National Women's Annual Clinical Report 2013

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Cover artwork:
Compilation of last 9 ACR covers

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 Health 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, Ruby Risso, Steffi Richter, Louise Grey, Praveen Singh, Coila Bevan, Hedwig van Asten, Simone Pook, Dr Elaine Fyfe and Alice Li.

Thanks also to those who have provided data and chapter comments, especially Dr Janet Rowan, Dr Lesley McCowan, Dr Emma Parry, Dr Jenny McDougall, Dr Mahesh Harilall, Dr Martin Sowter, Dr Lucille Wilkinson, Dr Anthony Taylor, Pauline Fakalata, Janice Taylor, Sandra Smith, Ines Blaj, Dr Katie Groom, Dr Michelle Wise, Dr Lois Eva, Dr Malcolm Battin, Dr Claire McClintock, Dr Mairi Wallace, Dr Katherine McKenzie, Dr Paul MacPherson, Dr Elizabeth Curr, Margaret Berry, Dr C Farquhar, Hedwig van Asten, Dr Denys Court, Dr Carolyn Bilborough, Dr Maha Haddad.

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

I am proud to present the 2013 National Women's Annual Clinical Report.

This year marks the 50th anniversary of the establishment of National Women's in the form it functions as today. National Women's has an established reputation as a centre of excellence in Women's Health in its dual roles of providing care for the Auckland population and as a referral centre for the wider region and for some conditions the rest of New Zealand. One of the particular characteristics of National Women's has been its willingness to accept accountability for the care that the service delivers and to present the outcomes of care in an open and public manner.

Over the past 12 months National Women's has reaffirmed its commitment to excellence with the adoption of a new vision- "Excellence in Women's Health through empowerment and partnership". This recognized that our ability to continue to provide high quality care in an increasingly constrained environment is dependent upon our ability to work collaboratively across the community of stakeholders and providers with whom we share the responsibility of care for the women and families that we serve. It also reminds us that each and every one in our service has an important role to play in the care that is provided. This report speaks to our collective efforts during 2013.

Specific areas of interest in this report include the impact of our rising intervention rates, both induction of labour and caesarean section, on the distribution of gestation at birth, and admission of term babies to our neonatal intensive care. You will also be interested to learn about our current strategies for the prevention and management of perineal trauma. You will note a steady increase in our laparoscopic hysterectomy rate as we build up laparoscopic surgical competencies in our team. Demands on our gynaecological oncology service continue to grow and we have become effectively the provider of these services for the Northern half of the North Island. There will be further changes in service delivery in this area in the coming years as part of the introduction of National Tumour Standards and a need to meet faster cancer timeframes.

The preparation of the data for this report is the consequence of an extremely hard working and dedicated multidisciplinary team of epidemiologist, data specialists and clinicians who recognize the value of high quality data which we can then use to enable continuous quality improvement. On behalf of the service I wish to sincerely thank this team for once again producing a detailed and comprehensive report.

Dr Sue Fleming
Director Women's Health

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Chapter 1

INTRODUCTION

1 INTRODUCTION

1.1 Purpose of this report

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

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

1.2 Report structure

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

Chapter 1: Introduction

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

Chapter 2: Service provision

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

Chapter 3: Summary statistics

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

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 2013, 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 2013.

Chapter 11: Maternal mortality and morbidity

This chapter provides data on maternal deaths and severe maternal morbidities among women giving birth at NW during 2013.

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 2013 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 2013 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 gynaecologic oncology and general gynaecology inpatient surgical care.

1.4 Data sources

Data for this report have been extracted from the NW maternity clinical database (Healthware CSC) and from stand-alone databases for neonatology, perinatal mortality, fertility, termination services (Epsom Day Unit), gynaecologic oncology, colposcopy, and gynaecologic surgeries. Data from the ATLAS database (ICD-10 coded data on hospital discharges), supported by the Business Intelligence Unit, 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 registration data for mothers with self-employed lead maternity caregivers (LMCs) were shared by LMCs and entered into Healthware by one Healthware administrator. Registration data for mothers under the care of NW primary maternity services, and all antenatal, birth, and postnatal data were entered by clerks and NW midwives.

1.4.2 Neonatology database

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

1.4.3 Colposcopy database

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

1.5 Data quality

1.5.1 Maternity data quality

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

For the 2004 -2013 years, the data have been cleaned for ad hoc analysis for service provision, audit and research, policy, and for this clinical report. Cleaning has included completing missing data and checking out of range and inconsistent data. These cleaning strategies have been focussed around priority areas for reporting and areas where cleaning could be efficiently completed within the resource available. Further details of variables cleaned are provided below and in Appendix 1.

NW acknowledges 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 2013 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, 3M, Concerto, Éclair and Impax (Radiology PACS System) by ADHB has enhanced data collection, checks on data integrity and clinical audit tremendously. Authorised clinical staff can access the complete clinical record electronically so that no clinical record is lost and the delays inherent in the old paper-based system are avoided.

1.5.3 Gynaecologic data quality

As noted under data sources, gynaecologic data were largely obtained from stand alone Access databases. Fertility Plus data were extracted and reported by the service and Epsom Day Unit data were extracted from ATLAS. Gynaecologic oncology and general gynaecologic surgery data were cleaned against the ATLAS and PIMS theatre databases, and by clinical review of individual cases where complications occurred. ATLAS data were searched for completeness of the surgical databases as well as for complications of surgery. Missing, inconsistent and out of range data were also checked against clinical records.

1.6 Analytical and statistical methods

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

Chapter 2

SERVICE PROVISION

2 SERVICE PROVISION

2.1 Maternity services

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

2.1.1 National Services

Maternal

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

Fetal/Neonatal

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

Other

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

2.1.2 Regional Services

Maternal

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

Fetal/Neonatal

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

2.2 Wards and clinics in the maternity service

The following wards and clinics make up the maternity service:

2.2.1 Labour and Birthing Suite

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

2.2.2 High Dependency Unit (HDU)

- HDU is a level 1 Intensive Care Unit with some level 2 facilities. It managed 184 admissions in 2013. 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 1335 referrals in 2013 (1093 in 2012, 1256 in 2011, 1444 in 2010). DAU has 4 chairs for simultaneous care of up to 4 women. Most common referral reasons are hypertensive disorders, small for gestational age babies and post term assessment.
- An external cephalic version (ECV) clinic is provided at the DAU twice weekly.

2.2.4 Antenatal and Postnatal Wards

- There are 77 antenatal and postnatal beds at National Women's for women and babies requiring secondary and tertiary care. All primary postnatal stays where the mother and baby are well are transferred to Birthcare Auckland, who hold the contract to provide these services.

2.2.5 High Risk Medical Service (including Diabetes Service)

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

2.2.6 Community Services

- Community clinics are held at Green Lane Clinical Centre, along with antenatal clinics in 15 General Practice facilities in the ADHB catchment area.
- Community midwifery clinics and postnatal home visits provide continuity of midwifery care during the antenatal and postnatal period with labour and birth midwifery services provided by core midwives in Labour and Birthing Suite.
- Clinics staffed by publicly funded obstetricians are held four times a week at Green Lane Clinical Centre seeing women under community midwifery care and reviewing secondary referrals from private LMCs.
- Clinics staffed by obstetric physicians are held two times per week.
- A midwifery staffed Walk in Centre acts as a first point of contact and triage for some pregnant women. These women access the centre by phone or by turning up, either with or without an appointment, and are made aware of their choices for maternity care. If presenting with an acute problem, they are referred to obstetric care as necessary.
- Virtual appointments are held for women who are postdates with a low risk pregnancy. There is a willingness to increase the number for virtual clinics for women with particular conditions.
- The Vulnerable Pregnant Women's multidisciplinary team provides a midwifery-lead fortnightly forum for midwifery, maternal mental health and health social workers to plan and coordinate clinical and social care for a client group of

pregnant women described as vulnerable. This forum grew out of an urgent need to coordinate the care of women with complex social needs, at times placing them and their babies at high risk. This risk inevitably involves statutory child protection services, adding a further layer of complexity. The increased coordination of service has resulted in outcomes such as; less traumatic uplifts of new born babies from the hospital; increasing numbers of babies remaining in their parents' care with intensive social service support in place at the time of birth; increasing numbers of babies being placed in kin care without the disruption to attachment inherent in protracted foster placements and reduced interdisciplinary and interagency conflict.

- The PBAC (Positive Birth after Caesarean) clinic was started in February 2011 to promote informed decision making and patient satisfaction. 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

2.3 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 acute 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, perioperative care for elective and acute general gynaecology, gynaecologic oncology and breast surgery. It also provides care to women with early pregnancy complications and complications of fertility treatment. Medical and surgical terminations of pregnancy up to 20 weeks gestation are also performed.
- Radiology assisted procedures like fibroid embolisation, management of AV malformation, diagnostic biopsy are part of the Gynaecology caseload.
- In preparation for a major surgery we accept referrals for administration of preoperative blood transfusion and iron infusion.
- The service has access to the ACH Level 8 High Dependency Unit (HDU) and the Critical Care Unit for those women requiring a higher level of care and monitoring.
- In recent years this unit was involved in many changes through the Releasing Time to Care project. This improved patients' care and satisfaction as nurses can now spend more time directly caring for their patients.
- Enhanced recovery after surgery was another project that has successfully been implemented. We see great results in terms of improved recovery, timely and well planned discharges from hospital.

2.3.4 Outpatient clinics

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

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

2.3.5 Early Pregnancy Assessment Unit (EPAU)

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

2.3.6 Epsom Day Unit (EDU)

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

2.3.7 Fertility Plus

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

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

2.3.8 Gynaecologic Oncology

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

2.3.9 Women's Assessment Unit (WAU)

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

2.4 University of Auckland

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

2.5 Newborn Service

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

2.5.1 Regional and District Services

The Newborn Service is contracted to provide:

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

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

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

2.5.2 The Newborn Services support services

The Newborn Service includes the following:-

- Neonatal Homecare Service
- Child Development Unit

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

There is a close relationship with tertiary services at Starship with approximately 10 % of neonates being transferred from the NICU to Starship each year for ongoing medical services (General paediatrics, respiratory paediatrics, paediatric metabolic and neuroservices) and surgical services (paediatric cardiac, general surgery, gastroenterology).

2.5.3 University Links

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

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

2.6 Lead Maternity Carer services

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

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

- General Practitioner (GP). Antenatal care is based in the GP's rooms. Midwifery care intrapartum and in the postnatal period for women who choose a GP is provided by either a hospital midwife or an independent midwife. If the woman's pregnancy and or labour become complicated then the GP and woman can choose a private obstetrician or NW secondary services to provide care. There is now only one GP providing LMC care at NW.
- 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.
- NW Community Midwives. These midwives are employed by the hospital and provide continuity of antenatal and postnatal care. Labour care is provided by the hospital Labour and Birthing Suite core midwives. Secondary care is provided by the hospital specialists.
- High Risk Medical and Diabetic Midwives. The High Risk service is a multidisciplinary team of midwifery, medical and obstetric practitioners who provide care for women who have diabetes or other medical conditions. The woman has a named midwife from this service who is her LMC and who provides continuity of antenatal and postnatal care. Labour care is provided by the hospital core midwives in Labour and Birthing Suite

2.6.1 Funding of Maternity Services

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

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

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

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

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

2.7 Quality Department

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

Reportable events

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

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

There were 533 incidents reported in 2013, (524 in 2012) including five serious events requiring investigation using one of the in-depth review methodologies.

Chapter 3

SUMMARY STATISTICS

3 SUMMARY STATISTICS

3.1 Mother and baby numbers: NWH 2013

Table 1: Mother and baby numbers: NWH 2013

Total number of mothers birthing at National Women's	7188
Mothers birthing before arrival (BBA)	35
Total number of mothers	**7223**
Total number of babies born at National Women's	7342
Babies born before arrival (BBA)	35
Total number of babies	**7377**

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.

Seven women gave birth twice during the calendar year 2013 and are therefore counted twice in the above table and throughout this report.

Table 2: Contribution of multiple births to mother and baby numbers: NWH 2013

		Mothers	Babies
National Women's births	Singletons	7037	7037
	Twins	147	293
	Triplets	4	12
Totals (not including BBA)		**7188**	**7342**
BBA	Singletons	35	35
	Twins	0	0
	Triplets	0	0
Totals (including BBA)		**7223**	**7377**

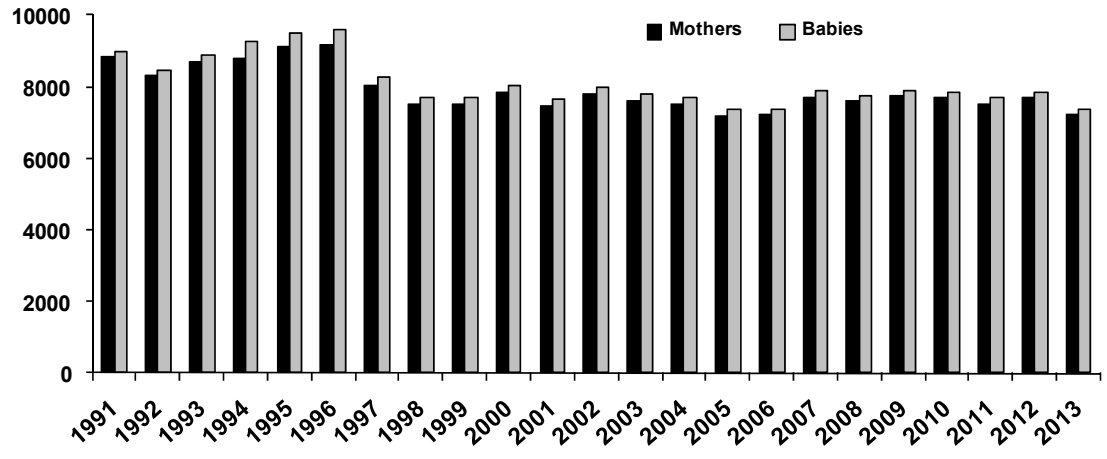


Figure 1: Numbers of women birthing and babies born at NWH (1991-2013)

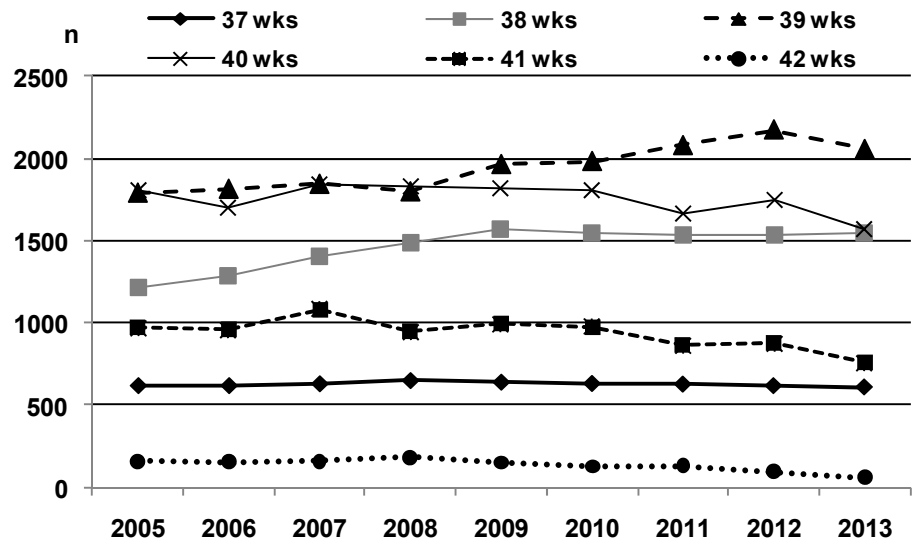


Figure 2: Term births by gestation NWH (2005-2013)

3.2 Summary of maternal outcomes 2013

Table 3: Mode of onset of birth NWH 2013

	Birthing Mothers n=7223	
	n	%
Spontaneous onset of labour	3270	45.3
Iatrogenic onset of birth	3953	54.7
CS Elective	1227	17.0
Emergency CS before onset of labour	288	4.0
Induction of labour	2438	33.8

Table 4: Mode of birth by parity NWH 2013

	Birthing Mothers n=7223		Nullipara n=3441		Multipara n=3782	
	n	%	n	%	n	%
Spontaneous Vertex Birth	3828	53.0	1479	43.0	2349	62.1
Vaginal Breech Birth	56	0.8	22	0.6	34	0.9
Operative Vaginal Birth	833	11.5	674	19.6	159	4.2
Forceps	292	4.0	232	6.7	60	1.6
Ventouse	541	7.5	442	12.8	99	2.6
Caesarean Section	2506	34.7	1266	36.8	1240	32.8
CS Elective	1227	17.0	396	11.5	831	22.0
CS Emergency	1279	17.7	870	25.3	409	10.8

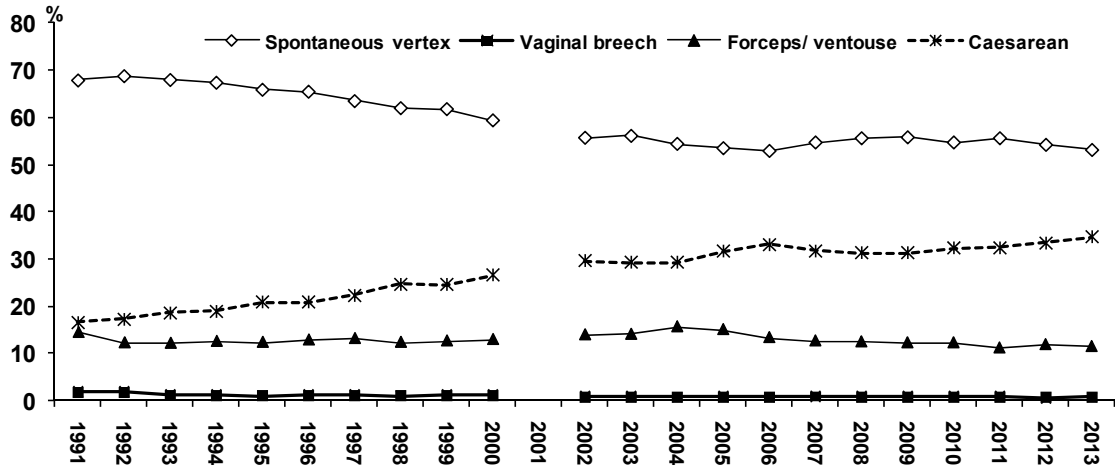


Figure 3: Mode of birth NWH (1991-2013)

Table 5: Maternal postpartum outcomes NWH 2013

	Birthing mothers	n	%
PPH ≥1000mls	7223	701	9.7
SVB	3890	272	7.0
Instrumental vaginal birth	827	102	12.3
Caesarean section	2506	327	13.0
Episiotomy among vaginal births	4717	1200	25.4
Third/ fourth degree tears among vaginal births	4717	138	2.9
Postpartum blood transfusions	7223	196	2.7

3.2.1 Maternal deaths

In 2013 there were 2 maternal deaths.

3.3 Summary of neonatal outcomes 2013

Table 6: Neonatal outcomes among babies born at NWH in 2013

	Babies born n=7377	
	n	**%**
Gender		
Male	3854	52.2
Female	3522	47.7
Preterm birth		
20-27 weeks	103	1.4
28-31 weeks	103	1.4
32-36 weeks	568	7.7
Term birth		
37-41 weeks	6542	88.7
42+ weeks	61	0.8
SGA (by Customised Centile)		
Preterm	303	4.1
Term	779	10.6
Admission to NICU		
Preterm	435	5.9
Term	396	5.4
	Live births N=7300	
Apgar at 5 min <7	**n**	**%**
Preterm	59	0.8
Term	90	1.2
	Live births excluding admissions to NICU N=6452	
Infant Feeding at discharge from NW facility	**n**	**%**
Exclusive breastfeeding	5094	79.0
Fully breastfeeding	256	4.0
Partial breastfeeding	963	14.9
Artificial feeding	138	2.1

Table 7: Perinatal related mortality NWH 2013

	Babies N	n	Rate
Fetal deaths	7377	77	10.4/1000 births
Early neonatal deaths	7300	28	3.8/1000 live births
Late neonatal deaths	7300	9	1.2/1000 live births
Neonatal death	7300	37	5.1/1000 live births
Perinatal deaths (fetal & early neonatal)	7377	114	14.2/1000 births
Perinatal related deaths (fetal & all neonatal)	7377	123	15.5/1000 births

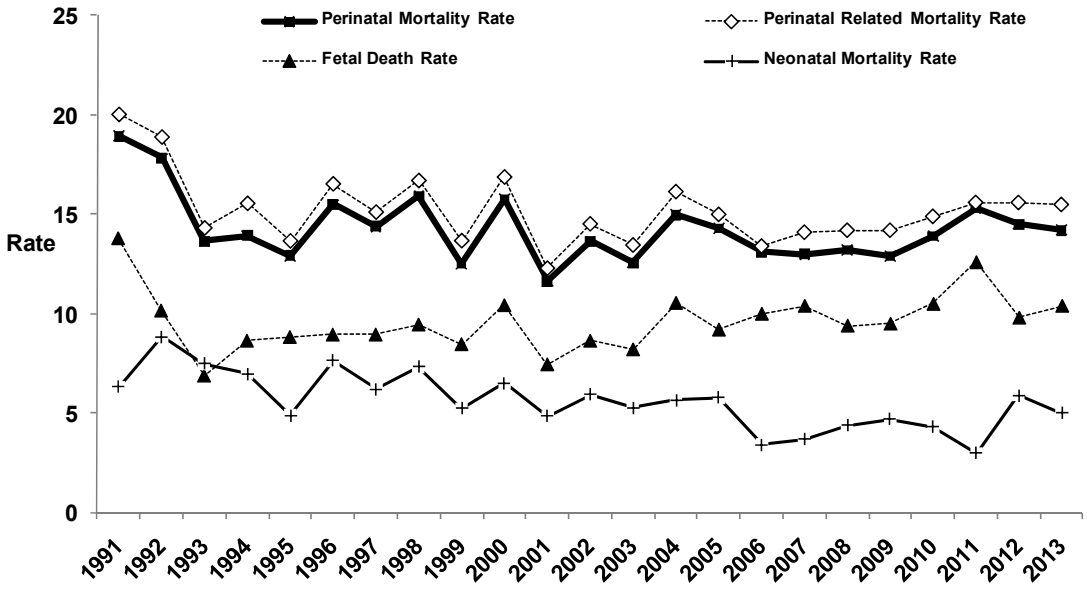


Figure 4: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate NWH (1991-2013) (all rates expressed as deaths/1000 births)

Chapter 4

MATERNAL DEMOGRAPHY

4 MATERNAL DEMOGRAPHY

This chapter describes the demographic characteristics of the women giving birth at NW in 2013. Additional data pertaining to this chapter can be found in Appendix 3.

4.1 Maternal domicile

In 2013, 68% of women giving birth at National Women's were from the Auckland District Health Board area. This proportion has changed very little over the last 10 years. The proportion from Waitemata DHB area has remained unchanged irrespective of the new service at WDHB for mothers with gestational diabetes who used to receive care from the ADHB service. Some mothers from outside ADHB catchment area require tertiary services, but a substantial proportion of the 32% of our clientele from other DHBs are making a personal choice to birth at NW.

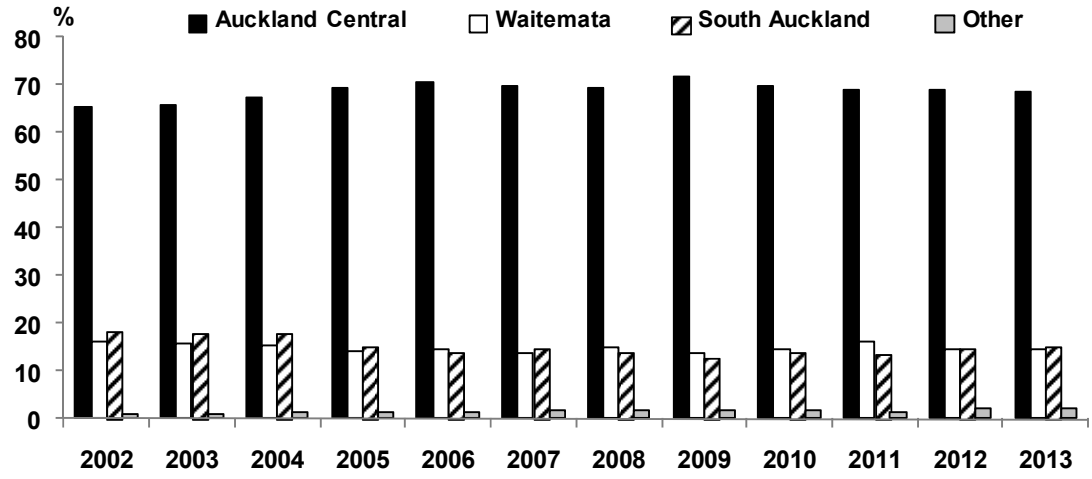


Figure 5: Domicile (DHB of residence) of women birthing at NWH (2002-2013)

4.2 Maternal age, parity, and ethnicity

4.2.1 Maternal Age

The steady rise in the proportion of women aged over 35 giving birth at National Women's has stabilised in the past 5 years. Women over 40 in 2013 accounted for 4.3% of births, almost double the 2.5% in 2000. Although still a small proportion of our total maternity population this group contribute to an increased demand for medical services within the department.

At the same time, there has been a gradual and on-going reduction in births among mothers up to 25 years of age, including among mothers up to 20 years of age.

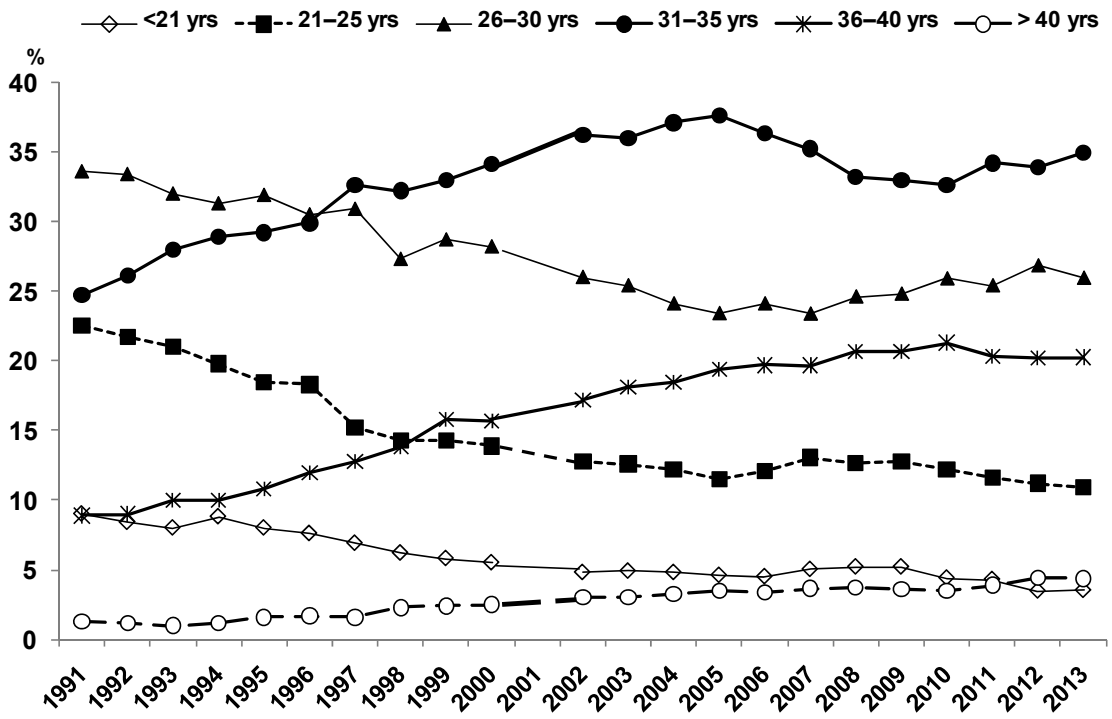


Figure 6: Maternal age distribution among women birthing at NWH (1991-2013)

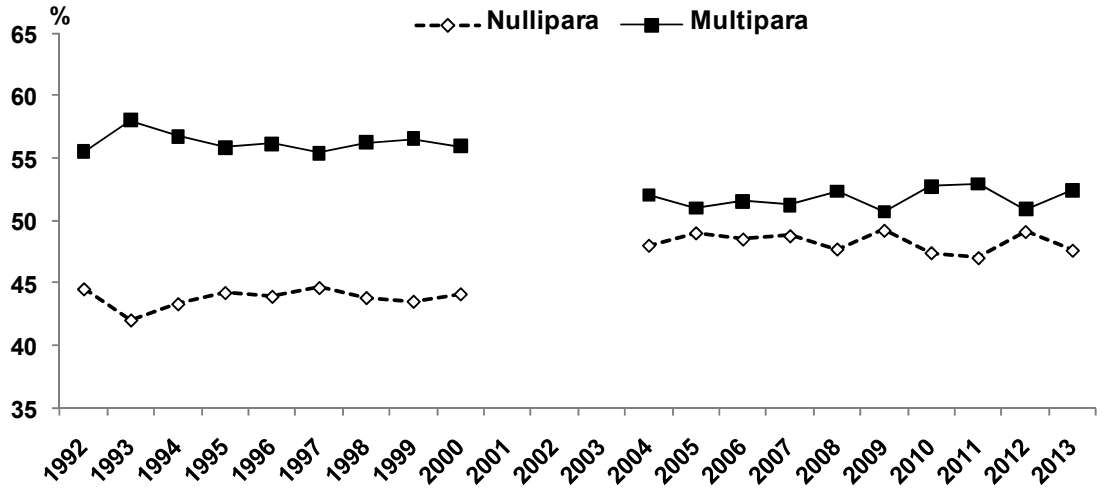


Figure 7: Parity distribution among women birthing at NWH (1992-2013)

The ratio of multiparous to nulliparous women has remained fairly constant over recent years at close to 1:1. This is a significant change from the 1990s when the ratio of multiparous to nulliparous mothers was 1.2-1.3:1.

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 2013, 7.4% of mothers giving birth at NW were prioritised as Māori, 12.5% Pacific peoples, 8.6% Indian, 21.8% Other Asian, 10.7% Other European, 35.3% NZ European, and 3.7% Other ethnicities. The proportion of women birthing at National Women's of Chinese and other Asian origin has increased from 15.6% to 22.5% in six years and this may have implications for how our antenatal services are provided and how patient information is provided.

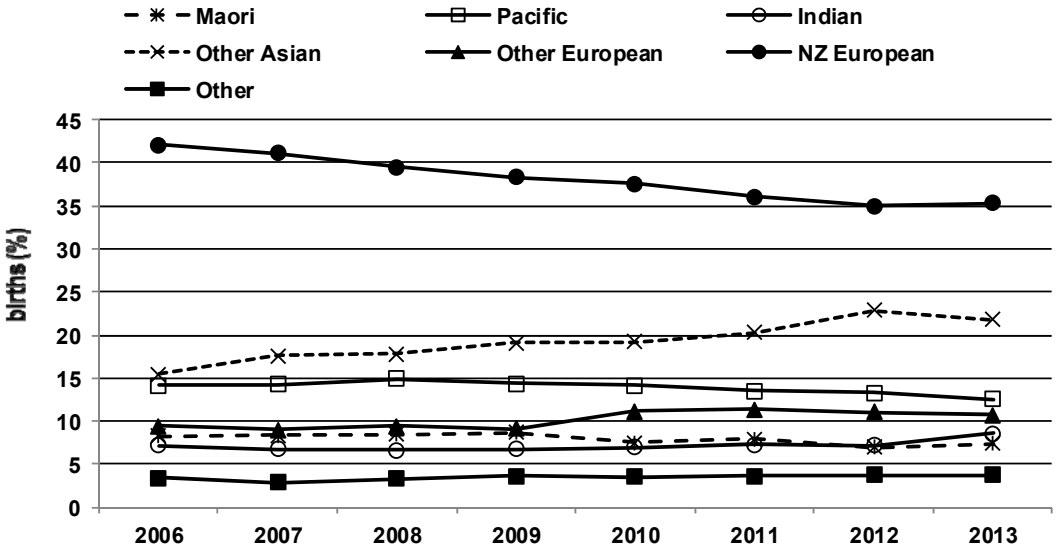
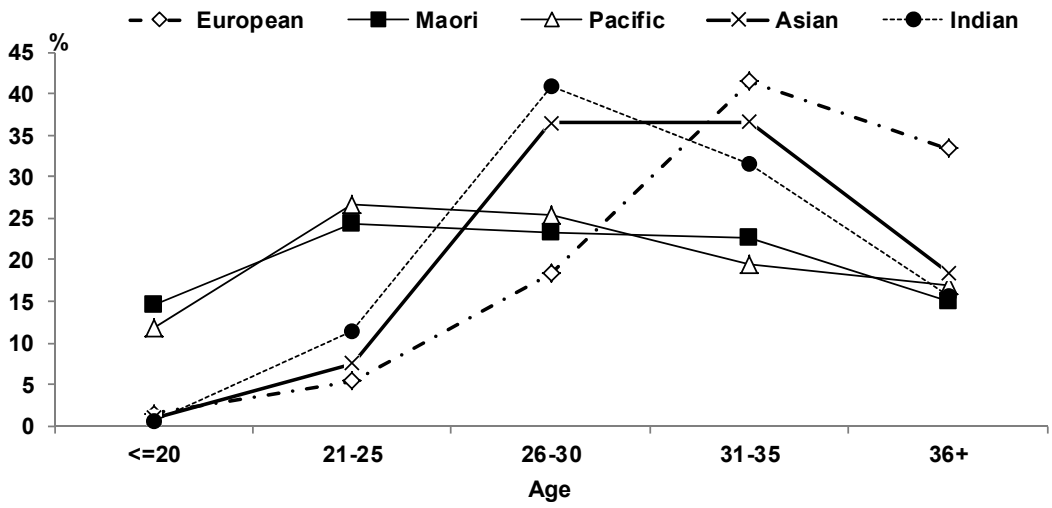


Figure 8: Ethnicity of mothers giving birth at NWH 2006-2013



Rates not presented if denominator <30 women

Figure 9: Maternal age among European, Māori, Pacific, Other Asian and Indian mothers NWH 2013

There are clear differences in maternal age at birth according to the mother's ethnicity as shown in the preceding figure.

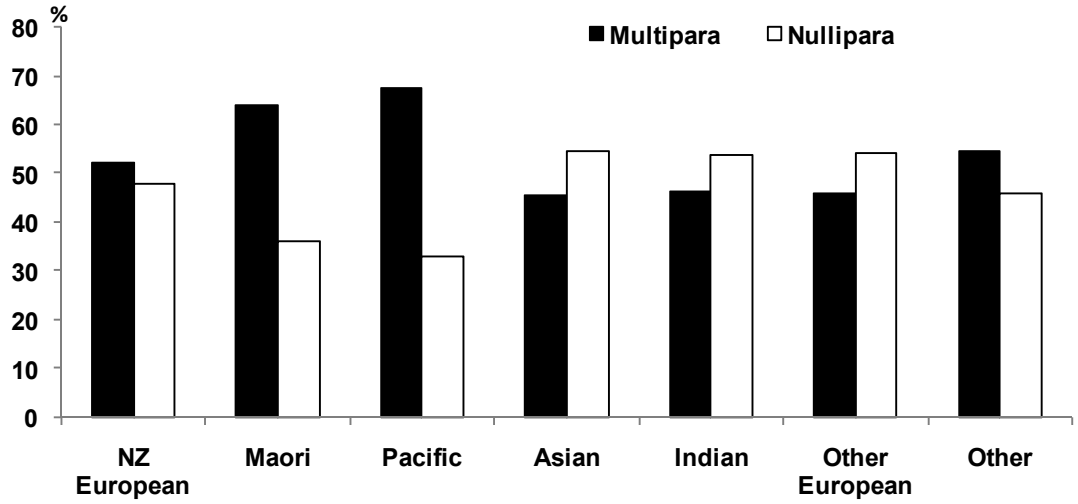


Figure 10: Parity distribution by maternal ethnicity NWH 2013

While 54% of Asian and 47% of NZ European mothers giving birth at NW are having their first baby, 36% of Māori and 33% 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 8: Smoking status of women at booking and at birth NWH 2013

Smoking Status	Smoking at booking n=7223		Smoking at birth n=7223	
	n	%	n	%
Yes	415	5.7	325	4.5
No	6799	94.1	6883	95.3
Missing data	9	0.1	15	0.2

Among women birthing at NW in 2013, 5.7% reported smoking at booking and 4.5% at birth. This is a 21% decrease in smoking rates from booking to birth, suggesting a positive response to smoking cessation education.

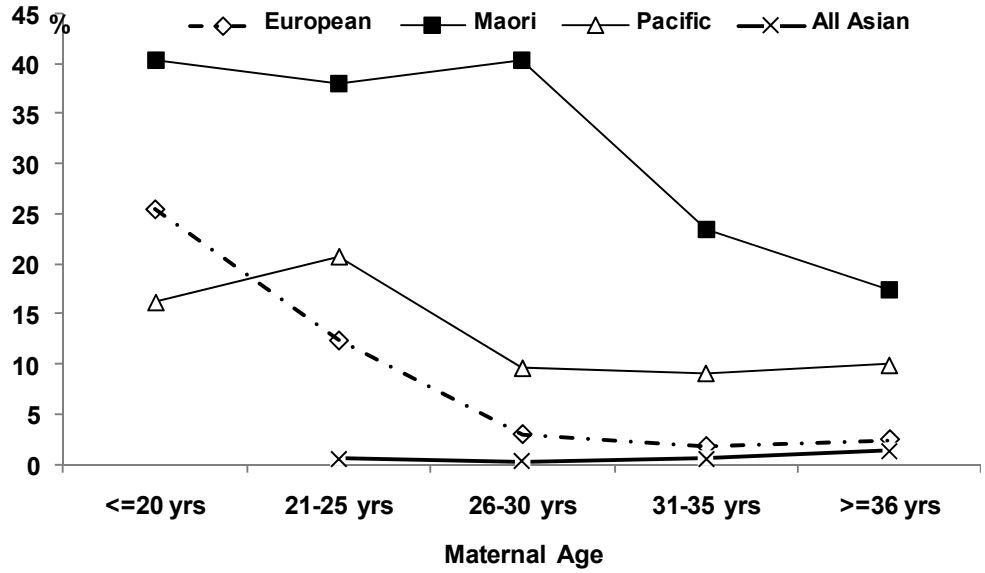


Figure 11: Smoking rates at booking by age and ethnicity NWH 2013

While the smoking rate among women birthing at NW is low compared to the NZ birthing population (15% at the time of birth)(NMMG, Annual report 2013), some populations within NW have very high rates, including mothers under 26 years old, women living in areas of high socioeconomic deprivation, and Maori and Pacific mothers. Within ethnic groups, there is an increased rate of smoking among younger mothers and among mothers living in areas with higher deprivation. At booking, 12.7% of women attending the NW Community clinic reported that they were smoking. These data help to identify the most at risk groups who need help with this important modifiable risk factor.

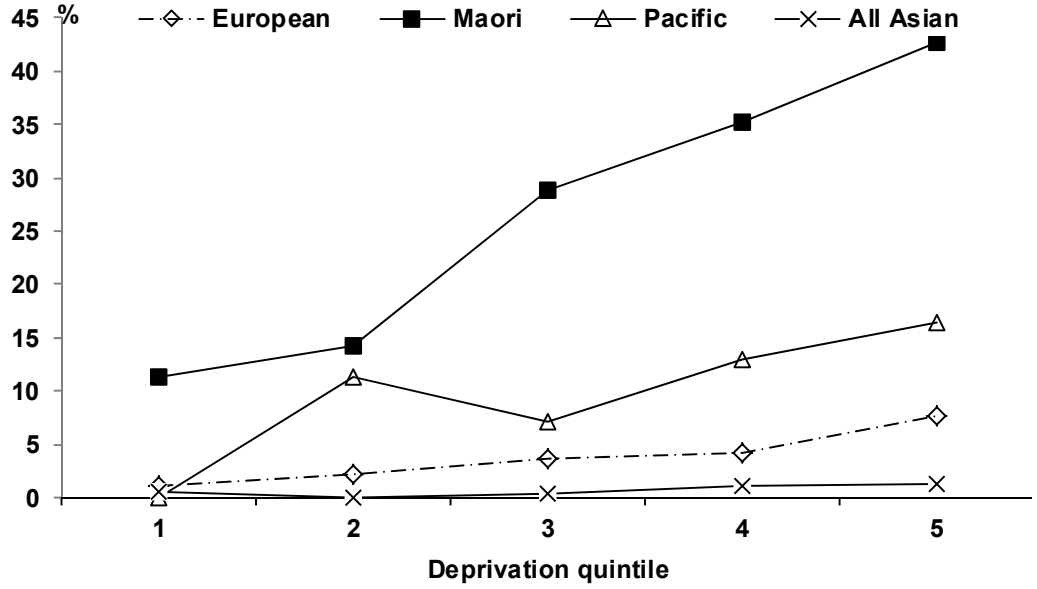


Figure 12: Smoking at booking by deprivation quintile and maternal ethnicity NWH 2013

4.4 Body mass index

Forty two percent of the maternity population birthing at NW were overweight in 2013 (BMI ≥25), 18% obese (BMI ≥30), and 9% morbidly obese (BMI ≥35). Interestingly, despite a general concern that obesity rates are increasing, these rates have not changed over the last five years.

As well as being an independent risk factor for a number of complications of pregnancy and poor outcomes, obesity is associated with deprivation (see figure below). It is also strongly associated with ethnicity with over 60% of Maori and 80% of Pacific mothers being overweight or obese. This may make developing effective interventions to reduce the impact of maternal obesity particularly challenging and interventions should take account of the problems of accessing health care amongst women in economically deprived circumstances.

