National Women's Annual Clinical Report 2011

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

Disclaimer

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

Acknowledgements

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

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

Thanks also to those who have provided chapter comments, especially Dr Janet Rowan, Dr Lesley McCowan, Dr Emma Parry, Dr Jenny McDougall, Dr Mahesh Harilall, Dr Martin Sowter, Dr Lucille Wilkinson, Dr Martin Minehan, Dr Padmaja Koya, Pauline Fakalata, Dr Anne Dezoete, Janice Taylor, Ines Blaj, Dr Katie Groom, Dr Tim Dawson, Dr Michelle Wise, Dr Ai Ling Tan, Dr Malcolm Battin, Hedwig van Asten, Dr Claire McClintoch, Dr Khaldoun Aweidah, Dr Mairi Wallace, Dr Katherine McKenzie.

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

It is my pleasure to present the 2011 National Women's Annual Clinical Report.

In 2011 we have had a focus on preparing for the implementation of the Ministry of Health's Maternity Quality and Safety programme in 2012. We have redesigned our Clinical Governance structure with a broader membership including consumers, independent LMCs, private obstetricians, and Maori and Pacific representation across all levels of the Women's Healthcare Service Group. An integral part of the Maternity Quality and Safety programme is collection of clinical data, national data sets, implementation of agreed national clinical indicators and of course an Annual Clinical Report.

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

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

Kirsty Walsh
Interim General Manager, Women's Healthcare Service Group

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Chapter 1

INTRODUCTION

1 INTRODUCTION

1.1 Purpose of this report

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

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

1.2 Report structure

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

Chapter 1: Introduction

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

Chapter 2: Service provision

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

Chapter 3: Summary statistics

This chapter provides, for the obstetric and neonatal population at NW, summary data on principal outcomes. It also includes benchmarking of NW maternity data with Women's Hospitals Australasia (WHA) clinical indicators.

Chapter 4: Maternal demography

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

Chapter 5: Antenatal complications

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

Chapter 6: Labour and birth

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

Chapter 7: **Labour and birth outcomes**

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

Chapter 8: Postnatal care

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

Chapter 9: Newborn services

This chapter describes interventions and outcomes for the babies cared for in the Neonatal Intensive Care Unit who were born in 2011, including benchmarking with the Australian and New Zealand Neonatal Network (ANZNN). It includes a report of activity of the Child Development Unit.

Chapter 10: Perinatal mortality

This chapter provides information and analyses about fetal and neonatal deaths of babies born at NW in 2011.

Chapter 11: Maternal mortality and morbidity

This chapter provides data on maternal deaths and severe maternal morbidities among women giving birth at NW during 2011.

Chapter 12: Gynaecology

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

Appendices

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

1.3 Description of women and babies included in the Annual Clinical Report

The maternity section of this Annual Clinical Report includes data pertaining to women giving birth to babies at and beyond 20 weeks gestation at NW during the 2011 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 2011 calendar year. This includes babies transferred from other units or home.

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

1.4 Data sources

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

Maternity data for years prior to 2001 were collected into the AMSIS (Auckland Maternity Services Information System) database. For this report, most data for the years prior to 2001, included in tables and figures to demonstrate time trends, have been obtained from previous Annual Clinical Reports.

1.4.1 Healthware

The majority of booking data on mothers with non-NW lead maternity caregivers (LMCs) were entered into Healthware by one Healthware administrator. Booking data for NW

bookings, and all antenatal, birth, and postnatal data were entered by clerks and NW midwives.

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

For the 2004 -2011 years, the data have been cleaned for ad hoc analysis for service provision, audit and research, policy, and for this clinical report. Cleaning has included completing missing data and checking out of range and inconsistent data. These cleaning strategies have been focussed around priority areas for reporting and areas where cleaning could be efficiently completed within the resource available. Further details of variables cleaned are provided below and in Appendix 1.

1.4.2 Neonatology database

Neonatal Intensive Care Unit (NICU) data are collected prospectively by the Resident Medical Officers and Nurse Specialists - Advanced Neonatal Practice working on the NICU. The neonatal database is used to produce problem lists, flow sheets and letters which also ensures checks of data integrity throughout a baby's stay. Further data are collected and accuracy checked for the Australia and New Zealand Neonatal Network (ANZNN).

1.5 Data quality

1.5.1 Maternity data quality

Specific cleaning queries were used and discrepancies identified were checked and corrected prior to analysis of the data for the 2011 NW Annual Clinical Report. These queries are listed in Appendix 1.

NW acknowledge that these cleaning efforts, whilst extremely time consuming, are not comprehensive. On occasion, it became apparent during analysis that further cleaning was required and this was performed on an ad hoc basis and may not be included in the list provided in the appendix.

Services or individuals wishing to use the 2011 data for further analysis should be aware that areas not mentioned may not have been cleaned. For further advice please contact the Women's Health Intelligence Department.

1.5.2 Neonatal data quality

Additional checks of the accuracy of the data were made in preparing the annual report and prior to sending the data to ANZNN. The clinical records and some original radiology images were checked on all serious adverse outcomes (IVH, PVL, ROP, NEC, death). Laboratory and clinical records were checked on all possible or definite septicaemias or meningitides. Records were checked when the data entered in different fields in the database appeared inconsistent. Maternal and neonatal records of all babies with encephalopathy or neonatal seizures were reviewed.

The introduction of comprehensive computerised clinical records (CRIS, Concerto, Éclair and Impax (Radiology PACS System)) by ADHB has enhanced data collection, checks on data integrity and clinical audit tremendously. Authorised clinical staff can access the complete clinical record electronically so that no clinical record is lost and the delays inherent in the old paper-based system are avoided.

1.5.3 Gynaecologic data quality

As noted under data sources, gynaecologic data were largely obtained from stand alone Access databases. Colposcopy data were obtained from tables within the Healthware database. Fertility Plus data were extracted and reported by the service and Epsom Day unit data were extracted from ATLAS. Gynaecologic oncology and general gynaecologic

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

1.6 Analytical and statistical methods

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

1.7 Clinical indicators

We have for some years contributed maternity data to the WHA (Women's Hospitals Australasia) benchmarking initiative. This year we have presented our 2011 data compared to WHA mean data for maternity units with level 3 neonatal intensive care units for the three year intervals from July 2007 - June 2011. The clinical indicators are presented as a summary table in the summary statistics chapter and also in the chapter throughout the report to which they pertain.

Chapter 2

SERVICE PROVISION

2 SERVICE PROVISION

2.1 Maternity services

National Women's provides national and regional services, as well as primary, secondary and tertiary maternity services to women resident in ADHB region and to women resident outside the region whose private LMC has an access agreement with NW.

2.1.1 National Services

1.1.1 Maternal

- Management of major maternal cardiac disease – pregnant women who are likely to require bypass or valve surgery during pregnancy. NW also cares for women with cardiac disease who reside in the Pacific Islands.
- Management of women with major liver disease in pregnancy.

Fetal/Neonatal

- Fetal transfusions for rhesus incompatibility. NW has a relationship in place to obtain irradiated blood from the National Blood service.
- Management of fetal cardiac anomalies that are "duct-dependent" and require neonatal prostaglandin infusion.
- Care for mothers and babies under the care of Starship Hospital cardiologists who treat fetal cardiac problems throughout the country and from the Pacific region.
- Multi-fetal reduction for high-multiple pregnancies following fertility treatment.
- National service for laser ablation of fetal vessels in twin-twin transfusion
- National Maternal Fetal Medicine Network.

Other

- Transfers of mothers and babies from regions outside ADHB when more proximate neonatal intensive care units and maternity facilities are full.
- National Women's is currently the only training centre for obstetricians training in maternal fetal medicine in New Zealand.

2.1.2 Regional Services

1.1.2 Maternal

- Gestational and pre-existing diabetes in pregnancy services to WDHB and to CMDHB as requested.
- Pre-pregnancy counselling for diabetic and high risk women.
- Care for pregnant women with HIV infection from CMDHB and WDHB. With the rollout of the "National HIV screening in pregnancy" programme, these caseloads have increased but absolute numbers remain small.

1.1.3 Fetal/Neonatal

- Diagnosis and management of major fetal abnormalities, including provision of mid-trimester termination services. This service is also provided to hospitals in the Mid Central DHB on an ad hoc basis due to limitations in the service provided from Waikato.

2.2 Wards and clinics in the maternity service

The following wards and clinics make up the maternity service:

2.2.1 Labour and Birthing Suite

- National Women's Labour and Birthing suite is a 16 bed unit including a 2 bed High Dependency unit providing care for obstetric high risk cases.
- Services include one to one midwifery care for women in labour. Pain relief options include water, entonox, pethidine, and epidural anaesthesia. NW also provides facilities for women wanting a waterbirth.
- Care is provided to women by a multidisciplinary team of midwives and nurses specialised in high risk obstetrics, obstetricians, anaesthetists, obstetric physicians, independent lead maternity carers, hospital aides and ward clerks. To ensure midwives maintain their competency in intrapartum care provision, staff are rotated from the antenatal/postnatal wards to labour and birthing suite for a 6 -12 week rotation.
- Labour and birth care is provided by Labour and Birthing Suite (Core) midwives to women whose Lead Maternity Carer is the Community Midwifery Clinic service or the High Risk Maternity and Diabetic Service, to women under the care of private obstetricians who do not have an independent midwife contracted to provide midwifery care, and to women transferred to National Women's secondary and tertiary services. Care is available on occasion to mothers under independent midwifery care when their midwife needs relief.
- The Labour and Birthing Suite midwives liaise closely with independent lead maternity carers.

2.2.2 High Dependency Unit (HDU)

- HDU is a level 1 Intensive Care Unit with some level 2 facilities. It managed 213 admissions in 2011. The main reasons for admission are excessive blood loss and hypertensive disease. The midwifery and nursing staff in this unit work hard to maintain a strong focus on the woman's experience to ensure healthy mother and baby bonding and to encourage breastfeeding.

2.2.3 Women's Assessment Unit (WAU)

- This service is open 24 hours a day, 7 days a week and provides acute care for women experiencing pregnancy and gynaecologic complications.
- Inductions of labour are booked through WAU and inductions performed in this unit. Women are transferred to Labour and Birthing Suite at the onset of labour.
- WAU provides a service for women from 20 weeks gestation requiring second trimester termination of pregnancy or for women who have suffered an intrauterine death.
- Day Assessment Unit (DAU) is a service provided from within WAU, providing appointment based care for women with complex pregnancies, managing approximately 1256 referrals in 2011 (1444 in 2010) consistent with previous years. DAU has 4 chairs for simultaneous care of up to 4 women. Most common referral reasons are hypertensive disorders, small for gestational age babies and post term assessment.
- An external cephalic version (ECV) clinic is provided at the DAU twice weekly.

2.2.4 Antenatal and Postnatal Wards

- There are 83 antenatal and postnatal beds at National Women's for women and babies requiring secondary and tertiary care. All primary postnatal stays where the mother and baby are well are transferred to Birthcare Auckland, who hold the contract to provide these services.

2.2.5 High Risk Medical Service (including Diabetes Service)

- The High Risk Medical, Fetal Medicine, and Diabetes services are provided from an outpatient clinic located on level 9 in the Auckland City Hospital (ACH) support building. This facility is also used by Newborn Services, including the Child Development Unit, where NICU admissions are followed after discharge to assess long term outcome.
- The High Risk Medical and Diabetes services provide antenatal and postnatal midwifery community visits to patients at home as well as in Starship Hospital and on the postnatal wards at ACH. Two ADHB pool cars are available to assist this service.

2.2.6 Community Services

- Community clinics are held at Green Lane Clinical Centre, along with antenatal clinics in 14 General Practice facilities in the ADHB catchment area.
- Community midwifery clinics and postnatal home visits provide continuity of midwifery care during the antenatal and postnatal period with labour and birth midwifery services provided by core midwives in Labour and Birthing Suite.
- Clinics staffed by publicly funded obstetricians are held four times a week at Green Lane Clinical Centre seeing women under the care of community midwifery care and reviewing secondary referrals from private LMCs.
- Clinics staffed by obstetric physicians are held two times per week.
- A midwifery staffed Walk in Centre acts as a first point of contact and triage for some pregnant women. These women access the centre by phone or by turning up, either with or without an appointment, and are made aware of their choices for maternity care. If presenting with an acute problem, they are referred to obstetric care as necessary.
- The Vulnerable Pregnant Women's multidisciplinary team provides a midwifery lead weekly forum for midwifery, maternal mental health and health social workers to plan and coordinate clinical and social care for a client group of pregnant women described as vulnerable. This forum grew out of an urgent need to coordinate the care of women with complex social needs, at times placing them and their babies at high risk. This risk inevitably involves statutory child protection services, adding a further layer of complexity. The increased coordination of service has resulted in outcomes such as; less traumatic uplifts of new born babies from the hospital; increasing numbers of babies remaining in their parents care with intensive social service support in place at the time of birth; increasing numbers of babies being placed in kin care without the disruption to attachment inherent in protracted foster placements and reduced interdisciplinary and interagency conflict.

2.3 Gynaecology service

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

The service is comprised of:

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

2.3.1 District Services

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

2.3.2 Regional Services

- First and second trimester termination of pregnancy
- Urogynaecology services to Waitemata District Health Board (WDHB)
- Fertility services – Fertility Plus is one of three providers in the Auckland region. Service includes reproductive endocrinology.
- Recurrent pregnancy loss diagnosis and management
- Gynaecologic Oncology
- Vulval clinic provides an "extended regional service" for all vulval disorders. Three centres provide this type of care in New Zealand – Auckland, Wellington and Christchurch
- Female Multidisciplinary Clinics offer a service to women with multifaceted endocrine and anatomical conditions. This is a clinic where the reproductive endocrinologist, gynaecologist, psychologist and gynaecology physiotherapist work together to provide collective complex treatment plans for girls and women with complicated hormonal and gynaecologic concerns.

Wards and Clinics in the Gynaecology Service

2.3.3 Inpatient Services – Ward 97, Auckland City Hospital

- Ward 97 is a 22 bed ward providing care for women with acute gynaecology problems, preoperative and postoperative care for general gynaecology, gynaecologic oncology and breast surgery. It also provides care to women with early pregnancy complications and medical terminations of pregnancy up to 20 weeks gestation.

- The service has access to the ACH Level 8 High Dependency Unit (HDU) and the Critical Care Unit for those women requiring a higher level of care and monitoring.

2.3.4 Outpatient clinics

The gynaecologic outpatient clinics are held at the Greenlane Clinical Centre and include:

- General gynaecology (i.e. menstrual disorders, pelvic floor dysfunction, sterilisation)
- Hormone replacement therapy and family planning
- Endometriosis and pelvic pain
- Urogynaecology
- Colposcopy
- Gynaecologic Oncology
- Pre admissions clinic

2.3.4 Early Pregnancy Assessment Unit (EPAU)

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

2.3.5 Epsom Day Unit (EDU)

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

2.3.6 Fertility Plus

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

Publicly funded fertility treatment is available to women under 40 years of age, who are non-smokers and have a BMI under 32. If couples do not meet the criteria for publicly funded fertility treatment, private treatment is available.

2.3.7 Gynaecologic Oncology

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

2.3.8 Women's Assessment Unit (WAU)

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

2.4 University of Auckland

NW has close associations with the University of Auckland, including involvement in research, clinical teaching, and particular projects. The Obstetrics and Gynaecology

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

2.5 Newborn Service

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

2.5.1 Regional and District Services

The Newborn Service is contracted to provide:

- Level 3 neonatal intensive care to the Northland region, to Central Auckland, and to the West and North Auckland areas – 16 cots.
- Level 2 neonatal care to Central Auckland area – 32 cots.

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

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

2.5.2 The Newborn Services support services

The Newborn Service includes the following:-

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

2.5.3 University Links

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

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

2.6 Lead Maternity Carer services

The provision of health in New Zealand is funded by the Ministry of Health, which sets policy, through 21 District Health Boards (DHBs). In 1996 significant changes to the way that maternity care was funded, and therefore provided, were outlined in Section 88 of the Public Health and Disability Act. The Section 88 notice requires all women to have a Lead Maternity Carer (LMC), who is chosen by the woman and has responsibility for ensuring provision of maternity services throughout her pregnancy and postpartum period. Maternity services, apart from the services provided by a private obstetrician, are free. LMCs are required to obtain access agreements with any maternity facility where they intend to provide care. To ensure the woman receives continuity of care all LMCs are required to have back up arrangements with another self employed practitioner who the woman has met. There is a range of LMC models of care available in New Zealand. At National Women's the following models are available:

1 Independent Midwifery. These midwives are self employed and generally provide continuity of care in the antenatal, intrapartum and postnatal period. Antenatal visits are usually provided through a midwifery clinic in the community and postnatal visits are provided in the woman's home. If the woman's pregnancy and or labour become complicated then the midwife and woman can choose a private obstetrician or NW secondary services to provide care.

2 General Practitioner (GP). Antenatal care is based in the GP's rooms. Midwifery care intrapartum and in the postnatal period for women who choose a GP is provided by either a hospital midwife or an independent midwife. If the woman's pregnancy and or labour become complicated then the GP and woman can choose a private obstetrician or NW secondary services to provide care.

3 Private Obstetrician. Private obstetricians provide antenatal care in their rooms. Midwifery care when the woman goes into labour and postnatal care can be provided by either the hospital or independent midwives.

4 Community Midwives. These midwives are employed by the hospital and provide continuity of antenatal and postnatal care. Labour care is provided by the hospital Labour and Birthing Suite Core midwives. Secondary care is provided by the hospital specialists.

5 High Risk Medical and Diabetic Midwives. The High Risk service is a multidisciplinary team of midwifery, medical and obstetric practitioners who provide care for women who have diabetes or other medical conditions. The woman has a named midwife from this service who is her LMC and who provides continuity of antenatal and postnatal care. Labour care is provided by the hospital core midwives in Labour and Birthing Suite

2.6.1 Funding of Maternity Services

Funding for Maternity services underwent significant changes in 2009. Funding for primary maternity care from independent midwives, General Practitioners and private obstetricians is still claimed via Section 88. It is module based, with first, second and third trimester, labour and birth, and postnatal modules, and is a fixed payment per woman per module.

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

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

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

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

2.7 Quality Department

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

Reportable events

With the introduction of the clinical governance structure the fortnightly incident review meetings which were attended by senior management and senior clinical staff have ceased. The incidents are now being reviewed in the maternity and gynaecology clinical governance meetings. The next step is to establish the unit based clinical governance meetings where incidents relating to the units will be reviewed. Currently the over-arching level 2 Women's Health clinical governance meeting is receiving a monthly report on all Women's Health reported incidents.

The management of incidents with adverse outcome is consistent with processes in place in DHBs throughout New Zealand, and involves the scoring of each incident using nationally approved criteria. An investigation team uses one of three methodologies for in-depth analysis of incidents meeting criteria for investigation. The report and recommendations from these investigations are presented to the ADHB adverse events review meeting. Meetings with the patient and family occur to ensure that they are fully updated on the outcome of all investigations. In order to address the challenge of ensuring that learning from incidents is disseminated to staff, Women's Health have very recently added a site *(Learning from adverse events)* to their intranet page. This will provide staff with a short summary of the event and the learning.

There were 493 incidents reported in 2011, including eight serious events requiring investigation using one of the in-depth review methodologies.

2.8 Service development

Perineal Tear Clinic

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

Positive Birth After Caesarean Clinic (PBAC)

The PBAC clinic was started in February 2011 in an attempt to address the low rate of attempted VBAC at NW highlighted in previous annual clinical reports. Women are encouraged to attend this obstetric/midwifery clinic 4-6 weeks after a Caesarean section, pre-pregnancy, or in the first half of their next pregnancy to discuss the options for their next birth. Women can be referred by their LMC, via the maternity Walk-in Centre at NWH or can refer themselves. Most women attend the clinic twice during their pregnancy and obtain the remainder of their care from their usual LMC. The service has produced a short film clip on VBAC, and this can be accessed online at http://nationalwomenshealth.adhb.govt.nz/services/maternity/pregnancy-advice/vaginal-birth-after-caesarean

2.9 Concerns/Opportunities/Positives

A range of things always affects the provision of any service throughout a year – issues, opportunities and positives and in 2011 NW has had the following to work through:

- The Change Management process to improve clinical leadership and integration of the Labour & Birthing Suite and Women's Assessment Unit was implemented. A Charge Midwife Manager was appointed to manage both units and the introduction of Clinical Charge Midwives in the Women's Assessment Unit is partially complete.
- The Medical Director role remains vacant but it is envisaged that this role will be filled in 2012.
- The Level 3 Midwifery Advisor role was filled in 2011. We are actively working to implement the final Women's HSG leadership structure.
- The Maternity Quality and Safety Standards are being implemented within National Women's including a restructure of our Clinical Governance process and improved representation from consumers and independent LMCs.
- Staff have been working hard throughout 2011 to deliver an electronic maternity record and we hope to see this Go Live in June 2012.
- Development of the Women's HSG Strategy and Management Operating System to focus on key target areas and deliverables for provision of Women's Health services.

Chapter 3

SUMMARY STATISTICS

3 SUMMARY STATISTICS

3.1 Mother and baby numbers: NW 2011

Table 1: Mother and baby numbers: National Women's 2011

Total number of mothers birthing at National Women's	7493
Mothers birthing before arrival (BBA)	33
Total number of mothers	**7523**
Total number of babies born at National Women's	7657
Babies born before arrival (BBA)	33
Total number of babies	**7690**

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.

Two women gave birth twice during the calendar year 2011 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 2011

		Mothers	Babies
National Women's births	Singletons	7327	7327
	Twins	159	318
	Triplets	4	12
Totals (not including BBA)		**7490**	**7657**
BBA	Singletons	33	33
	Twins	0	0
	Triplets	0	0
Totals (including BBA)		**7523**	**7690**

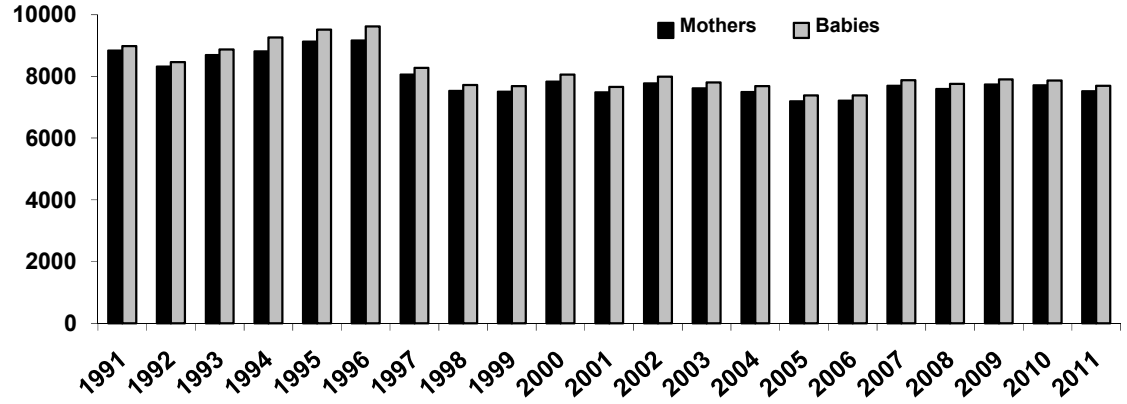

Figure 1: Numbers of women birthing and babies born at National Women's (1991-2011)

3.2 Summary of maternal outcomes 2011

Table 3: Mode of onset of birth

	Birthing Mothers n=7523	
	n	%
Spontaneous onset of labour	3628	48.2
Iatrogenic onset of birth	3895	51.8
CS Elective	1183	15.7
Emergency CS before onset of labour	249	3.3
Induction of labour	2463	32.7

Table 4: Mode of birth

	Birthing Mothers n=7523		Nullipara n=3539		Multipara n=3984	
	n	%	n	%	n	%
Spontaneous Vertex Birth	4183	55.6	1651	46.7	2532	63.6
Vaginal Breech Birth	60	0.8	23	0.6	37	0.9
Operative Vaginal Birth	832	11.1	643	18.2	189	4.7
Forceps	319	4.2	247	7.0	72	1.8
Ventouse	513	6.8	396	11.2	117	2.9
Caesarean Section	2448	32.5	1222	34.5	1226	30.8
CS Elective	1183	15.7	353	10.0	830	20.8
CS Emergency	1265	16.8	869	24.6	396	9.9

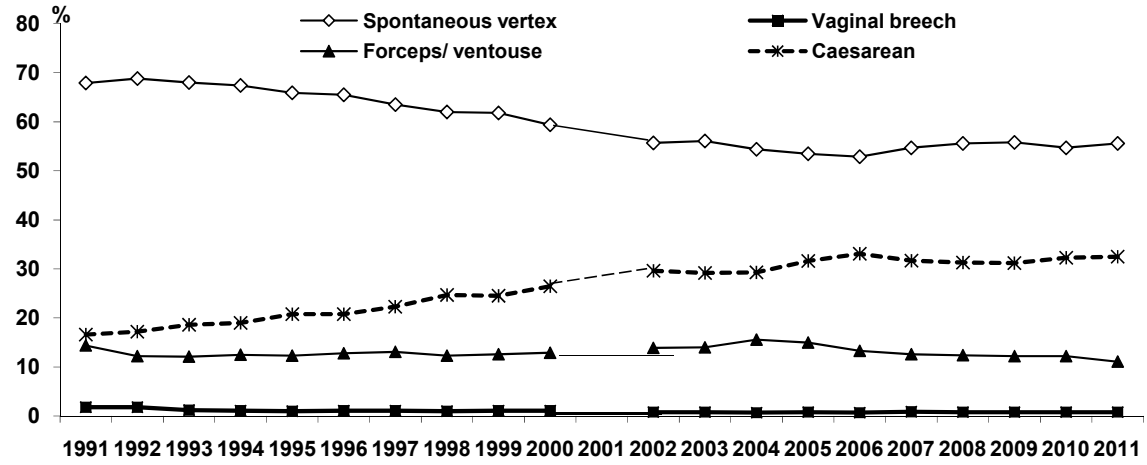

Figure 2: Mode of birth (1998-2011)

Table 5: Maternal postpartum outcomes

	Birthing mothers	n	%
PPH ≥1000mls	7523	659	8.8
SVB	4243	226	5.3
Instrumental vaginal birth	832	81	9.7
Caesarean section	2448	352	14.3
Episiotomy among vaginal births	5075	1153	22.7
Third/ fourth degree tears among vaginal births	5075	114	2.2
Postpartum blood transfusions	7523	194	2.6
Infant Feeding at discharge from NW facility (excludes babies admitted to NICU)			
Exclusive breastfeeding	6723	5439	80.9
Fully breastfeeding	6723	285	4.2
Partial breastfeeding	6723	841	12.5
Artificial feeding	6723	158	2.4

3.2.1 Maternal deaths

In 2011 there were two maternal deaths. Details of these deaths have been sent to the National Perinatal and Maternal Mortality Review Committee (PMMRC).

3.3 Summary of neonatal outcomes 2011

Table 6: Neonatal outcomes among babies born at National Women's in 2011

	Babies born n=7690	
	n	%
Gender		
Male	3916	50.9
Female	3770	49.0
Preterm birth		
20-27 weeks	120	1.6
28-31 weeks	94	1.2
32-36 weeks	573	7.5
Term birth		
37-41 weeks	6771	88.0
42+ weeks	132	1.7
Apgar at 5 min <7**		
Preterm	56	0.7
Term	94	1.2
SGA (by Customised Centile)		
Preterm	284	3.7
Term	715	9.3
Admission to NICU		
Preterm	436	5.7
Term	417	5.4

**numerator excludes fetal deaths

Table 7: Perinatal related mortality 2011

	Babies born n=7690	Rate
Fetal deaths (Still birth & TOPs)	97	12.6/1000 births
Early neonatal deaths	21	2.7/1000 live births
Late neonatal deaths	2	0.3/1000 live births
Neonatal death	23	3.0/1000 live births
Perinatal deaths (fetal & early neonatal)	118	15.3/1000 births
Perinatal related deaths (fetal & all neonatal)	120	15.6/1000 births

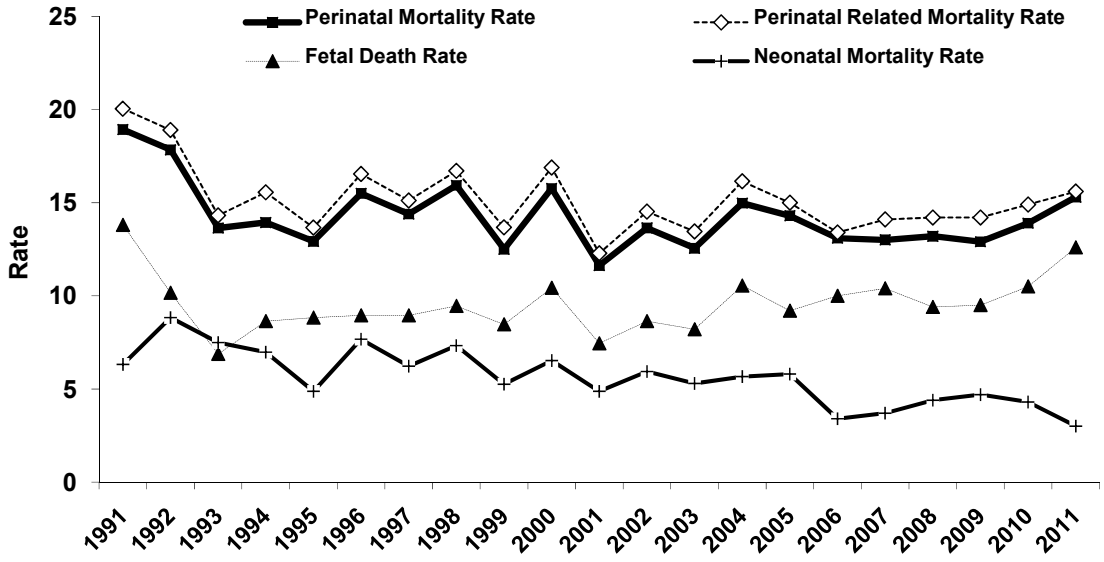

Figure 3: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate 1991-2011 (all rates expressed as deaths/1000 births)

3.4 Maternal and perinatal clinical indicators

Methods

The tables present National Women's data for the 2007-2011 calendar years compared to WHA (Women's Hospitals Australasia) means for contributing New Zealand and Australian maternity units with level 3 neonatal intensive care units. Below are figures representing the 2011 total NW data with 95% confidence intervals compared to WHA 2007-2010 data.

Table 8: Benchmarking against WHA perinatal indicators (units with level 3 NICU) (2007-2011)

Perinatal indicators	Definition	WHA mean 2007-2008 %	WHA mean 2008-2009 %	WHA mean 2009-2010 %	NW 2007 n=7875 %	NW 2008 n=7753 %	NW 2009 n=7897 %	NW 2010 n=7866 %	NW 2011 n=7690 %
Preterm birth	Babies born before 37 weeks/Inborn babies	11.9	11.7	11.9	11.5	10.9	9.7	10.1	10.2
	Babies born before 32 weeks/Inborn babies	3.4	3.46	3.21	3.0	3.3	2.7	3.1	2.8
Perinatal Mortality	Fetal death and neonatal death up to 28 days/Inborn babies	1.28			1.41	1.42	1.42	1.49	1.56
	Neonatal deaths up to 7 days (ENND)/Inborn babies	0.331			0.254	0.34	0.345	0.33	0.27
	Neonatal deaths up to 28 days (ENND+LNND)/Inborn babies	0.408			0.368	0.44	0.473	0.43	0.30
	Fetal deaths/Inborn babies	0.874			1.041	0.98	0.95	1.06	1.26
Five minute Apgar of ≤4	Babies with 5 minute Apgar<=4/Total liveborn, singleton term babies	0.265			0.10	0.13	0.24	0.23	0.31
Five minute Apgar of ≤6	Babies with 5 minute Apgar<=6/Total liveborn, singleton term babies	1.22	1.54	1.33			0.884	0.93	1.37
Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3	Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3/Inborn babies	0.103	0.104	0.865	0.10	0.039	0.063	0.063	0.052
Breastfeeding	Exclusive breastfeeding/Live born singleton term births	77.0			73.3	76.7	80.1	81.6	80.6

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

Table 9: Benchmarking against WHA maternity indicators (units with level 3 NICU) (2007-2011)

		WHA mean 07-08	WHA mean 08-09	WHA mean 09-10	NW 2007 n= 7695	NW 2008 n= 7589	NW 2009 n= 7735	NW 2010 n= 7709	NW 2011 n=7523
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Caesarean section	Mothers birthing by Caesarean section/Mothers giving birth	28.0	29.6	29.4	31.7	31.3	31.2	32.3	32.5
VBAC	P1 previous Caesarean/mothers giving birth	7.87	9.13	8.8	10.7	10.6	10.0	10.1	10.3
	Prelabour repeat Caesarean/P1 previous Caesarean	60.0	55.1	57.8	59.4	57.9	56.8	59.7	63.4
	VBAC/induced or spontaneous labour P1 previous Caesarean	49.3		49.6	52.4	58.8	61.7	65.5	59.2
	VBAC/P1 previous Caesarean	19.7	19.7	20.8	21.3	21.5	22.5	21.3	21.6
Peripartum hysterectomy	Hysterectomy at same admission as birth/Mothers giving birth	0.102			0.117	0.18	0.155	0.091	0.16
Instrumental vaginal birth	Forceps births/All vaginal births	5.2	6.57	7.4	4.2	4.9	5.7	6.8	6.4
	Ventouse births/All vaginal births	9.01	10.1	10.6	13.0	12.1	11.4	11.3	10.7
	Double instrumental/All vaginal births	0.841			1.3	1.0	0.68	1.0	0.7
Maternal age	Age 35 or more/Mothers giving birth	23.4	23.8	23.4	30.7	31.1	30.5	31.1	30.4
	Age 40 or more/Mothers giving birth	4.57	4.31	4.4	5.9	6.0	5.8	6.0	6.1
Vaginal birth with regional anaesthesia	Any regional anaesthetic/All vaginal births	27.2	28.0	29.1	43.9	43.7	43.4	43.7	43.5
General anaesthesia for Caesarean section	General anaesthetic for Caesarean section/All Caesarean sections	8.9	8.18	8.1	7.6	6.8	6.4	6.3	5.6
Episiotomy	Mothers having an episiotomy/Mothers giving birth vaginally	17.8	18.0	18.6	21.5	20.5	22.3	24.0	22.7
Third and fourth degree tears	3rd and 4th degree tears/Mothers giving birth vaginally	2.76	3.11	3.5	3.1	3.1	2.2	2.3	2.2
Postpartum haemorrhage	Blood loss >=1000ml and <1500ml/All vaginal births	1.91	2.43	2.4			2.6	3.1	3.2
	Blood loss >=1500ml/ All vaginal births	1.35	1.69	1.7	1.12	2.4	2.6	2.7	2.9
	Blood loss >=1000ml and <1500ml/Mothers giving birth by Caesarean		5.46	5.8				11.0	9.1
	Blood loss >=1500ml/Mothers giving birth by Caesarean	2.71	2.68	2.9	3.32	5.2	5.0	4.7	5.3
Blood transfusion	Postpartum blood transfusion/Mothers giving birth	1.63	1.78	2.1	2.2	2.8	3.0	2.5	2.6
Maternal admission to intensive care unit	Admitted to intensive care unit during same hospital admission as birth/Mothers giving birth	0.203			0.23	0.16	0.310	0.26	0.19

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

Conclusions from the simple comparison of benchmark data should be drawn with caution. Data reliability may vary and case-mix differences such as ethnicity, socio-economic status, age and BMI may effect rates. For example, the proportion of our maternity population over the age of 35 years is significantly greater (30.4% in 2011) than the mean for WHA contributing hospitals (23.4%). Nonetheless benchmarking allows us to compare

rates with other maternity services and to identify areas where we may wish to further analyse our own data or conduct clinical audit in the future.

The overall Caesarean section rate at NW remains above the WHA mean. Recent Ministry of Health Maternity Clinical Indicators suggest that NWH is within benchmark for caesarean section for standard primiparae in NZ in 2009. NW has a higher rate of women with one previous CS amongst those who have had one previous birth, so in order to keep the CS rate stable in future the VBAC rate will need to at least remain stable or increase. Fewer women undergo a trial of labour at NW than the mean, however of those who do, the chance of success is greater.

The episiotomy rate in the public sector is lower than the WHA mean but higher overall due to high rates of episiotomy among independent LMCs. The rate of third and fourth degree perineal tears was lower than the WHA mean in 2011. These data are consistent with Ministry of Health NZ Maternity Clinical Indicator 2009 data.

The postpartum haemorrhage and postpartum transfusion rates at NW continue to lie above the WHA means. The postpartum transfusion rate is however not significantly above the national rate in NZ presented in the Ministry of Health 2009 maternity indicators. It is possible that the excess of haemorrhage is related to ascertainment, as a lot of work has been done at NW to ensure good collection of blood loss data. Further work is planned around improving implementation of the guidelines for prevention and management of postpartum haemorrhage.

Chapter 4

MATERNAL DEMOGRAPHY

4 MATERNAL DEMOGRAPHY

This chapter describes the demographic characteristics of the women giving birth at NW in 2011. Additional data pertaining to this chapter can be found in Appendix 3.

4.1 Maternal domicile

In 2011, 69% of women giving birth at National Women's were from the Auckland District Health Board area. This proportion has changed very little over the last 5 years. Some mothers from outside ADHB catchment area require tertiary services, but a substantial proportion of the 31% of our clientele from other DHBs are making a personal choice to birth at NW.

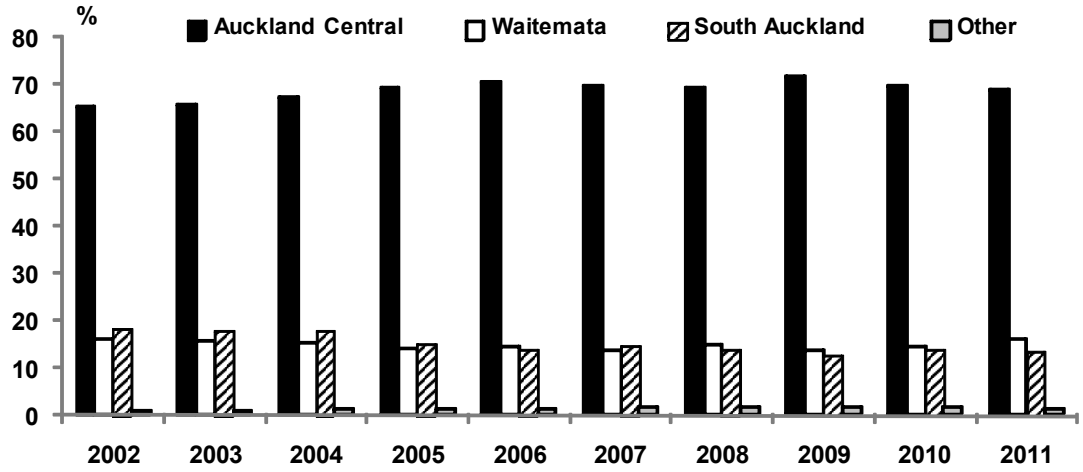

Figure 4: Domicile (DHB of residence) of women birthing at NW (2002-2011)

4.2 Maternal age, parity, and ethnicity

WHA Maternity Indicators		WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	NW 2011
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Maternal age	Age 35 or more/Mothers giving birth	23.4	30.7	31.1	30.5	31.1	30.4
	Age 40 or more/Mothers giving birth	4.4	5.9	6.0	5.8	6.0	6.1

4.2.1 Maternal Age

The population of women giving birth at National Women's is significantly older than the average for women giving birth in units with level 3 facilities in Australasia. The proportion of our population aged over 40 is 30% higher than the WHA mean though still small in absolute terms (6.1% vs. 4.4%). More significant is the difference in the proportion of women aged over 35. They make up close to one in three women delivering at NWH compared to one in four across WHA.

The steady rise in the proportion of women aged over 35 giving birth at National Womens over the last 20 years may be plateauing but it seems likely that the rate will increase still further with time. This shift towards women delivering at an older age has implications for service provision and intervention rates.

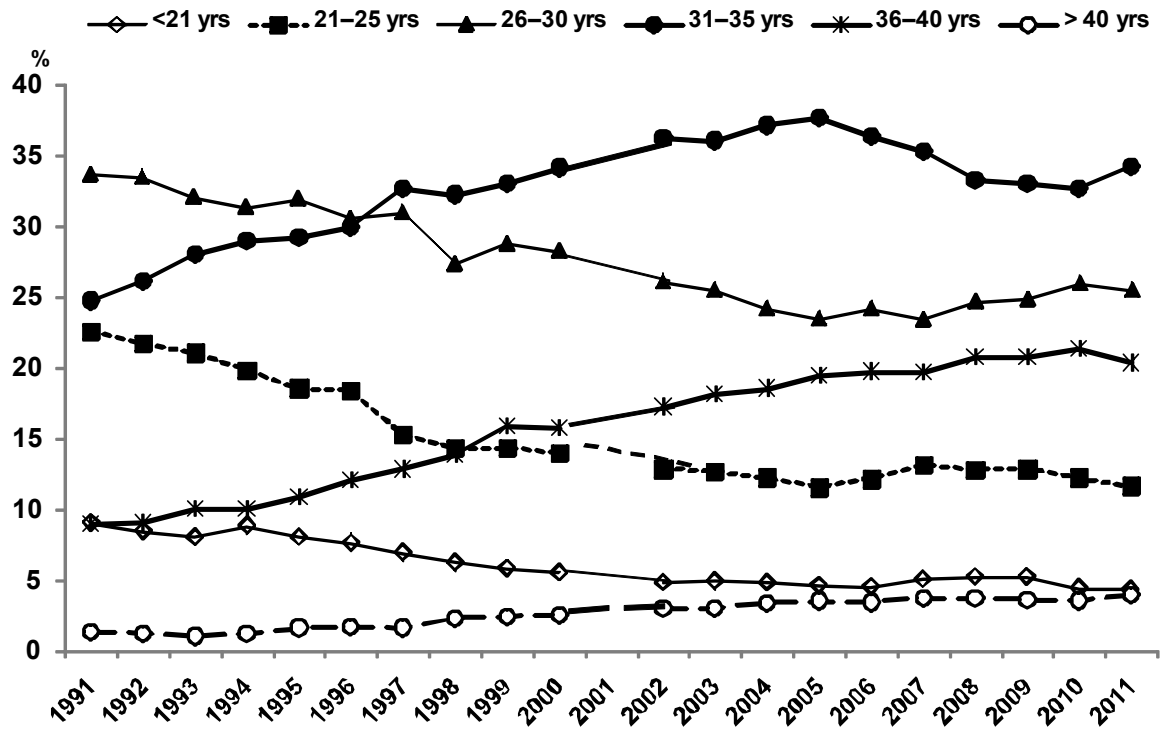

Figure 5: Maternal age distribution (1991-2011)

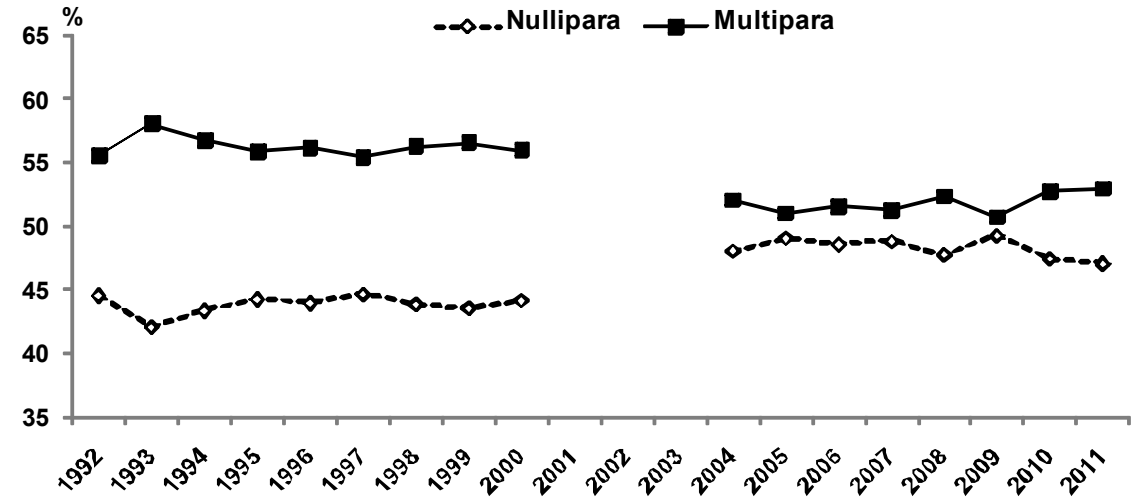

Figure 6: Parity distribution (1992-2011)

The ratio of nulliparous to multiparous women has remained fairly constant over recent years, but is markedly closer to 1:1 than it was 10 years ago. It is too early to be sure that the apparent change in this ratio in the 2010-2011 reports represents a consistent trend.

4.2.2 Maternal ethnicity

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

In 2011, 7.9% of mothers giving birth at NW were prioritised as Māori, 13.5% Pacific peoples, 7.3% Indian, 20.3% Other Asian, 11.3% Other European, 36.0% NZ European, and 3.6% Other.

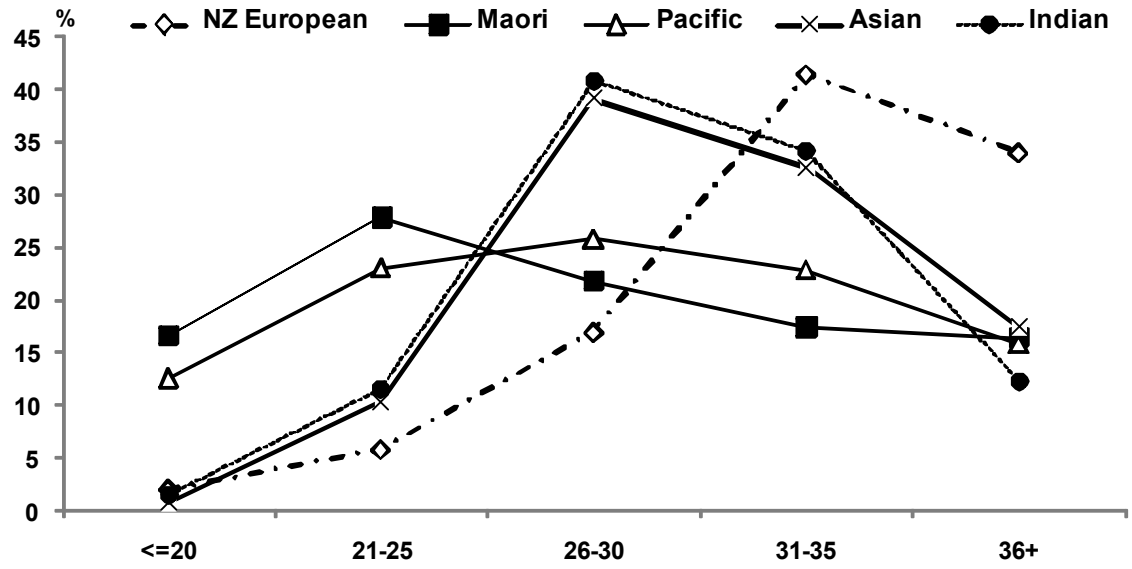

Figure 7: Maternal age among European, Māori, Pacific, Other Asian and Indian ethnicities

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

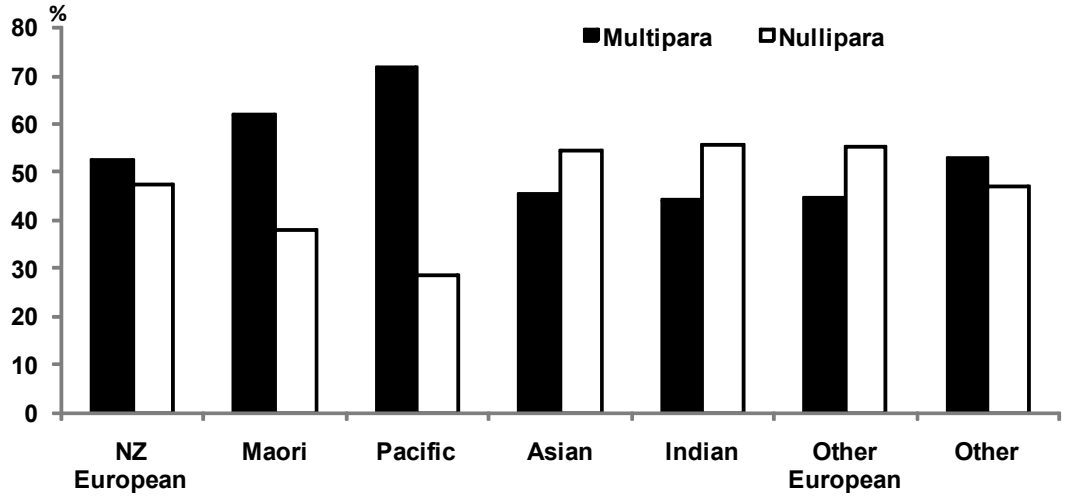

Figure 8: Parity distribution by maternal ethnicity (2011)

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

4.3 Smoking

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

Smoking Status	Smoking at booking n=7523		Smoking at birth n=7523	
	n	%	n	%
Yes	493	6.6	425	5.6
No	7029	93.4	7039	93.6
Missing data	1	0.0	59	0.8

In 2010 and 2011, smoking data were missing for fewer than 1% of mothers. This is a huge improvement over missing data in 30% in 2009. Of all women 6.6% reported smoking at booking falling to 5.6% at birth. This is a relatively small change and may represent either under-reporting at booking or suggest that we should be reviewing how we develop our smoking cessation programmes.

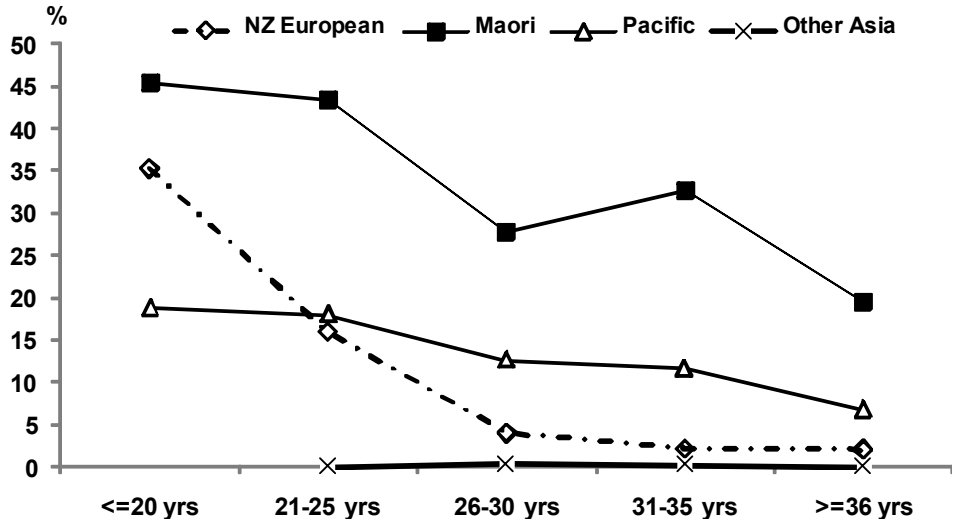

Figure 9: Smoking rates at booking by age and ethnicity

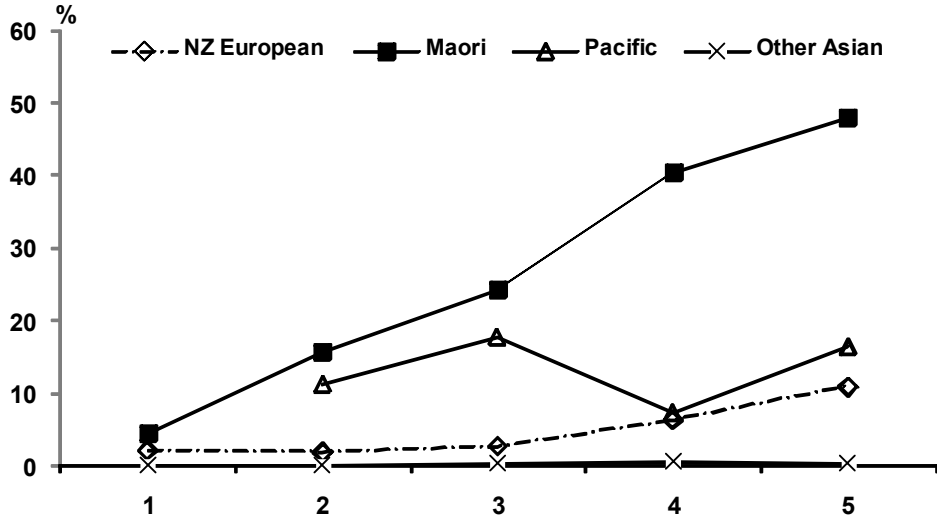

Figure 10: Smoking at booking by deprivation quintile and maternal ethnicity

Smoking rates remain substantially different by ethnic group, maternal age and deprivation score (NZDep2006). For future service planning, the dramatically higher

smoking rates amongst older Māori and Pacific Island women when compared to other ethnic groups suggest that resources should be focused on these women.

4.4 Smoking cessation services

The ADHB Smokefree Pregnancy Services, set up in 2008, provided data on women referred to their service. These data were matched with Healthware data to define a dataset of women who gave birth in 2011 and were seen by Smokefree Pregnancy Services at the hospital. Some women may have used, and/or been seen by, services outside the hospital. These data were not available for analysis.

In 2011, 210 referrals were received by ADHB Smokefree Pregnancy Services.

The data in the table below describe the 218 pregnant women who birthed at NW in 2011 and had at least one appointment at Smokefree Pregnancy Services. Smokefree Pregnancy Services saw 201 women in 2009 and 322 in 2010. The data on smoking at birth were obtained from the National Women's maternity database (Healthware).

Table 11: Smoking rates among women seen at the Smokefree Pregnancy Service who delivered at NW 2011.

	Mothers seen by ADHB Smokefree Pregnancy Services					
	Total N=218		Smoking at booking N=177		Not smoking at booking N=41*	
	n	%	n	%	n	%
Smoking at birth						
Yes	160	73	147	83	13	32
No	55	25	29	16	26	63
Missing	3	1	1	1	2	5

* 30 recent past smokers, 5 past smokers, and 6 non-smokers

Of the 218 women seen by the service, 177 (81%) were recorded in the maternity database as smokers at booking. Some women are referred who have recently quit and request support for maintenance.

Overall, of women seen by the service, 55/218 (25%) (29/177 (16%) of current smokers) were recorded as non-smoking at birth. A Cochrane systematic review (2009) of randomised controlled trials of interventions for promoting smoking cessation in pregnancy found a significant reduction of 6% in smoking in late pregnancy.

Among mothers smoking at booking who were not seen at Smokefree Pregnancy Services, 25% reported not smoking at birth, significantly more than the 16% among smokers referred to the Smokefree Pregnancy Service. There are a number of possible reasons for this. Women who are motivated to quit on their own are more likely to have a successful quit attempt. Those seeking support or referred for support find it harder to quit and are more likely to have cut down than quit.

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

4.5 Body mass index

Thirty five percent of our maternity population were overweight in 2011 (BMI >25), 17% obese (BMI >30), and 8% morbidly obese (BMI >35). This has not changed at NW in the three years that reasonably complete data have been available.

As well as being an independent risk factor for a number of complications of pregnancy and poor outcomes, obesity is associated with deprivation (see figure 15 below) making developing effective interventions to reduce the impact of maternal obesity particularly challenging.

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

Table 12: Maternal BMI (missing data excluded)

	2006[1]		2007[2]		2008[3]		2009[4]		2010[5]		2011[6]	
BMI	n=5660		n=6909		n=7117		n=7735		n=7709		n=7523	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
<19	304	5.4	388	5.6	405	5.7	442	6.0	443	5.7	439	5.8
19-25	3329	58.8	4129	59.8	4180	58.7	4344	58.5	4404	57.1	4268	56.7
26-30	1113	19.7	1315	19.0	1368	19.2	1441	19.4	1418	18.4	1370	18.2
31-35	512	9.1	625	9.1	630	8.9	686	9.2	684	8.9	680	9.0
36-40							303	4.1	328	4.3	325	4.3
41-45	402	7.1	452	6.5	534	7.5	118	1.6	133	1.7	160	2.1
>45							92	1.2	80	1.0	96	1.2

1 Missing data in 2006=21.5%
2 Missing data in 2007 =10.2%
3 Missing data in 2008 = 6.2%
4 Missing data in 2009= 4.0%
5 Missing data in 2010 = 2.8%
6 Missing data in 2011 = 1.2%

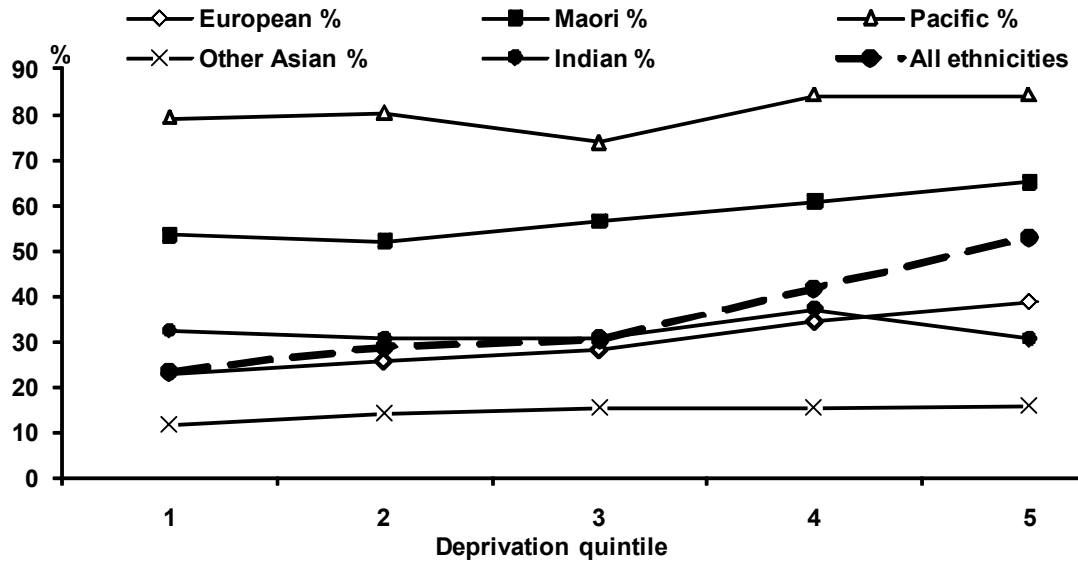

Figure 11: BMI >25 by ethnicity and deprivation quintile

When rates of overweight are presented by ethnicity (Figure 11) it is evident that there is a small increase in the rate of overweight (BMI>25) with increasing socioeconomic deprivation but that this is small compared to the difference in overweight related to ethnicity. In other words, the association between deprivation quintile and overweight in our maternity population at NW (which is represented by the dotted line) is mostly explained by confounding due to ethnicity.

4.6 Socio Economic status

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

Table 13: Deprivation quintile

	Women giving birth in 2011	
	n=	7523
Deprivation decile	**n**	**%**
1	514	6.8
2	808	10.7
3	779	10.4
4	653	8.7
5	657	8.7
6	824	11.0
7	811	10.8
8	967	12.9
9	642	8.5
10	862	11.5
missing	6	0.1

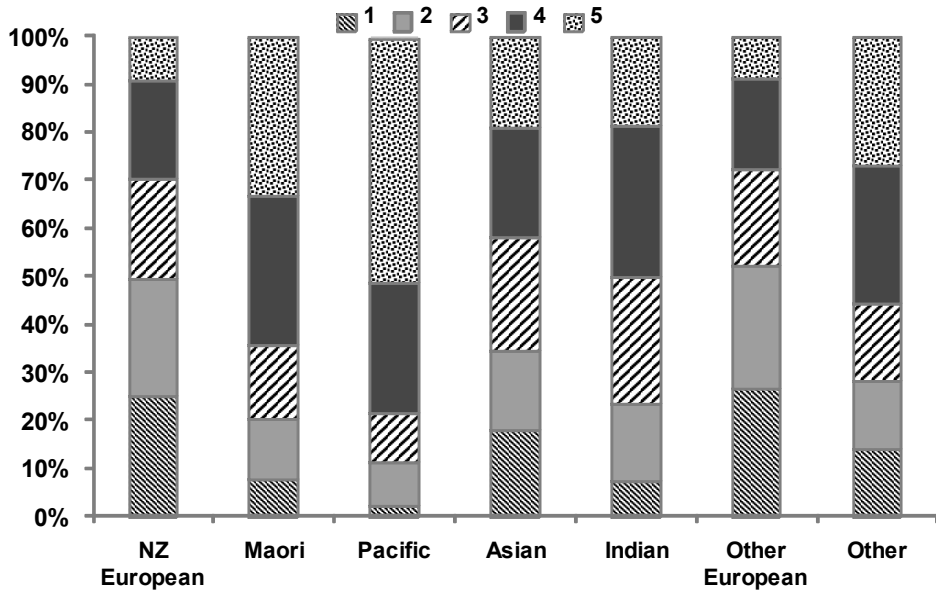

Figure 12: Deprivation quintile and maternal ethnicity

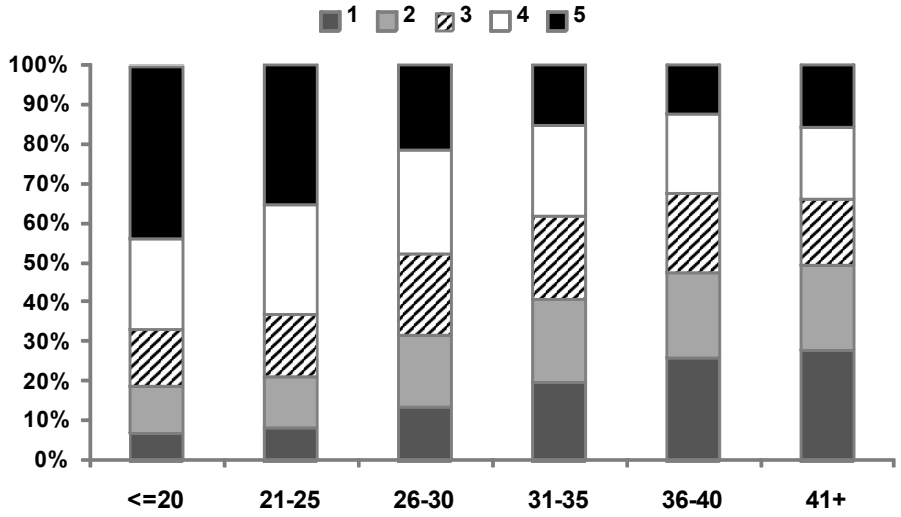

Figure 13: Deprivation quintile and maternal age

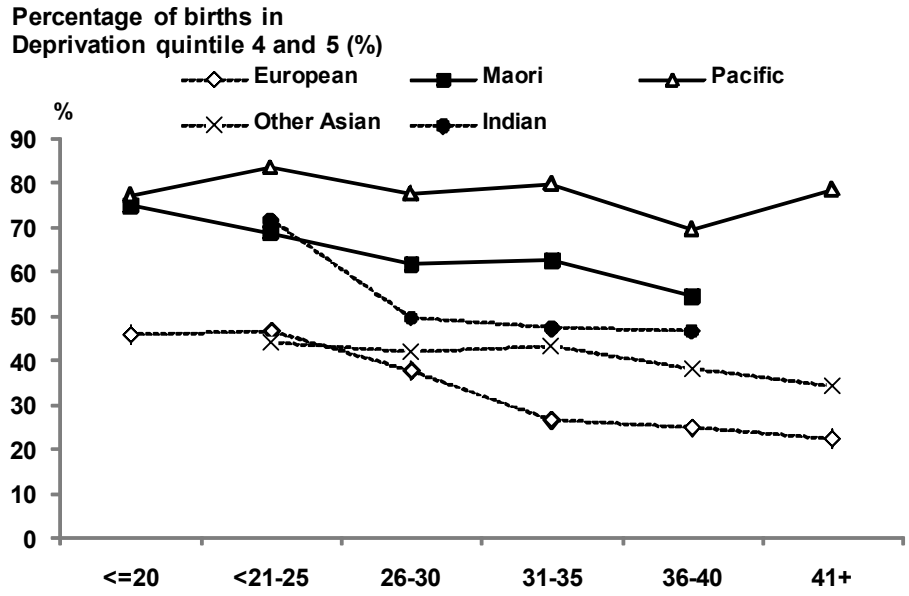

Figure 14: Deprivation (quintile 4 or 5) by age and ethnicity

Figure 14 suggests that while higher deprivation is associated with younger age (figure 13), ethnicity remains a stronger predictor of deprivation and is independent of this association.

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

4.7 Lead Maternity Carer (LMC) at birth

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

In 2011, 47% of women were booked with Independent Midwives, 22% with Private Obstetricians, 18% with National Women's Community clinics, and 11% with National Women's specialist medical and diabetes clinics. During 2010, the Domino service at NW was discontinued due to an inability to recruit midwives. Overall nearly 70% of women who gave birth at NW in 2011 were booked with a private Lead Maternity Carer. Over the last 10 years this proportion has been surprisingly constant with 66% of women booking with a private LMC in 1997. Only 56 women (0.7%) booked with a General Practitioner in 2011 continuing a downward trend. It seems unlikely that any intervention to encourage GPs back into obstetrics will have much impact on service provision in Auckland.

Fewer than one percent (37 women) of mothers were unbooked, and eighty percent of these women were Māori or Pacific.

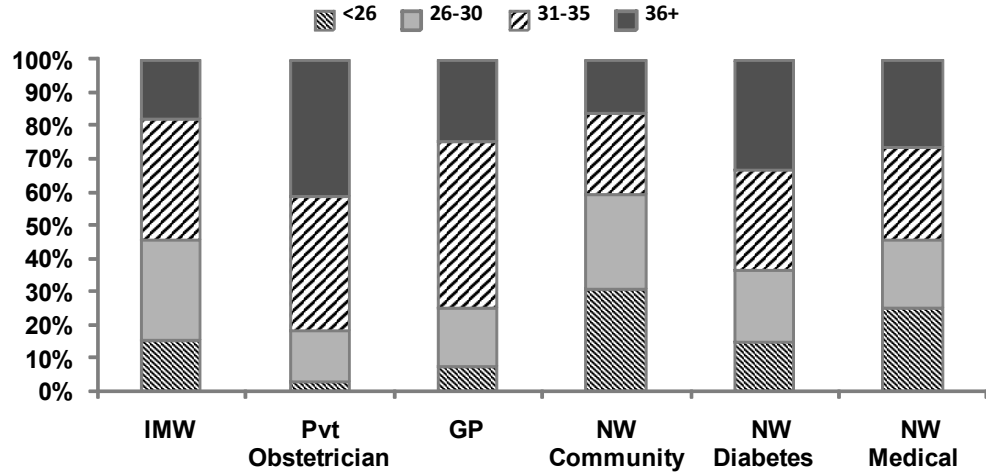

Figure 15: LMC at birth and maternal age

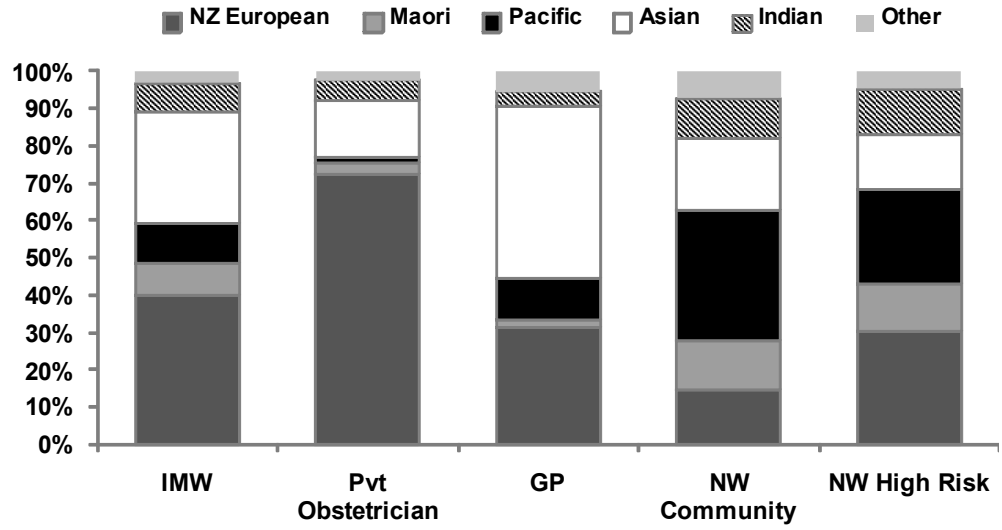

Figure 16: LMC at birth and maternal ethnicity

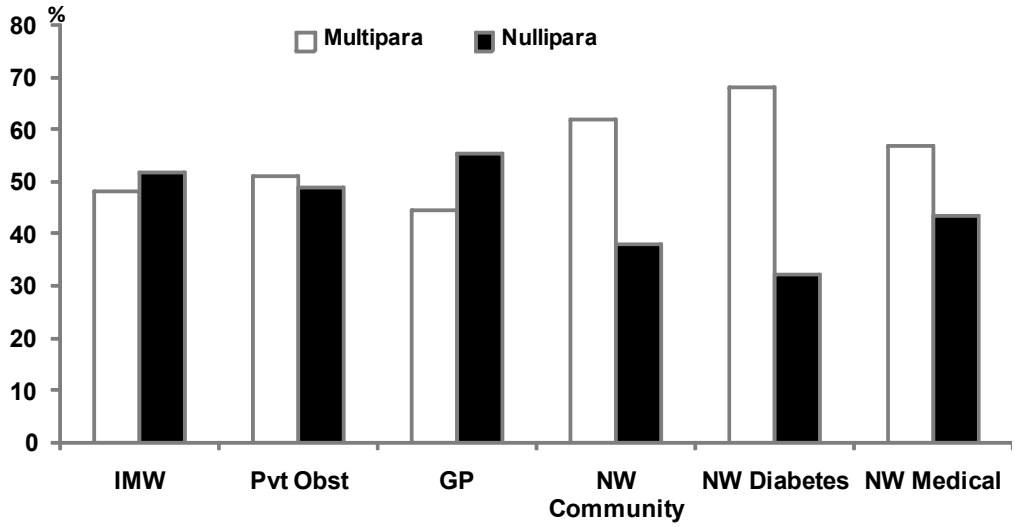

Figure 17: LMC at birth and parity

Women booked with a private obstetrician were more likely to be older, particularly over 35 years, compared to women booked with other LMCs. Private LMCs (both independent midwives and obstetricians) have significantly fewer Māori and Pacific women booking with them compared to public LMCs. The importance of public LMCs in the provision of antenatal care for Māori and Pacific Island women and the issues for these women accessing an independent midwife for pregnancy care needs to be considered.

4.8 Standard primipara

The definition for standard primipara is a woman with no prior birth ≥ 20 weeks, aged 20-34 years at index birth, with a singleton pregnancy, cephalic presentation, gestation 37-41 weeks, baby not small for gestational age (customised centile ≥10th), no medical disease, (defined as no history of cardiac disease, renal disease, mental health disorder, SLE, HIV infection, CVA/TIA, diabetes or hypertension), no gestational diabetes in index pregnancy, no pregnancy associated hypertensive disease in index pregnancy, no antepartum haemorrhage during index pregnancy. The objective of reporting outcomes for this tightly defined sub-group is to permit comparison between individual caregivers within National Women's and to compare outcomes with those in other institutions.

In 2011, 32% of primiparous women were defined as standard. Fewer European and Māori primipara are standard primipara compared to Other Asian and Indian women.

