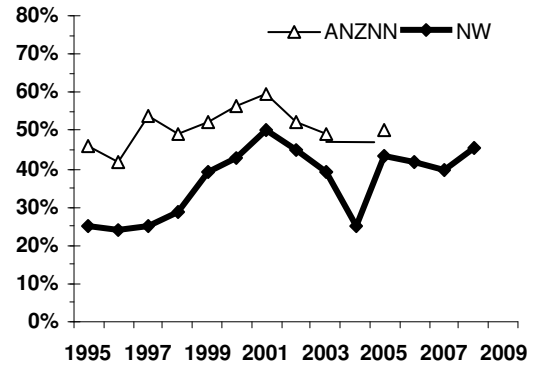

Figure 114: Chronic lung disease at 24-27weeks

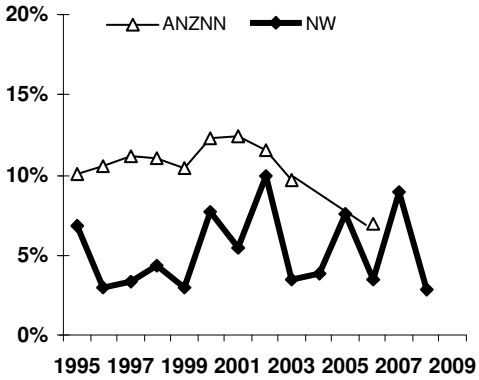

Figure 115: Chronic lung disease at 28-31weeks

Overall ANZNN data demonstrate that for infants 24-27 weeks gestation there was an increase in the rate of CLD in the late 1990s. NW 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 NW 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. Particularly when there have been changes in the way treatments have been applied. An example of this is the use of pulse oximetry. The target oxygen saturation levels increased in the late 1990s, only to fall again in 2002 with the presentation of the BOOST trial of oxygen saturation in CLD. It is likely that much of the temporal trend in the incidence of CLD is due to change in treatment used rather than any changes in underlying lung disease.

9.5.7 Necrotising enterocolitis benchmarked with ANZNN

In 2009, 6 inborn infants (4 % of VLBW infants and 4 % <32 week gestation infants) developed proven NEC. Although the incidence was low overall, there seemed to be an increase in the incidence between 2002 and 2005 in infants under 28 weeks gestation. However this was not statistically significant and can be attributed to random variation.

In addition eight infants with proven NEC were transferred in from other hospitals for surgery and subsequent management. Some of these infants had long periods of stay in the neonatal unit due to short bowel syndrome and complex nutritional needs.

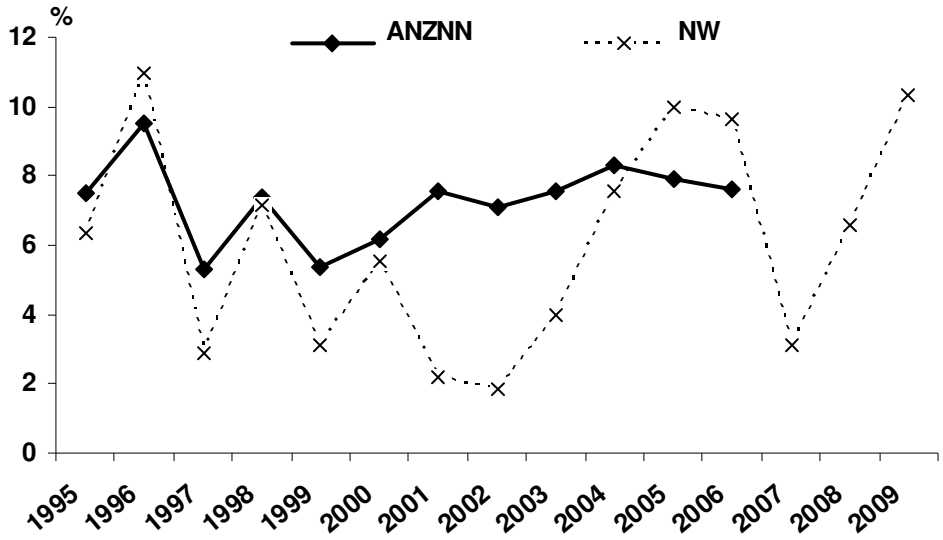

Figure 116: NEC in ANZNN assigned babies under 28 weeks gestation compared with the incidence in ANZNN 1995-2009

9.5.8 Patent Ductus Arteriosus (ANZNN babies)

With the changing attitude towards ductus treatment a pilot RCT (INDUCE study) was started in 2007 looking at treatment versus non-treatment with Indomethacin and its impact on chronic lung disease.

In 2009, 21 inborn infants were treated for a symptomatic PDA. This included 18 infants who had a single course of indomethacin and three a repeat course plus three infants recruited into the INDUCE trial. 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. In 2009, 3 infants had surgical ligation of their PDA.

9.5.9 Pneumothorax needing drainage (ANZNN babies)

Thirteen babies developed a pneumothorax that needed drainage in 2009. An additional 12 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, 6 were term.

In the group benchmarked with ANZNN babies only 3 babies or 2% had a pneumothorax requiring drainage.

9.5.10 Postnatal corticosteroids (ANZNN babies)

These data are on the use of postnatal corticosteroids to treat CLD. Data on steroid use to facilitate extubation, associated with upper airway oedema, are excluded. The denominator used in the figures is the number of babies alive at 1 week of age.

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

In 2009, the overall rate for postnatal steroid use was 5% for the group of babies benchmarked with ANZNN. The rates of those treated decreased with advancing gestational age from 25 % for infants 24-25 gestation to zero for 30-31 weeks gestation.

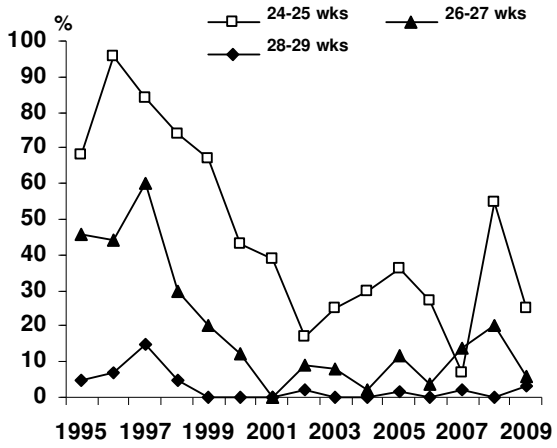

Figure 117: Percentage receiving postnatal dexamethasone by gestational age (ANZNN alive at one week <32wks)

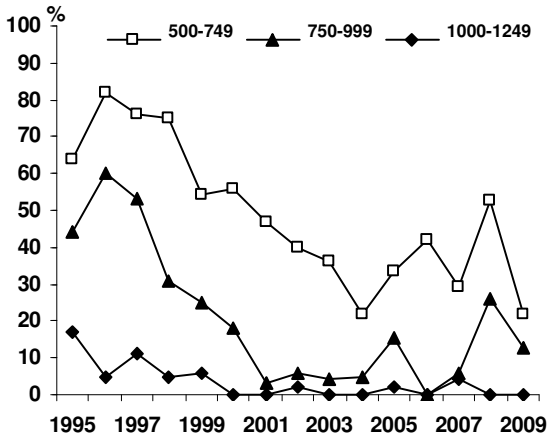

Figure 118: Percentage receiving postnatal dexamethasone by birth weight (ANZNN alive at one week <1500g)

9.6 Immunisation

9.6.1 Hepatitis B

In 2009, 18 infants admitted to NICU were identified as potentially exposed to hepatitis B in the perinatal period. Sixteen were received immunisation and Hep B immunoglobulin in labour and birthing suite or the neonatal unit and one received this treatment prior to admission to the neonatal unit. The other infant was transferred on day 4 with a lethal condition and was presumed treated at the base hospital.

9.6.2 BCG

70 babies were given BCG vaccination whilst in the neonatal unit.

9.6.3 Infrarix Hexa and Prevanar at 6 weeks

There were 92 babies who were first admitted before 42 days and finally discharged at or after 42 days, and who did not die so were potentially eligible for their 6 week immunisation. Eighty two babies (84%) had their immunisation at the routine time. Of the ten babies who did not have immunisation at the routine time: the parents declined for 2 and wanted to delay until 6 weeks post term in 1, it was elected to delay vaccination in a further 6 infants. Of those that were delayed 3 were on dexamethasone for chronic lung disease at the time, 3 were planned to be delayed until after cardiac or other major surgery and one was transferred to the referring hospital at the time immunisations were due. In addition, 6 babies had more than one admission to NICU but were not at NWH at 42 days so the responsibility for immunisation was taken elsewhere.

9.6.4 Infrarix Hexa and Prevanar at 3 months

There were 27 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 20 (74%) received these at the routine time. Of the 7 babies who did not have immunisation at the routine time: the parents declined for 2; 3 were transferred in for surgery, and the immunisations were given later after recovery; one infant was on dexamethasone for chronic lung disease and one infant was a transfer in with major sepsis, 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.

Achieving a high rate of breast feeding is an important goal for those who look after sick or preterm infants and their mothers. However, there are ongoing and different challenges for the different groups of babies. For the most preterm infants, who may be in hospital for 3 or more months, 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. Note the group 20-24 wks in the figure only contains 4 infants but 25-27 wks has 39 infants so is more representative of feeding in the NICU.

For most preterm infants time to establishing feeding is a major determinant of length of NICU stay but 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.

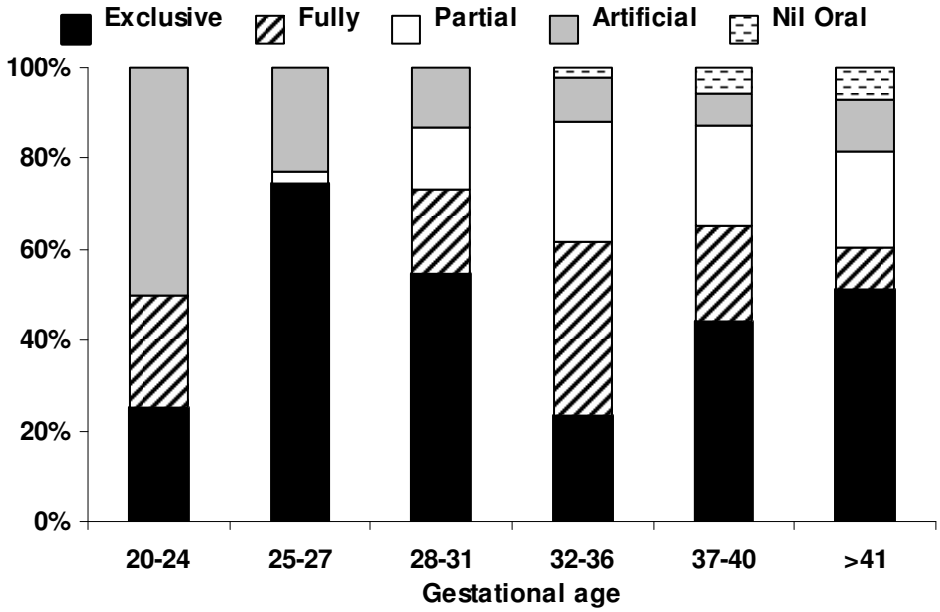

Figure 119: Method of feeding at discharge from NICU by gestational age and birth weight

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 2009. 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 2007

One hundred and sixty-one infants who weighed <1500 grams, survived to discharge from the Newborn Service. Fifty-six (35%) weighed <1000 grams at birth.

Eight infants with congenital abnormalities were excluded from the following tables. Two infants died after discharge from NW. Seventeen children were lost to followup of whom five weighed less than 1000 grams. Nine were from other centres in New Zealand, four lived overseas, and four did not attend appointments. Data were obtained for 134 (89%) children.

One hundred and eighteen 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 their progress.

The *Bayley Scales of Infant 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 78: 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 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 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 79: Outcome categories at 2 years for children under 1500g born in 2007 (n=134)

	Number	Description
Category I	1 (0.7%)	1 child with sensori-neural hearing loss with aids, left hemiplegia, language and social delay.
Category II	9 (6.7%)	6 children with low cognitive scores. 1 child with low cognitive and motor scores and hemiplegia. 1 child with hemiplegia. 1 child with myopia and spectacles.
Category III	2 (1.6%)	2 children with motor delay.
Category IV	122 (91.0%)	

Table 80: Outcome of children <1500g born in 2007 at 2 years by gestational age groups (n=134)

	Gestational age (weeks)					
Outcome	**23-28 weeks n=69**		**29 – 34 weeks n=65**		**Total n=134**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	1	(1.4)	0		1	(0.7)
II	7	(10.2)	2	(3.1)	9	(6.7)
III	2	(2.9)	0		2	(1.6)
IV	59	(85.5)	63	(96.9)	122	(91.0)

Table 81: Outcome of children <1500g born in 2007 at 2 years by birth weight groups (n=134)

	Birthweight (grams)					
Outcome	**<1000g n=46**		**1000 – 1499g n=88**		**Total n=134**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	1	(2.1)	0		1	(0.7)
II	7	(15.3)	2	(2.3)	9	(6.7)
III	1	(2.1)	1	(1.1)	2	(1.6)
IV	37	(80.5)	85	(96.6)	122	(91.0)

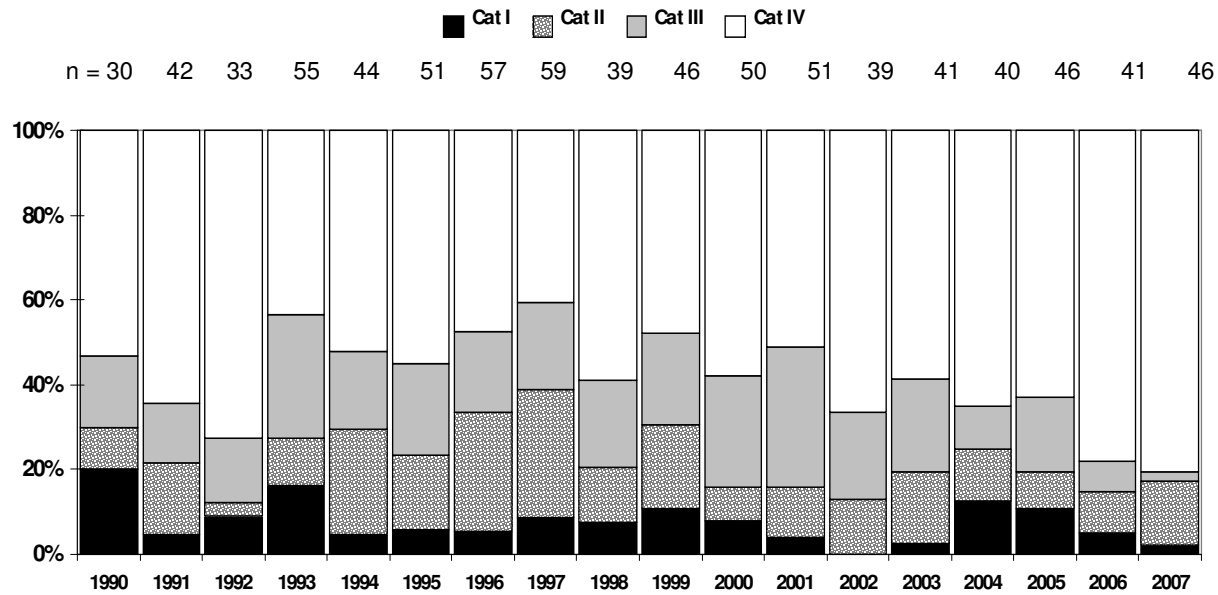

Figure 120: Outcome at 18-24 months of children <1000g birth weight born 1990-2007

9.9.2 Development at 4 years of children under 1500g born in 2005

One hundred and forty-four children born in 2005, who weighed less than 1500 grams and were cared for in the Newborn Service, survived to hospital discharge. There were 52 infants less than 1000grams. Seven children had congenital abnormalities and were not included in the analyses of data.

No infants were known to have died after discharge from NW (except one of the children with a major congenital abnormality).

At 4 years, data were obtained for 97 children. Of the 40 not assessed 22 (55%) 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 82: Outcome categories at 4 years

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

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

Table 83: Outcome categories at 4 years for children under 1500g born 2005 (n =97)

	Number	Description
Category I	4 (4%)	1 child with severe intellectual disability (and tracheostomy in situ at 4.5 years). 1 child with cognitive impairment and Autistic Spectrum Disorder. 1 child with global developmental delay and mild cerebral palsy. 1 child with cerebral palsy (could not walk alone at 4 years).
Category II	17 (18%)	2 children with cognitive and motor delay. 2 children with cerebral palsy (L hemiplegia, spastic diplegia). 9 children with cognitive delay. 4 children with global developmental delay.
Category III	5 (5%)	4 children with low motor scores. 1 child with low motor score and shunted hydrocephalus.
Category IV	71 (73%)	

Summary

Babies weighing less than 1500g at birth are at risk for developmental problems. However, less than 1% of children born in 2007 and examined around 2 years corrected age, had severe disability. Ninety-one percent were within the average range for cognitive and motor development.

For children born in 2005, and assessed at 4 years, 4 percent had severe disability, and 73 percent were within the average range or above for cognitive and motor abilities.

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 within 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 within 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 clinical practice or policies are referred to the Maternal Clinical Review Committee.

10.1 Perinatal and perinatal-related mortality rates

Table 84: Inborn and BBA deaths

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fetal deaths	20-22 weeks	33	20	30	23	25	26	24	24	29	24
	23-24 weeks	12	10	10	8	18	11	12	15	11	14
	25-26 weeks	9	2	4	6	3	3	6	7	4	4
	27-28 weeks	3	1	2	1	10	6	3	5	8	6
	29-38 weeks	27	15	17	24	13	17	24	19	21	19
	>38 weeks		9	6	2	13	5	5	12	3	8
Total fetal deaths		**84**	**57**	**69**	**64**	**82**	**68**	**74**	**82**	**76**	**75**
Neonatal deaths	Early neonatal deaths (≤7 days)	43	32	40	34	33	38	23	20	26	27
	Late neonatal deaths (8-28 days)	9	5	7	7	9	5	2	9	8	10
Total neonatal deaths		**52**	**37**	**47**	**41**	**42**	**43**	**25**	**29**	**34**	**37**
Total deaths		136	94	116	105	124	111	99	111	110	112
Perinatal mortality rate/1000		15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2	12.9
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
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

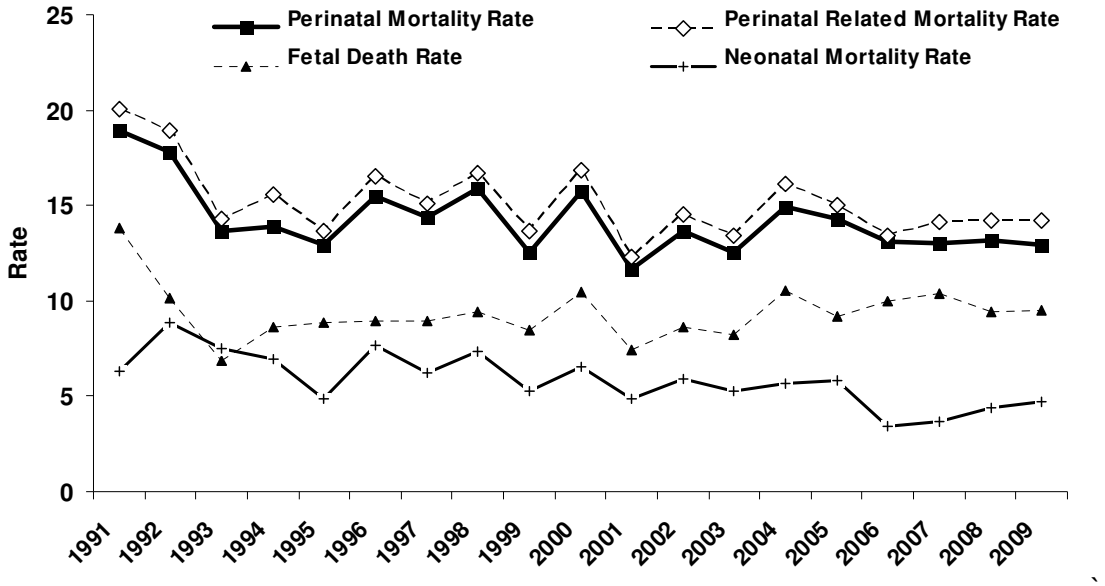

Figure 121: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate (1991-2009) (all rates expressed as deaths/1000 births)

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

Table 85: Perinatal related loss and DHB of residence

DHB of residence	TOP N=26		Stillbirth N=51		Neonatal death N=35		Perinatal related death N=112	
	n	%	n	%	n	%	n	%
Auckland	18	69.2	36	70.6	16	45.7	70	62.5
Counties Manukau	1	3.8	6	11.8	2	5.7	9	8.0
Waitemata	5	19.2	7	13.7	11	31.4	23	20.5
Other	2	7.7	2	3.9	6	17.1	10	8.9

38% 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 2009 was 12.4/1000 total births.

10.2 Gestational age and perinatal-related loss

Table 86: 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***
20-23 weeks	43	0.5	30	40.0	3.8	13	35.1	100	43	38.3	5.4
24-27 weeks	73	0.9	14	18.7	1.8	14	37.8	237	28	25.0	3.5
28-31 weeks	98	1.2	7	9.3	0.9	0			7	6.3	0.9
32-36 weeks	555	7.0	9	12.0	1.2	4	10.8	7.3	13	11.6	1.7
37-40 weeks	5986	74.7	13	17.3	1.8	4	10.8	0.7	17	15.2	2.4
≥41 weeks	1142	14.5	2	2.7	1.8	2	5.4	1.8	4	3.6	3.5
Total	7897		75		9.5	37		4.7	112		14.2

* 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 87: 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	7576	95.9	69	92	9.1	30	81.1	4.0	99	88.4	13.1
Multiple	321	4.1	6	8.0	18.7	7	18.9	21.9	13	11.6	40.4
Total	7897		75		9.5	37		4.7	112		14.2

* 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 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 Maternal characteristics and perinatal mortality

Table 88: Relative risk of fetal death, neonatal death and perinatal related mortality by demographic factors among women RESIDING IN ADHB AREA and giving birth at NW 2006-2009

	Total births n=21665	Fetal deaths n=182			Neonatal deaths n=67			Perinatal related deaths n=249		
		n	FD rate*	RR (95% CI)	n	NND rate‡	RR (95% CI)	n	Perinatal related mortality rate†	RR (95%CI)
Maternal Ethnicity										
NZ European	8512	50	5.9	Ref	13	1.5	Ref	63	7.4	Ref
Maori	1794	24	13.4	2.3 (1.4-3.7)	15	8.5	5.5 (2.6-11.6)	39	21.7	2.9 (2.0-4.4)
Pacific	3521	40	11.4	1.9 (1.3-2.5)	16	4.6	3.0 (1.4-6.2)	56	15.9	2.1 (1.5-3.1)
Asian	3469	26	7.5	1.3 (0.8-2.0)	12	3.5	2.3 (1.0-5.0)	38	11.0	1.5 (1.0-2.2)
Indian	1623	17	10.5	1.8 (1.0-3.1)	6	3.7	2.4 (0.9-6.4)	23	14.2	1.9 (1.2-3.1)
Other European	1974	17	8.6	1.5 (0.8-2.5)	3	1.5	1.0 (0.3-3.5)	20	10.1	1.4 (0.8-2.3)
Other	772	8	10.4	N	2	2.6	N	10	13.0	N
Parity										
Nullipara	10608	86	8.1	0.9 (0.7-1.2)	32	3.0	1.0 (0.6-1.5)	118	11.1	0.9 (0.7-1.2)
Multipara	11057	96	8.7	Ref	35	3.2	Ref	131	11.8	Ref
Maternal Age										
≤25	3849	43	11.2	1.5 (1.0-2.1)	20	5.3	1.7 (1.0-3.0)	63	16.4	1.5 (1.1-2.1)
26-35	12664	97	7.7	Ref	38	3.0	Ref	135	10.7	Ref
≥36	5152	42	8.2	1.1 (0.7-1.5)	9	1.8	0.6 (0.3-1.2)	51	9.9	0.9 (0.7-1.3)
Maternal Smoking										
Currently smoking	1904	31	16.3	2.0 (1.4-2.9)	17	9.1	3.4 (1.9-5.9)	48	25.2	2.3 (1.7-3.2)
No or not smoking in last month	17296	141	8.2	Ref	46	2.7	Ref	187	10.8	Ref
Missing	2465	10	4.1	N	4	1.6	N	14	5.7	N
Maternal BMI										
<19	1050	8	7.6	1.1 (0.5-2.2)	4	3.8	1.6 (0.6-4.6)	12	11.4	1.2 (0.7-2.2)
19-25	11795	84	7.1	Ref	28	2.4	Ref	112	9.5	Ref
26-30	3787	29	7.7	1.1 (0.7-1.6)	11	2.9	1.2 (0.6-2.5)	40	10.6	1.1 (0.8-1.6)
31-35	1760	18	10.2	1.4 (0.9-2.4)	10	5.7	2.4 (1.2-4.9)	28	15.9	1.7 (1.1-2.5)
>35	1398	23	16.5	2.3 (1.5-3.7)	6	4.4	1.8 (0.8-4.4)	29	20.7	2.2 (1.5-3.3)
Missing	1875	20	10.7	N	8	4.3	N	28	14.9	N
Diabetes										
GDM	867	3	3.5	N	1	1.2	N	4	4.6	N
Type1	45	2	44.4	N	0	0.0	N	2	44.4	N
Type 2	105	1	9.5	N	2	19.2	N	3	28.6	N
Non diabetic	20648	176	8.5		64	3.1		240	11.6	
Hypertension										
Gestational hypertension	716	4	5.6	N	0	0.0	N	4	5.6	N
Chronic Hypertension	469	4	8.5	N	1	2.2	N	5	10.7	N
Pre-eclampsia	672	9	13.4	N	1	1.5	N	10	14.9	N
Nil	19808	165	8.3		65	3.3		230	11.6	

* Fetal death rate = number of fetal deaths per 1000 births ‡Neonatal Death rate = number of deaths per 1000 live births
† Perinatal-related mortality rate = number of perinatal related deaths per 1000 births N= not calculated

The above table represents demographic characteristics of women with perinatal deaths at NW for a 4 year period from 2006-9. Pacific and Maori mothers both have significantly increased risks of neonatal death as well as increased fetal deaths. Indian mothers have increased perinatal mortality and a trend to increased fetal deaths. In order to determine whether these ethnic groups have an independently increased risk of perinatal death multivariate analysis needs to be performed adjusting for age, smoking, BMI and parity. Young age (<25 years) and smoking are risk factors for both fetal and neonatal death

and are also likely to be highly correlated. Consistent with the international literature maternal BMI >35 is also associated with increased risk of fetal death and a tendency to increased neonatal death.