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

Table 9: Maternal BMI NWH 2009-2013

	2009		2010		2011		2012		2013	
	n=7735		n=7709		n=7523		n=7695		n=7223	
	n	%	n	%	n	%	n	%	n	%
<18.5	445	5.8	442	5.7	440	5.8	481	6.3	255	3.5
18.5-24.99	3868	50.0	3916	50.8	3798	50.4	3949	51.3	3826	53.0
25-29.99	1763	22.0	1721	22.3	1646	21.8	1678	21.8	1679	23.2
30-34.99	783	10.1	792	10.3	795	10.5	771	10.0	699	9.7
35-39.99	373	4.8	360	4.7	370	4.9	354	4.6	367	5.1
>=40	251	3.3	265	3.4	309	4.1	289	3.8	250	3.5
Missing	308	4.0	221	2.9	185	2.5	173	2.3	147	2.0

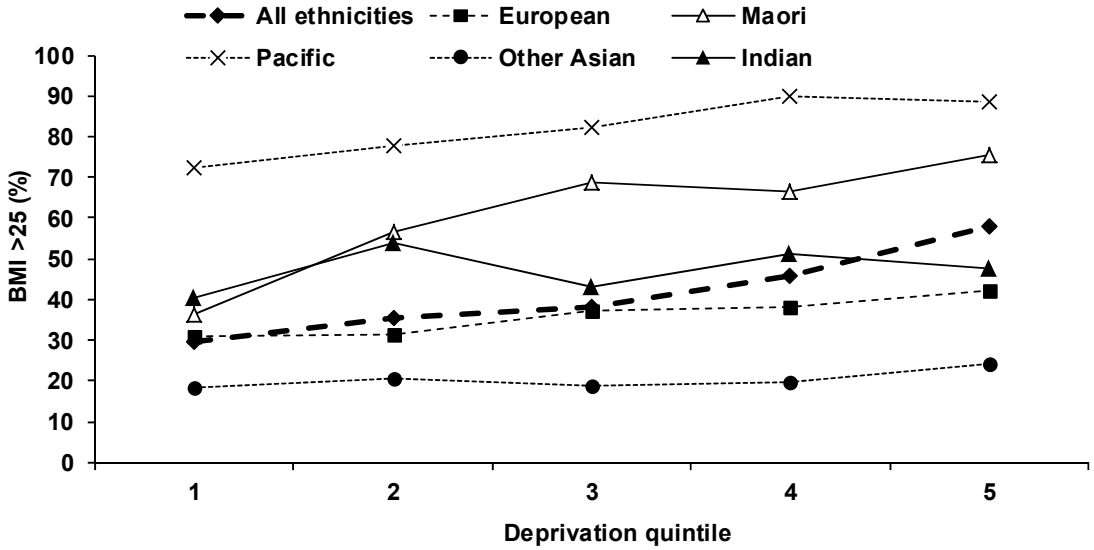


Figure 13: BMI >25 by ethnicity and deprivation quintile NWH 2013

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

4.5 Socio Economic status

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

Table 10: Deprivation decile (NZDep2006) among women birthing at NWH 2013

	Women giving birth in 2013	
	n=7223	
Deprivation decile	**n**	**%**
1	468	6.5
2	780	10.8
3	781	10.8
4	632	8.7
5	683	9.5
6	865	12.0
7	712	9.9
8	905	12.5
9	533	7.4
10	852	11.8
missing	12	0.2

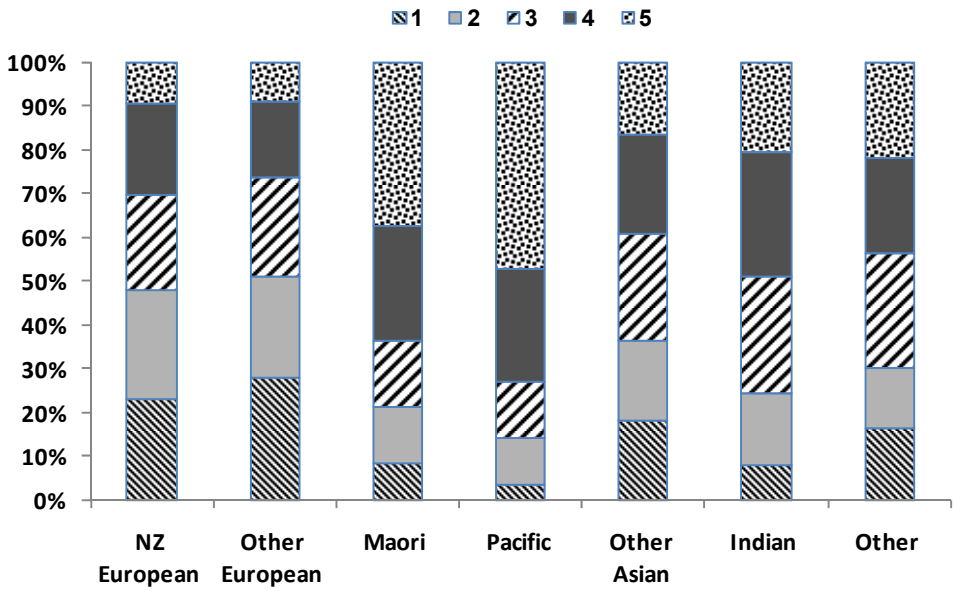


Figure 14: Deprivation quintile (1(least deprived) - 5(most deprived)) by maternal ethnicity NWH 2013

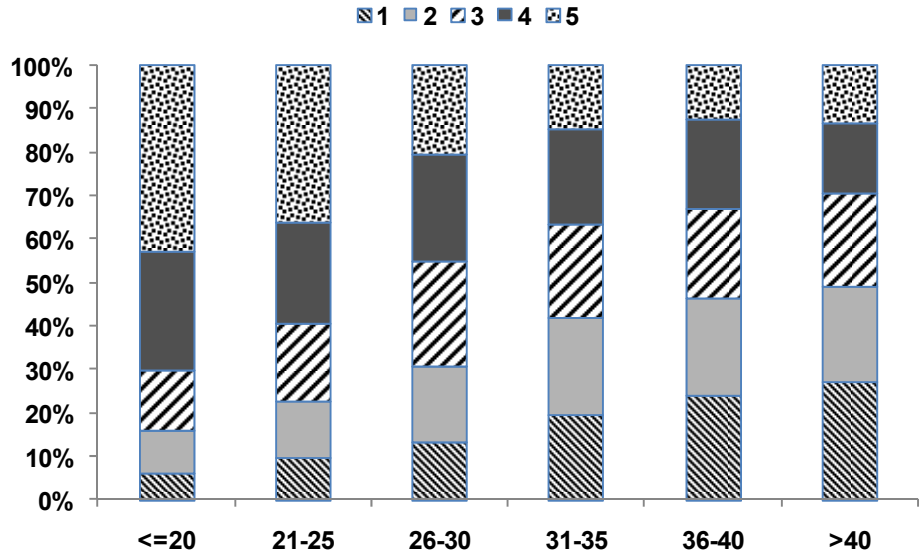
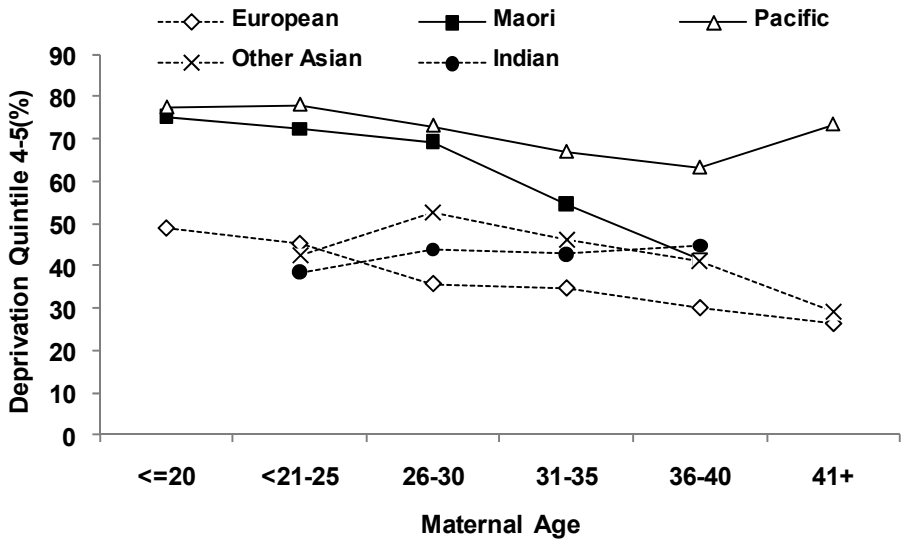


Figure 15: Deprivation quintile (1(least deprived) - 5(most deprived)) by maternal age NWH 2013



Rates not presented if denominator <30 women

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

Figure 16 suggests that the strong association between young maternal age and higher socioeconomic deprivation seen in figure 15 is mostly due to the high proportion of Maori and Pacific mothers among young mothers.

4.6 Lead Maternity Carer (LMC) at birth

The data given throughout this report for LMC relate to LMC at birth.

In 2013, 48% of women were registered with a self-employed (or independent) midwife at birth, 26% with a private obstetrician, 19% with the National Women's Community clinic service, and 7% with National Women's specialist medical and diabetes clinic services. Overall 74% of women who gave birth at NW in 2013 were under the care of a self-employed Lead Maternity Carer compared to 65% in 2006.

There is only one GP who has an access agreement to birth babies at NW, who cared for 17 women (0.2%) in 2013.

Only 28 women were unbooked in 2013, 24 of whom were Māori or Pacific mothers.

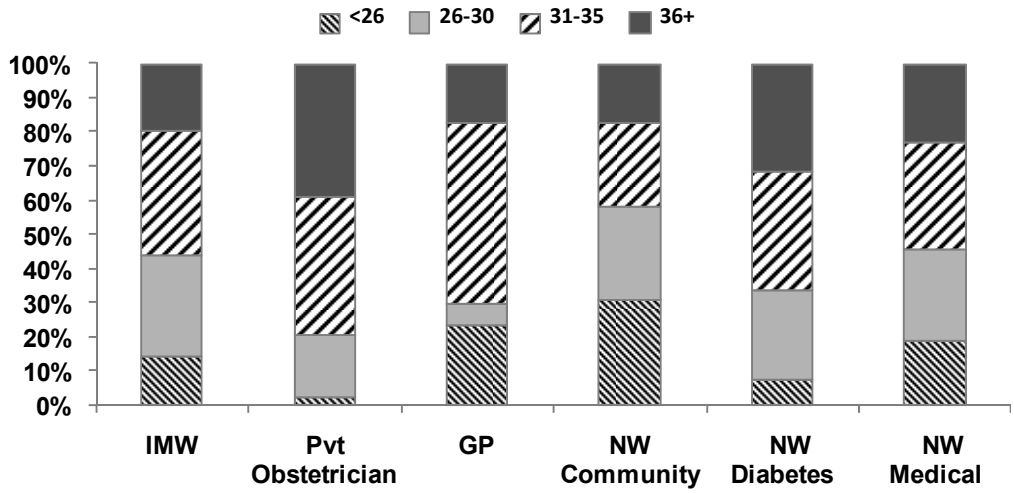


Figure 17: LMC at birth and maternal age NWH 2013

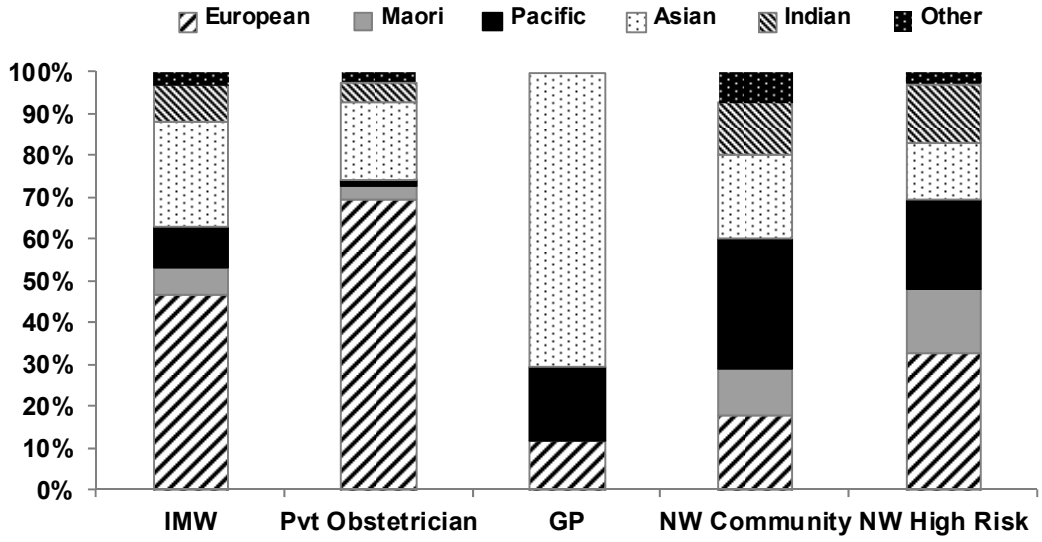


Figure 18: LMC at birth and maternal ethnicity NWH 2013

Women booked with a private obstetrician were more likely to be older, particularly over 35 years, compared to women booked with other LMCs. Maori and Pacific mothers are less likely than European mothers to be registered with a self-employed LMC (either a midwife or an obstetrician). Reasons why Maori and Pacific mothers are less likely to be registered with a self-employed LMC for pregnancy care should be explored.

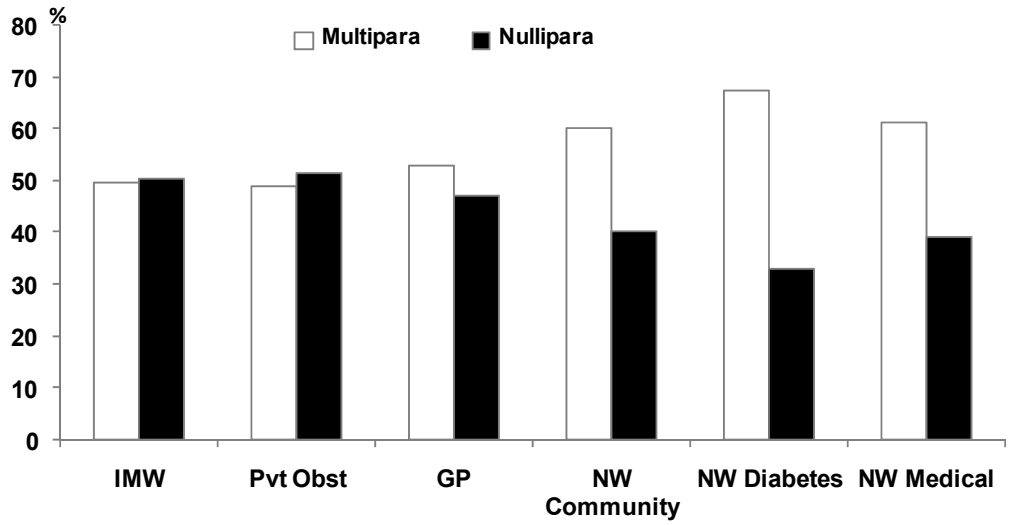


Figure 19: LMC at birth and parity NWH 2013

4.7 Standard primipara

A standard primiparous mother is defined as a woman with no prior birth at 20 or more weeks gestation, aged 20-34 years at the first birth, with a singleton pregnancy, cephalic presentation, gestation 37-41 weeks, baby not small for gestational age (customised centile $\geq 10^{th}$), without medical disease (cardiac disease, renal disease, mental health disorder, SLE, HIV infection, CVA/TIA, diabetes or hypertension), gestational diabetes, pregnancy associated hypertensive disease, or antepartum haemorrhage.

The objective of reporting outcomes for this tightly defined sub-group is to permit comparisons over time, between individual caregivers, and with other institutions.

In 2013, 35% of primiparous women were defined as standard. Outcomes for standard primipara are given in section 6.

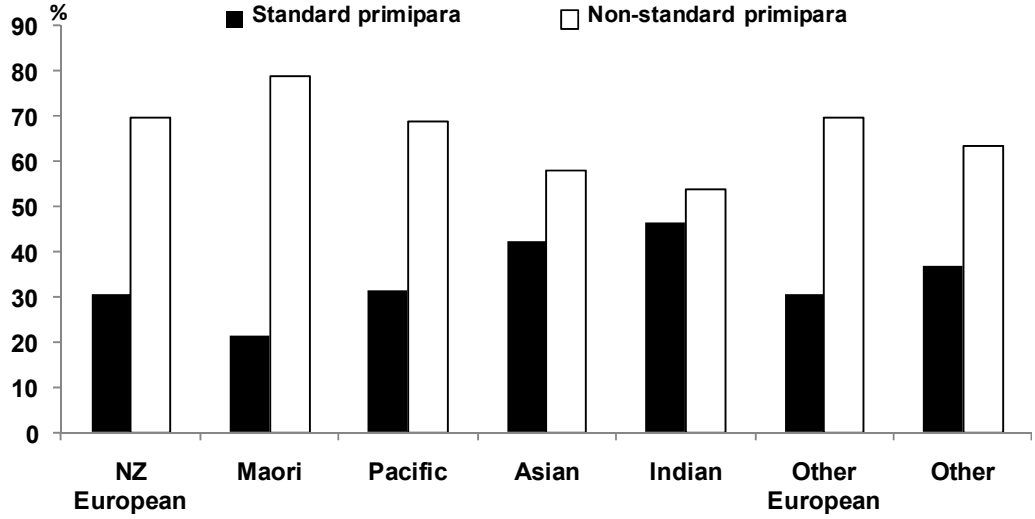


Figure 20: Proportion of standard primipara among primipara by maternal ethnicity NW 2013

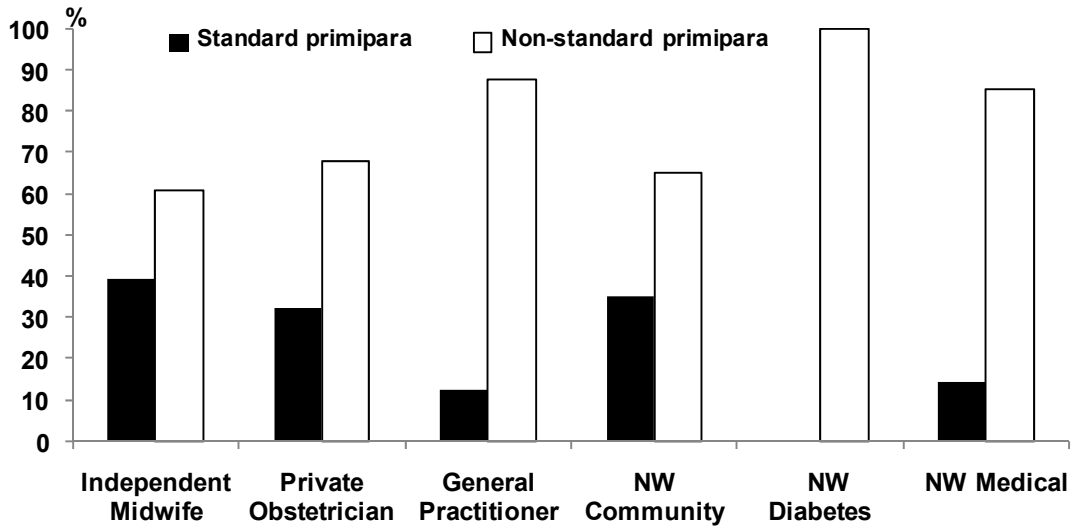


Figure 21: Standard primipara by LMC at birth NW 2013

Chapter 5

ANTENATAL COMPLICATIONS

5 ANTENATAL COMPLICATIONS

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

5.1 Preterm birth

Methods

Preterm birth is defined as birth prior to 37 completed weeks. Since 2004, iatrogenic birth has been defined as induction of labour (including induction for preterm premature rupture of membranes (PPROM)), elective Caesarean section and emergency Caesarean before the onset of labour.

Findings

Table 11: Rates of total, spontaneous and iatrogenic preterm birth NWH 2004 – 2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total birthing women	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**
Women birthing preterm (<37) total	756	685	716	796	733	658	689	684	709	673
Incidence %	10.1	9.5	9.9	10.3	9.7	8.5	8.9	9.1	9.2	9.3
Women birthing <32 weeks	220	211	212	212	222	185	212	190	203	185
Incidence %	2.9	2.9	2.9	2.8	2.9	2.4	2.8	2.5	2.6	2.6
Spontaneous and iatrogenic preterm birth										
Spontaneous 32-36 weeks	266	230	239	292	188	184	218	200	194	193
Incidence %	3.6	3.2	3.3	3.8	2.5	2.4	2.8	2.7	2.5	2.7
Spontaneous <32 weeks	106	93	96	105	105	91	94	79	90	72
Incidence %	1.4	1.3	1.3	1.4	1.4	1.2	1.2	1.1	1.2	1.0
Iatrogenic 32-36 weeks	270	244	265	292	323	289	259	294	312	295
Incidence %	3.6	3.4	3.7	3.8	4.2	3.7	3.4	3.9	4.1	4.1
Iatrogenic <32 weeks	114	118	116	107	117	94	118	111	113	113
Incidence %	1.5	1.6	1.6	1.4	1.5	1.2	1.5	1.5	1.5	1.6
Total babies										
Total babies 32-36 weeks	636	559	591	667	590	555	547	573	592	568
Total babies <32 weeks	250	247	245	237	253	214	246	214	228	206

There has been a reduction in total preterm birth rate (<37 weeks gestation) from 2004-2013 (10.1% to 9.3%, chi square test for linear trend p=0.002). This reduction in overall preterm birth is due to a significant reduction in spontaneous preterm birth rate (<37 weeks gestation) from 2004-2013. More specifically, there has been a significant reduction at both 32-36 weeks (chi square test for trend p<0.00001) and at <32 weeks (p=0.003) in spontaneous preterm birth.

Conversely, there has been a significant increase in iatrogenic preterm birth rate between 32-36 weeks (chi squared for trend p=0.04) but no change in iatrogenic birth rate at <32 weeks gestation (chi squared for trend p=0.6).

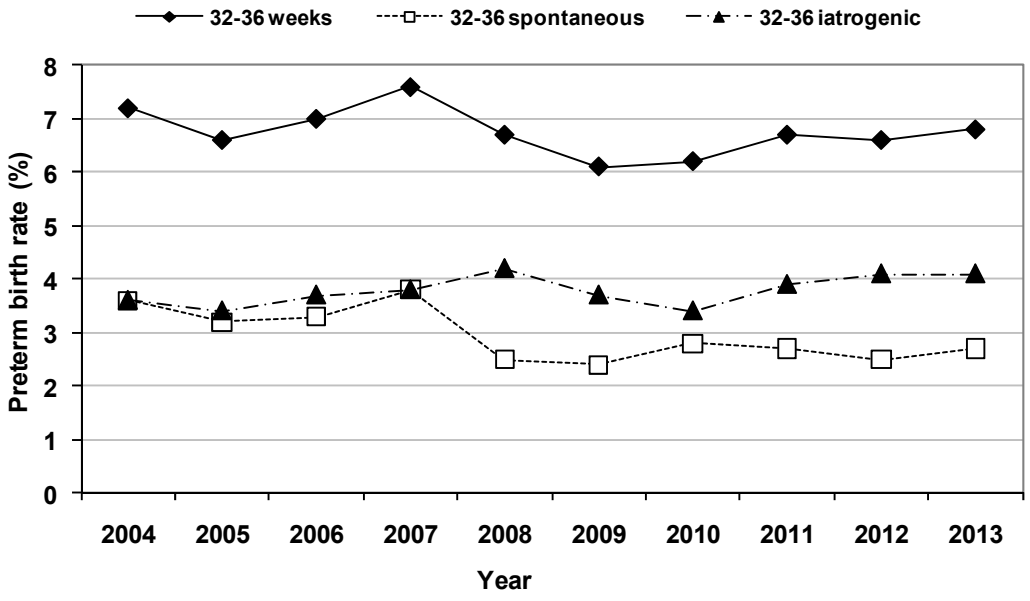


Figure 22: Preterm birth rate 32-36 weeks (mothers) NWH 2004-2013

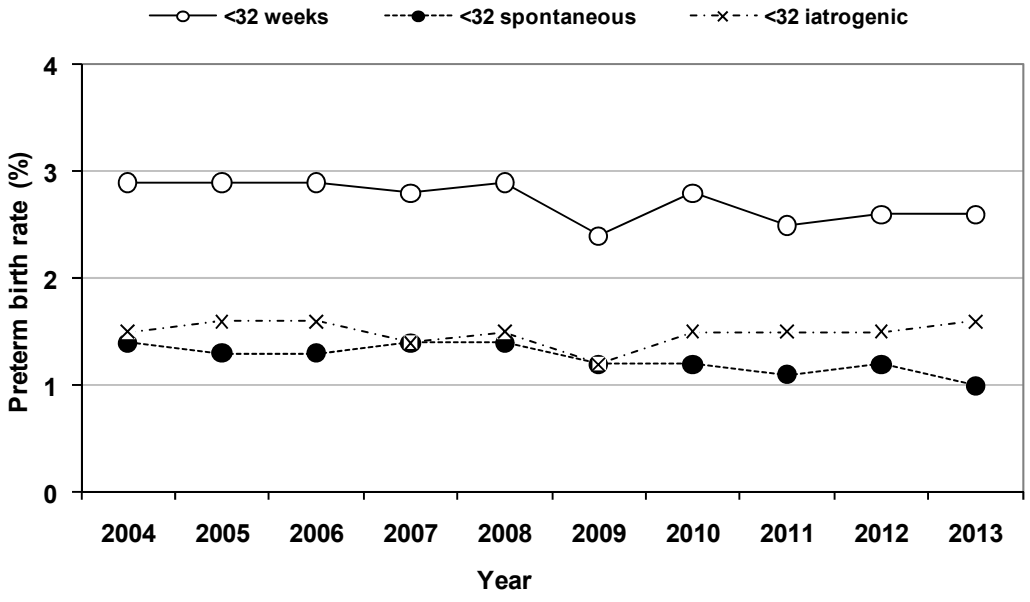


Figure 23: Preterm birth rate < 32 weeks (mothers) NWH 2004-2013

There are a number of possible reasons for the observed reduction in spontaneous preterm birth. A reduction in the rates of smoking amongst pregnant women and a more smoke free environment may have a significant impact. A recent systematic review published in the Lancet highlights an association between national and regional smoke free legislation policies and a reduction in rates of preterm birth within the populations studied. In December 2004 New Zealand was the third country worldwide to introduce smoke-free legislation for all indoor workplaces including bars and restaurants. This reduction in passive smoking and the impact on each individual's smoking habit may have influenced rates of preterm birth within our unit over the last decade.

Women with a multiple pregnancy are at much higher risk of preterm birth. A recent reduction in the incidence of multiple pregnancies following assisted reproduction may have led to lower rates of multiple pregnancies overall and subsequently had a positive effect on preterm birth rates. Examination of the data over time for singleton pregnancies only would allow estimation of this effect.

More recently, National Women's Health has developed a Preterm Birth Clinic for the assessment, surveillance and, where necessary, treatment of women deemed to be at very high risk of preterm birth. A similar clinic running in the United Kingdom for over ten years has been associated with a significant reduction in preterm and early preterm (<32 weeks) birth within the hospital and the local region. However, as the National Women's Health Preterm Birth Clinic has only been active for the last 18 months it is unlikely that this will have influenced the downward trend in spontaneous preterm births seen since 2004. However, increasing clinician awareness of risk and a less formal approach to surveillance and intervention in the form of cervical cerclage and vaginal progesterone therapy may have had an impact on the falling rates of spontaneous preterm birth.

As with previous annual reports, the rate of iatrogenic preterm birth exceeds that of spontaneous preterm birth (both at 32-36 weeks and <32 weeks). Our higher rates of iatrogenic preterm birth are likely to reflect the tertiary level of care provided by National Women's Health dealing with high risk pregnancies and in-utero transfers of care in those requiring early birth on fetal and/or maternal grounds.

The rising rates of iatrogenic preterm birth at 32-36 weeks may reflect a changing demographic in our general population. For example women with BMI >35 and of advanced maternal age (age 41+ years) have significantly increased rates of iatrogenic preterm birth (10.9% and 12.6% respectively, compared to an overall rate of 5.6%). It is also possible that with increasing confidence in neonatal care and more intensive surveillance, thresholds for delivery are changing. Examination of the indication for elective CS, emergency prelabour CS and IOL at 32-36 weeks may help determine the reasons more clearly.

We continue to see the highest rates of preterm birth (both spontaneous and iatrogenic) in women at risk for other pregnancy complications, most specifically in women ≤20 years of age (15.7%), Maori women (16.0%) and in those currently smoking (16.4%). Continued efforts to help women become smoke-free in pregnancy are likely to further impact on a reduction of overall preterm birth rates. It is very likely that there are additional confounding factors that contribute to risk for Maori and young women. Investigation of these may reveal modifiable risk factors and so further potential to reduce rates of preterm birth.

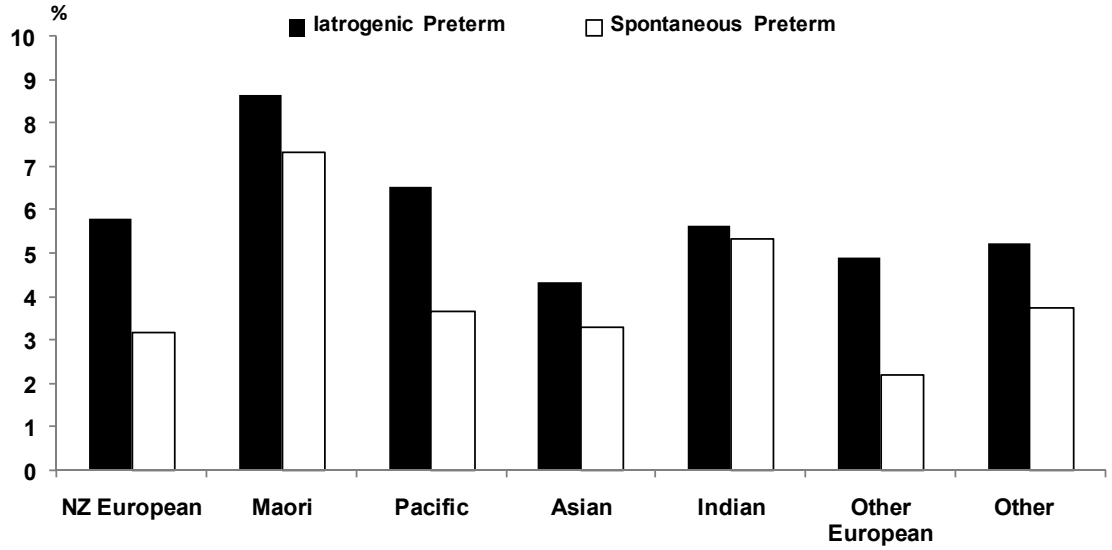


Figure 24: Iatrogenic and spontaneous preterm birth rates <37 weeks by ethnicity NWH 2013

National Women's Health remains very active in clinical trials research endeavouring to reduce spontaneous and iatrogenic preterm birth rates and also to reduce morbidity and mortality associated with preterm birth. Within the last two years results of the PROGRESS study and the PPROMT trial have been presented. National Women's Health recruited women to these two large international multicentre trials which will make a significant contribution to our knowledge of the use of vaginal progesterone therapy for the prevention of spontaneous preterm birth and the management of PPROM at 34-37 weeks respectively.

We are currently the lead centre for two multicentre trials aiming to reduce iatrogenic preterm birth; the EPPI (Enoxaparin for the Prevention of Preeclampsia and IUGR) trial and STRIDER NZAus (a randomised placebo controlled trial of sildenafil in severe early onset IUGR). We are also recruiting women to other multicentre trials including the MAGENTA study (Magnesium sulphate at 30-34 weeks Gestational age; Neuroprotection Trial) and APTS (Australian Placental Transfusion Study).

Table 12: Perinatal outcome of preterm births by gestation at birth NWH 2013 (n=774)

Gestation	Births	Fetal deaths	Live births	% Liveborn	Neonatal Death	% of live births surviving >=28 days
20	12	10	2	17	2	0
21	15	8	7	47	7	0
22	7	6	1	14	1	0
23	15	12	3	20	2	33
24	16	6	10	63	3	70
25	15	4	11	73	1	91
26	14	2	12	86	0	100
27	9	1	8	89	0	100
28	25	3	22	88	1	95
29	17	3	14	82	1	93
30	20	1	19	95	1	95
31	41	5	36	88	0	100
32	44	2	42	95	3	93
33	67	0	67	100	2	97
34	81	3	78	96	1	99
35	115	1	114	99	1	99
36	261	3	258	99	0	100
Totals	774	70	704	91	26	96

Summary and Implications

Being born too early continues to impose risks of neonatal morbidity and mortality with life-long implications. Reassuringly National Women's Health preterm birth rates may be reducing. Many preterm births are unavoidable and in some cases essential when the mother or fetus is significantly compromised. However, we should continue to aim to reduce rates of spontaneous preterm birth and improve management of maternal and fetal conditions to safely reduce the need for preterm birth. This includes simple measures such as continued smoke change advice to all smoking pregnant women and continued involvement in relevant clinical trials.

5.2 Small and large for gestational age babies

Methods

Until 2004, the NWH 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.

In 2013, an updated algorithm, based on more recent NWH data, has been applied to the data to determine customised centile.

SGA is defined as birthweight <10th customised centile. Customised centiles define 10% of the "normal" population as SGA with the consequence that rates of SGA in a complex population like National Women's are >10% (14.7% in 2013). LGA (large for gestational age) is defined as birthweight >90th customised centile.

Findings

Table 13: Rates of SGA and LGA as defined by customised birthweight centiles (compared to AGA) by demographic characteristics NWH 2013

	Total Babies	Customised Birthweight <10th%(SGA)		Customised Birthweight >=10th% & <=90th% (AGA)		Customised Birthweight >90th%(LGA)	
	N	n	%	n	%	n	%
Total*	**7377**	**1082**	**14.7**	**5716**	**77.5**	**572**	**7.8**
Maternal Age							
<=20	257	45	17.5	198	77.0	13	5.1
21-25	801	138	17.2	604	75.4	58	7.2
26-30	1907	251	13.2	1512	79.3	143	7.5
31-35	2571	348	13.5	2010	78.2	213	8.3
36-40	1512	232	15.3	1153	76.3	124	8.2
>40	329	68	20.7	239	72.6	21	6.4
Ethnicity							
NZ European	2623	372	14.2	2038	77.7	209	8.0
Maori	543	106	19.5	385	70.9	50	9.2
Pacific	919	164	17.8	690	75.1	64	7.0
Asian	1600	197	12.3	1288	80.5	115	7.2
Indian	630	102	16.2	468	74.3	60	9.5
Other European	790	103	13.0	635	80.4	52	6.6
Other	272	38	14.0	212	77.9	22	8.1
Parity							
Multipara	3868	573	14.8	2970	76.8	319	8.2
Primipara	3509	509	14.5	2746	78.3	253	7.2
Smoking at booking							
Currently smoking	422	110	26.1	293	69.4	19	4.5
Not smoking	6939	971	14.0	5416	78.1	552	8.0
Unknown	9	1		7		1	

	Total Babies	Customised Birthweight <10th%(SGA)		Customised Birthweight >=10th% & <=90th% (AGA)		Customised Birthweight >90th%(LGA)	
	N	n	%	n	%	n	%
BMI							
<18.5	257	37	14.4	205	79.8	15	5.8
18.5-24.99	3891	514	13.2	3087	79.3	288	7.4
25-29.99	1727	249	14.4	1330	77.0	144	8.3
30-34.99	715	116	16.2	541	75.7	58	8.1
35-39.99	367	80	21.3	257	68.4	39	10.4
>=40	258	56	21.7	188	72.9	14	5.4
Missing	153	30	19.6	108	70.6	14	9.2
Plurality							
Singleton	7067	925	13.1	5572	78.8	570	8.1
Multiple	303	157	51.8	144	47.5	2	0.7

* customised centile was not assigned for 7 babies for whom birthweight was unknown or gestation at death was greater than one week prior to birth
AGA=appropriate for gestational age

Differences in age and ethnicity between mothers of SGA and AGA infants are present. There is a U shaped relationship between age and risk of SGA with elevated risk in both young and older mothers. Maori, Pacific and Indian mothers have an increased risk of SGA which was also found in last year's report. In Maori women the elevated risk may be associated with the higher rates of smoking in pregnancy and in Indian and Pacific women this may be related to pregnancy complications such as hypertensive disorders. The independent risk factors for SGA in our population have recently been published and after adjustment for confounders ethnicity was not an independent risk factor (Anderson et al Aust NZ J Obstet Gynecol 2012, DOI: 10.1111/ajo.12016). The increased risk of SGA among obese women (18.8% (252/1340)) is clinically relevant as it is more difficult to detect these SGA infants before birth. Recent data from National Women's show that this increased risk of SGA in obese women (adjusted odds ratio 1.24 (1.11-1.39)) is independent of other common confounders such as hypertensive disorders. Consistent with international literature women who smoke have an elevated risk of SGA infants. Ceasing smoking in early pregnancy can prevent this risk of SGA in smokers and is an important goal of antenatal care.

Other independent risk factors for SGA identified by Anderson et al were: age >35 years, nulliparity, gestational hypertension and preeclampsia, chronic hypertension, placental abruption, APH of unknown origin, along with smoking and obesity already mentioned above.

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

Table 14: Birthweight and gestation at birth among SGA, LGA and appropriately grown (AGA) babies (n=babies) NWH 2013

	Customised Birthweight <10th%(SGA) N=1082		Customised Birthweight >=10th% & <=90th%(AGA) N=5716		Customised Birthweight >90th%(LGA) N=572	
	n	%	n	%	n	%
Median birth weight(IQR) g	2610(2210-2910)		3410(3137.5-3680)		4130(3857.5-4410)	
Gestation at birth						
Term	779	72.0	5300	92.7	523	91.4
Preterm	303	28.0	416	7.3	49	8.6
Preterm <32 wks	107	9.9	87	1.6	7	1.2
Median gestation (IQR) weeks	38(36-39)		39(38-40)		39(38-40)	

Consistent with findings in previous years more than one quarter of SGA infants were born preterm and 9.9% were born < 32 weeks. Rates of preterm delivery were not increased in LGA infants compared with AGA.

Table 15: Interventions and outcomes among SGA, LGA and AGA babies born preterm <37 weeks NWH 2013

	Customised Birthweight <10th%(SGA) n=303		Customised Birthweight >=10th% & <=90th%(AGA) n=416		Customised Birthweight >90th%(LGA) n=49	
	n	%	n	%	n	%
Onset of birth - preterm						
Spontaneous labour	68	22.4	202	48.6	22	44.9
Induction and elective/pre labour CS	235	77.6	214	51.4	27	55.1
NICU admission						
Any stay	194	64.0	216	51.9	25	51.0
>= 2 days	184	60.7	201	48.3	23	46.9
Apgar at 5 mins < 7	23	7.6	30	7.2	6	12.2
Fetal death (n/1000 births)	45	149	17	41	2	41
Neonatal death (n/1000 live births)	14	46	9	22	3	61

Iatrogenic preterm birth appeared more common among SGA babies compared with AGA or LGA babies. This is likely because of an association with preeclampsia, and antenatal diagnosis of SGA in other “placental insufficiency” syndromes. Preterm SGA infants were 3- 4 times more likely to be stillborn compared with preterm AGA and LGA babies.

Table 16: Interventions and outcomes among SGA, LGA and AGA babies at term NWH 2013

	Customised Birthweight <10th%(SGA) n=779		Customised Birthweight >=10th% & <=90th%(AGA) n=5300		Customised Birthweight >90th%(LGA) n=523	
	n	%	n	%	n	%
Onset of birth – preterm						
Spontaneous labour	259	33.2	2453	46.3	208	39.8
Induction and elective/pre labour CS	520	66.8	2847	53.7	315	60.2
NICU admission						
Any stay	81	10.4	272	5.1	43	8.2
>= 2 days	57	7.3	176	3.3	24	4.6
Apgar at 5 mins < 7	16	2.1	67	1.3	7	1.3
Fetal death (n/1000 births)	3	3.9	4	0.8	0	0.0
Neonatal death (n/1000 live births)	4	5.1	5	0.9	2	3.8

Perinatal deaths in term SGA infants were less common than in preterm SGA infants but were approximately four fold higher compared with rates in AGA infants. Term SGA and LGA infants were both more likely to be admitted to the neonatal unit compared with their AGA counterparts.

Summary / Implications

These 2013 data again confirm that babies who are SGA by customised centiles have higher rates of morbidity and mortality compared with AGA babies. This applies both to babies born at term and preterm. Women who smoke have higher rates of SGA than non-smokers. Cessation early in pregnancy with appropriate support should be the goal for all pregnant smokers. A paper which describes independent risk factors for SGA in our population has recently been published and provides more information for the interested reader.

5.3 Multiple pregnancy

This section describes the characteristics and outcomes of mothers who gave birth to twins and triplets at NW during 2013 and the outcomes of their babies.

Findings

Table 17: Multiple pregnancy rates NWH 2000-2013

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total number of multiple pregnancies	218	179	208	191	188	187	162	177	160	159	153	163	162	151
Incidence %	2.7	2.3	2.6	2.4	2.4	2.5	2.2	2.3	2.1	2.1	2.0	2.2	2.1	2.1
Number of twin pregnancies	207	175	201	184	188	184	157	174	156	156	149	159	156	147
Number of triplet pregnancies	11	4	7	7	0	3	5	3	4	3	4	4	6	4
Number of quadruplet pregnancies	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 18: Fetal/neonatal outcomes of multiple pregnancies NWH 2000-2013

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total number of babies born in a multiple pregnancy	447	362	423	389	376	377	329	357	324	321	310	330	330	305
Incidence %	5.3	4.7	5.3	4.9	4.9	5.1	4.5	4.5	4.2	4.1	3.9	4.3	4.2	4.1
Number of multiple pregnancies where one or more babies died	14		26	11	15	13	8	9	12	9	13	17	11	10
Incidence % (no. of multiple pregnancies where a baby died/number of multiple pregnancies)	6.4		12.5	5.8	8.0	7.0	4.9	5.1	7.5	5.8	8.5	10.4	6.8	6.6
Number of babies who died in a multiple pregnancy	23				23	17	12	11	16	13	16	26	18	16
Total number of babies born in a twin pregnancy	414	350	402	368	376	368	314	348	312	321	298	318	312	293
Twin perinatal deaths (< 7days)	20				23	16	11	10	13	12	15	23	15	14
Twin perinatal mortality rate*	48.3				61.2	43.4	35.0	28.7	41.7	37.4	50.3	72.3	48.1	47.8

*Perinatal twin deaths (<7 days)/1000 twin babies born

There has been a significant reduction in multiple birth rate from 2000-2013 (chi square test for linear trend $p<0.00001$). Given that there has been an increase in births to older mothers over this time, which is associated with increased rates of spontaneous multiple pregnancy, it is likely that this is a result of a move towards single embryo transfer in assisted reproduction. The proportion of multiple births at NWH with a reported history of assisted reproduction was 8.5% compared to 2.2% of singleton births.

The perinatal mortality rate is 3 times higher in twins than singletons at NWH (47.8/1000 births versus 13.9/1000 births) and is stable.

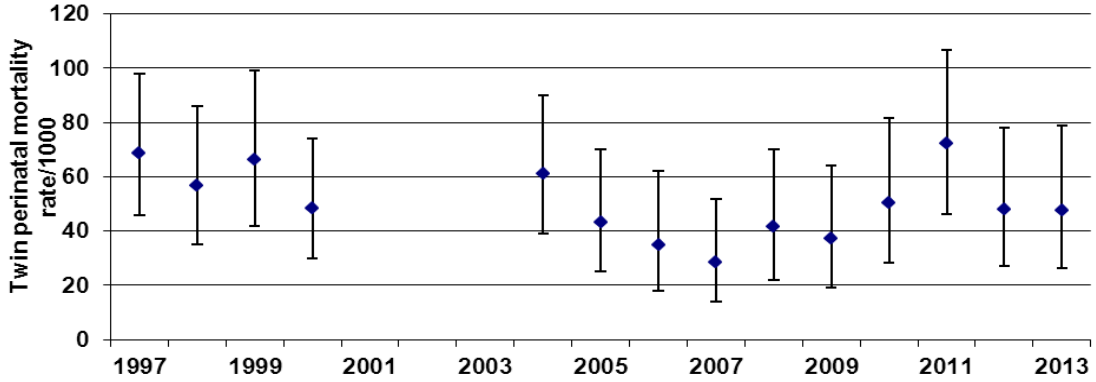


Figure 25: Twin perinatal mortality rate (per 1000 twin babies) NWH 1997-2013 with 95% confidence intervals

There has been no significant change in perinatal mortality among twins from 2004-2013 (Chi square test for linear trend p=0.5).

Table 19: Mode of onset of birth among twin pregnancies (mothers) by gestation at birth NWH 2013

	Preterm births n=94		Term births n=53	
	n	%	n	%
Mode of onset of birth				
CS elective	34	36	14	26
CS emergency before labour	17	18	2	4
Induction of labour	18	19	32	60
Spontaneous labour	25	26	5	9

Table 20: Mode of birth among twin pregnancies NWH 2005-2013

	Twin pregnancies																	
	2005 n=184		2006 n=157		2007 n=174		2008 n=156		2009 n=156		2010 n=149		2011 n=159		2012 n=156		2013 N=147	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	N	%
SVB/vaginal breech both twins	53	29	38	24	47	27	52	33	48	31	36	24	38	24	34	22	50	34
SVB 1st twin, operative vaginal 2nd twin	8	4	7	4	3	2	2	1	2	1	2	1	6	4	3	2	2	1
Operative vaginal 1st twin, SVB 2nd twin	5	3	5	3	6	3	4	3	7	4	7	5	5	3	9	6	3	2
Operative vaginal birth both twins	7	4	3	2	11	6	4	3	9	6	4	3	2	1	4	3	5	3
SVB 1st twin, Caesarean section 2nd twin	1	1	1	1	2	1	3	2	1	1	1	1	1	1	4	3	1	1
Operative vaginal birth 1st twin, Caesarean section 2nd twin	0		0		0		0		0		0		0		0		0	0
CS elective both twins	52	28			46	29	51	33	37	24	58	39	63	40	64	41	48	33
CS emergency both twins	58	31			57	36	39	25	52	33	41	28	44	28	38	24	38	26

Fifty-nine percent of twin pregnancies are delivered abdominally. As noted in previous reports caesarean section has become the norm, but the rate is not increasing and appears to be stable. In 2013 only one woman had a vaginal birth for the first twin and

caesarean section for the second twin without an overall increase in general caesarean section rate for twins. This is encouraging as there is no evidence that caesarean confers a benefit in a twin pregnancy without other obstetric issues.

Table 21: Fetal/newborn outcomes of twin babies NWH 2013

	Singletons N=7072		Twins N=293	
	n	%	n	%
Apgar <7 at 5 minutes	**139**	**2.0**	**10**	**3.4**
Admission to NICU ≥ 2 days	**542**	**7.7**	**113**	**38.6**
≤ 34 weeks	210/286	73.4	86/103	83.5
35-36	82/289	28.4	20/84	23.8
≥ 37 weeks	250/6497	3.9	7/106	6.6

Table 22: Perinatal-related deaths in twin pregnancies by gestation at birth NWH 2013

	Twin pregnancies			
	One twin died n=3		Both twins died n=12	
Gestation (weeks)	**n**	**Outcome**	**n**	**Outcome**
20 – 23	1	FD	4	4FD
24 – 27	1	LNND	4	4FD
28 – 31			2	2FD
32 – 36	1	ENND	2	2FD
37 – 40				

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

There were 15 perinatal related deaths of twins and 1 of a triplet. Fifteen out of the 16 losses were in a monochorionic twin placentation. The majority of the cases were complicated by specific monochorionic pathologies. The perinatal loss in a dichorionic twin pregnancy was secondary to a major fetal cardiac anomaly.

These data imply that a dichorionic pregnancy which reaches 20 weeks has a very good prognosis.

Summary / Implications

Multiple pregnancy rates are steady. These are high risk pregnancies and should be managed in conjunction with an Obstetrician. Section 88 guidelines recommend that the care of a multiple pregnancy is led by an Obstetrician. Where there are monochorionic twins the risks are higher and closer monitoring is needed and regular ultrasound scanning should be instituted early at 16 to 18 weeks.

On reaching 37 weeks twin pregnancies should be delivered as the outcomes are improved. A randomised controlled trial has shown that vaginal delivery is safe in an uncomplicated twin pregnancy.

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 2013. 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 women seen by the Diabetes service for pre-pregnancy counselling or those who birthed prior to 20 weeks or elsewhere.

