National Women's Annual Clinical Report 2008

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It is my pleasure to present the 2008 National Women's Annual Clinical Report. This year we are pleased to include sections on Gynaecology Surgery and Colposcopy and we have enhanced the Obstetric section with data on body mass index.
Compiling and presenting this report assists in ensuring that we maintain our focus on continuous quality improvement and we value the feedback that we receive from colleagues who share this report with us.
It would not be possible to provide the services we do without our valued staff and my thanks go again to all members of National Women's staff for their commitment to ensuring we deliver the best possible care to the women and their babies that use our services. My particular thanks also to those whose enthusiasm and dedication 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 gynaecological 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, fetal growth restriction, 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 feeding.

Chapter 9: Newborn services
This chapter describes interventions and outcomes for the babies cared for in the Neonatal Intensive Care Unit in 2008, 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 analysis about babies who died at NW.

Chapter 11: Gynaecology
This chapter provides information on fertility services, recurrent pregnancy loss clinic, termination of pregnancy, gynaecology inpatient surgeries, colposcopy and gynaecologic oncology services.

Appendices
The appendices provide additional detailed statistical tables for the chapters, and 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 2008 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 2008 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 clinical maternity database (Healthware iSoft) and from stand-alone databases for neonatology, perinatal mortality, Fertility Plus, Epsom Day Unit, gynaecologic oncology, and gynaecological 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) are entered into Healthware by one Healthware administrator. Booking data for NW bookings, and all antenatal, birth, and postnatal data are entered by clerks and NW midwives. Recurrent Pregnancy Loss Clinic data are entered by the specialist nurse in that service.

Data cleaning is undertaken daily for birth numbers. On a monthly basis, cleaning of place and mode of birth and reconciliation with Birthcare numbers is 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

NICU data are collected prospectively by the Resident Medical Officers and Nurse Specialists - Advanced Neonatal Practice working on the Newborn Intensive Care Unit. 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 2008 NW Annual Clinical Report. These are listed in Appendix 1.

It should be acknowledged 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 2008 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 were reviewed of all babies with encephalopathy or neonatal seizures.

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 there are no delays inherent in the old paper-based system.

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 data to the WHA (Women's Hospitals Australasia) benchmarking initiative. This year we have presented our 2008 data compared to WHA mean data for maternity units with level 3 neonatal intensive care units for June 2005-June 2006. We have also calculated rates for public care women in 2008. NW public care includes mothers who have 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 services nationally and regionally, 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 treats 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 starting 2009). These cases currently are transferred to Brisbane for care.
- National Maternal Fetal Medicine Network approved by the Ministry of Health in 2008.

Other

- Transfers of mothers and babies from regions outside ADHB when more proximate NICUs 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. These services are currently performed in maternity clinics and will be funded via casemix funding from 2009.

- 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. This will be addressed with the implementation of the National MFM service model of care in 2009.

Midwifery

In 2008 National Women's and AUT School of Midwifery ran a postgraduate certificate in complex midwifery care program. This was to address an awareness of a national decrease in the number of midwives familiar with complex pregnancies. Three midwives graduated, two of whom are now permanent staff in our HDU. Over the year the Ministry of Health was lobbied to fund this initiative nationally and to increase the numbers of midwives able to participate in tertiary midwifery training programmes throughout the country. Midwives on the programme received tutorials in patho-physiology and hands on skills sharing from senior medical and midwifery staff at National Women's and nursing staff in DCCM at Auckland City Hospital. It is hoped that future cohorts of trainees will ensure that there is a stable midwifery workforce skilled in caring for the sickest of our obstetric women; that new midwives will receive coaching and assistance from these midwives: and that ultimately women will receive the best midwifery care available. It is hoped that this will address some of the midwifery retention issues identified at ADHB and attract midwives who wish to formally improve their skills in caring for high risk women and their babies

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.
- Our services include one on one midwifery care to women in labour and pain relieving options including water, entonox, pethidine, and epidural anaesthesia.
- Care is provided to women by a multidisciplinary team of midwives, nurses specialising 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 gynaecological complications.
- Induction of labour is booked through WAU and induction performed in this unit. Women are transferred to Labour and Birthing Suite at the onset of labour.
- WAU provide a service for women requiring second trimester termination of pregnancy and for women who have suffered an intrauterine death.
- Day Assessment Unit is a service provided from within WAU, providing appointment based care for women with complex pregnancies, managing approximately 1500 referrals in 2008, consistent with numbers in 2007. 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 Day Assessment Unit 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 Auckland Birthcare, who hold the contract to provide these services.

2.2.5 Community clinics, home visits and outreach clinics

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.

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 the women residing in the ADHB area of Central Auckland. NW also provides regional specialist gynaecological services.

The service is comprised of one inpatient ward at Auckland City Hospital, a day surgery service at Green Lane Clinical Centre (GLCC), and outpatient services at GLCC, which include General and Specialty Gynaecology Clinics, Epsom Day Unit providing first trimester termination care, and a colposcopy service. Women's Assessment Unit at ACH provides acute assessment services for both Gynaecology and Obstetric patients. The gynaecology service offers a full range of services.

2.3.1 Regional Services

- First and second trimester termination of pregnancy.
- Urogynaecology services to WDHB.
- Fertility services – Fertility Plus is one of three providers in the Auckland region. This service includes reproductive endocrinology.
- Recurrent pregnancy loss diagnostic / management service.
- Gynaecologic Oncology.
- Vulval clinic provides an "extended" regional service for vulval disease as there are only three such services in the country. NW provides vulval services to women from Palmerston North and north, especially for complex dermatologic and vaginal conditions.

2.3.2 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 consulting and procedures.

2.4 Wards and clinics in the Gynaecology service

2.4.1 High Dependency Unit

The Gynaecology Service has access to the ACH Level 8 HDU and Critical Care for women requiring a higher level of care and monitoring.

2.4.2 Ward 97

This is a 22 bed ward providing care for women with acute gynaecology problems, pre and post operative care for gynaecology and breast surgical patients, and gynaecology and breast complications. It also provides care to women with early pregnancy complications and medical terminations up to 20 weeks gestation. This ward accommodates outliers when Adult Health Services are full. This has an impact on the provision of elective gynaecology services as the beds are taken up with non gynaecology patients.

2.4.3 Outpatient clinics

The gynaecological outpatient clinics are held at the Green Lane Clinical Centre (GLCC) and include:

- General Gynaecology (e.g. menstrual disorders, pelvic floor dysfunction, and sterilisation.)
- Hormone replacement therapy and family planning
- Endometriosis and pelvic pain
- Urogynaecology
- Pre admission clinic prior to day stay and inpatient surgery
- Colposcopy
- Gynaecologic Oncology

Referrals to the Gynaecology Service are triaged by NW gynaecologists so that patients can be seen at the most appropriate clinic and in a timely way.

2.4.4 Early Pregnancy Assessment Unit (EPAU)

EPAU is a nurse-led outpatient service, with social worker and medical support, on level 6 at the GLCC, provided for women referred for management of early pregnancy complications, including miscarriage, ectopic and molar pregnancy, and for consultation for second trimester termination. It manages approximately 1300 visits per year along with phone consultations. Women requiring surgical management of miscarriage are referred to the sub-contracted private provider at Auckland City Surgical Services in Remuera**.**

2.4.5 Fertility Services

The National Women's Fertility Service offers a range of secondary and tertiary reproductive endocrinology, infertility, and subfertility 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. Services provided include:

- Donor insemination (DI)
- (IUI) intrauterine insemination with or without superovulation
- In vitro fertilisation (IVF)
- Intracytoplasmic sperm injection (ICSI)

- Pre-implantation genetic diagnosis (PGD)
- Reproductive endocrinology
- Private tertiary infertility service
- Recurrent pregnancy loss clinic which looks after women until 14 weeks gestation

2.4.6 Gynaecologic Oncology

NW is the regional service provider for surgical gynaecologic oncology, providing services to CMDHB, WDHB, and Northland. It also provides services as requested to Bay of Plenty and Waikato. Surgical services for women with vulval cancer are provided to a wider regional area due to the rarity of this cancer. This service has close associations with Radiation and Medical Oncology at ACH.

2.5 University of Auckland

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

2.6 Newborn service

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

2.6.1 Regional and District Services

The Newborn Service is contracted to provide:

- Level 3 neonatal intensive care to the Northland region and to the Central, West and North Auckland areas – 16 cots. Babies who are domiciled in the Waitemata DHB catchment areas will be transferred to North Shore Hospital or Waitakere Hospital to complete the Level 2 component of care closer to home.
- Level 2 neonatal care to Central Auckland areas – 30 cots.
- NICU provides a regional service for babies requiring laser treatment for retinopathy of prematurity.
- NW is the national referral centre for births of infants requiring Paediatric Cardiology
- NW is the regional referral centre for infants requiring the services of Paediatric and Neonatal Surgery

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.

2.6.2 Neonatal Clinics and support services

The Newborn Service is supported by:

- Neonatal Homecare Service
- Child Development Unit

- Paediatric Outpatient Service
- Specialist Lactation Service
- Neonatal Emergency Transport Service
- Sibling Playroom facility, a Parent Care Support group (this is a voluntary organisation on site), and the Women's Health Information Centre.

2.6.3 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.

2.6.4 Dr David Knight

2008 was an eventful year with regard to clinical leadership in Newborn Services. After 24 years at the National Women's Hospital, Dr David Knight resigned to take over as Director of Neonatology, Mater Health Services in Brisbane. His departure in May marked closure to a long and productive association with National Women's Health, which included two epochs as clinical director and one term as Clinical Leader.

Dr Knight was first appointed as a neonatologist at NW in 1983. In total he served for 14 years as clinical director and was Clinical Leader of the National Women's and Starship Children's Hospitals between 2002 and 2007.

Throughout his tenure in these positions he provided strong leadership. Notable achievements include the introduction and training of Neonatal Nurse Practitioners / Nurse Specialists-Advanced nursing practice in New Zealand; he was involved in the establishment of the Australian and New Zealand Neonatal Network ANZNN; served for several years on the Fetus and Newborn committee of the Paediatric Society of New Zealand and provided leadership to Management in the Clinical Leader role in Women's and Children's Health.

In addition to his management activities, Dr Knight was both a skilled clinician and an accomplished researcher. His major field of research interest was neonatal echocardiography and particularly the ductus arteriosis on which he has published widely. His other research interests were diverse but included contributions to the field of prevention and treatment of neonatal lung disease.

A major legacy left by Dr Knight was the development of the neonatal database which continues to be a significant resource for the service. In addition to providing the neonatal data for this annual report, it provides data each year for ANZNN, serves as an audit tool, supports neonatal research projects and writes the neonatal discharge summaries.

We congratulate Dr Knight on his appointment and wish him well for the future.

2.7 Lead Maternity Carer services

The provision of health in New Zealand is funded by the Ministry of Health, who 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 are 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 midwives' 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

2.7.1 Funding of Maternity Services

- Funding for primary maternity care is claimed via Section 88. It is module based; first, second and third trimester, labour and birth and postnatal and is a fixed amount per woman per module.

- Secondary and tertiary services are funded as a fee per birth to a maternity facility.
- Labour and birth funding is a fee paid to a maternity facility for every woman who births in the facility.
- Postnatal facility funding is a fee paid to a maternity facility for every woman who has a postnatal stay at the facility of greater than 12 hours.
- Funding in 2009 will change to case mix based funding and outpatient clinic funding.

In New Zealand women can choose at which hospital they wish to birth their baby. There are no geographical boundaries for provision of primary maternity care. 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 national services as outlined in section 2.1.1.

Birthcare Auckland holds a contract with ADHB to provide postnatal facilities to well women and well babies born at NW.

2.8 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 2008 which relate to the provision of maternity services are discussed below.

2.8.1 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. In 2008 the Breastfeeding Policy was taken to the community for widespread consultation. During 2008 79% of mothers achieved "exclusive breastfeeding on discharge from the facility.

2.8.2 Family Violence Intervention

ADHB recognises that Family Violence is a major health issue and has committed resources within ADHB to address it. ADHB is also contracted to the Ministry of Health to implement a Family Violence Intervention programme within ADHB. The Family Violence Intervention Team (FVIT) is a small but committed team. It comprises of ADHB staff, Preventing Violence in the Home (PVH) and works closely with Te Puaruruhau. Preventing Violence in the Home 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. Te Puaruruhau is a specialist service within ADHB for children and adolescents at risk of abuse or neglect.

Women's Health began screening for Family Violence in 2006 and made a good start. However, screening rates have been variable since then so the team embarked on re-profiling within Women's Health.

2.8.3 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.

2.8.4 Smoking

Addressing smoking in pregnancy remains a priority for NW. In October 2008 ADHB Smokefree Services was funded by the Ministry of Health to establish a specialised smoking cessation service for pregnant women and their families/whanau. A streamlined referral and feedback process has been developed between NW and Smokefree Services. In 2009 the ADHB Pregnancy Smokefree Service will establish a Smokefree Hot Desk on Ward 96/98 to provide on the spot information and support for inpatients and their families.

2.8.5 HIV

The Ministry of Health have funded a programme to introduce screening for HIV for all pregnant women in New Zealand. This will be monitored and evaluated by the National Screening Unit. Previously LMCs only screened women whom they perceived to be at high risk. The three Auckland DHBs have worked together with regard to the implementation of this programme and whilst each DHB has employed a Co-ordinator for the programme, the co-ordinators will work collaboratively to provide cover for one another. We see the implementation of this screening programme as a good step in identifying and managing HIV positive women to ensure the best possible outcome for their babies.

2.8.6 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.

2.8.7 Body Mass Index

National Women's and its access holders have put considerable energy into collecting accurate BMI data for its maternity population. The "rising BMI" epidemic has been an issue for a number of years now and having good data on 95% of women who birth at NW will enable NW to analyse the consequences for women and their babies.

2.8.8 GP Liaison

Dr Diana Good has worked with Women's Health as a General Practitioner Liaison during 2008. The role of GP Liaison is focussed on improving the information flow between primary and secondary care.

2.9 Issues

A range of issues always affects the provision of any service throughout a year and in 2008 National Women's Health 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 means delays for women booked for elective gynaecological 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 was been contracted out to a private provider. Women requiring emergency surgery are still treated in the level nine theatre complex at ACH.

Chapter 3

SUMMARY STATISTICS

3 SUMMARY STATISTICS

3.1 Mother and baby numbers: NW 2008

Table 1: Mother and baby numbers: National Women's 2008

Total number of mothers birthing at National Women's	7579
Mothers birthing before arrival (BBA)	10
Total number of mothers	**7589**
Total number of babies born at National Women's	7743
Babies born before arrival (BBA)	10
Total number of babies	**7753**

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 2008 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 2008

		Mothers	Babies
National Women's births	Singletons	7419	7419
	Twins	156	312
	Triplets	4	12
Totals (not including BBA)			
BBA	Singletons	10	10
	Twins	0	0
	Triplets	0	0
Totals (including BBA)		**7589**	**7753**

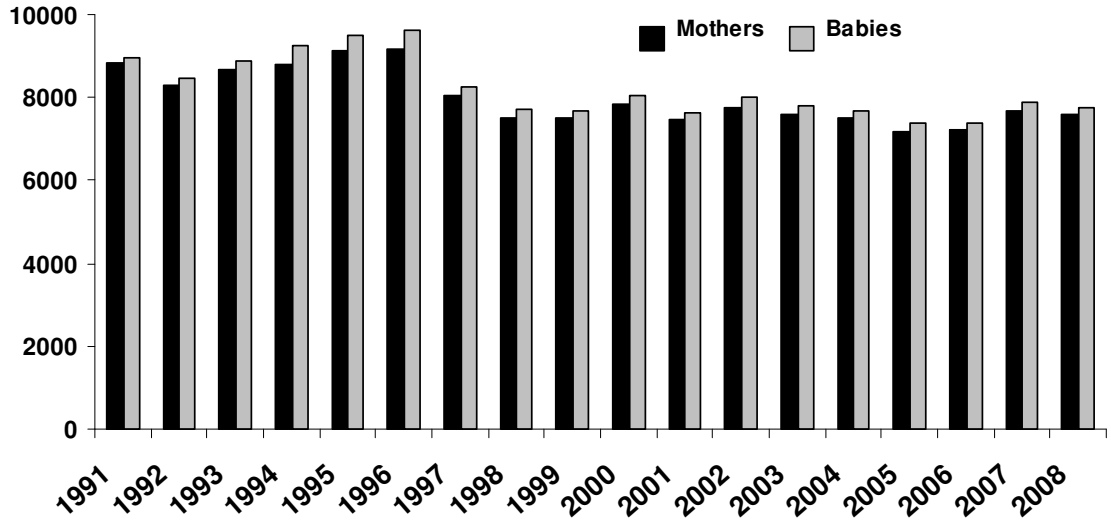

Figure 1: Numbers of women birthing and babies born at National Women's (1991-2008)

3.2 Summary of maternal outcomes 2008

Table 3: Mode of onset of birth

	Birthing Mothers n=7589	
	n	%
Spontaneous onset of labour	4070	53.6
Iatrogenic	3519	46.4
CS elective	1093	14.4
Emergency CS before onset of labour	223	2.9
Induction of labour	2203	29.0

Table 4: Mode of birth

	Birthing mothers n=7589		Nullipara n=3623		Multipara n=3966	
	n	%	n	%	n	%
Spontaneous vertex birth	4218	55.6	1714	47.3	2504	63.1
Vaginal breech birth	62	0.8	35	1.0	27	0.7
Operative vaginal birth	937	12.4	722	20.0	215	5.4
Forceps	301	4.0	248	6.9	53	1.3
Ventouse	636	8.4	474	13.1	162	4.1
Caesarean section	2372	31.1	1152	31.8	1220	30.8
CS elective	1093	14.4	313	8.6	780	19.7
CS emergency	1279	16.9	839	23.2	440	11.1

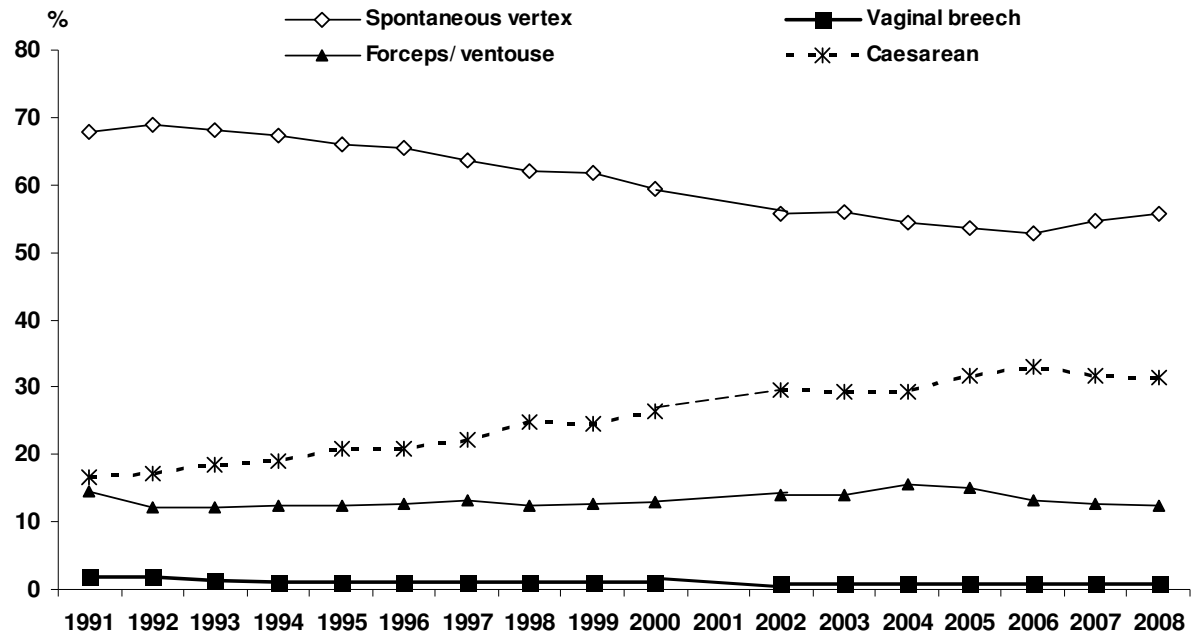

Figure 2: Mode of birth (1998-2008)

Table 5: Maternal postpartum outcomes

	Birthing mothers	n	%
PPH ≥1000mls	7589	634	8.4
SVB	4280	196	4.6
Instrumental vaginal birth	937	68	7.3
Caesarean section	2372	370	15.6
Episiotomy among vaginal births	5217	1069	20.5
Third/ fourth degree tears among vaginal births	5217	160	3.1
Postpartum blood transfusions	7695	214	2.8
Infant Feeding at discharge from NW facility (excludes babies admitted to NICU)			
Exclusive breastfeeding	6636	5254	79.2
Fully breastfeeding	6636	304	4.6
Partial breastfeeding	6636	871	13.1
Artificial feeding	6636	207	3.1

Maternal deaths

In 2008 there were 2 maternal deaths. One woman died due to suicide in the antenatal period and one woman died due to postpartum haemorrhage. Details of these deaths have been sent to the National Perinatal and Maternal Mortality Review Committee (PMMRC).

3.3 Summary of neonatal outcomes 2008

Table 6: Neonatal outcomes among babies born at National Women's in 2008

	Babies born n=7753	
	n	%
Gender		
Male	3984	51.7
Female	3769	48.6
Preterm birth		
20-27 weeks	120	1.5
28-31 weeks	133	1.7
32-36 weeks	590	7.6
Term birth		
37-41 weeks	6727	86.7
42+ weeks	183	1.5
5 minute Apgar <7 (excludes fetal deaths)		
Preterm	115	1.5
Term	52	0.7
SGA (by Customised Centile)		
Preterm	229	3.0
At term	622	8.0
Admission to NICU		
Preterm	523	6.7
Term	114	1.5

Table 7: Perinatal mortality 2008

	Babies born n=7753
Number of fetal deaths (stillbirths &TOPs)	76
Number of early neonatal deaths	26
Number of late neonatal deaths	8
Perinatal mortality rate (/1000)	13.2
Perinatal mortality rate (excluding lethal and terminated fetal abnormalities) (/1000)	9.4
Perinatal-related loss rate (/1000)	14.2

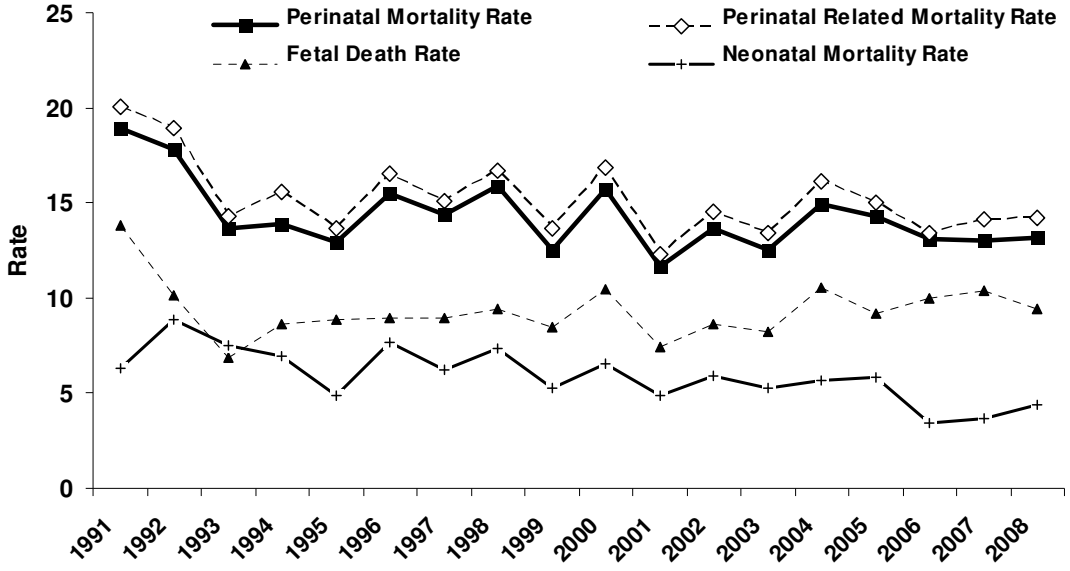

Figure 3: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate 1991-2008 (all rates expressed as deaths/1000 births)

3.4 Maternal clinical indicators

Methods

The tables present National Women's data for the 2007 and 2008 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 2005-June 2006[1]. WHA indicators are not presented if the required data could not be extracted from the NW dataset with accuracy. The data for NW are presented with 95% confidence intervals. Where the 95% confidence interval does not include the mean for WHA units, it can be assumed that our rates differ significantly. These have been bolded in the table.
*Note some data have been corrected for 2007.

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

		WHA mean 05-06	NW 2007 n=7695	NW 2008 n=7589	NW Public* 2008 n=2552
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**
Caesarean section	Mothers delivering by caesarean section/Mothers giving birth	28.4	**31.7**	**31.3**	29.5
VBAC	P1 previous caesarean/mothers giving birth	7.54	**10.7**	**10.6**	**10.0**
	Prelabour repeat caesarean/P1 previous caesarean	59.3	59.4	57.9	**47.6**
	VBAC/induced or spontaneous labour P1 previous caesarean	49.1	52.4	**58.8**	**64.6**
	VBAC/P1 previous caesarean	NA	21.3	21.5	29.2
Peripartum hysterectomy	Hysterectomy at same admission as birth/Mothers giving birth	0.113	0.117	0.18	0.27
Instrumental vaginal birth	Forceps births/All vaginal births	4.4	4.2	4.9	3.6
	Ventouse births/All vaginal births	8.98	**13.0**	**12.1**	8.7
	Double instrumental/All vaginal births	0.877	**1.3**	1.0	0.7
Maternal age	Age 35 or more/Mothers giving birth	21.9	**30.7**	**31.1**	**24.6**
	Age 40 or more/Mothers giving birth	4.35	**5.9**	**6.0**	**5.8**
Vaginal birth with regional anaesthesia	Any regional anaesthetic/All vaginal births	24.9	**43.9**	**43.7**	**33.7**
General anaesthesia for caesarean section	General anaesthetic for Caesarean section/All caesarean sections	9.73	**7.6**	**6.8**	10.9
Episiotomy	Mothers having an episiotomy/Mothers giving birth vaginally	17.6	**21.5**	**20.5**	**12.7**
Third and fourth degree tears	3rd and 4th degree tears/Mothers giving birth vaginally	2.3	**3.1**	**3.1**	**3.4**
Postpartum haemorrhage	Blood loss >=500ml and <1500ml/All vaginal births	9.54	**12.9**	**14.8**	**19.1**
	Blood loss >=1500ml/ All vaginal births	1.03	1.12	**2.4**	**2.8**
	Blood loss >=500ml and <1500ml/Mothers giving birth by Caesarean	41.6	**69.2**	**72.2**	**74.5**
	Blood loss >=1500ml/Mothers giving birth by Caesarean	2.54	**3.32**	**5.2**	**8.0**
Blood transfusion	Postpartum blood transfusion/Mothers giving birth	1.64	**2.2**	**2.8**	**3.6**
Maternal admission to intensive care unit	Admitted to intensive care unit during same hospital admission as birth/Mothers giving birth	0.214	0.23	0.16	0.39

* Includes women for whom NW is the LMC at booking, transfers from other DHBs, and unbooked women
NA=Data not available
P1=parity 1, only previous birth by caesarean section
Bolded numbers are significantly different from WHA mean; public includes low and high risk NW clinics and transfers

Table 9: Perinatal indicators benchmarked against WHA 2005-2006

Perinatal indicators	Definition	WHA mean 2005-2006 %	NW 2007 n=7875 %	NW 2008 n=7753 %	2008 Public only n=2643 %
Preterm birth	Babies born before 37 weeks/Inborn babies	13.3	**11.5**	**10.9**	**16.2**
	Babies born before 32 weeks/Inborn babies	4.04	**3.0**	**3.3**	**6.2**
Perinatal Mortality	Fetal death and neonatal death up to 28 days/Inborn babies	1.44	1.41	1.42	**2.38**
	Neonatal deaths up to 7 days (ENND)/Inborn babies	0.457	**0.254**	0.34	**0.81**
	Neonatal deaths up to 28 days (ENND+LNND)/Inborn babies	0.527	0.368	0.44	**1.07**
	Fetal deaths/Inborn babies	0.915	1.041	0.98	1.32
Five minute Apgar of ≤4	Babies with 5 minute Apgar<=4/Total liveborn, singleton term babies	0.187	0.10	0.13	0.23
Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3	Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3/Inborn babies	0.164	0.10	**0.039**	**0**
Breastfeeding	Exclusive breastfeeding/Live born singleton term births	76	**73.3**	76.7	**69.1**

This is the second year that perinatal indicators benchmarked against other Australasian women's hospitals have been reported. National Women's is a member organisation of Women's Hospitals Australasia (WHA) which conducts one of the largest contemporaneous data collection exercises world-wide[1]. Conclusions from the simple comparison of such 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 not be apparent. For example, the proportion of our maternity population over the age of 35 years is significantly greater (31.1% in 2008) than the mean for WHA contributing hospitals (21.9%). Nonetheless, it allows us to compare rates and identify areas where we may wish to further analyse our own data or conduct clinical audit or service planning in future.

The overall caesarean section rate at NW remains above the WHA mean, but it is pleasing to note that the public rate is now not significantly different from the mean. NW has a higher rate of women with one previous CS amongst those who have had one previous birth, so in order to keep the CS rate stable in future the VBAC rate will need to at least remain stable or increase. Fewer women undergo a trial of labour at NW than the mean, but of those who do, the chance of success is greater. This is pleasing and would suggest that the focus should be on encouraging more women to undergo a trial of labour. Currently the public team is in the process of setting up a VBAC clinic.

As in previous years, the overall Ventouse rate is high, but this year in the public sector it is consistent with the WHA mean as is the double instrumental delivery rate. The episiotomy rate in the public sector is lower than the mean this year.

We should be concerned however that again we have a higher overall rate of third and fourth degree perineal tears. The issues are discussed further in Chapter 7. As previously noted, there is potential for under-reporting of third degree tears and comparison between units is therefore fraught.

Of greatest concern is the postpartum haemorrhage rate which shows no signs of decreasing and is above the mean. This is for both vaginal and Caesarean births, and

especially so in the public sector. Postpartum transfusion is also high. It is disappointing that despite a focus in 2008 on prevention and management of PPH including care planning, this remains the case. Peripartum hysterectomy is not under-utilised either. Maternal admission to intensive care is not higher than the mean however. Further audit is urgently required to find out what are the preventable factors here.

In terms of perinatal outcome, NW has a high rate of preterm birth and it is likely that this is associated with the higher neonatal death rate. Fetal death rate is not above the mean. Five minute Apgars and HIE are also comparable to the mean 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. Additional data pertaining to this chapter can be found in Appendix 3.

4.2 Maternal domicile

In 2008, 70% of women giving birth at National Women's were from the Auckland District Health Board area. This proportion has changed little over the last five years rising slowly from 65% in 2002. Thirty percent of our clientele are from outside the ADHB catchment area. Some mothers require tertiary services, but many exercise personal choice to birth at NW.

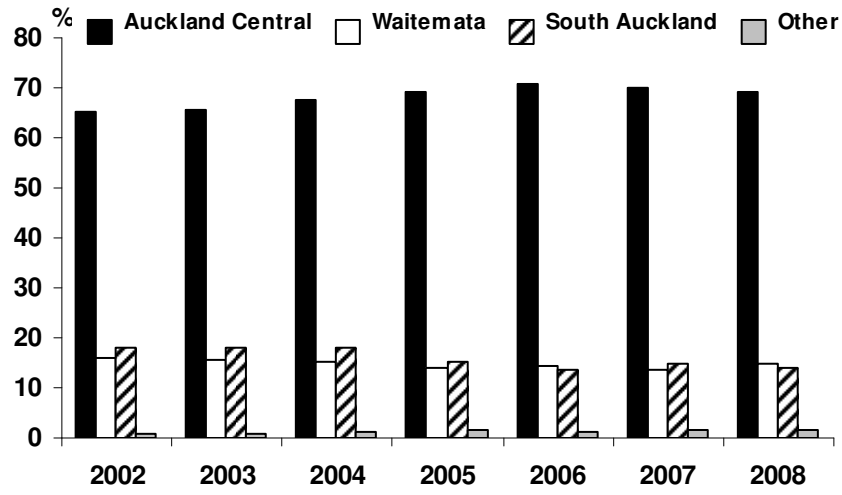

Figure 4: Domicile of women birthing at NW (2002-2008)

4.3 Maternal age, parity, and ethnicity

WHA Maternity Indicators		WHA mean 05-06	NW 2007	NW 2008	NW Public 2008
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**
Maternal age	Age 35 or more/Mothers giving birth	21.9	**30.7**	**31.1**	**24.6**
	Age 40 or more/Mothers giving birth	4.35	**5.9**	**6.0**	**5.8**

The population of women giving birth at National Women's is significantly older than the average for women giving birth in units with level 3 facilities in Australasia. The proportion of women aged 35 and over continues to rise, as it has done for the past 20 years. Interestingly, women aged from 31-35 years have reduced in proportion to other groups while younger women are stable or increasing as mothers. This would suggest that the age structure of the maternity population may be changing back towards a younger group of mothers. As the age structure of the maternity population has implications for services and intervention rates, it will be interesting to watch these changes in the future.

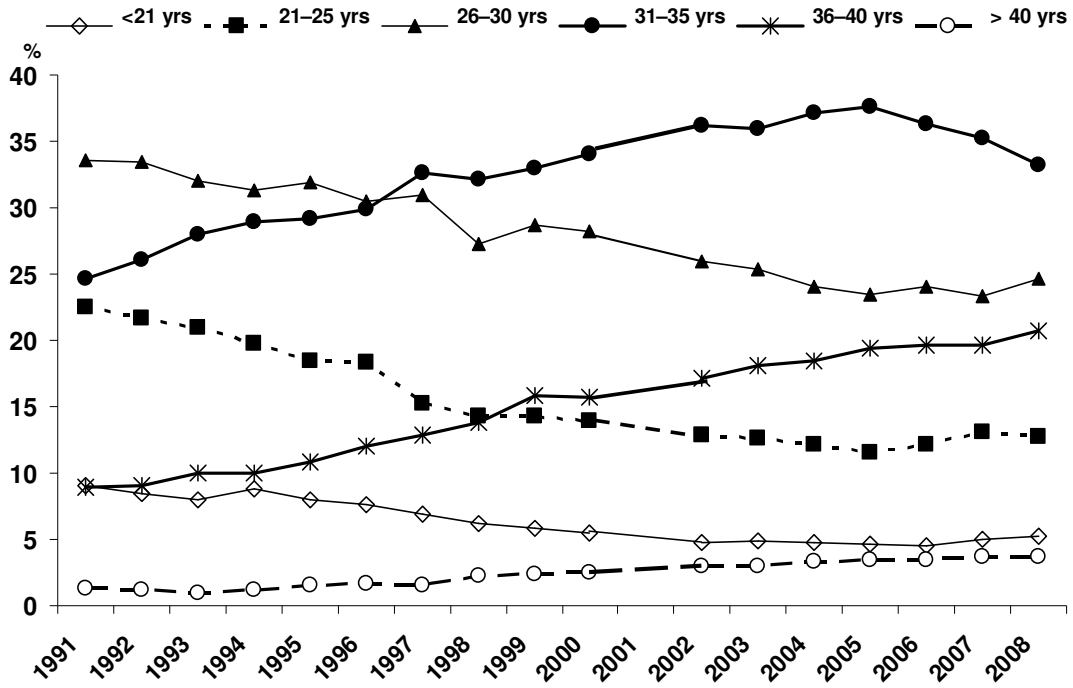

Figure 5: Maternal age distribution (1991-2008)

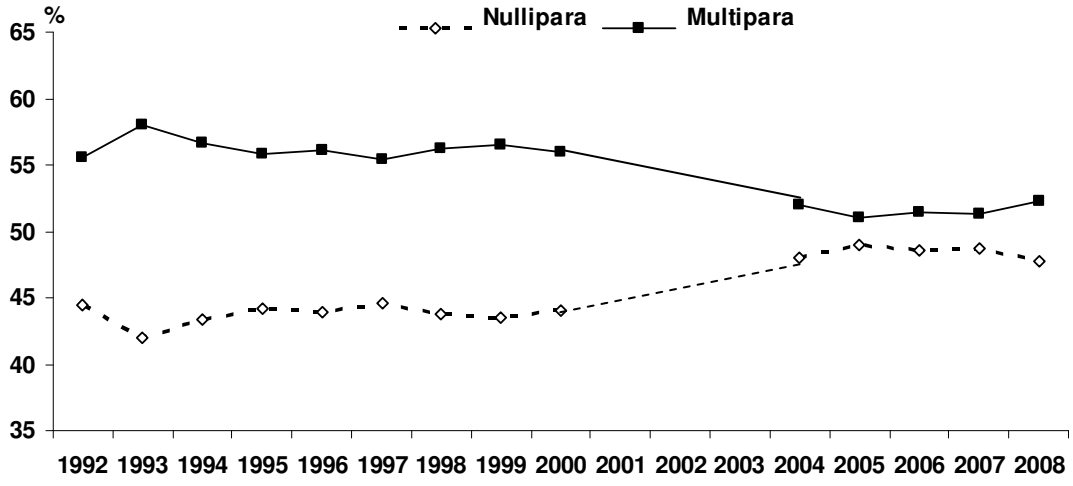

Figure 6: Parity distribution (1992-2008)

The ratio of nulliparous to multiparous women has remained fairly constant over recent years. The small move in the ratio towards multipara this year reflects the increasing fertility rates in the population. This ratio has potential implications on service requirements.

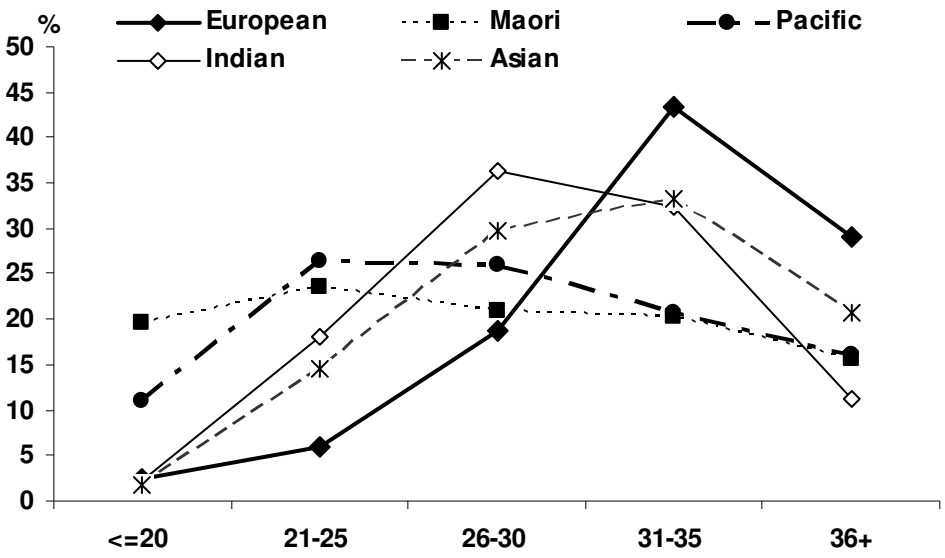

Figure 7: Maternal age among European, Maori, Pacific, Asian and Indian ethnicities

Ethnic differences in maternal age at birth have been apparent over many years though the increase in maternal age seems particularly marked for European women with more than 70% now over 30 years of age at birth compared to less than 40% of Maori and Pacific Island women.

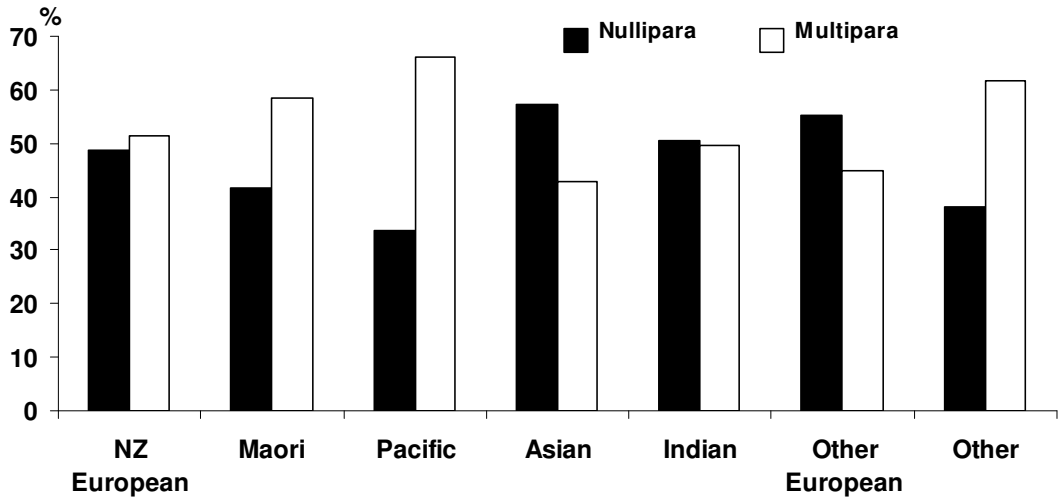

Figure 8: Parity distribution by maternal ethnicity (2008)

While more than 50% of Asian mothers giving birth at NW are having their first baby, only 33% of Pacific mothers are giving birth to their first baby.

4.4 Lead Maternity Carer (LMC) and maternal demographic characteristics

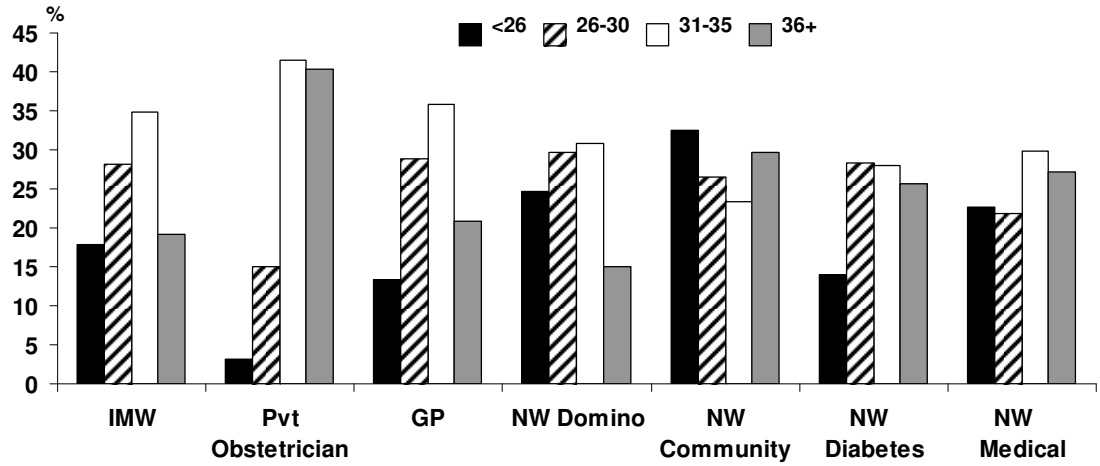

Figure 9: LMC at booking and maternal age

The data given throughout this report for LMC relate to LMC at booking. In reality few women change their type of LMC during pregnancy.

In 2008 42% of women were booked with Independent Midwives, 23% with Private Obstetricians, 19% with National Women's Community clinics, 3% with National Women's DOMINO midwives and 9% with National Women's specialist medical and diabetes clinics. Overall 67% of women who gave birth at NW in 2008 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 2008.

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

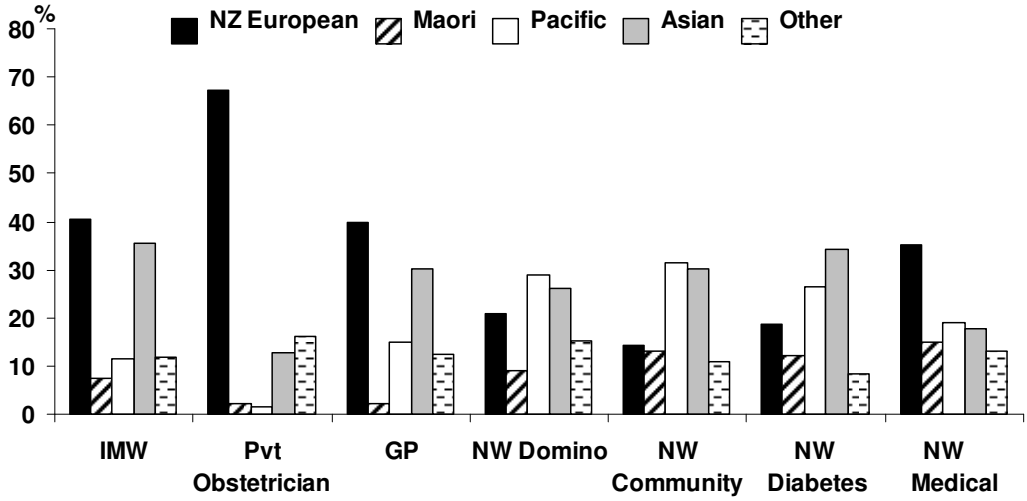

Figure 10: LMC at booking and maternal ethnicity

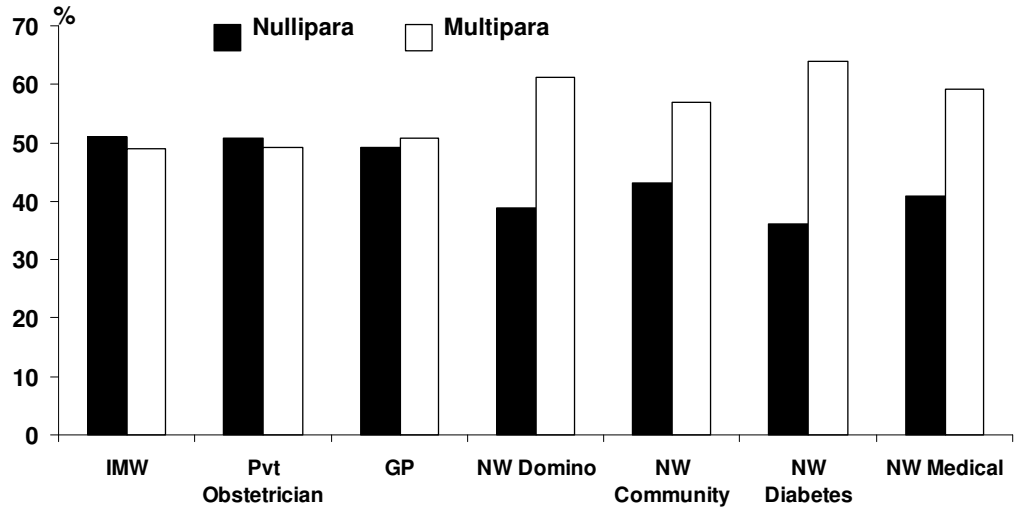

Figure 11: LMC at booking and parity

Women booked with a private obstetrician were more likely to be older, particularly over 35, and of European origin compared to women booked with other LMCs. Both Private Obstetricians and Independent Midwives have a significantly lower proportion of non-European women booking with them compared to the National Women's Domino and Community teams. Probably because of this, these caregiver groups care for more nulliparous women and for fewer women with high BMI.

4.5 Smoking

	Mothers giving birth 2008 N=7589	
	n	%
Smoking at booking	823	10.8
No or not in past month	5988	78.9
Missing smoking data	778	10.3

In this report (2008) smoking data *at booking* have been used throughout. In previous years, smoking at birth has been presented in many analyses. Changes to the collection of smoking data in 2008, along with almost 30% missing smoking data at birth, made it difficult to analyse these data in a way that was comparable to previous years or comparable to data collected at booking.

In 2008, smoking data were missing at booking for only 10% of women. Missing data were most common among women attending high risk clinics. Probably this is due to a failure to enter the data rather than a failure to address smoking behaviour. Among women with smoking data available, 823/6811 (12.1%) women replied yes to smoking within the previous month. This is higher than the 9% of mothers with smoking data smoking at booking last year.

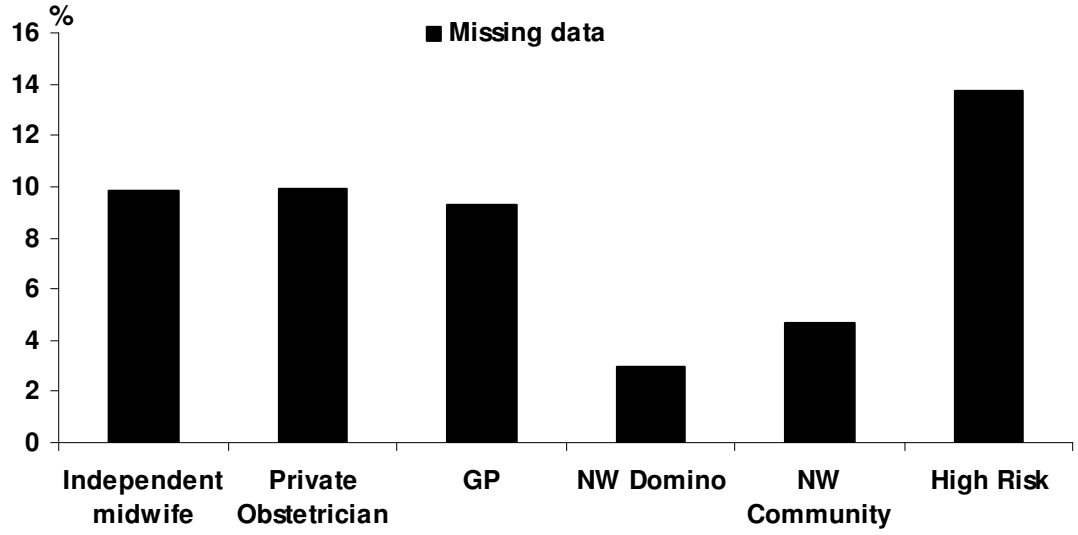

Figure 12: Proportion of mothers without smoking data at maternity booking by LMC at booking.

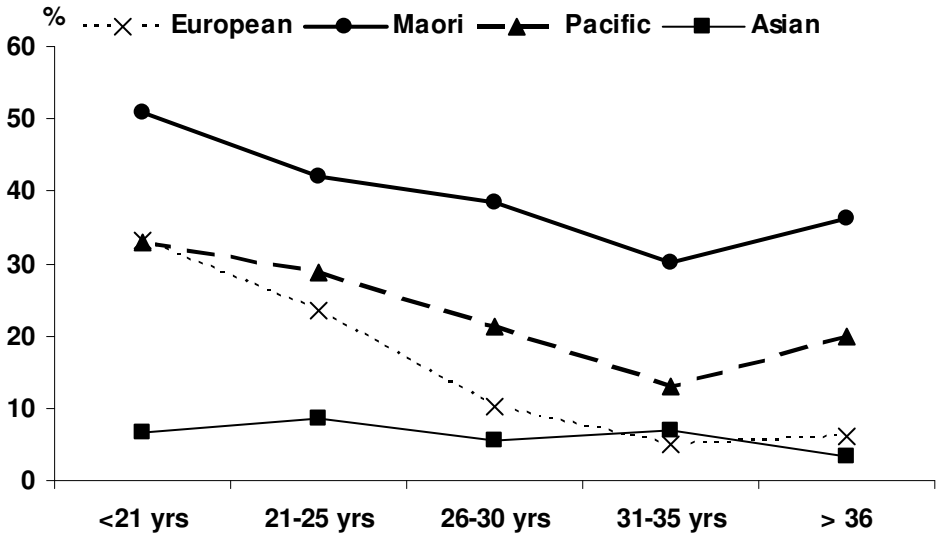

Figure 13: Smoking rates at booking by age and ethnicity

Smoking rates remain substantially different by ethnic group with the rates among Maori women 40% overall compared to 9% for European women. Also there are significant differences in smoking rates by age, although these are smaller than the differences based on a mother's ethnicity.

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

4.6 Body mass index

This year we have included a section under antenatal complications which explores the problems of obesity in the obstetric population. See section 5.7. Thirty five percent of the maternity population were overweight in 2008. This has not changed in the three years that reasonably complete data have been available.

Table 10: Maternal BMI (missing data removed)

	2006 [1]		2007 [2]		2008 [3]	
	n=5660		n=6909		n=7117	
	n	%	n	%	n	%
<19	304	5.4	388	5.6	405	5.7
19-25	3329	58.8	4129	59.8	4180	58.7
26-30	1113	19.7	1315	19.0	1368	19.2
31-35	512	9.1	625	9.1	630	8.9
>35	402	7.1	452	6.5	534	7.5

1 Missing data in 2006=21.5%
2 Missing data in 2007 =10.2%
3 Missing data in 2008 = 6.2%

4.7 Standard primipara

The definition for standard primipara is given in the appendix. 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 2008, 35% of primiparous women were defined as standard. Fewer European and Maori primipara are standard primipara compared to Asian and Indian women

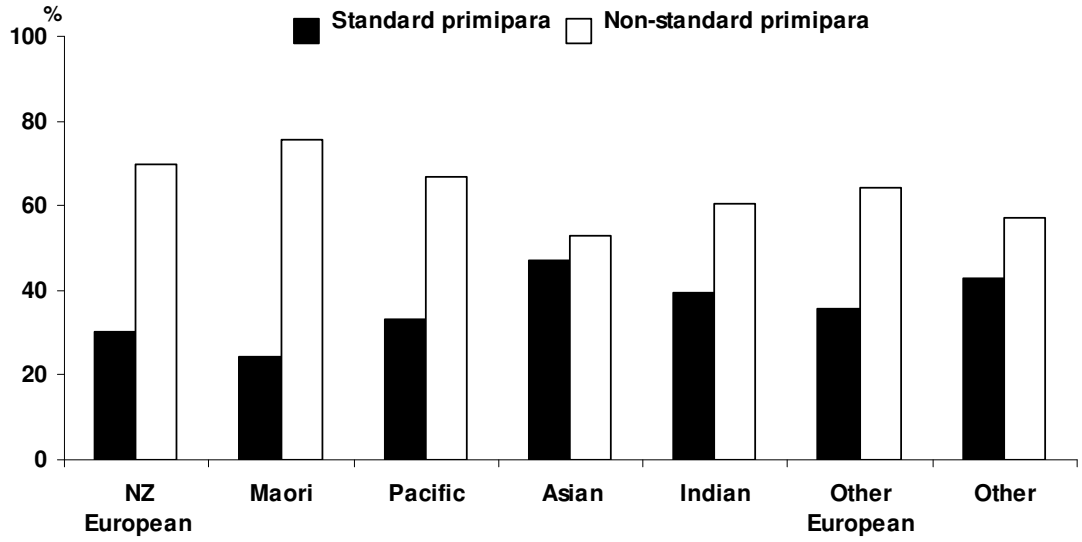

Figure 14: Standard primipara rates by maternal ethnicity

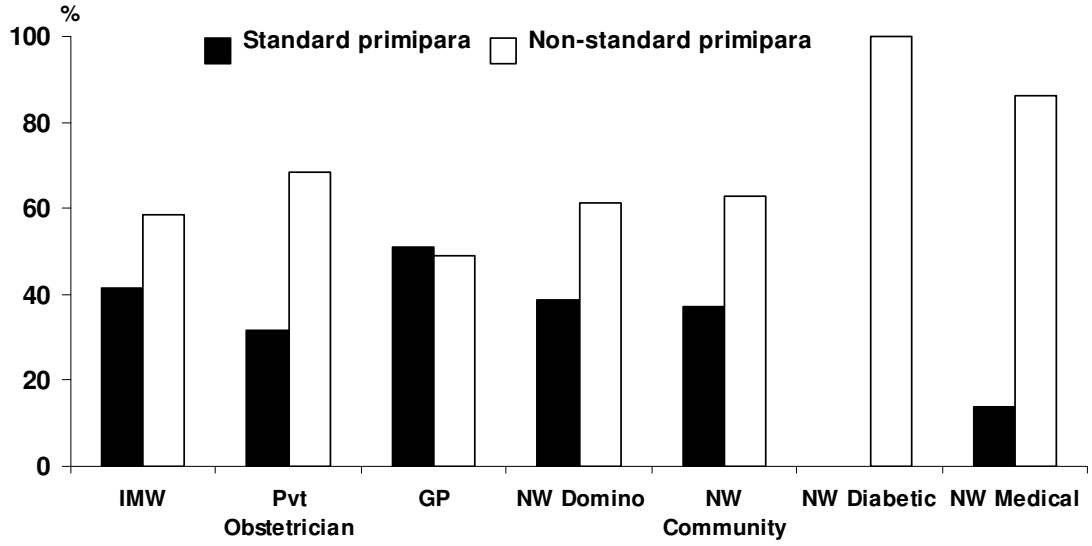

Figure 15: Standard primipara rates by LMC at booking

Chapter 5

ANTENATAL COMPLICATIONS

5 ANTENATAL COMPLICATIONS

This chapter provides data and analysis 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	Public 2008 n=2643
Indicator	**Definition**	**%**	**%**	**%**	**%**
Preterm birth	Babies born before 37 weeks/Inborn babies	13.3	**11.5**	**10.9**	**16.2**
	Babies born before 32 weeks/Inborn babies	4.04	**3.0**	**3.3**	**6.2**

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 11: Rates of preterm birth <37 completed weeks (1994 – 2008)

	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008
Total number of women	8812	9125	9157	8055	7492	7501	7827	7491	7194	7212	7695	7589
Women birthing preterm	852	913	911	906	852	850	912	756	685	716	796	733
Incidence %	†	†	†	†	11.4	11.3	11.7	10.1	9.5	9.9	10.3	9.7
Spontaneous <37 weeks						350	385	372	323	335	397	293
Incidence %						4.7	4.9	5.0*	4.5	4.6	5.2	3.9
Iatrogenic <37 weeks						500	527	384	362	381	399	440
Incidence %						6.7	6.7	5.1*	5.0	5.3	5.2	5.8
Total babies <37 weeks	1010	1052	1085	1047	991	984	1062	886	806	836	904	843

† Note denominators pre-1998 include postnatal transfers and therefore incidence has not been calculated
* Changes in rates of spontaneous and iatrogenic preterm births from the 1999-2000 data are likely to be related to definition and data collection changes rather than real differences. See methods above.

The overall rate of preterm birth at National Women's has remained stable at approximately 10% and is comparable to other similar units and rates recorded in the literature. However, when assessing the number of women with either spontaneous or iatrogenic preterm birth there may be some evidence of change. Typically recorded breakdown of preterm birth rates would suggest one quarter to one third are due to iatrogenic preterm birth (on maternal and/or fetal grounds). Rates at National Women's have previously demonstrated a similar number of iatrogenic and spontaneous preterm births. In 2008 data, even more women had an iatrogenic preterm birth, now reaching

5.8% (compared to rates in 2004 of 5.1% p=0.07) and conversely there was a trend towards fewer spontaneous preterm births (3.9%).