A further analysis of deaths (n=12) among Indian women in 2009 revealed some themes. Three (25%) were due to fetal abnormalities, 6 (50%) were due to complications of poor placentation [3 with recurrent bleeds followed by SRM or labour and 3 with combinations of hypertension and IUGR]. Two deaths were in women with GDM but in one case the death was unrelated to the diabetes. The final case was a late stillbirth in an unbooked woman.

10.5 Lead maternity carer (LMC) and perinatal mortality

Table 89: 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	3433	43.5	19	25.3	5.5	8	21.6	2.3	27	24.1	7.9
Private Obstetrician	1777	22.5	11	14.7	6.2	3	8.1	1.7	14	12.5	7.9
G.P.	115	1.5	1	1.3	8.7	0	0.0	0.0	1	0.9	8.7
NW Domino	324	4.1	0	0.0	0.0	2	5.4	6.2	2	1.8	6.2
NW Community	1422	18.0	18	24.0	12.7	3	8.1	2.1	21	18.8	14.8
NW Diabetes	306	3.9	1	1.3	3.3	2	5.4	6.5	3	2.7	9.8
NW Medical	419	5.3	16	21.3	38.2	16	43.2	38.2	32	28.6	76.3
Other DHB	42	0.5	1	1.3	23.8	2	5.4	47.6	3	2.7	71.4
Unbooked	59	0.7	8	10.7	135.6	1	2.7	16.9	9	8.0	152.5
Total	7897		75		9.5	37		4.7	112		14.2

* 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 groups which are outliers 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 (153/1000). Of the 9 deaths in unbooked women, approximately half (5) were due to very preterm birth 2 of which were associated with antepartum haemorrhage. Maori and Pacific women and recent immigrants were over represented in this group of perinatal deaths,

Deaths attributed to women attending the medical clinic also includes deaths in the fetal medicine service. The commonest causes of death in this group are congenital abnormality (31%), specific perinatal condition (largely twin to twin transfusion syndrome-22%) followed by preterm (22%).

10.6 Causes of perinatal-related deaths

Table 90: Fetal and neonatal death by Perinatal Death Classification (PSANZ-PDC) 2009

	Fetal deaths n=75			Neonatal deaths n=37			Total n=112		
	n	%	Rate*	n	%	Rate**	n	%	Rate*
Congenital abnormality	22	29.3	2.8	9	24.3	1.2	31	27.7	3.9
Perinatal infection	1	1.3	0.1	3	8.1	0.4	4	3.6	0.5
Antepartum haemorrhage	10	13.3	1.3	5	13.5	0.6	15	13.4	1.9
Maternal conditions	3	4.0	0.4	3	8.1	0.4	6	5.4	0.8
Hypertension	6	8.0	0.8	0		0.0	6	5.4	0.8
Specific perinatal conditions	11	14.7	1.4	5	13.5	0.6	16	14.3	2.0
Hypoxic peripartum death	1	1.3	0.1	0		0.0	1	0.9	0.1
Fetal growth restriction	5	6.7	0.6	0		0.0	5	4.5	0.6
Spontaneous preterm	7	9.3	0.9	12	32.4	1.5	19	17.0	2.4
Unexplained antepartum death	9	12.0	1.1	0		0.0	9	8.0	1.1

* Rate: per 1000 births (n=7897 in 2009) ** Rate: per 1000 live births (n=7822 in 2009)

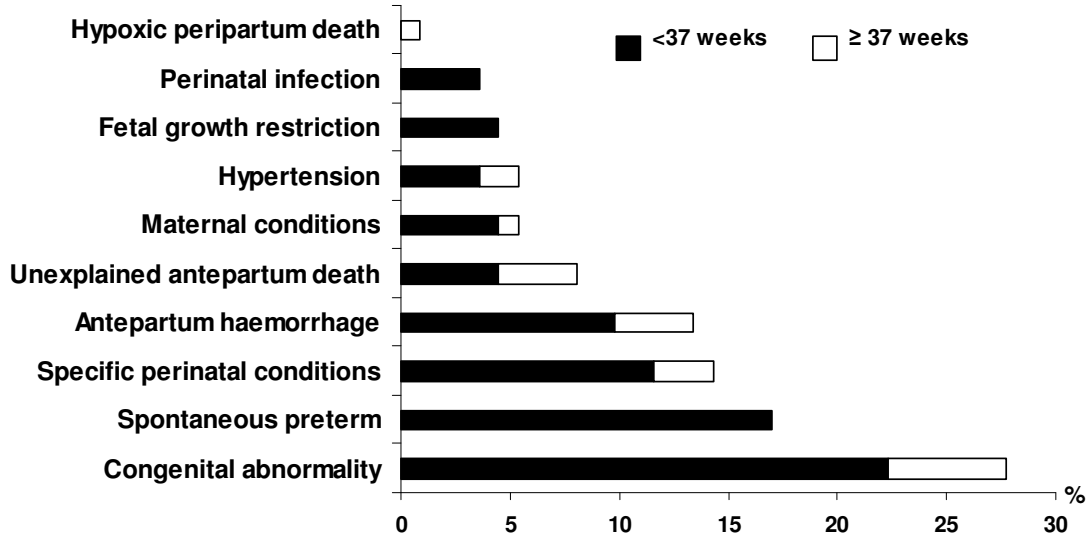

Figure 122: Contribution to perinatal related death by obstetric antecedent cause (PSANZ-PDC) and gestation at birth

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

10.7 Neonatal deaths

Table 91: Neonatal deaths by neonatal classification (PSANZ-NDC) and gestational age

	Total neonatal deaths	< 37 weeks	≥ 37 weeks
	N %	n %	n %
Total	37	31	6
Extreme prematurity	12 32	12 32	0
Congenital abnormality	10 27	5 16	5 83
Infection	2 5	2 6	0
Gastrintestinal	3 8	3 10	0
Neurological	4 11	3 10	1 2
Cardio-respiratory disorders	5 14	5 16	0
Other	1 3	1 3	0

10.8 Necropsy

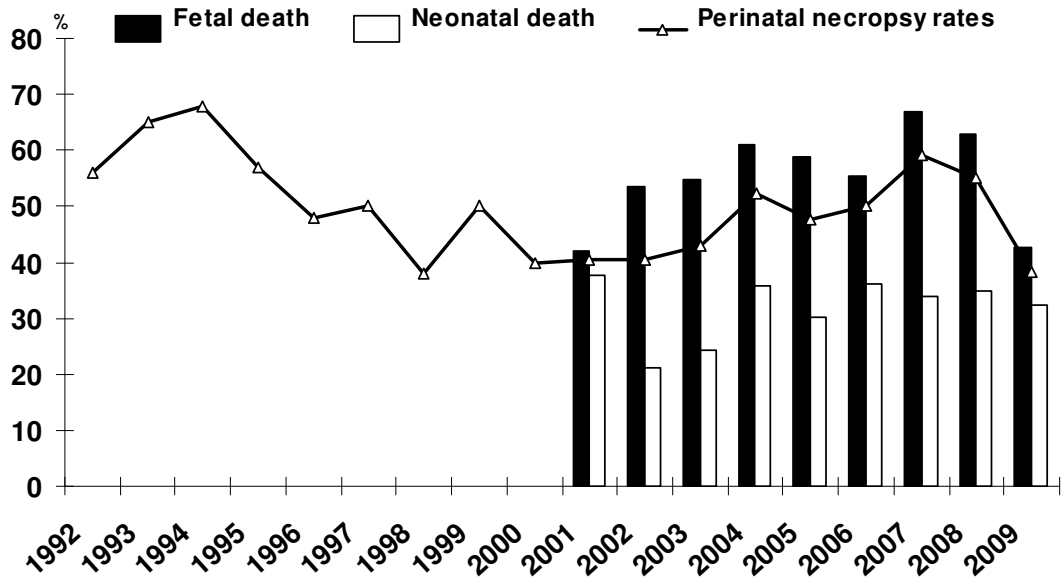

Figure 123: Necropsy rates (1991-2009)

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 has fallen to 38% in 2009, especially for fetal deaths, 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 five of the 112 deaths in 2009. However, 55 percent of all perinatal deaths in 2009 (50% in 2008) were found to be SGA defined as birthweight <10th customised centile; 57 percent of fetal deaths and 51 percent of neonatal deaths. After exclusion of deaths due to congenital abnormalities these rates were very similar with 55% of fetal deaths and 54% of neonatal deaths having birthweights <10th customised centile.

Chapter 11

GYNAECOLOGY

11 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.

11.1 Fertility PLUS

This section documents the IVF and ICSI clinical outcomes from Fertility PLUS in 2009 and a discussion on recent advancements in the service.

Table 92: Fertility PLUS IVF/ICSI clinical outcomes

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

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

It is pleasing to note that Fertility PLUS' pregnancy rate per embryo transfer remains above the NPSU benchmark. As previously discussed, the pregnancy rate is dependent on the woman's age, the cause of and duration of infertility, the number of embryos transferred and ethnicity. None of this is taken into account in the benchmarking data presented in the above table. Fertility PLUS has had an increasingly challenging population demographic. The "poor prognosis" IVF/ICSI patients have increased in number. The percentage of patients requiring maximal stimulation of FSH to produce oocytes has increased from <15% in 2006 to more than 30% in 2009.

The fine tuning of success rates in assisted reproduction is an ongoing process, and we continue to see improved implantation rates for the embryos that arise from IVF/ICSI treatments. Small percentage increases in success continue to come from developments, particularly with culture systems, in the embryology laboratory; the faithful application of evidence based fertility medicine; and the accumulated years of experience of fertility specialists.

As our success has continued to improve in the past few years, minimisation of preventable risks is becoming one of our top priorities. Prevention of hyperstimulation syndrome (OHSS) and avoidance of multiple pregnancies are of particular interest.

The single embryo transfer policy for younger women has allowed us to reduce our multiple pregnancy rates from around 30% to below 10% consistently in the past couple of years. Extended embryo culture to the blastocyst stage allows more effective selection of a single embryo, but the search continues for other means of selecting the best embryo, including the emerging approach of metabolomics. In 2009, 80% of women under 36 had only one embryo replaced, which is the best method of reducing multiple births after ART.

These women under 36 who had a single embryo transfer in 2009, had a clinical pregnancy rate of 48%, with no monozygotic twinning.

Another emerging area is that of third party assisted reproduction, an area that requires considerable counselling input. Whilst egg and sperm donation are now well established in New Zealand, we are seeing greater demand for surrogacy and embryo donation.

Preimplation genetic diagnosis (PGD) allows patients at high risk for single gene disorders, and occasionally inheritable chromosome disorders, to have children who do not have these conditions, through embryo biopsy and analysis before the time of embryo replacement. We have had a number of successful outcomes for patients undergoing this new treatment.

11.2 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 - 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 the women were resident in Counties Manukau DHB area, 30% from within ADHB and 30% from Waitemata DHB. Interpreters were required by 5% of women accessing the service.

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

Table 93: Number of terminations

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

Table 94: Number of counselling sessions

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

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.

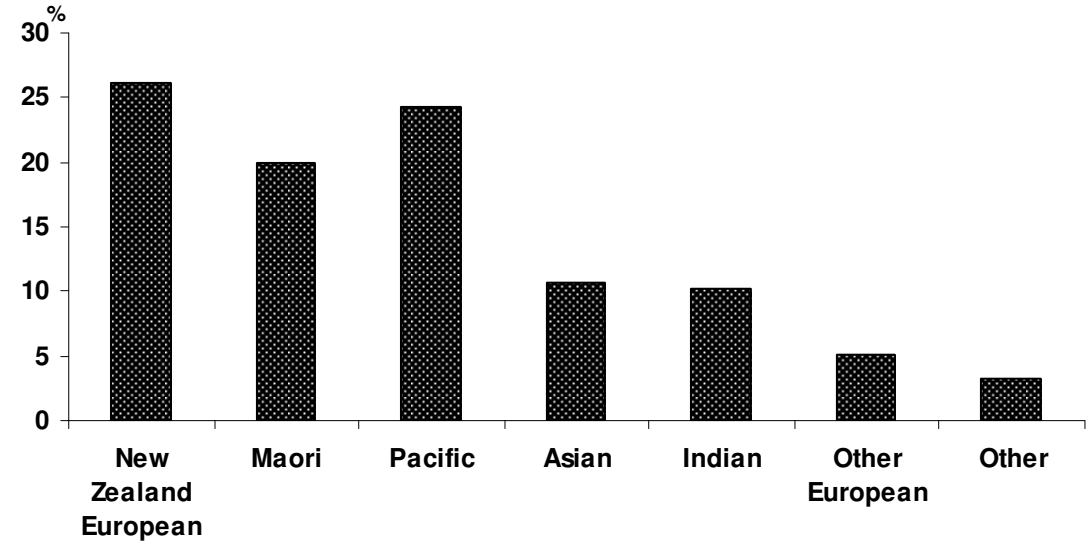

Figure 124: Ethnicity of women having a termination in 2009

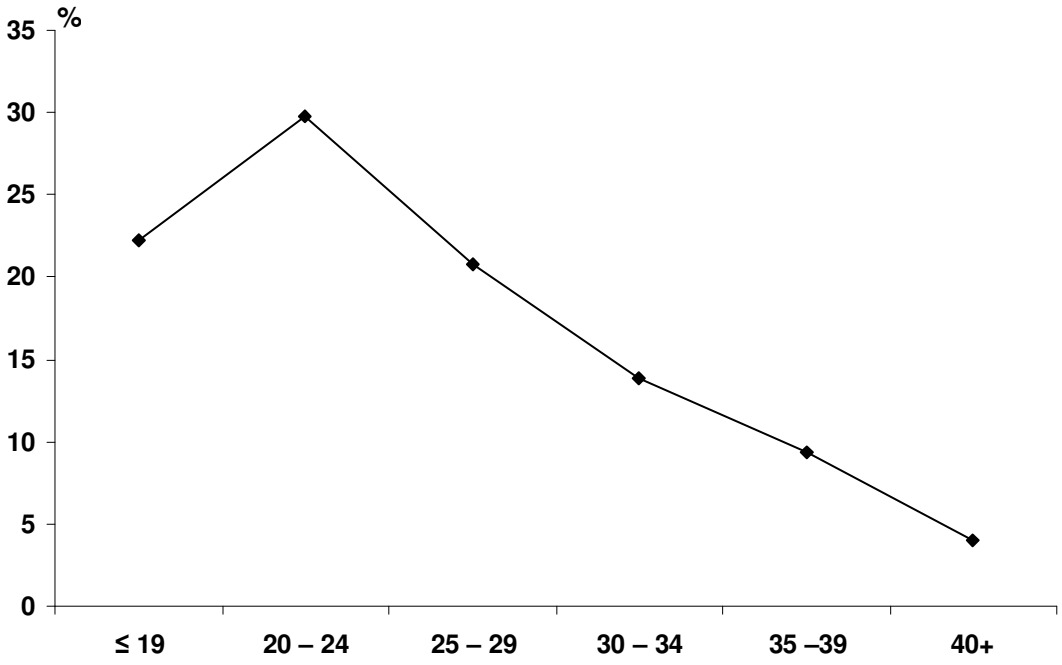

Figure 125: Age of women having a termination in 2009

11.3 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 95: Characteristics of women undergoing second trimester medical termination of pregnancy in 2009

	N=59	
	n	%
DHB of residence		
ADHB	53	90
CMDHB	4	7
Waikato	2	3
Indication for termination of pregnancy		
Fetal anomaly	16	27
Intrauterine death	16	27
Maternal mental health	17	29
SROM	10	17
Gestation (wks)		
14	9	15
15	4	7
16	11	19
17	11	19
18	14	24
19	10	17

Table 96: Clinical details and outcomes of medical termination up to 20 weeks at NW 2009

	N=59	
	n	%
Mifegynae	47	80
PV misoprostol	55	93
Oral misoprostol		
Not given	12	20
1 dose	19	32
2 dose	13	22
3 doses	9	15
$\geq$ 4 doses	6	10
Syntocinon infusion	9	15
Manual removal of placenta	6	10
Retained products of conception	1	2
Transfusion	1*	2
Nights in hospital		
0	19	32
1	33	56
2-3	6	10
>3	1*	2

*One patient with a morbidly adherent placenta required hysterectomy and blood transfusion following failed medical termination

Fifty-nine women in 2009 had a medical termination of pregnancy between 14 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 10% this year (16% in 2008). One woman with a morbidly adherent placenta failed medical treatment and required hysterectomy and blood transfusion.

In 2009, 32% of women were managed as a day stay. We are looking to change the timing of admission to achieve greater than 50% day stay.

11.4 Gynaecology inpatient surgery

Methods:

The data presented in this section are collected via a purpose built 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 11.9. 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 surgeries rather than individuals. Some individuals had more than one surgery in 2009.

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 2009, there were 1270 admissions to Ward 97 for general gynaecologic surgery. 1224 (96%) of these were for primary procedures, 19 (1.5%) were admissions for repeat surgery as a result of complications of surgery at ACH and 27 (2.1%) were admissions for repeat surgery as a result of complications of surgery at a private hospital. In 2009, only primary procedures are included in the data presented.

Table 97: Primary indication and admission timing for inpatient gynaecologic surgery

	2008 N=1256*		2009 N=1224	
	n	%	n	%
Primary indication for surgery				
Abnormal bleeding, non pregnant	272	21.7	241	19.7
Miscarriage / Termination	269	21.4	246	20.1
Urogynaecology / prolapse	163	13.0	170	13.9
Ovarian cyst	118	9.4	114	9.3
Abscess	69	5.5	56	4.6
Pain, cause unknown	67	5.3	61	5.0
Cancer / Pelvic mass	65	5.2	59	4.8
Endometriosis	61	4.9	100	8.2
Ectopic pregnancy	56	4.5	74	6.1
Infertility	26	2.1	21	1.7
Post operative complication	13	1.0		
Sterilisation	13	1.0	8	0.7
Other, please specify	64	5.1	74	6.1

* includes admissions for repeat surgery for complications

Bleeding, either associated with or outside of pregnancy, is the most frequent indication for gynaecologic surgery at ACH again in 2009. The next most common indication is urogynaecology or pelvic prolapse.

The number of women having surgical treatment for endometriosis in the last year has increased by about 60%.

Table 98: Surgical approach and timing of surgery among inpatient surgeries in 2009 by PRIMARY surgical procedure

		Timing of surgery			
	Total	Acute		Elective	
	N	n	%	n	%
Total	**1224**	**322**	**26.3**	**902**	**73.7**
Ovarian and /or tubal surgery	201	94	46.3	107	53.2
Hysteroscopy	192	14	7.3	178	92.7
Urogynaecology procedure	164	2	1.2	162	98.8
Hysterectomy	142	6	4.2	136	95.8
Surgical termination of pregnancy	135	7	5.2	128	94.8
Evacuation retained products conception	118	113	95.8	5	4.2
Diagnostic laparoscopy	106	29	27.4	77	72.6
Endometriosis surgery	65	1	1.5	64	98.5
Other vulval procedure	48	43	89.6	5	10.4
Other	27	10	37.0	17	63.0
Other uterine/cervical	26	3	11.5	23	88.5

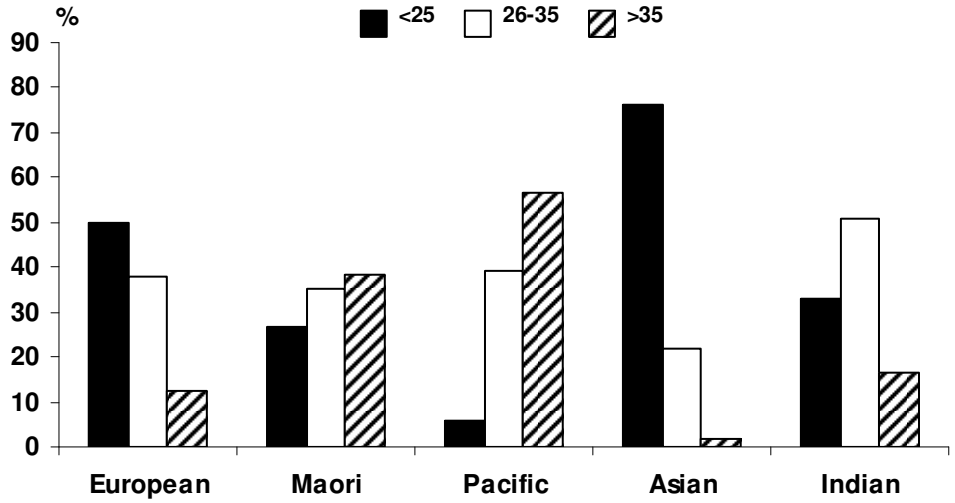

Figure 126: BMI by ethnicity among women having inpatient gynaecology surgery (2009) (missing data removed)

At least forty-four percent of our surgical population are overweight, and 17% of our population are morbidly obese (BMI>35). Height and/or weight data were missing from the database for 25% of surgeries. BMI is strongly associated with ethnicity as shown in figure 3. Surgical and anaesthetic complications are directly related to obesity.

Table 99: Demographic details of women having inpatient gynaecology surgery in 2009

	2008 N=1256		2009 N=1224	
	n	%	n	%
Ethnicity				
NZ European	456	36.3	478	39.1
Maori	136	10.8	133	10.9
Pacific	232	18.5	221	18.1
Asian	146	11.6	122	10.0
Indian	101	8.0	95	7.8
Other European	112	8.9	129	10.5
Other	54	4.3	36	2.9
Not stated	19	1.5	10	0.8
Age				
≤20	79	6.3	76	6.2
21-30	256	20.4	235	19.2
31-40	372	29.6	400	32.7
41-50	266	21.2	259	21.2
51-60	136	10.8	127	10.4
>60	147	11.7	127	10.4
BMI				
<19	24	1.9	27	2.2
19-25	325	25.9	356	29.1
26-30	228	18.2	221	18.1
31-35	143	11.4	114	9.3
>35	169	13.5	204	16.7
Missing	367	29.2	302	24.7
Smoking status				
Currently smoking	208	16.6	179	14.6
Past smoker	110	8.8	118	9.6
Never	689	54.9	675	55.2
Unknown	249	19.8	252	20.6
DHB of residence				
Auckland	1005	80.0	961	78.5
Counties Manukau	88	7.0	89	7.3
Waitemata	131	10.4	143	11.7
Other	32	2.5	31	2.5

Fifteen percent of gynaecologic surgical patients are known to be current smokers and a further 10% are past smokers. Twenty-one percent of smoking status data are missing from the database. Smoking is also an important risk factor for anaesthetic and postoperative complications.

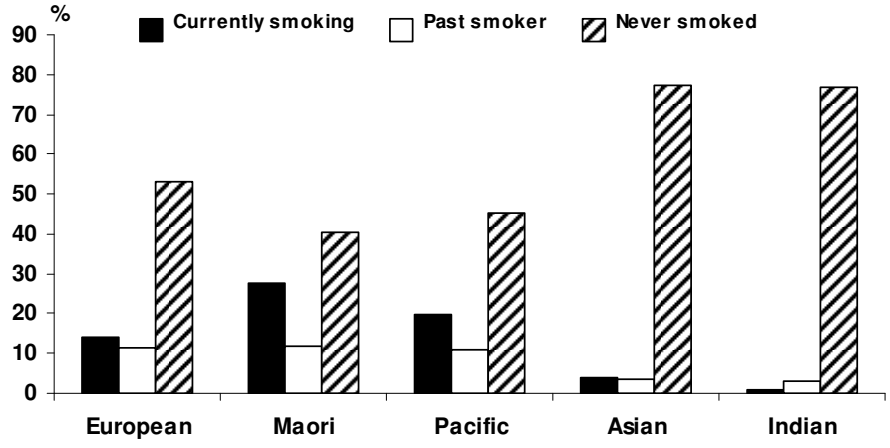

Figure 127: Smoking status by ethnicity among women having Inpatient Gynaecology surgery (2009)

ACHS Gynaecology Indicators: Injury to major viscous		ACHS 2007	ACHS 2008	NW 2008	NW 2009
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	0.98 (0.51-1.71)
Denominator	Gynaecological surgeries				

Bolded rates for NW in 2009 are significantly different from WHA mean

Table 100: Postoperative complications among inpatient surgeries in 2009 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 (includes TED)*		Admission to DCCM	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1224**	**184**	**15.0**	**23**	**1.9**	**16**	**1.3**	**62**	**5.1**	**16**	**1.3**	**12**	**1.0**	**102**	**8.3**	**5**	**0.4**	**11**	**0.9**	**4**	**0.3**
Ovarian and /or tubal surgery	201	30	14.9	3	1.5	5	2.5	12	6.0	5	2.5	3	1.5	13	6.5	2	1.0	1	0.5	1	0.5
Hysteroscopy	192	24	12.5	8	4.2	1	0.5	6	3.1	0		1	0.5	15	7.8	0		0		0	
Urogynaecology procedure	164	22	13.4	0		5	3.1	3	1.8	1	0.6	1	0.6	14	8.5	0		2	1.2	0	
Hysterectomy	142	39	27.5	3	2.1	4	2.8	16	11.3	7	4.9	2	1.4	26	18.3	2	1.4	3	2.1	2	1.4
Surgical termination of pregnancy	135	9	6.7	0		0		1	0.7	1	0.7	2	1.5	7	5.2	0		2	1.5	0	
Evacuation retained products conception	118	25	21.2	0		0		16	13.6	1	0.9	1	0.9	9	7.6	0		0		1	0.9
Diagnostic laparoscopy†	106	13	12.3	4	3.8	1	0.9	1	0.9	0		0		7	6.6	1	0.9	1	0.9	0	
Endometriosis surgery	65	6	9.2	2	3.1	0		1	1.5	1	1.5	0		4	6.2	0		1	1.5	0	
Other Vulval procedure	48	4	8.3	0		0		0		0		1	2.1	4	8.3	0		0		0	
Other	27	5	18.5	2	7.4	0		2	7.4	0		0		1	3.7	0		0		0	
Other Uterine/cervical	26	6	23.1	1	3.9	0		4	15.4	0		1	3.9	2	7.7	0		1	3.9	0	

* TED Thrombo embolic disease

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

Definitions of complications:

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: If 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.