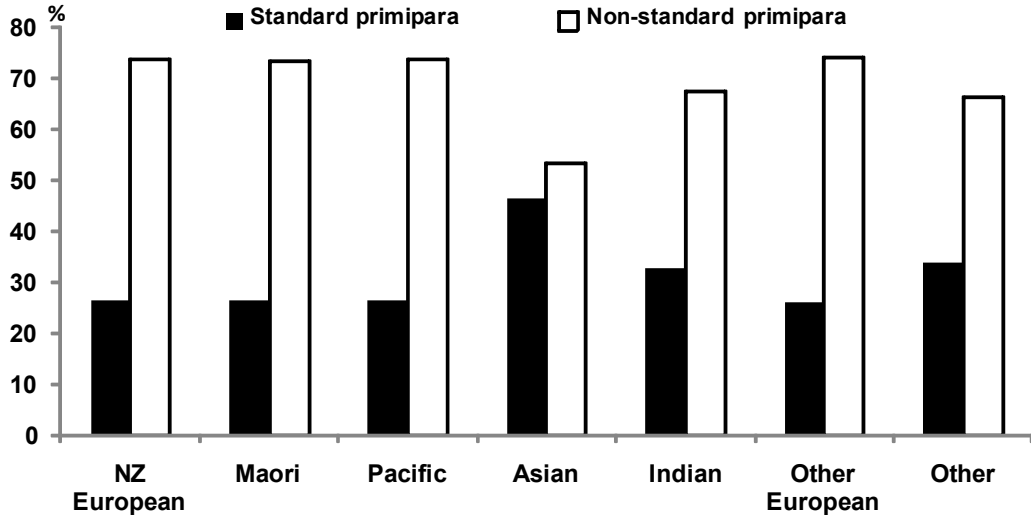

Figure 18: Standard primipara rates by maternal ethnicity

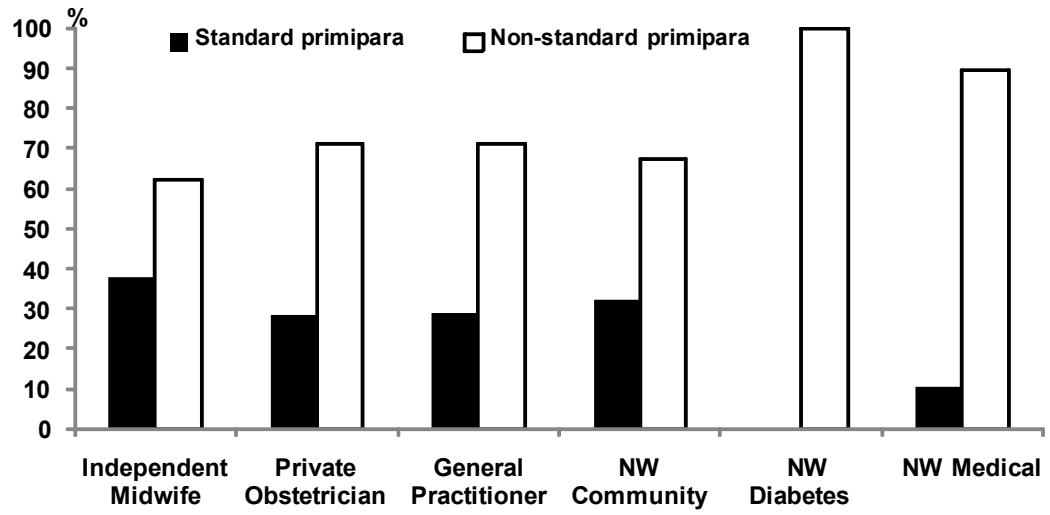

Figure 19: Standard primipara rates by LMC at birth

Chapter 5

ANTENATAL COMPLICATIONS

5 ANTENATAL COMPLICATIONS

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

5.1 Preterm birth

WHA Maternity Indicator for Preterm birth		WHA mean 05-06	NW 2007 n=7875	NW 2008 n=7753	NW 2009 n=7897	NW 2010 n=7866	NW 2011 n=7690
Indicator	**Definition**	**%**	**%**	**%**	%	**%**	**%**
Preterm birth	Babies born before 37 weeks/Inborn babies	13.3	11.5	10.9	9.7	8.9	10.2
	Babies born before 32 weeks/Inborn babies	4.04	3.0	3.3	2.7	3.1	2.8

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

Methods

Preterm birth is defined as birth prior to 37 completed weeks. Since 2004, iatrogenic birth has been defined as induction of labour (including induction for preterm premature rupture of membranes (PPROM)), elective Caesarean section and emergency Caesarean before the onset of labour. Prior to 2001, elective Caesareans were not defined at data entry but derived based on a definition of Caesarean section before the onset of contractions.

Table 14: Rates of preterm birth <37 completed weeks (1998 – 2011)

	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011
Total number of women	7492	7501	7827	7491	7194	7212	7695	7589	7735	7709	7523
Women birthing preterm	852	850	912	756	685	716	796	733	658	689	684
Incidence %	11.4	11.3	11.7	10.1	9.5	9.9	10.3	9.7	8.5	8.9	9.1
Spontaneous <37 weeks		350	385	372	323	335	397	293	275	312	279
Incidence %		4.7	4.9	5.0*	4.5	4.6	5.2	3.9	3.6	4.0	3.7
Iatrogenic <37 weeks		500	527	384	362	381	399	440	383	377	405
Incidence %		6.7	6.7	5.1*	5.0	5.3	5.2	5.8	5.0	4.9	5.4
Total babies <37 weeks	991	984	1062	886	806	836	904	843	769	793	787

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

There has been little change in overall rates of preterm birth in the last five years. An overall rate of birth <37 weeks of approx 9% is comparable to other similar units and is expected from our population in terms of demographic and risk. National Women's has a higher proportion of iatrogenic preterm births than some other units but this is likely to reflect the tertiary level of care provided by National Women's dealing with high risk pregnancies and in-utero transfers of care in those requiring early birthing on fetal and/or maternal grounds. Reassuringly the rate of iatrogenic preterm birth appears to be remaining stable at approximately 5% despite a possible increase in the number of more complicated births seen with increasing BMI and advancing maternal age.

Of note the highest rate of preterm birth is in women up to age 20 (18.2%), much higher than women >40 years (13%) and women aged 26-40 (8.5%). For women aged <20 years the risk of preterm birth is relatively equally spilt between iatrogenic and spontaneous preterm birth. Further investigation into these preterm births may be

warranted as potential preventative measures may have an impact. Rates of both iatrogenic and spontaneous preterm birth are higher for Maori women (as has been seen previously), and this also warrants further investigation as it is likely avoidable confounding factors are contributing to this increased risk.

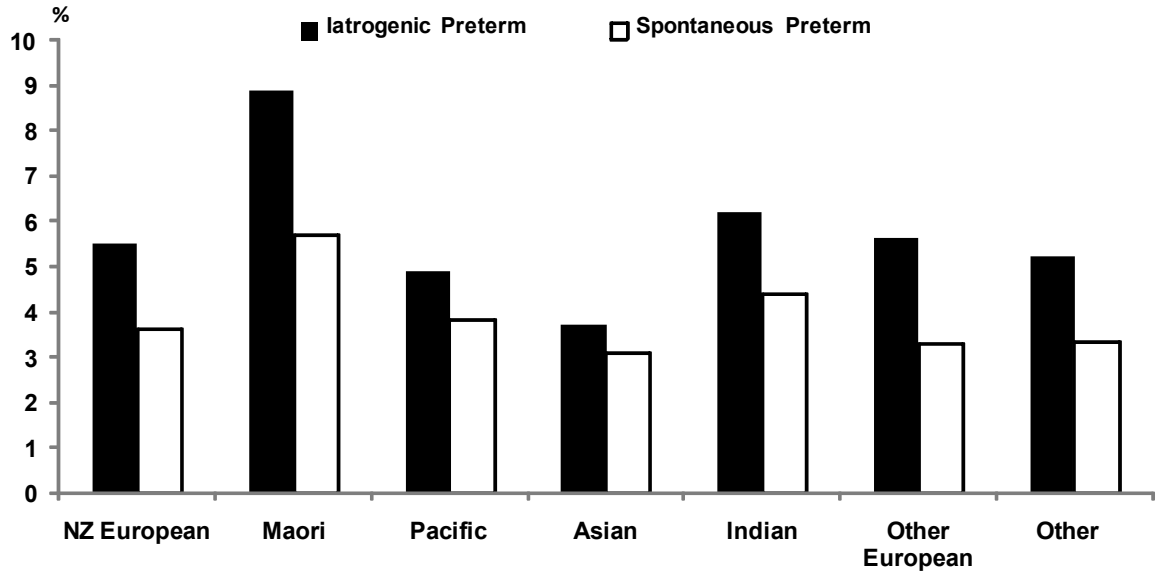

Figure 20: Spontaneous and iatrogenic preterm birth rates (<37 weeks) by ethnicity

Table 15: Rates of preterm birth <32 completed weeks (1997–2011)

	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011
Total number of women	7492	7501	7827	7491	7194	7212	7695	7695	7735	7709	7523
Women birthing <32 weeks	212	229	244	220	211	212	212	222	185	212	190
Incidence %	2.8	3.1	3.1	2.9	2.9	2.9	2.8	2.9	2.4	2.8	2.5
Spontaneous <32 weeks		86	107	106	93	96	105	105	91	94	79
Incidence %		1.1	1.4	1.4*	1.3	1.3	1.4	1.4	1.2	1.2	1.1
Iatrogenic <32 weeks		143	137	114	118	116	107	117	94	118	111
Incidence %		1.9	1.8	1.5*	1.6	1.6	1.4	1.5	1.2	1.5	1.5
Total babies <32 weeks		271	287	250	247	245	237	253	214	246	214

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

The rates of birth <32 weeks gestation have remained very stable in the last 10 years at just under 3%. These rates may be a little higher than expected from a general population but reflect the high risk nature of National Women's population and in-utero transfers from other centres without NICU facilities able to care for infants <32 weeks gestation. Birth <32 weeks only makes a small contribution to all births at National Women's but these infants are likely to have the largest impact on neonatal mortality and severe morbidity as well as use of NICU facilities and resources. We continue to strive to reduce rates of early preterm birth and subsequent complications of prematurity by active involvement in clinical trials and development of guidelines to implement changes to clinical practice when clinical trials have demonstrated improved outcomes. In 2011 this has included on-going involvement in the PROGRESS study (PROGesterone after previous preterm birth for prevention of neonatal RESpiratory Syndrome) and EPPI Trial (Enoxaparin for the Prevention of Preeclampsia and IUGR), commencing recruitment to the ASTEROID study (Australasian antenatal Study To Evaluate the Role Of Intramuscular Dexamathasone versus betamethasone prior to preterm birth to increase survival free of childhood

neurosensory disability) and the use of magnesium sulphate for neuroprotection in women at very high risk of delivery <30weeks.

Table 16: Perinatal outcome of preterm births by gestation (n=787)

Gestation	Births	Fetal deaths	Live births	% Live born	Neonatal Death	% of live births surviving >=28 days
20	11	8	3	27	3	0
21	19	17	2	11	2	0
22	19	16	3	16	3	0
23	15	12	3	20	1	67
24	12	4	8	67	2	75
25	11	2	9	82	1	89
26	17	3	14	82	0	100
27	16	2	14	88	0	100
28	14	0	14	100	0	100
29	19	2	17	89	0	100
30	26	3	23	88	1	96
31	35	0	35	100	2	94
32	40	1	39	98	1	97
33	48	3	45	94	1	98
34	96	3	93	97	0	100
35	142	2	140	99	0	100
36	247	5	242	98	0	100
Totals	787	83	704	89	17	98

Perinatal outcome for premature babies is excellent with survival rates of all livebirths from 26 weeks approaching those expected at term. Long term morbidity for these premature babies should also be considered and is discussed in Chapter 9.

Summary and Implications

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

Reassuringly National Women's preterm birth rates have not increased in recent years. Many preterm births are unavoidable and in some cases essential when the mother or fetus is significantly compromised. However, we should continue to aim to reduce these rates. This includes simple measures such as avoiding late preterm births by limiting all elective CS to gestations $\geq$39 weeks, continued smoke change advice to all smoking pregnant women, and continued involvement in clinical trials.

5.2 Small and large for gestational age babies

Methods

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

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

Findings

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

	Total Babies	Customised Birthweight<10th %(SGA)		Customised Birthweight>=10th% & <=90th%(AGA)		Customised Birthweight>90th% (LGA)	
	N	n	%	n	%	n	%
Total	**7690**	**999**	**13.0**	**6128**	**79.7**	**563**	**7.3**
Maternal Age							
<=20	332	62	18.7	248	74.7	22	6.6
21-25	891	138	15.5	686	77.0	67	7.5
26-30	1946	228	11.7	1599	82.2	119	6.1
31-35	2620	295	11.3	2124	81.1	201	7.7
36-40	1589	221	13.9	1234	77.7	134	8.4
>40	312	55	17.6	237	76.0	20	6.4
Ethnicity							
NZ European	2785	331	11.9	2210	79.4	244	8.8
Maori	623	100	16.1	473	75.9	50	8.0
Pacific	1033	159	15.4	810	78.4	64	6.2
Asian	1549	187	12.1	1292	83.4	70	4.5
Indian	555	86	15.5	423	76.2	46	8.3
Other European	872	92	10.6	711	81.5	69	7.9
Other	273	44	16.1	209	76.6	20	7.3
Parity							
Multipara	4066	483	11.9	3261	80.2	322	7.9
Primipara	3624	516	14.2	2867	79.1	241	6.7
Smoking at booking							
Currently smoking	503	115	22.9	366	72.8	22	4.4
Not smoking	7186	884	12.3	5762	80.2	540	7.5
Unknown	1	0	0.0	0	0.0	1	100.0
BMI							
<19	445	47	10.6	367	82.5	31	7.0
19-25	4350	478	11.0	3548	81.6	324	7.4
26-30	1414	231	16.3	1072	75.8	111	7.9
31-35	700	89	12.7	570	81.4	41	5.9
>35	589	103	17.5	442	75.0	44	7.5
Missing data	192	51	26.6	129	67.2	12	6.3
Plurality							
Singleton	7360	855	11.6	5947	80.8	558	7.6
Multiple	330	144	43.6	181	54.8	5	1.5

There are differences in age, ethnicity and parity between mothers of SGA and AGA infants. There is a U shaped relationship between age and risk of SGA with elevated risk in both young and older mothers. Maori, Pacific and Indian mothers have an increased risk of SGA which was also found in last year's report. In Maori women the elevated risk may be associated with the higher rates of smoking in pregnancy and in Indian and Pacific women this may be related to pregnancy complications such as hypertensive disorders. The independent risk factors for SGA in our population are currently being investigated (Anderson et al paper submitted).

The increased risk of SGA among over-weight and obese women (15.6% (423/2703)) may be clinically relevant as it is more difficult to detect these SGA infants before birth. Recent data from National Women's show that this increased risk of SGA in overweight and obese women is independent of other common confounders such as hypertensive disorders (Anderson et al submitted paper).

Consistent with international literature women who smoke have an elevated risk of SGA infants. Ceasing smoking in early pregnancy can prevent this risk of SGA in smokers and is an important goal of antenatal care.

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

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

	Customised Birthweight<10th%(SGA) n=999		**Customised Birthweight>=10th% & <=90th%(AGA) n=6128**		**Customised Birthweight>90th%(LGA) n=563**	
	n	**%**	**n**	**%**	**n**	**%**
Median birth weight(IQR) g	2610(2120-2885)		3420(3130-3700)		4120(3840-4410)	
Gestation at birth						
Term	715	71.6	5670	92.5	518	92.0
Preterm	284	28.4	458	7.5	45	8.0
Preterm <32 wks	110	11.0	93	1.6	11	2.0
Median gestation (IGR) weeks	38(36-40)		39(38-40)		39(38-40)	

More than one quarter of SGA infants were born preterm and 11% were born < 32 weeks.

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

	Customised Birthweight<10th%(SGA) n=284		Customised Birthweight>=10th% & <=90th%(AGA) n=458		Customised Birthweight>90th%(LGA) n=45	
	n	%	n	%	n	%
Onset of birth - preterm						
Spontaneous labour	74	26.1	219	47.8	21	46.7
Induction and pre labour CS	210	73.9	239	52.2	24	53.3
NICU admission						
Any stay	181	63.7	234	51.1	21	46.7
>= 2 days	178	62.7	230	50.2	21	46.7
Apgar at 5 mins < 7	18	6.3	69	15.1	7	15.6
Fetal death (n/1000)	58	204.2	23	50.2	2	44.4
Neonatal death (n/1000 live births)	11	38.7	4	8.7	2	44.4

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

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

	Customised Birthweight<10th% (SGA) n=715		Customised Birthweight>=10th% & <=90th%(AGA) n=5670		Customised Birthweight>90th%(LGA) n=518	
	n	%	n	%	n	%
Onset of birth - preterm						
Spontaneous labour	285	39.9	2851	50.3	220	42.5
Induction and pre labour CS	430	60.1	2819	49.7	298	57.5
NICU admission						
Any stay	84	11.7	301	5.3	32	6.2
>= 2 days	78	10.9	244	4.3	27	5.2
Apgar at 5 mins < 7	18	2.5	69	1.2	7	1.4
Fetal death (n/1000)	8	11.2	5	0.9	1	1.9
Neonatal death (n/1000 live births)	2	2.8	1	0.2	0	0.0

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

Summary / Implications

These 2012 data again confirm that babies who are SGA by customised centiles have higher rates of morbidity and mortality than their AGA and LGA counterparts. This applies both to babies born at term and preterm. Women who smoke have higher rates of SGA than non smokers. Cessation early in pregnancy with appropriate support should be the goal for all pregnant smokers. A paper which describes independent risk factors for SGA in our population will hopefully be published this year which may be of assistance to clinicians.

5.3 Multiple pregnancy

This section describes the characteristics and outcomes of mothers who gave birth to twins and triplets at NW during 2011 and the outcomes of their babies.

Findings

Table 21: Multiple pregnancy rates

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total number of multiple pregnancies	182	172	218	179	208	191	188	187	162	177	160	159	153	163
Incidence %	2.4	2.2	2.7	2.3	2.6	2.4	2.4	2.5	2.2	2.3	2.1	2.1	2.0	2.2
Number of twin pregnancies	176	166	207	175	201	184	188	184	157	174	156	156	149	159
Number of triplet pregnancies	5	6	11	4	7	7	0	3	5	3	4	3	4	4
Number of quadruplet pregnancies	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 22: Fetal/neonatal outcomes of multiple pregnancies

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total number of babies born in a multiple pregnancy	371	350	447	362	423	389	376	377	329	357	324	321	310	330
Incidence %	4.8	4.6	5.3	4.7	5.3	4.9	4.9	5.1	4.5	4.5	4.2	4.1	3.9	4.3
Number of multiple pregnancies where one or more babies died	12	12	14		26	11	15	13	8	9	12	9	13	17
Incidence % (no. of multiple pregnancies where a baby died/number of multiple pregnancies)	6.6	7.0	6.4		12.5	5.8	8.0	7.0	4.9	5.1	7.5	5.8	8.5	10.4
Number of babies who died in a multiple pregnancy	25	22	23				23	17	12	11	16	13	16	26
Total number of babies born in a twin pregnancy	352	332	414	350	402	368	376	368	314	348	312	321	298	318
Twin perinatal deaths (≤ 7days)	28	20	22	20				23	16	11	10	13	12	23
Twin perinatal mortality rate*	68.6	56.8	62.5	48.3				61.2	43.4	35.0	28.7	41.7	37.4	72.3

*Perinatal twin deaths/1000 twin babies born

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

The perinatal mortality rate is higher in twins than singletons (72.3/1000 births versus 12.8/1000 births). The rate in 2011 appears higher than previous years, however this is

not statistically significant. Examination of the individual cases has not shown any particular underlying aetiology contributing to the total perinatal mortality rate.

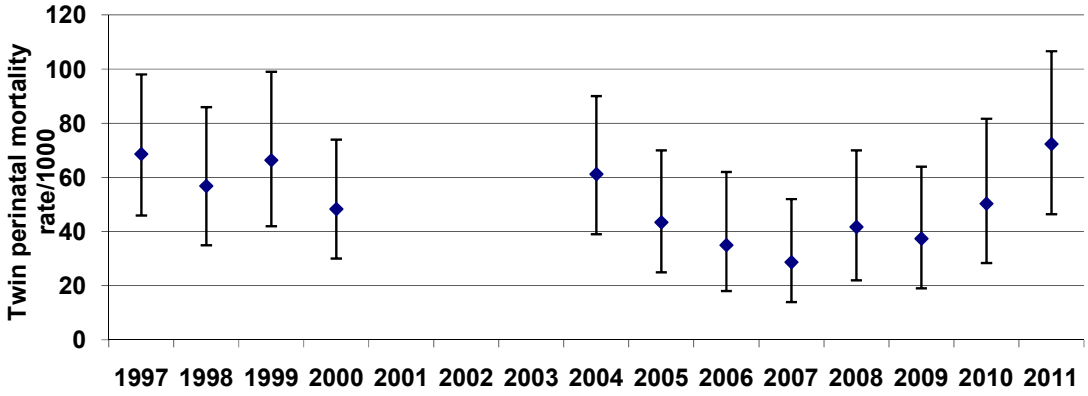

Figure 21: Twin perinatal mortality rate (per 1000 twin births) 1997-2011 with 95% confidence intervals

Table 23: Mode of onset of birth among twin pregnancies by gestation at birth

	Preterm births n=190		Term births n=128	
	n	%	n	%
Mode of onset of birth				
CS elective	56	29.5	70	54.7
CS emergency before labour	34	17.9	8	6.3
Induction of labour	38	20.0	36	28.1
Spontaneous labour	62	32.6	14	10.9

Sixty percent of twins are born preterm making preterm birth the norm. For twin pregnancies that proceed to term there has been research published in the last year which better guides management of timing of delivery.

The Timing of Twins study coordinated by the ARCH in Adelaide, involving NWH as a study centre, was published in the BJOG. Women at 37 weeks were randomised to planned delivery or waiting to 38 weeks. The study showed that in women with an uncomplicated twin pregnancy, elective birth at 37 weeks gestation is associated with a significant reduction in risk of serious adverse outcomes for the babies. This study did not differentiate monochorionic from dichorionic twins, but the vast majority of randomised women had a dichorionic twin pregnancy. It has been recognised for many years that monochorionic twin pregnancies are higher risk than dichorionic and it is likely that the majority of monochorionic twins were electively delivered before randomisation at 37 weeks.

There have been two large cohort studies published in the last year examining the ongoing risk to monochorionic twins as gestation advances. This is not such a robust method as a randomised controlled trial. However both studies provide reassurance that it is safe to wait to 36-37 weeks for elective delivery of monochorionic twins with a reduction in neonatal complications and costs. At $\geq$ 37 weeks only 2.3% of twins require Neonatal Unit admission.

Sixty-two percent of twins are delivered abdominally. As noted previously caesarean section has become the norm. Once again in 2011 only one woman had a caesarean section for the second twin which is reassuring.

Table 24: Mode of birth among twin pregnancies

	Twin pregnancies															
	2004 n=188		2005 n=184		2006 n=157		2007 n=174		2008 n=156		2009 n=156		2010 n=149		2011 n=159	
	n	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%
SVB/vag breech both twins	52	52	53	29	38	24	47	27	52	33	48	31	36	24	38	24
SVB 1st twin, operative vaginal 2nd twin	4	4	8	4	7	4	3	2	2	1	2	1	2	1	6	4
Operative vaginal 1st twin, SVB 2nd twin	8	8	5	3	5	3	6	3	4	3	7	4	7	5	5	3
Operative vaginal birth both twins	7	7	7	4	3	2	11	6	4	3	9	6	4	3	2	1
SVB 1st twin, Caesarean section 2nd twin	4	4	1	1	1	1	2	1	3	2	1	1	1	1	1	1
Operative vaginal birth 1st twin, Caesarean section 2nd twin	5	5	0		0		0		0		0		0		0	
CS elective both twins	48	26	52	28			46	29	51	33	37	24	58	39	63	40
CS emergency both twins	60	32	58	31			57	36	39	25	52	33	41	28	44	28

Table 25: Fetal/newborn outcomes of twin babies

		Twins babies n=318	
	N	n	%
Apgar <7 at 5 minutes	150	8	2.5
Admission to NICU ≥ 2 days	778	128	40.3
≤ 34 weeks	301	86	28.6
35-36	128	34	26.6
≥ 37 weeks	349	8	2.3

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

	Twin pregnancies			
	One twin died n=9		Both twins died n=14	
Gestation (weeks)	**n**	**Outcome**	**n**	**Outcome**
20 – 23			12	12FD
24 – 27			2	2FD
28 – 31	2	FD/ENND		
32 – 36	2	FD/ENND		
37 – 40	5	4FD/ENND		

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

There were 23 perinatal related deaths of twins and 3 of triplets. In 5 of these spontaneous preterm birth contributed to the loss. In two cases there was antepartum bleeding and in three of the latest losses there was a congenital anomaly or specific perinatal event. Most losses occur before 28 weeks. In all losses where both twins died this occurred prior to 24 weeks. If a twin pregnancy with no complications/ congenital anomalies proceeds to 28 weeks, the outlook is good for both babies.

Summary / Implications

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

As expected more babies are born preterm and 41% will spend some time in NICU. Timing of delivery is uncertain but 2.3% of twins born after 37 weeks spend time in NICU suggesting that routine delivery at 37 weeks should be considered carefully. Women with uncomplicated twin pregnancy at term should have the Timing of Twins study discussed.

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

5.4 Diabetes

Methods

The data in this section relate to women with a diagnosis of pre-existing or gestational diabetes who birthed at National Women's in 2011. It includes women who were cared for solely by the National Women's Diabetes Clinic, women with some input from the Diabetes Clinic while under the care of non-Diabetes Clinic LMCs, and women with no Diabetes Clinic input. It does not include 63 women seen by the Diabetes service for pre-pregnancy counselling or who birthed prior to 20 weeks or who birthed elsewhere.

Findings

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

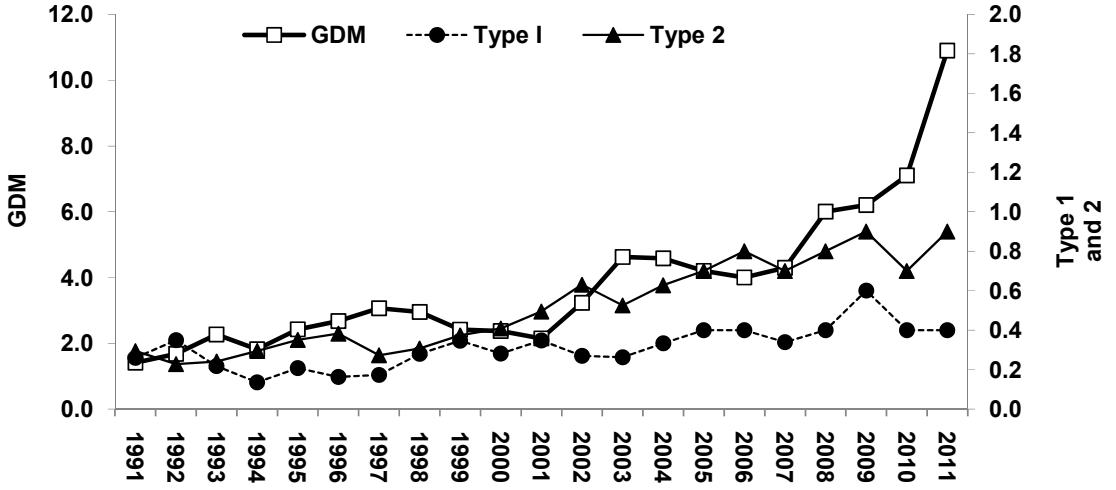

Figure 22: Incidence of diabetes (% of all inborn and BBA births) (1991-2011)

5.4.1 Demographic characteristics of women with diabetes

During 2011, 14.3% of our referrals with GDM were from Waitemata. During 2012, Waitemata will provide a diabetes in pregnancy service for many of these women, so this may result in a temporary decrease in numbers of women attending the National Women's service.

Polynesian women still have the highest rates of type 2 diabetes, but their rate of GDM is likely to be higher than shown. From our preliminary analysis of women with false negative OGTTs and elevated HbA1c (see below re HbA1c), Polynesian women were overrepresented. Many of these women will meet the criteria for early testing with an HbAc1, so it will be interesting to see if we start to capture more women who would benefit from treatment in this population over the next few years.

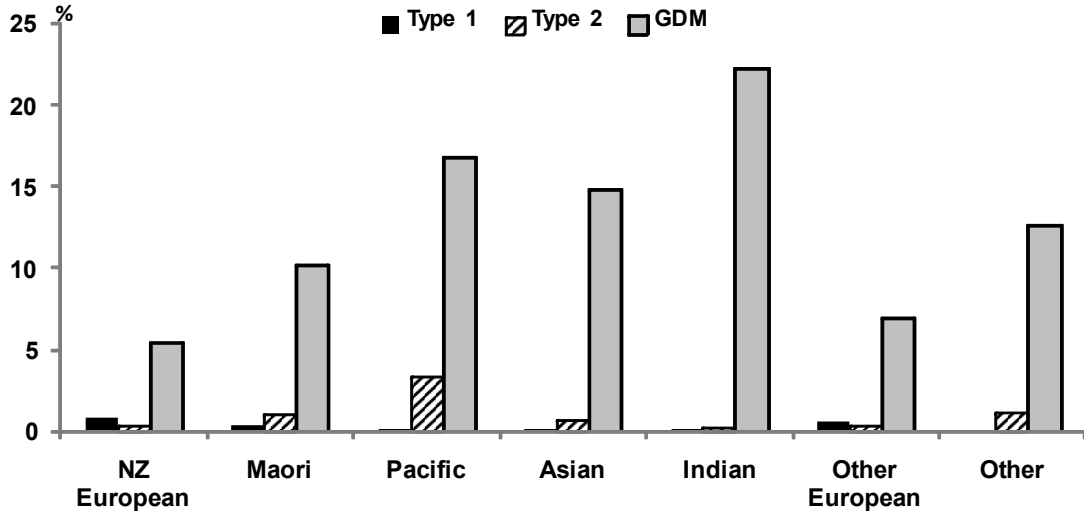

Figure 23: Incidence of diabetes by ethnic group (2011)

5.4.2 Outcomes of pregnancies complicated by diabetes

Maternal outcomes

It is interesting that the Caesarean section rate has not increased in our diabetes population and in women with GDM. This may relate to our tight glucose aims and individual planning regarding timing of delivery.

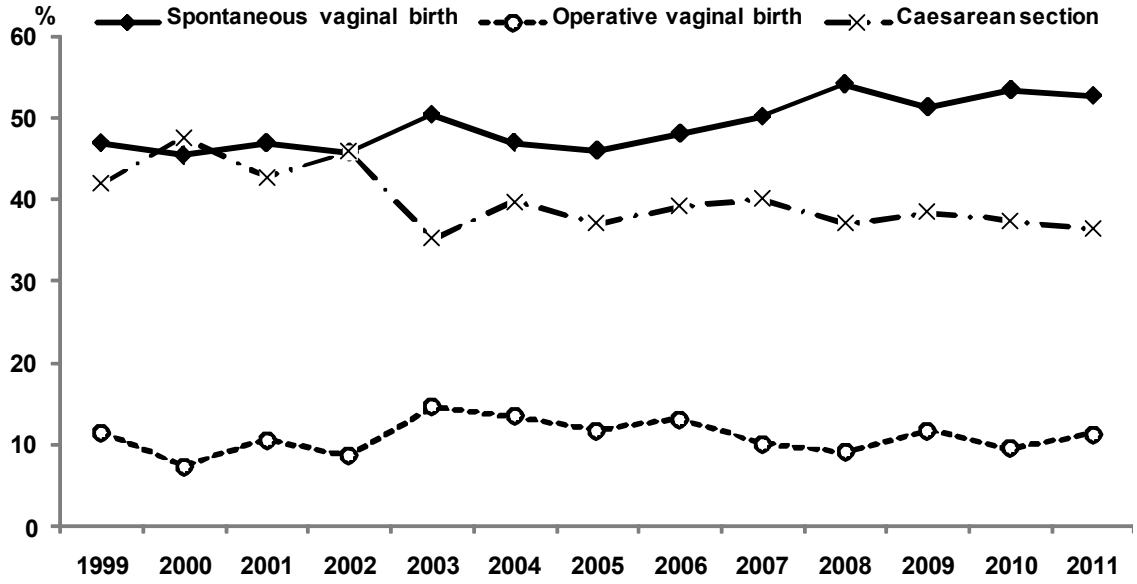

Figure 24: Mode of birth among women with GDM (1999-2011)

5.4.3 Maternal postpartum glucose tolerance testing

Table 27: Rates of postnatal glucose tolerance testing (GTT) among women with GDM (2002-2011)

	2003 n=352		2004 n=342		2005 n=304		2006 n=286		2007 n=331		2008 n=457		2009 n=480		2010 n=548		2011 n=821	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Postnatal GTT	260	74	260	76	238	78	206	72	249	75	313	68	324	68	369	67	480	58
No post-natal GTT	92	26	82	24	66	22	80	28	82	25	144	32	156	32	179	33	341	42

Fewer women are performing postnatal testing for glucose intolerance. This may relate to the significant increase in referrals to our service without a parallel increase in resources to care for these women. We would like to address this because of the long term implications for the health of women who have been diagnosed with GDM. It is possible that we will move to doing HbA1c routinely for glucose assessment postpartum, but further data are required to decide optimal timing for this test.

Table 28: Results of postnatal glucose tolerance testing (GTT) among women with GDM (2002-2011)

	2003 n=260		2004 n=260		2005 n=238		2006 n=206		2007 n=249		2008 n=313		2009 n=324		2010 n=369		2011 n=480	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Normal	196	75	194	75	190	80	158	77	175	70	236	75	264	82	266	72	375	78
IFG/ IGT*	39	15	49	19	34	14	39	19	50	20	58	19	42	13	80	22	90	19
Type 2	25	10	17	7	14	6	9	4	24	10	19	6	18	5	23	6	14	3
Type 1																	1	0.1

*IFG =Impaired fasting glucose IGT= Impaired glucose tolerance

5.4.4 Neonatal outcomes among babies of women with diabetes in pregnancy

Outcomes are similar to previous years. We continue to note the high risk subgroup of women with GDM who are reclassified with type 2 diabetes postpartum. We hope this might improve with recommendations for early testing in high risk women.

Table 29: Neonatal outcomes among babies of women with diabetes

	Type 1 n=35		Type2 n=70		GDM n=827		Postnatally diagnosed Type 2 n=12		No diabetes n=6746	
	n	%	n	%	n	%	n	%	n	%
Birthweight (Median(IQR)	3620 (3255-3960)		3270 (2620-3570)		3260 (2930-3600)		2943 (2060-3765)		3390 (3020-3730)	
<1500g	0	0	2	2.9	7	0.8	2	16.7	186	2.8
<2500g	2	5.7	12	17.1	71	8.6	5	41.7	586	8.7
SGA <10th percentile	1	2.9	13	18.6	100	12.4	4	33.3	881	13.1
LGA >90th percentile	16	45.7	9	12.9	68	8.2	3	25.0	467	6.9
Admission to NICU		0		0.0		0.0		0.0		0.0
Any admission	11	31.4	15	21.4	103	12.5	7	58.3	717	10.6
>= 2 days	11	31.4	15	21.4	92	11.1	6	50.0	654	9.7
Hypoglycaemia < 2.3 mmol/l	12	34.3	11	15.7	60	7.3	0	0.0	ND	
Hypoglycaemia 2.3 - 2.6 mmol/l	4	11.4	12	17.1	41	5.0	1	8.3	ND	
IV Dextrose	7	20.0	8	11.4	21	2.5	3	25.0	ND	
Perinatal related losses (/1000)	0	0	1	14.3	4	4.8	0	0	115	17.0

ND=Not documented

5.4.5 Perinatal losses

There were 5 perinatal related losses among women with diabetes in 2011. One was in a woman with type 2 diabetes who presented with staphylococcal sepsis and intrauterine fetal death at 23 weeks. The other four were in women with GDM: two related to congenital anomalies, one was identified with severe neural tube defect at 19 weeks and the pregnancy was terminated, the other had trisomy 18 and severe cardiac anomalies; another was a neonatal death from pulmonary hypoplasia and sepsis in a woman who had PPROM from 15 weeks and delivered at 31 weeks; the final one was a neonatal death associated with perinatal asphyxia in a woman who had a ventouse delivery at term.

HbA1c in pregnancy- its place in testing for diabetes in pregnancy

During 2011, approximately 10% of our referrals were in women whose 75g OGTT was not diagnostic for GDM, but there was clinical concern they had GDM and their HbA1c

level was significantly elevated, reflecting hyperglycaemia over several weeks at least. Of these women, 90% required medication in addition to lifestyle intervention. We are analysing our data and working to clarify the role of HbA1c in pregnancy. Currently, we are recommending it is done at booking in high risk women to identify unrecognised glucose intolerance.

Diagnostic Criteria for GDM

We continue to recommend the 75g OGTT for diagnosis of GDM in later pregnancy. We have not changed our diagnostic cut off to international recommendations at this point, although a number of clinicians in the service are looking at whether this should be recommended in the future and the Australasian Diabetes in Pregnancy Society (ADIPS) has endorsed the new criteria in their recent guidelines. We are developing models of care for “lower risk” women with GDM, as it will not be possible to continue to expand the hospital clinic.

Summary

The service has been struggling to cope with the increase in numbers. We are developing strategies to manage this and are unable to consider new criteria until this is in place.

There are indications that we have improved our uptake of screening for GDM and we have also defined a role for HbA1c in early pregnancy for identifying pre-existing unrecognised glucose intolerance. We are examining whether HbA1c might be a useful adjunctive test in later pregnancy in specific circumstances.

Our outcomes remain good.

Recommendations

1. Continue to develop models of care with community clinics and hopefully GPs to cope with the increasing numbers. This will require intensive education to ensure the level of care for women is not compromised.
2. Set up discussions about the new guidelines for the diagnosis of GDM. This will become more pressing now that other countries and ADIPS have endorsed the new diagnostic criteria.
3. Develop recommendations about postnatal testing, whether to adopt HbA1c instead of OGTT, as adherence to performing OGTT has dropped with fewer available resources in our service to follow up these women.

5.5 Antepartum Haemorrhage

Methods

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

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

Findings

Table 30: Antepartum haemorrhage incidence

	1996	1997	1998	1999	2000	2005	2006	2007	2008	2009	2010	2011
Total APH	451	453	451	484	594	398	411	533	424	438	438	455
Incidence %	4.9	5.6	6.0	6.5	7.6	5.5	5.7	6.9	5.6	5.7	5.7	6.0
Proven abruption	96	115	82	49	54	41	44	58	36	39	50	54
Proven placenta praevia	67	94	91	74	69	81	68	94	73	66	58	60
APH (uncertain origin)	287	281	278	361	471	276	299	381	315	333	330	341

In 2011, 455 women (6.0% of the total pregnant population) had an antepartum haemorrhage or placenta praevia without bleeding. This figure has not changed significantly from year to year. The underlying causes have remained unchanged with APH of uncertain origin the most frequent "cause" over the last 15 years, despite improvements in ultrasound and other imaging modalities. History taking, careful examination and clinical acumen remain important when assessing women with post-partum haemorrhage.

In our population placenta praevia is significantly more common with increasing maternal age: there was an incidence of 0.3% (11 of 3121 women) in women aged 30 or under rising to 1.1% in women aged >30 (49 of 4402 women). The incidence of placenta praevia in women with a previous Caesarean section was 1.3% (16 of 1203 women) compared to 0.6% (18/2781) among multipara without previous Caesarean consistent with previous Caesarean section being a risk factor for placenta praevia. Smoking status, BMI and hypertensive disease were not associated with placenta praevia.

Table 31: Maternal outcomes of pregnancies complicated by antepartum haemorrhage

	Placenta praevia n=62*		Placental abruption n=54		APH uncertain n=341		No APH n=7066	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	0	0	14	25.9	205	60.1	4024	56.9
Operative vaginal	0	0	4	7.4	41	12.0	787	11.1
CS elective	45	72.6	4	7.4	29	8.5	1105	15.6
CS emergency	17	27.4	32	59.3	66	19.4	1150	16.3
Maternal transfusion	10	16.1	7	13.0	25	7.3	168	2.4

*2 women had both praevia and abruption

Women with a placenta praevia had a significant requirement for blood products with 16% of women requiring transfusion during pregnancy or birth. However, it is reassuring that 84% are managed without resort to blood transfusion. The use of cell saver technology and changing attitudes to the use of blood products may all be contributing to this.

A confirmed placental abruption is a less common diagnosis with an incidence of 0.7% in 2011 (54 out of 7523 women). There was no difference in incidence with maternal age, BMI or previous Caesarean section. Smoking is a significant risk factor with an incidence of 2.0% compared to 0.6% in non-smokers. Pre-eclampsia may also be a significant risk factor with an incidence of 1.1% in this group compared to 0.7% in normotensive women.

Placental abruption is associated with significant maternal morbidity with 59% requiring birthing by emergency Caesarean section and 13% being transfused. Fetal morbidity is also significant with a median birth weight of 2850g and an incidence of SGA of 24%. Half of these babies were admitted to NICU and there were two perinatal deaths amongst 50 babies in this group (40/1000 births).

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

Women with an APH of uncertain origin make up the largest proportion of women presenting with antepartum haemorrhage (341 of 455 women). Placenta praevia can be confirmed or excluded reliably by ultrasonography and it is likely that many of these women with no firm diagnosis had unconfirmed small abruptions. The associations with BMI, smoking and hypertensive disease would support this assumption.

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

	Placenta praevia		Placental abruption		APH uncertain origin		No APH	
	n=62		n=55		n=356		n=7215	
	n	%	n	%	n	%	n	%
Gestation at birth								
<37 weeks	21	33.9	27	49.1	101	28.4	636	8.8
<32 weeks	2	3.2	15	27.3	52	14.6	145	2.0
Birthweight								
Median(IQR)	3125	(2670-3520)	2850	(1400-3420)	3120	(2495-3530)	3390	(3025-3730)
<2500g	11	17.7	24	43.6	89	25.0	552	7.7
<1500g	2	3.2	15	27.3	44	12.4	136	1.9
Small for gestation age	4	6.5	13	23.6	68	19.1	914	12.7
Perinatal related deaths (n/1000)	1	1.6	3	5.5	26	7.3	90	1.2
Admission to NICU	15	24.2	21	38.2	74	20.8	741	10.3
>=2 days in NICU	15	24.2	20	36.4	70	19.7	671	9.3

5.6 Hypertensive disease

Methods

The following definitions of hypertension in pregnancy have been used in this report:

- **Gestational hypertension**: Gestational hypertension (GH) is a blood pressure systolic ≥ 140 and / or diastolic ≥ 90 mmHg on two or more consecutive occasions at least 4 hours apart or one measurement systolic BP ≥ 170 and or diastolic BP ≥ 110 mmHg.
- **Preeclampsia**: Gestational hypertension accompanied by proteinuria measured as ≥ 2+ protein on one dipstick sample or Protein Creatinine Ratio (PCR) ≥ 30 on a spot urine sample, or a 24 hour collection ≥ 0.3g in 24 hours.
- **Chronic hypertension**: diastolic BP $\underline{\geq}$ 90mmHg at booking or a medical history of essential hypertension. Includes women with superimposed pre-eclampsia if these are not categorised separately.
- **Super imposed preeclampsia:** The development of preeclampsia in a patient with chronic hypertension.

The cleaning of hypertension data involves reconciling data from booking history, indication for induction and operative birth, reason for admission to the ward or to High Dependency Unit, data collected at birth and coded data from the Decision Support Unit.

Findings

The overall rate of hypertensive disease in pregnancy (8%) is similar to the rate in 2010. It still remains a very common medical disorder in pregnancy. Chronic hypertension is more common in the multiparous population, with gestational hypertension and preeclampsia being predominant in nulliparous women. Women with increased BMI had higher rates of hypertensive disease in pregnancy, especially if their BMI was greater than 35. Twenty-two percent of women with a BMI over 45 had hypertensive disease in pregnancy.

There were 2 reported cases of eclampsia in 2011 (0.3% of hypertensive pregnancies).

Table 33: Hypertensive disease in pregnancy (2011)

	All women n=7523		Nullipara n=3539		Multipara n=3984	
	n	%	n	%	n	%
Any hypertensive disease	602	8.0	337	9.5	265	6.7
Gestational hypertension	254	3.4	154	4.4	100	2.5
Chronic hypertension	153	2.0	60	1.7	93	2.3
Superimposed pre-eclampsia	17	0.2	7	0.2	10	0.3
Pre-eclampsia	178	2.4	116	3.3	62	1.6
Eclampsia	2	0.03	2	0.06	0	

Hypertensive disease is associated with an increase in interventions to interrupt pregnancy. Fifty one percent of normotensive women went into labour spontaneously, compared with only 22%, 11% and 34% of the women with gestational hypertension, pre-eclampsia or chronic hypertension respectively. A diagnosis of preeclampsia, chronic hypertension or superimposed preeclampsia is associated with a high risk of Caesarean section birth (53%, 45% and 82% respectively).

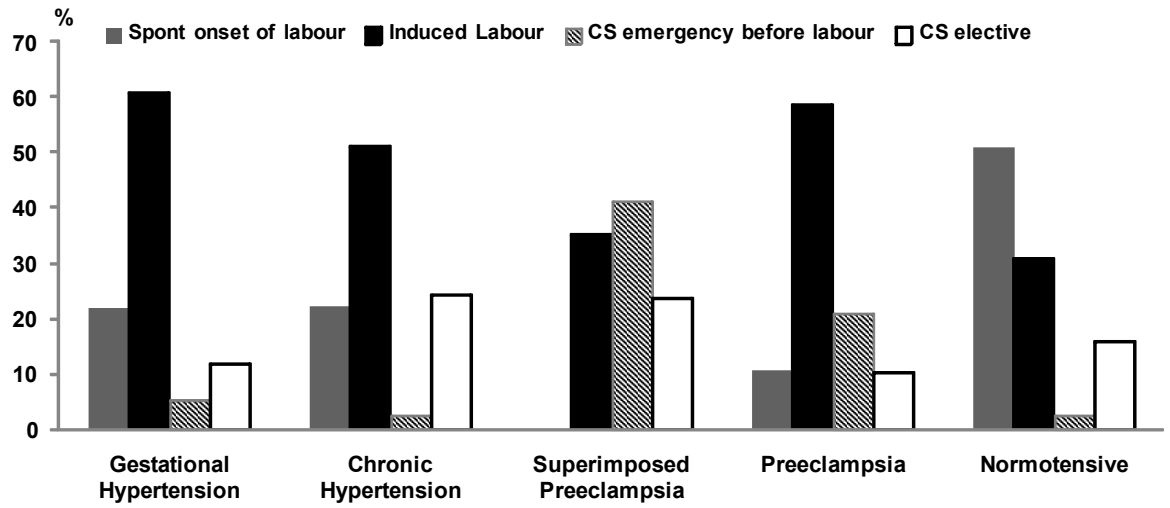

Figure 25: Onset of birth and hypertensive disorders of pregnancy

Table 34: Mode of birth for women with hypertensive disease

	Gestational hypertension n=254		Chronic hypertension n=153		Superimposed preeclampsia n=17		Pre-eclampsia n=178		Normotensive n=6921	
	n	%	n	%	n	%	n	%	n	%
Mode of birth										
Normal vaginal	106	41.7	71	46.4	3	17.6	65	36.5	3998	57.8
Operative vaginal	45	17.7	14	9.2	0	0	19	10.7	754	10.9
CS elective	30	11.8	37	24.2	4	23.5	18	10.1	1094	15.8
CS emergency	73	28.7	31	20.3	10	58.8	76	42.7	1075	15.5
Epidural	193	76.0	114	74.5	15	88.2	142	79.8	4110	59.4
General Anaesthetic	13	5.1	5	3.3	1	5.9	12	6.7	177	2.6

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

	Gestational hypertension n=261		Chronic hypertension n=156		Superimposed preeclampsia n=20		Preeclampsia n=192		Normotensive n=7061	
	n	%	n	%	n	%	n	%	n	%
Gestation at birth										
<37 weeks	39	14.9	15	9.6	16	80.0	80	41.7	637	9.0
<32 weeks	6	2.3	3	1.9	8	40.0	16	8.3	181	2.6
SGA	48	18.4	30	19.2	13	65.0	13	6.8	838	11.9
NICU Admission	41	15.7	18	11.5	12	60.0	65	33.9	717	10.2
>=2 days in NICU	38	14.6	12	7.7	12	60.0	64	33.3	652	9.2
Apgar <7 at 5 minutes	4	1.5	4	2.6	1	5.0	8	4.2	133	1.9
Perinatal related deaths (n/1000)	3	11.5	2	12.8	2	100.0	2	10.4	108	15.3

Hypertensive disease in pregnancy is associated with a range of adverse perinatal complications. Very preterm birth (<32 weeks) is more common in women who have superimposed preeclampsia or preeclampsia (40% and 8.3% of births respectively, compared to 2.6% of normotensive pregnancies).

SGA is also increased in pre-eclamptic and chronically hypertensive groups, as is NICU admission and prolonged NICU stay. This is most pronounced in the pre-eclamptic group, probably reflecting the increased risk of prematurity and SGA in this group. The perinatal related mortality rates given may not reflect the true risk, because of the small numbers in each hypertensive group. There were nine perinatal related deaths in the hypertensive group, two fewer than in 2010.

Summary / Implications

Occurring at a rate of 8%, antenatal hypertensive disease continues to be the most common medical complication associated with pregnancy at NW. Gestational or chronic hypertension alone are less often associated with significant adverse maternal or perinatal outcomes The negative pregnancy outcomes associated with the other hypertensive conditions are again reflected in the 2011 data. This reemphasises the need to adequately monitor hypertensive pregnancies and ensure timely referral for specialist level care.

5.7 Body Mass Index

Methods

BMI is calculated as weight (kg) divided by height (m) squared. Weight used for this calculation is the first recorded weight in pregnancy. Out of range heights and weights are checked for accuracy.

Findings

Table 36: Maternal BMI 2006-2011 (missing data excluded)

	2006 [1]		2007 [2]		2008 [3]		2009[4]		2010[5]		2011[6]	
	n=5660		n=6909		n=7117		n=7426		n=7490		n=7523	
	n	%	n	%	n	%	n	%	n	%	n	%
<19	304	5.4	388	5.6	405	5.7	442	6.0	443	5.9	439	6.0
19-25	3329	58.8	4129	59.8	4180	58.7	4344	58.5	4404	58.8	4268	58.2
26-30	1113	19.7	1315	19.0	1368	19.2	1441	19.4	1418	18.9	1370	18.7
31-35	512	9.1	625	9.1	630	8.9	686	9.2	684	9.1	680	9.3
36-40							303	4.1	328	4.4	325	4.4
41-45	402	7.1	452	6.5	534	7.5	118	1.6	133	1.8	160	2.2
>45							92	1.2	80	1.1	96	1.3

1 Missing data 21.5% 2 Missing data 10.2% 3 Missing data 6.2% 4 Missing data 4.0% 5 Missing data 2.8% 6 Missing data 2.5%

Rates of obesity, including morbid obesity (BMI>35) have remained similar over the last 6 years. Over time, data collection has improved with less than 2.5% missing data in 2012 compared with more than 20% missing data in 2012 compared with more than 20% missing data in 2006.

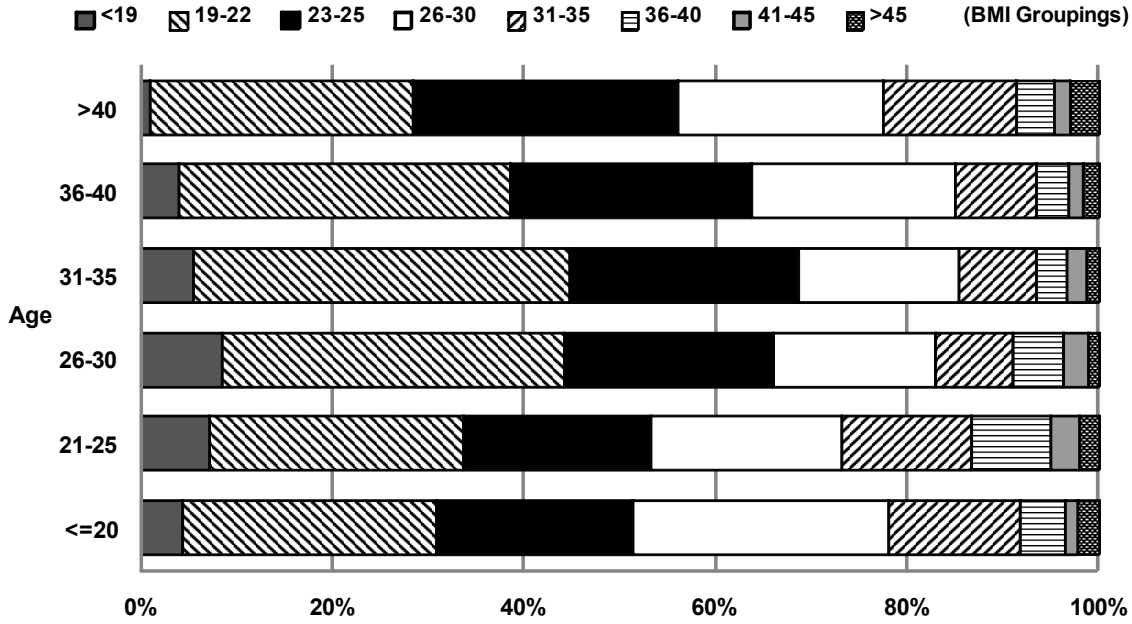

Figure 26: Distribution of BMI by maternal age

As observed in previous years, the relationship between BMI and age is “U shaped” with a large proportion of overweight and obesity in younger (<25 years, 48%) and older (>40 years, 44%) mothers. Higher rates of obesity in younger pregnant women are associated with higher rates of socio economic deprivation and with ethnicity.

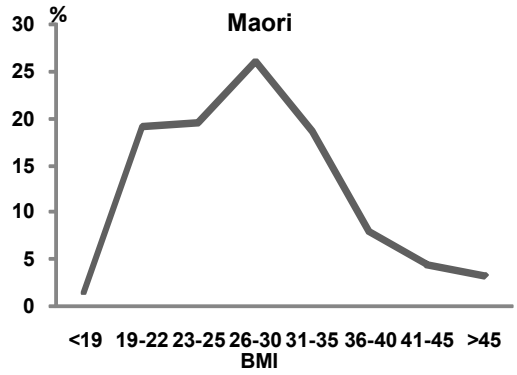

Figure 27: Distribution of BMI among Māori women

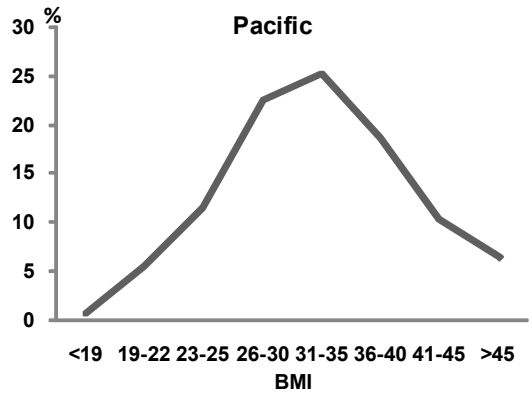

Figure 28: Distribution of BMI among Pacific women

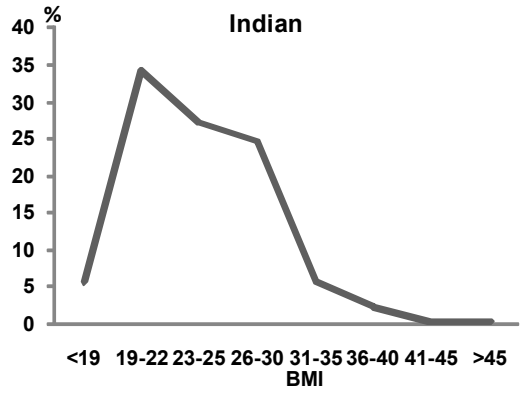

Figure 29: Distribution of BMI among Indian women

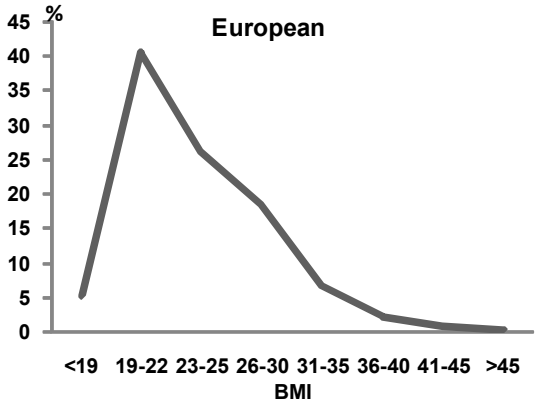

Figure 30: Distribution of BMI among European women

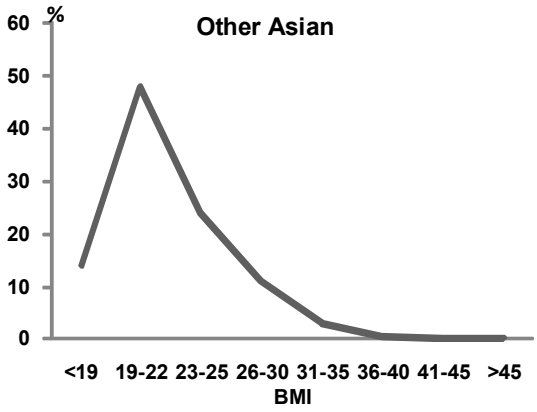

Figure 31: Distribution of BMI among Other Asian women

Māori and especially Pacific women are over represented amongst the obese groups (34% and 60% respectively). 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 3.5-fold amongst obese women (smoking rate 13.3%) compared with those with normal BMI (smoking rate 3.8%). This is also likely to contribute to pregnancy complications in these women.

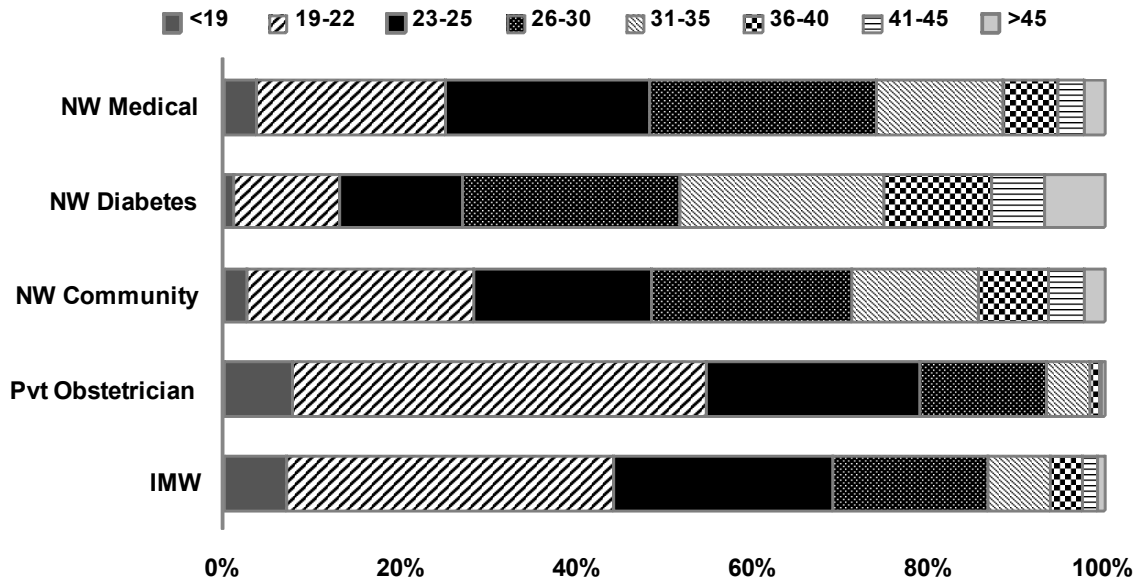

Figure 32: Distribution of BMI by LMC at birth

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

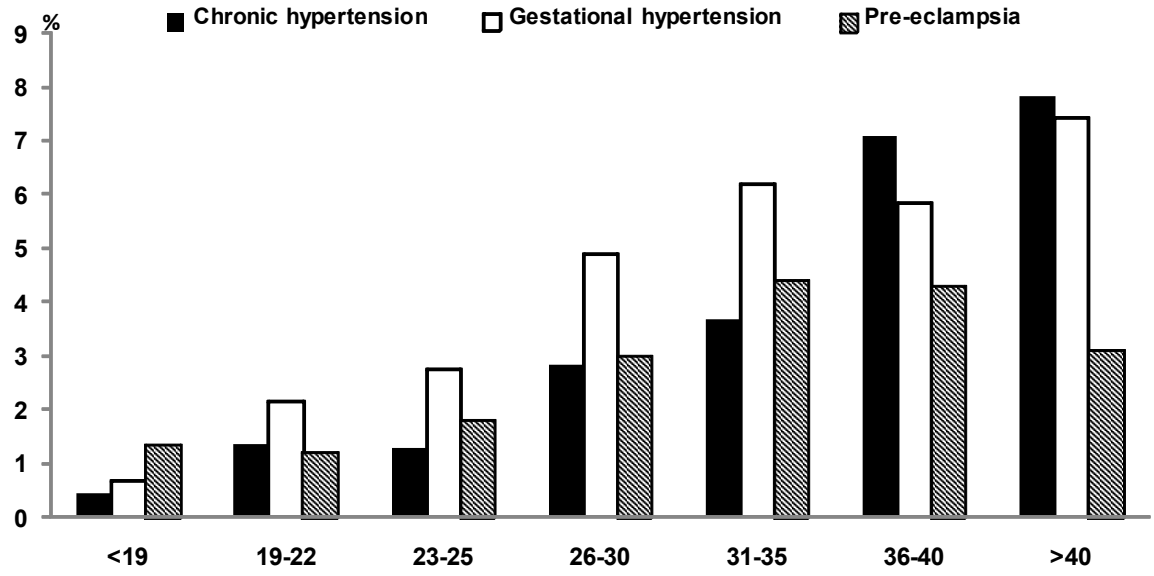

Figure 33: Rates of hypertensive diseases by maternal BMI (Chronic hypertension includes superimposed pre-eclampsia)

As has been shown in the international literature, rates of hypertensive complications increase progressively with increasing BMI. The lack of trend for pre-eclampsia in women with a BMI>35 is likely due to confounding factors such as fewer nulliparous women and higher smoking rates.

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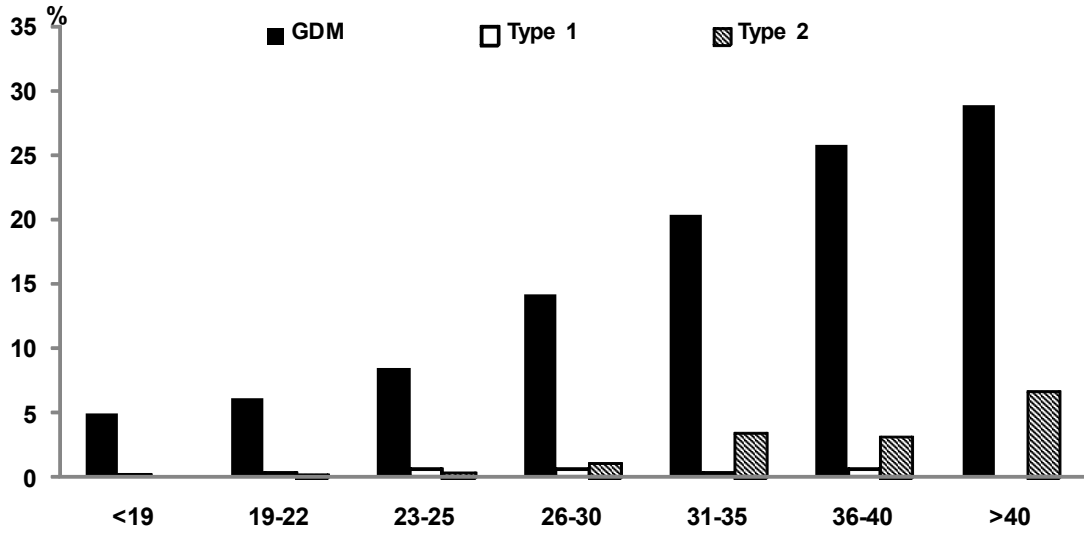

Figure 34: Rates of diabetes by maternal BMI

Increasing maternal BMI is strongly associated with increasing rates of GDM and Type 2 diabetes as shown above. GDM is diagnosed in almost one in five overweight or obese women, or over a quarter of women with a BMI >40. Obese women with GDM are also more likely than normal weight women to be subsequently diagnosed with Type 2 diabetes therefore followup glucose tolerance testing is crucial.

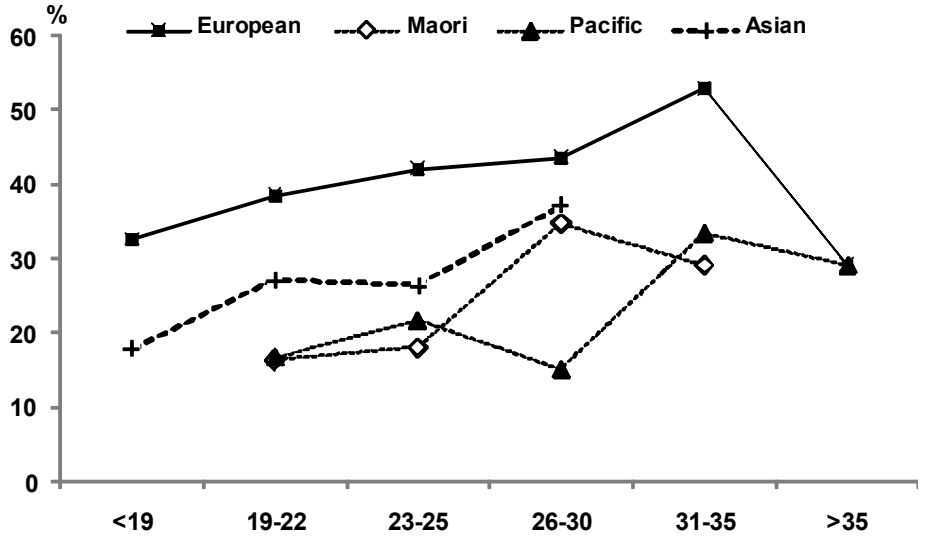

Figure 35: Caesarean section rate by BMI and ethnicity among nulliparous mothers (no data point plotted if denominator < 30)

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

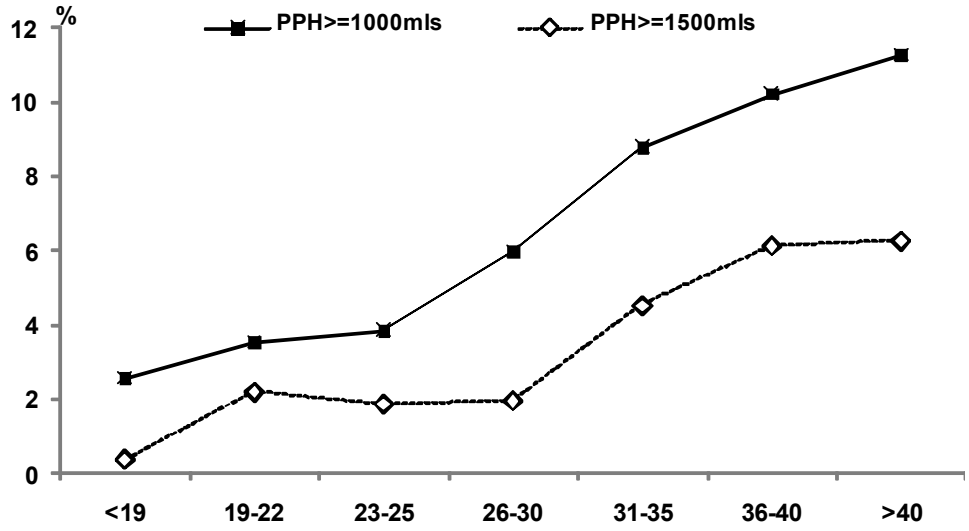

Figure 36: Postpartum haemorrhage rate by BMI among spontaneous vaginal births

Rates of major PPH are increased in women with high BMI who have spontaneous vaginal births. The reasons for this are unclear, but a recent analysis of NWH data found that obese nulliparous women had an elevated risk of major PPH (>=1000mls) independent of other risk factors such as infant birthweight, induction of labour, chronic hypertension etc.

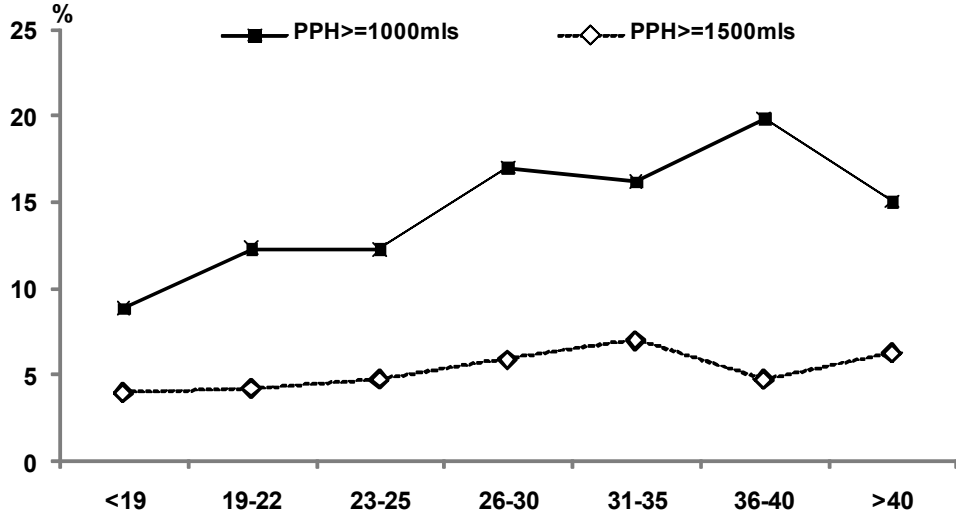

Figure 37: Postpartum haemorrhage rate by BMI among Caesarean sections

In the same NWH analysis described above, nulliparous obese women were again found to have an elevated risk for major PPH (>=1000mls) at the time of Caesarean section. This finding may be partially explained by factors such as increased operation time and greater operative difficulty.

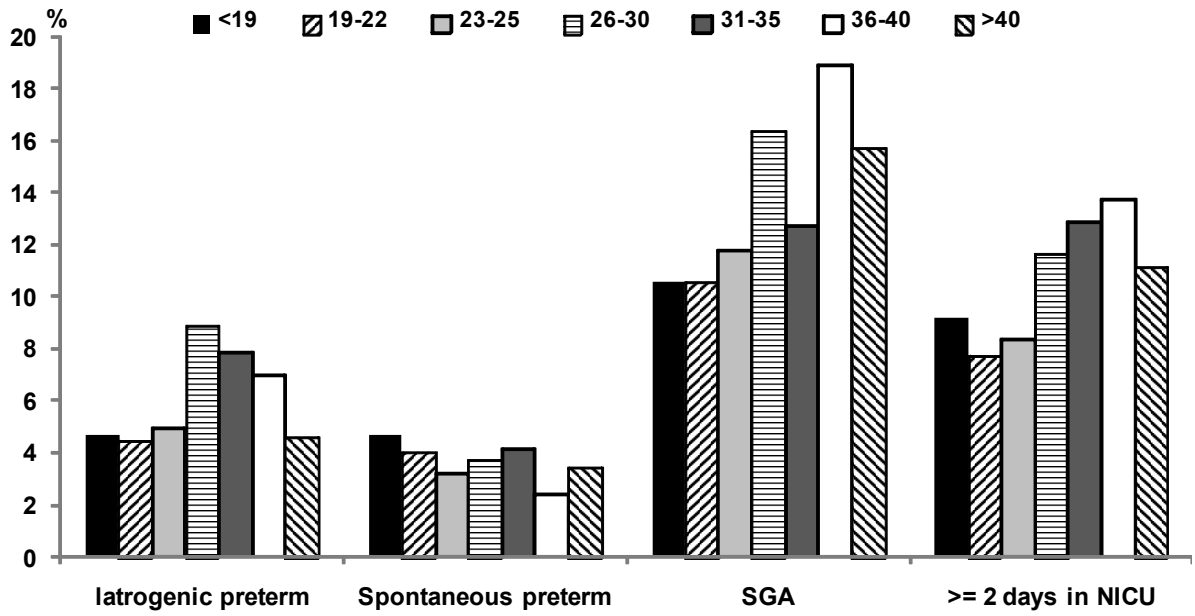

Figure 38: Neonatal outcomes and BMI

Rates of neonatal complications may be increased amongst the very obese. Higher rates of SGA occur in obese women which raises particular challenges as SGA is less likely to be detected antenatally in these same obese women. The higher rates of NICU admission in obese women may be explained by higher rates of SGA or slightly higher rates of iatrogenic preterm birth (possibly due to increased rates of pre-eclampsia and diabetes).

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

5.8 Fetal Medicine Unit

Methods

The data included in this section have been extracted from the MFM Viewpoint database for 2011.

Findings

In 2011, the service provided care for 875 women/pregnancies, including care for 794 singleton pregnancies, 74 twin pregnancies, 6 triplet pregnancies and 1 quadruplet pregnancy. Note these figures differ from those in the multiple pregnancy chapter as not all women cared for in the service birth at National Women's Health.