There may be several reasons for this. Firstly consider our particularly high rate of iatrogenic preterm birth. As a Tertiary Referral Centre with a high risk population women are more likely to require early intervention and high rates of iatrogenic early delivery 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.

Secondly, the rates of iatrogenic preterm birth may be rising for a number of reasons. Advancing maternal age and increasing BMI are two problems we increasingly encounter and the inherent pregnancy related risks they impose (such as preeclampsia, gestational diabetes and SGA) may necessitate early delivery. It is also possible that improvements in antenatal management, such as better recognition of SGA with customised growth charts, has led us to better identification of 'at risk' babies and an increase in (appropriate) intervention.

The trend towards fewer spontaneous preterm births may not be sustained but may reflect success with other antenatal interventions such as the Smokechange Programme. Becoming smoke free is one of the few interventions proven to be effective at reducing the risk of preterm birth. Data from local Auckland women in the SCOPE Study have demonstrated that by stopping smoking by 15 weeks gestation women achieve rates of spontaneous preterm birth and SGA babies comparable to non-smokers.

Table 12: Rates of preterm birth <32 completed weeks (1994–2008)

	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008
Total number of women	8812	9125	9157	8055	7492	7501	7827	7491	7194	7212	7695	7695
Women birthing <32 weeks	208	245	241	207	212	229	244	220	211	212	212	222
Incidence %	†	†	†	†	2.8	3.1	3.1	2.9	2.9	2.9	2.8	2.9
Spontaneous <32 weeks						86	107	106	93	96	105	105
Incidence %						1.1	1.4	1.4	1.3	1.3	1.4	1.4
Iatrogenic <32 weeks						143	137	114	118	116	107	117
Incidence %						1.9	1.8	1.5	1.6	1.6	1.4	1.5
Total babies <32 weeks						271	287	250	247	245	237	253

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

Reassuringly there has been no change in the rates of early preterm birth <32 weeks (overall and for spontaneous or iatrogenic). These babies represent those most likely to have not only neonatal complications, but additional difficulties extending through childhood and with lasting impacts on adult health and welfare leading to enormous healthcare, social and financial costs. The overall rate of 2.9% may be higher than most populations but again is likely to represent the higher risk populations seen in a Tertiary Referral Centre.

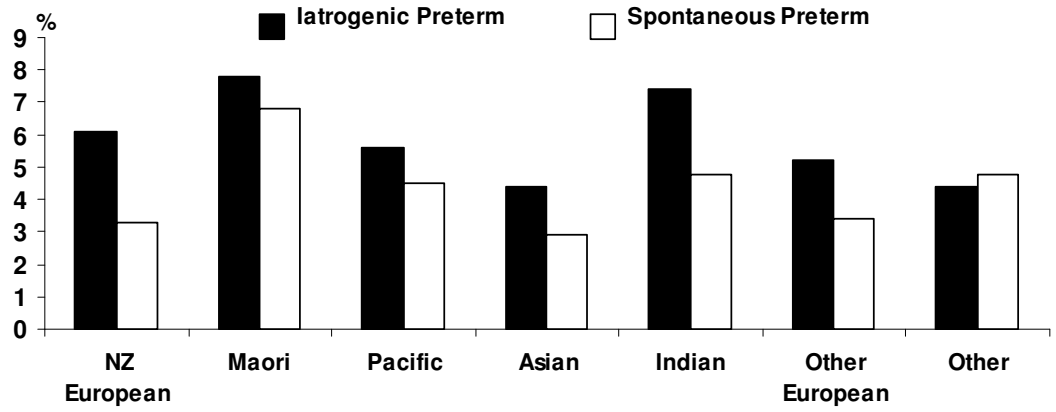

Figure 16: Spontaneous and iatrogenic preterm birth rates (<37 weeks) by ethnicity

Iatrogenic preterm birth remains more common than spontaneous preterm birth regardless of ethnic group. The highest overall rates of preterm birth are amongst Maori and Indian women. There are likely to be a number of confounding factors contributing to this such as level of antenatal care, smoking history, maternal BMI and risk of diabetes.

Table 13: Perinatal outcome of preterm births by gestation (n=842)

Gestation	Births	Fetal deaths	Live births	% Live born	Neonatal death	% of live births surviving >28 days
20	8	6	2	25	2	0
21	16	14	2	13	2	0
22	14	9	5	36	5	0
23	12	8	4	33	4	0
24	12	3	9	75	2	78
25	15	0	15	100	2	87
26	21	4	17	81	2	88
27	22	5	17	77	0	100
28	17	3	14	82	0	100
29	34	2	32	94	2	94
30	42	1	41	98	1	98
31	40	3	37	93	0	100
32	49	2	47	96	0	100
33	45	3	42	93	0	100
34	94	2	92	98	1	99
35	151	0	151	100	1	99
36	251	3	248	99	2	99
Totals	843	68	775	91	26	96

Perinatal outcome data for these premature babies are excellent with survival rates of all livebirths from 27 weeks approaching those expected at term. However, long term morbidity for these premature babies should also be considered.

Summary / Implications

Rates of preterm birth at National Women's remain stable but with a trend towards a shift from spontaneous to iatrogenic preterm birth. This may represent a combination of factors including a rising number of women considered to have 'high risk' pregnancies, more timely intervention of 'at risk' pregnancies or benefits from interventions to stop preterm birth. Current data are unable to determine if these (or other) factors are contributing to these changes or if this simply reflects normal variation of data.

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 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 14: Rates and relative risks 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	%	RR*	95%CI	n	%	n	%	RR*	95%CI
Total	**7753**	**851**	**11.0**			**6129**	**79.0**	**773**	**10.0**		
Maternal Age											
≤ 20	398	54	13.6	1.5	1.1-1.9	311	78.1	33	8.3	0.9	0.6-1.2
21-25	985	125	12.7	1.4	1.1-1.7	770	78.2	90	9.1	0.9	0.8-1.2
26-30	1905	222	11.7	1.3	1.1-1.5	1498	78.6	185	9.7	1.0	0.8-1.2
31-35	2576	235	9.1		Ref	2081	80.8	260	10.1		Ref
36-40	1603	184	11.5	1.3	1.1-1.5	1242	77.5	177	11.0	1.1	0.9-1.3
>40	286	31	10.8	1.2	0.8-1.7	227	79.4	28	9.8	1.0	0.7-1.4
Ethnicity											
NZ European	3077	275	8.9		Ref	2463	80.0	339	11.0		Ref
Maori	655	94	14.4	1.6	1.3-2.0	496	75.7	65	9.9	1.0	0.7-1.2
Pacific	1156	149	12.9	1.4	1.2-1.7	909	78.6	98	8.5	0.8	0.7-1.0
Asian	1370	183	13.4	1.4	1.2-1.7	1082	79.0	105	7.7	0.7	0.6-0.9
Indian	513	64	12.5	1.4	1.1-1.8	405	78.9	44	8.6	0.8	0.6-1.1
Other European	723	57	7.9	0.9	0.7-1.2	583	80.6	83	11.5	1.0	0.8-1.3
Other	259	29	11.2			191	73.8	39	15.1		
Parity											
Multipara	4049	412	10.2		Ref	3197	79.0	440	10.9		Ref
Primipara	3704	439	11.9	1.1	1.0-1.3	2932	79.2	333	9.0	0.8	0.7-1.0

*Relative risk of SGA/LGA compared to AGA for each predictor category compared to the identified referent category

Table 15: Rates and relative risks 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	%	RR*	95%CI	n	%	n	%	RR*	95%CI
Smoking at booking											
Currently smoking	844	147	17.4	1.7	1.5-2.1	635	75.2	62	7.3	0.8	0.6-1.0
No or not smoking in last month	6112	589	9.6		Ref	4889	80.0	634	10.4		Ref
Unknown	797	115	14.4	1.5	1.2-1.8	605	75.9	77	9.7	1.0	0.8-1.2
BMI											
<19	408	55	13.5	1.4	1.1-1.9	324	79.4	29	7.1	0.7	0.5-1.0
19-25	4268	385	9.0		Ref	3441	80.6	442	10.4		Ref
26-35	2041	250	12.2	1.3	1.2-1.6	1600	78.4	191	9.4	0.9	0.8-1.1
>35	545	64	11.7	1.3	1.1-1.7	408	74.9	73	13.4	1.3	1.1-1.7
Missing data	491	97	19.8	2.1	1.7-2.6	356	72.5	38	7.7	1.8	1.3-2.6
Plurality											
Singleton	7429	735	9.9			5927	79.8	767	10.3		
Multiple	324	116	35.8		**	202	62.3	6	1.9		**

*Relative risk of SGA/LGA compared to AGA for each predictor category compared to the identified referent category
**Relative risks for multiple pregnancy have not been calculated as population centiles have not been validated for use in multiple pregnancy

Risk factors for SGA in the NW population include the well known risk factor of smoking and also young and older maternal age. The increased risk seen in specific ethnic groups needs further exploration in multivariate analysis to determine whether these ethnic groups have independently increased risks. For example the elevated risk seen in univariate analysis in Maori women may be due to higher rates of smoking. It is interesting and more difficult to speculate why rates of SGA appear increased in Pacific, Asian and Indian women compared with Caucasian as customised centiles adjust for maternal ethnicity. If these effects persist after multivariate analysis then explanations need to be sought including whether it may be opportune to update the regression models involved in the centile calculator which were developed on data from births from 1993 -2000.

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

	Customised birthweight <10th% (SGA) n=851		Customised birthweight ≥10th% & ≤ 90th % (AGA) n=6129		Customised birthweight > 90th % (LGA) n=773	
	n	%	n	%	n	%
Median birth weight (IQR) g	2620(2160-2900)		3405(3115-3690)		4135(3850-4420)	
Gestation at birth						
Term	622	73.0	5582	91.0	706	91.3
Preterm	229	26.9	547	8.9	67	8.7
Preterm <32 wks	94	11.0	140	2.3	19	7.5
Median gestation (IQR) weeks	39(38-40)		39(38-40)		38(36-40)	

As has been shown by local and international publications SGA babies are more likely to be born preterm.

Table 17: Interventions and outcomes among SGA, LGA and AGA babies born preterm

	Customised birthweight <10th% (SGA) n=229				Customised birthweight ≥10th% & ≤ 90th % (AGA) n=547		Customised birthweight >90th % (LGA) n=67			
	n	%	RR*	95%CI	n	%	n	%	RR*	95%CI
Onset of birth – preterm										
Spontaneous labour	62	27.1	Ref		235	43.0	32	47.8	Ref	
Induction and pre labour CS	167	72.9	1.3	1.1-1.4	312	57.0	35	52.2	0.9	0.7-1.2
NICU admission										
Any stay	165	72.1	1.2	1.1-1.3	333	60.9	25	37.3	0.6	0.4-0.8
≥2 days	163	71.2	1.2	1.1-1.3	326	59.6	23	34.3	0.6	0.4-0.8
Apgar at 5 mins <7	52	22.7	2.3	1.7-3.3	53	9.7	10	14.9	1.5	0.8-2.9
Fetal death (n/ 1000)	39	170	4.2	2.6-7.0	22	40	7	104	2.6	1.2-5.8
Neonatal death(n/1000 live births)	10	44	1.6	0.7-3.5	15	27	1	15	0.5	0.1-4.1

17% of all preterm SGA infants born at NW were stillborn and 4.3% died in the neonatal period which is higher than the corresponding rates in AGA babies (4.0% and 2.7% respectively). Preterm LGA babies did not appear to have increased morbidity compared with AGA babies.

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

	Customised birthweight <10th% (SGA) n=622				Customised birthweight ≥10th% & ≤ 90th% (AGA) n=5582		Customised birthweight >90th % (LGA) n=706			
	n	%	RR*	95%CI	n	%	n	%	RR*	95%CI
Onset of birth – preterm										
Spontaneous labour	296	47.6	Ref		3148	56.4	342	48.4	Ref	
Induction and pre labour CS	326	52.4	1.2	1.1-1.3	2434	43.6	364	51.6	1.2	1.1-1.3
NICU admission										
Any stay	68	10.9	2.9	2.2-3.8	211	3.8	35	5.0	1.3	0.9-1.9
≥2 days	60	9.6	3.5	2.6-4.6	155	2.8	26	3.7	1.3	0.9-2.0
Apgar at 5 mins <7	11	1.8	2.7	1.4-5.4	36	0.6	5	0.7	1.1	0.4-2.8
Fetal death (n/ 1000)	2	3	3.0	0.6-14.8	6	1	0			
Neonatal death(n/1000 live births)	4	6.4	9.0	2.3-35.8	4	0.7	0			

Perinatal deaths in term SGA infants were less common than in preterm SGA infants but these term 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.

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. Induction and pre-labour LSCS are also increased in these SGA babies when born preterm. This is likely due to antenatal recognition of SGA and also associated conditions such as preeclampsia.

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 2008 and the outcomes of their babies.

Findings

Table 19: Multiple pregnancy rates

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total number of multiple pregnancies	172	194	210	182	172	218	179	208	191	188	187	162	177	160
Incidence %				2.4	2.2	2.7	2.3	2.6	2.4	2.4	2.5	2.2	2.3	2.1
Number of twin pregnancies	169	187	204	176	166	207	175	201	184	188	184	157	174	156
Number of triplet pregnancies	2	7	6	5	6	11	4	7	7	0	3	5	3	4
Number of quadruplet pregnancies	1	0	0	1	0	0	0	0	0	0	0	0	0	0

Table 20: Fetal/neonatal outcomes of multiple pregnancies

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total number of babies born in a multiple pregnancy	348	395	426	371	350	447	362	423	389	376	377	329	357	324
Incidence %				4.8	4.6	5.3	4.7	5.3	4.9	4.9	5.1	4.5	4.5	4.2
Number of multiple pregnancies where one or more babies died	10	23	20	12	12	14		26	11	15	13	8	9	12
Incidence % (no. of multiple pregnancies where a baby died/number of multiple pregnancies)	5.8	11.9	9.5	6.6	7.0	6.4		12.5	5.8	8.0	7.0	4.9	5.1	7.5
Number of babies who died in a multiple pregnancy	12	36	30	25	22	23				23	17	12	11	16
Total number of babies born in a twin pregnancy	338	374	408	352	332	414	350	402	368	376	368	314	348	312
Twin perinatal deaths (≤ 7days)			28	20	22	20				23	16	11	10	13
Twin perinatal mortality rate*			68.6	56.8	62.5	48.3				61.2	43.4	35.0	28.7	41.7

*Perinatal twin deaths/1000 twin babies born

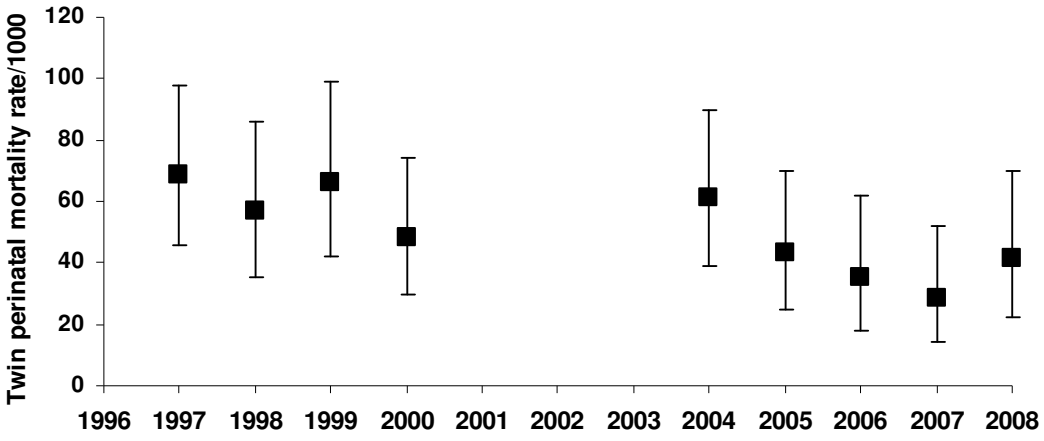

Figure 17: Twin perinatal mortality 1997-2008 with 95% confidence intervals

The rate of multiple pregnancy remains stable. In 2008 there was a 7.5% 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 will be offered in New Zealand for the first time.

Table 21: Mode of onset of birth among twin pregnancies

	Preterm births n=204		Term births n=108	
	n	%	n	%
Mode of onset of birth				
CS elective	60	29	42	39
CS emergency before labour	40	20	4	4
Induction of labour	44	22	44	41
Spontaneous labour	60	29	18	17

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

For those multiple pregnancies that proceed to term nearly half are induced.

Table 22: 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	
	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
Spontaneous vaginal birth 1st twin, operative vaginal 2nd twin	7	3	4	2	8	4	7	4	3	2	2	1
Operative vaginal 1st twin, spontaneous vaginal 2nd twin	9	4	8	4	5	3	5	3	6	3	4	3
Instrumental vaginal birth both twins	11	5	7	4	7	4	3	2	11	6	4	3
Spontaneous vaginal birth 1st twin, caesarean section 2nd twin	4	2	4	2	1	1	1	1	2	1	3	2
Operative vaginal birth 1st twin, caesarean section 2nd twin	2	1	5	3	0		0		0		0	
CS elective both twins	90	43	48	26	52	28			46	29	51	33
CS emergency both twins			60	32	58	31			57	36	39	25

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 23: Fetal/newborn outcomes of twin babies

		Twin babies n=312	
	n	n	%
Apgar <7 at 5 minutes		16	5.1
Admission to NICU ≥ 2 days		149	47.8
≤34 weeks	102	91	89.2
35-36	102	52	51.0
≥37 weeks	108	6	5.6

Table 24: Perinatal-related deaths in twin pregnancies by gestation

	Twin pregnancies			
	One twin died n=7		Both twins died n=4	
Gestation (weeks)	**n**	**Outcome**	**n**	**Outcome**
20 – 23			4	3 FD,1 FD /ENND
24 – 27	1	LNND		
28 – 31	2	FD,LNND		
32 – 36	3	3 FD		
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 and increased risk of preterm birth. The delivery 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 MC twins are at higher risk and should be scanned prior to 14 weeks to determine chorionicity and then two weekly from 16 weeks.

5.4 Diabetes

Methods

The statistics given in this section relate to women with a diagnosis of pre-existing or gestational diabetes who delivered at National Women's. It includes women who were cared for solely by the National Women's Diabetic Clinic, women with some input from the Diabetic Clinic while under the care of non-Diabetic Clinic LMC, and women with no Diabetic Clinic input. It does not include women cared for by the Diabetic Clinic who delivered prior to 20 weeks or who delivered elsewhere.

Findings

In addition to these data the diabetes service had 54 referrals for pre-pregnancy counselling, similar to the previous year. Also 41 other women were booked into clinic but their data are not shown as they either miscarried or transferred elsewhere for delivery.

Figure 18 demonstrates a further increase in numbers of women with GDM and type 2 diabetes diagnosed prepregnancy.

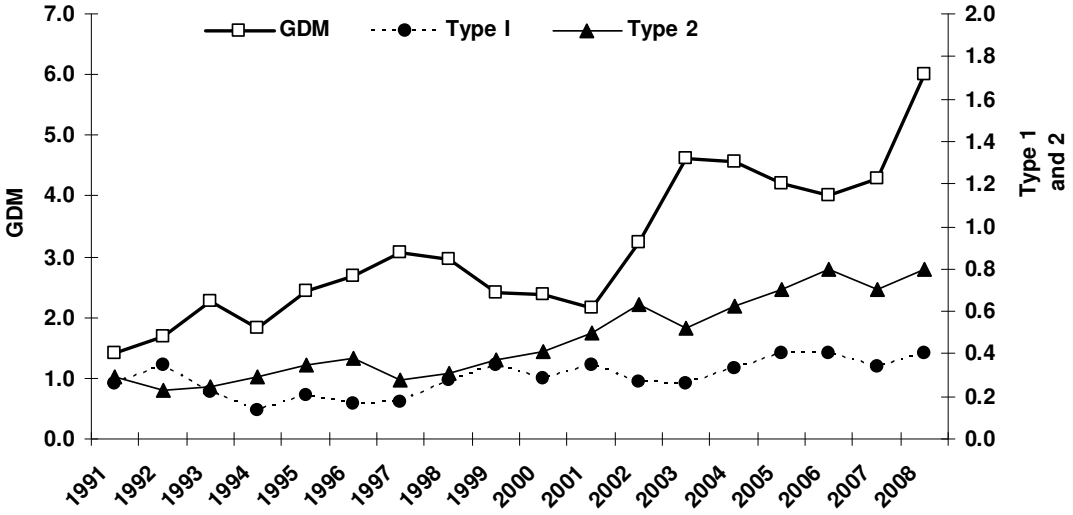

Figure 18: Incidence of diabetes (% of all inborn and BBA births) (1991-2008)

5.4.1 Demographic characteristics s of women with diabetes

The demographics again demonstrate the increased rates of GDM in non-European ethnicities. The results of the HAPO (Hyperglycemia and Adverse Pregnancy Outcomes) study have shown that risks of adverse pregnancy outcomes increase at lower glucose levels than those currently used to diagnose GDM in NZ. International guidelines under development are likely to recommend that all pregnant women perform a 75g oral glucose tolerance test as a one-step procedure to screen for and diagnose GDM (no 50g glucose load as a screen first). Also, they will recommend lower fasting and post load glucose levels for diagnosis than currently seen in New Zealand. The recommendations will include a one hour result with the option of keeping a two hour result. If these new criteria are adopted, the incidence of GDM is likely to be at least 15% of the total pregnant population.

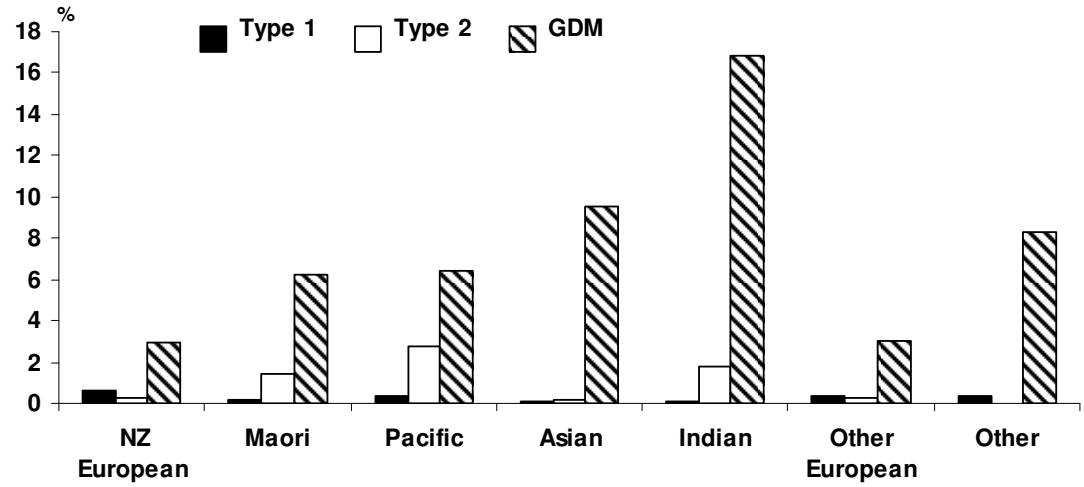

Figure 19: Incidence of diabetes by ethnic group (2008)

5.4.2 Outcomes of pregnancies complicated by diabetes

Maternal outcomes

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

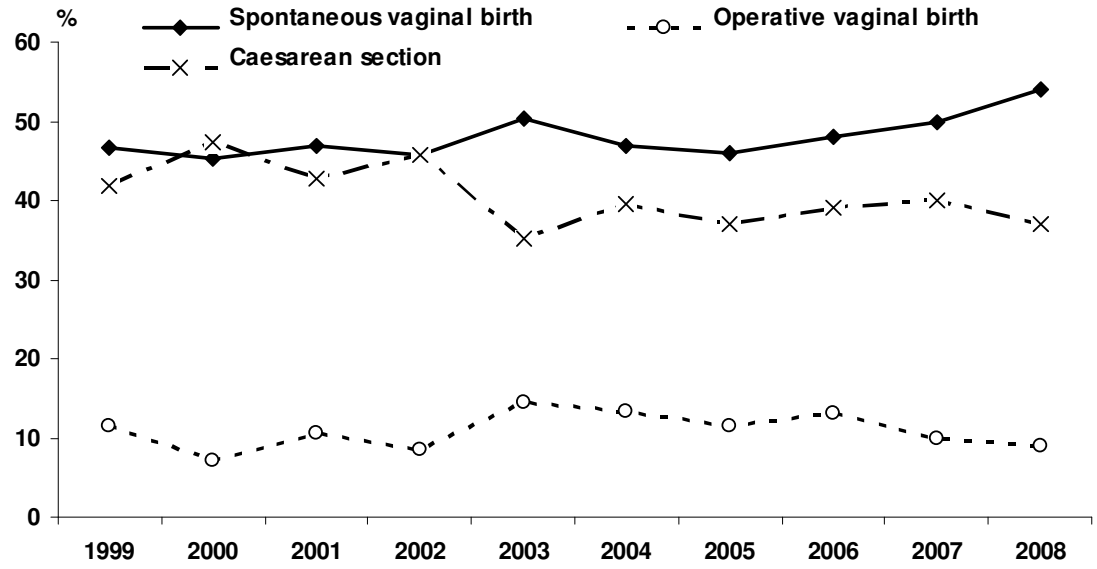

Figure 20: Mode of birth among women with GDM (1999-2008)

5.4.3 Maternal postpartum glucose tolerance testing

Table 25: Rates of postnatal glucose tolerance testing (GTT) among women with GDM (1999-2008)

	1999 n=183		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	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Postnatal GTT	129	70	121	67	132	81	171	68	260	74	260	76	238	78	206	72	249	75	313	68
No post-natal GTT	54	30	59	33	31	19	82	32	92	26	82	24	66	22	80	28	82	25	144	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 delivery. They are discharged on medication and therefore they do not have a postpartum glucose tolerance test.

Table 26: Results of postnatal glucose tolerance testing (GTT) among women with GDM (1999-2008)

	1999 n=129		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	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Normal	89	69	89	74	90	69	116	69	196	75	194	75	190	80	158	77	175	70	236	75
IFG/ IGT*	22	17	17	14	23	18	37	22	39	15	49	19	34	14	39	19	50	20	58	19
Type 2	18	14	15	12	17	13	16	9	25	10	17	7	14	6	9	4	24	10	19	6

*IFG =Impaired fasting glucose
IGT= Impaired glucose tolerance

5.4.4 Perinatal losses

One woman with well-controlled GDM had a stillbirth at 36 weeks gestation. The PSANZ perinatal death classification assigned was Fetal Growth Restriction.

5.4.5 Neonatal outcomes among babies of women with diabetes in pregnancy

We have examined the increased rates of SGA infants reported in women with type 2 diabetes since customised centiles have been used. The increase is mainly due to more Pacific infants being recognised as SGA and these infants do have increased morbidity (Rowan, Luen, Sadler, McCowan AustNZ J Obstet Gynecol 2009;49:180-184).
It is very difficult to control glucose excursions adequately enough in women with type 1 diabetes to improve the LGA rate.

Table 27: Neonatal outcomes among babies of women with diabetes

	Type I n=33	Type 2 n=63	GDM n=443	Postnatally diagnosed Type 2 n=19	No diabetes n=7195
	n %	n %	n %	n %	n %
Birthweight (Median(IQR))	3460(3060-3820)	3370(3020-3650)	3250(2860-3580)	3110(2685-3730)	3400(3030-3750)
<1500g	0	2 3.2	4 0.9	0	209 2.9
<2500g	3 9.1	9 14.3	46 10.4	3 15.8	621 8.6
SGA <10th Percentile	1 3.0	9 14.3	52 11.7	2 10.5	787 10.9
LGA >90th Percentile	12 36.4	4 6.3	69 15.6	6 31.6	682 9.5
Admission to NICU					
Any admission	8 24.2	13 20.6	65 14.7	4 21.1	747 10.4
≥2 days	7 21.2	13 20.6	60 13.5	4 21.1	669 9.3
Hypoglycaemia <2.3 mmol/l	12 36.4	16 25.4	55 12.4	4 21.1	
Hypoglycaemia <2.6 mmol/l	13 39.4	21 33.3	91 20.5	5 26.3	
IV Dextrose	4 12.1	9 14.3	31 7.0	3 15.8	

The MiG Trial

The MiG (metformin in gestational diabetes) trial findings have been implemented into routine practice in clinic and most women with GDM who require pharmacological therapy are treated with metformin initially (alone or in conjunction with insulin). Neonatal outcomes have remained consistent with previous years with this change in practice.

Summary

Good outcomes are continuing in the diabetes service despite a significant increase in referrals and more women with pre-existing type 2 diabetes coming through the clinic. The challenge for the future will be how we manage the further increase in workload associated with increasing rates of obesity and likely lower 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.

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. Formalise clinic protocols in writing.
3. Continue current multidisciplinary care.

5.5 Antepartum haemorrhage

Methods

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

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

Findings

Table 28: Antepartum haemorrhage incidence

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2005	2006	2007	2008
Total APH	286	365	515	460	451	453	451	484	594	398	411	533	424
Incidence %	6.3	4.1	5.6	5.0	4.9	5.6	6.0	6.5	7.6	5.5	5.7	6.9	5.6
Proven abruption	58	72	94	101	96	115	82	49	54	41	44	58	36
Proven placenta praevia	38	65	61	86	67	94	91	74	69	81	68	94	73
APH (uncertain origin)	190	227	365	273	287	281	278	361	471	276	299	381	315

In 2008 424 women (5.6% of the total pregnant population) had an antepartum haemorrhage or placenta praevia without bleeding. This figure has not changed significantly from year to year and there have been no trends in incidence over time.

In our population placenta praevia is significantly more common with increasing maternal age: there was an incidence of 0.5% (15 of 3220 women) in women aged 30 or under rising to 1.6% in women aged 36 to 40 (25 of 1570 women) and 2.1% (6 of 280 women) in women over 40. No woman under 25 had a placenta praevia.

Interestingly, the incidence of placenta praevia in women with a previous caesarean section was 1.3% (16 of 1212 women) suggesting that previous caesarean section may not be an important risk factor. 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 had no association with placenta praevia.

Table 29: Maternal outcomes of pregnancies complicated by antepartum haemorrhage

	Placenta praevia n=73		Placental abruption n=36		APH uncertain origin n=315		No APH n=7165	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	1	1.4	17	47.2	181	57.5	4081	57.0
Operative vaginal	0		2	5.6	41	13.0	894	12.5
CS elective	44	60.3	1	2.8	24	7.6	1024	14.3
CS emergency	28	38.4	16	44.4	69	21.9	1166	16.3
Maternal transfusion	17	23.3	8	22.2	28	8.9	172	2.4

Women with a placenta praevia had a significant requirement for blood products with 23% of women requiring transfusion during pregnancy or delivery. 38% were delivered by emergency section, a similar proportion to previous years. Planning delivery 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 delivery would be useful to determine how well we are managing these women. The finding that 38% of women with placenta praevia are delivered before 37 weeks suggests that not much can be done to reduce the proportion delivered by emergency caesarean section.

A confirmed placental abruption is a less common diagnosis with an incidence of 0.5% (36 women out of 7589). There was no difference in incidence with maternal age, BMI or previous caesarean section. Smoking appears to be a significant risk factor with an incidence of 1.0% (8 of 823 women) compared to 0.3% (19 out of 5988 women) in non-smokers. Pre-eclampsia is also a significant risk factor with an incidence of 2.7% in this group (5 out of 186 women) compared to 0.4% (28 of 6959 women) in normotensive women.

Placental abruption is associated with significant maternal morbidity with 44% requiring delivery by emergency section and 22% being transfused. Fetal morbidity is also significant with a median birth weight of 2155g and an incidence of SGA of 24%. More than half of these babies were admitted to NICU and with three perinatal deaths in this group, the perinatal mortality rate is nearly ten times higher than in women with no history of antepartum haemorrhage.

Women with an APH of uncertain origin make up the largest proportion of women presenting with antepartum haemorrhage (315 of 414 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 (0.7% vs. 0.48%) and women with pre-eclampsia (4.4% vs. 0.4%) would support this.

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

	Placenta praevia n=76		Placental abruption n=38		APH uncertain origin n=323		No APH n=7753	
	n	%	n	%	n	%	n	%
Gestation at birth								
<37 weeks	28	36.8	22	57.9	91	28.2	702	9.1
<32 weeks	4	5.3	13	34.2	48	14.9	188	2.4
Birthweight								
Median (IQR)	2990(2620-3355)		2155(1590-3310)		3135(2455-3580)		3409(3050-3750)	
<2500g	17	22.4	22	57.9	85	26.3	558	7.2
<1500g	5	6.6	8	21.1	39	12.1	161	2.1
Small for gestational age	11	14.5	9	23.7	50	15.5	781	10.1
Perinatal deaths (n /1000)	2	26.0	3	78.9	30	93	75	9.7
Admission to NICU	19	25.0	21	55.3	67	20.7	730	9.4
≥2 days in NICU	18	23.7	21	55.3	61	18.9	653	8.4

The higher rates of pre-term birth, emergency caesarean section, an increased requirement for blood transfusion and a perinatal mortality rate as high as in women with a confirmed abruption suggest that this group should still be treated as a high risk group. The most recent report by The Perinatal and Maternal Mortality Review Committee (2009) have also drawn attention to the importance of monitoring women with antepartum haemorrhage of unknown origin.

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 SBP ≥140 and or DBP ≥90 mmHg on two or more consecutive occasions at least 4 hours apart or one measurement SBP ≥170 and or DBP ≥110 mmHg.
- **Pre-eclampsia**: 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.

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 (8.3%) is lower than the rates reported for the previous two years (10%), but 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 the nullip. There were no reported cases of eclampsia in 2008.

Table 31: Hypertensive disease in pregnancy (2008)

	All women n=7589		Nullipara n=3623		Multipara n=3966	
	n	%	n	%	n	%
Any hypertensive disease	630	8.3	340	9.4	290	7.3
Chronic hypertension	173	2.3	53	1.5	120	3.0
Gestational hypertension	271	3.6	160	4.4	111	2.8
Preeclampsia	186	2.5	127	3.5	59	1.5

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 31%, 11.3% and 28.9% of the women with gestational hypertension, pre-eclampsia or chronic hypertension respectively. A diagnosis of preeclampsia or chronic hypertension is associated with a high risk of caesarean section delivery (49.5% and 47.4% respectively).

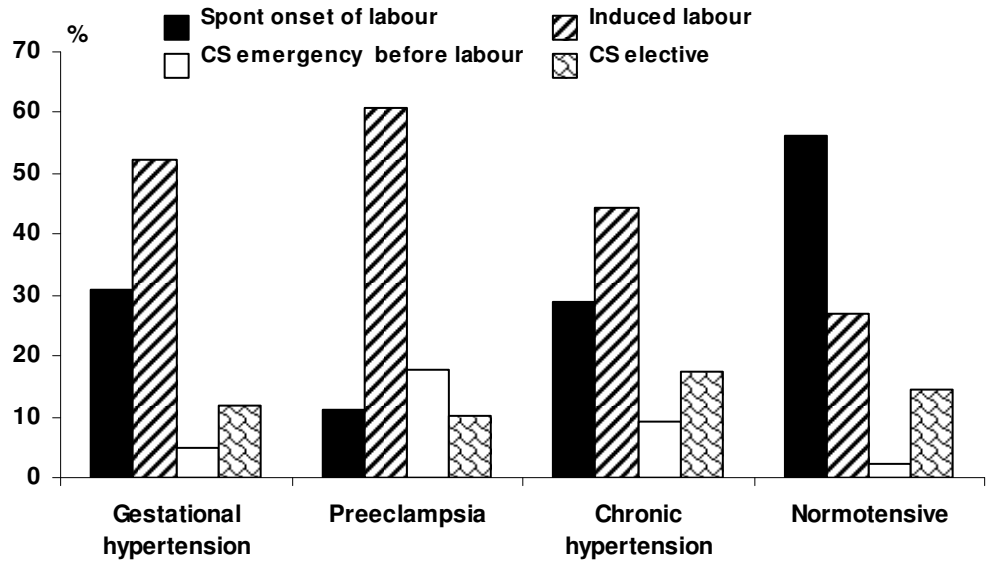

Figure 21: Onset of birth and hypertensive disorders of pregnancy

Table 32: Mode of birth for women with hypertensive disease

	Gestational hypertension n=271		Pre-eclampsia n=186		Chronic hypertension n=173		Normotensive n=6959	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	116	42.8	70	37.6	77	44.5	4017	57.7
Operative vaginal	57	21.0	24	12.9	14	8.1	842	12.1
CS elective	32	11.8	19	10.2	30	17.3	1012	14.5
CS emergency	66	24.4	73	39.2	52	30.1	1088	15.6

Table 33: Perinatal outcomes and hypertensive complications of pregnancy (babies)

	Gestational hypertension n=284		Pre-eclampsia n=197		Chronic hypertension n=175		Normotensive n=7097	
	n	%	n	%	n	%	n	%
Gestation at birth								
<37 weeks	43	15.1	73	37.1	38	21.7	689	9.7
<32 weeks	8	2.8	20	10.2	8	4.6	222	3.1
SGA	36	12.7	54	27.4	35	20.0	726	10.2
NICU Admission	35	12.3	60	30.5	32	18.3	710	10.0
≥2 days in NICU	29	10.2	58	29.4	30	17.1	636	9.0
Apgars <7 at 5 mins	6	2.1	8	4.1	7	4.0	146	2.1
Perinatal deaths (n/1000)	1	3.5	4	20.3	3	17.1	105	14.8

Hypertensive disease in pregnancy is associated with a range of adverse perinatal complications. Very preterm birth (<32 weeks) is significantly more common in women who have preeclampsia (10.2% of deliveries compared to 3.1% 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 8 perinatal deaths in the hypertensive group, with one baby affected by congenital abnormalities. All but one of the remaining affected pregnancies were delivered between 20 and 31 weeks gestation, with the majority of babies being significantly growth restricted. This highlights SGA as a major determinant for risk of perinatal death in hypertensive disease.

Summary / Implications

At 8.3% 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 2008 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 $(m)^2$. Weight is first recorded weight in pregnancy. Out of range heights and weights are checked for accuracy.

Findings

Table 34: Maternal BMI (missing data removed)

	2006 [1]		2007 [2]		2008 [3]	
	n=5660		n=6909		n=7117	
	n	%	n	%	n	%
<19	304	5.4	388	5.6	405	5.7
19-25	3329	58.8	4129	59.8	4180	58.7
26-30	1113	19.7	1315	19.0	1368	19.2
31-35	512	9.1	625	9.1	630	8.9
>35	402	7.1	452	6.5	534	7.5

1 Missing data in 2006=21.5%
2 Missing data in 2007 =10.2%
3 Missing data in 2008 = 6.2%

It is surprising to see that the rates of morbid obesity have remained stable over the last 3 years. If the trends in the figure below persist with high rates of obesity in young women then increases in the proportion of women classified as obese and morbidly obese may increase in future years.

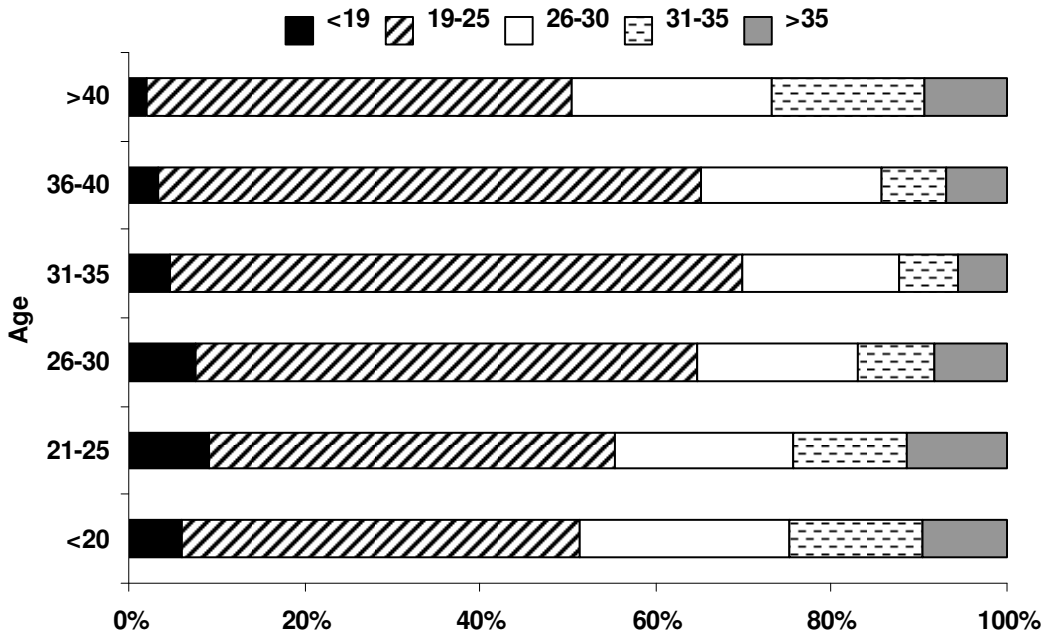

Figure 22: Distribution of BMI by maternal age

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 range for these women. 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.

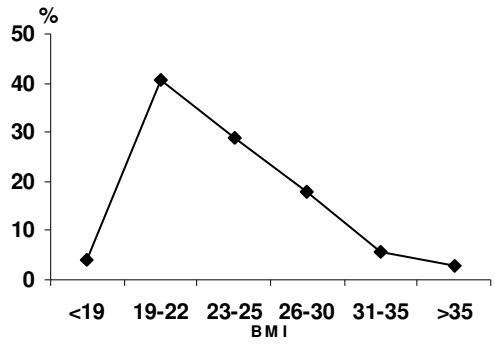

Figure 23: Distribution of BMI among European women

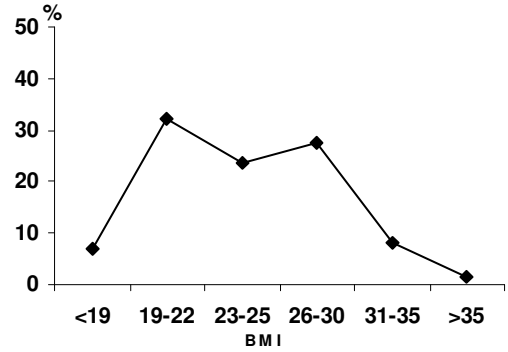

Figure 25: Distribution of BMI among Indian women

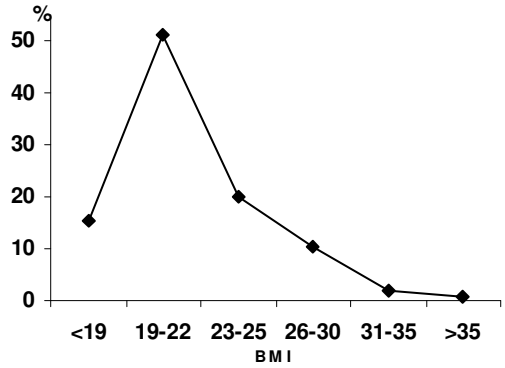

Figure 24: Distribution of BMI among Asian women

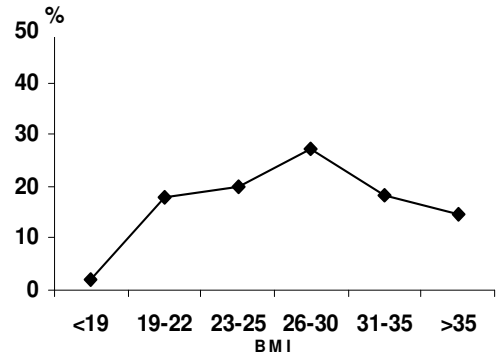

Figure 26: Distribution of BMI among Maori women

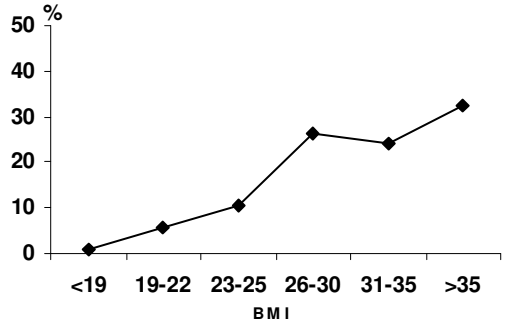

Figure 27: Distribution of BMI among Pacific women

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 range for these women. 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 likely to contribute to pregnancy complications in these women.

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 years to come.

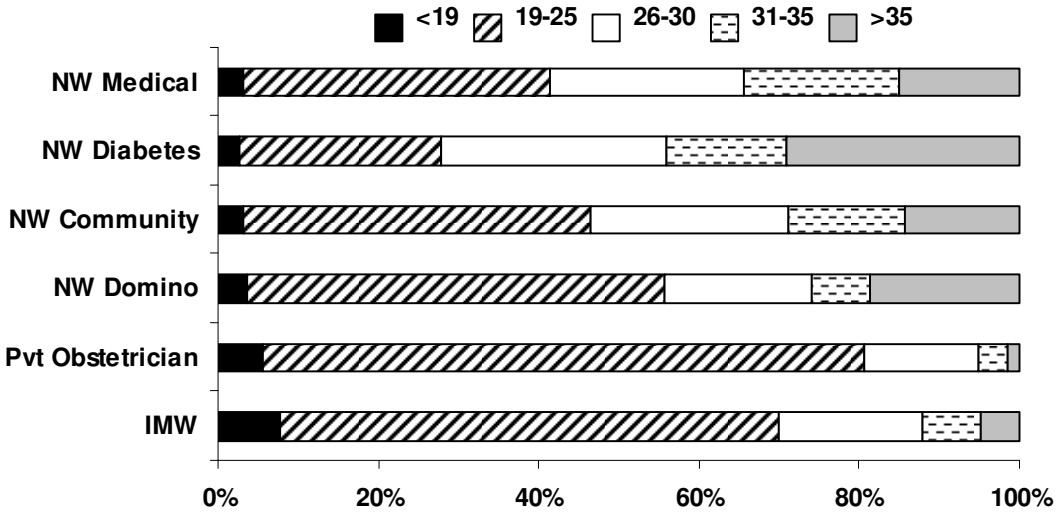

Figure 28: Distribution of BMI by LMC at booking

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

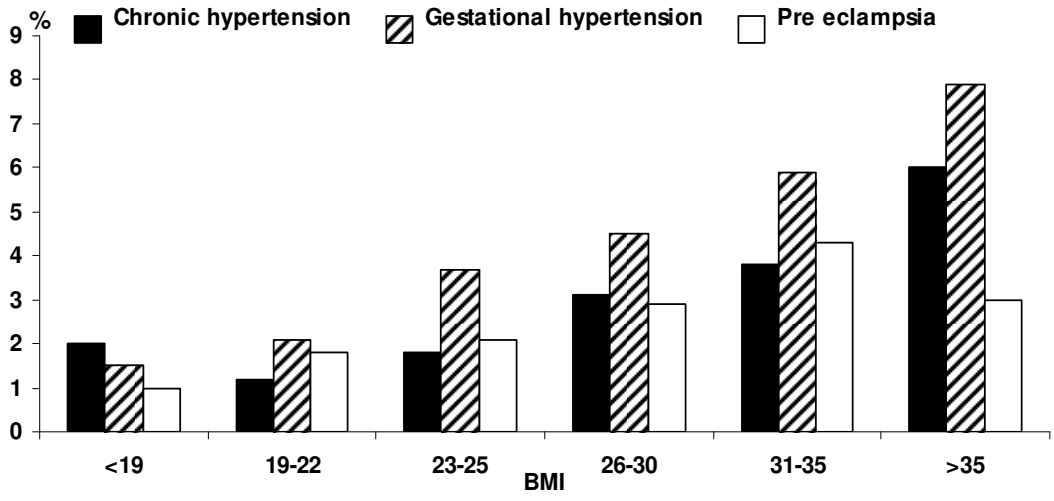

Figure 29: Rates of hypertensive diseases by maternal BMI

As has been shown in the international literature rates of all hypertensive complications increase progressively with increasing BMI. Future reports should separate pregnancy complications according to BMI into groups of nulliparous and multiparous women.

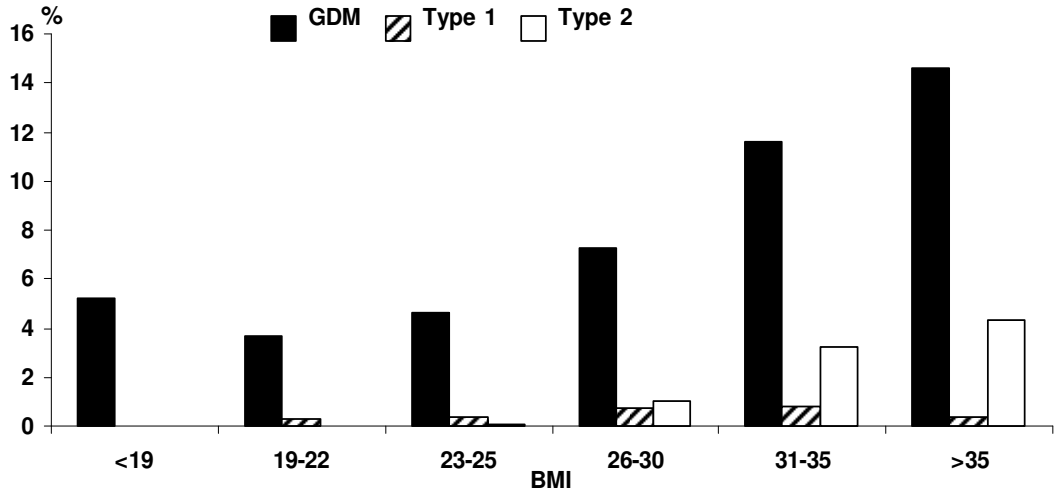

Figure 30: Rates of diabetes by maternal BMI

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. Similar analyses should be performed for Pacific and Maori women whose risk of pregnancy complications have not been investigated using ethnic BMI cut offs. Note Indian/Asian women are considered obese with BMI $\geq$27 and Maori and Pacific with BMI $\geq$ 32.

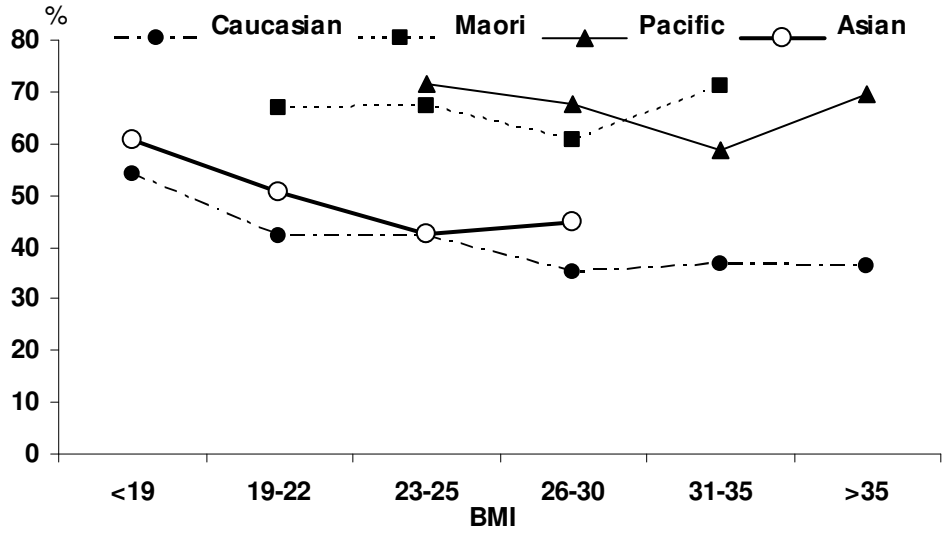

Figure 31: Spontaneous vaginal birth rate by BMI and by ethnicity among nulliparous mothers (no data point plotted if denominator < 30)

These data suggest 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,

epidural use, smoking and pregnancy complications need to be considered in multivariate models.

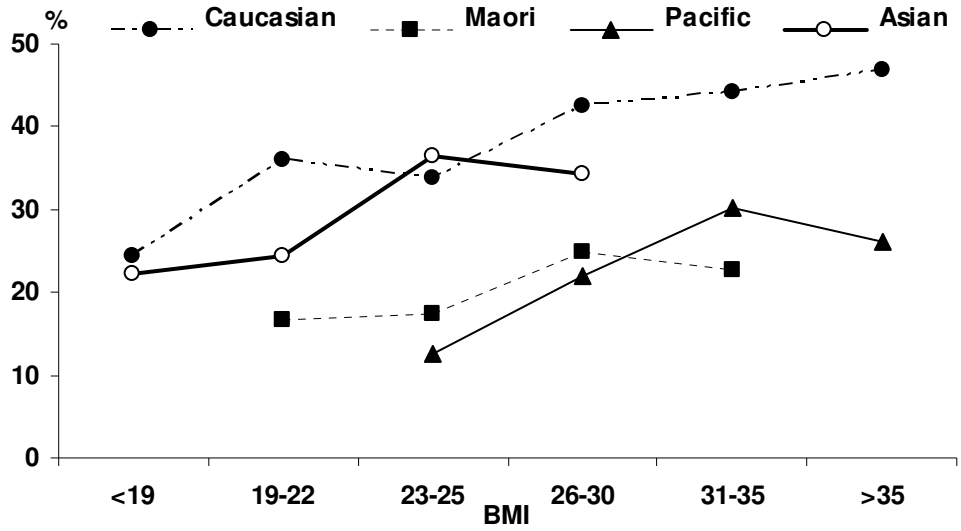

Figure 32: Caesarean section rate by BMI and by ethnicity among nulliparous mothers (no data point plotted if denominator < 30)

The same comments which apply to figure 31 also apply to these data re Caesarean section.

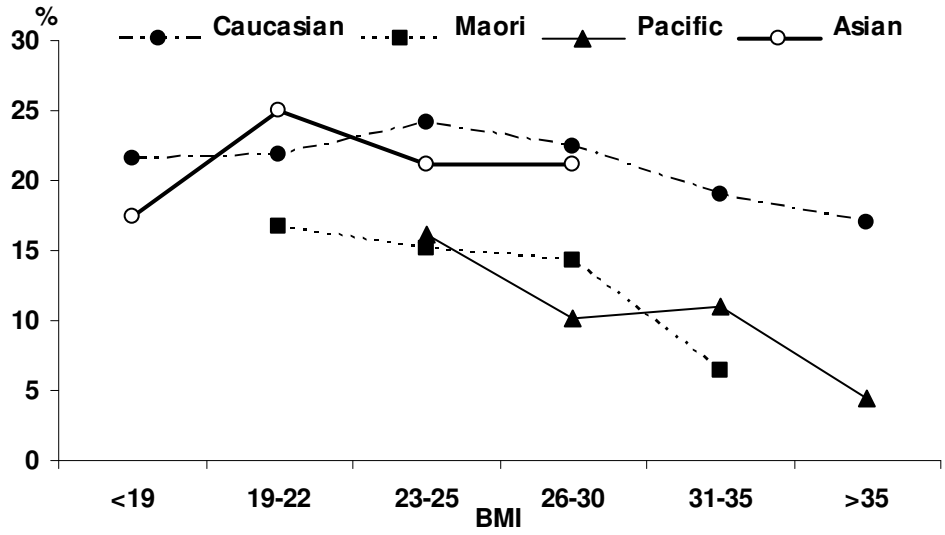

Figure 33: Operative vaginal birth rate by BMI and by ethnicity among nulliparous mothers (no data point plotted if denominator < 30)

The data in the above 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 delivery 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 prolonged pregnancy, diabetes and hypertensive disease.

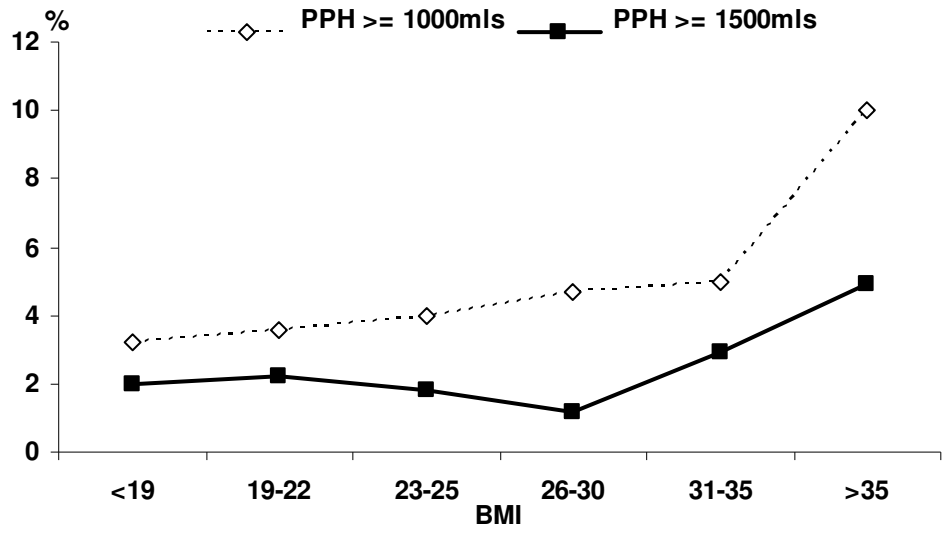

Figure 34: Postpartum haemorrhage rate by BMI among spontaneous vaginal births

Rates of major PPH are also 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.