The overall complication rate was 15% among women having inpatient gynaecologic surgery in 2009. This rate is unchanged from 2008.

Of the 4 admissions to the department of critical care medicine (DCCM), two admissions were anticipated due to multiple medical problems and the remaining two presented with sepsis pre-procedure (a small bowel obstruction associated with uterine carcinoma adherent to the omentum and fetal demise associated with sepsis).

There were eleven women who had “other” significant complications. There was one case of deep venous thrombosis in a patient with a BMI of 48 who had been given Clexane for 5 days postop. Two women had heavy bleeding following termination of pregnancy, one due to placenta accreta who went on to abdominal hysterectomy. One woman had a ureteric injury at hysterectomy requiring placement of a nephrostomy tube. Two women had mild ileus, one respiratory failure due to opiate, and a further one woman developed a neuropraxia due to positioning. There was a case of intraoperative pneumothorax during laparoscopic perihepatic adhesiolysis for RUQ pain and endometriosis treatment. The final two cases were of postoperative bleeding.

Table 101: Complications of surgery by timing of surgery

	Acute admission N=322		Elective admission N=902	
	n	%	n	%
Any complication	65	20.3	120	13.3
Transfusion	37	11.5	25	2.8

There is a higher overall complication rate following acute surgery compared to elective surgery. However there is no difference in the overall complication rate if transfusion is excluded.

Table 102: Intra operative injury

	N=16	
	n	%
Bladder	8	50.0
Bowel	4	25.0
Uterus	2	12.5
Other	2	12.5

11.5 Gynaecologic laparoscopic procedures

Methods

The data in this section have been obtained from a stand-alone ACCESS database of inpatient gynaecologic surgery procedures. This database was set up for the purpose of surgical audit and does not include procedures performed within the Gynaecologic Oncology team, or procedures performed for complications of primary surgery.

Table 103: Primary surgery performed, and timing of surgery among women having inpatient laparoscopic procedures in 2009

	Surgery in 2009 N=314		Acute admission		Elective admission	
	n	%	n	%	n	%
Total	**314**		**87**	**28**	**227**	**72**
Diagnostic laparoscopy	98	31	28	29	70	71
Ovarian cyst procedure	131	42	59	45	72	55
Endometriosis surgery	60	19	0		60	100
Hysterectomy	15	5	0		15	100
Urogynaecology procedure	2	1	0		2	100
Other uterine/cervical procedure	3	1	0		3	100
Hysteroscopy	3	1	0		3	100
Other	2	1	0		2	100

Table 104: Primary indication for surgery by timing of surgery among women having inpatient laparoscopic procedures in 2009

	Surgery in 2009 N=314		Acute admission		Elective admission	
	n	%	n	%	n	%
Total	**314**		**87**	**28**	**227**	**72**
Abnormal bleeding	18	6	2	16	16	89
Abscess	3	1	2	67	1	33
Cancer/pelvic mass	4	1	1	25	3	75
Ectopic pregnancy	52	17	51	98	1	2
Endometriosis	85	27	1	1	84	99
Infertility	18	6	0		18	100
Ovarian cyst	63	20	18	29	45	71
Pain, cause unknown	51	16	12	24	39	76
Sterilisation	8	3	0		8	100
Urogynaecology / prolapse	2	1	0		2	100
Other	10	3	0		10	100

Among women undergoing gynaecologic laparoscopic surgery in 2009, the most common indications were ovarian cysts, endometriosis, ectopic pregnancy, and pain of unknown cause. A similar proportion of laparoscopic procedures are acute (28%) as among operative procedures overall.

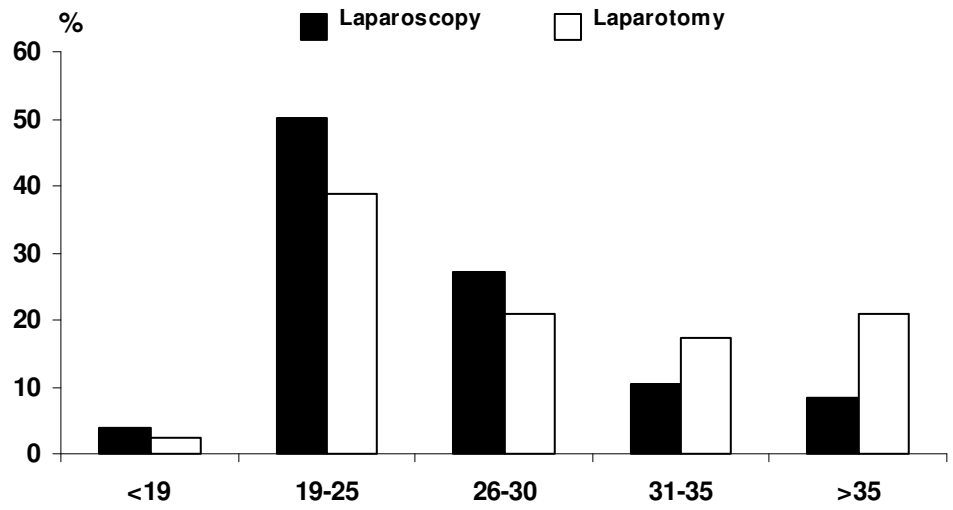

Figure 128: Distribution of BMI by surgical approach

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	NW 2008	NW 2009
Indicator	**Definition**	**%**	**%**	**%**	**%**
Numerator	Injury to major viscous during laparoscopic procedure, with repair, during or up to 2 weeks post operation	1.08	0.67	5/315=1.6	3/314=0.96 (95% CI 0.2-2.8)
Denominator	Laparoscopic procedures				

Table 105: Complications of inpatient gynaecologic laparoscopic surgery

	Total N=314	
	n	**%**
ANY COMPLICATION	36	11.5
Blood transfusion	3	1.0
Intra operative injury	5	1.6
Failure to complete procedure	6	1.9
Anaesthetic complications	2	0.6
Significant post-operative infection	4	1.3
Unplanned return to theatre	1	0.3
Admission to DCCM	0	
Readmission to hospital	24	7.6
Post op complications	20	6.4
Planned re admission	1	0.3
Other	3	1.0
Other significant complications	1	0.3

Of the 3 women requiring blood transfusion, 2 had pre-existing anaemia, and 1 case had a ruptured ectopic with minimal intraoperative blood loss.

Of the 6 cases where the planned procedure was not completed, 2 were due to dense bowel adhesions. It may have been possible to proceed with these cases if the women had been adequately counselled about the risk and if other specialties had been involved preoperatively. In a further 3 cases the planned procedure was not completed because it was deemed not necessary or not appropriate (eg cyst no longer present or alternative pathology found).These cases could have been booked as diagnostic laparoscopy +/-

cystectomy. In only 1 case, there was an intraoperative injury resulting in suspension of the case (this was a pneumothorax during perihepatic adhesiolysis for RUQ pain and endometriosis treatment).

In terms of minimizing failure to complete laparoscopic procedures, patient selection and counselling of risks appear important along with the need to involve specialists from other fields early.

11.6 Hysterectomy

Methods

Hysterectomy data have been obtained from a stand-alone ACCESS database of Ward 97 inpatient gynaecologic surgery procedures. This database was set up for the purpose of surgical audit and does not include procedures 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.

Findings

Table 106: Characteristics of women undergoing hysterectomy (excluding gynaecologic oncology) during 2009

	N=162	
	n	%
Age		
≤20	1	0.6
21-30	3	1.9
31-40	25	15.4
41-50	73	45.1
51-60	32	19.8
>60	28	17.3
Ethnicity		
NZ European	56	34.6
Maori	20	12.4
Pacific	20	12.4
Asian	25	15.4
Indian	22	13.6
Other European	16	9.9
Other	3	1.9
District Health Board of residence		
Auckland	153	94.4
Counties Manukau	1	0.6
Waitemata	5	3.1
Other	3	1.8
BMI		
<19	5	3.1
19-25	49	30.3
26-30	45	27.8
31-35	23	14.2
>35	27	16.7
Missing	13	8.0
Smoking		
Currently smoking	24	14.8
Past smoker	14	8.6
Never smoked	115	71.0
Unknown	8	4.9

Table 107: Surgical details of hysterectomies (excluding gynaecologic oncology) 2009

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

Table 108: Route of hysterectomy among non-malignant hysterectomies (2001-2009)

	2001 N=170		2002 N=208		2003 N=187		2005 N=161		2006 N=131		2007 N=189		2008 N=150		2009 N=162	
	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	86	57.3	109	67
Vaginal	65	38.2	72	34.6	63	33.7	54	34	36	27.5	67	35.4	45	30.0	37	23
Laparoscopic	15	8.8	23	11.1	24	12.8	21	13.0	14	10.7	13	6.9	19	12.7	16	10

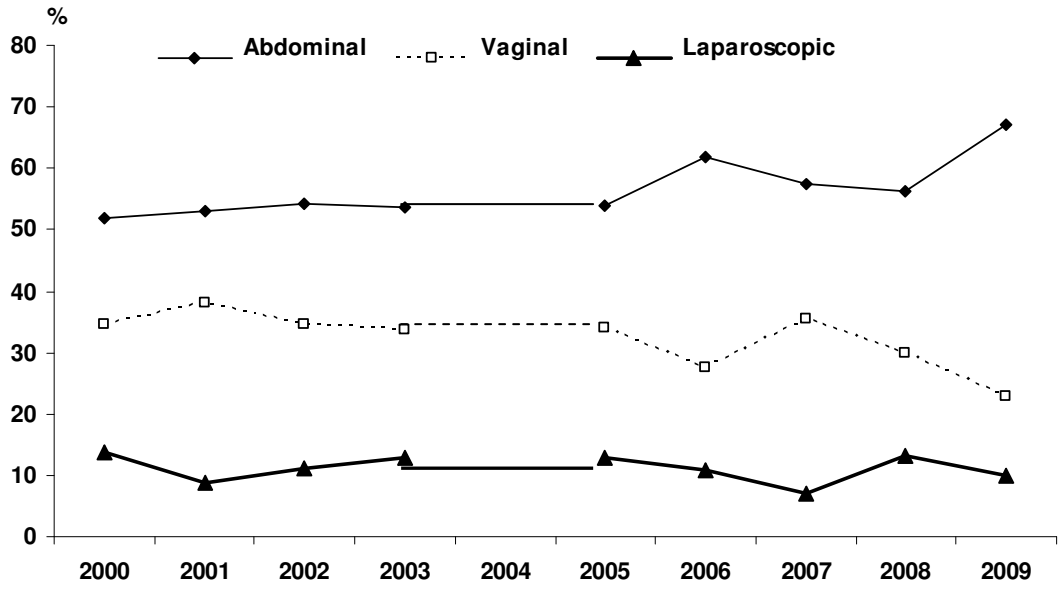

Figure 129: Route of hysterectomy among non malignant hysterectomies (2000-2009)

ACHS Gynaecology Indicators: Injury to URETER during a laparoscopic hysterectomy		ACHS 2007	ACHS 2008	NW 2008	NW 2009
Indicator	**Definition**	**%**	**%**	**%**	**%**
Numerator	Injury to ureter during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	0.17	0.57	0/19	0/26
Denominator	Laparoscopic hysterectomy procedures				

ACHS Gynaecology Indicators: Injury to BLADDER during a laparoscopic hysterectomy		ACHS 2007	ACHS 2008	NW 2008	NW 2009
Indicator	**Definition**	**%**	**%**	**%**	**%**
Numerator	Injury to bladder during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	1.13	0.48	0/19	0/26
Denominator	Laparoscopic hysterectomy procedures				

Table 109: Complications of surgery among women undergoing hysterectomy (excluding gynaecologic oncology) during 2009

	Total N=162	
	n	**%**
Any complication	**46**	**28**
Blood transfusion	20	12
Intraoperative injury	4	2
Anaesthetic complications	2	1
Significant postoperative infection	7	4
Other significant complications	5	3
Unplanned return to theatre	5	3
Admission to DCCM	2	1
Readmission to hospital	29	18
Failed to complete planned surgery	3	2

Summary / Implications

There has been a significant drop in the number of vaginal hysterectomy procedures as a proportion of the total hysterectomy cases, with a corresponding increase in the abdominal

hysterectomy rate. The vaginal hysterectomy rate for 2009 is the lowest on record since 1999 in this institution. That trend will need to be monitored closely.

Twenty-one laparoscopic assisted vaginal hysterectomies (LAVH) or total laparoscopic hysterectomies (TLH) were booked last year (in Ward 97). (A further three laparoscopic hysterectomies were booked and performed from another ACH ward). Of these 21 booked cases, five were converted to abdominal hysterectomy, two due to multiple adhesions (including one renal transplant patient who had recurrent peritonitis from dialysis); 2 due to the large size of the uterus and/or fibroid position; and one due to a complication of hysterectomy (an older woman, with difficult vaginal access and bleeding from parametrial vessels).

In total, five LAVH and 11 TLH were performed in 2009. Nineteen laparoscopic cases were performed in 2008.

There seems to be a slower uptake of laparoscopic hysterectomy in NZ compared to other developed countries. Over the last 10 years our laparoscopic hysterectomy rate has remained between 10-12%. In Australia there has been a steady increase in rates from 12-17% in 2004/5 to 31% in 2008/9.Training is probably a problem here in NZ.

The NW rates of abdominal hysterectomy are high at 68% compared to a steady decline in Australia from 50% to 35%. At NW, we also have a low vaginal hysterectomy rate of 23% compared to around 30-40% worldwide.

The length of stay appears high in laparoscopic cases which may be related to the use of patient controlled epidural anaesthesia (PCEA). This pain relief modality is not offered in private where length of stay is shorter.

A twelve percent blood transfusion rate is still high for non-malignant hysterectomies. A significant proportion of those patients had a pre-operative anaemia. Abdominal hysterectomy rates are another contributing factor.

There were 20 peri-operative blood transfusions in the service in 2009. Two followed laparoscopic procedures converted to abdominal hysterectomy (one with a large vascular broad ligament fibroid, one a patient with renal failure, having required a transfusion at a higher threshold on renal safety grounds); and one an LAVH, also with renal failure, having required a transfusion at a higher threshold on renal safety grounds. There were 5 transfusions among the vaginal hysterectomies; one associated with acute hysterectomy for bleeding following STOP, one associated with acute hysterectomy for bleeding following vaginal myomectomy, two in women with mild preoperative anaemia, and one associated with ongoing bleeding from the vaginal vault. Of the 12 transfusions following abdominal hysterectomy, five were in women with preoperative anaemia (3 in women with fibroids), one associated with hysterectomy performed for placenta accreta in a woman with an intrauterine death, three were associated with large difficult procedures, one with a presumed intra-abdominal bleed postoperatively despite minimal intraoperative bleeding, and one with a large wound haematoma requiring postoperative drainage.

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

An additional operating theatre was commissioned to women's health services over the last year. This will represent up to a third increased capacity in gynaecologic elective surgery access for our service. This will be reflected in 2010 data

11.7 Urogynaecology

Methods

Urogynaecology data have been obtained from the stand-alone ACCESS database of inpatient gynaecologic surgery procedures. This database was set up for the purpose of surgical audit and does not include procedures performed within the Gynaecologic Oncology team. The data below include urogynaecology procedures recorded as both the primary procedure at an operation and as secondary or "other" procedures. The database currently does not collect data on type of urogynaecological procedure performed.

Table 110: Demography of women undergoing inpatient urogynaecology surgery during 2009

	2009 N=173	
	n	%
Age		
21-30	1	0.6
31-40	16	9.3
41-50	43	24.9
51-60	41	23.7
>60	72	41.6
Ethnicity		
NZ European	100	57.8
Maori	15	8.7
Pacific	14	8.1
Asian	13	7.5
Indian	13	7.5
Other European	14	8.1
Other	4	2.3
District Health Board of residence		
Auckland	139	80.4
Counties Manukau	5	2.9
Waitemata	20	11.6
Other	9	5.2
BMI		
<19	1	0.6
19-25	56	32.4
26-30	58	33.5
31-35	26	15.0
>35	25	14.5
Missing	7	4.1
Smoking		
Currently smokes	16	9.3
Past smoker	20	11.6
Never smoked	121	69.9
Unknown	16	9.2

Twenty-three women had a hysterectomy in 2009 at the same operation as their urogynaecology procedure.

The majority of women coming forward for urogynaecology surgery were older than 50, with around 40% exceeding 60 years of age.

Almost 20% 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 and a total range of 0 to 9 days.

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

ACHS Gynaecology Indicators: Injury to URETER during a pelvic floor repair procedure		ACHS 2007	ACHS 2008	NW 2008	NW 2009
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	0
Denominator	Pelvic floor repair procedures*				

ACHS Gynaecology Indicators: Injury to BLADDER during a pelvic floor repair procedure		ACHS 2007	ACHS 2008	NW 2008	NW 2009
Indicator	**Definition**		**%**	**%**	**%**
Numerator	Injury to bladder during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	0.40	0.45	1/163=0.6	4/173=2.3 (95% CI 0.6-5.8)
Denominator	Pelvic floor repair procedures*				

* includes isolated incontinence procedures

There were 4 bladder injuries, one urethral injury and no ureteric injuries at pelvic floor/incontinence surgery in 2009. The urethral injury and one of the bladder injuries occurred during the placement of mid-urethral tapes for stress incontinence. Two further bladder injuries occurred with trochar insertion during a mesh repair of cystocoele. Re-siting of the trochar and extended catheterisation was sufficient treatment for these cases. The fourth bladder injury also resulted from a mesh anterior repair, but during the dissection prior to trochar insertion. In this case, the bladder needed repairing before mesh placement.

The indicator for injury to the bladder during a pelvic floor repair procedure is just significantly higher than the ACHS mean rate for 2008 (2.3% (95% confidence interval 0.6-5.8)). Given the rarity of these events in the ACHS data (indicated by the variability from year to year in the indicators above and evident in the full report), it is likely that this does not indicate an important quality issue.

Table 111: Complications of surgery among women undergoing urogynaecology procedures during 2009

	N=173	
	n	**%**
Total complications	**24**	**14**
Blood transfusion	3	2
Intraoperative injury to internal organs	5	3
Failure to complete planned surgery	0	
Anaesthetic complications	0	
Significant postoperative infection	2	1
Other significant complications	2	1
Unplanned return to theatre	1	1
Admission to DCCM	0	
Readmission to hospital	16	9

Two post-operative infections were recorded. One was a urinary tract infection following a combined anterior repair and bladder diverticulum repair. This led to ongoing urethral pain which settled following a steroid injection. The second case was an infected vault haematoma following a vaginal hysterectomy and Tension free Vaginal Tape (TVT).

One urogynaecology case required a return to theatre the same day as the primary procedure. Following a vaginal hysterectomy, vaginal repair and TVT there were signs of intra-peritoneal bleeding. At laparotomy there was bleeding seen at the vaginal vault that was re-sutured with good effect.

There were two further significant complications recorded among the urogynaecology operative cases. A post-operative haematoma developed following a rectocoele repair using a mesh device. At six weeks, there was mesh exposure seen, requiring re-operative repair. The second case was of femoral nerve neuropathy following a procidentia repair.

11.8 Colposcopy

Methods:

The data presented in this section are 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 112: Demographic details of women having an initial colposcopic examination in 2009

	Initial colposcopy in 2009 N=993	
	n	%
Ethnicity		
NZ European	427	43.0
Maori	95	9.6
Pacific	104	10.5
Asian	158	15.9
Indian	37	3.7
Other European	131	13.2
Other	20	2.0
Not stated	21	2.1
Age (yrs)		
≤20	28	2.8
21-30	422	42.5
31-40	245	24.7
41-50	195	19.6
51-60	76	7.7
>60	27	2.7
Smoking status		
Currently smoking	228	23.0
Not currently smoking	757	76.2
Unknown	8	0.8
Referral to smoking cessation	223	22.5
DHB of residence		
Auckland	927	93.4
Counties Manukau	18	1.8
Waitemata	33	3.3
Other	15	1.5

There has been nearly a 20% decrease in colposcopy referrals compared to the previous year. This reflects the changes made in the referral guidelines by the NSU in 2009. It is anticipated that this will be temporary, as the introduction of HPV testing at the end of 2009 has increased the referral rate again.

Despite recommendations that screening start at age 20 we are still getting teenage referrals, although the number of referrals has nearly halved compared to 2008. The outcome of these referrals has been audited and shows very low rates of high risk disease. None of the patients referred under the age of 20 were treated after colposcopic assessment. This is discussed further in the treatment section of the report.

Documentation of smoking data has improved dramatically as previously 43% of the data was missing and this has fallen to 0.8%.

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
	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
Denominator	All colposcopic examinations			

Table 113: Documentation of adequacy of colposcopic examination by type of colposcopic visit

	Total N=1817		Follow up visit N=668		Initial visit N=993		Post treatment N=156	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Satisfactory examination	916	50.4	297	44.5	573	57.7	46	29.5
Unsatisfactory examination	899	49.5	371	55.5	418	42.1	110	70.5
Not documented	2	0.1	0		2	0.2	0	

Documentation has improved with all but one set of notes containing complete data regarding the adequacy of the colposcopy.

Table 114: Clinical characteristics of women presenting for initial colposcopy in 2009

	Initial visit N=993	
	n	**%**
Referral reason		
Abnormal smear	768	77.3
Irregular bleeding (intermenstrual)	12	1.2
Irregular bleeding (postcoital)	91	9.2
Lesion present	1	
Suspicious cervix	82	8.3
Other referral reason	35	3.5
Vaginal discharge	2	0.2
Not documented	2	0.2
Referral smear cytology		
Normal	184	18.5
Low grade	544	54.8
High grade	214	21.6
Unsatisfactory	13	1.3
Inconclusive	4	0.4
No referral smear	14	1.4
Other	14	1.4
Inflammation	4	0.4
Not documented	2	0.2

Table 115: Histology of biopsies taken at initial examination 2009

	Initial visit biopsies N=464	
	n	%
High grade (includes HSIL, AIS, invasive)	123	26.5
LSIL	80	17.2
Dysplasia NOS	11	2.4
HPV	108	23.3
Condylomata / inflammation	39	8.4
Inconclusive	0	
Insufficient sample	1	0.2
Normal	102	22.0

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

Referral smear cytology	Total Colpo-scopies	Histologic diagnosis													
		No biopsy /UK*		High grade		LSIL		HPV		Condyloma inflammn		Dysplasia		Normal	
	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**993**	**530***	**53.4**	**123**	**12.4**	**80**	**8.1**	**108**	**10.9**	**39**	**3.9**	**11**	**1.1**	**102**	**10.3**
High grade	214*	57*	26.6	84	39.3	17	7.9	23	10.8	8	3.7	6	2.8	19	8.9
Low grade	544	296	54.4	36	6.6	60	11.0	75	13.8	19	3.5	5	0.9	53	9.7
Condyloma/ inflammation	4	3	75.0	0		0		0		0		0		1	25.0
Inconclusive	4	4	100	0		0		0		0		0		0	
Other	14	13	92.9	0		0		0		0		0		1	7.1
****No referral smear/UK**	16	14	87.5	0		0		1	6.3	0		0		1	6.3
Normal	184	135	73.4	2	1.1	2	1.1	7	3.8	11	6.0	0		27	14.7
Unsatisfactory	13	8	61.5	1	7.7	1	7.7	2	15.4	1	7.7	0		0	

Table 116: Histologic diagnosis (biopsy at initial colposcopy) by referral smear cytology

*Includes 1 with insufficient sample
UK=unknown
Inflammn=inflammation

Although the 76% biopsy rate for high grade cytology appears low, this is the same rate as 2008 and reflects the method of data collection, rather than clinical setting. Eleven patients had biopsies of the endocervix, endometrium or vagina, 5 had cervical biopsies privately, prior to attending their public appointment, and were not repeated. Six patients were pregnant and therefore not biopsied, as cancer was not suspected. Two patients were recorded incorrectly as first visits and were in fact follow up appointments, 1 had post menopausal bleeding rather than a cervical problem, 5 had incomplete colposcopies and the remainder had normal colposcopic appearance of the cervix and just had a repeat smear. Of these smears, only 1 was reported as high grade, 2 low grade, 4 ASCUS and the remainder were normal. This shows that although the biopsy rate is below the recommended target, it is justified and high grade lesions are not being missed.

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

The prediction of high grade lesions colposcopically has fallen by 10%, 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 117: Cervical histology findings by colposcopic diagnosis (at initial colposcopy if satisfactory)

		Histologic diagnosis											
Colposopic diagnosis	**Total Colpo-scopies**	**No biopsy***		**High grade**		**LSIL****		**HPV**		**Condyloma inflammn**		**Normal**	
	n	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	573	170*	29.7	103	18.0	79**	13.8	100	17.5	35	6.1	86	15.0
High grade	109	10	9.2	60	55.1	12**	11	15	13.8	4	3.7	8	7.3
Low grade	302*	50*	16.6	38	12.6	62**	20.5	73	24.2	20	6.6	59	19.5
Condyloma/ inflammn	14	7	50.0	0		0		2	14.3	3	21.4	2	14.3
Inconclusive	17	4	23.5	4	23.5	2	11.8	1	5.9	2	11.8	4	23.5
Other	9	2	22.2	0		0		1	11.1	2	22.2	4	44.4
Normal	122	97	79.5	1	0.8	3**	2.5	8	6.6	4	3.3	9	7.4

* Includes one woman with insufficient sample
** Includes 6 women with dysplasia
Inflammn=inflammation

Table 118: Histologic diagnosis (biopsy at initial colposcopy) by referral reason

		Histologic diagnosis											
Referral reason	**Total Colposcopies**	**No biopsy /unknown****		**High grade**		**LSIL**		**HPV**		**Condyloma inflammn**		**Dysplasia**		**Normal**	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	993	530*	53.4	123	12.4	80	8.1	108	10.9	39	3.9	11	1.1	102	10.3
Abnormal smear	768*	366*	47.7	122	15.9	74	9.6	98	12.8	28	3.7	10	1.3	70	9.1
Irregular bleeding (Intermenstrual)	12	10	83.3	1	8.3	0		1	8.3	0		0		0	
Irregular bleeding (postcoital)	91	66	72.5	0		3	3.3	2	2.2	4	4.4	1	1.1	15	16.5
Lesion present	1	1	100	0		0		0		0		0		0	
Suspicious cervix	82	55	67.1	0		2	2.4	6	7.3	6	7.3	0		13	15.9
Other referral reason	35	28	80.0	0		1	2.9	1	2.9	1	2.9	0		4	11.4
Vaginal Discharge	2	2	100	0		0		0		0		0		0	

* Includes one with insufficient sample
**Unknown biopsy histology has been added to no biopsy (n=2)

Table 119: Treatments 2007-2009

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

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. 85% 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. This followed introduction of a policy of review at a Multidisciplinary Meeting and compulsory pathology review of all patients being considered for treatment under the age of 20. This was a change implemented following a departmental audit showing none of the patients treated under the age of 20 had high grade lesions in their final histology. 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.