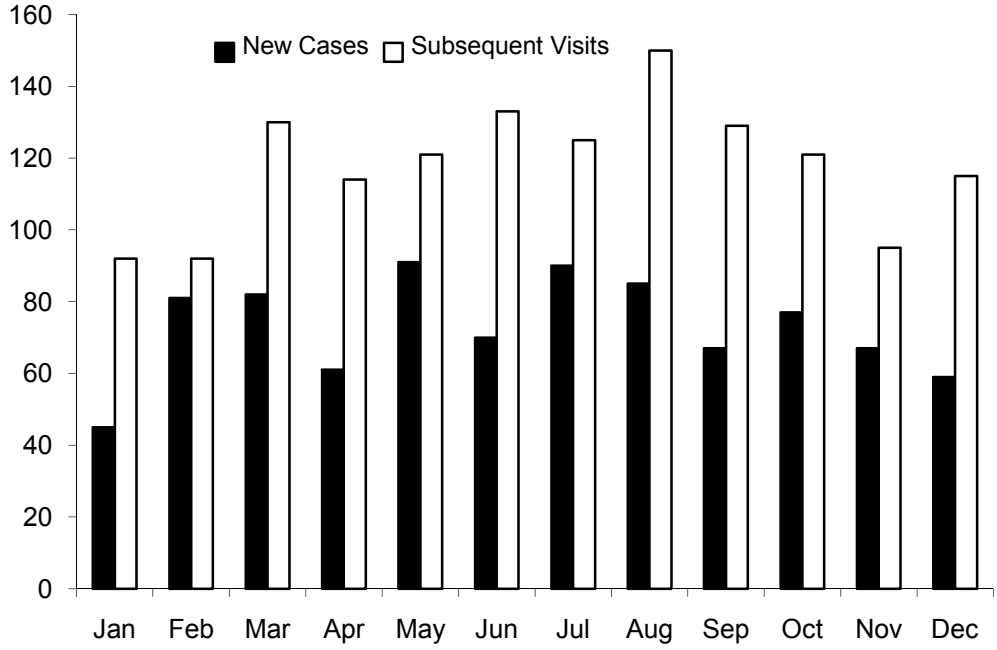

Figure 39: Number of new fetal medicine cases and subsequent visits in 2011

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

Table 37: Number of procedures performed in fetal medicine service (2000-2011)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Amniocentesis											142	156
CVS											43	97
Echocardiogram											257	366
Intrauterine transfusion (mothers)	6	9	6	1	2	*	2	11	5	10	7	4
Intrauterine transfusion (procedures)	24	24	14	3	2	*	3	21	8	21	11	9
Other procedures (mothers)	16	23	19	11	3	*	36	40	37	24	22	20
Other procedures (procedures)	16	32	32	11	3	*	44	49	39	26	25	21

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

Table 38: Mothers with babies diagnosed with fetal abnormalities (2011)

	Fetal abnormalities N=306	
	n	%
Heart	72	23.5
Kidneys	33	10.8
Brain	44	14.4
Extremities	20	6.5
Abdominal wall	29	9.5
Face	11	3.6
GIT	9	2.9
Head	2	0.7
Thorax	27	8.8
Spine	13	4.2
Neck/Skin	46	15.0
Skeleton	0	
Genitalia	0	

Comment

Between 2010 and 2011 the number of amniocenteses performed has remained stable, but there has been an increase in the number of chorionic villous samples (CVS) performed. This is in part due to a change in service configuration where CVS for a known genetic condition is now performed in Fetal Medicine. This allows more complete follow-up and there is a monthly meeting between the two services to discuss complex cases. The other reason is likely to be the introduction of the NZ wide changes in the combined first trimester screening for aneuploidy. This has resulted in women getting a high risk result during the timeframe when a CVS can be performed. All cases where there is a nuchal translucency (NT) of 3.5 or more are seen in the Fetal Medicine Service as further follow-up is offered to these women as there is an increased risk of cardiac and other structural anomalies, syndromes and fetal growth issues.

Babies with cardiac anomalies constitute the most common anomaly seen. The Fetal Cardiac Service which is run in conjunction with the Paediatric Cardiology Service, sees all babies with a cardiac anomaly diagnosed in NZ and from Tahiti and the Cook Islands. This results in an over-representation of these babies. In general all other anomalies are from Northland, WDHB, CMDHB and the ADHB regions. CMDHB have a Fetal Medicine Service, but any babies requiring early Paediatric Surgical input are delivered at National Women's Health.

The Fetal Medicine Unit is host to the NZ Fetal Therapy Service for some rarely performed procedures for women across New Zealand. These include Selective Fetoscopic Laser Photocoagulation of Anastomoses (SFLP) in TTTS, fetal chest shunts and ex utero-intrapartum treatment procedures (EXIT). These rarely performed procedures are subject to ongoing audit and children are assessed at 2 and 5 years of age.

Chapter 6

LABOUR and BIRTH

6 LABOUR AND BIRTH

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

6.1 Induction of labour

Methods

The four pathways to birth are: (1) induction of labour, (2) elective Caesarean section, (3) emergency Caesarean prior to onset of labour, and (4) spontaneous onset of labour. If any woman had a failed induction followed by emergency Caesarean, she has been categorised as an induced labour for the purposes of this section.

Input of induction-related data to the Healthware database requires active opening of an induction screen. This is not consistently done, especially if 'inductions' are performed on the Labour and Birthing Suite. To improve capture of these inductions, clinical notes were reviewed if the indication for ARM (artificial rupture of membranes) was induction or if an ARM was performed or syntocinon commenced before the onset of contractions. From 2008 clinical notes were also reviewed if syntocinon was commenced before 3cm dilatation. Indication for induction is prioritised at data entry to primary and secondary indication. Primary indications are given here.

Findings

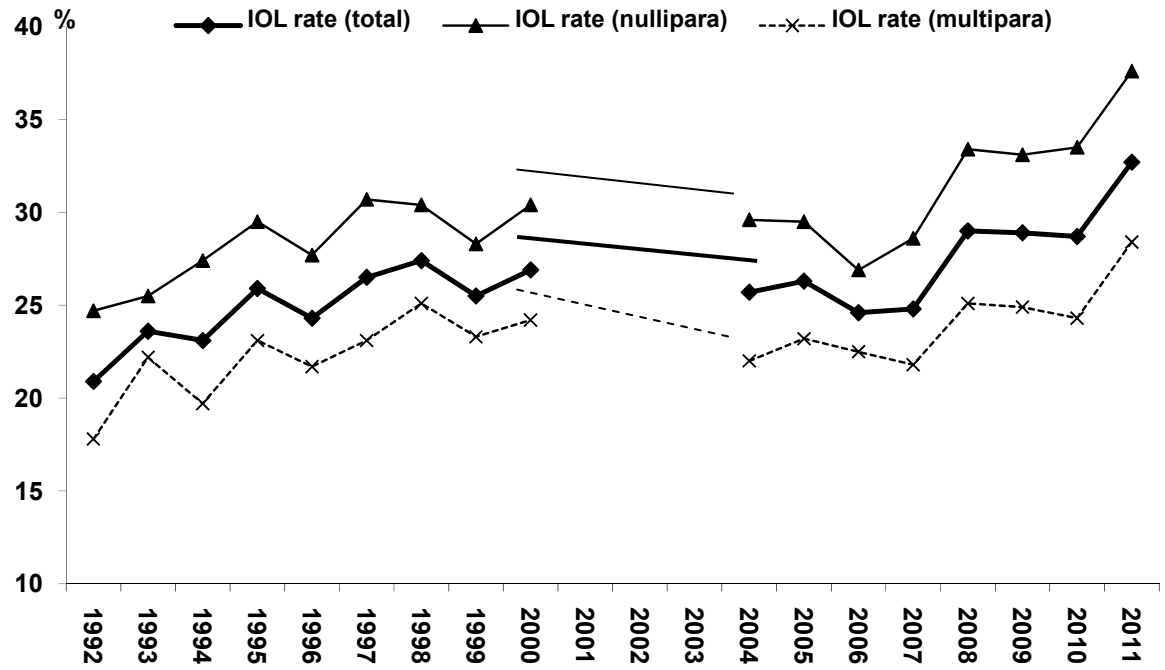

Figure 40 : Induction of labour rates (1992-2011)

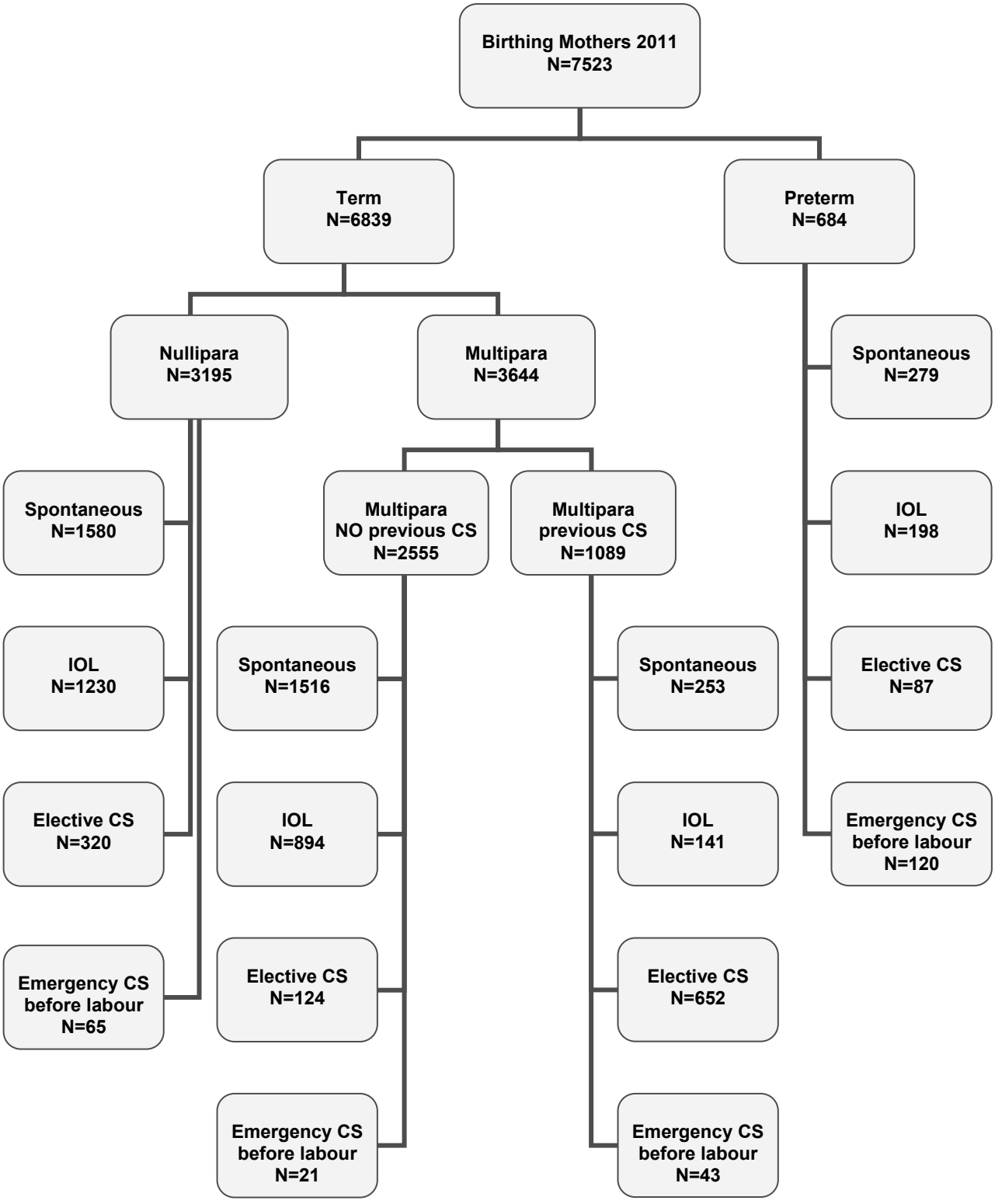

Figure 41: Pathways to birth by gestation and parity

Nulliparous women were more often induced at term than multiparous women without previous caesarean (38.5 vs 35%).More than one in three nulliparous women had induction of labour in 2011. There was a significant rise in overall induction rate in 2008, in part due to

accurate identification of inductions performed in Labour and Birthing Suite. The rate has risen significantly again in 2011. Further work is underway by the Labour and Birthing Clinical Governance Group in the form of a more detailed audit of inductions, and a review of IOL processes and methods. Foley catheters are now being used for IOL as a cost-effective and clinically safe method in selected cases.

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

	Total	Spontaneous Labour		Induced labour		CS Elective		CS Emergency before labour	
	N	n	%	n	%	n	%	n	%
Total	6839	3349	49.0	2265	33.1	1096	16.0	129	1.9
Maternal Age									
<=20	266	160	60.2	94	35.3	7	2.6	5	1.9
21-25	806	497	61.7	255	31.6	43	5.3	11	1.4
26-30	1779	995	55.9	605	34.0	151	8.5	28	1.6
31-35	2354	1136	48.3	761	32.3	417	17.7	40	1.7
36-40	1380	507	36.7	444	32.2	397	28.8	32	2.3
41+	254	54	21.3	106	41.7	81	31.9	13	5.1
Ethnicity									
NZ European	2465	1039	42.2	854	34.6	527	21.4	45	1.8
Maori	510	292	57.3	163	32.0	45	8.8	10	2.0
Pacific	928	514	55.4	315	33.9	83	8.9	16	1.7
Asian	1425	819	57.5	401	28.1	179	12.6	26	1.8
Indian	490	209	42.7	196	40.0	76	15.5	9	1.8
Other European	775	367	47.4	240	31.0	149	19.2	19	2.5
Other	246	109	44.3	96	39.0	37	15.0	4	1.6
BMI									
<19	402	255	63.4	97	24.1	46	11.4	4	1.0
19-25	3950	1987	50.3	1218	30.8	669	16.9	76	1.9
26-35	1832	830	45.3	683	37.3	282	15.4	37	2.0
>35	533	203	38.1	236	44.3	84	15.8	10	1.9
Missing	122	74	60.7	74	60.7	15	12.3	2	1.6
LMC at Birth									
IMW	3326	2035	61.2	1013	30.5	231	6.9	47	1.4
Private Obstetrician	1535	429	27.9	504	32.8	564	36.7	38	2.5
GP	51	31	60.8	12	23.5	7	13.7	1	2.0
NW Community	1276	700	54.9	379	29.7	173	13.6	24	1.9
NW Medical	253	92	36.4	107	42.3	45	17.8	9	3.6
NW Diabetes	362	34	9.4	244	67.4	75	20.7	9	2.5
Other DHB	11	7	63.6	2	18.2	1	9.1	1	9.1
Unbooked	25	21	84.0	4	16.0	0	0.0	0	0.0

There is an increase in rate of elective caesarean as maternal age increases. European women are twice as likely to have elective caesarean as women of other ethnicities. Pre-labour emergency caesarean and induction of labour increase with increasing BMI. The elective caesarean rate is highest among women attending a private obstetrician (37%) and lowest among those attending an independent midwife (7%). Women under the care of medical clinic have a 1.5-fold increased rate of induction of labour (42%) compared to

community women (30%), and women under diabetes clinic have a 2.2-fold increased rate (67%).

Indication for induction

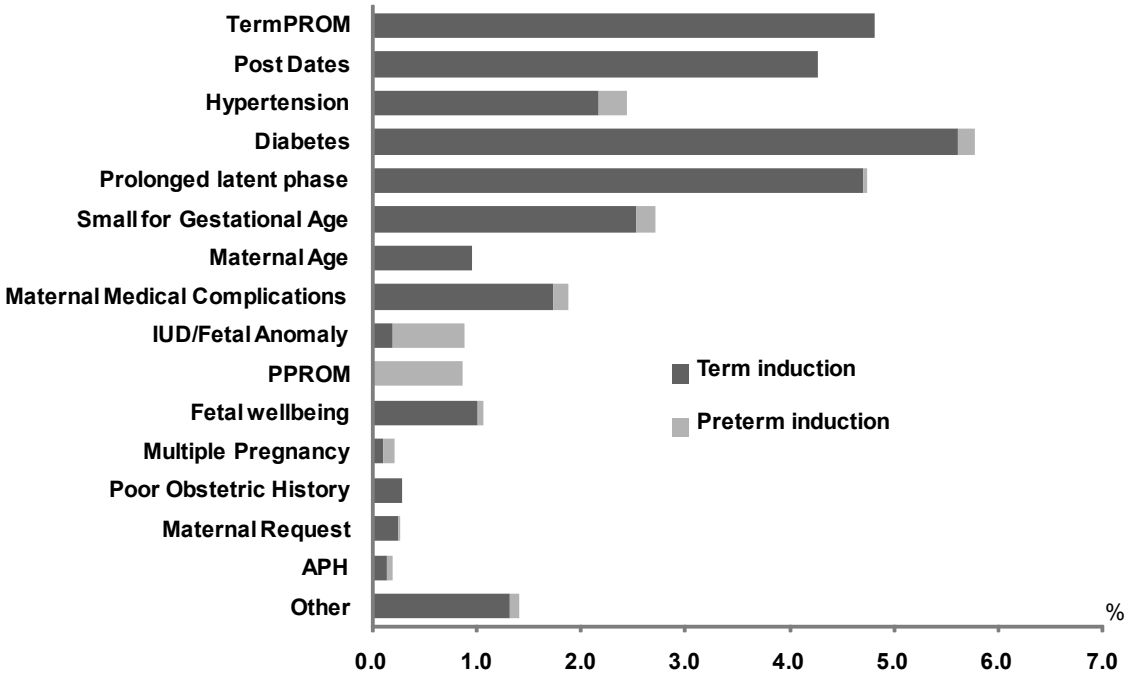

Figure 42: Primary indication for induction by gestation (as a percentage of all births)

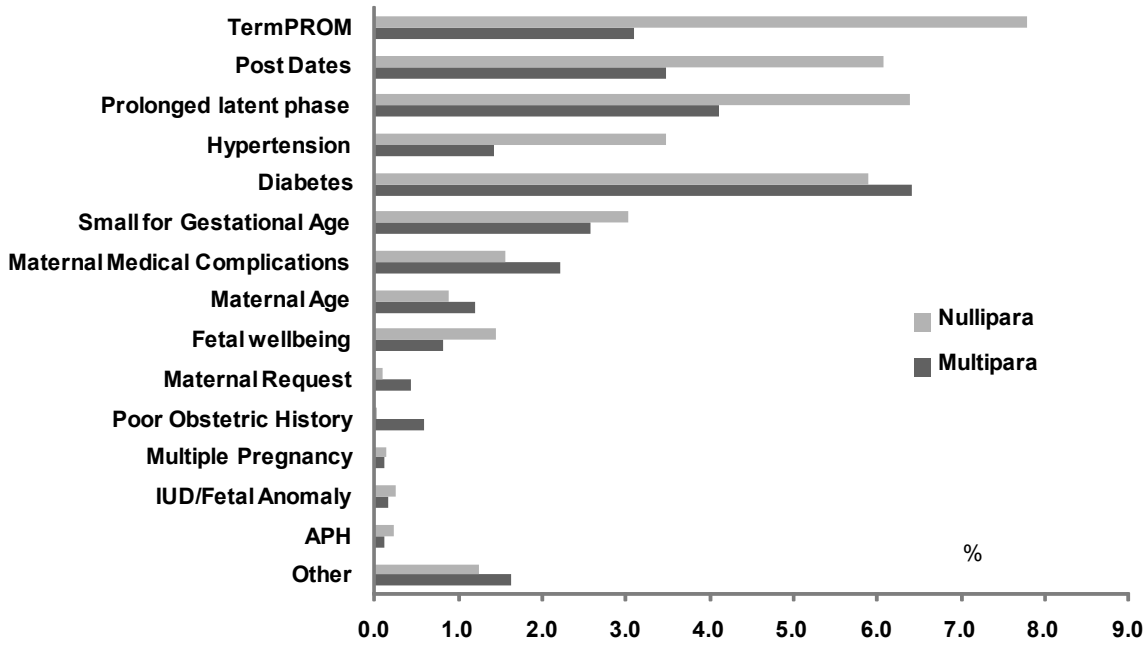

Figure 43: Primary indication for induction at term by parity (as a percentage of term births)

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

	Total		Age<35		Age>=35	
	n=	321	n=	236	n=	85
	n	%	n	%	n	%
40-40[6]	33	10.3	21	8.9	12	14.1
41-41[6]	219	68.2	162	68.6	57	67.1
42-42[6]	69	21.5	53	22.5	16	18.8

Diabetes was the most frequent reason for induction of labour in 2011. In previous years the most frequent causes have been term PROM and post dates pregnancy.

When post-dates was the primary indication for induction, 10% occurred prior to 41 weeks and 21.5% occurred at or beyond 42 weeks.

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

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

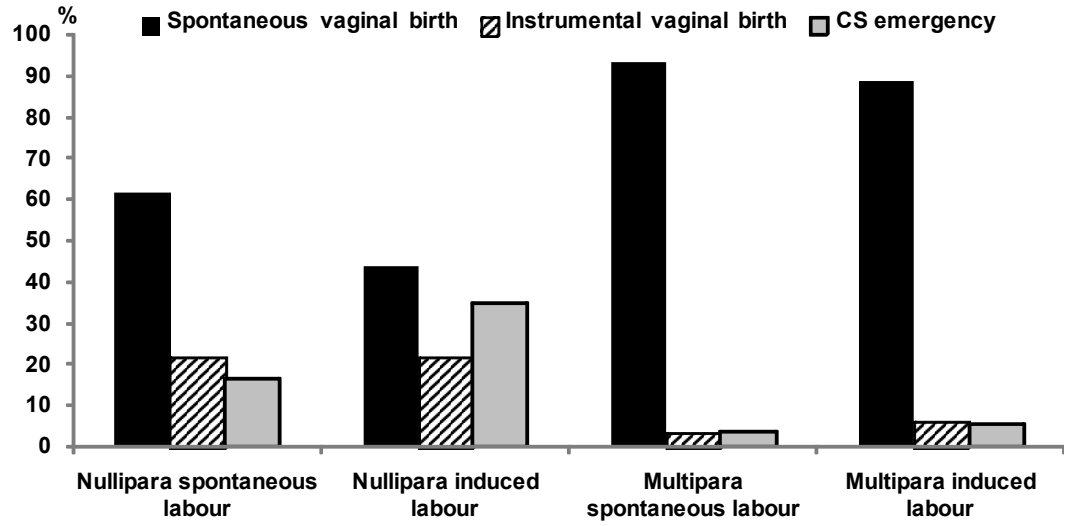

Figure 44: Mode of birth among intended vaginal births at term by parity and onset of labour (excludes previous Caesarean)

The emergency Caesarean section rate following induction is higher than following spontaneous onset of labour, for both nullipara and multipara without previous Caesarean. Among nulliparous women, induction is associated with a 2-fold increase in risk of emergency caesarean (from 17% to 35%). While induction may contribute to this, some of the difference is due to the indication for induction.

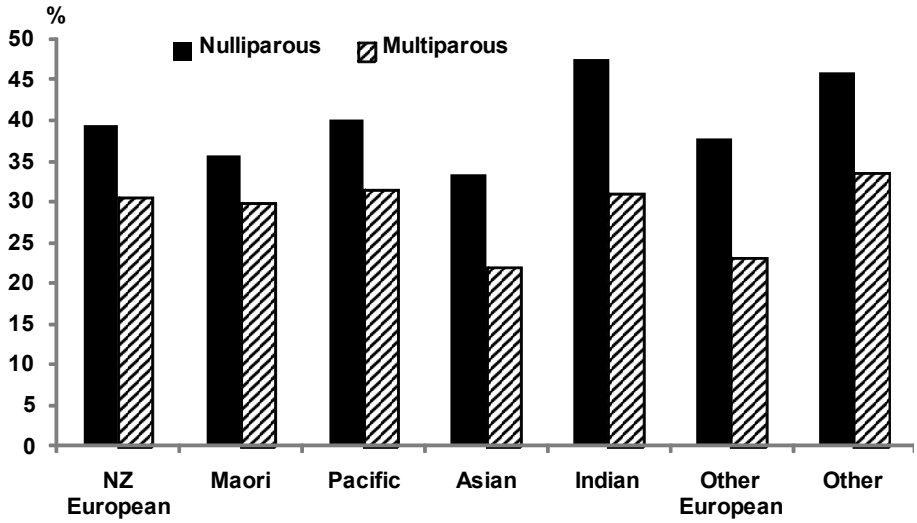

Figure 45: Induction rate by ethnicity and parity at term

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

6.2 Use of syntocinon

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

	Total birth	Syntocinon	
	N	n	%
Total	7523	2486	33.0
Induced labour			
Nullipara	1330	1000	75.2
Multipara	1133	692	61.1
Spontaneous labour			
Nullipara	1727	631	36.5
Multipara	1901	154	8.1

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

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

Syntocinon was used to augment spontaneous labour for 37% of nulliparous and 8% of multiparous women.

Summary / Implications

There is concern that the rate of induction is too high, and increasing. Recommendations from last year's annual clinical report are being implemented, including a review of the overall induction process. Work has been done on post dates, diabetes, methods of diagnosis of ruptured membranes, and methods of induction. An ongoing project is being led by the Labour and Birthing Clinical Governance Group. The rate of induction for term PROM may increase in 2012 since NWH guidelines have been updated to reflect the evidence for a more pro-active approach. There is also good evidence suggesting benefit for induction for women with fetal growth restriction and for women with gestational hypertension and mild pre-eclampsia. Education and guideline review and development have been a feature of these two indications in 2012. Unfortunately there is still a 2-fold increase in caesarean rate in labour in nulliparous women who are induced compared to spontaneous labour, and this unintended consequence was not found in the randomised controlled trials on term PROM, post-dates and hypertension. This may reflect differences between practice at NWH and study methodology, and further work is needed especially as regards timing of ARM and syntocinon, and indications for emergency caesarean.

6.3 Mode of birth

Findings

Table 42: Mode of birth trends (1997-2011) (n = mothers)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of births	8055	7531	7501	7827	7452	7775	7611	7491	7194	7212	7695	7589	7735	7709	7523
	%	%	%	%		%	%	%	%	%	%	%	%	%	%
Spontaneous vertex	63.5	62.0	61.8	59.4		55.7	56.1	54.4	53.5	52.9	54.7	55.6	55.8	54.7	55.6
Vaginal breech	1.1	1.0	1.1	1.1		0.8	0.8	0.7	0.8	0.7	0.9	0.8	0.8	0.8	0.8
Forceps/ ventouse	13.1	12.3	12.6	12.9		13.9	14.0	15.6	14.2	13.3	12.6	12.4	12.2	12.2	11.1
Caesarean	22.3	24.7	24.5	26.6		29.6	29.2	29.3	31.6	33.1	31.7	31.3	31.2	32.3	32.5
Elective								10.4	11.6	12.8	13.4	14.4	14.6	15.9	15.7
Emergency								18.8	20.0	20.3	18.3	16.9	16.6	16.4	16.8

From 1998, data exclude postnatal transfers.
In the case of twins only one mode of birth is given and mode of birth is prioritised as Caesarean, forceps/ventouse, vaginal breech, then spontaneous vaginal.
Data for 2001 are not available.

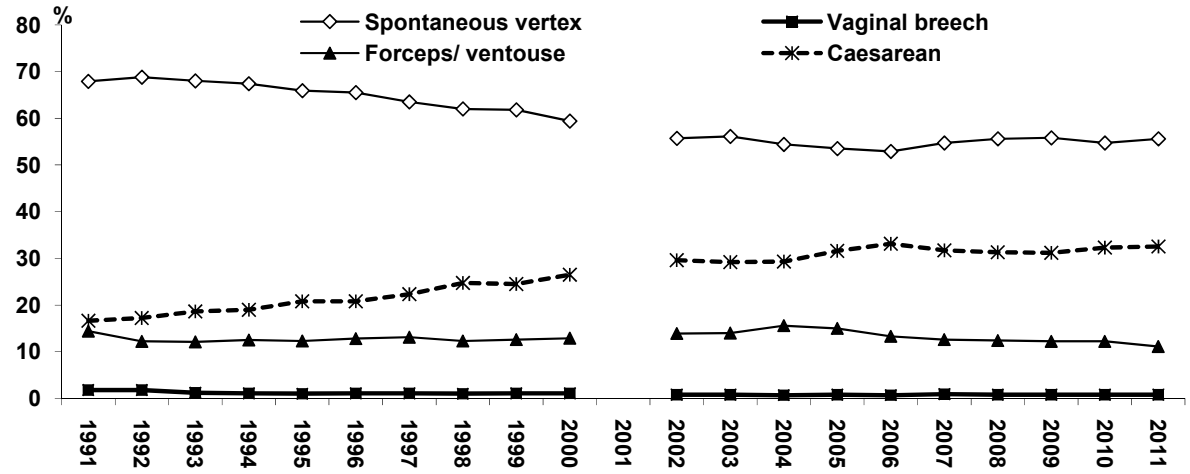

Figure 47: Mode of birth (1991–2011)

In the mid-90s, the overall Caesarean section rate at NW was around 20%. A peak of 33% was reached in 2006 and since then the rate has been stable at around 32%. Considerable effort has gone in to keeping the rate stable especially in increasing VBAC rate. More work is needed in prevention of the first caesarean section. The low rate of spontaneous vertex birth is still disappointing.

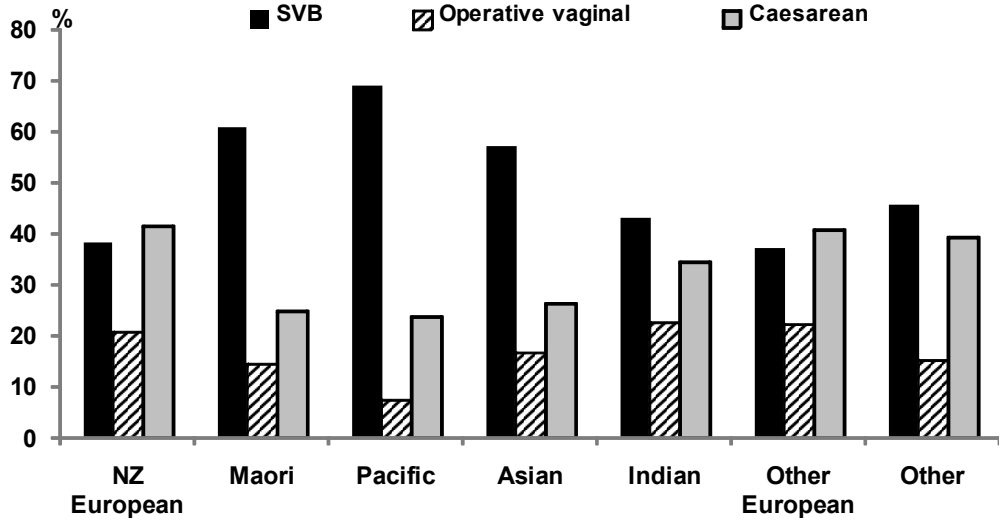

Figure 48: **Mode of birth by ethnicity among nullipara**

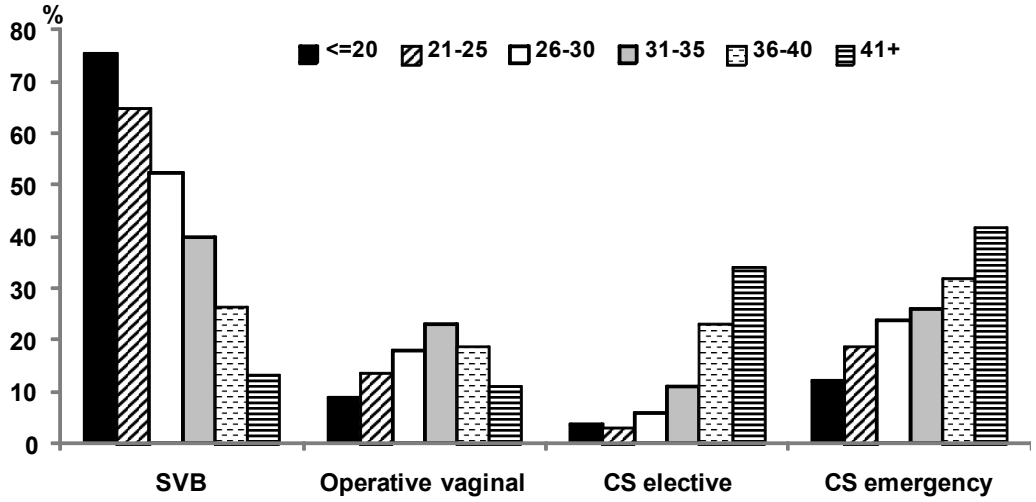

Figure 49: Mode of birth by maternal age among nulliparous women

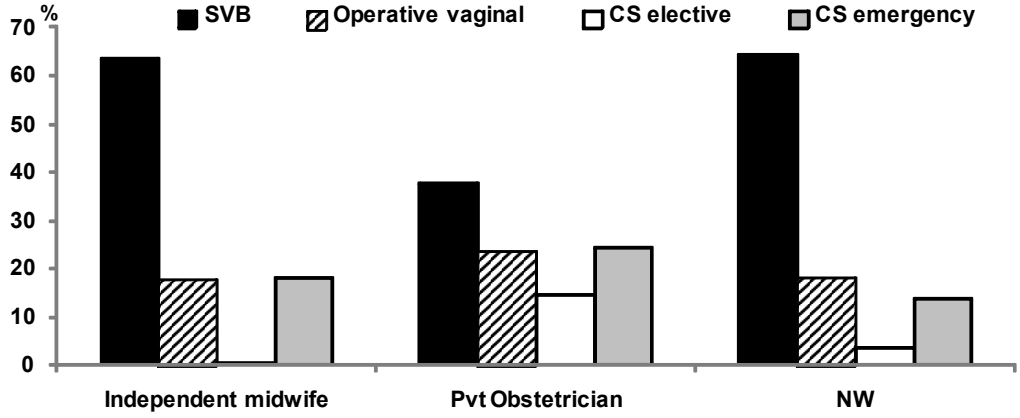

Figure 50: Mode of birth at term by LMC at birth among standard primipara

As in previous years, the outstanding feature of the figure above is the mode of birth for standard primipara under private specialist obstetrician care. See appendix for definition of standard primipara.

6.4 Spontaneous vaginal birth

Table 43: Spontaneous vaginal birth rates (2004-2011)

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

The spontaneous vaginal birth rate has remained relatively stable overall since 2004, however it is still below what may be considered ideal.

6.4.1 Waterbirth

Fifteen babies were recorded in the database as having been born in water in 2011. Three of these were under the care of NW LMC service, eleven under the care of an independent midwife, and one by a private obstetrician.

All were live births. No babies had an Apgar score of <7 at 1 minute or spent time in NICU.

6.5 Caesarean section

WHA Maternity Indicator for Caesarean section		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Caesarean section	Mothers birthing by Caesarean section/Mothers giving birth	28.0	29.4	31.7	31.3	31.2	32.3	32.5

Methods

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

Findings

The Caesarean section rate has remained the same as the last several years (32.5%). The most common reason for Caesarean section among multipara, and in fact the leading contributor to total Caesarean section rate, is repeat Caesarean, contributing 38% of all Caesareans. This is followed closely by nullipara having Caesarean before labour or following induction of labour.

Clinical experience and research evidence suggests that repeated Caesarean sections are associated with adverse maternal outcomes, such as abnormal placentation and postpartum haemorrhage, which may not as yet be reflected in the data.

Table 44: Caesarean section rates (1997-2011)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total births (mothers)	**8055**	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**
Caesarean sections	1797	1851	1837	2084	*	2301	2219	2193	2273	2390	2438	2372	2414	2491	2448
Incidence %	22.3	24.7	24.5	26.6	*	29.6	29.2	29.3	31.6	33.1	31.7	31.3	31.2	32.3	32.5
Total nullipara	**3591**	**3263**	**3262**	**3454**	*	*	*	**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**
Caesarean	912	900	898	1047	*	*	*	1118	1178	1253	1225	1152	1219	1223	1222
Incidence %	25.4	27.6	27.5	30.3	*	*	*	31.1	33.4	35.8	32.6	31.8	32.0	33.5	34.5
Total elective								233	249	296	310	313	340	383	353
Elective %	*	*	*	*	*	*	*	6.5	7.1	8.5	8.3	8.6	8.9	10.5	10.0
Total emergency								885	929	957	915	839	879	840	869
Emergency %	*	*	*	*	*	*	*	24.6	26.4	27.4	24.4	23.2	23.1	23.0	24.6
Total multipara	**4464**	**4229**	**4239**	**4372**	*	*	*	**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**
Caesarean	885	951	939	1037	*	*	*	1075	1095	1137	1213	1220	1195	1268	1226
Incidence %	19.8	22.5	22.2	23.7	*	*	*	27.6	29.8	30.6	30.8	30.8	30.5	31.2	30.8
Total elective								548	584	628	720	780	792	843	830
Elective %	*	*	*	*	*	*	*	14.1	15.9	16.9	18.3	19.7	20.2	20.8	20.8
Total emergency								527	511	509	493	440	403	425	396
Emergency %	*	*	*	*	*	*	*	13.5	13.9	13.7	12.5	11.1	10.2	10.5	9.9

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

Robson 10-group classification 2005-2011

The Robson-10 group classification attempts to "dissect" Caesarean section practice so that the maternity unit can understand trends within similar groups of mothers. The final column shows the contribution to the overall Caesarean section rate from each of these groups of mothers, and shows very clearly the impact of repeat Caesarean section on the Caesarean section rate at NW.

Table 45: Robson 10-Group Classification 2005-2011

	2005			2006			2007			2008			2009			2010			2011			
Robson Group	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**CS**	**Total Births**	**CS Rate**	**Contribution to CS rate**
	n	n	%	n	n	%	n	n	%	n	n	%	n	n	%	n	n	%	n	n	%	**%**
Totals	2273	7194	31.6	2390	7212	33.1	2438	7695	31.7	2372	7589	31.3	2414	7735	31.2	2491	7709	32.3	2448	7523	32.5	
1 Nullip, singleton, cephalic, term, spontaneous labour	359	1892	19.0	396	1920	20.6	353	2004	17.6	279	1809	15.4	281	1950	14.4	251	1736	14.5	244	1555	15.7	10.0
2 Nullip, singleton, cephalic, term, induced or CS before labour	479	1080	44.4	495	1024	48.3	515	1132	45.5	581	1275	45.6	647	1393	46.4	648	1384	46.8	669	1465	45.7	27.3
3 Multip, singleton, cephalic, no previous CS, term, spontaneous labour	76	1607	4.7	79	1601	4.9	57	1690	3.4	62	1640	3.8	55	1599	3.4	53	1693	3.1	49	1503	3.3	2.0
4 Multip, singleton, cephalic, no previous CS, term, induced or CS before labour	108	700	15.4	127	714	17.8	123	735	16.7	119	806	14.8	144	839	17.2	159	856	18.6	141	977	14.4	5.8
5 Previous CS, singleton, cephalic, term	638	895	71.3	677	936	72.3	748	1008	74.2	741	1017	72.9	698	967	72.2	757	1005	75.3	752	1016	74.0	30.7
6 Nullip, singleton, breech	175	192	91.1	187	205	91.2	183	208	88.0	166	195	85.1	164	174	94.3	177	199	88.9	151	172	87.8	6.2
7 Multiip, singleton, breech (incl prev CS)	114	136	83.8	106	123	86.2	121	143	84.6	135	151	89.4	132	161	82.0	115	141	81.6	117	142	82.4	4.8
8 All multiple (incl prev CS)	113	187	60.4	108	162	66.7	110	177	62.1	97	160	60.6	93	159	58.5	104	153	68.0	111	163	68.1	4.5
9 All abnormal lie (incl prev CS)	44	53	83.0	27	29	93.1	26	27	96.3	29	32	90.6	55	63	87.3	62	69	89.9	53	56	94.6	2.2
10 All preterm singleton cephalic (incl prev CS)	167	452	36.9	188	498	37.8	202	571	35.4	163	504	32.3	145	430	33.7	165	473	34.9	161	474	34.0	6.6

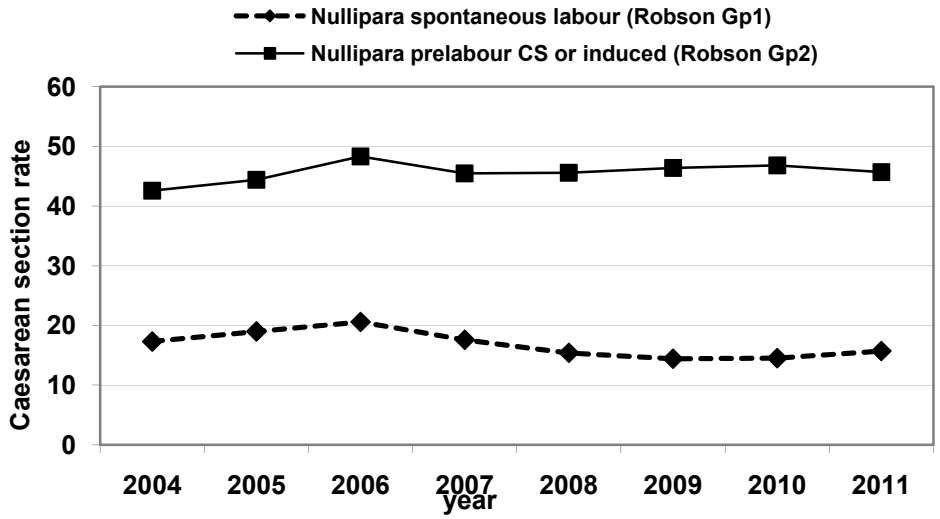

Figure 51: Robson groups 1&2: Nulliparous Caesarean section rates among singleton cephalic term pregnancies by onset of labour (2004-2011)

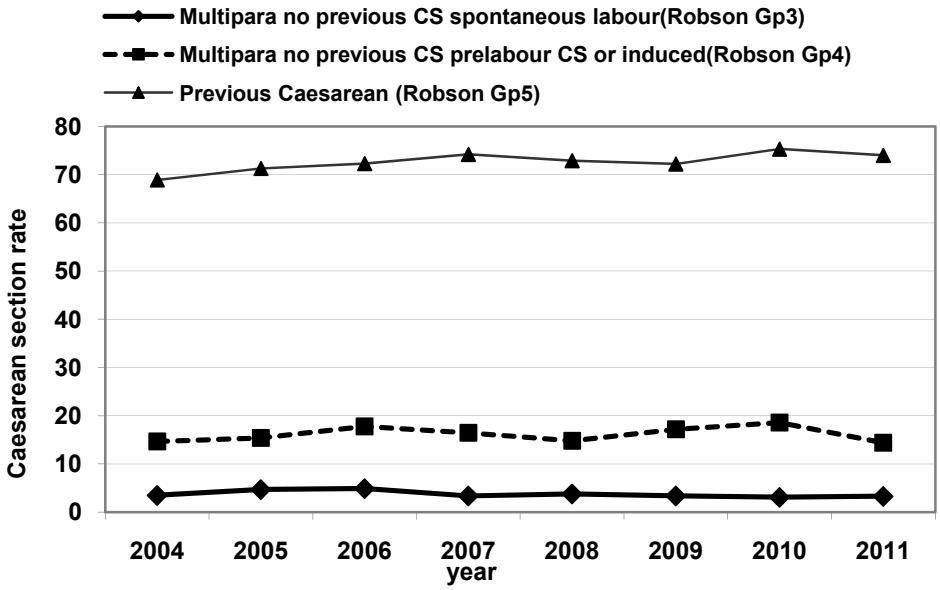

Figure 52: Robson groups 3-5: Multiparous Caesarean section rates among singleton cephalic term pregnancies by onset of labour and previous Caesarean status (2004-2011)

6.5.1 Indication for elective and pre labour Caesarean section

Thirty-eight percent of all elective and pre-labour emergency Caesarean sections were performed for the primary indication of 'repeat Caesarean section'. Specifically among multiparous women, 61% of elective and pre-labour Caesarean sections were performed primarily for "repeat Caesarean".

6.5.2 Indication for in labour emergency Caesarean section

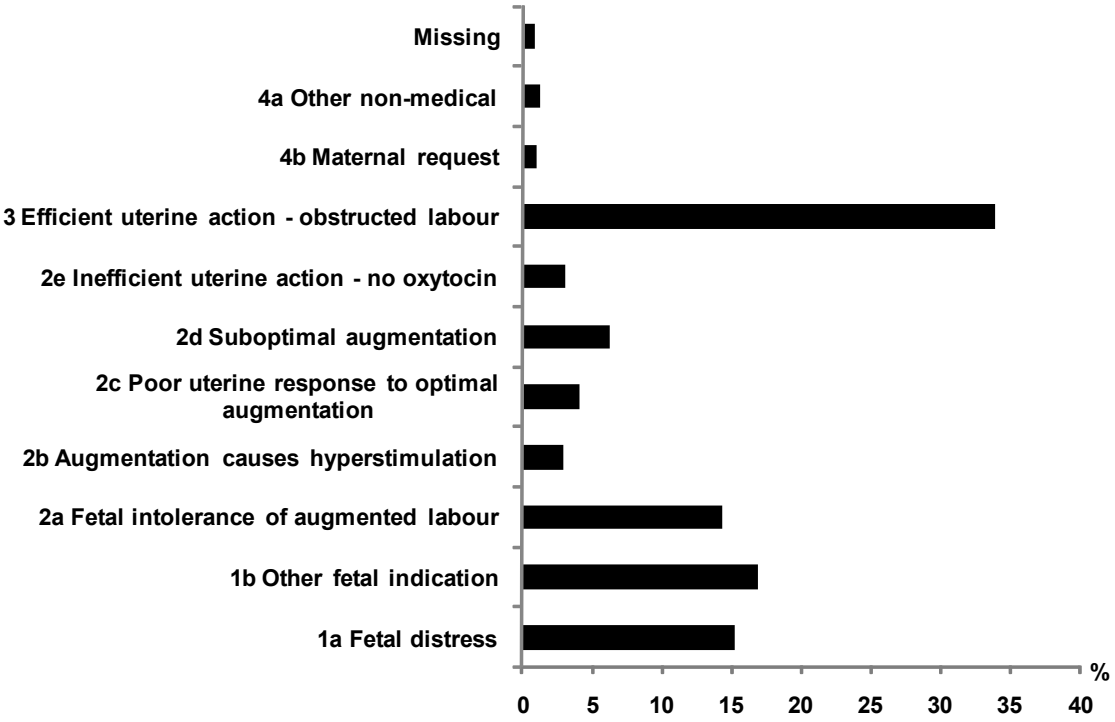

Figure 53: Indication for in labour emergency Caesarean section

The figure above shows the reasons for emergency Caesarean section in labour, of which the most frequent are still "obstructed labour" and emergency Caesarean for "other" fetal indications. The data suggest effective use of oxytocin in labour. However, we could consider those performed for "fetal distress" as the group with the potential to reduce the primary caesarean rate by optimising the use of fetal blood sampling in labour.

6.5.3 Vaginal birth after Caesarean section

WHA Maternity Indicator for VBAC		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
VBAC	P1 previous Caesarean/mothers giving birth	7.87	8.8	10.7	10.6	10.0	10.1	10.3
	Prelabour repeat Caesarean/P1 previous Caesarean	60.0	57.8	59.4	57.9	56.8	59.7	63.4
	VBAC/induced or spontaneous labour P1 previous Caesarean	49.3	49.6	52.4	58.8	. 61.7	65.5	59.2
	VBAC/P1 previous Caesarean	19.7	20.8	21.3	21.5	22.5	21.3	21.6

Data presented for NW are for elective Caesarean

Of all women giving birth at NW in 2011, 10.3% had previously had only one birth where that one birth was a Caesarean section. Further, 16% of all women and 30.2% of multipara giving birth at NW in 2011 had a history of previous Caesarean section. Given this knowledge, it is not surprising that the Caesarean section rate among multipara (31%) almost equals that of nullipara (34%).

Sixty three percent of para 1 women with one prior Caesarean had a pre-labour repeat Caesarean; this rate is higher than last year (60%), whereas in WHA hospitals overall the rate was lower (60% in 2008 to 58% in 2010). The rate of pre-labour repeat Caesarean for public women booked at NW was 50%, which is similar to last year (51%).

For women who had a trial of labour, 60% had a vaginal birth, which is higher than WHA average (50%). The vaginal birth rate in women who had trial of labour varied significantly by onset of labour, from 63% if labour started spontaneously to 51% if labour was induced.

The overall rate of vaginal birth among all para 1 women with a history of one Caesarean section (22%) is similar to previous years and to WHA average.

The VBAC rate in para 1 women with singleton, cephalic term pregnancies varied by LMC, from 8% in women with private obstetricians, to 29% in women with NW midwives, to 32% in women with IMW. These data could inform how we counsel women antenatally about the decision to plan VBAC or repeat Caesarean section. Next year we will be able to provide VBAC rates in the group of women who attended the Positive Birth after Caesarean (PBAC) Clinic, which started in February 2011.

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

Parity 1, previous Caesarean, all gestations										
	Spontaneous labour		Induced labour		CS elective		CS emergency before onset of labour		Total	
	n=191		n=93		n=453		n=40		n=777	
	n	%	n	%	n	%	n	%	n	%
SVB	71	37.2	26	28.0	0	0	0	0	97	12.5
Operative vaginal birth	50	26.2	21	22.6	0	0	0	0	71	9.1
CS elective	0	0.0	0	0.0	453	100	0	0	453	58.3
CS emergency	70	36.6	46	49.5	0	0	40	100	156	20.1

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

Parity 1, previous Caesarean, singleton, cephalic, term										
	Spontaneous labour		Induced labour		CS elective		CS emergency before onset of labour		Total	
	n=170		n=77		n=399		n=30		n=676	
	n	%	n	%	n	%	n	%	n	%
SVB	65	38.2	20	26.0	0	0	0	0	85	12.6
Operative vaginal birth	47	27.6	16	20.8	0	0	0	0	63	9.3
CS elective	0	0.0	0	0.0	399	100	0	0	399	59.0
CS emergency	58	34.1	41	53.2	0	0	30	100	129	19.1

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

Parity 1, previous Caesarean, singleton, cephalic, term										
	IMW		Pvt Obstetrician		GP		NW		Total	
	n=211		n=261		n=5		n=197		n=676	
	n	%	n	%	n	%	n	%	n	%
Vaginal birth	36	17.1	12	4.6	1	20.0	35	17.8	85	12.6
Operative vaginal birth	31	14.7	10	3.8	0	0.0	22	11.2	63	9.3
CS elective	81	38.4	215	82.4	4	80.0	98	49.7	399	59.0
CS emergency	63	29.9	24	9.2	0	0.0	42	21.3	129	19.1

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

Most of the data presented relate to women with only one previous caesarean. In 2011, 227 women had 2 or more prior Caesarean sections. Of these, 181 were at term with singleton baby and cephalic presentation; 177 (97%) of these women went on to have a further Caesarean section and 4 women had a vaginal birth.

6.6 Instrumental vaginal birth

WHA Maternity Indicator for Instrumental Vaginal Birth		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Instrumental vaginal birth	Forceps births/All vaginal births	5.2	7.4	4.2	4.9	5.7	6.8	6.4
	Ventouse births/All vaginal births	9.01	10.6	13.0	12.1	11.4	11.3	10.7
	Double instrumental/All vaginal births	0.841		1.3	1.0	0.68	1.0	0.7

The rate of instrumental birth has dropped in 2011 with a rate of 11% of all births. It has not been below 12% since 1997. The individual rates for nulliparous and multiparous women were 18.2% and 4.7% respectively. The ventouse was the instrument of choice in the majority of these cases, irrespective of parity or maternal ethnicity.

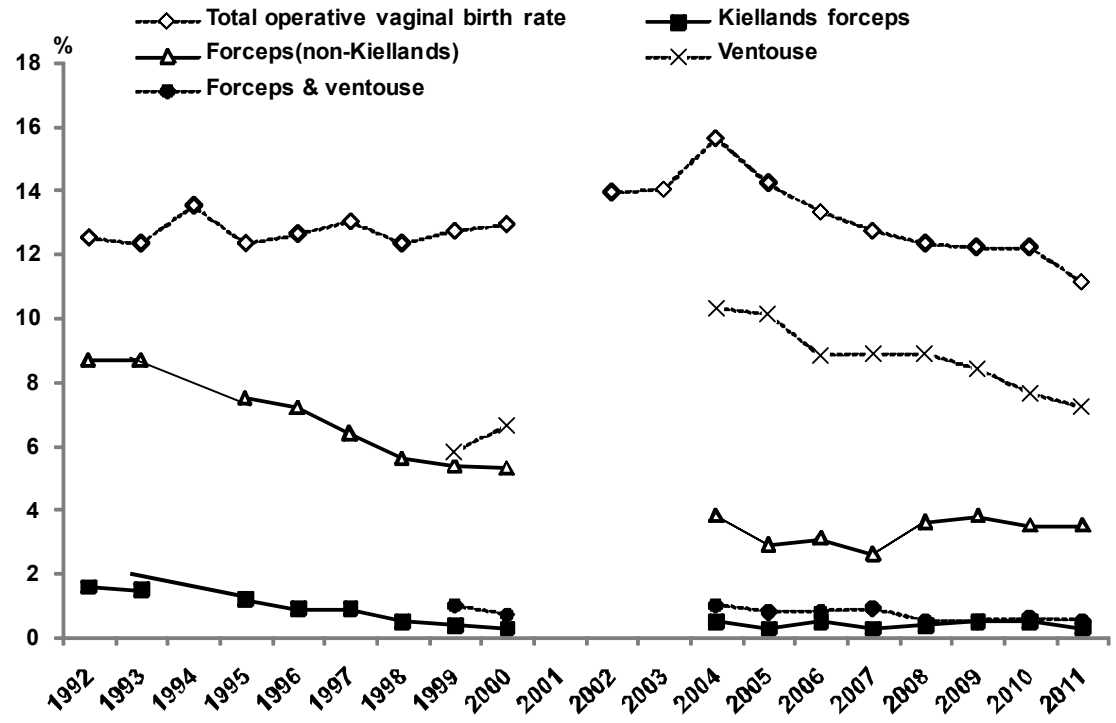

Figure 54: Operative vaginal birth (1992-2011)

6.6.1 Double instrumental and attempted instrumental prior to emergency Caesarean births

These data apply to the birth of a baby using more than one instrument (eg forceps and ventouse, or different types of forceps) and to birth of a baby by Caesarean section after an attempted vaginal instrumental birth.

The rate of double instrumental vaginal births at NW in 2011 was 0.7% out of all vaginal births (34 mothers/babies) Sixty seven mothers had an attempted vaginal instrumental birth prior to emergency Caesarean section compared to forty seven in 2010. These figures are very concerning due to the significantly increased maternal and neonatal morbidity known to be associated with double instrumental delivery and with emergency caesarean following

failed instrumental delivery (*references: 1. Cochrane review 2008 Trial of Instrumental Delivery in Theatre vs immediate caesarean section, by Majoko and Gardener; 2. Failed individual and sequential instrumental vaginal delivery, by Al-Kadri et al. Acta Obstet Gynecol Scand 2003*). We should strive to reduce the risk of failed instrumental delivery.

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

	Single instrument n=798		Double instrument n=34	
	n	%	n	%
Third or fourth degree tear	54	6.8	6	17.7
PPH>=1000mls	77	9.6	4	11.8
Transfusion	39	4.9	2	5.9

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

	Single instrument n=800		Double instrument n=34	
	n	%	n	%
Apgar score 1min <4	10	1.3	2	5.9
Apgar score 1min <7	105	13.2	8	23.5
Apgar score 5min <5	2	0.3	2	5.9
Apgar score 5min <7	10	1.3	3	8.8
NICU admission	68	8.5	5	14.7
Neonatal Death rate (/1000 livebirths)	3	3.8	0	

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

	Emergency Caesarean n=1198		Instrumental vaginal attempt prior to emergency Caesarean n=67	
	n	%	n	%
Episiotomy	1	0.1	1	2.1
PPH>=1000mls	208	17.4	16	23.9
Transfusion	51	4.3	1	1.5

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

	Emergency Caesarean n=1243		Instrumental vaginal attempt prior to emergency Caesarean n=67	
	n	%	n	%
Apgar score 1min <4	75	6.1	3	4.5
Apgar score 1min <7	248	20.0	7	10.5
Apgar score 5min <5	14	1.1	0	
Apgar score 5min <7	65	5.3	2	3.0
NICU admission	300	24.1	7	10.5
Neonatal Death rate (/1000 livebirths)	2	1.6	0	

6.7 Breech presentation

6.7.1 Breech birth

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

	N	Total breech	% Breech/total singleton birth	Breech & CS	% CS/total breech
Total singleton births	7360	314	4	268	85
20-24 weeks	59	26	44	0	0
25-31 weeks	108	32	30	27	84
32-36 weeks	418	43	10	35	81
>=37 weeks	6775	213	3	206	97

The influence of the Term Breech Trial (TBT) published in 2000 is evident in our figures, with almost all breech births at term occurring by Caesarean section. Among breech births at 32-36 weeks the percentage of Caesarean section births is 81%. Caesarean section for breech presentation contributes 11% of the total caesarean section rate (see table 46).

Both RANZCOG and RCOG have added a statement to their guidelines on breech births to the effect that women should be treated as individuals and that a vaginal birth can be safe. The NWH guideline on mode of birth for breech presentation will be updated in 2012.

6.7.2 External cephalic version

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

Findings

In 2011, a total of 109 ECVs were attempted for 103 women. Most ECVs were attempted at 36-37 weeks (range 35 to 39 weeks gestation). Most ECVs were attempted by one operator.

Among 103 women, the overall ECV success rate was 39%, lower than success rates reported internationally (50-60%).

Table 54: Mode of birth following attempted ECV (n=103)

	Failed ECV n=63		Successful ECV n=40	
	n	%	n	%
Type of Birth				
Vaginal	8	12.7	27	67.5
SVB	7	11.1	25	62.5
Operative vaginal	1	1.6	2	5
CS elective	40	63.5	1	2.5
CS emergency	15	23.8	12	30

Descent of the breech into the pelvis is associated with unsuccessful ECV. If there was no descent, the success rate was 55.2% compared with 7.4% if there was any descent at all (consistent with previous findings). This is consistent with data published from a NW study (2008) reporting an unengaged presenting part to be the strongest predictor for successful ECV.

Ninety three percent of successful ECVs remained cephalic at the time of birth, and six women whose ECV was unsuccessful also had a cephalic presentation at birth. Sixty eight percent of women who had a successful ECV achieved a vaginal birth, and this is consistent with the range of rates reported internationally (63-85%).

Of 261 women with a singleton term pregnancy who had either a breech presentation at birth or had had an attempted ECV, 39% had an attempted ECV. There was no statistically significant association between ECV among women with singleton breech at term (n=261) and maternal age or BMI. There was a significant difference by LMC at birth with a rate of ECV of 54% among independent midwifery clients compared to 16% of private obstetrician clients and 37% of NWH LMC clients. Only 17% (8/47) of women who had a history of prior Caesarean section and breech presentation at term were referred for ECV compared to 44% (95/214) of women without prior history of Caesarean section. There is no evidence from the international literature that a history of previous Caesarean section is a contraindication for ECV.

ECV is a safe procedure at NW, effective in reducing the number of breech presentations at birth and the number of caesareans performed. The challenge remains to increase the numbers of women undergoing attempted ECV, as only 1 in 3 women with breech presentation at birth had an ECV attempt. It is unlikely contraindications for ECV account for this. Last year, it was recommended that a prospective audit was required to ascertain why women either decline or are not being offered ECV, and that this be followed by development and implementation of policies to facilitate increased numbers of women attending for ECV.

Labour and Birth Summary / Implications

The Caesarean section rate has remained stable at 32.5%. The leading contributors to total caesarean rate are multipara having repeat Caesarean, and nullipara having caesarean before labour or following induction of labour.

The mode of birth in women with one previous Caesarean section continues to be predominantly by elective Caesarean (regardless of reason for first Caesarean). This is despite the fact that 2 out of 3 women who try for VBAC will have a vaginal birth. More women with previous caesarean eligible for trial of labour should be counselled about this option.

Only one in three women with breech presentation at term had an attempt at ECV. This is despite ongoing prospective audit of ECV showing that almost half of ECVs are successful (even in nulliparous women). More women with breech presentation, if suitable, should be referred for consultation about ECV and for consideration of vaginal breech birth.

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

6.8 Obstetric analgesia

WHA Maternity Indicator for Obstetric Anaesthesia		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Vaginal birth with regional anaesthesia	Any regional anaesthetic/All vaginal births	27.2	29.1	43.9	43.7	43.4	43.7	43.5
General anaesthesia for Caesarean section	General anaesthetic for Caesarean section/All Caesarean sections	8.9	8.1	7.6	6.8	6.4	6.3	5.6

Methods

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

Findings

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

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
All Women	**7523**	**4574**	**60.8**	**3269**	**43.5**	**983**	**13.1**	**61**	**0.8**	**383**	**5.1**
Mode of onset of birth											
CS elective	1183	1160	98.1	12	1.0	3	0.3	0	0.0	0	0.0
CS emergency before onset of labour	249	224	90.0	23	9.2	9	3.6	0	0.0	3	1.2
Labouring women*											
Nullipara	3057	2067	67.6	1760	57.6	637	20.8	43	1.4	261	8.5
Multipara	3034	1123	37.0	1474	48.6	334	11.0	18	0.6	119	3.9
Induced labour											
Nullipara	1330	1104	83.0	696	52.3	297	22.3	15	1.1	53	4.0
Multipara	1133	603	53.2	523	46.2	140	12.4	4	0.4	29	2.6
Spontaneous labour											
Nullipara	1727	963	55.8	1064	61.6	340	19.7	28	1.6	208	12.0
Multipara	1901	520	27.4	951	50.0	194	10.2	14	0.7	90	4.7

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

Epidurals are the most utilized mode of analgesia for the management of labour pain (60.8%), particularly for induced labour in nulliparous women (83%). This may be a result of their efficacy and relatively low rates of adverse effects.

Parenteral pethidine use is declining (13.1%, down from 15.5% last year) and this is consistent with international trends with many hospitals moving towards removing pethidine from their formularies.

The use of epidurals is highest in nulliparous European women (76.2%), over the age of 40 (87.2%), who use a private obstetrician (85.2%).

With respect to vaginal births, the epidural rates have been steady for the last 5 years averaging 43.5%, a rate higher than the WHA. General anaesthesia rates are trending down slowly. This is consistent with the increased use of regional anaesthesia for complex cases that previously would have been conducted with general anaesthesia.

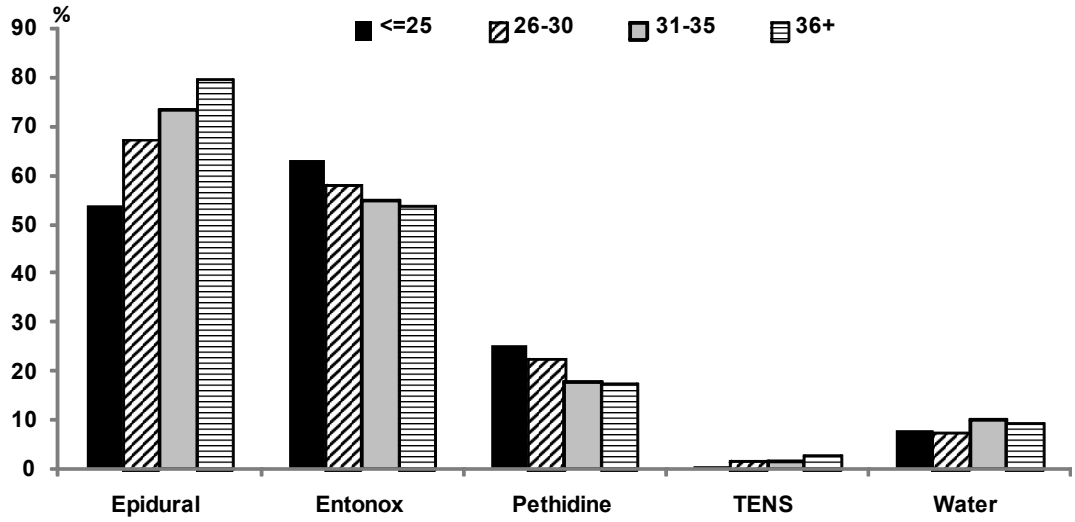

Figure 55: Analgesic use and maternal age among nulliparous labours

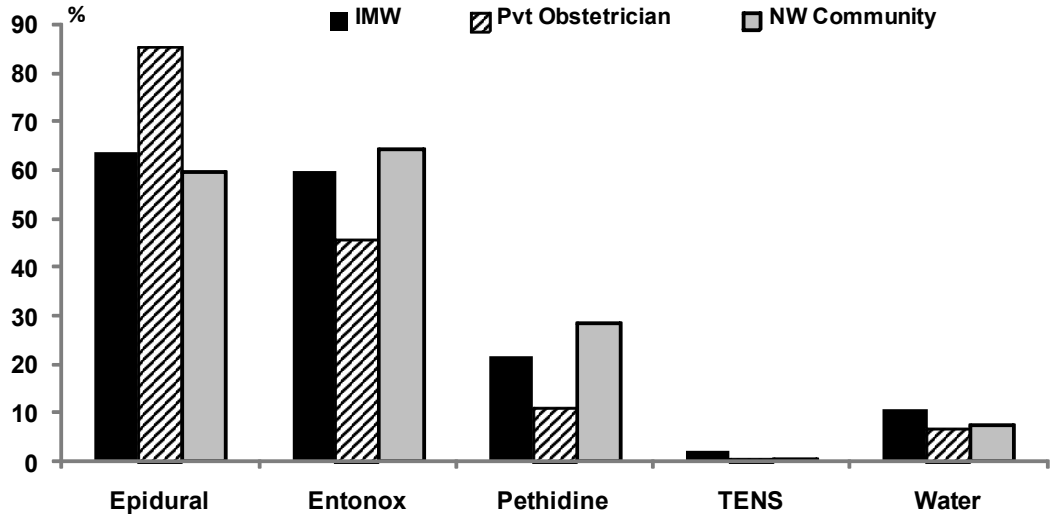

Figure 56: Analgesic use and LMC at birth among nulliparous labours

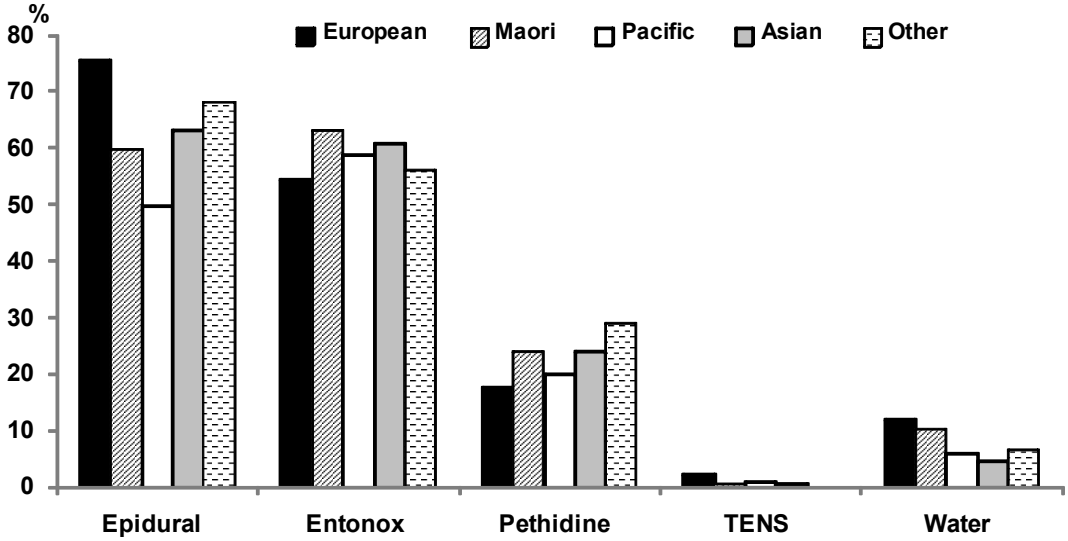

Figure 57: Analgesic use and ethnicity among nulliparous labours

Table 56: GA use and mode of birth

	Total	GA* only		GA* + epidural		Total GA*	
	N	n	%	n	%	n	%
Total	7523	134	1.8	74	1.0	208	2.8
Spont vaginal birth	4243	46	1.1	12	0.3	58	1.4
Operative vaginal	832	8	1.0	6	0.7	14	1.7
CS elective	1183	23	1.9	20	1.7	43	3.6
CS emergency	1265	57	4.5	36	2.8	93	7.4

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

6.9 Labour and birth at Birthcare Auckland

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

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

Methods

The data for mothers birthing at Birthcare (n=451) during 2011 were provided by Birthcare. The data on mothers transferred to NW in labour and birthing at NW and for mothers transferred to NW after birthing at Birthcare have been obtained from the NW clinical database Healthware.

Findings

Five hundred and fifty three women started labour at Birthcare Auckland and 102 (18%) transferred to NW in labour.

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

	Birth at Birthcare n= 451		Intrapartum transfer to NW n= 102		Total N= 553	
	n	%	n	%	n	%
Parity						
Nullipara	*		77	75.5	*	
Multipara	*		25	24.5	*	
Age						
<21	12	2.7	7	6.9	19	3.4
21-25	49	10.9	17	16.7	66	11.9
26-30	125	27.7	36	35.3	161	29.1
31-35	171	37.9	27	26.5	198	35.8
36-40	84	18.6	14	13.7	98	17.7
>40	10	2.2	1	1.0	11	2.0
Ethnicity						
NZ European	213	47.2	44	43.1	257	46.5
Māori	38	8.4	14	13.7	52	9.4
Pacific	53	11.8	7	6.9	60	10.8
Other Asian	43	9.5	14	13.7	57	10.3
Indian	12	2.7	4	3.9	16	2.9
Other European	75	16.6	17	16.7	92	16.6
Other	17	3.8	2	2.0	19	3.4
DHB of Domicile						
Auckland DHB	307	68.1	69	67.7	376	68.0
Counties Manukau DHB	48	10.6	15	14.7	63	11.4
Waitemata DHB	96	21.3	18	17.7	114	20.6

*data not valid

Table 58: Interventions and outcomes among women who commenced labour at Birthcare. (includes 102 intra partum transfers to NW)

	Total N=553	
	n	%
Intrapartum transfer to NW	102	18.4
Mode of birth		
Normal vaginal	500	90.4
Operative vaginal	19	3.4
Emergency caesarean	34	6.1
Perineal trauma		
Episiotomy	44	8.0
Third/fourth degree tear	10	1.8
Vaginal wall tear	4	0.7
Blood Loss		
≥500 mls	49	8.9
Perinatal outcomes		
Still birth (/1000)	1	1.8

Chapter 7

LABOUR and BIRTH OUTCOMES

7 LABOUR and BIRTH OUTCOMES

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

7.1 Perineal trauma

WHA Maternity Indicators for Perineal Trauma		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	NW 2011
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Episiotomy	Mothers having an episiotomy/Mothers giving birth vaginally	17.8	18.6	21.5	20.5	22.3	24.0	22.7
Third and fourth degree tears	3rd and 4th degree tears/Mothers giving birth vaginally	2.76	3.5	3.1	3.1	2.2	2.3	2.2

Table 59: Episiotomy rates (Denominator is vaginal births)

	1997 n= 6253	1998 n= 5676	1999 n= 5661	2000 n= 5739	2004 n= 5298	2005 n= 4921	2006 n= 4822	2007 n= 5257	2008 n= 5217	2009 n= 5321	2010 n= 5218	2011 n= 5075
Number of episiotomies	1252	1195	1251	1367	1181	1093	1103	1130	1069	1184	1252	1153
Incidence %	20.0	21.1	22.1	23.8	22.3	22.2	22.9	21.5	20.5	22.3	24.0	22.7
Episiotomy with 3rd/4th degree tear	8	9	5	17	15	23	47	49	46	56	49	46
Incidence %	0.1	0.2	0.1	0.3	0.3	0.5	1.0	0.9	0.9	1.0	0.9	0.9
All 3rd/4th degree tears	41	35	29	47	72	97	103	161	160	116	120	114
Incidence %	0.7	0.6	0.5	0.8	1.4	2.0	2.1	3.1	3.1	2.2	2.3	2.2

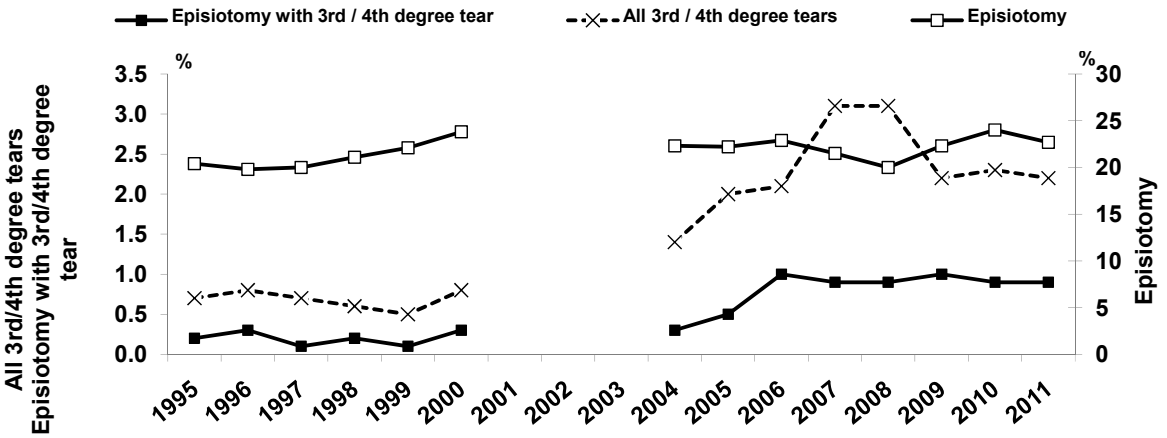

Figure 58: Perineal trauma rates

Table 60: Perineal trauma by mode of birth, parity and LMC at birth among all vaginal births (2011)

	Total	Episiotomy		3rd/4th tear		Vaginal wall tear	
	N	n	%	n	%	n	%
Total vaginal births	5075	1153	22.7	114	2.2	269	5.3
Mode of birth							
Normal vaginal	4183	621	14.8	54	1.3	223	5.3
Vaginal breech	60	9	15.0	0	0.0	0	0.0
Ventouse	513	252	49.1	28	5.5	28	5.5
Forceps	319	271	85.0	32	10.0	18	5.6
Parity							
Nulliparous	2317	857	37.0	93	4.0	192	8.3
Multiparous	2758	296	10.7	21	0.8	77	2.8
LMC at birth							
Independent Midwife	2715	654	24.1	78	2.9	153	5.6
Private Obstetrician	781	267	34.2	10	1.3	26	3.3
General Practitioner	42	10	23.8	0	0.0	2	4.8
NW Community	1009	156	15.5	21	2.1	61	6.0
NW Diabetes	236	33	14.0	3	1.3	10	4.2
NW Medical	232	30	12.9	2	0.9	13	5.6
Other DHB	24	2	8.3	0	0	1	4.2
Unbooked	36	1	2.8	0	0	3	8.3
Ethnicity							
New Zealand European	1671	457	27.4	27	1.6	75	4.5
Māori	458	39	8.5	5	1.1	25	5.5
Pacific	781	48	6.2	6	0.8	67	8.6
Asian	1105	348	31.5	29	2.6	55	5.0
Indian	358	99	27.7	30	8.4	17	4.8
Other European	522	129	24.7	13	2.5	24	4.6
Other	180	33	18.3	4	2.2	6	3.3

Third and fourth degree tears can be graded from 3a, an injury involving less than 50% of the external anal sphincter to 4th degree, a tear through to the anal mucosa. It is unusual for the incidence of third and fourth degree tears to be accurately recorded as awareness of the grading always increases observation and recording of tears. What we do know is that women suffering Obstetric Anal Sphincter Injuries (OASIS) have a high risk of suffering ongoing pain and faecal incontinence. Until October 2010 there was no specific follow up for these women. Now all women having a diagnosis of third or fourth degree tear are referred to the Perineal Tear Clinic. Referrals from midwives, physiotherapists and doctors of patients who have suffered other tears and have ongoing symptoms are also accepted at the clinic.