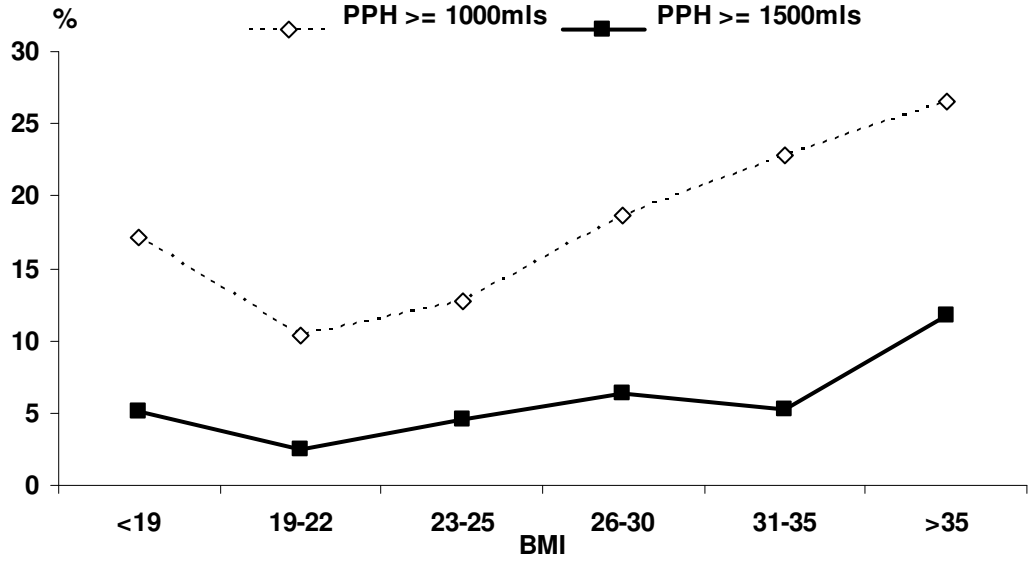

Figure 35: Postpartum haemorrhage rate by BMI among caesarean section

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.

Table 35: Neonatal outcomes and BMI

	Total n=7262	<19 n=408		19-22 n=2540		23-25 n=1728		26-30 n=1401		31-35 n=640		>35 n=545	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Preterm	701	47	11.5	209	8.2	168	9.7	153	10.9	58	9.1	66	12.1
Term	6561	361	88.5	2331	91.8	1560	90.3	1248	89.1	582	90.9	479	87.9
SGA	754	55	13.5	213	8.4	172	10.0	176	12.6	74	11.6	64	11.7
≥ 2 days in NICU	604	36	8.8	176	6.9	128	7.4	134	9.6	56	8.8	74	13.6
Perinatal deaths (n /1000)	101	3	7	24	9	25	14	28	20	10	16	11	20

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

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. In addition 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 smokechange and women's health social workers.

Women with a fetal anomaly, red cell antibodies or complex multiple pregnancy are seen in the Fetal Medicine Clinics. Here they are seen by Specialist and Sub-specialist Obstetricians with midwifery support. There is one full time fetal medicine midwife. 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 Maternal Fetal Medicine Service undertakes a number of complex invasive procedures including fetal blood sampling, in-utero transfusions, amniodrainage and fetal shunt placement. During 2007/8 due to staff shortages across the country the Auckland Maternal Fetal Medicine Service performed these procedures for most of the North Island and all of the South Island. The table below shows the numbers of cases performed over the last few years.

Figure 36: Number of referrals and procedures performed in maternal fetal medicine service(1998-2008)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Chronic villous sampling	187	155	126	133	126	111	132	*	143	137	133
Intrauterine transfusion (no of women)	6	8	6	9	6	1	2	*	2	11	5
Intrauterine transfusion (no of procedures)	9	27	24	24	14	3	2	*	3	21	8
Other procedures (no of women)	24	14	16	23	19	11	3	*	36	40	37
Other procedures (no of procedures)	34	16	16	32	32	11	3	*	44	49	39

* no data

In addition to the complex invasive procedures, routine amniocenteses and chorionic villous samplings (CVS) are performed. 339 amniocenteses and 133 CVS were performed last year. An audit of amniocenteses performed in 2007 found that all practitioners performing these are meeting recommended standards and that the procedure related loss rate is less than 0.5% in the unit.

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 elective 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. We suspect 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. In 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

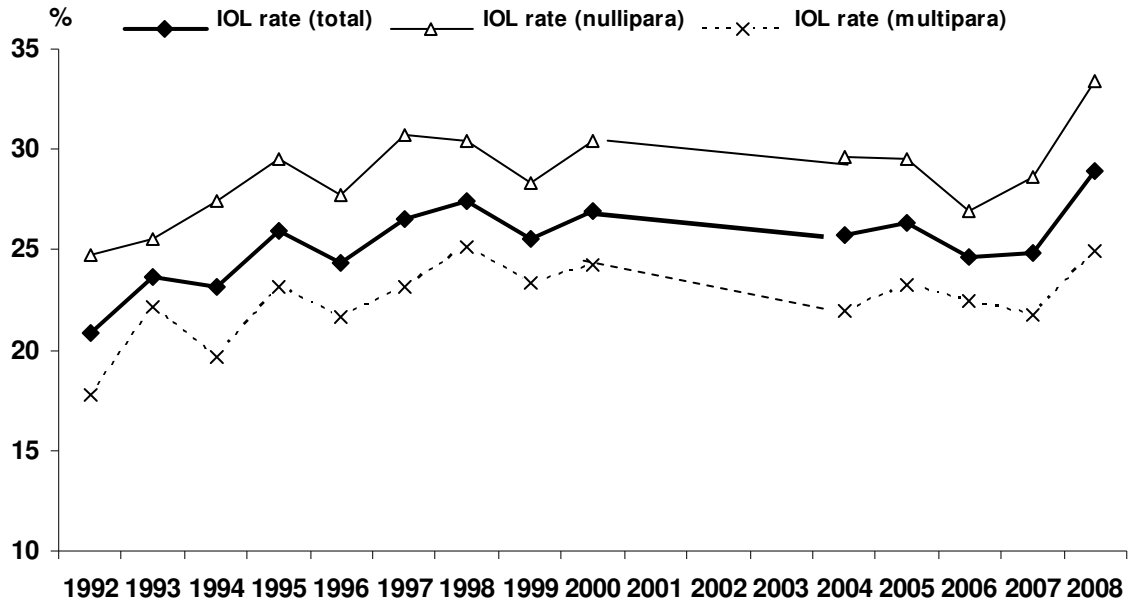

Figure 37 : Induction of labour rates (1992-2008)

In 2008 there was an increase in the induction of labour rate to 29%. At term 45% of pregnancies ended prior to spontaneous onset of labour. (29% by induction, 15% elective CS and 1.6% by emergency CS before onset labour)

Despite the increased induction rate, the absolute number of inductions in Women's Assessment Unit (WAU) was the same as in 2007. The increased inductions were performed in Labour and Birth Suite. This is, in part, explained by a change in cleaning of the data for women given syntocinon before 3cm dilatation. This group of women in most cases have their primary reason for induction recorded as "prolonged latent phase". It is concerning that this is the most common reason for induction as it may lead to unnecessary intervention.

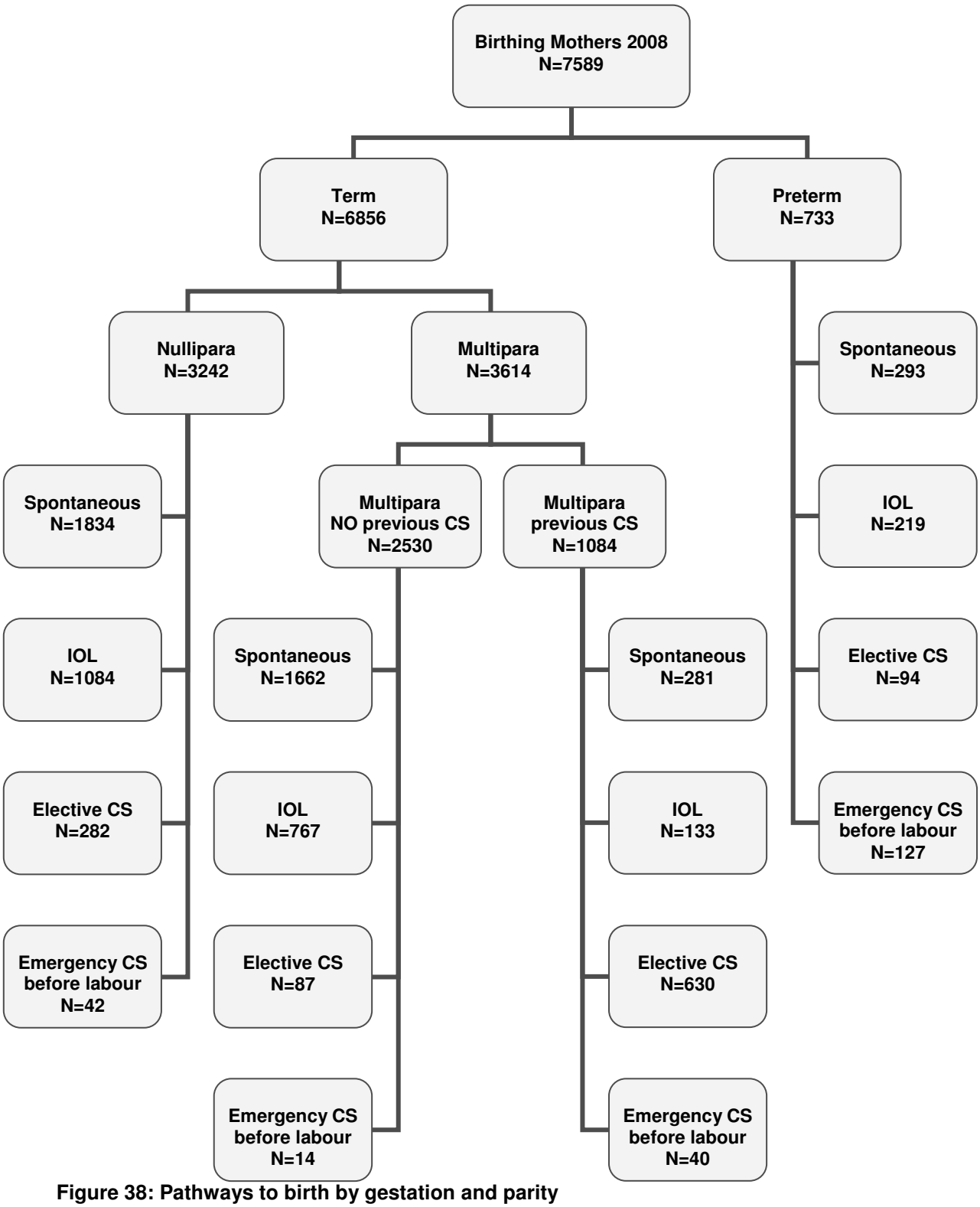

Figure 38: Pathways to birth by gestation and parity

Table 36: 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	6856	3777	55.1	1984	28.9	999	14.6	96	1.4
Maternal age									
≤ 20	343	241	70.3	95	27.7	5	1.5	2	0.6
21-25	856	598	69.9	218	25.5	37	4.3	3	0.4
26-30	1685	1026	60.9	504	29.9	134	8.0	21	1.3
31-35	2305	1244	54.0	647	28.1	36	1.6	378	16.4
36-40	1423	607	42.7	427	30.0	360	25.3	29	2.0
41+	244	61	25.0	93	38.1	85	34.8	5	2.1
Ethnicity									
NZ European	2713	1311	48.3	814	30.0	544	20.1	44	1.6
Maori	548	329	60.0	166	30.3	46	8.4	7	1.3
Pacific	1018	649	63.8	301	29.6	58	5.7	10	1.0
Asian	1253	792	63.2	300	23.9	145	11.6	16	1.3
Indian	444	230	51.8	147	33.1	59	12.6	11	2.5
Other European	652	339	52.0	180	27.6	127	19.5	6	0.9
Other	228	127	55.7	76	33.3	23	10.1	2	0.9
BMI									
<19	361	224	62.1	87	24.1	46	12.7	4	1.1
19-25	3891	2182	56.1	1071	27.5	593	15.2	45	1.2
26-35	1830	942	51.5	573	31.3	277	15.1	38	2.1
>35	479	230	48.0	193	40.3	53	11.1	3	0.6
Missing	349	208	59.6	82	23.5	51	14.6	8	2.3
LMC at booking									
IMW	2961	1986	67.1	755	25.5	199	6.7	21	0.7
Private Obstetrician	1588	546	34.4	487	30.7	516	32.5	39	2.5
GP	122	88	72.1	25	20.5	8	6.6	1	0.8
NW Community	1379	832	60.3	364	26.4	160	11.6	23	1.7
NW Domino	248	167	67.3	60	24.2	19	7.7	2	0.8
NW Medical	248	89	35.9	111	44.8	43	17.3	5	2.0
NW Diabetes	251	25	10.0	173	68.9	50	19.9	3	1.2
Other DHB	23	11	47.8	7	30.4	4	17.4	1	4.4
Unbooked	36	33	91.7	2	5.6	0		1	2.8

Indication for induction

Nulliparous women were more often induced than multiparous women (33 vs 25%). There has been a 30% increase in the number of women being induced having previously had a caesarean section from 9.2% in 2007 to 12.5% in 2008. (There has been a smaller proportional increase among multipara without previous caesarean from 27.4% to 30.7%). This may relate to the introduction of a new practice utilising a cervical ripening balloon. This is still in its infancy and being audited. The intention is to allow more women to labour and therefore hopefully increase our VBAC rate and improve outcomes.

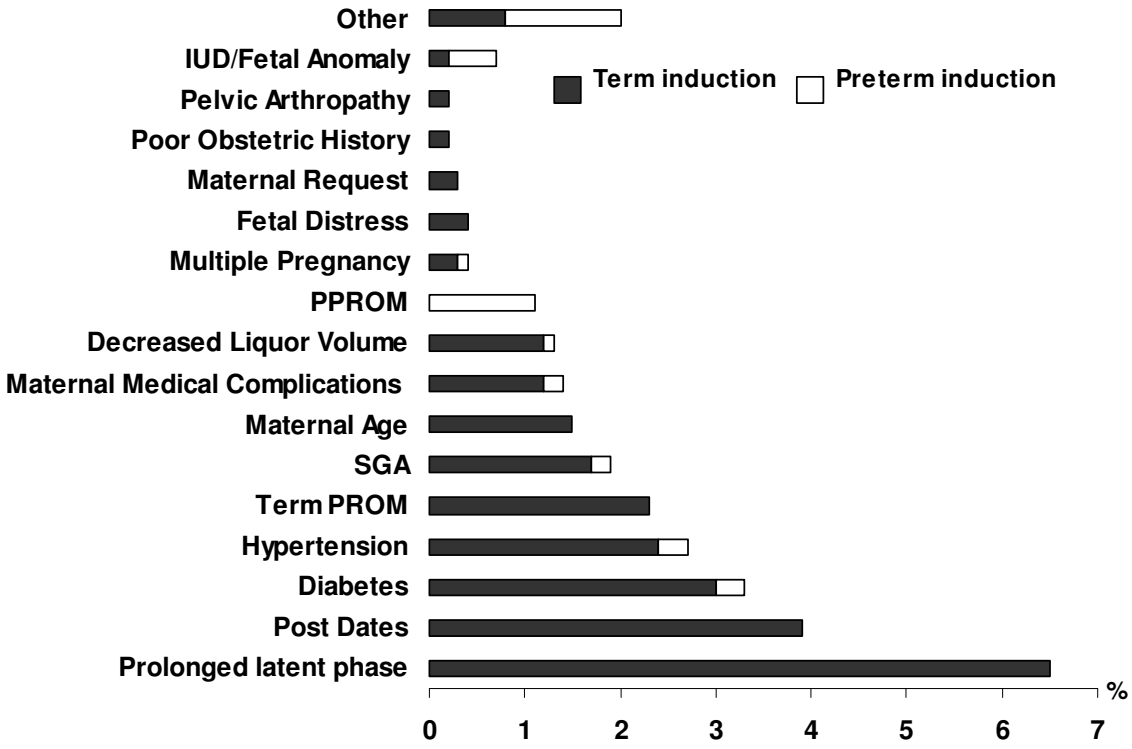

Figure 39: Primary indication for induction as a percentage of all births, including the contribution by gestation (n=inductions/birthing mothers)

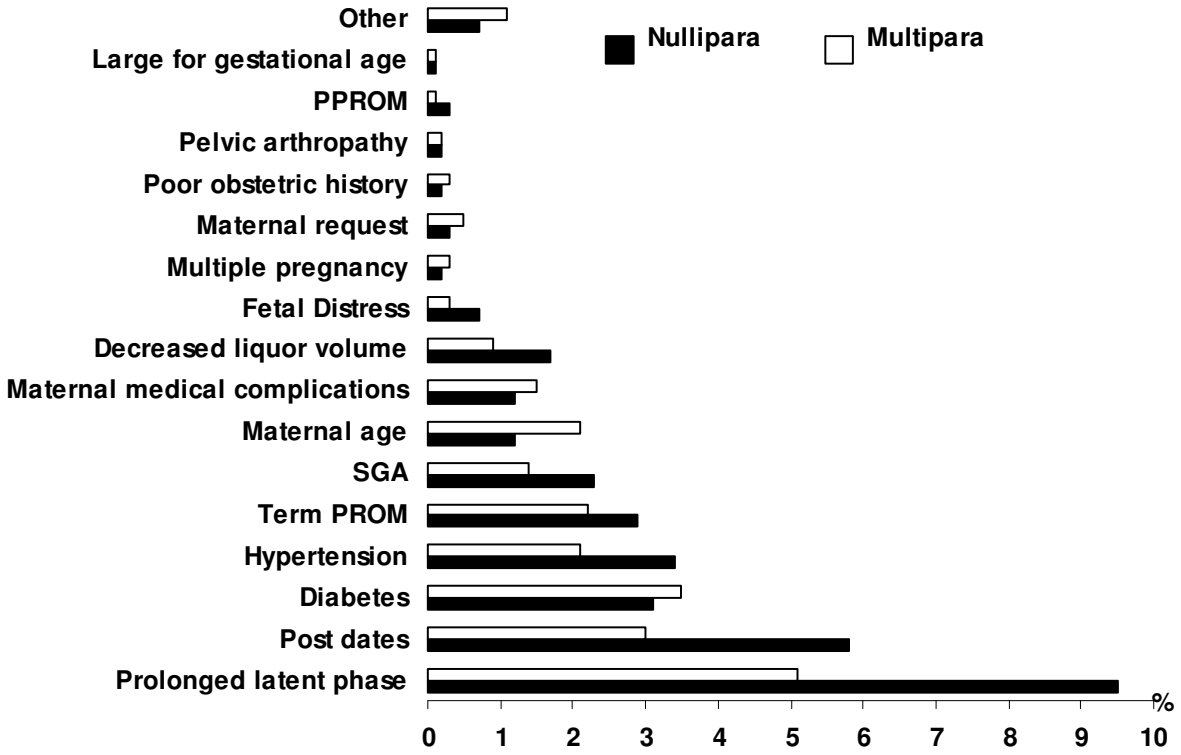

Figure 40: Primary indication for induction at term by parity (as a percentage of term births)

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

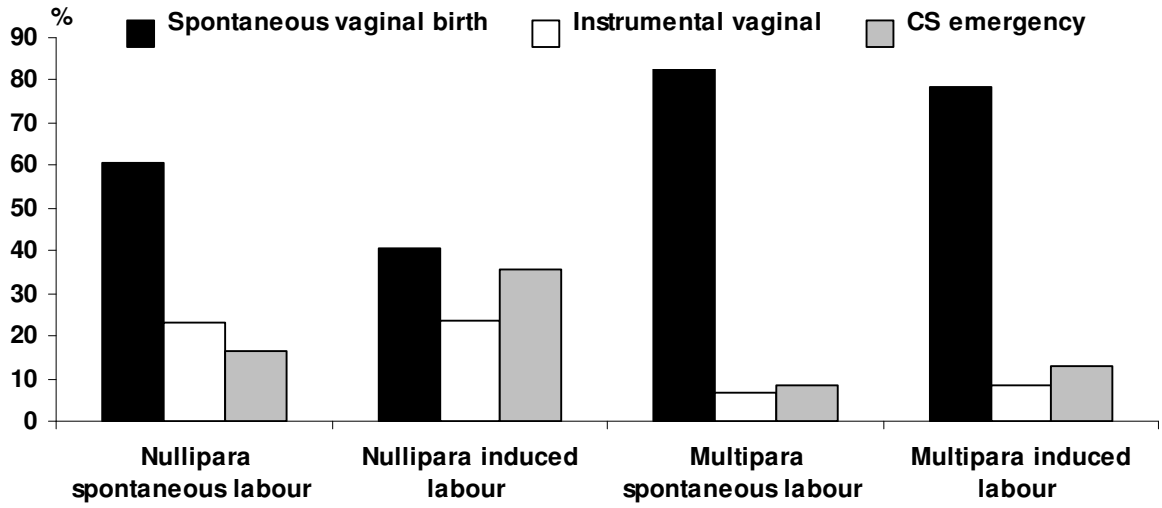

Figure 41: Mode of birth among intended vaginal births at term by parity and onset of labour (excludes previous caesarean)

The emergency caesarean section rate following induction, among both nullipara and multipara without previous caesarean, is double that among those women who spontaneously labour. Among nulliparous women, induction was associated with a spontaneous vaginal birth (SVB) rate of 40% compared with 60% following spontaneous labour. This decreased rate of spontaneous birth is entirely accounted for by an increased rate of emergency caesarean section, with no real change seen in the rate of instrumental birth.

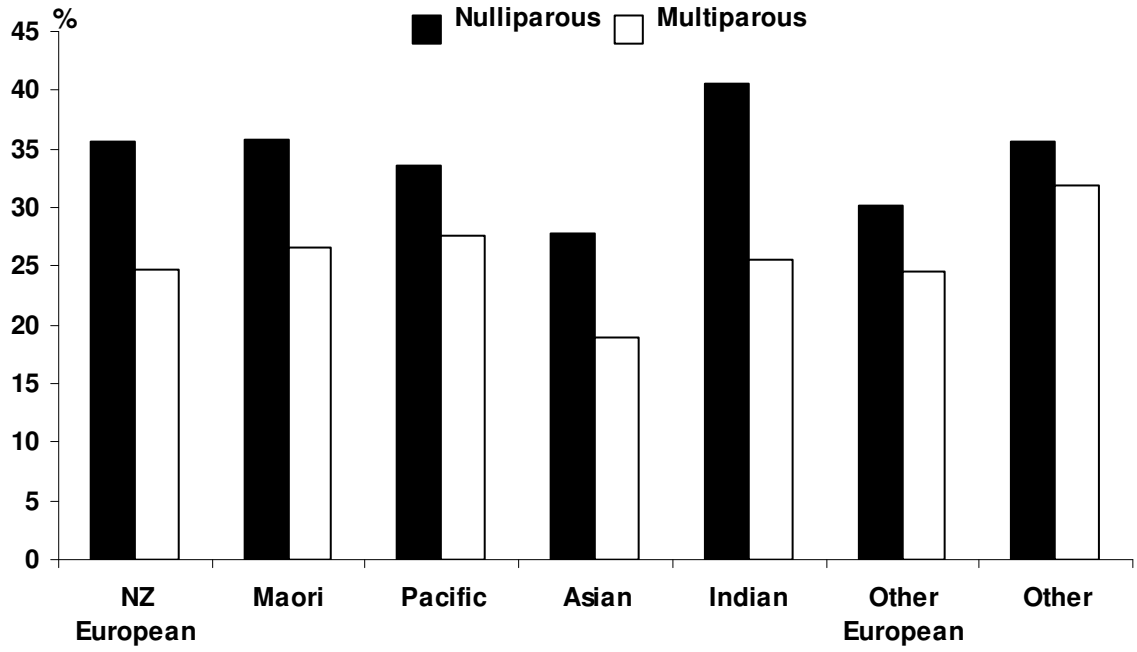

Figure 42: Induction rate by ethnicity and parity at term

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 37: Use of syntocinon by onset of labour and parity

	Total births	Syntocinon	
	N	n	%
Total	7589	2703	35.6
Induced labour			
Nullipara	1207	937	77.6
Multipara	996	667	67.0
Spontaneous labour			
Nullipara	1998	864	43.2
Multipara	2072	234	11.3

Figure 43: Dilatation at commencement of syntocinon infusion among labouring women by induction status

The induction status of women who commenced syntocinon before 3cm dilatation was reviewed in 2008. This resulted in an increase in induction rate and a reduction in the rate of augmentation with syntocinon.

Syntocinon was used to augment 43.2% of nulliparous and 11.3% of multiparous women's spontaneous labours.

Summary / Implications

Among both nulliparous and multiparous women, induction of labour continues to be associated with a decreased likelihood of spontaneous birth and a greater chance of caesarean section. These data cannot distinguish what proportion of this increase might be associated with the indication for induction and what proportion is associated with the intervention itself.

The increase in induction rate this year, due largely to improved processes for identifying unrecognised induction in Labour and Birth Suite, highlights the high rate of interruption of pregnancy at NW. In practical terms, the availability of induction spaces in the Women's Assessment Unit is often such that inductions are not started unless indicated according to NW guidelines. These guidelines do not recommend induction for prolonged latent phase of labour. As induction of labour increases interventions later in labour, these choices will influence outcome for these women and their babies.

6.3 Mode of birth

Findings

The rate of spontaneous vaginal birth increased in 2008, with a corresponding decrease in the caesarean section rate and in operative vaginal birth. Although modest, this at least suggests an arrest in the downward slide of the vaginal birth rate evident through the 90s.

Table 38: Mode of birth trends (1993-2008) (n = mothers)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of births	8690	8812	9125	9157	8055	7531	7501	7827	7452	7775	7611	7491	7194	7212	7695	7589
	%	%	%	%	%	%	%	%		%	%	%	%	%	%	%
Spontaneous vertex	68.0	67.4	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
Vaginal breech	1.2	1.1	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
Forceps/ ventouse	12.1	12.5	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
Caesarean	18.6	19.0	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
Elective												10.4	11.6	12.8	13.4	14.4
Emergency												18.8	20.0	20.3	18.3	16.9

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 from 2001 are not available.

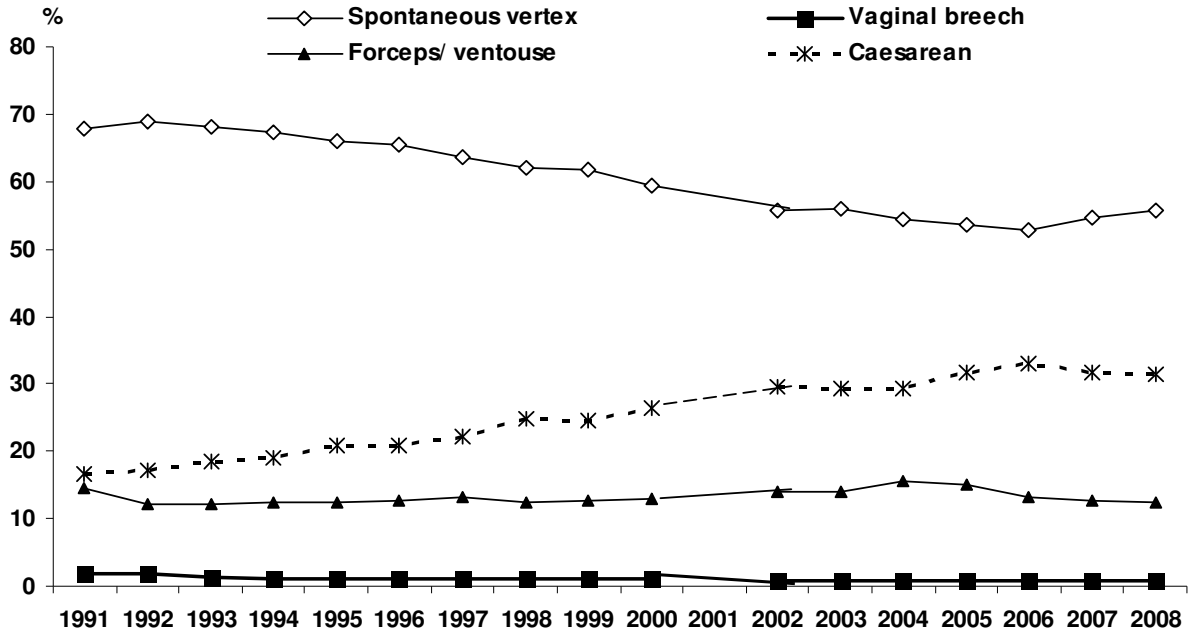

Figure 44: Mode of birth (1991–2008)

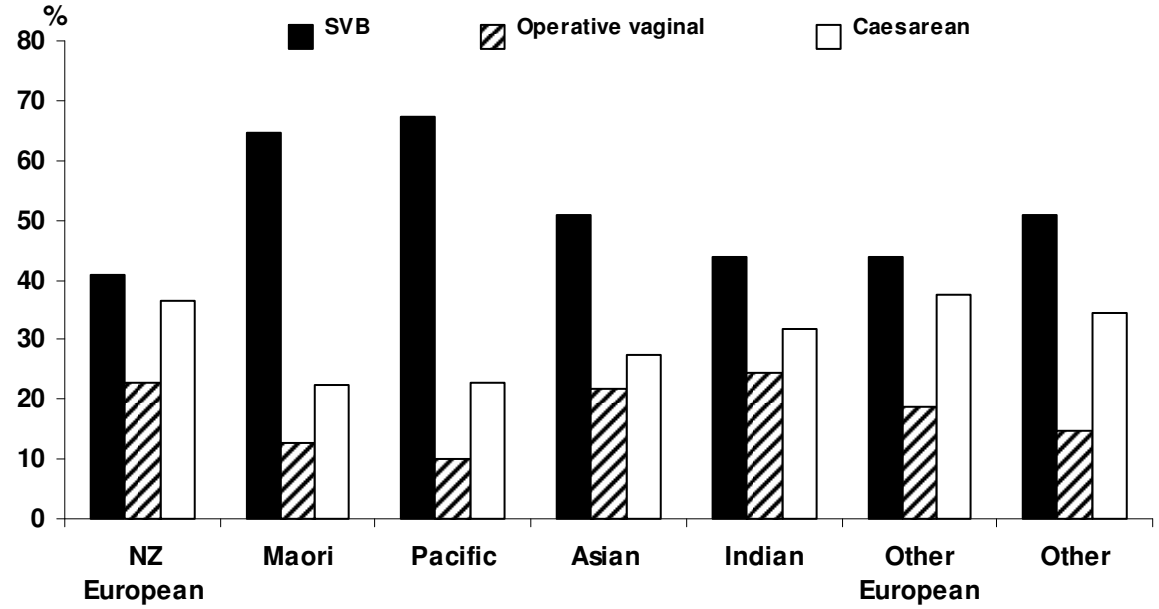

Figure 45: **Mode of birth by ethnicity among nullipara**

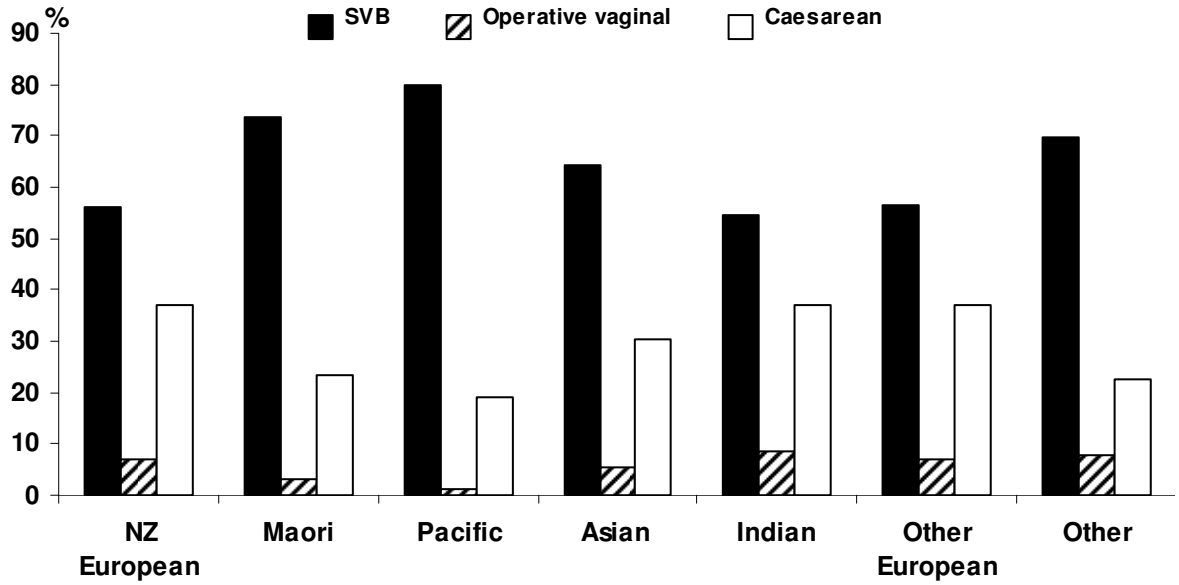

Figure 46: Mode of birth by ethnicity among multipara

Among different ethnic groups, Maori and Pacific Island women 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 electives.

The spontaneous vaginal birth rate does not appear to alter with increasing BMI. However there are fewer instrumental births, particularly ventouse, as BMI rises, at the expense of an increasing rate of emergency caesarean section.

Comparing mode of birth among LMC groups again shows marked differences, even for the 'standard primipara', where rates of spontaneous birth vary by 20 percent.

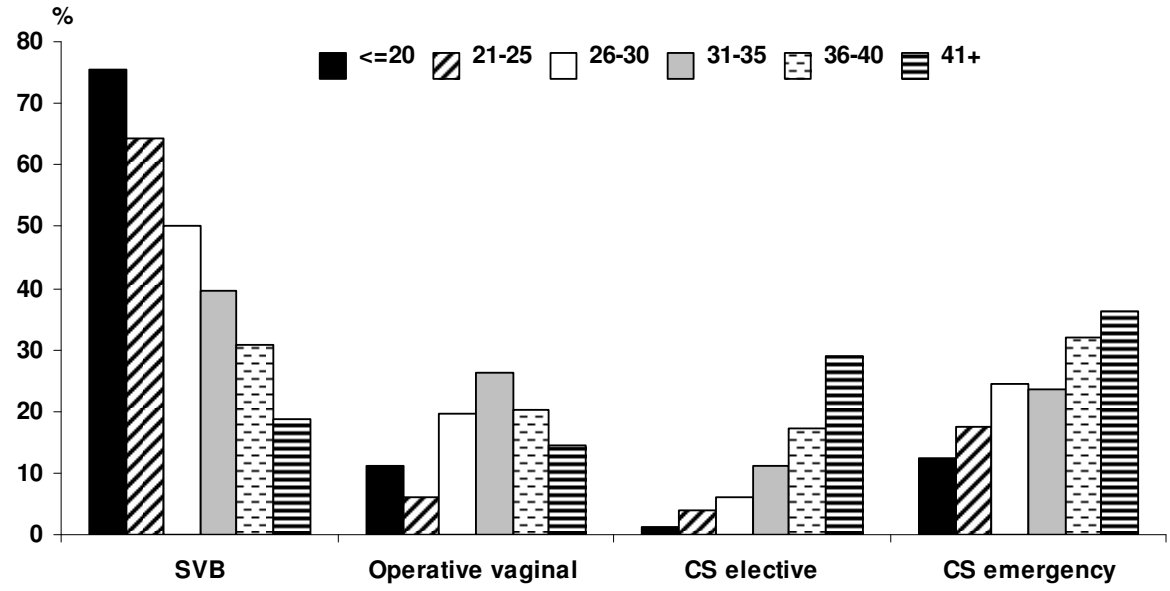

Figure 47: Mode of birth by maternal age among nulliparous women

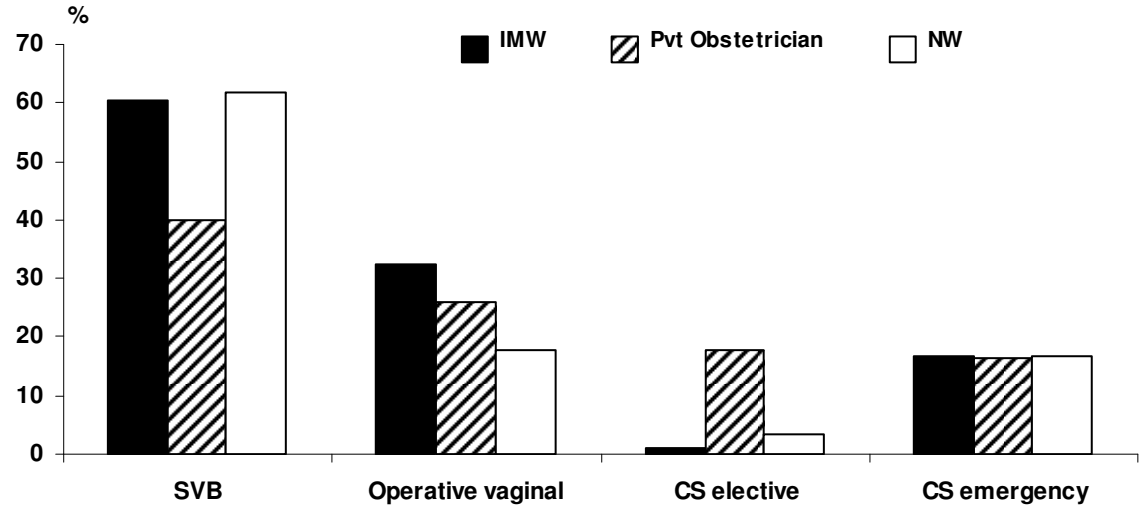

Figure 48: Mode of birth by LMC at booking among standard primipara

6.4 Spontaneous vertex birth

Table 39: Spontaneous vaginal birth rates (2004-2008)

	2004	2005	2006	2007	2008
	n	n	n	n	n
Total births (mothers)	7491	7194	7212	7695	7589
Spontaneous vaginal birth	4127	3899	3866	4282	4280
Incidence %	55.0	54.2	53.6	55.6	56.4
Total nullipara	3597	3522	3499	3752	3623
Spontaneous vaginal birth	1604	1535	1509	1755	1749
Incidence %	44.6	43.6	43.1	46.7	48.2
Total multipara	3894	3672	3713	3943	3966
Spontaneous vaginal birth	2523	2364	2357	2527	2531
Incidence %	64.8	64.3	63.4	64.1	63.8

An increase in spontaneous vaginal birth rate was noted earlier. There has been an increase in spontaneous vaginal birth rate among nullipara while the rate among multipara has remained stable.

6.5 Caesarean section

WHA Maternity Indicator for Caesarean section		WHA mean 05-06	NW 2007	NW 2008	2008 Public only
Indicator	**Definition**	**%**	**%**	**%**	**%**
Caesarean section	Mothers delivering by caesarean section/Mothers giving birth	28.4	**31.7**	**31.3**	29.5

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.

Table 40: Caesarean section rates (1994-2008)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total births (mothers)	**8812**	**9125**	**9157**	**8055**	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**
Caesarean sections	1670	1900	1905	1797	1851	1837	2084	*	2301	2219	2193	2273	2390	2438	2372
Incidence %	19.0	20.8	20.8	22.3	24.6	24.5	26.6	*	29.6	29.2	29.3	31.6	33.1	31.7	31.3
Total nullipara	**3814**	**4037**	**4018**	**3591**	**3263**	**3262**	**3454**	*	*	*	**3597**	**3522**	**3499**	**3752**	**3623**
Caesarean	790	936	888	912	900	898	1047	*	*	*	1118	1178	1253	1225	1152
Incidence %	20.7	23.2	22.1	25.4	27.6	27.5	30.3	*	*	*	31.1	33.4	35.8	32.6	31.8
Total elective											233	249	296	310	313
Elective %	*	*	*	*	*	*	*	*	*	*	6.5	7.0	8.5	8.2	8.7
Total emergency											885	929	957	915	839
Emergency %	*	*	*	*	*	*	*	*	*	*	24.6	26.4	27.4	24.4	22.4
Total multipara	**4998**	**5088**	**5139**	**4464**	**4229**	**4239**	**4372**	*	*	*	**3894**	**3672**	**3713**	**3943**	**3966**
Caesarean	880	964	1017	885	951	939	1037	*	*	*	1075	1095	1137	1213	1220
Incidence %	17.6	18.9	19.8	19.8	22.5	22.2	23.7	*	*	*	27.6	29.8	30.6	30.8	30.8
Total elective											548	584	628	720	780
Elective %	*	*	*	*	*	*	*	*	*	*	14.1	15.9	16.9	18.3	19.7
Total emergency											527	511	509	493	440
Emergency %	*	*	*	*	*	*	*	*	*	*	13.5	13.9	13.7	12.5	11.1

From 1998, data excludes postnatal transfers
* Data not available

Findings

Among nulliparous women the overall caesarean section rate, at 31.8%, was similar to the 31.1% in 2004, but has increased by two thirds since 1993. The caesarean rate in multiparous women has been close to 31% for the past 3 years. Among both multiparous and nulliparous women, the elective caesarean section rate has continued to rise, while the emergency caesarean rate has dropped.

Figure 49 demonstrates that overall caesarean section rate is stable in nullipara, and in multipara both with and without a history of previous caesarean section.

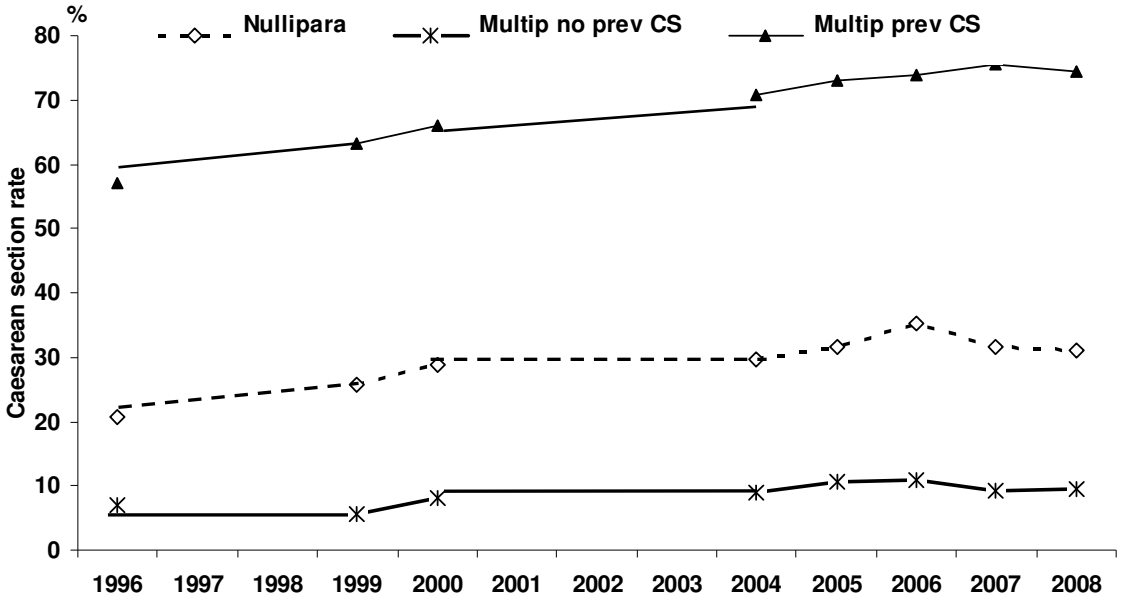

Figure 49: Caesarean section rates at term by parity and previous caesarean status (1996 – 2008)

Robson 10-group classification 2004-2008

Table 41: Robson 10-Group Classification 2004-2008 (All NW births)

	NW 2004			NW 2005			NW 2006			NW 2007			NW 2008			2008
	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	%	%
Totals	2193	7491	29.3	2273	7194	31.6	2390	7212	33.1	2438	7695	31.7	2372	7589	31.3	
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	11.8
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	24.5
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	2.6
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	5.0
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	31.2
Nullip,singleton,breech	156	172	90.7	175	192	91.1	187	205	91.2	183	208	88.0	166	195	85.1	7.0
Multip 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	5.7
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	4.1
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	1.2
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	6.9

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. In 2008, 73% of multipara at term with a singleton cephalic presentation and with a history of one previous caesarean section had a repeat caesarean. As is shown in section 6.3.3 most of the repeat caesareans are among mothers who have had only one prior caesarean. The hospital is currently planning a service for "Next Birth After Caesarean", beginning with advice at the time of index caesarean, followed by de-briefing postpartum, and then again early in the next pregnancy.

There is a trend to a reduced caesarean section rate among nullipara entering labour spontaneously. The rate of caesarean section in this group of mothers is lower than it was in 2004. However, the caesarean section rate of 15.4% in this group, along with a rate of 45.6% among term nulliparous mothers with cephalic presentation and iatrogenic onset of birth, has implications for caesarean section rates in the future.

6.5.1 Indication for elective and pre labour caesarean section

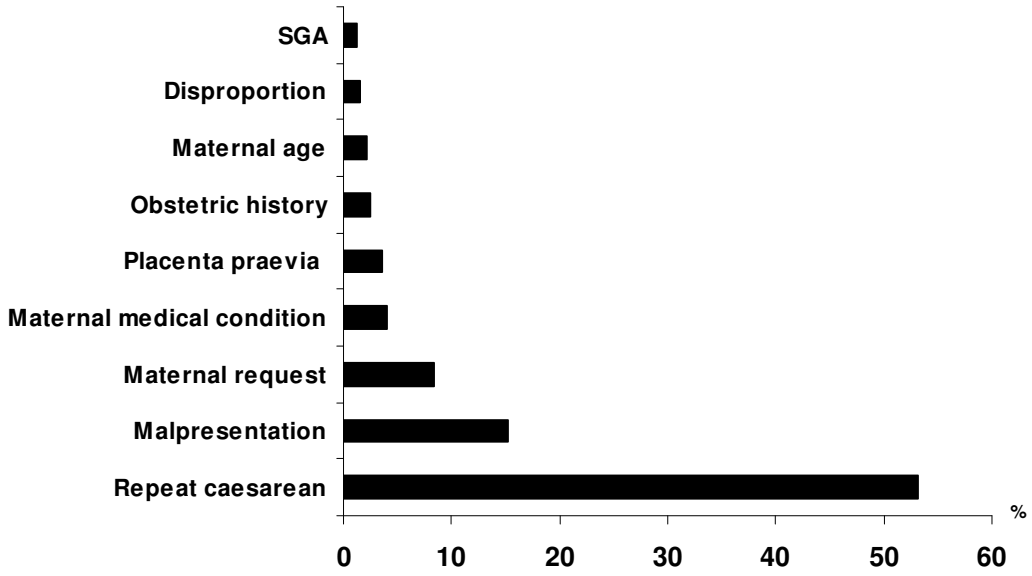

Figure 50: Principal indications for elective and pre labour caesarean section (n=1050)

Fifty-three percent of all elective and prelabour emergency caesarean sections at term were performed for the primary indication of 'repeat caesarean section'. Specifically among multiparous women, 75% of elective and prelabour caesarean sections were performed primarily for "repeat caesarean". In many cases, maternal request may be a secondary indication, although this is not currently recorded in the data.

6.5.2 Indication for in labour emergency caesarean section

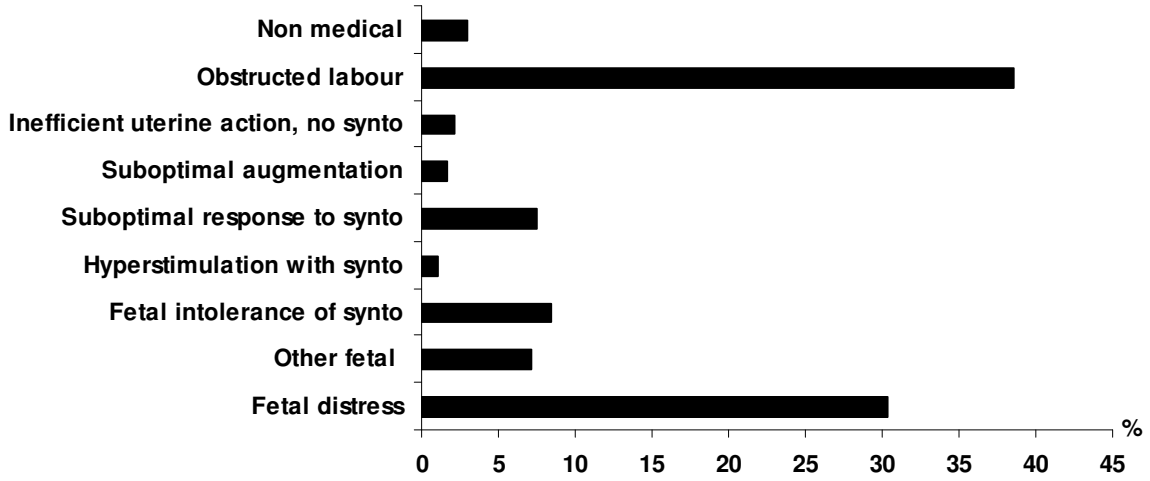

Figure 51: Indication for in labour emergency caesarean section

Assuming that the application of the recently introduced indications for emergency caesarean section in labour is reliable, figure 9 suggests good use of oxytocin in labour.

6.5.3 Vaginal birth after caesarean section

	WHA Maternity Indicator for VBAC	WHA mean 05-06	NW 2007	NW 2008	2008 Public only
Indicator	**Definition**	**%**	**%**	**%**	**%**
VBAC	P1 previous caesarean/mothers giving birth	7.54	**10.7**	**10.6**	**10.0**
	Prelabour repeat caesarean*/P1 previous caesarean	59.3	59.4	57.9	**47.6**
	VBAC/induced or spontaneous labour P1 previous caesarean	49.1	52.4	**58.8**	64.6
	VBAC/P1 previous caesarean	NA	21.3	21.5	29.2

* Data presented for NW are for elective caesarean

Almost eleven percent of all women, and 20% of all multipara, giving birth at NW have a history of prior Caesarean section, significantly more than the mean for level 3 units in Australasia (WHA). This has an obvious impact on the Caesarean section rate at NW.

Fifty-eight 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 significantly lower at 48%.

For women of all gestations with a history of one prior birth by caesarean section, the rate of vaginal birth was only 21%; 59% if labour started spontaneously and 52% 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 than elective caesarean is merely performing an inevitable caesarean at an earlier time.

Table 42: VBAC: Mode of birth among parity 1, all gestations prior caesarean pregnancies by mode of onset of birth (n=803)

Parity 1, previous caesarean, all gestations										
	Spontaneous labour n=195		Induced labour n=99		CS elective n=465	CS emergency before onset of labour n=44	Total n=803	
	n	%	n	%	n	n	n	%
Vaginal birth	72	36.9	32	32.3	0	0	104	13.0
Operative vaginal birth	44	22.6	20	20.2			64	8.0
CS elective	0		0		465	0	465	57.9
CS emergency	79	40.5	42	42.4	0	44	165	20.5

While some of the 509 women having caesarean sections prior to labour would have had contraindications for labour, it is likely that a significant number could have delivered vaginally if labour had been attempted. The number of women who actually underwent a trial of scar was only 294/803 (37%).

Table 43: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior caesarean pregnancies by mode of onset of birth (n=684)

Parity 1, previous caesarean, singleton, cephalic, term										
	Spontaneous labour n=174		Induced labour n=87		CS elective n=399	CS emergency before onset of labour n=24		Total n=684	
	n	%	n	%	n	n	%	n	%
Vaginal birth	62	35.6	31	35.6	0	0		93	13.6
Operative vaginal birth	43	24.7	19	21.8				62	9.1
CS elective	0		0		399	0		399	58.3
CS emergency	69	39.7	37	42.5	0	24		130	19.0

Table 44: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior caesarean pregnancies by LMC at booking (n=684)

	IMW n=197		Pvt Obstetrician n=278		GP n=7		NW* n=197		Other DHB n=4		Unbooked n=1	
	n	%	n	%	n	%	n	%	n	%	n	%
Vaginal birth	35	17.8	16	5.8	2	28.6	40	20.3				
Operative vaginal birth	29	14.7	8	2.9	0		24	12.2	1	25.0		
CS elective	85	43.1	218	78.4	2	28.6	91	46.2	3	75.0		
CS emergency	48	24.4	36	12.9	3	42.9	42	21.3			1	100

* 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. Is elective caesarean justified for 78% of women who have had one prior birth by caesarean section who present in the current pregnancy with singleton cephalic presentation at term?

In 2008, 172 women had 2 or more prior caesarean sections. Of these, 156 were at term with singleton baby and cephalic presentation and 152 (97%) of these women went on to have a further caesarean section.

6.6 Instrumental vaginal birth

WHA Maternity Indicator for Instrumental Vaginal Birth		WHA mean 05-06	NW 2007	NW 2008	2008 Public only
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**
Instrumental vaginal birth	Forceps births/All vaginal births	4.4	4.2	4.9	3.6
	Ventouse births/All vaginal births	8.98	**13.0**	12.1	8.7
	Double instrumental/All vaginal births	0.877	**1.3**	1.0	0.7

The rate of instrumental birth has varied little since 1992 and this remains the case for 2008 with a rate of 12.4%. 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. There has been concern in recent years that the rate of double instrumental procedures at NW was higher than the WHA average for level 3 units. This year the rate has dropped and is no longer an outlier in Australasia.

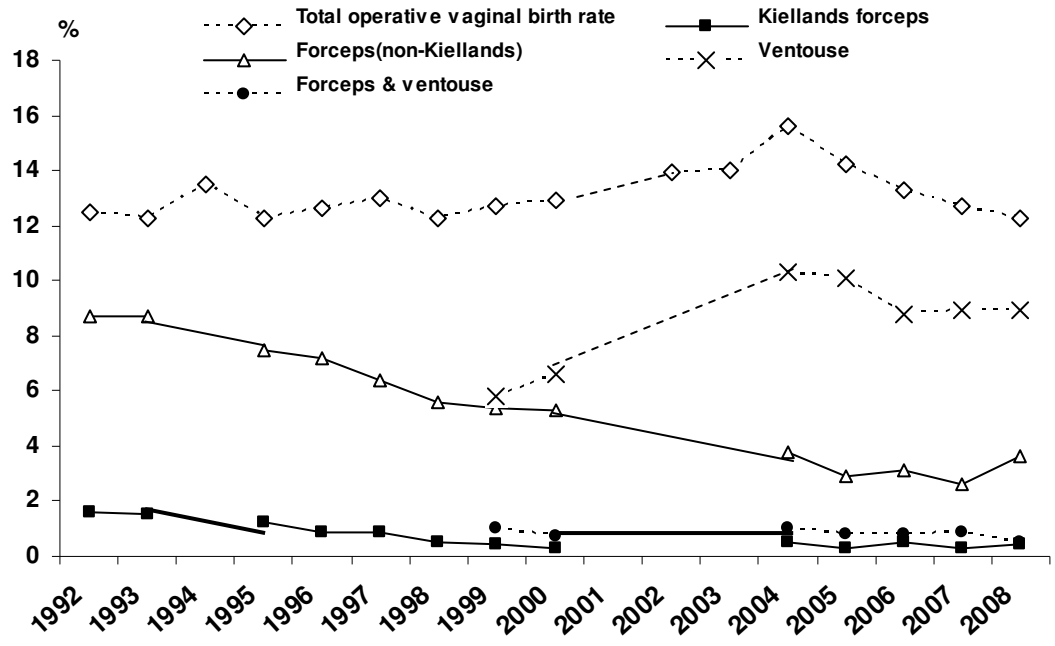

Figure 52: Operative vaginal birth (1992-2008)

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6.7 Breech birth

Table 45: Mode of birth by breech presentation (singletons)

	N	Total breech	% Breech /total singleton births	Breech & CS	% CS/ total breech
Total singleton births	7429	346	4.7	301	87.0
20-31 weeks	253	67	26.5	33	49.3
32-36 weeks	589	47	8.0	43	91.5
≥37 weeks	6587	232	3.5	225	97.0

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 deliveries 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.

Labour and Birth Summary / Implications

There has been an increase in spontaneous vaginal birth, with a corresponding fall in the caesarean section rate. Although not of a large magnitude, these changes are pleasing to see, particularly given that the caesarean section rate has decreased in the nulliparous population. This is likely to result in a further reduction in caesarean rates in the future as these women are likely to deliver vaginally in their next pregnancy.

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.

6.8 Obstetric analgesia

WHA Maternity Indicator for Obstetric Anaesthesia		WHA mean 05-06	NW 2007	NW 2008	2008 Public only
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**
Vaginal birth with regional anaesthesia	Any regional anaesthetic/All vaginal births	24.9	**43.9**	**43.7**	**33.7**
General anaesthesia for caesarean section	General anaesthetic for Caesarean section/All caesarean sections	9.73	**7.6**	**6.8**	10.9

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 and time and dilatation at which epidural is inserted. Data below exclude elective caesarean section and emergency caesarean before labour where appropriate**.**

Findings

Table 46: Analgesic use by parity and mode of onset of birth

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
All women	**7589**	**4542**	**59.8**	**3073**	**40.5**	**1397**	**18.4**	**62**	**0.8**	**559**	**7.4**
Mode of onset of birth											
CS elective	1093	1057	96.7	19†	1.7	10†	0.9	0		0	
CS emergency before onset labour	223	192	86.1	4	1.8	5	2.2	0		0	
Labouring women*											
Nullipara	3205	2140	66.8	1656	51.7	902	28.1	40	1.2	417	13.0
Multipara	3068	1153	37.6	1394	45.4	480	15.6	22	0.7	141	4.6
Induced labour											
Nullipara	1207	1004	83.2	512	42.4	319	26.4	14	1.2	77	6.4
Multipara	996	546	54.8	435	43.7	177	17.8	5	0.5	36	3.6
Spontaneous labour											
Nullipara	1998	1136	56.9	1144	57.3	583	29.2	26	1.3	340	17.0
Multipara	2072	607	29.3	959	46.3	303	14.6	17	0.8	105	5.1

* Excludes elective caesarean and emergency caesarean before onset of labour.
† Pain relief given prior to caesarean

Entonox and epidural analgesia are used more than other methods of pain relief in labour. Water is being increasingly used, particularly in spontaneous labour. The epidural rate among labouring women was 52% in 2008, 70% if induced and 43% if labouring spontaneously. These rates vary widely among ethnic groups and remain lower than in many developed countries. The comparatively high rate of general anaesthesia reflects the tertiary care aspect of our patients with coagulopathies, neurologic, cardiac and other co-morbidities and abnormal placentation all contributing.