11.8.1 Post treatment follow up

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

Table 120: Timing of follow up colposcopy of treatments in 2008

	2007 N=191		2008 N=213	
	n	%	n	%
≤ 8 months	168	88.0	182	85.5
> 8 months	3	1.6	3	1.4
No follow up	20	10.5	28	13.2

Of the 28 patients that did not meet the standard, more than 99% were offered follow up within the recommended 8 months, with only 1 patient not offered an appointment. Of the 27 patients offered appointments, but apparently not within guidelines, 3 were incorrectly coded, and were seen. Five patients were followed up within the DHB, but not in colposcopy, eg General Gynaecology and Gynaecologic Oncology. Eleven patients moved overseas or to another DHB and 8 patients did not attend repeated appointments.

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

*HSIL or LSIL on cytology

Table 121: Post treatment follow up findings

	2008 N=185*	
	n	%
Cytology findings at post treatment follow up		
Normal	152	82.2
High grade	3	1.6
Low grade	11	6.0
Condyloma/inflammation	3	1.6
Inconclusive	11	6.0
Other	2	1.1
No Colposcopy	3	1.6
Histology findings at post treatment follow up		
No biopsy taken	174	94.1
HPV	2	1.1
Condyloma/inflammation	2	1.1
Normal	7	3.8

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

The standard for adequate treatment is being met and the haemorrhage rate has decreased again and is negligible. The majority of patients being treated are discharged back to primary care after a single follow up visit, and repeated follow up colposcopies are not required.

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

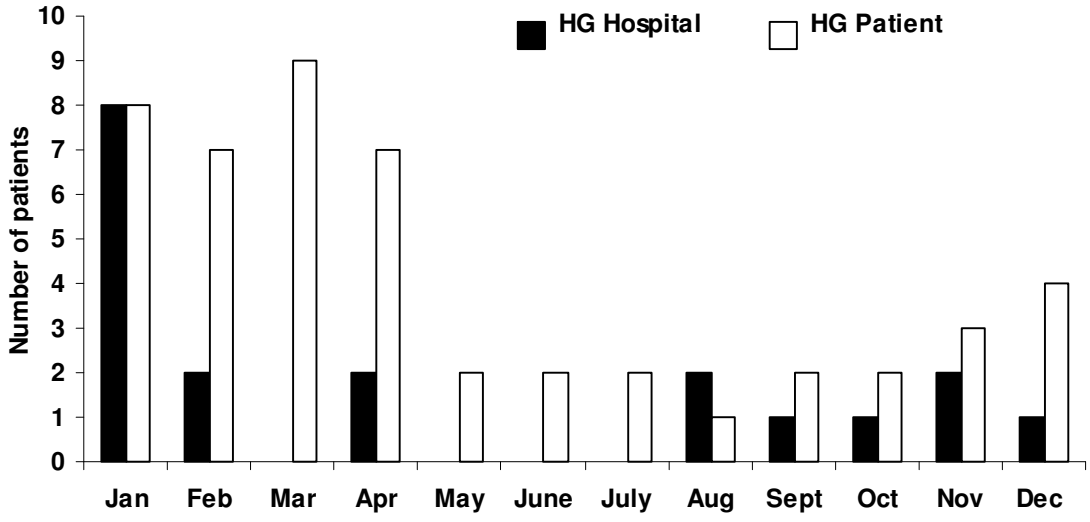

Figure 130: High grade referrals outside NSU Targets 2009: Hospital vs patient related delays

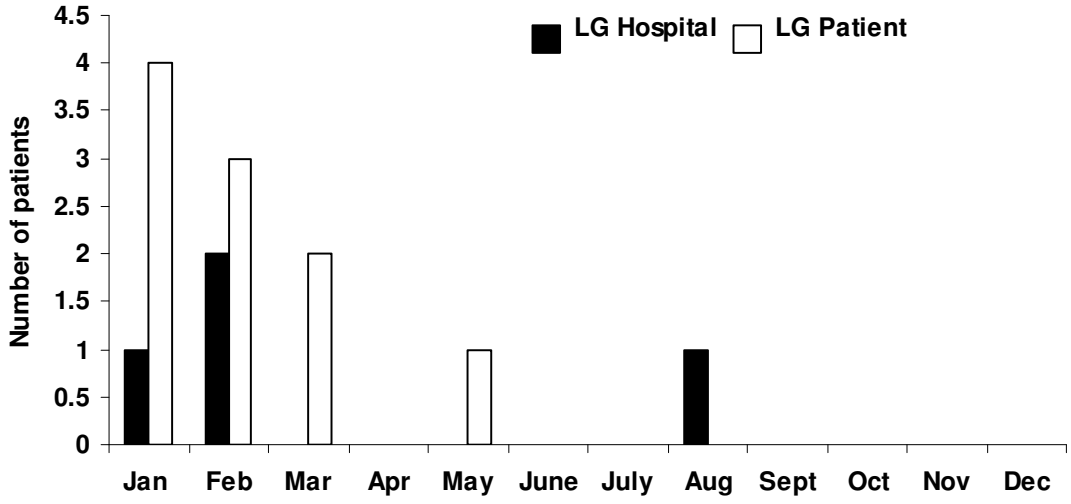

Figure 131: Low grade referrals outside NSU Targets: Hospital vs patient related delays

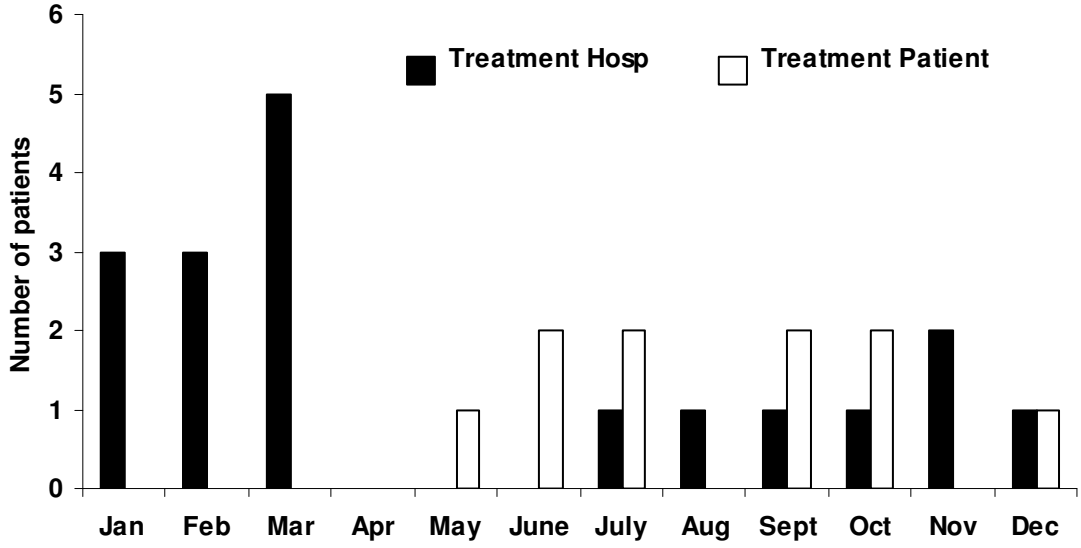

Figure 132: Treatments outside NSU Targets: Hospital vs patient related delays

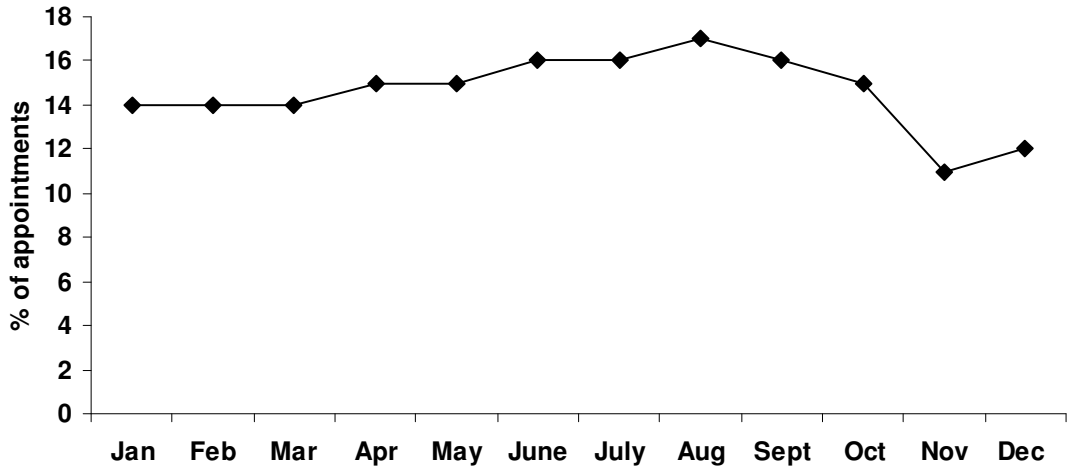

Figure 133: Patient did not attend (DNA) Rate

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.

In July 2008 there were 118 low grade referrals outside the waiting time. In July 2009 there were none.

During 2009 the numbers of patients not meeting target appointment time were minimal as shown, and were often beyond the control of the hospital, such as if patients change their appointments to suit them, which may be outside the target time. The DNA rate directly impacts on the number of appointments available and this is not consistently below the recommended figure of 15%.

Summary

The strategies implemented during 2008 have paid off and the waiting list for low grade referrals has been eliminated. 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.

Key members of staff will leave the unit in 2010 and this will potentially have a big impact.

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 and treatment is effective, with follow up exceeding the target of 90% of smears with no dyskaryosis. 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.

11.9 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 122: Primary site of MDM (Multidisciplinary meeting) reviewed cases 2009.

	Total N=611	
	n	%
Primary site		
Ovary	182	29.8
Endometrium	132	21.6
Cervix	92	15.1
Uterus	80	13.1
Vulva	35	5.7
Other/not stated/benign	90	14.7

Table 123: DHB of residence, age, and prioritised ethnicity by primary site among MDM reviewed cases 2009.

	Total N=611		Ovarian n=182		Endometrium/Uterus n=212		Cervix n=92		Vulva n=35		Other/not stated/ benign n=90	
	n	%	n	%	n	%	n	%	n	%	n	%
DHB												
Auckland DHB	169	27.7	55	30.2	58	27.4	18	19.6	9	25.7	29	32.2
Counties Manukau DHB	174	28.5	44	24.2	77	36.3	28	30.4	5	14.3	20	22.2
Waitemata DHB	134	21.9	47	25.8	39	18.4	18	19.6	5	14.3	25	27.8
Northland DHB	48	7.9	14	7.7	17	8.0	10	10.9	2	5.7	5	5.6
Bay of Plenty DHB	44	7.2	16	8.8	11	5.2	8	8.7	4	11.4	5	5.6
Other DHB	42	6.9	6	3.3	10	4.7	10	10.9	10	28.6	6	6.7
Age (yrs)												
≤25	35	5.7	12	6.6	15	7.1	2	2.2	3	8.6	3	3.3
26-35	89	14.6	28	15.4	33	15.6	13	14.1	2	5.7	13	14.4
36-45	106	17.4	29	15.9	26	12.3	32	34.8	6	17.1	13	14.4
46-55	135	22.1	47	25.8	40	18.9	18	19.6	4	11.4	26	28.9
56-65	104	17.0	27	14.8	46	21.7	6	6.5	5	14.3	20	22.2
66-75	84	13.8	19	10.4	33	15.6	14	15.2	8	22.9	10	11.1
>75	58	9.5	20	11.0	19	9.0	7	7.6	7	20.0	5	5.6
Ethnicity												
NZ European	260	42.6	81	44.5	72	34.0	37	40.2	23	65.7	47	52.2
Maori	86	14.1	26	14.3	33	15.6	16	17.4	3	8.6	8	8.9
Pacific	120	19.6	32	17.6	54	25.5	13	14.1	2	5.7	19	21.1
Asian	39	6.4	14	7.7	12	5.7	8	8.7	2	5.7	3	3.3
Indian	15	2.5	2	1.1	11	5.2	0		0		2	2.2
Other European	73	12.0	22	12.1	25	11.8	13	14.1	5	14.3	8	8.9
Other	8	1.0	4	2.2	1	0.5	2	2.2	0		1	1.1
Not stated	10	1.6	1	0.6	4	2.0	3	3.3	0		2	2.2

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 124: Key Performance Indicator: Time from referral to first multidisciplinary meeting (MDM) or clinic (includes new referrals and referrals for new site or recurrence. Excludes referrals for molar pregnancy and consideration of prophylactic surgery). Goal: 90% in less than 14 days

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

Table 125: Key Performance Indicator: Time from MDM or clinic to first surgery (new referrals of patients with malignancy who had surgery in 2009) Goal: 90% within 56 days

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

Table 126: Time from MDM or clinic to first surgery (new referrals of patients with gynaecologic malignancy who had surgery in 2009) by primary site

	Total	Unknown*		≤ 56 days		>56 days	
	n	n	%	n	%	n	%
Totals	**233**	**3**	**1**	**165**	**71**	**65**	**28**
Cervix	61	1	2	42	69	18	30
Endometrium	57			43	75	14	25
Ovary	53	1	2	36	68	16	30
Vulva	36			24	67	12	33
Uterus	7			6	86	1	14
Other/ Unknown	19	1	5	14	74	4	21

Three woman had unknown time seen by

11.9.2 Gynaecologic oncology surgeries

This section describes the surgery and outcomes of women undergoing inpatient surgery in 2009 under the care of the gynaecologic oncology team.

Table 127: Ethnicity and cancer status of women undergoing gynaecologic oncology inpatient surgery during 2009

	2009 N=321	
	n	%
Ethnicity		
NZ European	169	52.6
Maori	41	12.8
Pacific	49	15.3
Asian	18	5.6
Indian	3	0.9
Other European	32	10.0
Other	9	2.8
Status		
Benign	50	15.6
Pre malignant	12	3.7
Malignant	259	80.7

Table 128: Debulking rates in 2009 for women with ovarian malignancy

	Ovary N=55	
	n	%
Residual disease		
None	36	65.5
< 1cm	5	9.1
≥ 1cm	8	14.6
Not stated	6	10.9
Bowel surgery		
Yes	4	7.3
No	41	74.6
NA	1	1.8
Not stated	9	16.4
Length of stay (days)	5 (4-6)	

Table 129: Key Performance indicator: Clinical Outcomes among inpatient surgeries in malignant cases by gynaecologic oncology team in 2009. Goal: Comparative year to year data

	2007 N=174*		2008 N=246*		2009 N=259*	
Complication	n	%	n	%	n	%
Transfusion	18	10	19	8	30	12
Febrile morbidity	16	9	11	4	32	12
Wound infection	-		-		22	8
Thromboembolism	2	1	2	1	3	1
Cardiovascular	2	1	2	1	6	2
Gastro-intestinal	2	1	7	3	17	7
Urinary retention	-		-		12	5
Return to theatre within 6 weeks	5	3	6	2	14	5
Readmission with complications within 6 weeks	10	6	17	7	25	10
Death	1	1	2	1	2	0.8

* have assumed missing data are all “no”

This analysis includes the 259 inpatient surgeries performed by the Gynaecologic Oncology team in 2009 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 2009, with a rise in both MDM referral and surgical activity. 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 2009. 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.

There were 611 new referrals to the MDM and almost 1000 individual discussions in 2009. This is a 100% increase in activity over the past 4 years. Eighty percent of the surgery performed in the department had a malignant final histology. The use of triage tools, such as the risk of malignancy index (RMI) for ovarian masses, and MRI for assessment of invasion of endometrial cancer allows appropriate allocation of resources, enabling patients with a lower risk to be treated locally where possible.

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 throughout the year, 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.

The time to surgery KPI is still falling short, with patients experiencing an unacceptable wait for surgery. This is directly due to the lack of theatre list space and should be resolved following the opening of the new theatre in early 2010.

The KPI targets do not cover 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 this data. Whether all molar pregnancies need to be seen by a gynaecological oncologist is currently being reviewed, and it may be more appropriate for patients to be followed up locally.

The complication rates within the department are acceptable. The transfusion rate has increased to 12% and on review this appears to be 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 65% with no residual disease.

It is hoped that the increase in theatre resources in 2010 will improve the patient's wait for surgery and bring the department within the KPI targets. 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 onset of contraction time, assume this is an induction.

If time at start of Syntocinon is earlier than onset of contraction time, then check this is an induction.

If indication for ARM is induction and time of ARM is before onset of contractions, then induction data are entered.

If indication for ARM is induction and time of ARM is after onset of contractions, 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.

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 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 130: Mode of birth (1998-2009)

	1998 n=7531		1999 n=7501		2000 n=7827		2002 n=7775		2003 n=7611	
	n	%	n	%	n	n	n	%	n	%
Spontaneous vertex birth	4670	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	926	12.3	945	12.6	1010	12.9	1081	13.9	1065	14.0
Caesarean	1860	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

APPENDIX 3. MATERNAL DEMOGRAPHY

Table 131: DHB of domicile of mothers giving birth at National Women's (2002-2009)

	2003 n=7611		2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Auckland DHB	5007	65.8	5055	67.5	4985	69.3	5100	70.7	5382	69.9	5267	69.4	5551	71.8
Waitemata DHB	1138	15	1068	14.3	982	13.7	994	13.8	1043	13.6	1127	14.9	1054	13.6
Counties Manukau DHB	1368	18	1240	16.6	1089	15.1	994	13.8	1136	14.8	1060	14.0	991	12.8
Northland DHB	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

Table 132: Maternal age distribution (2000-2009)

		<21 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

Table 4: Maternal age and parity

	<21 yrs n = 400		21-25 yrs n = 992		26-30 yrs n = 1916		31-35 yrs n = 2552		36-40 yrs n = 1600		>40 yrs n = 275	
	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	328	82.0	580	58.5	1143	59.7	1156	45.3	523	32.7	81	29.5
Multipara	72	18.0	412	41.5	773	40.3	1396	54.7	1077	67.3	194	70.5

Table 133: Time trends in nulliparity and multiparity (Data for 2001-2003 not available)

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

*Does not include 39 BBA's

Table 134: Prioritised ethnicity of women giving birth at National Women's
(for information on assigning ethnicity and prioritising ethnicity, see Appendix 12)

	2009 n=7735	
	n	%
NZ European	2967	38.4
Chinese	995	12.9
Maori	670	8.7
Other European	630	8.1
Indian	520	6.7
Samoan	400	5.2
Tongan	394	5.1
Other Asian	293	3.8
Cook Island Maori	135	1.7
South East Asian	162	2.1
Middle Eastern	128	1.7
Niuean	94	1.2
African	95	1.2
European NFD	77	1.0
Fijian	57	0.7
Asian NFD	28	0.4
Latin American/ Hispanic	54	0.7
Other Pacific Island	30	0.4
Tokelauan	5	0.1
Other ethnicity	1	

Table 135: Maternal ethnicity and age

	Total	NZ European		Maori		Pacific		Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7735	2967	38.4	670	8.7	1115	14.4	1478	19.1	520	6.7	707	9.1	278	3.6
<21	400	78	19.5	119	29.8	153	38.3	15	3.8	8	2.0	9	2.3	18	4.5
21-25	992	154	15.5	183	18.4	275	27.7	214	21.6	69	7.0	41	4.1	56	5.6
26-30	1916	527	27.5	142	7.4	275	14.4	546	28.5	205	10.7	149	7.8	72	3.7
31-35	2552	1224	48.0	127	5.0	242	9.5	430	16.8	161	6.3	288	11.3	80	3.1
36-40	1600	846	52.9	82	5.1	135	8.4	235	14.7	69	4.3	189	11.8	44	2.8
41+	275	138	50.2	17	6.2	35	12.7	38	13.8	8	2.9	31	11.3	8	2.9

Table 136: Maternal ethnicity and parity

		NZ European n=2967		Maori n=670		Pacific n=1115		Asian n=1478		Indian n=520		Other European n=707		Other n=278	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	3811	1482	50.0	271	40.5	412	37.0	859	58.1	267	51.4	406	57.4	114	41.0
Multipara	3924	1485	50.1	399	59.6	703	63.1	619	41.9	253	48.7	301	42.6	164	59.0

Table 137: Ethnicity of women birthing at NW (2002-2009)

	2002 n=7775		2003 n=7611		2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
NZ European	3362	43.2	3224	42.4	2911	38.9	2802	38.9	3034	42.1	3161	41.1	2995	39.5	2967	38.4
Other European	642	8.3	608	8.0	548	7.3	674	9.4	682	9.5	695	9.0	713	9.4	707	9.1
Maori	547	7.0	486	6.4	509	6.8	545	7.6	597	8.3	641	8.3	641	8.4	670	8.7
Niuean	108	1.4	108	1.4	106	1.4	111	1.5	81	1.1	105	1.4	111	1.5	94	1.2
Cook Islander	160	2.1	159	2.1	140	1.9	106	1.5	113	1.6	157	2.0	137	1.8	135	1.7
Samoan	531	6.8	439	5.8	425	5.7	339	4.7	384	5.3	372	4.8	433	5.7	400	5.2
Tongan	432	5.6	406	5.3	355	4.7	315	4.4	346	4.8	347	4.5	349	4.6	394	5.1
Fijian	50	0.6	42	0.6	47	0.6	62	0.9	60	0.8	81	1.1	58	0.8	57	0.7
Other Pacific Islands	40	0.5	36	0.5	37	0.5	48	0.7	37	0.5	38	0.5	44	0.6	35	0.5
Chinese	780	10.0	811	10.7	871	11.6	769	10.7	707	9.8	881	11.4	874	11.5	995	12.9
Indian	467	6.0	548	7.2	540	7.2	545	7.6	520	7.2	521	6.8	505	6.7	520	6.7
Other Asian	422	5.4	438	5.8	404	5.4	354	4.9	408	5.7	473	6.1	478	6.3	440	5.7
Other	229	2.9	298	3.9	471	6.3	521	7.2	243	3.4	223	2.9	251	3.3	321	4.1
Not Stated	5	0.1	8	0.1	127	1.7	3		0		0	0.0	0	0.0	0	0.0

3.1 Smoking

Table 138: Smoking status at booking by ethnicity and maternal age

		Smoking at booking		No or Not in past month		Missing data	
	N	n	%	n	%	n	%
Ethnicity							
NZ European	2967	183	6.2	2576	86.8	208	7.0
Maori	670	259	38.7	373	55.7	38	5.7
Pacific	1115	223	20.0	833	74.7	59	5.3
Asian	1478	21	1.4	1406	95.1	51	3.5
Indian	520	13	2.5	478	91.9	29	5.6
Other European	707	31	4.4	622	88.0	54	7.6
Other	278	9	3.2	256	92.1	13	4.7
Age							
≤ 20	400	134	33.5	240	60.0	26	6.5
21-25	992	195	19.7	747	75.3	50	5.0
26-30	1916	179	9.3	1640	85.6	97	5.1
31-35	2552	125	4.9	2267	88.8	160	6.3
≥ 36	1875	106	5.7	1650	88.0	119	6.3

Table 139: Rates of smoking at booking by age and ethnicity (excludes women with missing smoking data)

		<21 yrs	21-25 yrs	26-30 yrs	31-35 yrs	≥ 36
Ethnicity	**N**	%	%	%	%	%
Total	**7283**	**374**	**942**	**1819**	**2392**	**1756**
NZ European	2759	35.8	24.3	8.7	3.9	4.0
Maori	632	55.9	49.4	42.9	23.3	28.1
Pacific	1056	28.4	23.7	22.6	14.0	18.0
Asian	1427	0	2.9	0.9	1.0	2.3
Indian	491	-	1.5	3.1	2.0	1.4
Other European	653	-	13.2	5.0	3.8	4.0
Other	265	5.6	3.6	1.6	5.2	2.0

Table 140: Smoking status at booking by LMC at birth

	Independent Midwife n=3422		Private Obstetrician n=1718		GP n=115		NW Domino n=320		NW Community n=1382		NW High Risk n=681		Other DHB n=39	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Smoking at booking	271	7.9	32	1.9	6	5.2	49	15.3	229	16.6	114	16.7	9	23.0
No or not smoking in last month	2969	86.8	1530	89.1	102	88.7	269	84.1	1136	82.2	524	76.9	9	23.0
Missing data	182	5.3	156	9.1	7	6.1	2	0.6	17	1.2	43	6.3	21	53.8

NW High Risk includes women booked under the Diabetes and Medical teams.
Unbooked women, data missing for 24 out of 58 women

3.2 Lead Maternity Carer (LMC) and maternal demographic characteristics

Table 141: LMC at birth

	n=7735	
	n	%
Independent Midwife	3422	44.2
Private Obstetrician	1718	22.2
General Practitioner	115	1.5
NW Domino	320	4.1
NW Community	1382	17.9
NW Diabetic	304	3.93
NW Medical	377	4.9
Other DHB	39	0.5
Unbooked	58	0.7