There is still some debate about whether an episiotomy helps protect against third degree tear. Recent evidence seems to show that an episiotomy needs to be deep enough and far enough lateral to make a difference.

In 2011, 114 patients were reported as having third or fourth degree tears. Inspection of the notes revealed that in fact only 104 of these patients had actually suffered Sphincter OASIS. Twenty nine of these patients were either under the care of private Obstetricians and chose not to attend the clinic or were lost to follow up. Seventy five patients were therefore seen at the Perineal Tear Clinic. The Perineal Tear Clinic is run by a Gynaecologist and a Physiotherapist. These patients attended 79 doctor visits and 120 Physiotherapy visits. In the clinic patients are usually first seen by the physiotherapist at 6 weeks post partum and then by the Gynaecologist at three to four months. As the physiotherapist and doctor work alongside each other there is an exchange of patients as the need arises. The physiotherapist plays an invaluable role; often after seeing her, patients only need to see the doctor quickly for advice about future deliveries. Not only does the physiotherapist provide pelvic floor rehabilitation she also provides advice

about correct toileting habits, diet and exercise. In 2011 only one patient needed referral to the colorectal surgeons, despite many patients having anal/rectal symptoms at their first visit.

Forty five percent of the women with OASIS had had an episiotomy. There is an almost 8 times greater risk of OASIS with a forceps than with a spontaneous vaginal birth and almost twice the risk of OASIS after a forceps than a delivery by ventouse.

According to the literature up to 40% of women who sustain an anal sphincter injury report problems with anal incontinence six months after birth[1] and approximately 10% of those may need a secondary repair of their anal sphincter[2].

In the first year of the Perineal Tear Clinic we haven't seen such a high incidence of patients needing referral for secondary repair, this is possibly due to an awareness of the poor prognosis of secondary anal sphincter repair and the good results of physiotherapy.

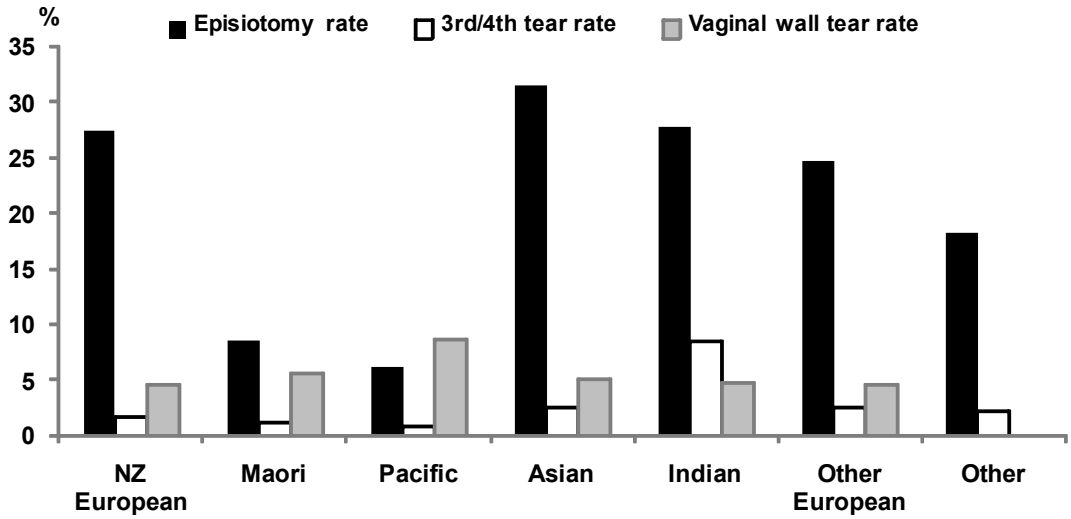

Figure 59: Perineal trauma rates among vaginal births by ethnicity 2011

Of even greater concern than the number of injuries caused by instrumental deliveries in the disproportionate representation of Indian, Asian and Other women in the clinic, particularly Indian women. Indian women have the highest incidence of instrumental vaginal birth. Given the known long term morbidity of anal sphincter injuries the indications for doing instrumental deliveries in Indian women need to be carefully considered.

[1] Fornell EK et al. Clinical consequences of anal sphincter rupture during vaginal birth. J Am Coll Surg 1996; 183: 553-558

[2] 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

7.2 Third stage management

Methods:

In 2008, the collection of third stage data was refined to better determine initial management of third stage compared to subsequent treatment in response to postpartum bleeding. Active management of third stage includes routine ecbolic given with birth of the anterior shoulder, early clamping of the cord, followed by gentle traction until the placenta is delivered. Physiologic third stage entails expectant management without ecbolic and delivery of the placenta by maternal effort.

Findings:

Table 61: Third stage management among vaginal births

	Physiological n=380		Active syntocinon n=2655		Active syntometrine n=1919		Other n=10		Unknown n=111	
	n	%	n	%	n	%	n	%	n	%
Primary PPH (≥500mls)	36	9.5	502	18.9	351	18.3	5	50.0	27	24.3
Primary PPH (≥1000mls)	9	2.4	180	6.8	106	5.5	2	20.0	10	9.0
Postpartum blood transfusion	4	1.1	66	2.5	41	2.1	1	10.0	3	2.7

In 2011, active management of third stage was used in at least 90% of vaginal births. This is supported by randomised controlled trials that have shown that active management of the third stage halves the risk of postpartum haemorrhage.

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

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

7.3 Postpartum haemorrhage

WHA Maternity Indicators for PPH		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	NW 2011
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Postpartum haemorrhage	Blood loss 1000-1499 ml/ All vaginal births	1.91	2.4				3.1	3.2
	Blood loss ≥1500ml/ All vaginal births	1.35	1.7	1.12	2.4	2.6	2.7	2.9
	Blood loss 1000-1499 ml/ Mothers birthing by Caesarean		5.8				11.0	9.1
	Blood loss ≥1500ml/ Mothers birthing by Caesarean	2.71	2.9	3.32	5.2	5.0	4.7	5.3
Blood transfusion	Postpartum blood transfusion/ Mothers giving birth	1.63	2.1	2.2	2.8	3.0	2.5	2.6

Methods

The source of blood loss data varies for some of the years shown. In the years 2005 to 2007, blood loss in labour and birth was not combined with blood loss recorded postnatally as in numerous cases the total blood loss was recorded in both places. The amended data on

PPH rate in 2005 and 2006 given here may underestimate PPH rate in those years. In 2008 and 2009, the data have been cleaned extensively. This cleaning has included a comparison of blood loss in Healthware to blood loss in the PIMS theatre database. These data have not been available in previous years. The effect of this is likely to have been an increase in the reporting of PPH, especially in those cases giving birth in Labour and Birthing Suite and then transferring to theatre for the management of retained placenta or bleeding.

Findings

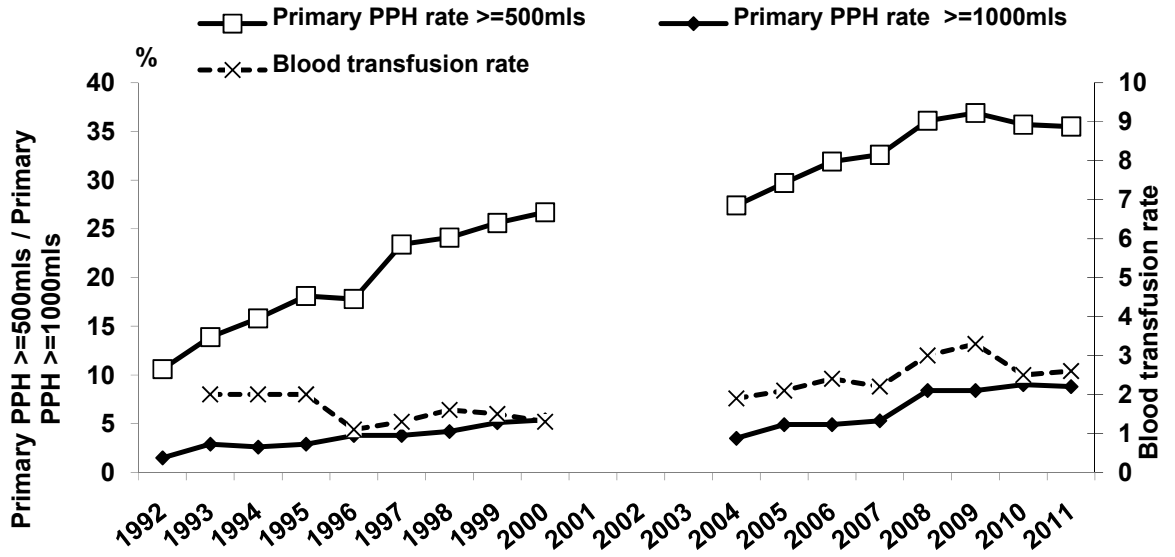

**Figure 60: Postpartum haemorrhage and transfusion rates (1992-2011) **

Table 62: Postpartum haemorrhage rate (1995-2011)

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

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

Table 63: Postpartum blood loss by mode of birth

	Spontaneous vaginal birth		Operative vaginal birth		CS emergency		CS elective		Total	
	n=	4243	n=	832	n=	1265	n=	1183	N=	7523
	n	%	n	%	n	%	n	%	n	%
PPH >=500mls	679	16.0	242	29.1	995	78.7	758	64.1	2674	35.5
PPH>=1000mls	226	5.3	81	9.7	224	17.7	128	10.8	659	8.8
PPH>=1500mls	113	2.7	32	3.8	80	6.3	49	4.1	274	3.6
Post partum transfusion	74	1.7	41	4.9	52	4.1	27	2.3	194	2.6

Table 64: Postpartum blood loss by onset of birth

	Spontaneous labour		Induced labour		CS emergency before onset of labour		CS elective		Total	
	n=	3628	n=	2463	n=	249	n=	1183	N=	7523
	n	%	n	%	n	%	n	%	n	%
PPH >=500mls	900	24.8	838	34.0	178	71.5	758	64.1	2674	35.5
PPH>=1000mls	249	6.9	251	10.2	31	12.4	128	10.8	659	8.8
PPH>=1500mls	104	2.9	110	4.5	11	4.4	49	4.1	274	3.6
Post partum transfusion	74	2.0	79	3.2	14	5.6	27	2.3	194	2.6

Of all women giving birth, the overall primary PPH rate (≥ 500mls) was 36%. It varied by mode of birth, from 16% for spontaneous vaginal birth to 79% for emergency caesarean. It also varied by onset of birth, from 25% following spontaneous onset to 34% following induced labour. The rate of blood loss ≥ 1500mls for women having a vaginal birth remained stable in 2011 at 2.7%, and for women having a caesarean has slightly decreased over the last few years to 5.3% in 2011. Only 2.6% of all mothers giving birth received a blood transfusion postpartum, with little variation by onset of birth.

The introduction of new guidelines for PPH late in 2009 were expected to result in an increased use of syntometrine for prevention of PPH in women at risk together with a more consistent approach to calling for help. Although we did not analyze PPH rates in the subset of women at risk, we did see an overall reduction in the blood transfusion rate from 3.3% in 2009 to 2.6% in 2010 and 2.6% again in 2011 which may be in part due to the new guidelines.

Table 65: Blood transfusion (1995-2011)

	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011
Antenatal	2	4	4	0	10	12	11	6	6	18	12	13
Antenatal & intrapartum	0	0		0	1	0	0	1	0	0	0	0
Antenatal & postpartum				1	0	3	0	0	2	2	0	0
Intrapartum	3	3	3	4	2	2	6	1	4	3	1	3
Intrapartum & postpartum	3	6	3	4	4	3	3	4	1	2	1	1
Postpartum	94	110	100	96	128	133	150	165	212	228	189	193
Total transfusions	102	123	110	105	145	153	170	177	225	253	203	210
Total transfusion rate	1.3	1.6	1.5	1.3	1.9	2.1	2.4	2.3	3.0	3.3	2.6	2.8

7.4 Neonatal outcomes by mode of birth

Perinatal Indicator		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	NW 2011
Perinatal indicators	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Five minute Apgar of <=4	Babies with 5 minute Apgar<=4/Total liveborn, singleton term babies	0.265		0.10	0.13	0.242	0.23	0.31

Methods

The following tables include all babies live born at NW.

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

	Spontaneous vertex n=4174		Vaginal breech n=36		Forceps birth n=317		Ventouse birth n=514		CS elective n=1246		CS emergency n=1306		Total N=7593	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	41	1.0	8	22.2	7	2.2	5	1.0	14	1.1	78	6.0	153	2.0
1 min Apgar <7	215	5.2	16	44.4	48	15.1	65	12.6	101	8.1	255	19.5	700	9.2
5 min Apgar <7	50	1.2	7	19.4	9	2.8	4	0.8	13	1.0	67	5.1	150	2.0
Admitted to NICU	319	7.6	22	61.1	35	11.0	38	7.4	132	10.6	307	23.5	853	11.2
≥2 days in NICU	289	6.9	22	61.1	33	10.4	34	6.6	112	9.0	288	22.1	778	10.2
Neonatal deaths (/1000 live births)	10	2.4	5	139	1	3.2	2	3.9	1	0.8	4	3.1	23	3.0

Table 67: Neonatal morbidity among live births by mode of onset of birth (all gestations)

	Spontaneous labour n=3647		Induced labour n=2430		CS elective n=1246		CS emergency before onset of labour n=270		Total N=7593	
	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	57	1.6	57	2.3	14	1.1	25	9.3	153	2.0
1 min Apgar <7	279	7.7	229	9.4	101	8.1	91	33.7	700	9.2
5 min Apgar <7	60	1.6	56	2.3	13	1.0	21	7.8	150	2.0
Admitted to NICU	362	9.9	229	9.4	132	10.6	130	48.1	853	11.2
≥2 days in NICU	335	9.2	201	8.3	112	9.0	130	48.1	778	10.2
Neonatal deaths (/1000 live births)	11	3.0	9	3.7	1	0.8	2	7.4	23	3.0

Table 68: Neonatal morbidity by mode of birth in live born term or post term (≥ 37 weeks) babies

	Spontaneous vertex n=3908		Vaginal breech n=11		Forceps birth n=282		Ventouse birth n=496		CS elective n=1129		CS emergency n=1063		Total N=6889	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	26	0.7	3	27.3	6	2.1	5	1.0	8	0.7	49	4.6	97	1.4
1 min Apgar <7	166	4.2	5	45.5	39	13.8	64	12.9	75	6.6	147	13.8	496	7.2
5 min Apgar <7	34	0.9	1	9.1	7	2.5	4	0.8	8	0.7	40	3.8	94	1.4
Admitted to NICU	180	4.6	5	45.5	15	5.3	34	6.9	62	5.5	121	11.4	417	6.1
≥2 days in NICU	154	3.9	5	45.5	13	4.6	30	6.0	42	3.7	105	9.9	349	5.1
Neonatal deaths (/1000 live births)	10	2.4	5	138.9	1	3.2	2	3.9	1	0.8	4	3.1	23	3.0

Table 69: Neonatal morbidity in term or post term live born (≥ 37 weeks) babies (2000-2010)

	2000 N=6915		2004 N=6793		2005 N=6578		2006 N=6543		2007 N=6971		2008 N=6910		2009 N=7128		2010 N=7065		2011 N=6889	
	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	106	1.5	73	1.1	46	0.7	78	1.1	97	1.4
1 min apgar <7	553	8.0	507	7.5	454	6.9	468	7.2	553	8.0	454	6.5	454	6.6	518	7.3	496	7.2
Admitted to NICU	405	5.9	349	5.1	346	5.3	283	4.3	405	5.9	322	4.6	314	4.5	364	5.1	417	6.1
≥2 days in NICU	*		254	3.7	275	4.2	226	3.5	*		271	3.9	241	3.5	299	4.2	349	5.1

Chapter 8

POSTNATAL CARE

8 POSTNATAL CARE

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

8.1 Infant feeding

Methods

The infant feeding status of infants born at National Women's is collected at the time of discharge from the hospital. For some this is in the immediate postpartum period, leaving from Labour and Birthing Suite, and for some this is following a post natal stay. Babies admitted to the Neonatal Intensive Care Unit are excluded from the data presented here. Infant feeding data for NICU babies can be found in Chapter 9.

Data are also collected at the time of postnatal home care discharge for those women and babies who have midwifery post discharge care provided by the National Women's Community Team. This is at discharge at approximately 4-6 weeks post birth.

Findings

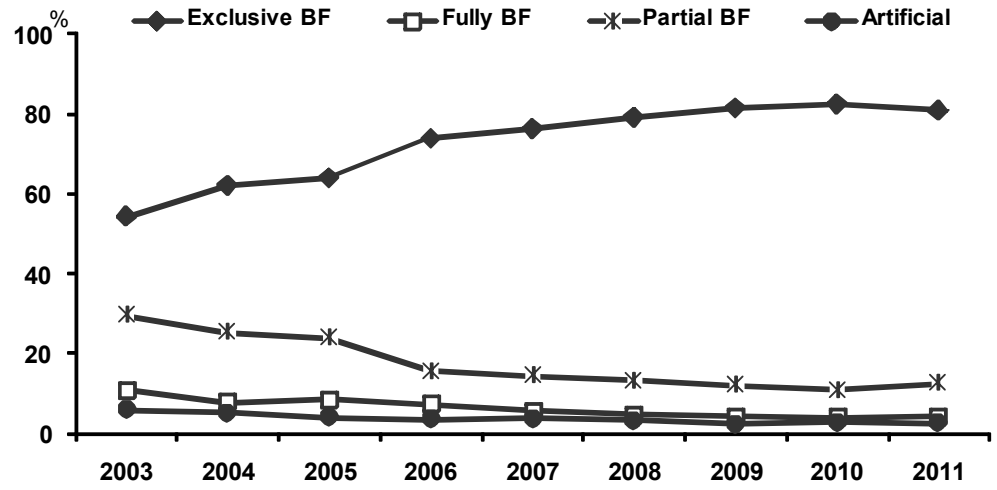

Figure 61: Method of infant feeding at discharge from NW (2003-2011)

In 2011, the exclusive breastfeeding rate on discharge from hospital following birth was 81% exceeding the NZ Breastfeeding Authority (NZBFA) target of 80%. The service experienced a slight decrease from the peak achieved in the previous year (82.6%).

The service remains committed to supporting breastfeeding through the employment of dedicated lactation consultants (LC), education of all staff involved with postnatal women (as wide reaching as ancillary staff) by a variety of modalities including e-learning, audit projects, skilled midwives with several undertaking additional LC qualifications and adherence to the WHO "Ten Steps to Successful Breastfeeding". An extensive external audit process was undertaken by the NZBFA in March 2011 resulting in the re-accreditation of NW as a Baby Friendly Hospital.

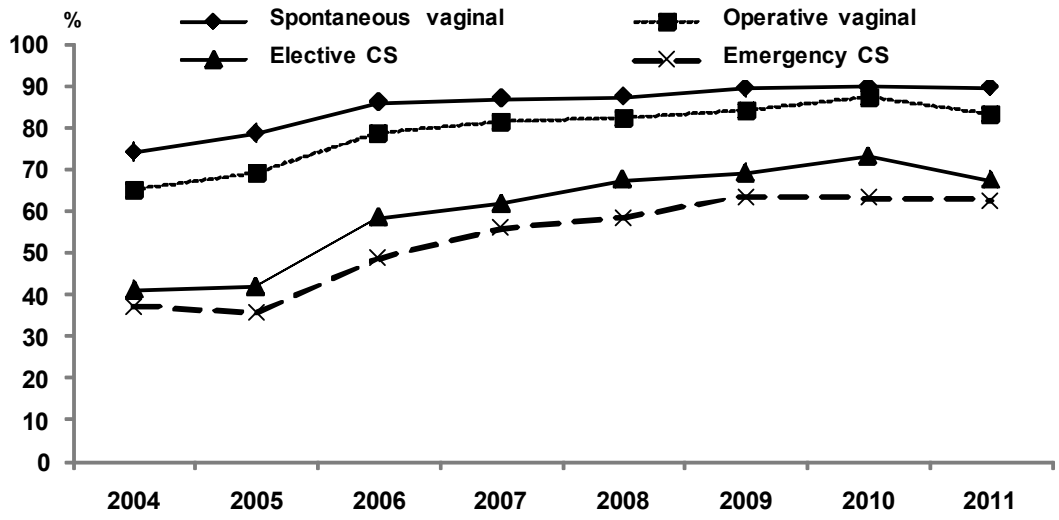

Figure 62: Exclusive breastfeeding at discharge from NW by mode of birth (2004-2011)

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

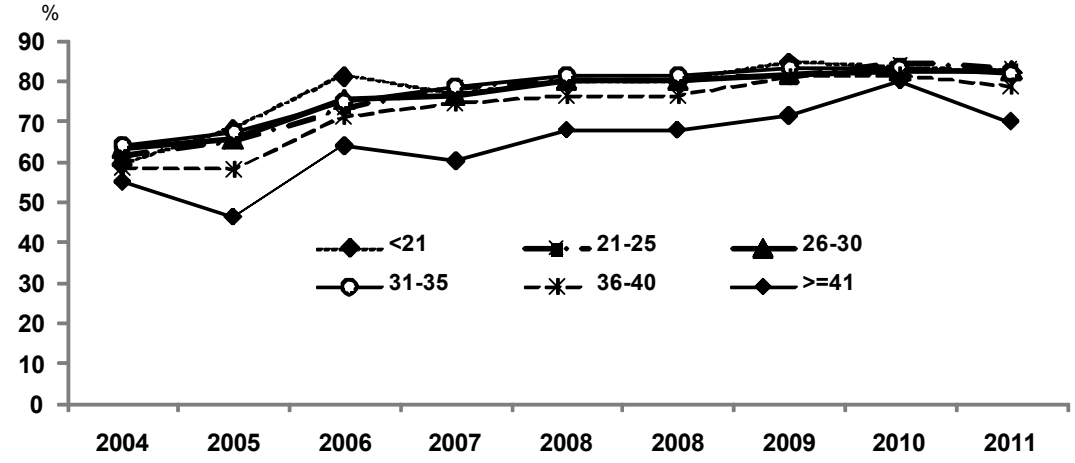

Figure 63: Exclusive breastfeeding rates at discharge from NW by maternal age (2004-2011)

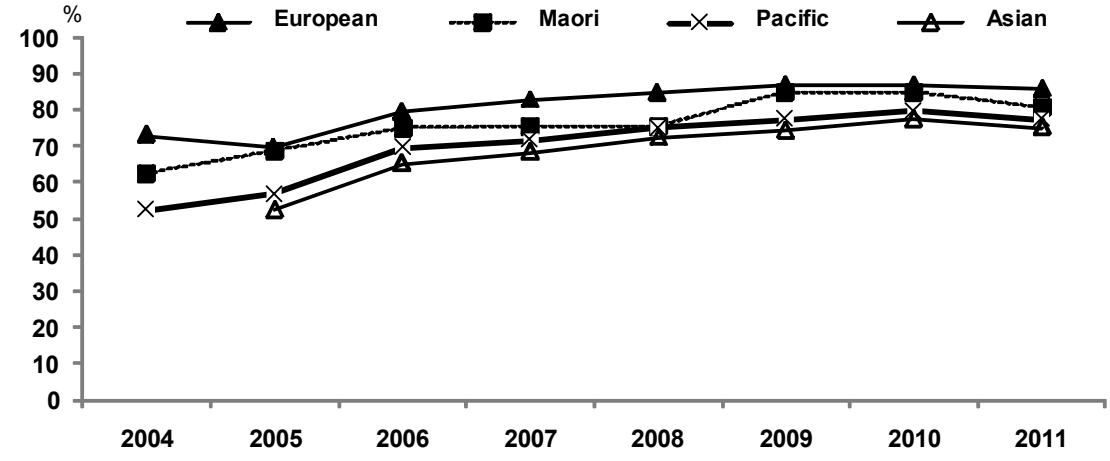

Figure 64: Exclusive breastfeeding rates at discharge from NW by ethnicity (2004-2011)

The rates for European and Māori mothers continue to remain over 80%, with the rates for Pacific and Asian mothers persistently in the 75 – 79% range.

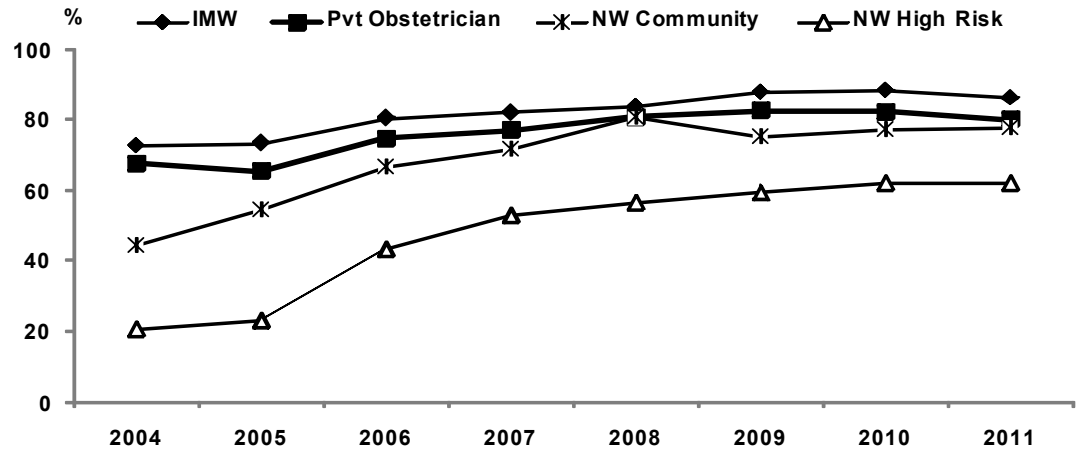

Figure 65: Exclusive breastfeeding rate at discharge from NW by LMC at birth (2004-2011)

There has been a plateau in the improvement in breastfeeding rates across all LMC groups.

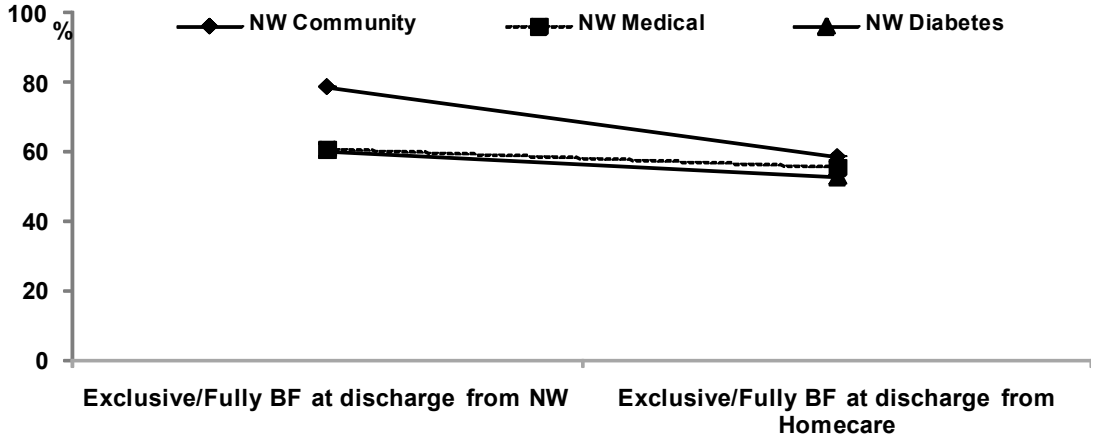

Figure 66: Change in combined exclusive and fully breastfeeding rate from hospital discharge to Homecare by NW LMC (4-6 weeks) (n=1165)

This figure demonstrates the extent to which fully and exclusive breastfeeding rates drop by the time of Homecare discharge at 4-6 weeks. The figure only includes those women cared for by NW midwives and with data at both time points. These are the only breastfeeding data available to us after discharge from hospital. The overall rate of exclusive breastfeeding at discharge from Homecare was 57.5%. The rate in 2010 was 55%.

Summary

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

The slight drop in rates in 2011 highlights the need to remain aware and supportive of the multitude of factors that contribute to a positive breastfeeding environment. Ensuring that the downward trend is reversed for all age groups, ethnicities and modalities of birth is a priority of the service.

The 81% exclusive breastfeeding rate on discharge from the National Women's facility demonstrates the dedication to achieving best practice and care provision for mothers and our future generation.

8.2 Postnatal admissions

Methods

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

Findings

Table 70: Maternal destination immediately after birth

	2004 N = 7491		2005 N = 7194		2006 N = 7212		2007 N = 7695		2008 N = 7589		2009 N = 7735		2010 N = 7709		2011 N =7523	
	n	%	N	%	n	%	n	%	n	%	n	%	n	%	n	%
NW Wards	4618	61.6	4286	61.6	4384	60.8	4590	59.6	4493	59.2	4557	58.9	4661	60.5	4730	62.9
Birthcare	2245	30.0	2354	29.9	2322	32.2	2493	32.4	2551	33.6	2637	34.1	2543	33.0	2357	31.3
Home	539	7.2	510	7.2	483	6.7	587	7.6	526	6.9	517	6.7	481	6.2	414	5.5
Other Units	89	1.2	44	1.2	23	0.3	25	0.3	19	0.3	24	0.3	24	0.3	22	0.3

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

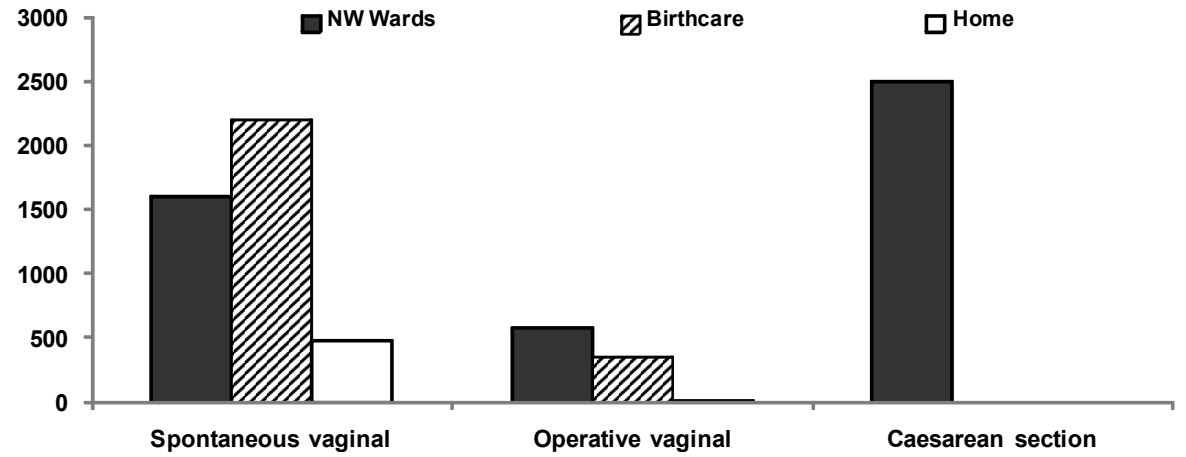

Figure 67: Maternal destination immediately after birth by mode of birth

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

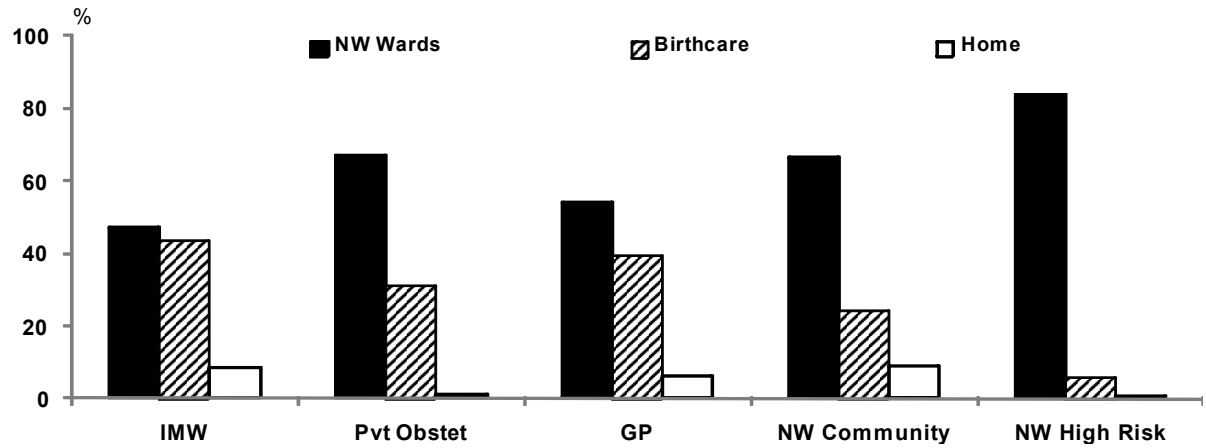

Figure 68: Postnatal destination immediately after birth by LMC at birth

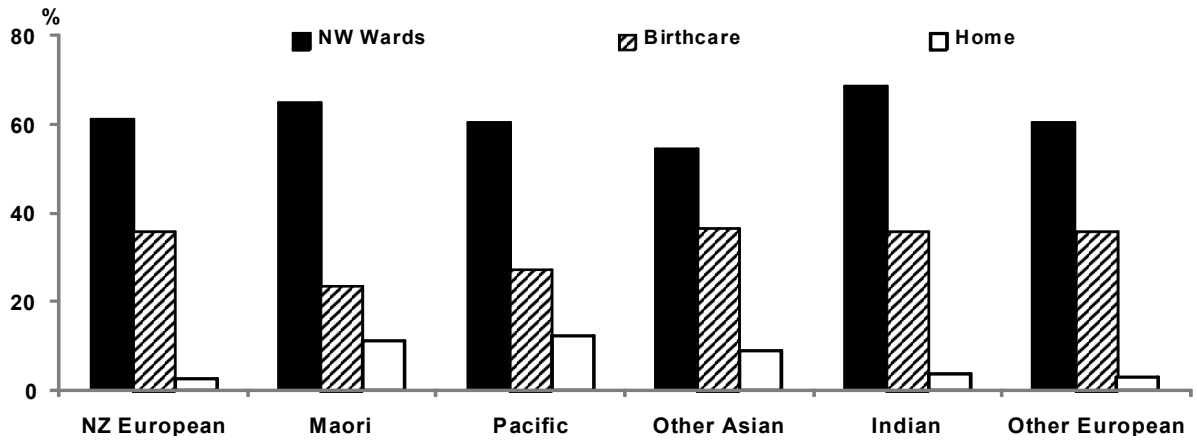

Figure 69: Postnatal destination immediately after birth by ethnicity

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

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

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

Table 71: Reason for admission to NW postnatal wards among women having a spontaneous vaginal birth

	N=1949	
	n	%
Neonatal reason*	807	41.4
Postpartum haemorrhage	317	16.3
Diabetes	238	12.2
Hypertensive disorder	65	3.3
Perineal trauma	67	3.4
Retained placenta/products	60	3.1
Fainting /dizziness	18	0.9
Other listed reasons†	377	19.3

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

Table 72: Discharge destination by mode of birth among initial admissions to NW wards

	N=4674*	
	n	%
Caesarean section birth - discharged to home	2082	44.5
Caesarean section birth - transferred to Birthcare	250	5.3
Caesarean section birth - transferred to other destinations	96	2.1
Operative vaginal birth - discharged to home	307	6.6
Operative vaginal birth - transferred to Birthcare	225	4.8
Operative vaginal birth - transferred to other destinations	13	0.3
Spontaneous vaginal birth - discharged to home	1258	26.9
Spontaneous vaginal birth - transferred to Birthcare	334	7.1
Spontaneous vaginal birth - transferred to other destinations	109	2.3

*56 women with unknown destination have been excluded

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

8.2.1 Postnatal readmissions

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

Table 73: Reasons for readmission

	N=405	
	n	%
Neonatal admission*	117	28.6
Infection †	70	17.3
Breast‡	54	13.3
Postpartum Haemorrhage	31	7.7
Hypertensive disorder	20	4.9
Retained products	12	3.0
Wound breakdown§	9	2.2
Epidural Complications	6	1.5
Obstetric Trauma	3	0.7
Other¶	83	20.5

* 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.

In 2011, 372 (4.9%) women of the 7523 women who gave birth at National Women's had postnatal readmissions, either after their initial postnatal stay or after being discharged to home or other postnatal facilities. Of the 405 readmissions: 341 women had one readmission, 29 women had two readmissions and 2 women had 3 readmissions. The median length of stay for women who had a postnatal readmission was 43 hours.

The most frequent indications for readmission in 2011 were neonatal admission and infection problems.

8.2.2 Admissions to postnatal wards of women who birthed elsewhere

There were 124 admissions in 2011 of mothers who had birthed elsewhere. Most often these births were at Birthcare Auckland, Waitakere, North Shore or Middlemore Hospitals. The majority of admissions were because the baby required admission to the neonatal unit.

Table 74: Reason for postnatal admission by place of birth for women who birthed elsewhere

	Total N= 124		Birthcare n=34		Home n=2		CMDHB* n=15		North Shore n=15		Waitakere n=25		Other n=33	
	N	%	n	%	n	%	N	%	n	%	n	%	n	%
Neonatal admission	73	59	11	32	1	50	9	60	12	80	14	56	26	79
Infection	5	4	1	3	0		1	7	0	0	3	12	0	0
Breast	2	2	0	0	0		1	7	0	0	0		1	3
PPH	13	11	6	18	1	50	1	7	0	0	4	16	1	3
Obstetric trauma	2	2	2	6	0		0		0	0	0		0	0
Retained placenta	10	9	9	27	0		0		0	0	0		1	3
Hypertension	3	2	0	0	0		1	7	0	0	0		2	6
Other	16	13	5	15	0		2	13	3	20	4	16	2	6

* 13 Middlemore, 1 Pukekohe, 1 Papakura

Chapter 9

NEWBORN SERVICES

9 NEWBORN SERVICES

This chapter provides data on the outcomes of babies cared for at the Neonatal Intensive Care Unit (NICU). Additional data can be found in Appendix 8.

Admissions and all other data in this chapter except occupancy relate to babies born in the 2011 calendar year. Occupancy data relate to the unit occupancy for each day in 2011.

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 2011 and admitted to the ACH NICU, (2) inborn (ACH) babies and (3) babies born in 2011 assigned to ACH by the Australia New Zealand Neonatal Network (ANZNN).

9.1.1 Australia New Zealand Neonatal Network (ANZNN)

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

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

Each infant is assigned to the NICU at which they were originally treated for at least 4 hours, even if that baby was subsequently transferred. Data are collected up to discharge home, even if care is in several hospitals.

ANZNN was established in 1994 and ACH has supplied data since 1995. De-identified data is sent electronically to the Sydney secretariat. Approval to send data was obtained from the North Health Ethics Committee prior to ACH joining ANZNN.

An annual report of the combined data from all units is published each year and feedback data are sent to each unit that contributes comparing the outcomes of that unit to those of the Network overall.

Data presented here are from the ANZNN annual reports and the ACH NICU database. The ANZNN data include data from ACH.

Table 75: Characteristics of <32 week or <1500g babies cared for at NW NICU by ANZNN status

	<32 weeks or <1500g					
	Total N=178		ANZNN n=159		Non ANZNN n=19	
Gestation (weeks)	**n**	**%**	**n**	**%**	**n**	**%**
<24	3	1.7	3	1.9	0	
24-25	23	12.9	17	10.7	6	31.6
26-27	34	19.1	28	17.6	6	31.6
28-29	40	22.5	37	23.3	3	15.8
30-31	57	32.0	54	34.0	3	15.8
32-36	20	11.2	19	11.9	1	5.3
>36	1	0.6	1	0.6	0	
Weight (g)						
<500	0		0		0	
500-749	23	12.9	22	13.8	1	5.3
750-999	34	19.1	26	16.4	8	42.1
1000-1249	35	19.7	28	17.6	7	36.8
1250-1499	47	26.4	45	28.3	2	10.5
1500-1999	33	18.5	32	20.1	1	5.3
2000-2499	6	3.4	6	3.8	0	0.0
Birthplace						
BBA	3	1.7	3	1.9	0	
National Women's	144	80.9	144	90.6	0	
Northland	5	2.8	5	3.1	0	
Waitemata DHB	6	3.4	6	3.8	0	
Counties Manukau DHB	13	7.3	0	0.0	13	68.4
Other	7	3.9	1	0.6	6	31.6

9.1 Inborn live birth at National Women's 1959-2011

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.

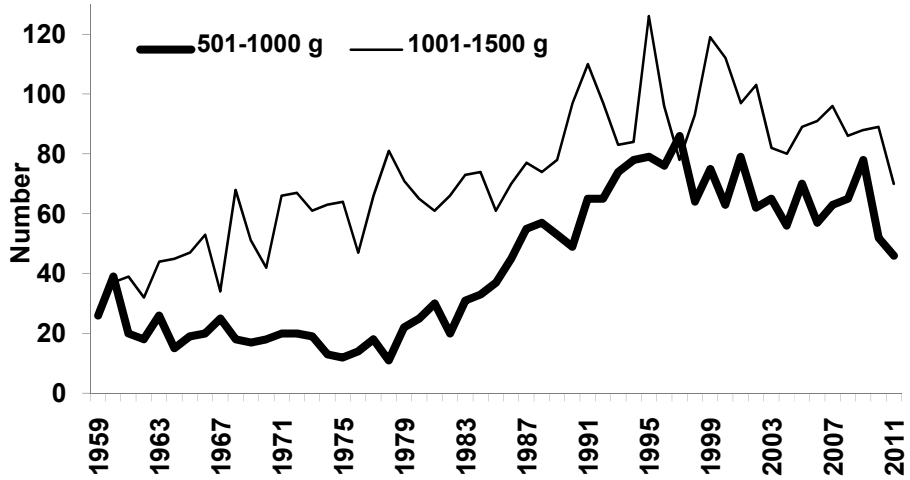

Figure 70: Number of inborn live births ≤1500g from 1959 to 2011 (excludes BBAs).

9.2 NICU occupancy

For 2011 the very high occupancy that was observed for 2007-2010 has continued. The occupancy of 15122 bed days is equivalent to a mean of 41.5 babies per day. Trends for the occupancy by gestational age groups and birth weight are given in the figure below. Although the number of births increases with an increasing gestational age the duration of stay decreases, as the infants require less time to achieve maturity. However immature babies have a more complex course and with the two Waitemata units caring for their level 2 babies the overall acuity of the ACH unit has risen for a given occupancy.

Table 76: Occupancy (baby days) on NICU (2000– 2011)

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

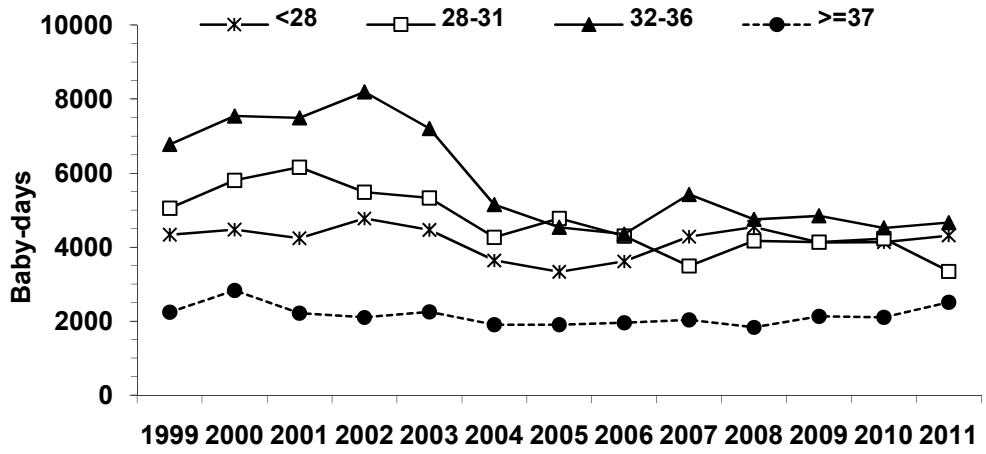

Figure 71: Occupancy (baby days per year) of NICU by gestational age

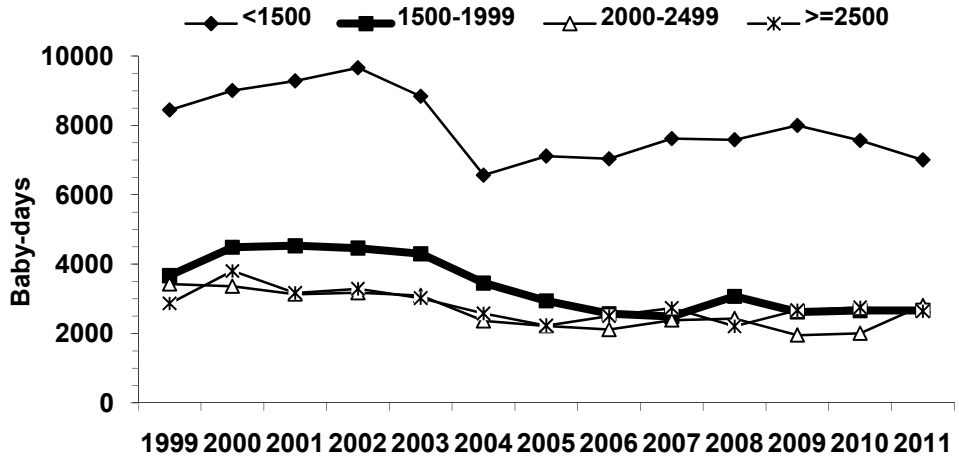

Figure 72: Occupancy (baby days per year) of NICU by birth weight

9.3 Admissions to NICU

Total admissions were 963 for the 2011 calendar year. Admissions to ACH NICU peaked in the mid 1990s prior to the opening of the two local Waitemata Level 2 neonatal units. The North Shore Hospital Neonatal Unit opened in 2003 and Waitakere Hospital in 2004. These two Waitemata units admit babies >1500g and >31 weeks gestation and will administer CPAP.

Auckland City Hospital continues to be the level 3 referral unit for the two Waitemata hospitals and for Northland Base Hospital. ACH NICU also provides regional neonatal intensive care services for infants undergoing surgical procedures in the newborn period and care for babies with antenatally diagnosed congenital cardiac disease likely to require intervention soon after birth.

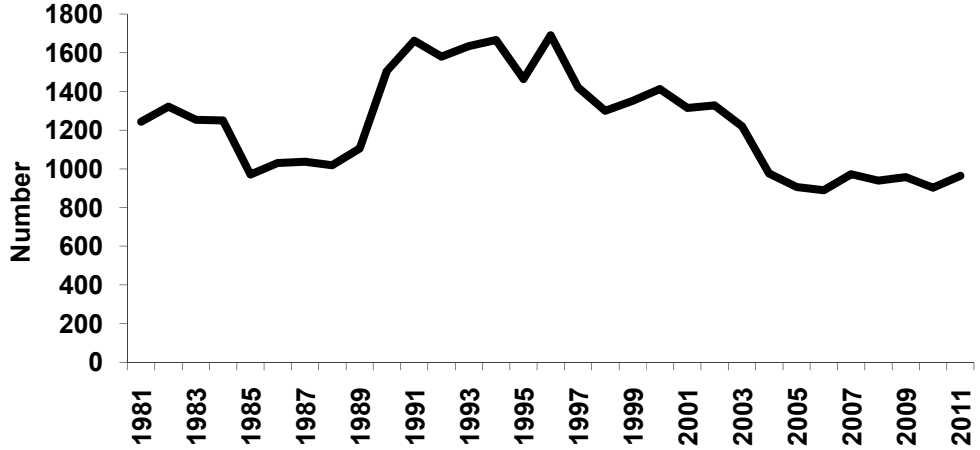

Figure 73: Admissions to NICU 1981-2011

Table 77: NICU admissions by year

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number	1690	1420	1300	1352	1412	1312	1331	1220	975	906	890	972	939	957	902	963

9.3.1 Admissions to NICU by gestation and birth weight

The rate of admission for babies below 32 weeks gestation or below 1500g birth weight has been fairly constant, at around 200 per year, over the last decade. Although there was a significant decrease in admissions of term babies and those 32-36 weeks gestation from 2004 there has been an ongoing increase in term infant admissions since 2008. These babies are likely to have a mixture of problems but the two most common (see Appendix) are respiratory distress and congenital abnormality, which includes cardiac anomalies.

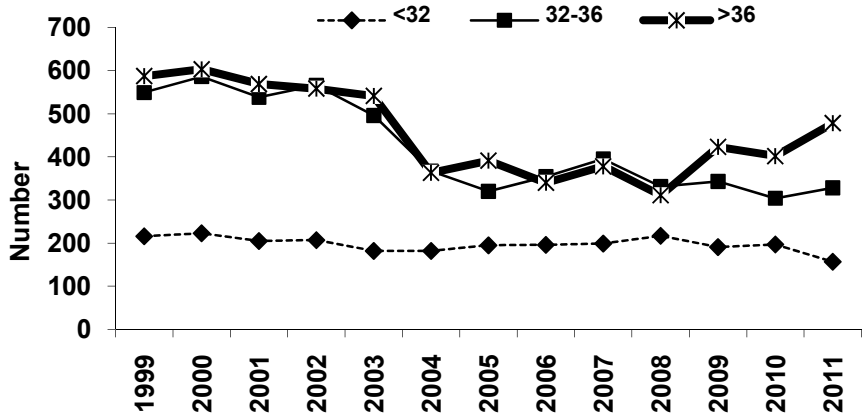

Figure 74: Admissions to NICU by gestational age

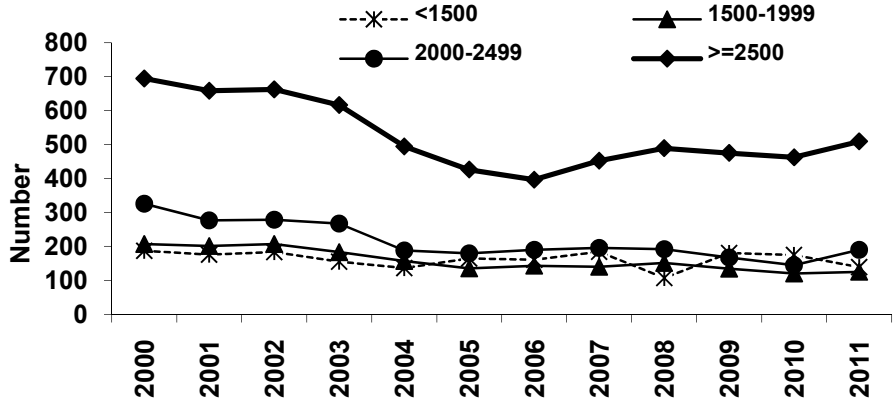

Figure 75: Admissions to NICU by birth weight

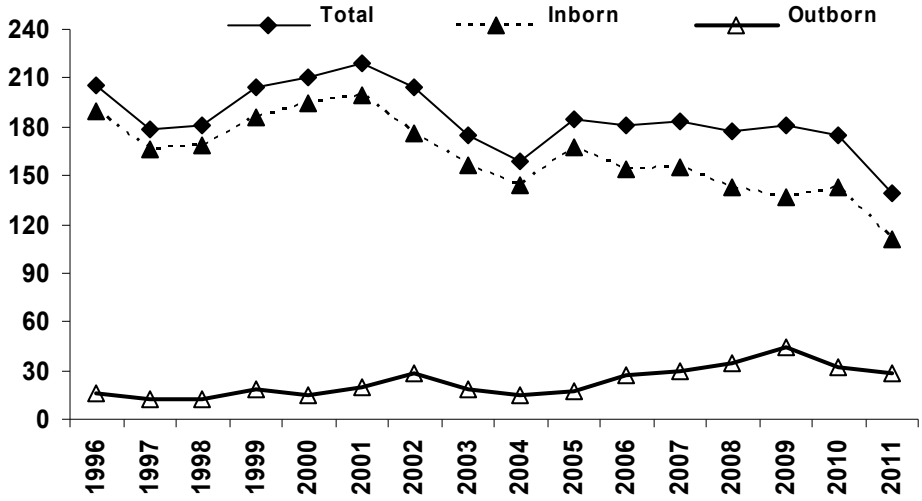

Figure 76: Admissions to NICU of <1500g babies (VLBW) by place of birth (outborn includes BBAs).

The number of VLBW infants admitted to the NICU has remained fairly stable over the last decade. Although there was a slight decrease in the total number of VLBW infants due to

fewer inborn babies in this weight group for 2011, this will need ongoing review to ascertain importance. The number of outborn VLBW infants is low but has remained steady over 2010-11. 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 there has been a decline in admissions of babies whose mothers are domiciled in the Waitemata DHB since the opening of the two level 2 units. The modest increase in the number of babies admitted to NICU whose mothers were domiciled in the ADHB region in 2008 and 2009 was considered due to better allocation, with a drop in unknowns. However, there also was a small increase observed in 2011.

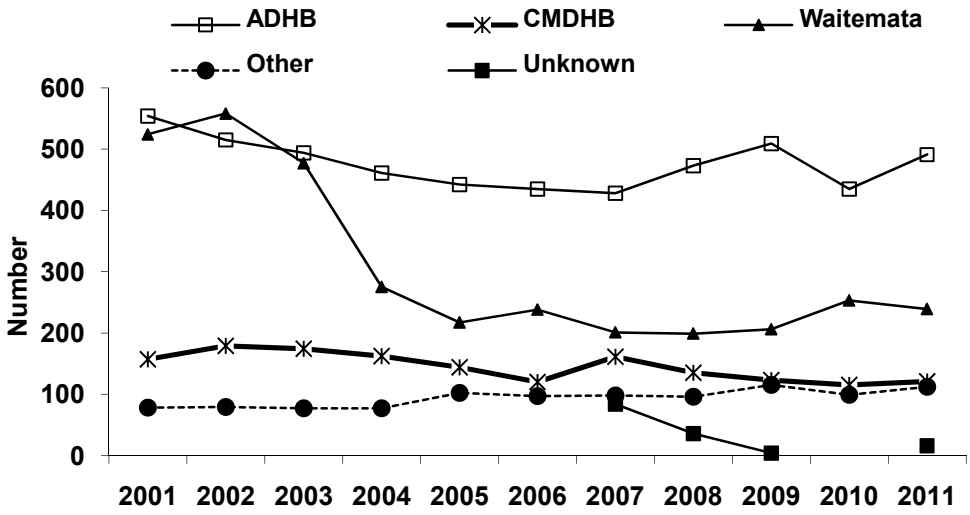

Figure 77: Admissions to NICU by maternal domicile

9.3.3 Admissions to NICU by ethnicity of baby

The most frequent ethnicity of NICU admissions was NZ European with 36.2% overall, including 36.3% of preterm and 36.2 of term infants respectively. Due to changes in reporting infant ethnicity made in 2007 we have not reported long term changes in infant ethnicity over time. However, the fact that for 2011 only just over one in three infants are NZ European should be noted.

The second largest single ethnic group is Maori with an overall rate of 17.8% compared to 14.5% for Pacific people. Asian and Indian were the two other major groups represented with 12.5% and 8.1% of admissions respectively. The number of Asian admissions has increased reflecting the increase in births to Chinese families in Auckland over the last 5 years.

9.3.4 Reasons for admission to NICU

Prematurity (32.5%) and respiratory distress (26.8%) remain the commonest reasons for admission to NICU. However, 112 babies (11.6%) were admitted because of congenital anomalies. This has increased from 70 (8.8%) in 2006. Forty three babies (4.5%) including 29 term infants were admitted primarily for hypoglycaemia. The full list is presented in Appendix 8.

9.3.5 Antenatal corticosteroids (benchmarked with ANZNN)

Antenatal steroid use has been consistently high in the Network (ANZNN) and ACH over the last five years. In 2011 over 85% of ACH babies <32 weeks gestation received some antenatal corticosteroids before birth and 50% received a course starting between 24 hours and seven days before birth. Although data are not available from ANZNN for all years, it appears that ACH and ANZNN rates are similar across age groups 24-31 weeks gestation.

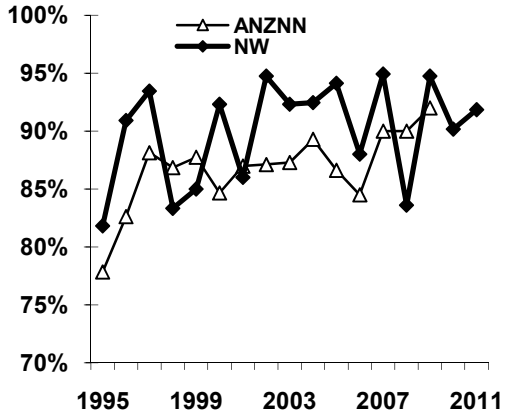

Figure 78: Any antenatal corticosteroids at 24-27 weeks

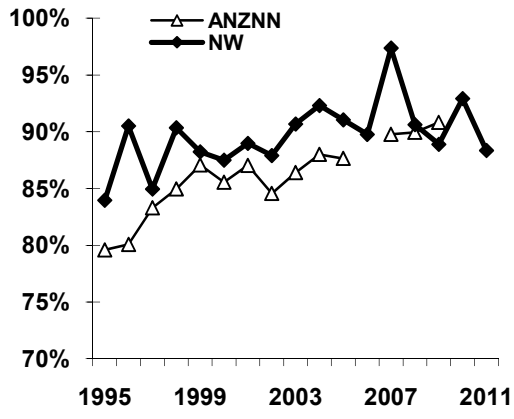

Figure 79: Any antenatal corticosteroids at 28-31 weeks

9.4 Care and complications

9.4.1 Infection (all admissions)

In 2011 there were 9 early-onset culture proven septicaemias compared with 7 in 2010, 10 in 2009 and 6 in both 2008 and 2007. The major organisms were Group B Streptococcus (4) and E Coli (2). There were 34 episodes of late-onset septicaemia, compared with 27, 33, 31 and 34 episodes in the four previous years. For late onset sepsis the most common organism was *Staphylococcus epidermidis* / coagulase negative *Staphylococcus.*

9.4.2 Hypoxic ischaemic encephalopathy (all admissions)

Four inborn babies developed significant stage 2 or 3 hypoxic ischemic encephalopathy (HIE) in 2011, giving an incidence of 0.52/1000 term live births. The incidences were 0.5, 0.6, 1.6, 0.5, 0.9, 1 and 0.4/1000 term live births for the years between 2003 and 2010.

Table 78: Details of Hypoxic Ischaemic Encephalopathy Stages 2 or 3.

Born at	Gestation	Birth Weight	HIE stage	Apgar 1/5	Comment
NW Theatre	38	2480	3	0 / 3	Em C. Section for fetal distress
NW Labour and Birthing Suite	39	2635	2	4 / 6	True knot in umbilical cord
NW Labour and Birthing Suite	38	3780	2	0 / 1	Breech vaginal delivery with difficult extraction
NW Theatre	37	2990	2	1 / 5	Em C. Section for fetal distress
Northland Hospital	38	3420	2	3 / 4	Spontaneous vaginal delivery Cord arterial pH = 6.67
North Shore	40	3525	2	3 / 5	Ventouse delivery for fetal distress and meconium stained liquor
Northland Hospital	41	4605	3	0 / 0	Planned home delivery but failed to progress so transferred to hospital Fetal distress on arrival, cord art. pH = 6.7 Prolonged resuscitation but died on day 3
Waitakere Hospital	40	2920	3	1 / 3	Ventouse delivery for fetal distress + Meconium aspiration syndrome
Waitakere Hospital	37	2650	2	5 / 5	Em C. Section for fetal distress

Em C= Emergency Caesarean

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

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

9.4.3 Intraventricular haemorrhage in very low birth weight infants admitted to NICU from 1985 to 2011

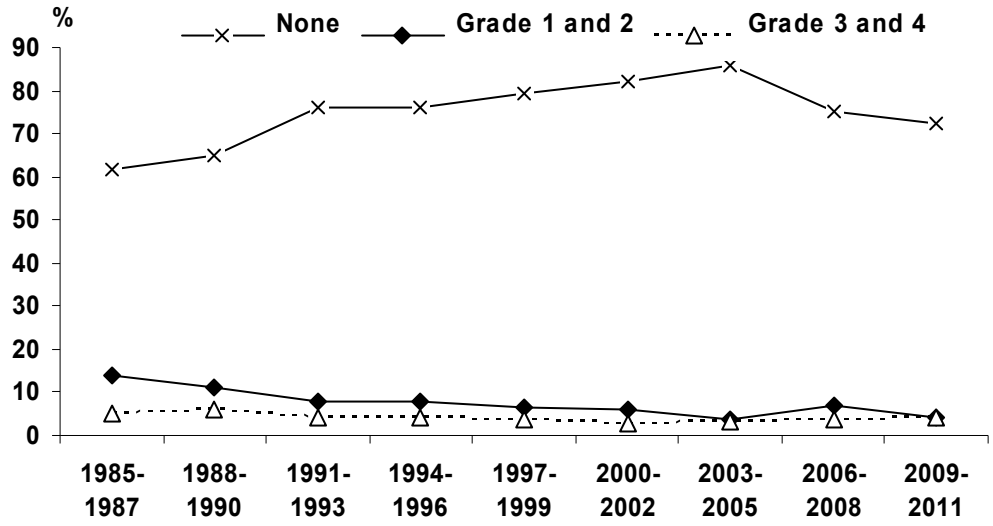

Figure 80: Intraventricular haemorrhage in <1250g infants admitted to NICU from 1985 to 2011
(Babies with unknown IVH status have been removed from the denominator.)

Since 2005, the criteria for routine cerebral ultrasound scanning at ACH has been <30 weeks or <1250g. This was changed from <32 weeks or <1500g due to the very low incidence of significant abnormalities in the larger more mature infants. Previously results were reported for 28-31 weeks to be consistent with ANZNN and pre 2005 data. However, from 2010 onward, to avoid major changes in the denominator, we have interpreted those infants in whom an ultrasound was not performed, due to the policy change, as negative (no IVH). Since 2000, the absolute number of cases of IVH has remained fairly constant.

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

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

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

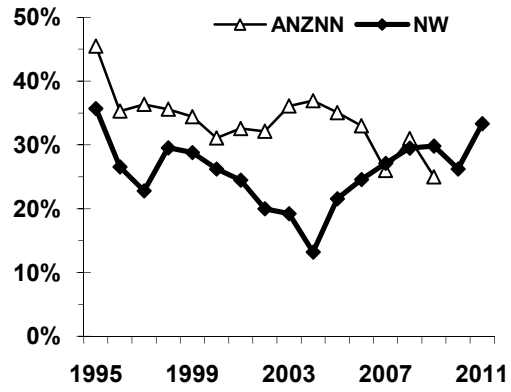

Figure 81: Any IVH at 24-27 weeks

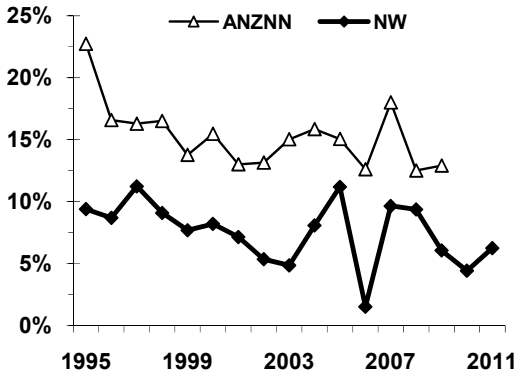

Figure 83: Any IVH at 28-31 weeks

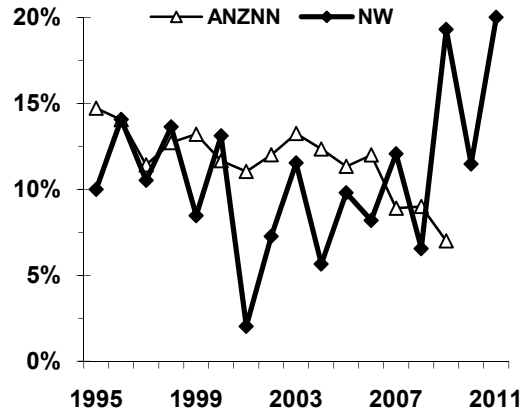

Figure 82: Severe (G3-4) IVH at 24-27 weeks

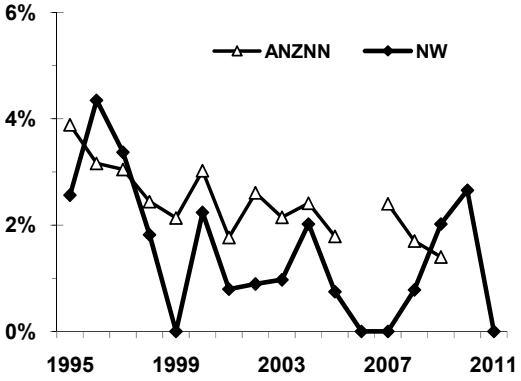

Figure 84: Severe (G3-4) IVH at 28-31 weeks

The rate of severe IVH at 24-27 weeks appears to be increased for the period 2009-11. However, this is expressed as a percentage so subject to small denominator numbers. For 2011 there were only 9 cases compared with 7, 11 and 4 over the prior three years but the total number of infants in this group was decreased.

Note that in 2005 there was a change in policy with routine imaging no longer being performed for clinically stable babies greater than 30 weeks gestation. Previously results were reported for 28-31 weeks to be consistent with ANZNN and pre 2005 data. However, for 2010 to avoid major changes in the denominator we have interpreted those infants in whom an ultrasound was not performed, due to the policy change, as negative (no IVH). Thus figure 85&86 is represented differently to the previous years. This rationale is supported by previous data on IVH for this age group and the fact that clinically unstable infants still have an ultrasound performed.

9.4.5 Assisted ventilation (all admissions)

9.4.6 Use and duration of assisted ventilation

Data in this section are presented for all inborn babies at ACH, thus excluding babies transferred to NICU in the postnatal period. This allows more meaningful comparisons of postnatal care at ACH over time. Note that although the total number of admissions has plateaued, the total number of babies receiving IPPV has increased dramatically to 196 for 2011. This number is higher than at any time for the last decade and reflects the increased acuity of current workload.

Table 79: Number of babies on assisted ventilation

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CPAP or IPPV	393	446	404	402	395	453	442	442	423	448	526
IPPV	126	140	109	123	140	152	139	144	132	178	196
CPAP	379	421	388	388	367	428	418	412	423	411	470

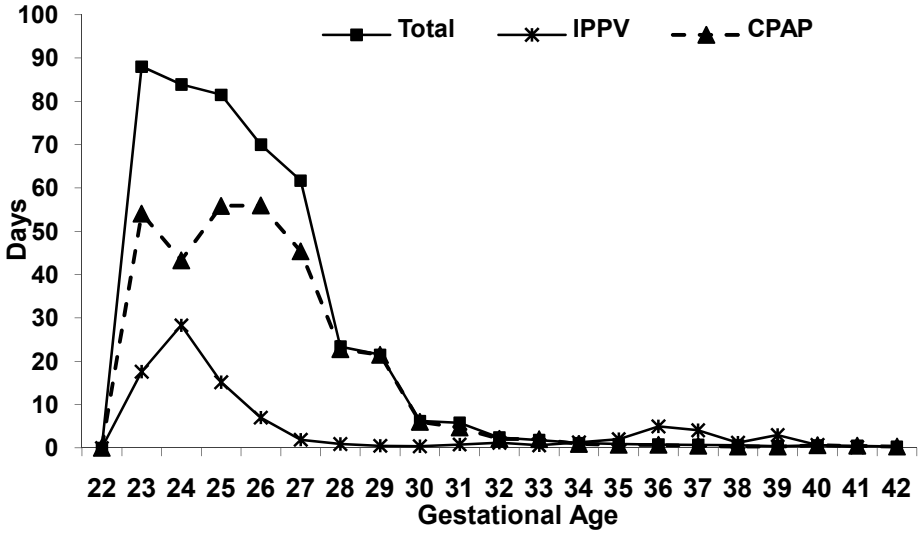

Figure 85: Median ventilation days on IPPV and CPAP and IPPV+CPAP by gestational age among (ventilated) survivors in 2010

The neonatal unit has used CPAP as the primary mode of respiratory support in uncomplicated inborn premature infants for more than a decade. Although the majority of infants born below 26 weeks gestation receive a period of positive pressure ventilation, there is a steady reduction in the proportion receiving such support from 26 to 32 weeks gestation.

Since 2010, as stated above, there has been a significant increase in the number of babies receiving IPPV. For 2011 there were 65 term babies who were ventilated which is similar to the previous year. The most common reasons for this requirement were: respiratory distress, meconium aspiration, congenital anomalies, support for encephalopathy, surgery and “other”, which includes metabolic disease. Note it is routine for babies with encephalopathy who receive whole body cooling to be ventilated due to the sedation they receive, regardless of respiratory status.

There is a clear pattern of decreasing need for CPAP with increasing gestation and reduction in use from 28 weeks onwards. From 2010 we have used humidified high flow air/oxygen as a method of weaning off CPAP, particularly after 34 weeks gestation, but not as a primary respiratory support. The advantages are primarily the ease of care during neuro-developmentally appropriate activities but there is a need to observe how use impacts on the statistics for overall duration of respiratory support.