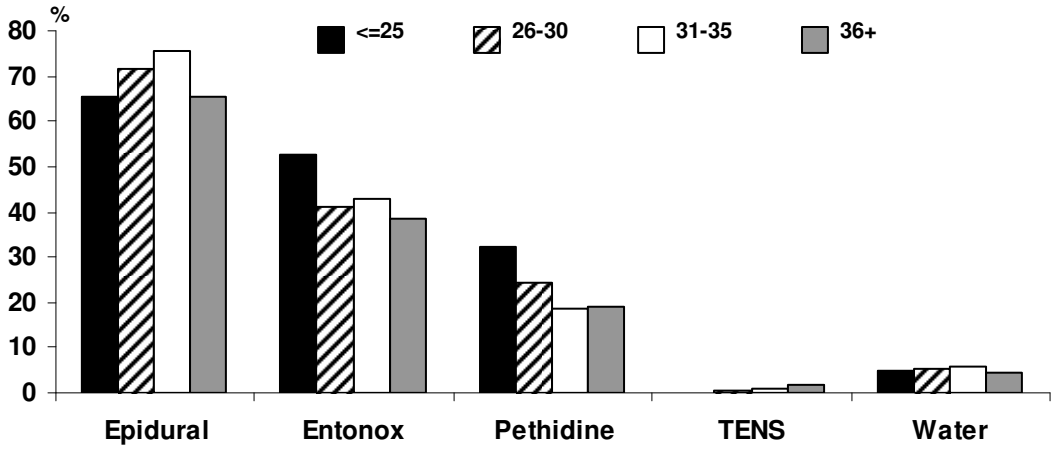


Figure 53: Analgesic use and maternal age among nulliparous labours

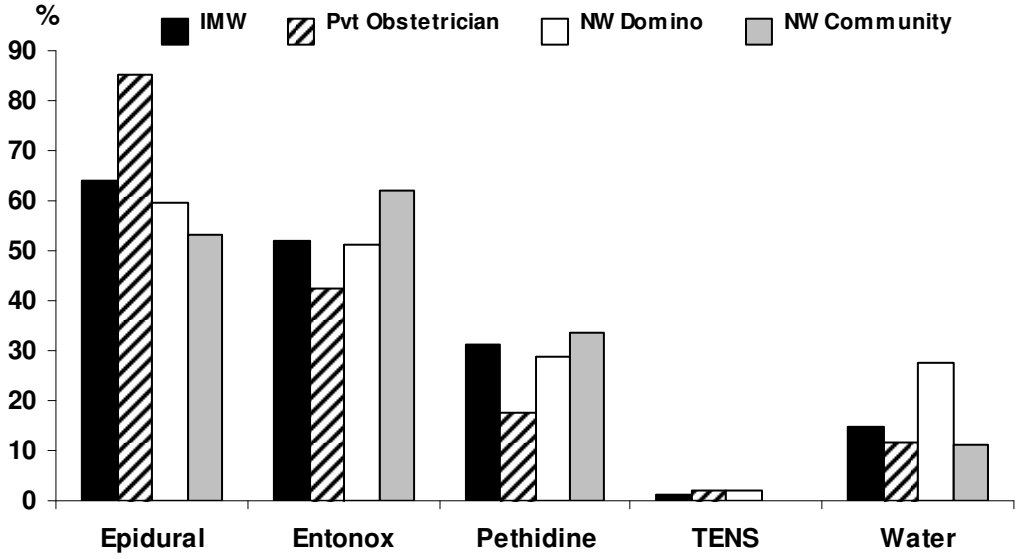


Figure 54: Analgesic use and LMC type among nulliparous labours

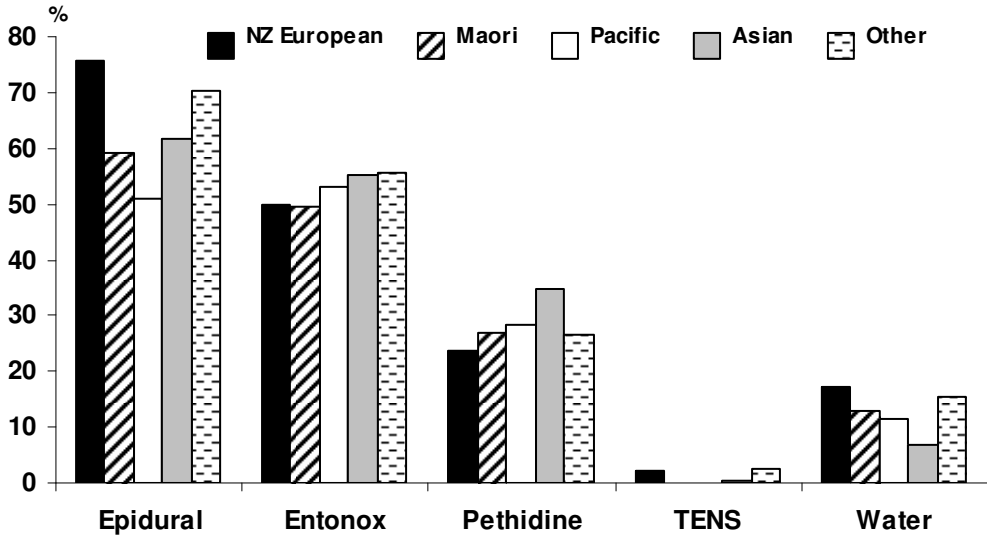


Figure 55: Analgesic use and ethnicity among nulliparous labours

Table 47: GA use and mode of birth

	Total	GA* only		GA* + epidural		Total GA*	
	N	n	%	n	%	n	%
Total	7589	185	2.4	76	1.0	261	3.4
Vaginal birth	4280	69	1.6	16	0.4	85	2.0
Operative vaginal	937	5	0.5	10	1.1	15	1.6
CS elective	1093	36	3.3	12	1.1	48	4.4
CS emergency	1279	75	5.9	38	3.0	113	8.8

*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.

6.9 Labour and Birth Clinical Governance

2008 has been a year of consolidation, and maintenance of the work stream around the pillars of clinical governance. Sadly Mairead O'Riordan returned to Ireland and her input has been greatly missed. Two of the committee attended a conference in London held by the RCOG on the Management of Labour Ward. Further activities in 2008 included:

- continuation of the caesarean section in labour audit
- education around Risk Pro reporting and introduction of a mandatory reporting list
- education and audit
- update of evidence-based guidelines

Caesarean section audit:
2008 has again seen a reduction in emergency caesarean section in labour rates. Unfortunately the overall rate has not changed due to the increasing elective section rate. We refined the audit tool allowing us to focus more on the indication for section rather than poor documentation. This audit and the introduction of the Robson groups for classifying births have:

- improved documentation of indication for caesarean
- facilitated review of the effect of interventions in labour on outcome
- facilitated update of guidelines e.g. oxytocin augmentation of labour
- supported introduction of urgency categories for decision to delivery interval as defined by RANZCOG
- focused Labour and Birth Suite on the definition of labour and care of women in the latent phase.

Incident reporting and management:
Re-profiling and some training on the use of the web based incident system "Risk Pro" for events which have potential clinical risks has increased reporting. A list of reportable events was developed in 2007 to ensure we were able to identify potential morbidity. The aim was to encourage non-judgemental/no blame reporting.

Education:
There has been a big focus this year on education, including recognition by Women's Health Management of the need for ongoing updates of knowledge.

- **PROMPT** (**Pr**actical **O**bstetric **M**ulti**p**rofessional **T**raining) is a day of multidisciplinary team building and scenario based teaching around obstetric emergencies, and these courses have been well attended. PROMPT is a requirement for all first year registrars.
- The need for a **definition of labour** and for education around effacement of the cervix and care of women in the latent phase was highlighted by the number of women mistakenly induced in the Labour and Birthing Suite. The need for a separate area for these women to be assessed and cared for outside of Labour and Birth has not yet been addressed.
- **Electronic fetal surveillance training** is run twice a year by RANZCOG and is well attended. This is an annual requirement for all junior doctors and is encouraged for all midwives. This training helps standardise interpretation, documentation, and communication of CTGs. Weekly multidisciplinary sessions around CTG interpretation continue.
- Ongoing education has occurred around the use of **fetal lactates** in labour.

Communication:
The clinical governance group recognises the need for improved communication between disciplines and to this end invite representatives from related disciplines to attend clinical governance meetings.

Clinical Audit:
The labour and birth clinical governance group was involved in initiating, supporting or undertaking the following additional audits in 2008:

- Management of third stage
- Decision for caesarean to delivery interval
- Cord lactate measurement

6.10 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 2008 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=436) during 2008 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.

Table 48: Demographic characteristics of women labouring at Birthcare by place of birth

	Birth at Birthcare n=436		Intrapartum transfer to NW n=86		Total n=522	
	n	%	n	%	n	%
Parity						
Nullipara	169	38.8	57	66.3	226	43.3
Multipara	267	61.2	29	33.7	296	56.7
Age						
<21	15	3.4	3	3.5	18	3.4
21-25	55	12.6	11	12.8	66	12.6
26-30	113	25.9	25	29.1	138	26.4
31-35	149	34.2	35	40.7	184	35.2
36-40	99	22.7	12	14.0	111	21.3
>40	5	1.1	0		5	1.0
Ethnicity						
NZ European	225	51.6	42	48.8	267	51.1
Maori	35	8.0	6	7.0	41	7.9
Pacific	56	12.8	10	11.6	66	12.6
Asian	33	7.6	7	8.1	40	7.7
Indian	15	3.4	2	2.3	17	3.3
Other European	62	14.2	15	17.4	77	14.8
Other	10	2.3	4	4.7	14	2.7
DHB of Domicile						
Auckland DHB	312	71.6	66	76.7	378	72.4
Counties Manukau DHB	48	11.0	8	9.3	56	10.7
Waitemata DHB	75	17.2	12	14.0	87	16.7
Waikato/ Northland DHB	1	0.2	0		1	0.2

Table 49: 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. (86 intrapartum transfers to NW)*

	Nullipara n=226		Multipara n=296	
	n	%	n	%
Intrapartum transfer to NW	57	25.2	29	9.8
Analgesia				
Epidural	46	20.4	19	6.4
Pethidine	24	10.6	6	2.0
Entonox	84	37.2	80	27.0
TENS	1	0.4	1	0.3
Water	159	70.4	195	65.9
Syntocinon	35	15.5	9	3.0
Mode of birth				
Normal vaginal	197	87.2	283	95.6
Operative vaginal	17	7.5	3	1.0
Emergency caesarean	12	5.3	10	3.4
Perineal trauma				
Episiotomy	27	11.9	9	3.0
Third/fourth degree tear	5	2.2	0	
Vaginal wall tear	11	4.9	1	0.3
Blood Loss				
≥500 mls	36	15.9	34	11.5
Perinatal outcomes				
Still birth	0		1	0.3

* 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 05-06	NW 2007	NW 2008	2008 Public only
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**
Episiotomy	Mothers having an episiotomy/Mothers giving birth vaginally	17.6	**21.5**	**20.5**	**12.7**
Third and fourth degree tears	3rd and 4th degree tears/Mothers giving birth vaginally	2.3	**3.1**	**3.1**	**3.4**

Table 50: Episiotomy rates (Denominator is vaginal births)

	1995 n=7224	1996 n=7250	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
Number of episiotomies	1473	1434	1252	1195	1251	1367	1181	1093	1103	1130	1069
Incidence %	20.4	19.8	20.0	21.1	22.1	23.8	22.3	22.2	22.9	21.5	20.5
Episiotomy with 3rd/4th degree tear	14	25	8	9	5	17	15	23	47	49	46
Incidence %	0.2	0.3	0.1	0.2	0.1	0.3	0.3	0.5	1.0	0.9	0.9
All 3rd/4th degree tears	47	61	41	35	29	47	72	97	103	161	160
Incidence %	0.7	0.8	0.7	0.6	0.5	0.8	1.4	2.0	2.1	3.1	3.1

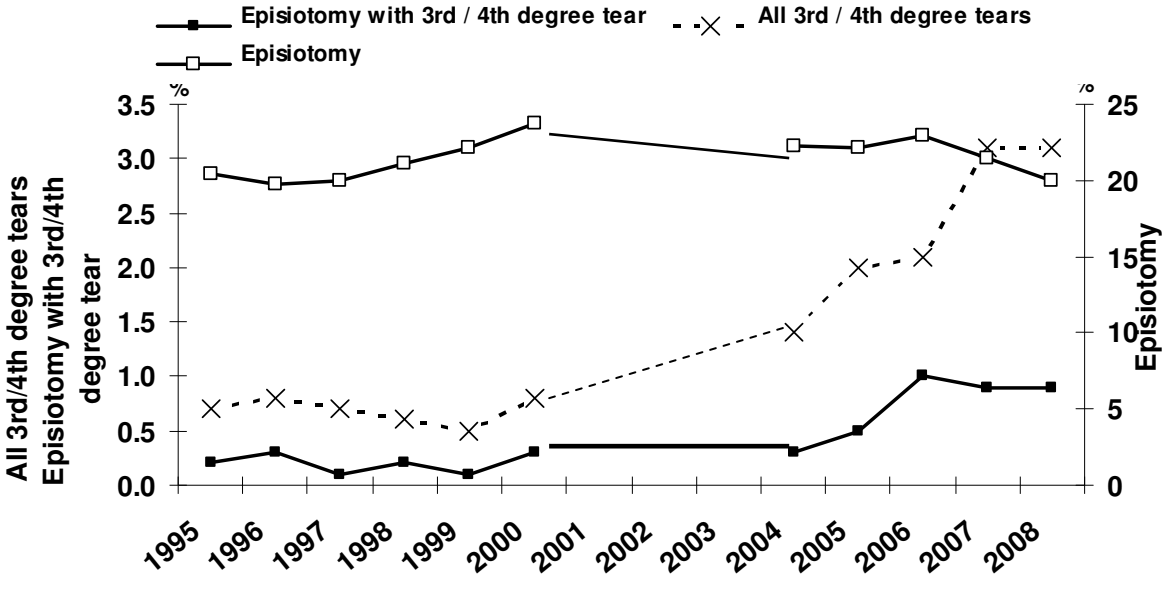


Figure 56: Perineal trauma rates

The episiotomy rate remains higher than the mean (17.6%) for those hospitals with level 3 NICU who benchmark with Women's Hospitals of Australasia (WHA) but it has continued to reduce and is now back to the rate reported in 1995. The incidence of 3rd and 4th degree tears remains at 3.1% (same as 2007), which is the highest rate reported and four times the rate reported in 1995. The possibility of improved reporting was raised in last year's report but the rise was still thought to be real. The rate is significantly higher than the 2.3% mean rate reported by hospitals reporting to WHA.

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]. Given this long-term morbidity, despite our rate being within those reported internationally, last year's annual report recommended an audit of 3rd and 4th degree tears to determine whether steps can be taken to reduce our increasing rate. The issues are complex and possibly interdependent. For example, although private obstetricians and general practitioners have the highest episiotomy rates (33.3% and 36.4% cf 20.5% over all) they have the lowest (reported) 3rd and 4th degree (2.6% and 2% cf 3.1%) and vaginal wall tear rates (3.2% and 4% cf 4.9%)—see Appendix 6.

[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

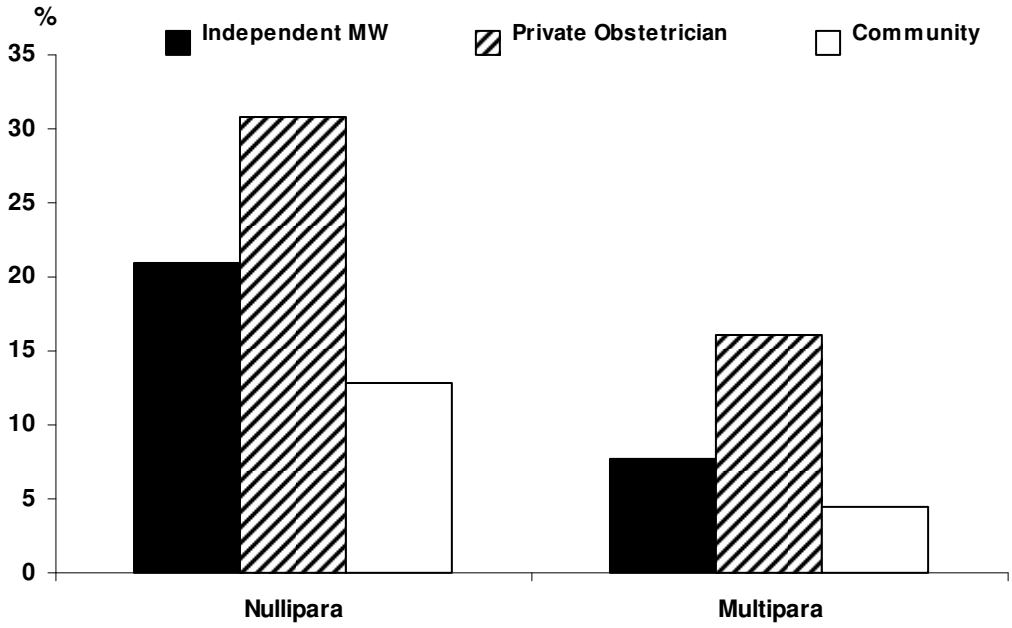


Figure 57: Episiotomy rate associated with spontaneous cephalic vaginal birth by LMC at booking and parity

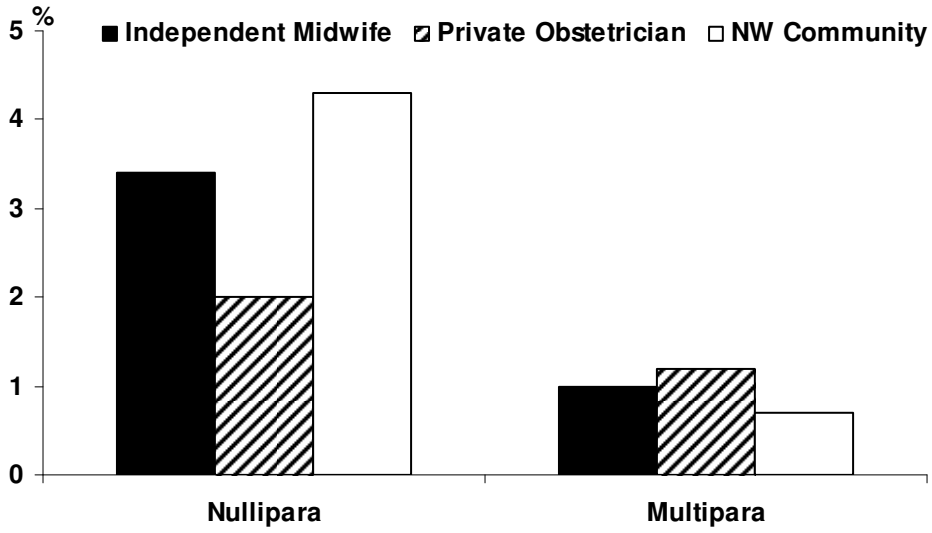


Figure 58: 3rd and 4th degree tear rate associated with spontaneous vaginal birth by LMC at booking and parity

7.2 Postpartum haemorrhage

WHA Maternity Indicators for PPH		WHA mean 05-06	NW 2007	NW 2008	2008 Public only
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**
Postpartum haemorrhage	Blood loss ≥500ml and <1500ml/All vaginal births	9.54	**12.9**	**14.8**	**19.1**
	Blood loss ≥1500ml/ All vaginal births	1.03	1.12	**2.4**	**2.8**
	Blood loss ≥500ml and <1500ml/Mothers birthing by Caesarean	41.6	**69.2**	**72.2**	**74.5**
	Blood loss ≥1500ml/Mothers birthing by Caesarean	2.54	**3.32**	**5.2**	**8.0**
Blood transfusion	Postpartum blood transfusion/Mothers giving birth	1.64	**2.2**	**2.8**	**3.6**

Methods

The source of blood loss data provided in the table below for postpartum haemorrhage varies for some of the years demonstrated. 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 impact of this is on the accuracy of reports of PPH rate in the 2005 and 2006 reports. The amended results given here may however underestimate PPH rate in those years.** In 2008, the data have been cleaned extensively. This cleaning has included, for the first time, 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 impact of this is likely to be an increase in the reporting of PPH.

Findings

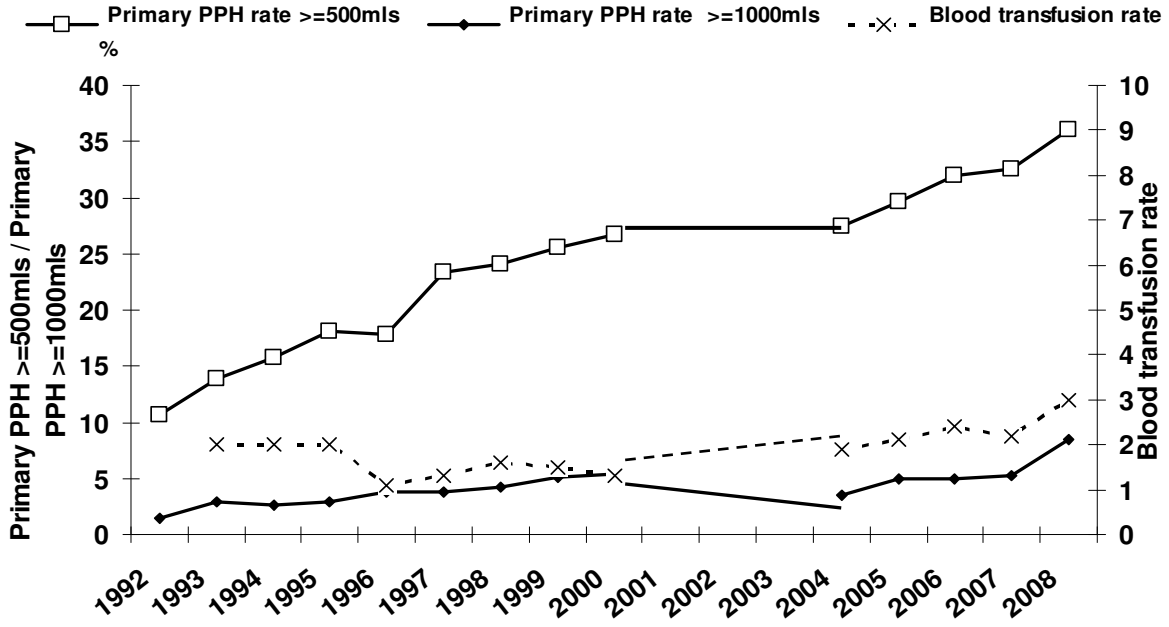


Figure 59: Postpartum haemorrhage and transfusion rates (1992-2008)

There is continuing concern about the apparent rise in PPH rates both ≥ 500 ml and ≥ 1000ml, as well as rates of transfusion. Although this rise has occurred for all modes of birth, it is in the CS group (both elective and emergency) that the greatest rise is seen and particularly for PPH ≥ 1000 ml. Further more detailed audit is required to elucidate the reasons for this. One reason may be the increasing complexity of CS.

Table 51: Postpartum haemorrhage rate (1993-2008)

	1993	1994	1995	1996	1997	1998	1999	2000	2004	2005*	2006*	2007*	2008
Total Births	8690	8812	9125	9157	8055	7531	7501	7827	7491	7194	7212	7695	7589
Primary PPH (≥500mls)	1211	1390	1655	1633	1882	1818	1921	2088	2056	2139	2302	2507	2736
Incidence %	13.9	15.8	18.1	17.8	23.4	24.1	25.6	26.7	27.4	29.7	31.9	32.6	36.1
Primary PPH (≥1000mls)	249	227	267	344	303	318	381	423	262	350	351	410	634
Incidence %	2.9	2.6	2.9	3.8	3.8	4.2	5.1	5.4	3.5	4.9	4.9	5.3	8.4

* Data corrected in 2007. See methodology above.

Table 52: Postpartum blood loss by mode of birth

	Spontaneous vaginal birth n=4280		Operative vaginal birth n=937		CS emergency n=1279		CS elective n=1093		Total n=7589	
	n	%	n	%	n	%	n	%	n	%
PPH ≥500mls	632	14.8	268	28.6	1024	80.1	812	74.3	2736	36.1
PPH ≥1000mls	196	4.6	68	7.3	244	19.1	126	11.5	634	8.4
Post partum blood transfusion	85	2.0	42	4.5	67	5.2	21	1.9	215	2.8

Table 53: Postpartum blood loss by onset of birth

	Spontaneous labour n=4070		Induced labour n=2203		CS emergency before onset of labour n=223		CS elective n=1093		Total n=7589	
	n	%	n	%	n	%	n	%	n	%
PPH ≥500mls	971	23.9	790	35.9	163	73.1	812	74.3	2736	36.1
PPH ≥1000mls	278	6.8	196	8.9	34	15.2	126	11.5	634	8.4
Post partum blood transfusion	99	2.4	79	3.6	16	7.2	21	1.9	215	2.8

It is reassuring that women who have a spontaneous or induced labour, even though they may end up with an emergency CS, still have a lower rate of PPH than those undergoing elective CS. Emergency CS prior to labour has the highest rate of PPH, possibly due to placental bleeding. The introduction of new guidelines for PPH this year 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 impact of these changes needs to be measured.

Table 54: Blood transfusion (1993-2008)

	1993	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008
Antenatal	5	3	9	4	2	4	4	0	10	12	11	6	6
Antenatal & intrapartum				1	0	0		0	1	0	0	1	0
Antenatal & postpartum								1	0	3	0	0	2
Intrapartum	3	3	11	7	3	3	3	4	2	2	6	1	4
Intrapartum & postpartum				1	3	6	3	4	4	3	3	4	1
Postpartum	151	128	152	90	94	110	100	96	128	133	150	165	212
Total transfusions	159	134	172	103	102	123	110	105	145	153	170	177	225
Total transfusion rate	2.0	2.0	2.0	1.1	1.3	1.6	1.5	1.3	1.9	2.1	2.4	2.3	3.0

7.3 Emergency peripartum hysterectomy

WHA Maternity Indicator for Peripartum Hysterectomy		WHA mean 05-06	NW 2007	NW 2008
Maternal indicator	**Definition**	**%**	**%**	**%**
Peripartum hysterectomy	Hysterectomy at birth admission/Mothers giving birth	0.113	0.117	0.184

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.

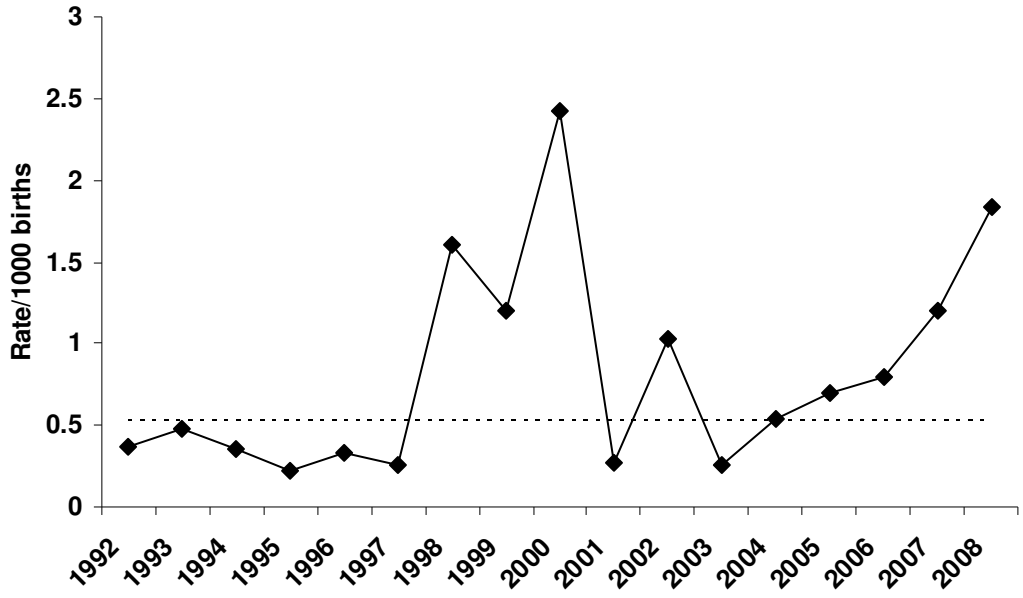


Figure 60: Emergency peripartum hysterectomy rates/1000 births (1992-2008) (horizontal dotted line represents median rate for 1992-2008)

Findings

There were 14 emergency peripartum hysterectomies in 2008. This is a rate of 1.84/1000 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.

7.4 Neonatal outcomes by mode of birth

WHA Perinatal Indicator		WHA mean 05-06	NW 2007	NW 2008	2008 Public only
Perinatal indicators	**Definition**	**%**	**%**	**%**	**%**
Five minute Apgar of <=4	Babies with 5 minute Apgar<=4/Total liveborn, singleton term babies	0.187	0.10	0.13	0.23

Methods

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

Table 55: Neonatal morbidity overall and by mode of birth (all gestations)

	Spontaneous vertex n=4276		Vaginal breech n=66		Forceps birth n=302		Ventouse birth n=639		CS elective n=1144		CS emergency n=1326		Total n=7753	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	68	1.6	35	53.0	4	1.3	4	0.6	6	0.5	32	2.4	149	1.9
1 min Apgar <7	251	5.9	48	72.7	34	11.3	92	14.4	73	6.4	212	16.0	710	9.2
5 min Apgar <7	83	1.9	36	54.5	6	2.0	7	1.1	4	0.3	31	2.3	167	2.2
Admitted to NICU	312	7.3	15	22.7	24	7.9	51	8.0	141	12.3	294	22.2	837	10.8
≥2 days in NICU	277	6.5	15	22.7	22	7.3	40	6.3	130	11.4	269	20.3	753	9.7
Fetal deaths (/1000)	40	9.4	31	470	1	3.3	0		1	0.9	3	2.2	76	9.8

Table 56: Neonatal morbidity overall and by mode of onset of birth (all gestations)

	Spontaneous labour n=4115		Induced labour n=2247		CS elective n=1144		CS emergency before onset of labour n=247		Total n=7753	
	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	59	1.4	73	3.2	6	0.5	11	4.5	149	1.9
1 min Apgar <7	315	7.7	254	11.3	73	6.4	68	27.5	710	9.2
5 min Apgar <7	73	1.8	83	3.7	4	0.3	7	2.8	167	2.2
Admitted to NICU	338	8.2	224	10.0	141	12.3	134	54.3	837	10.8
≥2 days in NICU	298	7.2	199	8.9	130	11.4	126	51.0	753	9.7
Fetal deaths (/1000)	21	5.1	52	23.1	1	0.9	2	8.1	76	9.8

Table 57: Neonatal morbidity by mode of birth in term or post term (≥ 37 weeks) babies

	Spontaneous vertex n=3916		Vaginal breech n=15		Forceps birth n=278		Ventouse birth n=611		CS elective n=1020		CS emergency n=1070		Total n=6910	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	17	0.4	1	6.7	0		4	0.7	6	0.6	18	1.7	46	0.7
1 min Apgar <7	147	3.8	6	40.	27	9.7	90	14.7	56	5.5	128	12.0	454	6.6
5 min Apgar <7	22	0.6	1	6.7	3	1.1	7	1.1	3	0.3	16	1.5	52	0.8
Admitted to NICU	118	3.0	1	6.7	8	2.9	41	6.7	53	5.2	93	8.7	314	4.5
≥2 days in NICU	87	2.2	1	6.7	6	2.2	30	4.9	43	4.2	74	6.9	241	3.5
Fetal deaths (/1000)	5	1.3	1	67	0		0		1	1.0	2	1.9	9	1.3

Table 58: Neonatal morbidity in term or post term (≥ 37 weeks) babies (2000-2008)

	2000 n=6915		2001		2002		2003		2004 n=6793		2005 n=6578		2006 n=6543		2007 n=6971		2008 n=6910	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min apgar <4	106	1.5							68	1.0	69	1.0	66	1.1	73	1.1	46	0.7
1 min apgar <7	553	8.0							507	7.5	454	6.9	468	7.2	454	6.5	454	6.6
Admitted to NICU	405	5.9							349	5.1	346	5.3	283	4.3	322	4.6	314	4.5
≥2 days in NICU	*								254	3.7	275	4.2	226	3.5	271	3.9	241	3.5

* The definition for length of stay in NICU changed following 2000 and so previous data are not comparable with data since 2001. In NICU a day is counted as any "part" of a day, e.g. admission at 2300 and discharge at 0100 would count as 2 days where as in Healthware a 24 hour clock is used so an admission at 2300 hrs and a discharge at 0100 would count as 2 hours.

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

Baby Friendly Hospital Certificate awarded

Breastfeeding statistics for 2008 reflect the ongoing commitment to the World Health Organisation (WHO) millennium goals and UNICEF's Ten Steps to Successful Breastfeeding. The training of all maternity services' staff in breastfeeding management appropriate to their area of work was achieved. The increase to 79.2% exclusive breastfeeding on discharge demonstrates National Women's is consistently above the Global Criterion of 75%. The Baby Friendly Hospital Initiative audit was completed in December 2007, and the Baby Friendly Certificate awarded in March 2008.

Methods

The breastfeeding 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 approximately 5-6 weeks post birth.

Findings

In 2008, the exclusive breastfeeding rate on discharge from hospital following birth exceeded the Ministry of Health target of 75%.

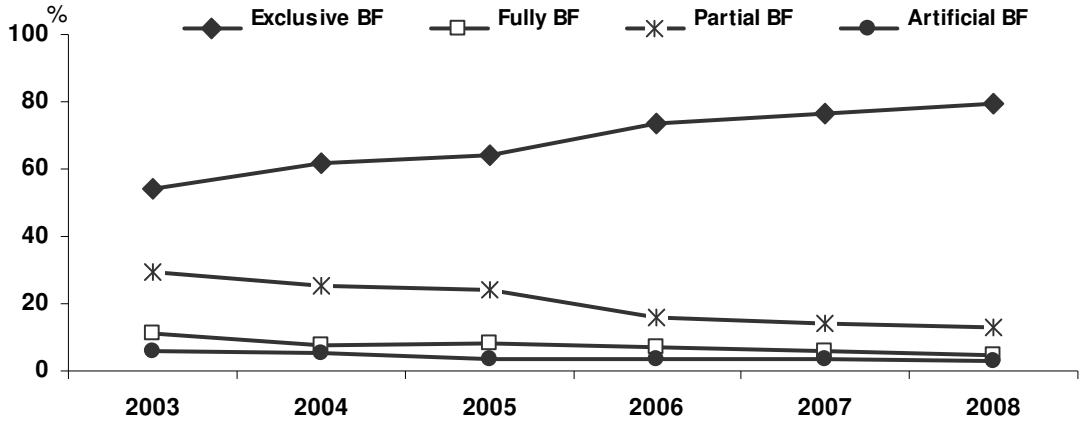


Figure 61: Method of infant feeding at discharge from NW (2003-2008)

Initiatives to reach the target included:

- Continuing an education programme commenced in 2006 for ward clerks, cleaners, physiotherapists and all ancillary staff to raise understanding of their role in supporting breastfeeding.
- Providing a breastfeeding seminar for medical staff to encourage support for early skin-to-skin contact and the initiation of breastfeeding within the first hour of birth.
- Senior House Officers (SHOs) completing the Breastfeeding e-learning Course for Doctors.
- Clinical audits for all Maternity Services' midwives and nursing staff to ensure consistent advice and to achieve 80% breastfeeding education among staff.
- Lactation Consultants added to the ADHB Bureau of staff available for cover.

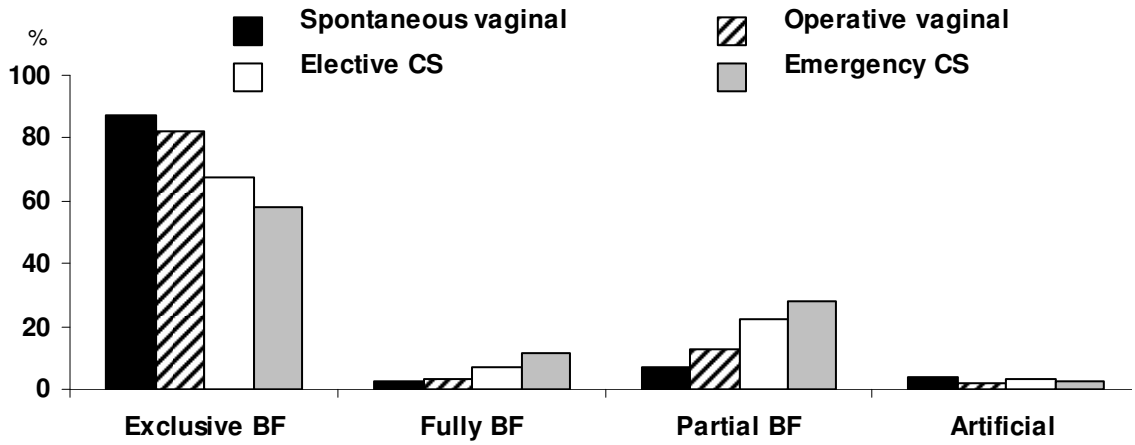


Figure 62: Exclusive breastfeeding at discharge from NW by mode of birth

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.

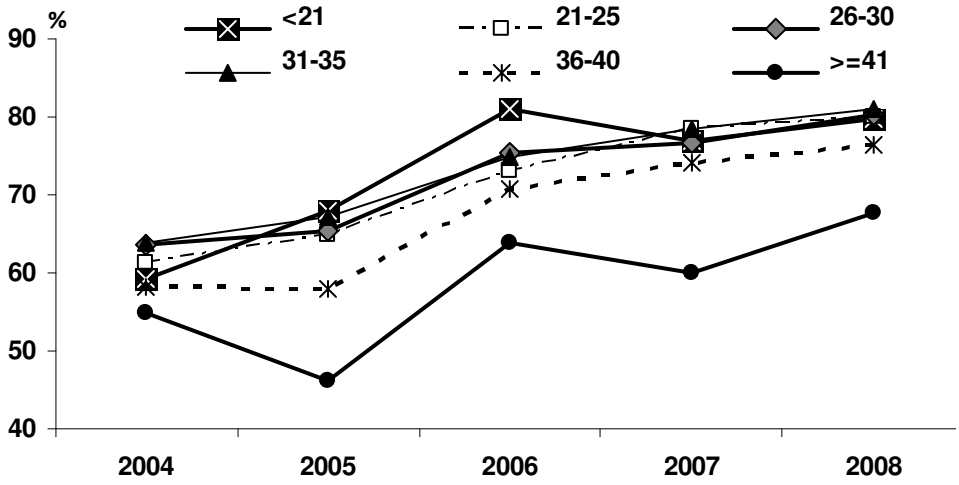


Figure 63: Exclusive breastfeeding rates at discharge from NW by maternal age (2004-2008)

It is encouraging to see that in all age groups there is an increase in exclusive breastfeeding rates; particularly in our <21 age group.

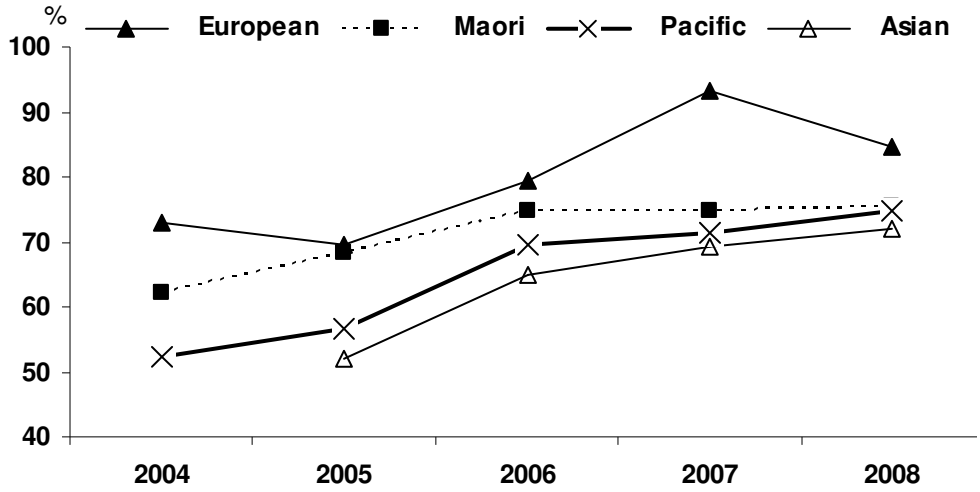


Figure 64: Exclusive breastfeeding rates at discharge from NW by ethnicity (2004-2008)

The increase in exclusive breastfeeding is apparent for all ethnicities; and this is in line with the Government's focus on improving breastfeeding particularly in the Maori and Pacific Island population. It is concerning however that the exclusive rate has decreased for the NZ European population and focus on this group is warranted in 2009.

Exclusive breastfeeding rates continue to increase among preterm and low birth weight babies.

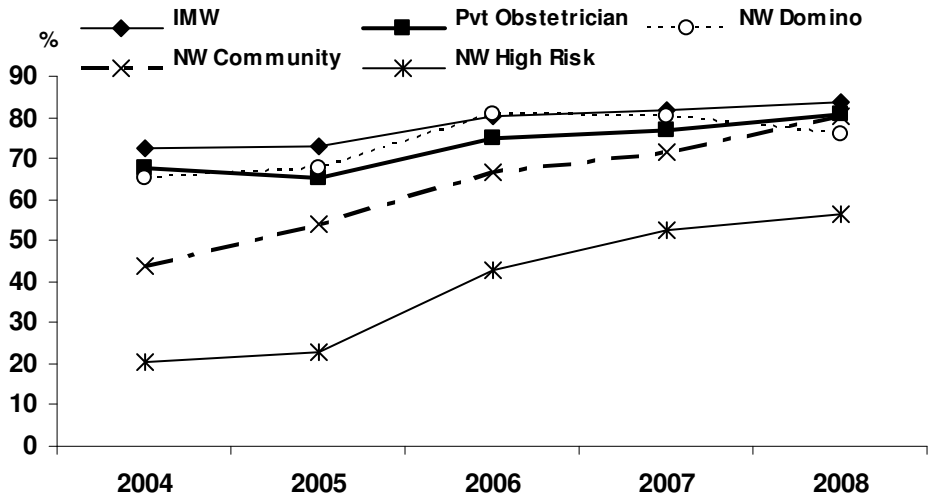


Figure 65: Exclusive breastfeeding rate at discharge from NW by LMC at booking (2004-2008)

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

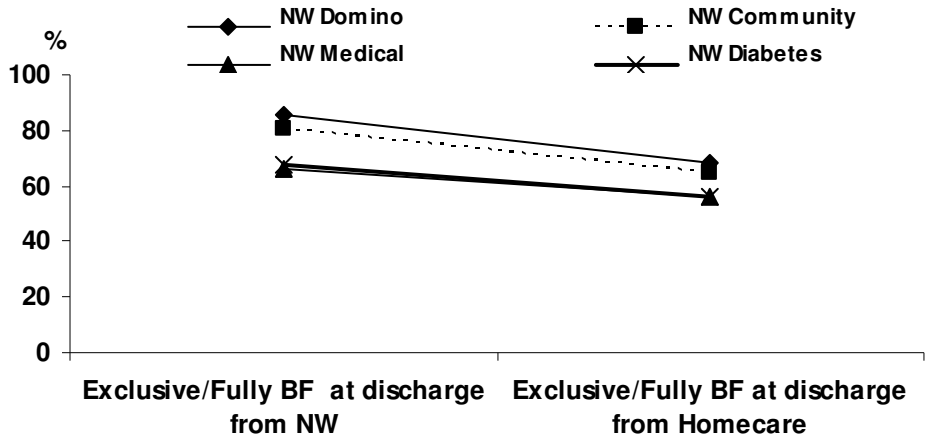


Figure 66: Change in combined exclusive and fully breastfeeding rate from hospital discharge to Homecare by NW LMC (4-6 weeks)

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.

There is an increase in breastfeeding rates at discharge from Homecare for all NW LMC groups compared to 2007 data.

With the introduction of the Healthy Eating Health Action MOH project and support for further community based breastfeeding support such as a NW Community lactation consultant clinic; it is anticipated the needs of women after discharge home will be better addressed in the future.

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 achievement of 79.2% exclusive breastfeeding on discharge from the National Women's facility demonstrates the dedication to achieving best practice and care provision for mothers and our future generation.

8.2 Postnatal admissions

Methods

Postnatal care following birth is provided at National Women's for women requiring secondary care or closer observation for themselves or their babies. The contractual arrangement with Birthcare Auckland to provide postnatal primary care continues as before.

Findings

Table 59: Maternal destination immediately after birth

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

The number of women who are admitted to the wards and or transferred to Birthcare has remained stable over the years.

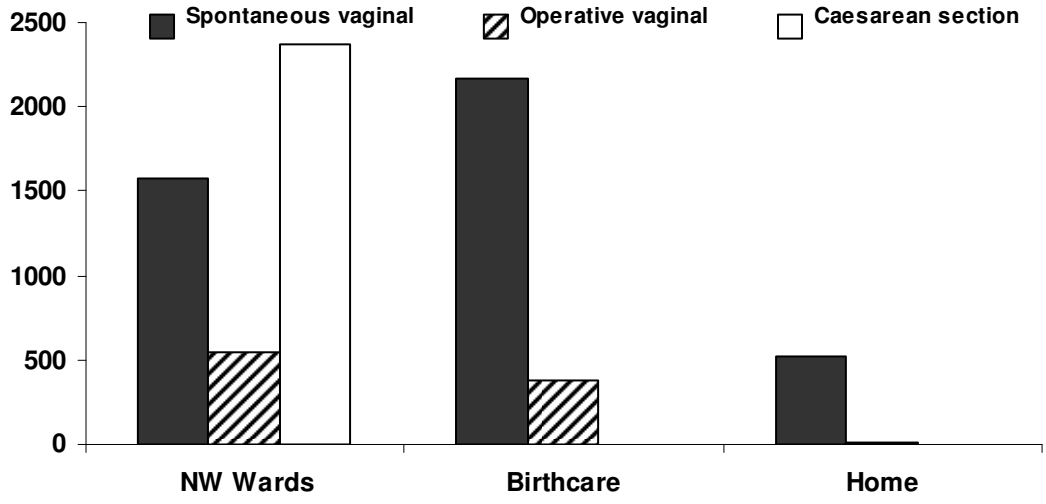


Figure 67: Maternal destination immediately after birth by mode of birth

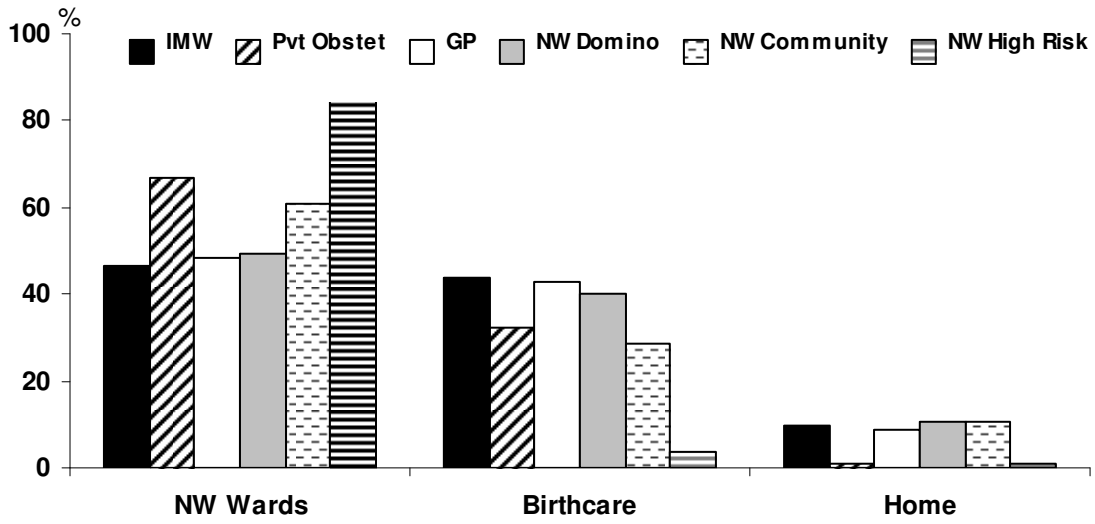


Figure 68: Postnatal destination immediately after birth by LMC

The percentage of women transferring to Birthcare remains relatively stable throughout the major LMC groups.

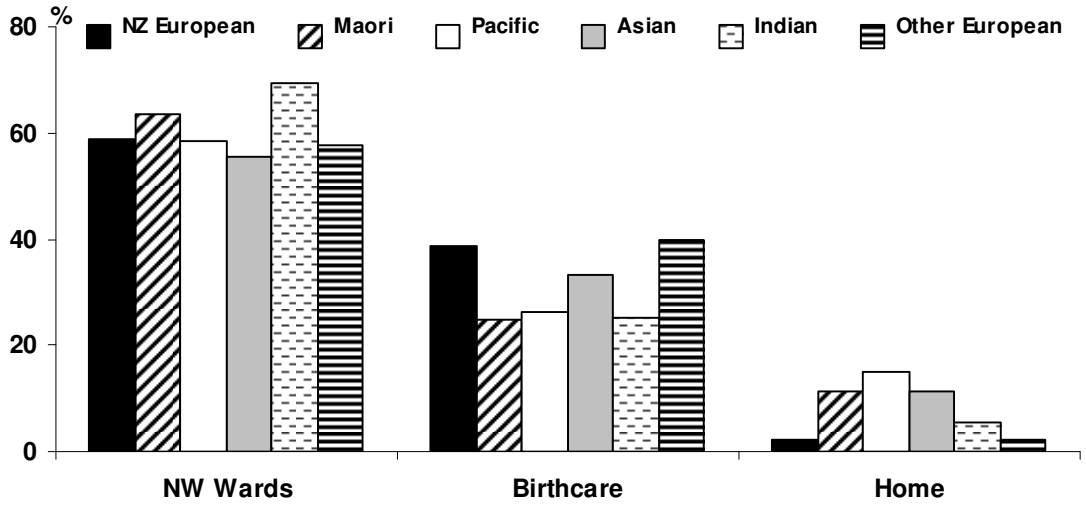


Figure 69: Postnatal destination immediately after birth by ethnicity

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 usually do so for neonatal care for their baby.

Table 60: Reason for admission to NW postnatal wards among women having a spontaneous vaginal birth

	n= 1571	
	n	%
Neonatal reason*	683	43.5
Postpartum haemorrhage	291	18.5
Diabetes	121	7.7
Hypertensive disorder	51	3.2
Perineal trauma	101	6.4
Retained placenta/products	51	3.2
Fainting /dizziness	27	1.7
Other listed reasons†	246	15.7

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

Table 61: Length of stay by mode of birth among initial admissions to NW wards

	n= 4493*		Length of stay Days
	n	%	Median
Caesarean section birth - discharged to home	2030	45.2	4
Caesarean section birth - transferred to Birthcare	251	5.6	1
Caesarean section birth - transferred to other destinations	80	1.8	5
Operative vaginal birth - discharged to home	311	6.9	3
Operative vaginal birth - transferred to Birthcare	223	5.0	1
Operative vaginal birth - transferred to other destinations	15	0.3	4
Spontaneous vaginal birth - discharged to home	1187	26.4	2
Spontaneous vaginal birth - transferred to Birthcare	299	6.7	1
Spontaneous vaginal birth - transferred to other destinations	70	1.6	2

*27 women with unknown destination have been excluded

In the table above “other destinations” includes units within ADHB, such as Starship Hospital where an infant might require further treatment, as well as other external facilities.

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 2008, 456 (6.0%) women of the 7589 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 456 readmissions: 370 women had one readmission, 34 women had two readmissions and 6 women had three readmissions.

Table 62: Reasons for readmission

	n=456	
	n	**%**
Neonatal admission*	92	20.2
Infection †	55	12.1
Breast‡	67	14.7
Wound breakdown§	9	2.0
Postpartum haemorrhage	9	2.0
Hypertensive disorder	19	4.2
Retained products	38	8.3
Epidural complications	5	1.1
Other¶	162	35.5

* 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.

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 2008 calendar year. Occupancy data relate to the unit occupancy for each day in 2008.

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 2008 and admitted to the NW NICU, (2) inborn (NW) babies and (3) babies born in 2008 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 either:

- <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 are 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 63: Characteristics of <32 week or <1500g babies cared for at NW NICU by ANZNN status

<32 weeks or <1500g						
	Total n=234		ANZNN n=201		Non ANZNN n=33	
Gestation (weeks)	**n**	**%**	**n**	**%**	**n**	**%**
<24						
24-25	34	15	25	74	9	26
26-27	44	19	36	82	8	18
28-29	48	21	45	94	3	6
30-31	90	38	83	92	7	8
32-36	15	6	12	80	3	20
Weight (g)						
<500	1	0.4	0	0	1	100
500-749	26	11	19	73	7	27
750-999	44	19	38	86	6	14
1000-1249	48	21	38	79	10	21
1250-1499	59	25	54	92	5	8
1500-1999	52	22	49	94	3	6
2000-2499	4	1.6	4	100	0	0
Birthplace						
National Women's	193	82.4	193	100	0	0
Born before arrival	3	1.3	3	100	0	0
Waitemata DHB	4	1.7	4	100	0	0
Counties Manukau DHB	23	10	0	0	23	100
Waikato	2	0.9	0	0	2	
Wellington	5	2	0	0	5	100
Palmerston North	1	0.4	0	0	1	100
Hastings	1	0.4	0	0	1	100
Other	2	0.9	1	50	1	50

9.1 Inborn live birth at National Women's 1959-2008

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.

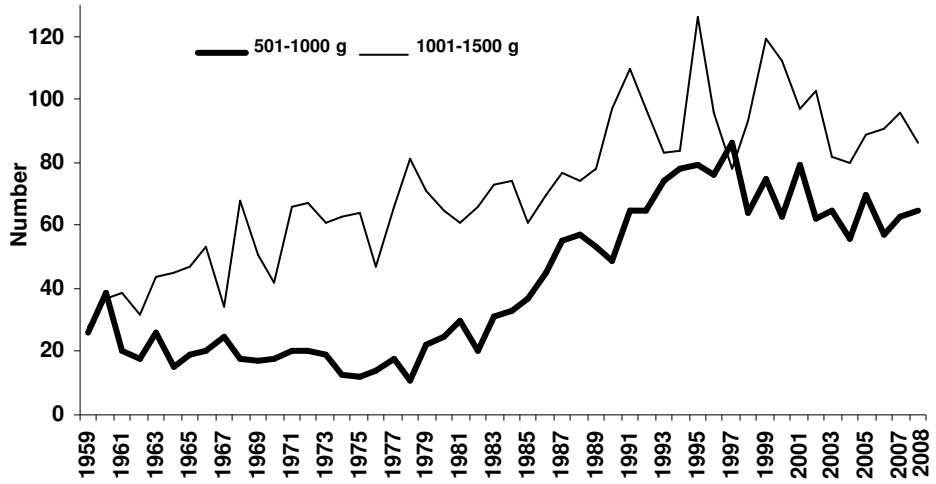


Figure 70: Number of inborn live-births ≤1500g from 1959 to 2008 (excludes BBAs).

9.2 NICU occupancy

For 2008 the modest increase in occupancy that was observed in 2007 has continued with the highest number of baby days since 2003. This was associated with an increase in bed-days for inborn infants born before 28 weeks gestation and from 28-31 weeks gestation. Typically these immature babies are more complex than more mature (32-36 wks) preterm or term babies.

Table 64: Occupancy (baby days) on NICU (1999 – 2008)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Baby days	18407	20652	20108	20551	19249	14958	14541	14212	15228	15296

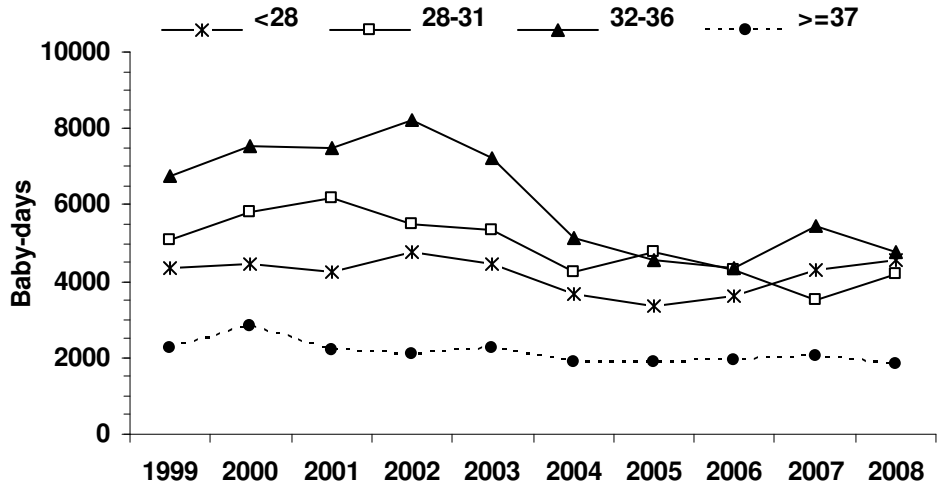


Figure 71: Occupancy (baby days per year) of NICU by gestational age

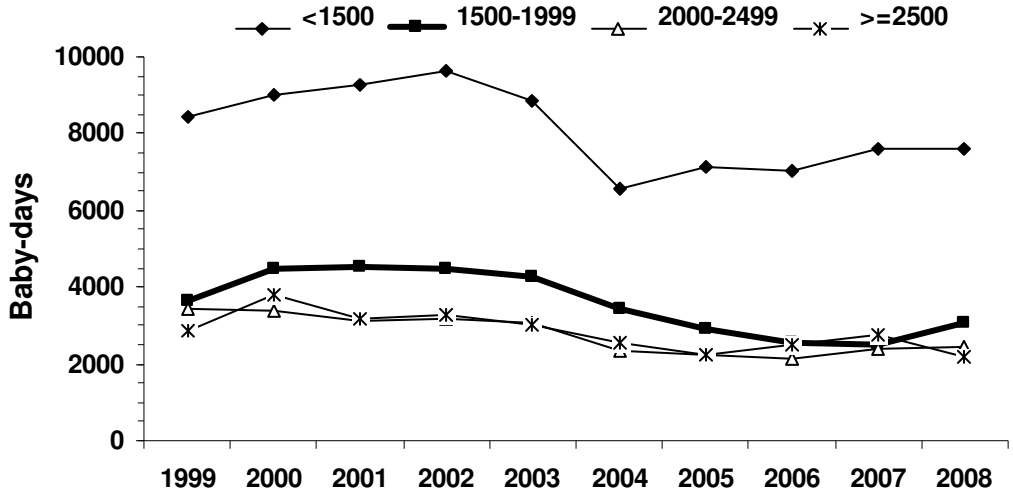


Figure 72: Occupancy (baby days per year) of NICU by birth weight

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 two local Level 2 neonatal units. However, the last five years has seen a plateau in overall NW admission numbers.

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, as well as care for babies with antenatally-diagnosed congenital cardiac disease likely to require intervention soon after birth.