Findings

Although numbers during 2013 are similar to 2012, (and the decrease from 2011 reflects Waitemata setting up their service), the overall trend reflects the increasing rates of obesity and diabetes in young women. We are continuing to address models of care to cope with the expected ongoing increase in numbers

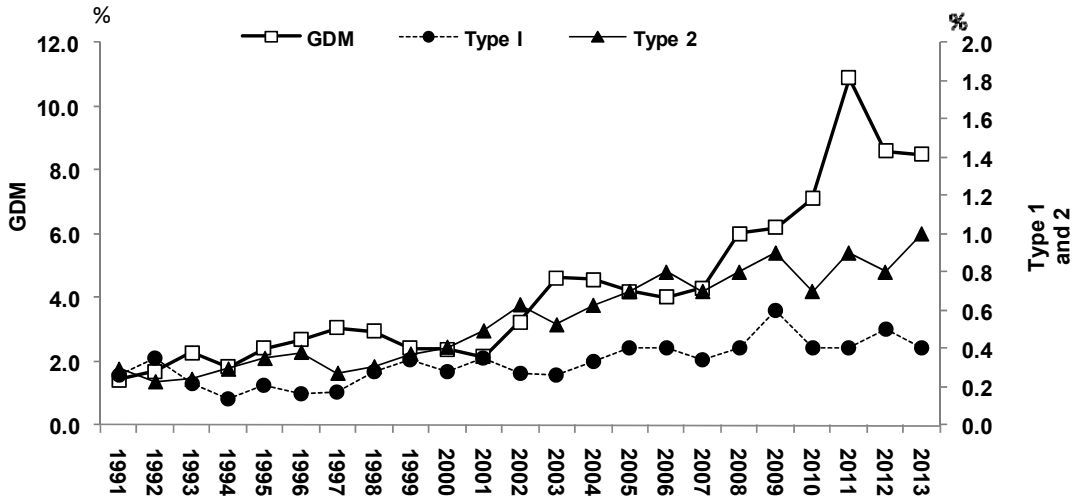


Figure 26: Incidence of diabetes (% of all inborn and BBA births) NWH 1991-2013

5.4.1 Demographic characteristics of women with diabetes NWH 2013

During 2013, New Zealand data were published in the non-pregnant population, reporting rates of diabetes and prediabetes (previously called impaired glucose tolerance or impaired fasting glucose), using international HbA1c cut-offs of ≥48mmol/mol to define diabetes and 39-46mmol/mol to define prediabetes. (Coppell, NZMJ 1 March 2013; 126(1370); 23-42) In women between 25-34 years and 35-44 years the rates (% (95th CI)) of diabetes were 3.0% (0.3, 5.7) and 4.6% (2.1, 7.1) with approximately half being undiagnosed before the testing. Rates of prediabetes in those age groups were 8.5% (4.1, 12.8) and 9.7% (5.6-13.8). Therefore, we would expect that at least 10% of women entering pregnancy already have some form of glucose intolerance. As a diagnosis of GDM includes women with previously unrecognised diabetes or prediabetes plus women who develop "transient" GDM when they are unable to compensate for the increasing insulin resistance that develops in the second half of pregnancy, we should expect our overall rate of GDM to be higher than reported. We may be underdiagnosing GDM in populations with the highest prevalence of type 2 diabetes, for example, Polynesian women.

As the population has changed, clinicians are focussing on identifying women who already have diabetes and prediabetes in early pregnancy. We are using HbA1c with a cutoff of >40mmol/mol to refer, but whether this is the most appropriate threshold requires further study. We have shown that 92% of women referred before 24 weeks with an HbA1c >40mmol/mol require medication for glucose control. (Rowan et al ANZJOG 2014)

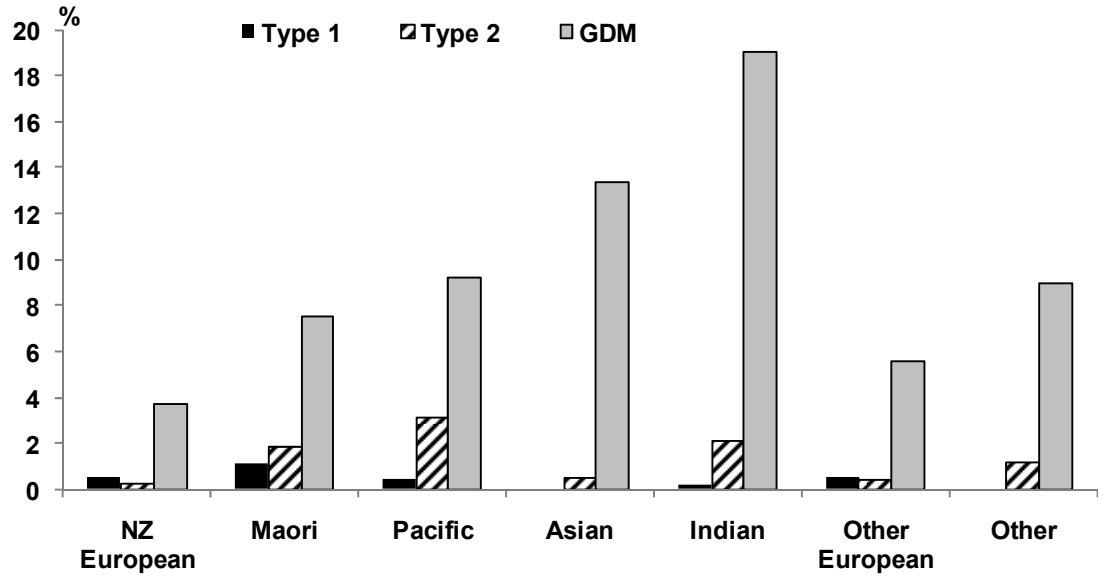


Figure 27: Incidence of diabetes by ethnic group NWH 2013

5.4.2 Maternal outcomes of pregnancies complicated by diabetes

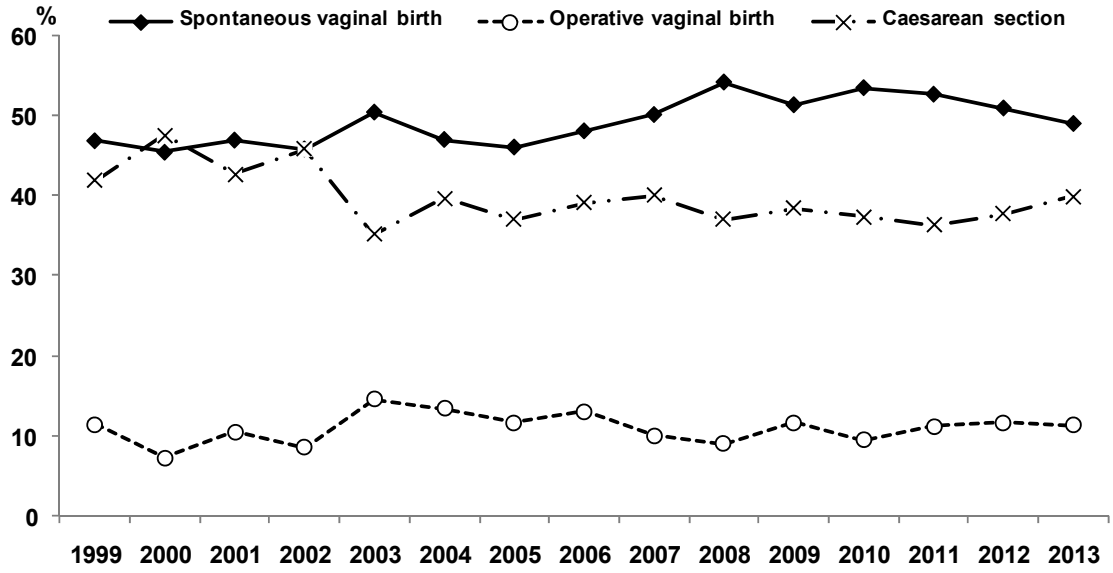


Figure 28: Mode of birth among women with GDM NWH 1999-2013

5.4.3 Maternal postpartum glucose tolerance testing

Table 23: Rates of postnatal glucose tolerance testing (GTT) among women with GDM NWH 2004-2013

	2004 n=342		2005 n=304		2006 n=286		2007 n=331		2008 n=457		2009 n=480		2010 n=548		2011 n=821		2012 n=662		2013 n=613	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Postnatal GTT/HbA1c	260	76	238	78	206	72	249	75	313	68	324	68	369	67	480	58	401	61	328	54
No post-natal GTT/HbA1c	82	24	66	22	80	28	82	25	144	32	156	32	179	33	341	42	261	39	285	46

In 2013 HbA1c testing at 3 months postnatal replaced the 6 week GTT test.

In the past, over 70% of women with GDM performed postnatal testing but this has declined in recent years with our service capacity being exceeded. We are now asking primary care practitioners to follow up women with a postpartum HbA1c result and to organise on-going annual screening. In Northland, changing to HbA1c measurement postpartum has been shown to significantly improve follow up rates compared with OGTT (McGrath, Diabetic Medicine 2013).

Similar to previous years, in women who perform postnatal testing, almost 30% have glucose intolerance or diabetes. HbA1c at 3 months postpartum is reported to be less sensitive than OGTT/fasting glucose, so it will be interesting to see how rates change over time with the new testing in place.

Table 24: Results of postnatal glucose tolerance testing (GTT) among women with GDM NWH 2004-2013

	2004 n=260		2005 n=238		2006 n=206		2007 n=249		2008 n=313		2009 n=324		2010 n=369		2011 n=480		2012 n=401		2013 n=328	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Normal	194	75	190	80	158	77	175	70	236	75	264	82	266	72	375	78	287	72	229	71
IFG/ IGT*	49	19	34	14	39	19	50	20	58	19	42	13	80	22	90	19	92	23	89	27
Type 2	17	7	14	6	9	4	24	10	19	7	18	5	23	6	14	3	21	5	9	2
Type 1															1	0.1	1	0.2	1	0.7

*IFG =Impaired fasting glucose IGT= Impaired glucose tolerance

5.4.4 Neonatal outcomes among babies of women with diabetes in pregnancy

Neonatal outcomes in women with type 1 diabetes vary each year, as numbers are small and underlying maternal diabetes control and complications relate to their outcomes. In women with type 2 diabetes, we appear to be seeing increasing rates of SGA, which is difficult to understand, as our treatment of these women has not changed in the past 5-10 years. It is unlikely to relate to tight glucose control, as these women often have suboptimal glucose control and women with GDM achieving tight glucose targets have improved outcomes without an increase in SGA. (Rowan Diab Care 2010) Other risk factors for SGA are prominent in this population but the accuracy of the customised centiles in this group may be an issue. Although birthweight centiles are adjusted for ethnicity, this may require further development. In women with type 2 diabetes, 60.9% are Polynesian and 31.3% are Indian or Asian. Also, the 10th percentile weight increases with maternal weight, without limits (there used to be BMI limits) and our population is becoming more obese. During 2013, in our women with type 2 diabetes, 51.6% had a BMI ≥35kgm² and 26.6% had a BMI ≥40kg/m². We have previously shown the

independent predictors of birthweight in type 2 diabetes are gestation, maternal height and glucose control, but not maternal weight. (Hughes ANZJOG 2006).

Table 25: Neonatal outcomes among babies of women with diabetes NWH 2013

	Type 1 n=29		Type2 n=70		GDM n=617		Postnatally diagnosed Type 2 n=12		No diabetes n=6649	
	n	%	n	%	n	%	n	%	n	%
Birthweight (Median(IQR))	3470(3170-3770)		2983 (2490-3370)		2983(2490-3370)		3170(2825-3465)		3283(2535-3780)	
<1500g	0	0	9	12.9	6	1.0	0	0.0	178	2.7
<2500g	0	0.0	18	25.7	67	10.9	3	25.0	565	8.5
SGA <10th percentile	0	0.0	24	34.3	94	15.2	4	33.3	960	14.4
LGA >90th percentile	13	44.8	6	8.6	55	8.9	3	25.0	495	7.4
Admission to NICU										
Any admission	11	37.9	22	31.4	88	14.3	2	16.7	708	10.6
>= 2 days	8	27.6	21	30.0	74	12.0	2	16.7	560	8.4
Hypoglycaemia < 2.3 mmol/l	7	24.1	14	20.0	60	9.7	1	8.3	ND	ND
Hypoglycaemia 2.3 - 2.5 mmol/l	2	6.9	4	5.7	34	5.5	2	16.7	ND	ND
IV Dextrose	6	20.7	10	14.3	19	3.1	0	0.0	ND	ND
Perinatal related losses (/1000)	1	35	3	43	2	2	1	0	108	16.2

ND=not documented

5.4.5 Perinatal losses

There were seven perinatal related losses.

Four of the seven were transfers from other centres for delivery at NWH, because of fetal anomalies, two with type 2 diabetes with poor control, one with type 1 diabetes and poor control and one with previously unrecognised diabetes and HbA1c of 57mmol/mol at 20 weeks gestation.

One of the other 3 presented with preterm rupture of membranes and oligohydramnios at 30 weeks. The baby died after birth of probable E Coli sepsis. Another was diagnosed with GDM at 20 weeks, having presented at 18 weeks with shortened cervix and a rescue cerclage was undertaken. She presented with ruptured membranes at 23 weeks and delivered after suture removal. The final woman had well controlled type 2 diabetes and chronic hypertension on medication. She had an antepartum haemorrhage at 23 weeks and delivered.

Summary

- Overall outcomes in women with GDM compare favourably with the background pregnant population.
- Women with pre-existing diabetes remain a higher risk population.
- Early indicators suggest the transition to postnatal testing with HbA1c at 12 weeks postpartum is going well.

Objectives/Aims

- As the epidemic of obesity and diabetes continues, we have been modifying our model of care so that lower risk women do not have the full diabetes service intervention. We aim to continue developing this process.
- Appropriate pre-pregnancy counselling services require further development.
- We are focussing on women who have probable underlying prediabetes/diabetes in early pregnancy to see how best to identify and treat them. We are collecting data to determine an optimal HbA1c threshold for referral and to determine if earlier treatment is of benefit.
- We aim to look in more detail at customised birth weights in our obese non-European populations in particular.

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 includes 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 26: Antepartum haemorrhage incidence NWH 1998-2013

	1998	1999	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total APH	451	484	594	398	411	533	424	438	438	455	511	460
Incidence %	6.0	6.5	7.6	5.5	5.7	6.9	5.6	5.7	5.7	6.0	6.6	6.4
Proven abruption	82	49	54	41	44	58	36	39	50	54	47	50
Proven placenta praevia	91	74	69	81	68	94	73	66	58	60	63	66
APH (uncertain origin)	278	361	471	276	299	381	315	333	330	341	401	344

In 2013, 460 women (6.4% of the total pregnant population) had an antepartum haemorrhage or placenta praevia without bleeding. This figure has remained unchanged at between 5 and 7 per cent for the last fifteen years. The underlying causes have also remained unchanged with APH of uncertain origin the most frequent “cause”, despite improvements in ultrasound and other imaging modalities. History taking, careful examination and clinical acumen remain important when assessing women with bleeding in pregnancy.

Placenta praevia is significantly more common with increasing maternal age: there was an incidence of 0.4% (11 of 2918 women) in women aged 30 or under rising to 1.6% in women aged >35 (29 of 1780 women). The incidence of placenta praevia in women with a previous Caesarean section was 1.2% (16 of 1146 women) compared to 0.8% among nulliparous women (29 of 3441 women) and 0.8% (21 of 2636 women) among multipara without a previous birth by Caesarean section. This is consistent with previous Caesarean section being a risk factor for placenta praevia. Smoking status, BMI and hypertensive disease were not associated with placenta praevia.

Table 27: Maternal outcomes of pregnancies complicated by antepartum haemorrhage NWH 2013

	Placenta praevia n=66		Placental abruption n=50		APH uncertain n=344		No APH n=6761	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	2	3.03	13	26.0	194	56.4	3675	54.4
Operative vaginal	0	0.00	5	10.0	34	9.9	794	11.7
CS elective	50	75.8	3	6.0	45	13.1	1129	16.7
CS emergency	14	21.2	29	58.0	71	20.6	1163	17.2
Maternal transfusion	6	9.1	6	12.0	16	4.7	179	2.6

Women with a placenta praevia had a significant requirement for blood products with 9% (6 of 66 women) of these women requiring transfusion during pregnancy or birth. However, it is reassuring that 91% were managed without resort to blood transfusion. The use of cell saver technology and changing attitudes to the use of blood products may all be contributing to this, though we do not currently collect these data.

A confirmed placental abruption is a less common diagnosis with an incidence of 0.7% in 2013 (50 of 7223 women). Smoking may be a significant risk factor with an incidence of abruption of 1.2% in smokers compared to 0.7% in non-smokers. Pre-eclampsia may also be a significant risk factor with an incidence of 1.3% (2 of 153 women) in this group compared to 0.7% (45 of 6699 women) in normotensive women. There does not appear to be any association with maternal age, BMI or previous Caesarean section.

Placental abruption is associated with significant maternal morbidity with 58% requiring birthing by emergency Caesarean section and 12% being transfused. Fetal morbidity is also high with a median birthweight of 2320g and an incidence of SGA of 24%. Forty-five percent of these babies were admitted to NICU and there were five perinatal deaths amongst 55 babies in this group (91/1000 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, and an increased requirement for blood transfusion. The perinatal mortality rate is five times higher in pregnancy where an APH of unknown origin has occurred compared to women with no antepartum haemorrhage. Women with APH of uncertain origin should be treated as a high risk group.

Women with an APH of uncertain origin make up the largest proportion of women presenting with antepartum haemorrhage (351 of 460 women). Placenta praevia can be confirmed or excluded reliably by ultrasonography. It is likely that many of these women with no firm diagnosis had unconfirmed small abruptions and the increased perinatal morbidity and mortality associated with APH of uncertain origin would support this assumption.

Table 28: Fetal/neonatal outcomes of pregnancies complicated by antepartum haemorrhage (babies) NWH 2013

	Placenta praevia		Placental abruption		APH uncertain origin		No APH	
	n=66		n=55		n=351		n=6905	
	n	%	n	%	n	%	n	%
Gestation at birth								
<37 weeks	17	25.8	31	56.4	96	27.4	630	9.1
<32 weeks	4	6.1	19	34.5	47	13.4	136	2.0
Birthweight								
Median(IQR)	3110 (2720-3500)		2320 (1460-3105)		3130 (2680-3553)		3375 (3030-3710)	
<2500g	11	16.7	29	52.7	73	20.8	540	7.8
<1500g	2	3.0	15	27.3	39	11.1	137	2.0
Small for gestation age	7	10.6	13	23.6	74	21.1	988	14.3
Perinatal related deaths (n/1000)	0	0.0	5	90.9	20	57.0	89	12.9
Admission to NICU	16	24.2	25	45.5	72	20.5	718	10.4
>=2 days in NICU	15	22.7	22	40.0	69	19.7	559	8.1

5.6 Hypertensive disease

Methods

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

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

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

Findings

The overall rate of hypertensive disease in pregnancy (7.3%) is lower than the rate in 2012 (8.5%). 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 of Maori or Pacific Island ethnicity had higher rates of hypertensive disorders in pregnancy. Hypertensive disease in pregnancy becomes more common with increasing maternal age. Women with increased BMI had higher rates of chronic hypertensive disease in pregnancy, especially if their BMI was greater than 40. Twenty-two percent of women with a BMI over 45 had hypertensive disease in pregnancy.

There were 3 reported cases of eclampsia in 2013, all occurring in nulliparous women. One of these occurred in the antenatal period and the other two were in the postnatal period. In this chapter, the cases of eclampsia are represented in the pre-eclampsia data.

Table 29: Hypertensive disease in pregnancy NWH 2013

	All women n=7223		Nullipara n=3441		Multipara n=3982	
	n	%	n	%	n	%
Any hypertensive disease	524	7.3	300	8.7	224	5.9
Gestational hypertension	219	3.0	141	4.1	78	2.1
Chronic hypertension	138	1.9	49	1.4	89	2.4
Superimposed pre-eclampsia	14	0.2	9	0.3	5	0.1
Pre-eclampsia	150	2.1	98	2.8	52	1.4
Eclampsia	3	0.04	3	0.09	0	0.00

Hypertensive disease is associated with an increase in interventions to interrupt pregnancy. Forty-six percent of normotensive women went into labour spontaneously, compared with only 22%, 13% and 18% of the women with gestational hypertension, pre-eclampsia or chronic hypertension respectively. A diagnosis of gestational hypertension,

preeclampsia, chronic hypertension or superimposed preeclampsia is associated with a high rate of Caesarean section birth (43%, 55%, 54% and 79% respectively).

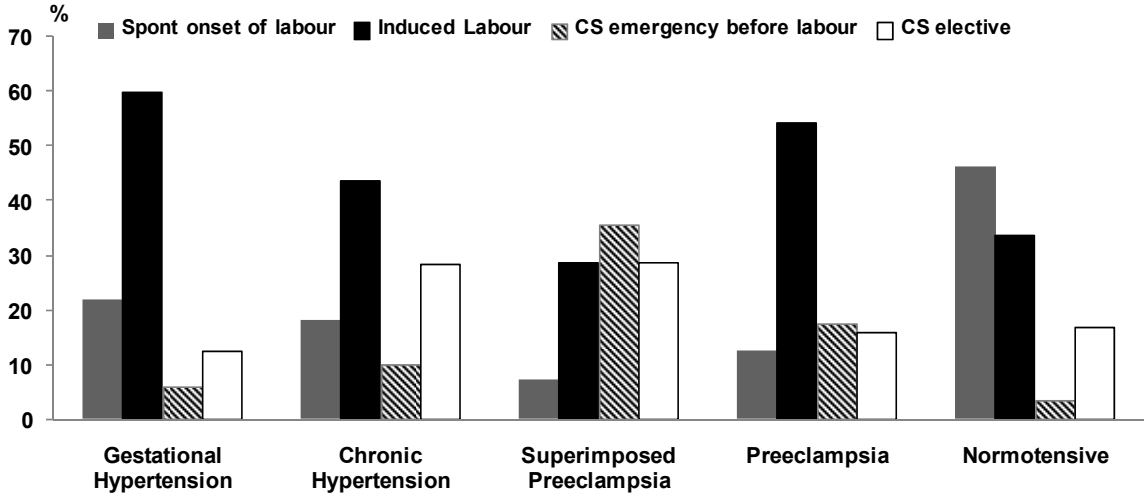


Figure 29: Onset of birth and hypertensive disorders of pregnancy NWH 2013

Table 30: Mode of birth among women with hypertensive disease NWH 2013

	Gestational hypertension n=219		Chronic hypertension n=138		Superimposed preeclampsia n=14		Pre-eclampsia n=153		Normotensive n=6699	
	n	%	n	%	n	%	n	%	n	%
Mode of birth										
Normal vaginal	95	43.4	56	40.6	3	21.4	55	35.9	3675	54.9
Operative vaginal	29	13.2	8	5.8	0	0	14	9.2	782	11.7
CS elective	27	12.3	39	28.3	4	28.6	24	15.7	1133	16.9
CS emergency	68	31.1	35	25.4	7	50.0	60	39.2	1109	16.6
Epidural	160	73.1	90	65.2	8	57.1	80	52.3	3616	54.0
General Anaesthetic	8	3.7	7	5.1	0	0.0	9	5.9	214	3.2

Table 31: Perinatal outcomes and hypertensive disease (babies) NWH 2013

	Gestational hypertension n=229		Chronic hypertension n=139		Superimposed preeclampsia n=15		Preeclampsia n=163		Normotensive n=6381	
	n	%	n	%	n	%	n	%	n	%
Gestation at birth										
<37 weeks	32	14.0	28	20.1	10	66.7	73	44.8	631	9.2
<32 weeks	2	0.9	10	7.2	3	20.0	18	11.0	173	2.5
SGA	57	24.9	38	27.3	10	66.7	58	35.6	919	13.5
NICU Admission	29	12.7	33	23.7	9	60.0	60	36.8	700	10.2
>=2 days in NICU	22	9.6	28	20.1	8	53.3	54	33.1	553	8.1
Apgar <7 at 5 minutes	4	1.7	5	3.6	0	0.0	8	4.9	132	1.9
Perinatal related deaths (n/1000)	2	8.7	2	14.4	1	66.7	2	12.3	107	15.7

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 (20% and 11% of births respectively, compared to 2.5% of normotensive pregnancies).

SGA is also increased in all of the hypertensive groups, as is NICU admission and prolonged NICU stay. This is most pronounced in the pre-eclamptic groups, probably reflecting the increased risk of prematurity and SGA in this group. The perinatal related mortality rates given may not reflect the true risk, because of the small numbers in each hypertensive group. There were seven perinatal related deaths in the hypertensive group, the same as in 2012.

Summary / Implications

Occurring at a rate of 7.3%, antenatal hypertensive disease is one of the most common medical complications associated with pregnancy at NW. Gestational hypertension is less often associated with significant adverse maternal or perinatal outcomes. The negative pregnancy outcomes associated with the other hypertensive conditions are reflected in the 2013 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 32: Maternal BMI using WHO categories NWH 2008-2013

	2008		2009		2010		2011		2012		2013	
	n=7589		n=7735		n=7709		n=7523		n=7695		n=7223	
	n	%	n	%	n	%	n	%	n	%	n	%
<18.5	402	5.3	445	5.8	442	5.7	440	5.8	481	6.3	255	3.5
18.5-24.99	3694	48.8	3868	50.0	3916	50.8	3798	50.4	3949	51.3	3826	53.0
25-29.99	1654	21.9	1763	22.0	1721	22.3	1646	21.8	1678	21.8	1679	23.2
30-34.99	724	9.6	783	10.1	792	10.3	795	10.5	771	10.0	699	9.7
35-39.99	356	4.7	373	4.8	360	4.7	370	4.9	354	4.6	367	5.0
>=40	264	3.5	251	3.3	265	3.4	309	4.1	289	3.8	250	3.5
Missing	471	6.2	308	4.0	221	2.9	185	2.5	173	2.3	147	2.0

Rates of obesity, including morbid obesity (BMI≥35) have remained similar over the last 5 years. Over time, data collection has improved with only 2% of the data missing in 2013.

It is unknown what proportion of pregnant mothers have their height and weight measured (strongly recommended) versus self-reported. A recent NZ publication showed marked discrepancies between measured and self-reported height and weight with potential to impact on clinical outcomes. (Jeffs E 2014)

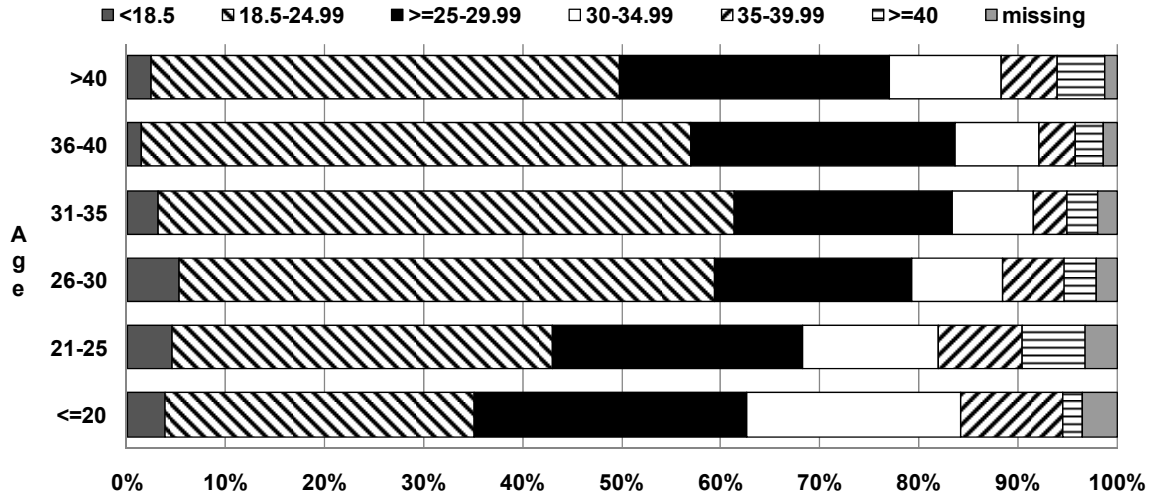


Figure 30: Distribution of BMI by maternal age NWH 2013

As observed in previous years, the relationship between BMI and age is "U shaped" with a large proportion of overweight and obesity in younger (<26 years (56%)) and older (>40 years (49%)) mothers. There were 33 women with BMI of 50 or more in 2013. Higher rates of obesity in younger pregnant women are associated with higher rates of socio-economic deprivation and also with ethnicity.

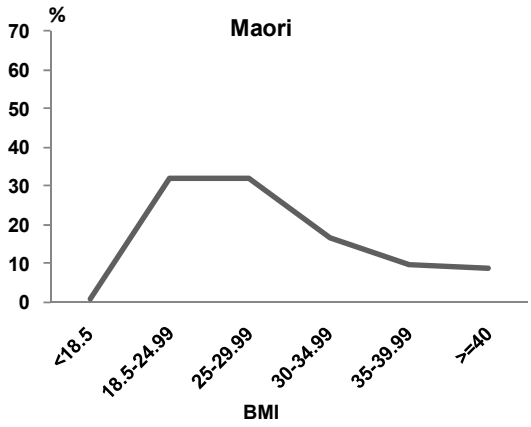


Figure 31: Distribution of BMI among Māori women NWH 2013

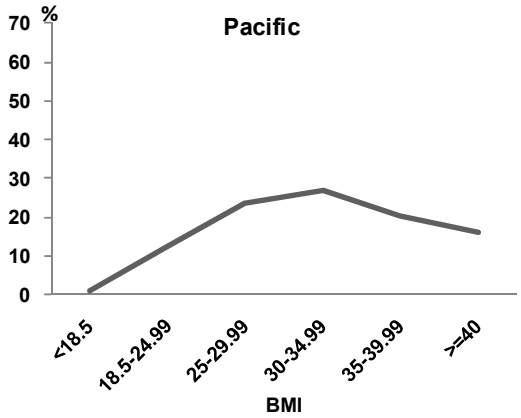


Figure 32: Distribution of BMI among Pacific women NWH 2013

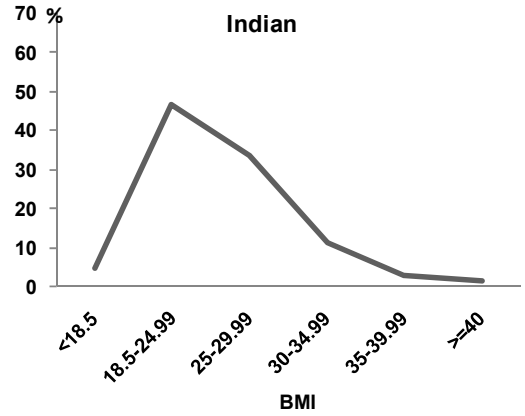


Figure 33: Distribution of BMI among Indian women NWH 2013

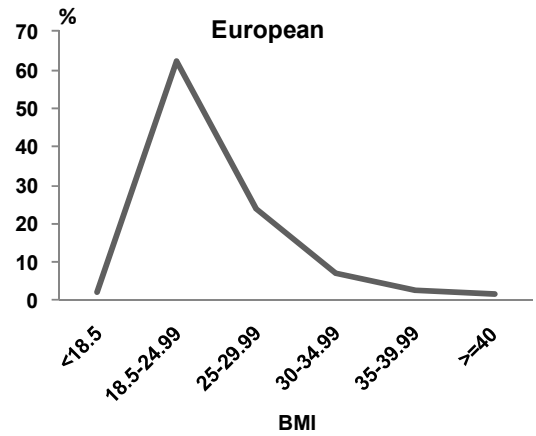


Figure 34: Distribution of BMI among European women NWH 2013

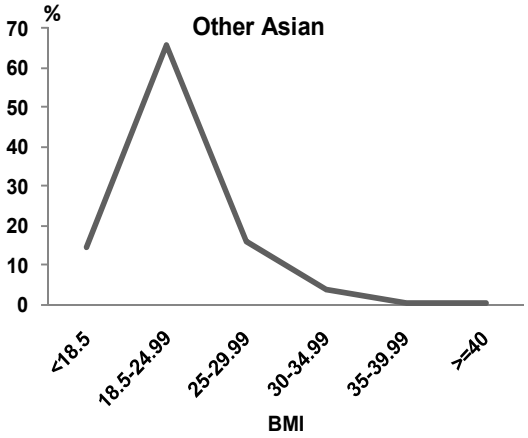


Figure 35: Distribution of BMI among Other Asian women NWH 2013

Māori and especially Pacific women are over represented amongst the obese groups (35% and 63% respectively). Obesity is more common amongst parous women, perhaps partly reflecting weight gained during a previous pregnancy and not lost postpartum, as well as increasing age. The prevalence of smoking is also increased 4.6-fold amongst obese women (smoking rate 12.4% in obese, 6.7% in overweight and 2.7% in women with normal BMI). This high rate of smoking is also likely to contribute to pregnancy complications in these women. (Appendix section 4.5)

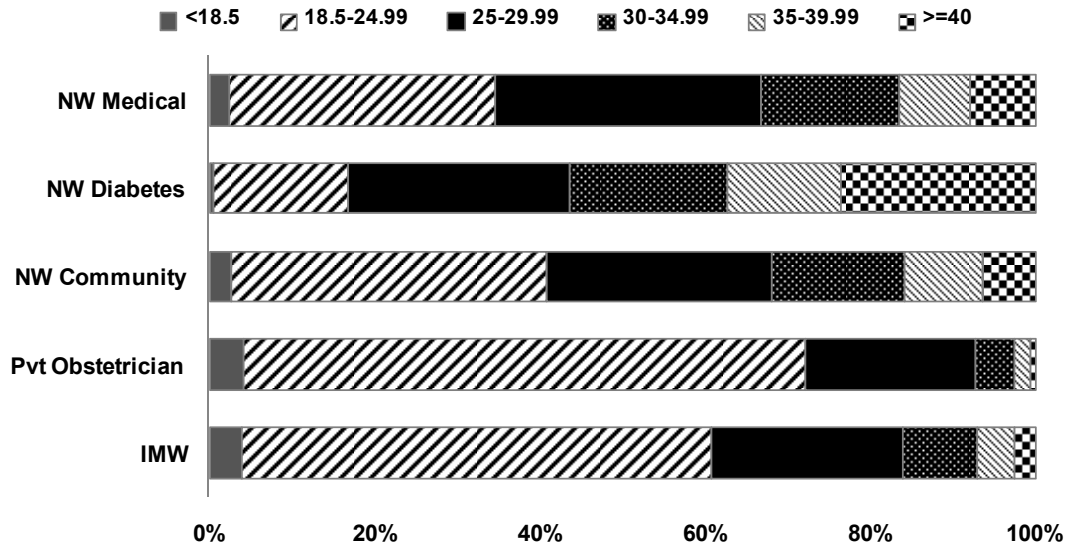


Figure 36: Distribution of BMI by LMC at birth NWH 2013

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

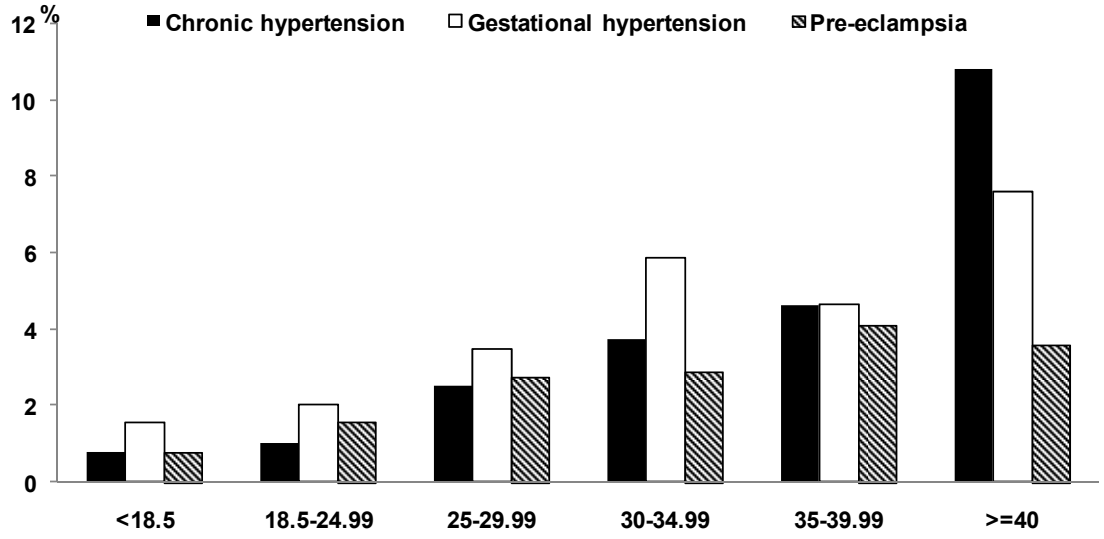


Figure 37: Rates of hypertensive diseases by maternal BMI NWH 2013 (Chronic hypertension includes superimposed pre-eclampsia)

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

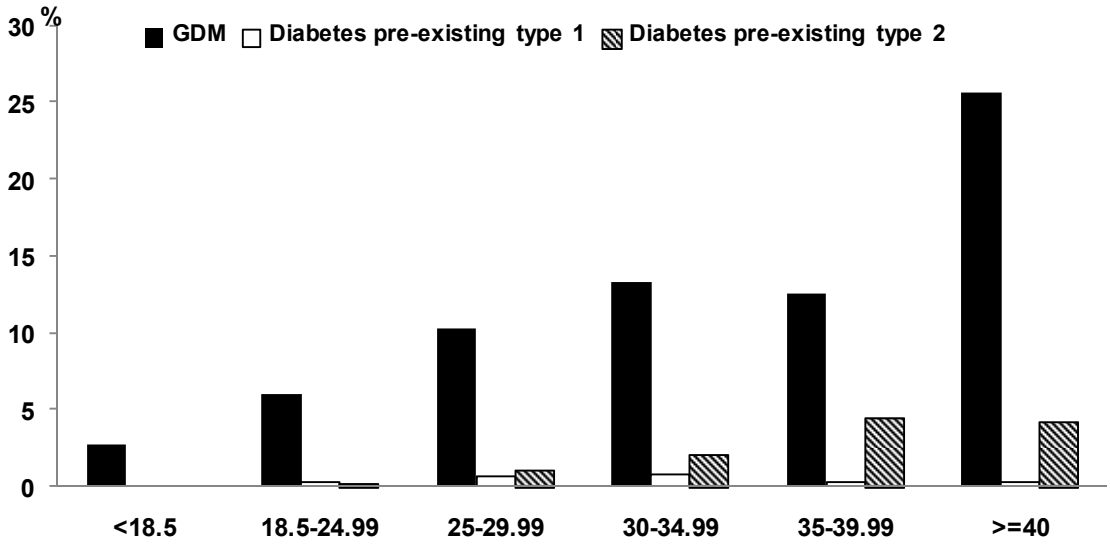


Figure 38: Rates of diabetes by maternal BMI NWH 2013

Increasing maternal BMI is also strongly associated with increasing rates of GDM and Type 2 diabetes as shown above. GDM is diagnosed in 12% of overweight or obese women, and 24% 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 follow-up testing is crucial.

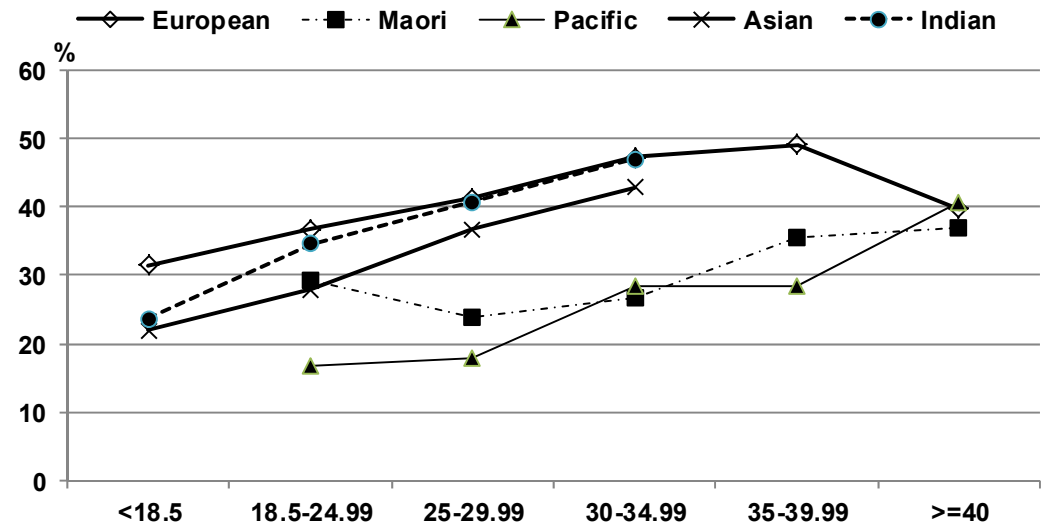


Figure 39: Caesarean section rate by BMI and ethnicity among nulliparous mothers NWH 2009-2013 (no data point plotted if denominator < 30)

The above graph shows that among nulliparous women increasing BMI is associated with increasing Caesarean rates independent of ethnicity. Overall, European and Asian women have higher rates of Caesarean section than Pacific and Maori women. However there are a number of confounding factors, such as maternal age (European women are older than Māori and Pacific mothers), smoking and pregnancy complications. Additionally, obese women have elevated rates of induction of labour including

indications such as diabetes, hypertensive disease, and possibly prolonged pregnancy that need to be adjusted for in multivariate models before conclusions can be drawn from these data. A recent publication from National Women's which explored the relationship between ethnicity and Caesarean section in term nullipara (after adjusting for confounders such as age and BMI) found that Pacific and Chinese women had lower rates of Caesarean section than European whereas Indian women had elevated rates (Anderson et al Aust N Z J Obstet Gynaecol. Jan 2013. DOI: 10.1111/ajo.12036).

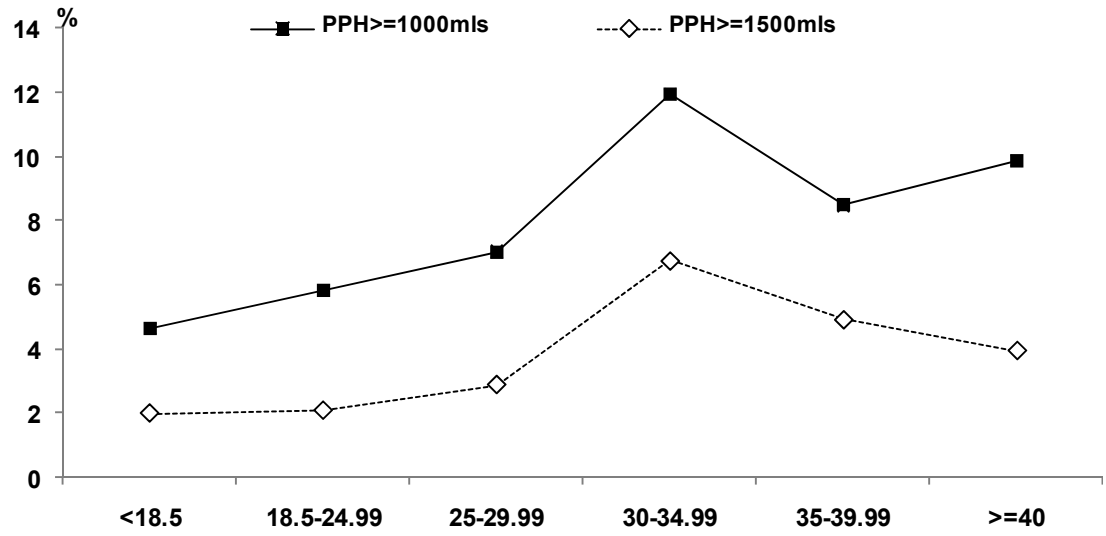


Figure 40: Postpartum haemorrhage rate by BMI among spontaneous vaginal births NWH 2013

Rates of major PPH are increased in women with high BMI who have spontaneous vaginal births. The reasons for this are unclear, but a recent report from NWH data found that obese nulliparous women had an elevated risk of major PPH (>=1000mls) independent of other risk factors such as infant birthweight, induction of labour, chronic hypertension etc. (Fyfe et al, BMC Pregnancy and Childbirth 2012, 12:112; doi:10.1186/1471-2393-12-112) It is recommended that women with high BMI should receive active management of the third stage.