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

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

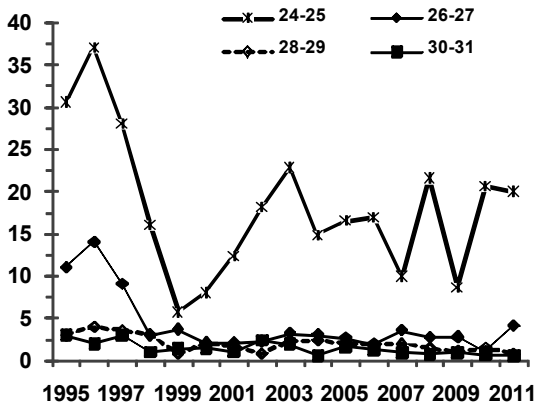

Figure 86: Median days on IPPV

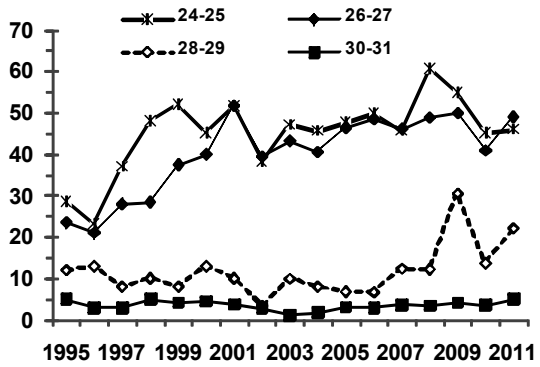

Figure 87: Median days on CPAP

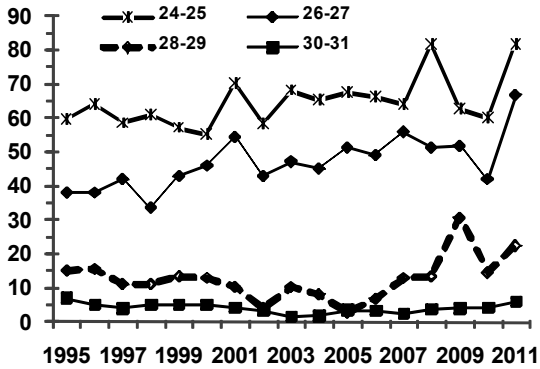

Figure 88: Median days on CPAP + IPPV

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

The shift in 1997 to a CPAP-based approach was associated with a dramatic decrease in the time ventilated for infants under 28 weeks gestation. For babies of 24 and 25 weeks gestation, this fell from a median of 37 days to just 6 days by 1999. However the next 4 years saw a gradual increase in median number of days on IPPV to 23 days in 2003. Since then there has been a fluctuation in median duration of IPPV; however, it should be noted that the number of babies in the gestational age band are small.

The introduction of CPAP also resulted in a decline in the median number of days on IPPV for infants 26-27 weeks gestation. Since 1999 this has remained fairly constant below 5 days.

As time on IPPV has decreased the time on CPAP has increased. There has been a steady increase over the last 15 years for the most immature babies below 28 weeks. In 2009, there was a peak in use for more mature infants at 28-29 weeks gestation but this was not sustained in 2011. The cause of this is uncertain but could reflect changes in the method of weaning from CPAP, particularly with a shift from the practice of “cycling off” CPAP.

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

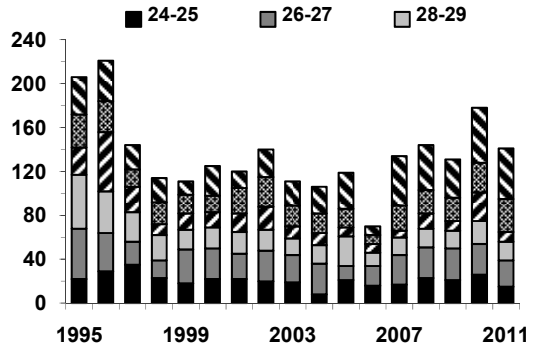

Figure 89: Number on IPPV

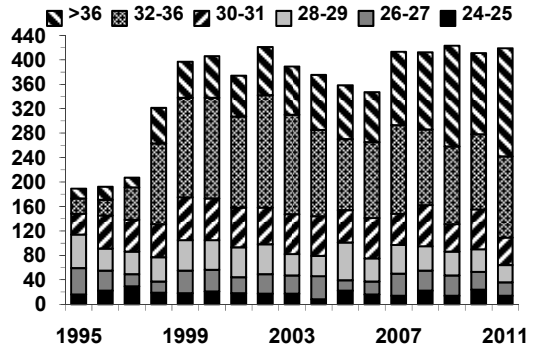

Figure 90: Number on CPAP

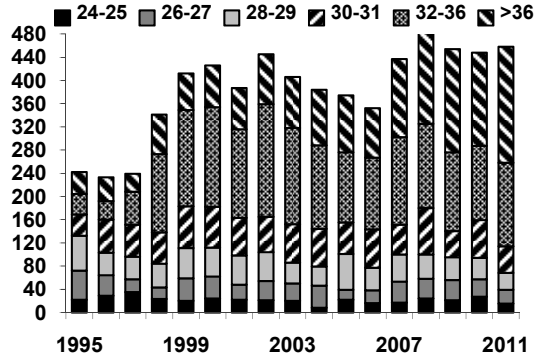

Figure 91: Number on CPAP + IPPV

These figures show the number of babies requiring respiratory support at ACH over the last 15 years. For 2011 the number is less than last year but similar to 2007-9.

The effect of introducing double short-pronged Hudson® CPAP in 1997 is clear with a reduction in number receiving intubation and assisted ventilation. As Head-box oxygen was also phased out with all babies requiring oxygen being placed on CPAP, there was a concomitant increase in the use of CPAP, particularly in babies from 32-36 weeks gestation.

In 2011 we collected information on the use of High Flow Humidified Air / Oxygen. This technique was used in 63 babies as a method of weaning infants from CPAP. The median duration was 9.7 (range 0.4-52) days. This use would be in addition to the CPAP documented in Figures 92 & 93 Although some units use this as mode of primary respiratory support at ACH use is solely for weaning. Note also that ACH does not use any method of non invasive ventilation such as Nasal IPPV.

9.4.9 Positive pressure ventilation and CPAP use in NW and across Australia and New Zealand at 24-27 weeks gestation (ANZNN benchmarking)

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

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

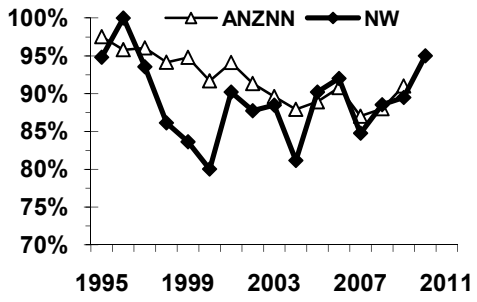

Figure 92: Percentage on IPPV (24-27 wks ANZNN assigned)

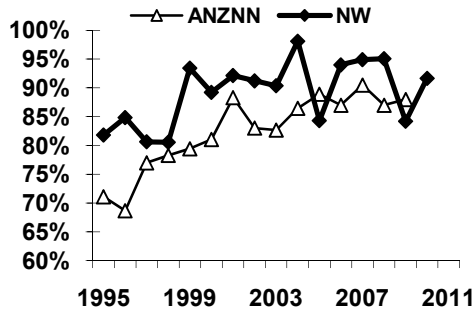

Figure 93: Percentage on CPAP (24-27 wks ANZNN assigned)

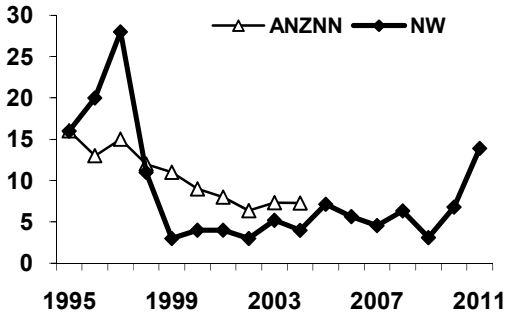

Figure 94: Median days on IPPV (24-27 wks ANZNN assigned)

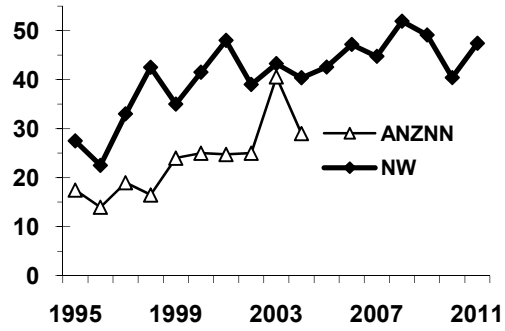

Figure 95: Median days on CPAP (24-27 wks ANZNN assigned)

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

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

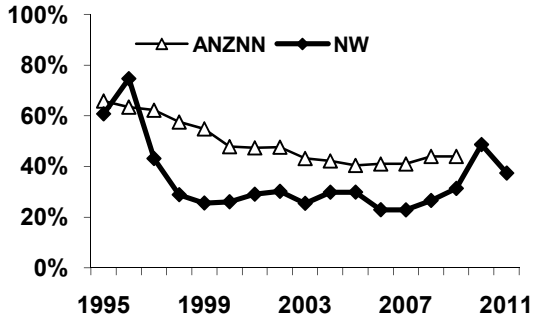

Figure 96: Percentage on IPPV (28-31 wks ANZNN assigned)

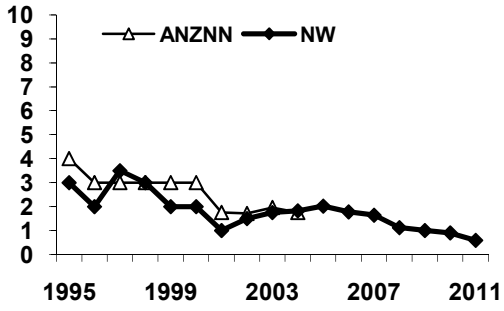

Figure 97: Median days on IPPV (28-31 wks ANZNN assigned)

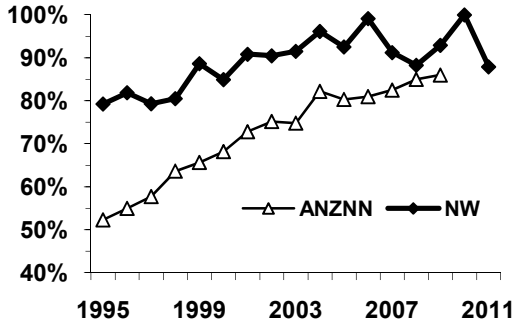

Figure 98: Percentage on CPAP (28-31 wks ANZNN assigned)

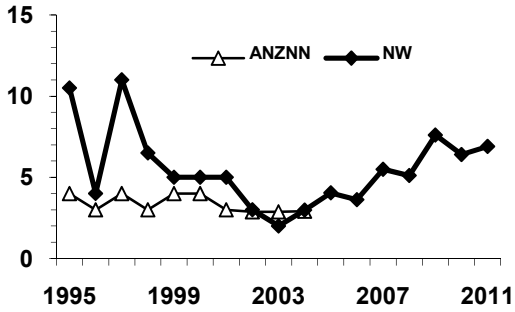

Figure 99: Median days on CPAP (28-31 wks ANZNN assigned)

The pattern of respiratory support in NW babies of 28-31 weeks gestation parallels that seen in the less mature babies.

9.4.11 High frequency oscillatory ventilation and inhaled nitric oxide

These data are on all babies admitted to NICU in each year, including those born in other hospitals or at home.

High frequency oscillatory ventilation (HFOV) is typically used for 'rescue' treatment at ACH. Hence, babies treated with HFOV are the sickest babies in NICU who would be expected to have a very poor outlook whatever the treatment. At all gestations, mortality in these infants tends to be high. In 2011 the survival following use of both HFOV and iNO was considerably higher than our experience for the previous decade, which was approximately 60%, 67% and 57% survival following treatment with HFOV, iNO or HFOV + iNO respectively.

Table 80: HFOV and inhaled nitric oxide (iNO) use and survival (2011)

	HFOV		iNO		HFOV + iNO	
	Treated n	Survivors n(%)	Treated n	Survivors n(%)	Treated n	Survivors n(%)
Total	**20**	**18(00)**	**26**	**22(85)**	**11**	**9(82)**
<28 weeks	12	11(92)	6	6(67)	5	4(80)
28-31 weeks	1	1(100)	2	1(50)	1	1(100)
32-36 weeks	1	10(100)	6	6(100)	1	1(100)
≥37 weeks	6	5(83)	12	9(83)	4	3(75)

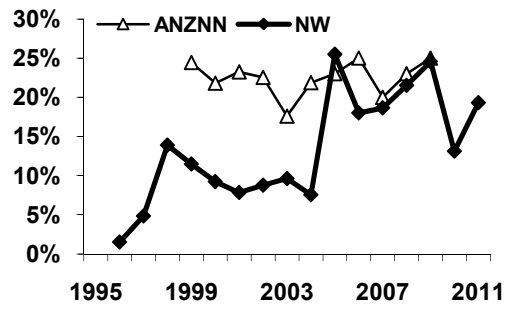

Figure 100: HFOV at 24-27 weeks (ANZNN assigned babies)

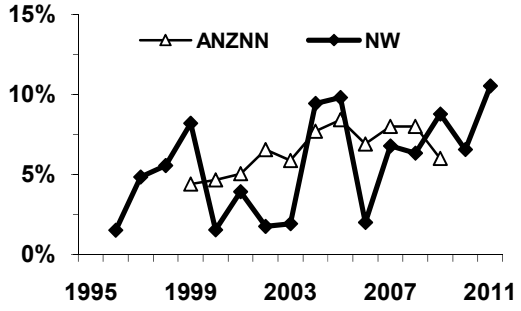

Figure 101: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies)

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

9.4.12 Term/post-term infants on assisted ventilation from 1995 to 2011

This figure shows the number of term infants ventilated or treated with CPAP. Inborn and outborn infants are included. In the late 1990s there has been a significant increase in CPAP use due to the removal of headbox oxygen as a therapy. For 2007 there was a moderate increase in the number of term infants receiving IPPV. Since 2008 there has been an increase in numbers receiving CPAP.

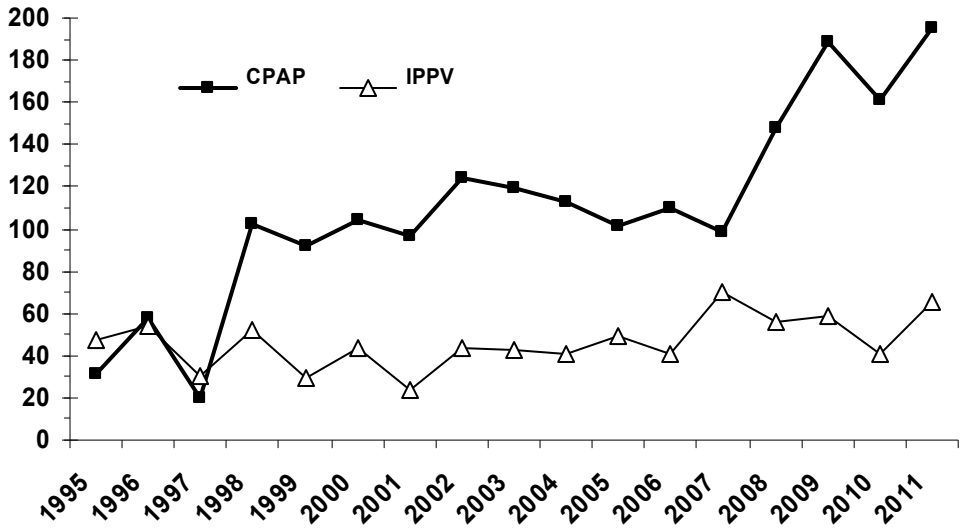

Figure 102: Number of term and post term babies needing assisted ventilation

In previous years the most common reasons for ventilating term infants were meconium aspiration or persistent pulmonary hypertension of the newborn (PPHN) In 2011, TTN/RDS, meconium/ PPHN, congenital anomalies, support for surgery, neonatal encephalopathy and "other", which could include a neuromuscular problem were the reasons for ventilation (see Appendix 8). Prior to the move to ACH site some of these infants would have been transferred early to Starship Hospital. Appendix 8 documents the number of surgical babies requiring respiratory support from 2008 onward.

In 2011, the most common reason for using CPAP in term babies was transient tachypnoea of the newborn with 96 babies on CPAP (approximately 50% of CPAP use at term), followed by other, meconium aspiration and infection (Appendix 8).

9.5 Outcomes

9.5.1 Survival of NW inborn babies by birthweight

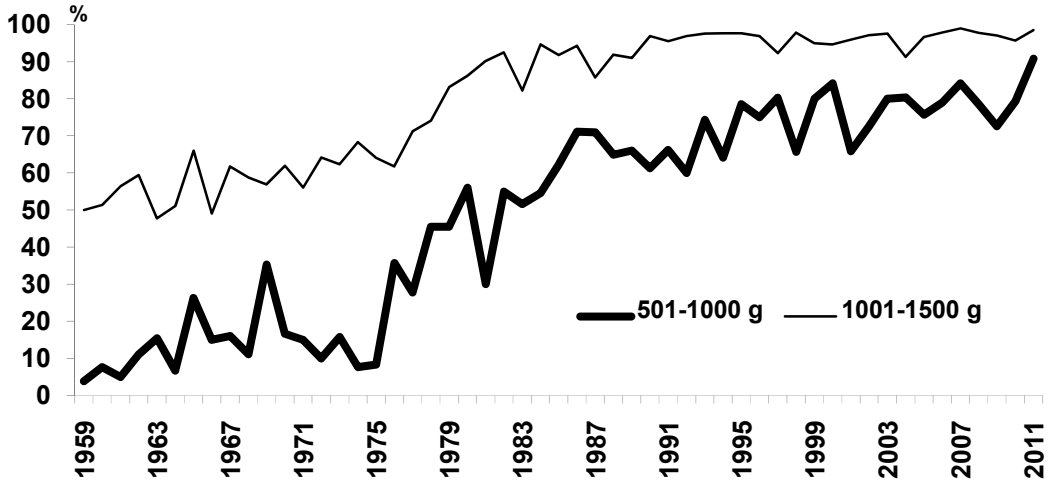

Figure 103: Neonatal survival (0-28 days) of ≤1500g inborn live births from 1959 to 2011

Over the years the definitions used have been the same, counting all babies, including those who died soon after birth, if they showed signs of life.

The numbers of babies with anomalies and the number who were not actively treated because of their low gestation varies from year to year, and has a big influence on the overall survival rate, particularly in the extremely low birth weight group (500-1000g, ELBW).

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

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

Although there have not been such dramatic changes in survival rates over the last decade, it is worth noting the current quality of survival, in terms of neurodevelopment, as reported in the Child Development Unit (CDU) section of the report (section 9.9).

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

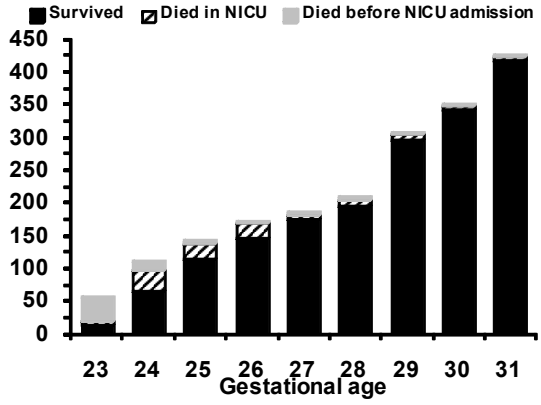

Figure 104: Numbers of live inborn babies 23 to 31 weeks gestation in 2000-2011

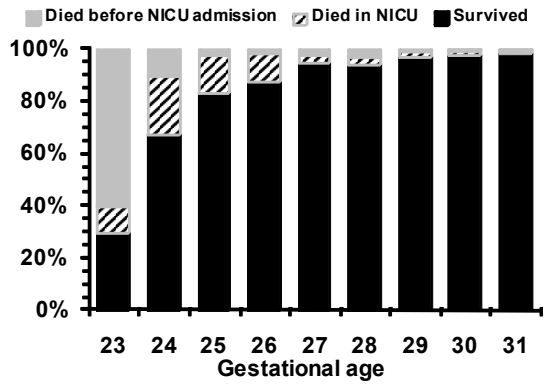

Figure 105: Survival of live inborn babies 23-31 weeks 2000-2011 (n = 1955)

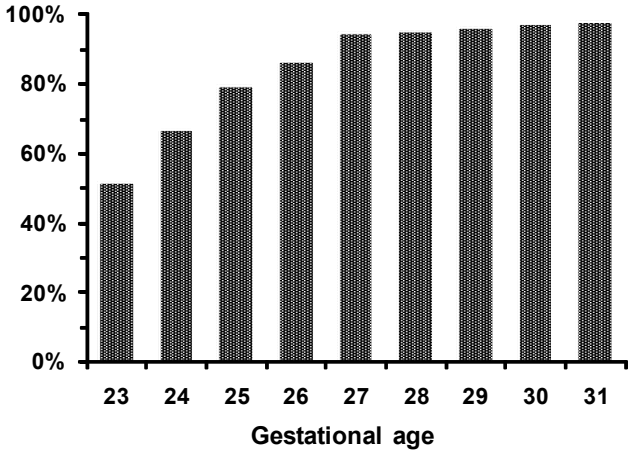

Figure 106: Survival of live inborn babies admitted to NICU from 1995 to 2011 (n =3043)

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

The ACH rates are comparable to outcomes published by ANZNN, which approximate population data.

Although the number of infants in each group per year is small, the pattern of survival in very preterm infants has been steady over the last decade and present survival rates are not significantly different to those of earlier years.

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

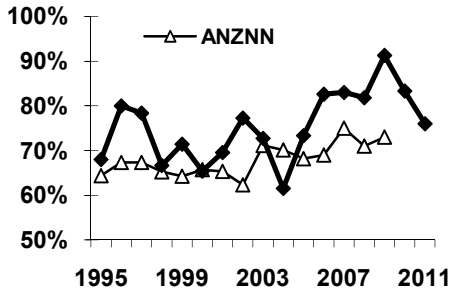

Figure 107: Survival at 24-25 weeks gestation compared with ANZNN data

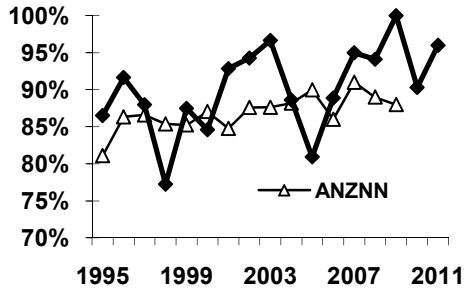

Figure 108: Survival at 26-27 weeks compared with ANZNN data

Survival rates for 24-27 weeks gestation are consistently good at ACH. The relatively small numbers at 24-25 weeks gestation account for the year to year variation. Over the 12 years, there were between 21 and 37 babies per year in this age group. These data are for all inborn babies admitted, including those with lethal malformations but excluding deaths in Labour and Birthing Suite.

9.5.4 Cystic periventricular leukomalacia (PVL)

In 2011 one inborn baby developed cystic PVL. She was inborn at 24 wks gestation weighing only 575g. Her neonatal course was complex including multiple episodes of infection, necrotising enterocolitis and hypotension. Examination at discharge revealed some concerns regarding tone.

A further outborn baby who was born at 26 weeks gestation weighing 1060g was transferred to ACH for surgical management of NEC at 44 days of age. He was known to have grade IV intraventricular haemorrhage and cystic PVL prior to transfer.

9.5.5 Retinopathy of prematurity benchmarked with ANZNN

As previously reported, changes in the screening technique and the appointment of a new ophthalmologist in 2006 were associated with an increased incidence of ROP. A large proportion of the increase was due to increased detection of milder grades (Stage 1 and 2) that do not have any short or long-term consequences. The rates of significant (Stage 3 or 4) ROP in below 1500g infants were 2% in 2011, 3% in 2010, 5.7% in 2009, 4.7% in 2008, 5% in 2007 and 6% in 2006 compared to 1% in both 2005 and 2004. In 2011, 3 inborn babies received laser therapy for advanced ROP compared with 11, 8, 6 and 4 for years 2006-9 respectively.

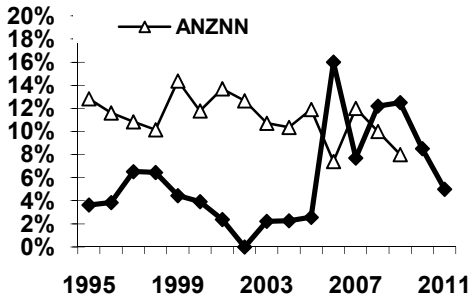

Figure 109: ROP at 24-27 weeks

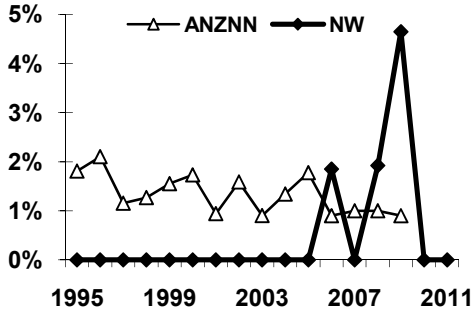

Figure 110: ROP at 28-31 weeks

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.

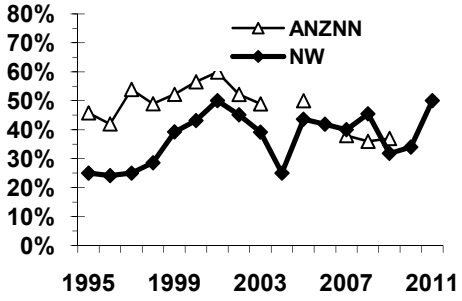

Figure 111: Chronic lung disease at 24-27weeks

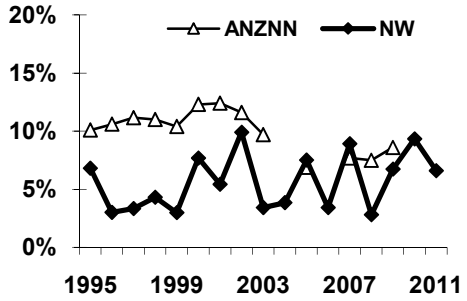

Figure 112: Chronic lung disease at 28-31weeks

The ANZNN data demonstrate that for infants 24-27 weeks gestation there was an increase in the rate of CLD in the late 1990s. NWH / ACH data seem to mirror this pattern and also with the subsequent relative decrease in CLD that occurred up to 2003. However, the definition of CLD was based on the requirement for support at a corrected age of 36 weeks. Hence BPD was defined by the treatment being given and so changes in the target oxygen saturation levels were associated with altered rates of CLD. In the late 1990s target levels were increased only then to fall in 2002 with the presentation of the BOOST trial of oxygen saturation in CLD.

Since 2005 there have been no discernable major trends in the incidence at NWH / ACH with only minor differences in year to year variability. These rates are broadly similar to those reported by ANZNN.

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

9.5.7 Necrotising enterocolitis benchmarked with ANZNN

In 2011, 10 inborn infants (8% <32 week gestation infants) developed proven or probable NEC. The benchmarking figure below compares rates for babies below 28 weeks gestation from ACH and the ANZNN. Moderate variability in rate is demonstrated at ACH, which can be accounted for by the smaller numbers with year to year differences attributed to random variation rather than any major change in practices.

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

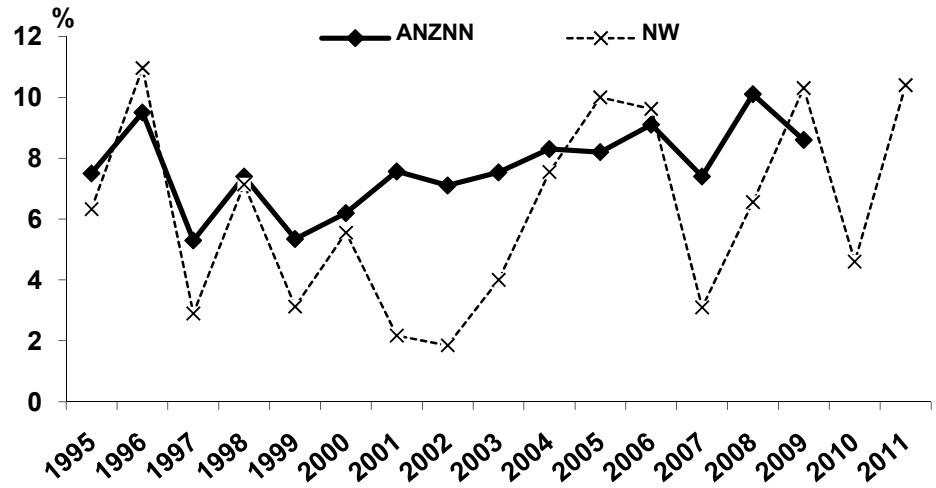

Figure 113: NEC in ANZNN assigned babies under 28 weeks gestation compared with the incidence in ANZNN 1995-2011

9.5.8 Patent Ductus Arteriosus (all babies)

In 2011, 24 infants were treated medically for a symptomatic PDA. As Indomethacin, which had been the longstanding first line treatment before becoming unavailable in 2010 was available, there were two medical treatment regimens used. Indomethacin was used for 15 courses and Ibuprofen for 12 courses, some babies received more than one treatment. In 2011, three inborn (ANZNN benchmarked) NICU infants had surgical ligation of their PDA. This number is similar to previous years. All infants who received treatment for a symptomatic PDA associated with prematurity (i.e. did not have a congenital cardiac anomaly) were less than 1500g and the majority below 1000g.

9.5.9 Pneumothorax needing drainage (all babies)

In total five babies developed a pneumothorax that needed drainage in 2011. An additional 20 babies were found to have a small pneumothorax that did not require a procedure and resolved spontaneously. Of the infants who required drainage of a pneumothorax, one was outborn. Of the total group of infants who developed a pneumothorax (i.e. drained or not), the majority were preterm with respiratory distress syndrome but there were also four with meconium aspiration and one 31 week gestation infant with pulmonary hypoplasia secondary to early rupture of membranes. In 2011, two inborn NICU infants <32 weeks had a pneumothorax of which one required drainage.

9.5.10 Postnatal corticosteroids (ANZNN babies)

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

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

In 2011, twenty inborn infants below 28 weeks gestation received postnatal steroids for chronic lung disease. The number treated varied with gestational age with 68% of infants at 24-25 weeks gestation receiving steroids but only 6% of those born at 30-31 weeks gestation.

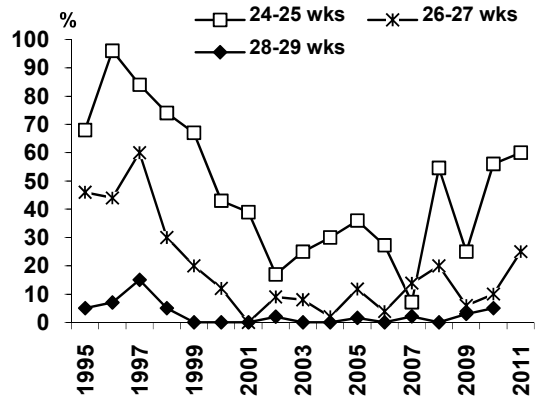

Figure 114: Percentage receiving postnatal dexamethasone by gestational age (ANZNN alive at one week <32wks)

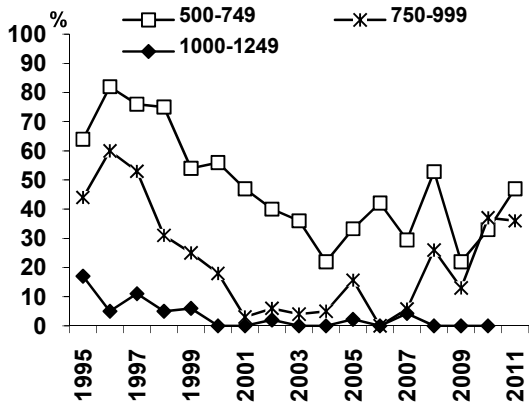

Figure 115: Percentage receiving postnatal dexamethasone by birth weight (ANZNN alive at one week <1500g)

9.6 Immunisation

9.6.1 Hepatitis B

In 2011, 15 infants admitted to NICU were identified as potentially exposed to hepatitis B in the perinatal period due to positive maternal serology. They all received immunisation and Hep B immunoglobulin in labour and birthing suite or the neonatal unit. One other baby received immunisation and Hep B immunoglobulin as the maternal serology was unknown at the time of NICU admission.

9.6.2 BCG

In 2011 there were 36 babies who were given BCG vaccination whilst in the neonatal unit. These numbers are reduced compared to previous years due to changes in criteria to be eligible to receive the BCG brought in by the Ministry of Health in the most recent immunisation schedule.

9.6.3 Infrarix Hexa and Prevanar at 6 weeks

There were 90 babies who were first admitted before 42 days and discharged at or after 42 days, and who did not die so were potentially eligible for their 6 week immunisation. Eighty four babies (93%) had their immunisation at the routine time. Of the six babies who did not have immunisation at the routine time, one infant was receiving palliative care, three infants were transferred to other centres for vaccination there, one family declined permission and in one complex infant vaccination was delayed until after cardiac surgery.

9.6.4 Infrarix Hexa and Prevanar at 3 months

There were 23 babies who were first admitted before 90 days and finally discharged at or after 90 days, and who did not die who were potentially eligible for immunisation. Of these 20 (87%) received these at the routine time. The 3 babies who did not have immunisation at the routine time were discharged back to other centres for vaccination there after recovery.

9.7 Infant Feeding (Inborn)

Data are presented on babies admitted to the NICU who were either discharged to the postnatal ward or to home. Note it is a standard of care for VLBW infants to receive human milk fortifier, which is classified as a breast milk substitute. For the purposes of this report VLBW infants who only receive breast milk and fortifier are classified as exclusive breast feeding.

The breast feeding rates by gestation for 2011 report show that nearly 80% of infants in the NICU receive breast milk to some degree. It is particularly pleasing to note that over 60% were fully or exclusively fed breast milk. Overall these data are consistent with the 1igh rates of breast milk feeding reported for 2009-10. However there are some differences in proportion of partial/full/exclusive in the 20-24 and 25-27 gestational age groups, which may reflect the relatively small numbers in these groups.

The newborn service strives to achieve a high rate of breast feeding across the range of gestational age groups. However, there are ongoing and different challenges for the different groups of babies. Preterm infants born below 28 weeks gestation may be in hospital for 3 or more months and neonatal growth is a major issue. In addition, the mothers may have to express milk for many weeks before the baby is ready to breast feed, often at times of considerable maternal stress. Some mothers are unable to maintain their supply up to the time of infant discharge despite input and support from the staff but nevertheless have provided valuable breast milk earlier in the neonatal course. Another situation where exclusive breast feeding may not be possible is when the mother is unwell and not able to express sufficient milk to maintain supply for a

relatively large well infant. Finally, for some term infants admitted to NICU for a short period the aim may be to get the baby back with mother and establish feeding on the ward.

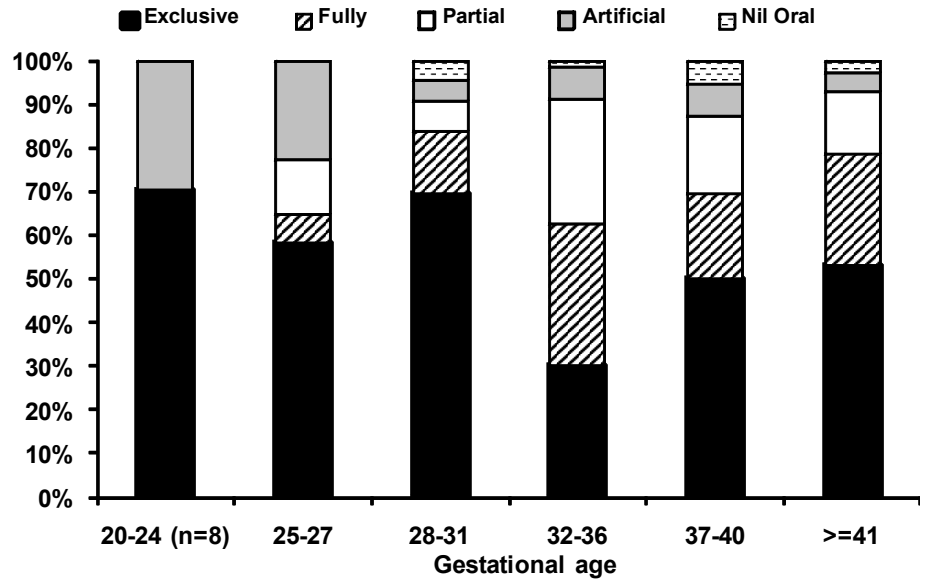

Figure 116: Method of feeding at discharge from NICU by gestational age

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

There were 15 neonatal and infant deaths occurring in inborn infants in the NICU plus another 7 deaths in outborn infants admitted to the NICU during 2011. These include deaths before 28 days or up to NICU discharge (whichever is the greater).

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

9.9 Child Development Unit

9.9.1 Follow up at 2 years (corrected) of Children under 1500 grams born in 2009

One hundred and forty infants who weighed <1500 grams, survived to discharge from the Newborn Service. Fifty (36%) weighed <1000 grams at birth.

Four infants had congenital abnormalities, two of whom died. These were excluded from the following tables. Two further babies died after discharge from National Women's. Seventeen children were lost to followup. Ten were from other centres in New Zealand, one lived overseas, and six did not attend appointments. Data were obtained for 117 (87%) children.

Ninety-eight 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), 19 reports were obtained from paediatricians and other professionals monitoring the children's progress.

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

Table 81: Outcome categories for infants under 30 months of age

Category I	**(Severe disability): one or more of the following**	
	(i)	Sensorineural deafness (requiring hearing aids)
	(ii)	Bilateral blindness
	(iii)	Severe cerebral palsy
	(iv)	Developmental delay (Bayley* Mental Score 2 or more standard deviations below mean)
Category II	**One or more of the following**	
	(i)	Bayley* Mental Score between 1 & 2 standard deviations below mean
	(ii)	Mild-moderate cerebral palsy without developmental (cognitive) delay
	(iii)	Impaired vision requiring spectacles
	(iv)	Conductive hearing loss requiring aids
Category III**	**Presence of tone disorder or motor delay**	
		Bayley* Motor Score more than 1 standard deviation below mean (but Mental score within average range)
Category IV	**Normal development**	
	(i)	No apparent tone disorder, and
	(ii)	No apparent developmental delay (Bayley* Mental and Motor Scores within average range or above)

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

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

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

Table 82: Outcome categories at 2 years for children under 1500g born in 2009 (n=117)

	Number	Description
Category I	4 (3.4%)	1 child with profound hearing loss, global developmental delay and quadriplegic cerebral palsy. 1 child with VP shunt, global developmental delay, increased tone and spectacles. 2 children with global developmental delay.
Category II	14 (12.0%)	1 child with spastic diplegia, low motor scores, shunt and spectacles. 2 children with cerebral palsy and low motor scores. 1 child with right diplegia. 1 child with auditory neuropathy. 3 children with low cognitive, motor and language scores. 1 child with developmental delay (mainly speech) and possible Autistic Spectrum Disorder. 3 children with cognitive and language delays. 1 child with low cognitive scores. 1 child with delayed development.
Category III	6 (5.1%)	1 child with increased tone (left leg). 5 children with low motor scores.
Category IV	93 (79.5%)	

Table 83: Outcome of children <1500g born in 2009 at 2 years by gestational age groups (n=117)

	Gestational age (weeks)					
Outcome	**24 - 28 weeks n=62**		**29 – 35 weeks n=55**		**Total n=117**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	4	6.4	0	0	4	3.4
II	6	9.7	8	14.6	14	12.0
III	5	8.1	1	1.8	6	5.1
IV	47	75.8	46	83.6	93	79.5

Table 84: Outcome of children <1500g born in 2009 at 2 years by birth weight groups (n=117)

	Birthweight (grams)					
Outcome	**<1000g n=44**		**1000 – 1499g n=73**		**Total n=117**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	4	9.1	0	0	4	3.4
II	5	11.4	9	12.3	14	12.0
III	4	9.1	2	2.7	6	5.1
IV	31	70.4	62	85.0	93	79.5

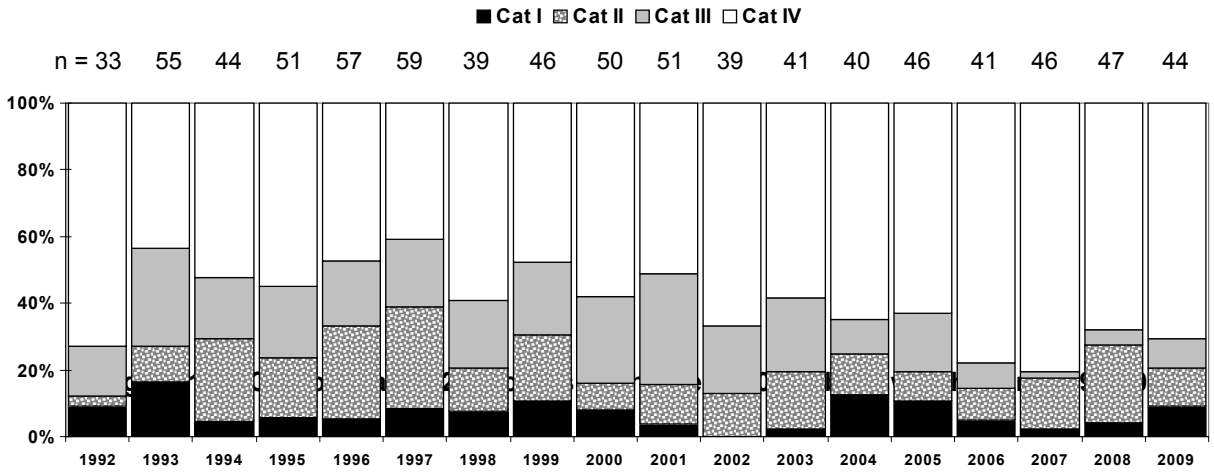

Figure 117: Outcomes at 18-24 months of children <1000g birth weight born 1992-2009

9.9.2 Development at 4 years of children under 1500g born in 2007

One hundred and sixty-one children born in 2007, who weighed less than 1500 grams, were cared for in the Newborn Service and survived to hospital discharge. There were 56 infants weighing less than 1000grams.

Eight children had congenital abnormalities and were not included in the analyses of data. Two further infants were known to have died after discharge from National Women's.

At 4 years chronological age, data were obtained for 104 children. Of the 47 not assessed 28 (60%) 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 85: Outcome categories at 4 years

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

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

Table 86: Outcome categories at 4 years for children under 1500g born 2007 (n =104)

	Number	Description
Category I	3 (3%)	1 child with sensorineural hearing loss with aids, left hemiplegia and language delay. 1 child with low cognitive scores and moderate-severe sensorineural hearing loss with aids. 1 child with low cognitive scores.
Category II	19 (18%)	1 child with low cognitive scores and mild right hemiplegia. 1 child with left hemiplegia. 3 children with low cognitive and motor scores. 1 child with mild-high frequency hearing loss and speech delay. 13 children with low cognitive scores.
Category III	2 (2.0%)	2 children with low motor scores.
Category IV	80 (77%)	

Chapter 10

PERINATAL RELATED MORTALITY

10 PERINATAL RELATED MORTALITY

This chapter provides information on perinatal related deaths. Further data tables can be found in Appendix 9.

NW has a Bereavement Team whose members care for women with pregnancy loss, including women with stillbirth and neonatal death and also those who undergo termination for fetal abnormality or other cause.

Methods

Perinatal related mortality data are obtained from the Healthware clinical database and also from a stand alone Access database. These data include classifications of cause of death assigned following multi-disciplinary discussion.

The classification of perinatal related death uses the Perinatal Society of Australia and New Zealand (PSANZ) system which was first released in May 2003, updated in November 2004 and most recently in March 2009. It includes a classification system by antecedent cause (PSANZ-PDC). In addition neonatal deaths are classified by relevant conditions preceding neonatal death using the PSANZ-NDC. PSANZ-PDC (PSANZ Perinatal Death Classification) is used to identify the single most important factor which led to the chain of events that resulted in the death. PSANZ-NDC (PSANZ Neonatal Death Classification) is applied, in addition to the PSANZ-PDC, to identify the single most important factor in the neonatal period which caused the neonatal death. Two associated factors can also be recorded in each of these systems, but associated factors are not included in the analysis in this report. The PSANZ system was developed because of shortcomings in ICD10 coding alone and in the Whitfield system which classified a higher proportion of deaths as unexplained.

Perinatal mortality rate is defined as fetal death (stillbirth of a baby of at least 20 weeks of gestation at issue or at least 400 grams birth weight if gestation is unknown) plus early neonatal death (death of a liveborn baby before completion of the first 7 days of life), and expressed as a rate per 1000 total babies born. Perinatal related mortality rate includes, in addition, late neonatal deaths (death of a liveborn baby of any gestation and weight following 7 days of life but before completion of 28 days of life). Perinatal related death risk is presented by gestation and in this case is the risk of fetal death or neonatal death per 1000 babies remaining in utero to represent the risk at a specific gestation in pregnancy. Fetal death rate is calculated per 1000 babies born, meaning babies remaining in utero if data are presented by gestation, or meaning total babies born if presented as an overall rate. Neonatal death rate is per 1000 live born babies, except in the perinatal mortality time trends figure where neonatal death rates are per 1000 total babies born. This variation is to demonstrate the contribution of fetal deaths and neonatal deaths to overall perinatal related mortality rates.

Perinatal related mortality rates are also presented excluding deaths of babies with lethal abnormalities and terminations for fetal abnormalities. This is calculated by excluding fetal deaths where the primary PDC classification was congenital abnormality and neonatal deaths where the primary NDC classification was congenital abnormality.

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

10.1 Perinatal and perinatal related mortality rates

Table 87: Inborn and BBA deaths

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

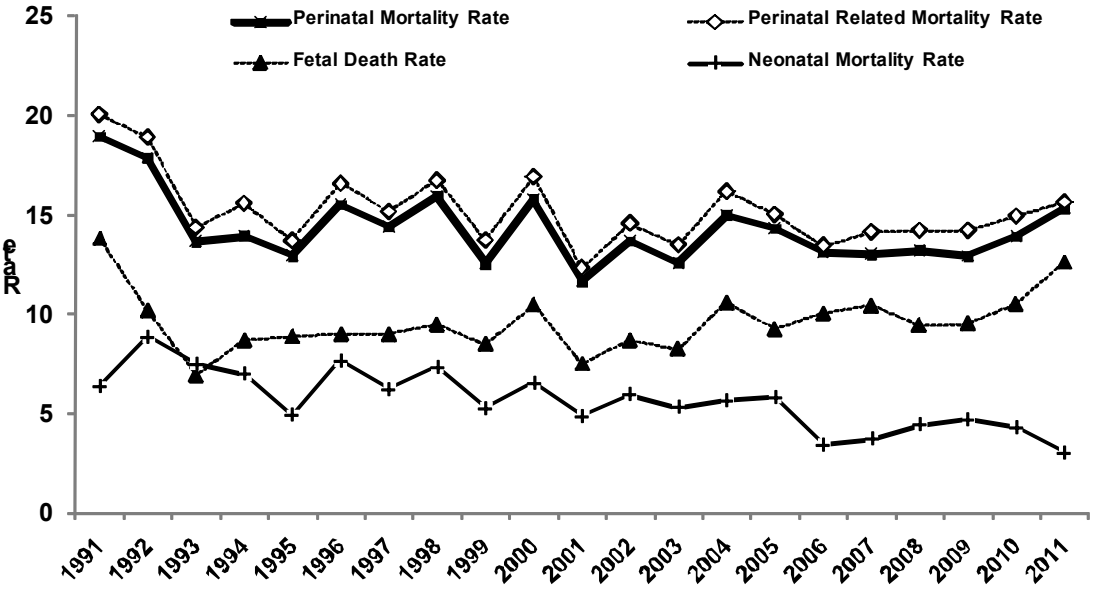

Figure 118: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate (1991-2011) (all rates expressed as deaths/1000 births).

Consistent with New Zealand and international data the perinatal mortality rate at NWH, has not shown any reduction over the last 3 years. Reassuringly the perinatal related mortality rate (excluding lethal and terminated fetal abnormalities) has been very stable over the last three years.

Table 88: Perinatal related loss and DHB of residence

DHB of residence	TOP n=48		Stillbirth n=56		Neonatal death n=16		Perinatal related death n=120	
	n	%	n	%	n	%	n	%
Auckland	30	62	34	61	6	38	70	58
Counties Manukau	8	2	6	11	2	12	16	13
Waitemata	6	1	13	23	7	43	26	22
Other	4	1	3	1	1	1	8	

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

Thirty five percent of all perinatal deaths occurred in women who did not reside in Auckland DHB area. The majority of these deaths were from pregnancies/ babies who required transfer to our tertiary centre for their care. The perinatal related mortality rate for women resident in ADHB area and giving birth at National Women's in 2011 was 13.3/1000 total births which is virtually identical to the rate last year of 13.1/1000 total births.

10.2 Gestational age and perinatal related mortality

Table 89: Gestational age and perinatal related mortality

	Births		Fetal deaths		Neonatal deaths		Total perinatal related deaths	
	n	%	n	% FD risk*	n	% NND risk **	n	% Perinatal related mortality risk***
<24 weeks	76	1.0	57	59 7.4	11	48 579	68	57 8.8
24-27 weeks	44	0.6	7	7 0.9	2	9 54.1	9	8 1.2
28-31 weeks	94	2.8	5	5 0.7	4	17 44.9	9	8 1.2
32-36 weeks	573	10.2	14	14 1.9	2	9 3.6	16	13 2.1
37-40 weeks	5907	87.1	14	14 2.0	3	13 0.5	17	14 2.5
≥41 weeks	996	13.0	0		1	4 1.0	1	1 1.0
Total	7690		97		23		120	

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

10.3 Multiple births and perinatal related mortality

Table 90: 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	7360	95.7	74	76 10.1	20	87 2.7	94	78 12.8
Multiple	330	42.9	23	24 69.7	3	13 9.8	26	22 78.8
Total	7690		97	12.6	23	3.0	120	15.6

* Fetal death rate = number of fetal deaths per 1000 births
‡ Neonatal Death rate = number of deaths per 1000 live births
† Perinatal-related mortality rate = number of perinatal related deaths per 1000 births

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

10.4 Lead maternity carer (LMC) and perinatal related mortality

Table 91: LMC at birth and perinatal related mortality

	Births		Fetal deaths			Neonatal deaths			Total perinatal related deaths		
	N	%	n	%	FD rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Independent Midwife	3542	46.1	25	25.8	7.1	2	8.7	0.6	27	22.5	7.6
Private Obstetrician	1734	22.5	19	19.6	11.0	4	17.4	2.3	23	19.2	13.3
G.P.	56	0.7	0	0		0	0		0	0	
NW Community	1428	18.6	14	14.4	9.8	4	17.4	2.8	18	15.0	12.6
NW Diabetes	431	5.6	1	1.0	2.3	1	4.3	2.3	2	1.7	4.6
NW Medical	407	5.3	31	32.0	76.2	9	39.1	23.9	40	33.3	98.3
Other DHB	54	0.7	2	2.1	37.0	1	4.3	19.2	3	2.5	55.6
Unbooked	38	0.5	5	5.2	131.6	2	8.7	60.6	7	5.8	184.2
Total	7690		97		12.6	23		3.0	120		15.6

* Fetal death rate = number of fetal deaths per 1000 births
‡ Neonatal Death rate = number of deaths per 1000 live births
† Perinatal related mortality rate = number of perinatal related deaths per 1000 births

There are 2 outlying groups in the above table, namely unbooked women and those attending the medical clinic. As has been found in other reports, unbooked women have high perinatal related mortality (87.7/1000).

Perinatal deaths among mothers attending the medical clinic also includes deaths in the fetal medicine service. Fourteen of the 40 deaths (35%) were terminations of pregnancy. The commonest causes of death in this group were: congenital abnormality 22 (55%), specific perinatal condition 6 (15%, 4 of whom were deaths due to twin to twin transfusion syndrome), spontaneous preterm 4 (10%) and maternal conditions 4 (10%).

It is pleasing to see that there were only 2 perinatal related deaths in patients attending the diabetes clinic in 2011.

10.5 Causes of perinatal related deaths

Table 92: Fetal and neonatal death by Perinatal Death Classification (PSANZ-PDC) 2011

	Fetal deaths n=97			Neonatal deaths n=23			Total n=120		
	n	%	Rate*	n	%	Rate**	n	%	Rate*
Congenital abnormality	32	33	4.2	11	48	1.4	43	36	5.6
Perinatal infection	4	4	0.5	0			4	3	0.5
Antepartum haemorrhage	6	6	0.8	3	13	0.4	9	8	1.2
Maternal conditions	8	8	1.0	0			8	7	1.0
Hypertension	4	4	0.5	0			4	3	0.5
Specific perinatal conditions	21	22	2.7	2	9	0.3	23	19	3.0
Hypoxic peripartum death	0		0	1	4	0.1	1	1	0.1
Fetal growth restriction	7	7	0.9	1	4	0.1	8	7	1.0
Spontaneous preterm	6	6	0.8	4	17	0.5	10	8	1.3
Unexplained antepartum death	9	9	1.2	0			9	8	1.2

* Rate: per 1000 births (n=7690 in 2011) ** Rate: per 1000 live births (n=7593 in 2011)

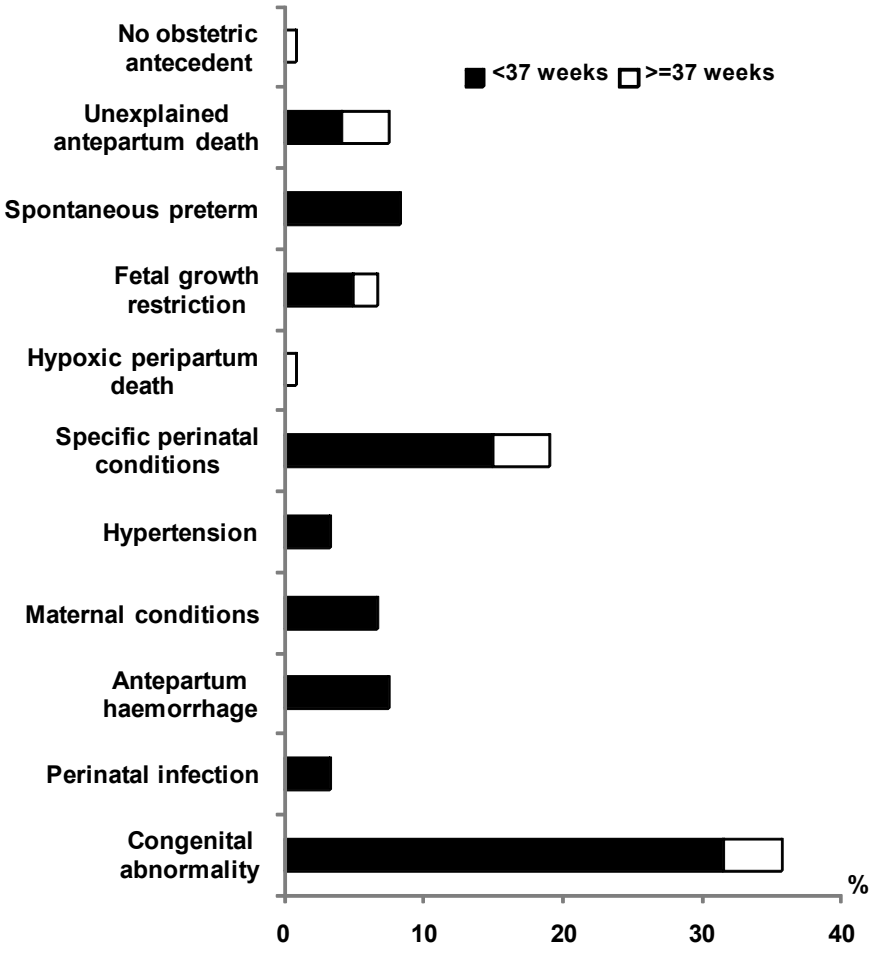

Figure 119: Contribution to perinatal related death by obstetric antecedent cause (PSANZ-PDC) and gestation at birth

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

10.6 Neonatal deaths

Table 93: Neonatal deaths by neonatal classification (PSANZ-NDC) and gestational age

	Total neonatal deaths		< 37 weeks		≥ 37 weeks	
	N	%	n	%	n	%
Total	23		19		4	
Extreme prematurity	6	26	6	32		
Congenital abnormality	11	48	9	47	2	50
Infection	1	4	1	5		
Gastrointestinal	1	4	1	5		
Neurological						
Cardio-respiratory disorders	3	13	2	11	1	25
Other	1	4			1	25

The large majority of neonatal deaths (48%) are due to congenital abnormality with the second commonest classification being extreme prematurity.

10.7 Necropsy

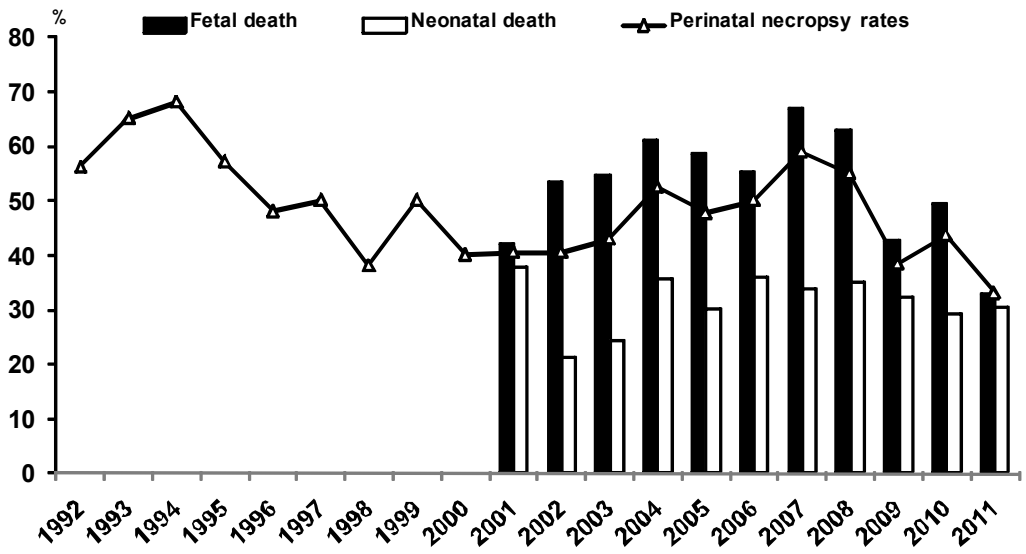

Figure 120: Necropsy rates (1991-2011)

Post-mortem is the gold standard investigation for perinatal related death. NW is fortunate to have access to a world-class perinatal pathology service provided by Dr Jane Zuccollo. The post-mortem rate fell to 33% in 2011 much lower than ideal for a tertiary referral centre.

Small for Gestational Age and Perinatal Related Death

Fetal growth restriction (FGR) was the primary perinatal death classification assigned for eight of the 120 deaths in 2011. This classification is used when there is antenatal diagnosis of FGR or where pre-specified pathological criteria for FGR are identified.

However, 68 percent of all perinatal deaths in 2011 were found to be SGA at birth defined as birthweight <10th customised centile; comprising 65 percent of fetal deaths and 65 percent of neonatal deaths.

National data from the PMMRC shows that fewer than a quarter of non-anomalous SGA infants who are stillborn after 24 weeks of gestation were recognised to be SGA before birth. These data are not available for National Women's. Customised antenatal growth charts (GROW a free down load from www.gestation.net) were developed as a tool to increase detection of SGA infants before birth. Recent audit data from National Women's Community Clinic has shown increased antenatal detection of SGA infants in those women who had GROW charts in their notes. A recent publication from Adelaide also confirms this. (Roex A et al; Aust NZ J Obstet Gynaecol 2012) Generating a GROW chart at the booking visit is recommended at NW and has also been recommended for several years in the PMMRC annual reports.

Chapter 11

SEVERE MATERNAL MORBIDITY

11 SEVERE MATERNAL MORBIDITY

This chapter provides data on maternal deaths and severe maternal morbidities among women giving birth at NW during 2011.

11.1 Maternal Mortality

In 2011 there were two maternal deaths among women who birthed at National Women's. Details of these deaths have been sent to the National Perinatal and Maternal Mortality Review Committee (PMMRC)

11.2 Emergency peripartum hysterectomy

WHA Maternity Indicator for Peripartum Hysterectomy		WHA mean 07-08	WHA mean 09-10	NW 2007	NW 2008	NW 2009	NW 2010	NW 2011
Maternal indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Peripartum hysterectomy	Hysterectomy at birth admission/Mothers giving birth	0.102		0.117	0.184	0.155*	0.091	0.16

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

Methods

Emergency peripartum hysterectomy is defined as hysterectomy performed for complications related to pregnancy within 6 weeks of birth, when that pregnancy resulted in birth at NW at or beyond 20 weeks gestation. Semi-elective cases are excluded.

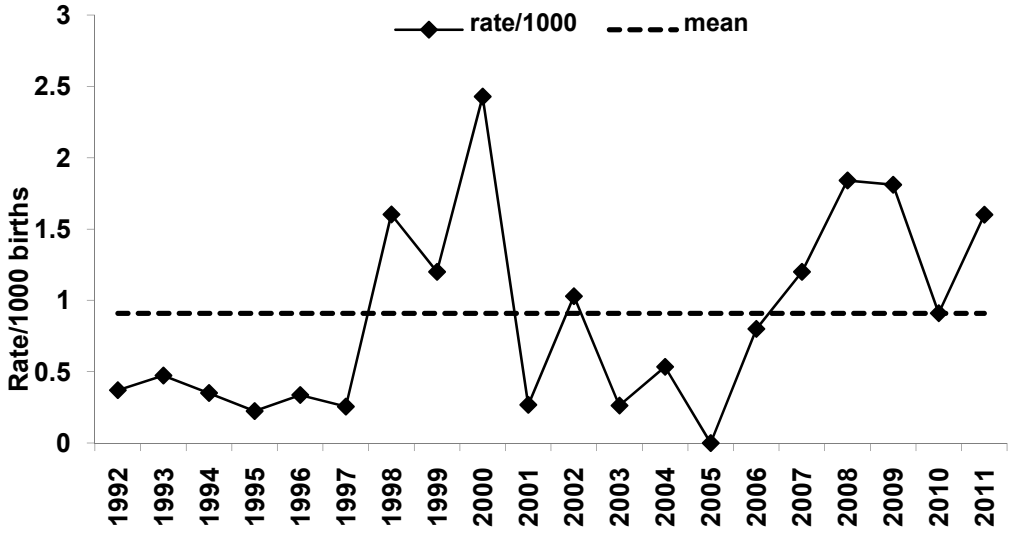

Figure 121: Emergency peripartum hysterectomy rates/1000 births (1992-2011) (horizontal dotted line represents median rate for 1992-2010)

Findings

There were 12 emergency peripartum hysterectomies in 2011. This is a rate of 1.6/1000 births, which is consistent with rates over the past 20 years, and is consistent with international rates. In the year 2000, there was a significantly higher rate than in the surrounding years. This is no definitive evidence of an increase in rate over the time period.

11.3 Other Severe Maternal Morbidity

11.3.1 AMOSS reportable severe maternal morbidities

Specific and complete ascertainment of women diagnosed with one of a set of predefined rare conditions associated with severe maternal morbidity has been set up in New Zealand by AMOSS (the Australasian maternity outcomes surveillance system) under the auspices of the PMMRC (Perinatal and Maternal mortality review committee). Data collection is undertaken by monthly queries to individual clinicians to identify cases, supported by hospital discharge coding data.

The current set of reportable conditions includes antenatal pulmonary embolism, amniotic fluid embolism, eclampsia, peripartum hysterectomy, placenta accreta/percreta/increta, influenza requiring admission to ICU, and BMI>50. The conditions collected may vary from year to year. Data collection started in NZ in January 2010.

Table 94: Incidence of AMOSS reportable severe maternal morbidities at NW 2011

	Women giving birth at NW 2011 n=7523	
Diagnosis	**n**	**per 1000**
Antenatal pulmonary embolism	2	0.27
Amniotic fluid embolism	3	0.40
Eclampsia	2	0.27
Placenta accreta/percreta/increta	10	1.33

There were no maternal deaths among the severe morbidities reported in 2011, specifically there were no deaths secondary to haemorrhage or amniotic fluid embolism.

11.3.2 Admission to Intensive Care

There were 19 admissions of pregnant or postpartum (within 6 weeks) mothers, who had given birth at ACH, to intensive care or cardiac critical care unit in 2011 (2.5/1000 mothers giving birth). Reasons for admission were pre-existing medical condition (7), postpartum haemorrhage (6), sepsis (4), and other (2).

Chapter 12

GYNAECOLOGY

12 GYNAECOLOGY

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

12.1 Fertility PLUS

This section documents the IVF and ICSI clinical outcomes from Fertility PLUS in 2011 and a discussion on recent advances in the service.

Table 95: Fertility PLUS IVF/ICSI clinical outcomes

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of cycles started	289	309	306	316	398	440	458	470	496	468	516
Number of cycles stopped				41	41	67	63	49	36	30	41
Percent cycles stopped				13%	10%	15%	12%	10%	7.3%	6.4%	7.9%
NPSU 2000 benchmark for cycles stopped	10%	10%	10%	10%	10%	10%	10%*	10%*	10%	10%	**9%***
Number of Cycles reaching Oocyte pick up (OPU)	230	247	246	275	357	373	405	421	460	438	**475**
Number of cycles reaching embryo replacement	189	201	206	237	304	313	364	369	407	397	**433**
Percent cycles reaching embryo replacement				86%	85%	84%	90%	88%	88%	91%	**91%**
NPSU 2002 benchmark for replacement		87%	87%	87%	87%	87%	83%*	83%*	83%	83%	**83%***
Number of clinical pregnancies	57	65	67	83	96	124	130	129	138	141	**141**
Clinical pregnancy rate/cycle started				26%	24%	28%	28%	27%	28%	30%	**27%**
NPSU 2000 benchmark for clinical pregnancy rate/cycle started	24%	24%	24%	24%	24%	24%	24%*	24%	24%	24%	**23%***
Clinical pregnancy rate/OPU	25%	26%	27%	30%	27%	33%	32%	31%	30%	32%	**30%**
NPSU 2002 benchmark clinical pregnancy rate /OPU		26%	26%	26%	26%	26%	27%*	26%*	28%	28%	**26%***
Clinical pregnancy rate/embryo replacement	30%	32%	33%	35%	32%	40%	36%	35%	34%	36%	**32%**
Clinical pregnancy rate/embryo replacement (women ≤35yrs with FSH<9)				45%	36%	42%	41%	39%	41%	39%	**40%**
Clinical pregnancy rate/ER in women having single blastocyst transfer.						56%	52%	41%	47%	44%	**44%**
NPSU 2002 benchmark clinical pregnancy rate/embryo replacement		31%	31%	31%	31%	31%	32%*	31%*	31%	31%	**31%***
Twin pregnancy rate				20%	12.5%	9.6%	10%	5%	9.5%	11%	**7.1%**
NPSU 2002 benchmark twin pregnancy rate		<20%	<20%	<20%	<20%	<20%	<12%*	<10%	<10%	10%	**<10%**
Clinical pregnancy rate per thawed embryo replacement								32%	23%	33%	**27%**
NPSU benchmark for thawed embryo replacements 2007								23%	23%	23%	**24%**
Twin pregnancy rate after thawed embryo transfer										1%	**11%**
NPSU benchmark for Twin pregnancy rate after thawed embryo transfer										10%	**10%**

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

Fertility Plus had its most busy year ever for 2011 with the highest recorded number of IVF cycles started, cycles reaching oocyte pick up and embryo replacement.

Very good results were maintained and poor outcomes were minimised.

The percentage of IVF/ICSI cycles that were stopped remains low at 7.9%.

The pregnancy rate per cycle for all those who started was good at 27%, irrespective of the woman's age.

We adhere to minimising the twin pregnancy rate by encouraging all women to replace only one embryo, but women 36 years or over are given the option of up to 2 embryos after informed consent.

The twin pregnancy rate for fresh embryo transfers was 7.1% and the majority occurred in older aged women.

The twin pregnancy rate from thawed embryo transfers was 11% which is just above the benchmark goal. We will address this by re-focusing on the benefits of single embryo transfer to patients returning for thawed cycles.

12.2 Termination of pregnancy

Epsom Day Unit is the Auckland regional service for first trimester terminations of pregnancy. It is a multi-disciplinary service incorporating staff nurses, health care assistants, social workers, surgeons from NW, community doctors with a particular interest in family planning, and a small administrative support team.

Epsom Day Unit provides a two-day service. On day one, assessment is undertaken, including psychosocial, medical, legal certification, contraceptive prescription and education. The women will meet with a social worker, community doctor and staff nurse. On day two a second certifying assessment is undertaken and, if certified, the surgical termination of pregnancy occurs.

Approximately 40% of women accessing the service in 2011 were resident in Counties Manukau DHB area, 30% from within ADHB and 30% from Waitemata DHB area. Interpreters were required by 5% of women accessing the service.

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

Table 96: Number of terminations

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

Table 97: Number of counselling sessions

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

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.

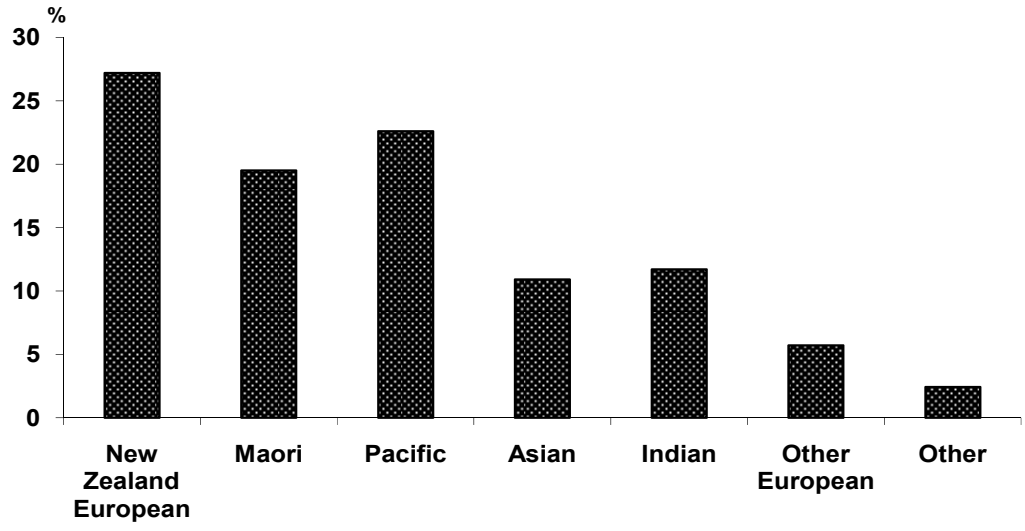

Figure 122: Ethnicity of women having a first trimester termination of pregnancy in 2011

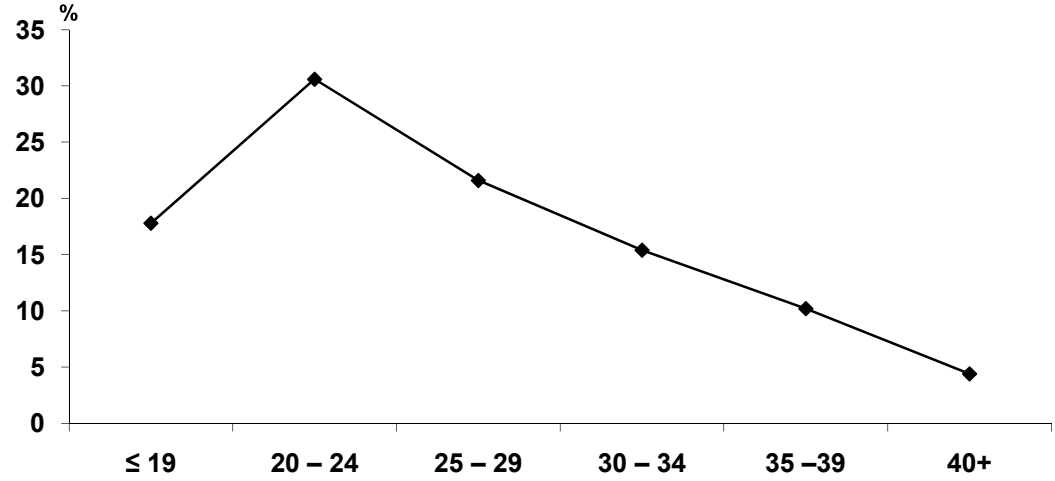

Figure 123: Age of women having a first trimester termination of pregnancy in 2011

12.3 Second trimester Termination of pregnancy

Methods:

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

Findings:

Table 98: Characteristics of women undergoing second trimester medical termination of pregnancy in 2009-2011

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

Sixty nine women in 2011 had a medical termination of pregnancy between 12 and 21 weeks (considerably more than the 46 in 2010). Counties Manukau DHB is in the process of setting up their own unit for 2nd trimester termination and so we can expect to have fewer cases in the future.

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

Table 99: Clinical details and outcomes of second trimester medical termination 2009-2011

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

The number of women requiring manual removal of the placenta following birth was 4% in 2011 (16% in 2008, 10% in 2009, 15% in 2010). In mid 2011 we introduced the administration of intravenous Oxytocin 10IU post delivery of the fetus to advance delivery of placenta. The drop in the proportion of women who needed to go to theatre for manual removal of the placenta this year may be a consequence of this change in postpartum management.