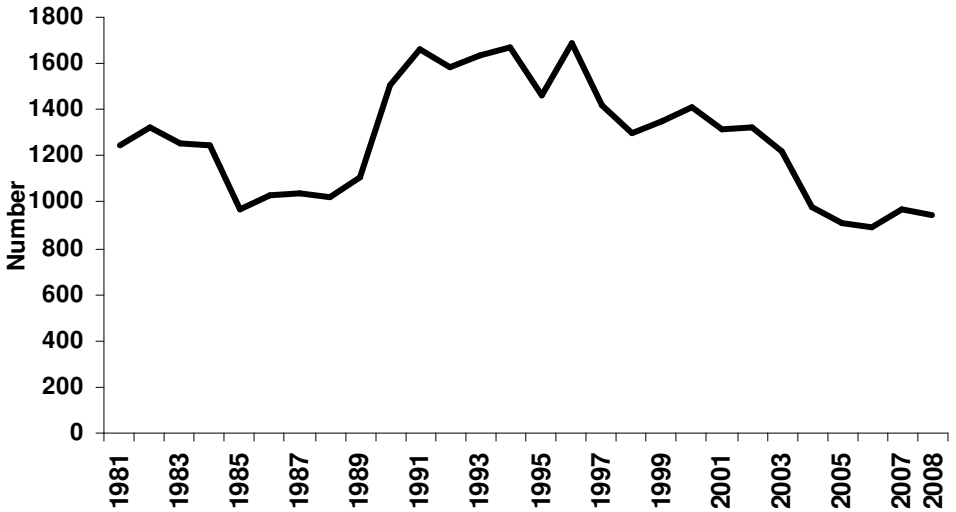


Figure 73: Admissions to NICU 1981-2008

Table 65: NICU admissions by year

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number	1666	1464	1690	1420	1300	1352	1412	1312	1331	1220	975	906	890	972	939

9.3.1 Admissions to NICU by gestation and birth weight

Review of admissions by gestational age and birth weight category demonstrates that the previously mentioned reduction in admissions in 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.

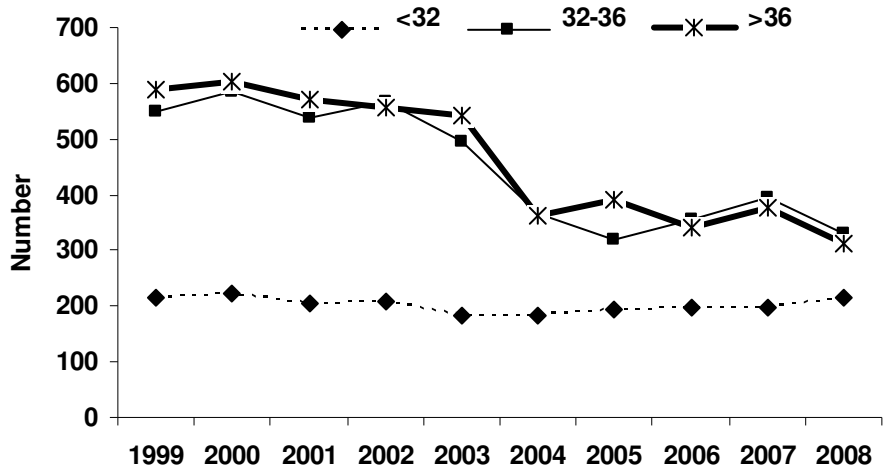


Figure 74: Admissions to NICU by gestational age

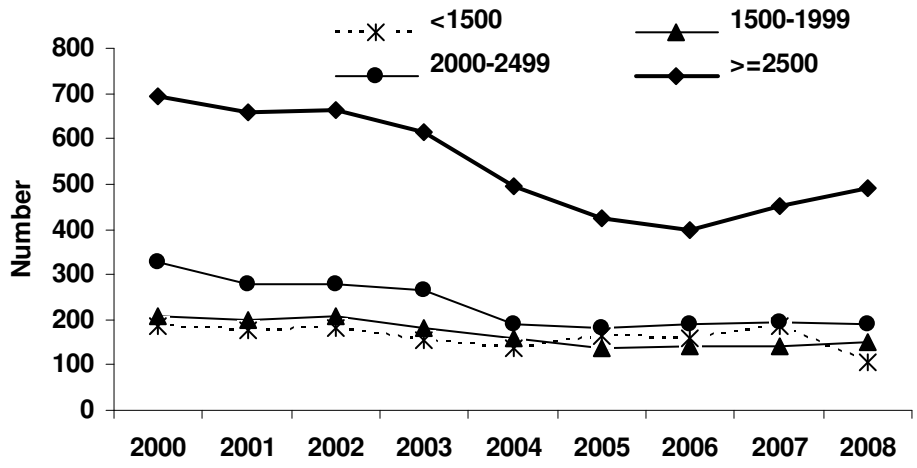


Figure 75: Admissions to NICU by birth weight

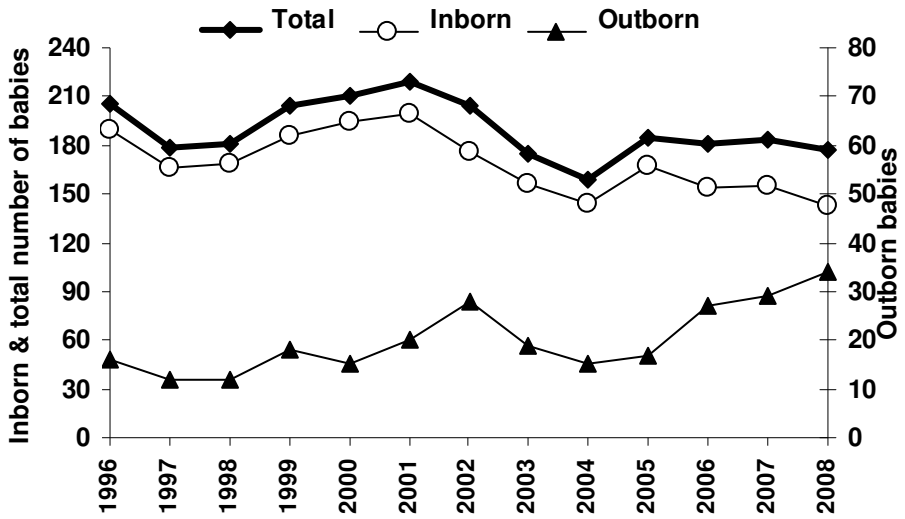


Figure 76: Admissions to NICU of <1500g babies (VLBW) by place of birth (outborn includes BBAs).

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 three years. Although the proportion of outborn infants is low at 12.5% for 2008, this has slowly increased 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, over the last 5 years, there has been a decline in admissions of babies whose mothers are domiciled in the Waitemata District Health Board area. In 2008 there has also been a modest increase in numbers of babies admitted to NICU whose mothers are domiciled in the Auckland District Health Board. This may just be common cause variation or better allocation, with a drop in unknowns, but could reflect demographic changes including increases in overall birth rate and should be observed.

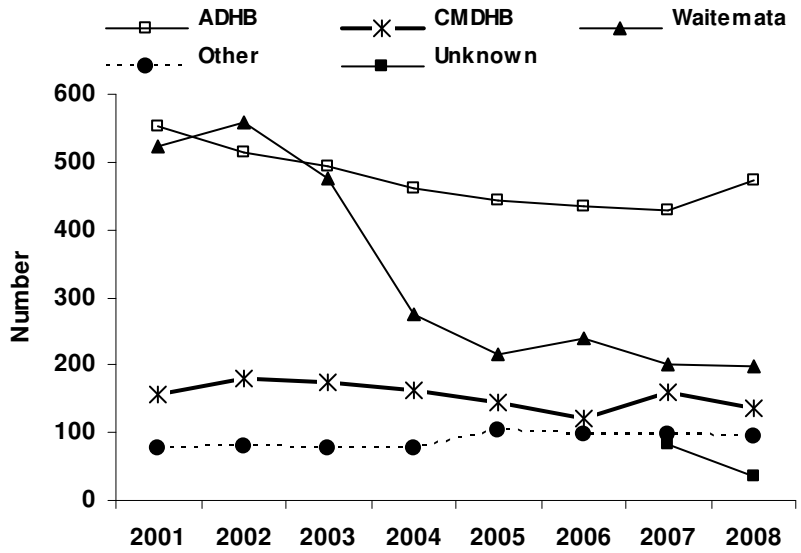


Figure 77: Admissions to NICU by maternal domicile

9.3.3 Admissions to NICU by ethnicity of baby

The majority of NICU admissions are NZ European; however the percentage has fallen from 54% in 2006 to 39% overall, including 39% of preterm and 39% of term infants respectively. This may reflect changes in recoding ethnicity as from 2007 data on baby's ethnicity were used in preference to maternal ethnicity, which was previously reported. The next largest single ethnic group is Pacific people who for the first time represent a greater percentage than Maori. Overall 16.5% of admissions were Pacific people with 17.4% of premature and 15.1% of term admissions. Maori were the third most common with 15.7% of admissions, which is increased from 13% in 2006. As in previous years, Maori ethnicity is more commonly associated with preterm admission (16%) compared with term admission (15.1%). Asian and Indian were the two other major groups represented with 10.8% and 8.0% of admissions respectively.

9.3.4 Reasons for admission to NICU

Prematurity (39.5%) and respiratory distress (21%) remain the commonest reasons for admission to NICU. However, 87 babies (9.2%) were admitted because of congenital anomalies. Thirty-six babies (3.8%) including 25 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 2008 88% of NW babies <32 weeks gestation received some antenatal corticosteroids before birth and 51% 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 down from previous years, which may reflect changes in practice. Unfortunately 2007 and 2008 data from ANZNN are not yet available for comparison.

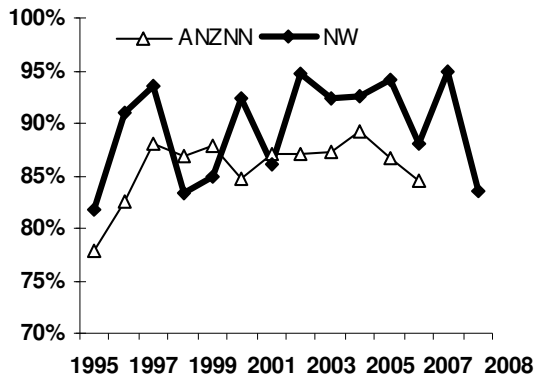


Figure 78: Any antenatal corticosteroids at 24-27 weeks

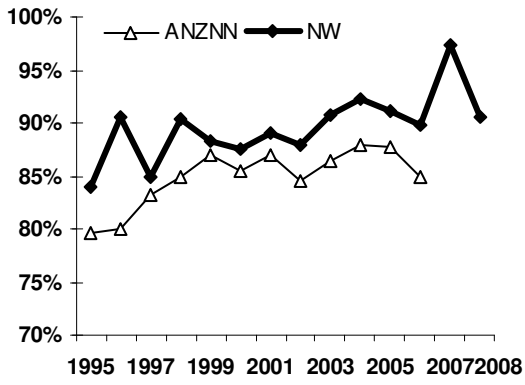


Figure 79: Any antenatal corticosteroids at 28-31 weeks

9.4 Care and complications

9.4.1 Infection (all admissions)

In 2008 there were 6 early-onset culture proven septicaemias compared with 6 and 5 in 2006 and 2007 respectively. There were 30 episodes of late-onset septicaemia in 22 babies, which compared reasonably with 31 and 34 episodes in the two previous years. For early-onset infection (1st 48 hrs) the organisms were Listeria (3), *E. coli* (2) and *Streptococcus pneumonia* (1). *Staphylococcus epidermidis* and coagulase negative *Staphylococcus* continue to make up the majority of late onset sepsis (32%). However, there were also 8 cases of late *Staphylococcus aureus* septicaemia, 5 late *E. coli* infections; 2 enterobacter septicaemia and 2 Klebsiella septicaemia. One extremely premature baby with a late onset septicaemia and other morbidities died.

9.4.2 Hypoxic ischaemic encephalopathy (all admissions)

Three inborn babies developed significant stage 2 or 3 hypoxic ischaemic encephalopathy (HIE) in 2008, giving an incidence of 0.4/1000 term live births. The incidences were 0.6, 1.6, 0.5, 0.9 and 1/1000 term live births for the years between 2003 and 2007. In 2006 four planned home births had significant HIE. In 2008 there was one infant who was born at home and died at 3 hours of age after transfer to NW. This infant had pulmonary hypoplasia due to major renal anomalies. The infant presented in extremis and died quickly so was not included in the encephalopathy table below.

Table 66: Details of Hypoxic Ischaemic Encephalopathy Stages 2 or 3.

Born at	Gestation	Birth Weight	HIE stage	Apgar 1/5	Comment
North Shore	40	3800	2	2/4	Outborn, fetal distress and meconium staining in labour
NW	39	3090	2	3/6	Inborn, tight nuchal cord
Waitakere	40	2985	2	5/6	Outborn, fetal distress and meconium staining in labour
NW	33	2070	2	1/2	Inborn, oligohydramnios
NW	39	3600	2	4/10	Inborn emergency caesarean section but insult suspected before labour
North Shore	40	3500	3	1/1	Outborn, fetal distress in labour

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 2008

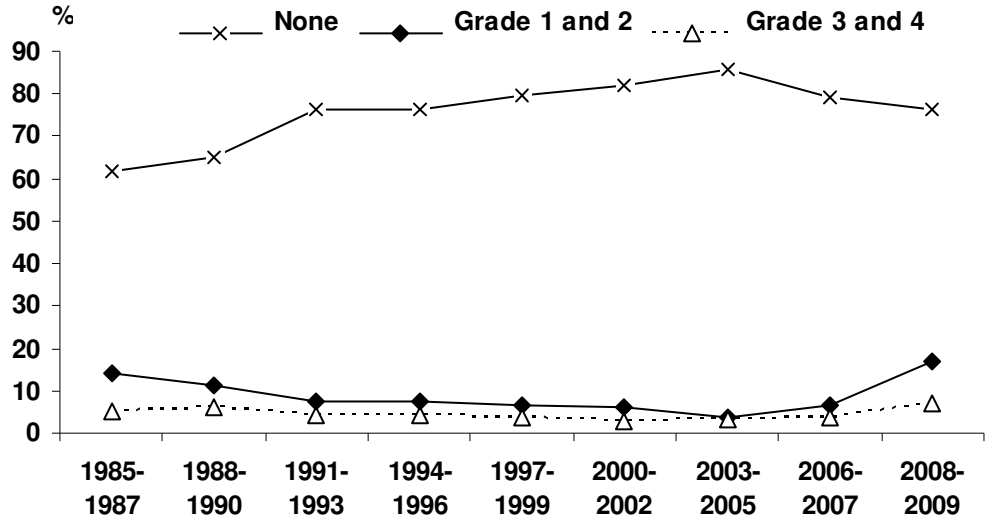


Figure 80: Intraventricular haemorrhage in all <1250g infants admitted to NICU from 1985 to 2008 (Babies with unknown IVH status have been removed from the denominator.)

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 81-84). However, there is some variation year to year that will reflect the smallish number of infants in each gestational age group. For 2008 the overall rate appeared to increase a little but the rate of severe (G3-4) IVH was lower than for 2007.

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

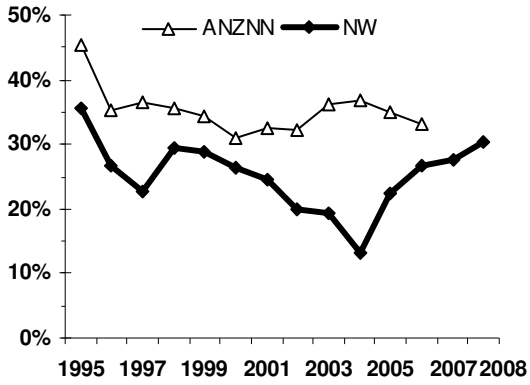


Figure 81: Any IVH at 24-27 weeks

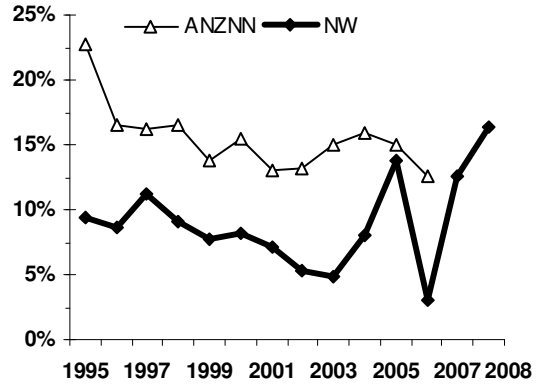


Figure 83: Any IVH at 28-31 weeks

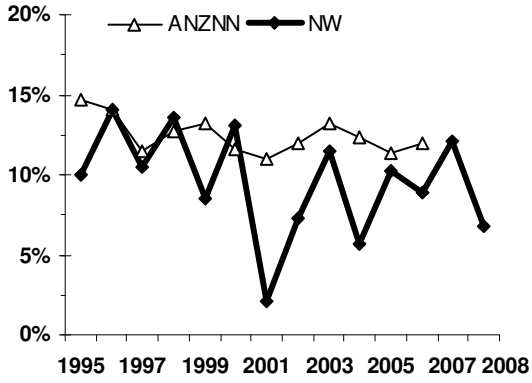


Figure 82: Severe (G3-4) IVH at 24-27 weeks

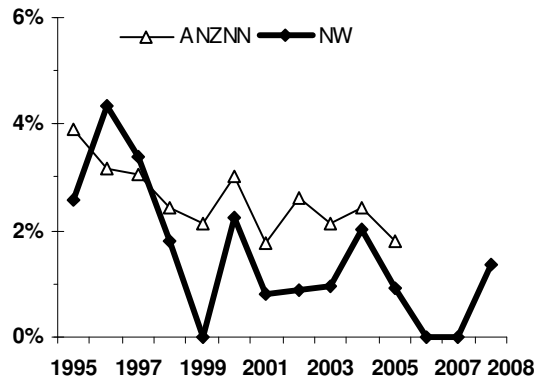


Figure 84: Severe (G3-4) IVH at 28-31 weeks

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 born at NW, excluding babies transferred in postnatally. This allows more meaningful comparisons of postnatal care at NW over time.

Table 67: Number of babies on assisted ventilation

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

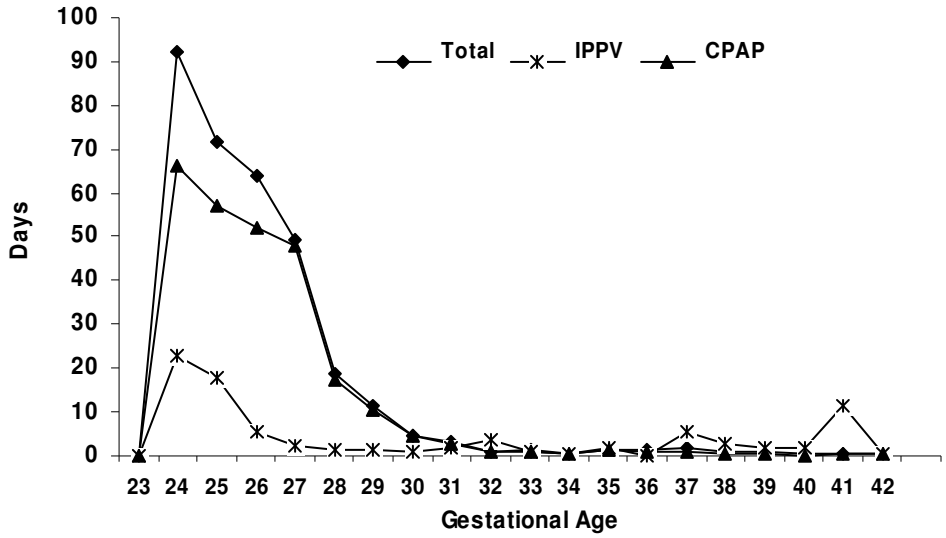


Figure 85: Median ventilation days on IPPV and CPAP and IPPV+CPAP by gestational age among (ventilated) survivors in 2008

NW NICU 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)

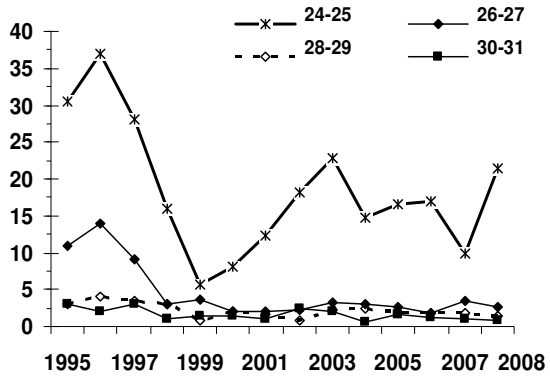


Figure 86: Median days on IPPV

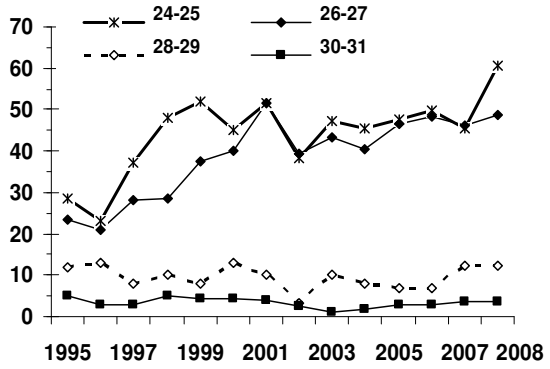


Figure 87: Median days on CPAP

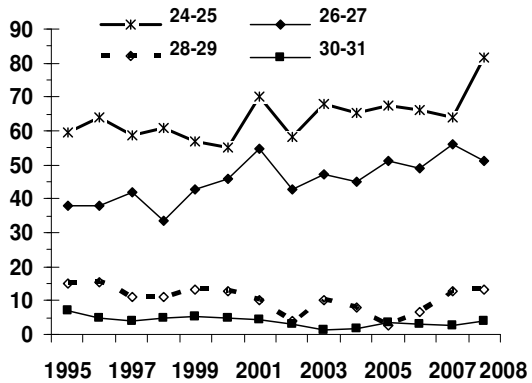


Figure 88: Median days on CPAP + IPPV

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 to a median of 21 days However, it should be noted that the number of babies in that 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, particularly for the most immature babies but also for babies of 26 and 27 weeks gestation.

9.4.8 Trends in the use of assisted ventilation among all infants born in NW.

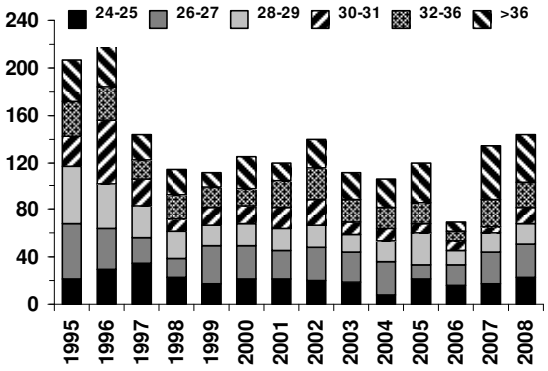


Figure 89: Number on IPPV

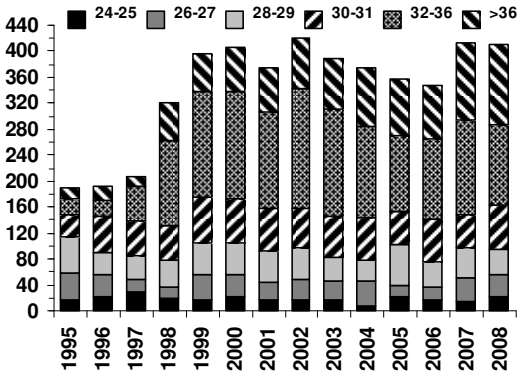


Figure 90: Number on CPAP

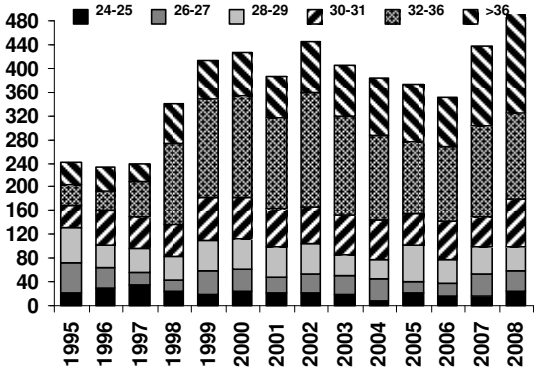


Figure 91: Number on CPAP + IPPV

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 2009 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.

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).

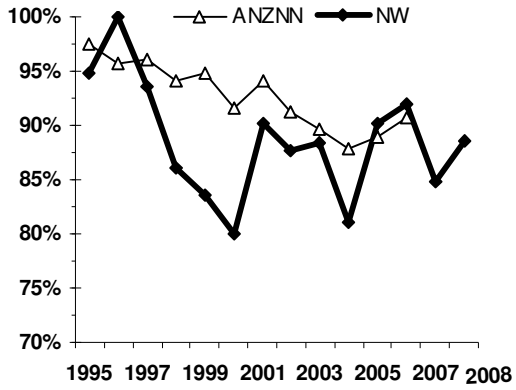


Figure 92: Percentage on IPPV (24-27 wks ANZNN assigned)

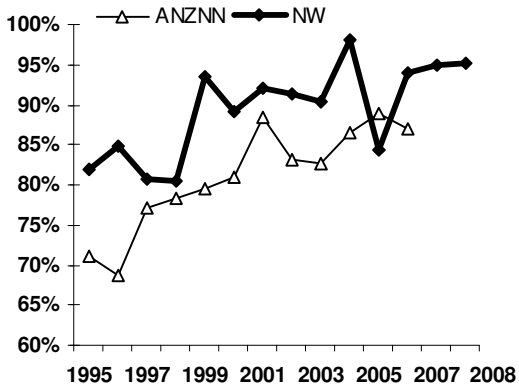


Figure 93: Percentage on CPAP (24-27 wks ANZNN assigned)

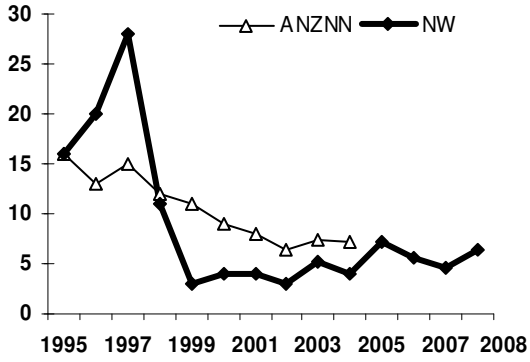


Figure 94: Median days on IPPV (24-27 wks ANZNN assigned)

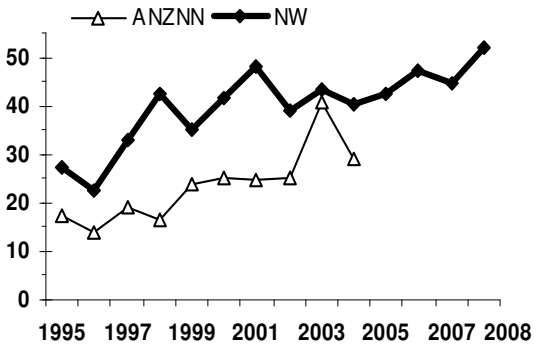


Figure 95: Median days on CPAP (24-27 wks ANZNN assigned)

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. In 2008 the NW data are consistent with previous years but 2008 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)

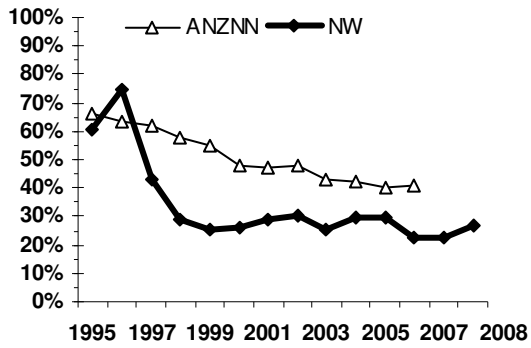


Figure 96: Percentage on IPPV (28-31 wks ANZNN assigned)

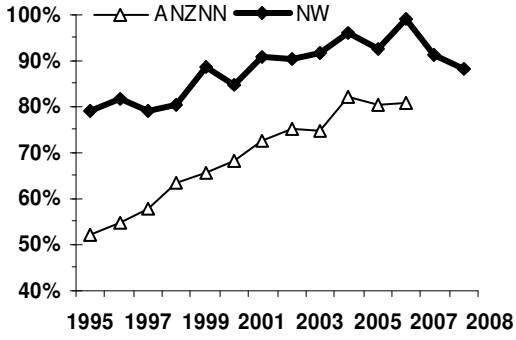


Figure 98: Percentage on CPAP (28-31 wks ANZNN assigned)

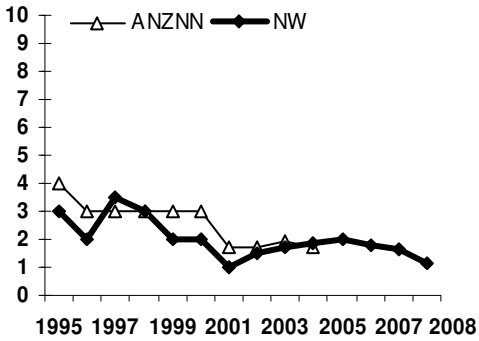


Figure 97: Median days on IPPV (28-31 wks ANZNN assigned)

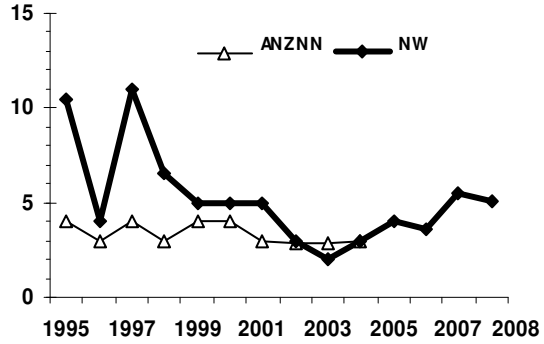


Figure 99: Median days on CPAP (28-31 wks ANZNN assigned)

The pattern of respiratory support in NW babies of 28-31 weeks gestation parallels that seen in the less mature babies. Again 2007 ANZNN data are not as yet 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. Term babies do better than preterm infants.

Table 68: HFOV and inhaled nitric oxide (iNO) use and survival (2008)

	HFOV		iNO		HFOV + iNO	
	n	% alive	n	% alive	n	% alive
Total						
<28 weeks	17	53	5	60	4	50
28-31 weeks	1	0	2	100	0	-
32-36 weeks	4	75	2	100	2	100
≥37 weeks	5	60	9	88	3	67

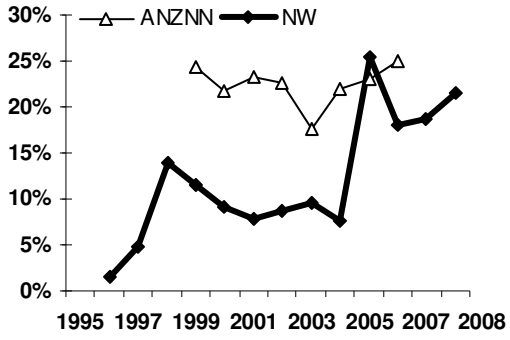


Figure 100: HFOV at 24-27 weeks (ANZNN assigned babies)

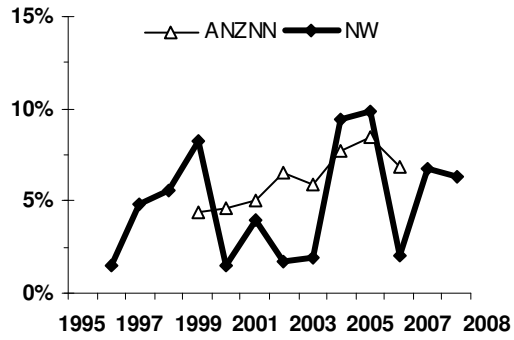


Figure 101: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies)

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 2008

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 2008 there was an increase in numbers for both IPPV and CPAP.

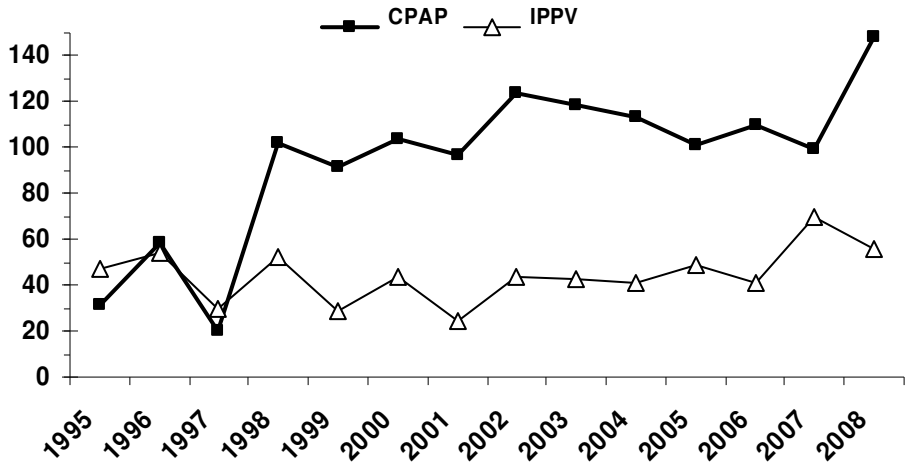


Figure 102: Number of term and post term babies needing assisted ventilation

In previous years the most common reasons for ventilating term infants were meconium aspiration or persistent pulmonary hypertension of the newborn (PPHN) In 2008, congenital anomalies; support for surgery; neonatal encephalopathy and "other", which could include neuromuscular problem were the most common reasons (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 2008, the most common reason for using CPAP was transient tachypnoea of the newborn with 84 babies on CPAP (>50% of CPAP use at term), followed by meconium aspiration (see table 229 in appendix 8).

9.5 Outcomes

9.5.1 Survival of NW inborn babies by birthweight

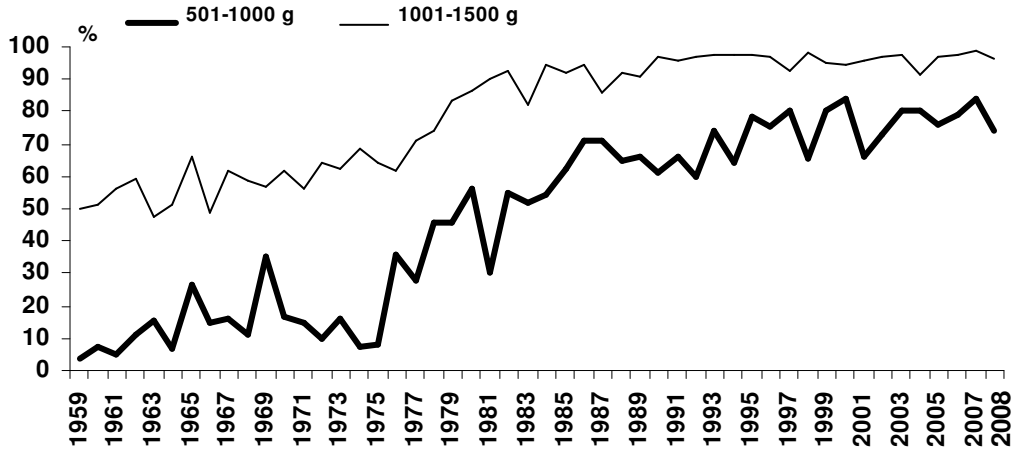


Figure 103: Neonatal survival (0-28 days) of ≤1500g inborn live births from 1959 to 2008

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.

9.5.2 Survival of inborn babies (23 to 31 weeks) by gestational age

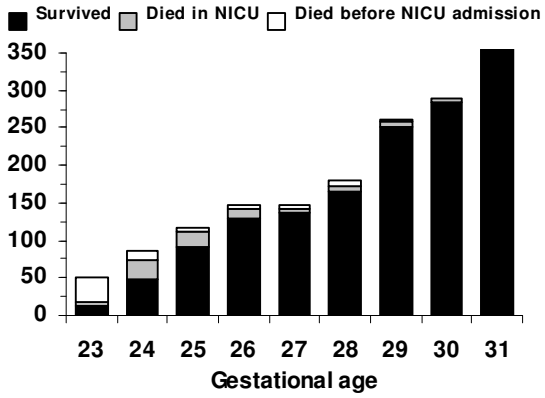


Figure 104: Numbers of live inborn babies 23 to 31 weeks gestation in 2000-2008

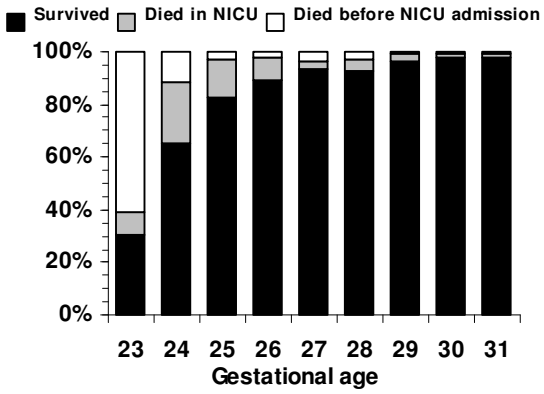


Figure 105: Survival of live inborn babies 23-31 weeks 2000-2008 (n = 1472)

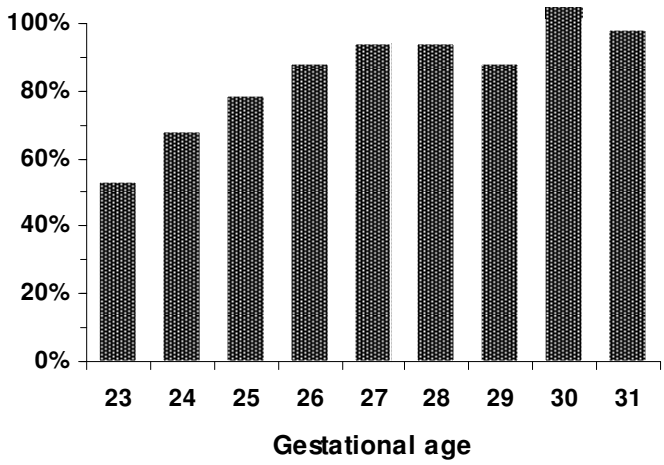


Figure 106: Survival of live inborn babies admitted to NICU from 1995 to 2008 (n =2288)

The number of infants born at 23 weeks gestation who survive in a single year is low. However, there is a step increase in survival between 23 and 27 weeks gestational age at birth. The data are useful in informing our guidelines on management of borderline viability. The NW rates are very 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)

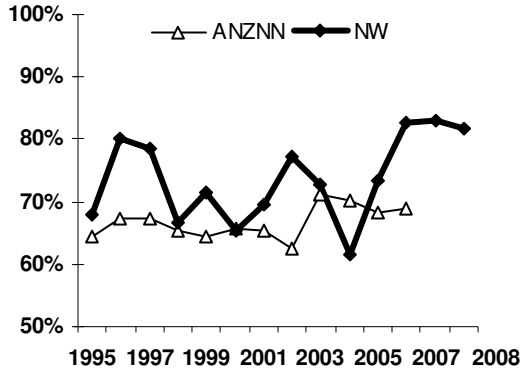


Figure 107: Survival at 24-25 weeks gestation compared with ANZNN data

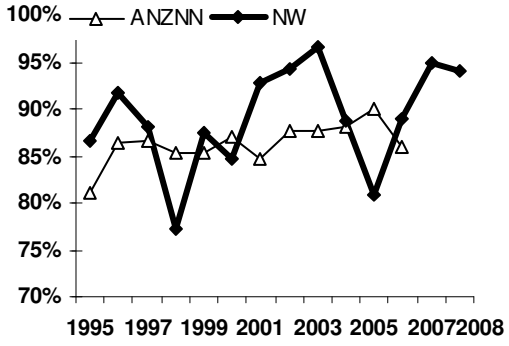


Figure 108: Survival at 26-27 weeks compared with ANZNN data

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)

Two babies who were inborn at NW developed Cystic PVL in 2008. In addition one baby who was transferred to NW at 43 days of age was diagnosed with PVL.

9.5.5 Retinopathy of prematurity benchmarked with ANZNN

There was a striking rise in the incidence of ROP in 2006, which was very likely due to a different screening technique undertaken by a new ophthalmologist. 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 3 years: 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 4.7% in 2008, 5% in 2007 and 6% in 2006 compared to 1% in both 2005 and 2004.

In 2008, 6 inborn babies received laser therapy for advanced ROP, which is consistent with the number in 2007. Of these babies, 3 were 24 weeks gestation, 2 were 25 weeks, and one was 27 weeks gestation. Furthermore, four of the six were multiples. NICU also provides a regional service for babies requiring laser treatment, and five infants were transferred specifically for treatment with established ROP.

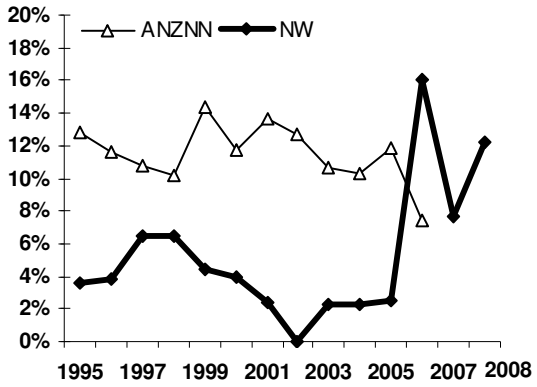


Figure 109: ROP at 24-27 weeks

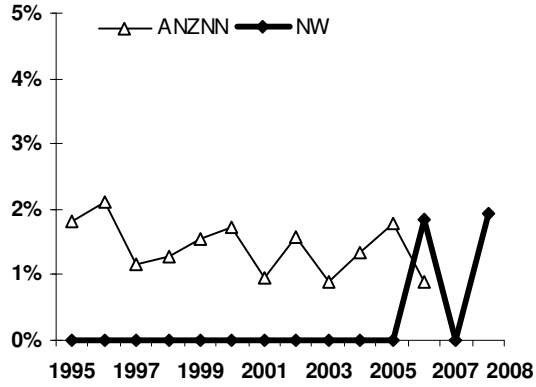


Figure 110: ROP at 28-31 weeks

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.

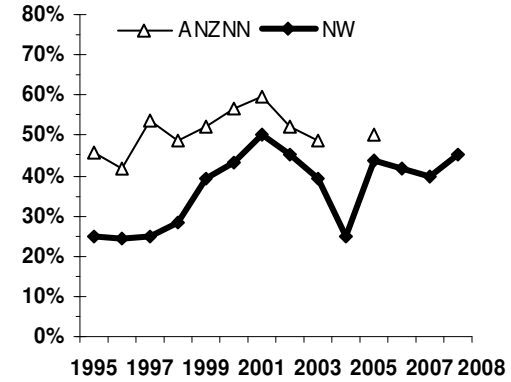


Figure 111: Chronic lung disease at 24-27weeks

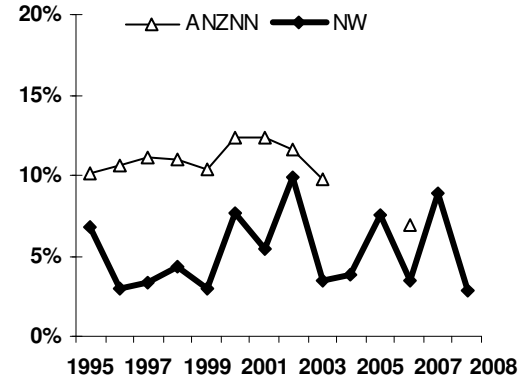


Figure 112: Chronic lung disease at 28-31weeks

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 2008, 4/189 (2.1%) of VLBW infants and 4/189 (2.1%) of <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.

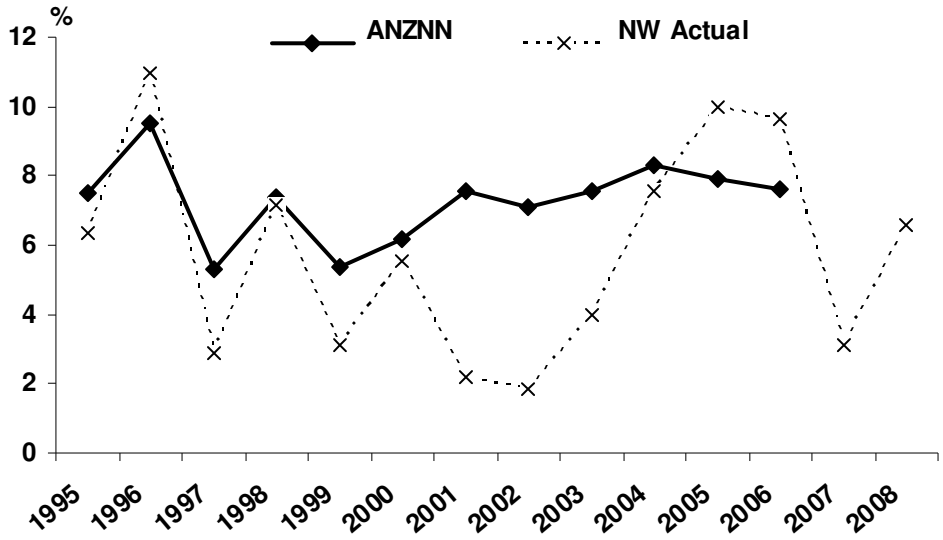


Figure 113: NEC in ANZNN assigned babies under 28 weeks gestation compared with the incidence in ANZNN 1995-2008

In addition five infants with proven NEC were transferred in from other hospitals for surgery and subsequent management.

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 2008, 38 inborn and 3 outborn babies were treated for a symptomatic PDA. Five babies had a shortened course of indomethacin, twenty had a standard course and four babies had two standard courses. Twelve babies were recruited into the INDUCE trial.

In 2008, two babies had their PDA ligated. Both of them were under 1000g and <27 weeks gestation.

9.5.9 Pneumothorax needing drainage (ANZNN babies)

Seven babies developed a pneumothorax that needed drainage in 2008. An additional 18 babies were found to have a small pneumothorax that did not require a procedure and resolved spontaneously. Of the 7 infants who required drainage of a pneumothorax 3 were 25 weeks or less. Also 3 of the 7 were outborn.

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 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 2008, 20 babies or 10.9% of inborn babies <32 weeks gestation were treated with dexamethasone. The rates of those treated clearly decreased with advancing gestational age from 59% in those between 23 and 25 weeks gestation. One baby born at 32 weeks gestation or greater received postnatal steroids for chronic lung disease following a neonatal course that included severe lung disease treated with high frequency ventilation.

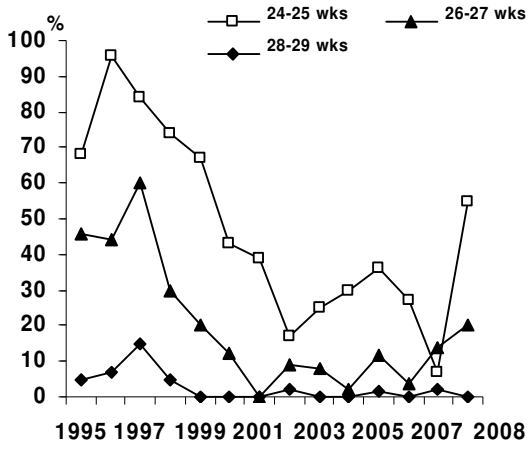


Figure 114: Percentage receiving postnatal dexamethasone by gestational age (ANZNN alive at one week <32wks)

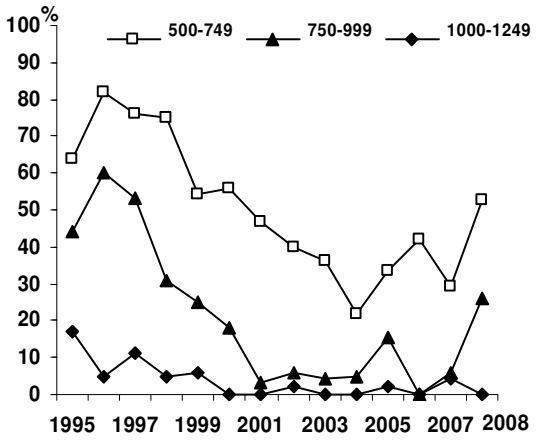


Figure 115: Percentage receiving postnatal dexamethasone by birth weight (ANZNN alive at one week <1500g)

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

There were 21 neonatal and infant deaths occurring in NICU of infants admitted during 2008. These include deaths before 28 days or up to NICU discharge (whichever is the greater). Fifteen of the 21 infants who died were born in NW. In addition, seven infants who were born at NW and two outborn infants who were admitted to NICU died after transfer to Starship Hospital, for management of congenital cardiac disease (7) or diaphragmatic hernia (2).

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 2008, 13 deaths in NICU (59%) occurred in babies of <28 weeks gestation. This included three outborn babies who were transferred in for treatment of necrotising enterocolitis.

The three term infants who died in NICU all had significant anomalies including: chromosomal abnormality, cardiac disease and pulmonary hypertension; pulmonary hypoplasia, secondary to dysplastic kidneys; and diaphragmatic hernia with Trisomy 18.

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

9.6 Child Development Unit

9.6.1 Follow up at 2 years (corrected) of Children under 1500 grams born in 2006

One hundred and forty-four infants who weighed <1500 grams, survived to discharge from the Newborn Service. Forty-six (32%) weighed <1000 grams at birth.

Four infants with congenital abnormalities were assessed but were excluded from the following tables. Three infants died after discharge from National Women's Health. Eighteen children were lost to followup of whom four weighed less than 1000 grams. Nine were from other centres in New Zealand, five lived overseas, and four did not attend appointments. Data were obtained for 119 (87%) children.

One hundred and two children received individual assessment at the Child Development Unit, and when this was not possible (mainly because of distance from home to National Women's), 17 reports were obtained from paediatricians and other professionals monitoring 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 69: 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 70: Outcome categories at 2 years for children under 1500g born in 2006 (n=119)

	Number	Description
Category I	2 (1.7%)	1 child with low cognitive, motor and language scores. 1 child with severe visual loss (stage 5 ROP bilaterally).
Category II	11 (9.2%)	8 children with low cognitive, motor and language scores. 1 child with low cognitive, motor and language scores and tonal abnormalities. 1 child with slow development, squint, and shunted hydrocephalus. 1 child with slow cognitive and language development.
Category III	4 (3.4%)	4 children with motor delay.
Category IV	102 (85.7%)	

Table 71: Outcome of children <1500g born in 2006 at 2 years by gestational age groups (n=119)

	Gestational age (weeks)					
Outcome	**24-28 weeks n=55**		**29 – 36 weeks n=64**		**Total n=119**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	2	3.6	0	-	2	1.7
II	8	14.6	3	4.7	11	9.2
III	2	3.6	2	3.1	4	3.4
IV	43	78.2	59	92.2	102	85.7

Table 72: Outcome of children <1500g born in 2006 at 2 years by birth weight groups (n=119)

	Birthweight (grams)					
Outcome	**<1000g n=41**		**1000 – 1499g n=78**		**Total n=119**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	2	4.9	0	-	2	1.7
II	4	9.8	7	9.0	11	9.2
III	3	7.3	1	1.3	4	3.4
IV	32	78.0	70	89.7	102	85.7

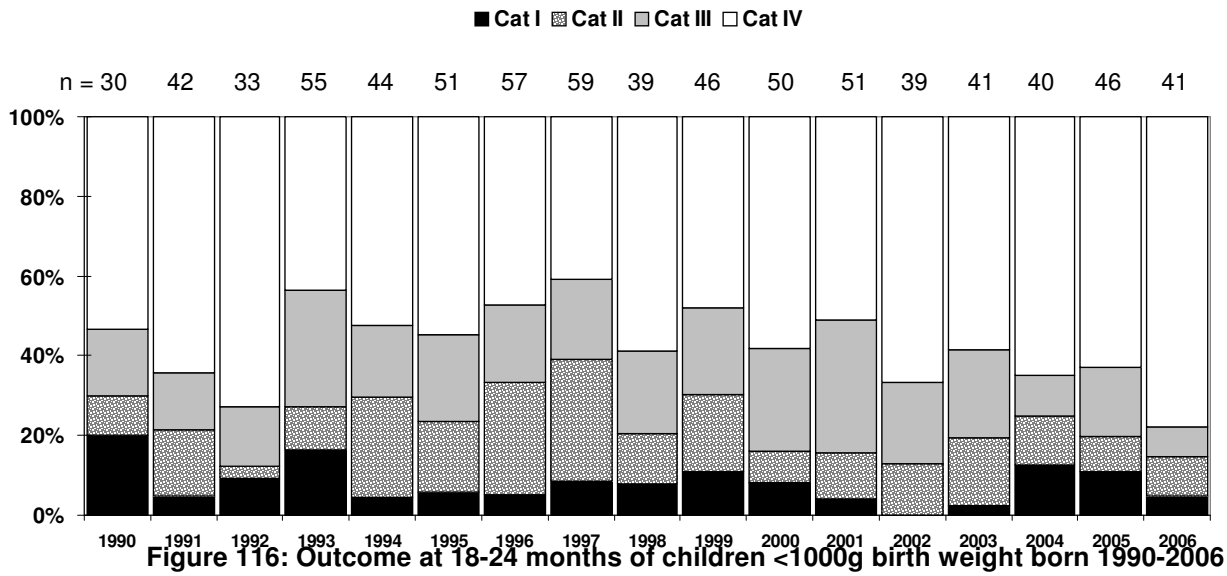


Figure 116: Outcome at 18-24 months of children <1000g birth weight born 1990-2006

3.1.2 Development at 4 years of children under 1500g born in 2004

One hundred and twenty-two children born in 2004, who weighed less than 1500 grams and were cared for in the Newborn Service, survived to hospital discharge. There were 45 infants less than 1000grams. Two children had congenital abnormalities and were not included in the analyses of data.

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

At 4 years, data were obtained for 86 children. Of the 30 not assessed 24 (80%) 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 73: 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 74: Outcome categories at 4 years for children under 1500g born 2004 (n =86)

	Number	Description
Category I	6 (7.0%)	2 children with cognitive and motor delay and Autistic Spectrum Disorder. 1 child with low cognitive and motor scores. 1 child with low cognitive scores and sensori-neural hearing loss with bilateral aids. 1 medically fragile child with delayed development, tracheostomy and gastrostomy. 1 child with low cognitive scores.
Category II	15 (17.4%)	11 children with cognitive delay. 1 child with hemiplegia. 2 children with cognitive and motor delay. 1 child with severe Attention Deficit Hyperactivity Disorder.
Category III	2 (2.3%)	2 children with low motor scores.
Category IV	63 (73.3%)	

Summary

Babies weighing less than 1500g at birth are at risk for developmental problems. However, less than 2% of children born in 2006 and examined around 2 years corrected age, had severe disability. Eighty-six percent were within the average range for cognitive and motor development.

For children born in 2004, and assessed at 4 years, 7 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.

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 which resulted in the death. PSANZ-NDC (PSANZ Neonatal Death Classification) is 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 of $\geq$20 weeks or $\geq$ 400g if gestation is unknown and 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 per 1000 babies, 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 in 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 75: Inborn and BBA deaths

		2000	2001	2002	2003	2004	2005	2006	2007	2008
Fetal deaths	20-22 weeks	33	20	30	23	25	26	24	24	29
	23-24 weeks	12	10	10	8	18	11	12	15	11
	25-26 weeks	9	2	4	6	3	3	6	7	4
	27-28 weeks	3	1	2	1	10	6	3	5	8
	29-38 weeks	27	15	17	24	13	17	24	19	21
	>38 weeks		9	6	2	13	5	5	12	3
Total fetal deaths		**84**	**57**	**69**	**64**	**82**	**68**	**74**	**82**	**76**
Neonatal deaths	Early neonatal deaths (≤7 days)	43	32	40	34	33	38	23	20	26
	Late neonatal deaths (8-28 days)	9	5	7	7	9	5	2	9	8
Total neonatal deaths		**52**	**37**	**47**	**41**	**42**	**43**	**25**	**29**	**34**
Total deaths		136	94	116	105	124	111	99	111	110
Perinatal mortality rate/1000		15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2
Perinatal related mortality rate/1000		16.9	12.3	14.5	13.5	16.2	15.0	13.4	14.1	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

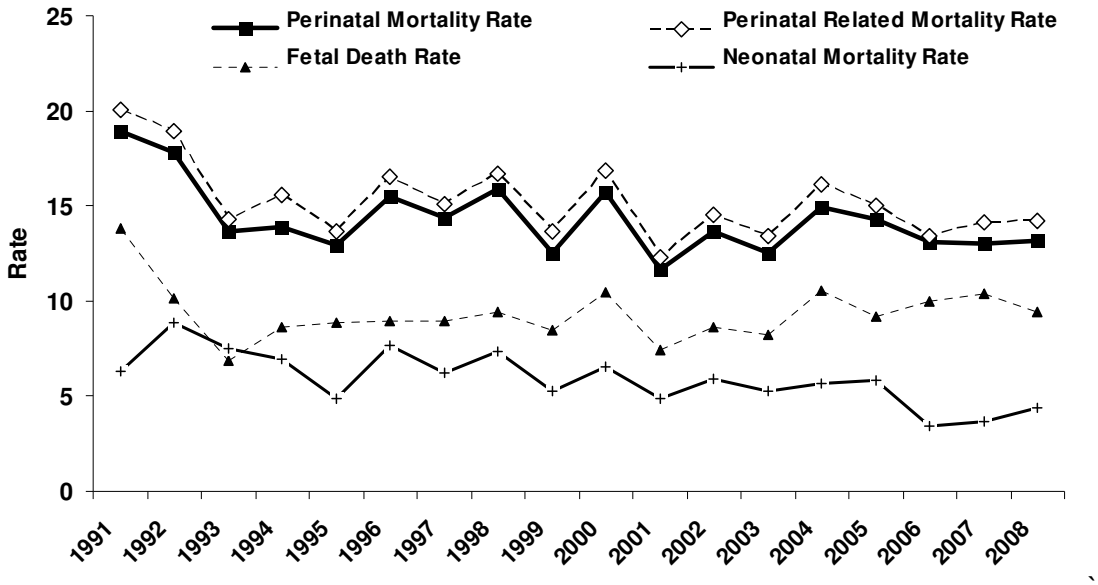


Figure 117: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate (1991-2008) (all rates expressed as deaths/1000 births)

Over the last 3 years the perinatal mortality rate, fetal death rate and neonatal mortality rates have been stable. It is very pleasing to see that there were only 3 fetal deaths in pregnancies beyond 38 weeks in 2008.