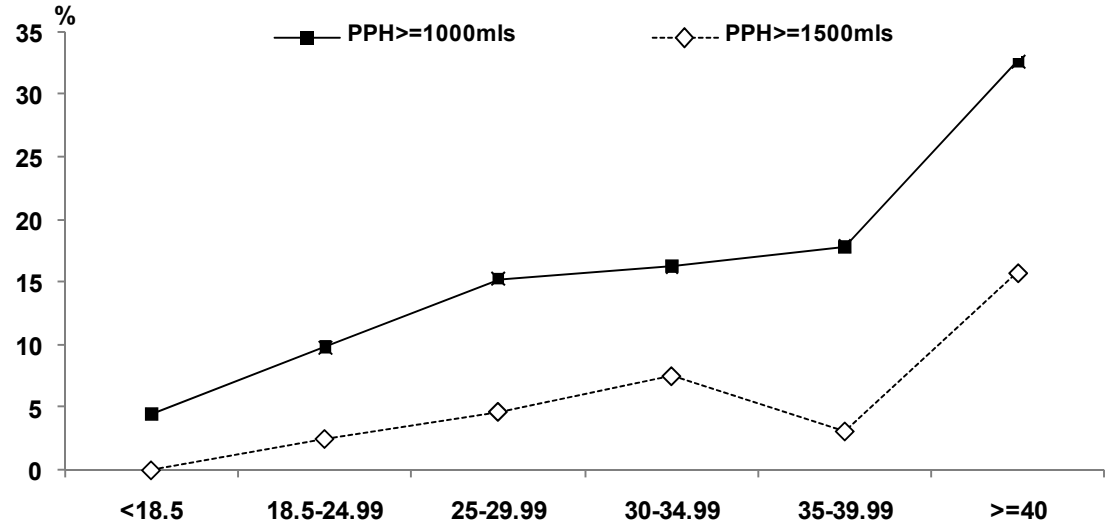


Figure 41: Postpartum haemorrhage rate by BMI among Caesarean sections NWH 2013

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

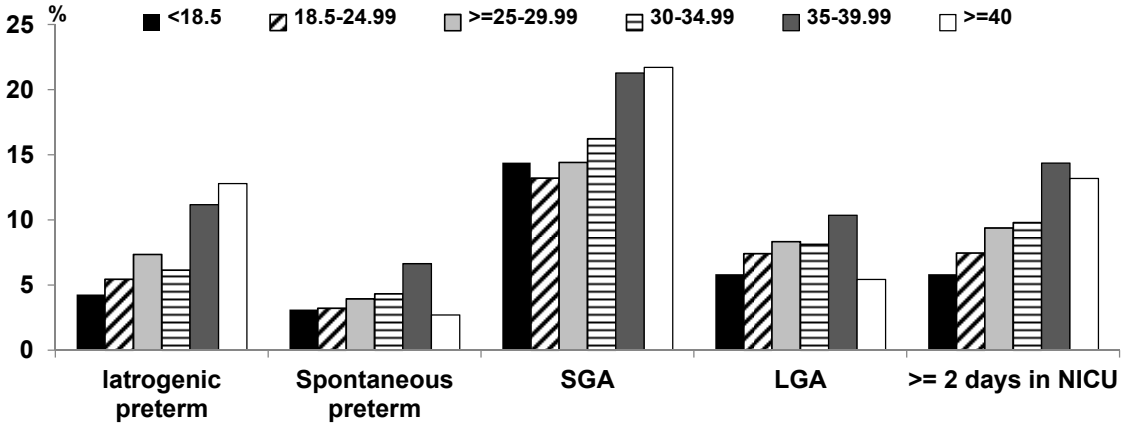


Figure 42: Neonatal outcomes and BMI NWH 2013

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

In future years, ethnic-specific BMI categories should be considered when reporting BMI-related outcomes at NWH. Ethnic-specific BMI categories attempt to account for differing lean-body mass and fat percentages between ethnicities by lowering criteria for overweight and obesity in Asian and Indian women, and increasing criteria for Maori and Pacific women. To date there has been one study showing an increased risk of GDM

and pre-eclampsia in Chinese women with BMI of 23-25, for whom that level is currently classified as normal by WHO criteria. As no studies comparing obstetric outcomes have been performed for Maori and Pacific ethnicities to date, ethnic-specific BMI criteria cannot be recommended in these groups at this time.

5.8 Fetal Medicine Unit

Methods

The data included in this section have been extracted from the MFM Viewpoint database for 2013.

Findings

In 2013 the service provided care for 1146 women/pregnancies, including care for 1036 singleton pregnancies, 102 twin pregnancies and 8 triplet pregnancies. Note these figures differ from those in the multiple pregnancy chapter as not all women cared for in the service birth at National Women's Health.

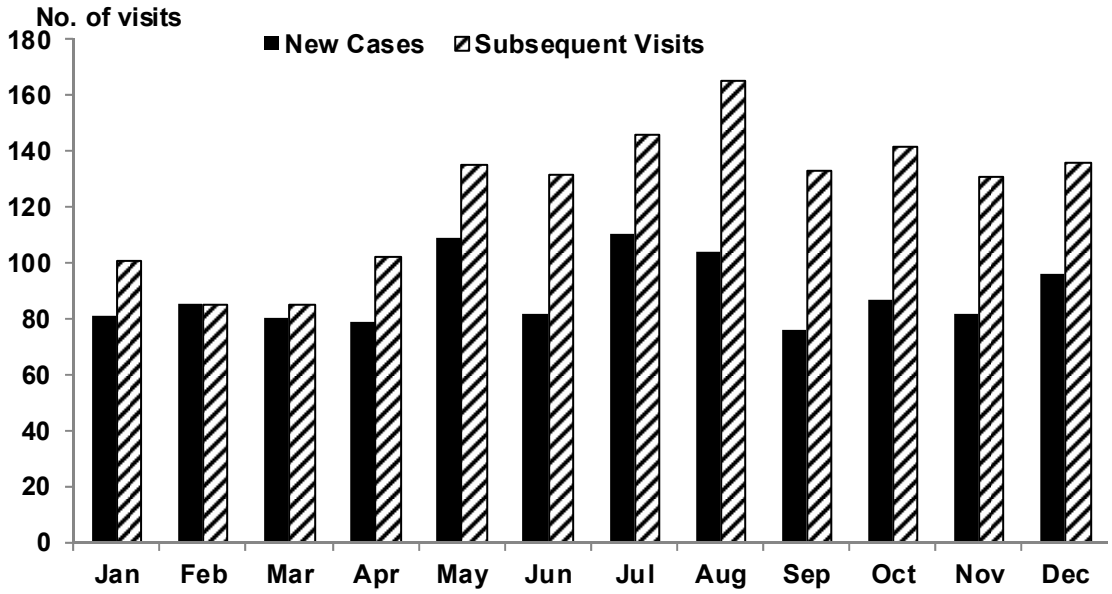


Figure 43: Number of new cases and subsequent visits NWH 2013

In 2013 there were on average 89 new cases per month and 124 subsequent visits

Table 33: Number of procedures performed in fetal medicine service NWH 2002-2013

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Amniocentesis									142	156	165	165
CVS									43	97	89	87
Echocardiogram									257	366	410	457
Intrauterine transfusion (mothers)	6	1	2	*	2	11	5	10	7	4	10	11
Intrauterine transfusion (procedures)	14	3	2	*	3	21	8	21	11	9	25	29
Other procedures (mothers)	19	11	3	*	36	40	37	24	22	20	26	50
Other procedures (procedures)	32	11	3	*	44	49	39	26	25	21	26	60

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

Other procedures includes fetal blood sampling, amnio-drainage, amnio-infusion, other sampling, shunt, embryo reduction/fetocide, and laser ablation.

Table 34: Mothers with babies diagnosed with fetal abnormalities NWH 2013

Fetal abnormalities	2013 N=263	
	n	%
Heart	38	14.4
Kidneys	28	10.6
Brain	41	15.6
Extremities	38	14.4
Abdominal wall	18	6.8
Face	16	6.1
GIT	10	3.8
Head	24	9.1
Thorax	12	4.6
Spine	15	5.7
Neck/Skin	12	4.6
Skeleton	9	3.4
Genitalia	2	0.8

Comment

There is a 19% increase in the number of women cared for in 2013. This is likely to be due to 2013 being the first full year that the Auckland Fetal Medicine Service has been providing the tertiary service for the Waikato DHB region. It is likely that these figures will now remain steady.

The number of amniocenteses and Chorionic villous samplings has remained steady over the last three years which seems surprising given the increase in women seen. Although MSS1 has resulted in a reduction in invasive procedures, women with a high risk result and normal appearing fetal anatomy are seen in the Women's Health Ultrasound department.

Babies with cardiac anomalies are the most common reason for review. The number of echocardiograms has increased steadily. This probably reflects a number of training programmes that have been implemented to improve antenatal detection and a lower threshold for referral.

The numbers of intrauterine transfusion procedures remains stable. The majority of these are performed for red cell isoimmunisation and Anti-D remains the most common red cell antibody.

The number of other complex procedures appears to have increased in 2013. This may have an underlying clinical reason or be secondary to alternative methods of data collection used for this year's annual report. The relative contributions of different fetal organs affected in the case of anomalies remains similar to previous years.

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 Gestation at birth

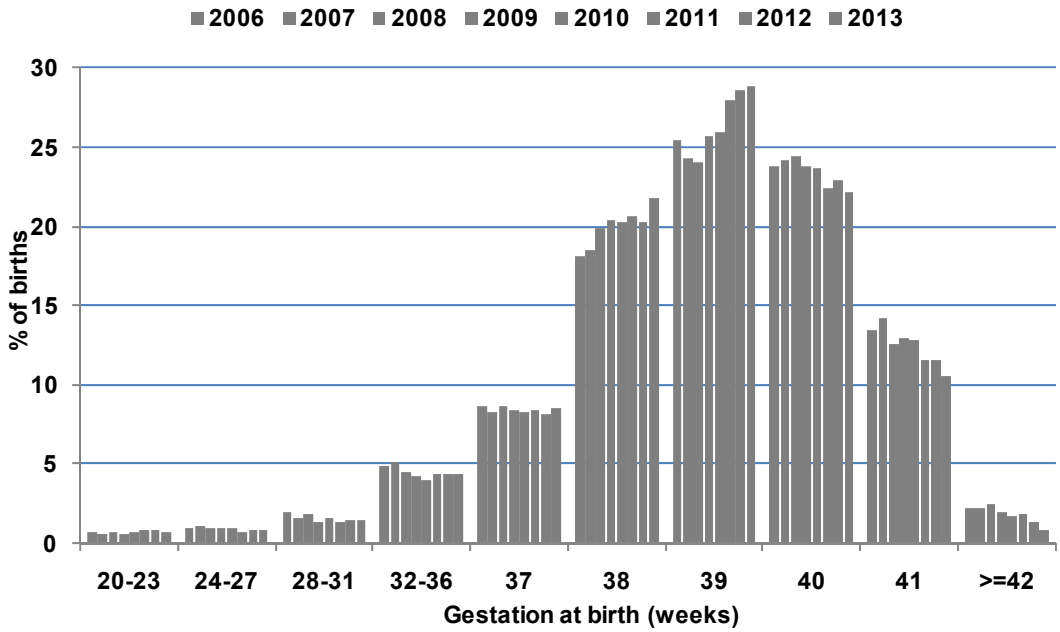


Figure 44: Distribution of gestation at birth NWH 2006-2013

There has been a marked change in gestation at birth among births at NWH. There has been a small reduction in preterm births (due to a reduction in spontaneous preterm births at both <32 weeks and 32-36 weeks gestation).

Whether the recently instituted Preterm Birth Clinic has had an impact on this rate remains unclear though given it has only been in place for approximately 18 months, sees a small number of women and the trend is longer this is unlikely as yet.

Other reasons to consider include a reduction in smoking rates (a recent Lancet paper reported a reduction in PTB rates in areas/countries with smoking bans) and a reduction in multiple birth rates from assisted reproduction. In future years examining these data for singletons alone may be useful.

Against this trend, the ever advancing maternal age, rates of obesity and therefore GDM, women conceiving with more complicated medical conditions and lower thresholds for delivery at late preterm gestations all contribute to an increase in preterm birth. It remains to be seen whether in future the results of the PPROMT may halt or reverse this trend.

The distribution of gestation at birth has also changed among term births, with an increase in births at 38 and 39 weeks and a decrease in births at >=40 weeks. This is probably due to an increase in induction and elective Caesarean sections prior to 40 weeks.

In 2014 there is some expectation that change in induction of labour guidelines and practice may occur as a result of the evidence based regional consensus statement on

indications for induction of labour. Some of these guidelines (such as induction for maternal age) will challenge current practice.

There is also increasing international evidence of increased long term morbidity among babies born at 37 and 38 weeks compared to births at 39 weeks gestation and over.

There has been no apparent reduction in stillbirth at term at NWH during this time (chi square test for trend for 2006-2013: p=0.24) but there has been an increase in admissions to NICU (chi square test for trend 2006-2013: p<0.0001).

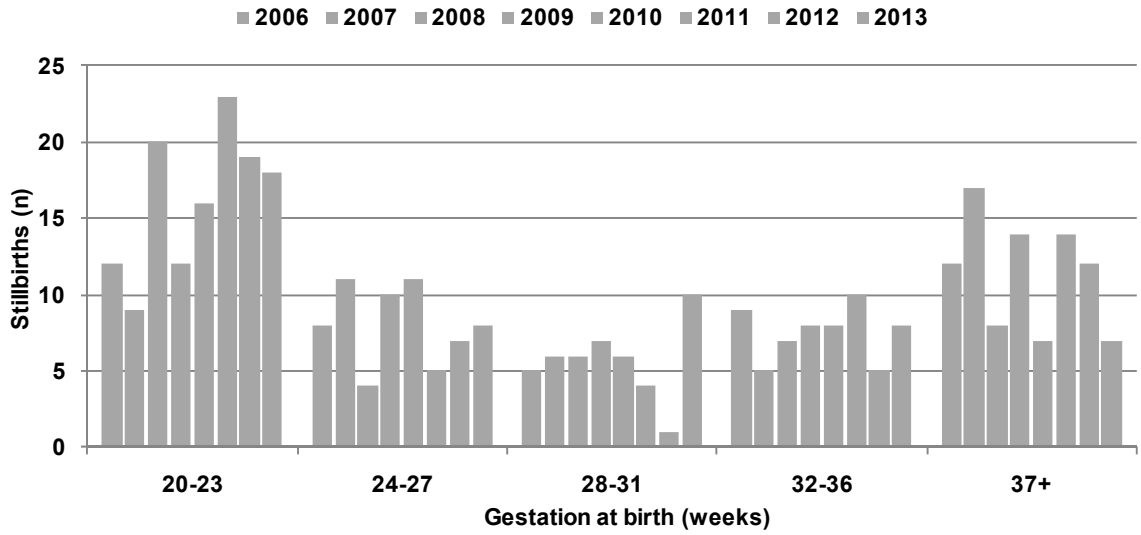


Figure 45: Absolute number of stillbirths by gestation at birth NWH 2006-2013

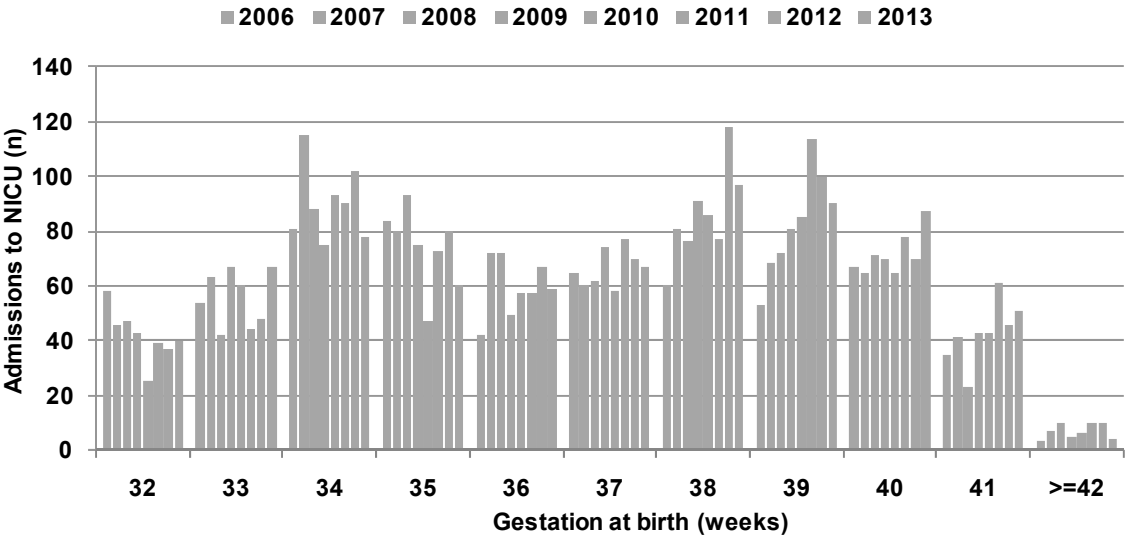


Figure 46: **Absolute number of admissions to NICU by gestation at birth (>=32 weeks gestation) NWH 2006-2013**

6.2 Iatrogenic birth

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 (typically by ARM with or without an oxytocin infusion). 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

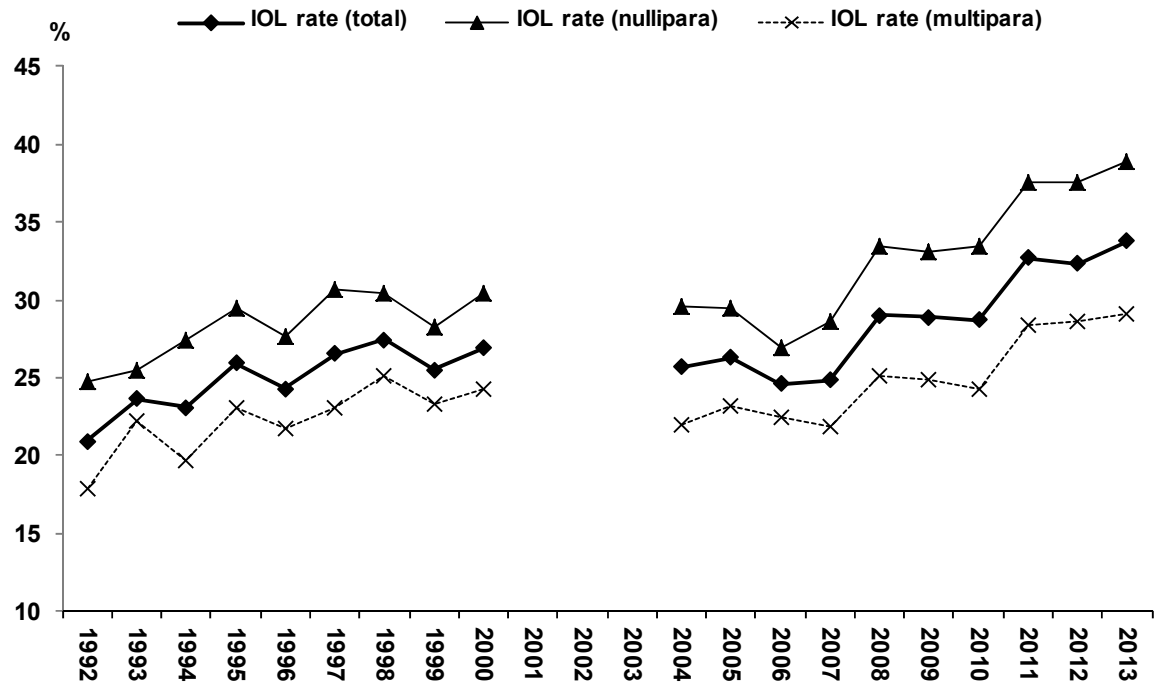


Figure 47 : Induction of labour rates NWH 1992-2013

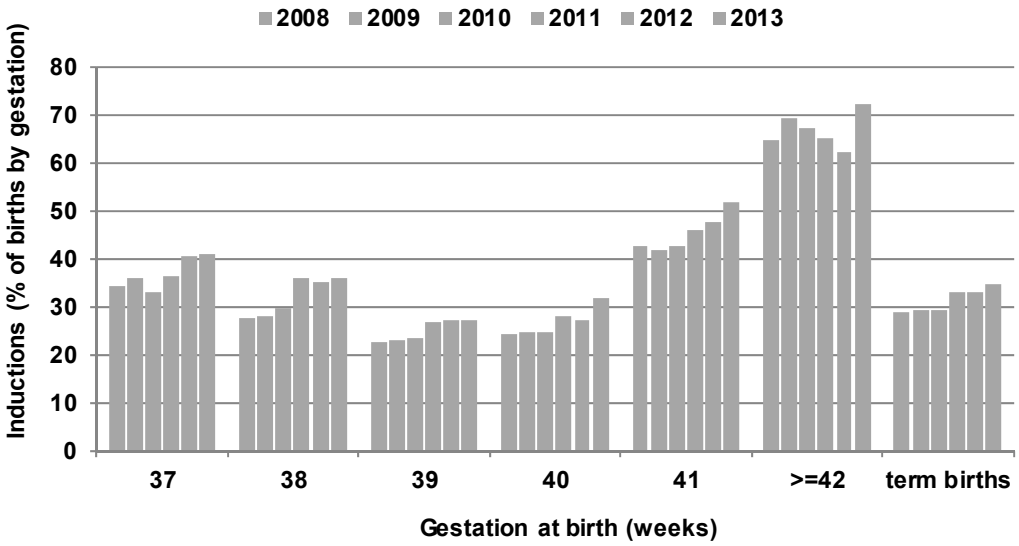


Figure 48: Induction of labour as a proportion of births by gestation NWH 2008-2013

The induction rate has increased markedly from 2007 (24.8%) to 2013 (33.8%). There has been an increase in induction rate at term, and specifically at each of 37-41 weeks gestation.

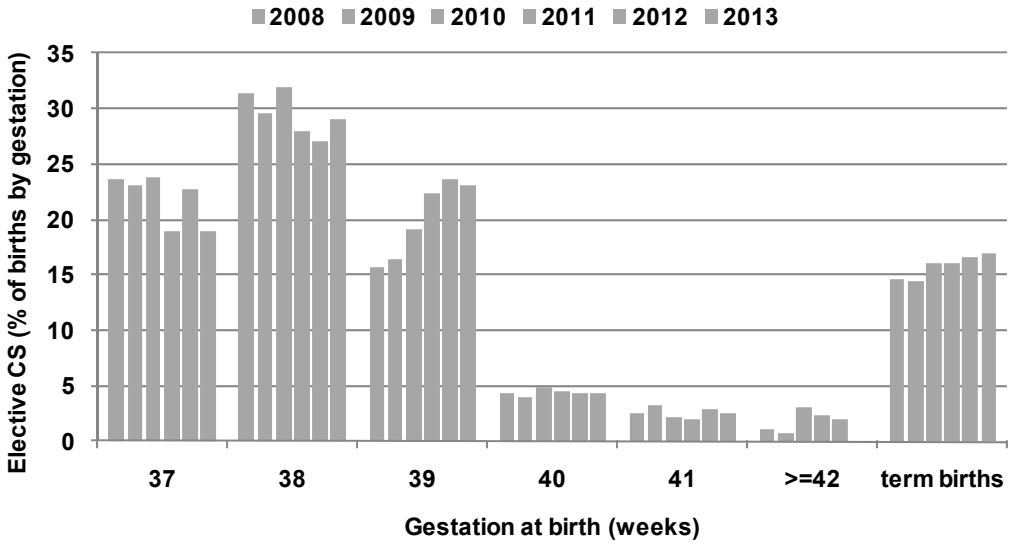


Figure 49: Elective Caesarean section as a proportion of births by gestation NWH 2008-2013

There has been a significant increase in elective Caesarean birth at term. Fewer elective caesareans are being performed at 37 and 38 weeks over the past 3 years, with the increase occurring at 39 weeks gestation, which is associated with improved neonatal outcomes.

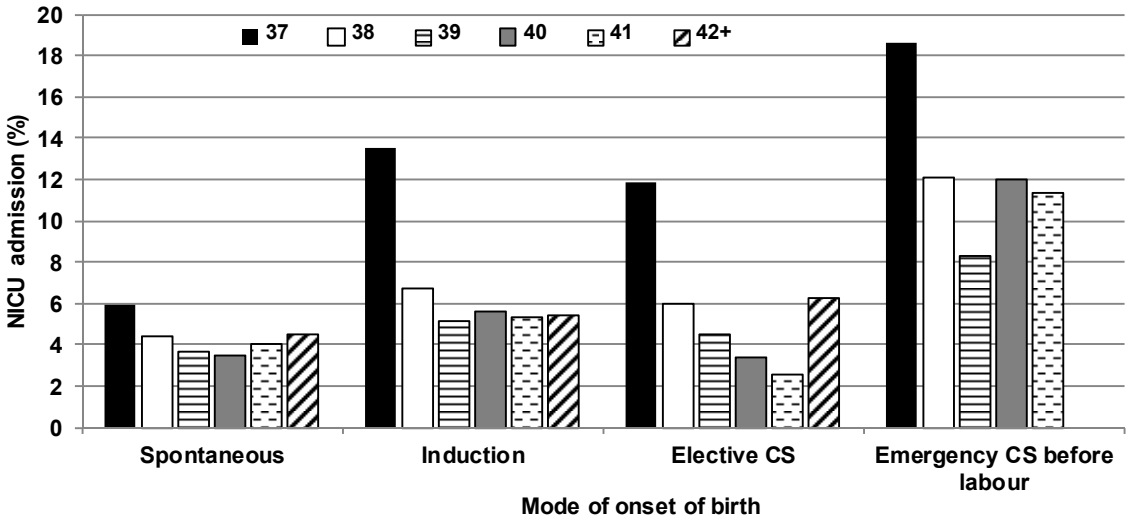


Figure 50: Rate of admission to NICU by gestation and mode of onset of birth at term NWH 2006-2013

The figure above shows an association between mode of onset of birth and admission to NICU and between gestation and admission to NICU. Whatever the mode of onset of birth (iatrogenic or spontaneous) there is an increase in NICU admission for 37 and 38 week born infants compared to 39 week born infants. It is therefore likely that the trend of increasing rates of elective caesarean and induction of labour at 37 and 38 weeks is responsible for the increase in admissions to NICU at these gestations.

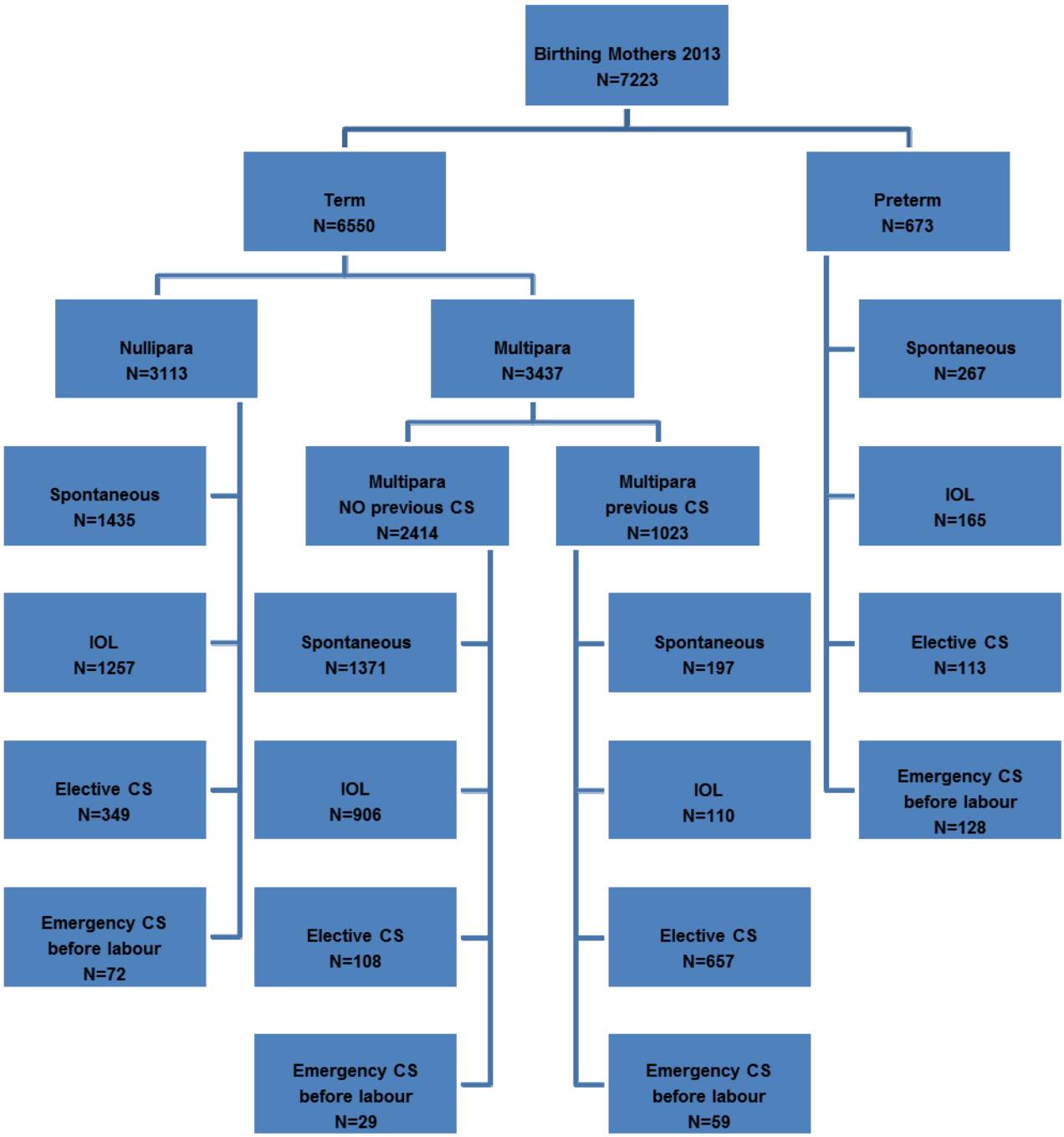


Figure 51: Pathways to birth by gestation and parity NWH 2013

Nulliparous women were more often induced at term than multiparous women without previous caesarean. More than one in three nulliparous women had induction of labour in 2013. Of concern is that compared with 2012, there has been an increase in induction rates for both term nullipara (36.5 to 40.4%) and term multipara (28.1 to 30.3%). A detailed

audit of inductions has therefore become a priority, and a review of induction of labour processes and methods which was commenced in 2013 will continue in 2014. The use of Foley catheters for induction of labour as a cost-effective and clinically safe method in selected cases, such as women with previous caesarean, or with growth restricted babies, is now embedded.

Table 35: Maternal demographic characteristics by onset of birth at term NWH 2013

	Total	Spontaneous Labour		Induced labour		CS Elective		CS Emergency before labour	
	N	n	%	n	%	n	%	n	%
Total	6550	3003	45.8	2273	34.7	1114	17.0	160	2.4
Maternal Age									
<=20	214	149	69.6	61	28.5	3	1.4	1	0.5
21-25	716	416	58.1	256	35.8	34	4.7	10	1.4
26-30	1719	889	51.7	621	36.1	177	10.3	32	1.9
31-35	2312	1051	45.5	758	32.8	433	18.7	70	3.0
36-40	1315	442	33.6	473	36.0	360	27.4	40	3.0
41+	274	56	20.4	104	38.0	107	39.1	7	2.6
Ethnicity									
NZ European	2319	920	39.7	799	34.5	535	23.1	65	2.8
Maori	447	226	50.6	160	35.8	53	11.9	8	1.8
Pacific	812	428	52.7	299	36.8	69	8.5	16	2.0
Asian	1456	774	53.2	441	30.3	212	14.6	29	2.0
Indian	552	229	41.5	243	44.0	62	11.2	18	3.3
Other European	721	300	41.6	250	34.7	153	21.2	18	2.5
Other	243	126	51.9	81	33.3	30	12.3	6	2.5
BMI									
<18.5	237	127	53.6	76	32.1	26	11.0	8	3.4
18.5-24.99	3532	1704	48.2	1125	31.9	623	17.6	80	2.3
>=25-29.99	1518	656	43.2	546	36.0	275	18.1	41	2.7
30-34.99	631	264	41.8	256	40.6	95	15.1	16	2.5
35-39.99	306	120	39.2	133	43.5	46	15.0	7	2.3
>=40	215	58	27.0	117	54.4	33	15.3	7	3.3
missing	111	74	66.7	20	18.0	16	14.4	1	0.9
LMC at Birth									
IMW	3229	1854	57.4	1023	31.7	291	9.0	61	1.9
Private Obstetrician	1694	423	25.0	624	36.8	584	34.5	63	3.7
GP	16	9	56.3	6	37.5	1	6.3	0	0.0
NW Community	1213	620	51.1	400	33.0	168	13.8	25	2.1
NW Medical	207	61	29.5	104	50.2	39	18.8	3	1.4
NW Diabetes	163	15	9.2	110	67.5	30	18.4	8	4.9
Other DHB	9	3	33.3	5	55.6	1	11.1	0	0.0
Unbooked	19	18	94.7	1	5.3	0	0.0	0	0.0

There is an increase in rate of elective caesarean as maternal age increases; particularly from age 41 years. European women remain twice as likely to have elective caesarean as women of other ethnicities. Pre-labour emergency caesarean and induction of labour increase with increasing BMI. Women under the care of medical clinic have a 1.4-fold increased rate of induction of labour (50.2%) compared to community women (33.0%), and women under diabetes clinic have a 2-fold increased rate (67.5%).

The elective caesarean rate is highest among women attending a private obstetrician (34.5%) and lowest among those attending an independent midwife (9%). It is likely that this involves several drivers, which would include provider-selection by women who have a preferred mode of birth. In 2014 a Private Obstetricians' Governance Group has been formed which (in part) may assist with the clarification of such drivers.

Indication for induction

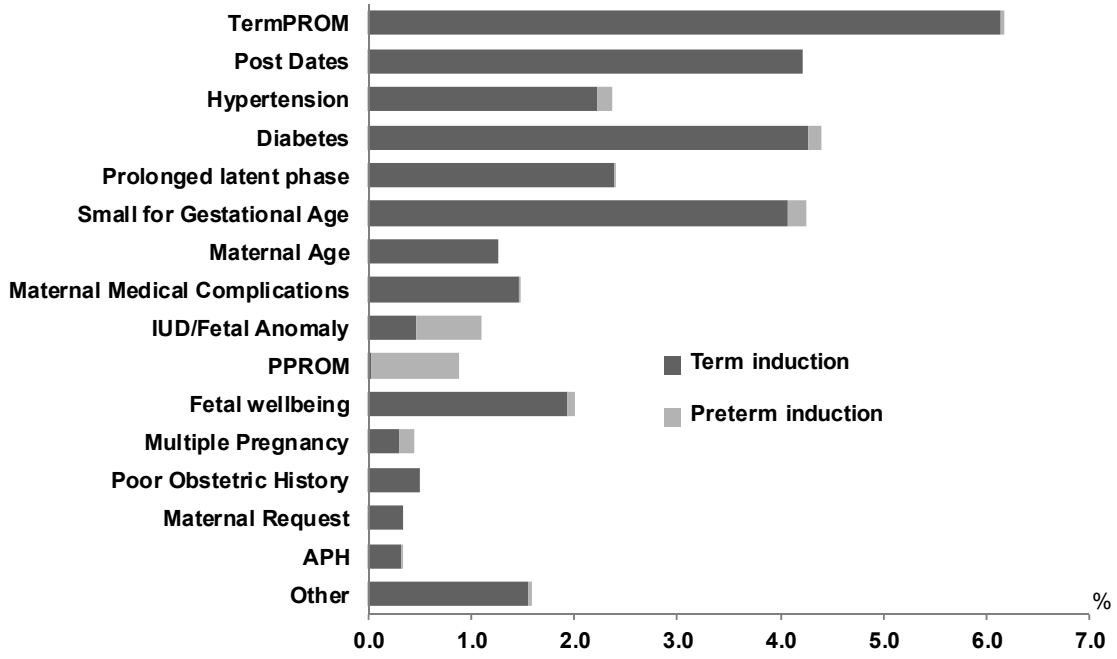


Figure 52: Primary indication for induction by gestation (as a percentage of all births) NWH 2013

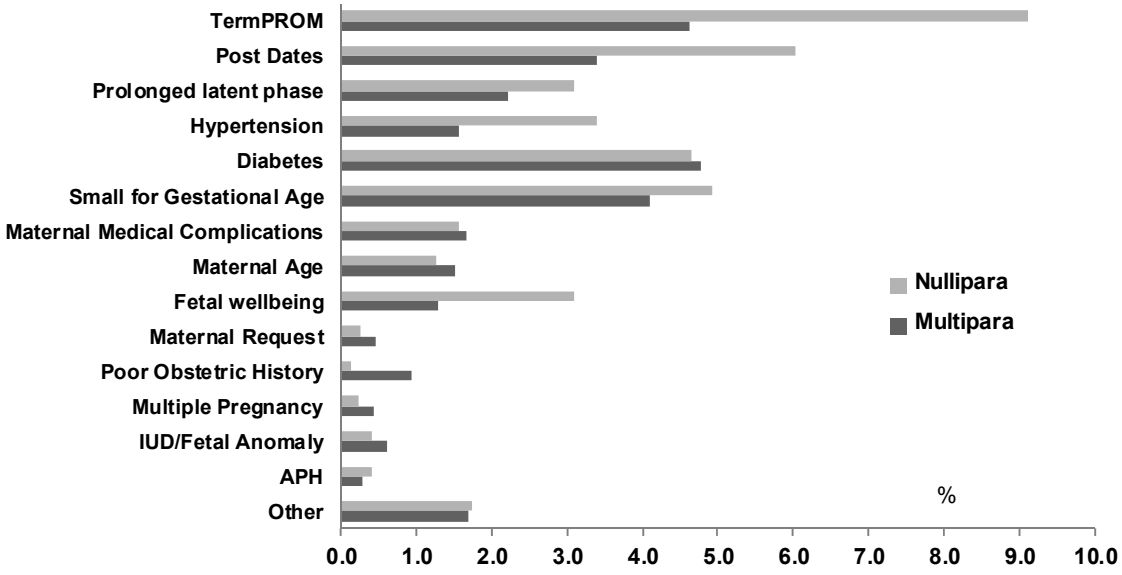


Figure 53: Primary indication for induction at term by parity (as a percentage of term births) NWH 2013

Table 36: Gestation at birth among women whose primary indication for induction was 'post-dates' NWH 2013

	Total n=305		Age<35 n=225		Age>=35 n=82	
	n	%	n	%	n	%
40-40[6]	36	11.8	21	9.4	15	18.3
41-41[6]	229	75.1	170	76.2	59	72.0
42-42[6]	38	12.5	32	14.3	6	7.3
43-43[6]	0	0.0	0	0.0	0	0.0

In contrast to 2012 when prolonged latent phase was the most frequent reason for induction of labour, in 2013, it was term PROM and diabetes, followed closely by post-dates pregnancy and suspected SGA. The reduction in inductions for prolonged latent phase is due to improved data checking processes.

When post-dates was stated to be the primary indication for induction, 11.8% occurred prior to 41 weeks (down from 15% in 2012 but similar to the 10% incidence in 2011), and 12.5% occurred at or beyond 42 weeks (down from 16% in 2012 and 22% in 2011).

Audit of those inductions which occur prior to 41 weeks where 'post-dates' is stated as the primary indication found that 'post-dates' sometimes disguises secondary indications which are of greater significance to the decision, such as hypertension. The review of induction indications and processes will likely increase clarity on this issue

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

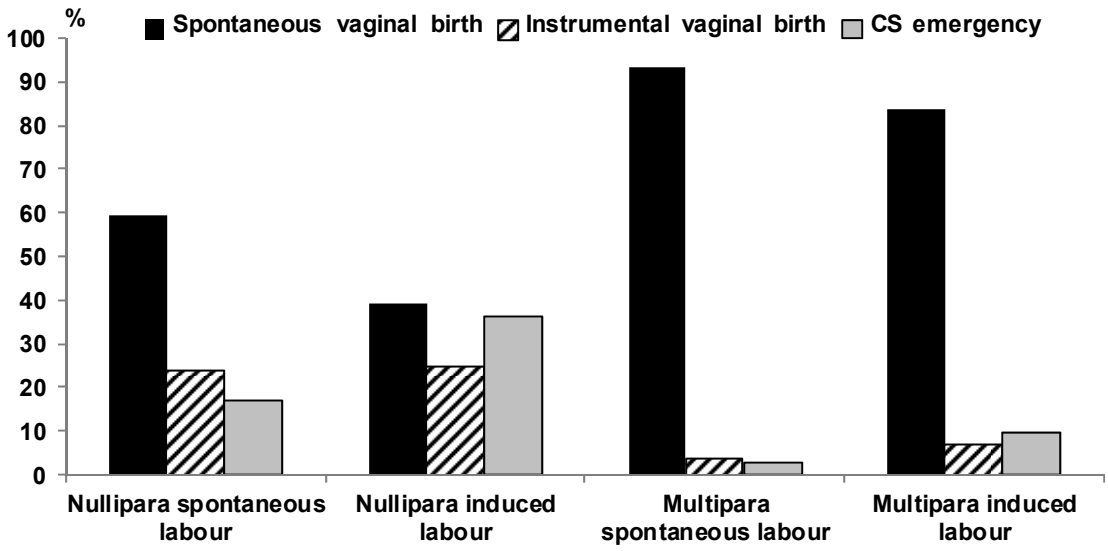


Figure 54: Mode of birth among intended vaginal births at term by parity and onset of labour (excludes previous Caesarean) NWH 2013

The emergency Caesarean section rate following induction is higher than following spontaneous onset of labour, for both nullipara and multipara without previous Caesarean. Among multiparous women, induction is associated with an increase in risk of emergency caesarean (from 3% to 10%). In comparison, the risk of emergency caesarean in nulliparous women having induction in 2013 was 36%.

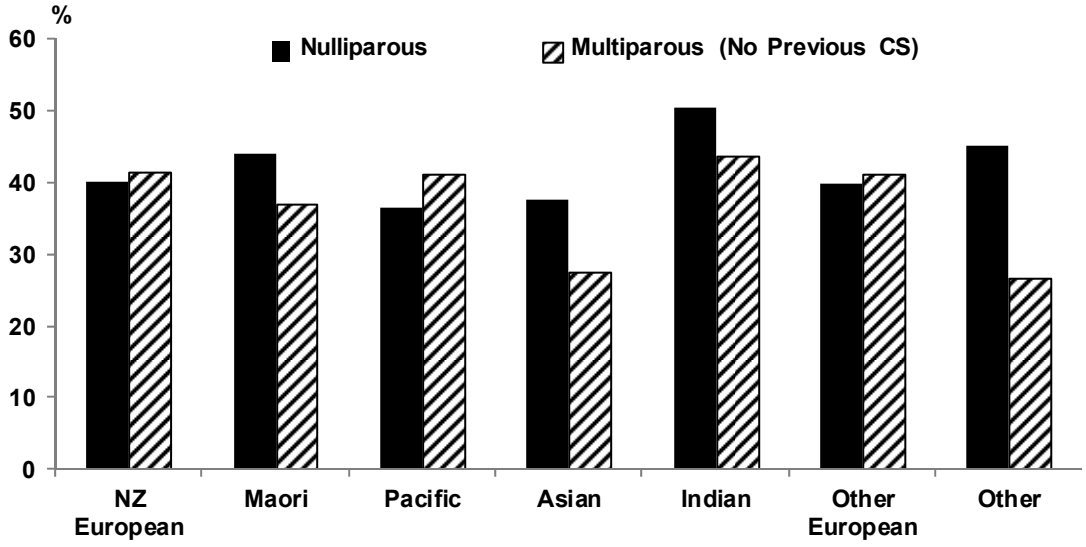


Figure 55: Induction rate by ethnicity and parity at term NWH 2013

Indian women appear to have the highest rate of induction of labour (50% for term nullipara and 43.5% for term multipara without previous caesarean section). Pacific and Asian term nulliparous women have the lowest induction rate (36.5 and 37.5% respectively) and Asian term multiparous women without previous caesarean have the lowest rate at 27.4%. This may reflect different levels of clinical risk in these populations.

6.2.1 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'. For multiparous women, 62.6% of elective and pre-labour Caesarean sections were performed for this indication. The next most common indication overall for elective or pre-labour Caesarean section was malpresentation at 11.4%.

It is of concern that at NWH in 2013, 138 nulliparous women had an elective caesarean section for the 'indication' of maternal request; representing 20% of all nulliparous caesarean sections, and up from 16% in 2012.

6.2.2 Indication for in labour emergency Caesarean section

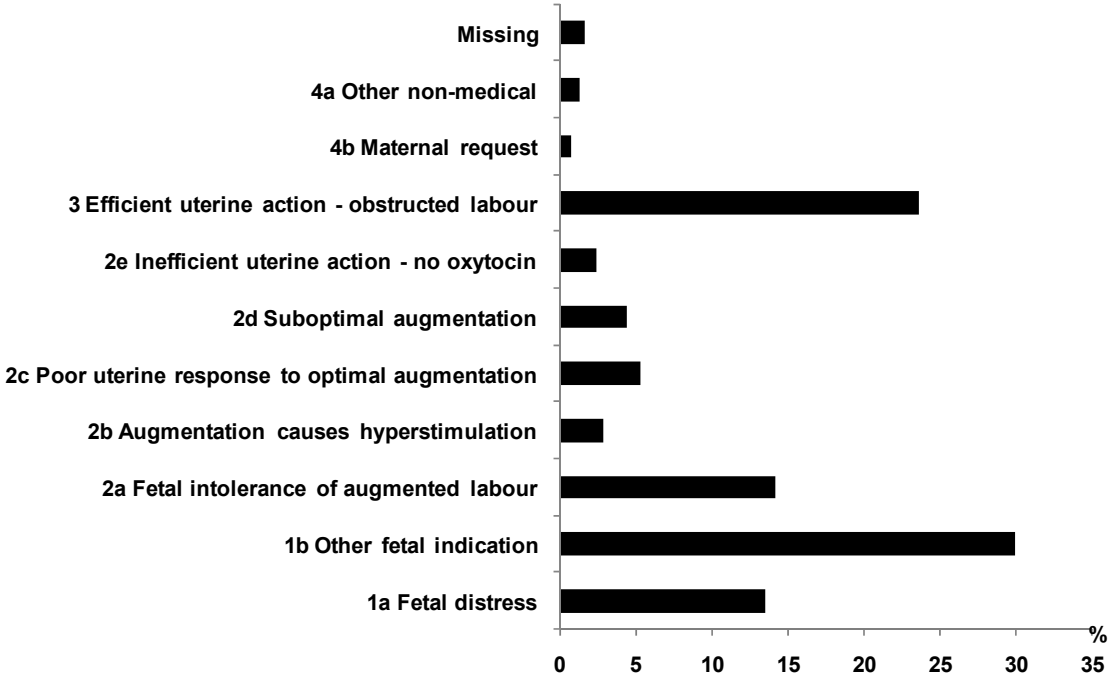


Figure 56: Indication for in labour emergency Caesarean section NWH 2013

The figure above shows the reasons for emergency Caesarean section in labour, of which the most frequent are still "obstructed labour" and "other fetal indications". The data suggest effective use of oxytocin in labour. Caesareans performed for "fetal intolerance" without fetal blood sampling (FBS) in labour are more likely to be unnecessary. The use of FBS prior to a conclusive diagnosis of fetal intolerance of labour is to be encouraged when practicable. Similarly; caesareans for fetal distress, other than where category 1 indications existed, will include some unnecessary procedures. Electronic fetal heart rate monitoring in labour is a screening test for fetal hypoxia with a well-established high false positive rate and very low false-negative rate.