Table 142: LMC at birth and maternal age

	Total	<21		21-25		26-30		31-35		36-40		41+	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Total	7735	400	5.2	992	12.8	1916	24.8	2552	33.0	1600	20.7	275	3.6
Independent Midwife	3422	145	4.2	466	13.6	1020	29.8	1140	33.3	593	17.3	58	1.7
Private Obstetrician	1718	5	0.3	37	2.2	251	14.6	703	40.9	602	35.0	120	7.0
General Practitioner	115	0		9	7.8	29	25.2	47	40.9	27	23.5	3	2.6
NW Domino	320	41	12.8	61	19.1	78	24.4	91	28.4	43	13.4	6	1.9
NW Community	1382	144	10.4	303	21.9	378	27.4	341	24.7	179	13.0	37	2.7
NW Diabetes	304	8	2.6	26	8.6	70	23.0	98	32.2	76	25.0	26	8.6
NW Medical	377	40	10.6	65	17.2	67	17.8	112	29.7	70	18.6	23	6.1
Other DHB	39	6	15.4	9	23.1	8	20.5	10	25.6	5	12.8	1	2.6
Unbooked	58	11	19.0	16	27.6	15	25.9	10	17.2	5	8.6	1	1.7

Table 143: LMC at birth and parity

	Total	Nullipara		Multipara	
	N	n	%	n	%
Total	7735	3811	49.3	3924	50.7
Independent Midwife	3422	1879	54.9	1543	45.1
Private Obstetrician	1718	829	48.3	889	51.7
General Practitioner	115	50	43.5	65	56.5
NW Domino	320	164	51.3	156	48.8
NW Community	1382	558	40.4	824	59.6
NW Diabetes	304	122	40.1	182	59.9
NW Medical	377	174	46.2	203	53.8
Other DHB	39	18	46.2	21	53.8
Unbooked	58	17	29.3	41	70.7

Table 144: LMC at birth and maternal ethnicity

	Total	NZ European		Maori		Pacific		Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7735	2967	38.4	670	8.7	1115	14.4	1478	19.1	520	6.7	707	9.1	278	3.6
Independent Midwife	3422	1320	38.6	274	8.0	344	10.1	895	26.2	191	5.6	327	9.6	71	2.1
Private Obstetrician	1718	1163	67.7	49	2.9	21	1.2	167	9.7	79	4.6	202	11.8	37	2.2
General Practitioner	115	47	40.9	3	2.6	18	15.7	31	27.0	2	1.7	12	10.4	2	1.7
NW Domino	320	49	15.3	44	13.8	110	34.4	41	12.8	35	10.9	18	5.6	23	7.2
NW Community	1382	175	12.7	172	12.4	440	31.8	263	19.0	140	10.1	79	5.7	113	8.2
NW Diabetes	304	55	18.1	32	10.5	83	27.3	48	15.8	46	15.1	23	7.6	17	5.6
NW Medical	377	144	38.2	61	16.2	66	17.5	28	7.4	23	6.1	42	11.1	13	3.4
Other DHB	39	12	30.8	12	30.8	11	28.2	1	2.6	1	2.6	1	2.6	1	2.6
Unbooked	58	2	3.5	23	39.7	22	37.9	4	6.9	3	5.2	3	5.2	1	1.7

3.3 Standard primipara

Table 145: Demographic characteristics of standard and non-standard primipara

	Total primipara	Standard primipara		Non-standard primipara	
	N	n	%	n	%
Total	**3811**	**1318**	**34.6**	**2493**	**65.4**
Age					
< 21	328	50	15.2	278	84.8
21-25	580	276	47.6	304	52.4
26-30	1143	568	49.7	575	50.3
31-35	1156	424	36.7	732	63.3
36-40	523	0		523	100
41+	81	0		81	100
Ethnicity					
NZ European	1482	426	28.7	1056	71.3
Maori	271	82	30.3	189	69.7
Pacific	412	111	26.9	301	73.1
Asian	859	422	49.1	437	50.9
Indian	267	106	39.7	161	60.3
Other European	406	130	32.0	276	68.0
Other	114	41	36.0	73	64.0
LMC at Birth					
Independent Midwife	1879	774	41.2	1105	58.8
Private Obstetrician	829	238	28.7	591	71.3
General Practitioner	50	19	38.0	31	62.0
NW Domino	164	62	37.8	102	62.2
NW Community	558	184	33.0	374	67.0
NW Diabetic	122	0		122	100
NW - Medical	174	35	20.1	139	79.9
Other DHB	18	0		18	100
Unbooked	17	6	35.3	11	64.7
Smoking					
Smoking at booking	308	80	26.0	228	74.0
No or not smoking in last month	3279	1174	35.8	2105	64.2
Missing	224	64	28.6	160	71.4

APPENDIX 4. ANTENATAL COMPLICATIONS

Preterm birth

Table 146: Preterm birth and maternal demographic characteristics

	Total	Total preterm birth		Iatrogenic preterm		Spontaneous preterm	
	N	n	%	n	%	n	%
Total	7735	658	8.5	383	5.0	275	3.6
Age							
≤20	400	44	11.0	27	6.8	17	4.3
21-25	992	104	10.5	54	5.4	50	5.0
26-30	1916	146	7.6	80	4.2	66	3.4
31-35	2552	201	7.9	123	4.8	78	3.1
36-40	1600	129	8.1	73	4.6	56	3.5
41+	275	34	12.4	26	9.5	8	2.9
Ethnicity							
NZ European	2967	251	8.5	147	5.0	104	3.5
Maori	670	85	12.7	48	7.2	37	5.5
Pacific	1115	115	10.3	68	6.1	47	4.2
Asian	1478	84	5.7	45	3.0	39	2.6
Indian	520	47	9.0	30	5.8	17	3.3
Other European	707	51	7.2	32	4.5	19	2.7
Other	278	25	9.0	13	4.7	12	4.3
Parity							
Nulliparous	3811	307	8.1	152	4.0	153	4.0
Multiparous	3924	351	8.9	229	5.8	122	3.1
Plurality							
Singleton	7576	550	7.3	319	4.2	231	3.0
Twins	156	105	67.3	62	39.7	43	27.6
Triplets	3	3	100.0	2	66.7	1	33.3
Smoking at booking							
Currently smoking	739	102	13.8	43	5.8	59	8.0
No or not in last month	6544	484	7.4	289	4.4	195	3.0
Unknown	452	72	15.9	35	7.7	37	8.2
BMI							
<19	442	25	5.7	16	3.6	9	2.0
19-25	4344	305	7.0	164	3.8	141	3.2
26-30	1441	99	6.9	62	4.3	37	2.6
30-35	686	73	10.6	53	7.7	20	2.9
>35	513	58	11.3	39	7.6	19	3.7
Missing	309	98	31.7	49	15.9	49	15.9

4.2 Diabetes

Table 147: Women with diabetes birthing at NW at or beyond 20 weeks gestation (1991-2009)

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

Table 148: Perinatal deaths (1993 – 2009) 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
Total number of perinatal related losses	0	2	8	9	1	4
Perinatal related loss rate /1000 births	0	5	21	22	2	7

Table 149: DHB of domicile of women with diabetes birthing at NW (2009)

		Type I n=47		Type 2 n=71		GDM n=480		No diabetes n=7137	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	5547	16	34.0	31	43.7	270	56.3	5230	73.3
Waitemata	1053	26	55.3	36	50.7	161	33.5	830	11.6
Counties Manukau	995	3	6.4	4	4.3	44	9.1	944	13.2
Other	140	2	4.3	0		5	1.0	133	1.9

Table 150: Demographic characteristics of women with diabetes

		Type I n=47		Type 2 n=71		GDM n=480		No diabetes n=7137	
	N	n	%	n	%	n	%	n	%
Age									
≤ 20	400	1	0.3	1	0.3	7	1.8	391	97.8
21-25	992	7	0.7	3	0.3	45	4.5	937	94.5
26-30	1916	15	0.8	10	0.5	108	5.6	1783	93.1
31-35	2552	13	0.5	26	1.0	159	6.2	2354	92.2
36-40	1600	11	0.7	25	1.6	123	7.7	1441	90.1
41+	275	0		6	2.2	38	13.8	231	84.0
Ethnicity									
NZ European	2967	33	1.1	6	0.2	101	3.4	2827	95.3
Maori	670	3	0.5	13	1.9	35	5.2	619	92.4
Pacific	1115	2	0.2	32	2.9	81	7.3	1000	89.7
Asian	1478	1	0.1	5	0.3	133	9.0	1339	90.6
Indian	520	1	0.2	9	1.7	78	15.0	432	83.1
Other European	707	6	0.9	2	0.3	31	4.4	668	94.5
Other	278	1	0.4	4	1.4	21	7.6	252	90.7
BMI									
<19	442	0		1	0.2	14	3.2	427	96.6
19-25	4344	22	0.5	7	0.2	192	4.4	4123	94.9
26-30	1441	15	1.0	12	0.8	107	7.4	1307	90.7
21-35	686	7	1.0	21	3.1	76	11.1	582	84.8
>35	513	2	0.4	28	5.5	84	16.4	399	77.8
Missing	309	1	0.3	2	0.7	7	2.3	299	96.8
Smoking									
Smoking at booking	739	8	1.1	20	2.7	42	5.7	669	90.5
No or not in last month	6544	38	0.6	50	0.8	421	6.4	6035	92.2
Missing	452	1	0.2	1	0.2	17	3.8	433	95.8
Body weight at booking (kg)									
Median (IQR)		72.8(66.3-83)		89.5(74.8-113.5)		77.8(67.6-93.5)			

Table 151: Maternal outcomes among women with diabetes

	Type I n=47		Type 2 n=71		GDM n=463		Postnatally Diagnosed Type 2 n=17		No diabetes n=7137	
	n	%	n	%	n	%	n	%	n	%
Induction of labour	28	59.6	45	63.4	273	59.0	10	58.8	1882	26.4
Mode of birth										
Spontaneous vaginal birth	11	23.4	36	50.7	236	51.0	10	58.8	4020	56.3
Ventouse	1	2.1	2	2.8	32	6.9	0		573	8.0
Forceps	6	12.8	2	2.8	17	3.7	0		314	4.4
CS emergency	12	25.5	14	19.7	79	17.1	3	17.7	1167	16.4
CS elective	16	34.0	16	22.5	99	21.4	4	23.5	1004	14.1
Gestation at birth										
<32 weeks	1	2.1	5	7.0	7	1.5	0		172	2.4
<37 weeks	11	23.4	22	31.0	60	13.0	5	29.4	560	7.9
PPH ≥500 mls	25	53.2	36	50.7	204	44.1	11	64.7	2574	36.1
PPH ≥1000 mls	9	19.2	8	11.3	48	10.3	6	35.3	580	8.1
Postpartum transfusion	3	6.4	2	2.8	13	2.8	3	17.7	232	3.3

4.4 Antepartum haemorrhage

Table 152: Characteristics of pregnancies complicated by antepartum haemorrhage

		Placenta praevia n=66		Placental abruption n=39		APH uncertain origin n=333		No APH n=7297	
	Total	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Maternal age									
≤20	400	0	0.0	0	0.0	20	5.0	380	95.0
21-25	992	2	0.2	4	0.4	52	5.2	934	94.2
26-30	1916	8	0.4	10	0.5	84	4.4	1814	94.7
31-35	2552	20	0.8	17	0.7	111	4.3	2404	94.2
36-40	1600	29	1.8	6	0.4	60	3.8	1505	94.1
41+	275	7	2.5	2	0.7	6	2.2	260	94.5
Parity									
Nulliparous	3811	34	0.9	20	0.5	157	4.1	3600	94.5
Multip previous CS	1166	19	1.6	6	0.5	62	5.3	1079	92.5
Multip no previous CS	2758	13	0.5	13	0.5	114	4.1	2618	94.9
Smoking status at booking									
Currently smoking	739	6	0.8	7	0.9	52	7.0	674	91.2
No or not in last month	6544	58	0.9	29	0.4	253	3.9	6204	94.8
Unknown	452	2	0.4	3	0.7	28	6.2	419	92.7
BMI									
<19	442	0	0.0	1	0.2	17	3.8	424	95.9
19-25	4344	45	1.0	24	0.6	165	3.8	4110	94.6
26-30	1441	12	0.8	5	0.3	60	4.2	1364	94.7
31-35	686	4	0.6	5	0.7	32	4.7	645	94.0
>35	513	4	0.8	1	0.2	27	5.3	481	93.8
Missing data	309	1	0.3	3	1.0	32	10.4	273	88.3
Hypertensive disease									
Gestational hypertension	249	0	0.0	3	1.2	13	5.2	233	93.6
Chronic hypertension*	157	2	3.0	0	0.0	12	3.6	143	2.0
Chronic hypertension with superimposed preeclampsia	31	0	0.0	0	0.0	1	3.2	30	96.8
Preeclampsia	244	1	0.4	5	2.0	11	4.5	227	93.0
Nil	7054	63	0.9	31	0.4	296	4.2	6664	94.5

*includes chronic hypertension with super-imposed pre-eclampsia

4.5 Hypertensive disease

Table 153: Demographic characteristics of women with hypertensive disease

		Gestational hypertension		Chronic hypertension		Superimposed preeclampsia		Preeclampsia		Normotensive	
	Total	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Ethnicity											
NZ European	2967	118	4.0	71	2.4	9	0.3	99	3.3	2670	90.0
Maori	670	25	3.7	15	2.2	6	0.9	24	3.6	600	89.6
Pacific	1115	40	3.6	22	2.0	7	0.6	52	4.7	994	89.1
Asian	1478	21	1.4	17	1.2	2	0.1	27	1.8	1411	95.5
Indian	520	17	3.3	11	2.1	5	1.0	18	3.5	469	90.2
Other European	707	25	3.5	16	2.3	2	0.3	19	2.7	645	91.2
Other	278	3	1.1	5	1.8	0	0.0	5	1.8	265	95.3
Maternal age (nullipara)											
≤20	328	13	4.0	4	1.2	0	0.0	24	7.3	287	87.5
21-25	580	20	3.4	3	0.5	0	0.0	26	4.5	531	91.6
26-30	1143	38	3.3	6	0.5	2	0.2	49	4.3	1048	91.7
31-35	1156	60	5.2	19	1.6	6	0.5	42	3.6	1029	89.0
36-40	523	32	6.1	13	2.5	2	0.4	23	4.4	453	86.6
41+	81	4	4.9	4	4.9	0	0.0	4	4.9	69	85.2
Maternal age (multipara)											
≤20	72	1	1.4	2	2.8	0	0.0	1	1.4	68	94.4
21-25	412	4	1.0	9	2.2	4	1.0	14	3.4	381	92.5
26-30	773	14	1.8	13	1.7	3	0.4	12	1.6	731	94.6
31-35	1396	34	2.4	38	2.7	10	0.7	26	1.9	1288	92.3
36-40	1077	20	1.9	36	3.3	3	0.3	16	1.5	1002	93.0
41+	194	9	4.6	10	5.2	1	0.5	7	3.6	167	86.1
Smoking at booking											
Currently smoking	739	24	3.2	18	2.4	7	0.9	24	3.2	666	90.1
No or not in past month	6544	211	3.2	134	2.0	21	0.3	205	3.1	5973	91.3
Unknown	452	14	3.1	5	1.1	3	0.7	15	3.3	415	91.8
BMI											
<19	442	7	1.6	2	0.5	0	0.0	10	2.3	423	95.7
19-25	4344	106	2.4	62	1.4	6	0.1	102	2.3	4068	93.6
26-30	1441	69	4.8	36	2.5	5	0.3	60	4.2	1271	88.2
31-35	686	32	4.7	28	4.1	9	1.3	23	3.4	594	86.6
36-40	303	14	4.6	13	4.3	3	1.0	16	5.3	257	84.8
41-45	118	6	5.1	6	5.1	1	0.8	10	8.5	95	80.5
>45	92	7	7.6	8	8.7	3	3.3	9	9.8	65	70.7
Unknown	309	8	2.6	2	0.6	4	1.3	14	4.5	281	90.9

Table 154: Onset of birth among women with hypertensive disease

		Gestational hypertension n=249		Chronic hypertension n=157		Superimposed preeclampsia n=31		Preeclampsia n=244		Normotensive n=7054	
	Total	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Spontaneous onset of labour	4125	64	25.7	48	30.6	5	16.1	31	12.7	3977	56.4
Induced labour	2238	157	63.1	66	42.0	11	35.5	145	59.4	1859	26.4
CS emergency before onset of labour	240	3	1.2	7	4.5	10	32.3	35	14.3	185	2.6
CS elective	1132	25	10.0	36	22.9	5	16.1	33	13.5	1033	14.6

4.6 Smoking cessation

Table 155: Smoking at birth among women NOT seen at the ADHB Smokefree Pregnancy Services

	Mothers NOT seen by ADHB Smokefree Pregnancy Services							
	Total N=7534		Smoking at booking N=552		Not smoking at booking or within past month N=6530		Missing smoking status data at booking N=452	
	n	%	n	%	n	%	n	%
Smoking at birth								
Yes	312	4	304	55	8	0.1	0	
No or not in past month	4926	65	151	27	4405	67	370	82
Missing	2296	30	97	18	2117	32	82	18

4.7 BMI

Table 156: Demographic characteristics and BMI

	Total n=7426	<19 n=442		19-22 n=2602		23-25 n=1742		26-30 n=1441		31-35 n=686		36-40 n=303		41-45 n=118		>45 n=92	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity																	
NZ European	2864	115	4.0	1170	40.9	777	27.1	562	19.3	176	6.2	47	1.6	20	0.7	7	0.2
Maori	596	10	1.7	102	17.1	132	22.2	169	28.4	97	16.3	53	8.9	19	3.2	14	2.4
Pacific	1048	7	0.7	60	5.7	126	12.0	255	24.3	297	28.3	166	15.8	73	7.0	64	6.1
Asian	1458	233	16.0	717	49.2	316	21.7	155	10.6	30	2.1	6	0.4	1	0.1	0	
Indian	510	33	6.5	177	34.7	133	26.1	123	24.1	31	6.1	10	2.0	2	0.4	1	0.2
Other European	677	34	5.0	297	43.9	177	26.1	118	17.4	29	4.3	13	1.9	3	0.4	6	0.9
Other	273	10	3.7	79	28.9	81	29.7	69	25.3	26	9.5	8	2.9	0		0	
Age																	
≤20	355	9	2.5	78	22.0	83	23.4	97	27.3	50	14.1	24	6.8	9	2.5	5	1.4
21-25	925	84	9.1	246	26.6	172	18.6	201	21.7	124	13.4	57	6.2	27	2.9	14	1.5
26-30	1824	159	8.6	669	36.3	375	20.4	345	18.7	162	8.8	77	4.2	29	1.6	26	1.4
31-35	2493	125	5.0	963	38.8	598	24.1	449	18.1	207	8.3	91	3.7	28	1.1	22	0.9
36-40	1555	58	3.7	571	36.7	440	28.3	287	18.5	116	7.5	47	3.0	16	1.0	20	1.3
>40	266	7	2.6	75	28.2	74	27.8	62	23.3	27	10.2	7	2.6	9	3.4	5	1.9
Parity																	
Nullipara	3648	178	7.6	1431	39.2	887	24.3	635	17.4	246	6.7	109	3.0	34	0.9	28	0.8
Multipara	3778	164	4.3	1171	31.0	855	22.6	806	21.3	440	11.7	194	5.1	84	2.2	64	1.7
Smoking status at booking																	
Smoking	661	17	2.6	126	19.1	125	18.9	150	22.7	134	20.3	62	9.4	24	3.6	23	3.5
No or not in past month	6441	408	6.3	2350	36.5	1534	23.8	1233	19.1	526	8.2	233	3.6	90	1.4	67	1.0

Table 157: LMC at birth and BMI

	Total n=7426	<19 n=442		19-22 n=2602		23-25 n=1742		26-30 n=1441		31-35 n=686		36-40 n=303		41-45 n=118		>45 n=92	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
IMW	3336	252	7.6	1304	39.1	776	23.3	596	17.9	266	8.0	92	2.8	34	1.0	16	0.5
Pvt Obstetrician	1689	107	6.3	759	44.9	471	27.9	266	15.8	58	3.4	21	1.2	3	0.2	4	0.2
GP	112	7	6.3	42	37.5	31	27.7	17	15.2	10	8.9	2	1.8	2	0.8	1	0.9
NW Domino	319	11	3.5	84	26.3	60	18.8	80	25.1	42	13.2	27	8.5	10	3.1	5	1.6
NW Community	1355	49	3.6	300	22.1	278	20.5	340	25.1	207	15.3	100	7.4	42	3.1	39	2.9
NW Diabetes	300	3	1.0	31	10.3	57	19.0	72	24.0	58	19.3	43	14.3	18	6.0	18	6.0
NW Medical	299	13	4.4	80	26.8	64	21.4	67	22.4	45	15.1	15	5.0	7	2.3	8	2.7
Other DHB	10	0		2	20.0	2	20.0	3	30.0	0		2	20.0	0		1	10.0
Unbooked	6	0		0		3	50.0	0		0		1	16.7	2	33.3	0	

Table 158:Mode of birth by ethnicity among all nullipara

	Total n=3811	SVB n=1839		Operative vaginal birth n=753		Caesarean n=1219	
	N	n	%	n	%	n	%
European	1888	771	40.8	418	22.1	699	37.0
Maori	271	166	61.3	35	12.9	70	25.8
Pacific	412	274	66.5	43	10.4	95	23.1
Asian*	1126	570	50.6	236	21.0	320	28.4
Other	114	58	50.9	21	18.4	35	30.7

* includes Indian

Table 159: Mode of birth by ethnicity among nullipara, BMI <19

	Total n=278	SVB n=156		Operative vaginal birth n=60		Caesarean n=62	
	N	n	%	n	%	n	%
European	74	37	50.0	18	24.3	19	25.7
Maori	4	4	100	0		0	
Pacific	6	5	83.3	1	16.7	0	
Asian	188	107	56.9	40	21.3	41	21.8
Other	6	3	50.0	1	16.7	2	33.3

Table 160: Mode of birth by ethnicity among nullipara, BMI 19-22

	Total n=1431	SVB n=692		Operative vaginal birth n=312		Caesarean n=427	
	N	n	%	n	%	n	%
European	764	324	42.4	179	23.4	261	34.2
Maori	47	30	63.8	6	12.8	11	23.4
Pacific	29	24	82.8	3	10.3	2	6.9
Asian	548	293	53.5	115	21.0	140	25.6
Other	43	21	48.8	9	20.9	13	30.2

Table 161: Mode of birth by ethnicity among nullipara, BMI 23-25

	Total N=887	SVB n=384		Operative vaginal birth n=195		Caesarean n=308	
	N	n	%	n	%	n	%
European	490	181	36.9	118	24.1	191	39.0
Maori	60	33	55.0	10	16.7	17	28.3
Pacific	75	56	74.7	8	10.7	11	14.7
Asian	225	98	43.6	51	22.7	76	33.8
Other	37	16	43.2	8	21.6	13	35.1

Table 162: Mode of birth by ethnicity among nullipara, BMI 26-30

	Total n=635	SVB n=321	Operative vaginal birth n=118	Caesarean n=196
	N	n %	n %	n %
European	325	133 40.9	70 21.5	122 37.5
Maori	71	46 64.8	12 16.9	13 18.3
Pacific	106	81 76.4	7 6.6	18 17.0
Asian	114	48 42.1	26 22.8	40 35.1
Other	19	13 68.4	3 15.8	3 15.8

Table 163: Mode of birth by ethnicity among nullipara, BMI 31-35

	Total n=246	SVB n=109	Operative vaginal birth n=35	Caesarean n=102
	N	n %	n %	n %
European	108	35 32.4	17 15.7	56 51.9
Maori	30	19 63.3	4 13.3	7 23.3
Pacific	82	44 53.7	13 15.9	25 30.5
Asian	22	8 36.7	1 4.6	13 60.0
Other	4	3 75.0	0	1 25.0

Table 164: Mode of birth by ethnicity among nullipara, BMI >35

	Total n=170	SVB n=89	Operative vaginal birth n=16	Caesarean n=66
	N	n %	n %	n %
Caucasian	43	17 40	6 42	21 49
Maori	30	18 60	2 153	10 33
Pacific	84	46 55	8 7	30 36
Asian*	10	6 60	0 20	4 40
Other	3	2 67	0 0	1 33

Table 165: Pregnancy complications and BMI

	BMI<19 n=442	BMI 19-22 n=2602	BMI 23-25 n=1742	BMI 26-30 n=1441	BMI 31-35 n=686	BMI 36-40 n=303	BMI>40 n=210
	n %	n %	n %	n %	n %	n %	n %
Diabetes							0.0
GDM	14 3.2	92 3.5	100 5.7	109 7.6	76 11.1	42 13.9	42 20.0
Type 1	0	5 0.2	17 1.0	15 1.0	7 1.0	2 0.7	0 0.0
Type 2	1 0.2	2 0.1	5 0.3	12 0.8	21 3.1	15 5.0	13 6.2
Non diabetic	427 96.6	2503 96.2	1620 93.0	1305 90.6	582 84.8	244 80.5	155 73.8

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

	Total n=4186	BMI<19 n=269	BMI 19-22 n=1446	BMI 23-25 n=924	BMI 26-30 n=803	BMI 31-35 n=431	BMI 36-40 n=199	BMI>40 n=114
	n %	n %	n %	n %	n %	n %	n %	n %
PPH ≥ 1000mls	204 4.9	10 3.7	48 3.3	42 4.6	650 6.2	26 6.0	17 8	11 5.6
PPH ≥ 1500mls	102 2.4	2 0.7	28 1.9	18 2.0	23 2.9	13 3.0	13 6.5	5 4.4

Table 167: Postpartum haemorrhage associated with Caesarean section by BMI

	Total n=2318	BMI <19 n=107	BMI 19-22 n=764	BMI 23-25 n=578	BMI 26-30 n=482	BMI 31-35 n=212	BMI 36-40 n=94	BMI >40 n=81
	n %	n %	n %	n %	n %	n %	n %	n %
PPH ≥ 1000mls	364 15.7	13 12.2	102 13.4	80 13.8	73 15.2	45 21.2	25 26.6	26 32.1
PPH ≥ 1500mls	119 5.1	6 5.6	27 3.5	27 4.7	25 5.2	17 8.0	10 10.6	7 8.6