In 2011, 57% of women were managed as day stay cases, compared to 32% in 2009 and 28% in 2010. The aim is to achieve day stay management for 80% of women.

12.4 Gynaecology inpatient surgery

Methods:

The data presented in this section are collected in a surgical audit database. Data are entered on all inpatient gynaecologic surgeries from Ward 97, *excluding those performed by the Gynaecologic Oncology team* (whose data are collected in a separate database and presented in Section 12.9.) The data were compared to data from the PIMS Theatre database and from clinical coding in an attempt to improve accuracy. The numbers relate to episodes of surgery rather than individuals. Some individuals had more than one surgical episode in the year.

As more than one procedure may occur at an operation, it may appear that numbers are not consistent within this section. If a specific procedure is discussed, then all accounts of this procedure are included, however for summary tables, the first procedure entered into the database has been used to represent the primary surgical episode.

Findings:

In 2011, there were 1692 admissions to Ward 97 for general gynaecologic surgery. 1628 (96.2%) of these were for primary procedures (an increase of 7% from 2010), 36 (2.1%) were admissions for repeat surgery as a result of complications of surgery at ACH and 28 (1.7%) were admissions for repeat surgery as a result of complications of surgery at a private hospital. Only primary procedures are included in the data presented.

Table 100: Primary indication for inpatient gynaecologic surgery

	2008 N=1256*		2009 N=1224		2010 N=1569		2011 N= 1628	
	n	%	n	%	n	%	n	%
Primary indication for surgery								
Abnormal bleeding, non pregnant	272	21.7	241	19.7	280	17.9	379	23.3
Miscarriage / Termination	269	21.4	246	20.1	419	26.7	343	21.1
Urogynaecology / prolapse	163	13.0	170	13.9	205	13.1	203	12.5
Ovarian cyst	118	9.4	114	9.3	139	8.9	165	10.1
Abscess	69	5.5	56	4.6	73	4.7	72	4.4
Pain, cause unknown	67	5.3	61	5.0	70	4.5	95	5.8
Cancer / Pelvic mass	65	5.2	59	4.8	68	4.3	72	4.4
Endometriosis	61	4.9	100	8.2	116	7.4	98	6.0
Ectopic pregnancy	56	4.5	74	6.1	68	4.3	101	6.2
Infertility	26	2.1	21	1.7	33	2.1	21	1.3
Post operative complication	13	1.0			2	0.1	0	
Sterilisation	13	1.0	8	0.7	20	1.3	6	0.4
Other, please specify	64	5.1	74	6.1	76	4.8	73	4.5

* includes admissions for repeat surgery for complications

Abnormal bleeding in the non pregnant patient was the most common cause for gynaecologic surgery in 2011. There was a 5% reduction in procedures for miscarriage or termination.

Table 101: Primary surgical procedure and timing of surgery among inpatient surgeries 2011

		Timing of surgery			
	Total	Acute		Elective	
	N	n	%	n	%
Total	**1628**	**422**	**25.9**	**1207**	**74.1**
Ovarian and /or tubal surgery	268	130	48.5	138	51.5
Hysteroscopy	294	26	8.8	271	91.3
Evacuation retained products conception	188	144	76.6	44	23.4
Surgical termination of pregnancy	157	3	1.9	154	98.1
Urogynaecology procedure	181	1	0.6	180	99.5
Hysterectomy	164	2	1.2	162	98.8
Diagnostic laparoscopy	127	33	26.0	94	74.0
Endometriosis surgery	77	1	1.3	77	98.7
Other vulval procedure	75	62	82.7	13	17.3
Other uterine/cervical	52	7	13.5	45	86.5
Vaginal procedure	19	4	21.1	15	79.0
Fibroid embolisation	8	0		8	100
Other	18	8	44.4	10	55.6

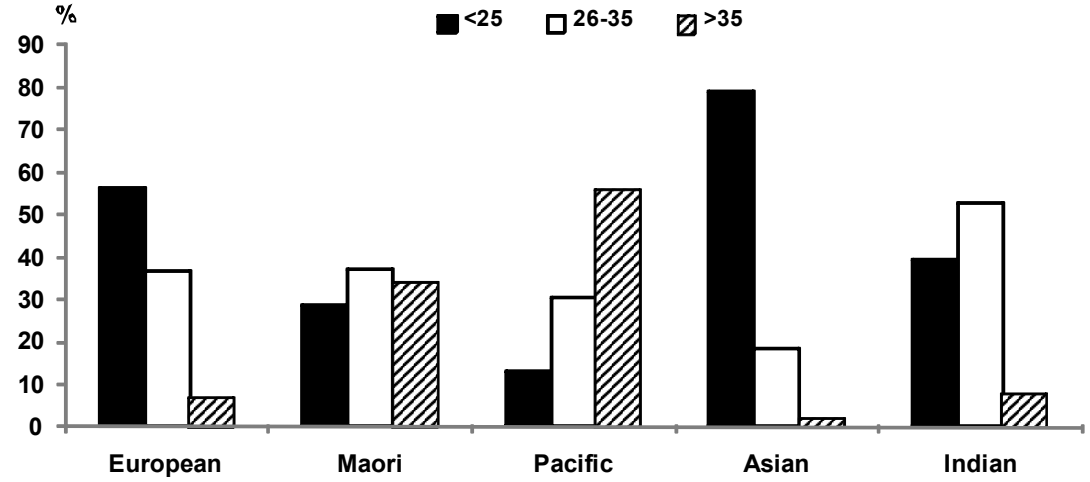

Figure 124: BMI by ethnicity among women having inpatient gynaecology surgery (2011) (missing data removed)

Over 50% of our surgical population in 2011 were overweight and > 17% morbidly obese. Missing data for height and or weight has reduced by half and is now unavailable for only 6.3% of patients.

Table 102: Demographic details of women having inpatient gynaecology surgery (2008-2011)

	2008 N=1256		2009 N=1224		2010 N=1569		2011 N=1628	
	n	%	n	%	n	%	N	%
Ethnicity								
NZ European	456	36.3	478	39.1	590	37.6	615	37.8
Maori	136	10.8	133	10.9	174	11.1	167	10.3
Pacific	232	18.5	221	18.1	263	16.8	286	17.6
Other Asian	146	11.6	122	10.0	174	11.1	220	13.5
Indian	101	8.0	95	7.8	125	8.0	124	7.6
Other European	112	8.9	129	10.5	187	11.9	164	10.1
Other	54	4.3	36	2.9	47	3.0	44	2.7
Not stated	19	1.5	10	0.8	9	0.6	8	0.5
Age								
≤20	79	6.3	76	6.2	114	7.3	94	5.7
21-30	256	20.4	235	19.2	356	22.7	361	22.2
31-40	372	29.6	400	32.7	473	30.1	478	29.4
41-50	266	21.2	259	21.2	305	19.4	342	21.0
51-60	136	10.8	127	10.4	146	9.3	191	11.9
>60	147	11.7	127	10.4	175	11.2	161	9.9
BMI								
<19	24	1.9	27	2.2	47	3.0	59	3.6
19-25	325	25.9	356	29.1	589	37.5	648	39.8
26-30	228	18.2	221	18.1	311	19.8	335	20.6
31-35	143	11.4	114	9.3	178	11.3	196	12.0
>35	169	13.5	204	16.7	239	15.2	287	17.6
Missing	367	29.2	302	24.7	205	13.1	103	6.3
Smoking status								
Currently smoking	208	16.6	179	14.6	260	16.6	288	17.7
Past smoker	110	8.8	118	9.6	177	11.3	215	13.2
Never	689	54.9	675	55.2	988	63.0	1121	68.9
Unknown	249	19.8	252	20.6	144	9.2	4	0.3
DHB of residence								
Auckland	1005	80.0	961	78.5	1231	78.5	1346	82.7
Counties Manukau	88	7.0	89	7.3	117	7.5	114	7.0
Waitemata	131	10.4	143	11.7	163	10.4	135	8.3
Other	32	2.5	31	2.5	58	3.7	33	2.0

In 2011 18% of patients admitted to being current smokers. Less than 1% of smoking status data were missing from the database.

Seventeen percent of patients having gynaecologic surgery are domiciled outside ADHB catchment area, a reduction of 3% from 2010.

Table 103: Intra operative injury (2011)

	N=1628	
	n	%
Bladder	4	0.2
Bowel	7	0.4
Ureter	2	0.1
Other	1	0.06

ACHS Gynaecology Indicators: Injury to major viscous		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**% (95% CI)**	**% (95% CI)**
Numerator	Injury to major viscous, with repair, during or up to 2 weeks post operation	0.42	0.38	0.32	0.32	0.98	4/1569=0.25	11/1643=0.67
Denominator	Gynaecological surgeries							

Table 104: Postoperative complications among primary inpatient surgeries in 2011 by PRIMARY surgical procedure (note individual complications are not mutually exclusive so do not add to the total in the left-most column)

	Total	Any complication		Failure to complete planned procedure		Intra operative injury to internal organs		Blood Transfusion		Significant post-op Infection		Unplanned return to theatre in 6 weeks		Readmission in 6 weeks		Anaesthetic complication		Other significant complication		Admission to DCCM	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1628**	**239**	**14.7**	**24**	**1.5**	**14**	**0.9**	**67**	**4.1**	**8**	**0.5**	**19**	**1.2**	**133**	**8.2**	**5**	**0.3**	**22**	**1.4**	**8**	**0.5**
Ovarian and /or tubal surgery	268	53	19.8	2	0.8	3	1.1	20	7.5	1	0.4	2	0.8	25	9.3	0		6	2.2	4	1.5
Hysteroscopy	294	35	11.9	10	3.4	0		8	2.7	1	0.3	0		17	5.8	2	0.7	0		0	
Urogynaecology procedure	181	26	14.4	1	0.6	2	1.1	3	1.7	0		6	3.3	22	12.2	1	0.6	3	1.7	1	0.6
Hysterectomy	164	48	29.3	2	1.2	7	4.3	14	8.5	5	3.1	8	4.9	29	17.7	1	0.6	8	4.9	2	1.2
Surgical termination of pregnancy	157	4	2.6	1	0.6	0		0		0		1	0.6	2	1.3	0		0		0	
Evacuation retained products conception	188	25	13.2	0		0		17	9.0	0		1	0.5	7	3.7	0		1	0.5	0	
Diagnostic laparoscopy†	127	23	18.1	5	3.9	1	0.8	1	0.8	1	0.8	1	0.8	14	11.0	0		2	1.6	1	0.8
Endometriosis surgery	77	7	9.1	1	1.3	0		0		0		0		5	6.5	1	1.3	0		0	
Other Vulval procedure	75	4	5.3	0		0		0		0		0		3	4.0	0		1	1.3	0	
Vaginal procedure	19	4	21.1	1	5.3	0		2	10.5	0		0		2	10.5	0		0		0	
Fibroid embolism	8	1	12.5	0		0		0		0		0		1	12.5	0		0		0	
Other	18	3	16.7	1	5.6	0		1	5.6	0		0		1	5.6	0		1	5.6	0	
Other Uterine/cervical	52	6	11.5	0		1	1.9	1	1.9	0		0		5	9.6	0		0		0	

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

Definitions of complications:

Intra operative injury to internal organs: Injury to bladder, bowel, ureter, major blood vessel. Also includes uterine perforation.

Significant postop infection: Any infection (defined by evidence of wound dehiscence or wound collection, pelvic abscess, or fever>39^{o}C) occurring as a result of surgery.

Readmission: Re-admission to hospital (hospital stay of 3 hours or more) for a reason related to the surgical procedure occurs within 6 weeks of surgery. Includes planned readmission.

Other significant complications: Includes thrombo-embolic complications (DVT, PE), gastrointestinal complications (ileus, bowel obstruction), fistulae.

Table 105: Complications of surgery by timing of surgery

	Acute admission N=421		Elective admission N=1207	
	n	%	n	%
Any complication	83	19.7	156	12.9
Failure to complete planned procedure	4	1.0	20	1.7
Intra operative injury to internal organs	1	0.2	13	1.1
Significant post op infection	2	0.5	6	0.5
Anaesthetic complication	1	0.2	4	0.3
Other significant complication	6	1.4	16	1.3
Unplanned return to theatre in 6 weeks	1	0.2	18	1.5
Admission to DCCM	4	1.0	4	0.3
Readmission in 6 weeks	31	7.4	102	8.5
Transfusion	44	10.5	23	1.9

Nine percent of patients attending for evacuation of retained products of conception (ERPOC) and 7.5% of patients having ovarian or tubal surgery required transfusion. More than 10% of patients having a vaginal procedure required transfusion.

Almost 30% of patients having a hysterectomy are coded as having a complication; 17.7% were readmissions up to 6 weeks and 8.5% required transfusion. There has been an increase this year in the number of intraoperative injuries to other internal organs.

Elective procedures consistently have fewer complications than acute cases.

12.5 Gynaecologic laparoscopic procedures

Methods

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

Table 106: Primary surgery performed, and timing of surgery among women having inpatient laparoscopic procedures in 2011

	Surgery in 2011 N=420		Acute admission		Elective admission	
	n	%	n	%	n	%
Total	**420**		**124**	**29.5**	**296**	**70.5**
Ovarian/tubal	192	45.6	92	74.2	100	33.7
Diagnostic laparoscopy	118	28.0	28	23.7	90	76.3
Endometriosis surgery	74	17.6	1	1.4	73	98.6
Hysterectomy	26	6.2	0		26	100
Other uterine/cervical procedure	4		1		3	
Hysteroscopy	2		1		1	
Other	4		1		3	

Table 107: Primary indication for surgery by timing of surgery among women having inpatient laparoscopic procedures in 2011

	Surgery in 2011 N=420		Acute admission		Elective admission	
	n	%	n	%	n	%
Total	**420**		**124**	**29.5**	**296**	**70.5**
Endometriosis	89	21.2	1	1.1	88	98.9
Ovarian cyst	102	24.2	19	18.6	83	81.3
Ectopic pregnancy	82	19.5	79	96.3	3	3.6
Pain, cause unknown	66	15.7	20	30.3	46	69.7
Abnormal bleeding	29	6.9	0		29	100
Infertility	18	4.3	0		18	100
Cancer/pelvic mass	12	2.9	0		12	100
Sterilisation	4	1.0	0		4	100
Abscess	2	0.5	1		1	
Urogynaecology / prolapse	4	1.0	0		4	
Other	12	2.9	4		8	

In 2011, there were 420 Laparoscopic procedures, 296 elective and 124 acute procedures. Sixty-five percent of gynaecologic laparoscopic surgeries in 2011 were for endometriosis, ovarian cysts or ectopic pregnancy.

ACHS Gynaecology Indicators: Injury to MAJOR VISCOUS during a laparoscopic procedure		**ACHS 2007**	**ACHS 2008**	**ACHS 2009**	**NW 2008**	**NW 2009**	**NW 2010**	**NW 2011**
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to major viscous during laparoscopic procedure, with repair, during or up to 2 weeks post operation	1.08	0.67	0.56	5/315=1.6	5/315=1.6	0	4/420=0.95
Denominator	Laparoscopic procedures							

Table 108: Complications of inpatient gynaecologic laparoscopic surgery

	Total N=420	
	n	%
ANY COMPLICATION	72	17.1
Blood transfusion	14	3.3
Intra operative injury	2	0.4
Failure to complete procedure	6	1.4
Anaesthetic complications	2	0.5
Significant post-operative infection	1	0.2
Unplanned return to theatre	4	1.0
Admission to DCCM	3	0.7
Readmission to hospital	46	11.0
Post op complications	38	9.1
Planned re admission	4	1.0
Other	6	1.4
Other significant complications	6	1.4

Major intraoperative injuries were reported in two cases. One patient required a laparotomy and Hartmann's procedure 3 days after the primary procedure for bowel injury with delayed diagnosis. One patient had arm and hand swelling after a prolonged laparoscopic procedure. Nerve conduction studies showed no nerve injury but "unmasking" of a carpal tunnel phenomenon.

There were two further partial thickness serosal bowel injuries sutured following laparoscopic procedures which were converted to laparotomy and therefore not included in this section (but included in the ACHS indicator above).

There were 14 cases of perioperative blood transfusion (3.3%). Of the 14 cases requiring transfusion, eight cases were related to ruptured ectopic with haemoperitoreum and one case with haemoperitoneum due to a ruptured cyst. There were three transfusions following laparoscopic hysterectomy; one case bled from the lateral port incision after total laparoscopic hysterectomy; two cases were difficult laparoscopic assisted vaginal hysterectomies for large multifibroid uteri with preexisting anemia. The remaining cases occurred with pre-existing anaemia, and in one case there was bleeding into a large inflamed abscess cavity.

The six cases of failure to complete procedure included two cases of pregnancy of unknown location where diagnostic laparoscopy showed normal tubes. Three cases were abandoned due to extensive disease and one case was failure to dilate the cervix and hence failed hysteroscopy.

12.6 Hysterectomy

Methods

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

Findings

Table 109: Characteristics of women undergoing hysterectomy (excluding gynaecologic oncology) during 2011

	N=166	
	n	%
Age		
≤20	0	
21-30	1	0.6
31-40	21	12.7
41-50	73	44.0
51-60	43	25.9
>60	28	16.9
Ethnicity		
NZ European	56	33.7
Maori	22	13.3
Pacific	30	18.1
Other Asian	31	18.7
Indian	14	8.4
Other European	12	7.2
Other	1	0.6
Not Stated	0	
District Health Board of residence		
Auckland	156	94.0
Counties Manukau	5	3.0
Waitemata	5	3.0
Other	0	
BMI		
<19	7	4.2
19-25	53	31.9
26-30	43	25.9
31-35	28	16.9
>35	35	21.1
Missing	0	
Smoking		
Currently smoking	24	14.5
Past smoker	22	13.3
Never smoked	120	72.3
Unknown	0	

Table 110: Surgical details of hysterectomies (excluding gynaecologic oncology) 2008-2011

	2008 N=150		2009 N=162		2010 N=173		2011 N=166	
	n	%	n	%	n	%	N	%
Approach								
Laparotomy	86	57	104	63	90	52.0	107	64.5
Total laparoscopic hysterectomy	5	3	9	6	20	11.6	15	9.0
Laparoscopic assisted vaginal	12	8	7	4	15	8.7	12	7.2
Laparoscopic converted to laparotomy	2	1	5	3	2	1.2	3	1.8
Vaginal	45	30	37	23	46	26.6	29	17.5
Timing of surgery								
Elective	145	97	155	96	170	98.3	164	98.8
Acute	5	3	7	4	3	1.7	2	1.2
Primary indication for surgery								
Abnormal bleeding, non pregnant	64	43	72	44	76	43.9	75	45.2
Cancer /pelvic mass	37	25	40	24	37	21.4	37	22.3
Urogynaecology / prolapse	35	23	24	15	41	23.7	25	15.1
Pain, cause unknown	5	3	4	2	2	1.2	6	3.6
Endometriosis	3	2	6	4	9	5.2	5	3.0
Ovarian cyst	2	1	9	6	3	1.7	12	7.2
Post operative complication	1	1	0		0		0	
Other	3	2	7	4	5	2.9	6	3.6
ASA rating								
0	20	13	9	6	0		0	
1	45	30	51	31	58	33.5	57	34.3
2	67	45	71	44	72	41.6	81	48.8
3	17	11	9	6	24	13.9	20	12.1
5	1	1	0		0		0	
Missing			22	14	19	11.0	8	4.8
Length of stay	**Median**	**(IQR)**	**Median**	**(IQR)**	**Median**	**(IQR)**	**Median**	**(IQR)**
All hysterectomies	4	(3-5)	4	(3-5)	4	(3-5)	4	(3-5)
By approach:								
Laparotomy	4	(4-5)	4	(4-5)	4	(3-5)	4	(4-5)
Laparoscopy	3	(3-3)	3	(2-3)	3	(2-4)	3	(3-5)
Vaginal	3	(3-4)	3	(3-4)	3	(3-4)	3	(2-3)

Twenty one percent of hysterectomy patients have BMI > 35. The proportion of hysterectomies done via laparoscopic approach (16%) is quite close to the proportion via vaginal approach (17%) and may be related to the rate of overweight or obese (50%).

Table 111: Route of hysterectomy among non-malignant hysterectomies (2001-2011)

	2001 N=170		2002 N=208		2003 N=187		2005 N=161		2006 N=131		2007 N=189		2008 N=150		2009 N=162		2010 N=173		2011 N=166	
			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Abdominal	90	52.9	113	54.3	100	53.5	86	53	81	61.8	109	57.7	88	58.7	109	67	92	53.2	110	66.3
Vaginal	65	38.2	72	34.6	63	33.7	54	34	36	27.5	67	35.4	45	30.0	37	23	46	26.6	29	17.5
Laparoscopic	15	8.8	23	11.1	24	12.8	21	13.0	14	10.7	13	6.9	17	11.3	16	10	35	20.2	27	16.3

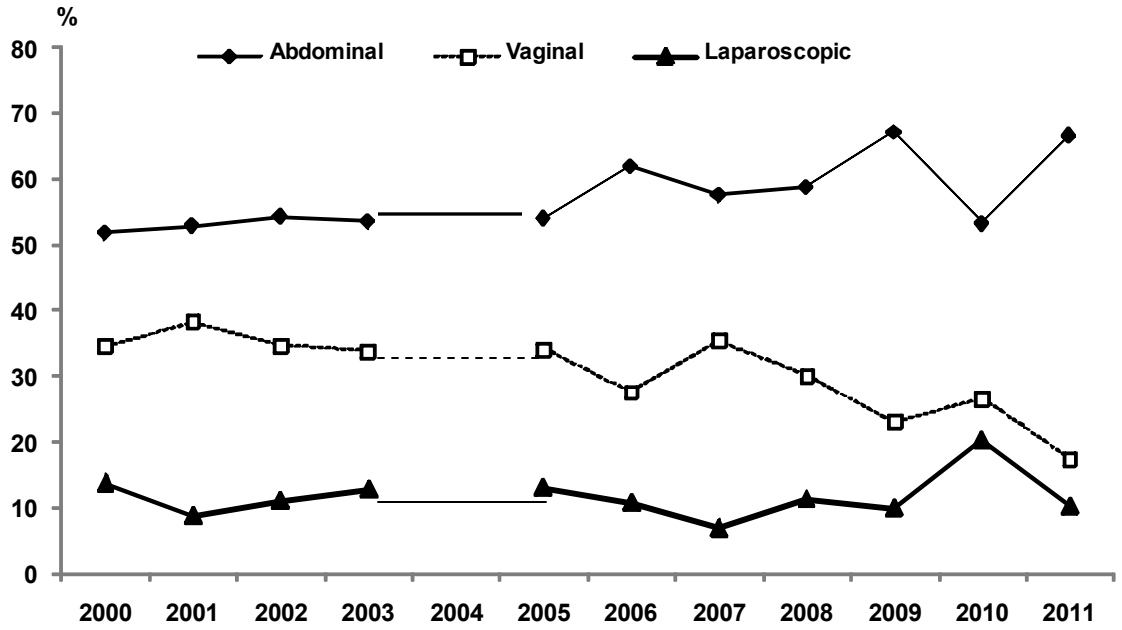

Figure 125: Route of hysterectomy among non malignant hysterectomies (2000-2011)

ACHS Gynaecology Indicators: Injury to URETER during a LAPAROSCOPIC HYSTERECTOMY		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to ureter during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	0.17	0.57	0.23	0/17	0/16	0	0/27
Denominator	Laparoscopic hysterectomy procedures							

ACHS Gynaecology Indicators: Injury to BLADDER during a LAPAROSCOPIC HYSTERECTOMY		ACHS 2007	ACHS 2008	ACHS 2009	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to bladder during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation	1.13	0.48	0.78	0/17	0/16	0	0/27
Denominator	Laparoscopic hysterectomy procedures							

There were 7 major intra-operative injuries associated with hysterectomy. This included 3 bowel injuries, two ureteric injuries, one bladder injury and a patient who had arm and hand swelling after a prolonged laparoscopic procedure. Of the three cases of bowel injury, two were serosal injuries repaired in primary procedures, and one case involved delayed diagnosis of a small bowel injury which resulted in death. There were three cases of urinary tract injury, one bladder injury repaired on entry, and two ureteric injuries, one repaired primarily and one repaired six weeks later.

Table 112: Complications of surgery among women undergoing hysterectomy (excluding gynaecologic oncology) during 2011

	2009 N=162		2010 N=173		2011 N= 166	
	n	%	n	%	n	%
Any complication	**46**	**28**	**45**	**26.0**	**48**	**28.9**
Blood transfusion	20	12	18	10.4	14	8.4
Intraoperative injury	4	2	2	1.2	7	4.2
Anaesthetic complications	2	1	2	1.2	1	0.6
Significant postoperative infection	7	4	5	2.9	5	3.0
Other significant complications	5	3	11	6.4	8	4.8
Unplanned return to theatre	5	3	7	4.1	8	4.8
Admission to DCCM	2	1	2	1.2	2	1.2
Readmission to hospital	29	18	19	11.0	29	17.5
Failed to complete planned surgery	3	2	1	0.6	2	1.2

Two cases converted to abdominal from laparoscopy due to extensive disease.

There were 14 cases of perioperative blood transfusion (8.4%). Three cases were transfused after laparoscopic hysterectomy (TLH (1), LAVH (2)), and 2 following laparoscopic hysterectomy converted to open. Three cases were transfused following vaginal hysterectomy which was converted to laparotomy. Bleeding was from uterine pedicles diagnosed at laparotomy. One of these cases lost 7000ml and required 10 units of red cells. Six transfusions occurred after TAH and were related to adhesions and multifibroid uterus.

Summary / Implications

Hysterectomy rates in our service remain stable and low. There continues to be a gradual trend downwards in the number of vaginal hysterectomies. This is comparable with the rates seen in both the US and UK.

It is unclear why there has been an increase in the number of intra-operative injuries this year. It is fortunate that we are able to involve general surgical and urological colleagues when planning difficult cases. Consideration should also be given to colleagues' early involvement in any case where significant difficulties are encountered intra-operatively or an injury is suspected.

Low numbers, high acuity cases and patients with high BMI all contribute to limiting appropriate surgical training opportunities for registrars. Novel gynaecological surgical training approaches need consideration to ensure our trainees complete their training with adequate skills.

17.5% of patients are readmitted to the ward within 6 weeks of hysterectomy. This is an area where audit of cases may identify whether the readmission was required and potentially identify circumstances where the service could be improved.

Transfusion rates for hysterectomy, ERPOC and tubal surgery are greater than 7.5%. Ongoing monitoring as to the appropriateness of transfusions and any factors prior to surgery that may mitigate risk may help to ensure this does not increase further.

12.7 Urogynaecology

Methods

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

From the gynaecology surgical database, urogynaecologic procedures have been identified using the surgical audit forms submitted for each operative case. In 2011, urogynaecology procedures are categorised as: procedures including hysterectomy; incontinence tape procedures; prolapse repairs using synthetic mesh augmentation; 'other' prolapse repairs.

Findings

Table 113: Demography of women undergoing inpatient urogynaecology surgery 2011

	2011 N=214	
	n	%
Age		
≤ 30	5	2.3
31-40	23	10.8
41-50	53	24.8
51-60	56	26.2
>60	77	36.0
Ethnicity		
NZ European	116	54.2
Maori	22	10.3
Pacific	17	7.9
Other Asian	15	7.0
Indian	14	6.5
Other European	25	11.7
Other	5	2.3
Not stated		
District Health Board of residence		
Auckland	180	84.1
Counties Manukau	8	3.7
Waitemata	20	9.4
Other	6	2.8
BMI		
<19	3	1.4
19-25	75	35.1
26-30	72	33.6
31-35	41	19.2
>35	22	10.3
Missing	1	0.5
Smoking		
Currently smokes	30	14.0
Past smoker	37	17.3
Never smoked	147	68.7
Unknown	0	
Length of stay Median (IQR)	2	(1-3)

In 2011, 214 women had a urogynaecology procedure as a primary admission.

Of the 214 primary admissions, there were 112 TVTs, 29 mesh repairs, 104 prolapse repairs, and 52 other urogynaecology procedures. Fifty women had two urogynaecology procedures and 6 had three procedures at primary surgery. Twenty seven women also had a hysterectomy at the time of their primary admission for urogynaecology surgery.

The demographic characteristics of women undergoing a urogynaecology procedure during 2011 were very similar to those of the previous year. Over 60% of our patients were over 50 years old, with more than a third older than 60 years. The majority of women were of NZ European ethnicity, a larger proportion (10%) was Maori than in 2010. Thirty percent of women operated on were obese or morbidly obese while another one third was classified as overweight. The majority of our patients are current or ever non-smokers.

Fifteen percent of cases came from outside the Auckland DHB catchment. The median length of stay and interquartile range was unchanged from the previous year.

ACHS Gynaecology Indicators: Injury to MAJOR VISCOUS during a pelvic floor repair procedure		ACHS		NW			
		2008	2009	2008	2009	2010	2011
Indicator	**Definition**	**%**	**%**	**% (95%CI)**	**% (95%CI)**	**% (95%CI)**	**% (95%CI)**
Numerator	Injury to major viscous during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	1.03	0.81	2/163= 1.2 (0.1-4.4)	4/173=2.3 (0.6-5.8)	1/209=0.5 (0.01-2.6)	2/214=0.9 (0.1-3.3)
Denominator	Pelvic floor repair procedures*						

ACHS Gynaecology Indicators: Injury to URETER during a pelvic floor repair procedure		ACHS		NW			
		2008	2009	2008	2009	2010	2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to ureter during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	0.55	0.046	0	0	0	0
Denominator	Pelvic floor repair procedures*						

ACHS Gynaecology Indicators: Injury to BLADDER during a pelvic floor repair procedure		ACHS		NW			
		2008	2009	2008	2009	2010	2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Injury to bladder during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	0.94	0.37	1/163=0.6 (0.02-3.4)	2.3 (0.6-5.8)	1/209=0.5 (0.01-2.6)	2/214=0.9 (0.1-3.3)
Denominator	Pelvic floor repair procedures*						

* includes isolated incontinence procedures

Table 114: Complications of urogynaecologic surgery procedures 2011

	2011 N=214	
	n	%
Total complications	**33**	**15.4**
Blood transfusion	5	2.3
Intra-operative injury to internal organs	2	0.9
Failure to complete planned surgery	1	0.5
Anaesthetic complications	1	0.5
Significant postoperative infection	1	0.5
Other significant complications	3	1.4
Unplanned return to theatre	7	3.3
Admission to DCCM	1	0.5
Readmission to hospital	27	12.6
Postoperative complication	19	8.6
Planned re-admission	7	3.2
Other	1	0.5

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

Details of some of the complications are as follows:

Five women required blood transfusion as a result of their surgery, two intra-operatively. In one a TVT combined with posterior repair and vaginal hysterectomy was complicated by bleeding from a uterine artery pedicle. A laparotomy was needed to secure haemostasis with the patient admitted to intensive care post-operatively. The other intra-operative transfusion was for intra-abdominal bleeding during a laparoscopically-assisted vaginal hysterectomy combined with a posterior vaginal repair.

Of the three remaining women who had post-operative blood transfusions one needed transfusing the day after a combined vaginal hysterectomy, vaginal repair and TVT. The second case had an uneventful TVT then bled in recovery. She proceeded to have successful radiological embolisation of an aberrant pudendal vessel. The third case requiring transfusion had a large bleed following an anterior and posterior mesh repair. The resulting haematoma led to exposure of the mesh and a subsequent revision procedure some weeks later. These last two women are also coded as 'other significant' complications in the table above. The third such coded patient suffered a myocardial infarction on day two post-operatively and went to coronary care.

The two cases where an intra-operative organ injury occurred were both bladder injuries that occurred during a mesh prolapse repair, during dissection prior to trochar placement. In both cases the bladder was repaired and the mesh placement was able to be completed. Of these two women, one had no problems post-operatively while the second had heavier bleeding during the operation such that the concomitant TVT placement was deferred. Subsequent testing has suggested a likely bleeding disorder. This patient is the one whose planned surgery was unable to be completed.

Anaesthetically, one woman was found to have an unexpectedly 'difficult' airway during her urogynaecology surgery. This was successfully managed and the procedure completed.

The cases recorded as needing an unplanned return to theatre are those where a second procedure occurred within six weeks of the index urogynaecology surgery. There were seven such cases, six were to correct voiding dysfunction after a TVT with

the tape being pulled down or divided to release voiding obstruction. The other was to drain a vaginal vault abscess after a haematoma became infected.

As well as these women, reasons for the post-operative returns to hospital included post-operative pain, bleeding, review of voiding problems and trial removals of catheter. In some cases these events then led to unplanned returns to theatre.

Within the subspecialty of urogynaecology there is considerable debate around the appropriate use of vaginally-placed synthetic mesh in prolapse repair surgery. This is in contrast to incontinence surgery where synthetic mid-urethral tape placement is regarded as a gold-standard procedure. As our figures show, vaginal mesh was used for prolapse repair in 29 cases during 2011. The additional complications that mesh use can cause are related to vaginal mesh exposure, often requiring additional surgery to correct, and longer term pain and dyspareunia. A more detailed audit of our mesh repair outcomes is underway.

12.8 Colposcopy

Methods:

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

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

Findings:

Table 115: Demographic details of women having an initial colposcopic examination in 2011

	Initial Colposcopy in 2008 N=1224		Initial colposcopy in 2009 N=993		Initial colposcopy in 2010 N=1214		Initial colposcopy in 2011 N=1289	
	n	%	n	%	n	%		
Ethnicity								
NZ European	519	42.4	427	43.0	543	44.7	569	44.1
Maori	112	9.2	95	9.6	113	9.3	121	9.4
Pacific	126	10.3	104	10.5	109	9.0	126	9.8
Other Asian	205	16.8	158	15.9	198	16.3	198	15.4
Indian	37	3.0	37	3.7	63	5.2	56	4.3
Other European	110	9.0	131	13.2	145	11.9	180	14.0
Other	76	6.2	20	2.0	16	1.3	14	1.1
Not stated	39	3.2	21	2.1	13	13	25	1.9
Age (yrs)								
≤20	53	4.3	28	2.8	29	2.4	40	3.1
21-30	545	44.5	422	42.5	422	34.8	535	41.5
31-40	295	24.1	245	24.7	389	32.0	374	29.0
41-50	203	16.6	195	19.6	218	18.0	189	14.7
51-60	97	7.9	76	7.7	106	8.7	108	8.4
>60	31	2.5	27	2.7	50	4.1	43	3.3
Smoking status								
Currently smoking	312	25.5	228	23.0	266	21.9	279	21.6
Not currently smoking	851	69.5	757	76.2	943	77.7	981	76.1
Unknown	911	74.4	8	0.8	5	0.4	29	2.3
Referral to smoking cessation			223	22.5	255	21.0	259	20.1
DHB of residence								
Auckland	1124	91.8	927	93.4	1131	93.2	1188	92.2
Counties Manukau	29	2.4	18	1.8	25	2.1	22	1.7
Waitemata	43	3.5	33	3.3	39	3.2	48	3.7
Other	28	2.3	15	1.5	49	4.0	31	2.4

NCSP guidelines state that women under the age of 20 should not be screened, but despite this 40 referrals in 2011 were from this age group. Some primary care practitioners appear to be following the Australian guidelines, which accounts for this group.

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

Colposcopy Standards: Documentation of adequacy of examination		Standard	NW 2008	NW 2009	NW 2010	NW 2011
	Definition	**%**	**%**	**%**	**%**	**%**
Numerator	Documented that entire squamo-columnar junction is seen and whether the upper limit of any cervical lesion is seen	100	97	99.9	93	95.7
Denominator	All colposcopic examinations					

Table 116: Documentation of adequacy of colposcopic examination by type of colposcopic visit (2011)

	Total N=1902*		Follow up visit N=538		Initial visit N=1289		Post treatment N=57	
	N	**%**	**N**	**%**	**n**	**%**	**n**	**%**
Satisfactory examination	1518	79.8	408	75.9	1066	82.7	41	71.9
Unsatisfactory examination	256	13.5	91	16.9	149	11.6	16	28.1
Not applicable	46	2.4	16	3.0	30	2.3	0	
Incomplete documentation	34	1.8	11	20	2	1.8	0	
Not documented	48	2.5	12	2.2	21	1.6	0	

*Unknown type of visit n=15 (adequacy not documented)

Documentation of the SCJ is fundamental in recording a colposcopic episode. Documentation has improved slightly compared to last year, but is still not meeting the standard. This will be resolved with the introduction of the electronic direct entry database, as this is a mandatory field.

Table 117: Clinical characteristics of women presenting for initial colposcopy in 2011

	Initial visit N=1289	
	n	**%**
Referral reason		
Abnormal smear	1065	82.6
Irregular bleeding (intermenstrual)	14	1.1
Irregular bleeding (postcoital)	98	7.6
Suspicious cervix	57	4.4
Other referral reason	29	2.3
Not documented	26	2.0
Referral smear cytology		
Normal	152	11.8
Low grade	799	62.0
High grade	244	18.9
Unsatisfactory	0	
Inconclusive	2	0.2
No referral smear	5	0.4
Other	10	0.8
Inflammation	2	0.2
Not documented	75	5.8

Table 118: Histology of biopsy at initial examination 2011

	Initial visit biopsies N=1289	
	n	%
No Biopsy taken	580	45.0
High grade (includes HSIL, AIS, invasive)	150	11.6
LSIL	154	12.0
Dysplasia NOS	6	0.5
HPV	154	12.0
Condylomata / inflammation	35	2.7
Inconclusive	1	0.1
Insufficient sample	4	0.3
Normal	203	15.8

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

Table 119: Histological diagnosis (biopsy at initial colposcopy) by referral smear cytology (2011)

Referral smear cytology	Total Colpo-scopies	Histological diagnosis													
		No biopsy /UK		High grade		LSIL		Dysplasia		HPV		Condyloma/ inflammn		Normal	
	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1289**	**579**	**44.9**	**150**	**11.6**	**154**	**12.0**	**6**	**0.5**	**155**	**12.0**	**35**	**2.7**	**203**	**15.9**
High grade	244*	45	18.4	96	39.3	30	12.3	3	1.2	21	8.8	6	2.5	40	16.4
Low grade	799**	371	46.4	52	6.5	115	14.4	2	0.3	118	14.8	24	3.0	115	14.4
Other†	14	10	71.4	0		1	7.1	0		0		0		3	2.1
No referral smear/UK	80***	38	47.5	4	4.9	7	8.8	1	1.2	8	9.9	1	1.2	20	25.0
Normal	152	113	74.3	0		1	0.7	0		8	5.3	5	3.3	25	16.5

* 2 with insufficient sample not included in table
** 1 with insufficient sample and 1 inconclusive histology not included in table
*** 1 with insufficient sample not included in table

† Includes 0 condyloma, 2 inflammation, 2 inconclusive, 0 unsatisfactory, and 10 other referral smear
UK=unknown Inflammn=inflammation

Eighteen percent of the high grade referrals appear not to have had biopsies, which although is significantly short of the 95% standard for biopsy rate, is consistent with previous years. This again relates to a combination of problems with data entry, as only cervical biopsies are recorded, and so vaginal biopsies taken as a result of a referral for a high grade vault smear would not be captured. Also a proportion of women are referred for treatment, having previously had a private colposcopy and biopsy, and a biopsy would not be repeated in clinic. Some of the patients with high grade smear and colposcopy were not biopsied as they were pregnant, and the remainder had normal colposcopy, with no identifiable area to biopsy, or had cervical polyps.

Colposcopy Standard: Predictive value of a colposcopic high grade diagnosis		Standard	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Numerator	High grade histology	65	65	55	56	52
Denominator	Initial satisfactory colposcopies where colposcopic diagnosis is high grade					

Table 120: Cervical histology findings by colposcopic diagnosis (at initial colposcopy if satisfactory) (2011)

				Histological diagnosis									
Colposopic diagnosis	**Total Colpo-scopies**	**No biopsy**		**High grade**		**LSIL#**		**HPV**		**Condyloma inflammn**		**Normal**	
	n	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	1066	424	39.8	140	13.1	152	14.3	138	13.0	34	3.2	178	16.7
High grade	141*	10	7.1	74	52.5	19	13.5	13	9.2	6	4.3	17	12.1
Low grade	404**	32	7.9	53	13.1	103	25.5	90	22.3	15	3.7	107	26.5
Condyloma/ inflammation	35	10	28.6	1	2.9	9	25.7	7	20.0	4	11.4	4	11.4
Inconclusive	9	2	22.2	1	11.1	0		1	11.1	1	11.1	4	44.4
Other	77	31	40.3	6	7.8	7	9.1	12	15.6	5	6.5	16	20.8
Normal	397	332	83.6	6	7.8	13	3.3	15	3.8	4	1.0	30	7.6
Not documented	3	0		2	66.7	1	33.3	0		0		0	

* 1 insufficient sample
** 1 inconclusive histology and 3 insufficient sample
# Includes 4 women with dysplasia NOS

The positive predictive value of high grade disease is 52.5% and 47.8 for low grade, which is below the recognised standard. It is unclear why 16.4% of normal appearing cervices had biopsies, although some relate to removal of cervical polyps or a pipelle biopsy of the endometrium. The introduction of photographic records will enable audit and peer review of apparently normal colposcopic appearances with abnormal results.

Table 121: Histological diagnosis (biopsy at initial colposcopy) by referral reason (2011)

				Histological diagnosis									
Referral reason	**Total Colposcopies**	**No biopsy /unknown**		**High grade**		**LSIL#**		**HPV**		**Condyloma Inflammn**		**Normal**	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	1289	577	44.8	151	11.7	160	12.4	155	12.0	36	2.8	203	15.8
Abnormal smear	1065*	426	40.0	145	13.6	149	14.0	140	13.5	29	2.7	165	15.5
Irregular bleeding (Intermenstrual/NOS)	14	4	28.6	2	14.3	3	21.4	2	14.3	0		3	21.4
Irregular bleeding (postcoital)	98**	70	71.4	2	2.0	5	5.1	4	4.1	3	3.1	13	13.3
Suspicious cervix	57	40	70.2	0		1	1.8	3	5.3	2	3.5	11	19.3
Other referral reason	29	22	75.9	0		1	3.5	0		1	3.5	5	17.2
Not documented	26	15	57.7	2	7.7	1	3.9	2	7.7	0		6	23.1

*3 insufficient biopsy sample and 1 inconclusive histology
**1 insufficient biopsy sample
#Includes 6 Dysplasia NOS

Post coital bleeding (PCB) is not a good predictor of high grade disease and this has previously been shown in departmental audits. If a cervix is macroscopically normal, it is unlikely that colposcopy will add much to clinical assessment. We would suggest that

intermenstrual bleeding (IMB) and PCB are referred to general gynaecology rather than colposcopy clinic, if the smear is normal.

Table 122: Cervical treatments 2007-2011

	2007 N=191		2008 N=212		2009 N=199		2010 N=198		2011 N=236	
	n	%	n	%	n	%	n	%	n	%
LLETZ	182	95.3	197	92.9	187	94.0	185	92.9	220	93.2
Cold knife cone	6	3.1	11	5.2	9	4.5	11	5.6	16	6.8
Diathermy	0		2	1.0	1	0.5	0		0	
Hysterectomy	3	1.6	1	0.5	1	0.5	2	1.0	0	
Laser ablation	0		0		1	0.5	1*	0.5	0	
Laser cone	0		1	0.5	0		0		0	

The number of treatments has increased and LLETZ is the treatment of choice, as it can usually be performed safely under local anaesthetic in the colposcopy clinic and provides an excisional biopsy for histological confirmation of disease. In 2011 85% were performed under local anaesthetic.

In 2011 no patient under the age of 20 underwent treatment for abnormal smears. Twenty five women under the age of 25 were treated (17 HSIL, 1 LSIL, 5 Normal, 2 other). As there is increasing evidence that even one treatment can have a detrimental effect on future pregnancies, histological and multidisciplinary (MDM) review of all cases under the age of 25 is recommended. Conservative management after MDM review of women under the age of 25 presenting with biopsy proven CIN2 is preferred management at NW.

12.8.1 Post treatment follow up

Colposcopy Standard: Follow up after treatment		Standard	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Numerator	Follow up visit no later than 8 months following treatment	>90	88	88	81	92
Denominator	All treatments					

This standard is now met. However 100% of women were offered appropriate follow up within the time frame.

Table 123: Timing of follow up colposcopy (ACH) after treatments (2007-2009)

	2007 N=191		2008 N=213		2009 N=199		2010 N=198	
	n	%	n	%	n	%	n	%
≤ 8 months	168	88.0	182	85.5	162	81.4	182	91.9
> 8 months	3	1.6	3	1.4	4	2.0	2	1.0
No follow up	20	10.5	28	13.2	33	16.6	14	7.1

Of those with follow up beyond 8 months or no follow up, 4 did not attend repeated appointments, 4 moved overseas, 1 moved to Christchurch and the rest were referred to WDHB or CMDHB as they had moved out of area. All of these patients subsequently attended follow up in their local DHB and had negative smears.

Two further women had polyps removed rather than LLETZ for CIN and so did not require follow up colposcopy.

Colposcopy Standards: Dyskaryosis* after treatment		Standard	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Numerator	Treated women with no dyskaryosis* following treatment	>90%	90	92	76	81**
Denominator	All treatments					

*HSIL or LSIL on cytology
** excludes ASCUS; 70% including ASCUS

Table 124: Post treatment follow up findings

	2010 treatments N=182	
	N	**%**
Cytology findings at post treatment follow up		
Normal	126	67.0
High grade	8	4.4
Low grade	27	14.8
ASCUS	19	10.4
Other	2	1.1
Histology findings at post treatment follow up		
No biopsy taken	169	92.9
HG	2	1.1
LG	1	0.5
HPV	2	1.1
Condyloma/inflammation	1	0.5
Normal	7	3.8

The standard regarding no dyskaryosis in follow up smears after LLETZ treatment appears to have fallen over the past 2 years, although only 4.4% had high grade cytology at follow up. Possibilities include new infection or inadequate treatment. This change has also coincided with the change from conventional cytology to liquid-based cytology (LBC).

Colposcopy Standard: Primary haemorrhage after treatment		Standard	NW 2008	NW 2009	NW 2010	NW 2011
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**
Numerator	Treated women who require treatment for primary haemorrhage	<5%	1	0.5	0	1.7
Denominator	All treatments					

Three cases of primary haemorrhage and two of infection were reported post treatment in 2011.

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

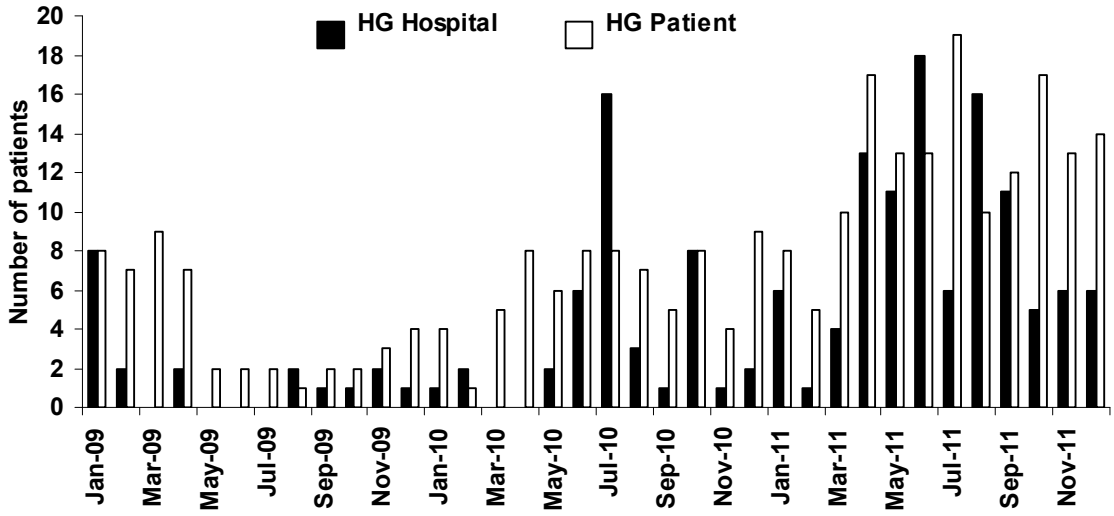

Figure 126: High grade referrals outside NSU Targets 2009 & 2010: Hospital vs patient related delays

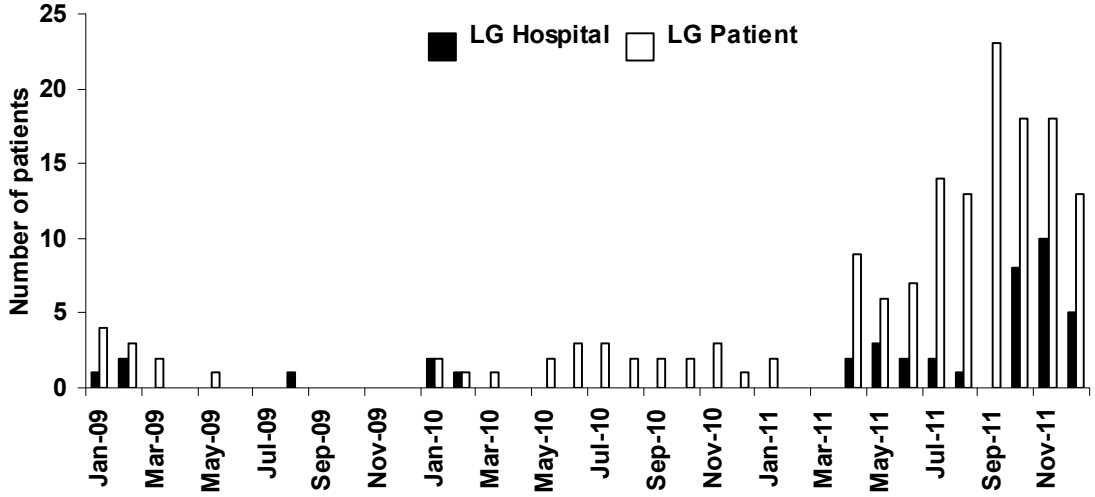

Figure 127: Low grade referrals outside NSU Targets: Hospital vs patient related delays

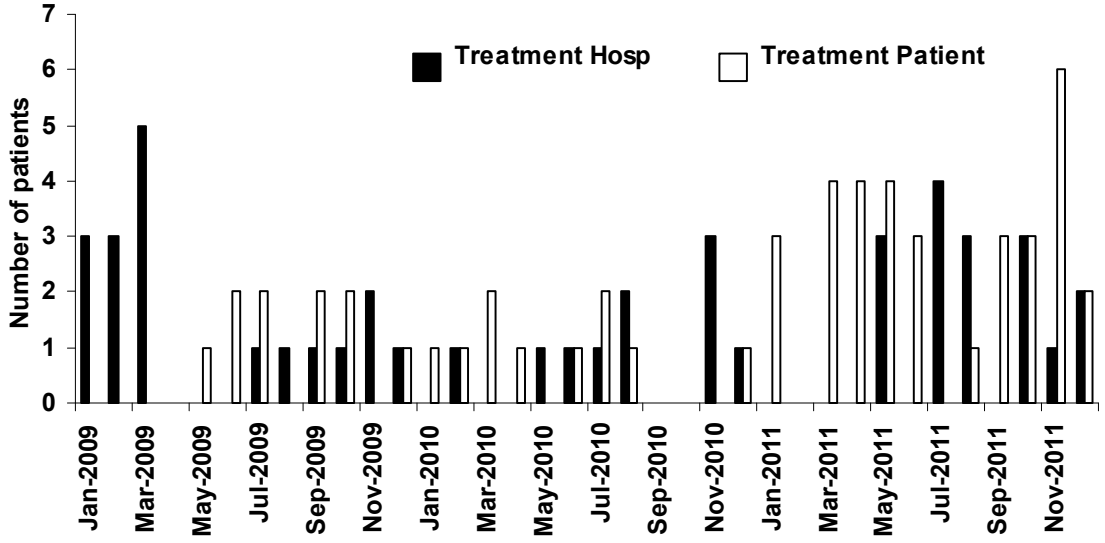

Figure 128: Treatments outside NSU Targets: Hospital vs patient related delays

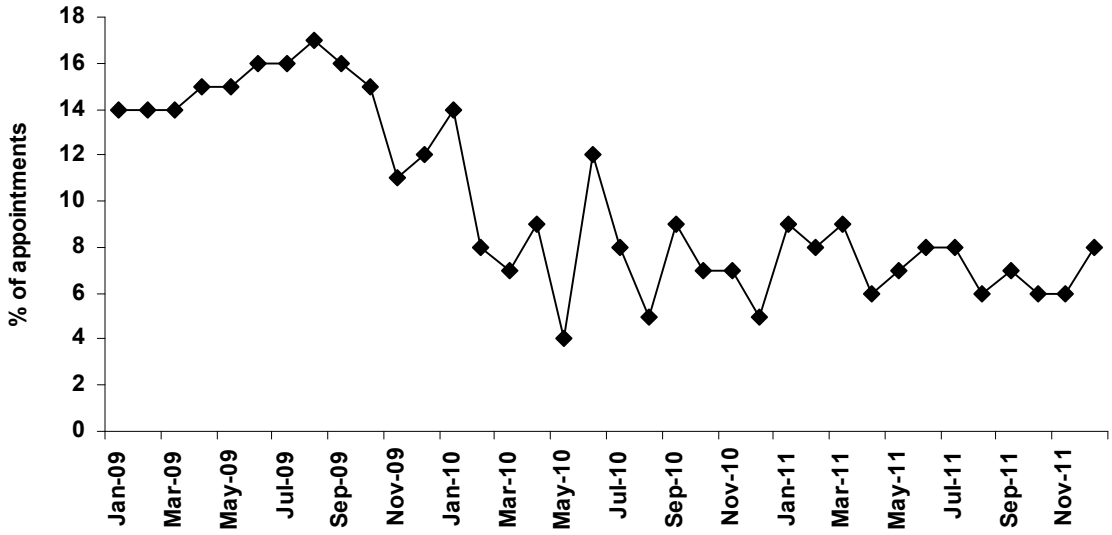

Figure 129: Patient did not attend (DNA) Rate

Summary

During 2011, the previous excellent results in target times slipped and once again low grade patients were not receiving timely appointments. This coincided with a reduced number of clinics, due to staff on maternity leave, and it is therefore anticipated that this is a temporary effect and should resolve by the next report. This highlights the narrow resource margin the service is working with and in the long term the service should be expanded to allow a more comfortable margin of error.

The treatment guideline targets are often not met due to histology and cytology MDM review and this part of our service is often overlooked. The increasing evidence that CIN2 may resolve spontaneously in younger women means that timely review from specialist gynaecological pathologists may avoid unnecessary treatment with potential risks and an adequately resource pathology service is paramount to any colposcopy unit.

Strategies put in place to reduce the DNA rate in 2010 have continued to be successful in 2011. This is a direct reflection on the increased nursing and clerical resource provided to directly address this problem, and their efforts are to be congratulated, as DNA rates are now well below the NCSP standard of 15% of first appointments.

Diagnostic accuracy appears to have fallen and this is a difficult area to address. The introduction of a photographic record will allow peer review and facilitate self audit to improve diagnostic accuracy. The 85% local anaesthetic rate for LLETZ is acceptable, as although previously 90% was deemed the target, this was based on an overseas population. It is now recognised that due to our patient characteristics, this may not be achievable in New Zealand.

The decrease in follow up smears with no dyskaryosis after LLETZ treatment was of concern to the department and prompted an excellent trainee intern audit. The LBC manufacturers were contacted to enquire whether a similar effect had been noticed in other units.

If this was due to treatment failures, it was suggested that different junior staff passing through colposcopy attachments could impact on the rate, but patients with clear and involved margins were identified, and no correlation was found between margin status and subsequent abnormal smear. Individual statistics were sent to each colposcopist to allow them to review their own practice and no individual rogue practice was found. It is planned that the audit will be repeated next year, to see whether this trend continues.

As in previous Annual Clinical Reports, problems have been highlighted in our methods of data collection, and a large amount of work in data cleaning is needed to address this. The current system has margin for error in the interpretation of paper based records when the data is transferred into an electronic database by non clinical staff. It is hoped that the introduction next year of an electronic record, with direct data entry at the clinical point of contact will improve this and provide more accurate records.

12.9 Gynaecologic oncology surgical services

Methods

The data in this section have been obtained from (1) an ACCESS database recording gynaecologic oncology referrals; (2) an EXCEL spreadsheet of the oncology surgical waiting list; and (3) an ACCESS database of all MDM reviews and inpatient surgeries among women cared for by the gynaecologic oncology service.

Table 125: Primary site of Gynaecologic Oncology cases, including MDM (Multidisciplinary meeting) reviewed cases and surgical cases 2009-2011.

	Total 2009 N=611		Total 2010 N=707		Total 2011 N=681	
	n	%	n	%	n	%
Primary site						
Ovary	182	29.8	194	27.4	204	30.0
Uterus	80	13.1	78	11.0	31	4.6
Endometrium	132	21.6	192	27.2	170	25.0
Cervix	92	15.1	81	11.5	83	12.2
Vulva	35	5.7	46	6.5	48	7.1
Placenta					57	8.4
Vagina					17	2.5
Fallopian tube					10	1.5
Mullerian					6	0.9
Prophylactic gynae	90	14.7	116	16.4	13	1.9
Unknown					9	1.3
Peritoneal					4	0.6
Non gynae cancer					27	4.0
Other/not stated/benign					2	0.3

Table 126: DHB of residence, age, and prioritised ethnicity by primary site among MDM reviewed cases 2011.

	Total N=681		Ovarian n=204		Endometrium /Uterus n=201		Cervix n=83		Vulva n=48		Other n=145	
	n	%	n	%	n	%	n	%	n	%	n	%
DHB												
Auckland	154	22.6	43	21.1	46	22.9	16	19.3	10	20.8	39	26.9
Counties Manukau	187	27.5	30	14.7	63	31.3	18	21.7	10	20.8	30	20.7
Waitemata	180	26.4	53	26.0	54	26.9	19	22.9	4	8.3	53	36.6
Northland	59	8.7	10	4.9	14	7.0	12	14.5	5	10.4	10	6.9
Bay of Plenty	46	6.8	4	2.0	16	8.0	6	7.2	4	8.3	4	2.8
Other	37	5.4	9	4.4	8	4.0	11	13.3	15	31.3	9	6.2
missing	1	0.2		0.0		0.0	1	1.2		0.0		0.0
Age (yrs)				0.0		0.0		0.0		0.0		0.0
≤25	32	4.7	12	5.9	6	3.0	3	3.6	2	4.2	11	7.6
26-35	98	14.4	18	8.8	14	7.0	27	32.5	6	12.5	33	22.8
36-45	91	13.4	25	12.3	16	8.0	17	20.5	5	10.4	28	19.3
46-55	126	18.5	42	20.6	46	22.9	12	14.5	9	18.8	18	12.4
56-65	135	19.8	36	17.6	54	26.9	15	18.1	11	22.9	18	12.4
66-75	127	18.7	40	19.6	47	23.4	6	7.2	11	22.9	23	15.9
>75	71	10.4	31	15.2	18	9.0	2	2.4	4	8.3	14	9.7
missing	1	0.2		0.0		0.0	1	1.2		0.0		0.0
Ethnicity				0.0		0.0		0.0		0.0		0.0
NZ European	293	43.0	84	41.2	71	35.3	33	39.8	27	56.3	78	53.8
Maori	111	16.3	38	18.6	34	16.9	20	24.1	8	16.7	11	7.6
Pacific	104	15.3	31	15.2	48	23.9	5	6.0	3	6.3	17	11.7
Other Asian	48	7.1	14	6.9	16	8.0	5	6.0	0	0.0	13	9.0
Indian	23	3.4	8	3.9	11	5.5	1	1.2	1	2.1	2	1.4
Other European	86	12.6	26	12.7	13	6.5	18	21.7	9	18.8	20	13.8
Other	5	0.7	1	0.5	3	1.5	1	1.2	0	0.0	0	0.0
Not stated/missing	11	1.6	2	1.0	5	2.5	0	0.0	0	0.0	4	2.8

12.9.1 Reporting to Gynaecologic Oncology Key Performance Indicators (KPI)

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

Table 127: Key Performance Indicator: Time from referral to first multidisciplinary meeting (MDM) or clinic (includes new referrals and referrals for new site or recurrence. Excludes referrals for molar pregnancy and consideration of prophylactic surgery). Goal: 90% in less than 14 days

	2007 N=448		2008 N=494		2009 N=497		2010 N=580		2011 N=563	
	n	%	n	%	n	%	n	%	n	%
<14 days	291	65	284	57	351	71	426	73	413	73.4
=14 days	22	5	21	4	28	6	34	6	30	5.3
>14 days	135	30	172	35	113	23	118	20	115	20.4
Missing data			17	3	5	1	2	0.3	1	
Deceased									4	

Of the 115 cases where the key performance indicator was not achieved in 2011, 63 cases were scheduled for discussion within the 14 day timeframe, but deferred for various reasons. If these were excluded from analysis then the KPI would increase to 85%, just pushing the total planned MDM discussion in 14 days or less to over the 90% target, which shows the target is potentially achievable. Unfortunately of the cases

deferred, the majority were due to lack of pathology. Some of the patients outside of the KPI were planned discussions at a point in the future after investigations or treatment had been completed.

Table 128: Key Performance Indicator: Time from MDM or clinic to first surgery (new referrals of patients with malignancy who had surgery in 2010) Goal: 90% within 56 days

	2007 N=100		2008 N=164		2009 N=233		2010 N=228		2011 N=173	
	n	%	n	%	n	%	n	%	n	%
≤ 56 days	75	75	115	70	165	71	188	82	139	80.4
> 56 days	24	24	43	26	65	28	40	18	34	19.7
Missing data	1	1	6	4	3	1				

The number of surgeries included in this indicator is lower in 2011 as patients have been excluded if they were referred to radiation or medical oncology prior to surgery and in some cases where they were re-referred for recurrences. For example, patients with ovarian cancer receiving neo-adjuvant chemotherapy prior to interval debulking will always fall outside the timeline.

Reasons for delay beyond 56 days in the remaining 33 were as follows:

- Patient delay (refused treatment, needed medical work-up for co-morbidities, patient ill on day of surgery)
- 6 Surgery recommended at DHB of residence, but re-referred after further investigation/treatment
- 2 Awaiting pathology review prior to treatment decision
- 1 Initial surgery elsewhere, but required completion surgery at ADHB
- 1 Cancelled on table as anaesthetic complication
- 1 Delayed as surgeon injured
- 2 BMI > 60, delay as 2 surgeons required

The remaining 8 had no identifiable reason for their delayed surgery.

Table 129: Time from MDM or clinic to first surgery (new referrals of patients with gynaecologic malignancy who had surgery in 2011) by primary site

	Total	≤ 56 days		>56 days	
	n	n	%	n	%
Totals	**172**	**139**	**81**	**33**	**19**
Cervix	27	21	78	6	22
Endometrium	73	56	77	17	23
Uterus	3	3	100	0	
Ovary	39	33	85	6	15
Vulva	13	12	92	1	8
Other	17	14	82	3	18

Endometrial cancers make up the largest group with delayed surgery. This is not surprising given obesity is a risk factor, and these patients often have co-morbidities requiring greater pre operative planning and investigation.

12.9.2 Gynaecologic oncology surgeries

This section describes the surgery and outcomes of women undergoing inpatient surgery in 2011 under the care of the gynaecologic oncology team.

Table 130: Ethnicity and cancer status of women undergoing gynaecologic oncology inpatient surgery during 2011

	2011 N=399	
	n	%
Ethnicity		
NZ European	207	51.9
Maori	62	15.5
Pacific	45	11.3
Other Asian	17	4.3
Indian	13	3.3
Other European	53	13.3
Other	2	0.5
Status at time of surgery		
Benign	40	10.0
Pre malignant	55	13.8
Malignant	256	64.2
Prophylactic	1	0.3
Unknown prior to surgery	47	11.8

Table 131: Debulking rates in ovarian malignancy 2011

	Ovary N=66	
	n	%
Residual disease		
None	52	78.8
< 1cm	4	6.1
≥ 1cm	5	7.6
NA	2	3.0
Not stated	3	4.5
Bowel surgery		
Yes	13	19.7
No	49	74.2
NA	2	3.0
Not stated	2	3.0

Table 132: Key Performance indicator: Clinical Outcomes among inpatient surgeries in malignant cases by gynaecologic oncology team in 2011. Goal: Comparative year to year data (2007-2011)

	2007 N=174*		2008 N=246*		2009 N=259*		2010 N=353*		2011 N=299*	
Complication	n	%	n	%	n	%	n	%	n	%
Transfusion	18	10	19	8	30	12	40	11	32	10.7
Febrile morbidity	16	9	11	4	32	12	28	8	19	6.4
Wound infection	-		-		22	8	20	6	14	4.7
Thromboembolism	2	1	2	1	3	1	2	1	2	0.7
Cardiovascular	2	1	2	1	6	2	3	1	3	1.0
Gastro-intestinal	2	1	7	3	17	7	12	3	11	3.7
Urinary retention	-		-		12	5	12	3	8	2.7
Return to theatre within 6 weeks	5	3	6	2	14	5	18	5	8	2.7
Readmission with complications within 6 weeks	10	6	17	7	25	10	24	7	15	5.0
Death	1	1	2	1	2	1	5	1	1	0.3

* have assumed missing data are all “no”

This analysis includes the 299 inpatient surgeries performed by the Gynaecologic Oncology team in 2011 where a diagnosis of cancer was confirmed. The complications data were checked for accuracy against discharge coding data.

Summary/Implications

The Department of Gynaecologic Oncology workload plateaued this year. The delay in some surgery and the reduced number of surgeries is explained as the department was short staffed for 6 months due to parental leave, with partial locum cover, although despite this the surgical volume through the department was still greater than 2009. These figures do not include all departmental activity as pre-invasive referrals seen in the vulval and colposcopy clinics are not included, nor are molar pregnancies and genetic referrals, which account for approximately 100 first specialist appointments (FSA) per year. Molar pregnancies are currently reviewed in the Gynae Oncology clinic, although they rarely need surgical input. Consideration should be given to local follow up via nurse led clinics, as already the case at WDHB. MDM pathology review however is still important and should continue.

As shown in Table 128 there is ongoing difficulty in achieving MDM discussion within 14 days. The appointment of a part time MDM coordinator has helped improve the collection of necessary information prior to MDM, but resource is still not available for this position to be full time. The need for specialist pathology review is paramount in decision making in these meetings, and often delays are occurring as either slides are delayed from other DHBs, or there is insufficient time for the reviewing pathologist to assess the case adequately prior to the meetings. We would encourage referring DHBs to inform their pathology labs to send the pathology at the same time as the referral is made.

The aim in the department is to give patients a date for surgery in 2-3 weeks at the time they are seen in the gynaecologic oncology clinic. The extra theatre time allocated to enable each SMO to have a full day operating list has helped to make this more likely. However from Table 129 it is clear that this is not always possible. The increasing obesity epidemic, particularly in patients with endometrial cancer means delays prior to surgery are more likely, as co-morbidities mean greater planning, investigation and often admissions for non oncological reasons prior to surgery. Surgery is more time consuming in patients with high BMI and this can have an adverse effect on the volume of surgery on a list. Two patients this year had BMI of 60-70, each requiring a list to be cancelled, in order to provide 2 experienced surgeons for each case. This trend should not be taken lightly when considering resource allocation and service planning, as it is likely to have a big effect on the department.

The complication rates this year have fallen across the board, and it is encouraging that patients are undergoing increasing radicality of surgery without a major increase in complications. Despite the number of obese patients, the wound infection rate has fallen, and this may be due to a change in technique. It is hoped that with the introduction of sentinel nodes for vulval cancer in 2012 that the wound infection rate would fall further. The ovarian debulking rate is acceptable, although there is selection bias, as this rate does not account for patients in whom attempt at debulking is deemed unsuitable.

Areas for improvement include the fact that survival data and long term follow up data are lacking, as the resource is not currently available within the department to collect data after patient discharge. This is important and the appointment of a dedicated full time MDM coordinator would facilitate this. The MDM workload continues to increase

and is outgrowing the current resource allocation and structure. MDM review is the cornerstone of Gynaecologic Oncology management and this must be recognised and adequately provided for.

The department is committed to providing a high quality regional tertiary service and the potential improvement in resources should facilitate this.

APPENDIX 1. DATA CLEANING QUERIES

1.1 Data cleaning queries

The following is a list of the data cleaning and validation queries which were carried out for the production of this report. This list is not exhaustive and some further ad hoc cleaning was carried out during analysis.

Antenatal

Ethnicity is Not Stated or Other

Check parity if parity is less than parity at previous live birth (although previously parity was defined as 2 for twins). Check that obstetric history has been completed for women with a gravidity >1.

Previous Caesarean; If indication for Caesarean section=repeat Caesarean, previous Caesar=yes and parity is > 0.

LMC is Other Please Specify, Null, NW Obstetrician or charge midwives.

BMI (Body Mass Index) Calculated from earliest weight recorded, as weight (kg)/height(m)^2. If BMI <17 or >40, check height and weight

Antenatal Complications

Medical Conditions: If delivered at NW HDU (High Dependency Unit), any DCC (Department of Critical Care) or ICU (Intensive Care Unit), then antenatal summary medical conditions is not = missing.

If Antenatal Admission for Hypertension, APH or Diabetes, check AN Summary screen medical conditions is not = missing &/or check data is consistent.

If Induction Indication is Hypertension, APH or Diabetes, check AN Summary screen medical conditions is not = missing &/or check data is consistent.

If Reason for Operative Birth is Hypertension, APH or Diabetes, check AN Summary screen medical conditions is not = missing &/or check data is consistent.

If HDU Admission for Hypertension, APH or Diabetes, check AN or PN screen medical conditions & blood loss/ transfusion is not = missing &/or data is consistent.

Medical History Screen; Previous Medical Conditions = Chronic Hypertension, Diabetes Type 1 or Diabetes Type 2 & AN Summary screen medical conditions is not = missing &/or check data is consistent.

Antenatal Summary - Hypertension Fields can not be Null (Eclampsia, Gestational Hypertension, Pre eclampsia, Other Current Med Surg Cond).

Antenatal Summmary; Current Medications (prior to labour or elective cs) = Antihypertensives then check Hypertension Fields are not Null &/or data is consistent. (Eclampsia, Gestational Hypertension, Pre eclampsia, Other Current Med Surg Cond).

Antenatal Diabetes Screen fields - Hypertension, Chronic HT pre preg or Antihypertensive Treatment pre preg indicate Hypertension, check Antenatal Summary Hypertension fields are not null &/or data is consistent.

Eclampsia = Yes (Boolean in Antenatal Summary).

Diastolic greater than or equal to 90, but no Hypertension entered in AN Summary fields.

Antenatal Summary screen; Reason for Specialist Consultation = Diabetes, check Sugar Tolerance = is not null.
If Antenatal Summary Sugar Tolerance indicates Diabetes check Diabetic Screens AN or PN = missing.

Antenatal Diabetes screen without a PN Diabetes Screen & vice versa.

Newborn Diabetes; Newborn Discharge Summary, check for missing diabetic data.

Induction of Labour

If time at ARM is earlier than established labour time, assume this is an induction.

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

If indication for ARM is induction and time of ARM is established labour, then induction data are entered.

If indication for ARM is induction and time of ARM is after established labour time, then indication for ARM is labour augmentation.

If an induction occurred, there is an Induction Indication entered.

Indication for Induction Is Other Please Specify and Comment fields for checking.

Pregnancy/Birth

Homebirths & BBA's (babies born before arrival at hospital when intended birth in hospital) All checked as appropriately classified.

Check 'Delivered by' is not missing.

Check that admission to Labour & Birth Suite/Operating Theatre/WAU is before birth time (unless is recorded as BBA).

If birth location is BBA, then birth time is before admission.

Onset of contraction time is before full dilatation which is in turn before Birth time (sometimes there is no onset of contraction time because of pre-labour Caesarean).

There should be NO onset of contraction time if method of Birth is Elective Caesarean not in labour or Emergency Caesarean not in labour.

Onset of contraction time should **not** be missing if method of Birth is Caesarean (elective or emergency) in labour.

Full Dilatation Time should not be null if Birth Method is a vaginal birth.

If indication for induction is SRM then rupture of membrane time should be before induction start time which in turn is before onset of contraction time.

Syntocinon time is before birth time.

Membranes ruptured time is not null.

Membranes ruptured time is before birth time.

Time of epidural insertion is before birth time.

Full dilatation time is before birth time.

Birth time is always before birth of placenta time.

Placenta birth time is not null.

Check all Classical Caesareans to ensure they are authentic.

A Caesarean Section (CS) must have an option from the expanded tree to describe what type of CS. Cannot be just Lower Segment Caesarean Section or Classical Caesarean Section.