6.3 Use of syntocinon

Table 37: Use of syntocinon by onset of labour and parity NWH 2013

	Total birth	Syntocinon	
	N	n	%
Total	7223	2361	32.7
Induced labour			
Nullipara	1337	1000	74.8
Multipara	1101	702	63.8
Spontaneous labour			
Nullipara	1579	545	34.5
Multipara	1691	107	6.3

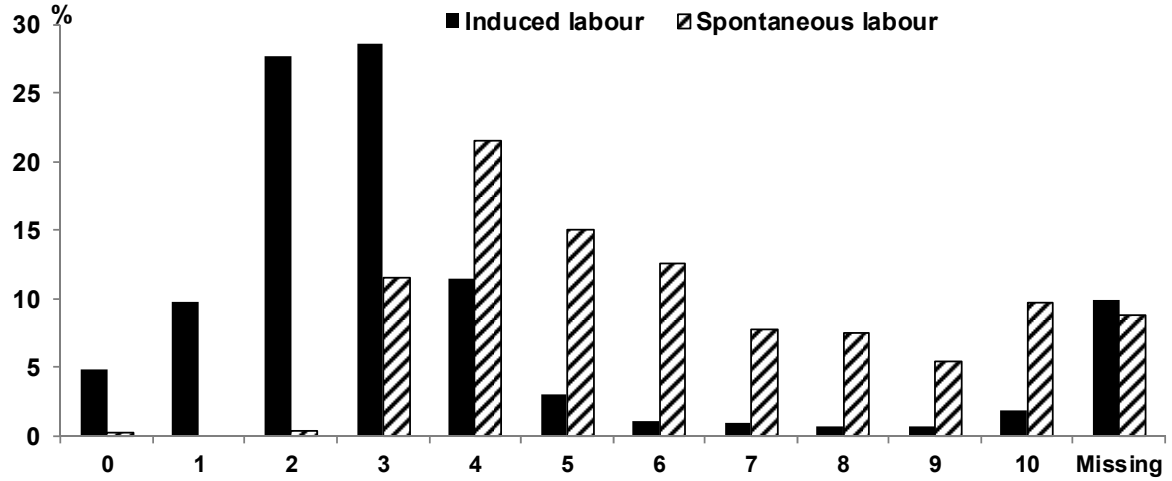


Figure 57: Dilatation at commencement of syntocinon infusion among labouring women by induction status NWH 2013

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

Syntocinon was used to augment spontaneous labour for 34.5% of nulliparous and 6.3% of multiparous women (down from 38% and 8% respectively). Given international evidence that syntocinon in established labour has an impact on length of labour but no significant impact on mode of birth, the use of syntocinon infusions to augment labour in multiparous women is open to challenge.

Summary / Implications

In the 2012 Annual Clinical Report it was stated that “There is concern that the rate of induction is too high”. Despite that it has again risen in 2013. Whilst it is an open question as to what is an “appropriate” induction rate, it is hoped that the evidence based regional consensus on indications and timing of induction will allow an audit of practice at NWH which will bring intellectual clarity to this issue.

6.4 Mode of birth

Findings

Table 38: Mode of birth trends NWH 1998-2013 (n = mothers)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of births	7531	7501	7827	7452	7775	7611	7491	7194	7212	7695	7589	7735	7709	7523	7695	7223
	%	%	%		%	%	%	%	%	%	%	%	%	%	%	%
Spontaneous vertex	62.0	61.8	59.4		55.7	56.1	54.4	53.5	52.9	54.7	55.6	55.8	54.7	55.6	54.2	53.0
Vaginal breech	1.0	1.1	1.1		0.8	0.8	0.7	0.8	0.7	0.9	0.8	0.8	0.8	0.8	0.6	0.8
Forceps/ ventouse	12.3	12.6	12.9		13.9	14.0	15.6	14.2	13.3	12.6	12.4	12.2	12.2	11.1	11.8	11.5
Caesarean	24.7	24.5	26.6		29.6	29.2	29.3	31.6	33.1	31.7	31.3	31.2	32.3	32.5	33.4	34.7
Elective							10.4	11.6	12.8	13.4	14.4	14.6	15.9	15.7	16.6	17.0
Emergency							18.8	20.0	20.3	18.3	16.9	16.6	16.4	16.8	16.8	17.7

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.

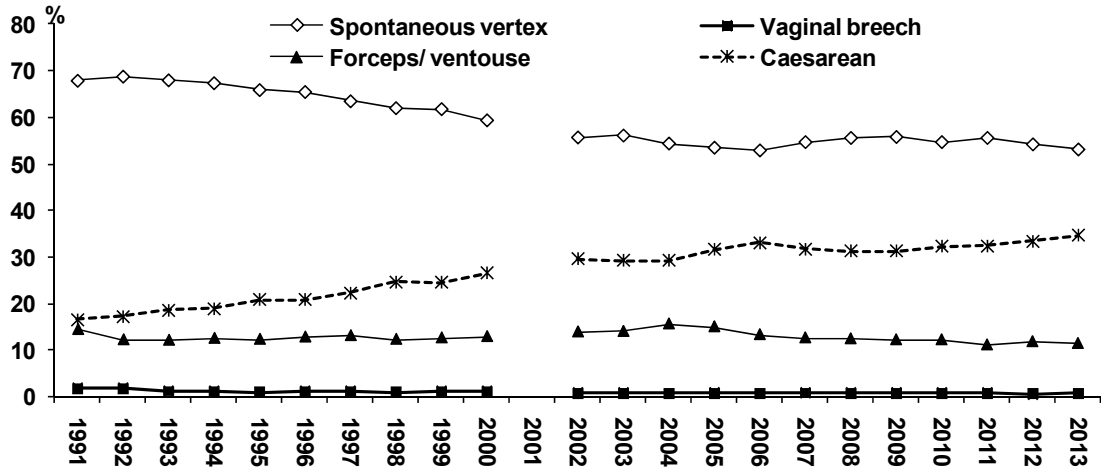


Figure 58: Mode of birth NWH 1991–2013

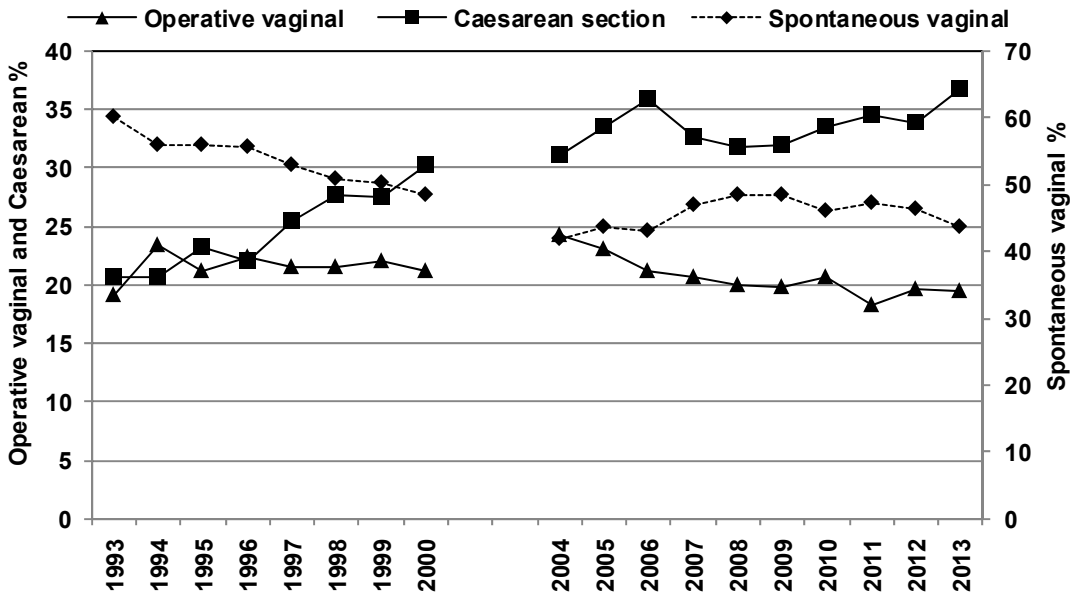


Figure 59: Mode of birth for nullipara NWH 1993-2013

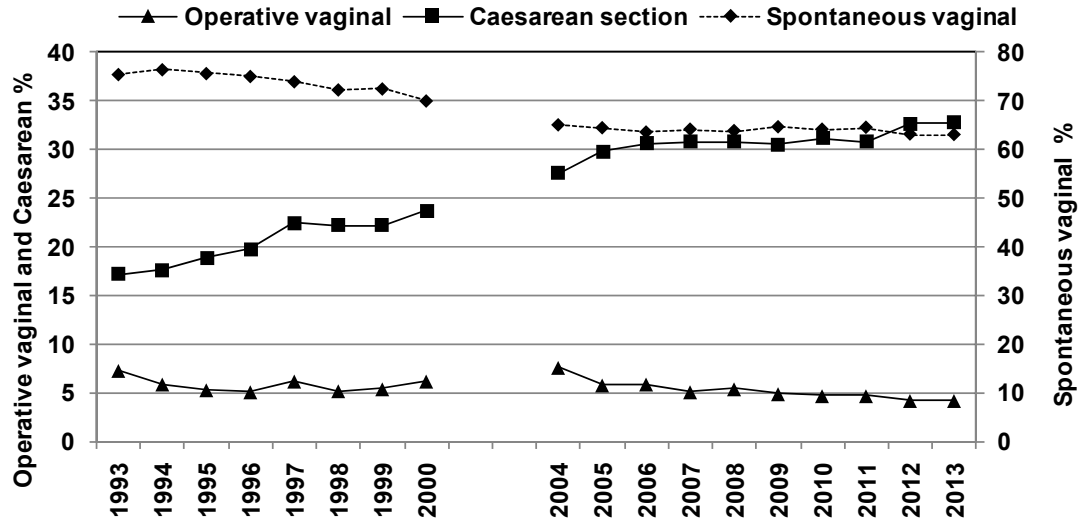


Figure 60: Mode of birth for multipara NWH 1993-2013

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 not significantly changed. However, subsequent years may prove a slow upward trend which reaches significance. It is of note that whilst the rate of spontaneous vaginal birth has been stable for multipara over the past decade, it is not possible to be as confident that this will remain the case for nullipara.

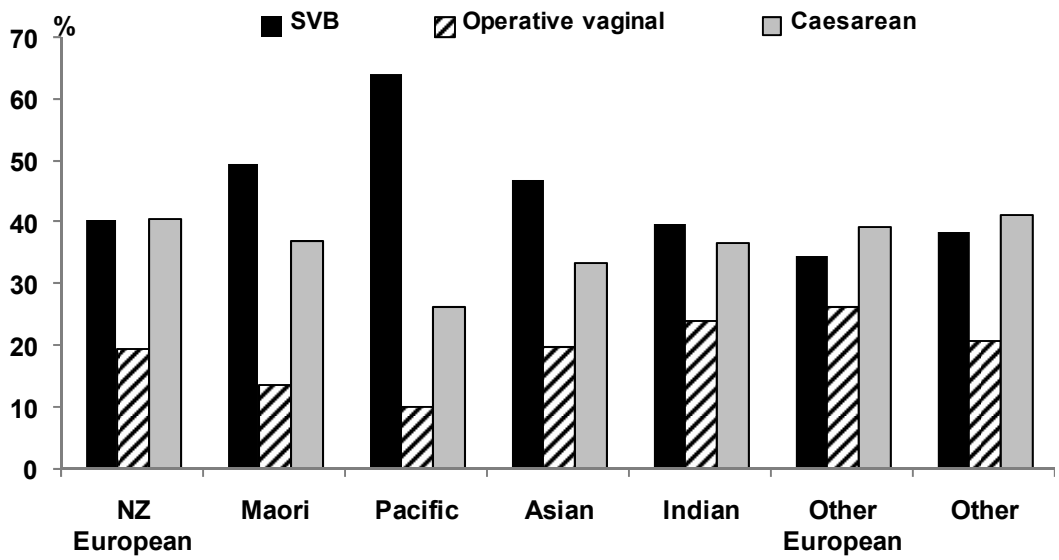


Figure 61: **Mode of birth by ethnicity among nulliparous women NWH 2013**

As has been the case for many years, Pacific women have higher rates of spontaneous vaginal birth (SVB) than all other ethnic groups, with Maori and Asian ethnicities also showing higher rates than other groups.

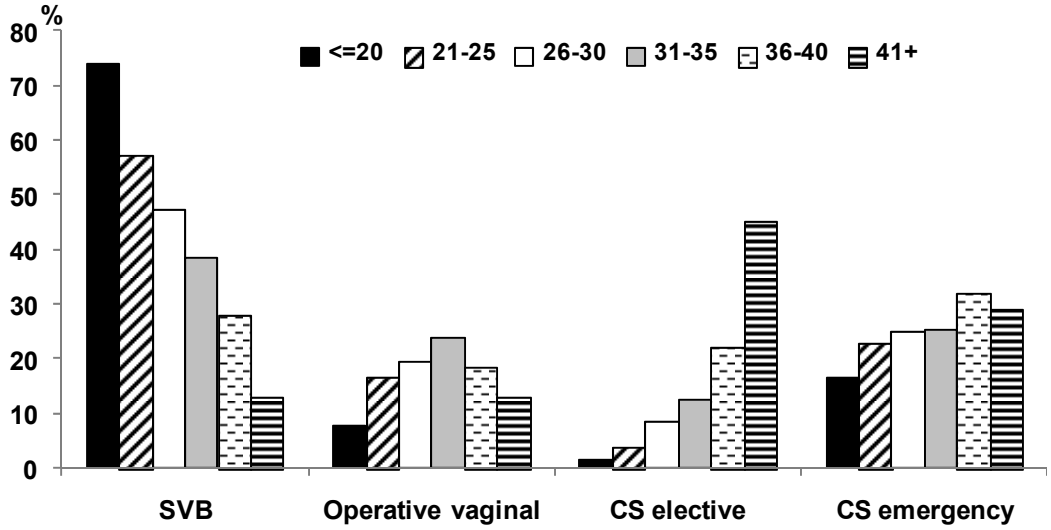


Figure 62: Mode of birth by maternal age among nulliparous women NWH 2013

The SVB rate falls with increasing age. Operative vaginal birth increases with increasing age until 35 years, beyond which there is a marked increase in elective caesarean section rate.

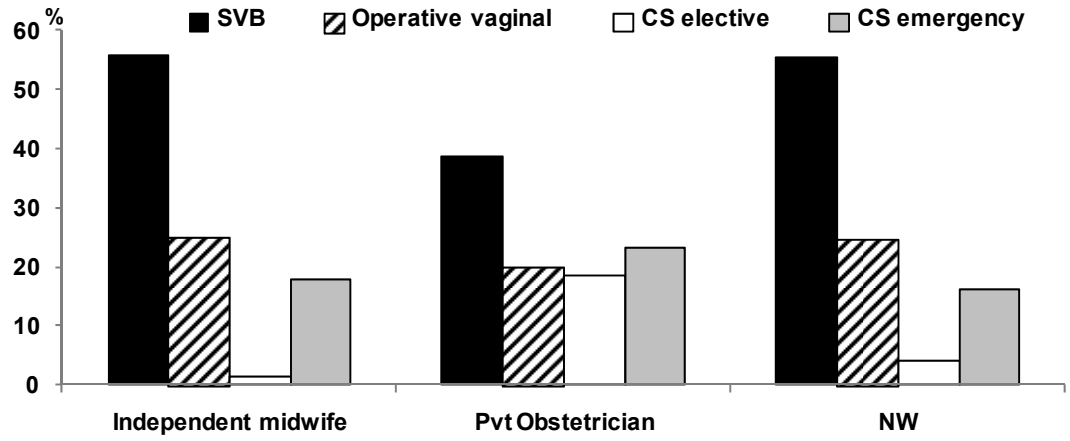


Figure 63: Mode of birth at term by LMC at birth among standard primipara NWH 2013

Of the three caregiver groups compared in the figure above, SVB rates are lowest, and elective CS rates highest for standard primiparae under private specialist obstetrician care. Although maternal age does seem to be associated with an increased CS rate (all nulliparae), the standard primipara is aged between 20 and 34 years.

6.5 Spontaneous vaginal birth

Table 39: Spontaneous vaginal birth rates NWH 2004-2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
	n	n	n	n	n	n	n	n	n	n
Total births (mothers)	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**
Spontaneous vaginal birth	4127	3899	3866	4282	4280	4374	4217	4243	4218	3884
Incidence %	55.1	54.2	53.6	55.6	56.4	56.4	55.5	56.4	54.8	53.8
Total nullipara	3597	3522	3499	3752	3623	3811	3650	3539	3778	3441
Spontaneous vaginal birth	1604	1535	1509	1755	1749	1839	1675	1674	1746	1501
Incidence %	44.6	43.6	43.1	46.8	48.3	48.3	45.9	47.3	46.2	43.6
Total multipara	3894	3672	3713	3943	3966	3924	4059	3984	3917	3782
Spontaneous vaginal birth	2523	2364	2357	2527	2531	2495	2601	2569	2472	2383
Incidence %	64.8	64.4	63.5	64.1	63.8	63.6	64.1	64.5	63.1	63.0

The spontaneous vaginal birth rate has remained consistently low since 2004. SVB rate in standard primiparae is one of the clinical indicators reported annually by the Ministry of Health as part of the Maternity Quality and Safety Programme. This allows the opportunity to compare with national rates. ADHB at 65.6% was at the national average in this respect in the latest report, which was for 2011 data, despite wide variations between practitioner groups. All practitioner groups should strive for excellence in care and realise the potential for improvement in spontaneous vaginal birth rate in this low risk group of women. See appendix for definition of the standard primipara.

6.5.1 Waterbirth

Thirty two babies were recorded in the database as having been born in water in 2013. Four of these were under the care of NW LMC service and twenty eight were under the care of an independent midwife.

All were live births.

6.6 Caesarean section

Methods

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

Findings

The Caesarean section rate (34.7%) is the highest it has ever been at NWH. The most common reason for Caesarean section is repeat Caesarean. This is followed closely by nullipara having Caesarean before labour or following induction of labour. See Robson groups on the following page which show the contribution of various clinical groupings to the Caesarean section rate.

Research evidence is clear that repeated Caesarean sections are strongly associated with adverse maternal outcomes, such as abnormal placentation, postpartum haemorrhage and peripartum hysterectomy.

National Women's supports vaginal birth after Caesarean, see section 6.5.3. We also have a policy of consultant attendance for any possible Caesarean section at full dilatation to ensure robust decision making and safe care. This policy has been more strictly implemented in 2013 since an audit revealed low compliance.

Table 40: Caesarean section rates NWH 1998-2013

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total births (mothers)	**7492**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**
Caesarean Sections	1851	1837	2084	*	2301	2219	2193	2273	2390	2438	2372	2414	2491	2448	2570	2506
Incidence %	24.7	24.5	26.6	*	29.6	29.2	29.3	31.6	33.1	31.7	31.3	31.2	32.3	32.5	33.4	34.7
Total nullipara	**3263**	**3262**	**3454**	*	*	*	**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**	**3778**	**3441**
Caesarean	900	898	1047	*	*	*	1118	1178	1253	1225	1152	1219	1223	1222	1288	1266
Incidence %	27.6	27.5	30.3	*	*	*	31.1	33.4	35.8	32.6	31.8	32.0	33.5	34.5	34.1	36.8
Total elective							233	249	296	310	313	340	383	353	408	396
Elective %	*	*	*	*	*	*	6.5	7.1	8.5	8.3	8.6	8.9	10.5	10.0	10.8	11.5
Total emergency							885	929	957	915	839	879	840	869	880	870
Emergency %	*	*	*	*	*	*	24.6	26.4	27.4	24.4	23.2	23.1	23.0	24.6	23.3	25.3
Total multipara	**4229**	**4239**	**4372**	*	*	*	**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**	**3917**	**3782**
Caesarean	951	939	1037	*	*	*	1075	1095	1137	1213	1220	1195	1268	1226	1282	1240
Incidence %	22.5	22.2	23.7	*	*	*	27.6	29.8	30.6	30.8	30.8	30.5	31.2	30.8	32.7	32.8
Total elective							548	584	628	720	780	792	843	830	868	831
Elective %	*	*	*	*	*	*	14.1	15.9	16.9	18.3	19.7	20.2	20.8	20.8	22.2	22.0
Total emergency							527	511	509	493	440	403	425	396	414	409
Emergency %	*	*	*	*	*	*	13.5	13.9	13.7	12.5	11.1	10.2	10.5	9.9	10.6	10.8

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

Robson 10-group classification 2005-2013

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 41: Robson 10-Group Classification NWH 2006-2013

	2006			2007			2008			2009			2010			2011			2012			2013			
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**	**CS**	**Total Births**	**CS Rate**	**Contribution to CS rate**
	n	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**n**	**n**	**%**	**%**
Totals	**2390**	**7212**	**33.1**	**2438**	**7695**	**31.7**	**2372**	**7589**	**31.3**	**2414**	**7735**	**31.2**	**2491**	**7709**	**32.3**	**2448**	**7523**	**32.5**	**2570**	**7695**	**33.4**	**2506**	**7223**	**34.7**	
1 Nullip, singleton, cephalic, term, spontaneous labour	396	1920	20.6	353	2004	17.6	279	1809	15.4	281	1950	14.4	251	1736	14.5	244	1555	15.7	275	1684	16.3	238	1426	16.7	9.5
2 Nullip, singleton, cephalic, term, induced or CS before labour	495	1024	48.3	515	1132	45.5	581	1275	45.6	647	1393	46.4	648	1384	46.8	669	1465	45.7	686	1555	44.1	735	1530	48.0	29.3
3 Multip, singleton, cephalic, no previous CS, term, spontaneous labour	79	1601	4.9	57	1690	3.4	62	1640	3.8	55	1599	3.4	53	1693	3.1	49	1503	3.3	41	1467	2.8	35	1359	2.6	1.4
4 Multip, singleton, cephalic, no previous CS, term, induced or CS before labour	127	714	17.8	123	735	16.7	119	806	14.8	144	839	17.2	159	856	18.6	141	977	14.4	154	957	16.1	176	980	18.0	7.0
5 Previous CS, singleton, cephalic, term	677	936	72.3	748	1008	74.2	741	1017	72.9	698	967	72.2	757	1005	75.3	752	1016	74.0	757	977	77.5	755	970	77.8	30.1
6 Nullip, singleton, breech	187	205	91.2	183	208	88.0	166	195	85.1	164	174	94.3	177	199	88.9	151	172	87.8	186	202	92.1	154	172	89.5	6.1
7 Multiip, singleton, breech (incl prev CS)	106	123	86.2	121	143	84.6	135	151	89.4	132	161	82.0	115	141	81.6	117	142	82.4	132	154	85.7	127	147	86.4	5.1
8 All multiple (incl prev CS)	108	162	66.7	110	177	62.1	97	160	60.6	93	159	58.5	104	153	68.0	111	163	68.1	112	163	68.7	91	151	60.3	3.6
9 All abnormal lie (incl prev CS)	27	29	93.1	26	27	96.3	29	32	90.6	55	63	87.3	62	69	89.9	53	56	94.6	40	47	85.1	17	22	80.0	0.7
10 All preterm singleton cephalic (incl prev CS)	188	498	37.8	202	571	35.4	163	504	32.3	145	430	33.7	165	473	34.9	161	474	34.0	187	489	38.2	178	466	38.2	7.1

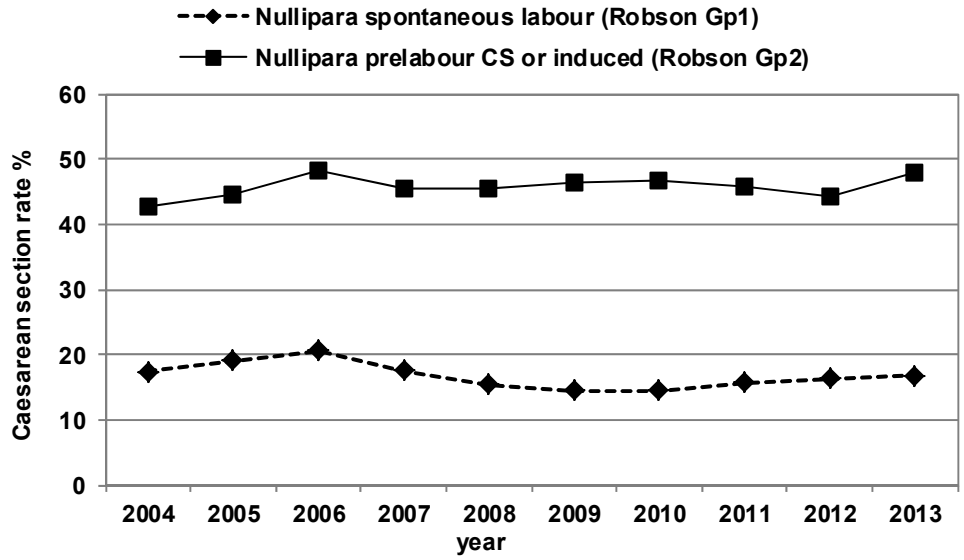


Figure 64: Robson groups 1&2: Nulliparous caesarean section rates among singleton cephalic term pregnancies by onset of labour NWH 2004-2013

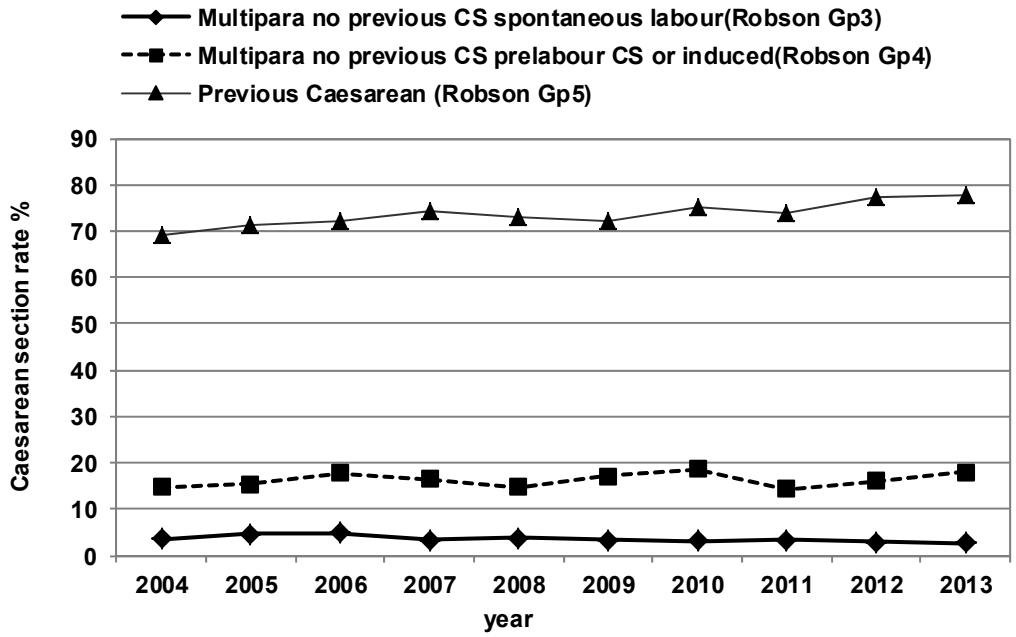


Figure 65: Robson groups 3-5: Multiparous caesarean section rates among singleton cephalic term pregnancies by onset of labour and previous caesarean status NWH 2004-2013

6.5.3 Vaginal birth after Caesarean section (VBAC)

This section refers to women giving birth at NW in 2013 who previously had only one birth where that one birth was a Caesarean. Of these 752 women, overall 70% had a planned caesarean prior to labour (up from 64% last year and 63% the year before). The overall VBAC rate was 18.2%, similar to last year (17%) and the year before (22%). The overall successful trial of labour rate was 61%, which is at the lower end of the range of rates reported internationally (60-80%).

For women with a singleton cephalic pregnancy who delivered at term, the rate of planned caesarean prior to labour varied by LMC: 50% for women under the care of independent

midwives, 54% for women under the care of NW, and as high as 81% for women under the care of private obstetricians. The rate of successful trial of labour also varied by LMC: 79% for women under the care of NW, 56% for women under the care of independent midwives, and only 42% for women under the care of private obstetricians.

The successful trial of labour rate also varied by onset of labour, from 78% in spontaneous labour (higher than 68% last year) to 43% if labour was induced (lower than 48% last year).

These data could inform how we counsel women during pregnancy about the decision to plan VBAC or to plan repeat Caesarean. Of note, the philosophy of the Positive Birth After Caesarean (PBAC) clinic, which started in February 2011, is to provide evidence-based information about options for mode of birth, make an individualized plan for the woman, and support her choice during pregnancy and in labour.

Table 42: VBAC: Mode of birth among parity 1 prior Caesarean pregnancies by mode of onset of birth (n=752) NWH 2013

Parity 1, previous Caesarean, all gestations										
	Spontaneous labour n=143		Induced labour n=80		CS elective n=468		CS emergency before onset of labour n=61		Total n=752	
	n	%	n	%	n	%	n	%	n	%
SVB	80	55.9	23	28.8	0	0	0	0	103	13.7
Operative vaginal birth	23	16.1	11	13.8	0	0	0	0	34	4.5
CS elective	0	0.0	0	0.0	468	100	0	0	467	62.1
CS emergency	40	28.0	46	57.5	0	0	61	100	148	19.7

Table 43: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by mode of onset of birth (n=648) NWH 2013

Parity 1, previous Caesarean, singleton, cephalic, term										
	Spontaneous labour n=127		Induced labour n=65		CS elective n=415		CS emergency before onset of labour n=41		Total n=648	
	n	%	n	%	n	%	n	%	n	%
SVB	69	54.3	17	26.2	0	0	0	0	86	13.3
Operative vaginal birth	23	18.1	9	13.8	0	0	0	0	32	4.9
CS elective	0	0.0	0	0.0	415	100	0	0	414	63.9
CS emergency	35	27.6	39	60.0	0		41	100	116	17.9

Table 44: VBAC: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by LMC at birth (n=648) NWH 2013

Parity 1, previous Caesarean, singleton, cephalic, term								
	IMW n=223		Pvt Obstetrician n=265		NW n=160		Total n=648	
	n	%	n	%	n	%	n	%
Vaginal birth	49	22.0	14	5.3	23	14.4	86	13.3
Operative vaginal birth	13	5.8	7	2.6	12	7.5	32	4.9
CS elective	112	50.2	215	81.1	88	55.0	415	64.0
CS emergency	49	22.0	29	10.9	37	23.1	115	17.7

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

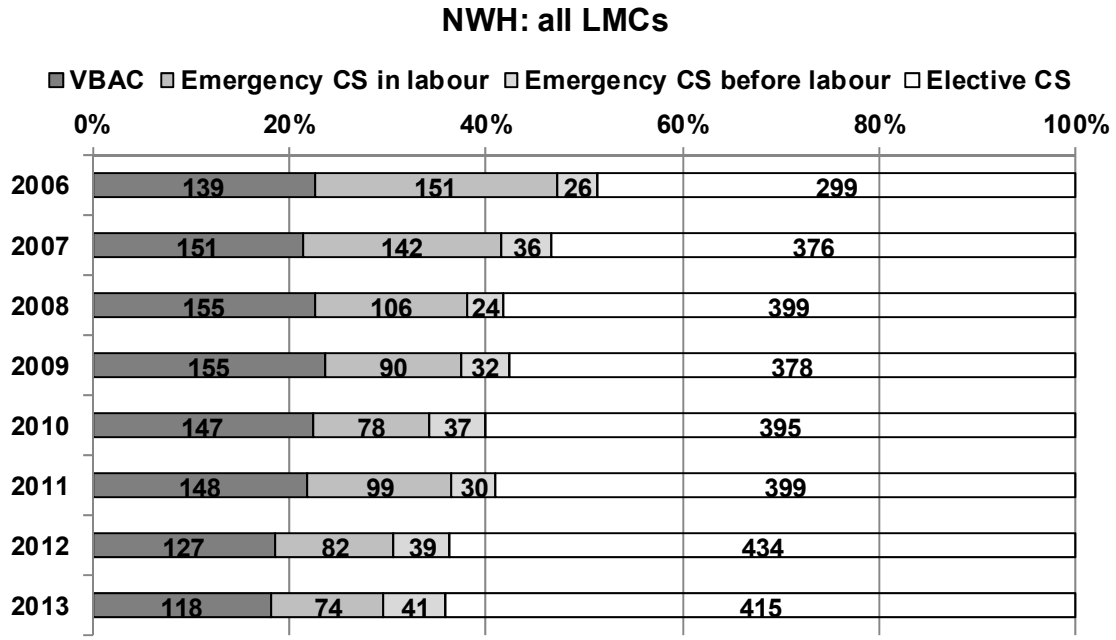


Figure 66: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies NWH 2006-2013

The figures above and below look at trends in trial of labour and VBAC rates at NWH over the years 2006 to 2013 among primiparous women with a previous CS presenting at term with cephalic singleton pregnancy. The figure above includes all women birthing at NWH within this category and those below are presented by LMC at birth.

The three stacked bars to the left of each figure represent women who present for a trial of labour and the bar to the right represents elective repeat caesarean section. Since 2006, there has been an increase in the proportion of women birthing by elective repeat Caesarean section from approximately 49 percent in 2006 to 64 percent in 2013. Meanwhile, of trials of labour, 44 percent were successful in 2006 compared to 51 percent in 2013. This is not a statistically significant increase and the proportion of women achieving a VBAC among this group of primiparous women with one previous caesarean at term with a cephalic singleton has dropped from 22.6% to 18.2% from 2006-2013 (p=0.05).

The figures following show the same data by LMC at birth. It is clear that women under the care of private obstetricians are more likely to elect for repeat Caesarean section, and this has increased from 74 percent in 2006 to 81 percent in 2013, and this trend of increasing elective repeat caesarean section is apparent in all LMC groups.

Trial of labour was successful among 52 and 54 percent of women having a trial of labour under DHB and independent midwifery LMC care on average over the years 2006-2013. Forty three percent of private obstetrician patients having a trial of labour had a successful VBAC, and this was statistically significantly lower than for the other LMC groups.

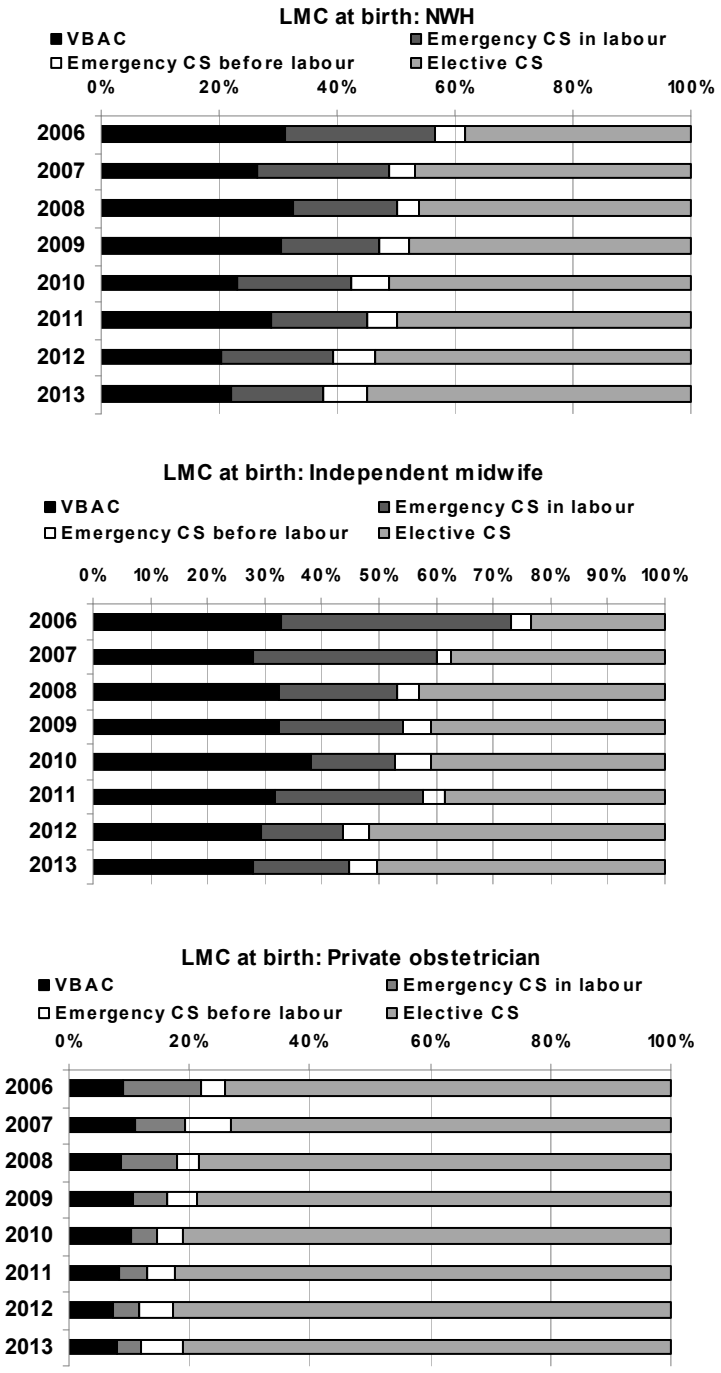


Figure 67: Mode of birth among parity 1, singleton, cephalic, term prior Caesarean pregnancies by LMC at birth NWH 2006-2013

6.6 Instrumental vaginal birth

The rate of instrumental birth dropped in 2011 to below 12% for the first time since 1997, and has remained stable at around 12% since. The rate for multiparous women has fallen even further than in 2011 and is now 4.2%. Rates of instrumental vaginal birth for term nullipara remain stable at around 20.8%.

In the previous Annual Clinical Report it was stated that although ventouse remains the instrument most frequently used, irrespective of parity or maternal ethnicity, this may not reflect best practice given that a double instrumental or caesarean delivery is more likely after attempted ventouse than forceps birth. It is therefore of interest that the reduction in operative vaginal births is related solely to a reduction in ventouse births, with forceps delivery rates stable.

However, the above statement must be balanced against the reduced risk of perineal trauma with a successful ventouse delivery. This is especially so in women of Indian ethnicity where the rate of perineal trauma is too high with forceps delivery for forceps to be considered the instrument of choice.

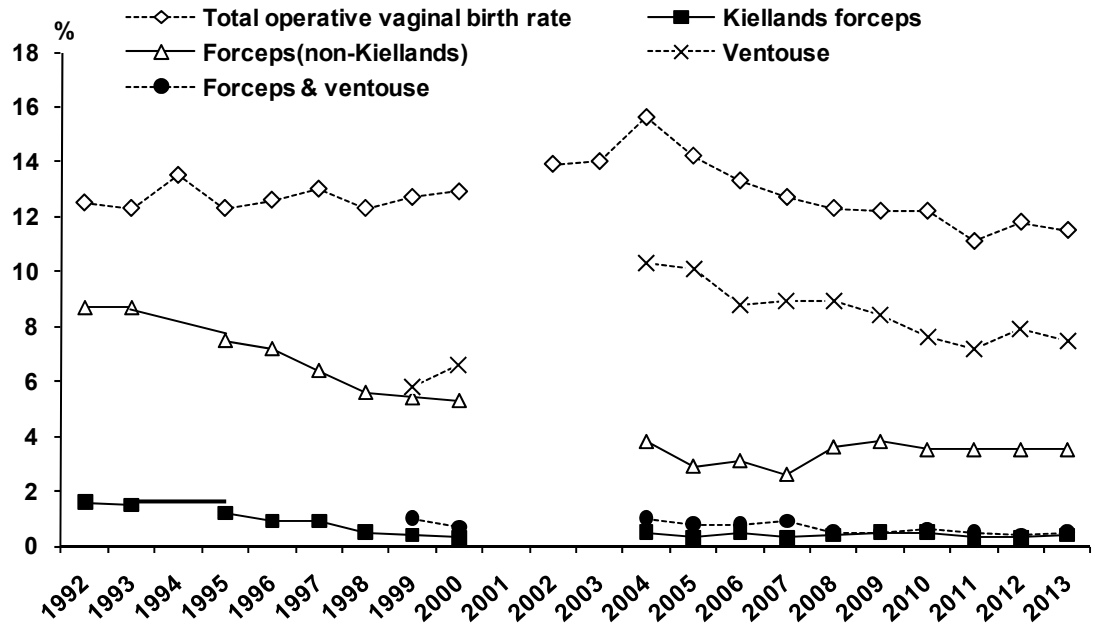


Figure 68: Operative vaginal birth NWH 1992-2013

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 ventouse and forceps, or different types of forceps) and to birth of a baby by Caesarean section after an attempted vaginal instrumental birth.

The rate of double instrumental vaginal births (as a proportion of all vaginal births) at NW in 2013 was 0.74% (41 mothers/5550 vaginal births) or 0.72% of mothers who attempted labour (41 mothers/5709 mothers). Forty eight mothers had an emergency Caesarean section after a prior attempt at instrumental birth (0.84% of mothers who attempted labour).

These are rare events but are associated with more severe outcomes for both mother and baby as referenced in the previous ACR. Given these increased risks of adverse outcome, it is intended in 2014 to determine factors which may be associated with these events which could allow us to reduce the rate. Such factors may include case selection (indication and examination findings), operator experience and supervision.

Table 45: Maternal outcomes following double instrumental vaginal birth compared to single instrumental vaginal birth, attempted instrumental vaginal birth prior to emergency Caesarean section and emergency Caesarean section in labour NWH 2013

	Single instrument (vaginal birth) n=789		Double instrument (vaginal birth) n=41		Emergency Caesarean with prior instrumental attempt n=48		Emergency Caesarean in labour without prior instrumental n= 1231	
	n	%	n	%	n	%	n	%
Episiotomy	555	70.3	37	90.2	4	8.3	1	0.1
Third or fourth degree tear	56	7.1	4	9.8	0	n/a	n/a	n/a
PPH>=1000mls	96	12.2	6	14.6	13	27.1	216	17.6
Transfusion	46	5.8	3	7.3	0		50	4.1

Table 46: Neonatal outcomes following double instrumental vaginal birth compared to single instrumental vaginal birth, attempted instrumental vaginal birth prior to emergency Caesarean section and emergency Caesarean section in labour NWH 2013

	Single instrument (vaginal birth) n=794		Double instrument (vaginal birth) n=41		Emergency Caesarean with prior instrumental attempt n=48		Emergency Caesarean in labour without prior instrumental n= 1273	
	n	%	n	%	n	%	n	%
Apgar score 1min <4	7	0.9	1	2.4	2	4.2	79	6.2
Apgar score 1min <7	77	9.7	9	22.0	10	20.8	238	18.7
Apgar score 5min <5	1	0.1	1	2.4	2	4.2	25	2.0
Apgar score 5min <7	3	0.4	1	2.4	3	6.3	67	5.3
NICU admission	69	8.7	6	14.6	5	10.4	295	23.2
Neonatal Death rate (/1000 live births)	1	1.3	0		0		2	1.6

6.7 Breech presentation

6.7.1 Breech birth

Table 47: Mode of birth by breech presentation (singletons) NWH 2013

	N	Total breech	% Breech/total singleton birth	Breech & CS	% CS/total breech
Total singleton births	7072	319	5	281	88
20-24 weeks	52	18	35	0	0
25-31 weeks	111	36	32	24	67
32-36 weeks	412	46	11	45	98
>=37 weeks	6497	219	3	212	97

Breech births constituted 5.4% of all births in 2013; 4.5% of singletons. The NWH guideline on Breech Birth was updated in May 2012 to reflect changes in guidelines internationally towards offering the options of planned vaginal breech birth versus planned caesarean birth, where strict selection criteria are met and ECV has been unsuccessful.

In 2013, 11.9% of singleton breeches were born vaginally. Considerable effort is made in counselling and advising women who wish to attempt vaginal breech birth. Although only a small number of obstetricians will consider conducting vaginal breech births, the desire to accommodate this option is such that those obstetricians make themselves available sometimes outside the roster in order to accommodate the wishes of women who make this choice.

6.7.2 External cephalic version

This section reports statistics relating to women who attended the Day Assessment Unit at NW for external cephalic version (ECV) for breech presentation. Data regarding ECV are captured directly into Healthware at the time of the procedure.

Findings

In 2013, a total of 96 ECVs were attempted for 88 women. Most ECVs were attempted at 37-38 weeks (range 36 to 40 weeks gestation). Most ECVs were attempted by one operator.

Among 88 women, the overall ECV success rate was 40.9%, lower than success rates reported internationally (50-60%).

Table 48: Mode of birth following attempted ECV (n=88) NWH 2013

	Failed ECV n=52		Successful ECV n=36	
	n	%	n	%
Type of Birth				
Vaginal	5	9.6	28	77.8
SVB	5*	9.6	25	69.4
Operative vaginal	0	0.0	3	8.3
CS elective	38	73.1	4	11.1
CS emergency	9	17.3	4	11.1

* These babies were breech presentation at birth

Descent of the breech into the pelvis is associated with unsuccessful ECV. If there was no descent, the success rate was 66% compared with 7% 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 two 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. Seventy 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, 38% overall 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 50% among independent midwifery clients compared to 13% of private obstetrician clients and 51% of NWH LMC clients. Only 4% (2/48) of women who had a history of prior Caesarean section and breech presentation at term were referred for ECV compared to 40% (86/213) of women without prior history of Caesarean section. There is no evidence from the international literature that a history of previous Caesarean section is a contraindication for ECV.