Table 168: Neonatal outcomes and BMI

	BMI<19 n=444		BMI 19-22 n=2660		BMI 23-25 n=1772		BMI 26-30 n=1473		BMI 31-35 n=700		BMI 36-40 n=311		BMI >40 n=214	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Preterm	26	5.9	211	7.9	148	8.4	123	8.4	83	11.9	42	13.5	25	11.7
Term	418	94.1	2449	92.1	1624	91.7	1350	91.7	617	88.1	269	86.5	189	88.3
SGA	55	12.4	271	10.2	172	9.7	196	13.3	106	15.1	49	15.8	25	11.7
≥ 2 days in NICU	27	6.1	196	7.4	130	7.3	136	9.2	78	11.1	33	10.6	30	14.0
Perinatal deaths (n /1000)	6	13.5	33	12.4	23	13.0	19	12.9	13	18.6	3	9.6	7	32.7

Table 169: Maternal interventions and birth outcomes by BMI

	BMI<19 n=442		BMI 19-22 n=2602		BMI 23-25 n=1742		BMI 26-30 n=1441		BMI 31-35 n=686		BMI 36-40 n=303		BMI >40 n=210	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Onset of birth														
Spontaneous labour	275	62.2	1494	57.4	880	50.5	714	49.6	352	51.3	143	47.2	83	27.4
Induced labour	109	24.7	670	25.8	530	30.4	444	30.8	227	33.1	105	34.7	87	28.7
Emergency CS before labour	11	2.5	67	2.6	49	2.8	41	2.9	29	4.2	12	4.0	8	2.6
Elective CS	47	10.6	371	14.3	283	16.3	242	16.8	78	11.4	43	14.2	32	10.6
Mode of birth														
Spontaneous vaginal birth	269	60.9	1446	55.6	927	53.0	803	55.7	431	62.8	199	65.7	114	37.6
Operative vaginal	66	14.9	392	15.1	240	13.8	156	10.8	43	6.3	10	3.3	15	5.0
Elective CS	47	10.6	371	14.3	283	16.3	242	16.8	78	11.4	43	14.2	32	10.6
Emergency CS in labour	49	11.1	289	11.1	216	12.4	174	12.1	83	12.1	30	9.9	34	11.2
Emergency CS not in labour	11	2.5	104	4.0	79	4.5	66	4.6	51	7.4	21	6.9	15	5.0

APPENDIX 5. LABOUR AND BIRTH

5.1 Induction of labour

Table 170: Induction of labour rates (1992-2009) No data available on induction rates for 2001-2003

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

*Does not include 39 BBA's

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

	Nullipara n=3504		Multipara n=3573	
	n	**%**	**n**	**%**
Total	1166	33.3	894	25.0
Prolonged latent phase	120	3.4	122	3.4
Post dates	211	6.0	109	3.1
Diabetes	105	3.0	122	3.4
Hypertension	177	5.1	57	1.6
Maternal age	54	1.5	73	2.0
Maternal medical complications	37	1.1	57	1.6
SGA	88	2.5	76	2.1
Term PROM	226	6.4	105	2.9
Decreased liquor volume	62	1.8	33	0.9
Maternal request	7	0.2	16	0.4
Poor obstetric history	8	0.2	21	0.6
Fetal Distress	17	0.5	28	0.8
Pelvic arthropathy	1	0.03	4	0.1
Multiple pregnancy	8	0.2	17	0.5
Large for gestational age	3	0.1	8	0.2
IUD/Fetal anomaly	12	0.3	13	0.4
APH	4	0.1	3	0.1
Other	26	0.7	30	0.8

Table 172: Indication for induction by gestation

	Preterm n= 658		Term n=7077	
	n	%	n	%
Total	178	27.1	2060	29.1
Post Dates	0		320	4.5
Hypertension	18	2.7	234	3.3
Prolonged latent phase	1	0.2	242	3.4
Term PROM	0		331	4.7
Diabetes	25	3.8	227	3.2
SGA	13	2.0	164	2.3
Maternal Age	0		127	1.8
Maternal Medical Complications	7	1.1	94	1.3
Decreased Liquor Volume	3	0.5	95	1.3
Maternal Request	0		23	0.3
PPROM	57	8.7	0	
Multiple Pregnancy	8	1.2	25	0.4
Fetal Distress	2	0.3	45	0.6
Poor Obstetric History	0		29	0.4
Pelvic Arthropathy	0		5	0.1
IUD/Fetal Anomaly	40	6.1	25	0.4
Other	4	0.6	74	1.0

Table 173: Rates of induction by age and ethnicity among term nullipara and multipara (excluding previous Caesarean)

	Term Nullipara	Induction of labour		Term Multipara no prev CS	Induction of labour	
	N	n	%	N	n	%
Total	3504	1166	33.3	2525	777	30.8
Age						
≤25	819	234	28.6	356	67	18.8
26-30	1061	309	29.1	565	142	25.1
31-35	1075	397	36.9	864	256	29.6
>35	549	226	41.2	740	312	42.2
Ethnicity						
NZ European	1351	487	36.0	904	358	39.6
Maori	241	90	37.3	267	67	25.1
Pacific	369	112	30.4	488	118	24.2
Asian	817	212	25.9	413	89	21.5
Indian	244	94	38.5	148	44	29.7
Other European	375	135	36.0	200	75	37.5
Other	107	36	33.6	105	26	24.8

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

	Nullipara				Multipara (no previous CS)			
	Spontaneous labour n=1971		Induced labour n=1166		Spontaneous labour n=1608		Induced labour n=777	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB	1223	62.0	477	40.9	1485	92.4	667	85.8
Operative vaginal	448	22.7	278	23.8	62	3.9	46	5.9
CS emergency in labour	300	15.2	318	27.3	61	3.8	48	6.2
CS emergency not in labour*	0		93	8.0	0		16	2.1
Epidural	1098	55.7	982	84.2	351	21.8	420	54.1

*failed induction rate

Table 175: Mode of birth at term among nullipara by indication for induction

	Post dates n=211		Term PROM n=226		Hypertension n=177		Prolonged latent phase n=120		Diabetes n=105		SGA n=88		Other n= 239	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	83	39.3	95	42.0	74	41.8	53	44.2	52	49.5	42	47.7	78	32.6
Operative vaginal	46	21.8	55	24.3	44	24.9	35	29.2	19	18.1	18	20.5	61	25.5
CS emergency in labour	64	30.3	69	30.5	44	13.8	30	25.0	23	21.9	18	20.5	70	29.2
CS emergency not in labour*	18	8.5	7	7.5	15	16.1	2	1.7	11	10.5	10	11.4	30	12.5
Epidural	178	84.4	195	86.3	142	80.2	105	87.5	79	75.2	74	84.1	209	87.4

*failed induction rate

Table 176: Mode of birth at term among multipara (excluding previous Caesarean) women by indication for induction

	Post dates n=97		Diabetes n=101		SGA n=65		Prolonged latent phase n=107		Maternal Age n=69		Hypertension n=46		Other n= 292	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	83	85.6	86	85.1	58	89.2	97	90.7	57	82.6	38	82.6	248	84.9
Operative vaginal	8	8.2	4	4.0	5	7.7	3	2.8	5	7.2	5	10.9	16	5.5
CS emergency in labour	6	6.2	7	6.9	2	3.1	6	5.6	6	8.7	2	4.3	19	6.5
CS emergency not in labour*	0		4	4.0	0		1	0.9	1	1.4	1	2.2	9	3.1
Epidural	51	52.6	38	37.6	30	46.2	63	58.9	41	59.4	25	54.3	172	58.9

*failed induction rate

Table 177: Gestation at birth among women whose primary indication for induction was 'post dates'

Gestation at birth	Total n=320		Age <35 n=243		Age ≥35 n=77	
	n	%	n	%	n	%
40 – 40[6]	10	3.1	7	2.9	3	3.9
41 – 41[6]	219	68.4	162	66.7	57	74.0
42 – 42[6]	91	28.4	74	30.5	17	22.1

5.3 Use of Syntocinon

Table 178: Dilatation at start of syntocinon infusion among labouring women by induction status

	Induced labour n=1672		Spontaneous labour n=1022	
	n	%	n	%
0	63	3.8	0	
1	229	13.7	0	
2	505	30.2	0	
3	468	28.0	205	20.1
4	175	10.5	203	19.9
5	57	3.4	148	14.5
6	15	0.9	88	8.6
7	13	0.8	72	7.0
8	9	0.5	71	6.9
9	14	0.8	64	6.3
10	41	2.5	99	9.7
Missing	83	5.0	72	7.0

5.4 Mode of birth

Table 179: Mode of birth by parity and previous Caesarean section status

	Nullipara preterm n=307		Nullipara term n=3504		Multipara no prev CS preterm n=233		Multipara no prev CS term n=2525		Multipara prev CS preterm n=118		Multipara prev CS term n=1048	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	124	40.4	1697	48.4	137	58.8	2143	84.9	19	16.1	193	18.4
Vaginal breech	15	4.9	3	0.1	23	9.9	9	0.4	10	8.5	1	0.1
Operative vaginal birth	27	8.8	726	20.7	6	2.6	108	4.3	4	3.4	76	7.3
Ventouse	11	3.6	485	13.8	3	1.3	64	2.5	1	0.8	44	4.2
Forceps	16	5.2	241	6.9	3	1.3	44	1.7	3	2.5	32	3.1
Caesarean section	141	45.9	1078	30.8	67	28.8	265	10.5	85	72.0	778	74.2
Emergency	101	32.9	778	22.2	43	18.5	148	5.9	44	37.3	168	16.0
Elective	40	13.0	300	8.6	24	10.3	117	4.6	41	34.7	610	58.2

Table 180: LMC by parity and previous Caesarean section status

	IMW n=3422		Pvt Obstetrician n=1718		GP n=115		NW n=2383		Other DHB n=39		Unbooked n=58	
	n	%	n	%	n	%	n	%	n	%	n	%
Primipara	1879	54.9	829	48.3	50	43.5	1018	42.7	18	46.2	17	29.3
Standard primip	774	22.6	238	13.9	19	16.5	281	11.8	0	0	6	10.3
Multipara	1543	45.1	889	51.7	65	56.5	1365	57.3	21	53.8	41	70.7
Previous CS	295	8.6	383	22.3	12	10.4	466	19.6	3	7.7	7	12.1
No prev CS	1248	36.5	506	29.5	53	46.1	899	37.7	18	46.2	34	58.6

Table 181: Mode of birth by LMC at birth (term nullipara)

	IMW n=1796		Pvt Obstetrician n=761		GP n=47		NW n=883		Other DHB n=3		Unbooked n=14	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	966	53.8	191	25.1	27	57.4	498	56.4	1	33.3	14	100
Vaginal breech	1	0.1	0		0		2	0.2	0		0	
Forceps	133	7.4	57	7.5	2	4.3	49	5.5	0		0	
Ventouse	256	14.3	109	14.3	8	17.0	111	12.6	1	33.3	0	
CS elective	68	3.8	181	23.8	1	2.1	50	5.7	0		0	
CS emergency	372	20.7	223	29.3	9	19.2	173	19.6	1	3.3	0	

Table 182: Mode of birth at term by LMC at birth (standard primipara)

	IMW n=774		Pvt Obstetrician n=238		GP n=19		NW n=281		Unbooked n=6	
	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	488	63.0	74	31.1	15	78.9	171	60.9	6	100
Forceps	60	7.8	17	7.1	0		13	4.6	0	
Ventouse	115	14.9	42	17.6	2	10.5	49	17.4	0	
CS elective	5	0.6	44	18.5	0		3	1.1	0	
CS emergency	106	13.7	61	25.6	2	10.5	45	16.0	0	

Table 183: Mode of birth at term by LMC at birth (multipara, no previous CS)

	IMW n=1181		Pvt Obstetrician n=471		GP n=50		NW n=795		Other DHB n=5		Unbooked n=23	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1043	88.3	371	78.8	42	84.0	661	83.1	5	100	21	91.3
Vaginal breech	2	0.2	1	0.2	0		6	0.8	0		0	
Forceps	24	2.0	8	1.7	1	2.0	11	1.4	0		0	
Ventouse	25	2.1	19	4.0	2	4.0	17	2.1	0		1	4.3
CS elective	33	2.8	46	9.8	1	2.0	37	4.7	0		0	
CS emergency	54	4.6	26	5.5	4	8.0	63	7.9	0		1	4.3

Table 184: Mode of birth at term by LMC (multipara, previous CS)

	IMW n=275		Pvt Obstetrician n=357		GP n=12		NW n=398		Other DHB n=1		Unbooked n=5	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	66	24.0	25	7.0	4	33.3	95	23.9	0		3	60
Vaginal breech	0		0		0		1	0.3	0		0	
Forceps	14	5.1	6	1.7	1	8.3	11	2.8	0		0	
Ventouse	17	6.2	10	2.8	0		16	4.0	0		1	20
CS elective	112	40.7	276	77.3	7	58.3	214	53.8	1	100	0	
CS emergency	66	24.0	40	11.2	0		61	15.3	0		1	20

Table 185: Mode of birth by ethnicity

	NZ European n=2967		Maori n=670		Pacific n=1115		Asian n=1478		Indian n=520		Other European n=707		Other n=278	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1441	48.6	437	65.2	804	72.1	855	57.8	251	48.3	363	51.3	162	58.3
Vaginal breech	16	0.5	15	2.2	10	0.9	13	0.9	1	0.2	1	0.1	5	1.8
Forceps	173	5.8	24	3.6	26	2.3	59	4.0	23	4.4	28	4.0	6	2.2
Ventouse	266	9.0	27	4.0	32	2.9	143	9.7	59	11.4	60	8.5	21	7.6
CS elective	569	19.2	78	11.6	84	7.5	165	11.3	76	14.6	125	17.7	35	12.6
CS emergency	502	16.9	89	13.3	159	14.3	243	16.4	110	21.2	130	18.4	49	17.6

Table 186: Mode of birth by ethnicity (nullipara)

	NZ European n=1482		Maori n=271		Pacific n=412		Asian n=859		Indian n=267		Other European n=406		Other n=114	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	579	39.1	166	61.3	271	65.8	456	53.1	110	41.2	183	45.1	56	49.1
Vaginal breech	8	0.5	0		3	0.7	4	0.5	0		1	0.2	2	1.8
Forceps	132	8.9	15	5.5	19	4.6	49	5.7	16	6.0	23	5.7	3	2.6
Ventouse	212	14.3	20	7.4	24	5.8	125	14.6	46	17.2	51	12.6	18	15.8
CS elective	186	12.6	16	5.9	19	4.6	48	5.6	19	7.1	44	10.8	8	7.0
CS emergency	365	24.6	54	19.9	76	18.4	177	20.6	76	28.5	104	25.6	27	23.7

Table 187: Mode of birth by ethnicity (multipara)

	NZ European n=1485		Maori n=399		Pacific n=703		Asian n=619		Indian n=253		Other European n=301		Other n=164	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	862	58.0	271	67.9	533	75.8	399	64.5	141	55.7	180	59.8	106	64.6
Vaginal breech	383	25.8	62	15.5	65	9.2	117	18.9	57	22.5	81	26.9	27	16.5
Forceps	41	2.8	9	2.3	7	1.0	10	1.6	7	2.8	5	1.7	3	1.8
Ventouse	54	3.6	7	1.8	8	1.1	18	2.9	13	5.1	9	3.0	3	1.8
CS elective	383	25.8	62	15.5	65	9.2	117	18.9	57	22.5	81	26.9	27	16.5
CS emergency	137	9.2	35	8.8	83	11.8	66	10.7	34	13.4	26	8.6	22	13.4

Table 188: Mode of birth by maternal age (nullipara)

	≤20 n=328		21-25 n=580		26-30 n=1143		31-35 n=1156		36-40 n=523		41+ n=81	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	232	70.7	370	63.8	614	53.7	436	37.7	151	28.9	18	22.2
Vaginal breech	1	0.3	2	0.3	8	0.7	3	0.3	4	0.8	0	
Forceps	14	4.3	29	5.0	74	6.5	92	8.0	42	8.0	6	7.4
Ventouse	27	8.2	49	8.4	168	14.7	181	15.7	66	12.6	5	6.2
CS elective	9	2.7	25	4.3	63	5.5	114	9.9	102	19.5	27	33.3
CS emergency	45	13.7	105	18.1	216	18.9	330	28.5	158	30.2	25	30.9

Table 189: Mode of birth by maternal age (multipara)

	≤20 n=72		21-25 n=412		26-30 n=773		31-35 n=1396		36-40 n=1077		41+ n=194	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	62	86.1	313	76.0	561	72.6	858	61.5	599	55.6	99	51.0
Vaginal breech	2	2.8	8	1.9	14	1.8	12	0.9	6	0.6	1	0.5
Forceps	0		5	1.2	19	2.5	36	2.6	17	1.6	5	2.6
Ventouse	1	1.4	6	1.5	20	2.6	48	3.4	34	3.2	3	1.5
CS elective	2	2.8	42	10.2	90	11.6	298	21.3	304	28.2	56	28.9
CS emergency	5	6.9	38	9.2	69	8.9	144	10.3	117	10.9	30	15.5

5.5 Operative births

Table 190: Primary indication for elective or pre labour emergency Caesarean section (all gestations)

	Total N= 1507		Nullipara n=561		Multipara n= 946	
	n	%	n	%	n	%
Repeat Caesarean	585	38.8	0		583	61.6
Malpresentation	212	14.1	130	23.2	82	8.7
Maternal request	95	6.3	67	11.9	29	3.1
Obstetric history	52	3.5	7	1.3	45	4.8
Placenta praevia	48	3.2	29	5.2	19	2.0
Maternal medical condition	54	3.6	31	5.5	23	2.4
Maternal age	12	0.8	11	2.0	1	0.1
Fetal distress	98	6.5	72	12.8	26	2.8
Failed Induction	63	4.2	42	7.5	21	2.2
SGA	37	2.5	21	3.7	16	1.7
Disproportion	25	1.7	19	3.4	6	0.6
Hypertension	30	2.0	19	3.4	11	1.2
Multiple pregnancy	22	1.5	9	1.6	13	1.4
Diabetes	29	1.9	15	2.7	15	1.6
APH / abruption	30	2.0	13	2.3	17	1.8
Other	115	7.0	76	13.5	39	41.2

Table 191: Indication for in labour emergency Caesarean section at term(spontaneous or induced onset of labour) (n=907)

	n=907	
	n	%
Fetal distress	201	22.2
Other fetal indication	86	9.5
Fetal intolerance of augmented labour	81	8.9
Augmentation causes hyper stimulation	12	1.3
Poor uterine response to optimal augmentation	59	6.5
Suboptimal augmentation	48	5.3
Inefficient uterine action, no oxytocin	23	2.5
Efficient uterine action: obstructed labour	364	40.1
Maternal request	13	1.4
Other non medical	16	1.8
Missing	4	0.4

Table 192: Operative vaginal birth rates 1996-2009

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total births (mothers)	**9157**	**8055**	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**
Total operative vaginal births	1156	1051	925	949	1006		1081	1065	1171	1022	956	975	937	947
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
Total nullipara	**4018**	**3591**	**3263**	**3262**	**3455**				**3597**	**3522**	**3499**	**3752**	**3623**	**3811**
Operative vaginal births	895	776	704	722	733				875	809	737	772	722	753
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
Total multipara	**5139**	**4464**	**4229**	**4239**	**4372**				**3894**	**3672**	**3713**	**3943**	**3966**	**3924**
Operative vaginal births	261	275	221	227	273				296	213	219	203	215	194
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

Table 193: Type of operative vaginal birth: (1996-2009)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total births	**9157**	**8055**	**7492**	**7501**	**7827**	**7471**	**7755**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7753**
Total operative vaginal births	1156	1051	925	949	1006		1081	1065	1171	1022	956	975	937	947
% 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
Total forceps alone	739	590	464	439	435		391	352	323	234	256	222	301	339
% 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
Kiellands forceps	83	73	41	33	21				36	22	33	22	29	42
% 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
Other forceps	656	517	423	406	414				287	212	223	200	272	297
% 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
Ventouse or forceps /ventouse	417	461	461	510	571		690	713	848	788	700	753	677	650
% 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
Ventouse alone				436	516				771	728	639	686	636	608
% of all births				5.8	6.6				10.3	10.1	8.9	8.9	8.4	7.8
Forceps/ ventouse				74	55				77	60	61	67	41	35
% of all births				1.0	0.7				1.0	0.8	0.8	0.9	0.5	0.5

Table 194: Breech birth (1996-2009)
Note no data in 2001-2003

	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009
Total babies born	9612	8270	7721	7679	8054	7679	7384	7379	7875	7753	7897
Total breech births	479	434	400	440	484	421	432	419	449	439	335
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
Total singleton babies				7329	7609	7303	7007	7050	7518	7427	7576
Total singleton breech				341	363	318	328	328	351	346	335
Percent of singletons				4.7	4.8	4.4	4.7	4.7	4.7	4.7	4.4
Total multiple babies				350	445	376	377	329	357	324	321
Total multiple breech				99	121	103	104	91	98	93	89
Percent of multiple births				28.3	27.2	27.4	27.6	27.7	27.5	28.7	27.7

Table 195: Mode of birth by type of breech (singletons only)

	Extended leg n=158		Flexed leg n=112		Unspecified n=65		Total breech n= 335	
	n	%	n	%	n	%	n	%
Vaginal breech	19	12.0	12	10.7	8	12.3	39	11.6
Caesarean section	139	88.0	100	89.3	57	87.7	296	88.4
CS emergency	50	31.7	33	29.5	20	30.8	103	30.8
CS elective	89	56.3	67	59.8	37	56.9	193	57.6

Table 196: Mode of birth by type of breech (multiples only)

	Extended leg n=24		Flexed leg n=35		Unspecified n=30		Total breech n=89	
	n	%	n	%	n	%	n	%
Vaginal breech	7	29.2	12	34.3	5	16.7	23	25.8
Caesarean section	17	70.8	23	65.7	25	83.3	66	74.2
CS emergency	10	41.6	10	28.6	12	40.0	33	37.1
CS elective	7	29.2	13	37.1	13	43.3	33	37.1

Table 197: Referral for ECV (women at term with singleton breech presentation or attempted ECV) by demographic and clinical characteristics

	Singleton breech at term or attempted ECV	ECV n=111		No ECV n=172	
	n=283	n	%	n	%
Age (years					
≤ 20	5	2	40	3	60
21-30	93	43	46	50	54
31-40	168	62	37	106	63
≥ 41	17	4	24	13	76
Ethnicity					
NZ/Other European	115	48	42	97	58
Maori/ Pacific Island	58	23	40	35	60
Asian	52	26	50	26	50
Indian	18	8	44	10	56
Other	10	6	60	4	40
BMI					
<19	24	10	42	14	58
19-25	157	61	39	96	61
26-30	46	18	39	28	61
31-35	31	17	55	14	45
>35	18	3	17	15	83
LMC at birth					
Independent/Domino MW	120	59	49	61	51
NW Community	51	21	41	30	59
NW Diabetes/Medical	33	13	39	20	61
Private Obstetrician	76	16	21	60	79
GP	2	2	100	0	0
Unbooked	1	1	100	0	0
Previous CS					
No	229	107	47	122	53
Yes	54	4	7	50	93

5.6 Anaesthesia use

Table 198: Epidural use among women with spontaneous and induced labour (2000-2009)

	2000	2004	2005	2006	2007	2008	2009
Number of births	7827	7491	7194	7212	7695	7589	7753
Number women with spontaneous labour	4820	4817	4246	4256	4490	4070	4125
Spontaneous labour and epidural	2143	2434	2138	2168	2057	1743	1717
%	44.5	50.5	50.4	50.9	45.8	42.8	41.6
Number of women with induced labour	2002	1922	1894	1776	1906	2203	2238
Induced labour and epidural	1313	1412	1373	1269	1326	1550	1599
%	65.6	73.5	72.5	71.5	69.6	70.4	71.4

Table 199: Analgesic use and LMC at birth among labouring nulliparous women

LMC type	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
IMW	1773	1121	63.2	971	54.8	521	29.4	34	1.9	233	13.1
Pvt Obstetrician	593	507	85.5	249	42.0	65	11.0	12	2.0	75	12.6
GP	49	34	69.4	29	59.2	13	26.5	1	2.0	4	8.2
NW Domino	157	94	59.9	85	54.1	37	23.6	2	1.3	20	12.7
NW Community	511	284	55.6	302	59.1	161	31.5	0		46	9.0
NW Diabetes	105	68	64.8	53	50.5	27	25.7	1	1.0	3	2.9
NW Medical	137	89	65.0	67	48.9	32	23.4	1	0.7	9	6.6
Other DHB	11	4	36.4	8	72.7	2	18.2	0		0	
Unbooked	17	1	5.9	7	41.2	0		0		0	

Table 200: Analgesic use and ethnicity among labouring nulliparous women

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
NZ European	1246	926	74.3	622	49.9	258	20.7	38	3.0	181	14.5
Maori	250	144	57.6	142	56.8	70	28.0	2	0.8	33	13.2
Pacific	384	183	47.7	211	54.9	87	22.7	2	0.5	37	9.6
Asian	792	485	61.2	441	55.7	248	31.3	1	0.1	49	6.2
Indian	234	161	68.8	131	56.0	77	32.9	1	0.4	23	9.8
Other European	348	234	67.2	177	50.9	86	24.7	7	2.0	57	16.4
Other	99	69	69.7	47	47.5	32	32.3	0		10	10.1

Table 201: Analgesic use and maternal age among labouring nulliparous women

Maternal age (years)	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
≤20	310	151	48.7	194	62.6	91	29.4	1	0.3	33	10.6
21-25	543	310	57.1	308	56.7	174	32.0	1	0.2	53	9.8
26-30	1045	668	63.9	594	56.8	287	27.5	14	1.3	130	12.4
31-35	1007	742	73.7	470	46.7	209	20.8	22	2.2	123	12.2
36-40	399	290	72.7	186	46.6	82	20.6	11	2.8	47	11.8
41+	49	41	83.7	19	38.8	15	30.6	2	4.1	4	8.2