10.2 Gestational age and perinatal-related loss

Table 76: Gestational age and perinatal related mortality

	Births		Fetal deaths		Neonatal deaths		Total perinatal related deaths	
	n	%	n	%	FD rate*	n	%	NND rate **	n	%	Perinatal related mortality risk***
20-23 weeks	50	0.6	37	49	4.8	13	38	1000	50	45	6.4
24-27 weeks	70	0.9	12	16	1.6	6	18	103	18	16	2.3
28-31 weeks	133	1.7	9	12	1.2	3	9	24.2	12	11	1.6
32-36 weeks	590	7.6	10	13	1.3	4	12	17.2	14	13	1.8
37-40 weeks	5783	74.6	7	9	0.9	7	21	1.2	14	13	1.8
≥41 weeks	1127	14.5	1	1	0.1	1	3	0.9	2	2	0.3
Total	7753		76		9.8	34		4.4	110		14.2

* Fetal death rate = number of fetal deaths per 1000 babies remaining in utero
** NND rate = number of deaths per 1000 live births in that gestation category
*** Perinatal related death risk = number of perinatal related deaths per 1000 babies remaining in utero

The very low perinatal related death risk in births beyond 41 weeks suggests good clinical management.

10.3 Multiple births and perinatal mortality

Table 77: 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	7429	95.8	64	84.2	8.6	30	88.2	4.0	94	85.5	12.6
Multiple	324	4.2	12	15.8	37.0	4	11.8	12.3	16	14.6	49.3
Total	7753		76		9.8	34		4.4	110		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 78: Relative risk of fetal death, neonatal death and perinatal related mortality by demographic factors among women giving birth at NW 2006-2008

	Total births n=23007	Fetal deaths n=232			Neonatal deaths n=88			Perinatal related deaths n=320		
		n	FD rate*	RR (95% CI)	n	NND rate‡	RR (95% CI)	n	Perinatal related mortality rate†	RR (95%CI)
Maternal Ethnicity										
NZ European	9448	87	9.2	Ref	24	2.6	Ref	111	11.7	Ref
Maori	1932	26	13.5	1.4(0.9-2.3)	24	12.6	4.9(2.8-8.6)	50	25.9	2.2(1.6-3.1)
Pacific	3319	45	13.6	1.5(1.0-2.1)	20	6.1	2.4(1.3-4.3)	65	19.6	1.7(1.2-2.3)
Asian	3867	24	6.2	0.7(0.4-1.1)	9	2.3	0.9(0.4-2.0)	33	8.5	0.7(0.5-1.1)
Indian	1566	18	11.5	1.2(0.8-2.1)	3	1.9	0.8(0.2-2.5)	21	13.4	1.1(0.7-1.8)
Other European	2144	23	10.7	1.2(0.7-1.8)	7	3.3	1.3(0.6-3.0)	30	14.0	1.2(0.8-1.8)
Other	731	9	12.3		1	1.4		10	13.7	
Parity										
Nullipara	11144	129	11.6	1.3(1.0-1.7)	40	3.6	0.9(0.6-1.4)	169	15.2	1.2(1.0-1.5)
Multipara	11863	103	8.7	Ref	48	4.1	Ref	151	12.7	Ref
Maternal Age										
≤25	4017	63	15.7	1.9(1.4-2.6)	28	7.1	1.9(1.2-3.1)	91	22.7	1.9(1.5-2.5)
26-34	11879	99	8.3	Ref	43	3.7	Ref	142	12.0	Ref
≥35	7111	70	9.8	1.2(0.9-1.6)	17	2.4	0.7(0.4-1.2)	87	12.2	1.0(0.8-1.3)
Maternal Smoking										
Currently smoking	1953	40	20.5	2.0(1.4-2.8)	26	13.6	4.4(2.8-7.0)	66	33.8	2.6(1.9-3.3)
No or not smoking in last month	17669	180	10.2	Ref	54	3.1	Ref	234	13.2	Ref
Missing	3385	12	3.5	0.3(0.2-0.6)	8	2.4	0.8(0.4-1.6)	20	5.9	0.4(0.3-0.7)
Maternal BMI										
<19	1105	10	9.0	0.9(0.5-1.8)	3	2.7	1.1(0.3-3.5)	13	11.8	1.0(0.5-1.7)
19-25	11877	115	9.7	Ref	30	2.6	Ref	145	12.2	Ref
26-30	3900	40	10.3	1.1(0.7-1.5)	16	4.1	1.6(0.9-3.0)	56	14.4	1.2(0.9-1.6)
31-35	1799	19	10.6	1.1(0.7-1.8)	15	8.4	3.3(1.8-6.1)	34	18.9	1.5(1.1-2.2)
>35	1415	23	16.3	1.7(1.1-2.6)	7	5.0	2.0(0.9-4.5)	30	21.2	1.7(1.2-2.6)
Missing	2911	25	8.6		17	5.9		42	14.4	
LMC at booking										
Independent MW	8977	70	7.8	1.2(0.8-1.8)	13	1.5	0.7(0.3-1.5)	83	9.2	1.0(0.7-1.5)
Pvt Obstetrician	5483	44	8.0	1.2(0.8-1.9)	10	1.8	0.8(0.3-2.0)	54	9.8	1.1(0.7-1.7)
GP	417	1	2.4	0.4(0-2.6)	1	2.4	1.1(0.1-8.4)	2	4.8	0.5(0.1-2.2)
Domino	1184	10	8.4	1.3(0.6-2.8)	3	2.6	1.1(0.3-4.2)	13	11.0	1.2(0.7-2.3)
Community	4518	30	6.6	Ref	10	2.2	Ref	40	8.9	Ref
Diabetes	771	10	13.0	2.0(1.0-4.0)	5	6.6	2.9(1.0-8.6)	15	19.5	2.2(1.2-4.0)
Medical	1191	53	44.5	6.7(4.3-10.4)	34	29.9	13.4(6.6-27)	87	73.0	8.3(5.7-11.9)
Other DHB	314	6	19.1	2.9(1.2-6.9)	5	16.2	7.3(2.5-21.2)	11	35.0	4.0(2.1-7.6)
Unbooked	152	8	52.6	7.9(3.7-17)	7	48.6	22(8-56)	15	98.7	11(6-20)

* 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

The above table represents demographic characteristics of women with perinatal deaths at National Women's Health for a 3 year period from 2006-8. Pacific and Maori both have significantly increased risks of neonatal death and a tendency 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.

10.5 Lead maternity carer (LMC) and perinatal mortality

Table 79: LMC at booking 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	3168	40.9	24	31.6	7.6	2	5.9	0.6	26	23.6	8.2
Private Obstetrician	1814	23.4	17	22.4	9.4	3	8.8	1.7	20	18.2	11.0
G.P.	128	1.7	0	0.0		1	2.9	7.8	1	0.9	7.8
NW Domino	262	3.4	1	1.3	3.8	0	0.0		1	0.9	3.8
NW Community	1513	19.5	9	11.8	5.9	3	8.8	2.0	12	10.9	7.9
NW Diabetes	298	3.8	1	1.3	3.4	0	0.0		1	0.9	3.4
NW Medical	430	5.5	21	27.6	48.8	22	64.7	53.8	43	39.1	100.0
Other DHB	90	1.2	1	1.3	11.1	1	2.9	11.2	2	1.8	22.2
Unbooked	50	0.6	2	2.6	4.0	2	5.9	41.7	4	3.6	80.0
Total	7753		76		9.8	34		4.4	110		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

As has been found in other studies, unbooked women have very high perinatal mortality (80/1000). Of the 4 deaths in unbooked women, 2 were due to extreme prematurity with birth at 22 and 23 weeks, one was due to hydrops and the fourth was a death with no post-mortem or placental histology where the death was classified as unexplained.

The high rate of deaths in women booked in the Medical Clinic is explained by the high number of fetal abnormalities (42% of deaths), twin to twin transfusion syndrome deaths (30%) and only 1 unexplained death.

10.6 Causes of perinatal-related deaths

Table 80: Fetal and neonatal death by Perinatal Death Classification (PSANZ-PDC) 2008

	Fetal deaths n=76			Neonatal deaths n=34			Total n=110		
	n	%	Rate*	n	%	Rate**	n	%	Rate*
Congenital abnormality	22	28.9	2.8	12	35.3	1.6	34	30.9	4.4
Perinatal infection	2	2.6	0.3	3	8.8	0.4	5	4.5	0.6
Antepartum haemorrhage	10	13.2	1.3	3	8.8	0.4	13	11.8	1.7
Maternal conditions	1	1.3	0.1	2	5.9	0.3	3	2.7	0.4
Hypertension	4	5.3	0.5	0	0.0	0.0	4	3.6	0.5
Specific perinatal conditions	16	21.1	2.1	6	17.6	0.8	22	20.0	2.8
Hypoxic peripartum death	1	1.3	0.1	0	0.0	0.0	1	0.9	0.1
Fetal growth restriction	8	10.5	1.0	1	2.9	0.1	9	8.2	1.2
Spontaneous preterm	5	6.6	0.6	6	17.6	0.8	11	10.0	1.4
Unexplained antepartum death	7	9.2	0.9				7	6.4	0.9
No obstetric antecedent				1	2.9	0.1	1	0.9	0.1

* Rate: per 1000 births (n=7753 in 2008) ** Rate: per 1000 live births (n=7667 in 2008)

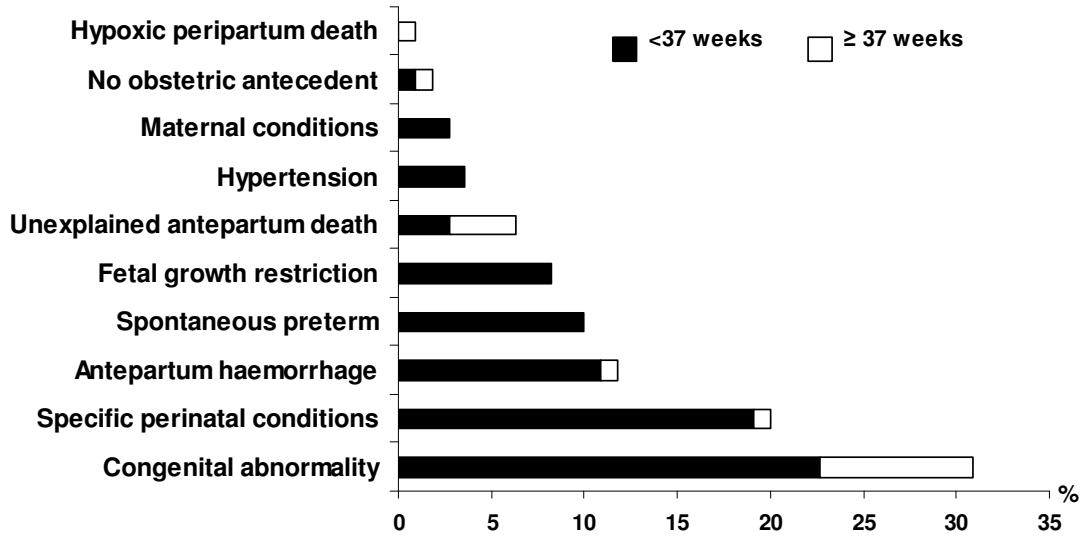


Figure 118: Contribution to perinatal related death by obstetric antecedent cause (PSANZ-PDC) and gestation at birth

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

10.7 Neonatal deaths

Table 81: Neonatal deaths by neonatal classification (PSANZ-NDC) and gestational age

	Total neonatal deaths	< 37 weeks		≥ 37 weeks	
		n	%	n	%
Total	34	26	76.5	8	23.5
Extreme prematurity	11	11	100	0	
Congenital abnormality	12	4	33.3	8	66.7
Infection	9	9	100	0	
Cardio-respiratory disorders	2	2	100	0	

10.8 Necropsy

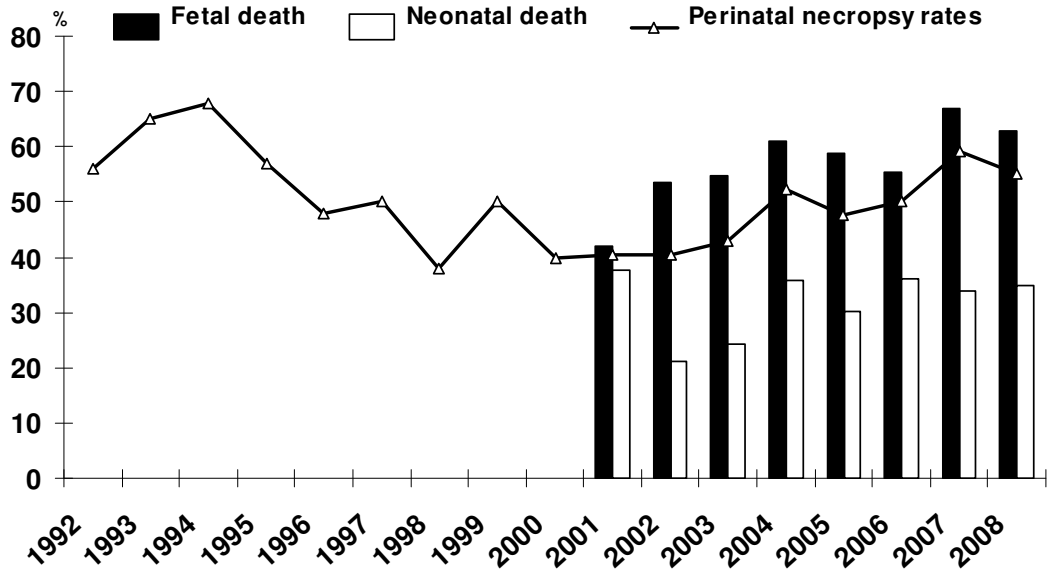


Figure 119: Necropsy rates (1991-2008)

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 and Dr Jeanette MacFarlane. The post-mortem rate remains steady but lower than ideal in a tertiary referral centre.

Small for Gestational Age and Perinatal Death

Fetal growth restriction was the primary perinatal death classification assigned for nine of the 110 deaths in 2008. However, 50 percent of all perinatal deaths in 2008 were found to be growth restricted at birth using customised centiles; 54 percent of fetal deaths and 41 percent of neonatal deaths. After exclusion of deaths due to congenital abnormalities these rates were very similar with 54% of fetal deaths and 36% of neonatal deaths growth restricted.

Chapter 11

GYNAECOLOGY

11 GYNAECOLOGY

This chapter provides data and commentary on Fertility Plus, Recurrent Pregnancy Loss, Early Pregnancy Assessment Unit, Termination of Pregnancy, Hysterectomy and Gynaecologic Oncology Services.

11.1 Fertility PLUS

This section documents the IVF and ICSI clinical outcomes from Fertility PLUS in 2008 and a discussion on recent advancements in the service.

Table 82: Fertility PLUS IVF/ICSI clinical outcomes

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of cycles started	132	125	289	309	306	316	398	440	458	470
Number of cycles stopped						41	41	67	63	49
Percent cycles stopped						13%	10%	15%	12%	10%
NPSU 2000 benchmark for cycles stopped		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
Number of cycles reaching embryo replacement	80	99	189	201	206	237	304	313	364	369
Percent cycles reaching embryo replacement						86%	85%	84%	90%	88%
NPSU 2002 benchmark for replacement				87%	87%	87%	87%	87%	83%*	83%*
Number of clinical pregnancies	23	24	57	65	67	83	96	124	130	129
Clinical pregnancy rate/cycle started						26%	24%	28%	28%	27%
NPSU 2000 benchmark for clinical pregnancy rate/cycle started		24%	24%	24%	24%	24%	24%	24%	24%*	24%
Clinical pregnancy rate/OPU	23%	21%	25%	26%	27%	30%	27%	33%	32%	31%
NPSU 2002 benchmark clinical Pregnancy rate /OPU				26%	26%	26%	26%	26%	27%*	26%*
Clinical pregnancy rate/embryo replacement	29%	24%	30%	32%	33%	35%	32%	40%	36%	35%
Clinical pregnancy rate/embryo replacement (women ≤35yrs with FSH<9)						45%	36%	42%	41%	39%
Clinical pregnancy rate/ER in women having single blastocyst transfer.								56%	52%	41%
NPSU 2002 benchmark clinical pregnancy rate/embryo replacement				31%	31%	31%	31%	31%	32%*	31%*
Twin pregnancy rate						20%	12.5%	9.6%	10%	5%
NPSU 2002 benchmark twin pregnancy rate				≤20%	≤20%	≤20%	≤20%	≤20%	≤12%*	≤10%
Clinical pregnancy rate per thawed embryo replacement										32%
NPSU benchmark for thawed embryo replacements 2007										23%

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

Multiple Pregnancy rate

Since the introduction of our single embryo transfer (SET) policy, Fertility PLUS has achieved a marked reduction in the percentage of pregnancies which result in a multiple birth. It is essential for achieving accreditation of a Fertility Clinic in Australia and New Zealand to be able to show that a policy is in place to reduce the multiple pregnancy risk.

In 2006, almost 30% of Fertility Plus pregnancies were twin pregnancies. By replacing one embryo in good prognosis patients, we reduced that to 12% in 2007.
In 2008, we achieved a further reduction in fresh IVF/ICSI cycles to just 5% twin pregnancies. We have not had any higher order multiple pregnancies for many years.

The down side of replacing just one embryo is that it does reduce the pregnancy rate for a fresh transfer, although extra good quality embryos can be frozen and replaced in an unstimulated cycle. The above table may appear to show a slightly reduced pregnancy rate following transfers, but this is because of the SET policy, which has been very successful in minimising twin births. A more accurate picture of the improvement in culture systems and ART would be to report the implantation rate (IR) of embryos i.e. the percent of embryos replaced that give rise to a pregnancy.

The chance of a pregnancy from a cycle also includes the pregnancies from a thawed embryo. Fertility PLUS has excellent results from thawed embryos. The latest ANZARD results showed that the best 25% of clinics in Australia and New Zealand had thawed embryo rates of >29% per transfer. Our rate was 35% per transfer, which puts us in the top few clinics.

The table also covers all women treated in a particular year, regardless of age and cause of infertility. If a greater number of older women are treated in any given year, one would expect a lower clinical pregnancy rate.

Pre-implantation genetic diagnosis (PGD) update:

In May 2008 we achieved our first clinical pregnancy following PGD. The PGD was done to prevent the transmission of a gene which causes vascular problems and often early death from stroke. An amniocentesis showed that the fetus was unaffected by the mutant gene.

11.2 Recurrent pregnancy loss

Methods

The data presented in this section were extracted from Healthware and relate to registrations with the Recurrent Pregnancy Loss Clinic (RPLC) in 2008 and to completed pregnancies in 2008 among women registered with the RPLC.

Table 83: Demographic details of women referred to the RPLC in 2008

	Women referred in 2008 n=83	
	n	%
Ethnicity		
NZ European	32	38.6
Maori	6	7.2
Pacific	12	14.5
Asian	14	16.9
Other European	15	18.1
Other	4	4.8
Age		
≤30	19	22.9
31-35	30	36.1
36-40	34	41.0
Gravidity		
3	34	41.0
4	16	19.3
5	13	15.7
>5	20	24.1
Parity		
0	49	59.0
1	18	21.7
2+	16	19.3

The Recurrent Pregnancy Loss Clinic is based at Fertility Plus at Greenlane Clinical Centre.

The referral criteria are as follows:

- Three consecutive first trimester pregnancy losses
- Two consecutive second trimester pregnancy losses
- Maternal age under 40 at time of initial referral
- Resident in Auckland, Waitemata or Counties Manukau District Health Board (pregnancy loss does not include termination of pregnancy)

Referral criteria remain unchanged since October 2004.

The service provides:

- A recurrent pregnancy loss clinic supported by a Doctor and a Registered Nurse
- A weekly early pregnancy clinic, supported by a Doctor and a Registered Nurse
- A Pregnancy Loss Counselling service
- Physiotherapy for relaxation techniques, back pain assessment related to pregnancy, and pelvic floor assessment

- Support and monitoring up to the 14th week of pregnancy
- Seven day per week telephone advisory service between 8.30 am and 3.30 pm
- Acute medical assessment for clinical emergencies, seven days per week

Table 84: Demographic details of women referred to the RPLC in 2008 (continued)

	Women referred in 2008 n=83	
	n	%
Smoking		
Currently smoked	15	18.1
Never smoked	52	62.7
Past smoker	16	19.3
BMI		
<19	2	2.4
19-25	25	30.1
26-30	23	27.7
>30	14	16.9
Unknown	19	22.9
Infertility history		
Yes	27	32.5
No	56	67.5
Final diagnosis		
Chromosomal	3	3.6
Structural abnormalities	5	6.0
Thrombophilia	5	6.0
Unexplained	67	80.7
Other	2	2.4
Unknown	1	1.2

Pregnancy outcomes in 2008

During 2008, there were 96 completed pregnancies among 86 women previously registered with the RPLC, including nine women who completed 2 or 3 pregnancies. Among these 96 pregnancies were 55 births (57%), and 38 early pregnancy losses (3 ectopic pregnancies, 2 TOP and 33 miscarriages). Outcome of pregnancy was unknown for 3 pregnancies.

Table 85: Pregnancy outcome by Recurrent Pregnancy Loss Clinic diagnosis (births in 2008)

Diagnosis	N	Birth ≥20 wk n=55		Early pregnancy loss n=38	
		n	%	n	%
Chromosomal	5	4	80.0	1	20.0
Structural Abnormality	5	3	60.0	2	40.0
Thrombophilia	5	3	60.0	2	40.0
Unexplained	76	43	56.6	33	43.4
Unknown/Missing	2	2	100.0	0	

Table 86: Pregnancy outcomes by maternal characteristics (births in 2008 among women registered with the Recurrent Pregnancy Loss Clinic)

	N	Birth ≥20 wks n=55		Early pregnancy loss n=38	
		n	%	n	%
Parity					
0	47	25	53.2	22	46.8
1	37	26	70.2	11	29.7
2+	9	4	44.4	5	55.6
Gravidity					
3	36	15	41.7	21	58.3
4	27	19	70.4	8	29.6
5	11	8	72.7	3	27.3
≥6	19	13	68.4	6	31.6
Maternal age					
≤30	15	8	53.3	7	46.7
31-35	43	28	65.1	15	34.9
36-40	35	19	54.3	16	45.7
BMI					
19-25	44	21	47.7	23	52.3
26-30	16	6	37.5	10	62.5
>30	16	16	100	0	
Missing	17	12	70.6	5	29.4

Summary

- 80% of couples seen in the clinic have a diagnosis of unexplained recurrent pregnancy loss.
- The number of couples with a history of infertility is 32.5%.

11.3 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 are resident in Counties Manukau DHB area, 30% are from within ADHB and 30% are 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 87: Number of terminations

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total number of terminations	5835	5557	5775	5960	5809	5598	5548	5594	5550

Table 88: Number of counselling sessions

	2001	2002	2003	2004	2005	2006	2007	2008
	n	n	n	n	n	n	n	n
Post op counselling	51	36	10	22	35	33	23	25
Pregnancy option counselling	78	90	70	92	89	87	86	99
Declines %	2.0	1.4	1.8	2.6	2.7	3.0	2.1	2.5

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.

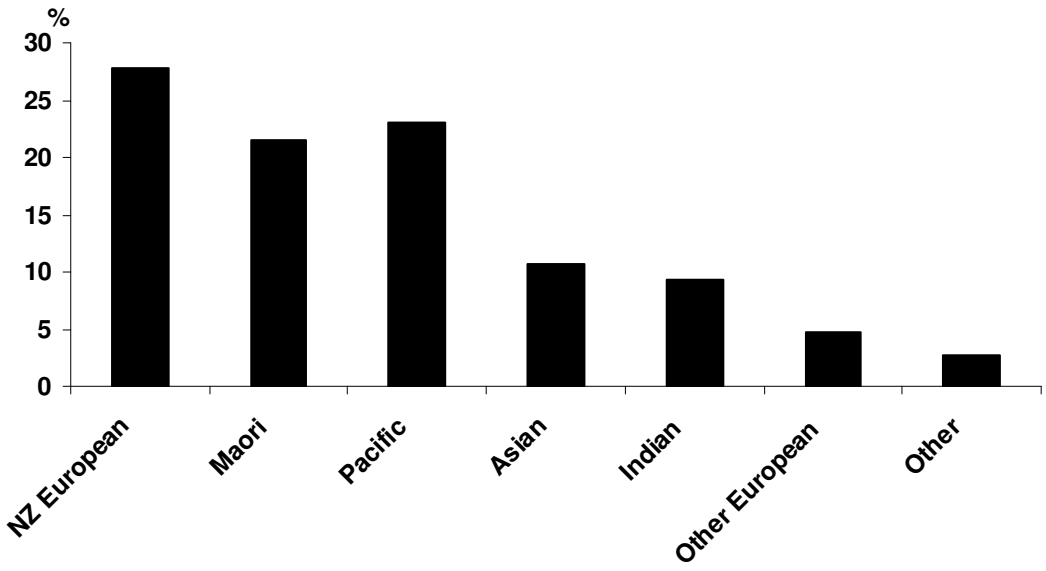


Figure 120: Ethnicity of women having a termination in 2008

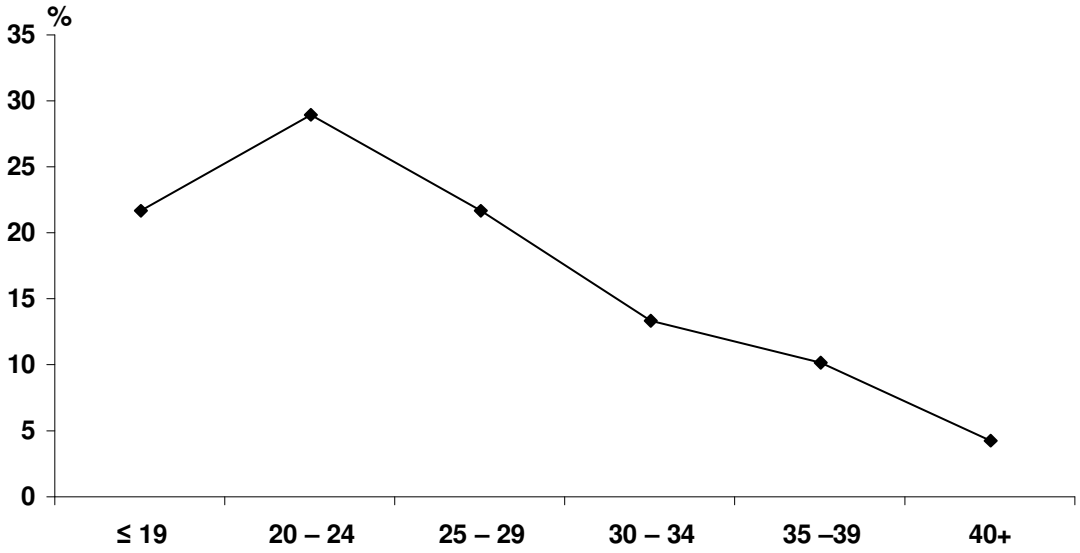


Figure 121: Age of women having a termination in 2008

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 gynaecological surgeries, *excluding those performed by the Gynaecologic Oncology team* (whose data are collected in a separate database and presented in Section 11.8). The data were compared to data from the PIMS Theatre database and from clinical coding in an attempt to improve accuracy.

Table 89: Primary indication for inpatient gynaecology surgery in 2008

	N=1256	
	n	%
Abnormal bleeding, non pregnant	272	21.7
Miscarriage / Termination	269	21.4
Urogynaecology / prolapse	163	13.0
Ovarian cyst	118	9.4
Abscess	69	5.5
Pain, cause unknown	67	5.3
Cancer / Pelvic mass	65	5.2
Endometriosis	61	4.9
Ectopic pregnancy	56	4.5
Infertility	26	2.1
Post operative complication	13	1.0
Sterilisation	13	1.0
Other, please specify	64	5.1

Table 90: Primary surgical procedure for inpatient gynaecology surgery in 2008

	N=1256	
	n*	%
Hysterectomy	128	10.2
Ovarian and /or tubal surgery	210	16.7
Diagnostic laparoscopy	96	7.6
Endometriosis surgery	41	3.3
Other uterine / cervical procedure	39	3.1
Urogynaecology procedure	148	11.8
Hysteroscopy +/- procedure	213	17.0
Evacuation retained products conception	173	13.8
Surgical termination of pregnancy	108	8.6
Vulval procedure	66	5.3
Other	34	2.6

* note this table represents the "primary" procedure only. It does not attempt to account for women who had more than one of these procedures on one occasion.

The most frequent primary indication for inpatient surgery in 2008 was vaginal bleeding (in pregnancy and outside of pregnancy) followed by urogynaecological problems.

Table 91: Surgical approach and timing of surgery among inpatient surgeries in 2008 by PRIMARY surgical procedure

		Timing of surgery			
	Total	Acute		Elective	
	n	n	%	n	%
Total	**1256**	**374**	**29.8**	**882**	**70.2**
Hysterectomy	128	5	4	123	96
Ovarian and /or tubal surgery	210	81	39	129	61
Diagnostic laparoscopy	96	23	24	73	76
Endometriosis surgery	42	2	5	40	95
Other uterine / cervical procedure	39	5	13	34	87
Urogynaecology procedure	148	1	1	147	99
Hysteroscopy +/- procedure*	213	13	6	200	94
Evacuation retained products conception	173	168	97	5	3
Surgical termination of pregnancy	108	4	4	104	96
Vulval procedure	66	58	88	8	12
Other	33	14	42	19	58

*Includes hysteroscopy with procedure and 5 D&C without hysteroscopy
†Excludes one woman who had a radiologically assisted uterine cervical procedure
‡These procedures had multiple approaches

Thirty percent of inpatient surgical procedures are acute procedures. In 13 cases (1%) the planned procedure was not completed.

A significant proportion of women are overweight or obese with BMI >25; although data were unavailable for almost 30% of women admitted for surgery. As demonstrated in the figure below, there is a wide variation in the distribution of obesity by ethnicity. These findings are in keeping with international trends and pose challenges in anaesthetic and perioperative care.

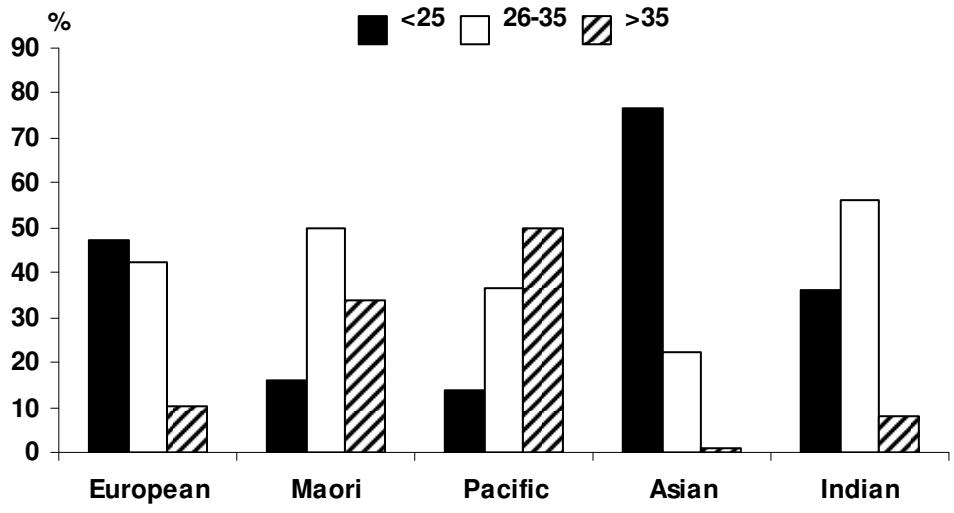


Figure 122: BMI by ethnicity among women having inpatient gynaecology surgery (2008) (missing data removed)

Table 92: Demographic details of women having inpatient gynaecology surgery in 2008

	Surgery in 2008 n=1256	
	n	**%**
Ethnicity		
NZ European	456	36.3
Maori	136	10.8
Pacific	232	18.5
Asian	146	11.6
Indian	101	8.0
Other European	112	8.9
Other	54	4.3
Not stated	19	1.5
Age		
≤20	79	6.3
21-30	256	20.4
31-40	372	29.6
41-50	266	21.2
51-60	136	10.8
>60	147	11.7
BMI		
<19	24	1.9
19-25	325	25.9
26-30	228	18.2
31-35	143	11.4
>35	169	13.5
Missing	367	29.2
Smoking status		
Currently smoking	208	16.6
Past smoker	110	8.8
Never	689	54.9
Unknown	249	19.8
DHB of residence		
Auckland	1005	80.0
Counties Manukau	88	7.0
Waitemata	131	10.4
Other	32	2.5

ACHS Gynaecology Indicators: Injury to major viscous		ACHS 2007	NW 2008
Indicator	**Definition**	**%**	**%**
Numerator	Injury to major viscous, with repair, during or up to 2 weeks post operation	**0.42**	**0.32**
Denominator	Gynaecological surgeries		

Table 93: Postoperative complications among inpatient surgeries in 2008 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	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	Wound haematoma	Admission to DCCM
	N	**n %**	**n %**	**n %**	**n %**	**n %**	**n %**	**n %**	**n %**	**n %**
Total	**1256**	**200 15.9**	**11 0.9**	**77 6.1**	**10 0.8**	**11 0.9**	**116 9.2**	**7 0.6**	**1 0.1**	**6 0.5**
Hysterectomy	128	28 21.9	1 0.8	14 10.9	4 3.1	2 1.6	17 13.3	0		1 0.8
Ovarian and /or tubal surgery	210	36 17.7	4 1.9	16 7.6	1 0.5	1 0.5	17 8.1	3 1.4		1 0.5
Diagnostic laparoscopy†	96	17 17.7	1 1.0	4 4.2	2 2.1	1 1.0	13 13.5			
Endometriosis surgery	42	6 14.3		1 2.4			3 7.1			2 4.8
Other uterine / cervical procedure	39	8 20.5		2 5.1		1 2.6	5 12.8			
Urogynaecology procedure	148	24 16.2	2 1.4	1 0.7	1 0.7	2 1.4	21 14.2	2 1.4		
Hysteroscopy and/or procedure*	213	27 12.7	1 0.5	11 5.2			13 6.1	2 0.9		
ERPOC	173	32 18.5	2 1.2	21 12.1	1 0.6		11 6.4			
STOP	108	4 3.7					4 3.7			
Vulval procedure	66	6 9.1				1 1.5	6 9.1			
Other	33	12 36.4		7 21.2	1 3.0	3 9.1	6 18.2		1 3.0	2 6.1

* Includes hysteroscopy with procedure and 5 D&C without hysteroscopy

† 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.

Significant wound haematoma: Any haematoma requiring admission or drainage or transfusion.

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.

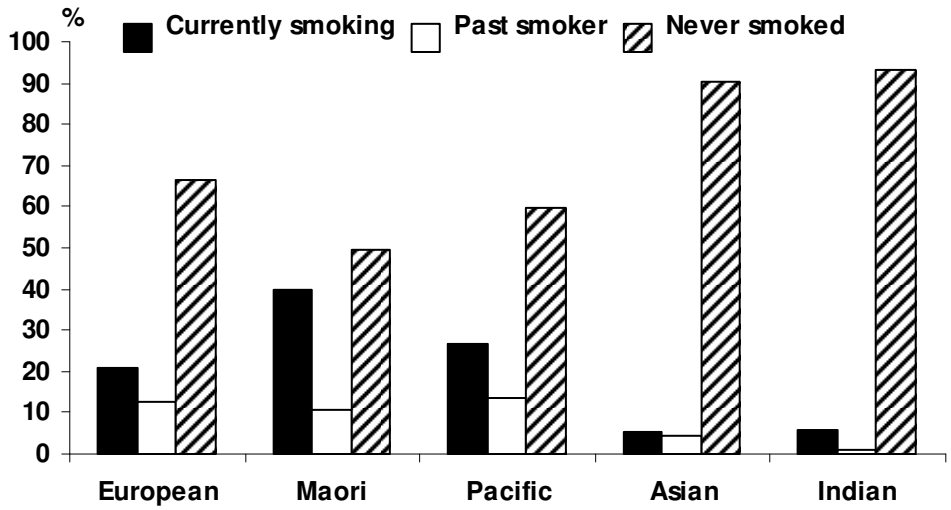


Figure 123: Smoking status by ethnicity among women having Inpatient Gynaecology surgery (2008)

Table 94: Complications of surgery by timing of surgery

	Acute admission n=374		Elective admission n=882	
	n	%	n	%
Any complication	84	22	116	13
Transfusion	55	15	22	3

The overall complication rate was 16% among women having inpatient gynaecologic surgery in 2008. There is a higher overall complication rate among acute cases, and this excess is due to a higher rate of transfusion following acute cases. The complication rate excluding transfusion was 11-12% associated with both acute and elective surgery.

Readmission rates following hysterectomy, urogynaecology, uterine or cervical procedures, and diagnostic laparoscopic procedures are similar at around 13%. It would be useful to review the reason for re-admission, especially for women in the last two categories.

Table 95: Intra operative injury

	n=11	
	n	%
Bladder	2	18
Bowel	3	27
Cervix	1	9
Uterus	4	36
Ovary	1	9

Summary / Implications

Obesity and acute cases are associated with increased complications and so lead to higher demand on current resources. These risk factors need to be monitored and strategies developed to minimise morbidity where possible.

This is the first attempt at capturing the gynaecological data on operative complications including visceral injury, unexpected return to theatre, infective and thrombo-embolic complications. This may not be complete but attempts are being made to refine the database to capture more accurate data for 2009.

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.

Table 96: Primary surgery performed, and timing of surgery among women having inpatient laparoscopic procedures in 2008

	Surgery in 2008 n=314		Acute n=80		Elective n=234	
	n	%	n	%	n	%
Diagnostic laparoscopy	95	30	23	24	72	76
Ovarian cyst procedure	65	21	11	17	54	83
Other tubal surgery	47	15	35	75	12	26
Endometriosis surgery	41	13	2	5	39	95
Oophorectomy and/or salpingectomy	25	8	7	28	18	72
Hysterectomy	19	6			19	100
Tubal ligation	12	4	0		12	100
Urogynaecology procedure	4	1	1	25	3	75
Other uterine procedure	2	1	0		2	100
Cervical procedure	1		0		1	100
Hysteroscopy +/- procedure	1		0		1	100
Other	2	1	1	50	1	50

Table 97: Gynaecology primary indication for surgery by timing of surgery among women having inpatient laparoscopic procedures in 2008

	N=314	Acute admission n=80		Elective admission n=234	
	Total	n	%	n	%
Abnormal bleeding	23	1	4	22	96
Abscess	4	2	50	2	50
Cancer/pelvic mass	10	1	10	9	90
Ectopic pregnancy	43	43	100	0	
Endometriosis	55	2	4	53	96
Infertility	20	0		20	100
Miscarriage /TOP	1	0		1	100
Ovarian cyst	84	12	14	72	86
Pain, cause unknown	50	16	32	34	68
Post operative complications	1	1	100	0	
Sterilisation	11	0		11	100
Urogynaecology / prolapse	5	1	20	4	80
Other	7	1	14	6	86

Among women undergoing gynaecologic laparoscopic surgery in 2008, the most common indications were ovarian cysts, endometriosis and other pain. A similar proportion of laparoscopic procedures are acute (25%) as among operative procedures overall.

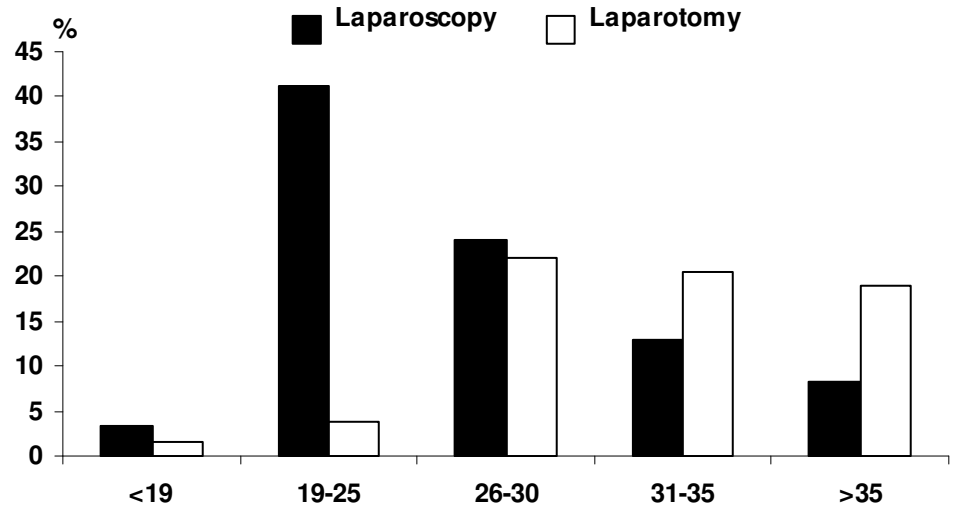


Figure 124: Distribution of BMI by surgical approach

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	NW 2008
Indicator	**Definition**	**%**	**%**
Numerator	Injury to major viscous during laparoscopic procedure, with repair, during or up to 2 weeks post operation	1.08	5/315=1.6
Denominator	Laparoscopic procedures		

Table 98: Complications of inpatient gynaecology laparoscopic surgery

	Total n=314	
	n	**%**
ANY COMPLICATION	43	13.7
Blood transfusion	9	2.9
Intra operative injury*	5	1.6
Failure to complete procedure	2	0.6
Anaesthetic complications	2	0.6
Significant post-operative infection	2	0.6
Wound haematoma	1	0.3
Unplanned return to theatre	2	0.6
Admission to DCCM	2	0.6
Readmission to hospital	28	8.6
Post op complications	18	5.7
Planned re admission	3	1.0
Other	7	2.2
Other significant complications	2[†]	0.6

*One bladder intraoperative injury occurred during a diagnostic laparoscopy; a bowel injury, a laceration to the cervix, removal of an injured and bleeding fallopian tube, and injury to an ovary during 4 separate ovarian/tubal procedures.
[†]One patient had a pulmonary embolus and was admitted to CCU; one had a postop ileus.

11.6 Hysterectomy

Methods

In 2008, hysterectomy data 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. Hysterectomy cases were cross-referenced against PIMS Theatre and against coding data.

Findings

Table 99: Characteristics of women undergoing hysterectomy (excluding gynaecologic oncology) during 2008

	n=150	
	n	%
Age		
21-30	1	1
31-40	23	15
41-50	71	47
51-60	34	23
>60	21	14
Ethnicity		
NZ European	49	33
Maori	9	6
Pacific	21	14
Asian	21	14
Indian	19	13
Other European	21	14
Other	7	5
Not stated	3	2
District Health Board of residence		
Auckland	132	88
Counties Manukau	6	4
Waitemata	10	7
Other	2	1
BMI		
<19	2	1
19-25	51	34
26-30	43	29
31-35	27	18
>35	22	15
Missing	5	3
Smoking		
Currently smoking	23	15
Past smoker	14	9
Never smoked	92	61
Unknown	21	14

Table 100: Surgical details of hysterectomies (excluding gynaecologic oncology) 2008

	n=150	
	n	%
Approach		
Laparotomy	86	57
Total laparoscopic hysterectomy	5	3
Laparoscopic assisted vaginal	12	8
Laparoscopic converted to open	2	1
Vaginal	45	30
Timing of surgery		
Elective	145	97
Acute	5	3
Primary indication for surgery		
Abnormal bleeding, non pregnant	64	43
Cancer /pelvic mass	37	25
Urogynaecology / prolapse	35	23
Pain, cause unknown	5	3
Endometriosis	3	2
Ovarian cyst	2	1
Post operative complication	1	1
Other	3	2
ASA rating		
0	20	13
1	45	30
2	67	45
3	17	11
5	1	1
Length of stay	**Median**	**(IQR)**
All hysterectomies	4	(3-5)
By approach:		
Laparotomy	4	(4-5)
Laparoscopy	3	(3-3)
Vaginal	3	(3-4)

Table 101: Route of hysterectomy among non-malignant hysterectomies (2000-2008)

	2000 n=197		2001 n=170		2002 n=208		2003 n=187		2005 n=161		2006 n=131		2007 n=189		2008 n=150	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Abdominal	102	51.8	90	52.9	113	54.3	100	53.5	84	54	81	61.8	109	57.7	86	57.3
Vaginal	68	34.5	65	38.2	72	34.6	63	33.7	54	34	36	27.5	67	35.4	45	30.0
Laparoscopic	27	13.7	15	8.8	23	11.1	24	12.8	21	13.0	14	10.7	13	6.9	19	12.7

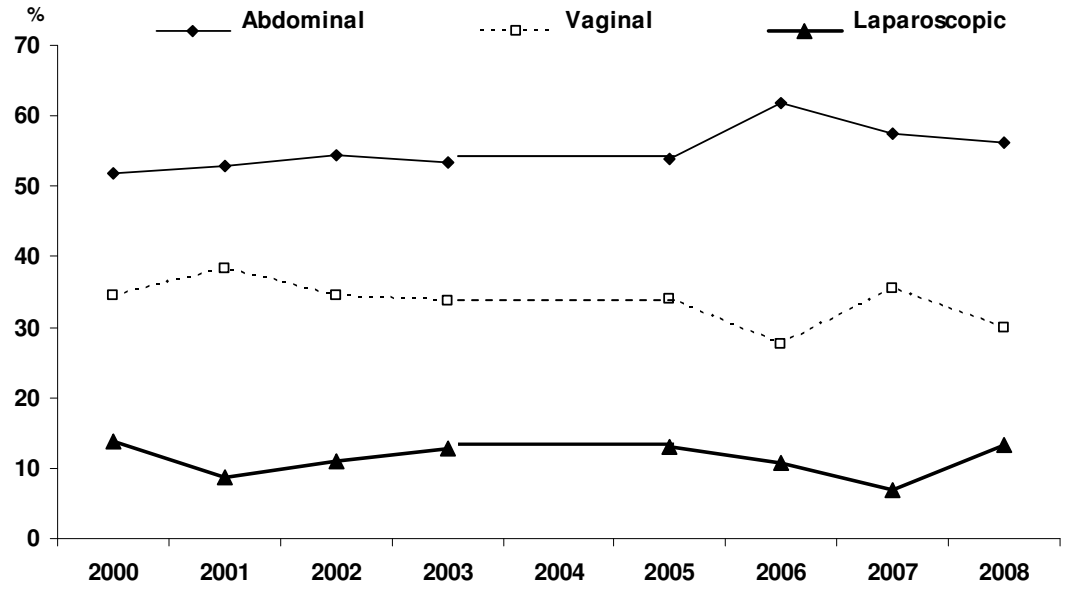


Figure 125: Route of hysterectomy among non malignant hysterectomies (2000-2008)

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

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

Table 102: Complications of surgery among women undergoing hysterectomy (excluding gynaecologic oncology) during 2008

	Total n=150	
	n	**%**
Any complication	**31**	**20.7**
Blood transfusion	15	10.0
Intraoperative injury	1*	0.7
Anaesthetic complications	1	0.7
Significant postoperative infection	5	3.3
Significant haematoma	0	
Other significant complications	1	0.7
Unplanned return to theatre	2	1.3
Admission to DCCM	1	0.7
Readmission to hospital	20	13.3

* bowel injury at abdominal hysterectomy

Of the 15 women requiring transfusions, 8 had a pre-op Hb less than 10g/L, 6 had intra operative blood loss of over 1000ml, and one was transfused for a vault haematoma at 13 days.

Summary / Implications

The total number of non-malignant hysterectomies performed at National Women's has dropped to 150 in 2008. This could be due to other modalities of treatment of heavy menstrual bleeding becoming more available and more widely offered such as Mirena intrauterine system, fibroid embolisation, and third generation endometrial ablation techniques. We need to monitor this trend as it will have implications for surgical training for trainees.

In this report the vaginal hysterectomy rate of 43% (combined vaginal 30% and LAVH and TLH 13%) is commendable. The laparoscopic group includes laparoscopic assisted and total laparoscopic hysterectomy.

The blood transfusion rate is still high for non-malignant hysterectomies and needs to be monitored. Every effort should be made to reduce the need for blood transfusion including correcting anaemia preoperatively.

RANZCOG trainees must be trained and skilled at performing the most appropriate surgical technique. The use of newer technologies such as laparoscopic trainers, simulators and virtual operative scenarios will have to be considered in the training programme as the total number of laparoscopic hysterectomies is small.

11.7 Urogynaecology

Methods

Urogynaecology data 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. The data below include urogynaecology procedures recorded as both the primary procedure at an operation and as "other" procedure at another primary surgery. The database currently does not collect data on type of urogynaecological procedure performed.

Table 103: Demography of women undergoing inpatient urogynaecology surgery during 2008

	n=163	
	n	%
Age		
21-30	2	1
31-40	13	8
41-50	34	21
51-60	41	25
>60	73	45
Ethnicity		
NZ European	107	66
Maori	11	7
Pacific	10	6
Asian	7	4
Indian	7	4
Other European	17	10
Other	2	1
Not stated	2	1
District Health Board of residence		
Auckland	134	82
Counties Manukau	6	4
Waitemata	15	9
Other	8	5
BMI		
<19	1	1
19-25	42	26
26-30	59	36
31-35	37	23
>35	19	12
Missing	5	3
Smoking		
Currently smokes	20	12
Past smoker	15	9
Never smoked	110	67
Unknown	18	11

Thirty-four women had a hysterectomy at the same operation as their urogynaecology procedure.

Median length of stay for inpatient urogynaecology procedures was 2 days with an interquartile range of 1 day to 4 days and a total range of 0 to 20 days.

ACHS Gynaecology Indicators: Injury to MAJOR VISCOUS during a pelvic floor repair procedure		ACHS 2007	NW 2008
Indicator	**Definition**	**%**	**%**
Numerator	Injury to major viscous during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	1.08	2/163=1.23
Denominator	Pelvic floor repair procedures		

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

ACHS Gynaecology Indicators: Injury to BLADDER during a pelvic floor repair procedure		ACHS 2007	NW 2008
Indicator	**Definition**	**%**	**%**
Numerator	Injury to bladder during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	0.40	1/163=0.61
Denominator	Pelvic floor repair procedures		

None of these indicators is significantly different from the ACHS rate.

Table 104: Complications of surgery among women undergoing urogynaecology procedures during 2008

	n=163	
	n	**%**
Total complications	**29**	**18**
Blood transfusion	2	1
Intraoperative injury to internal organs	2	1
Failure to complete planned surgery	2	1
Anaesthetic complications	2	1
Significant postoperative infection	3	2
Significant haematoma	0	
Other significant complications	1	1
Unplanned return to theatre	3	2
Admission to DCCM	0	
Readmission to hospital	26	16

Intraoperative injury to internal organs included one bladder injury and one rectal injury.

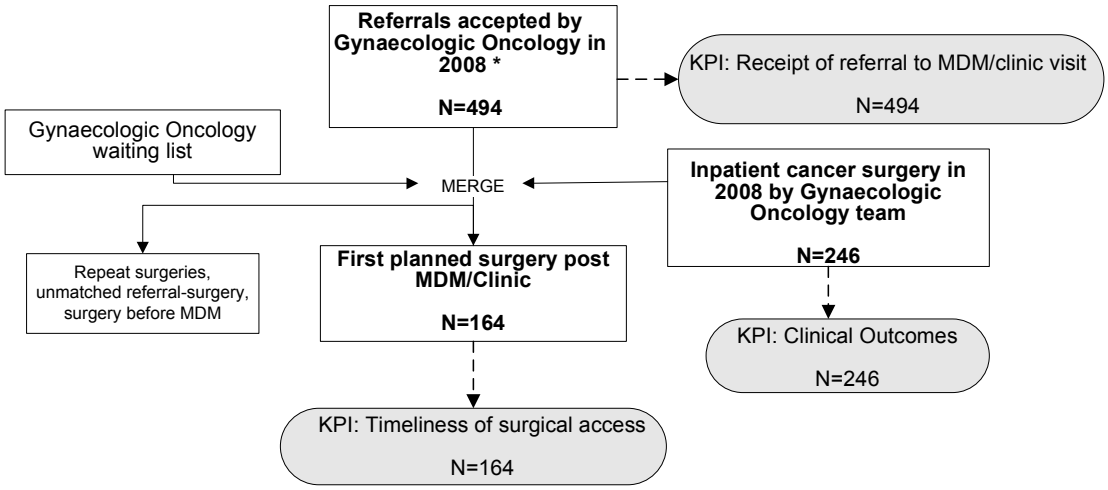
11.8 Gynaecologic oncology surgical services

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.

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 inpatient surgeries among women with a confirmed malignancy. The data on primary site of gynaecologic cancers was not available for all cases in 2008.



* new referrals and referrals for new site or recurrence. Excludes referrals for molar pregnancy and consideration of prophylactic surgery

Figure 126: Use of Gynaecologic Oncology Databases to calculate KPI (inclusions and exclusions).

Findings

Table 105: Time from referral to first multidisciplinary meeting (MDM) or clinic

GOAL: 90% less than 14 days

	2007 n=448 %	Jan-Mar 2008 n=124 %	Apr-Jun 2008 n=107 %	Jul-Sep 2008 n=140 %	Oct-Dec 2008 n=123 %
<14 days	65	43	50	70	68
=14 days	5	5	7	2	4
>14 days	30	52	36	29	26
Missing data			7	3	2

There were 494 new referrals accepted to Gynaecologic Oncology in 2008, excluding cases referred for consideration of prophylactic surgery and for molar pregnancy.

Table 106: Time from MDM or clinic to first surgery (new referrals with surgery in 2008)

GOAL: 90% within 56 days

	2007* n=100 %	Jan-Mar 2008 n=24 %	Apr-Jun 2008 n=49 %	Jul-Sep 2008 n=48 %	Oct-Dec 2008 n=43 %
≤ 56 days	75	75	61	67	81
> 56 days	24	25	35	27	16
Missing data	1		4	6	2

* these data differ from the 2007 report as they are based on surgeries in 2007 (rather than referrals in 2007)

Table 107: Clinical Outcomes among inpatient surgeries in malignant cases by gynaecologic oncology team in 2008

GOAL: Comparative year to year data

	2007 n=174*		2008 n=246*	
Complication	**n**	**%**	**n**	**%**
Transfusion	18	10	19	8
Febrile morbidity	16	9	11	4
Thromboembolism	2	1	2	1
Cardiovascular	2	1	2	1
Gastro-intestinal	2	1	7	3
Return to theatre within 6 weeks	5	3	6	2
Readmission with complications within 6 weeks	10	6	17	7
Death	1	1	2	1

* have assumed missing data are all “no”

This analysis includes the 246 inpatient surgeries performed by the Gynaecologic Oncology team in 2008 where a diagnosis of cancer was confirmed and data were entered into the Gynaecologic Oncology database. The complications data were checked for accuracy against discharge coding data. If no complication was identified after this review, it was assumed that where outcome data were missing no complication occurred.

Summary/Implications

Productivity within the department has increased in 2008, with a 30% increase in surgical activity. It is hoped that the introduction of the MDM-based database at the end of 2008 will lead to more accurate and easily accessible data, to calculate future KPI results.

The department, however, 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%. An audit is currently being undertaken to address this issue, to investigate whether the delay is due to inadequate information from the referring hospital, or inadequate resource within the MDM.

Despite the appointment of an additional 1.0 FTE Gynaecological Oncologist, the time to surgery KPI is still falling short, with patients experiencing an unacceptable wait for surgical treatment. This is due to the lack of additional theatre resource attached to

this appointment, but it is envisaged that this will be resolved with the opening of the 4th Level 9 theatre.

The KPI targets do not cover all of the work within the department, and it has recently been necessary to refer cases requiring prophylactic surgery (which are excluded from this data) and counselling back to the general department, in order to prioritise the surgical resource for cancer cases.

Despite the increase in surgical activity, the complication rates have fallen, with the exception of readmission due to a complication within 6 weeks, and ileus, which have remained stable. It is likely the readmissions are due to wound infection.

It is hoped that an increase in theatre resources within the next year will improve the department's performance and allow productivity to increase within the previously agreed targets. This will also allow the department to expand the services it currently offers.

11.9 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).

Findings:

Table 108: Demographic details of women having an initial colposcopic examination in 2008

	Initial colposcopy in 2008 n=1224	
	n	**%**
Ethnicity		
NZ European	519	42.4
Maori	112	9.2
Pacific	126	10.3
Asian	205	16.8
Indian	37	3.0
Other European	110	9.0
Other	76	6.2
Not stated	39	3.2
Age – mean(sd) (yrs)	34.1(11.4)	
≤20	53	4.3
21-30	545	44.5
31-40	295	24.1
41-50	203	16.6
51-60	97	7.9
>60	31	2.5
Smoking status		
Currently smoking	312	15.0
Not currently smoking	851	41.0
Unknown	911	43.9
DHB of residence		
Auckland	1124	91.8
Counties Manukau	29	2.4
Waitemata	43	3.5
Other	28	2.3

Despite recommendations that screening starts at age 20 we are still getting teenage referrals. The outcome of these referrals has been audited and shows very low rates of high risk disease. Consideration should be given as to whether these referrals should be accepted by the service.

The majority of referrals are within the DHB and the outside DHB referrals probably reflect the expertise at NWH in managing vaginal neoplasia.

Colposcopy Standards: Documentation of adequacy of examination		Standard	NW 2008
	Definition	**%**	**%**
Numerator	Documented that entire squamo-columnar junction is seen and whether the upper limit of any cervical lesion is seen	100%	97%
Denominator	All colposcopic examinations		

Table 109: Documentation of adequacy of colposcopic examination by type of colposcopic visit

	Total N=2074		Follow up visit N=681		Initial visit N=1224		Post treatment N=169	
	n	%	n	%	n	%	n	%
Satisfactory examination	1126	54.3	322	47.2	758	61.9	46	27.2
Unsatisfactory examination	894	43.1	336	49.4	437	35.7	121	71.6
Not documented	54	2.6	23	3.4	29	2.4	2	1.2

Fifty-four percent of colposcopy examinations in 2008 were considered to be adequate (defined as the entire squamocolumnar junction having been seen and the upper limit of any cervical lesion also being seen) and 62% of initial examinations. Whether the examination was adequate was recorded in the database in all but 2.6% of colposcopies (BSSCP Standard 100%).