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

Labour and Birth Summary / Implications

The summary and implications remain similar to 2012. The Caesarean section rate has increased with the leading contributors to the total rate being multipara having repeat Caesarean, and nullipara having Caesarean before labour or following induction of labour. The reason for nullipara making a maternal request for elective Caesarean should be further explored, and when understood consideration given to the appropriate information on relative and subsequent risks of Caesarean, especially multiple Caesarean sections.

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

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

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.

6.8 Obstetric analgesia

Methods

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

Findings

Table 49: Analgesic use by parity and mode of onset of birth NWH 2013

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
All Women	**7223**	**3954**	**54.7**	**3209**	**44.4**	**505**	**7.0**	**76**	**1.1**	**354**	**4.9**
Mode of onset of birth											
CS elective	1227	790	64.4	21	1.7	4	0.3	2	0.2	2	0.2
CS emergency before onset of labour	288	158	54.9	33	11.5	3	1.0	1	0.3	0	0.0
Labouring women*											
Nullipara	2916	1975	67.7	1748	59.9	308	10.6	43	1.5	250	8.6
Multipara	2792	1031	36.9	1407	50.4	190	6.8	30	1.1	102	3.7
Induced labour											
Nullipara	1337	1097	82.0	709	53.0	160	12.0	19	1.4	54	4.0
Multipara	1101	612	55.6	503	45.7	79	7.2	13	1.2	19	1.7
Spontaneous labour											
Nullipara	1579	878	55.6	1039	65.8	148	9.4	24	1.5	196	12.4
Multipara	1691	419	24.8	904	53.5	111	6.6	17	1.0	83	4.9

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

Epidurals continue to be the most used mode of analgesia for the management of labour pain (52.6% of women in labour), with women having induced labours being the most frequent utilisers (69.7% compared with spontaneous labour 39.2%). Among labouring nulliparous women other demographic factors linked to highest use of epidurals are: private obstetrician LMC (81.5%), and age > 40 years (83.7%).

Use of parenteral pethidine continues to decline year on year (7.0% in 2013, 8.9% in 2012, 13.1% in 2011, 15.5% in 2010) in keeping with international trends. This will most likely fall even further following the ratification of a proposal by the NZ Medical Council to allow other opiates to be administered by midwives.

Use of general anaesthesia for caesarean section remains reasonable based on internationally recommended levels. However, in the past year there has been an increase in the total percentage of women administered a GA (3.3% cf 2.0% in 2012) with most of this increase being because of an increase in GA administration in 9.5% of emergency caesarean births (5.3% in 2012). Approximately a third of these represent conversion from regional to general anaesthesia, but this equates to only 10 cases.

Table 50: GA use and mode of birth NWH 2013

	Total	GA* only		GA* + epidural		Total GA*	
	N	n	%	n	%	n	%
Total	7223	163	2.3	75	1.0	238	3.3
SVB	3884	48	1.2	15	0.4	63	1.6
Operative vaginal	833	7	0.8	4	0.5	11	1.3
CS elective	1227	31	2.5	12	1.0	43	3.5
CS emergency	1279	77	6.0	44	3.4	121	9.5

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

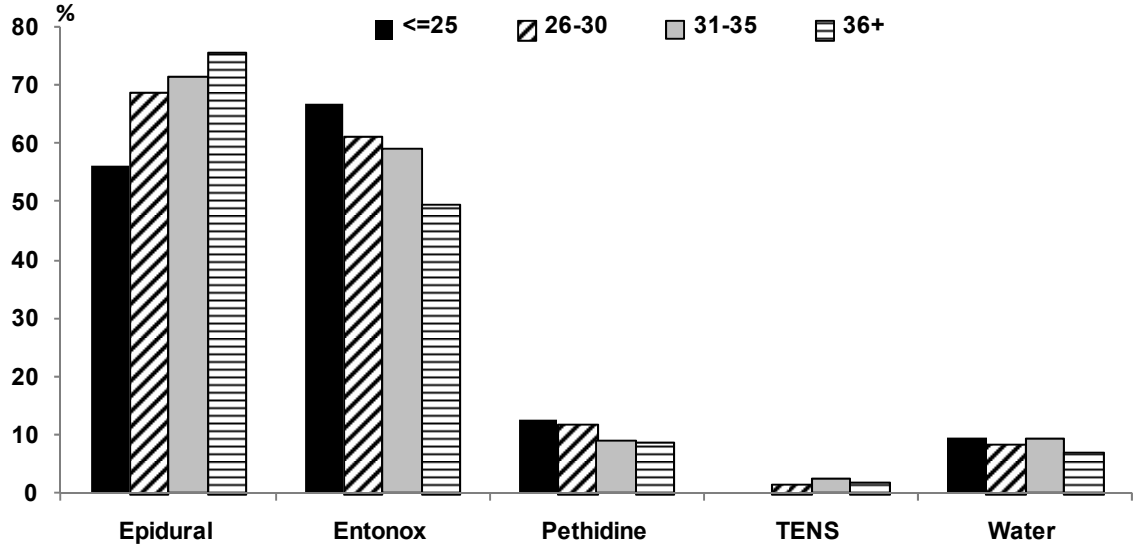


Figure 69: Analgesic use and maternal age among labouring nulliparous women NWH 2013

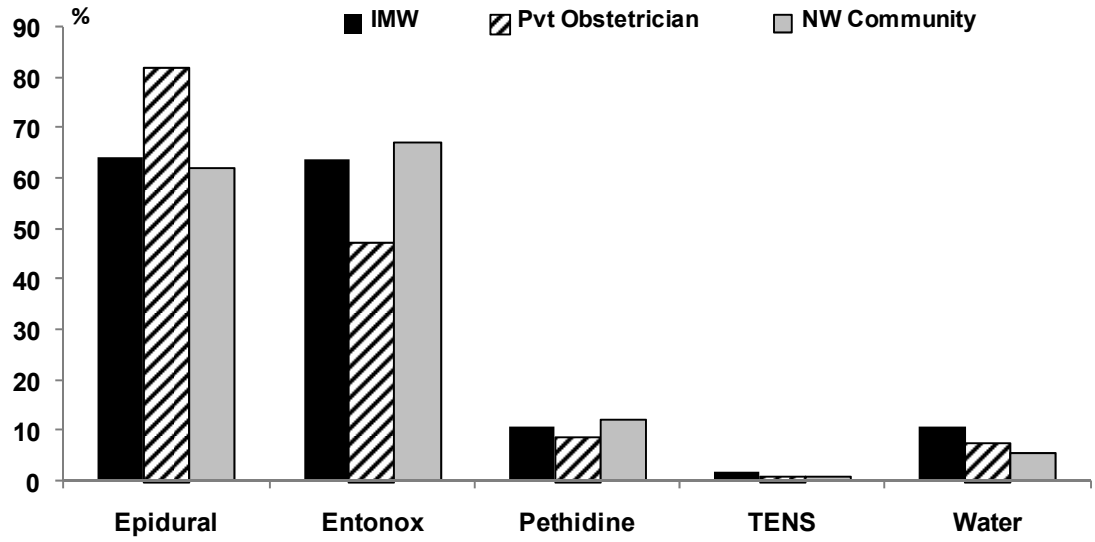


Figure 70: Analgesic use and LMC at birth among labouring nulliparous women NWH 2013

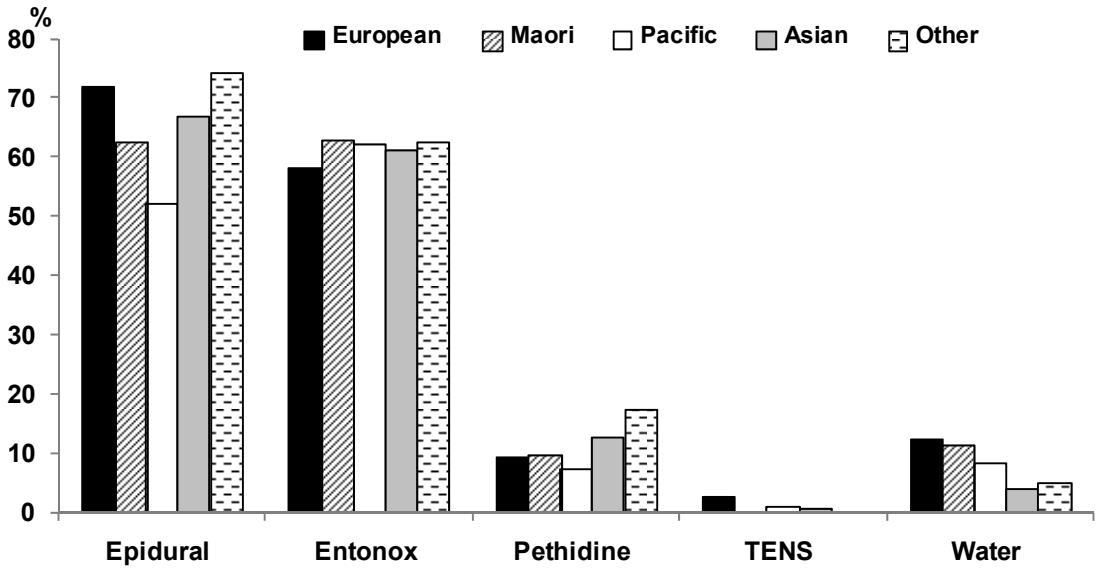


Figure 71: Analgesic use and ethnicity among labouring nulliparous women NWH 2013

6.9 Labour and birth at Birthcare Auckland

Birthcare Auckland is a primary maternity hospital located 1km across the Auckland Domain from Auckland City Hospital. Birthcare is contracted by Auckland DHB to provide primary birthing and postnatal facilities. Birthcare is midwifery-led, supporting LMCs to provide labour and birth care. Birthcare provides postnatal care for women who birth at Auckland City Hospital and also to North Shore, Waitakere and Counties Manukau Hospitals. Birthcare has four birthing rooms and 45 postnatal beds.

Birthcare also provides free childbirth education classes, lactation consultant services, paediatric services, physiotherapist services and classes. LMCs have 4 clinic rooms for antenatal assessments and care.

Methods

The data for mothers birthing at Birthcare (n=354) during 2013 were provided by Birthcare. The data on mothers transferred to NW in labour and birthing at NW have been obtained from the NW clinical database Healthware.

Findings

Four hundred and forty two women started labour at Birthcare, and 354 birthed there. Eighty-eight (20%) of women transferred in labour; 68 of nullipara (54%) and 20 of multipara (9%). Exclusive breastfeeding rate on discharge of mothers birthing at Birthcare was 90%, compared to 93% of the women transferred from Birthcare to NW intrapartum. There were 448 births at Birthcare in 2009, 417 in 2010, 451 in 2011 and 398 in 2012.

Table 51: Demographic characteristics of women labouring at Birthcare by place of birth 2013

	Birth at Birthcare n=354		Intrapartum transfer to NW n=88		Total n=442	
	n	%	n	%	n	%
Parity						
Nullipara	126	35.6	68	77.3	194	43.9
Multipara	228	64.4	20	22.7	248	56.1
Age						
<21	8	2.3	2	2.3	10	2.3
21-25	28	7.9	14	15.9	42	9.5
26-30	100	28.2	35	39.8	135	30.5
31-35	133	37.6	30	34.1	163	36.9
36-40	76	21.5	6	6.8	82	18.6
>40	9	2.5	1	1.1	10	2.3
Ethnicity						
NZ European	149	42.1	43	48.9	192	43.4
Māori	45	12.7	13	14.8	58	13.1
Pacific	39	11.0	6	6.8	45	10.2
Other Asian	32	9.0	3	3.4	35	7.9
Indian	8	2.3	3	3.4	11	2.5
Other European	71	20.1	17	19.3	88	19.9
Other	10	2.8	3	3.4	13	2.9
DHB of Domicile						
Auckland DHB	223	63.0	57	64.8	280	63.3
Counties Manukau DHB	42	11.9	10	11.4	52	11.8
Waitemata DHB	89	25.1	20	22.7	109	24.7
Other		0.0	1	1.1	1	0.2

Table 52: Interventions and outcomes among women who commenced labour at Birthcare 2013 (includes 88 intra partum transfers to NW)

	Birth at Birthcare n=354		Intrapartum transfer to NW n=88		Total n=442	
	n	%	n	%	n	%
Intrapartum transfer to NW					88	19.9
Mode of birth						
Normal vaginal	354	100.0	43	48.9	397	89.8
Operative vaginal			24	27.3	24	5.4
Emergency caesarean			21	23.9	21	4.8
Perineal trauma						
Episiotomy	24	6.8	10	11.4	34	7.7
Third/fourth degree tear	5	1.4	17	19.3	22	5.0
Vaginal wall tear	4	1.1	3	3.4	7	1.6
2nd degree tear	91	25.7	1	1.1	92	20.8
1st degree tear	81	22.9	24	27.3	105	23.8
Graze	20	5.6	9	10.2	29	6.6
Labial tear	9	2.5	19	21.6	28	6.3
Intact	135	38.1	4	4.5	139	31.4
Blood loss						
≥500 mls	14	4.0	31	35.2	45	10.2
Perinatal outcomes						
Still birth (/1000)			1	*	1	*
Exclusive breastfeeding rate	319	90.1	82	93.2	401	90.7

* Not calculated due to small numbers

Chapter 7

LABOUR and BIRTH OUTCOMES

7 LABOUR and BIRTH OUTCOMES

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

7.1 Perineal trauma

Table 53: Episiotomy rates among vaginal births NWH 1998-2013

	1998 n= 5676	1999 n= 5661	2000 n= 5739	2004 n= 5298	2005 n= 4921	2006 n= 4822	2007 n= 5257	2008 n= 5217	2009 n= 5321	2010 n= 5218	2011 n= 5075	2012 n= 5125	2013 n= 4717
Number of episiotomies	1195	1251	1367	1181	1093	1103	1130	1069	1184	1252	1153	1170	1200
Incidence %	21.1	22.1	23.8	22.3	22.2	22.9	21.5	20.5	22.3	24.0	22.7	22.8	25.4
Episiotomy with 3rd/4th degree tear	9	5	17	15	23	47	49	46	56	49	46	60	61
Incidence %	0.2	0.1	0.3	0.3	0.5	1.0	0.9	0.9	1.0	0.9	0.9	1.2	1.3
All 3rd/4th degree tears	35	29	47	72	97	103	161	160	116	120	114	158	138
Incidence %	0.6	0.5	0.8	1.4	2.0	2.1	3.1	3.1	2.2	2.3	2.2	3.1	2.9

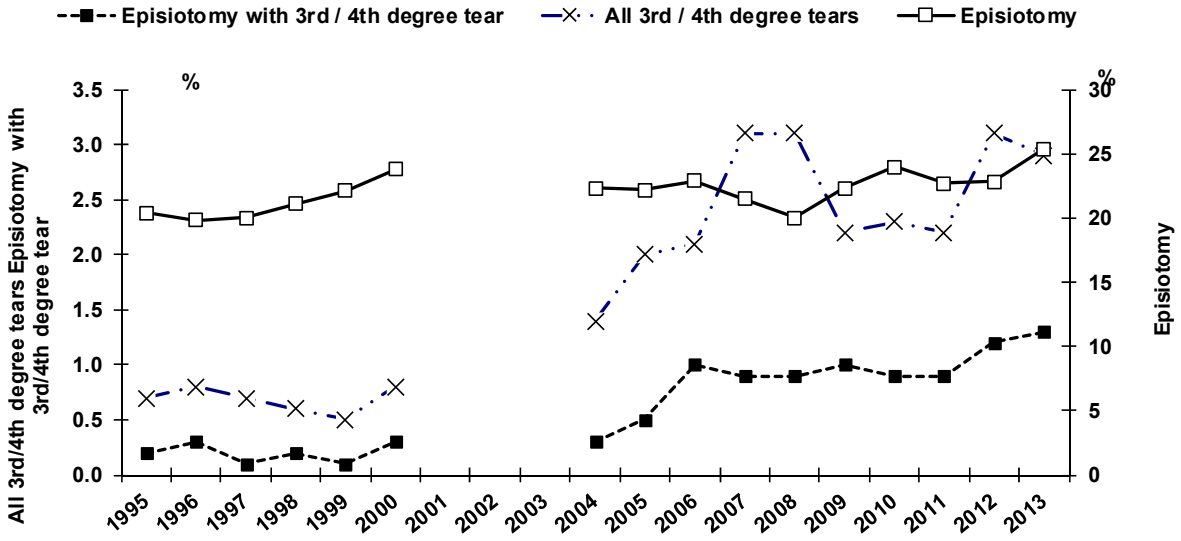


Figure 72: Perineal trauma rates NWH 1995-2013

Table 54: Perineal trauma by mode of birth, parity and LMC at birth among all vaginal births NWH 2013

	Total	Episiotomy		3rd/4th tear		Vaginal wall tear	
	N	n	%	n	%	n	%
Total vaginal births	4717	1200	25.4	138	2.9	279	5.9
Mode of birth							
Normal vaginal	3828	603	15.8	77	2.0	224	5.9
Vaginal breech	56	4	7.1	1	1.8	1	1.8
Ventouse	541	345	63.8	33	6.1	32	5.9
Forceps	292	248	84.9	27	9.2	22	7.5
Parity							
Nulliparous	2175	901	41.4	112	5.1	192	8.8
Multiparous	2542	299	11.8	26	1.0	87	3.4
LMC at birth							
Independent Midwife	2585	658	25.5	82	3.2	149	5.8
Private Obstetrician	884	350	39.6	12	1.4	35	4.0
General Practitioner	13	2	15.4	0	0.0	1	7.7
NW Community	927	138	14.9	31	3.3	75	8.1
NW Diabetes	100	18	18.0	5	5.0	9	9.0
NW Medical	162	28	17.3	7	4.3	8	4.9
Other DHB	19	2	10.5	0	0.0	1	5.3
Unbooked	27	4	14.8	1	3.7	1	3.7
Ethnicity							
New Zealand European	1517	397	26.2	30	2.0	85	5.6
Māori	380	27	7.1	10	2.6	18	4.7
Pacific	681	63	9.3	13	1.9	60	8.8
Asian	1089	392	36.0	47	4.3	62	5.7
Indian	392	127	32.4	27	6.9	25	6.4
Other European	482	156	32.4	6	1.2	21	4.4
Other	176	38	21.6	5	2.8	8	4.5

In the early 2000s there was a dramatic rise in third and fourth degree tear rates which have since stabilised at 2-3%. In 2013 a further small decrease in the 3rd/4th degree tear rate occurred, and a small increase in the episiotomy rate.

As commented upon in previous reports, causal factors for the increased rate in the early 2000s may have included better diagnosis. Diagnosis of the type of tear and the correct procedure for repair remains a focus and in 2014 a specific documentation form is being introduced for use in all births involving perineal trauma. This will include diagnosis, repair, and follow-up care for these women.

As a lack of support of the perineum ("hands off policy") with crowning of the head and birth of the posterior shoulder, as well as an inadequate episiotomy (size or position) increase a patient's risk of anal sphincter injury, from late 2012 there was an education campaign instituted in Labour and Birth Suite. Our education program continues for all midwives, focusing on the risk of trauma to the perineum and the identification of women most at risk.

With an increase in various risk factors, including ethnic group (i.e. Indian, Asian women), mean BMI and incidence of LGA babies, continued focus on prevention of perineal trauma remains a priority. The approach will include such things as perineal massage, support of the perineum, "hands on" the presenting part at the time of the birth, and improved supervision for those women most at risk of trauma. Where an episiotomy is indicated, the need for it to be at the correct angle and of adequate length will also be reinforced.

The perineal tear clinic is well utilised with appropriate referrals being received.

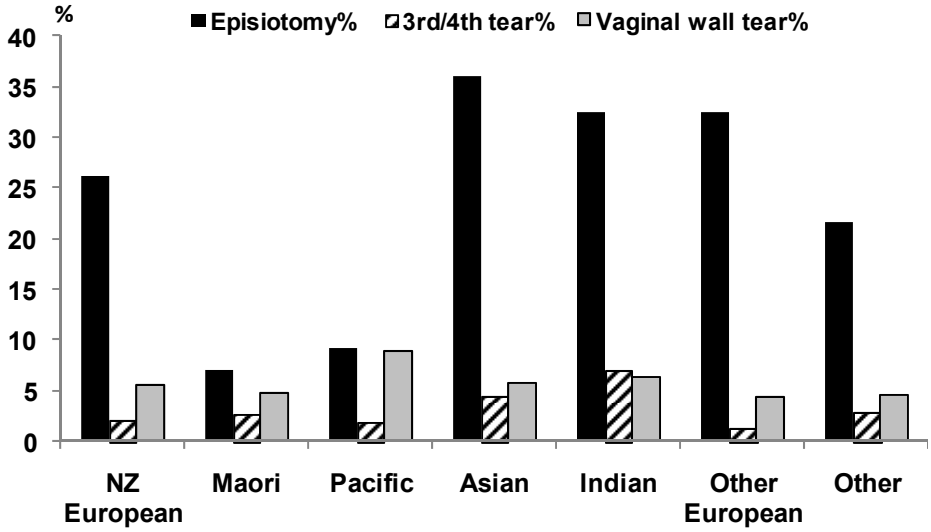


Figure 73: Perineal trauma rates among vaginal births by ethnicity NWH 2013

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 55: Third stage management among vaginal births NWH 2013

	Physiological n=326		Active syntocinon n=3275		Active syntometrine n=1944		Other n=11		Unknown n=295	
	n	%	n	%	n	%	n	%	n	%
Primary PPH (≥500mls)	36	11.1	485	20.8	440	23.1	3	37.5	26	17.3
Primary PPH (≥1000mls)	12	3.7	193	8.3	161	8.5	3	37.5	5	3.3
Postpartum blood transfusion	7	2.1	95	2.9	55	2.8	0	0	8	2.7

In 2013 the management of the third stage of labour has changed insignificantly from 2012. Physiological management of the third stage remains unchanged. There has been a slight increase in the use of syntometrine as the first line ecbolic and an increase in blood loss over 1000mls.

Improvement of the estimation of blood loss including the weighing of all blood is now deeply embedded. The overall rate of PPH is slightly up on 2012 but the transfusion rate is slightly down.

The practice of delayed cord clamping has increased which has led to an overall delay in the administration of the ecbolic in such cases but this does not seem to have had a major effect on the PPH rate.

Physiological management of third stage is supported as an option for low risk women, with informed consent.

7.3 Postpartum haemorrhage

Methods

The source of blood loss data varies for some of the years shown. In the years 2005 to 2007, blood loss in labour and birth was not combined with blood loss recorded postnatally as in numerous cases the total blood loss was recorded in both places. The amended data on PPH rate in 2005 and 2006 given here may underestimate the PPH rate in those years. From 2008 , the data have been cleaned extensively. This cleaning has included a comparison of blood loss recorded 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

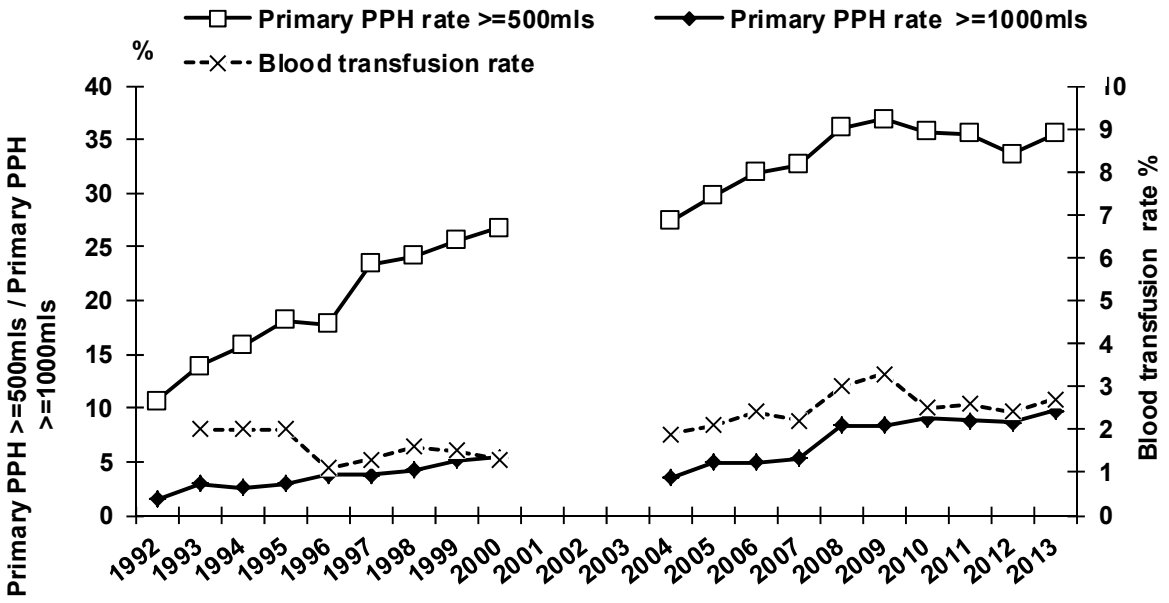


Figure 74: Postpartum haemorrhage and transfusion rates NWH 1992-2013

PPH rates have not changed since 2009.

Table 56: Postpartum haemorrhage rate NWH 1997-2013

	1997	1998	1999	2000	2004	2005*	2006*	2007*	2008	2009	2010	2011	2012	2013
Total Births	8055	7531	7501	7827	7491	7194	7212	7695	7589	7735	7709	7523	7695	7223
Primary PPH (≥500mls)	1882	1818	1921	2088	2056	2139	2302	2507	2736	2850	2753	2674	2587	2563
Incidence %	23.4	24.1	25.6	26.7	27.4	29.7	31.9	32.6	36.1	36.9	35.7	35.5	33.6	35.5
Primary PPH (≥1000mls)	303	318	381	423	262	350	351	410	634	651	695	659	662	701
Incidence %	3.8	4.2	5.1	5.4	3.5	4.9	4.9	5.3	8.4	8.4	9.0	8.8	8.6	9.7

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

Table 57: Postpartum blood loss by mode of birth NWH 2013

	Spontaneous vaginal birth n=3884		Operative vaginal birth n=833		CS emergency n=1279		CS elective n=1227		Total n=7223	
	n	%	n	%	n	%	n	%	n	%
PPH>=500mls	701	18.0	289	34.7	919	71.9	654	53.3	2563	35.5
PPH>=1000mls	272	7.0	102	12.2	228	17.8	99	8.1	701	9.7
PPH>=1500mls	115	3.0	49	5.9	72	5.6	29	2.4	265	3.7
Postpartum transfusion	82	2.1	49	5.9	50	3.9	15	1.2	196	2.7

Table 58: Postpartum blood loss by onset of birth NWH 2013

	Spontaneous labour n=3181		Induced labour n=2528		CS emergency before onset of labour n=287		CS elective n=1227		Total N=7223	
	n	%	n	%	n	%	n	%	n	%
PPH >=500mls	821	25.8	907	35.9	181	63.1	654	53.3	2563	35.5
PPH>=1000mls	273	8.6	290	11.5	39	13.6	99	8.1	701	9.7
PPH>=1500mls	111	3.5	110	4.4	15	5.2	29	2.4	265	3.7
Postpartum transfusion	86	2.7	83	3.3	12	4.2	15	1.2	196	2.7

With an overall PPH rate of 35.5% the challenge for NW is not to remain stable but to decrease the rate.

The New Zealand maternity clinical indicators for 2009 to 2011 for women requiring a blood transfusion after Caesarean section and after vaginal birth are a concern.

The introduction of iron infusions and improved risk assessment, planning and documentation for third stage may be able to effect some change.

Table 59: Blood transfusion NWH 1998-2013

	1998	1999	2000	2004	2005	2006	2007	2008	2009	2011	2012	2013
Antenatal	4	4	0	10	12	11	6	6	18	13	5	4
Antenatal & intrapartum	0		0	1	0	0	1	0	0	0	1	1
Antenatal & postpartum			1	0	3	0	0	2	2	0	1	2
Intrapartum	3	3	4	2	2	6	1	4	3	3	1	6
Intrapartum & postpartur	6	3	4	4	3	3	4	1	2	1	1	2
Postpartum	110	100	96	128	133	150	165	212	228	193	180	192
Total transfusions	123	110	105	145	153	170	177	225	253	210	189	207
Total transfusion rate	1.6	1.5	1.3	1.9	2.1	2.4	2.3	3.0	3.3	2.8	2.5	2.9

7.4 Neonatal outcomes by mode of birth

Methods

The following tables include all babies live born at NW.

Table 60: Neonatal morbidity among live births by mode of birth (all gestations) NW 2013

	Spontaneous vertex n=3835		Vaginal breech n=30		Forceps birth n=294		Ventouse birth n=544		CS elective n=1278		CS emergency n=1319		Total N=7300	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	27	0.7	7	23.3	4	1.4	4	0.7	20	1.6	81	6.1	143	2.0
1 min Apgar <7	198	5.2	22	73.3	40	13.7	46	8.5	105	8.2	248	18.8	659	9.0
5 min Apgar <7	43	1.1	8	26.7	2	0.7	2	0.4	24	1.9	70	5.3	149	2.0
Admitted to NICU	259	6.8	14	46.7	36	12.2	40	7.4	182	14.2	300	22.7	831	11.4
≥2 days in NICU	213	5.6	11	36.7	27	9.2	23	4.2	135	10.6	256	19.4	665	9.1
Neonatal deaths (/1000 live births)	16	4.2	3	100.0	1	*	0		4	3.1	13	9.9	37	5.1

* Not calculated due to small numbers

Table 61: Neonatal morbidity among live births by mode of onset of birth (all gestations) NWH 2013

	Spontaneous labour n=3279		Induced labour n=2433		CS elective n=1278		CS emergency before onset of labour n=310		Total N=7300	
	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	52	1.6	44	1.8	20	1.6	27	8.7	143	2.0
1 min Apgar <7	244	7.4	224	9.2	105	8.2	86	27.7	659	9.0
5 min Apgar <7	56	1.7	42	1.7	24	1.9	27	8.7	149	2.0
Admitted to NICU	285	8.7	219	9.0	182	14.2	145	46.8	831	11.4
≥2 days in NICU	232	7.1	163	6.7	135	10.6	135	43.6	665	9.1
Neonatal deaths (/1000 live births)	15	4.6	11	4.5	4	3.1	7	22.6	37	5.1

Table 62: Neonatal morbidity by mode of birth in live born term or post term (≥ 37 weeks) babies NWH 2013

	Spontaneous vertex n=3567		Vaginal breech n=13		Forceps birth n=273		Ventouse birth n=532		CS elective n=1128		CS emergency n=1083		Total N=6596	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <4	13	0.4	0	0.0	3	1.1	4	0.8	11	1.0	50	4.6	81	1.2
1 min Apgar <7	143	4.0	7	53.8	38	14.0	44	8.3	67	5.9	147	13.6	446	6.8
5 min Apgar <7	27	0.8	3	23.1	1	0.4	2	0.4	15	1.3	42	3.9	90	1.4
Admitted to NICU	129	3.6	2	15.4	24	8.8	36	6.8	92	8.2	113	10.4	396	6.0
≥2 days in NICU	94	2.6	1	7.7	15	5.5	19	3.6	49	4.3	79	7.3	257	3.9
Neonatal deaths (/1000 live births)	4	1.1	0		1	*	0	0.0	2	*	4	3.7	11	1.7

* Not calculated due to small numbers

Table 63: Neonatal morbidity in term or post term live born (≥ 37 weeks) babies NWH 2004-2013

	2006 N=6531		2007 N=6953		2008 N=6902		2009 N=7113		2010 N=7065		2011 N=6889		2012 N=7030		2013 N=6596	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min apgar <4	66	1.0	73	1.0	38	0.5	78	1.1	76	1.1	97	1.4	92	1.3	81	1.2
5 min apgar <7	39	0.6	45	0.6	44	0.6	63	0.9	65	0.9	94	1.4	73	1.0	90	1.4
Admitted to NICU	283	4.3	322	4.6	314	4.5	364	5.1	343	4.8	417	6.0	413	5.9	396	6.0
≥2 days in NICU	226	3.5	271	3.9	241	3.5	299	4.2	268	3.8	349	5.1	358	5.1	257	3.9
Neonatal death (/1000 live births)	1	0.15	7	1.01	8	1.16	6	0.84	7	0.99	4	0.58	9	1.28	11	1.67

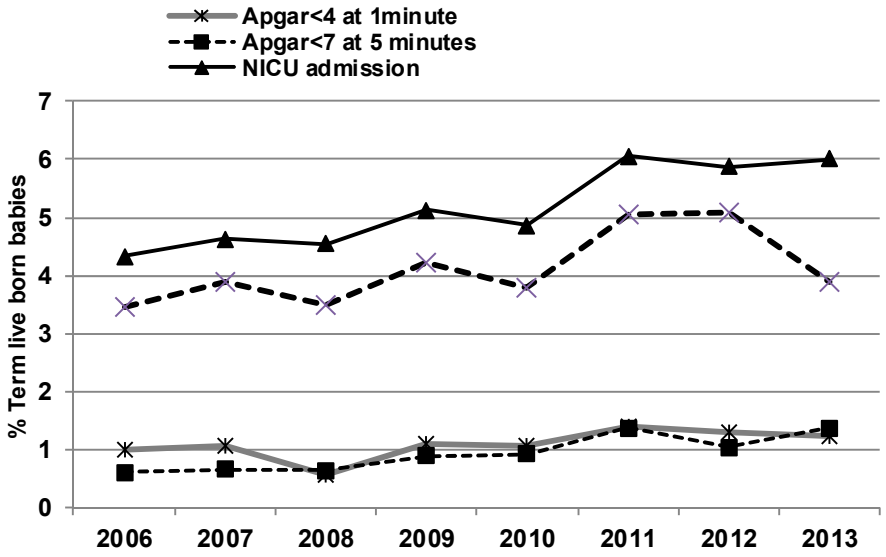


Figure 75: NICU admission and low Apgar score rates (% of live born term infants) NW 2006-2013

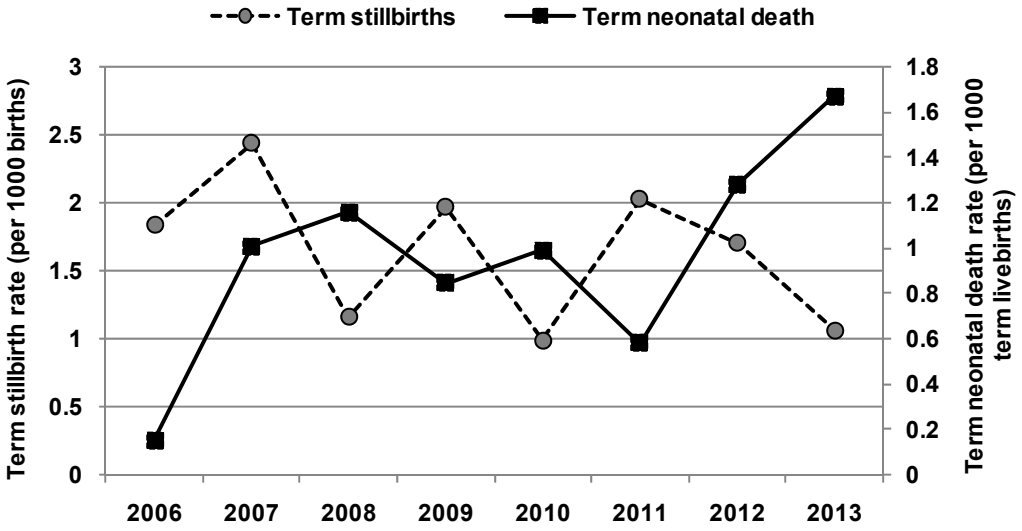


Figure 76: Term stillbirth and neonatal death rate NW 2006-2013

The figures above show marked changes in neonatal outcomes at term at NW over the 8 years from 2006-2013. There has been a significant increase in NICU admission rate at term

(Chi square test for trend: p<0.0001), increased rates of Apgar score <4 at one minute (Chi square test for trend: p=0.0011) and <7 at five minutes (Chi square test for trend: p<0.0001), and an increase in term neonatal death rate (Chi square test for trend: p=0.04), although this significance is heavily reliant on the 11 deaths in 2013. There appears to have been a decrease in stillbirth rate at term but this is not statistically significant (Chi square test for trend: p=0.24).

Increased NICU admission is associated with increased earlier births, which in turn is associated with increased induction and elective CS rates. However this does not explain the increased low Apgar scores and the increased neonatal mortality.

This year there were 3 hypoxic peripartum deaths (usually 0-2) although one was >1 month of age (and therefore classified as an infant rather than perinatal death). There were 9 inborn cases of hypoxic ischaemic encephalopathy (HIE) Sarnat stage 2 or 3 which is more than our usual experience (2006-2012 range: 2-8). It would be of concern if this became an established trend.

Congenital abnormality was the underlying cause of death of 8 of the 11 neonatal deaths in 2013.

Chapter 8

POSTNATAL CARE

8 POSTNATAL CARE

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

8.1 Infant feeding

Methods

The feeding status of infants born at National Women's is collected at the time of discharge from the hospital. For some this is in the immediate postpartum period, leaving from Labour and Birthing Suite, and for some this is following a postnatal 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 Homecare 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

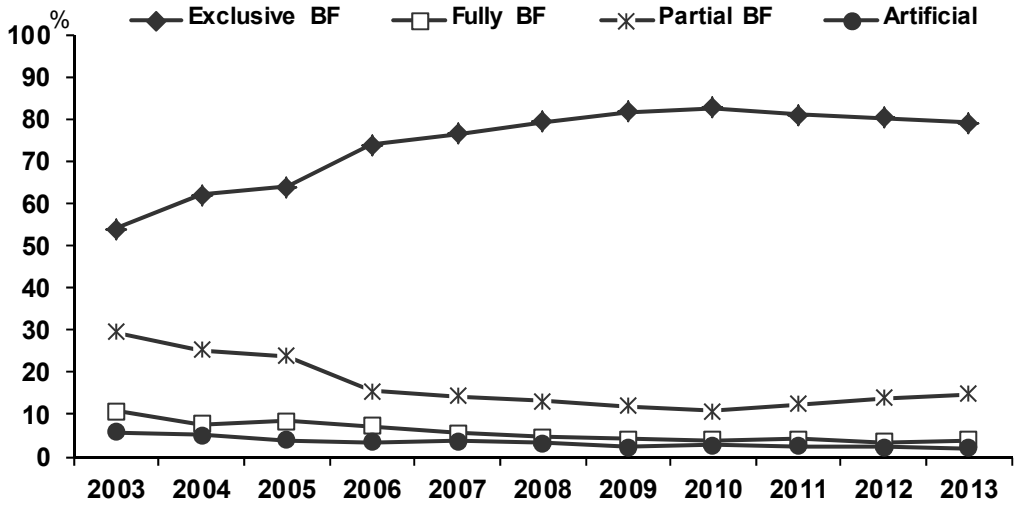


Figure 77: Method of infant feeding at discharge from NWH 2003-2013

In 2013, the exclusive breastfeeding rate on discharge from hospital following birth was 79%, exceeding the NZ Breastfeeding Authority (NZBFA) target of 75%. It is of note that this rate includes babies of diabetic mothers, preterm and/or low birth weight babies (<2500g) who do not go to NICU and babies of mothers with medical complications. It is important to interpret the exclusive breastfeeding rate with regard to the complexity of the population of women birthing at National Women's.

The service remains committed to supporting breastfeeding through the employment of dedicated lactation consultants (LC), education of all staff involved with postnatal women (as wide reaching as ancillary staff) by a variety of modalities including e-learning, audit projects, skilled midwives, with several undertaking additional LC qualifications, and adherence to the WHO "Ten Steps to Successful Breastfeeding".

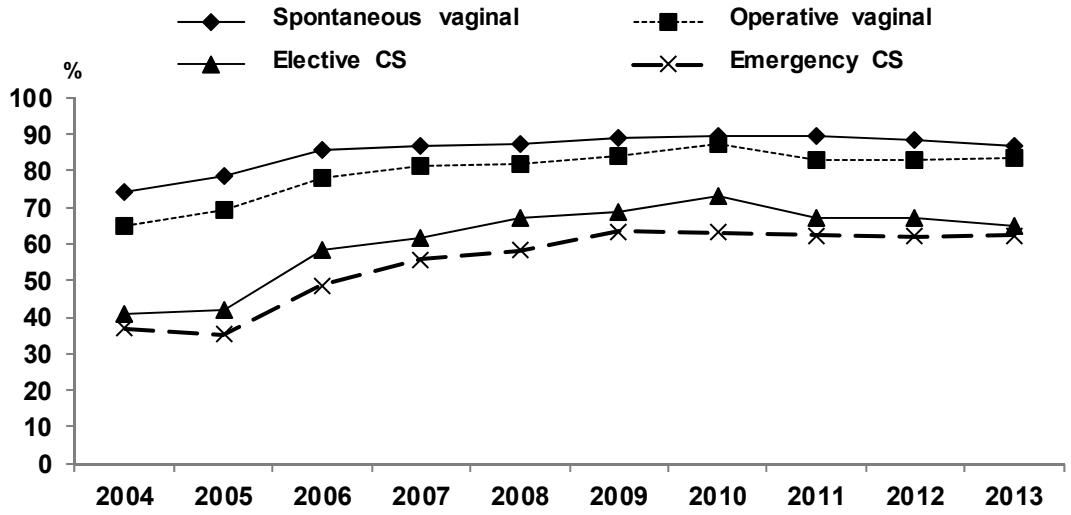


Figure 78: Exclusive breastfeeding at discharge from NWH by mode of birth 2004-2013

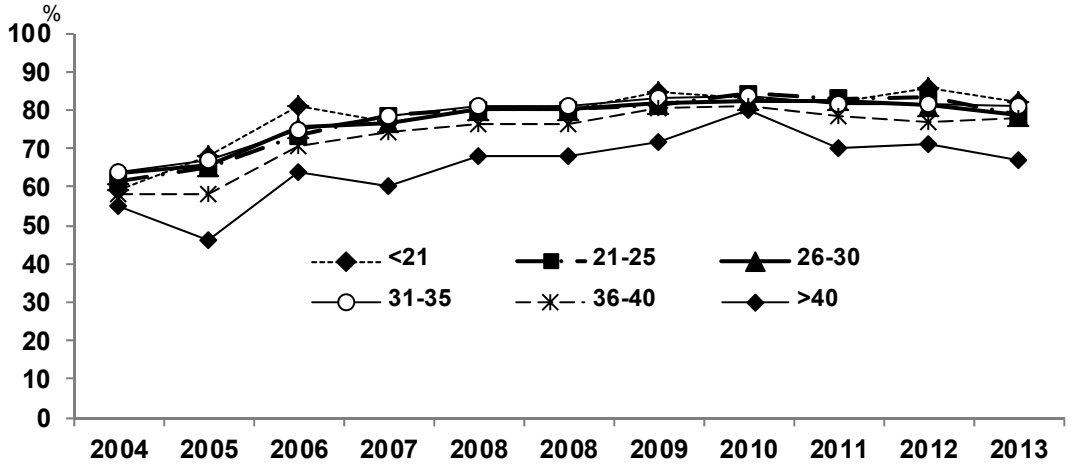


Figure 79: Exclusive breastfeeding rates at discharge from NWH by maternal age 2004-2013

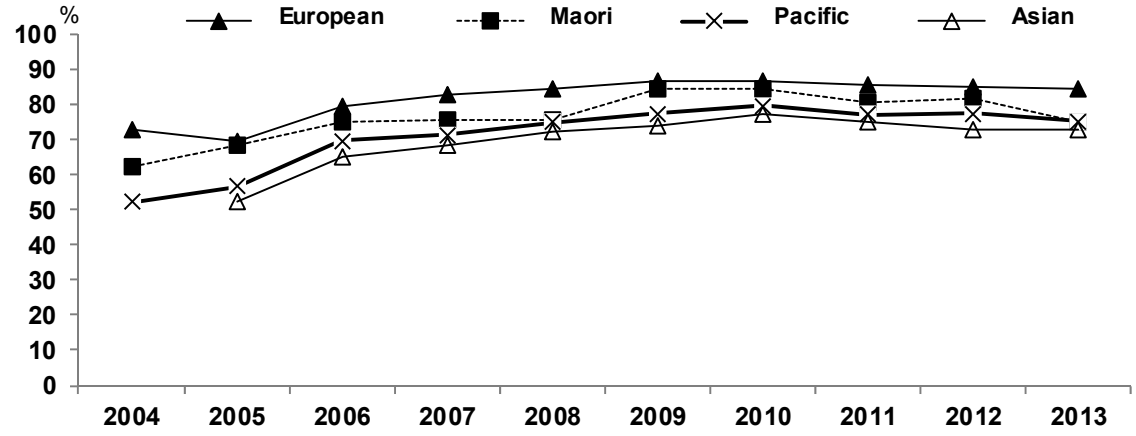


Figure 80: Exclusive breastfeeding rates at discharge from NWH by ethnicity 2004-2013

Breastfeeding rates for NZ European mothers remain stable at over 84%, rates for Asian mothers are unchanged at 73% and those for Maori and Pacific mothers have dropped slightly to 75%.