All emergency in labour CS must have an audit screen, Robson Group, urgency status. All emergency CS are checked by Labour and Birthing Suite.

If Birth Method is anything other than SVD or Spontaneous Breech Birth, check there is a reason for Operative Birth.

If Birth Method is a SVD or Spontaneous Breech Birth, check there is NO reason for operative birth.

If indication for operative birth is fetal distress, then fetal distress variable (in Labour & Birth Baby) is yes or meconium was present.

Check if failure to progress is the primary indication for operative birth & mode of birth is elective Caesarean.

Indication for Operative Birth Is Other Please Specify + Comment fields - for checking.

If Birth Presentation is Breech, should not be a Spontaneous Vertex Birth.

If Birth method is breech, then presentation is breech.

If indication for Caesarean is breech or malpresentation, then presentation is NOT cephalic.

If Birth method is 'Elective CS' then Dilatation at Syntocinon should be null.

Membrane method is SRM but has indication for ARM, check.

If ARM check there is an indication for ARM.

If vaginal birth, membranes method should not be At time of C/S.

Birth Presentation is null.

If Dilatation at Epidural is not Null then Anaesthesia should show Epidural Lumbar or Epidural Spinal.

If Time of Epidural is not Null then Anaesthesia should show Epidural Lumbar or Epidural Spinal.

If Caesarean is mode of birth, anaesthesia is not missing.

If had an epidural, then dilatation at last VE is not missing and time of epidural is not missing.

If there is postpartum transfusion and blood loss is < 1000 mls, check blood loss.

Blood Loss is not out of range ie: <50, >1500 or is null.

Blood Loss >=1500 & Blood Transfusion = No.

Blood Loss <1500 & Blood Transfusion =Yes.

Vaginal Birth & Lacerations is Null.

Sutured by Is Not Null, Lacerations Is Null.

If Instrumental Birth (Forceps) then check for Episiotomy.

Postnatal

Mothers Destination to Ward is somewhere within Auckland City Hospital but PN screen does not reflect this.

Mothers and baby's destination are not null

Mothers destination not NW's & PN Admission screen entered

PN Adm - Missing 'Admitted to ward time', 'CMS Discharge date' or 'Admission Type'

PN Adm - 1° Reason for PN Admission is Other & Comment

PN Adm - 1° Reason for PN Admission is Null or SVD
Mothers Destination to Ward & Admitted to (PN Admission Screen) do not match or is null

PN Admission - missing Admission Type

Baby Destination (L&B Baby) is a NW location, check Discharge Time & Discharge to & Discharge Care (Newborn Discharge Summary) is not null

Newborn Discharge Summary Missing Data (If DHB is ADHB & LMC is NW LMC)

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

Discharge Care - Postnatal Admission NOT NW, but Postnatal Homecare Summary Screen

Postnatal Homecare Missing Data

Breast Feeding Baby Unknown or missing fields from Immediate Newborn Assessment & Newborn Discharge Summary Screen.

Baby

Birth weight – check if <400g or >5kg.

If gestation <35 weeks, check birth weight if >2500g.

If gestation >35 weeks, check birth weight if <2500g.

Gestation: check if < 20wks or > 44 wks.

If indication for induction is post term, check gestation if gestation is < 40 weeks.

Gestation to Neonatal Gestation (Immediate Newborn Assessment screen) > 1 week difference if <28 weeks and >2 weeks difference if $\geq$ 28 weeks.

Perinatal mortality database for perinatal deaths gestation to derived gestation > 1 week difference

Neonatal database gestation to derived gestation > 1 week difference.
(Because of the incomplete reconciliation of data sets, there may be a minimal number of cases where gestation varies in reporting of the neonatal and maternity data.)

Gestational Age (Immediate Newborn Assessment) Is Null.

Days in NICU/PIN/Paed care on Ward are not null or check if >30.

Missing Apgars.

Live birth with Apgars 1min or Apgars 5 min of 0.

Data Checks with Other Sources

CMS/ Coding data to ensure correct birth numbers.

Neonatology database; fields checked include Birthweight, Gestation, Apgars & Days in NICU.

Perinatal related deaths database fields cross-referenced with Healthware include; ethnicity, gestation – LMP/EDD, LMC, Gravida/Parity, Height/Weight/BMI, Outcome, Apgars, Sex, Gestation, Birth Weight, PSANZ-PDC & PSANZ-NDC classifications, customised centile.

PIMs theatre data checked against Healthware for epidural and GA

Smoking Cessation Database cross-referenced with Healthware for smoking & referral to Smokefree Pregnancy service.

APPENDIX 2. SUMMARY STATISTICS

Table 133: Mode of birth (1998-2011)

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

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

	2010 n=7709		2011 n=7523	
	n	%	n	%
Spontaneous vertex birth	4217	54.7	4183	55.6
Vaginal breech	59	0.8	60	0.8
Operative vaginal	942	12.2	832	11.1
Caesarean	2491	32.3	2448	32.5

APPENDIX 3. MATERNAL DEMOGRAPHY

3.1 DHB of smoking residence

Table 134: DHB of domicile of mothers giving birth at National Women's (2003-2011)

	2003 n=7611		2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	5007	65.8	5055	67.5	4985	69.3	5100	70.7	5382	69.9	5267	69.4	5551	71.8
Waitemata	1138	15	1068	14.3	982	13.7	994	13.8	1043	13.6	1127	14.9	1054	13.6
Counties Manukau	1368	18	1240	16.6	1089	15.1	994	13.8	1136	14.8	1060	14.0	991	12.8
Northland	38	0.5	37	0.5	31	0.4	40	0.6	41	0.5	40	0.5	40	0.5
North Island Other	42	0.6	72	1.0	93	1.3	69	1.0	73	0.9	71	0.9	79	1.0
South Island	13	0.2	12	0.2	9	0.1	13	0.2	14	0.2	18	0.2	15	0.2
Overseas	5	0.1	7	0.1	5	0.1	2	0.03	6	0.1	6	0.1	5	0.1

	2010 n=7709		2011 n=7523	
DHB	**n**	**%**	**n**	**%**
Auckland	5392	69.9	5176	68.8
Waitemata	1110	14.4	1220	16.2
Counties Manukau	1082	14.0	1009	13.4
Northland	43	0.6	40	0.5
North Island Other	64	0.8	52	0.7
South Island	17	0.2	18	0.2
Overseas	1	0.01	6	0.1

3.2 Maternal Age

Table 135: Maternal age distribution (2000-2011)

		≤20 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
2000	7827	431	5.5	1091	13.9	2204	28.2	2670	34.1	1232	15.7	199	2.5
2002	7775	376	4.8	998	12.8	2018	26.0	2816	36.2	1335	17.2	232	3.0
2003	7611	372	4.9	959	12.6	1933	25.4	2738	36.0	1380	18.1	229	3.0
2004	7491	357	4.8	913	12.2	1809	24.1	2781	37.1	1384	18.5	247	3.3
2005	7194	330	4.6	828	11.5	1685	23.4	2702	37.6	1395	19.4	254	3.5
2006	7212	323	4.5	869	12.0	1735	24.1	2619	36.3	1421	19.7	245	3.4
2007	7695	386	5.0	1005	13.1	1798	23.4	2710	35.2	1514	19.7	282	3.7
2008	7589	394	5.2	963	12.7	1863	24.5	2519	33.2	1570	20.7	280	3.7
2009	7735	400	5.2	992	12.8	1916	24.8	2552	33.0	1600	20.7	275	3.6
2010	7709	335	4.3	943	12.2	1998	25.9	2516	32.6	1644	21.3	273	3.5
2011	7523	325	4.3	878	11.6	1918	25.4	2576	34.2	1534	20.3	292	3.9

Table 136: Maternal age and parity (2011)

	<=20 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	n=	325	n=	878	n=	1918	n=	2576	n=	1534	n=	292
	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	253	77.8	498	56.7	1090	56.8	1133	44.0	474	30.9	91	31.2
Multipara	72	22.2	380	43.3	828	43.2	1443	56.0	1060	69.1	201	68.8

3.3 Parity

Table 137: Time trends in nulliparity and multiparity (Data for 2001-2003 not available) **(1993-2011)**

	1993	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011
Number of births	8690	8812	9125	9157	8055	7492*	7501	7827	7491	7194	7212	7695	7589	7735	7709	7523
Nullipara	3649	3814	4037	4018	3591	3263	3262	3455	3597	3522	3499	3752	3623	3811	3650	3539
%	42.0	43.3	44.2	43.9	44.6	43.6	43.5	44.1	48.0	49.0	48.5	48.8	47.7	49.3	47.3	47.0
Multipara	5041	4998	5088	5139	4464	4229	4239	4372	3894	3672	3713	3943	3966	3924	4059	3984
%	58.0	56.7	55.8	56.1	55.4	56.4	56.5	55.9	52.0	51.0	51.5	51.2	52.3	50.7	52.7	52.9

*Does not include 39 BBA's

3.4 Ethnicity

Table 138: Prioritised ethnicity of women giving birth at National Women's (2011)
(for information on assigning ethnicity and prioritising ethnicity, see Appendix 12)

	2011	
	n=7523	
	n	%
New Zealand European	2712	36.0
Chinese	984	13.1
Other European	735	9.8
Maori	597	7.9
Indian	548	7.3
Samoan	380	5.1
Tongan	342	4.5
Other Asian	318	4.2
Southeast Asian	180	2.4
European NFD	116	1.5
Middle Eastern	121	1.6
Cook Island Maori	112	1.5
African	84	1.1
Niuean	95	1.3
Asian NFD	47	0.6
Fijian	59	0.8
Latin American	51	0.7
Other Pacific Island	26	0.3
Tokelauan	3	0.0
Other ethnicity	13	0.2

Table 139: Maternal ethnicity and age (2011)

	Total	NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
Age	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	7523	2712	36.0	597	7.9	1017	13.5	1529	20.3	548	7.3	851	11.3	269	3.6
<=20	325	54	16.6	99	30.5	128	39.4	10	3.1	8	2.5	12	3.7	14	4.3
21-25	878	157	17.9	166	18.9	234	26.7	158	18.0	63	7.2	42	4.8	58	6.6
26-30	1918	458	23.9	130	6.8	262	13.7	598	31.2	223	11.6	170	8.9	77	4.0
31-35	2576	1123	43.6	104	4.0	232	9.0	497	19.3	187	7.3	363	14.1	70	2.7
36-40	1534	795	51.8	79	5.1	124	8.1	213	13.9	56	3.7	228	14.9	39	2.5
41+	292	125	42.8	19	6.5	37	12.7	53	18.2	11	3.8	36	12.3	11	3.8

Table 140: Maternal ethnicity and parity (2011)

		NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
		n=2712		n=597		n=1017		n=1529		n=548		n=851		n=269	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Nullipara	3539	1287	47.5	226	37.9	289	28.4	835	54.6	305	55.7	470	55.2	127	47.2
Multipara	3984	1425	52.5	371	62.1	728	71.6	694	45.4	243	44.3	381	44.8	142	52.8

Table 141: Ethnicity of women birthing at NW (2004-2011)

	2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735		2010 n=7709		2011 n=7523	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
NZ European	2911	38.9	2802	38.9	3034	42.1	3161	41.1	2995	39.5	2967	38.4	2898	37.6	2712	36.0
Other European	548	7.3	674	9.4	682	9.5	695	9.0	713	9.4	707	9.1	856	11.1	851	11.3
Maori	509	6.8	545	7.6	597	8.3	641	8.3	641	8.4	670	8.7	579	7.5	597	7.9
Niuean	106	1.4	111	1.5	81	1.1	105	1.4	111	1.5	94	1.2	96	1.2	95	1.3
Cook Islander	140	1.9	106	1.5	113	1.6	157	2.0	137	1.8	135	1.7	112	1.5	112	1.5
Samoan	425	5.7	339	4.7	384	5.3	372	4.8	433	5.7	400	5.2	422	5.5	380	5.1
Tongan	355	4.7	315	4.4	346	4.8	347	4.5	349	4.6	394	5.1	378	4.9	342	4.5
Fijian	47	0.6	62	0.9	60	0.8	81	1.1	58	0.8	57	0.7	46	0.6	59	0.8
Other Pacific Islands	37	0.5	48	0.7	37	0.5	38	0.5	44	0.6	35	0.5	34	0.4	29	0.4
Chinese	871	11.6	769	10.7	707	9.8	881	11.4	874	11.5	995	12.9	950	12.3	984	13.1
Indian	540	7.2	545	7.6	520	7.2	521	6.8	505	6.7	520	6.7	539	7.0	548	7.3
Other Asian	404	5.4	354	4.9	408	5.7	473	6.1	478	6.3	440	5.7	526	6.8	545	7.2
Other	471	6.3	521	7.2	243	3.4	223	2.9	251	3.3	321	4.1	273	3.5	269	3.6
Not Stated	127	1.7	3		0		0	0.0	0	0.0	0	0.0	0	0.0	0	0

3.5 Smoking

Table 142: Smoking status at booking by prioritised ethnicity and maternal age (2011)

		Smoking at booking		Not currently smoking		Missing data	
	N	n	%	n	%	n	%
Ethnicity							
NZ European	2712	103	3.8	2608	96.2	1	0.0
Maori	597	206	34.5	391	65.5	0	0.0
Pacific	1017	137	13.5	880	86.5	0	0.0
Asian	1529	4	0.3	1525	99.7	0	0.0
Indian	548	5	0.9	543	99.1	0	0.0
Other European	851	30	3.5	821	96.5	0	0.0
Other	269	8	3.0	261	97.0	0	0.0
Age							
<=20	325	91	28.0	234	72.0	0	0.0
21-25	878	147	16.7	731	83.3	0	0.0
26-30	1918	104	5.4	1814	94.6	0	0.0
31-35	2576	93	3.6	2482	96.4	1	0.0
>=36	1826	58	3.2	1768	96.8	0	0.0

Table 143: Smoking status at booking by LMC at birth (2011)

	Independent midwife		Private Obstetrician		GP		NW Community		NW High Risk		Other DHB	
	n=3522		n=1672		n=56		n=1387		n=799		n=50	
	n	%	n	%	n	%	n	%	n	%	n	%
Smoking at booking	156	4.4	12	0.7	1	1.8	207	14.9	92	11.5	8	16.0
Not smoking	3366	95.6	1660	99.3	55	98.2	1179	85.0	0	0.0	42	84.0
Missing data	0	0.0	0	0.0	0	0.0	1	0.1	707	88.5	0	0.0

NW High Risk includes women booked under the Diabetes and Medical teams.

Table 144: Smoking at birth among women NOT seen at the ADHB Smokefree Pregnancy Services (2011)

	Mothers NOT seen by ADHB Smokefree Pregnancy Services					
	Total N=7305		Smoking at booking N=316		Not smoking at booking N=6988	
	n	%	n	%	n	%
Smoking at birth						
Yes	265	4	236	75	29	0.4
Not currently smoking	6984	96	78	25	6906	99
Missing	56	1	2	1	53	1

Missing smoking at booking n=1

3.6 Socio economic deprivation

Table 145: BMI by deprivation quintile and prioritised maternal ethnicity (2011)

				European			Maori			Pacific			Other Asian			Indian		
Deprivation quintile	Total	BMI>25		Total	BMI>25		Total	BMI>25		Total	BMI>25		Total	BMI>25		Total	BMI>25	
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
1	1305	304	23.3	887	202	22.8	43	23	53.5	24	19	79.2	275	32	11.6	40	13	32.5
2	1401	401	28.6	868	222	25.6	73	38	52.1	86	69	80.2	250	35	14.0	88	27	30.7
3	1446	438	30.3	719	202	28.1	85	48	56.5	103	76	73.8	357	55	15.4	139	43	30.9
4	1734	719	41.5	697	240	34.4	176	107	60.8	265	223	84.2	347	54	15.6	172	64	37.2
5	1449	766	52.9	317	123	38.8	175	114	65.1	503	423	84.1	286	45	15.7	101	31	30.7
Total	**7338**	**2631**	**35.9**	**3489**	**990**	**28.4**	**552**	**330**	**59.8**	**983**	**812**	**82.6**	**1515**	**221**	**14.6**	**540**	**178**	**33.0**

Table 146: Deprivation Quintile (NZ Dep06)by prioritised maternal ethnicity (2011)

	NZ European		Other European		Maori		Pacific		Other Asian		Indian		Other	
	n=2712		n=851		N=597		n=1017		n=1529		n=548		n=269	
Quintile	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
1	674	24.9	225	26.4	45	7.5	24	2.4	276	18.1	40	7.3	38	14.1
2	669	24.7	220	25.9	77	12.9	89	8.8	251	16.4	88	16.1	38	14.1
3	562	20.7	171	20.1	91	15.2	107	10.5	363	23.7	144	26.3	43	16.0
4	557	20.5	161	18.9	186	31.2	273	26.8	350	22.9	173	31.6	78	29.0
5	249	9.2	74	8.7	198	33.2	519	51.0	289	18.9	103	18.8	72	26.8

*1 woman missing

Table 147: Smoking and socio economic deprivation (NZ Dep06) (2011)

Deprivation decile	Total	Smoking at booking	
	7523	**n=**	**493**
	N	**n**	**%**
1	514	7	1.4
2	808	18	2.2
3	779	21	2.7
4	653	22	3.4
5	657	21	3.2
6	824	42	5.1
7	811	52	6.4
8	967	91	9.4
9	642	68	10.6
10	862	150	17.4

Table 148: Deprivation Quintile (NZ Dep06) and maternal age (2011)

	<=20		21-25		26-30		31-35		36-40		>40	
Deprivation quintile	n=325		n=878		n=1918		n=2576		n=1534		n=292	
	n	%	n	%	n	%	n	%	n	%	n	%
1	21	6.5	68	7.7	255	13.3	501	19.4	397	25.9	80	27.4
2	39	12.0	114	13.0	345	18.0	541	21.0	330	21.5	63	21.6
3	46	14.2	138	15.7	400	20.9	547	21.2	301	19.6	49	16.8
4	76	23.4	244	27.8	501	26.1	589	22.9	315	20.5	53	18.2
5	141	43.4	313	35.6	415	21.6	397	15.4	191	12.5	47	16.1

Table 149: LMC and socio economic deprivation (NZ Dep06) (2011)

Deprivation decile	Independent midwife		Private obstetrician		General practitioner		NW community		NW diabetes		NW medical		Other DHB		Unbooked	
	n=3522		n=1672		n=56		n=1387		n=422		n=377		n=50		n=37	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	215	6.1	231	13.8	3	5.4	27	1.9	16	3.8	19	5.0	2	4.0	1	2.7
2	345	9.8	334	20.0	3	5.4	65	4.7	23	5.5	31	8.2	6	12.0	1	2.7
3	372	10.6	246	14.7	9	16.1	94	6.8	26	6.2	28	7.4	2	4.0	2	5.4
4	308	8.7	179	10.7	6	10.7	96	6.9	24	5.7	32	8.5	5	10.0	3	8.1
5	364	10.3	166	9.9	2	3.6	64	4.6	22	5.2	34	9.0	5	10.0	0	0.0
6	406	11.5	164	9.8	6	10.7	164	11.8	45	10.7	29	7.7	5	10.0	5	13.5
7	398	11.3	137	8.2	11	19.6	146	10.5	65	15.4	47	12.5	6	12.0	1	2.7
8	478	13.6	96	5.7	6	10.7	228	16.4	86	20.4	61	16.2	4	8.0	8	21.6
9	273	7.8	65	3.9	4	7.1	184	13.3	67	15.9	37	9.8	5	10.0	7	18.9
10	363	10.3	54	3.2	6	10.7	319	23.0	48	11.4	54	14.3	9	18.0	9	24.3

*One woman missing

3.7 Lead Maternity Carer (LMC)

Table 150: LMC at birth (2011)

	N=7523	
	n	%
Independent Midwife	3522	46.8
Private Obstetrician	1672	22.2
General Practitioner	56	0.7
NW Community	1387	18.4
NW Diabetic	422	5.6
NW Medical	377	5.0
Other DHB	50	0.7
Unbooked	37	0.5

Table 151: LMC at birth and maternal age (2011)

	Total	<=20		21-25		26-30		31-35		36-40		>40	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Total	7523	325	4.3	878	11.7	1918	25.5	2576	34.2	1534	20.4	292	3.9
Independent Midwife	3522	119	3.4	422	12.0	1063	30.2	1280	36.3	569	16.2	69	2.0
Private Obstetrician	1672	5	0.3	38	2.3	261	15.6	677	40.5	570	34.1	121	7.2
General Practitioner	56	2	3.6	2	3.6	10	17.9	28	50.0	13	23.2	1	1.8
NW Community	1387	133	9.6	291	21.0	394	28.4	340	24.5	179	12.9	50	3.6
NW Diabetes	422	12	2.8	50	11.8	93	22.0	127	30.1	114	27.0	26	6.2
NW Medical	377	39	10.3	55	14.6	77	20.4	107	28.4	76	20.2	23	6.1
Other DHB	50	11	22.0	7	14.0	8	16.0	13	26.0	10	20.0	1	2.0
Unbooked	37	4	10.8	13	35.1	12	32.4	4	10.8	3	8.1	1	2.7

Table 152: LMC at birth and parity (2011)

	Total	Nullipara		Multipara	
	N	n	%	n	%
Total	7523	3539	47.0	3984	53.0
Independent Midwife	3522	1826	51.8	1696	48.2
Private Obstetrician	1672	817	48.9	855	51.1
General Practitioner	56	31	55.4	25	44.6
NW Community	1387	527	38.0	860	62.0
NW Diabetes	422	135	32.0	287	68.0
NW Medical	377	163	43.2	214	56.8
Other DHB	50	29	58.0	21	42.0
Unbooked	37	11	29.7	26	70.3

Table 153: LMC at birth and prioritised maternal ethnicity (2011)

	Total	NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7523	2712	36.0	597	7.9	1017	13.5	1529	20.3	548	7.3	851	11.3	269	3.6
Independent Midwife	3522	1236	35.1	263	7.5	321	9.1	923	26.2	237	6.7	443	12.6	99	2.8
Private Obstetrician	1672	1031	61.7	43	2.6	20	1.2	218	13.0	77	4.6	249	14.9	34	2.0
General Practitioner	56	17	30.4	1	1.8	6	10.7	25	44.6	2	3.6	2	3.6	3	5.4
NW Community	1387	192	13.8	170	12.3	457	32.9	248	17.9	140	10.1	86	6.2	94	6.8
NW Diabetes	422	74	17.5	39	9.2	124	29.4	72	17.1	68	16.1	24	5.7	21	5.0
NW Medical	377	149	39.5	55	14.6	65	17.2	35	9.3	22	5.8	37	9.8	14	3.7
Other DHB	50	10	20.0	14	28.0	8	16.0	7	14.0	0	0.0	9	18.0	2	4.0
Unbooked	37	3	8.1	12	32.4	16	43.2	1	2.7	2	5.4	1	2.7	2	5.4

3.8 Standard primipara

Table 154: Demographic characteristics of standard and non-standard primipara (2011)

	Total primipara	Standard primipara		Non-standard primipara	
	N	n	%	n	%
Total	**3539**	**1129**	**31.9**	**2410**	**68.1**
Age					
<=20	253	27	10.7	226	89.3
21-25	498	223	44.8	275	55.2
26-30	1090	514	47.2	576	52.8
31-35	1133	365	32.2	768	67.8
36-40	474	0	0.0	474	100.0
>40	91	0	0.0	91	100.0
Ethnicity (prioritised)					
NZ European	1287	339	26.3	948	73.7
Maori	226	60	26.5	166	73.5
Pacific	289	76	26.3	213	73.7
Asian	835	389	46.6	446	53.4
Indian	305	100	32.8	205	67.2
Other European	470	122	26.0	348	74.0
Other	127	43	33.9	84	66.1
LMC at Birth					
Independent Midwife	1826	694	38.0	1132	62.0
Private Obstetrician	817	234	28.6	583	71.4
General Practitioner	31	9	29.0	22	71.0
NW Community	527	171	32.4	356	67.6
NW Diabetes	135	0	0.0	135	100.0
NW Medical	163	17	10.4	146	89.6
Other DHB	29	0	0.0	29	100.0
Unbooked	11	4	36.4	7	63.6
Smoking					
Smoking at booking	171	41	24.0	130	76.0
No or not smoking in last month	3367	1088	32.3	2279	67.7
Missing	1	0	0.0	1	100.0

APPENDIX 4. ANTENATAL COMPLICATIONS

4.1 Preterm birth

Table 155: Preterm birth and maternal demographic characteristics (2011)

	Total	Total preterm birth		Iatrogenic preterm		Spontaneous preterm	
	N	n	%	n	%	n	%
Total	7523	684	9.1	405	5.4	279	3.7
Age							
<=20	325	59	18.2	27	8.3	32	9.8
21-25	878	72	8.2	35	4.0	37	4.2
26-30	1918	139	7.2	73	3.8	66	3.4
31-35	2576	222	8.6	133	5.2	89	3.5
36-40	1534	154	10.0	108	7.0	46	3.0
41+	292	38	13.0	29	9.9	9	3.1
Ethnicity							
NZ European	2712	247	9.1	149	5.5	98	3.6
Maori	597	87	14.6	53	8.9	34	5.7
Pacific	1017	89	8.8	50	4.9	39	3.8
Asian	1529	104	6.8	57	3.7	47	3.1
Indian	548	58	10.6	34	6.2	24	4.4
Other European	851	76	8.9	48	5.6	28	3.3
Other	269	23	8.6	14	5.2	9	3.3
Parity							
Nulliparous	3539	344	9.7	197	5.6	147	4.2
Multiparous	3984	340	8.5	208	5.2	132	3.3
Plurality							
Singleton	7360	585	7.9	339	4.6	246	3.3
Twins	159	95	59.7	64	40.3	31	19.5
Triplets	4	4	100.0	2	50.0	2	50.0
Smoking at booking							
Currently smoking	493	72	14.6	42	8.5	30	6.1
No or not in past month	7029	612	8.7	363	5.2	249	3.5
Unknown	1	0	0.0	0	0.0	0	0.0
BMI							
<19	439	37	8.4	18	4.1	19	4.3
19-25	4268	318	7.5	173	4.1	145	3.4
26-30	1370	145	10.6	102	7.4	43	3.1
31-35	680	73	10.7	49	7.2	24	3.5
>35	581	48	8.3	32	5.5	16	2.8
Missing	185	63	34.1	31	16.8	32	17.3
Deprivation quintile (NZ Dep 06)							
1	1322	101	7.6	60	4.5	41	3.1
2	1432	117	8.2	70	4.9	47	3.3
3	1481	145	9.8	85	5.7	60	4.1
4	1778	174	9.8	100	5.6	74	4.2
5	1504	145	9.6	89	5.9	56	3.7

4.2 Diabetes

Table 156: Women with diabetes birthing at NW at or beyond 20 weeks gestation (1991-2011)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Type I	23	29	19	12	19	15	14	21	26	22	26
Type 2	26	19	21	26	32	35	22	23	28	32	37
GDM	125	140	197	160	221	245	247	221	181	186	161
Total	174	188	237	198	272	295	283	265	235	240	224

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Type I	21	20	25	31	33	26	31	47	30	33
Type 2	49	40	47	52	57	54	63	71	55	70
GDM	251	352	343	304	286	331	457	480	545	821
Total	321	412	415	387	376	411	551	598	630	924

Table 157: Perinatal deaths (1993 – 2011) among births complicated by diabetes

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

	2004	2005	2006	2007	2008	2009	2010	2011
Total number of perinatal related losses	0	2	8	9	1	4	10	5
Perinatal related loss rate /1000 births	0	5	21	22	2	7	16	5

Table 158: DHB of domicile of women with diabetes birthing at NW (2011

	Type 1		Type 2		GDM		No Diabetes	
	n=	33	n=	70	n=	821	n=	6599
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	14	42.4	37	52.9	435	53.0	4690	71.1
Waitemata	16	48.5	30	42.9	300	36.5	874	13.2
Counties Manukau	2	6.1	3	4.3	80	9.7	924	14.0
Other	1	3.0	0		6	0.7	111	1.7

Table 159: Demographic characteristics of women with diabetes (2011)

		Type 1		Type 2		GDM		No Diabetes	
		n=33		n=70		n=821		n=6599	
	N	n	%	n	%	n	%	n	%
Age									
<=20	325	3	0.9	2	0.6	15	4.6	305	93.8
21-25	878	4	0.5	8	0.9	73	8.3	793	90.3
26-30	1918	11	0.6	17	0.9	212	11.1	1678	87.5
31-35	2576	9	0.3	17	0.7	274	10.6	2276	88.4
36-40	1534	6	0.4	23	1.5	194	12.6	1311	85.5
41+	292	0	0.0	3	1.0	53	18.2	236	80.8
Ethnicity									
NZ European	2712	23	0.8	7	0.3	148	5.5	2534	93.4
Maori	597	2	0.3	6	1.0	61	10.2	528	88.4
Pacific	1017	1	0.1	33	3.2	171	16.8	812	79.8
Asian	1529	1	0.1	9	0.6	226	14.8	1293	84.6
Indian	548	1	0.2	10	1.8	122	22.3	415	75.7
Other European	851	5	0.6	2	0.2	59	6.9	785	92.2
Other	269	0	0.0	3	1.1	34	12.6	232	86.2
BMI									
<19	439	1	0.2	0	0.0	22	5.0	416	94.8
19-25	4268	20	0.5	6	0.1	300	7.0	3942	92.4
26-30	1370	8	0.6	14	1.0	195	14.2	1153	84.2
31-35	680	2	0.3	23	3.4	138	20.3	517	76.0
>35	581	2	0.3	27	4.6	158	27.2	394	67.8
missing	185	0	0.0	0	0.0	8	4.3	177	95.7
Smoking									
Smoking at booking	493	3	0.6	7	1.4	47	9.5	436	88.4
Not currently smoking	7029	30	0.4	63	0.9	774	11.0	6162	87.7
Missing	1	0	0.0	0	0.0	0	0.0	1	100.0

Table 160: Maternal outcomes among women with diabetes (2011)

	Type 1		Type 2		GDM		Postnatally Diagnosed Type 2		No Diabetes	
	n=34		n=70		n=808		n=12		n=6599	
	n	%	n	%	n	%	n	%	n	%
Induction of labour	21	61.8	42	60.0	492	60.9	3	25.0	1905	28.9
Mode of Birth										
Spontaneous vaginal birth	10	29.4	31	44.3	427	52.8	4	33.3	3771	57.1
Ventouse	4	11.8	1	1.4	57	7.1	0	0.0	451	6.8
Forceps	1	2.9	2	2.9	33	4.1	1	8.3	282	4.3
CS emergency	8	23.5	20	28.6	151	18.7	5	41.7	1081	16.4
CS elective	11	32.4	16	22.9	140	17.3	2	16.7	1014	15.4
Gestationat birth										
<32 weeks	0	0.0	4	5.7	10	1.2	1	8.3	175	2.7
<37 weeks	7	20.6	13	18.6	88	10.9	5	41.7	571	8.7
PPH >=500mls	19	55.9	38	54.3	330	40.8	7	58.3	2280	34.6
PPH >=1000 mls	7	20.6	10	14.3	86	10.6	2	16.7	554	8.4
Postpartum transfusion	2	5.9	3	4.3	20	2.5	0	0.0	185	2.8

4.3 Antepartum haemorrhage

Table 161: Characteristics of pregnancies complicated by antepartum haemorrhage (2011)

		Placenta praevia		Placental abruption		APH uncertain origin		No APH	
		n=	60	n=	54	n=	341	n=	7066
	Total	n	%	n	%	n	%	n	%
Maternal age									
<=20	325	1	0.3	3	0.9	20	6.2	301	92.6
21-25	878	1	0.1	3	0.3	51	5.8	823	93.7
26-30	1918	9	0.5	17	0.9	89	4.6	1803	94.0
31-35	2576	21	0.8	17	0.7	99	3.8	2439	94.7
36-40	1534	24	1.6	12	0.8	63	4.1	1434	93.5
>40	292	4	1.4	2	0.7	19	6.5	266	91.1
Parity									
Nulliparous	3539	26	0.7	26	0.7	154	4.4	3332	94.2
Multip previous CS	1203	16	1.3	12	1.0	60	5.0	1114	92.6
Mullip no previous CS	2781	18	0.6	16	0.6	127	4.6	2620	94.2
Smoking status at booking									
Currently smoking	493	5	1.0	10	2.0	40	8.1	438	88.8
Not currently smoking	7029	55	0.8	44	0.6	301	4.3	6627	94.3
Unknown	1	0	0.0	0	0.0	0	0.0	1	100.0
BMI									
<19	439	4	0.9	0	0.0	22	5.0	413	94.1
19-25	4268	36	0.8	32	0.7	174	4.1	4024	94.3
26-30	1370	13	0.9	6	0.4	56	4.1	1295	94.5
31-35	680	6	0.9	2	0.3	37	5.4	635	93.4
>35	581	0	0.0	9	1.5	32	5.5	540	92.9
Missing data	185	1	0.5	5	2.7	20	10.8	159	85.9
Hypertensive disease									
Gestational hypertension	254	0	0	1	0.4	11	4.3	242	95.3
Chronic hypertension	153	2	1.3	1	0.7	12	7.8	138	90.2
Chronic hypertension with superimposed pre-eclampsia	17	0	0.0	1	5.9	0	0.0	16	94.1
Pre-eclampsia	178	1	0.6	2	1.1	7	3.9	168	94.4
Nil	6921	57	0.8	49	0.7	311	4.5	6502	93.9

4.4 Hypertensive disease

Table 162: Demographic characteristics of women with hypertensive disease (2011)

		Gestational hypertension n=254		Chronic hypertension n=153		Superimposed preeclampsia n=17		Preeclampsia n=178		Normotensive n=6921	
	Total	n	%	n	%	n	%	n	%	n	%
Ethnicity (prioritised)											
NZ European	2712	114	4.2	73	2.7	6	0.2	60	2.2	2459	90.7
Maori	597	27	4.5	13	2.2	2	0.3	20	3.4	535	89.6
Pacific	1017	41	4.0	19	1.9	5	0.5	41	4.0	911	89.6
Asian	1529	20	1.3	14	0.9	2	0.1	25	1.6	1468	96.0
Indian	548	18	3.3	6	1.1	1	0.2	9	1.6	514	93.8
Other European	851	25	2.9	21	2.5	1	0.1	18	2.1	786	92.4
Other	269	9	3.3	7	2.6	0	0.0	5	1.9	248	92.2
Maternal age (nullipara)											
<=20	253	12	4.7	2	0.8	0	0.0	17	6.7	222	87.7
21-25	498	16	3.2	1	0.2	0	0.0	17	3.4	464	93.2
26-30	1090	46	4.2	15	1.4	1	0.1	27	2.5	1001	91.8
31-35	1133	52	4.6	24	2.1	3	0.3	28	2.5	1026	90.6
36-40	474	24	5.1	15	3.2	1	0.2	24	5.1	410	86.5
41+	91	4	4.4	3	3.3	2	2.2	3	3.3	79	86.8
Maternal age (multipara)											
<=20	72	2	2.8	0	0.0	0	0.0	3	4.2	67	93.1
21-25	380	7	1.8	5	1.3	1	0.3	6	1.6	361	95.0
26-30	828	27	3.3	14	1.7	1	0.1	10	1.2	776	93.7
31-35	1443	29	2.0	30	2.1	5	0.3	17	1.2	1362	94.4
36-40	1060	30	2.8	34	3.2	2	0.2	21	2.0	973	91.8
41+	201	5	2.5	10	5.0	1	0.5	5	2.5	180	89.6
Smoking											
Currently smoking	493	16	3.2	11	2.2	1	0.2	8	1.6	457	92.7
Not currently smoking	7029	238	3.4	142	2.0	16	0.2	170	2.4	6463	91.9
Unknown	1	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
BMI											
<19	439	3	0.7	2	0.5	0	0.0	6	1.4	428	97.5
19-25	4268	102	2.4	55	1.3	2	0.0	62	1.5	4047	94.8
26-30	1370	67	4.9	34	2.5	5	0.4	41	3.0	1223	89.3
31-35	680	42	6.2	23	3.4	2	0.3	30	4.4	583	85.7
36-40	325	19	5.8	18	5.5	5	1.5	14	4.3	269	82.8
41-45	160	12	7.5	9	5.6	2	1.3	3	1.9	134	83.8
>45	96	7	7.3	8	8.3	1	1.0	5	5.2	75	78.1
Unknown	185	2	1.1	4	2.2	0	0.0	17	9.2	162	87.6

Table 163: Onset of birth among women with hypertensive disease (2011)

	Gestational hypertension		Chronic hypertension		Superimposed preeclampsia		Preeclampsia		Normotensive	
	n=	254	n=	153	n=	17	n=	178	n=	6921
	n	%	n	%	n	%	n	%	n	%
Spontaneous onset of labour	56	22.0	34	22.2	0	0.0	19	10.7	3519	50.8
Induced labour	154	60.6	78	51.0	6	35.3	104	58.4	2121	30.6
CS emergency before onset of labour	14	5.5	4	2.6	7	41.2	37	20.8	187	2.7
CS elective	30	11.8	37	24.2	4	23.5	18	10.1	1094	15.8

4.5 BMI

Table 164: Demographic characteristics and BMI (2011) (excludes missing data)

	Total	<19		19-22		23-25		26-30		31-35		36-40		41-45		>45	
	7338	N=439		N=2568		N=1700		N=1370		N=680		N=325		N=160		N=96	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity																	
NZ European	2667	130	4.9	1042	39.1	718	26.9	506	19.0	177	6.6	55	2.1	29	1.1	10	0.4
Maori	552	8	1.4	106	19.2	108	19.6	143	25.9	102	18.5	43	7.8	24	4.3	18	3.3
Pacific	983	5	0.5	54	5.5	112	11.4	220	22.4	247	25.1	183	18.6	100	10.2	62	6.3
Asian	1515	209	13.8	725	47.9	360	23.8	165	10.9	48	3.2	6	0.4	1	0.1	14	0.9
Indian	540	31	5.7	185	34.3	146	27.0	133	24.6	31	5.7	12	2.2	1	0.2	8	1.5
Other European	822	48	5.8	369	44.9	192	23.4	137	16.7	49	6.0	21	2.6	2	0.2	29	3.5
Other	259	8	3.1	87	33.6	64	24.7	66	25.5	26	10.0	5	1.9	3	1.2	10	3.9
Age																	
<=20	297	13	4.4	79	26.6	61	20.5	79	26.6	41	13.8	14	4.7	4	1.3	6	2.0
21-25	842	61	7.2	224	26.6	165	19.6	167	19.8	114	13.5	70	8.3	26	3.1	15	1.8
26-30	1880	160	8.5	674	35.9	411	21.9	317	16.9	152	8.1	98	5.2	50	2.7	18	1.0
31-35	2527	140	5.5	993	39.3	603	23.9	425	16.8	206	8.2	80	3.2	53	2.1	27	1.1
36-40	1505	62	4.1	519	34.5	381	25.3	320	21.3	127	8.4	52	3.5	22	1.5	22	1.5
>40	287	3	1.0	79	27.5	79	27.5	62	21.6	40	13.9	11	3.8	5	1.7	8	2.8
Parity																	
Nullipara	3434	251	7.3	1372	40.0	839	24.4	596	17.4	225	6.6	103	3.0	30	0.9	18	0.5
Multipara	3904	188	4.8	1196	30.6	861	22.1	774	19.8	455	11.7	222	5.7	130	3.3	78	2.0
Smoking status at booking																	
Smoking	451	11	2.4	80	17.7	82	18.2	110	24.4	77	17.1	41	9.1	27	6.0	23	5.1
Not currently smoking	6886	428	6.2	2487	36.1	1618	23.5	1260	18.3	603	8.8	284	4.1	133	1.9	73	1.1

*Smoking data missing for 1 woman

Table 165: LMC at birth and BMI (2011)

	Total	<19		19-22		23-25		26-30		31-35		36-40		41-45		>45	
	7338	n=439		n=2568		n=1700		n=1370		n=680		n=325		n=160		n=96	
	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
IMW	3478	251	7.2	1292	37.1	867	24.9	613	17.6	244	7.0	126	3.6	60	1.7	25	0.7
Pvt Obst	1649	128	7.8	776	47.1	400	24.3	238	14.4	82	5.0	16	1.0	6	0.4	3	0.2
NW Comm	1347	36	2.7	348	25.8	271	20.1	307	22.8	194	14.4	105	7.8	57	4.2	29	2.2
NW Diabetes	419	5	1.2	50	11.9	59	14.1	103	24.6	97	23.2	52	12.4	25	6.0	28	6.7
NW Medical	349	13	3.7	75	21.5	81	23.2	90	25.8	50	14.3	22	6.3	10	2.9	8	2.3
GP	55	4	7.3	17	30.9	15	27.3	12	21.8	6	10.9	1	1.8	0	0.0	0	0.0
Other DHB	22	2	9.1	5	22.7	3	13.6	2	9.1	5	22.7	2	9.1	0	0.0	3	13.6
Unbooked	17	0	0.0	4	23.5	4	23.5	4	23.5	2	11.8	1	5.9	2	11.8	0	0.0

Table 166: Pregnancy complications and BMI (2011

	BMI<19		BMI 19-22		BMI 23-25		BMI 26-30		BMI 31-35		BMI 36-40		BMI >40	
	n=439		n=2568		n=1700		n=1370		n=680		n=325		n=256	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Diabetes														
GDM	22	5.0	157	6.1	143	8.4	195	14.2	138	20.3	84	25.9	74	28.9
Type 1	1	0.2	9	0.4	11	0.7	8	0.6	2	0.3	2	0.6	0	
Type 2	0		2	0.1	4	0.2	14	1.0	23	3.4	10	3.1	17	6.6
Non diabetes*	416	94.8	2400	93.5	1542	90.7	1153	84.2	517	76.0	229	70.5	165	64.5
Hypertension														
Chronic hypertension	2	0.5	33	1.3	22	1.3	34	2.5	23	3.4	18	5.5	17	6.6
Gestational hypertension	3	0.7	54	2.1	47	2.8	67	4.9	42	6.2	19	5.8	19	7.4
Pre-eclampsia	6	1.4	32	1.3	31	1.8	41	3.0	30	4.4	14	4.3	8	3.1
Superimposed pre-eclampsia	0	0.0	2	0.1	0	0.0	5	0.4	2	0.3	5	1.5	3	1.2
Nil	428	97.5	2447	95.3	1600	94.1	1223	89.3	583	85.7	269	82.8	209	81.6

* includes women who have not had diabetes screening in pregnancy

Table 167: Postpartum haemorrhage associated with spontaneous vaginal birth by BMI (2011)

	Total		BMI<19		BMI 19-22		BMI 23-25		BMI 26-30		BMI 31-35		BMI 36-40		BMI>40	
	n=	4133	n=	275	n=	1419	n=	912	n=	772	n=	399	n=	196	n=	160
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
PPH>=1000mls	211	5.1	7	2.5	50	3.5	35	3.8	46	6.0	35	8.8	20	10.2	18	11.3
PPH>=1500mls	104	2.5	1	0.4	31	2.2	17	1.9	15	1.9	18	4.5	12	6.1	10	6.3

Table 168: Postpartum haemorrhage associated with Caesarean section by BMI (2011)

	Total		BMI<19		BMI 19-22		BMI 23-25		BMI 26-30		BMI 31-35		BMI 36-40		BMI>40	
	n=	2384	n=	102	n=	813	n=	572	n=	477	n=	229	n=	106	n=	160
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
PPH>=1000mls	342	14.3	9	8.8	100	12.3	70	12.2	81	17.0	37	16.2	21	19.8	24	15.0
PPH>=1500mls	124	5.2	4	3.9	34	4.2	27	4.7	28	5.9	16	7.0	5	4.7	10	6.3

Table 169: Neonatal outcomes and BMI (2011)

	BMI<19		BMI 19-22		BMI 23-25		BMI 26-30		BMI 31-35		BMI 36-40		BMI>40	
	n=	445	n=	2620	n=	1730	n=	1414	n=	700	n=	328	n=	261
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Preterm	42	9.4	220	8.4	142	8.2	177	12.5	84	12.0	31	9.5	21	8.0
Term	403	90.6	2400	91.6	1588	91.8	1237	87.5	616	88.0	297	90.5	240	92.0
SGA	47	10.6	275	10.5	203	11.7	231	16.3	89	12.7	62	18.9	41	15.7
≥2 days NICU	41	9.2	201	7.7	145	8.4	164	11.6	90	12.9	45	13.7	29	11.1
Perinatal deaths (n/1000)	6	13.5	29	11.1	33	19.1	33	23.3	13	18.6	2	6.1	1	3.8

Table 170: Maternal interventions and birth outcomes by BMI (2011)

	BMI<19		BMI 19-22		BMI 23-25		BMI 26-30		BMI 31-35		BMI 36-40		BMI >40	
	n=439		n=2568		n=1700		n=1370		n=680		n=325		n=256	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Onset of birth														
Spontaneous labour	274	62.4	1337	52.1	795	46.8	600	43.8	297	43.7	132	40.6	87	34.0
Induced labour	105	23.9	741	28.9	570	33.5	504	36.8	258	37.9	128	39.4	117	45.7
Emergency CS before labour	12	2.7	57	2.2	63	3.7	43	3.1	30	4.4	14	4.3	8	3.1
Elective CS	48	10.9	433	16.9	272	16.0	223	16.3	95	14.0	51	15.7	44	17.2
Mode of birth														
Spontaneous vaginal birth	275	62.6	1419	55.3	912	53.6	772	56.4	399	58.7	196	60.3	160	62.5
Operative vaginal	62	14.1	336	13.1	216	12.7	121	8.8	52	7.6	23	7.1	11	4.3
Elective CS	48	10.9	433	16.9	272	16.0	223	16.3	95	14.0	51	15.7	44	17.2
Emergency CS in labour	38	8.7	270	10.5	199	11.7	169	12.3	86	12.6	28	8.6	24	9.4
Emergency CS not in labour	16	3.6	110	4.3	101	5.9	85	6.2	48	7.1	27	8.3	17	6.6

APPENDIX 5. LABOUR AND BIRTH

5.1 Induction of labour

Table 171: Induction of labour rates (1993-2011) No data available on induction rates for 2001-2003

	1993	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011
Total Births	8690	8812	9125	9157	8055	7531*	7501	7827	7491	7194	7212	7695	7589	7735	7709	7523
Women Induced	2049	2033	2366	2225	2135	2053	1910	2106	1922	1894	1776	1906	2203	2238	2214	5314
Incidence (%)	**23.6**	**23.1**	**25.9**	**24.3**	**26.5**	**27.3**	**25.5**	**26.9**	**25.7**	**26.3**	**24.6**	**24.8**	**29.0**	**28.9**	**28.7**	**32.7**
Total Nullipara	3649	3814	4037	4018	3591	3263	3262	3455	3597	3522	3499	3752	3623	3811	3650	3539
Nullipara Induced	931	1046	1191	1112	1104	992	923	1049	1064	1042	940	1047	1207	1260	1226	1330
Incidence (%)	**25.5**	**27.4**	**29.5**	**27.7**	**30.7**	**30.4**	**28.3**	**30.4**	**29.6**	**29.6**	**26.9**	**27.9**	**33.3**	**33.1**	**33.5**	**37.6**
Total Multipara	5041	4998	5088	5139	4464	4229	4239	4372	3894	3672	3713	3943	3966	3924	4059	3984
Multipara Induced	1118	987	1175	1113	1031	1061	987	1057	858	852	836	859	996	978	988	1133
Incidence (%)	**22.2**	**19.7**	**23.1**	**21.7**	**23.1**	**25.1**	**23.3**	**24.2**	**22.0**	**23.2**	**22.5**	**21.8**	**25.1**	**24.9**	**24.3**	**28.4**

*Does not include 39 BBA's

Table 172: Indication for induction by gestation (2011)

	Preterm		Term	
	n=	684	n=	6839
	n	%	n	%
Total	198	28.9	2265	33.1
Other	7	1.0	99	1.4
APH	3	0.4	11	0.2
Maternal Request	1	0.1	19	0.3
Poor Obstetric History	0	0.0	22	0.3
Multiple Pregnancy	8	1.2	8	0.1
Fetal wellbeing	4	0.6	76	1.1
PPROM	65	9.5	0	0.0
IUD/Fetal Anomaly	52	7.6	14	0.2
Maternal Medical Complications	10	1.5	131	1.9
Maternal Age	0	0.0	72	1.1
Small for Gestational Age	13	1.9	191	2.8
Prolonged latent phase	3	0.4	354	5.2
Diabetes	12	1.8	422	6.2
Hypertension	20	2.9	163	2.4
Post Dates	0	0.0	321	4.7
TermPROM	0	0.0	362	5.3

Table 173: Indication for induction by parity (term births) (2011)

	Multipara n= 3644		Nullipara n= 3195	
	n	%	n	%
Total	1035	28.4	1230	38.5
Other	59	1.6	40	1.3
APH	4	0.1	7	0.2
IUD/Fetal Anomaly	6	0.2	8	0.3
Multiple Pregnancy	4	0.1	4	0.1
Poor Obstetric History	21	0.6	1	0.0
Maternal Request	16	0.4	3	0.1
Fetal wellbeing	30	0.8	46	1.4
Maternal Age	44	1.2	28	0.9
Maternal Medical Complications	81	2.2	50	1.6
Small for Gestational Age	94	2.6	97	3.0
Diabetes	234	6.4	188	5.9
hypertension	52	1.4	111	3.5
Prolonged latent phase	150	4.1	204	6.4
Post Dates	127	3.5	194	6.1
TermPROM	113	3.1	249	7.8

Table 174: Rates of induction by age and ethnicity (prioritised) among term nullipara and multipara (excluding previous Caesarean) (2011)

	Term Nullipara	Induction of labour		Term Multipara no prev CS	Induction of labour	
	N	n	%	N	n	%
Total	**3195**	**1230**	**38.5**	**2555**	**894**	**35.0**
Age						
<=25	663	245	37.0	337	89	26.4
26-30	1010	379	37.5	584	189	32.4
31-35	1032	416	40.3	907	300	33.1
>=35	490	190	38.8	727	316	43.5
Ethnicity						
NZ European	517	457	88.4	865	349	40.3
Maori	191	68	35.6	248	80	32.3
Pacific	266	107	40.2	524	183	34.9
Asian	778	260	33.4	460	118	25.7
Indian	269	128	47.6	139	53	38.1
Other European	421	159	37.8	230	74	32.2
Other	111	51	45.9	89	37	41.6

5.2 Outcomes following induction

Table 175: Mode of birth at term by onset of birth and parity (excluding women with prior CS) among intended vaginal births (2011)

	Nullipara				Multipara			
	Spontaneous labour n=1580		Induced labour n=1230		Spontaneous labour n=1516		Induced labour n=894	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB	975	61.7	539	43.8	1413	93.2	793	88.7
Operative vaginal	341	21.6	265	21.5	48	3.2	50	5.6
CS emergency in labour	264	16.7	305	24.8	55	3.6	31	3.5
CS emergency not in labour*	0	0.0	121	9.8	0	0.0	20	2.2
Epidural	910	57.6	1043	84.8	322	21.2	437	48.9

*failed induction rate

Table 176: Mode of birth at term among nullipara by indication for induction (2011)

	Post dates n=194		Term PROM n=249		Hypertension n=111		Prolonged latent phase n=204		Diabetes n=188		SGA n=97		Other n=187	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	63	32.5	127	51.0	43	38.7	81	39.7	96	51.1	55	56.7	74	39.6
Operative vaginal	47	24.2	55	22.1	25	22.5	49	24.0	39	20.7	13	13.4	37	19.8
CS emergency in labour	60	30.9	56	22.5	27	24.3	61	29.9	35	18.6	12	12.4	54	28.9
CS emergency not in labour*	24	12.4	11	4.4	16	14.4	13	6.4	18	9.6	17	17.5	22	11.8
Epidural	50	25.8	43	17.3	18	16.2	70	34.3	72	38.3	42	43.3	142	75.9

*failed induction rate

Table 177: Mode of birth at term among multipara (excluding previous Caesarean) women by indication for induction (2011)

	Post dates n=110		TermProm n=95		Hypertension n=43		Prolonged latent phase n=127		Diabetes n=198		SGA n=86		Other n=235	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	99	90.0	87	91.6	39	90.7	113	89.0	176	88.9	77	89.5	202	86.0
Operative vaginal	5	4.5	5	5.3	2	4.7	7	5.5	8	4.0	4	4.7	19	8.1
CS emergency in labour	2	1.8	3	3.2	0	0.0	7	5.5	11	5.6	1	1.2	7	3.0
CS emergency not in labour	4	3.6	0	0.0	2	4.7	0	0.0	3	1.5	4	4.7	7	3.0
Epidural	50	45.5	43	45.3	18	41.9	70	55.1	72	36.4	42	48.8	142	60.4

*failed induction rate

5.3 Use of Syntocinon

Table 178: Dilatation at start of syntocinon infusion among labouring women by induction status (2011)

	Induced labour n=1692		Spontaneous labour n=785	
Dilatation	n	%	n	%
0	79	4.7	0	0
1	191	11.3	0	0
2	434	25.7	0	0
3	485	28.7	84	10.7
4	159	9.4	163	20.8
5	63	3.7	110	14.0
6	31	1.8	81	10.3
7	12	0.7	47	6.0
8	17	1.0	52	6.6
9	14	0.8	53	6.8
10	35	2.1	93	11.8
Missing	172	10.2	102	13.0

5.4 Mode of birth

Table 179: Mode of birth by parity and previous Caesarean section status (2011)

	Nullipara preterm n=344		Nullipara term n=3195		Multipara no prev CS preterm n=226		Multipara no prev CS term n=2555		Multipara prev CS preterm n=114		Multipara prev CS term n=1089	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	140	40.7	1511	47.3	117	51.8	2198	86.0	25	21.9	192	17.6
Vaginal breech	20	5.8	3	0.1	20	8.8	8	0.3	9	7.9	0	0.0
Operative vaginal birth	37	10.8	606	19.0	8	3.5	98	3.8	10	8.8	73	6.7
Ventouse	15	4.4	381	11.9	2	0.9	70	2.7	1	0.9	44	4.0
Forceps	22	6.4	225	7.0	6	2.7	28	1.1	9	7.9	29	2.7
Caesarean section	147	42.7	1075	33.6	81	35.8	251	9.8	70	61.4	824	75.7
Emergency	114	33.1	755	23.6	56	24.8	127	5.0	41	36.0	172	15.8
Elective	33	9.6	320	10.0	25	11.1	124	4.9	29	25.4	652	59.9

Table 180: LMC by parity and previous Caesarean section status (2011)

	IMW n=3522		Pvt Obstetrician n=1672		GP n=56		NW n=2186		Other DHB n=50		Unbooked n=37	
	n	%	n	%	n	%	n	%	n	%	n	%
Primipara	1826	51.8	817	48.9	31	55.4	825	37.7	29	58.0	11	29.7
Standard primip	694	19.7	234	14.0	9	16.1	188	8.6	0	0.0	4	10.8
Multipara	1696	48.2	855	51.1	25	44.6	1361	62.3	21	42.0	26	70.3
Previous CS	342	9.7	393	23.5	8	14.3	450	20.6	7	14.0	3	8.1
No prev CS	1354	38.4	462	27.6	17	30.4	911	41.7	14	28.0	23	62.2

Table 181: Mode of birth by LMC at birth (term nullipara) (2011)

	IMW n=1715		PVT Obstetrician n=734		GP n=29		NW n=703		Other DHB n=5		Unbooked n=7	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	925	53.9	188	25.6	17	58.6	371	52.8	2	40.0	6	85.7
Vaginal breech	3	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Forceps	126	7.3	57	7.8	1	3.4	41	5.8	0	0.0	0	0.0
Ventouse	201	11.7	90	12.3	3	10.3	86	12.2	0	0.0	1	14.3
Cs elective	67	3.9	203	27.7	1	3.4	49	7.0	0	0.0	0	0.0
Cs emergency	393	22.9	196	26.7	7	24.1	156	22.2	3	60.0	0	0.0

Table 182: Mode of birth at term by LMC at birth (standard primipara) (2011)

	IMW n=694		PVT Obstetrician n=234		GP n=9		NW n=187		Unbooked n=4	
	n	%	n	%	n	%	n	%	n	%
SVD	442	63.7	88	37.6	8	88.9	120	64.2	3	75.0
Forceps	43	6.2	20	8.5	0	0.0	13	7.0	0	0.0
Ventouse	79	11.4	35	15.0	1	11.1	21	11.2	1	25.0
Cs elective	4	0.6	34	14.5	0	0.0	7	3.7	0	0.0
Cs emergency	126	18.2	57	24.4	0	0.0	26	13.9	0	0.0

Table 183: Mode of birth at term by LMC at birth (multipara, no previous CS) (2011)

	IMW n=1610		Pvt Obstetrician n=801		GP n=22		NW n=1187		Other DHB n=6		Unbooked n=18	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	1242	77.1	340	42.4	14	63.6	773	65.1	3	50.0	18	100.0
Vaginal breech	2	0.1	0	0.0	0	0.0	6	0.5	0	0.0	0	0.0
Forceps	20	1.2	20	2.5	1	4.5	15	1.3	1	16.7	0	0.0
Ventouse	50	3.1	30	3.7	1	4.5	33	2.8	0	0.0	0	0.0
CS elective	164	10.2	361	45.1	6	27.3	244	20.6	1	16.7	0	0.0
CS emergency	132	8.2	50	6.2	0	0.0	116	9.8	1	16.7	0	0.0

Table 184: Mode of birth at term by LMC (multipara, previous CS) (2011)

	IMW n=315		Pvt Obstetrician n=367		GP n=7		NW n=394		Other DHB n=4		Unbooked n=2	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	79	25.1	17	4.6	1	14.3	91	23.0	2	50.0	2	100.0
Forceps	11	3.5	6	1.6	0	0.0	12	3.0	0	0.0	0	0.0
Ventouse	22	7.0	6	1.6	0	0.0	16	4.1	0	0.0	0	0.0
CS elective	126	40.0	307	83.7	6	85.7	212	53.8	1	25.0	0	0.0
CS emergency	77	24.4	31	8.4	0	0.0	63	16.0	1	25.0	0	0.0

Table 185: Mode of birth by ethnicity (2011)

	NZ European n=2712		Maori n=597		Pacific n=1017		Other Asian n=1529		Indian n=548		Other European n=851		Other n=269	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1299	47.9	399	66.8	742	73.0	927	60.6	274	50.0	393	46.2	149	55.4
Vaginal breech	17	0.6	11	1.8	8	0.8	9	0.6	6	1.1	5	0.6	4	1.5
Forceps	142	5.2	18	3.0	9	0.9	62	4.1	29	5.3	48	5.6	11	4.1
Ventouse	213	7.9	30	5.0	22	2.2	107	7.0	49	8.9	76	8.9	16	5.9
CS elective	574	21.2	51	8.5	94	9.2	188	12.3	78	14.2	160	18.8	38	14.1
CS emergency	467	17.2	88	14.7	142	14.0	236	15.4	112	20.4	169	19.9	51	19.0

Table 186: Mode of birth by ethnicity (nullipara) (2011)

	NZ European n=1287		Maori n=226		Pacific n=289		Other Asian n=835		Indian n=305		Other European n=470		Other n=127	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	486	37.8	135	59.7	200	69.2	473	56.6	128	42.0	173	36.8	56	44.1
Vaginal breech	7	0.5	3	1.3	0	0.0	5	0.6	4	1.3	2	0.4	2	1.6
Forceps	101	7.8	12	5.3	6	2.1	51	6.1	29	9.5	39	8.3	9	7.1
Ventouse	161	12.5	20	8.8	15	5.2	87	10.4	39	12.8	64	13.6	10	7.9
CS elective	181	14.1	8	3.5	15	5.2	51	6.1	18	5.9	66	14.0	14	11.0
CS emergency	351	27.3	48	21.2	53	18.3	168	20.1	87	28.5	126	26.8	36	28.3

Table 187: Mode of birth by ethnicity (multipara) (2011)

	NZ European n=1425		Maori n=371		Pacific n=728		Other Asian n=694		Indian n=243		Other European n=381		Other n=142	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	813	57.1	264	71.2	542	74.5	454	65.4	146	60.1	220	57.7	93	65.5
Vaginal breech	10	0.7	8	2.2	8	1.1	4	0.6	2	0.8	3	0.8	2	1.4
Forceps	41	2.9	6	1.6	3	0.4	11	1.6	0	0.0	9	2.4	2	1.4
Ventouse	52	3.6	10	2.7	7	1.0	20	2.9	10	4.1	12	3.1	6	4.2
CS elective	393	27.6	43	11.6	79	10.9	137	19.7	60	24.7	94	24.7	24	16.9
CS emergency	116	8.1	40	10.8	89	12.2	68	9.8	25	10.3	43	11.3	15	10.6

Table 188: Mode of birth by maternal age (nullipara) (2011)

	<=20 n=253		21-25 n=498		26-30 n=1090		31-35 n=1133		36-40 n=474		>40 n=91	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	189	74.7	318	63.9	564	51.7	447	39.5	121	25.5	12	13.2
Vaginal breech	2	0.8	4	0.8	7	0.6	6	0.5	4	0.8	0	0.0
Forceps	8	3.2	28	5.6	71	6.5	97	8.6	40	8.4	3	3.3
Ventouse	14	5.5	40	8.0	123	11.3	164	14.5	48	10.1	7	7.7
CS elective	9	3.6	15	3.0	66	6.1	123	10.9	109	23.0	31	34.1
CS emergency	31	12.3	93	18.7	259	23.8	296	26.1	152	32.1	38	41.8

Table 189: Mode of birth by maternal age (multipara) (2011)

	<=20 n=72		21-25 n=380		26-30 n=828		31-35 n=1443		36-40 n=1060		>40 n=201	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	64	88.9	299	78.7	618	74.6	905	62.7	550	51.9	96	47.8
Vaginal breech	0	0.0	4	1.1	7	0.8	11	0.8	13	1.2	2	1.0
Forceps	1	1.4	3	0.8	13	1.6	30	2.1	21	2.0	4	2.0
Ventouse	1	1.4	10	2.6	17	2.1	43	3.0	38	3.6	8	4.0
CS elective	0	0.0	34	8.9	95	11.5	321	22.2	319	30.1	61	30.3
CS emergency	6	8.3	30	7.9	78	9.4	133	9.2	119	11.2	30	14.9

5.5 Operative births

Table 190: Primary indication for elective or pre labour emergency Caesarean section (all gestations) (2011)

	Total N=1609		Nullipara n=610		Multipara n=999	
	n	%	n	%	n	%
Abruption/APH	26	1.6	14	2.3	12	1.2
Diabetes	35	2.2	11	1.8	24	2.4
Disproportion	14	0.9	11	1.8	3	0.3
Failed Induction	64	4.0	46	7.5	18	1.8
Fetal Distress	104	6.5	71	11.6	33	3.3
Hypertension	32	2.0	23	3.8	9	0.9
Malpresentation	206	12.8	130	21.3	76	7.6
Maternal Age	22	1.4	19	3.1	3	0.3
Maternal Medical Condition	64	4.0	39	6.4	25	2.5
Maternal Request	122	7.6	84	13.8	38	3.8
Multiple Pregnancy	36	2.2	20	3.3	16	1.6
Obstetric History	45	2.8	8	1.3	37	3.7
Placenta Praevia with or without bleeding	54	3.4	24	3.9	30	3.0
Repeat Caesarean Section	609	37.8		0.0	609	61.0
Small for Gestational Age	48	3.0	31	5.1	17	1.7
Other (please specify)	128	8.0	79	13.0	49	4.9

Table 191: Indication for in labour emergency Caesarean section all gestations (spontaneous or induced onset of labour) (n=839) (2011)

	n=	839
	n	%
1a Fetal distress	128	15.3
1b Other fetal indication	141	16.8
2a Fetal intolerance of augmented labour	120	14.3
2b Augmentation causes hyperstimulation	25	3.0
2c Poor uterine response to optimal augmentation	34	4.1
2d Suboptimal augmentation	53	6.3
2e Inefficient uterine action - no oxytocin	26	3.1
3 Efficient uterine action - obstructed labour	284	33.8
4b Maternal request	9	1.1
4a Other non-medical	11	1.3
Missing	8	1.0

Table 192: Operative vaginal birth rates (1997-2011)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total births (mothers)	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**
Total operative vaginal births	925	949	1006		1081	1065	1171	1022	956	975	937	947	942	832
Incidence %	12.3	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3	12.2	12.2	11.1
Total nullipara	**3263**	**3262**	**3455**				**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**
Operative vaginal births	704	722	733				875	809	737	772	722	753	752	643
Nulliparous operative vaginal birth rate (%)	21.6	22.1	21.2				24.3	23.0	21.1	20.6	19.9	19.8	20.6	18.2
Total multipara	**4229**	**4239**	**4372**				**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**
Operative vaginal births	221	227	273				296	213	219	203	215	194	190	189
Multiparous operative vaginal birth rate (%)	5.2	5.4	6.2				7.6	5.8	5.9	5.1	5.4	4.9	4.7	4.7

Table 193: Type of operative vaginal birth: (1997-2011)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total births	**7492**	**7501**	**7827**	**7471**	**7755**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7753**	**7709**	**7523**
Total operative vaginal births	925	949	1006		1081	1065	1171	1022	956	975	937	947	942	832
% of all births	12.3	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3	12.2	12.2	11.1
Total forceps alone	464	439	435		391	352	323	234	256	222	301	339	308	288
% of all births	6.2	5.9	5.6		5.0	4.6	4.3	3.3	3.5	2.9	4.0	4.0	4.0	3.8
Kiellands forceps	41	33	21				36	22	33	22	29	42	38	25
% of all births	0.5	0.4	0.3				0.5	0.3	0.5	0.3	0.4	0.5	0.5	0.3
Other forceps	423	406	414				287	212	223	200	272	297	270	263
% of all births	5.6	5.4	5.3				3.8	2.9	3.1	2.6	3.6	3.8	3.5	3.5
Ventouse or forceps /ventouse	461	510	571		690	713	848	788	700	753	677	650	634	544
% of all births	6.2	6.8	7.3		8.9	9.4	11.3	11.0	9.7	9.8	8.9	8.4	8.3	7.2
Ventouse alone		436	516				771	728	639	686	636	608	584	509
% of all births		5.8	6.6				10.3	10.1	8.9	8.9	8.4	7.8	7.6	6.8
Forceps/ ventouse		74	55				77	60	61	67	41	35	50	35
% of all births		1.0	0.7				1.0	0.8	0.8	0.9	0.5	0.5	0.6	0.5

Table 194: Breech birth (1997-2011) Note no data in 2001-2003

	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011
Total babies born	7721	7679	8054	7679	7384	7379	7875	7753	7897	7866	7690
Total breech births	400	440	484	421	432	419	449	439	335	434	406
Percent of total births	5.2	5.7	6.0	5.5	5.9	5.7	5.7	5.7	4.2	5.5	5.2
Total singleton babies		7329	7609	7303	7007	7050	7518	7427	7576	7556	7360
Total singleton breech		341	363	318	328	328	351	346	335	340	310
Percent of singletons		4.7	4.8	4.4	4.7	4.7	4.7	4.7	4.4	4.3	4.2
Total multiple babies		350	445	376	377	329	357	324	321	310	330
Total multiple breech		99	121	103	104	91	98	93	89	94	96
Percent of multiple births		28.3	27.2	27.4	27.6	27.7	27.5	28.7	27.7	30.3	34.3

Table 195: Mode of birth by type of breech (singletons only) (2011)

	Extended leg n=153		Flexed leg n=100		Unspecificed n=57		Total breech n=310	
	n	%	n	%	n	%	n	%
Vaginal breech	23	15.0	13	13.0	6	10.5	42	13.5
Caesarean	130	85.0	87	87.0	51	89.5	268	86.5
CS emergency	35	22.9	41	41.0	22	38.6	98	31.6
CS elective	95	62.1	46	46.0	29	50.9	170	54.8

Table 196: Mode of birth by type of breech (multiples only)(2011)

	Extended leg n=28		Flexed leg n=28		Unspecificed n=40		Total breech n=96	
	n	%	n	%	n	%	n	%
Vaginal breech	9	32.1	5	17.9	9	22.5	23	24.0
Caesarean	19	67.9	23	82.1	31	77.5	73	76.0
CS emergency	5	17.9	9	32.1	15	37.5	29	30.2
CS elective	14	50.0	14	50.0	16	40.0	44	45.8

Table 197: Referral for ECV (women at term with singleton breech presentation or attempted ECV) by demographic and clinical characteristics (2011)

	Singleton breech at term or attempted ECV n=261	ECV n=103		No ECV n=158	
		n	%	n	%
Age (years					
≤ 20	7	4	57	3	43
21-30	77	38	49	39	51
31-40	162	56	35	106	65
≥ 41	15	5	33	10	67
Ethnicity (prioritised)					
NZ/Other European	143	57	40	86	60
Maori/ Pacific Island	52	18	35	34	65
Other Asian	48	21	44	27	56
Indian	14	6	43	8	57
Other	4	1	25	3	75
BMI					
<19	9	5	56	4	44
19-25	159	67	42	92	58
26-30	31	9	29	22	71
31-35	25	13	52	12	48
>35	30	7	23	23	77
LMC at birth					
Independent MW	123	66	54	57	46
NW Community	42	17	40	25	60
NW Diabetes/Medical	28	9	32	19	68
Private Obstetrician	68	11	16	57	84
Previous CS Yes	47	8	17	39	83
No	214	95	44	119	56

5.6 Anaesthesia use

Table 198: Epidural use among women with spontaneous and induced labour (2000-2011)

	2000	2004	2005	2006	2007	2008	2009	2010	2011
Number of births	7827	7491	7194	7212	7695	7589	7753	7709	7523
Number women with spontaneous labour	4820	4817	4246	4256	4490	4070	4125	4007	3628
Spontaneous labour and epidural	2143	2434	2138	2168	2057	1743	1717	1686	1483
%	44.5	50.5	50.4	50.9	45.8	42.8	41.6	42.1	40.9
Number of women with induced labour	2002	1922	1894	1776	1906	2203	2238	2214	2463
Induced labour and epidural	1313	1412	1373	1269	1326	1550	1599	1557	1707
%	65.6	73.5	72.5	71.5	69.6	70.4	71.4	70.3	69.3

Table 199: Analgesic use and LMC at birth among labouring nulliparous women (2011)

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
IMW	1714	1091	63.7	1026	59.9	369	21.5	36	2.1	183	10.7
Pvt Obstetrician	561	478	85.2	254	45.3	60	10.7	5	0.3	37	6.6
GP	29	20	69.0	17	58.6	4	13.8	0	0.0	0	0.0
NW_Community	478	285	59.6	308	64.4	137	28.7	2	0.4	35	7.3
NW_Diabetes	118	96	81.4	68	57.6	34	28.8	0	0.0	1	0.8
NW_Medical	128	86	67.2	70	54.7	27	21.1	0	0.0	5	3.9
Other DHB	18	6	33.3	10	55.6	2	11.1	0	0.0	0	0.0
Unbooked	11	5	45.5	7	63.6	4	36.4	0	0.0	0	0.0

Table 200: Analgesic use and ethnicity (prioritised) among labouring nulliparous women (2011)

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
NZ European	1060	808	76.2	579	54.6	185	17.5	21	2.0	121	11.4
Maori	208	124	59.6	131	63.0	50	24.0	1	0.5	21	10.1
Pacific	266	132	49.6	156	58.6	53	19.9	2	0.8	16	6.0
Asian	759	460	60.6	472	62.2	185	24.4	5	0.7	29	3.8
Indian	275	191	69.5	155	56.4	64	23.3	2	0.7	17	6.2
Other European	382	279	73.0	207	54.2	69	18.1	12	3.1	50	13.1
Other	107	73	68.2	60	56.1	31	29.0	0	0.0	7	6.5

Table 201: Analgesic use and maternal age among labouring nulliparous women (2011)

Maternal age	Total	Epidural		Entonox		Pethidine		TENS		Water	
(years)	N	n	%	n	%	n	%	n	%	n	%
<=20	234	118	50.4	156	66.7	58	24.8	1	0.4	25	10.7
21-25	471	262	55.6	290	61.6	121	25.7	2	0.4	31	6.6
26-30	991	664	67.0	571	57.6	219	22.1	13	1.3	73	7.4
31-35	975	717	73.5	536	55.0	172	17.6	17	1.7	97	9.9
36-40	339	265	78.2	188	55.5	56	16.5	10	2.9	32	9.4
>40	47	41	87.2	19	40.4	11	23.4	0	0.0	3	6.4

APPENDIX 6. LABOUR and BIRTH OUTCOMES

6.1 Perineal trauma

Table 202: Episiotomy rates in vaginal births, all gestations by LMC at birth and parity (2011)