APPENDIX 6. LABOUR and BIRTH OUTCOMES

6.1 Perineal trauma

Table 202: Perineal trauma by mode of birth, parity and LMC at birth among all vaginal births

	Total	Episiotomy		3rd/4th tear		Vaginal wall tear	
	N	n	%	n	%	n	%
Total vaginal births	5321	1184	22.3	116	2.2	289	5.4
Mode of birth							
Normal vaginal	4313	564	13.1	58	1.3	237	5.5
Vaginal breech	61	11	18.0	0		2	3.3
Ventouse	608	342	56.3	28	4.6	32	5.3
Forceps	339	267	78.8	30	8.9	18	5.3
Parity							
Nulliparous	2592	876	33.8	100	3.9	211	8.1
Multiparous	2729	308	11.3	16	0.6	78	2.9
LMC at birth							
Independent Midwife	2665	614	23.0	54	2.0	157	5.9
Private Obstetrician	850	281	33.1	13	1.5	24	2.8
General Practitioner	92	27	29.4	2	2.2	1	1.1
NW Domino	270	38	14.1	13	4.8	23	8.5
NW Community	963	145	15.1	24	2.5	60	6.2
NW Diabetes	183	34	18.6	5	2.7	10	5.5
NW Medical	222	41	18.5	4	1.8	12	5.4
Other DHB	21	1	4.8	0		0	
Unbooked	55	3	5.5	1	1.8	2	3.6

Table 203: Episiotomy rates in vaginal births, all gestations by LMC at birth and parity

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	2592	876	33.8	2729	308	11.3
Independent Midwife	1411	466	33.0	1254	148	11.8
Private Obstetrician	385	196	50.9	465	85	18.3
General Practitioner	39	18	46.2	53	9	17.0
NW Domino	136	33	24.3	134	5	3.7
NW Community	412	104	25.2	551	41	7.4
NW Diabetes	75	23	30.7	108	11	10.2
NW Medical	111	33	29.7	111	8	7.2
Other DHB	6	1	16.7	15	0	
Unbooked	17	2	11.8	38	1	2.6

Table 204: Episiotomy rates in spontaneous (non operative) vertex (not breech) birth, all gestations by LMC at birth and parity

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1821	361	19.8	2492	203	8.2
Independent Midwife	1014	203	20.0	1163	100	8.6
Private Obstetrician	209	68	32.5	415	62	14.9
General Practitioner	28	11	39.3	49	9	18.4
NW Domino	104	10	9.6	126	2	1.6
NW Community	308	38	12.3	503	19	3.8
NW Diabetes	53	9	17.0	100	7	7.0
NW Medical	83	20	24.1	91	3	3.3
Other DHB	5	0		13	0	
Unbooked	17	2	11.8	32	1	3.1

Table 205: 3rd and 4th degree tears in spontaneous (non operative) vertex birth by LMC at birth and parity

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1821	50	2.8	2493	8	0.3
Independent Midwife	1014	20	2.0	1163	2	0.2
Private Obstetrician	209	4	1.9	415	1	0.2
GP	28	0		49	0	
NW Domino	104	7	6.7	126	0	
NW Community	308	15	4.9	503	4	0.8
NW Diabetes	53	1	1.9	100	1	1.0
NW Medical	83	2	2.4	91	0	
Other DHB	5	0		13	0	
Unbooked	17	1	5.9	32	0	

Table 206:Third stage management by PPH risk

	Total n=447	Physiological n=447		Active syntocinon n=2688		Active syntometrine n=1969		Other n=46		Unknown n=171	
	n	n	%	n	%	n	%	n	%	n	%
Spontaneous vaginal birth	4374	446	10.2	2104	48.1	1649	37.7	30	0.7	145	3.3
Operative vaginal birtl	947	1	0.1	584	61.7	320	33.8	16	1.7	26	2.8
BMI											
<19	335	31	9.3	178	53.1	112	33.4	3	0.9	11	3.3
19-25	3002	288	9.6	1554	51.8	1041	34.7	26	0.9	93	3.1
26-30	959	65	6.8	484	50.5	369	38.5	7	0.7	34	3.5
31-35	474	32	6.8	232	48.9	198	41.8	5	1.1	7	1.5
>35	338	10	3.0	150	44.4	163	48.2	3	0.9	12	3.6
missing	213	21	9.9	90	42.3	86	40.4	2	0.9	14	6.6
Previous CS	303	12	4.0	154	50.8	122	40.3	4	1.3	11	3.6
Hypertension											
Nil	4920	441	9.0	2361	48.0	1914	38.9	45	0.9	159	3.2
Gestational Hypertension	171	3	1.8	134	78.4	28	16.4	1	0.6	5	2.9
Chronic hypertension	94	1	1.1	74	78.7	17	18.1	0	0.0	2	2.1
Superimposed preeclampsia	14	1	7.1	12	85.7	0	0.0	0	0.0	1	7.1
Preeclampsia	122	1	0.8	107	87.7	10	8.2	0	0.0	1	0.8
Singleton	5255	447	8.5	2659	50.6	1934	36.8	44	0.8	171	3.3
Twins	66	0	0.0	29	43.9	35	53.0	2	3.0	0	0.0

Table 207: Postpartum transfusion rates by recorded blood loss at birth

	Total	Postpartum transfusion	
	n=7735	n=232	
		n	%
Blood loss <500mls	4867	10	0.2
PPH ≥500- <1000	2199	31	1.4
PPH ≥1000mls	651	190	29
Blood loss unknown	18	1	6

APPENDIX 7. POSTNATAL CARE

7.1 Infant Feeding

Table 208: Method of Infant feeding at discharge from NW (2003-2009)

	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	
	n	%
Exclusive breastfeeding	5659	81.7
Fully breastfeeding	287	4.1
Partial breastfeeding	824	11.9
Artificial feeding	158	2.3

Table 209: Infant feeding on discharge from NW by mode of birth, LMC and maternal age

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total	6928	5650	81.6	287	4.1	824	11.9	158	2.3
Mode of birth									
Spontaneous vaginal	4017	3584	89.2	81	2.0	267	6.7	85	2.1
Operative vaginal	863	723	83.8	33	3.8	96	11.1	11	1.3
Elective CS	996	686	68.9	69	6.9	201	20.2	40	4.0
Emergency CS	1052	666	63.3	104	9.9	260	24.7	22	2.1
LMC at birth									
IMW	3191	2795	87.6	79	2.5	275	8.6	42	1.3
Private Obstetrician	1581	1304	82.4	67	4.2	183	11.6	27	1.7
GP	107	88	82.2	3	2.8	16	15.0	0	
NW Community	1258	941	74.8	72	5.7	200	15.9	45	3.6
NW Domino	292	228	78.1	11	3.8	37	12.7	16	5.5
NW Medical	198	123	62.1	28	14.1	34	17.2	13	6.6
NW Diabetes	252	143	56.8	26	10.3	76	30.2	7	2.8
Unbooked	42	31	73.8	0		3	7.1	8	19.1
Other DHB	7	6	85.7	1	14.3	0		0	
Maternal age									
≤ 20	336	284	84.5	12	3.6	28	8.3	12	3.6
21-25	865	703	81.3	37	4.3	93	10.8	32	3.7
26-30	1733	1416	81.7	76	4.4	207	11.9	34	2.0
31-35	2322	1928	83.0	92	4.0	263	11.3	39	1.7
36-40	1437	1160	80.7	55	3.8	190	13.2	32	2.2
41+	235	168	71.5	15	6.4	43	18.3	9	3.8

Table 210: Infant feeding on discharge from NW by maternal ethnicity, gestation, birthweight and among standard primpara

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Ethnicity									
NZ European	2646	2298	86.8	93	3.5	207	7.8	48	1.8
Māori	556	471	84.7	14	2.5	49	8.8	22	4.0
Pacific	985	761	77.3	51	5.2	127	12.9	46	4.7
Asian	1389	1020	73.4	69	5.0	281	20.0	19	1.4
Indian	463	349	75.4	29	6.3	81	17.5	4	0.9
Other European	639	546	85.5	19	3.0	59	9.2	15	2.4
Other	250	214	85.6	12	4.8	20	8.0	4	1.6
Gestation									
< 37 weeks	233	133	57.1	34	14.6	63	27.0	3	1.3
≥37 weeks	6695	5526	82.5	253	3.8	761	11.4	155	2.3
Birth weight									
< 2.5 kgs	151	57	37.8	40	26.5	51	33.8	3	2.0
2.5 - 2.9 kgs	1089	839	77.0	58	5.3	163	15.0	29	2.7
3.0 - 4.4 kgs	5566	4685	84.2	7	0.1	581	10.4	120	2.2
≥ 4.5 kgs	122	78	63.9	9	7.4	29	23.8	6	4.9
Standard / Non standard Primipara									
Standard	1255	1097	87.4	36	2.9	101	8.1	21	1.7
Non standard	5673	4562	80.4	251	4.4	723	12.7	137	2.4

Table 211: Infant feeding on discharge from NW Homecare

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Community	900	510	56.7	66	7.3	211	23.4	113	12.6
Domino	258	170	65.9	17	6.6	40	15.5	31	12.0
Medical	57	23	40.4	3	5.3	18	31.6	13	22.8
Diabetes	89	46	51.7	12	13.5	22	24.7	9	10.1

7.2 Postnatal Admissions

Table 212: Maternal destination following birth by mode of birth

	Total n=7735	NW Wards n=4557		Birthcare Auckland n=2637		Home n=517		Other Units n=24	
	N	n	%	n	%	n	%	n	%
Spontaneous vaginal	4374	1568	35.9	2276	52.0	511	11.7	19	0.4
Operative vaginal	947	575	60.7	361	38.1	6	0.6	5	0.5
CS Elective	1132	1132	100	0		0		0	
CS Emergency	1282	1282	100	0		0		0	

Table 213: Maternal destination following birth by LMC at birth

	Total n=7735	NW Wards n=4557		Birthcare n=2637		Home n=517		Other Units n=24	
	N	n	%	n	%	n	%	n	%
Independent Midwife	3422	1553	45.4	1556	45.5	296	8.7	17	0.5
Private Obstetrician	1718	1140	66.4	548	31.9	25	1.5	5	0.3
General Practitioner	115	54	47.0	50	43.5	11	9.6	0	
NW Domino	320	183	57.2	107	33.4	30	9.4	0	
NW Community	1382	905	65.5	341	24.7	135	9.8	1	0.1
NW High Risk	681	644	94.6	26	3.8	10	1.5	1	0.1
Other DHB	39	37	94.9	1	2.6	1	2.6	0	
Unbooked	58	41	70.7	8	13.8	9	15.5	0	

Table 214: Maternal destination following birth by ethnicity

	Total	NW Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
NZ European	2968	1735	58.5	1139	38.4	79	2.7	15	0.5
Maori	669	410	61.3	194	29.0	64	9.6	1	0.2
Pacific	1115	673	60.4	283	25.4	157	14.1	2	0.2
Asian	1478	825	55.8	525	35.5	127	8.6	1	0.1
Indian	521	328	63.0	157	30.1	34	6.5	2	0.4
Other European	706	411	58.2	273	38.7	19	2.7	3	0.4
Other	278	175	63.0	66	23.7	37	13.3	0	

Table 215: Postnatal readmission reason by maternal destination following birth

	NW Wards n=297		Birthcare n=118		Home n=12		Other Units n=1	
	n	%	n	%	n	%	n	%
Neonatal admission	35	11.8	28	23.7	0		0	
Postpartum haemorrhage	29	9.8	18	15.3	2	66.6	1	100
Infection	12	4.0	11	9.3	0		0	
Breast	49	16.5	17	14.4	2	16.7	0	
Wound	37	12.5	0	0.0	0		0	
Other	135	45.5	44	37.3	8	66.6	0	

Table 216: Place of birth for women admitted postnatally who did not birth at NW.

	n=141	
	n	%
Birthcare	29	20.6
Home	7	5.0
Middlemore	29	20.6
Pukekohe	1	0.7
North Shore	20	14.2
Waitakere	27	19.2
Other	28	19.9

APPENDIX 8. NEWBORN SERVICES

8.1 NICU Occupancy

Table 217: Occupancy (baby-days) for NICU by gestational age

Gestation (weeks)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	18407	20652	20108	20551	19249	14958	14541	14212	15228	15296	15236
<28	4337	4471	4237	4772	4466	3639	3328	3612	4282	4546	4129
28-31	5054	5807	6159	5483	5331	4265	4774	4322	3490	4170	4137
32-36	6776	7543	7496	8198	7204	5150	4535	4326	5423	4750	4844
≥37	2240	2831	2216	2098	2248	1904	1904	1952	2033	1830	2126

Table 218: Occupancy (baby-days) for NICU by birth weight

Weight(g)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	18407	20652	20108	20580	19249	14958	14505	14212	15228	15296	15236
<1500	8444	9003	9281	9658	8837	6563	7115	7034	7618	7584	7996
1500-1999	3669	4485	4526	4460	4295	3457	2942	2568	2489	3071	2620
2000-2499	3427	3362	3135	3173	3097	2360	2221	2111	2384	2432	1953
≥2500	2867	3802	3166	3289	3020	2578	2227	2499	2737	2209	2667

8.2 Admissions to NICU

Table 219: Admissions of inborn babies to NICU by gestational age groups

	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	
	n	%	n	%	n	%	n	%
Total	791		870		822		820	
20-27	44	5.6	58	6.7	58	7.1	57	7.0
28-31	119	15.0	107	12.3	122	14.8	91	11.1
32-36	331	41.8	377	43.3	331	40.3	315	38.4
≥ 37	297	37.5	328	37.7	311	37.8	357	43.5

Table 220: Live births at National Women's by birthweight (includes BBA)

Birth weight (g)	2009
Total	7822
<500	11
500-749	19
750-999	42
1000-1499	80
1500-1999	126
2000-2499	307
2500-2999	1212
3000-3999	5064
≥4000	961

Table 221: Admissions of inborn babies to NICU by birth weight

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	1154	1104	1098	1004	861	825	791	870	822	820
<500	0	1	1	0	0	0	0	1	0	0
500-749	22	23	14	20	11	25	19	19	19	15
750-999	41	37	37	32	37	34	24	37	37	42
1000-1249	45	47	47	31	38	47	34	47	35	31
1250-1499	64	48	56	53	36	42	57	51	52	49
1500-1999	193	186	193	164	138	120	130	130	135	126
2000-2499	291	243	256	238	177	170	182	188	180	155
2500-2999	182	199	184	156	147	119	125	139	118	117
3000-3999	239	232	221	237	208	215	183	198	212	246
≥4000	77	88	89	73	69	53	37	60	34	39

Table 222: Admissions of inborn babies to NICU by gestational age

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	1154	1104	1098	1004	861	825	791	870	822	820
23	5	7	1	1	0	1	1	5	0	1
24	4	10	8	9	3	15	9	4	8	9
25	21	12	13	10	8	14	9	13	16	12
26	23	12	15	15	18	11	13	18	17	15
27	15	14	20	15	24	9	12	18	17	20
28	18	21	19	18	18	23	16	21	13	19
29	34	29	32	18	19	41	25	26	29	20
30	32	36	32	31	35	29	29	27	37	22
31	54	42	36	43	32	33	49	33	43	30
32	78	58	67	49	42	42	63	46	40	42
33	98	77	100	78	65	38	50	63	48	65
34	135	125	138	137	79	83	88	114	90	82
35	106	116	125	96	84	70	82	82	83	69
36	114	112	92	89	79	62	48	72	70	57
37	88	77	84	71	61	70	58	59	54	64
38	93	101	98	88	86	83	69	81	86	89
39	77	88	61	85	68	72	52	68	68	77
40	109	106	78	90	84	80	78	74	70	83
41	44	55	66	52	51	39	37	39	23	38
42	6	6	13	9	5	9	3	6	10	6
43	0	0	0	0	0	1	0	1	0	0

Table 223: Admissions of outborn babies to NICU by gestational age

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	258	209	228	216	114	81	99	102	117	137
23	0	1	1	0	0	0	0	0	1	0
24	4	1	3	0	3	3	3	5	3	4
25	1	1	2	2	0	0	8	6	7	3
26	0	3	1	2	1	2	5	5	5	11
27	2	5	2	2	1	1	3	6	5	4
28	3	2	3	3	3	4	2	3	2	10
29	1	1	4	7	2	3	6	5	4	6
30	5	8	12	3	4	3	4	1	8	2
31	1	3	4	3	5	3	2	3	2	3
32	2	8	5	8	4	7	5	2	8	3
33	6	3	1	5	4	7	1	4	1	7
34	5	10	7	13	10	5	6	4	6	3
35	9	7	10	5	6	4	9	4	8	5
36	33	19	19	16	6	2	2	4	4	10
37	19	17	16	20	6	7	3	9	8	11
38	38	28	22	23	13	5	5	10	5	8
39	24	21	35	29	13	8	9	9	8	5
40	61	42	49	43	19	12	17	9	22	30
41	33	27	30	30	10	3	8	9	7	11
42	11	2	2	2	3	2	1	4	3	1
43+	0	0	0	0	1	0	0	0	0	0

Table 224: Admissions of outborn babies to NICU by birth weight

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	258	209	228	216	114	81	99	102	117	137
<500									1	
500-749	3	5	3	2	3	2	10	8	7	4
750-999	3	6	10	4	4	5	5	11	7	17
1000-1249	2	3	4	8	3	4	7	6	13	15
1250-1499	7	6	11	5	5	6	5	4	7	8
1500-1999	14	15	14	18	18	15	13	10	16	8
2000-2499	35	34	21	28	11	10	8	8	12	12
2500-2999	37	32	34	29	13	10	15	13	13	12
3000-3999	120	87	101	91	43	22	26	33	31	50
≥4000	37	21	30	31	14	7	9	9	10	11

Table 225: Admissions of outborn babies to NICU by gestational age groups

	2000		2001		2002		2003		2004		2005	
	n	%	n	%	n	%	n	%	n	%	n	%
Total	258		209		228		216		114		81	
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		2007		2008		2009	
	n	%	n	%	n	%	n	%
Total	99		102		117		137	
20-27	19	19.2	22	21.6	21	17.9	22	16.1
28-31	14	14.1	12	11.8	16	13.7	21	15.3
32-36	23	23.2	18	17.6	27	23.1	28	20.4
≥ 37	43	43.4	50	49.0	53	45.3	66	48.2

8.2.1 Admissions to NICU by domicile of mother

Table 226: Domicile of mother of all babies admitted to NICU

	2002		2003		2004		2005		2006		2007		2008	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	1331		1222		975		906		890		972		939	
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	%
Total	957	
Northern Region	872	91.1
Auckland	509	58.4
Counties Manukau	123	14.1
Waitemata	206	23.6
Northland	34	3.9
Midland Region	50	5.2
Central Region	15	1.6
Southern Region	16	1.7
Overseas	0	0.0
Missing	4	0.4

Table 227: DHB of mothers of all babies admitted to NICU

	2009 N=957				
DHB	**n**	**%**	**DHB**	**n**	**%**
Auckland	509	53.2	**Mid-Central**	7	0.7
Counties Manukau	123	12.9	**Hawkes Bay**	8	0.8
Waitemata	206	21.5	**Capital & Coast**	4	0.4
Northland	34	3.6	**Nelson Marlborough**	0	0.0
Waikato	17	1.8	**Canterbury**	10	1.0
Bay of Plenty	7	0.7	**South Canterbury**	1	0.1
Hutt	4	0.4	**Otago**	2	0.2
Tairawhiti	3	0.3	**Southland**	2	0.2
Taranaki	7	0.7	**West Coast**	1	0.1
Lakes	5	0.5	**Overseas**	0	0.0
Wanganui	3	0.3	**Missing**	4	0.4

8.2.3 Admissions to NICU by ethnicity of baby

Table 228: Ethnicity of babies admitted to NICU

	Preterm (<37 weeks) N=534		Term N=423		Total N=957	
	n	%	n	%	n	%
NZ European	199	37.3	163	38.5	362	37.8
Maori	98	18.4	67	15.8	165	17.2
Pacific	100	18.7	68	16.1	168	17.6
Asian	45	8.4	46	10.9	91	9.5
Indian	36	6.7	33	7.8	69	7.2
Other European	38	7.1	35	8.3	73	7.6
Other	17	3.2	11	2.6	28	2.9
Not Stated	1	0.2	0	0.0	1	0.1

8.2.4 Reason for admission to NICU

Table 229: Main reason for admission to NICU

	Preterm N=534		Term N=423		Total N=957	
	n	%	n	%	n	%
Prematurity	347	65.0	1	0.2	348	36.4
Respiratory distress	73	13.7	199	47.0	272	28.4
Congenital abnormality	21	3.9	80	18.9	101	10.6
Hypoglycaemia	12	2.2	22	5.2	34	3.6
Depression at birth	9	1.7	25	5.9	34	3.6
SGA	31	5.8	9	2.1	40	4.2
Other	16	3.0	44	10.4	60	6.3
Cyanotic episode	1	0.2	7	1.7	8	0.8
Suspected infection	4	0.7	17	4.0	21	2.2
Jaundice	2	0.4	2	0.5	4	0.4
Haemolytic disease	3	0.6	2	0.5	5	0.5
Feeding difficulty	3	0.6	1	0.2	4	0.4
Bile stained vomiting	6	1.1	5	1.2	11	1.1
Neurological problem	0	0.0	6	1.4	6	0.6
Neonatal abstinence syndrome	0	0.0	1	0.2	1	0.1
Maternal diabetes mellitus	5	0.9	1	0.2	6	0.6
Vomiting	1	0.2	1	0.2	2	0.2

The one baby admitted to NICU for prematurity at term was born by CS at 37 weeks and suffered RDS

8.2.5 Antenatal corticosteroids

Table 230: Percentage receiving antenatal corticosteroids by birth weight among ANZNN assigned babies

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	n(%)	n(%)
Total	155	55	96	149	54	87	150	79(53)	132(88)
<500	1	100	100	0	0	0	0	0	0
500-749	19	53	84	19	58	79	15	11(73)	13(87)
750-999	37	54	97	38	45	92	42	23(55)	42(100)
1000-1249	47	49	100	38	58	87	39	20(51)	31(79)
1250-1499	51	61	96	54	56	87	54	25(46)	46(85)

Table 231: Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies

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

Gestation (weeks)	2007			2008			2009		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	n(%)	n(%)
Total	165	56	98	189	51	88	157	79(50)	142(90)
<24	5	40	60	0	0	0	1	0	0
24-25	17	53	94	25	36	80	20	14(70)	19(95)
26-27	36	69	100	36	50	86	37	20(54)	25(95)
28-29	47	45	98	45	60	87	45	25(56)	40(89)
30-31	60	60	100	83	52	93	54	20(37)	48(89)

8.3 Care and complications

8.3.1 Infection

Table 232: Organisms causing serious infection in NICU

Organism	Early Infection	Late Infection
MRSA	0	1
E Coli	0	1
Staph aureus	0	3
Staph epidermidis	0	4
Coagulase negative *staphylococcus*	0	9
Haemophilus	1	0
Enterococcus	1	0
Pseudomonas	1	0
Candida	0	2
Listeria	1	0
Group B Strep	6	5
Unknown	6	0

8.3.2 Intraventricular haemorrhage

8.3.2.1 Intraventricular haemorrhage (benchmarked with ANZNN)

Table 233: Intraventricular haemorrhage by birth weight

Birth Weight (g)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	183	59	100	5	6	4	9
<500	0	0	0	0	0	0	0
500-749	15	1	11	0	0	0	3
750-999	42	2	31	1	2	2	4
1000-1249	39	3	31	1	3	1	0
1250-1499	54	30	18	2	1	1	2
1500-1999	30	20	9	1	0	0	0
2000-2499	3	3	0	0	0	0	0

Table 234: Intraventricular haemorrhage by gestation

Gestation (weeks)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	183	59	100	5	6	4	9
<24	1	0	1	0	0	0	0
24-25	20	1	9	0	2	1	7
26-27	37	1	29	1	3	2	1
28-29	45	3	36	3	1	1	1
30-31	54	38	16	0	0	0	0
32-36	26	16	9	1	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 1985-2009

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

8.3.3 Assisted ventilation

Table 236: High Frequency Oscillatory Ventilation

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 11 years.

Gestation (wks)	2009	Total	%
Total	15/29	129/221	58
<28	8/18	64/117	55
28-31	2/3	15/26	58
32-36	3/5	12/25	48
≥37	2/3	37/52	71

Table 237: Inhaled Nitric Oxide (iNO)

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 11 years.

Gestation (wks)	2009	Total	%
Total	10/20	148/224	66
<28	2/7	18/45	40
28-31	0/2	9/20	45
32-36	2/3	20/35	57
≥37	6/8	101/124	81

Table 238: iNO plus HFOV

Gestation (weeks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	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	59/104	57
<28	0/1	1/4	1/2	0/1	-	-	0/4	2/3	0/1	3/4	2/4	2/6	11/30	37
28-31	-	0/2	-	-	1/3	-	-	1/1	-	2/3	-	0/1	4/10	40
32-36	1/2	1/1	2/3	0/2	0/3	-	-	0/1	1/1	1/1	2/2	2/3	10/19	53
≥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	34/45	76

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 239: Reason for ventilation and CPAP in term and post-term infants

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
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
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
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
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
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
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
Support for surgery												14/8	10/3
Other											21/25	6/13	17/36
Missing reason											3/2		1/0

Numbers in each cell are IPPV/CPAP. Some babies from 1997 – 2006 with other diagnoses are not included in this table.