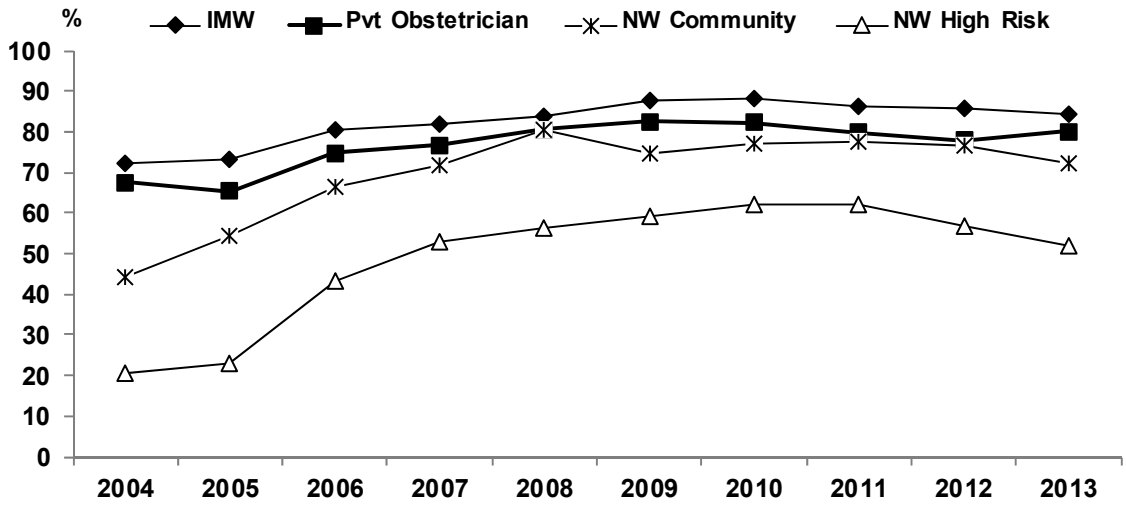


Figure 81: Exclusive breastfeeding rate at discharge from NWH by LMC at birth 2004-2013

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

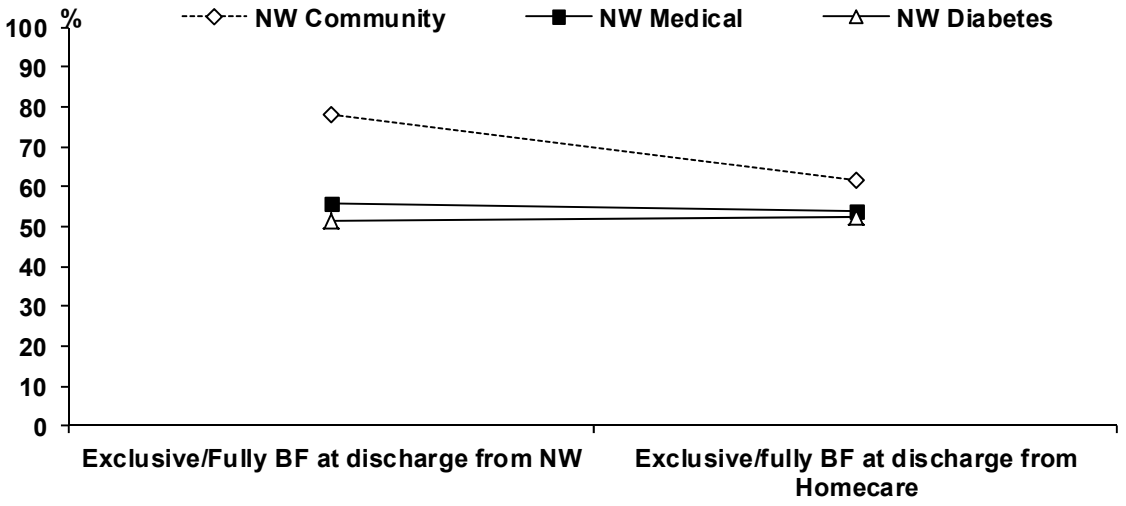


Figure 82: Breastfeeding rates (exclusive and fully breastfeeding) at hospital discharge and at discharge from NWH Homecare (4-6 weeks) (n=1083) 2013

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 includes only women under the care of NWH LMC midwives. These are the only breastfeeding data available to us after discharge from hospital. The overall rate of exclusive/fully breastfeeding at discharge from Homecare was 56%.

Summary

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

The 2013 rates are stable, but to maintain this achievement there is a need to remain aware and supportive of the multitude of factors that contribute to a positive breastfeeding environment. Ensuring that the downward trend is reversed for all age groups, ethnicities and modalities of birth remains a priority of the service.

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

8.2 Postnatal admissions

Methods

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

Findings

Table 64: Maternal destination immediately after birth NWH 2007-2013

	2007 N = 7695		2008 N = 7589		2009 N = 7735		2010 N = 7709		2011 N =7523		2012 N=7695		2013 N=7223	
	n	%	n	%	N	%	n	n	n	%	n	%	n	%
NW Wards	4590	59.6	4493	59.2	4797	62.3	4797	4797	4661	60.5	4730	62.9	4617	63.9
Birthcare	2493	32.4	2551	33.6	2469	32.1	2469	2469	2543	33.0	2357	31.3	2251	31.2
Home	587	7.6	526	6.9	407	5.5	407	407	481	6.2	414	5.5	336	4.6
Other Units	25	0.3	19	0.3	22	0.3	22	22	24	0.3	22	0.3	19	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.

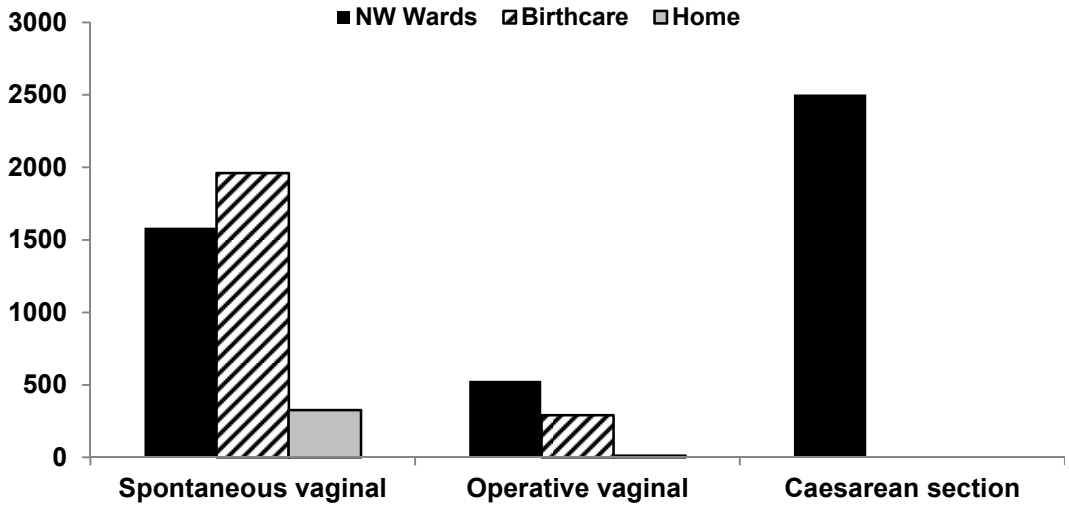


Figure 83: Maternal destination immediately after birth by mode of birth NWH 2013

As expected, mothers are admitted initially to the NW wards after Caesarean section. Over half of the women having a spontaneous vaginal birth are admitted directly to Birthcare Auckland for postnatal care. This figure is a reminder of the high acuity on the postnatal wards at NW.

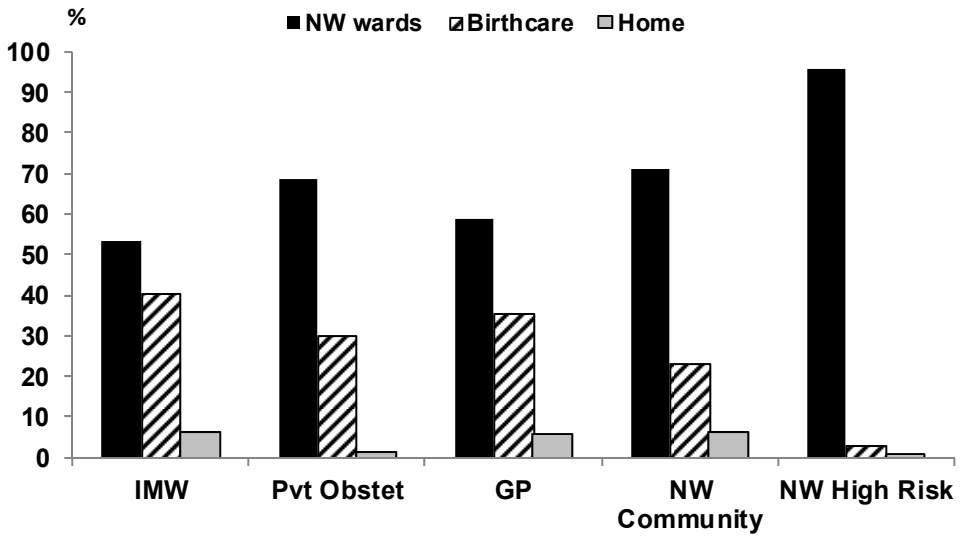


Figure 84: Postnatal destination immediately after birth by LMC at birth NWH 2013

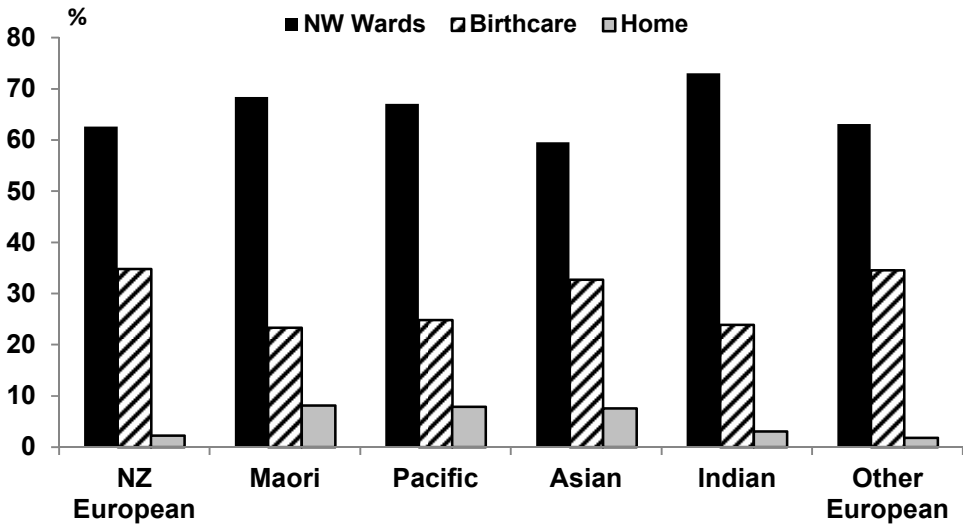


Figure 85: Postnatal destination immediately after birth by ethnicity NWH 2013

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

8.2.1 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 65: Reason for admission to NWH postnatal wards among women having a spontaneous vaginal birth 2013

	N=1581	
	n	%
Neonatal reason*	701	44.3
Postpartum haemorrhage	292	18.5
Diabetes	129	8.2
Hypertensive disorder	52	3.3
Perineal trauma	91	5.8
Retained placenta/products	59	3.7
Fainting /dizziness	19	1.2
Other listed reasons†	238	15.1

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

Table 66: Discharge destination by mode of birth among initial admissions to NW wards

	N=4624	
	n	%
Caesarean section birth - discharged to home	1985	42.9
Caesarean section birth - transferred to Birthcare	403	8.7
Caesarean section birth - discharged to other destinations	113	2.4
Operative vaginal birth - discharged to home	267	5.8
Operative vaginal birth - transferred to Birthcare	235	5.1
Operative vaginal birth - discharged to other destinations	29	0.6
Spontaneous vaginal birth - discharged to home	1118	24.2
Spontaneous vaginal birth - transferred to Birthcare	381	8.2
Spontaneous vaginal birth - discharged to other destinations	93	2.0

8.2.2 Postnatal readmissions

Any visit of 3 hours or more duration is defined as a postnatal re-admission and is included in this section.

Table 67: Reasons for readmission NWH 2013

	N=315	
	n	%
Neonatal admission*	51	16.2
Infection†	46	14.6
Breast‡	68	21.6
Postpartum haemorrhage	25	7.9
Hypertensive disorder	12	3.8
Retained products	9	2.9
Wound breakdown§	13	4.1
Epidural complications	5	1.6
Other¶	76	24.1

* 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 2013, 287 (4.0%) women of the 7223 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 315 readmissions: 262 women had one readmission, 22 women had two readmissions and 3 women had 3 readmissions.

The most frequent indications for readmission in 2013 were breast problems, followed by neonatal admissions.

8.2.3 Admissions to postnatal wards of women who birthed elsewhere

There were 107 admissions in 2013 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 68: Reason for postnatal admission by place of birth for women who birthed elsewhere NWH 2013

	Total		Birthcare		Home		CMDHB*		North Shore		Waitakere		Other	
	N=107		n=29		n=2		n=12		n=20		n=21		n=23	
	N	%	n	%	n	%	n	%	n	%	n	%	n	%
Neonatal admission	68	63.6	9	31.0	1	50.0	11	91.7	15	75.0	15	71.4	17	73.9
Infection	7	6.5	1	3.4	0		0		0		4	19.0	2	8.7
Breast	2	1.9	1	3.4	0		0		1	5.0	0		0	
Postpartum haemorrhage	11	10.3	8	27.6	1	50.0	0		1	5.0	1	4.8	0	
Obstetric trauma	3	2.8	2	6.9	0		0		1	5.0	0		0	
Retained placenta/products	4	3.7	3	10.3	0		1	8.3	0		0		0	
Other	12	11.2	5	17.2	0		0		2	10.0	1	4.8	4	17.4

* All 12 from Middlemore hospital

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 2013 calendar year. Occupancy data relate to the unit occupancy for each day in 2013.

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 2013 and admitted to the Auckland City Hospital (ACH) NICU, (2) inborn (ACH) babies and (3) babies born in 2013 assigned to ACH by the Australia New Zealand Neonatal Network (ANZNN).

Australia New Zealand Neonatal Network (ANZNN)

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

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

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

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

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

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

Table 69: Characteristics of <32 week or <1500g babies cared for at NW NICU by ANZNN status 2013

	<32 weeks or <1500g					
	Total N=178		ANZNN n=167		Non ANZNN n=11	
Gestation (weeks)	**n**	**%**	**n**	**%**	**n**	**%**
<24	2	1.1	2	1.2	0	0
24-25	22	12.4	19	11.4	3	27.3
26-27	28	15.7	25	15.0	3	27.3
28-29	41	23.0	40	24.0	1	9.1
30-31	62	34.8	58	34.7	4	36.4
32-36	23	12.9	23	13.8	0	0
Weight (g)						
500-749	15	8.4	14	8.4	1	9.1
750-999	41	23.0	36	21.6	5	45.5
1000-1249	33	18.5	31	18.6	2	18.2
1250-1499	55	30.9	53	1.2	2	18.2
1500-1999	32	18.0	31		1	9.1
2000-2499	2	1.1	2		0	0
Birthplace						
BBA	4	2.2	4	2.4	0	
National Women's	148	83.1	148	88.6	0	
Northland	7	3.9	7	4.2	0	
Waitemata DHB	7	3.9	7	4.2	0	
Counties Manukau DHB	6	3.4	0		6	54.5
Other	6	3.4	5	3.0	1	9.1

9.1 Inborn live birth at National Women's 1959-2013

This includes all babies born alive (including those who died at or soon after birth and those with lethal anomalies). The weight ranges 501-1000 and 1001-1500 are used as these data have been collected prospectively since 1959, initially by Professor Ross Howie.

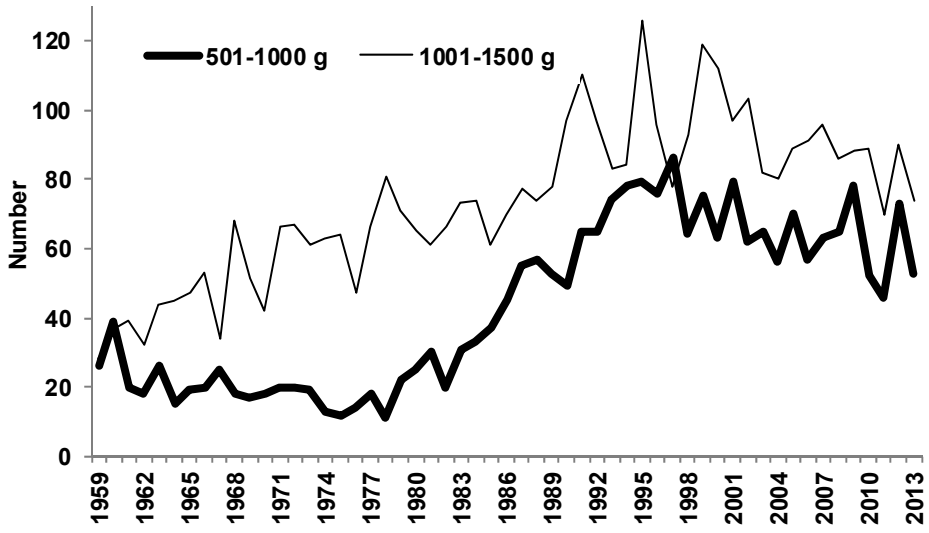


Figure 86: Number of inborn live births ≤1500g NWH 1959-2013 (excludes BBAs).

9.2 NICU occupancy

The 2013 occupancy of 14296 bed days is approximately equivalent to a mean of 39.2 babies per day, which is a small decrease but still represents a high occupancy of more than 95%. Trends for the occupancy by gestational age groups and birth weight are given in the figures below. Although the number of births increases with an increasing gestational age the duration of stay decreases, as the infants require less time to achieve maturity. As the two Waitemata units care for their routine level 2 babies the overall acuity of the ACH unit has risen for a given occupancy.

Table 70: Occupancy (baby days) on NICU 2000– 2013

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Baby days	20652	20108	20551	19249	14958	14541	14212	15228	15296	15236	14982	15122	14461	14296

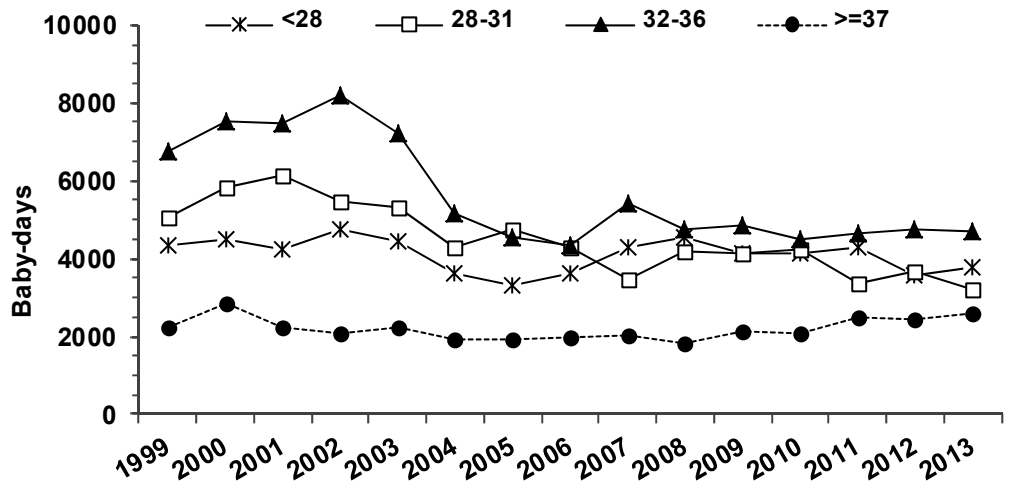


Figure 87: Occupancy (baby days per year) of NICU by gestational age 1999-2013

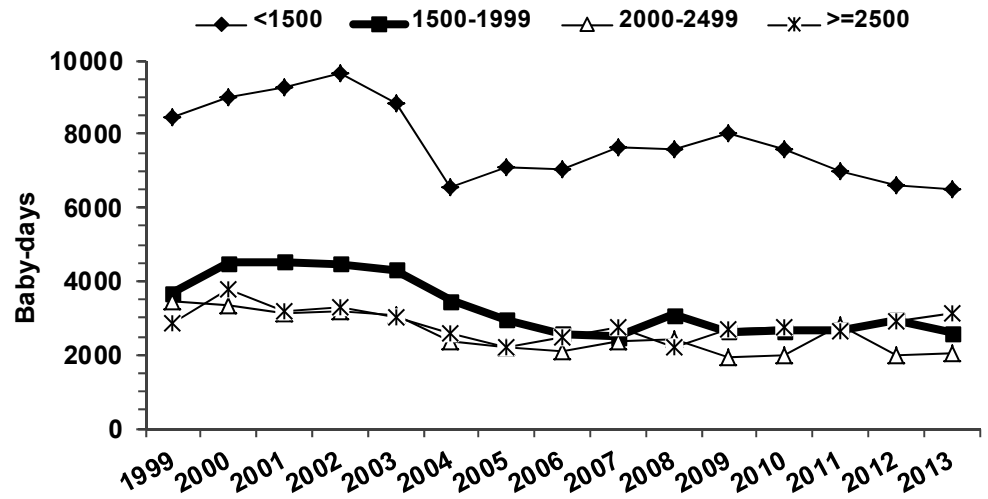


Figure 88: Occupancy (baby days per year) of NICU by birth weight 1999-2013

9.3 Admissions to NICU

Total admissions were 930 for the 2013 calendar year and have remained circa 900-1000 since the opening of the two Waitemata neonatal units. The North Shore Hospital Neonatal Unit opened in 2003 and Waitakere Hospital in 2004. These two Waitemata units admit babies >1500g and >31 weeks gestation and will administer Level 2 care including CPAP.

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

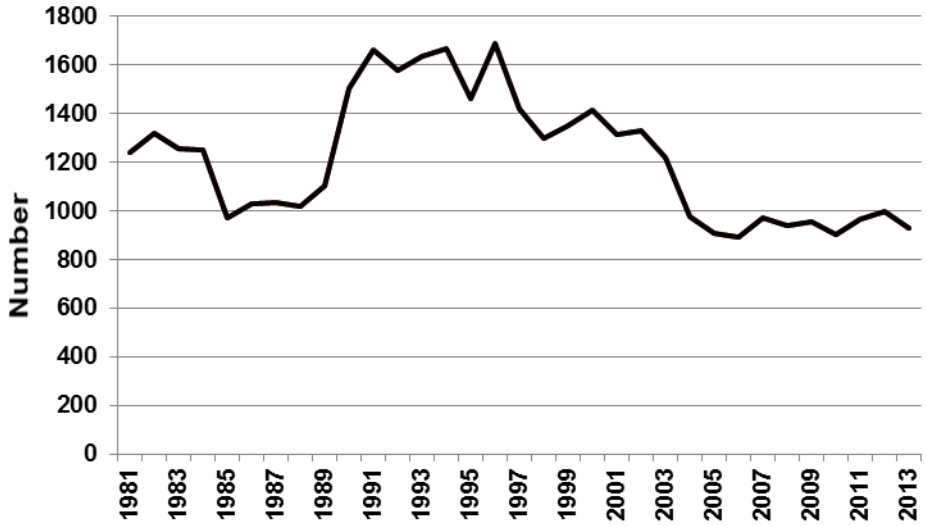


Figure 89: Admissions to NICU 1981-2013

Table 71: NICU admissions by year 1998-2013

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number	1300	1352	1412	1312	1331	1220	975	906	890	972	939	957	902	963	1000	930

9.3.1 Admissions to NICU by gestation and birth weight

For 2013 total inborn deliveries were decreased by five percent, which has some effect on NICU admission numbers in all the gestational age groups. The rate of admission for babies below 32 weeks gestation or below 1500g birth weight has decreased a little for the last three years compared to the previous decade, which had been fairly constantat around 200 per year. The opening of the Waitemata units caused a significant decrease in admissions of term babies and those 32-36 weeks gestation from 2004. However, from 2008 until 2011 there was a steady rise in term infant admissions, which also appears to be falling slightly in this year's data. 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.

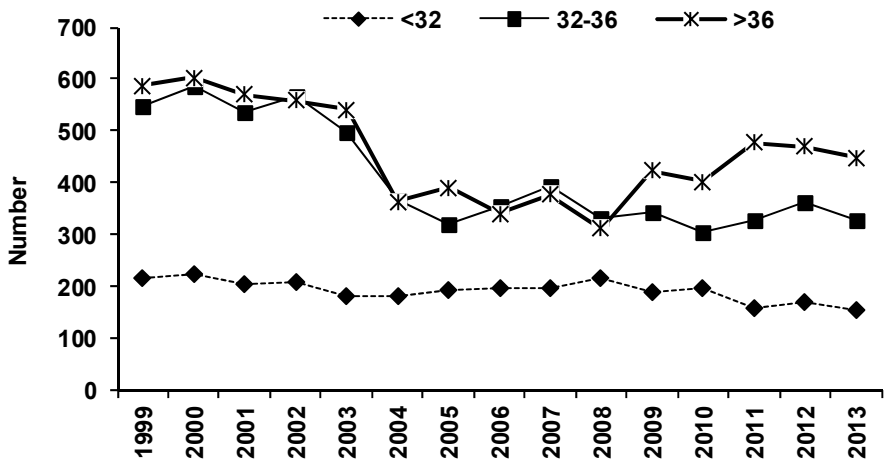


Figure 90: Admissions to NICU (total) by gestational age 1999-2013

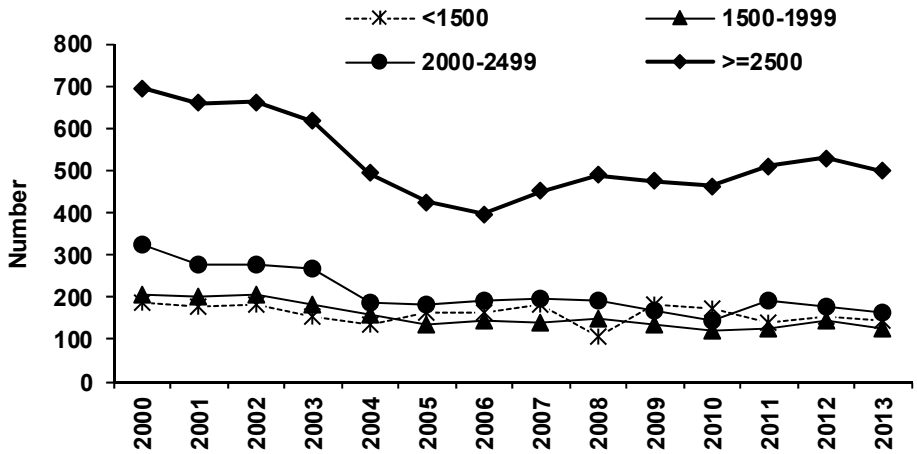


Figure 91: Admissions to NICU (total) by birth weight 2000-2013

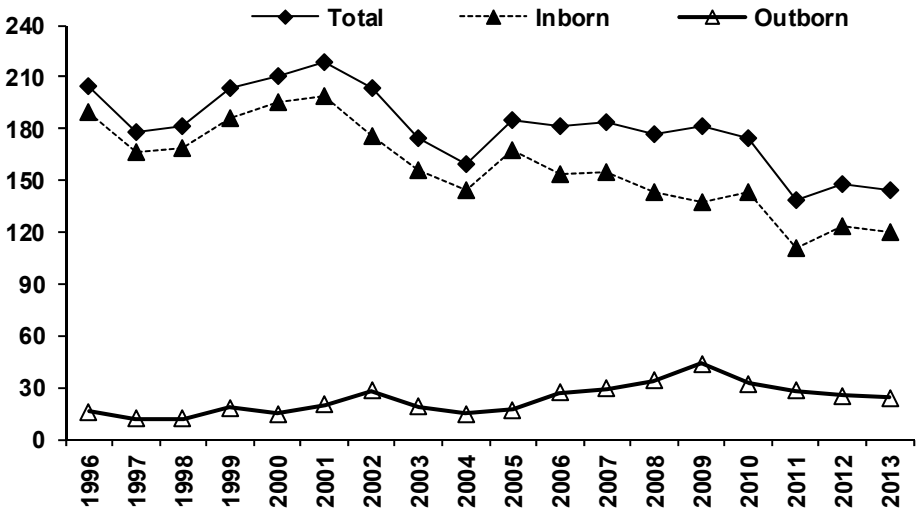


Figure 92: Admissions to NICU of <1500g babies (VLBW) by place of birth 1996-2013 (outborn includes BBAs).

The total number of outborn VLBW infants admitted to the NICU has remained low in 2013. However, this group of infants includes transfers from level 2 units for level 3 care and those infants who are transferred from Middlemore Hospital NICU for surgical care so are a significant group. As a general principle, antenatal transfer is preferable as this avoids transportation of small or fragile infants. Hence the number of outborn infants is very much lower than the number of infants born to mothers domiciled outside of ADHB.

9.3.2 Admissions to NICU by domicile of mother

As previously noted there was a decline in admissions of babies whose mothers are domiciled in the Waitemata DHB with the opening of their two level 2 units in the early 2000s. The modest increase in the number of babies admitted to NICU whose mothers were domiciled in the ADHB region in 2008 and 2009 is considered due to better allocation, with a drop in unknowns. The last year has also seen a small decrease in admission numbers from ADHB and Waitemata consistent with a fall in birth numbers of approximately five percent but consistent numbers of admissions from CMDHB, which represent approximately 15 percent of NICU admissions overall.

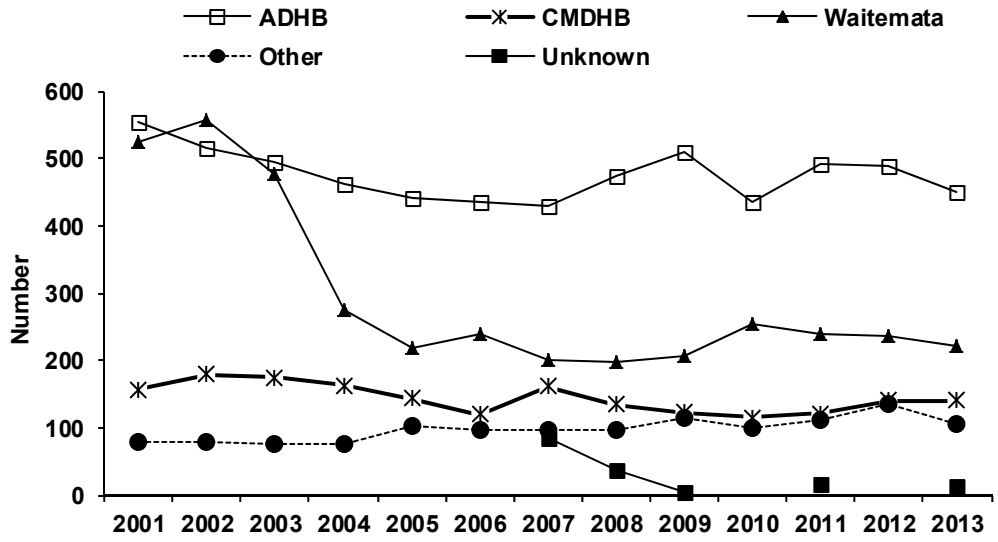


Figure 93: Admissions to NICU by maternal domicile 2001-2013

9.3.3 Admissions to NICU by ethnicity of baby

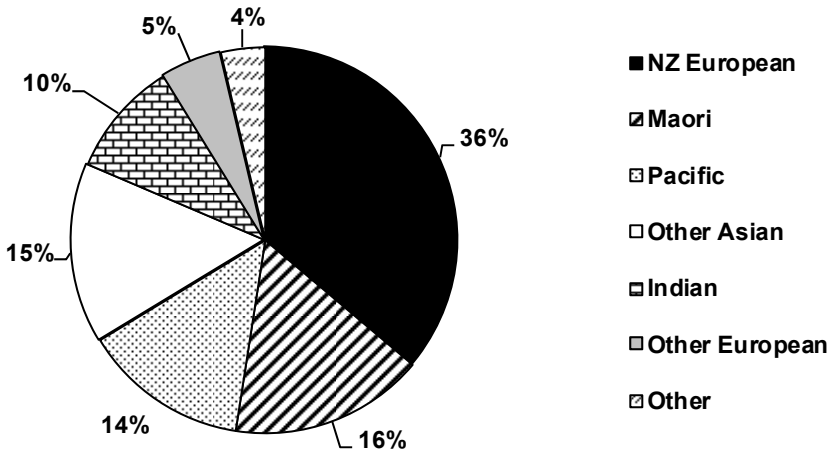


Figure 94: Admissions to NICU by ethnicity of baby 2013

The most frequent ethnicity of NICU admissions was NZ European with 36.2% overall, including 37.0% of preterm and 35.5 % of term infants respectively. The second largest single ethnic group is Maori with an overall rate of 16.3% compared to 13.9% for Pacific people. Asian and Indian were the two other major groups represented with 15.1 % and 9.8% of admissions respectively. Note the number of Asian admissions has increased over the last 5 years and remains greater than the Pacific admissions. Due to the change to reporting infant ethnicity made in 2007 we have not reported long term changes in infant ethnicity over time. However, there have not been any major changes for 2012 to 2013 and the high rate of non NZ European ethnicity should be noted.

9.3.4 Reasons for admission to NICU

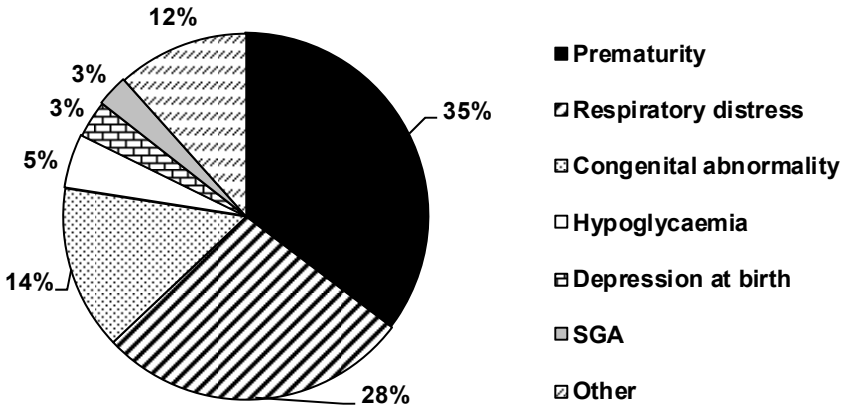


Figure 95: Reasons for admissions to NICU 2013
Other reason for admission includes; cyanotic episode, suspected infection, neurological problem, haemolytic disease, feeding difficulty, bile stained vomiting, jaundice

Prematurity (35.3%), respiratory distress (27.6%) and congenital anomalies (14.5%) remain the three commonest reasons for admission to NICU with rates very similar to last year. Forty five babies (4.8%), including 34 term infants, were admitted primarily for hypoglycaemia. Prevention of this using glucose gel has been the subject of a major ongoing research trial over the last year. The full list of reasons for admission 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 2013, 90% of ACH babies <32 weeks gestation received some antenatal corticosteroids before birth and 56% 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.

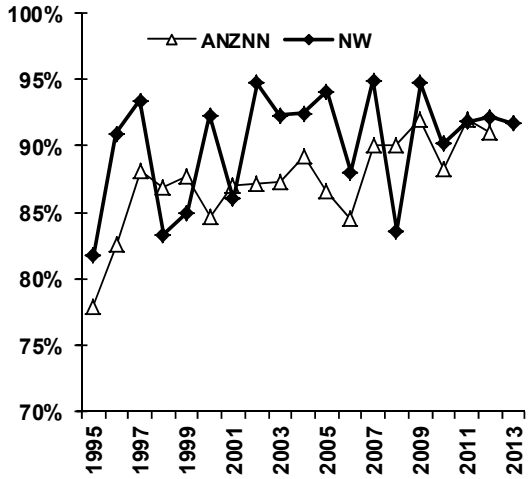


Figure 96: Any antenatal corticosteroids at 24-27 weeks 1995-2013

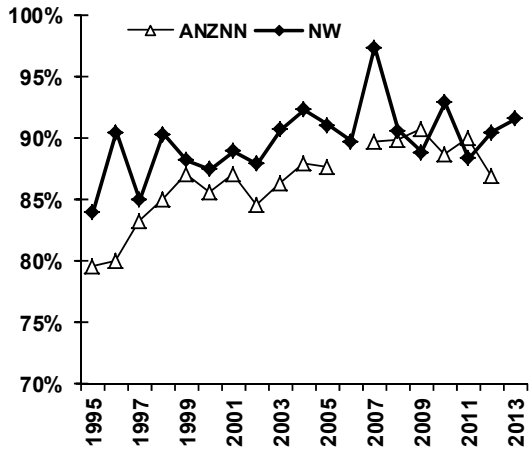


Figure 97: Any antenatal corticosteroids at 28-31 weeks 1995-2013

9.4 Care and complications

9.4.1 Infection (all admissions)

In 2013, there were 5 early-onset culture proven septicaemias compared with 9 in 2012, 9 in 2011 , 7 in 2010, 10 in 2009 and 6 in both 2008 and 2007. The major organisms were E coli (4) and Group B Streptococcus (1). There were 22 episodes of late-onset septicaemia, compared with 28, 34, 27, 33, 31 and 34 episodes in the six previous years. For late onset sepsis the most common organism was *Staphylococcus epidermidis* / coagulase negative *Staphylococcus.*

9.4.2 Hypoxic ischaemic encephalopathy (all admissions)

Nine inborn babies developed significant stage 2 or 3 hypoxic ischaemic encephalopathy (HIE) in 2013, giving an incidence of 1.22/1000 term live births. The incidences were between 0.26 and 1.6/1000 term live births for the years between 2003 and 2012.

Table 72: Details of inborn Hypoxic Ischaemic Encephalopathy Stages 2 or 3.

	Gestation	Birth Weight	HIE stage	Apgar 1/5	Comment
Theatre	39	3235	3	3/4	Prolapsed cord, cooled, abnormal MRI and poor neurological function
Theatre	39	3120	3	1/3	Fetal bradycardia, emergency section, cooled, abnormal MRI & neuro status - palliative care
Delivery Suite	41	4170	3	0/0	Emergency section for obstructed labour, initial cooling but withdrawn support
Theatre	41	3955	3	3/5	Amniotic fluid embolism, cooled, MRI reassuring
Theatre	37	3210	2	2/2	Maternal DKA, cooled, MRI abnormal
Theatre	41	3420	3	1/0	Thick meconium, cooled, abnormal MRI and abnormal examination
Theatre	38	3430	2	4/8	Knot in cord, cooled, early seizure, MRI and EEG reassuring
Theatre	37	3220	2	1/2	Fail to progress, seizures, cooling, MRI abnormal
Theatre	40	3530	2	3/5	Meconium aspiration syndrome, cooling, MRI reassuring

9.4.3 Intraventricular haemorrhage in very low birth weight infants admitted to NICU 1985-2013

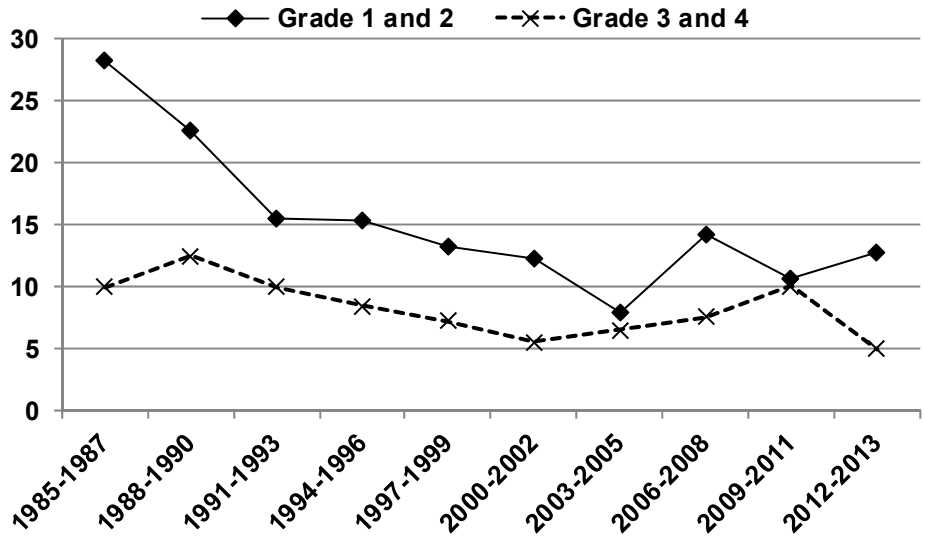


Figure 98: Intraventricular haemorrhage in <1250g infants admitted to NICU 1985-2013

This figure demonstrates the historical trend in IVH rates over the last 20 years. However, there have been some changes in investigation and reporting during this period. In 2005, the criteria for routine cerebral ultrasound scanning was changed to <30 weeks or <1250g. It had previously been <32 weeks or <1500g but there was a very low incidence of significant abnormalities in the larger more mature infants. 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). From 2014, we have redrawn the graph to represent the total number of IVH cases for the two groups (i.e. combined grade 1 & 2 versus combined grade 3 & 4). Previously the data had been crudely averaged and may have under represented total IVH burden. As we consider this a more informative representation we have redrawn the graph back to 1985 so the graph shape is similar previously but with more informative rates. These changes will not affect later graphs which compare with ANZNN data.

On the whole, ACH data for rates of IVH are comparable with ANZNN data (Fig 89-92) but with more year-to-year variation due to the smaller number of infants in each group. The rates of severe IVH (Grade 3 & 4) are low but these are associated with significant neurodevelopmental consequences so remain an important benchmark. Included in this group are a consistent but small number of outborn babies who have not had tertiary level antenatal care.

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

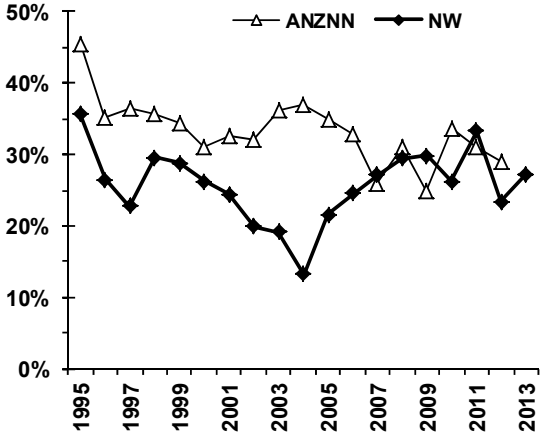


Figure 99: Any IVH at 24-27 weeks 1995-2013

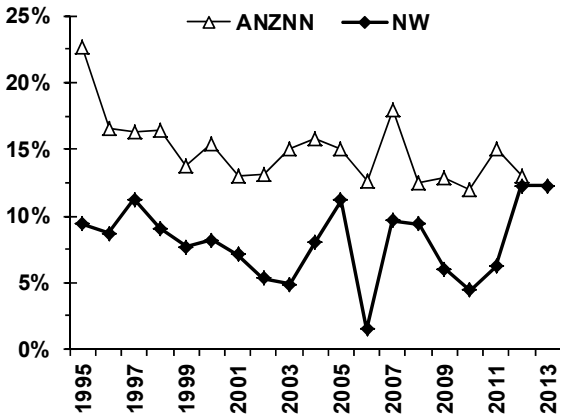


Figure 101: Any IVH at 28-31 weeks 1995-2013

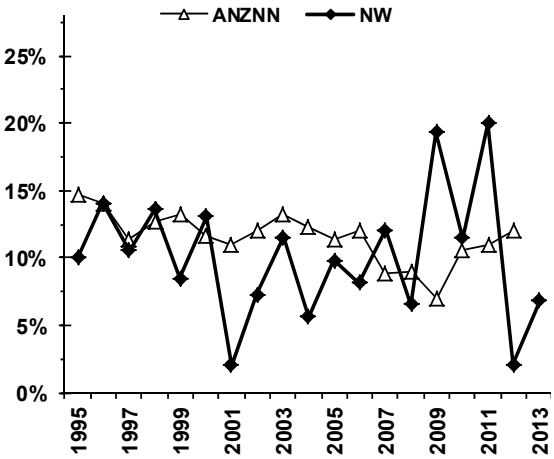


Figure 100: Severe (G3-4) IVH at 24-27 weeks 1995-2013

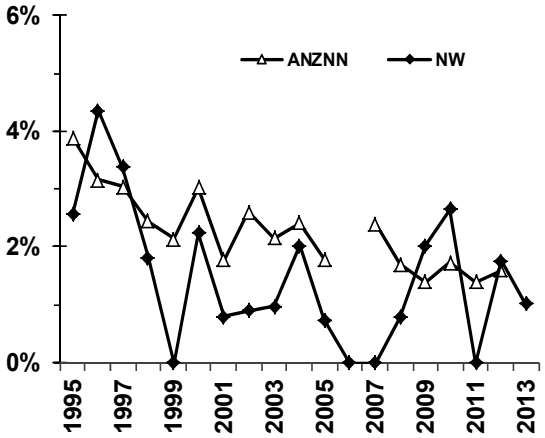


Figure 102: Severe (G3-4) IVH at 28-31 weeks 1995-2013

The rate of severe IVH at 24-27 weeks is lower for 2012 and 2013 compared to the period 2009-11. Although this is encouraging, it is expressed as a percentage so variation could reflect modest changes in either numerator or denominator numbers. For 2013 there were only three 24-27 week infants with severe (G3-4) IVH compared with 1, 9, 7, 11 and 4 in the previous 5 years.

9.4.5 Assisted ventilation (all admissions)

Data in this section are presented for **all inborn babies at ACH**, thus excluding babies transferred to NICU in the postnatal period. This allows more meaningful comparisons of postnatal care at ACH over time. Note that this year we have redrawn the table to include numbers of babies who received support using High Frequency ventilation, which is typically used as a rescue therapy. Importantly we have also added numbers receiving HiFlow air/oxygen. This practice was introduced three years ago but has increased in use and now represents a significant proportion of our respiratory support. Data has also been added on this modality for 2011 and 2012. In addition, we have recalculated the IPPV and CPAP data for these two years as the last two reports had included respiratory support for outborn infants. Although this accurately reflected total work load it was not helpful for assessment of trends in respiratory support use.