Table 110: Clinical characteristics of women presenting for initial colposcopy in 2008

	Initial visit N=1224	
	n	%
Referral reason		
Abnormal smear	972	79.4
Irregular bleeding (intermenstrual)	17	1.4
Irregular bleeding (postcoital)	92	7.5
Lesion present	1	0.1
Suspicious cervix	73	6.0
Other referral reason	60	4.9
Not documented	9	0.7
Referral smear cytology		
Normal	196	16.0
Low grade	690	56.4
High grade	251	20.5
Unsatisfactory	16	1.3
Other	15	1.2
Inflammation	7	0.6
Inconclusive	5	0.4
No referral smear	36	2.9
Not documented	8	0.7

Table 111: Histology of biopsies taken at initial examination 2008

	Initial visit biopsies n=607	
	n	%
High grade (includes HSIL, AIS, invasive)	162	26.7
LSIL	95	15.7
Dysplasia NOS	4	0.7
HPV	150	24.7
Condylomata / inflammation	53	8.7
Inconclusive	6	1.0
Normal	137	22.6

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

Table 112: Histologic diagnosis (biopsy at initial colposcopy) by referral smear cytology

Referral smear cytology	Total Colpo-scopies	Histologic diagnosis											
		No biopsy /unknown*		High grade		LSIL		HPV		Condyloma inflammation		Inconclusive		Insufficient sample		Normal	
	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1224**	**617**	**49.8**	**162**	**13.2**	**99**	**8.0**	**150**	**12.3**	**53**	**4.3**	**1**	**0.1**	**5**	**0.4**	**137**	**11.2**
High grade	250	57	23.9	113	45.2	24‡	9.6	28	11.2	7	2.8			1	0.4	18	7.2
Low grade	691	341	49.4	46	6.7	64 φ	9.9	107	15.5	37	5.4	1	0.1	2	0.3	92	13.3
Condyloma inflammation	7	3	42.9			2	28.6			1	14.3					1	14.3
Inconclusive	5	3	60.0	1	20.0			1	20.0								
Other	15	11	73.3	1	6.7	1	6.7			1	6.7					1	6.7
****No referral smear/unknown**	44	36	81.8	1	2.3	2	4.5	3	6.8							2	5.6
Normal	196	151	77.0			6	3.1	11	5.6	5	2.6			2	1.0	21	10.7
Unsatisfactory	16	12	75.0							2	12.5					2	12.5

*Unknown biopsy histology result has been added to no biopsy (n=7)
**Unknown referral smear status has to added to no referral reason (n=8)
‡ Includes 2 with dysplasia NOS
φ Includes 2 with dysplasia NOS

Although the 76% biopsy rate for high grade cytology appears low, the 57 patients without biopsy of the cervix include women with high grade vaginal lesions, those who had a biopsy privately before clinic appointment and some who had no visible lesion at the time of colposcopy. It has been suggested in the literature that random biopsies may pick up disease in the absence of a visible disease, but this is not common practice in our clinic at present.

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

Table 113: Cervical histology findings by colposcopic diagnosis (at initial colposcopy if satisfactory)

Colposopic diagnosis	Total Colpo-scopies	No biopsy**	Histologic diagnosis						
			High grade	LSIL	HPV	Condyloma inflammation	Inconclusive	Insufficient sample	Normal
	n	n %	n %	n %	n %	n %	n %	n %	n %
Total	758	223 29.4	141 18.6	89 11.7	139 18.3	46 6.1	1 0.1	5 0.7	114 15.0
High grade	141	3† 2.1	88 62.4	12 8.5	17 12.1	3 2.1			17 12.1
Low grade	437	82 18.8	50 11.4	74* 16.9	115 26.3	33 7.6	1 0.2	4 0.9	78 17.8
Condyloma inflammation	32	16 50.0	1 3.1		3 9.4	7 21.9			5 15.6
Inconclusive	5	1 20.0	2 40.0	1 20.0	1 20.0				
Other	8	3 37.5			1 12.5	2 25.0			2 25.0
Normal	133	115 86.5		2 1.5	2 1.5	1 0.8		1 0.8	12 9.0

* Includes 3 with dysplasia NOS
**Unknown biopsy histology result has been added to no biopsy (n=4)
† Biopsy confirming HG histology was performed at private colposcopy prior to public referral

Table 114: Histologic diagnosis (biopsy at initial colposcopy) by referral reason

Referral reason	Total Colposcopies	No biopsy /unknown*	Histologic diagnosis						
			High grade	LSIL	HPV	Condyloma inflammation	Inconclusive	Insufficient sample	Normal
	n	n %	n %	n %	n %	n %	n %	n %	n %
Total	1224	617 50.4	162 13.2	99 8.0	150 12.3	53 4.3	1 0.1	5 0.4	137 11.2
Abnormal smear	972	426 43.8	156 16.1	93** 9.6	141 14.5	44 4.5	1 0.1	3 0.3	108 11.1
Irregular bleeding (Intermenstrual)	17	9 52.9	3 17.7			1 5.9			4 23.5
Irregular bleeding (postcoital)	92	67 72.8	1 1.1	3 3.3	3 3.3	3 3.3		2 2.2	13 14.1
Lesion present	1	1 100							
Suspicious cervix	73	54 73.9	1 1.4	3 4.1	5 6.9	4 5.5			6 8.2
Other referral reason	60				1 1.7	1 1.7			6 10.0
Unknown	9		1 11.1						

* Unknown smear histology has been added to no biopsy (n=7) **Includes 4 with dysplasia NOS

Table 115: Treatments 2007-2008

	2007 n=191		2008 n=211	
	n	%	n	%
LLETZ	182	95.3	196	92.9
Cold knife cone	6	3.1	11	5.2
Diathermy	0		2	1.0
Hysterectomy	3	1.6	1	
Laser cone	0		1	

The majority of treatments are LLETZ, which 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. 88% of LLETZ are performed in the clinic and under local anaesthesia.

Post treatment follow up:

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

Table 116: Timing of follow up colposcopy of treatments in 2007

	2007 n=191	
	n	%
≤ 8 months	168	88.0
> 8 months	3	1.6
No follow up	20	10.5

Of the 20 women who did not have a follow up visit, 9 did not attend planned follow up, 4 moved overseas, 4 moved to another area with a plan for follow up there, and 3 women were referred back to their GP for follow up. These women were offered follow up within 8 months. Therefore 98.5% were offered follow up within the required timeframe.

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

*HSIL or LSIL on cytology

Table 117: Post treatment follow up findings (for treatments in 2007)

	2007 n=171	
	n	**%**
Cytology findings at post treatment follow up		
Normal	133	78.2
High grade	7	4.2
Low grade	10	5.9
ASCUS	16	9.4
Unsatisfactory	1	0.6
No smear	3	1.8
Unknown	1	0.6
Histology findings at post treatment follow up		
No biopsy taken	158	92.4
LSIL	2	1.2
HPV	4	2.3
Condyloma/inflammation	1	0.6
Other	1	0.6
Normal	5	2.9

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

*Two of 191 treatments

The standard for adequate treatment is being met and the haemorrhage rate is very small. This means that the majority of patients being treated can be discharged back to primary care after a single follow up visit, and repeated follow up colposcopies are not required.

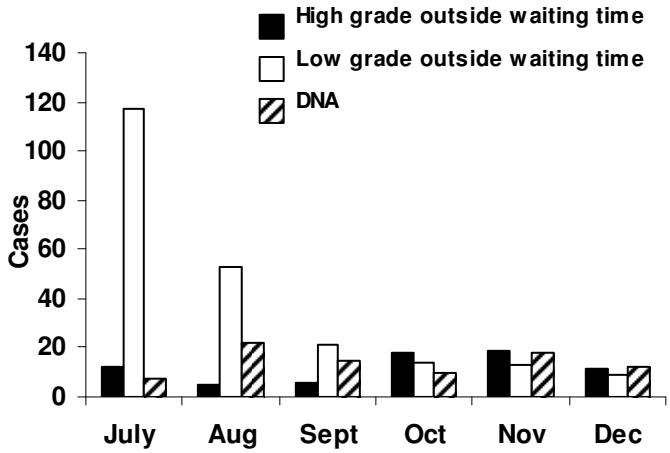


Figure 127: Waiting times for first appointment/ DNA rates(Data from NSU monthly data reports)

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.
The monthly returns to the NSU have shown a sharp decrease in the women outside the recommended waiting time of 6 months for first visit for a low grade referral. The DNA rate directly impacts on the number of appointments available and this is not consistently below the recommended figure of 15%.

Summary

During 2008 improvements have been made in waiting times for low grade (LG) referrals and DNA rates and it is anticipated this improvement will continue in 2009. Strategies have included extra clinics, decreased length of appointments, tighter triage of referrals and increase in nurse non-clinical time, as well as a change in NSU guidelines. Reducing the number of low grade referrals that require follow up appointments will improve access for high grade referrals.

“Suspicious cervix”, and “post coital bleeding” are poor predictors of cancer, or indeed high grade disease, and it may be that the level of urgency placed on these referrals is misplaced. This may reflect the lack of exposure of GPs to colposcopy during their time as junior doctors. Currently house officers do not attend the colposcopy clinic and registrar experience is varied. This is something that should be addressed and a more formal training programme is currently being explored. Currently there is not formal accreditation in colposcopy in New Zealand, and this is being addressed at College level. It is hoped that a more formal training within a defined syllabus will improve the quality of future colposcopists.

Overall, diagnostic colposcopic accuracy is adequate and treatment is effective, with follow up reaching the target of 90% of smears with no dyskaryosis. Complication rates are low and 88% of LLETZ treatments are performed under local anaesthetic in the clinic.

Areas for future improvement should include trying to reduce the DNA rates, which have a large impact on the efficiency of the service. We are also currently exploring methods of reducing the duplication of data via direct entry methods. It is hoped that this would create additional time for administrative staff to streamline clinic processes.

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

APPENDIX 2. SUMMARY STATISTICS

Table 118: Mode of birth (1998-2008)

	1998 n=7531		1999 n=7501		2000 n=7827		2002 n=7775	
	n	%	n	%	n	%	n	%
Spontaneous vertex birth	4670	62	4635	61.8	4650	59.4	4327	55.7
Vaginal breech	75	1	83	1.1	87	1.1	66	0.8
Operative vaginal	926	12.3	945	12.6	1010	12.9	1081	13.9
Caesarean	1860	24.7	1838	24.5	2080	26.6	2301	29.6

	2003 n=7611		2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex birth	4269	56.1	4073	54.4	3845	53.4	3815	52.9	4212	54.7	4218	55.5
Vaginal breech	58	0.8	54	0.7	54	0.7	51	0.7	70	0.9	62	0.8
Operative vaginal	1065	14.0	1171	15.6	1022	14.2	956	13.3	975	12.6	937	12.3
Caesarean	2219	29.1	2193	29.3	2273	31.6	2390	33.1	1428	31.7	2372	31.3

APPENDIX 3. MATERNAL DEMOGRAPHY

Table 119: DHB of domicile of women giving birth at National Women's (2002-2008)

	2002 n=7775		2003 n=7611		2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Auckland DHB	5085	65.4	5007	65.8	5055	67.5	4985	69.3	5100	70.7	5382	69.9	5267	69.4
Waitemata DHB	1180	15.2	1138	15	1068	14.3	982	13.7	994	13.8	1043	13.6	1127	14.9
Counties Manukau DHB	1408	18.1	1368	18	1240	16.6	1089	15.1	994	13.8	1136	14.8	1060	14.0
Northland DHB	29	0.4	38	0.5	37	0.5	31	0.4	40	0.6	41	0.5	40	0.5
North Island Other	68	0.9	42	0.6	72	1.0	93	1.3	69	1.0	73	0.9	71	0.9
South Island	5	0.1	13	0.2	12	0.2	9	0.1	13	0.2	14	0.2	18	0.2
Overseas			5	0.1	7	0.1	5	0.1	2	0.03	6	0.08	6	0.1

Table 120: Maternal age distribution (2000-2008)

		<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	24.6	2519	33.2	1570	20.7	280	3.7

Table 121: Maternal age and parity

	Total	<21 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	3623	325	9.0	558	15.4	1077	29.7	1122	31.0	472	13.0	69	1.9
Multipara	3966	69	1.7	405	10.2	786	19.8	1397	35.2	1098	27.7	211	5.3

Table 122: 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
Number of births	8315	8690	8812	9125	9157	8055	7492*	7501	7827	7491	7194	7212	7695	7589
Nullipara	3700	3649	3814	4037	4018	3591	3263	3262	3455	3597	3522	3499	3752	3623
%	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
Multipara	4615	5041	4998	5088	5139	4464	4229	4239	4372	3894	3672	3713	3943	3966
%	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

*Does not include 39 BBA's

Table 123: Prioritised ethnicity of women giving birth at National Women's
(for information on assigning ethnicity and prioritising ethnicity, see Appendix 1)

	2008 n=7589	
	n	%
NZ European	2995	39.5
Chinese	874	11.5
Maori	641	8.5
Other European	639	8.4
Indian	505	6.7
Samoan	433	5.7
Tongan	349	4.6
Other Asian	302	4.0
Cook Island Maori	137	1.8
South East Asian	128	1.7
Middle Eastern	111	1.5
Niuean	111	1.5
African	95	1.3
European NFD	74	1.0
Fijian	58	0.8
Asian NFD	48	0.6
Latin American/ Hispanic	45	0.6
Other Pacific Island	33	0.4
Tokelauan	11	0.1

Table 124: Maternal ethnicity and age

	Total	NZ European		Maori		Pacific		Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7589	2995	39.5	641	8.5	1132	14.9	1352	17.8	505	6.7	713	9.4	251	3.3
<21	394	84	21.3	127	32.2	142	36.0	13	3.3	5	1.3	11	2.8	12	3.1
21-25	963	178	18.5	1689	17.5	258	26.8	179	18.6	71	7.4	51	5.3	58	6.0
26-30	1863	534	28.7	131	7.0	317	17.0	453	24.3	215	11.5	147	7.9	66	3.5
31-35	2519	1252	49.7	121	4.8	224	8.9	416	16.5	142	5.6	286	11.4	78	3.1
36-40	1570	815	51.9	76	4.8	148	9.4	244	15.5	66	4.2	191	12.2	30	1.9
41+	280	132	47.1	18	6.4	43	15.4	47	16.8	6	2.1	27	9.6	7	2.5

Table 125: Maternal ethnicity and parity

		NZ European n=2995		Maori n=641		Pacific n=1132		Asian n=1352		Indian n=505		Other European n=713		Other n=251	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	3623	1460	48.7	266	41.5	381	33.7	775	57.3	255	50.5	393	55.1	96	38.2
Multipara	3966	1538	51.3	375	58.5	751	66.3	577	42.7	250	49.5	320	44.9	155	61.8

Table 126: Ethnicity of women birthing at NW (2000-2008)

	2000 n=7827		2002 n=7775		2003 n=7611		2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
NZ European	3988	51.0	3362	43.2	3224	42.4	2911	38.9	2802	39.0	3034	42.1	3161	42.1	2995	39.5
Other European	*		642	8.3	608	8.0	548	7.3	674	9.4	682	9.5	695	9.5	713	9.4
Maori	629	8.0	547	7.0	486	6.4	509	6.8	545	7.6	597	8.3	641	8.3	641	8.5
Niuean	138	1.8	108	1.4	108	1.4	106	1.4	111	1.5	81	1.1	105	1.1	111	1.5
Cook Islander	176	2.2	160	2.1	159	2.1	140	1.9	106	1.5	113	1.6	157	1.6	137	1.8
Samoan	546	7.0	531	6.8	439	5.8	425	5.7	339	4.7	384	5.3	372	5.3	433	5.7
Tongan	498	6.4	432	5.6	406	5.3	355	4.7	315	4.4	346	4.8	347	4.8	349	4.6
Fijian	55	0.7	50	0.6	42	0.6	47	0.6	62	0.9	60	0.8	81	0.8	58	0.8
Other Pacific Islands	33	0.4	40	0.5	36	0.5	37	0.5	47	0.7	37	0.5	38	0.5	44	0.6
Chinese	763	9.7	780	10.0	811	10.7	871	11.6	769	10.7	707	9.8	881	9.8	874	11.5
Indian	347	4.4	467	6.0	548	7.2	540	7.2	545	7.6	520	7.2	521	7.2	505	6.7
Other Asian	386	4.9	422	5.4	438	5.8	404	5.4	354	4.9	408	5.7	473	5.7	478	6.3
Other	268	3.4	229	2.9	298	3.9	471	6.3	521	7.2	243	3.4	223	3.4	251	3.3
Not Stated			5	0.1	8	0.1	127	1.7	3		0		0		0	0.0

* All women with ethnicity of Other European are included in the NZ European ethnicity

3.1 Smoking

Table 127: Smoking status at booking by ethnicity and maternal age

		Yes within past month		No or Not in past month		Missing data	
	N	n	%	n	%	n	%
Ethnicity							
NZ European	2995	235	8.7	2459	91.3	301	10.1
Maori	642	208	39.9	314	60.2	119	18.5
Pacific	1131	229	22.6	786	77.4	117	10.3
Asian	1352	90	7.2	1161	92.8	101	7.5
Indian	505	12	2.6	452	97.4	41	8.1
Other European	713	37	5.8	597	94.2	79	11.1
Other	251	12	5.2	219	94.8	20	8.0
Age							
≤ 20	394	123	36.4	215	63.4	56	14.2
21-25	963	197	22.8	667	77.2	99	10.3
26-30	1863	194	11.6	1468	88.4	201	10.8
31-35	2519	168	7.3	2143	92.7	208	8.3
≥ 36	1850	141	8.6	1495	91.4	214	11.6

Table 128: 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		**338**	**864**	**1662**	**2311**	**1636**
NZ European	2694	37.3	25.6	10.2	5.1	7.0
Maori	522	51.0	42.0	38.4	30.2	36.3
Pacific	1015	32.8	28.6	21.3	12.9	19.8
Asian	1251	10.0	9.6	6.6	8.9	3.8
Indian	464	0	6.1	2.6	1.5	1.5
Other European	634	0	15.6	10.0	4.6	2.6
Other	231	9.1	5.8	1.7	4.1	11.1

Table 129: Smoking status at booking by LMC group

	Independent Midwife n=3150		Private Obstetrician n=1759		GP n=128		NW Domino n=260		NW Community n=1474		NW High Risk n=682		Other DHB n=86	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Smoking at booking	362	11.5	46	2.6	19	14.8	37	14.2	255	17.3	92	13.4	7	8.1
No or not smoking in last month	2479	78.6	24	1.4	97	75.8	215	82.6	1149	78.0	496	72.7	11	12.8
Missing data	309	9.8	174	9.9	12	9.3	8	3.1	70	4.7	94	13.7	68	79.1

NW High Risk includes women booked under the Diabetes and Medical teams.
Unbooked women, data missing for 42 out of 49 women

3.2 Lead Maternity Carer (LMC) and maternal demographic characteristics

Table 130: LMC at booking

	n=7589	
	n	%
Independent Midwife	3150	41.5
Private Obstetrician	1759	23.2
General Practitioner	128	1.7
NW Domino	260	3.4
NW Community	1474	19.4
NW Diabetic	293	3.9
NW Medical	389	5.1
Other DHB	86	1.1
Unbooked	50	0.7

Table 131: LMC at booking and maternal age

	Total	<21		21-25		26-30		31-35		36-40		41+	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Total	7589	394	5.2	963	12.7	1863	24.6	2519	33.2	1570	20.7	280	3.7
Independent Midwife	3150	142	4.5	419	13.3	889	28.2	1095	34.8	554	17.6	51	1.6
Private Obstetrician	1759	5	0.3	50	2.8	263	15.0	730	41.5	588	33.4	123	7.0
General Practitioner	128	2	1.6	15	11.7	37	28.9	46	35.9	26	20.3	2	0.6
NW Domino	260	24	9.2	40	15.4	77	29.6	80	30.8	33	12.7	6	2.3
NW Community	1474	166	11.3	313	21.2	390	26.5	345	23.4	213	14.5	47	3.2
NW Diabetes	293	10	3.4	31	10.6	83	28.3	82	28.0	62	21.2	25	8.5
NW Medical	389	28	7.2	60	15.4	85	21.9	116	29.8	80	20.6	20	5.1
Other DHB	86	12	14.0	21	24.4	27	31.4	18	20.9	6	7.0	2	2.3
Unbooked	50	5	10.0	14	28.0	12	24.0	7	14.0	8	16.0	4	8.0

Table 132: LMC at booking and parity

	Total	Nullipara		Multipara	
	N	n	%	n	%
Total					
Independent Midwife	3150	1605	51.0	1545	49.1
Private Obstetrician	1759	892	50.7	867	49.3
General Practitioner	128	63	49.2	65	50.8
NW Domino	260	101	38.9	159	61.1
NW Community	1474	635	43.1	839	56.9
NW Diabetes	293	106	36.2	187	63.8
NW Medical	389	159	40.9	230	59.1
Other DHB	86	45	52.3	41	47.7
Unbooked	50	33	66.0	17	34.0

Table 133: LMC at booking and maternal ethnicity

	Total	NZ European		Maori		Pacific		Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7589	2995	39.5	641	8.5	1131	14.9	1352	17.8	505	6.7	713	9.4	251	3.3
Independent Midwife	3150	1276	40.5	237	7.5	366	11.6	762	24.2	139	4.4	297	9.4	73	2.3
Private Obstetrician	1759	1180	67.1	40	2.3	28	1.6	165	9.4	61	3.5	254	14.4	31	1.8
General Practitioner	128	51	39.8	3	2.3	19	14.8	37	28.9	2	1.6	13	10.2	3	2.3
NW Domino	260	54	20.8	23	8.9	75	28.9	28	10.8	40	15.4	21	8.1	19	7.3
NW Community	1474	211	14.3	195	13.2	463	31.4	273	18.5	172	11.7	67	4.6	93	6.3
NW Diabetes	293	55	18.8	35	12.0	78	26.6	43	14.7	57	19.5	13	4.4	12	4.1
NW Medical	389	137	35.2	58	14.9	74	19.0	42	10.8	27	6.9	37	9.5	14	3.6
Other DHB	86	30	34.9	28	32.6	8	9.3	2	2.3	6	7.0	10	11.6	2	2.3
Unbooked	50	1	2.0	22	44.0	21	42.0	0		1	2.0	1	2.0	4	8.0

3.3 Standard primipara

Table 134: Demographic characteristics of standard and non-standard primipara

	Total	Standard primipara		Non-standard primipara	
	N	n	%	n	%
Total	**3623**	**1282**	**35.4**	**2341**	**64.6**
Age					
< 21	325	44	13.5	281	86.5
21-25	558	266	47.7	292	52.3
26-30	1077	538	50.0	539	50.0
31-35	1122	434	38.7	688	61.3
36-40	472	0		472	100.0
41+	69	0		69	100.0
Ethnicity					
NZ European	1457	442	30.3	1015	69.7
Maori	266	65	24.4	201	75.6
Pacific	381	127	33.3	254	66.7
Asian	775	365	47.1	410	52.9
Indian	255	101	39.6	154	60.4
Other European	393	141	35.9	252	64.1
Other	96	41	42.7	55	57.3
LMC at Booking					
Independent Midwife	1605	665	41.4	940	58.6
Private Obstetrician	892	281	31.5	611	68.5
General Practitioner	63	32	50.8	31	49.2
NW Domino	101	39	38.6	62	61.4
NW Community	635	235	37.0	400	63.0
NW Diabetic	106	0		106	100.0
NW - Medical	159	22	13.8	137	86.2
Other DHB	45	4	8.9	41	91.1
Unbooked	17	4	23.5	13	76.5
Smoking					
Currently smoking	357	103	28.9	254	71.2
No or not smoking in last month	2914	1072	36.8	1842	63.2
Missing	352	107	30.4	245	69.6

APPENDIX 4. ANTENATAL COMPLICATIONS

4.1 Preterm birth

Table 135: Preterm birth and maternal demographic characteristics

	Total	Total preterm birth		Iatrogenic preterm		Spontaneous preterm	
	N	n	%	n	%	n	%
Total	7589	733	9.7	440	5.8	293	3.9
Age							
≤20	394	51	12.9	23	5.8	28	7.1
21-25	963	107	11.1	56	5.8	50	5.2
26-30	1863	178	9.6	88	4.7	71	3.8
31-35	2519	214	8.5	160	6.4	81	3.2
36-40	1570	147	9.4	94	6.0	53	3.4
41+	280	36	12.9	26	9.3	10	3.6
Ethnicity							
NZ European	2995	282	9.4	182	6.1	100	3.3
Maori	641	93	14.5	50	7.8	43	6.7
Pacific	1132	114	10.1	63	5.6	51	4.5
Asian	1352	99	7.3	60	4.4	39	2.9
Indian	505	61	12.1	37	7.3	24	4.8
Other European	713	61	8.6	37	5.2	24	3.4
Other	251	23	9.2	11	4.4	12	4.8
Parity							
Nulliparous	3623	381	10.5	217	6.0	164	4.5
Multiparous	3966	352	8.9	223	5.6	129	3.3
Plurality							
Singleton	7429	627	8.4	367	4.9	260	3.5
Twins	156	102	65.4	72	46.2	30	19.2
Triplets	4	4	100.0	1	25.0	3	75.0
Smoking at booking							
Currently smoking	737	86	11.7	55	7.5	31	4.2
No or not in last month	5494	494	9.0	304	5.5	190	3.5
Unknown	625	153	24.5	81	13.0	72	11.5
BMI							
<19	405	44	10.9	28	6.9	16	4.0
19-25	4180	321	7.7	193	4.6	128	3.1
26-35	1998	181	9.1	123	6.2	58	2.9
>35	534	60	11.2	34	6.4	26	4.9
Missing	472	127	26.9	62	13.1	65	13.8

4.2 Small and Large for Gestational Age Babies

Table 136: Demography of mothers of SGA, LGA, and AGA babies as defined by customised birth centiles (this table includes mothers of twins twice)

	Total Babies	Customised birthweight <10th% (SGA)		Customised birthweight ≥10th% & ≤ 90th % (AGA)		Customised birthweight > 90th % (LGA)	
	N	n	%	n	%	n	%
Total	**7753**	**851**	**11.0**	**6129**	**79.1**	**773**	**10.0**
Maternal Age							
≤ 20	398	54	13.6	311	78.1	33	8.3
21-25	985	125	12.7	770	78.2	90	9.1
26-30	1905	222	11.7	1498	78.6	185	9.7
31-35	2576	235	9.1	2081	80.8	260	10.1
36-40	1603	184	11.5	1242	77.5	177	11.0
>40	286	31	10.8	227	79.4	28	9.8
Ethnicity							
NZ European	3077	275	8.9	2463	80.1	339	11.0
Maori	655	94	14.4	496	75.7	65	9.9
Pacific	1156	149	12.9	909	78.6	98	8.5
Asian	1370	183	13.4	1082	79.0	105	7.7
Indian	513	64	12.5	405	79.0	44	8.6
Other European	723	57	7.9	583	80.6	83	11.5
Other	259	29	11.2	191	73.8	39	15.1
Parity							
Multipara	4049	412	10.2	3197	79.0	440	10.9
Primipara	3704	439	11.9	2932	79.2	333	9.0
Smoking at booking							
Currently smoking	844	147	17.4	635	75.2	62	7.4
No or not smoking in last month	6112	589	9.6	4889	80.0	634	10.4
Unknown	797	115	14.4	605	75.9	77	9.7
BMI							
<19	408	55	13.5	324	79.4	29	7.1
19-25	4268	385	9.0	3441	80.6	442	10.4
26-35	2041	250	12.2	1600	78.4	191	9.4
>35	545	64	11.7	408	74.9	73	13.4
Missing data	491	97	19.8	356	72.5	38	7.7
Plurality							
Singleton	7429	735	9.9	5927	79.8	767	10.3
Multiple	324	116	35.8	202	62.3	6	1.9

4.3 Diabetes

Table 137: Women with diabetes birthing at NW ≥ 20 weeks gestation (1991-2008)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Type I	23	29	19	12	19	15	14	21	26	22	26	21	20	25	31	33	26	31
Type 2	26	19	21	26	32	35	22	23	28	32	37	49	40	47	52	57	54	63
GDM	125	140	197	160	221	245	247	221	181	186	161	251	352	343	304	286	331	457
Total	174	188	237	198	272	295	283	265	235	240	224	321	412	415	387	376	411	551

Table 138: Perinatal deaths (1993 – 2008) among births complicated by diabetes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total number of perinatal related losses	3	1	3	6	3	6	1	2	2	3	6	0	2	8	9	1
Perinatal related loss rate /1000 births	13	5	11	20	11	21	4	8	9	9	9	0	5	21	22	2

Table 139: Demographic characteristics of women with diabetes

		Type I n=31		Type 2 n=63		GDM n=457		No diabetes n=7038	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Age									
≤ 20	394	3	0.8	2	0.5	5	1.3	384	97.5
21-25	963	3	0.3	6	0.6	35	3.6	919	95.4
26-30	1863	9	0.5	14	0.8	125	6.7	1715	92.1
31-35	2519	10	0.4	15	0.6	143	5.7	2351	93.3
36-40	1570	5	0.3	18	1.1	118	7.5	1429	91.0
41+	280	1	0.4	8	2.9	31	11.1	240	85.7
Ethnicity									
NZ European	2995	20	0.7	8	0.3	87	2.9	2880	96.2
Maori	641	1	0.2	9	1.4	40	6.2	591	92.2
Pacific	1132	4	0.4	32	2.8	73	6.4	1023	90.4
Asian	1352	1	0.1	3	0.2	129	9.5	1219	90.2
Indian	505	1	0.2	9	1.8	85	16.8	410	81.2
Other European	713	3	0.4	2	0.3	22	3.1	686	96.2
Other	251	1	0.4	0	0.0	21	8.4	229	91.2
BMI									
<19	405	0	0.0	0	0.0	21	5.2	384	94.8
19-25	4180	13	0.3	3	0.1	169	4.0	3995	95.6
26-35	1998	15	0.8	33	1.7	173	8.7	1777	88.9
>35	534	2	0.4	23	4.3	78	14.6	431	80.7
Missing	472	1	0.2	4	0.8	16	3.4	451	95.6
Smoking									
Smoking at booking	823	3	0.4	14	1.7	44	5.3	762	92.6
No or not in last month	5988	28	0.5	46	0.8	368	6.1	5546	92.6
Missing	778	0		3	0.4	45	5.8	730	93.8
Body weight at booking (kg)									
Median (IQR)		72.8(64.5-85.1)		92.0-(83.7-107)		78.5(65.5-94)			

Table 140: DHB of domicile of women with diabetes birthing at NW (2008)

		Type I n=31		Type 2 n=63		GDM n=457		No diabetes n=7038	
	N	n	%	n	%	n	%	n	%
Auckland	5264	10	32.3	28	44.4	243	53.2	4983	70.8
Waitemata	1127	17	54.8	32	50.8	169	37.0	909	12.9
Counties Manukau	1062	4	12.9	3	4.8	41	9.0	1014	14.4
Other	136	0		0		4	0.9	132	1.9

Table 141: Maternal outcomes among women with diabetes

	Type I n=31		Type 2 n=63		GDM n=438		Postnatally Diagnosed Type 2 n=19		No diabetes n=7038	
	n	%	n	%	n	%	n	%	n	%
Induction of labour	19	61.3	42	66.7	250	57.1	14	73.7	1878	26.7
Mode of birth										
Spontaneous vaginal birth	8	25.8	24	38.1	236	53.9	11	57.9	4001	56.8
Ventouse	4	12.9	4	6.3	26	5.9	1	5.3	601	8.5
Forceps	3	9.7	2	3.2	13	3.0	0		283	4.0
CS emergency	7	22.6	20	31.7	82	18.7	3	15.8	1167	16.6
CS elective	9	29.0	13	20.6	81	18.5	4	21.1	986	14.0
Gestation at birth										
<32 weeks	0		3	4.8	6	1.4	0		213	3.0
<37 weeks	9	29.0	11	17.5	60	13.7	3	15.8	650	9.2
PPH ≥500 mls	20	64.5	37	58.7	191	43.6	8	42.1	2480	35.2
PPH ≥1000 mls	4	12.9	7	11.1	45	10.3	1	5.3	577	8.2
Postpartum transfusion	0		1	1.6	15	3.4	1	5.3	208	3.0

4.4 Antepartum haemorrhage

Table 142: Characteristics of pregnancies complicated by antepartum haemorrhage

		Placenta praevia n=73		Placental abruption n=36		APH uncertain origin n=315		No APH n=7165	
		n	%	n	%	n	%	n	%
Maternal age									
≤20	394	0		2	0.5	34	8.6	358	90.9
21-25	963	0		6	0.6	53	5.5	904	93.9
26-30	1863	15	0.8	8	0.4	71	3.8	1769	95.0
31-35	2519	27	1.1	14	0.6	88	3.5	2390	94.9
36-40	1570	25	1.6	6	0.4	61	3.9	1478	94.1
41+	280	6	2.1	0		8	2.9	266	95.0
Parity									
Nulliparous	3623	33	0.9	20	0.6	153	4.2	3417	94.3
Multip previous CS	1212	16	1.3	3	0.2	50	4.1	1143	94.3
Multip no previous CS	2754	24	0.9	13	0.5	112	4.1	2605	94.6
Smoking status at booking									
Currently smoking	416	6	1.4	8	1.9	57	13.7	367	88.2
No or not in last month	4899	55	1.1	19	0.4	221	4.5	4648	94.9
Unknown	2274	12	0.5	9	0.4	37	1.6	2150	94.5
BMI									
<19	405	7	1.7	2	0.5	11	2.7	385	95.1
19-25	4180	36	0.9	16	0.4	159	3.8	3969	95.0
26-30	1368	12	0.9	4	0.3	59	4.3	1293	94.5
31-35	630	6	1.0	6	1.0	31	4.9	587	93.2
>35	534	2	0.4	2	0.4	27	5.1	503	94.2
Missing data	472	10	2.1	6	1.3	28	5.9	428	90.7
Hypertensive disease									
Gestational hypertension	271	1	0.4	3	1.1	12	4.4	255	94.1
Preeclampsia	186	4	2.2	5	2.7	7	3.8	170	91.4
Chronic hypertension	173	1	0.6	0		11	6.4	161	93.1
Nil	6959	67	1.0	28	0.4	285	4.1	6579	94.5

4.5 Hypertensive disease

Table 143: Demographic characteristics of women with hypertensive disease

		Gestational hypertension		Preeclampsia		Chronic hypertension		Normotensive	
	Total	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Ethnicity									
NZ European	2995	131	4.4	76	2.5	74	2.5	2714	90.6
Maori	641	20	3.1	19	3.0	14	2.2	588	91.7
Pacific	1132	45	4.0	33	2.9	31	2.7	1023	90.4
Asian	1352	28	2.1	20	1.5	20	1.5	1284	95.0
Indian	505	20	4.0	22	4.4	9	1.8	454	89.9
Other European	713	22	3.1	13	1.8	19	2.7	659	92.4
Other	251	5	2.0	3	1.2	6	2.4	237	94.4
Maternal age (nullipara)									
≤20	325	11	3.4	9	2.8	1	0.3	304	93.5
21-25	558	19	3.4	17	3.0	3	0.5	519	93.0
26-30	1077	38	3.5	43	4.0	16	1.5	980	91.0
31-35	1122	61	5.4	36	3.2	16	1.4	1009	89.9
36-40	472	26	5.5	20	4.2	15	3.2	411	87.1
41+	69	5	7.2	2	2.9	2	2.9	60	87.0
Maternal age (multipara)									
≤20	69	0	0.0	1	1.4	2	2.9	66	95.7
21-25	405	7	1.7	5	1.2	7	1.7	386	95.3
26-30	786	14	1.8	14	1.8	15	1.9	743	94.5
31-35	1397	40	2.9	21	1.5	37	2.6	1299	93.0
36-40	1098	39	3.6	13	1.2	46	4.2	1000	91.1
41+	211	11	5.2	5	2.4	13	6.2	182	86.3
Smoking at booking									
Currently smoking	823	30	3.6	17	2.1	18	2.2	758	92.1
No or not in past month	5988	215	3.6	145	2.4	136	2.3	5492	91.7
Unknown	778	26	3.3	24	3.1	19	2.4	709	91.1
BMI									
<19	405	6	1.5	4	1.0	8	2.0	387	95.6
19-25	4180	115	2.8	81	1.9	61	1.5	3923	93.9
26-30	1368	62	4.5	39	2.9	42	3.1	1225	89.5
31-35	630	37	5.9	27	4.3	24	3.8	542	86.0
>35	534	42	7.9	16	3.0	32	6.0	444	83.1
Unknown	472	9	1.9	19	4.0	6	1.3	438	92.8

Table 144: Onset of birth among women with hypertensive disease

	Gestational hypertension n=271		Pre-eclampsia n=186		Chronic hypertension n=173		Normotensive n=6959	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Spontaneous onset of labour	84	31.0	21	11.3	50	28.9	3915	56.3
Induced labour	142	52.4	113	60.8	77	44.5	1871	26.9
CS emergency before onset of labour	13	4.8	33	17.7	16	9.2	161	2.3
CS elective	32	11.8	19	10.2	30	17.3	1012	14.5

4.6 BMI

Table 145: Demographic characteristics and BMI

	Total n=7117	<19 n=405		19-22 n=2494		23-25 n=1686		26-30 n=1368		31-35 n=630		>35 n=534	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity													
NZ European	2866	106	3.7	1157	40.4	819	28.6	534	18.6	161	5.6	89	3.1
Maori	525	11	2.1	94	17.9	105	20.0	142	27.1	96	18.3	77	14.7
Pacific	1024	8	0.8	58	5.7	110	10.7	270	26.4	247	24.1	331	32.3
Asian	1310	203	15.5	671	51.2	262	20.0	138	10.5	26	2.0	10	0.8
Indian	477	34	7.1	153	32.1	113	23.7	131	27.5	38	8.0	8	1.7
Other European	681	34	5.0	290	42.6	202	29.7	103	15.1	35	5.1	17	2.5
Other	234	9	3.9	71	30.3	75	32.1	50	21.4	27	11.5	2	0.9
Age													
≤20	345	21	6.1	77	22.3	80	23.2	82	23.8	52	15.1	33	9.6
21-25	872	80	9.2	242	27.8	160	18.4	178	20.4	113	13.0	99	11.4
26-30	1744	134	7.7	642	36.8	353	20.2	320	18.4	150	8.6	145	8.3
31-35	2406	116	4.8	923	38.4	642	26.7	428	17.8	165	6.9	132	5.5
36-40	1492	49	3.3	526	35.3	397	26.6	307	20.6	110	7.4	103	6.9
>40	258	5	1.9	84	32.6	54	20.9	53	20.5	40	15.5	22	8.5
Parity													
Nullipara	3424	262	7.7	1348	39.4	841	24.6	608	17.8	214	6.3	151	4.4
Multipara	3693	143	3.9	1146	31.0	845	22.9	760	20.6	416	11.3	383	10.4
Smoking status at booking													
Smoking	777	31	7.7	177	7.1	143	8.5	169	12.4	131	20.8	126	23.6
No or not in past month	5871	352	86.9	2137	85.7	1417	84.0	1119	81.8	463	73.5	383	71.7
Missing	469	22	5.4	180	7.2	126	7.5	80	5.8	36	5.7	25	4.7

Table 146: LMC at booking and BMI

	Total n=7117	<19 n=405		19-22 n=2494		23-25 n=1686		26-30 n=1368		31-35 n=630		>35 n=534	
	N	n	%	n	%	n	%	n	%	n	%	n	%
IMW	3047	234	7.7	1131	37.1	767	25.2	546	17.9	222	7.3	147	4.8
Pvt Obstetrician	1737	98	5.6	822	47.3	478	27.5	249	14.3	65	3.7	25	1.4
GP	124	5	4.0	58	46.8	31	25.0	18	14.5	7	5.7	5	4.0
NW Domino	243	7	2.9	66	27.2	39	16.1	60	24.7	35	14.4	36	14.8
NW Community	1357	42	3.1	314	23.1	270	19.9	350	25.8	189	13.9	192	14.2
NW Diabetes	280	7	2.5	33	11.8	32	11.4	74	26.4	59	21.1	75	26.8
NW Medical	312	11	3.5	64	20.5	66	21.2	69	22.1	51	16.4	51	16.4
Other DHB	14	1	7.1	6	42.9	2	14.3	2	14.3	2	14.3	1	7.1
Unbooked	3	0		0		1	33.3	0		0		2	66.6

Table 147:Mode of birth by ethnicity among all nullipara

	Total n=3623	SVB n=1749		Operative vaginal birth n=722		Caesarean n=1152	
	N	n	%	n	%	n	%
Caucasian	1850	765	41.4	405	21.9	680	36.8
Maori	266	172	64.7	34	12.8	60	22.6
Pacific	381	257	67.5	38	10.0	86	22.6
Asian*	1030	506	49.1	231	22.4	293	28.5
Other	96	49	51.0	14	14.6	33	34.4

* includes Indian

Table 148: Mode of birth by ethnicity among nullipara, BMI <19

	Total n=262	SVB n=154		Operative vaginal birth n=47		Caesarean n=61	
	N	n	%	n	%	n	%
Caucasian	74	40	54.1	16	21.6	18	24.3
Maori	7	4	57.1	1	14.3	2	28.6
Pacific	7	6	85.7	0		1	14.3
Asian	167	101	60.5	29	17.4	37	22.2
Other	7	3	42.9	1	14.3	3	42.9

Table 149: Mode of birth by ethnicity among nullipara, BMI 19-22

	Total n=1348	SVB n=636		Operative vaginal birth n=304		Caesarean n=408	
	N	n	%	n	%	n	%
Caucasian	741	313	42.2	162	21.9	266	35.9
Maori	54	36	66.7	9	16.7	9	16.7
Pacific	27	19	70.4	5	18.5	3	11.1
Asian	484	245	50.6	121	25.0	118	24.4
Other	42	23	54.8	7	16.7	12	28.6

Table 150: Mode of birth by ethnicity among nullipara, BMI 23-25

	Total n=841	SVB n=386		Operative vaginal birth n=186		Caesarean n=269	
	N	n	%	n	%	n	%
Caucasian	528	223	42.2	127	24.1	178	33.7
Maori	46	31	67.4	7	15.2	8	17.4
Pacific	56	40	71.4	9	16.1	7	12.5
Asian	184	78	42.4	39	21.2	67	36.4
Other	27	14	51.9	4	14.8	9	33.3

Table 151: Mode of birth by ethnicity among nullipara, BMI 26-30

	Total n=608	SVB n=276		Operative vaginal birth n=115		Caesarean n=217	
	N	n	%	n	%	n	%
Caucasian	308	108	35.1	69	22.4	131	42.5
Maori	56	34	60.7	8	14.3	14	25.0
Pacific	109	74	67.8	11	10.1	24	22.0
Asian	123	55	44.7	26	21.1	42	34.2
Other	12	5	41.7	1	8.3	6	50.0

Table 152: Mode of birth by ethnicity among nullipara, BMI 31-35

	Total n=214	SVB n=107		Operative vaginal birth n=32		Caesarean n=75	
	N	n	%	n	%	n	%
Caucasian	79	29	36.7	15	19.0	35	44.3
Maori	31	22	71.0	2	6.5	7	22.6
Pacific	73	43	58.9	8	11.0	22	30.1
Asian	26	11	42.3	6	23.1	9	34.6
Other	5	2	40.0	1	20.0	2	40.0

Table 153: Mode of birth by ethnicity among nullipara, BMI >35

	Total n=151	SVB n=82		Operative vaginal birth n=16		Caesarean n=53	
	N	n	%	n	%	n	%
Caucasian	47	17	36.2	8	17.0	22	46.8
Maori	24	15	62.5	1	4.2	8	33.3
Pacific	69	48	69.6	3	4.4	18	26.1
Asian*	10	1	10.0	4	40.0	5	50.0
Other	1	1	100	0		0	

Table 154: Pregnancy complications and BMI

	Total n=7117	<19 n=405		19-22 n=2494		23-25 n=1686		26-30 n=1368		31-35 n=630		>35 n=534	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Hypertension													
Chronic hypertension	167	8	2.0	31	1.2	30	1.8	42	3.1	24	3.8	32	6.0
Gestational hypertension	262	6	1.5	53	2.1	62	3.7	62	4.5	37	5.9	42	7.9
Pre eclampsia	167	4	1.0	46	1.8	35	2.1	39	2.9	27	4.3	16	3.0
No hypertension	6521	387	95.6	2364	94.8	1559	92.5	1225	89.6	542	86.0	444	83.2
Diabetes													
GDM	441	21	5.2	91	3.7	78	4.6	100	7.3	73	11.6	78	14.6
Type 1	30	0		7	0.3	6	0.4	10	0.7	5	0.8	2	0.4
Type 2	59	0		1		0	0.1	13	1.0	20	3.2	23	4.3
Non diabetic	6587	384	94.8	2395	96.0	1600	94.9	1245	91.0	532	84.4	431	80.7

Table 155: Postpartum haemorrhage associated with spontaneous vaginal birth by BMI (all parities)

	Total n=3990	<19 n=248		19-22 n=1357		23-25 n=906		26-30 n=748		31-35 n=381		>35 n=350	
	N	n	%	n	%	n	%	n	%	n	%	n	%
PPH ≥ 1000mls	181	8	3.2	49	3.6	36	4.0	35	4.7	19	5.0	34	10.0
PPH ≥ 1500mls	88	5	2.0	30	2.2	16	1.8	9	1.2	11	2.9	17	4.9

Table 156: Postpartum haemorrhage associated with Caesarean section by BMI (all parities including previous caesarean)

	Total n=2221	<19 n=99		19-22 n=751		23-25 n=536		26-30 n=467		31-35 n=206		>35 n=162	
	N	n	%	n	%	n	%	n	%	n	%	n	%
PPH ≥ 1000mls	340	17	17.2	78	10.4	68	12.7	87	18.6	47	22.8	43	26.5
PPH ≥ 1500mls	108	5	5.1	19	2.5	24	4.5	30	6.4	11	5.3	19	11.7

Table 157: Maternal interventions and birth outcomes by BMI

	Total n=7117	<19 n=405		19-22 n=2494		23-25 n=1686		26-30 n=1368		31-35 n=630		>35 n=534	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Onset of birth													
Spontaneous labour	3797	240	59.3	1417	56.8	888	52.7	705	51.5	293	46.5	254	47.6
Induced labour	2095	103	25.4	665	26.7	494	29.3	394	28.8	234	37.1	205	38.4
Emergency CS before labour	189	11	2.7	47	1.9	43	2.6	48	3.5	23	3.7	17	3.2
Elective CS	1036	51	12.6	365	14.6	261	15.5	221	16.2	80	12.7	58	10.9
Mode of birth													
Spontaneous vaginal birth	3990	248	61.2	1357	54.4	906	53.7	748	54.7	381	60.5	350	65.5
Operative vaginal	906	58	14.3	386	15.5	244	14.5	153	11.2	43	6.8	22	4.1
Elective CS	1036	51	12.6	365	14.6	261	15.5	221	16.2	80	12.7	58	10.9
Emergency CS	1185	48	11.9	386	15.5	275	16.3	246	18.0	126	20.0	104	19.5

APPENDIX 5. LABOUR AND BIRTH

5.1 Induction of labour

Table 158: Induction of labour rates (1992-2008) No data available on induction rates for 2001-2003

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

*Does not include 39 BBA's

Table 159: Rates of induction by indication and parity (term births)

	Nullipara n=3242		Multipara n=3614	
	n	**%**	**n**	**%**
Total	1084	29.9	900	24.9
Prolonged latent phase	308	9.5	181	5.0
Post dates	188	5.8	108	3.0
Diabetes	101	3.1	128	3.5
Hypertension	109	3.4	76	2.1
Maternal age	40	1.2	75	2.1
Maternal medical complications	38	1.2	56	1.5
SGA	76	2.3	51	1.4
Term PROM	80	2.5	74	2.0
Decreased liquor volume	55	1.7	34	0.9
Maternal request	8	0.2	18	0.5
Poor obstetric history	5	0.2	12	0.3
Fetal Distress	22	0.7	12	0.3
Pelvic arthropathy	5	0.2	7	0.2
Multiple pregnancy	11	0.3	22	0.6
PPROM	10	0.3	3	0.1
Large for gestational age	4	0.1	5	0.1
IUD/Fetal anomaly	6	0.2	8	0.2
APH	4	0.1	7	0.2
Other	14	0.4	23	0.6

Table 160: Indication for induction by gestation

	Preterm n= 733		Term n=6856	
	n	%	n	%
Total	219	29.9	1984	28.9
Post Dates	0	0.0	296	4.3
Hypertension	24	3.3	185	2.7
Prolonged latent phase	1	0.1	493	7.2
Term PROM	0	0.0	174	2.5
Diabetes	20	2.7	229	3.3
SGA	14	1.9	127	1.9
Maternal Age	0		116	1.7
Maternal Medical Complications	16	2.2	94	1.4
Decreased Liquor Volume	5	0.7	89	1.3
Maternal Request	0	0.0	26	0.4
PPROM	80	10.9	0	
Multiple Pregnancy	6	0.8	19	0.3
Fetal Distress	3	0.4	34	0.5
Poor Obstetric History	1	0.1	17	0.2
Pelvic Arthropathy	0	0.0	12	0.2
IUD/Fetal Anomaly	39	5.3	16	0.2
Other	10	1.4	57	0.8

Table 161: Rates of induction by age and ethnicity among term nullipara and multipara

	Nullipara			Multipara		
	N	n	%	N	n	%
Age						
≤25	771	531	68.9	428	308	72.0
26-30	970	581	59.9	715	445	62.2
31-35	1019	545	53.5	1286	699	54.4
>35	482	177	36.7	1185	491	41.4
Ethnicity						
NZ European	1306	466	35.7	1407	348	24.7
Maori	221	79	35.7	327	87	26.6
Pacific	337	113	33.5	681	188	27.6
Asian	711	197	27.7	542	103	19.0
Indian	222	90	40.5	222	57	25.7
Other European	358	108	30.2	294	72	24.5
Other	87	31	35.6	141	45	31.9

5.2 Outcomes following induction

Table 162: 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=1834		Induced labour n=1084		Spontaneous labour n=1662		Induced labour n=767	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB	1114	60.7	440	40.6	1501	90.3	646	84.2
Forceps	134	7.3	94	8.7	18	1.1	14	1.8
Ventouse	287	15.6	164	15.1	66	4.0	41	5.3
CS emergency	299	16.3	386	35.6	77	4.6	66	8.6
Epidural	1066	58.1	924	85.2	561	33.8	561	73.1

Table 163: Mode of birth at term among nullipara by indication for induction

	Post dates n=188		Hypertension n=109		Term PROM n=93		Prolonged latent phase n=308		Diabetes n=101		SGA n=76		Other n= 209	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	60	31.9	45	41.3	49	52.7	124	40.3	49	48.5	40	52.6	73	34.9
Operative vaginal	53	28.2	28	25.7	14	15.1	71	23.1	23	22.8	16	21.1	53	25.4
CS emergency	75	39.9	36	33.0	30	32.3	113	36.7	29	28.7	20	26.3	83	39.7
Epidural	163	86.7	91	83.5	80	86.0	273	88.6	78	77.2	54	71.1	197	94.3

Table 164: Mode of birth at term among multipara (excluding previous caesarean) women by indication for induction

	Post dates n=92		Diabetes n=103		SGA n=45		Prolonged latent phase n=152		Maternal Age n=72		Hypertension n=63		Other n= 240	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	75	81.5	89	86.4	36	80.0	136	89.5	57	79.2	47	74.6	205	85.4
Operative vaginal	7	7.6	5	4.9	3	6.7	7	4.6	8	11.1	8	12.7	17	7.1
CS emergency	10	10.9	9	8.7	6	13.3	9	5.9	7	9.7	8	12.7	17	7.1
Epidural	39	42.4	41	39.8	28	62.2	81	53.3	36	50.0	39	61.9	140	58.3

Table 165: Gestation at birth among women whose primary indication for induction was 'post dates'

Gestation at birth	Total n=293		Age <35 n=220		Age ≥35 n=73	
	n	%	n	%	n	%
39	2	0.7	1	0.5	1	1.4
40 – 40^{6}	26	8.9	20	9.1	6	8.2
41 – 41^{6}	179	61.1	128	58.2	51	69.9
42 – 42^{6}	86	29.4	71	32.3	15	20.5

5.3 Use of Syntocinon

Table 166: Dilatation at start of syntocinon infusion among labouring women by induction status

	Induced labour n=1604		Spontaneous labour n=1098	
	n	%	n	%
0	81	5.0	0	0.0
1	220	13.7	0	0.0
2	551	34.4	0	0.0
3	363	22.6	235	21.4
4	135	8.4	214	19.5
5	59	3.7	126	11.5
6	17	1.1	94	8.6
7	15	0.9	85	7.7
8	6	0.4	57	5.2
9	15	0.9	64	5.8
10	45	2.8	132	12.0
Missing	97	6.0	91	8.3

5.4 Mode of birth

Table 167: Mode of birth by parity and previous caesarean section status

	Nullipara preterm n=381		Nullipara term n=3242		Multipara no prev CS preterm n=224		Multipara no prev CS term n=2530		Multipara prev CS preterm n=128		Multipara prev CS term n=1084	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	166	43.6	1548	47.7	135	60.3	2141	84.6	21	16.4	207	19.1
Vaginal breech	29	7.6	6	0.2	14	6.3	6	0.2	6	4.7	1	0.1
Operative vaginal birth	43	11.3	679	20.9	4	1.8	139	5.5	3	2.3	69	6.4
Ventouse	23	6.0	451	13.9	2	0.9	107	4.2	2	1.6	51	4.7
Forceps	20	5.2	228	7.0	2	0.9	32	1.3	1	0.8	18	1.7
Caesarean section	143	37.5	1009	31.1	71	31.7	244	9.6	98	76.6	807	74.4
Emergency	112	29.4	727	22.4	54	24.1	157	6.2	52	40.6	177	16.3
Elective	31	8.1	282	8.7	17	7.6	87	3.4	46	35.9	630	58.1

Table 168: Mode of birth by LMC (term nullipara)

	IMW n=1497		Pvt Obstetrician n=799		GP n=60		NW n=867		Other DHB n=8		Unbooked n=11	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	789	52.7	227	28.4	29	48.3	490	56.5	5	62.5	8	72.7
Vaginal breech	4	0.3	0		0		2	0.2				
Forceps	106	7.1	69	8.6	4	6.7	48	5.5	1	12.5		
Ventouse	212	14.2	120	15.0	13	21.7	104	12.0	1	12.5	1	9.1
CS elective	53	3.5	182	22.8	3	5.0	44	5.1				
CS emergency	333	22.2	201	25.2	11	18.3	179	20.7	1	12.5	2	18.2

Table 169: Mode of birth by LMC (standard primipara)

	IMW n=665		Pvt Obstetrician n=281		GP n=32		NW n=296		Other DHB n=4		Unbooked n=4	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	401	60.3	112	39.9	16	50.0	183	61.8	3	75.0	4	100
Forceps	45	6.8	24	8.5	2	6.3	17	5.7	1	25.0		
Ventouse	103	15.5	49	17.4	9	28.1	36	12.2				
CS elective	5	0.8	50	17.8	0		10	3.4				
CS emergency	111	16.7	46	16.4	5	15.6	50	16.9				

Table 170: Mode of birth by LMC (term, multipara, no previous CS)

	IMW n=1184		Pvt Obstetrician n=405		GP n=51		NW n=858		Other DHB n=10		Unbooked n=22	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1034	87.3	296	73.1	41	80.4	741	86.4	9	90.0	20	90.9
Vaginal breech	3	0.3	1	0.2	0		2	0.2				
Forceps	8	0.7	11	2.7	2	3.9	10	1.2			1	4.6
Ventouse	45	3.8	39	9.6	3	5.9	20	2.3				
CS elective	29	2.4	33	8.1	1	2.0	24	2.8				
CS emergency	65	5.5	25	6.2	4	7.8	61	7.1	1	10.0	1	4.6

Table 171: Mode of birth by LMC (term, multipara, previous CS)

	IMW n=280		Pvt Obstetrician n=384		GP n=11		NW n=401		Other DHB n=5		Unbooked n=3	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	70	25.0	31	8.1	4	36.4	101	25.2			1	33.3
Vaginal breech	0		0		0		1	0.3				
Forceps	10	3.6	1	0.3	0		7	1.8	1	20.0		
Ventouse	21	7.5	8	2.1	0		21	5.2				
CS elective	117	41.8	301	78.4	4	36.4	204	50.9	4	80.0		
CS emergency	62	22.1	43	11.2	3	27.3	67	16.7			2	66.7

Table 172: Mode of birth by ethnicity

	NZ European n=2995		Maori n=641		Pacific n=1132		Asian n=1352		Indian n=505		Other European n=713		Other n=251	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1433	47.8	441	68.8	843	74.5	757	56.0	245	48.5	344	48.2	155	61.8
Vaginal breech	23	0.8	7	1.1	13	1.1	7	0.5	3	0.6	7	1.0	2	0.8
Forceps	161	5.4	11	1.7	21	1.9	52	3.8	25	5.0	26	3.6	5	2.0
Ventouse	278	9.3	34	5.3	26	2.3	149	11.0	58	11.5	70	9.8	21	8.4
CS elective	599	20.0	52	8.1	67	5.9	154	11.4	63	12.5	134	18.8	24	9.6
CS emergency	501	16.7	96	15.0	162	14.3	233	17.2	111	22.0	132	18.5	44	17.5

Table 173: Mode of birth by ethnicity (nullipara)

	NZ European n=1457		Maori n=266		Pacific n=381		Asian n=775		Indian n=255		Other European n=393		Other n=96	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	578	39.7	168	63.2	252	66.1	390	50.3	111	43.5	167	42.5	48	50.0
Vaginal breech	15	1.0	4	1.5	5	1.3	4	0.5	1	0.4	5	1.3	1	1.0
Forceps	136	9.3	10	3.8	17	4.5	44	5.7	17	6.7	20	5.1	4	4.2
Ventouse	196	13.5	24	9.0	21	5.5	125	16.1	45	17.6	53	13.5	10	10.4
CS elective	184	12.6	7	2.6	5	1.6	49	6.3	11	4.3	52	13.2	5	5.2
CS emergency	348	23.9	53	19.9	81	21.3	163	21.0	70	27.5	96	24.4	28	29.2

Table 174: Mode of birth by ethnicity (multipara)

	NZ European n=1538		Maori N=375		Pacific n=751		Asian n=577		Indian n=250		Other European n=320		Other n=155	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	855	55.6	273	72.8	591	78.7	367	63.6	134	53.6	177	55.3	107	69.0
Vaginal breech	8	0.5	3	0.8	8	1.1	3	0.5	2	0.8	2	0.6	1	0.6
Forceps	25	1.6	1	0.3	4	0.5	8	1.4	8	3.2	6	1.9	1	0.6
Ventouse	82	5.3	10	2.7	5	0.7	24	4.2	13	5.2	17	5.3	11	7.1
CS elective	415	27.0	45	12.0	62	8.3	105	18.2	52	20.8	82	25.6	19	12.3
CS emergency	153	9.9	43	11.5	81	10.8	70	12.1	41	16.4	36	11.3	16	10.3