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	2317	857	37.0	2758	296	10.7
Independent Midwife	1340	501	37.4	1375	153	11.1
Private Obstetrician	368	188	51.1	413	79	19.1
General Practitioner	23	7	30.4	19	3	15.8
National Women's	586	161	27.5	951	61	6.4

Table 203: Episiotomy rates in spontaneous (non operative) vertex (not breech) birth, all gestations by LMC at birth and parity (2011)

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1651	427	25.9	2532	194	7.7
Independent Midwife	988	272	27.5	1293	105	8.1
Private Obstetrician	208	78	37.5	358	59	16.5
General Practitioner	18	4	22.2	17	1	5.9
National Women's	437	73	16.7	864	29	3.4

Table 204: 3rd and 4th degree tears in spontaneous (non operative) vertex birth by LMC at birth and parity (2011)

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1651	42	2.5	2532	12	0.5
Independent Midwife	988	28	2.8	1293	7	0.5
Private Obstetrician	208	1	0.5	358	3	0.8
GP	18	0	0.0	17	0	0.0
National Women's	437	13	3.0	864	2	0.2

Table 205:Third stage management by PPH risk among vaginal births (2011)

	Total n=5075	Physiological n=380		Active syntocinon n=2655		Active syntometrine n=1919		Other n=10		Unknown n=111	
	n	n	%	n	%	n	%	n	%	n	%
Spontaneous vaginal birth	4243	378	8.9	2177	51.3	1590	37.5	4	0.1	94	2.2
Operative vaginal birth	832	2	0.2	478	57.5	329	39.5	6	0.7	17	2.0
BMI											
<19	337	32	9.5	163	48.4	135	40.1	0	0	7	2.1
19-25	2883	249	8.6	1518	52.7	1054	36.6	8	0.3	54	1.9
26-30	893	60	6.7	476	53.3	336	37.6	2	0.2	19	2.1
31-35	451	24	5.3	214	47.5	197	43.7	0	0	16	3.5
>35	390	8	2.1	210	53.8	161	41.3	0	0	11	2.8
missing	121	7	5.8	74	61.2	36	29.8	0	0	4	3.3
Previous CS	309	19	6.1	174	56.3	107	34.6	1	0.3	8	2.6
Hypertension											
Nil	4752	369	7.8	2385	50.2	1885	39.7	10	0.2	103	2.2
Gestational Hypertension	151	4	2.6	132	87.4	11	7.3	0	0.0	4	2.6
Chronic hypertension	85	6	7.1	56	65.9	20	23.5	0	0.0	3	3.5
Superimposed preeclampsia	3	0	0.0	3	100.0	0	0.0	0	0.0	0	0.0
Preeclampsia	84	1	1.2	79	94.0	3	3.6	0	0.0	1	1.2
Singleton	5023	376	7.5	2625	52.3	1902	37.9	10	0.2	110	2.2
Multiples	52	4	7.7	30	58.8	17	33.3	0	0.0	1	2.0

Table 206: Postpartum transfusion rates by recorded blood loss at birth (2011)

	Total	Postpartum transfusion	
		n	%
Total	**7523**	**194**	**2.6**
Blood loss <500	4835	8	0.2
PPH 500-999	2015	29	1.4
PPH 1000-1499	385	42	10.9
PPH 1500-2499	210	66	31.4
PPH >=2500	64	49	76.6
Blood loss unknown	14	0	0.0

APPENDIX 7. POSTNATAL CARE

7.1 Infant Feeding

Table 207: Method of Infant feeding at discharge from NW (2003-2011)

	2003 n = 5177		2004 n = 5938		2005 n = 5765		2006 n = 6158		2007 n = 6570		2008 n =6636	
	n	%	n	%	n	%	n	%	n	%	n	%
Exclusive breastfeeding	2789	53.9	3673	61.9	3686	63.9	4546	73.8	5064	77.1	5254	79.2
Fully breastfeeding	562	10.9	464	7.8	485	8.4	441	7.2	348	5.3	304	4.6
Partial breastfeeding	1521	29.4	1497	25.2	1375	23.9	958	15.6	929	14.1	871	13.1
Artificial feeding	305	5.9	304	5.1	219	3.8	213	3.5	229	3.5	207	3.1

	2009 n =6928		2010 N =6941		2011 n = 6723	
	n	%	n	%	n	%
Exclusive breastfeeding	5659	81.7	5736	82.6	5439	80.9
Fully breastfeeding	287	4.1	260	3.8	285	4.2
Partial breastfeeding	824	11.9	755	10.9	841	12.5
Artificial feeding	158	2.3	190	2.7	158	2.4

Table 208: Infant feeding on discharge from NW by mode of birth, LMC and maternal age (2011)

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total	6723	5439	80.9	285	4.2	841	12.5	158	2.4
Mode of birth									
Spontaneous vaginal	3857	3443	89.3	79	2.1	254	6.6	81	2.1
Operative vaginal	755	626	82.9	27	3.6	92	12.2	10.0	1.3
Elective CS	1113	748	67.2	89	8.0	231	20.8	45	4.0
Emergency CS	998	622	62.3	90	9.0	264	26.5	22	2.2
LMC at birth									
IMW	3276	2818	86.0	107	3.3	307	9.4	44	1.3
Private Obstetrician	1569	1253	79.9	60	3.8	224	14.3	32	2.0
GP	53	43	81.1	2	3.8	8	15.1	0	0
NW Community	1247	967	77.6	57	4.6	173	13.9	50	4.0
NW Medical	188	112	59.6	20	10.7	34	18.1	22	11.7
NW Diabetes	354	221	62.4	36	10.2	90	25.4	7	2.0
Unbooked	24	19	79.2	0	0	3	12.5	2	8.3
Other DHB	12	6	50.0	3	25.0	2	16.7	1	8.3
Maternal age									
≤ 20	259	213	82.2	10	3.9	21	8.1	15	5.8
21-25	759	630	83.0	23	3.4	86	11.3	17	2.2
26-30	1743	1436	82.4	66	3.8	209	12.0	32	1.8
31-35	2333	1905	81.7	103	4.4	286	12.3	39	1.7
36-40	1364	1070	78.5	68	5.0	184	13.5	42	3.1
>40	265	185	69.8	12	4.5	55	20.8	13	4.9

Table 209: Infant feeding on discharge from NW by prioritised maternal ethnicity, gestation, birthweight and among standard primpara (2011)

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Ethnicity									
NZ European	2422	2068	85.4	88	3.6	214	8.8	52	2.2
Māori	509	410	80.6	19	3.7	51	10.0	29	5.7
Pacific	905	669	77.2	44	4.9	126	13.9	36	4.0
Other Asian	1425	1064	14.7	74	5.2	270	19.0	17	1.2
Indian	481	361	75.1	31	6.4	88	18.3	1	0.2
Other European	752	652	86.7	19	2.5	66	8.8	15	2.0
Other	229	185	80.8	10	4.4	26	11.4	8	3.5
Gestation									
< 37 weeks	255	124	48.6	57	22.4	64	25.1	10	3.9
≥37 weeks	6468	5315	82.2	228	3.5	777	12.0	148	2.3
Birth weight									
< 2.5 kgs	176	70	39.8	42	23.9	59	33.5	5	2.8
2.5 - 2.9 kgs	1071	798	74.5	54	5.0	190	17.7	29	2.7
3.0 - 4.4 kgs	5352	4476	83.6	185	3.5	571	10.7	120	2.2
≥ 4.5 kgs	124	95	76.6	4	3.2	21	16.9	4	3.2
Primipara									
Standard	1073	937	87.3	31	2.9	94	8.8	11	1.0
Non standard	5650	4502	79.7	254	4.5	747	3.2	147	2.6
Quintile									
1	1210	987	81.6	48	4.0	149	12.3	26	2.2
2	1318	1084	82.3	48	3.6	162	12.3	24	1.8
3	1322	1085	82.1	59	4.5	160	12.1	18	1.4
4	1572	1257	80.0	70	4.5	203	12.9	42	2.7
5	1299	1024	78.8	60	4.6	167	12.9	48	3.7

Table 210: Infant feeding on discharge from NW Homecare (2011)

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Community	967	564	58.3	89	9.2	216	22.3	98	10.1
Medical	78	43	55.1	6	7.7	15	19.2	14	18.0
Diabetes	120	63	52.5	16	13.3	33	27.5	8	6.7

7.2 Postnatal Admissions

Table 211: Maternal destination following birth by mode of birth (2011)

	Total n=7523	NW Wards		Birthcare Auckland		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Total	**7523**	**4730**	**62.9**	**2357**	**31.3**	**414**	**5.5**	**22**	**0.3**
Spontaneous vaginal	4243	1729	40.7	2087	49.2	407	9.6	20	0.5
Operative vaginal	832	553	66.5	270	32.5	7	0.8	2	0.2
CS Elective	1183	1183	100.0	0	0.0	0	0.0	0	0.0
CS Emergency	1265	1265	100.0	0	0.0	0	0.0	0	0.0

Table 212: Maternal destination following birth by LMC at birth (2011)

	Total n=7523	NW Wards n=4730		Birthcare n=2357		Home n=414		Other Units n=22	
	N	n	%	n	%	n	%	N	%
Total	**7523**	**4730**	**62.9**	**2357**	**31.3**	**414**	**5.5**	**22**	**0.3**
Independent Midwife	3522	1724	48.9	1512	42.9	273	7.8	13	0.4
Private Obstetrician	1672	1171	70.0	479	28.6	20	1.2	2	0.1
General Practitioner	56	31	55.4	23	41.1	2	3.6	0	0.0
NW Community	1387	971	70.0	303	21.8	112	8.1	1	0.1
NW High Risk	799	753	94.2	25	4.4	5	0.6	6	0.8
Other DHB	50	47	94.0	2	4.0	1	2.0	0	0.0
Unbooked	37	33	89.2	3	8.1	1	2.7	0	0.0

Table 213: Maternal destination following birth by prioritised maternal ethnicity (2011)

	Total	NW Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
NZ European	2712	1683	62.1	954	35.2	65	2.4	10	0.4
Maori	597	404	67.7	134	22.4	56	9.4	3	0.5
Pacific	1017	691	67.9	253	24.9	72	7.1	1	0.1
Other Asian	1529	866	56.6	513	33.6	148	9.7	2	0.1
Indian	548	389	71.0	135	24.6	23	4.2	1	0.2
Other European	851	518	60.9	302	35.5	27	3.2	4	0.5
Other	269	179	66.5	66	24.5	23	8.6	4	0.4

Table 214: Postnatal readmission reason by maternal destination following birth (2011)

	NW Wards n=277		Birthcare n=114		Home n=14	
	n	%	n	%	n	%
Neonatal admission	68	24.5	44	38.6	5	35.7
Postpartum haemorrhage	20	7.2	9	7.9	2	14.3
Infection	56	20.2	12	10.5	2	14.3
Breast	32	11.6	21	18.4	1	7.1
Wound	9	3.2	0	0.0	0	0.0
Other	92	33.2	28	24.6	4	28.6

Table 215: Place of birth for women admitted postnatally who did not birth at NW (2011)

	n=124	
	n	%
Birthcare	34	27.4
Home	2	1.6
Middlemore	13	10.5
Papakura	1	0.8
Pukekohe	1	0.8
North Shore	15	12.1
Waitakere	25	20.2
Other	33	26.6

APPENDIX 8. NEWBORN SERVICES

8.1 NICU Occupancy

Table 216: Occupancy (baby-days) for NICU by gestational age (1999-2011)

Gestation (weeks)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	18407	20652	20108	20551	19249	14958	14541	14212	15228	15296	15236	14982
<28	4337	4471	4237	4772	4466	3639	3328	3612	4282	4546	4129	4133
28-31	5054	5807	6159	5483	5331	4265	4774	4322	3490	4170	4137	4230
32-36	6776	7543	7496	8198	7204	5150	4535	4326	5423	4750	4844	4519
≥37	2240	2831	2216	2098	2248	1904	1904	1952	2033	1830	2126	2100

Gestation (weeks)	2011
Total	15122
<28	4312
28-31	3344
32-36	4659
≥37	2507

Table 217: Occupancy (baby-days) for NICU by birth weight (1999-2011)

Weight(g)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	18407	20652	20108	20580	19249	14958	14505	14212	15228	15296	15236	14982
<1500	8444	9003	9281	9658	8837	6563	7115	7034	7618	7584	7996	7563
1500-1999	3669	4485	4526	4460	4295	3457	2942	2568	2489	3071	2620	2662
2000-2499	3427	3362	3135	3173	3097	2360	2221	2111	2384	2432	1953	2005
≥2500	2867	3802	3166	3289	3020	2578	2227	2499	2737	2209	2667	2752

Weight (g)	2011
Total	15122
<1500	7005
1500-1999	2669
2000-2499	2804
≥2500	2644

8.2 Admissions to NICU

Table 218: Admissions of inborn babies to NICU by gestational age groups (2000-2011)

	2000		2001		2002		2003		2004		2005	
	n	%	n	%	n	%	n	%	n	%	n	%
Total	1154		1104		1098		1004		861		825	
20-27	68	5.9	55	5.0	57	5.2	50	5.0	53	6.2	50	6.1
28-31	138	12.0	128	11.6	119	10.8	110	11.0	104	12.1	126	15.3
32-36	531	46.0	488	44.2	522	47.3	449	44.7	349	40.5	295	35.8
≥ 37	417	36.1	433	39.2	400	36.2	395	39.3	355	41.2	354	42.9

	2006		2007		2008		2009		2010		2011	
	n	%	n	%	n	%	n	%	n	%	n	%
Total	791		870		822		820		791		839	
20-27	44	5.6	58	6.7	58	7.1	57	7.0	58	7.3	43	5.0
28-31	119	15.0	107	12.3	122	14.8	91	11.1	110	13.9	81	9.7
32-36	331	41.8	377	43.3	331	40.3	315	38.4	280	35.3	305	36.4
≥ 37	297	37.5	328	37.7	311	37.8	357	43.5	342	43.2	410	48.9

Table 219: Live births at National Women's by birthweight (includes BBA) (2011)

Birth weight (g)	2011 N=7593	
Total	**n**	%
<500	8	0.1
500-749	22	0.3
750-999	24	0.3
1000-1499	26	0.3
1500-1999	114	1.5
2000-2499	353	4.7
2500-2999	1203	15.8
3000-3999	4961	65.3
≥4000	839	11.1

Table 220: Admissions of inborn babies to NICU by birth weight (2000-2011)

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total	**1154**	**1104**	**1098**	**1004**	**861**	**825**	**791**	**870**	**822**	**820**	**791**	**839**
<500	0	1	1	0	0	0	0	1	0	0	2	0
500-749	22	23	14	20	11	25	19	19	19	15	23	20
750-999	41	37	37	32	37	34	24	37	37	42	29	24
1000-1249	45	47	47	31	38	47	34	47	35	31	39	25
1250-1499	64	48	56	53	36	42	57	51	52	49	50	42
1500-1999	193	186	193	164	138	120	130	130	135	126	110	110
2000-2499	291	243	256	238	177	170	182	188	180	155	135	176
2500-2999	182	199	184	156	147	119	125	139	118	117	126	129
3000-3999	239	232	221	237	208	215	183	198	212	246	226	259
≥4000	77	88	89	73	69	53	37	60	34	39	51	54

Table 221: Admissions of inborn babies to NICU by gestational age (2000-2011)

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total	**1154**	**1104**	**1098**	**1004**	**861**	**825**	**791**	**870**	**822**	**820**	**791**	**839**
23	5	7	1	1	0	1	1	5	0	1	0	2
24	4	10	8	9	3	15	9	4	8	9	13	8
25	21	12	13	10	8	14	9	13	16	12	15	8
26	23	12	15	15	18	11	13	18	17	15	10	14
27	15	14	20	15	24	9	12	18	17	20	20	11
28	18	21	19	18	18	23	16	21	13	19	16	16
29	34	29	32	18	19	41	25	26	29	20	21	15
30	32	36	32	31	35	29	29	27	37	22	36	22
31	54	42	36	43	32	33	49	33	43	30	33	28
32	78	58	67	49	42	42	63	46	40	42	29	42
33	98	77	100	78	65	38	50	63	48	65	59	44
34	135	125	138	137	79	83	88	114	90	82	90	96
35	106	116	125	96	84	70	82	82	83	69	55	68
36	114	112	92	89	79	62	48	72	70	57	51	55
37	88	77	84	71	61	70	58	59	54	64	58	72
38	93	101	98	88	86	83	69	81	86	89	93	84
39	77	88	61	85	68	72	52	68	68	77	67	107
40	109	106	78	90	84	80	78	74	70	83	78	78
41	44	55	66	52	51	39	37	39	23	38	41	59
42	6	6	13	9	5	9	3	6	10	6	6	10
43	0	0	0	0	0	1	0	1	0	0	0	0

Table 222: Admissions of outborn babies to NICU by gestational age (2000-2011)

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total	**258**	**209**	**228**	**216**	**114**	**81**	**99**	**102**	**117**	**137**	**111**	**124**
22	0	0	0	0	0	0	0	0	0	0	1	0
23	0	1	1	0	0	0	0	0	1	0	0	1
24	4	1	3	0	3	3	3	5	3	4	4	6
25	1	1	2	2	0	0	8	6	7	3	4	1
26	0	3	1	2	1	2	5	5	5	11	3	5
27	2	5	2	2	1	1	3	6	5	4	7	4
28	3	2	3	3	3	4	2	3	2	10	7	3
29	1	1	4	7	2	3	6	5	4	6	5	6
30	5	8	12	3	4	3	4	1	8	2	2	4
31	1	3	4	3	5	3	2	3	2	3	0	3
32	2	8	5	8	4	7	5	2	8	3	3	4
33	6	3	1	5	4	7	1	4	1	7	4	6
34	5	10	7	13	10	5	6	4	6	3	3	4
35	9	7	10	5	6	4	9	4	8	5	4	5
36	33	19	19	16	6	2	2	4	4	10	5	4
37	19	17	16	20	6	7	3	9	8	11	9	8
38	38	28	22	23	13	5	5	10	5	8	12	9
39	24	21	35	29	13	8	9	9	8	5	9	15
40	61	42	49	43	19	12	17	9	22	30	17	19
41	33	27	30	30	10	3	8	9	7	11	11	17
42	11	2	2	2	3	2	1	4	3	1	1	0
43+	0	0	0	0	1	0	0	0	0	0	0	0

Table 223: Admissions of outborn babies to NICU by gestational age groups (2000-2011)

	2000 n=256		2001 n=209		2002 n=228		2003 n=216		2004 n=114		2005 n=81	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
20-27	7	2.7	11	5.3	9	3.9	6	2.8	5	4.4	6	7.4
28-31	10	3.9	14	6.7	23	10.1	16	7.4	14	12.3	13	16.0
32-36	55	21.3	47	22.5	42	18.4	47	21.8	30	26.3	25	30.9
≥ 37	186	72.1	137	65.6	154	67.5	147	68.1	65	57.0	37	45.7

	2006 n=99		2007 n=102		2008 n=117		2009 n=137		2010 n=111		2011 n=124	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
20-27	19	19.2	22	21.6	21	17.9	22	16.1	19	17.1	17	13.7
28-31	14	14.1	12	11.8	16	13.7	21	15.3	14	12.6	16	12.9
32-36	23	23.2	18	17.6	27	23.1	28	20.4	19	17.1	23	18.5
≥ 37	43	43.4	50	49.0	53	45.3	66	48.2	59	53.1	68	54.8

Table 224: Admissions of outborn babies to NICU by birth weight (2000-2011)

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total	**258**	**209**	**228**	**216**	**114**	**81**	**99**	**102**	**117**	**137**	**111**	**124**
<500									1		1	0
500-749	3	5	3	2	3	2	10	8	7	4	5	3
750-999	3	6	10	4	4	5	5	11	7	17	11	10
1000-1249	2	3	4	8	3	4	7	6	13	15	8	10
1250-1499	7	6	11	5	5	6	5	4	7	8	7	5
1500-1999	14	15	14	18	18	15	13	10	16	8	10	15
2000-2499	35	34	21	28	11	10	8	8	12	12	10	14
2500-2999	37	32	34	29	13	10	15	13	13	12	10	14
3000-3999	120	87	101	91	43	22	26	33	31	50	37	41
≥4000	37	21	30	31	14	7	9	9	10	11	12	12

8.2.1 Admissions to NICU by domicile of mother

Table 225: Domicile of mother of all babies admitted to NICU (2000-2011)

	2002 n=1331		2003 n=1222		2004 n=975		2005 n=906		2006 n=890		2007 n=972		2008 n=939	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Northern Region	1280	96.2	1177	96.3	934	95.8	834	91.9	826	92.8	824	84.8	841	89.6
Auckland	515	40.2	494	40	461	49.4	441	52.9	435	52.7	428	51.9	473	56.2
Counties Manukau	179	14.0	174	14.8	162	17.3	144	17.3	120	14.5	161	19.5	135	16.1
Waitemata	558	43.6	477	40.5	275	29.4	217	26	237	28.7	201	24.4	199	23.7
Northland	28	2.2	32	2.7	36	3.9	32	3.8	34	4.1	34	4.1	34	4.0
Midland Region	36	2.7	19	1.6	14	1.4	34	3.8	34	3.8	63	6.5	30	3.2
Central Region	8	0.6	9	0.7	16	1.6	23	2.5	17	1.9	0	0.0	13	1.4
Southern Region	6	0.5	13	1.1	7	0.7	8	0.9	12	1.3	0	0.0	19	2.0
Overseas	1	0.1	4	0.3	4	0.4	5	0.6	1	0.1	1	0.1	4	0.4
Missing	0	0.0	0	0.0	0	0.0	2	0.2	0	0.0	84	8.6	32	3.4

	2009 n=957		2010 n=902		2011 n=963	
		%	**n**	**%**	**n**	**%**
Northern Region	872	91.1	847	92.1	892	92.6
Auckland	509	58.4	435	48.2	491	51.0
Counties Manukau	123	14.1	115	12.8	121	12.6
Waitemata	206	23.6	253	28.1	239	24.8
Northland	34	3.9	44	4.9	41	4.3
Midland Region	50	5.2	23	2.5	24	2.5
Central Region	15	1.6	16	1.8	12	1.2
Southern Region	16	1.7	15	1.7	15	1.6
Overseas	0	0.0	1	0	0	
Missing	4	0.4	0		20	2.0

Table 226: DHB of mothers of all babies admitted to NICU (2011)

	2011 n=963			2011 n=963	
DHB	**n**	**%**	**DHB**	**n**	**%**
Auckland	491	51.0	**Wanganui**	0	0.0
Counties Manukau	121	12.6	**Mid-Central**	4	0.4
Waitemata	239	24.8	**Hawkes Bay**	5	0.5
Northland	41	4.3	**Capital & Coast**	5	0.5
Waikato	6	0.6	**Nelson Marlborough**	5	0.5
Bay of Plenty	3	0.3	**Canterbury**	9	0.9
Wairarapa	2	0.2	**Otago**	3	0.3
Tairawhiti	2	0.2	**Southland**	3	0.3
Taranaki	1	0.1	**West Coast**	2	0.2
Lakes	1	0.1	**Overseas**	4	0.4

*16 missing DHB

8.2.3 Admissions to NICU by ethnicity of baby

Table 227: Prioritised ethnicity of babies admitted to NICU (2011

	Preterm (<37 weeks) N=485		Term N=478		Total N=963	
	n	**%**	**n**	**%**	**n**	**%**
NZ European	176	36.3	173	36.2	349	36.2
Maori	85	17.5	86	18.0	171	17.8
Pacific	76	15.7	64	13.4	140	14.5
Other Asian	59	12.2	61	12.8	120	12.5
Indian	37	7.6	41	8.6	78	8.1
Other European	44	9.1	26	5.4	70	7.3
Other	7	1.4	25	5.2	33	3.4
Missing	1	0.2	2	0.4	3	0.3

8.2.4 Reason for admission to NICU

Table 228: Main reason for admission to NICU (2011)

	Preterm N=485		Term N=478		Total N=963	
	n	**%**	**n**	**%**	**n**	**%**
Prematurity	311	64.1	0		311	32.3
Respiratory distress	72	14.8	186	38.9	258	26.8
Congenital abnormality	22	4.5	90	18.8	112	11.6
Hypoglycaemia	14	2.9	29	6.1	43	4.5
Depression at birth	10	2.1	29	6.1	39	4.0
SGA	27	5.6	8	1.7	35	3.6
Cyanotic episode	2	0.4	8	1.7	10	1.0
Suspected infection	3	0.6	13	2.7	16	1.7
Neurological problem	0	0.0	10	2.1	10	1.0
Haemolytic disease	4	0.8	7	1.5	11	1.1
Feeding difficulty	3	0.6	1	0.2	4	0.4
Bile stained vomiting	3	0.6	8	1.7	11	1.1
Jaundice	0	0.0	12	2.5	12	1.2
Maternal diabetes mellitus	2	0.4	2	0.4	4	0.4
Other	7	1.4	45	9.4	52	5.4

Unknown =35 = 5 preterm and 30 term

8.2.5 Antenatal corticosteroids

Table 229: Percentage receiving antenatal corticosteroids by birth weight among ANZNN assigned babies (2003-2011)

Birth weight (g)	2003			2004			2005			2006		
	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %
Total	136	42	90	121	54	91	148	57	95	134	74	128
<500												
500-749	20	50	95	11	64	91	25	52	100	19	12	18
750-999	32	47	91	37	59	95	34	56	94	24	11	23
1000-1249	31	52	100	38	58	95	47	57	98	34	20	34
1250-1499	53	30	81	35	40	83	42	60	90	57	31	53

Birth weight (g)	2007			2008			2009			2010		
	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %
Total	155	55	96	149	54	87	150	53	88	154	93(60)	138(90)
<500	1	100	100	0	0	0	0	0	0	2	2(100)	2(100)
500-749	19	53	84	19	58	79	15	73	87	25	16(64)	22(88)
750-999	37	54	97	38	45	92	42	55	100	31	21(68)	28(90)
1000-1249	47	49	100	38	58	87	39	51	79	41	27(66)	39(95)
1250-1499	51	61	96	54	56	87	54	46	85	55	27(49)	47(85)

Birth weight (g)	2011		
	N n	1-7d n(%)	Any n(%)
Total	121	65(53)	110(91)
<500	0	0	0
500-749	22	12(54)	21(95)
750-999	26	16(61)	24(92)
1000-1249	28	16(57)	25(89)
1250-1499	45	21(47)	40(89)

Table 230: Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies (2003-2011)

Gestation (weeks)	2003			2004			2005			2006		
	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %
Total	160	42	93	157	53	92	176	55	94	163	48	94
<24	1	100	100	0			1	0	100	1	0	0
24-25	19	53	95	11	73	91	29	55	97	18	56	100
26-27	30	47	93	42	57	93	20	55	100	25	44	100
28-29	36	42	97	37	51	95	64	47	94	41	56	98
30-31	74	36	89	67	48	91	62	40	94	78	45	91

Table 231 (continued): Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies

Gestation (weeks)	2007			2008			2009			2010		
	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %	N n	1-7d %	Any %
Total	165	56	98	189	51	88	157	50	90	175	57	91
<24	5	40	60	0	0	0	1	0	0	1	0	0
24-25	17	53	94	25	36	80	20	70	95	30	57	87
26-27	36	69	100	36	50	86	37	54	95	31	65	94
28-29	47	45	98	45	60	87	45	56	89	42	62	88
30-31	60	60	100	83	52	93	54	37	89	71	52	96

Gestation (weeks)	N	2011 1-7d	Any
	n	n(%)	n(%)
Total	139	70(50)	123(88)
<24	3	0	3(100)
24-25	17	5(29)	16(94)
26-27	28	19(68)	25(89)
28-29	37	17(46)	32(86)
30-31	54	29(54)	47(87)

8.3 Care and complications

8.3.1 Infection

Table 232: Organisms causing serious infection in NICU (2011)

Organism	Early Infection	Late Infection
Staph epidermidis + Ecoli	0	0
E Coli	2	1
Staph aureus	0	2
Staph epidermidis	0	14
Coagulase negative *staphylococcus*	0	3
Enterococcus	0	3
Enetrobacter	0	3
Candida	0	1
Citrobacter	0	0
Group B Strep	4	2
Listeria monocytogenes	2	0
Klebsiella	0	2
Other / Unknown	1	3

8.3.2 Intraventricular haemorrhage

8.3.2.1 Intraventricular haemorrhage (benchmarked with ANZNN)

Table 233: Intraventricular haemorrhage by birth weight (2011)

Birth Weight (g)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**159**	**62**	**74**	**9**	**3**	**5**	**6**
<500	0						
500-749	22	0	13	2	1	1	5
750-999	26	3	18	1	0	3	1
1000-1249	28	5	18	3	1	1	0
1250-1499	45	24	18	2	1	0	0
1500-1999	32	24	7	1	0	0	0
2000-2499	6	6	0	0	0	0	0

Table 234: Intraventricular haemorrhage by gestation (2011) (benchmarked with ANZNN)

Gestation (weeks)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**159**	**62**	**74**	**9**	**3**	**5**	**6**
<24	3	0	0	1	0	1	1
24-25	17	0	11	0	1	1	4
26-27	28	2	17	4	1	3	1
28-29	37	3	29	4	1	0	0
30-31	54	45	9	0	0	0	0
32-36	19	12	7	0	0	0	0
>36	1	0	1	0	0	0	0

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

Table 235: Intraventricular haemorrhage in all <1250g babies admitted to NICU (1985-2011)

Year	Total	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
1985	70	10	33	6	14	5	2
1986	87	11	45	13	9	2	7
1987	98	14	58	9	11	2	4
1988	97	9	51	19	11	3	4
1989	113	18	62	8	9	11	5
1990	98	16	59	8	5	4	6
1991	125	14	81	16	4	2	8
1992	103	11	68	8	4	7	5
1993	114	7	82	6	10	3	6
1994	117	13	75	13	8	4	4
1995	121	11	82	12	8	1	7
1996	127	10	95	7	3	3	9
1997	117	12	82	9	4	3	7
1998	90	7	66	7	4	0	6
1999	121	6	93	13	3	0	6
2000	116	5	88	7	5	2	9
2001	122	5	95	16	4	0	2
2002	116	3	97	7	3	1	5
2003	97	0	85	2	3	0	7
2004	96	1	83	4	1	3	4
2005	117	3	94	4	10	3	3
2006	99	8	75	8	3	0	5
2007	129	5	95	7	10	4	8
2008	101	0	77	14	3	3	4
2009	124	17	85	3	7	3	9
2010	118	18	80	5	7	5	3
2011	92	12	56	8	2	7	7

8.3.3 Assisted ventilation

Table 236: High Frequency Oscillatory Ventilation (1998-2011)

Gestation (wks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	8/14	7/18	11/20	3/10	12/25	7/9	5/10	15/21	12/15	19/23	15/27
<28	5/7	2/7	4/8	2/5	2/7	4/5	2/6	9/14	6/9	11/14	9/17
28-31	1/2	2/6	-	1/2	1/3	-	-	3/3	2/2	3/4	0/1
32-36	1/2	1/2	2/3	0/2	0/3	-	0/1	0/1	1/1	1/1	3/4
≥37	1/3	2/3	5/9	0/1	9/12	3/4	3/3	3/3	2/2	4/4	3/5

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 13 years.

Gestation (wks)	2009	2010	2011	Total	%
Total	15/29	21/28	18/20	168/269	62
<28	8/18	12/18	11/12	87/147	59
28-31	2/3	3/3	1/1	19/30	63
32-36	3/5	2/3	1/1	15/29	52
≥37	2/3	4/4	5/6	46/62	74

Table 237: Inhaled Nitric Oxide (iNO) (1998-2011)

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

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 13 years.

Gestation (wks)	2009	2010	2011	Total	%
Total	10/20	32/36	20/26	200/286	70
<28	2/7	7/9	4/6	29/60	48
28-31	0/2	3/4	1/2	13/25	52
32-36	2/3	4/5	6/6	30/46	65
≥37	6/8	18/18	9/12	128/154	83

Table 238: iNO plus HFOV (1998-2011)

Gestation (weeks)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	%
Total	2/5	4/10	8/12	0/4	10/18	3/4	2/6	6/8	3/4	10/12	6/9	5/12	12/15	9/11	80/130	62
<28	0/1	1/4	1/2	0/1	-	-	0/4	2/3	0/1	3/4	2/4	2/6	5/7	4/5	20/42	48
28-31	-	0/2	-	-	1/3	-	-	1/1	-	2/3	-	0/1	2/2	1/1	7/13	54
32-36	1/2	1/1	2/3	0/2	0/3	-	-	0/1	1/1	1/1	2/2	2/3	1/2	1/1	12/22	55
≥37	1/2	2/3	5/7	0/1	9/12	3/4	2/2	3/3	2/2	4/4	2/3	1/2	4/4	3/4	41/53	77

The numbers in each cell are survivors/totals. The last column is the percentage survival over the last 13 years.

Table 239: Reason for ventilation and CPAP in term and post-term infants (1997-2011)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TTN/RDS	4/7	2/44	4/19	1/24	4/47	2/45	3/46	6/61	2/42	3/55	8/76	3/84	8/100	7/88	8/96
Infection	4/2	4/14	5/27	3/31	1/17	3/17	0/15	1/12	2/8	2/10	3/7	-/10	1/16	2/9	2/18
Meconium	1/5	9/18	4/15	7/21	1/15	6/25	9/20	4/13	7/16	8/15	9/19	4/13	4/15	10/14	13/30
Anomaly	8/0	16/4	8/9	13/9	11/8	14/9	8/5	4/6	9/10	7/7	8/6	10/8	6/5	9/8	7/9
PPHN	7/4	6/4	6/4	9/5	5/6	9/12	3/4	8/7	4/6	3/3	7/4	5/6	5/6	9/10	4/4
Encephalopathy	6/1	7/12	1/4	7/1	2/4	1/1	14/7	8/8	9/4	4/1	8/7	6/2	7/8	11/1	8/5
Support for surgery												14/8	10/3	13/6	9/3
Other											21/25	6/13	17/36	21/24	14/30
Missing reason											3/2		1/0		

Numbers in each cell are IPPV/CPAP. Some babies from 1997 – 2006 with other diagnoses are not included in this table.

8.4.1 Survival

Table 240: Numbers of survivors by gestational age of babies <32 weeks gestation (2011)

Gestation (weeks)	20	21	22	23	24	25	26	27	28	29	30	31
Born alive in NW	3	2	3	3	8	9	14	13	14	17	23	35
Died at birth in NW	3	2	3	1	1	1	0	0	0	0	1	1
Born alive at NW and admitted to NICU				3	7	8	14	13	14	17	22	34
Born alive at NW and survived				2	6	8	13	13	14	16	22	33
Outborn admitted				1	6	1	5	4	3	6	4	3

1.2

8.5 Outcomes

8.5.1 Retinopathy of prematurity

Table 241: Retinopathy of prematurity by birth weight in babies surviving to 36 weeks gestation (ANZNN assigned babies) (2011)

Birth Weight(g)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**104**	**31**	**36**	**31**	**14**	**2**	**0**
<500	0	0	0	0	0	0	0
500-749	19	1	10	4	8	1	0
750-999	22	3	8	9	2	1	0
1000-1249	27	8	6	7	0	0	0
1250-1499	27	16	5	1	0	0	0
1500-1999	9	3	7	0	0	0	0

Table 242: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks gestation (ANZNN assigned babies) (2011)

Gestation (wks)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**104**	**31**	**36**	**21**	**14**	**2**	**0**
<24	1	0	0	1	0	0	0
24-25	16	1	3	4	7	1	0
26-27	25	0	11	9	4	1	0
28-29	36	12	17	4	3	0	0
30-31	15	9	3	3	0	0	0
>31	11	9	2	0	0	0	0

8.5.2 Chronic lung disease

Table 243: Chronic lung disease by birth weight (inborn babies <1500gms) (2011)

Birth Weight (g)	Inborn <1500g n	Dead by 36 wks	Alive at 36 wks	In O_2	O_2 + CPAP/ IPPV	CPAP/ IPPV	CLD	CLD/ livebirth admissions %	CLD/ survivors to 36 wks %
Total	111	3	108	1	13	9	23	21	21
500-749	20	0	20	0	7	2	9	45	45
750-999	24	3	21	0	5	2	7	29	33
1000-1249	25	0	25	1	1	4	6	24	24
1250-1499	42	0	42	0	0	1	1	2	2

Table 244: Chronic lung disease by gestational age (inborn babies <32weeks) (2011) Lynn

Gestation (weeks)	Inborn <32wks n	Dead by 36 wks	Alive at 36 wks	In O_2	O_2+CPAP/ IPPV	CPAP/ IPPV	CLD	CLD/ livebirth admissions %	CLD/ survivors to 36 wks %
Total	**124**	**4**	**120**	**1**	**16**	**9**	**26**	**21**	**22**
<24	2	0	0	0	0	1	1	50	0
24-25	16	0	16	0	3	2	5	31	31
26-27	25	3	22	1	9	4	14	56	64
28-29	31	0	31	0	3	2	5	16	52
30-31	50	1	49	0	1	0	1	2	4

8.5.3 Necrotising enterocolitis ANNZN

The data in the two tables below are for babies with "confirmed" NEC and therefore do not include babies with "probable" NEC.

Table 245: Necrotising enterocolitis (NEC) by birth weight (2002-2011) ANNZN <1500g

Weight (g)	2002			2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**154**	**2**	**1**	**136**	**3**	**2**	**121**	**4**	**3**	**148**	**6**	**4**	**134**	**3**	**2**	**155**	**2**	**1**
<500																1	0	0
500-749	14	0		20	1	5	11	0	0	25	4	16	19	2	10	19	1	5
750-999	37	1	3	32	1	3	37	3	8	34	1	3	24	0	0	37	1	3
1000-1249	47	1	2	31	0		38	1	3	47	1	2	34	1	3	47	0	0
1250-1499	56	0		53	1	2	35	0		42	0		57	0		51	0	0

Weight (g)	2008			2009			2010			2011		
	N	n	%	N	n	%	N	n	%	N	n	%
Total	**149**	**4**	**3**	**150**	**6**	**4**	**154**	**7**	**5**	**121**	**5**	**4**
<500	0	0	0	0	0	0	2	0	0	0	0	0
500-749	19	2	11	15	1	7	25	0	0	22	2	9
750-999	38	1	3	42	4	10	31	1	3	26	2	8
1000-1249	38	1	3	39	0	0	41	4	10	28	1	4
1250-1499	54	0	0	54	1	2	55	2	4	45	0	0

Table 246: Necrotising enterocolitis by gestational age ANNZN <32wks (2002-2011)

Gestation (weeks)	2002			2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**174**	**3**	**2**	**160**	**4**	**3**	**157**	**4**	**3**	**175**	**6**	**3**	**162**	**3**	**2**	**165**	**2**	**1**
<24																5	0	0
24-25	21	1	5	20	1	4	11	1	9	29	4	14	18	1	6	17	1	6
26-27	33	0		30	1	3	42	3	7	20	0		25	2	8	36	1	3
28-29	52	1	2	36	1	3	37	0		64	0		41	0	0	47	0	0
30-31	68	1	1	74	1	1	67	0		62	1	2	78	0	0	60	0	0

Gestation (weeks)	2008			2009			2010			2011		
	N	n	%	N	n	%	N	n	%	N	n	%
Total	**189**	**4**	**2**	**157**	**6**	**4**	**175**	**7**	**4**	**139**	**6**	**15**
<24	0	0	0	1	0	0	1	0	0	3	1	33
24-25	25	3	12	20	1	5	30	0	0	17	2	12
26-27	36	1	3	37	5	14	31	2	7	28	2	7
28-29	45	0	0	45	0	0	42	4	10	37	1	3
30-31	83	0	0	54	0	0	71	1	1	54	0	0

8.5.4 Pneumothorax (All babies <1500g)

Table 247: Pneumothorax requiring drainage by birth weight (<1500g) (2003-2011)

Birth weight (g)	2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <1500g	**136**	**3**	**2**	**121**	**1**	**1**	**148**	**8**	**5**	**134**	**1**	**0.7**	**155**	**7**	**5**
<500													1	0	0
500-749	20	2	10	11	0		25	1	4	19	0	0	19	1	5
750-999	32	0		37	0		34	1	3	24	0	0	37	4	11
1000-1249	31	1	3	38	1	3	47	3	6	34	0	0	47	1	2
1250-1499	53	0		35	0		42	3	7	57	1	2	51	1	2

Birth weight (g)	2008			2009			2010			2011		
	N	n	%	N	n	%	N	n	%	N	n	%
Total <1500g	**149**	**7**	**5**	**137**	**6**	**5**	**143**	**2**	**1**	**139**	**0**	**0**
<500	0	0	0	0	0	0	2	0	0	0	0	0
500-749	19	2	11	15	1	7	23	1	4	23	0	0
750-999	38	1	3	42	3	7	29	0	0	34	0	0
1000-1249	38	0	0	31	0	0	39	0	0	35	0	0
1250-1499	54	4	7	49	2	4	50	1	2	47	0	0

Table 248: Pneumothorax requiring drainage by gestation (all babies <32wks) (2003-2011)

Gestation (weeks)	2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	N	%	N	N	%	N	n	%
Total <32wks	**160**	**3**	**2**	**157**	**3**	**2**	**176**	**11**	**6**	**163**	**1**	**1**	**165**	**7**	**4**
<24	1			0			1	0		1	0	0	5	0	0
24-25	19	2	11	11	0	0	29	1	3	18	0	0	17	2	1
26-27	30	0	0	42	1	2	20	3	15	25	0	0	36	2	6
28-29	36	1	3	37	0	0	64	5	8	41	1	2	47	3	6
30-31	74	0	0	67	2	3	62	2	3	78	0	0	60	0	0

Gestation (weeks)	2008			2009			2010			2011		
	N	n	%	N	n	%	N	N	%	N	N	%
Total <32wks	**189**	**7**	**4**	**148**	**3**	**2**	**164**	**2**	**1**	**157**	**1**	**1**
<24	0	0	0	1	0	0	0	0	0	3	0	0
24-25	25	2	8	21	1	5	28	0	0	23	0	0
26-27	36	1	3	35	2	6	30	0	0	34	0	0
28-29	45	2	4	39	0	0	37	2	5	40	0	0
30-31	83	2	2	52	0	0	69	0	0	57	1	2

Table 249: Inborn babies receiving postnatal corticosteroids by birth weight (babies alive at 1 week and less than 1500gms) (2011)

Birth weight (g)	N	n	%
Total	**107**	**18**	**16.8**
<500	0	0	
500-749	19	9	47
750-999	22	8	36
1000-1249	24	1	4.2
1250-1499	42	0	0

Table 250: Inborn babies receiving postnatal corticosteroids by gestational age (2011)(babies alive at 1 week and less than 32 weeks)

Gestation(weeks)	N	n	%
Total	**120**	**18**	**15**
<24	2	1	50
24-25	15	9	60
26-27	24	6	25
28-29	30	2	6.7
30-31	49	0	0

Table 251: Method of feeding at discharge from NICU by gestational age and birth weight (2011)

	Total	Exclusive		Fully		Partial		Artificial		Nil Oral	
	n	n	%	n	%	n	%	n	%	n	%
Total	828	376	45	129	16	132	16	53	6	29	4
Gestation (weeks)											
20-24	8	5	1.3	0		0		3	4.8	0	
25-27	31	18	4.8	2	1.0	4	2.4	7	11.3	0	
28-31	85	59	15.6	12	6.2	6	3.6	4	6.5	4	13.8
32-36	299	90	23.8	97	50.0	86	52.1	21	33.9	5	17.2
37-40*	335	169	44.7	65	33.5	59	35.8	24	38.7	18	62.1
≥41	70	37	9.8	18	9.3	10	6.1	3	4.8	2	6.9
Birth weight (gms)											
500-749	17	9	2.4	0		2	1.2	6	9.7	0	
750-999	20	13	3.4	1	0.5	3	1.8	3	4.8	0	
1000-1249	25	18	4.8	2	1.0	1	0.6	2	3.2	2	6.9
1250-1499	42	27	7.1	4	2.1	8	4.9	2	3.2	1	3.5
1500-1999	109	41	10.9	29	15.0	30	18.2	7	11.3	2	6.9
2000-2499	174	48	12.7	71	36.6	36	21.8	18	29.0	1	3.5
2500-2999*	128	54	14.3	31	16.0	32	19.4	5	8.1	6	20.7
3000-3999	259	141	37.3	46	23.7	40	24.2	17	27.4	15	51.7
>3999	54	27	7.1	10	5.2	13	7.9	3.2	3.2	2	6.9

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

Table 252: Outborn neonatal and post-neonatal deaths prior to discharge (2011)

Born at	Gestational age	Birth Weight	Apgar 1/5	Twin	Age at death (d)	Cause of death
MMH	33	1970	9	9	30	Epidermolysis Bullosa
MMH	29	1100	5	7	32	Necrotisng Enterocolitis
Wellington	24	802	1	8	61	Congenital Cardiac
MMH	24	820	1	6	39	Necrotisng Enterocolitis
Northland	41	4605	0	0	4	Hypoxic Ischemia
NSH	23	670	2	5	1	Extreme Immaturity
MMH	38	2775	5	8	3	Inborn error of metabolism

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

Table 253: Inborn neonatal and post-neonatal deaths prior to discharge from NICU (2011)

Birthplace	Gestational age	Birth weight	Apgar @1 min	Apgar @ 5 min	DOB to DOD (days)	Main Cause
Delivery suite	32	955	¼	3	Trisomy 18	Delivery suite
Theatre	34	2280	4/5	59	Pulmonary Hypertension	Theatre
Delivery suite	27	800	7/7	44	Bowel necrosis	Delivery suite
Theatre	26	760	2/1	2	Epidermolysis Bullosa	Theatre
Delivery suite	37	2790	3/2	42	Centronuclear myopathy	Delivery suite
Delivery suite	34	2150	7/9	117	Respiratory Failure + Type I laryngeal cleft	Delivery suite
Delivery suite	31	1640	2/6	1	Sepsis	Delivery suite
Theatre	26	740	5/6	79	Chronic lung	Theatre
Delivery suite	23	600	1/2	11	Extreme prematurity	Delivery suite
Theatre	26	925	5/8	45	IVH + Sepsis	Theatre
Delivery suite	24	740	4/7	5	Severe IVH + Sepsis	Delivery suite

APPENDIX 9. PERINATAL MORTALITY

Table 254: Postnatal transfer deaths (these are babies born elsewhere who transferred to NW for postnatal care) (2000-2011)

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Early neonatal deaths	< 7 days	6	1	3	3	3	3	3	5	3	4	5	21
Late neonatal deaths	8 – 28 days	0	1	0	0	0	3	3	2	3	5	1	2
Total deaths		6	2	3	3	3	6	6	7	6	9	6	23

Table 255: Perinatal and perinatal- related deaths (1994 – 2011)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total number of perinatal related losses	147	131	165	128	133	105	136	94	116	105	124	111	99	111	110	112	117	120
Fetal death	80	84	86	74	73	65	84	57	69	64	82	68	74	82	76	75	83	97
Early neonatal death	49	39	63	45	50	31	43	32	40	34	33	38	23	20	26	27	26	20
Late neonatal death	15	7	10	6	6	9	9	5	7	7	9	5	2	9	8	10	8	2
Perinatal mortality rate /1000	9.3	7.6	10.1	9.4	9.8	12.5	15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2	12.9	14.9	15.3
Perinatal related mortality rate /1000	15.6	13.7	16.5	14.7	16.1	13.7	16.9	12.3	14.5	13.5	16.1	16.1	13.4	14.1	14.2	14.2	13.9	15.6

Table 256: Perinatal mortality rate (per 1000 births) and perinatal-related mortality rate (per 1000 births) adjusted for lethal and terminated fetal abnormalities* (2000-2011)

	2000 Rate	2001 Rate	2002 Rate	2003 Rate	2004 Rate	2005 Rate	2006 Rate	2007 Rate	2008 Rate	2009 Rate	2010 Rate	2011 n	2011 Rate
Perinatal mortality rate	15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2	12.9	14.9	118	15.3
Perinatal mortality rate (excluding lethal & terminated fetal abnormalities)	11.5	8.0	8.9	8.2	11.4	9.7	8.4	7.8	9.3	9.4	9.4	118-42/ 7690-42	9.9
Perinatal related loss rate	16.9	12.3	14.5	13.5	16.2	15.0	13.4	14.1	14.2	14.2	13.9	120	15.6
Perinatal related loss rate (excluding lethal & terminated fetal abnormalities)	12	8.4	9.4	8.9	12.4	9.9	8.4	8.0	9.8	10.3	10.5	120-43/7690-43	10.1

*Defined as PDC-major=congenital abnormality for fetal deaths and NDC-major=congenital abnormality for neonatal deaths

Table 257: Maternal characteristics and perinatal related mortality (2011)

	Births n=7690		Stillbirths n=97			Neonatal deaths n=23		Perinatal related deaths n=120		
	N	%	n	%	SB rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Maternal ethnicity (prioritised)											
NZ European	2785	36.2	39	40	14.0	5	22	1.8	44	37	15.8
Maori	623	8.1	11	11	17.7	5	22	8.2	16	13	25.7
Pacific	1033	13.4	10	10	9.7	3	13	2.9	13	11	12.6
Other Asian	1549	20.1	11	11	7.1	2	9	1.3	13	11	8.4
Indian	555	7.2	12	12	21.6	3	13	5.5	15	13	27.0
Other European	872	11.3	8	8	9.2	2	9	2.3	10	8	11.5
Other	273	3.6	6	6	22.0	3	13	11.2	9	8	33.0
Parity											
Nullipara	3624	47.1	51	53	14.1	10	43	2.8	61	51	16.8
Multipara	4066	52.9	46	47	11.3	13	57	3.2	59	49	14.5
Maternal age											
≤25	1223	15.9	25	26	20.4	8	35	6.7	33	28	27.0
26-34	4096	53.3	39	40	9.5	6	26	1.5	45	38	11.0
≥35	2371	30.8	33	34	13.9	9	39	3.8	42	35	17.7
Maternal smoking at booking											
Currently smoking	503	6.5	10	10	19.9	2	9	4.1	12	10	23.9
Not smoking	7186	93.5	87	90	12.1	21	91	3.0	108	90	15.0
Missing data	1	0	0			0			0		
Maternal BMI (WHO categories)											
<18.5	445	5.8	6	6	13.5	0			6	5	13.5
18.5-24.99	3864	50.3	39	40	10.1	11	48	2.9	50	42	12.9
25-29.99	1685	21.9	35	36	20.8	4	17	2.4	39	33	23.1
>=30	1504	19.6	10	10	6.6	7	30	4.7	17	14	11.3
Missing	192	2.5	7	7	36.5	1	4	5.4	8	7	41.7
NZDep 2006 (quintile)											
1	1355	17.6	18	19	13.3	0			18	15	13.3
2	1460	19.0	14	14	9.6	4	17	2.8	18	15	12.3
3	1522	19.8	24	25	15.8	5	22	3.3	29	24	19.1
4	1817	23.6	20	21	11.0	8	35	4.5	28	23	15.4
5	1530	19.9	21	22	13.7	6	26	4.0	27	23	17.6
Missing data	6	0.1	0			0			0		

* Stillbirth rate = number of stillbirths per 1000 births

‡ Neonatal Death rate = number of neonatal deaths per 1000 live births

† Perinatal related mortality rate = number of stillbirths & neonatal deaths to 27 days per 1000 births

Table 258: Perinatal full necropsy rates (%) (1991-2011)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Perinatal necropsy rates (%)	58	56	65	68	57	48	50	38	50	40

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Perinatal necropsy rates (%)	40	41	43	52	48	50	59	55	38	44	33

Table 2589: Cause of perinatal-related death (2003-2004 ANZACPM; 2005-2011 PSANZ-PDC)

Classification*	2004 n	%	2005 n	%	2006 n	%	2007 N	%	2008 n	%	2009 n	%	2010 n	%	2011 n	%
Congenital abnormality	36	34	38	34	37	37	48	43	34	31	31	28	48	41	43	36
Perinatal infection	6	6	11	10	9	9	4	4	5	5	4	4	4	3	4	3
Hypertension	4	4	3	3	3	3	0		4	4	6	5	4	3	4	3
Antepartum haemorrhage	5	5	6	5	4	4	7	6	13	12	15	13	11	9	9	8
Maternal conditions	8	7	8	7	6	6	5	5	3	3	6	5	9	8	8	7
Specific perinatal conditions	5	5	10	9	7	7	7	6	22	20	16	14	8	7	23	19
Hypoxic peripartum death	3	3	4	4	0		2	2	1	1	1	1	2	2	1	1
Fetal growth restriction	6	6	1	1	8	8	11	10	9	8	5	4	2	2	8	7
Spontaneous preterm	23	22	20	18	13	13	16	14	11	10	19	17	8	7	10	8
Unexplained antepartum death	9	8	10	9	12	12	10	9	7	6	9	8	0		9	8
No obstetric antecedent	0		0		0		1	1	1	1	0	0	0		1	1
Total	124		111		99		111		110		112		117		120	

Table 260: Cause of death (PSANZ-PDC) among terminations of pregnancy (2011)

Classification	Termination of pregnancy n=48	
	n	%
Congenital abnormality	30	63
Antepartum haemorrhage	1	2
Perinatal Infection	2	4
Specific perinatal conditions	2	4
Hypertension	3	6
Maternal condition	5	10
Spontaneous preterm	3	6
Fetal growth restriction	2	4
Maternal mental health	4	8

Table 2591: Perinatal deaths by cause (PSANZ-PDC) and gestational age (2011)

Classification	Total n=120		< 37 weeks n=102		≥ 37 weeks n=18	
	n	%	n	%	n	%
Congenital abnormality	43	36	38	37	5	28
Perinatal infection	4	3	4	4	0	0
Antepartum haemorrhage	9	8	9	9	0	0
Maternal conditions	8	7	8	8	0	0
Hypertension	4	3	4	4	0	0
Specific perinatal conditions	23	19	18	18	5	29
Hypoxic peripartum death	1	1	0	0	1	6
Fetal growth restriction	8	7	6	6	2	11
Spontaneous preterm	10	8	10	10	0	0
Unexplained antepartum death	9	8	5	5	4	22
No obstetric antecedent	1	1	0	0	1	6

APPENDIX 10. GYNAECOLOGY

10.1 Termination of pregnancy

Table 2602: Demography and characteristics of women attending EDU (2002-2011)

	2002 n=5775	2003 n=5960	2004 n=5809	2005 n=5598	2006 n=5548	2007 n=5594	2008 n=5550	2009 n=5391	2010 n=5049	2011 n=4949
Ethnicity	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
New Zealand European	28.6	27.8	27.4	26.5	27.4	27.6	27.7	26.1	25.7	27.2
Maori	19.6	18.2	18.4	19.1	20.4	21.2	20.5	19.9	20.4	19.5
Pacific	22.9	23.0	22.8	23.2	23.8	24.5	23.1	24.3	24.1	22.6
Other Asian	10.9	12.3	11.6	11.2	11.4	10.5	10.8	10.6	10.3	10.9
Indian	6.4	7.4	7.7	8.3	8.2	8.3	9.4	10.2	11.7	11.7
Other European	5.1	5.1	5.4	5.7	5.0	4.5	4.8	5.1	5.2	5.7
Other	6.5	6.3	6.6	6.0	3.8	3.3	2.6	3.3	2.6	2.4
Age										
≤ 19	19.3	18.7	19.3	19.8	21.5	22.3	21.7	22.2	20.7	17.8
20 – 24	28.5	30.3	28.9	28.5	29.7	29.6	29.0	29.8	30.6	30.6
25 – 29	21.3	20.8	20.9	21.1	20.7	20.1	21.6	20.8	19.9	21.6
30 – 34	16.4	15.9	16.1	15.7	14.4	14.3	13.3	13.9	14.1	15.4
35 –39	10.4	10.2	10.9	10.7	9.5	9.7	10.1	9.3	10.0	10.2
≥40	4.1	4.1	3.9	4.3	3.9	4.0	4.3	4.0	4.7	4.4
Gestation (weeks) at termination										
6	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1
7	1.8	1.2	0.9	0.4	0.2	0.2	0.1	0.6	2.7	1.4
8	9.8	8.9	17.2	10.5	11.0	8.8	13.0	18.4	33.7	30.3
9	21.5	20.0	23.9	20.9	23.1	20.8	23.9	24.5	23.7	26.9
10	23.1	23.8	21.4	22.7	24.0	25.1	25.1	24.3	16.8	18.4
11	22.5	23.9	20.6	24.0	23.5	24.1	21.3	18.8	13.0	12.6
12	18.5	20.0	14.5	20.0	17.6	20.9	16.7	13.2	10.1	9.9
≥13	2.9	2.1	1.4	1.3	0.5	0.0	0.2	0.1	0.0	0.4

10.2 Gynaecology Inpatient Surgery

Table 2613: BMI by ethnicity (prioritised) among women having inpatient gynaecology surgery (2011) (missing data excluded)

	Total	<19		19-25		26-30		31-35		>35	
	N	n	%	n	%	n	%	n	%	n	%
Total	**1522**	**59**	**3.9**	**646**	**42.4**	**335**	**22.0**	**195**	**12.8**	**287**	**18.9**
NZ European	575	21	3.7	298	51.8	126	21.9	70	12.2	60	10.4
Maori	151	1	0.7	32	21.2	32	21.2	38	25.2	48	31.8
Pacific	270	2	0.7	36	13.3	41	15.2	55	20.4	136	50.4
Other Asian	206	17	8.3	114	55.3	58	28.2	8	3.9	9	4.4
Indian	118	8	6.8	55	46.6	35	29.7	12	10.2	8	6.8
Other European	154	8	5.2	78	50.7	34	22.1	11	7.1	23	14.9
Other	43	2	4.7	28	65.1	9	20.9	1	2.3	3	7.0
Not Stated	5	0		5	100	0		0		0	

3 women had unknown ethnicity; 103 had missing BMI

Table 2624: Smoking status by ethnicity (prioritised) among women having inpatient gynaecology surgery (2011)

		Currently smoking		Past smoker		Never smoked		Unknown	
	N	n	%	n	%	n	%	n	%
Total	**1625**	**287**	**17.7**	**215**	**13.2**	**1119**	**68.9**	**4**	**0.3**
NZ European	615	109	17.7	90	14.6	415	67.5	1	0.2
Maori	167	64	38.3	35	21.0	67	40.1	1	0.6
Pacific	286	78	27.3	33	11.5	175	61.2	0	
Other Asian	220	5	2.3	14	6.4	201	91.4	0	
Indian	124	2	1.6	3	2.4	118	95.2	1	0.8
Other European	164	23	14.0	34	20.7	107	65.2	0	
Other	44	5	11.4	5	11.4	33	75.0	1	2.3
Not stated	5	1	20.0	1	20.0	3	60.0	0	

3 women had a not stated ethnicity 1 was a current smoker and 2 women never smoked

Table 2635: ASA rating among women having inpatient gynaecology surgery (2011)

	Inpatient surgeries 2011 n=1628	
	n	%
ASA Rating		
0	0	
1	834	51.2
2	554	34.0
3	148	9.1
4	7	0.4
Missing	85	5.2

10.3 Gynaecology Laparoscopic Surgery

Table 2646: BMI and Surgical approach* (Missing data excluded) (n=104)

	Hysteroscopy n=277		Laparoscopy n=396		Laparotomy n=206		Vaginal n=575		Radiologically n=13		Vulval n=58	
	n	%	n	%	n	%	%	%	n	%	n	%
BMI												
<19	9	3.3	10	2.5	13	6.3	19	3.3	2	15.4	6	10.3
19-25	66	23.8	219	55.3	69	33.5	247	43.0	9	69.2	38	65.5
26-30	50	18.1	98	24.8	48	23.3	131	22.8	1	7.7	7	12.1
31-35	33	11.9	40	10.1	34	16.5	85	14.8	0	0	4	6.9
>35	119	43.0	29	7.3	42	20.4	93	16.2	1	7.7	3	5.2

6% of BMI data missing in 2011

APPENDIX 11. GLOSSARY OF ABBREVIATIONS

ABA	American Board of Anaesthesiologists	HMD	Hyaline Membrane Disease
ACL	Anticardiolipin antibody	HPV	Human papilloma virus
ACHS	Australian Council Healthcare Standards	ICH	Intracerebral haemorrhage
AMOSS	Australasian maternity outcomes surveillance system	IDDM	Insulin dependent diabetes mellitus
AMSIS	Auckland Maternity Services Information System	Indo	Treated with indomethacin
ANA	Antinuclear antibody	iNO	Inhaled nitrous oxide
ANZNN	Australia and New Zealand Neonatal Network	IPPV	Intermittent positive pressure ventilation
APH	Antepartum haemorrhage	IOL	Induction of labour
ARM	Artificial rupture of membranes	IUD	Intrauterine death
ASA	American Society of Anaesthesiologists	ICSI	Intracytoplasmic sperm injection
AUT	Auckland University of Technology	IVF	In vitro fertilisation
BBA	(Baby) Born Before Arrival (not a planned home birth)	IVH	Intraventricular haemorrhage
BFHI	Baby Friendly Hospital Initiative	KPI	Key performance indicator
BMI	Body mass index	LB	Live birth
BP	Blood Pressure	Ligate	Surgical ligation of PDA
BPD	Bronchopulmonary dysplasia	LLETZ	Large loop excision of the transformation zone
CDU	Child Development Unit	LMP	Last menstrual period
CHD	Congenital Heart Disease	LNND	Late neonatal death
CI	Confidence Interval	LSCS	Lower segment Caesarean section
CLD	Chronic lung disease	LSIL	Low-grade squamous intraepithelial lesion
CPAP	Continuous positive airways pressure	LV	Left ventricle
CRIS	Clinical Records Information System	MAS	Meconium aspiration syndrome
CS	Caesarean section	MCDA	Monochorionic diamniotic twin
CVA	Cerebro Vascular Accident	MCMA	Monochorionic monoamniotic twin
CVS	Chorionic villus sampling	MDM	Multi disciplinary meeting
DAU	Day Assessment unit	N/R	Not resuscitated
DBP	Diastolic blood pressure	NAS	Neonatal abstinence syndrome
DCCM	Department of Critical Care Medicine	NEC	Necrotising enterocolitis
DCDA	Dichorionic diamniotic twin	NFD	Not further defined
DHB	District Health Board	NICU	Neonatal Intensive Care Unit
DIC	Disseminated intravascular coagulopathy	NIDDM	Non-insulin dependent diabetes mellitus
DNA	Did not attend	NW	National Women's
DORV	Double outlet right ventricle	NPSU	National perinatal statistics unit (Australia)
DRG	Diagnosis related groups	NSU	National screening unit
ECMO	Extra Corporeal Membrane Oxygenation	NZBFA	NZ Breast Feeding Authority
EDU	Epsom Day Unit	OP	Occiput posterior
ENND	Early neonatal death	OPU	Oocyte pick up
ERPOC	Evacuation of retained products of conception	PCR	Protein Creatinine ratio
FH	Fetal heart	PDA	Patent ductus arteriosis
FTE	Fulltime equivalent	PE/PET	Pre-eclampsia
GA	General anaesthetic	PG	Prostaglandin
GDM	Gestational diabetes mellitus	PIN	Parent Infant Nursery
GH	Gestational hypertension	PM	Postmortem
GLH	Green Lane Hospital	PMMRC	Perinatal & Maternal Mortality Review Committee
GO	Gynaecologic oncology	PMR	Perinatal mortality rate
GP	General Practitioner	PPHN	Persistent pulmonary hypertension of the newborn
GPH	Gestational proteinuric hypertension	PRLR	Perinatal related loss rate
GTT/ OGTT	Oral glucose tolerance test	(P)PROM	(Preterm) prolonged rupture of membranes

Hb	Haemoglobin	PROM	Prolonged rupture of membranes
HbAIc	Glycosylated heamoglobin	PVL	Periventricular leukomalacia
HDU	High Dependency Unit	RDS	Respiratory distress syndrome
HELLP	Hemolysis, Elevated Liver Enzymes, Low Platelets	ROP	Retinopathy of prematurity
HFOV	High frequency oscillatory ventilation	RR	Relative risk
HIE	Hypoxic ischaemic encephalopathy	SBP	Systolic blood pressure
HIV	Human Immunodeficiency Virus	SCBU	Special Care Baby Unit
SGA	Small for gestational age	SLE	Systemic Lupus Erythematosus
SRM	Spontaneous rupture of membranes	US/USS	Ultrasound/ultrasound scan
STOP	Surgical termination of pregnancy	VBAC	Vaginal birth after Caesarean
SVB	Spontaneous vaginal birth	VLBW	Very low birth weight
TCM	Transcutaneous oxygen monitor	VSD	Ventricular septal defect
TGA	Transposition of the great arteries	WAU	Women's Assessment Unit
TIA	Transient Ischaemic Attack	wks	weeks
TOP	Termination of pregnancy	WHO	World Health Organisation
UAC	Umbilical artery catheter		
HMD	Hyaline Membrane Disease		

APPENDIX 12. DEFINITIONS

Antepartum haemorrhage (APH)
Vaginal bleeding from any cause at or beyond 20 weeks during pregnancy or labour. In places where the term represents antepartum haemorrhage overall, it includes placenta praevia without bleeding.

Augmentation
Describes use of oxytocin or artificial rupture of membranes to accelerate esrablished labour.

Breastfeeding

Exclusive breastfeeding: The infant has never, to the mother's knowledge, had any water, formula or other liquid or solid food. Only breastmilk, from the breast or expressed, and prescribed (as per Medicines Act 1981) medicines have been given from birth.

Fully breastfeeding: The infant has taken breastmilk only, no other liquids or solids except a minimal amount of water or prescribed medicines, in the past 48 hours.

Partial breastfeeding: The infant has taken some breastmilk and some infant formula or other solid food in the past 48 hours.

Artificial feeding:The infant has had no breastmilk but has had alternative liquid such as infant formula with or without solid food in the past 48 hours.

Chronic hypertension (CH)
Diastolic BP≥90mmHg at booking or a medical history of essential hypertension.

Early Neonatal Death (ENND)
Death of a live born baby in the first week of life before completion of 7 days of life

Elective Caesarean section
An elective Caesarean is defined as a Caesarean which was scheduled in advance and scheduled prior to the onset of labour. Therefore, Caesarean sections performed after the onset of labour but booked prior to labour are included with elective Caesarean.

Ethnicity
Ethnicity is collected at each hospital registration with the standard census 2001 question. The ethnicity used in this report represents the most recent response by an individual to the ethnicity question, and so may not be the ethnicity given at the time of birth admission. Three options are input into the CMS (Case Management System) database. In preparing the data for this report, each mother has been allocated to a single ethnic group. When more than one ethnic group is recorded, the prioritised ethnicity system outlined in 'Ministry of Health. 2004. *Ethnicity Data Protocols for the Health and Disability Sector*. Wellington: Ministry of Health.' (available online at *http://www.nzhis.govt.nz/documentation/ethnicity/index.html)* has been used.
The most summarised (Level 1) prioritisation is as follows: Maori, Pacific peoples, Asian, other groups except NZ European, NZ European. To this, we have added 'Other European' and split 'Indian' from Asian, either because these are a large group in our population and/or because their obstetric risk profile is significantly different from the remaining women in the 'Other' or 'Asian' category. In the majority of figures in this document, these categories are recombined. Level 2 prioritisation is given below.

Table 2657: 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.

1.2.1 Gestation

The gestation used in the maternity section of this report is derived from Best Estimate of date of birth (EDD Best) calculated by Healthware at booking based on Last Menstrual Period (LMP), scan data (overriding LMP data based on scan accuracy data sourced from the Australasian Society for Ultrasound Medicine), or clinical override of these dates as deemed appropriate. Healthware does not include gestation calculated from these data into its dataset, so this gestation, in weeks, is derived by taking the integer value of 40 + (date of birth - EDD Best)/ 7.

Gestational Diabetes (GDM)
This diagnosis is based on either a fasting glucose > 5.5mmol/L or a 2 hour glucose > 9.0mmol/L after a 75 gram oral glucose tolerance test.

Gestational hypertension (GH)
Gestational hypertension (GH) is a blood pressure systolic ≥140 and or diastolic ≥90 mmHg on two or more consecutive occasions at least 4 hours apart or one measurement systolic ≥170 and or diastolic ≥110 mmHg.

Infant Death
Death of a baby born alive before the age of 1 year.

Large for Gestational Age (>90th customised percentile)
Birth weight greater than 90th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31).

Late Neonatal Death (LNND)
Death of a baby after the 7th day and before completion of 28 days of life.

Lead Maternity Carer (LMC)
The Lead Maternity Carer is the practitioner or caregiver service selected by the woman to have the legal professional and practical responsibility for ensuring the woman and her baby are given clinically appropriate care.

National Women's LMC services
Community Midwives are the LMC for women who either self refer or are referred to NW for maternity care. The midwives provide continuity of antenatal and postnatal care to women who live in NW geographical boundary. Labour and birth care is provided by NW core Labour and Birthing Suite midwives.

Diabetic Midwives are the LMC for women who are referred to the Diabetic Service for secondary/tertiary and LMC care. The midwives provide continuity of antenatal and postnatal care to woman who live in NW geographical boundary. The Diabetic Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.

Medical Midwives are the LMC for women who are referred to the Medical Service for secondary/tertiary and LMC care. These women have complex medical needs. The midwives provide continuity of antenatal and postnatal care to women who live in NW geographical boundary. The Medical Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.

Self-employed LMC services
Independent midwife
General Practitioner (arranges private or hospital midwifery care)
Private Obstetrician (arranges private or hospital midwifery care)

Other LMC services
Unbooked Women who present at NW, usually in labour or pre-labour, and who do not have an LMC.

Other DHB. These women are usually transferred to NW in late pregnancy, and remain with their original LMC. This LMC might be another District Health Board LMC or a non-NW access holder (e.g. a private obstetrician or independent midwife without access rights at NW or a homebirth midwife without access rights at NW).

Live birth
Birth of a baby showing signs of life. In this report, live births are only included if >20 weeks gestation or >400g if gestation unknown.

Maternal age
Defined as mother's age at her baby's birth.

Mode of birth for multiple pregnancies
For analyses where the denominator is mothers, mode of birth is represented as the mode of birth of the baby requiring most intervention. Mode of birth has been prioritised as emergency Caesarean, elective Caesarean, forceps, ventouse, vaginal breech, then spontaneous vertex birth.

Onset of birth
Onset of birth has been defined by the 4 pathways to birth: (1) elective Caesarean section, (2) emergency Caesarean before the onset of labour, (3) induction of labour, and (4) spontaneous onset of labour.

Neonatal hypoglycaemia
Blood glucose < 2.3mmol/L.

Neonatal Death
Death of a live born baby before completion of 28 days of life .

Neonatal Death Rate
Early and late neonatal deaths per 1000 live births.

NZ Deprivation index (2006)
An area-based measure of socioeconomic deprivation derived from variables from the Census of Population and Dwellings 2006. The score is assigned according to most recently recorded maternal place of residence and may not be place of residence at time of birth and is presented as a decile or quintile. Increasing deciles of deprivation, from least deprived (decile 1) to most deprived (decile 10), are associated with higher mortality and rates of many diseases (Salmond and Crampton 2002a, 2002b). Census area unit level data are used throughout this report.

Parity
The number of times a woman has given birth to a liveborn baby of any birth weight or gestation or to a stillborn infant at or after 20 weeks gestation or where the infant weighed 400g or more and gestation is unknown. Multiple birth adds only one to parity total.

Perinatal Mortality Rate (PMR)
Fetal and early neonatal deaths per 1000 total births.

Perinatal Related Mortality Rate (PRLR)
Fetal and early and late neonatal deaths per 1000 total births.

Postnatally (or newly) Diagnosed Type 2 Diabetes
Type 2 diabetes diagnosed by postnatal glucose tolerance test (GTT) in a woman diagnosed as a gestational diabetic (GDM) during pregnancy.

Postpartum haemorrhage (PPH)
Primary PPH is >500mls blood loss from the genital tract within the first 24 hours of birth.
Secondary PPH is >500mls blood loss from the genital tract after 24 hours up to 6 weeks postpartum.

Preeclampsia (PE or PET)
Gestational hypertension accompanied by proteinuria measured as ≥2+ protein on one dipstick sample or PCR ≥30 on a spot urine sample, or a 24 hour collection ≥0.3g in 24 hours.

PSANZ-PDC (PSANZ Perinatal Death Classification)
Identifies the single most important factor which led to the chain of events which resulted in the perinatal death.

PSANZ-NDC (PSANZ Neonatal Death Classification)
Used in addition to the PSANZ-PDC to identify the single most important factor in the neonatal period which caused a neonatal death.

Small for gestational age (SGA) (customised)
Birthweight less than 10th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31)

Standard primipara
A woman with

- no prior birth $\geq$ 20 weeks,
- aged 20-34 years at index birth,
- with a singleton pregnancy,
- cephalic presentation,
- gestation 37-41 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