8.4.1 Survival

Table 240: Numbers and survival by gestational age of babies <32 weeks gestation in 2009

Gestation (weeks)	20	21	22	23	24	25	26	27	28	29	30	31
Born alive in NW	0	0	0	1	12	11	15	20	14	24	23	30
Died at birth in NW				0	2	0	0	0	0	0	0	0
Born alive at NW and admitted to NICU				1	10	11	15	20	14	24	23	30
Born alive at NW and survived				0	5	9	10	20	14	23	23	30
Outborn admitted				2	2	0	0	0	0	0	0	0
Outborn survived				2	2	0	0	0	0	0	0	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)

Birth Weight(g)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	122	30	34	35	16	7	0
<500	0	0	0	0	0	0	
500-749	8	1	1	2	2	2	
750-999	35	3	8	9	11	4	
1000-1249	38	7	14	14	2	1	
1250-1499	32	16	9	6	1	0	
1500-1999	9	3	2	4	0	0	

Table 242: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks gestation (ANZNN assigned babies)

Gestation (wks)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	122	30	34	35	16	7	0
<24	0	0	0	0	0	0	
24-25	13	0	1	2	6	4	
26-27	31	4	9	10	7	1	
28-29	45	7	14	20	2	2	
30-31	20	13	4	2	1	0	
>31	13	6	6	1	0	0	

8.5.2 Chronic lung disease

Table 243: Chronic lung disease by birth weight (inborn babies <1500gms)

Birth Weight (g)	n	Dead by 36 wks	Alive at 36 wks	In O_2	O_2 + CPAP/ IPPV	CPAP/ IPPV	CLD	CLD in All %	CLD if Alive %
Total	137	16	121	7	7	6	20	13.5	14.9
<500	0	0	0	0	0	0	0	0	0
500-749	15	7	8	1	1	0	2	1.4	1.5
750-999	42	7	35	4	4	3	11	7.4	8.2
1000-1249	31	2	29	2	2	1	5	3.4	3.7
1250-1499	49	0	49	1	0	2	3	2.0	2.2

Table 244: Chronic lung disease by gestational age (inborn babies <32weeks)

Gestation (weeks)	n	Dead by 36 wks	Alive at 36 wks	In O_2	O_2+CPAP/ IPPV	CPAP/ IPPV	CLD	%CLD in All	%CLD if Alive
Total	148	14	134	7	7	6	20	13.5	14.9
<24	1	1	0	0	0	0	0	0.0	0.0
24-25	21	7	14	1	4	0	5	3.4	3.7
26-27	35	6	29	6	2	1	9	6.1	6.7
28-29	39	0	39	0	1	5	6	4.1	4.5
30-31	52	0	52	0	0	0	0	0	0

8.5.3 Necrotising enterocolitis ANNZN

The data in the two tables below is for babies with confirmed NEC and therefore does not include babies with probable NEC.

Table 245: Necrotising enterocolitis (NEC) by birth weight

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		
	N	n	%	N	n	%
Total	149	4	3	150	6	4
<500	0	0	0	0		
500-749	19	2	11	15	1	7
750-999	38	1	3	42	4	10
1000-1249	38	1	3	39	0	0
1250-1499	54	0	0	54	1	2

Table 246: Necrotising enterocolitis by gestational age

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		
	N	n	%	N	n	%
Total	189	4	2	157	6	4
<24	0	0	0	1	0	0
24-25	25	3	12	20	1	5
26-27	36	1	3	37	5	14
28-29	45	0	0	45	0	0
30-31	83	0	0	54	0	0

8.5.4 Patent Ductus Arteriosus

Table 247: Patent Ductus Arteriosus by birth weight <1500g

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
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	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		
	N	Indo	Ligate	N	Indo	Ligate	N	Indo n(%)	Ligate n(%)
Total	155	36	2	143		3	137	21(15)	4(3)
<500	1	1	0	0	0	0	0	0	0
500-749	19	7	0	19	10	2	15	4(27)	0
750-999	37	17	2	37	10	1	42	9(21)	1(2)
1000-1249	47	8	0	35	5	0	31	6(19)	3(10)
1250-1499	51	3	0	52	2	0	49	2(4)	0

Table 248: Patent Ductus Arteriosus by gestational age

Gestation (weeks)	2003			2004			2005			2006		
	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate
Total	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		
	N	Indo	Ligate	N	Indo	Ligate	N	Indo n(%)	Ligate n(%)
Total	165	36	2	180	28	3	148	22(15)	4(3)
<24	5	3	1	0	0	0	1	0	0
24-25	17	10	0	24	11	2	21	5(24)	1(5)
26-27	36	19	1	34	12	1	35	14(40)	2(6)
28-29	47	4	0	42	1	0	39	1(3)	1(3)
30-31	60	0	0	80	4	0	52	2(4)	0

8.5.5 Pneumothorax

Table 249: Pneumothorax requiring drainage by birth weight

Birth weight (g)	2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
<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
Total <1500	136	3	2	121	1	1	148	8	5	134	1	0.7	155	7	5

Birth weight (g)	2008			2009		
	N	n	%	N	n	%
<500	0	0	0	0	0	0
500-749	19	2	11	15	1	7
750-999	38	1	3	42	3	7
1000-1249	38	0	0	31	0	0
1250-1499	54	4	7	49	2	4
Total <1500	149	7	5	137	6	5

Table 250: Pneumothorax requiring drainage by gestation

Gestation (weeks)	2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	N	%	N	n	%	N	n	%
<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
Total <32	160	3	2	157	3	2	176	11	6	163	1	1	165	7	4

Gestation (weeks)	2008			2009		
	N	n	%	N	n	%
<24	0	0	0	1	0	0
24-25	25	2	8	21	1	5
26-27	36	1	3	35	2	6
28-29	45	2	4	39	0	0
30-31	83	2	2	52	0	0
Total <32	189	7	4	148	3	2

Table 251: Inborn babies receiving postnatal corticosteroids by birth weight (babies alive at 1 week and less than 1500gms)

Birth weight (g)	N	n	%
Total	129	7	5
<500	0	0	0
500-749	9	2	22
750-999	40	5	13
1000-1249	31	0	0
1250-1499	49	0	0

Table 252: Inborn babies receiving postnatal corticosteroids by gestational age (babies alive at 1 week and less than 32 weeks)

Gestation(weeks)	N	n	%
Total	140	7	5
<24	0	0	0
24-25	16	4	25
26-27	33	2	6
28-29	39	1	3
30-31	52	0	0

Table 253: Method of feeding at discharge from NICU by Gestational Age and Birth weight

	Total n=798	Exclusive n=310		Fully n=206		Partial n=173		Artificial n=79		Nil Oral n=28	
	n	n	%	n	%	n	%	n	%	n	%
Gestation (weeks)											
20-24	4	1	25.0	1	25.0	0	0.0	2	50.0	0	0.0
25-27	39	29	74.4	0	0.0	1	2.6	9	23.1	0	0.0
28-31	90	49	54.4	17	18.9	12	13.3	12	13.3	0	0.0
32-36	311	73	23.5	119	38.3	82	26.4	30	9.6	7	2.3
37-40*	311	136	43.7	65	20.9	69	22.2	21	6.8	18	5.8
≥41	43	22	51.2	4	9.3	9	20.9	5	11.6	3	7.0
Birth weight (gms)											
500-749	8	7	87.5	1	12.5	0	0.0	0	0.0	0	0.0
750-999	35	23	65.7	0	0.0	4	11.4	8	22.9	0	0.0
1000-1249	31	20	64.5	4	12.9	1	3.2	6	19.4	0	0.0
1250-1499	46	22	47.8	13	28.3	4	8.7	7	15.2	0	0.0
1500-1999	126	40	31.7	42	33.3	25	19.8	15	11.9	4	3.2
2000-2499	153	29	19.0	62	40.5	44	28.8	15	9.8	3	2.0
2500-2999*	116	35	30.2	36	31.0	34	29.3	5	4.3	4	3.4
3000-3999	245	115	46.9	44	18.0	53	21.6	20	8.2	13	5.3

*2 babies with unknown BF status

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

Born at	Gestational age	Birth Weight	Apgar 1/5	Twin	Age at death (d)	Cause of death
North Shore	40	2800	1/0	0	0.7	Hypoxic ischemic encephalopathy
Waitakere	40	4790	0/0	0	1.3	Hypoxic ischemic encephalopathy
Waitakere	40	4160	4/4	0	6.2	Hypoxic ischemic encephalopathy
Middlemore	27	980	6/9	0	9.7	Necrotising enterocolitis
Middlemore	26	835	5/7	1	90.3	Chronic lung disease
Middlemore	26	1135	6/10	1	53.3	Persistent serratia meningitis
Middlemore	32	1580	8/9	0	10.4	Epidermolysis bullosa
Middlemore	24	870	2/6	0	32.2	Fungal enterocilitis with multisystem failure
Middlemore	29	810	2/8	0	24.2	Necrotising enterocolitis
Middlemore	26	1015	7/8	1	33.5	Mid Gut volvulus
Waikato	29	2497	3/7	0	5.7	Multi organ failure post operative
New Plymouth	35	1390	4/8	0	23.4	Smith Lemli Opitz syndrome

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

Born at	Gest age	Birth Weight	Apgar 1/5	Twin	Age at death (d)	Cause of death
NWH Birthing suite	23	625	2/2	0	1.8	Extreme Prematurity
NWH Theatre	24	590	3/4	0	6.7	Extreme Prematurity
NWH Birthing suite	24	665	5/7	0	7.9	Chronic lung disease with respiratory failure
NWH Birthing suite	24	825	5/5	0	10.8	Spontaneous intestinal perforation and candidiasis
NWH Birthing suite	24	600	3/5	1	4.5	Extreme Prematurity
NWH Birthing suite	24	580	2/4	1	4.5	Extreme Prematurity
NWH Theatre	25	850	4/7	0	3.2	Prematurity Bilateral severe IVH
NWH Theatre	25	850	5/7	0	0.6	Extreme Prematurity
NWH Theatre	26	670	4/6	0	4.8	Profound sepsis
NWH Birthing suite	26	990	3/7	1	37.8	Necrotising enterocolitis
NWH Birthing suite	26	735	2/6	0	0.04	Extreme Prematurity
NWH Birthing suite	26	890	5/7	0	24.9	Necrotising enterocolitis
NWH Birthing suite	26	960	6/9	0	17.8	Necrotising enterocolitis
NWH Birthing suite	27	940	4/7	0	26.1	Chronic lung disease
NWH Theatre	29	1360	9/10	1	57.5	Asphyxiation
NWH Theatre	32	2420	5/5	0	3.1	Severe RDS and PPHN
NWH Theatre	33	1490	5/8	0	9.2	Tetralogy of fallot withabsent pulmonary valve
NWH Birthing suite	34	2285	3/6	0	0.5	Cerebral ventriculomegaly
NWH Theatre	35	1340	7/9	1	10.6	Congenital anomalies with bowel atresia and sepsis
NWH Theatre	37	2750	1/2	0	4.1	Trisomy 13
NWH Birthing suite	38	3110	7/9	0	0.7	pulmonary valve absence
NWH Birthing suite	41	4000	1/1	0	0.5	Sub galeal Haemorrhage

APPENDIX 9. PERINATAL MORTALITY

Table 256: Postnatal transfer deaths (these are babies born elsewhere who transferred to NW for postnatal care) (2000-2009)

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Early neonatal deaths	< 7 days	6	1	3	3	3	3	3	5	3	4
Late neonatal deaths	8 – 28 days	0	1	0	0	0	3	3	2	3	5
Total deaths		6	2	3	3	3	6	6	7	6	9

Table 257: Perinatal and perinatal- related deaths (1993 – 2009)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total number of perinatal related losses	133	147	131	165	128	133	105	136	94	116	105	124	111	99	111	110	112
Fetal death	61	80	84	86	74	73	65	84	57	69	64	82	68	74	82	76	75
Early neonatal death	60	49	39	63	45	50	31	43	32	40	34	33	38	23	20	26	27
Late neonatal death	6	15	7	10	6	6	9	9	5	7	7	9	5	2	9	8	10
Perinatal mortality rate /1000	9.4	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
Perinatal related mortality rate /1000	14.3	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

Table 258: Perinatal mortality rate (per 1000 births) and perinatal-related mortality rate (per 1000 births) adjusted for lethal and terminated fetal abnormalities* (2000-2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	n	Rate
Perinatal mortality rate	15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2	102	12.9
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	102-28/ 7897-28	9.4
Perinatal related loss rate	16.9	12.3	14.5	13.5	16.2	15.0	13.4	14.1	14.2	112	14.2
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	75/7897-31	10.3

*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 2009

	Births n=7897		Stillbirths n=75			Neonatal deaths n=37			Perinatal related deaths n=112		
	n	%	n	%	SB rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Maternal Ethnicity											
NZ European	3043	38.5	25	33.3	8.2	10	27.0	3.3	35	31.3	11.5
Maori	683	8.6	13	17.3	19.0	9	24.3	13.4	22	19.6	32.2
Pacific	1140	14.4	12	16.0	10.5	6	16.2	5.3	18	16.1	15.8
Asian	1496	18.9	9	12.0	6.0	5	13.5	3.4	14	12.5	9.4
Indian	527	6.7	8	10.7	15.2	4	10.8	7.7	12	10.7	22.8
Other European	725	9.2	4	5.3	5.5	0	0.0		4	3.6	5.5
Other	283	3.6	4	5.3	14.1	3	8.1	10.8	7	6.3	24.7
Parity											
Nullipara	3881	49.1	29	38.7	7.5	16	43.2	4.2	45	40.2	11.6
Multipara	4016	50.8	46	61.3	11.5	21	56.8	5.3	67	59.8	16.7
Maternal Age											
≤25	1426	18.1	17	22.7	11.9	18	48.6	12.8	35	31.3	24.5
26-34	4042	51.2	40	53.3	9.9	13	35.1	3.2	53	47.3	13.1
≥35	2429	30.8	18	24.0	7.4	6	16.2	2.5	24	21.4	9.9
Maternal Smoking											
Currently smoking	755	9.6	13	17.3	17.2	6	16.2	8.1	19	17.0	25.2
No or not smoking in last month	6678	84.6	58	77.3	8.7	29	78.4	4.4	87	77.7	13.0
Missing	464	5.9	4	5.3	8.6	2	5.4	4.3	6	5.4	12.9
Maternal BMI											
<19	444	5.6	3	4.0	6.8	3	8.1	6.8	6	5.4	13.5
19-25	4432	56.1	34	45.3	7.7	22	59.5	7.5	56	50.0	12.6
26-30	1473	18.6	10	13.3	6.8	3	8.1	2.1	13	11.6	8.8
31-35	700	8.9	5	6.7	7.1	3	8.1	4.3	8	7.1	1.1
>35	525	6.6	8	10.7	15.2	2	5.4	3.9	10	8.9	19.0
Missing	323	4.1	7	9.3	21.7	1	2.7	3.2	8	7.1	24.8

* Stillbirth rate = number of stillbirths 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

Table 7: Perinatal full necropsy rates (%)

	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
Perinatal necropsy rates (%)	40	40	41	43	52	48	50	59	55	38

Table 260: Cause of perinatal-related death (2000-2009) (2000-2004 ANZACPM;2005-2009 PSANZ-PDC)

Classification*	2000		2001		2002		2003		2004		2005		2006		2007		2008		2009	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Congenital abnormality	37	25	28	30	42	36	36	34	36	34	38	34	37	37	48	43	34	31	31	28
Perinatal infection	11	8	5	5	7	6	6	6	6	6	11	10	9	9	4	4	5	5	4	4
Hypertension	5	4	3	3	3	3	4	4	4	4	3	3	3	3	0		4	4	6	5
Antepartum haemorrhage	10	8	10	11	3	3	5	5	5	5	6	5	4	4	7	6	13	12	15	13
Maternal conditions	5	4	3	3	8	7	8	7	8	7	8	7	6	6	5	5	3	3	6	5
Specific perinatal conditions	22	17	16	17	18	16	5	5	5	5	10	9	7	7	7	6	22	20	16	14
Hypoxic peripartum death	2	2	2	2	1	1	3	3	3	3	4	4	0		2	2	1	1	1	1
Fetal growth restriction	10	8	6	6	4	3	6	6	6	6	1	1	8	8	11	10	9	8	5	4
Spontaneous preterm	23	17	12	13	17	15	23	22	23	22	20	18	13	13	16	14	11	10	19	17
Unexplained antepartum death	11	8	9	10	13	11	9	8	9	8	10	9	12	12	10	9	7	6	9	8
No obstetric antecedent									0		0		0		1	1	1	1	0	
Total	136		94		116		105		124		111		99		111		110		112	

Table 261: Cause of death (PSANZ-PDC) among terminations of pregnancy

Classification	Termination of pregnancy n=26	
	n	%
Congenital abnormality	17	65
Perinatal Infection	1	4
Hypertension	1	4
Antepartum haemorrhage	1	
Maternal condition	1	
Fetal growth restriction	3	15
Spontaneous preterm	2	12

Table 262: Perinatal deaths by cause (PSANZ-PDC) and gestational age

Classification	Total n=112		< 37 weeks n=91		≥ 37 weeks n=21	
	n	%	n	%	n	%
Congenital abnormality	31	28	25	27	6	29
Perinatal infection	4	4	4	4	0	0
Antepartum haemorrhage	15	13	11	12	4	19
Maternal conditions	6	5	5	5	1	5
Hypertension	6	5	4	4	2	10
Specific perinatal conditions	16	14	13	14	3	14
Hypoxic peripartum death	1	1	0	0	1	5
Fetal growth restriction	5	4	5	5	0	0
Spontaneous preterm	19	17	19	21	0	0
Unexplained antepartum death	9	8	5	5	4	19

APPENDIX 10. GYNAECOLOGY

10.1 Termination of pregnancy

Table 263: Demography and characteristics of women attending EDU

	2002 n=5775	2003 n=5960	2004 n=5809	2005 n=5598	2006 n=5548	2007 n=5594	2008 n=5550	2009 n=5391
Ethnicity	%	%	%	%	%	%	%	%
New Zealand European	28.6	27.8	27.4	26.5	27.4	27.6	27.7	26.1
Maori	19.6	18.2	18.4	19.1	20.4	21.2	20.5	19.9
Pacific	22.9	23.0	22.8	23.2	23.8	24.5	23.1	24.3
Asian	10.9	12.3	11.6	11.2	11.4	10.5	10.8	10.6
Indian	6.4	7.4	7.7	8.3	8.2	8.3	9.4	10.2
Other European	5.1	5.1	5.4	5.7	5.0	4.5	4.8	5.1
Other	6.5	6.3	6.6	6.0	3.8	3.3	2.6	3.3
Age								
≤ 19	19.3	18.7	19.3	19.8	21.5	22.3	21.7	22.2
20 – 24	28.5	30.3	28.9	28.5	29.7	29.6	29.0	29.8
25 – 29	21.3	20.8	20.9	21.1	20.7	20.1	21.6	20.8
30 – 34	16.4	15.9	16.1	15.7	14.4	14.3	13.3	13.9
35 –39	10.4	10.2	10.9	10.7	9.5	9.7	10.1	9.3
40+	4.1	4.1	3.9	4.3	3.9	4.0	4.3	4.0
Gestation (weeks) at termination								
7	1	0.8	1.0	0.4	0.1	0.0	0.2	0.9
8	9	6.8	17.3	10.5	0.2	0.2	0.4	1.2
9	20	18	23.9	20.9	11.0	8.8	12.9	18.2
10	23	24	21.4	22.7	23.1	20.8	23.8	24.1
11	22.5	25	20.8	24.0	24.0	25.1	25.0	24.0
12	21	22.4	14.5	20.2	23.5	24.1	21.2	18.5
≥13	3.5	3	1.2	1.3	17.6	20.9	16.4	13.0

10.2 Gynaecology Inpatient Surgery

Table 264: BMI by ethnicity among women having inpatient gynaecology surgery (2009)
(missing data removed)

	Total	<19		19-25		26-30		31-35		>35	
	N	n	%	n	%	n	%	n	%	n	%
Total	**922**	**27**	**2.9**	**356**	**38.6**	**331**	**24.0**	**114**	**12.4**	**204**	**22.1**
NZ European	361	11	3.1	170	47.1	98	27.2	35	9.7	47	13.0
Maori	105	0		28	26.7	19	18.1	18	17.1	40	38.1
Pacific	156	1	0.6	8	5.1	21	13.5	38	24.4	88	56.4
Asian	101	9	8.9	68	67.3	19	18.8	3	3.0	2	2.0
Indian	67	0		22	32.8	29	43.3	5	7.5	11	16.4
Other European	96	3	3.1	44	45.8	27	28.1	12	2.5	10	10.4
Other	29	3	10.3	12	41.4	6	20.7	3	10.3	5	17.2
Not Stated	7	0		4	57.1	2	28.6	0		1	14.3

Missing data excluded.25.0% of BMI data

Table 265: Smoking status by ethnicity among women having inpatient gynaecology surgery (2009)

		Currently smoking		Past smoker		Never smoked		Unknown	
	N	n	%	n	%	n	%	n	%
Total	**1224**	**179**	**14.6**	**118**	**9.6**	**675**	**55.2**	**241**	**19.7**
NZ European	478	75	15.7	56	11.7	247	51.7	97	20.3
Maori	133	37	27.8	16	12.0	54	40.6	25	18.8
Pacific	221	44	19.9	24	10.9	100	45.3	51	23.1
Asian	122	5	4.1	4	3.3	94	77.1	18	14.8
Indian	95	1	1.1	3	3.2	73	76.8	15	15.8
Other European	129	11	8.5	13	10.1	76	58.9	28	21.7
Other	36	5	13.9	1	2.8	25	69.4	5	13.9
Not stated	10	1	10.0	1	10.0	6	60.0	2	20.0

Table 266: ASA rating among women having inpatient gynaecology surgery (2009)

	n=1224	
	n	%
ASA Rating		
0	47	3.8
1	534	43.6
2	416	34.0
3	94	7.7
4	5	0.4
Missing	128	10.5

10.3 Gynaecology Laparoscopic Surgery

Table 267: BMI and Surgical approach (Missing data excluded) (n=922)

	Hysteroscopy n=171		Laparoscopy n=253		Laparotomy n=168		Vaginal n=310		Vulval n=19	
	n	%	n	%	n	%	n	%	n	%
BMI										
<19	1	0.6	10	4.0	4	2.4	11	3.6	1	5.3
19-25	35	20.5	127	50.2	65	38.7	117	37.7	11	57.9
26-30	31	18.1	69	27.3	35	20.8	83	26.7	3	15.8
31-35	17	9.9	26	10.3	29	17.3	40	12.9	2	10.5
>35	87	50.9	21	8.3	35	20.8	59	19.0	2	10.5

*One woman had a radiologically assisted procedure, BMI 19-25

APPENDIX 11. GLOSSARY OF ABBREVIATIONS

ABA	American Board of Anaestheseologists	HMD	Hyaline Membrane Disease
ACL	Anticardiolipin antibody	HPV	Human papilloma virus
ACHS	Australian Council Healthcare Standards	ICH	Intracerebral haemorrhage
AMSIS	Auckland Maternity Services Information System	IDDM	Insulin dependent diabetes mellitus
ANA	Antinuclear antibody	Indo	Treated with indomethacin
ANZNN	Australia and New Zealand Neonatal Network	iNO	Inhaled nitrous oxide
APH	Antepartum haemorrhage	IPPV	Intermittent positive pressure ventilation
ARM	Artificial rupture of membranes	IOL	Induction of labour
ASA	American Society of Anaesthesiologists	IUD	Intrauterine death
AUT	Auckland University of Technology	ICSI	Intracytoplasmic sperm injection
BBA	(Baby) Born Before Arrival (not a planned home birth)	IVF	In vitro fertilisation
BMI	Body mass index	IVH	Intraventricular haemorrhage
BP	Blood Pressure	KPI	Key performance indicator
BPD	Bronchopulmonary dysplasia	LB	Live birth
CDU	Child Development Unit	Ligate	Surgical ligation of PDA
CHD	Congenital Heart Disease	LLETZ	Large loop excision of the transformation zone
CI	Confidence Interval	LMP	Last menstrual period
CLD	Chronic lung disease	LNND	Late neonatal death
CPAP	Continuous positive airways pressure	LSCS	Lower segment Caesarean section
CRIS	Clinical Records Information System	LSIL	Low-grade squamous intraepithelial lesion
CS	Caesarean section	LV	Left ventricle
CVA	Cerebro Vascular Accident	MAS	Meconium aspiration syndrome
CVS	Chorionic villus sampling	MCDA	Monochorionic diamniotic twin
DAU	Day Assessment unit	MCMA	Monochorionic monoamniotic twin
DBP	Diastolic blood pressure	MDM	Multi disciplinary meeting
DCCM	Department of Critical Care Medicine	N/R	Not resuscitated
DCDA	Dichorionic diamniotic twin	NAS	Neonatal abstinence syndrome
DHB	District Health Board	NEC	Necrotising enterocolitis
DIC	Disseminated intravascular coagulopathy	NFD	Not further defined
DNA	Did not attend	NICU	Neonatal Intensive Care Unit
DORV	Double outlet right ventricle	NIDDM	Non-insulin dependent diabetes mellitus
DRG	Diagnosis related groups	NW	National Women's
ECMO	Extra Corporeal Membrane Oxygenation	NPSU	National perinatal statistics unit (Australia)
EDU	Epsom Day Unit	NSU	National screening unit
ENND	Early neonatal death	OP	Occiput posterior
ERPOC	Evacuation of retained products of conception	OPU	Oocyte pick up
FH	Fetal heart	PCR	Protein Creatinine ratio
FTE	Fulltime equivalent	PDA	Patent ductus arteriosis
GA	General anaesthetic	PE/PET	Pre-eclampsia
GDM	Gestational diabetes mellitus	PG	Prostaglandin
GH	Gestational hypertension	PIN	Parent Infant Nursery
GLH	Green Lane Hospital	PM	Postmortem
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		

APPENDIX 12. DEFINITIONS

Antepartum haemorrhage (APH)
Vaginal bleeding from any cause at or beyond 20 weeks during pregnancy and labour, and includes placenta praevia without bleeding.

Augmentation
Describes use of oxytocin or artificial rupture of membranes to accelerate spontaneous 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 hospital registration with the standard census 2001 question. 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 BP ≥140 and or diastolic BP ≥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.

Infant Death
Death of a baby born alive before the age of 1 year.

Large for Gestational Age (>90th 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.

Live birth
Birth of a baby showing signs of life. In this report, live births are only included if ≥20 weeks gestation or ≥400g if gestation unknown.

National Women's LMC services

DOMINO Midwives are the LMCs for low risk women. Women self refer to this service. Domino midwives work in partnership with another midwife and provide continuity of antenatal, intrapartum and postnatal care.

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).

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.

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 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)
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