Table 175: Mode of birth by maternal age (nullipara)

	≤20 n=325		21-25 n=558		26-30 n=1077		31-35 n=1122		36-40 n=472		41+ n=69	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	239	73.5	358	64.2	526	48.8	434	38.7	144	30.5	13	18.8
Vaginal breech	6	1.8	5	0.9	14	1.3	8	0.7	1	0.2	1	1.4
Forceps	11	3.4	29	5.2	63	5.8	96	8.6	43	9.1	6	8.7
Ventouse	25	7.7	48	8.6	147	13.6	198	17.6	52	11.0	4	5.8
CS elective	4	1.2	21	3.8	63	5.9	124	11.1	81	17.2	20	29.0
CS emergency	40	12.3	97	17.4	264	24.5	262	23.4	151	32.0	25	36.2

Table 176: Mode of birth by maternal age (multipara)

	≤20 n=69		21-25 n=405		26-30 n=786		31-35 n=1397		36-40 n=1098		41+ n=211	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	59	85.5	345	85.2	568	72.3	854	61.1	579	52.7	99	46.9
Vaginal breech	1	1.4	1	0.2	4	0.5	5	0.4	13	1.2	3	1.4
Forceps	0		0		15	1.9	19	1.4	13	1.2	6	2.8
Ventouse	2	2.9	7	1.7	25	3.2	71	5.1	52	4.7	5	2.4
CS elective	1	1.4	22	5.4	90	11.5	288	20.6	309	28.1	70	33.2
CS emergency	6	8.7	30	7.4	84	10.7	160	11.5	132	12.0	28	13.3

5.5 Operative births

Table 177: Primary indication for elective or pre labour emergency caesarean section at term

	Term n=1050	
	n	%
Repeat caesarean	558	53.1
Malpresentation	161	15.3
Maternal request	88	8.4
Obstetric history	26	2.5
Placenta praevia	38	3.6
Maternal medical condition	43	4.1
Maternal age	22	2.1
Fetal distress	7	0.7
SGA	14	1.3
Disproportion	16	1.5
Hypertension	7	0.7
Multiple pregnancy	9	0.9
Diabetes	10	1.0
APH / abruption	6	0.6
Other	45	4.3

Table 178: Indication for in labour emergency caesarean section at term(spontaneous or induced onset of labour) (n=961)

	n=961	
	n	%
Fetal distress	292	30.4
Other fetal indication	69	7.2
Fetal intolerance of augmented labour	81	8.4
Augmentation causes hyper stimulation	11	1.1
Poor uterine response to optimal augmentation	72	7.5
Suboptimal augmentation	16	1.7
Inefficient uterine action, no oxytocin	20	2.1
Efficient uterine action: obstructed labour	371	38.6
Maternal request	10	1.0
Other non medical	19	2.0

Table 179: Indication for elective or pre labour caesarean section at term by LMC (n=1050)

	IMW n=203		Pvt Obstetrician n=539		GP n=8		NW n=294		Other DHB n=5		Unbooked n=1	
	n	%	n	%	n	%	n	%	n	%	n	%
Repeat caesarean	98	48.3	270	50.1	3	37.5	185	62.9	2	40		
Malpresentation	56	27.6	64	11.9	3	37.5	38	12.9				
Maternal request	11	5.4	70	13.0	1	12.5	5	1.7	1	20		
Obstetric history	5	2.5	12	2.2	0		9	3.1				
Placenta praevia	12	5.9	17	3.2	0		8	2.7	1	20		
Maternal medical condition	2	1.0	27	5.0	0		14	4.8				
Maternal age	0		17	3.2	0		4	1.4	1	20		
Fetal distress	2	1.0	2	0.4	0		3	1.0				
SGA	3	1.5	7	1.3	0		4	1.4				
Disproportion	4	2.0	10	1.9	0		2	0.7				
Hypertension	0		4	0.7	0		2	0.7			1	100
Multiple pregnancy	0		5	0.9	1	12.5	3	1.0				
Diabetes	2	1.0	3	0.6	0		5	1.7				
APH / abruption	0		3	0.6	0		3	1.0				
Failed induction	0		1	0.2	0		0					
Cord prolapse	1	0.5	0		0		1	0.3				
Maternal distress	0		1	0.2	0		0					
Tumour	0		0		0		1	0.3				
Other	7	3.4	26	4.8	0		7	2.4				

Table 180: Operative vaginal birth rates 1995-2008

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total births (mothers)	**9125**	**9157**	**8055**	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**
Total operative vaginal births	1120	1156	1051	925	949	1006		1081	1065	1171	1022	956	975	937
Incidence %	12.3	12.6	13.0	12.3	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3
Total nullipara	**4037**	**4018**	**3591**	**3263**	**3262**	**3455**				**3597**	**3522**	**3499**	**3752**	**3623**
Operative vaginal births	850	895	776	704	722	733				875	809	737	772	722
Nulliparous operative vaginal birth rate (%)	21.1	22.3	21.6	21.6	22.1	21.2				24.3	23.0	21.1	20.6	19.9
Total multipara	**5088**	**5139**	**4464**	**4229**	**4239**	**4372**				**3894**	**3672**	**3713**	**3943**	**3966**
Operative vaginal births	270	261	275	221	227	273				296	213	219	203	215
Multiparous operative vaginal birth rate (%)	5.3	5.1	6.2	5.2	5.4	6.2				7.6	5.8	5.9	5.1	5.4

Table 181: Type of operative vaginal birth: (1993-2007)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total births	**9125**	**9157**	**8055**	**7492**	**7501**	**7827**	**7471**	**7755**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**
Total operative vaginal births	1120	1156	1051	925	949	1006		1081	1065	1171	1022	956	975	937
% of all births	12.3	12.6	13.0	12.3	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3
Total forceps alone	795	739	590	464	439	435		391	352	323	234	256	222	301
% of all births	8.7	8.1	7.3	6.2	5.9	5.6		5.0	4.6	4.3	3.3	3.5	2.9	4.0
Kiellands forceps	112	83	73	41	33	21				36	22	33	22	29
% of all births	1.2	0.9	0.9	0.5	0.4	0.3				0.5	0.3	0.5	0.3	0.4
Other forceps	683	656	517	423	406	414				287	212	223	200	272
% of all births	7.5	7.2	6.4	5.6	5.4	5.3				3.8	2.9	3.1	2.6	3.6
Ventouse or forceps /ventouse	325	417	461	461	510	571		690	713	848	788	700	753	677
% of all births	3.6	4.6	5.7	6.1	6.8	7.3		8.9	9.4	11.3	11.0	9.7	9.8	8.9
Ventouse alone					436	516				771	728	639	686	636
% of all births					5.8	6.6				10.3	10.1	8.9	8.9	8.3
Forceps/ ventouse					74	55				77	60	61	67	41
% of all births					1.0	0.7				1.0	0.8	0.8	0.9	0.5

Table 182: Breech birth (1996-2007)
Note no data in 2001-2003

	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008
Total babies born	9612	8270	7721	7679	8054	7679	7384	7379	7875	7753
Total breech births	479	434	400	440	484	421	432	419	449	439
Percent of total births	5.0	5.2	5.2	5.7	6.0	5.5	5.9	5.7	5.7	5.7
Total singleton babies				7329	7609	7303	7007	7050	7518	7427
Total singleton breech				341	363	318	328	328	351	346
Percent of singletons				4.7	4.8	4.4	4.7	4.7	4.7	4.7
Total multiple babies				350	445	376	377	329	357	324
Total multiple breech				99	121	103	104	91	98	93
Percent of multiple births				28.3	27.2	27.4	27.6	27.7	27.5	28.7

Table 183: Mode of birth by type of breech (singletons only)

	Extended leg n=168		Flexed leg n=111		Unspecified n=67		Total breech n= 346	
	n	%	n	%	n	%	n	%
Vaginal breech	22	13.1	15	13.5	8	11.9	45	13.0
Caesarean section								
CS emergency	54	32.1	44	39.6	22	32.8	120	34.7
CS elective	92	54.8	52	46.8	37	55.2	181	52.3

Table 184: Mode of birth by type of breech (multiples only)

	Extended leg n=27		Flexed leg n=26		Unspecified n=40		Total breech n=93	
	n	%	n	%	n	%	n	%
Vaginal breech	9	33.3	6	23.1	7	17.5	22	23.7
Caesarean section								
CS emergency	7	25.9	10	38.5	17	42.5	34	36.6
CS elective	11	40.7	10	38.5	16	40.0	37	39.8

5.6 Analgesia/anaesthesia

Table 185: Epidural use among women with spontaneous and induced labour (2000-2008)

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

Table 186: Analgesic use and maternal age among labouring women

Maternal age (years)	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
≤20	385	168	43.6	215	55.8	119	30.9	0		45	11.7
21-25	905	375	41.4	495	54.7	241	26.6	1	0.1	77	8.5
26-30	1653	899	54.4	805	48.7	405	24.5	10	0.6	145	8.8
31-35	2032	1156	56.9	985	48.5	386	19.0	30	1.5	205	10.1
36-40	1123	609	54.2	480	42.7	201	17.9	19	1.7	75	6.7
41+	175	86	49.1	70	40.0	30	17.1	2	1.1	11	6.3

Table 187: Analgesic use and maternal age among labouring nulliparous women

Maternal age (years)	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	4
≤20	116	75	64.7	61	52.6	40	34.5	0		4	3.5
21-25	257	169	65.8	135	52.5	80	31.1	0		14	5.4
26-30	556	398	71.6	229	41.2	136	24.5	2	0.4	29	5.2
31-35	707	536	75.8	303	42.9	132	18.7	7	1.0	41	5.8
36-40	463	317	68.5	179	38.7	88	19.0	9	1.9	20	4.3
41+	104	55	52.9	40	38.5	20	19.2	1	1.0	5	4.8

Table 188: Analgesic use and LMC type among labouring women

LMC type	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
IMW	2903	1444	49.7	1409	48.5	726	25.0	32	1.1	306	10.5
Pvt Obstetrician	1127	871	77.3	443	39.3	148	13.1	18	1.6	103	9.1
GP	116	65	56.0	58	50.0	20	17.2	3	2.6	13	11.2
NW Domino	237	87	36.7	103	43.5	41	17.3	2	0.8	38	16.0
NW Community	1264	496	39.2	720	57.0	325	25.7	2	0.2	80	6.3
NW Diabetes	224	135	60.3	103	46.0	50	22.3	4	1.8	7	3.1
NW Medical	300	164	54.7	164	54.7	61	20.3	1	0.3	10	3.3
Other DHB	56	22	39.3	33	58.9	7	12.5	0		1	1.8
Unbooked	46	9	19.6	17	37.0	4	8.7	0		0	

Table 189: Analgesic use and LMC type among labouring nulliparous women

LMC type	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
IMW	1535	986	64.2	799	52.1	479	31.2	19	1.2	230	15.0
Pvt Obstetrician	650	554	85.2	275	42.3	114	17.5	14	2.2	75	11.5
GP	57	42	73.7	29	50.9	13	22.8	3	5.3	10	17.5
NW Domino	94	56	59.6	48	51.1	27	28.7	2	2.1	26	27.7
NW Community	596	318	53.4	369	61.9	201	33.7	1	0.2	66	11.1
NW Diabetes	99	77	77.8	44	44.4	28	28.3	1	1.0	4	4.0
NW Medical	128	87	68.0	68	53.1	34	26.6	0		5	3.9
Other DHB	30	15	50.0	18	60.0	5	16.7	0		1	3.3
Unbooked	16	5	31.3	6	37.5	1	6.3	0		0	

Table 190: Analgesic use and ethnicity among labouring women

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
NZ European	2302	1488	64.6	1058	46.0	429	18.6	39	1.7	289	12.6
Maori	572	238	41.6	288	50.3	125	21.9	0		50	8.7
Pacific	1032	323	31.3	466	45.2	197	19.1	0		57	5.5
Asian	1166	550	47.2	639	54.8	357	30.6	6	0.5	56	4.8
Indian	418	235	56.2	237	56.7	116	27.8	1	0.2	24	5.7
Other European	562	355	63.2	259	46.1	106	18.9	14	2.5	73	13.0
Other	221	104	47.1	103	46.6	52	23.5	2	0.9	9	4.1

Table 191: Analgesic use and ethnicity among labouring nulliparous women

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
NZ European	1221	925	75.8	610	50.0	290	23.8	24	2.0	211	17.3
Maori	254	150	59.1	126	49.6	68	26.8	0		33	13.0
Pacific	362	185	51.1	192	53.0	102	28.2	0		42	11.6
Asian	711	422	59.4	395	55.6	254	35.7	4	0.6	48	6.8
Indian	234	161	68.8	128	54.7	75	32.1	1	0.4	17	7.3
Other European	333	236	70.9	157	47.1	82	24.6	11	3.3	59	17.7
Other	90	61	67.8	48	53.3	31	34.4	0		7	7.8

APPENDIX 6. LABOUR and BIRTH OUTCOMES

6.1 Perineal trauma

Table 192: Perineal trauma by mode of birth, parity and LMC at booking among all vaginal births

	Total	Episiotomy		3rd/4th tear		Vaginal wall tear	
	N	n	%	n	%	n	%
Total vaginal births	5217	1069	20.5	160	3.1	257	4.9
Mode of birth							
Normal vaginal	4218	522	12.4	84	2.0	214	5.1
Vaginal breech	62	6	9.7	0		0	
Ventouse	636	303	47.6	45	7.1	29	4.6
Forceps	301	238	79.1	31	10.3	14	4.7
Parity							
Nulliparous	2471	783	31.7	120	4.9	180	7.3
Multiparous	2746	286	10.4	40	1.5	77	2.8
LMC							
Independent Midwife	2442	512	21.0	74	3.0	131	5.4
Private Obstetrician	876	292	33.3	23	2.6	28	3.2
General Practitioner	99	36	36.4	2	2.0	4	4.0
NW Domino	207	20	9.7	8	3.9	9	4.3
NW Community	1090	152	13.9	39	3.6	67	6.1
NW Diabetes	171	26	15.2	9	5.3	6	3.5
NW Medical	245	29	11.8	5	2.0	10	4.1
Other DHB	46	2	4.3	0		1	2.2
Unbooked	41	0		0		1	2.4

Table 193: Episiotomy rates in vaginal births, all gestations by LMC at booking and parity.

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	2471	783	31.7	2746	286	10.4
Independent Midwife	1199	383	31.9	1243	129	10.4
Private Obstetrician	460	209	45.4	416	83	20.0
General Practitioner	47	25	53.2	52	11	21.2
NW Domino	77	17	22.1	130	3	2.3
NW Community	481	110	22.9	609	42	6.9
NW Diabetes	71	19	26.8	100	7	7.0
NW Medical	98	18	18.4	147	11	7.5
Other DHB	24	2	8.3	22	0	
Unbooked	14	0		27	0	

Table 194: Episiotomy rates in spontaneous (non operative) vertex (not breech) birth, all gestations by LMC at booking and parity

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1714	335	19.5	2504	187	7.5
Independent Midwife	852	178	20.9	1151	88	7.6
Private Obstetrician	250	77	30.8	348	56	16.1
General Practitioner	30	11	36.7	47	8	17.0
NW Domino	53	7	13.2	126	1	0.8
NW Community	373	48	12.9	567	25	4.4
NW Diabetes	49	7	14.3	90	4	4.4
NW Medical	75	7	9.3	130	5	3.8
Other DHB	20	0		20	0	
Unbooked	12	0		25	0	

Table 195: 3rd and 4th degree tears in spontaneous (non operative) vertex birth by LMC at booking and parity

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1714	59	3.4	2504	25	1.0
Independent Midwife	852	29	3.4	1151	11	1.0
Private Obstetrician	250	5	2.0	348	4	1.2
GP	30	1	3.3	47	0	0
NW Domino	53	2	3.8	126	1	0.8
NW Community	373	16	4.3	567	4	0.7
NW Diabetes	49	5	10.2	90	3	3.3
NW Medical	75	1	1.3	130	2	1.5
Other DHB	20	0		20	0	
Unbooked	12	0		25	0	

Table 196: Postpartum transfusion rates by recorded blood loss at birth

		Postpartum transfusion n=215	
	Total	n	%
Blood loss <500mls	4822	13	0.3
PPH ≥500- <1000	2102	44	2.1
PPH ≥1000mls	634	158	24.9
Blood loss unknown	31	0	
Manual removal placenta	122	17	13.9

APPENDIX 7. POSTNATAL CARE

7.1 Infant Feeding

Table 197: 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	6636	5254	79.2	304	4.6	871	13.1	207	3.1
Mode of birth									
Spontaneous vaginal	3796	3313	87.3	88	2.3	259	6.8	136	3.6
Operative vaginal	828	680	82.1	27	3.3	106	12.8	15	1.8
Elective CS	991	667	67.3	72	7.3	220	22.2	32	3.2
Emergency CS	1021	594	58.2	117	11.5	286	28.0	24	2.4
LMC at booking									
IMW	2849	2382	83.6	102	3.6	308	10.8	57	2.0
Private Obstetrician	1576	1270	80.6	74	4.7	201	12.8	31	2.0
GP	119	99	83.2	8	6.7	9	7.6	3	2.5
NW Community	1334	1010	75.7	51	3.8	207	15.5	66	4.9
NW Domino	245	197	80.4	15	6.1	28	11.4	5	2.0
NW Medical	205	131	63.9	16	7.8	39	19.0	19	9.3
NW Diabetes	254	128	50.4	36	14.2	74	29.1	16	6.3
Unbooked	38	26	68.4	0		3	7.9	9	23.7
Other DHB	16	11	68.8	2	12.5	2	12.5	1	6.3
Maternal age									
≤ 20	322	257	79.8	14	4.3	31	9.6	20	6.2
21-25	823	659	80.1	21	2.6	105	12.8	38	4.6
26-30	1629	1306	80.2	72	4.4	208	12.8	43	2.6
31-35	2237	1813	81.0	114	5.1	261	11.7	49	2.2
36-40	1383	1055	76.3	67	4.8	216	15.6	45	3.3
41+	242	164	67.8	16	6.6	50	20.7	12	5.0

Table 198: Method of Infant Feeding at Discharge from NW (2003-2008)

	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

Table 199: 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	2629	2224	84.6	123	4.7	225	8.6	57	2.2
Māori	515	389	75.5	25	4.9	56	10.9	45	8.7
Pacific	987	739	74.9	38	3.9	149	15.1	61	6.2
Asian	1228	857	69.8	59	4.8	290	23.6	22	1.8
Indian	431	332	77.0	30	7.0	66	15.3	3	0.7
Other European	628	549	87.4	19	3.0	49	7.8	11	1.8
Other	218	164	75.2	10	4.6	36	16.5	8	3.7
Gestation									
< 37 weeks	236	120	50.8	34	14.4	67	28.4	15	6.4
≥37 weeks	6400	5134	80.2	270	4.2	804	12.6	192	3.0
Weight									
< 2.5 kgs	136	50	36.8	25	18.4	58	42.6	3	2.2
2.5 - 2.9 kgs	998	745	74.6	65	6.5	146	14.6	42	4.2
3.0 - 4.4 kgs	5352	4359	81.4	202	3.8	633	11.8	158	3.0
≥ 4.5 kgs	150	100	66.7	12	8.0	34	22.7	4	2.7
Standard / Non standard Primipara									
Standard	1177	995	84.5	37	3.1	131	11.1	14	1.2
Non standard	1957	1424	72.8	138	7.1	346	17.7	49	2.5

Table 200: Infant feeding on discharge from NW Homecare

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Community	1015	776	76.5	44	4.3	152	15.0	43	4.2
Domino	230	184	80.0	13	5.7	28	12.2	5	2.2
Medical	59	33	55.9	6	10.2	9	15.3	11	18.6
Diabetes	84	44	52.4	13	15.5	21	25.0	6	7.1

7.2 Postnatal Admissions

Table 201: Maternal destination following birth by mode of birth

	NW Wards n=4493		Birthcare n=2551		Home n=526		Other Units n=19	
	n	%	n	%	n	%	n	%
Spontaneous vaginal	1571	35.0	2174	85.2	518	98.5	17	89.5
Operative vaginal	550	12.2	377	14.8	8	1.5	2	10.5
CS Elective	1093	24.3	0		0		0	
CS Emergency	1279	28.5	0		0		0	

Table 202: Maternal destination following birth by LMC at booking

	Total n=7589	NW Wards n=4493		Birthcare n=2551		Home n=526		Other Units n=19	
	N	n	%	n	%	n	%	n	%
Independent Midwife	3150	1463	46.4	1374	43.6	303	9.6	10	0.3
Private Obstetrician	1759	1171	66.6	566	32.2	17	1.0	5	0.3
General Practitioner	128	62	48.4	55	43.0	11	8.6	0	
NW Domino	260	128	49.2	104	40.0	28	10.8	0	
NW Community	1474	894	60.7	422	28.6	157	10.7	1	0.1
NW High Risk	682	648	95.0	26	3.8	5	0.7	3	0.4
Other DHB	86	84	97.7	2	2.3	0		0	
Unbooked	50	43	86.0	2	4.0	5	10.0	0	

Table 203: Maternal destination following birth by ethnicity

	Total	NW Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
NZ European	2995	1759	58.7	1158	38.7	65	2.2	13	0.4
Maori	641	408	63.7	159	24.8	74	11.5	0	
Pacific	1132	661	58.4	299	26.4	171	15.1	1	
Asian	1352	751	55.6	449	33.2	151	11.2	1	
Indian	505	350	69.3	127	25.2	27	5.4	1	
Other European	713	412	57.8	283	39.7	15	2.1	3	0.4
Other	251	152	60.6	76	30.3	23	9.2	0	

Table 204: Postnatal readmission reason by maternal destination following birth

	NW Wards n=304		Birthcare n=126		Home n=23		Other Units n=3	
	n	%	n	%	n	%	n	%
Neonatal admission	52	17.1	33	26.2	7	30.4	0	
Infection	48	15.8	7	5.6	0		0	
Breast	38	12.5	27	21.4	0		2	66.7
Wound	11	3.6	1	0.8	1	4.3	0	
Other	155	60.0	58	46.0	15	65.2	2	66.7

APPENDIX 8. NEWBORN SERVICES

8.1 NICU Occupancy

Table 205: Occupancy (baby-days) for NICU by gestational age

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

Table 206: Occupancy (baby-days) for NICU by birth weight

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

8.2 Admissions to NICU

Table 207: 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	46.6	488	44.2	522	47.5	449	44.7	349	40.5	295	35.8
≥ 37	417	36.1	433	39.2	400	36.4	395	39.3	355	41.2	354	42.9

	2006		2007		2008	
	n	%	n	%	n	%
Total	791		870		822	
20-27	44	5.6	58	6.7	58	7.1
28-31	119	15.0	107	12.3	122	14.8
32-36	331	41.8	377	43.3	331	40.3
≥ 37	297	37.5	328	37.7	311	37.8

Table 208: Live births at National Women's by birthweight (includes BBA)

Birth weight (g)	2008
Total	7671
<500	0
500-749	26
750-999	37
1000-1499	88
1500-1999	138
2000-2499	319
2500-2999	1137
3000-3999	4947
≥4000	979

Table 209: Admissions of inborn babies to NICU by birth weight

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	1154	1104	1098	1004	861	825	791	870	822
<500	0	1	1	0	0	0	0	1	0
500-749	22	23	14	20	11	25	19	19	19
750-999	41	37	37	32	37	34	24	37	37
1000-1249	45	47	47	31	38	47	34	47	35
1250-1499	64	48	56	53	36	42	57	51	52
1500-1999	193	186	193	164	138	120	130	130	135
2000-2499	291	243	256	238	177	170	182	188	180
2500-2999	182	199	184	156	147	119	125	139	118
3000-3999	239	232	221	237	208	215	183	198	121
≥4000	77	88	89	73	69	53	37	60	34

Table 210: Admissions of inborn babies to NICU by gestational age

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

Table 211: Admissions of outborn babies to NICU by gestational age

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

Table 212: Admissions of outborn babies to NICU by birth weight

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

Table 213: 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	
	n	%	n	%	n	%
Total	99		102		117	
20-27	19	19.2	22	21.6	21	18.0
28-31	14	14.1	12	11.8	16	13.7
32-36	23	23.2	18	17.6	27	23.0
≥ 37	43	43.4	50	49.0	53	45.3

8.2.1 Admissions to NICU by domicile of mother

Table 214: 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	1177	96	934	96	833	92	826	92.8	824	84.8	841	89.5
Auckland	515	39	494	40	461	47	441	49	435	48.9	428	44.0	473	56
Counties Manukau	179	13	174	14	162	17	144	16	120	13.5	161	16.6	135	16
Waitemata	558	42	477	39	275	28	217	24	237	26.6	201	20.7	199	24
Northland	28	2.1	32	2.6	36	3.7	32	3.5	34	3.8	34	3.5	34	4
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			13	1.4
Southern Region	6	0.5	13	1.1	7	0.7	8	0.9	12	1.3			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											84	8.6	32	3.4

Table 215: DHB of mothers of all babies admitted to NICU

	2008 n=939				
DHB	**n**	**%**	**DHB**	**n**	**%**
Auckland	473	50.3	**Mid-Central**	5	0.5
Counties Manukau	135	14.4	**Hawkes Bay**	3	0.3
Waitemata	199	21.2	**Capital & Coast**	0	0
Northland	34	3.6	**Nelson Marlborough**	1	0.1
Waikato	10	1.1	**Canterbury**	9	0.9
Bay of Plenty	11	1.2	**South Canterbury**	2	0.2
Hutt	6	0.6	**Otago**	5	0.5
Tairawhiti	2	0.2	**Southland**	2	0.2
Taranaki	1	0.1	**West Coast**	1	0.1
Lakes	3	0.3	**Overseas**		
Wanganui	1	0.1	**Missing**	36	4.1

8.2.3 Admissions to NICU by ethnicity of baby

Table 216: Ethnicity of babies admitted to NICU

	Preterm (<37 weeks) n=575		Term n=364		Total n=939	
	n	%	n	%	n	%
NZ European	225	39.1	142	39.0	367	39.0
Maori	92	16.0	55	15.1	147	15.7
Pacific	100	17.4	55	15.1	155	16.5
Asian	62	10.8	39	10.7	101	10.8
Indian	50	8.7	25	6.9	75	8.0
Other European	29	5.0	31	8.6	60	6.4
Other	16	2.8	16	4.4	32	3.4
Not Stated	1	0.2	1	0.2	2	0.2

8.2.4 Reason for admission to NICU

Table 217: Main reason for admission to NICU

	Preterm N=575		Term N=364		Total N=939	
	n	%	n	%	n	%
Prematurity	371	64.5			371	39.5
Respiratory distress	79	13.7	120	33.0	199	21.2
Congenital abnormality	20	3.5	67	18.4	87	9.3
Hypoglycaemia	11	1.9	25	6.9	36	3.8
Depression at birth	10	1.7	30	8.2	40	4.3
SGA	25	4.4	12	3.3	37	3.9
Other	24	4.2	29	8.0	53	5.6
Cyanotic episode	2	0.4	10	2.8	12	1.3
Suspected infection	5	0.9	16	4.4	21	2.2
Jaundice	4	0.7	15	4.1	19	2.0
Haemolytic disease	1	0.2	4	1.1	5	0.5
Feeding difficulty	5	0.9	5	1.4	10	1.1
Bile stained vomiting			3	0.8	3	0.3
Neurological problem	4	0.7	4	1.1	8	0.9
Neonatal abstinence syndrome			1		1	0.1
Maternal diabetes mellitus	3	0.5			3	
Missing data	11	1.9	23	6.3	34	3.6

8.2.5 Antenatal corticosteroids

Table 218: 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	n	n	n	n	n	n	n	n(%)
Total	136	42	90	121	54	91	148	57	95	134	74	128(96)
<500												
500-749	20	50	95	11	64	91	25	52	100	19	12	18(95)
750-999	32	47	91	37	59	95	34	56	94	24	11	23(96)
1000-1249	31	52	100	38	58	95	47	57	98	34	20	34(100)
1250-1499	53	30	81	35	40	83	42	60	90	57	31	53(93)

Birth weight (g)	2007			2008		
	Any	1-7d	Any	Any	1-7d	Any
	n	n	n(%)	n(%)	n(%)	n(%)
Total	155	85(55)	149(96)	149	80(54)	130(87)
<500	1	1(100)	1(100)	0	0	0
500-749	19	10(53)	16(84)	19	11(58)	15(79)
750-999	37	20(54)	36(97)	38	17(45)	35(92)
1000-1249	47	23(49)	47(100)	38	22(58)	33(87)
1250-1499	51	31(61)	49(96)	54	30(56)	47(87)

Table 219: 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	n	n	n	n	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		
	N	1-7d	Any	Any	1-7d	Any
	n	n	n	n(%)	n(%)	n(%)
Total	165	93	161	189	97(51)	167(88)
<24	5	2	3	0	0	0
24-25	17	9	16	25	9(36)	20(80)
26-27	36	25	36	36	18(50)	31(86)
28-29	47	21	46	45	27(60)	39(87)
30-31	60	36	60	83	43(52)	77(93)

8.3 Care and complications

8.3.1 Infection

Table 220: Organisms causing serious infection in NICU

Organism	Early Infection	Late Infection
Strep agalactiae	0	0
E Coli	2	7
Staph aureus	0	8
Staph epidermidis	0	5
Coagulase negative *staphylococcus*	0	10
Strep viridans	0	0
Enterococcus	0	1
Klebsiella	0	3
Pseudomonas	0	0
Enterobacter	0	2
Bacilus Cereus	0	0
Citrobacter	0	0
Serratia	0	0
Candida	0	2
Listeria	3	0
Strep pneumoniae	1	0
Strep faecalis	0	1

Table 221: Late onset serious infection (Septicaemia and Meningitis)

Gestation (weeks)	Birth Weight (g)	Type	Gestation (weeks)	Birth Weight (g)	Type
23	710	E coli d37	26	725	Coag-neg staph d5
24	710	Staph aureus d39	26	725	Staph aureus d28
24	710	Klebsiella d11	26	920	Staph epidermidis d12
24	660	E coli d9	26	1000	Coag-neg staph d58
24	660	Coag-neg staph d10	26	1000	Coag-neg staph d68
24	660	Staph aureus d92	26	1180	Strep faecalis d37
24	842	Enterobacter d21	27	1050	E coli d50
25	790	Staph aureus d21	27	1050	Staph aureus d53
25	790	Coag-neg staph d79	27	990	Staph aureus d43
25	805	Staph epidermidis d4	28	700	Cog-neg staph d22
25	805	Enterococcus d6	30	1490	E coli d5
25	805	Candida d11	30	930	Coag-neg staph d17
25	830	Klebsiella d12	30	1705	Staph aureus d22
25	720	E coli d4	31	1805	Klebsiella d16
25	964	Enterobacter d19	32	1190	Staph epidermidis d8
25	810	E coli d5	32	1385	Coag-neg staph d20
25	704	Staph aureus d107	34	1750	Coag-neg staph d60
25	704	Strep faecalis d107	34	1750	Coag-neg staph d74
26	958	E coli d17	34	2680	MRSA d10
26	958	E coli d34	35	1960	Staph epidermidis d12
26	805	Staph epidermidis d5	39	2840	Staph epidermidis d18
26	805	Candida d6			

(All septicaemias) CONS = Coagulase negative *Staphylococcus*, GBS = Group B *Streptococcus* or *Strep agalactiae*
St.epi = Staph epidermidis, E coli = Escherichia coli, d=day

8.3.2 Intraventricular haemorrhage

8.3.2.1 Intraventricular haemorrhage (benchmarked with ANZNN)

Table 222: Intraventricular haemorrhage by birth weight

Birth Weight (g)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	149	11	93	18	4	2	2
<500	0	0	0	0	0	0	0
500-749	19	2	8	7	1	0	1
750-999	38	0	29	4	2	2	1
1000-1249	38	5	32	1	0	0	0
1250-1499	54	23	24	6	1	0	0

Comment: The rate of severe IVH in babies born in NW in 2007 was very low. Some outborn babies had severe IVH and these are included in the Newborn Section of the report

Table 223: Intraventricular haemorrhage by gestation

Gestation (weeks)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	189	57	102	21	4	2	3
<24	0	0	0	0	0	0	0
24-25	25	2	12	6	2	1	2
26-27	36	0	29	5	1	1	0
28-29	45	2	35	7	1	0	0
30-31	83	53	26	3	0	0	1

8.3.2.2 Intraventricular haemorrhage (all <1250g babies admitted to NICU)

Table 224: Intraventricular haemorrhage in all <1250g babies admitted to NICU 1985-2008

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

8.3.3 Assisted ventilation

Table 225: High Frequency Oscillatory Ventilation

Gestation (wks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total	%
Total	8/14	7/18	11/20	3/10	12/25	7/9	5/10	15/21	12/15	19/23	15/27	114/192	60
<28	5/7	2/7	4/8	2/5	2/7	4/5	2/6	9/14	6/9	11/14	9/17	56/99	57
28-31	1/2	2/6	-	1/2	1/3	-	-	3/3	2/2	3/4	0/1	13/23	59
32-36	1/2	1/2	2/3	0/2	0/3	-	0/1	0/1	1/1	1/1	3/4	9/20	45
≥37	1/3	2/3	5/9	0/1	9/12	3/4	3/3	3/3	2/2	4/4	3/5	35/49	71

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 226: Inhaled Nitric Oxide (iNO)

Gestation (wks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total	%
Total	11/22	12/21	16/25	11/16	13/24	6/10	7/13	13/16	8/10	26/29	15/18	138/204	66
<28	0/2	3/6	1/3	1/2	0/1	1/2	1/6	2/5	0/1	4/5	3/5	16/38	39
28-31	0/1	0/3	0/2	2/2	1/3	-	-	1/1	1/1	2/3	2/2	9/18	44
32-36	1/5	2/2	2/3	0/3	1/6	1/1	-	3/3	1/1	5/6	2/2	18/32	56
≥37	10/14	7/10	13/17	8/9	11/14	4/7	6/7	7/7	6/7	15/15	8/9	95/116	82

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 227: iNO plus HFOV

Gestation (weeks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total	%
Total	2/5	4/10	8/12	0/4	10/18	3/4	2/6	6/8	3/4	10/12	6/9	54/92	58
<28	0/1	1/4	1/2	0/1	-	-	0/4	2/3	0/1	3/4	2/4	9/24	35
28-31	-	0/2	-	-	1/3	-	-	1/1	-	2/3	-	4/9	44
32-36	1/2	1/1	2/3	0/2	0/3	-	-	0/1	1/1	1/1	2/2	8/16	50
≥37	1/2	2/3	5/7	0/1	9/12	3/4	2/2	3/3	2/2	4/4	2/3	33/43	77

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 10 years.

Table 228: Reason for ventilation and CPAP in term and post-term infants

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
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
Infection	4/2	4/14	5/27	3/31	1/17	3/17	0/15	1/12	2/8	2/10	3/7	-/10
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
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
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
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
Support for surgery												14/8
Other											21/25	6/13
Missing reason											3/2	

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 229: Numbers and survival by gestational age of babies <32 weeks gestation in 2008

Gestation (weeks)	20	21	22	23	24	25	26	27	28	29	30	31
Born alive in NW	2	2	5	4	9	15	17	17	14	32	41	37
Died at birth in NW	2	2	5	4	0	0	0	0	0	1	0	0
Born alive at NW and admitted to NICU	0	0	0	0	9	15	17	13	13	31	39	36
Born alive at NW and survived	0	0	0	0	7	13	15	17	13	29	38	36
Outborn admitted	0	0	0	1	3	7	5	5	2	4	8	2
Outborn survived	0	0	0	0	3	6	4	5	2	4	7	1

8.5 Outcomes

8.5.1 Retinopathy of prematurity

Table 230: 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	127	22	34	49	16	6	0
<500	0	0	0	0	0	0	
500-749	15	0	1	6	5	3	
750-999	32	0	7	13	9	3	
1000-1249	37	5	14	17	1	0	
1250-1499	36	14	11	10	1	0	
1500-1999	7	3	1	3	0	0	

Table 231: 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	127	22	34	49	16	6	0
<24	0	0	0	0	0	0	
24-25	19	0	1	5	9	4	
26-27	32	0	9	17	5	1	
28-29	43	3	19	18	2	1	
30-31	27	15	4	8	0	0	
>31	6	4	1	1	0	0	

8.5.2 Chronic lung disease

Table 232: Chronic lung disease by birth weight (inborn babies <32weeks)

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	143	12	131	8	13	11	32	114	134
<500	0	0	0	0	0	0	0	0	0
500-749	19	3	16	3	6	3	12	63	75
750-999	37	6	31	3	6	2	11	28	35
1000-1249	35	1	34	2	1	3	6	17	18
1250-1499	52	2	50	0	0	3	3	6	6

Table 233: 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	180	12	168	9	13	11	33	107	121
<24	0	0	0	0	0	0	0	0	0
24-25	24	5	19	3	6	3	12	50	63
26-27	34	4	30	4	6	3	13	42	43
28-29	42	2	40	1	1	2	4	10	10
30-31	80	1	79	1	0	3	4	5	5

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 234: 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	157	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		
	N	n	%
Total	149		
<500	0	0	0
500-749	19	2	10
750-999	38	1	3
1000-1249	38	1	3
1250-1499	54	0	0

Table 235: 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	175	3	2	160	4	3	121	4	3	176	6	3	163	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		
	N	n	%
Total	189		
<24	0	0	0
24-25	25	3	12
26-27	36	1	3
28-29	45	0	0
30-31	83	0	0

8.5.4 Patent Ductus Arteriosus

Table 236: 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		
	N	Indo	Ligate	N	Indo n(%)	Ligate n(%)
Total	155	36	2	149		
<500	1	1	0	0	0	0
500-749	19	7	0	19	19(100)	2(11)
750-999	37	17	2	38	37(97)	1(3)
1000-1249	47	8	0	38	35(92)	0
1250-1499	51	3	0	54	52(96)	0

Table 237: 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	6	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		
	N	Indo	Ligate	N	Indo n(%)	Ligate n(%)
Total	165	36	2	189	189	
<24	5	3	1	0	0	0
24-25	17	10	0	25	25(100)	24(96)
26-27	36	19	1	36	36(100)	34(94)
28-29	47	4	0	45	45(100)	42(93)
30-31	60	0	0	83	83(100)	80(96)

8.5.5 Pneumothorax

Table 238: 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		
	N	n	%
<500	0	0	0
500-749	19	2	10
750-999	38	1	2
1000-1249	38	0	0
1250-1499	54	4	7
Total <1500	149	7	5

Table 239: 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	0.6	165	7	4

Gestation (weeks)	2008		
	N	n	%
<24	0	0	0
24-25	25	2	8
26-27	36	1	2
28-29	45	2	4
30-31	83	2	2
Total <32	189	7	3

Table 240: Inborn babies receiving postnatal corticosteroids by birth weight

Birth weight (g)	N	n	%
Total	137	20	15
<500	0	0	0
500-749	17	9	53
750-999	35	10	29
1000-1249	35	0	0
1250-1499	50	1	2

Table 241: Inborn babies receiving postnatal corticosteroids by gestational age

Gestation(weeks)	N	n	%
Total	174		
<24	0	0	0
24-25	21	12	57
26-27	33	7	21
28-29	40	0	0
30-31	80	0	0

8.6 Details of deaths prior to discharge among inborn babies admitted to NICU

Table 242 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
NW Labour and Birthing Suite	24	590	4/7	No	1	Respiratory insufficiency & extreme prematurity
NW Theatre	24	710	5/8	No	45	Necrotising enterocolitis
NW Labour and Birthing Suite	25	810	6/7	No	6	Respiratory insufficiency & severe IVH
NW Theatre	25	830	6/8	Triplet 3	13	Respiratory insufficiency & sepsis
NW Theatre	25	860	8/9	No	63	Necrotising enterocolitis
NW Theatre	25	700	2/3	No	0	Respiratory insufficiency & sepsis
NW Labour and Birthing Suite	26	805	6/8	Twin 1	9	Sepsis
NW Theatre	26	760	6/9	No	6	Pulmonary haemorrhage
NW Theatre	26	1060	7/9	No	35	Necrotising enterocolitis
NW Theatre	26	600	4/10	No	34	Chronic lung disease
NW Theatre	29	1300	0/0	No	0	Asphyxia
NW Theatre	29	1400	0/1	No	0	Listeriosis
NW Theatre	30	930	9/9	No	19	Sepsis
NW Theatre	36	3000	4/7	No	3	Non immune hydrops
NW Labour and Birthing Suite	38	2650	9/10	No	11	Pulmonary hypertension & multiple anomalies including complex cardiac disease

8.7 Details of deaths prior to discharge among inborn babies admitted to NICU

Table 243 Inborn neonatal and post-neonatal deaths after transfer to Starship Hospital

Born at	Gestational age	Birth Weight	Apgar 1/5	Twin	Age at death (d)	Cause of death
NW Labour and Birthing Suite	34	2680	4/8	No	15	Congenital diaphragmatic hernia
NW Labour and Birthing Suite	37	3190	9/9	No	29	Complex congenital cardiac disease
NW Theatre	37	3270	9/10	No	11	Complex congenital cardiac disease
NW Theatre	39	3400	7/9	No	3	Complex congenital cardiac disease
NW Theatre	39	3590	3/5	No	0	Congenital diaphragmatic hernia
NW Labour and Birthing Suite	40	2890	5/7	No	2	Complex congenital cardiac disease
NW Labour and Birthing Suite	40	3020	0/0	No	4	Complex congenital cardiac disease

8.8 Details of deaths prior to discharge among outborn babies admitted to NICU

Table 244: 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
Middlemore	23	710	6/9	Twin 2	52	Necrotising enterocolitis
Middlemore	25	1050	4/8	No	36	Necrotising enterocolitis
Middlemore	26	1005	7/9	No	29	Necrotising enterocolitis
Middlemore	32	1230	2/9	No	1	Congenital CMV infection & intracerebral haemorrhage
Home	40	3200	3/3	No	0	Pulmonary hypoplasia secondary to multicystic dysplastic kidneys
Northshore	42	2520	5/9	No	3	Trisomy 18 Diaphragmatic hernia

8.9 Details of deaths prior to discharge among outborn babies admitted to NICU

Table 245: Outborn neonatal and post-neonatal deaths after transfer to Starship Hospital

Born at	Gestational age	Birth Weight	Apgar 1/5	Twin	Age at death (d)	Cause of death
Middlemore	31	1880	2/4	No	11	SVT, multiple anomalies including complex cardiac disease
Hutt Hospital	35	2030	4/6	No	13	Complex congenital cardiac disease

APPENDIX 9. PERINATAL MORTALITY

Table 246: Postnatal transfer deaths (these are babies born elsewhere who transferred to NW for postnatal care) (2000-2008)

		2000	2001	2002	2003	2004	2005	2006	2007	2008
Early neonatal deaths	< 7 days	6	1	3	3	3	3	3	5	3
Late neonatal deaths	8 – 28 days	0	1	0	0	0	3	3	2	3
Total deaths		6	2	3	3	3	6	6	7	6

Table 247: Perinatal and perinatal- related deaths (1992 – 2008)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2
Total number of perinatal related losses	168	133	147	131	165	128	133	105	136	94	116	105	124	111	99	111	
Fetal death	86	61	80	84	86	74	73	65	84	57	69	64	82	68	74	82	
Early neonatal death	65	60	49	39	63	45	50	31	43	32	40	34	33	38	23	20	
Late neonatal death	9	6	15	7	10	6	6	9	9	5	7	7	9	5	2	9	
Perinatal mortality rate /1000	11.6	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	
Perinatal related mortality rate /1000	19.7	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	

Table 248: Perinatal mortality rate (per 1000 births) and perinatal-related mortality rate (per 1000 births) adjusted for lethal and terminated fetal abnormalities* (2000-2008)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	
	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	n	Rate/ 1000
Perinatal mortality rate	15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	102	13.2
Perinatal mortality rate (excluding lethal & terminated fetal abnormalities)	11.5	8.0	8.9	8.2	11.4	9.7	8.4	7.8	72/ 7753-30	9.3
Perinatal related loss rate	16.9	12.3	14.5	13.5	16.2	15.0	13.4	14.1	110	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	76/ 7753-35	9.8

*Defined as PDC-major=congenital abnormality for fetal deaths and NDC-major=congenital abnormality for neonatal deaths

Table 249: Maternal characteristics and perinatal related mortality 2008

	Births n=7753		Stillbirths n=76			Neonatal deaths n=34			Perinatal related deaths n=110		
	n	%	n	%	SB rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Maternal Ethnicity											
NZ European	3077	39.7	25	32.9	8.1	8	23.5	2.6	33	30.0	10.7
Maori	655	8.5	6	7.9	9.1	8	23.5	12.1	14	12.7	21.3
Pacific	1156	14.9	17	22.4	14.7	8	23.5	6.9	25	22.7	21.6
Asian	1370	17.7	9	11.8	6.6	3	8.8	2.2	12	10.9	8.8
Indian	513	6.6	5	6.6	9.7	2	5.9	3.9	7	6.4	13.6
Other European	723	9.3	9	11.8	12.4	5	14.7	6.9	14	12.7	19.4
Other	259	3.3	5	6.6	19.3	0			5	4.5	19.3
Parity											
Nullipara	3704	47.8	44	57.9	12.1	16	47.1	4.4	60	54.5	16.4
Multipara	4041	52.2	32	42.1	8.0	18	52.9	4.5	50	45.5	12.5
Maternal Age											
≤25	1383	17.8	22	28.9	15.9	11	32.4	8.0	33	30.0	23.9
26-34	3955	51.0	30	39.5	7.6	16	47.1	4.0	46	41.8	11.6
≥35	2415	31.1	24	31.6	9.9	7	20.6	2.9	31	28.2	12.8
Maternal Smoking											
Currently smoking	844	10.9	11	14.5	13.0	10	29.4	11.8	21	19.1	24.9
No or not smoking in last month	6112	78.8	63	82.9	10.3	24	70.6	3.9	87	79.1	14.2
Missing	797	10.3	2	2.6	2.5	0			2	1.8	2.5
Maternal BMI											
<19	408	5.3	3	3.9	7.4	0			3	2.7	7.4
19-25	4268	55.0	40	52.6	9.4	9	26.5	2.1	49	44.5	11.5
26-35	2041	26.3	20	26.3	9.8	18	52.9	8.8	38	34.5	18.6
>35	545	7.0	10	13.2	18.3	1	2.9	1.8	11	10.0	20.2
Missing	491	6.3	3	3.9	6.1	6	17.6	12.2	9	8.2	18.3

* 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	2000	2001	2002	2003	2004	2005	2006	2007	2008
Perinatal necropsy rates (%)	58	56	65	68	57	48	50	38	50	40	40	41	43	52	48	50	59	55

Table 250: Cause of perinatal-related death (2000-2007) (2000-2004 ANZACPM;2005-2008 PSANZ-PDC)

Classification*	2000		2001		2002		2003		2004		2005		2006		2007		2008	
	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
Perinatal infection	11	8	5	5	7	6	6	6	6	6	11	10	9	9	4	4	5	5
Hypertension	5	4	3	3	3	3	4	4	4	4	3	3	3	3	0		4	4
Antepartum haemorrhage	10	8	10	11	3	3	5	5	5	5	6	5	4	4	7	6	13	12
Maternal conditions	5	4	3	3	8	7	8	7	8	7	8	7	6	6	5	5	3	3
Specific perinatal conditions	22	17	16	17	18	16	5	5	5	5	10	9	7	7	7	6	22	20
Hypoxic peripartum death	2	2	2	2	1	1	3	3	3	3	4	4	0		2	2	1	1
Fetal growth restriction	10	8	6	6	4	3	6	6	6	6	1	1	8	8	11	10	9	8
Spontaneous preterm	23	17	12	13	17	15	23	22	23	22	20	18	13	13	16	14	11	10
Unexplained antepartum death	11	8	9	10	13	11	9	8	9	8	10	9	12	12	10	9	7	6
No obstetric antecedent									0		0		0		1	1	1	1
Total	136		94		116		105		124		111		99		111		110	

Table 251: Cause of death (PSANZ-PDC) among terminations of pregnancy

Classification	Termination of pregnancy n=36	
	n	%
Congenital abnormality	21	58
Maternal conditions	3	8
Antepartum haemorrhage	2	6
Hypertension	3	8
Perinatal Infection	2	6
Fetal growth restriction	2	5
Spontaneous preterm	3	8

Table 252: Perinatal deaths by cause (PSANZ-PDC) and gestational age

Classification	Total n=110		< 37 weeks n=94		≥ 37 weeks n=16	
	n	%	n	%	n	%
Congenital abnormality	34	31	25	27	9	56
Perinatal infection	5	5	5	5	0	
Antepartum haemorrhage	13	12	12	13	1	6
Maternal conditions	3	3	3	3	0	
Hypertension	4	4	4	4	0	
Specific perinatal conditions	22	20	21	22	1	6
Hypoxic peripartum death	1	1	0		1	6
Fetal growth restriction	9	8	9	10	0	
Spontaneous preterm	11	10	11	12	0	
No obstetric antecedent	1	1	1	1	0	
Unexplained antepartum death	7	6	3	3	4	25

APPENDIX 10. GYNAECOLOGY

10.1 Termination of pregnancy

Table 253: 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
Ethnicity	%	%	%	%	%	%	%
New Zealand European	28.2	27.6	27.4	26.3	27.5	27.6	27.8
Maori	19.6	18.1	18.4	19.1	20.2	21.1	21.5
Pacific	21.9	23.0	22.8	23.2	23.7	24.5	23.1
Asian	11.8	12.2	11.6	11.1	11.4	10.5	10.7
Indian	7.2	7.3	7.7	8.2	8.2	8.3	9.3
Other European	5.0	5.2	5.3	5.7	4.9	4.5	4.8
Other	6.3	6.6	6.9	6.3	4.1	3.5	2.7
Age							
≤ 19	18	18	19.3	16.3	21.5	22.3	21.7
20 – 24	29	31	28.9	41	29.7	29.6	29.0
25 – 29	23	21	20.9	19.9	20.7	20.1	21.6
30 – 34	16	17	16.1	13.1	14.4	14.3	13.3
35 –39	10	10	10.9	6.6	9.5	9.7	10.1
40+	4	3	3.9	3.3	3.9	4.0	4.3
Gestation (weeks) at termination							
7	1	0.8	1.0	0.4	0.3	0.2	0.0
8	9	6.8	17.3	10.5	11.1	8.8	0.1
9	20	18	23.9	20.9	22.2	20.8	13.0
10	23	24	21.4	22.7	24.2	25.1	23.9
11	22.5	25	20.8	24.0	23.6	24.1	25.1
12	21	22.4	14.5	20.2	17.6	20.9	21.3
≥13	3.5	3	1.2	1.3	0.8	0.1	16.5

10.2 Gynaecology Inpatient Surgery

Table 254: BMI by ethnicity among women having inpatient gynaecology surgery (2008)
(missing data removed)

	Total	<19		19-25		26-30		31-35		>35	
	N	n	%	n	%	n	%	n	%	n	%
Total	**889**	**24**	**2.7**	**325**	**36.6**	**228**	**25.7**	**143**	**16.1**	**169**	**19.0**
NZ European	336	6	1.8	152	45.2	95	28.3	47	14.0	36	10.7
Maori	94	3	3.2	12	12.8	26	27.7	21	22.3	32	34.0
Pacific	161	2	1.2	20	12.4	24	14.9	35	21.7	80	49.7
Asian	94	7	7.5	65	69.2	18	19.2	3	3.2	1	1.1
Indian	75	1	1.3	26	34.7	28	37.3	14	18.7	6	8.0
Other European	78	4	5.1	33	42.3	25	32.1	9	11.5	7	9.0
Other	37	1	2.7	12	32.4	6	16.2	12	32.4	6	16.2
Not Stated	14	0		5	35.7	6	42.9	2	14.3	1	7.1

Missing data excluded. 1.1% of ethnicity data and 29.2% of BMI data

Table 255: Smoking status by ethnicity among women having inpatient gynaecology surgery (2008)

		Currently smoking		Past smoker		Never smoked		Unknown	
	N	n	%	n	%	n	%	n	%
Total	**1256**	**208**	**16.6**	**110**	**8.8**	**689**	**54.9**	**249**	**19.8**
NZ European	456	85	18.6	49	10.8	239	52.4	83	18.2
Maori	136	44	32.4	12	8.8	55	40.4	25	18.4
Pacific	232	52	22.4	26	11.2	115	49.6	39	16.8
Asian	146	6	4.1	5	3.4	102	69.9	33	22.6
Indian	101	5	5.0	1	1.0	80	79.2	15	14.9
Other European	112	9	8.0	9	8.0	62	55.4	32	28.6
Other	54	5	9.3	5	9.3	27	50.0	17	31.5
Not stated	19	2	10.5	3	15.8	9	47.4	5	26.3

Table 256: ASA rating among women having inpatient gynaecology surgery (2008)

	n=1256	
	n	%
ASA Rating		
0	189	15.1
1	556	44.3
2	398	31.7
3	107	8.5
4	5	0.4
5	1	

10.3 Gynaecology Laparoscopic Surgery

Table 257: BMI and Surgical approach

		Hysteroscopy n=199		Laparoscopy n=314		Laparotomy n=164		Vaginal n=517		Vulval n=61	
	N	n	%	n	%	n	%	n	%	n	%
BMI											
<19	22	1	4.6	9	40.9	2	9.1	8	36.4	2	9.1
19-25	325*	41	12.6	129	39.7	48	14.8	93	28.6	13	4.0
26-30	228	38	16.7	63	27.6	28	12.3	91	39.9	8	3.5
31-35	143	35	24.5	34	23.8	26	18.2	47	32.9	1	0.7
>35	169	68	40.2	26	15.4	24	14.2	50	29.6	1	5.9
Missing data	369	16	4.3	53	14.4	36	9.8	228	61.8	36	9.8

*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 papaloma virus
ACHS	Australia Council Health Standards	ICH	Intracerebral haemorrhage
ADAPT	Alcohol, Drugs and Pregnancy Team	IDDM	Insulin dependent diabetes mellitus
AMSIS	Auckland Maternity Services Information System	Indo	Treated with indomethacin
ANA	Antinuclear antibody	iNO	Inhaled nitrous oxide
ANZNN	Australia and New Zealand Neonatal Network	IPPV	Intermittent positive pressure ventilation
APH	Antepartum haemorrhage	IOL	Induction of labour
ARM	Artificial rupture of membranes	IUD	Intrauterine death
ASA	American Society of Anaesthesiologists	ICSI	Intracytoplasmic sperm injection
AUT	Auckland University of Technology	IVF	In vitro fertilisation
BBA	(Baby) Born Before Arrival (not a planned home birth)	IVH	Intraventricular haemorrhage
BMI	Body mass index	KPI	Key performance indicator
BP	Blood Pressure	LB	Live birth
BPD	Bronchopulmonary dysplasia	Ligate	Surgical ligation of PDA
CDU	Child Development Unit	LLETZ	Large loop excision of the transformation zone
CHD	Congenital Heart Disease	LMP	Last menstrual period
CI	Confidence Interval	LNND	Late neonatal death
CLD	Chronic lung disease	LSCS	Lower segment Caesarean section
CPAP	Continuous positive airways pressure	LSIL	Low-grade squamous intraepithelial lesions
CRIS	Clinical Records Information System	LV	Left ventricle
CS	Caesarean section	MAS	Meconium aspiration syndrome
CVA	Cerebro Vascular Accident	MCDA	Monochorionic diamniotic twin
CVS	Chorionic villus sampling	MCMA	Monochorionic monoamniotic
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
DORV	Double outlet right ventricle	NICU	Neonatal Intensive Care Unit
DRG	Diagnosis related groups	NIDDM	Non-insulin dependent diabetes mellitus
ECMO	Extra Corporeal Membrane Oxygenation	NW	National Women's
EDU	Epsom Day Unit	NPSU	National perinatal statistics unit (Australia)
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	Glucose tolerance test	PROM	Prolonged rupture of membranes
Hb	Haemoglobin	PVL	Periventricular leukomalacia
HbAIc	Glycosylated heamoglobin	RDS	Respiratory distress syndrome
HDU	High Dependency Unit	ROP	Retinopathy of prematurity
HELLP	Hemolysis, Elevated Liver Enzymes, Low Platelets (syndrome)	RR	Relative risk
HFOV	High frequency oscillatory ventilation	SBP	Systolic blood pressure
HDU	High Dependency Unit	SCBU	Special Care Baby Unit
HIE	Hypoxic ischaemic encephalopathy	SGA	Small for gestational age
HIV	Human Immunodeficiency Virus	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 ARM 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$\geq$90mmHg at booking or a medical history of essential hypertension.

Early Neonatal Death (ENND)
Death of a live born baby of $\geq$20 weeks gestation or $\geq$400g if gestation is unknown.

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 258: Level 2 prioritisation of ethnicity as outlined in 'Ministry of Health. 2004. Ethnicity Data Protocols for the Health and Disability Sector.'

Priority order	Ethnic Group Code Description
1	Māori
2	Tokelauan
3	Fijian
4	Niuean
5	Tongan
6	Cook Island Maori
7	Samoan
8	Other Pacific Island
9	Pacific Island NFD (Not Further Defined)
10	South East Asian
11	Indian
12	Chinese
13	Other Asian
14	Asian NFD
15	Latin American / Hispanic
16	African
17	Middle Eastern
18	Other
19	Other European
20	European NFD
21	NZ European

Fetal Death
Baby of at least 20 weeks gestation born without any signs of life or at least 400 grams birth weight if gestation is unknown.

Gestation
The gestation used in the maternity section of this report is derived from Best Estimate of date of birth (EDD Best) calculated by Healthware at booking based on Last Menstrual Period (LMP), scan data (overriding LMP data based on scan accuracy data sourced from the Australasian Society for Ultrasound Medicine), or clinical override of these dates as deemed appropriate. Healthware does not include gestation calculated from these data into its dataset, so this gestation, in weeks, is derived by taking the integer value of 40 + (date of birth - EDD Best)/ 7.

Gestational Diabetes (GDM)
This diagnosis is based on either a fasting glucose > 5.5mmol/L or a 2 hour glucose > 9.0mmol/L after a 75 gram oral glucose tolerance test.

Gestational hypertension (GH)
Gestational hypertension (GH) is a blood pressure SBP ≥140 and or DBP ≥90 mmHg on two or more consecutive occasions at least 4 hours apart or one measurement SBP ≥170 and or DBP ≥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 woman 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 woman 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 Specialist (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 of ≥20 weeks gestation ≥400g birthweight if gestation unknown, within the first 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