Table 73: Number of babies on assisted ventilation (inborn) NWH 2002-2013

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Any ventilation	446	404	402	395	384	444	446	455	453	469	482	501
IPPV	140	109	123	140	96	141	145	134	184	154	154	154
CPAP	421	388	388	367	374	419	415	423	418	427	441	443
HFOV					11	18	21	22	11	17	20	19
HiFlow										63	125	121

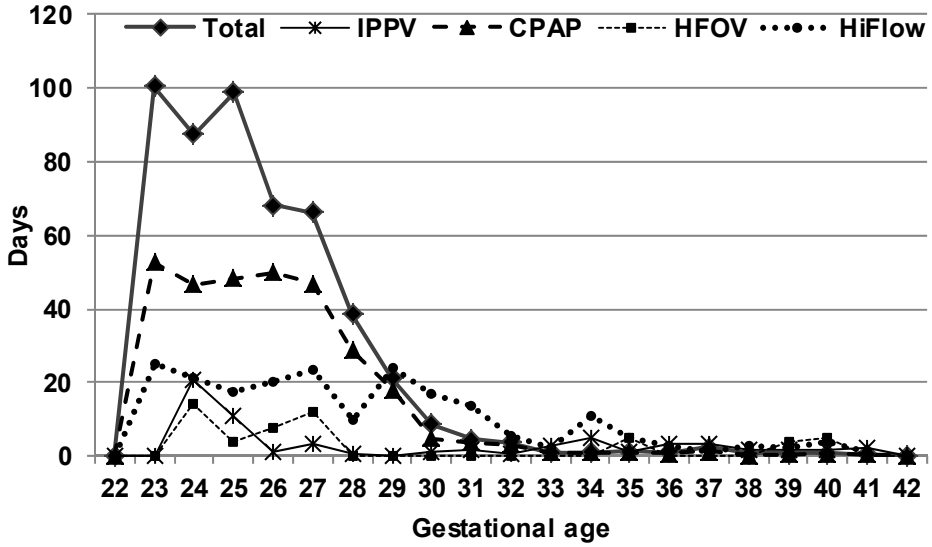


Figure 103: Median ventilation days by gestational age among (ventilated) inborn survivors NWH 2013

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, the number of babies receiving ventilation (IPPV and HFOV combined) has remained fairly stable but there has been an increase in the number of babies receiving CPAP and HiFlow. Overall the result has been a steady rise in the number of babies receiving any respiratory support over the last decade. The most common reasons for this requirement for support 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.

The use of humidified high flow air/oxygen as a method of weaning off CPAP, particularly after 34 weeks gestation, has been well received by parents and staff and is potentially going to become a primary method of respiratory support. This system offers advantages in the ease of care during neuro-developmentally appropriate activities and softer interface with the baby. There is a need to observe the respiratory outcomes and duration of respiratory support if this happens.

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

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

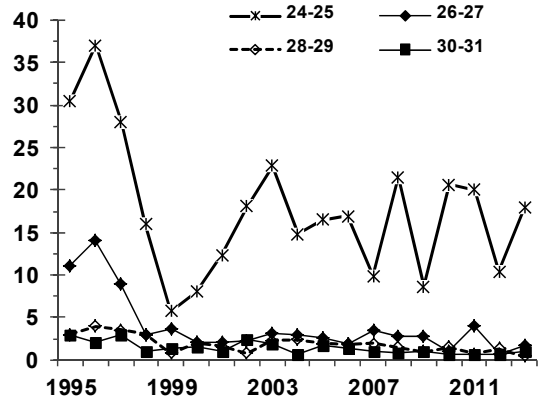


Figure 104: Median days on IPPV NWH 1995-2013

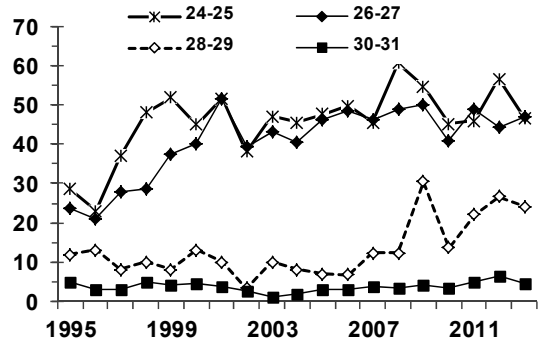


Figure 105: Median days on CPAP NWH 1995-2013

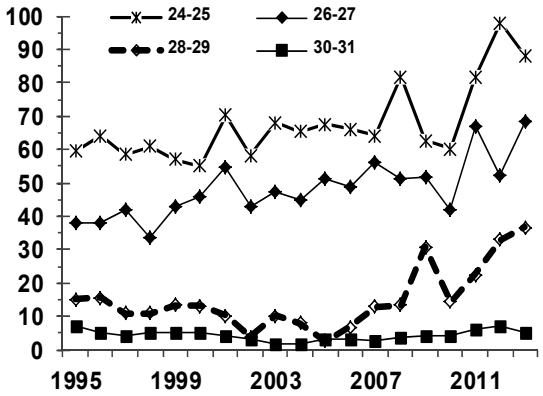


Figure 106: Median days on any ventilation NWH 1995-2013

The figures illustrate median days on respiratory support for inborn survivors. This group may be considered a more homogeneous population than the outborn.

As documented in previous reports, 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. The graph has been updated for 2013 and shows that for 24 - 25 week gestation infants the current median duration is just over 15 days but this varies each year due to small numbers.

The introduction of CPAP resulted in a decline in the median number of days on IPPV for infants 26-27 weeks gestation. There has been little change in this over the last 14 years and it remains below 5 days.

As time on IPPV has decreased the time on CPAP has increased. There has been a steady increase over the last 15 years for the most immature babies below 28 weeks. Since 2009, there has been an increase in duration of CPAP use for more mature infants at 28-29 weeks gestation but this appears to have plateaued in 2013.

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

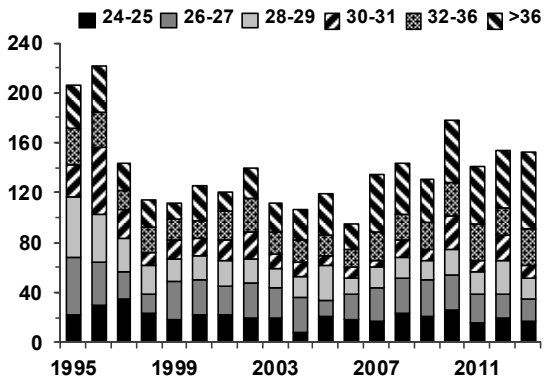


Figure 107: Number on IPPV NWH 1995-2013

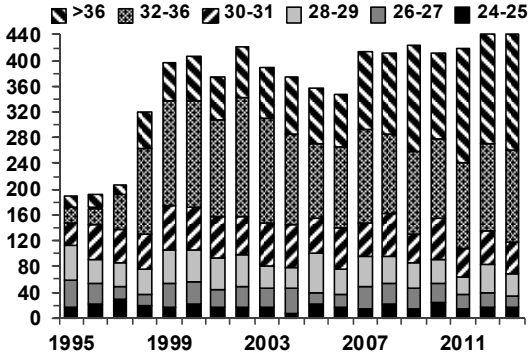


Figure 110: Number on CPAP NWH 1995-2013

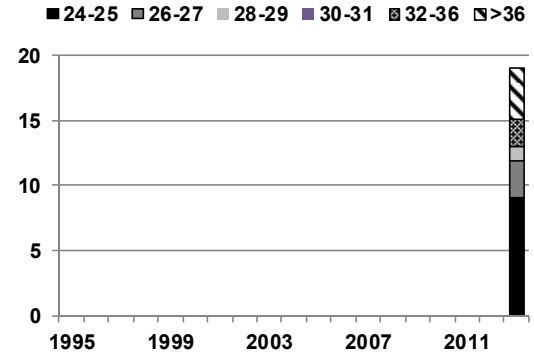


Figure 108: Number on HFOV NWH 2013

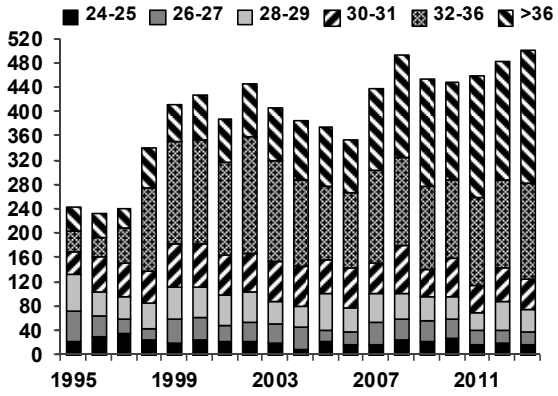


Figure 109: Number on any ventilation NWH 1995-2013

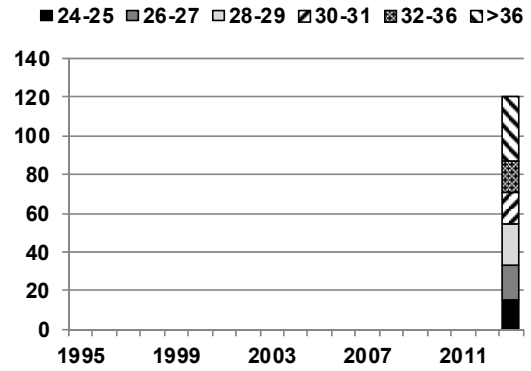


Figure 111: Number on HIFL NWH 2013

These figures show the number of babies requiring respiratory support at ACH over the last 15 years. The effect of introducing double short-pronged Hudson® CPAP in 1997 is clear with a reduction in number receiving intubation and assisted ventilation.

From 2011 onward we have collected information on the use of High Flow Humidified Air / Oxygen. Figures representing this data and HFOV have been added to the report this year. In 2013 this technique was used in 118 surviving babies for a median duration of 9.9 (0.06-368) days. Note NICU does not use any method of non invasive ventilation such as Nasal IPPV.

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

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

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

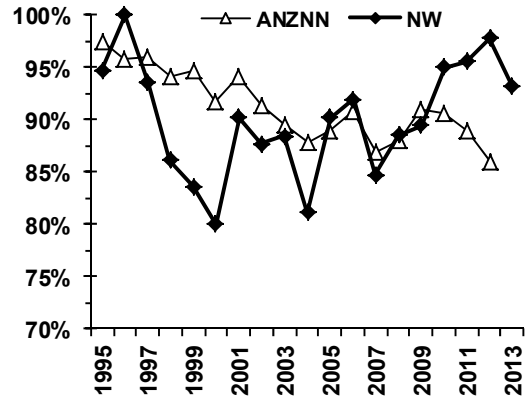


Figure 112: Percentage on IPPV (24-27 wks ANZNN assigned) NWH 1995-2013

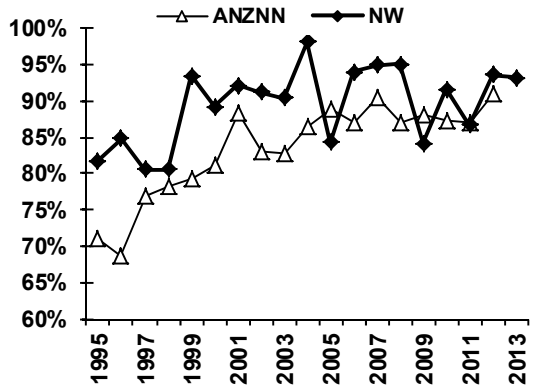


Figure 113: Percentage on CPAP (24-27 wks ANZNN assigned) NWH 1995-2013

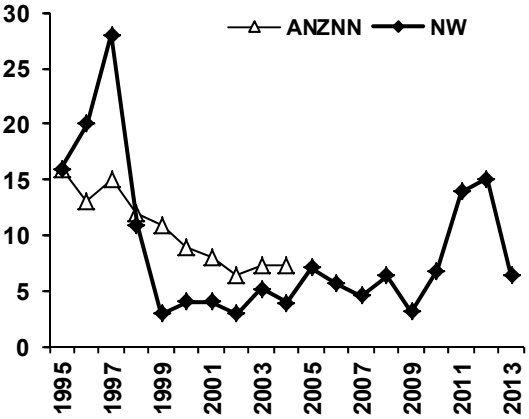


Figure 114: Median days on IPPV (24-27 wks ANZNN assigned) NWH 1995-2013

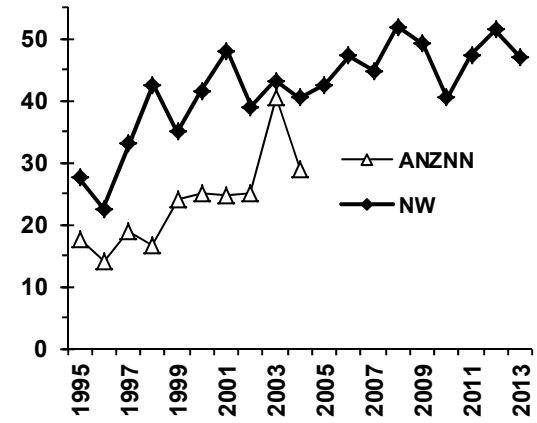


Figure 115: Median days on CPAP (24-27 wks ANZNN assigned) NWH 1995-2013

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

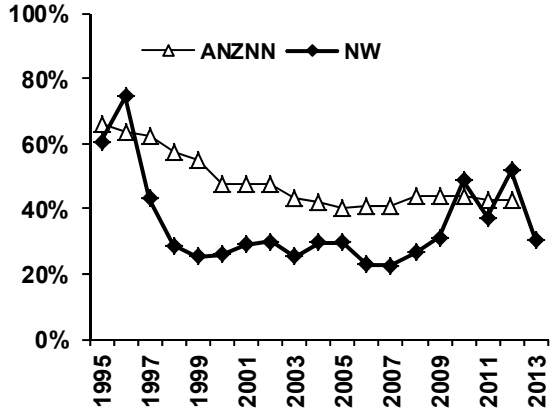


Figure 116: Percentage on IPPV (28-31 wks ANZNN assigned) NWH 1995-2013

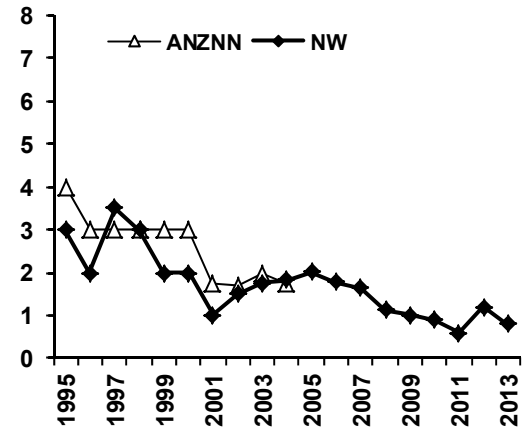


Figure 117: Median days on IPPV (28-31 wks ANZNN assigned) NWH 1995-2013

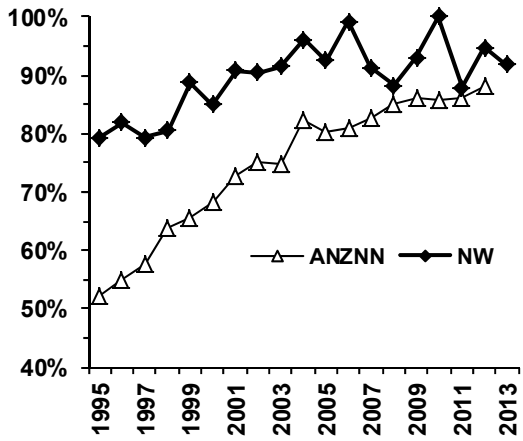


Figure 118: Percentage on CPAP (28-31 wks ANZNN assigned) NWH 1995-2013

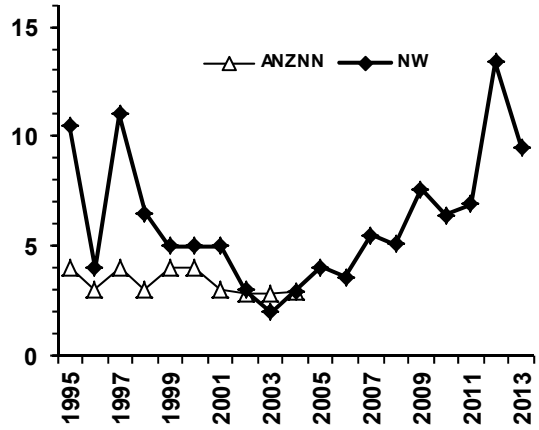


Figure 119: Median days on CPAP (28-31 wks ANZNN assigned) NWH 1995-2013

The pattern of respiratory support in NW babies of 28-31 weeks gestation parallels that seen in the less mature babies. The decrease in median days on CPAP in 2013 may be offset by use of HiFlow and this will require watching over the next couple of years.

9.4.10 High frequency oscillatory ventilation and inhaled nitric oxide

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

High frequency oscillatory ventilation (HFOV) is typically used for 'rescue' treatment at ACH. Hence, babies treated with HFOV are the sickest babies in NICU who would be expected to have a very poor outlook whatever the treatment. At all gestations, mortality in these infants tends to be high. In 2013 the survival following use of both HFOV (76%) and iNO (86%) 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. It is possible that either the threshold for using these modes of support has decreased or that the unit experience has increased. The most likely explanation is a combination of both of these factors. Certainly the graphs of HFOV and NO use in ANZNN assigned babies suggest an increasing frequency of use.

Table 74: HFOV and inhaled nitric oxide (iNO) use and survival NWH 2013

	HFOV		iNO		HFOV + iNO	
	Treated n	Survivors n(%)	Treated n	Survivors n(%)	Treated n	Survivors n(%)
Total	**25**	**19(76)**	**29**	**25(86)**	**14**	**11(79)**
<28 weeks	14	11(79)	7	6(86)	6	5(83)
28-31 weeks	2	1(50)	1	0(0)	1	0(0)
32-36 weeks	3	2(67)	5	3(60)	2	1(50)
≥37 weeks	6	5(83)	16	16(100)	5	5(100)

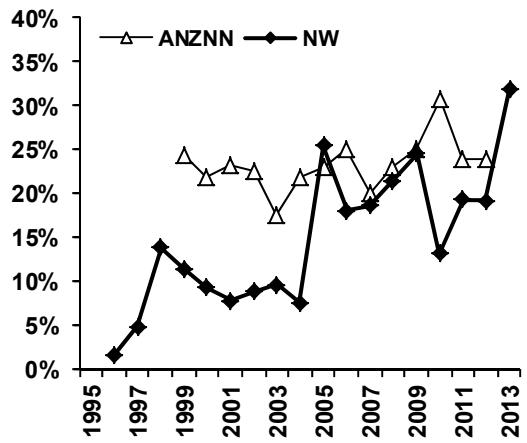


Figure 120: HFOV at 24-27 weeks (ANZNN assigned babies) NWH 1995-2013

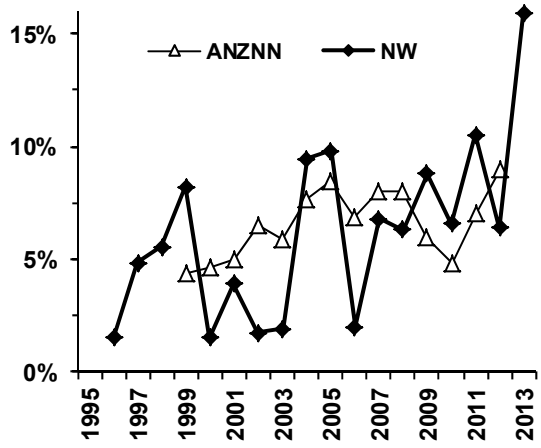


Figure 121: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies) NWH 1995-2013

These two figures compare the use of HFOV and iNO at ACH with use across the ANZNN. Generally, the use of these interventions in preterm infants has increased since 2003 and this trend continues for 2013.

9.4.11 Term/post-term infants on assisted ventilation from 1995 to 2013

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. Since 2008 there has been an increase in numbers receiving CPAP. For 2013 we have revised the figure to include data for HFOV and HiFlow and included an indication of total respiratory support (i.e. all modes combined)

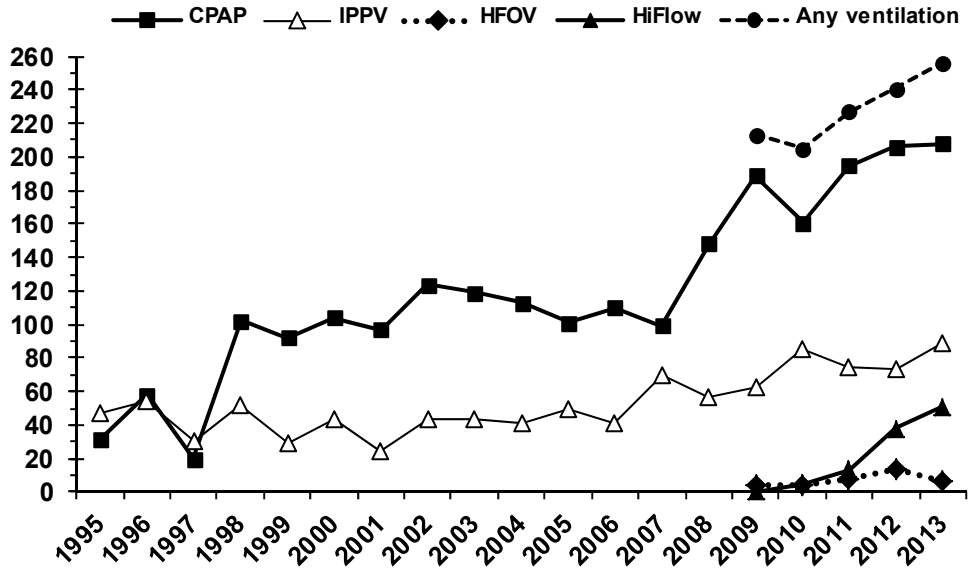


Figure 122: Number of term and post term babies needing respiratory support (IPPV,HFOV, CPAP and HiFlow) NWH 1995-2013

In 2013, TTN/RDS, meconium/ PPHN, infection, congenital anomalies, support for surgery, neonatal encephalopathy and "other", which could include a neuromuscular problem, were the reasons for ventilation (see Appendix 8).

9.5 Outcomes

9.5.1 Survival of NW inborn babies by birth weight

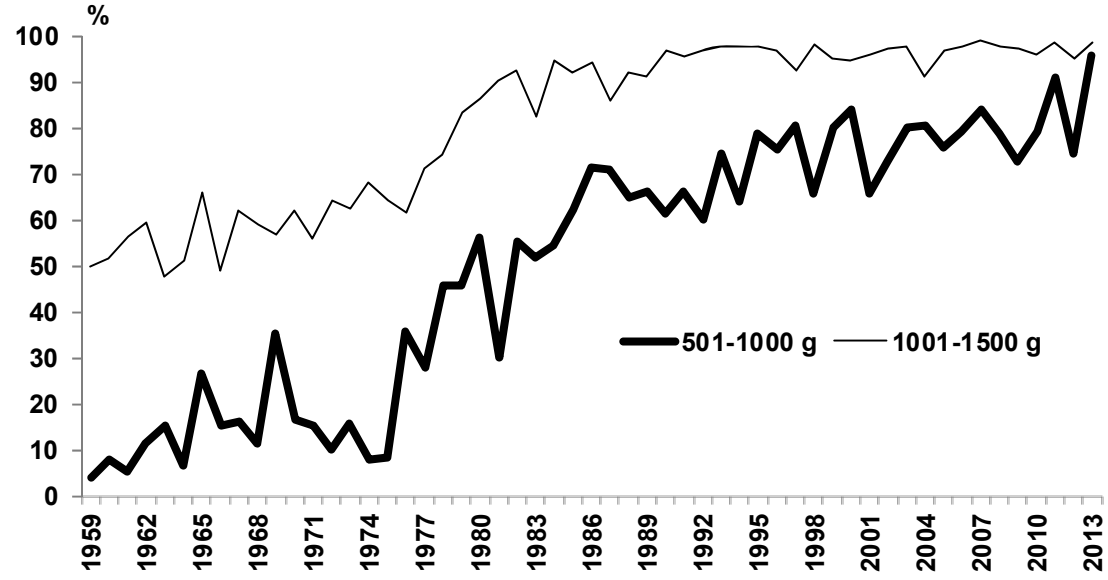


Figure 123: Neonatal survival (0-28 days) of ≤1500g inborn live births NWH 1959-2013

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).

Significant advances in neonatal care have been reviewed in previous reports. However, 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

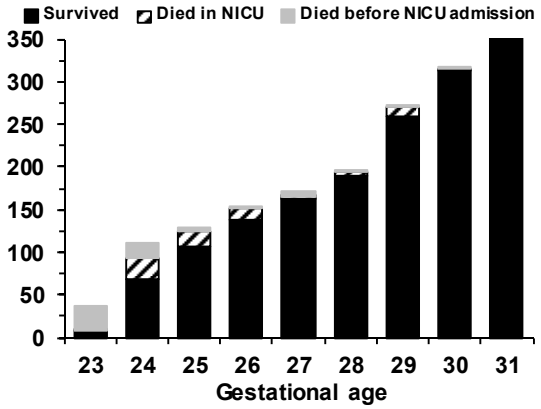


Figure 124: Numbers of live inborn babies 23 to 31 weeks gestation NWH 2003-2013 (n=1785)

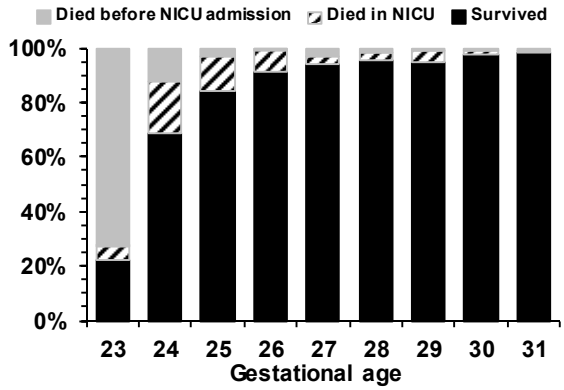


Figure 125: Survival of live inborn babies 23-31 weeks NWH 2003-2013 (n = 1785)

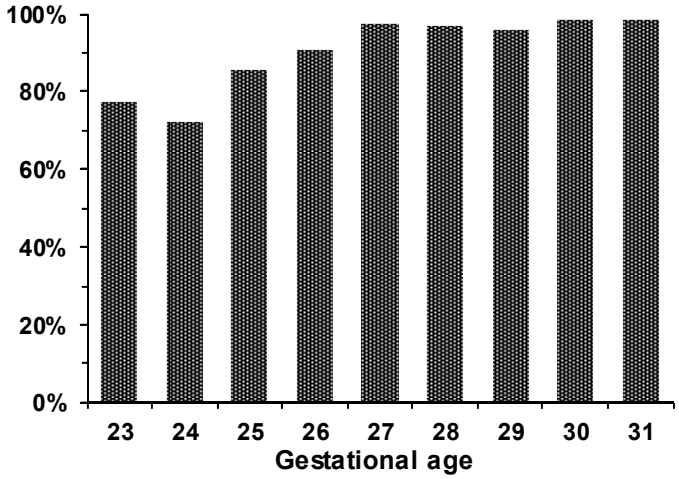


Figure 126: Survival of live inborn babies admitted to NICU 2003-2013 (n =1714)

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

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

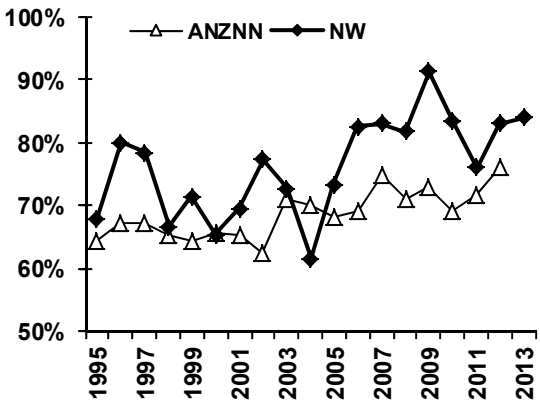


Figure 127: Survival at 24-25 weeks gestation compared with ANZNN data NWH 1995-2013

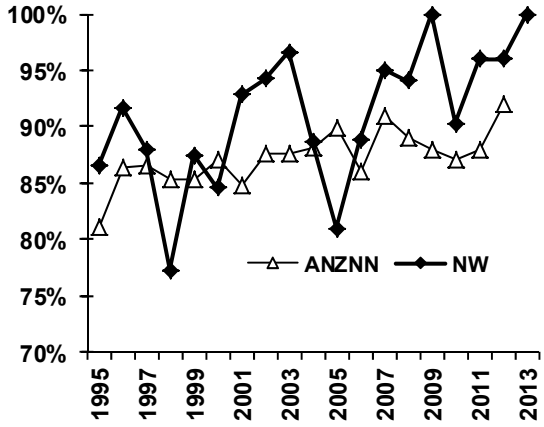


Figure 128: Survival at 26-27 weeks compared with ANZNN data NWH 1995-2013

Survival rates for 24-27 weeks gestation are consistently around 80% although there is some variation due to relatively small numbers at 24-25 weeks gestation. 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 2013 there were no babies who developed classic PVL. One inborn baby was reported to have cystic white matter injury. However, this was the result of an intracranial haemorrhage with adjacent white matter infarction. On follow up imaging this appeared as a single small localised cyst rather than PVL or a more typical porencephalic cyst, which would be in continuity with the ventricle.

9.5.5 Retinopathy of prematurity benchmarked with ANZNN

Rates of stage 3-4 ROP compare reasonably with ANZNN data but fluctuate each year due to small numbers. As previously reported, changes in the screening technique and the appointment of a new ophthalmologist in 2006 were associated with an increased incidence of ROP. However, a large proportion of the increase was due to increased detection of milder grades (Stage 1 and 2) that do not have any short or long-term consequences.

The rates of significant (Stage 3 or 4) ROP were increased for 2013 but these were all Stage 3 and no infant received laser therapy or intravitreal Bevacizumab injection. In 2012, 4 inborn babies received laser therapy for advanced ROP, which is similar to 3 to 11 per year for the previous 5 years.

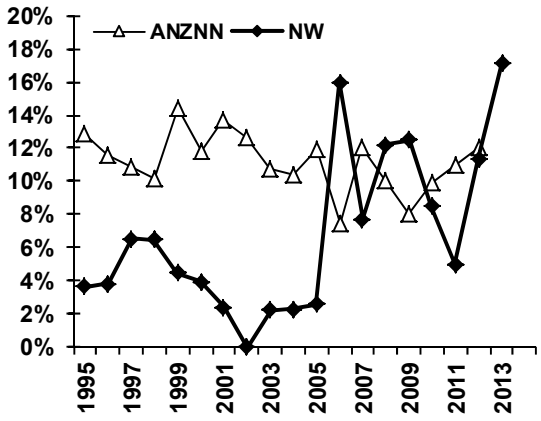


Figure 129: Stage 3-4 ROP at 24-27 weeks NWH 1995-2013

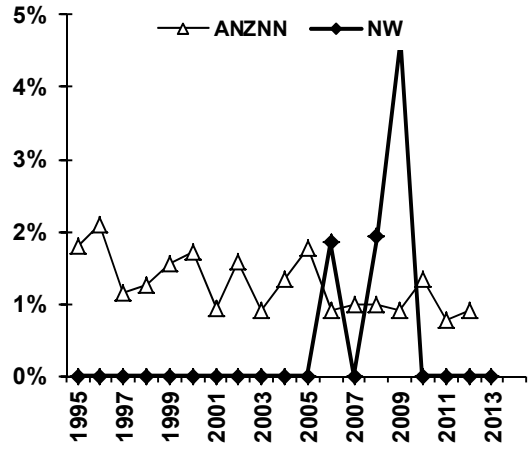


Figure 130: Stage 3-4 ROP at 28-31 weeks NWH 1995-2013

9.5.6 Chronic lung disease (CLD) benchmarked with ANZNN

The last two years have seen a dramatic change in chronic lung disease as defined by the use of support or oxygen at 36 weeks corrected gestation. ANZNN has also reported an increased rate but this is not as noteworthy as our local figures.

It has previously been recognised that some major changes in rates have been the result of altered clinical practice. As the definition of CLD was based on the requirement for support at a corrected age of 36 weeks, BPD was defined by the treatment being given. 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. Between 2005 and 2011 there were no discernible major trends in the incidence of chronic lung disease with only minor differences in year to year variability. Furthermore, the local rates were broadly similar to those reported by ANZNN.

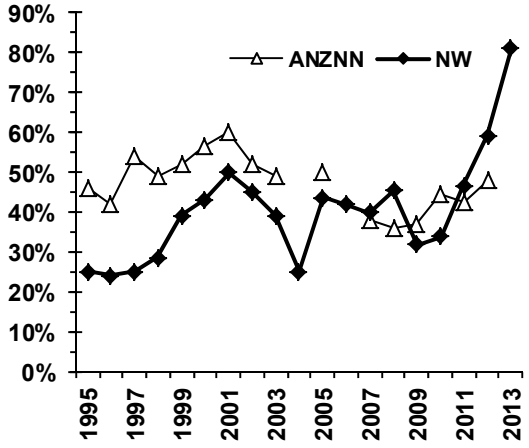


Figure 131: Chronic lung disease at 24-27weeks NWH 1995-2013

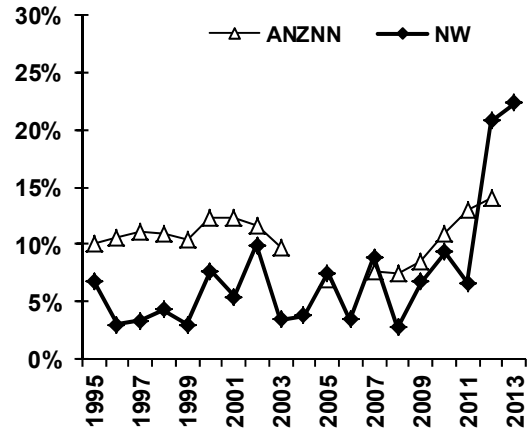


Figure 132: Chronic lung disease at 28-31weeks NWH 2013

Since 2012 there has been a rise in the rate of support at 36 weeks, it is possible that this again is due to practice changes such as greater use of overnight oxygen saturation recording rather than “spot” saturation to direct weaning of support and / or oxygen. In addition the use of High Flow, which tends to be more slowly weaned than CPAP may have made a contribution. Certainly some of the babies who were designated as CLD were receiving only high flow air at the lower end of the range. Other New Zealand centres, who use nasal flow systems, have also reported a rise in CLD rates so this is being monitored closely. However, the rates are concerning and these will be investigated further.

Finally, the ANZNN has a working party to review potential methods of diagnosing CLD so the definition may change again. “Physiological testing” may be a more robust method of diagnosis but it is not the only available method. 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 2013, one inborn infants (<2% <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 due to small numbers has been typical. However, probiotic use was introduced in 2011 initially as a clinical trial and more recently as a standard procedure for infants below 1500g or 32 weeks gestation so it is important to continue to observe NEC rates closely.

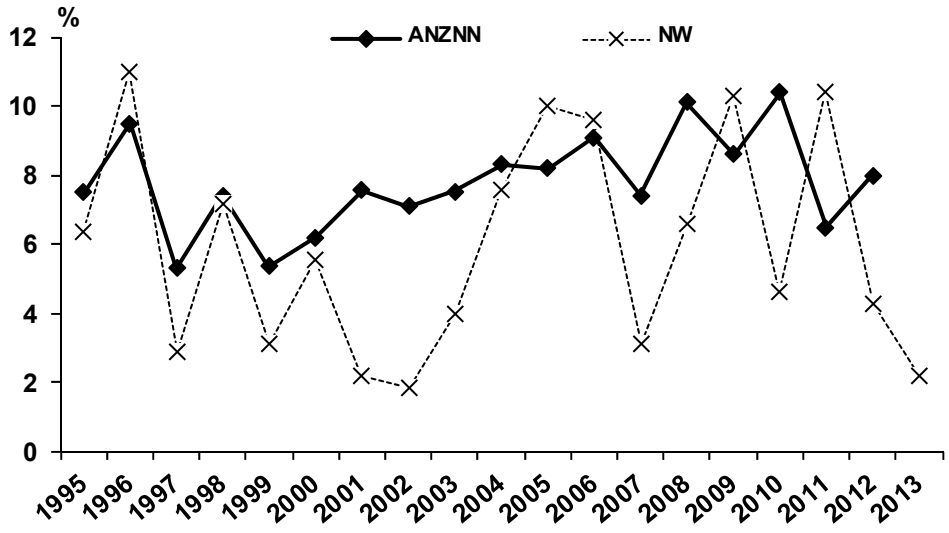


Figure 133: Necrotising enterocolitis (NEC) in ANZNN assigned babies under 28 weeks gestation compared with the incidence in ANZNN 1995-2013

9.5.8 Patent Ductus Arteriosus (all babies)

In 2013, 22 infants below 1500g or 32 weeks gestation were treated medically for a symptomatic PDA. In five cases a second course was given. There were two drugs available but the clinicians used Indomethacin in all cases in preference to Ibuprofen. In 2013, two inborn (ANZNN assigned) 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 10 babies developed a pneumothorax that needed drainage in 2013. A further two infants had drainage of fluid from hydrops or pleural effusion. Five of these infants were

preterm and seven term, which is different to previous years when term infants were very uncommon. In addition, 38 babies had a small pneumothorax that did not require a procedure and resolved spontaneously.

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 2013, 16 inborn infants below 28 weeks gestation received postnatal steroids for chronic lung disease. The number treated varied with gestational age so that 76% of infants at 24-25 weeks gestation received steroids but none of those born at 30-31 weeks gestation were treated with postnatal steroids. The numbers are small but there is a trend toward increased steroid use in the very premature infants.

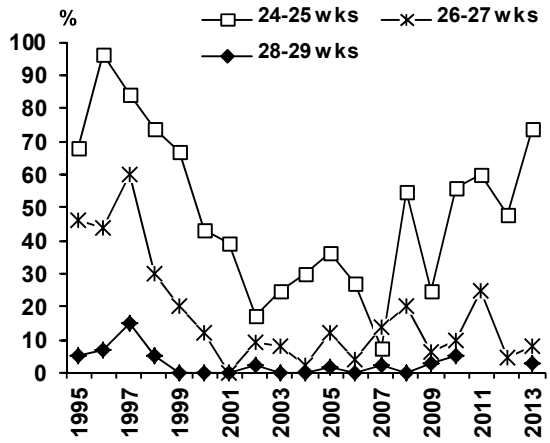


Figure 134: Percentage receiving postnatal dexamethasone by gestational age (ANZNN alive at one week <32wks) NWH 1995-2013

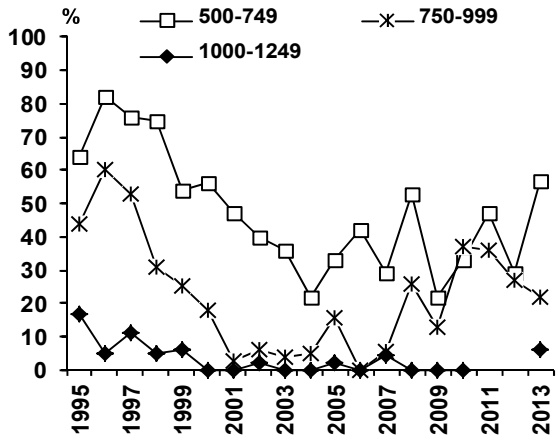


Figure 135: Percentage receiving postnatal dexamethasone by birth weight (ANZNN alive at one week <1500g) NWH 1995-2013

9.6 Immunisation

9.6.1 Hepatitis B

In 2013, 13 infants admitted to NICU were identified as potentially exposed to hepatitis B in the perinatal period due to positive maternal serology. All but one baby who died early in the neonatal period received immunisation and Hep B immunoglobulin in labour and birthing suite, the neonatal unit, or at their base hospital.

9.6.2 BCG

In 2013 there were 6 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 83 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. Seventy-seven babies (93%) had their immunisation at the routine time. Of the 6 babies who did not have immunisation at the routine time: four were transferred around 42-43 days of age and received the appropriate immunizations following transfer to the local hospital; one was delayed as receiving steroids at 42 days and one baby was in the community from day 21 but attended day case review in NICU on day 48. Their routine care was with the GP. So status at six weeks was fully accounted for.

9.6.4 Infrarix Hexa and Prevanar at 3 months

There were 21 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. All of these babies received these at the routine time.

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 2013 report show that all infants below 24 weeks gestation and nearly 90% of NICU infants below 28 weeks gestation receive breast milk to some degree. It is noted that around 50% were fully or exclusively fed breast milk. Overall these data are consistent with the high rates of breast milk feeding reported previously. However there are some differences in proportion of partial/full/exclusive in the 20-24 and 25-27 gestational age groups, which may reflect the relatively small numbers in these groups.

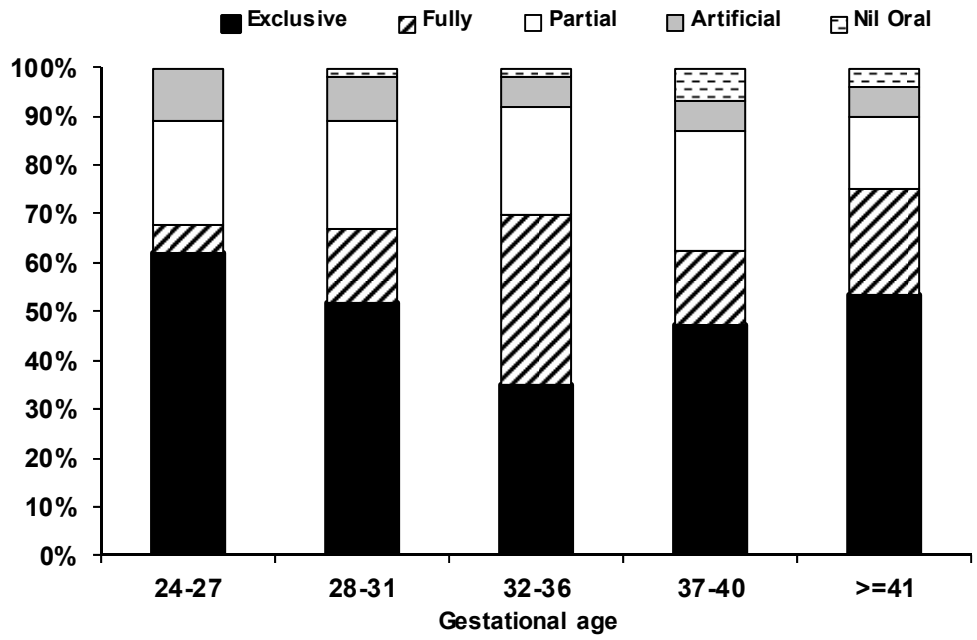


Figure 136: Method of feeding at discharge from NICU by gestational age 2013

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

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

For 2013 there were 31 neonatal and infant deaths occurring in inborn infants who had been admitted to the NICU plus another 4 deaths in outborn infants admitted to the NICU. Eighteen deaths occurred following transfer from NICU to Starship hospital for ongoing management of congenital anomalies, largely cardiac or multiple anomalies. Thirteen deaths occurred prior to NICU discharge. One death occurred in the community following referral to the palliative care team for ongoing management following perinatal asphyxia.

9.9 Child Development Unit

9.9.1 Follow up at 2 years (corrected) of children under 1500 grams born in 2011

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

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

No data was obtained from 28 children. Of these children, four were from other centres in New Zealand, ten lived overseas, and one did not attend appointments. A further 13 families declined follow up. Data were obtained for 83 children (69%). Of these children, 31 (37%) weighed <1000 grams at birth.

Eighty three children received individual assessment at the Child Development Unit, or when this was not possible (mainly because of distance from home to National Women's), seven reports were obtained from paediatricians, psychologists 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 two years (corrected age). Neurological examinations were carried out by paediatricians. Children were placed in outcome categories as set out in the table below.

Table 75: Outcome categories for infants under 30 months of age

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

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

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

** Previously known as "Mental Scores"

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

The table below presents the results, using these outcome categories, for the 83 children tested at 2 years of age (corrected).

Table 76: Outcome categories at 2 years (corrected) for children under 1500g born in 2011 (n=83) NWH

	Number	Description
Category I	2 (2.5%)	2 children with global developmental delay.
Category II	6 (7.0%)	2 children with hemiplegia and without cognitive delay. 1 child with mild cerebral palsy and impaired vision requiring spectacles. 3 children with Bayley Cognitive scores between 1 and 2 standard deviations below the mean.
Category III	2 (2.5%)	2 children with Bayley Motor scores more than 1 standard deviation below the mean but Cognitive scores within the average range.
Category IV	73 (88%)	

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

Table 77: Outcome of children <1500g born in 2011 at 2 years (corrected) by gestational age groups (n=83) NWH

	Gestational age (weeks)					
Outcome	**24 - 28 weeks n= 42**		**29 – 35 weeks n= 41**		**Total n=83**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	0		2	5	2	2.5
II	5	12	1	2	6	7
III	2	5	0		2	2.5
IV	35	83	38	93	73	88

Table 78: Outcome of children <1500g born in 2011 at 2 years (corrected) by birthweight groups (n=83) NWH

	Birthweight (grams)					
Outcome	**<1000g n=31**		**1000 – 1499g n=52**		**Total n=83**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	1	3	1	2	2	2.5
II	3	10	3	6	6	7
III	2	6	0		2	2.5
IV	25	81	48	92	73	88

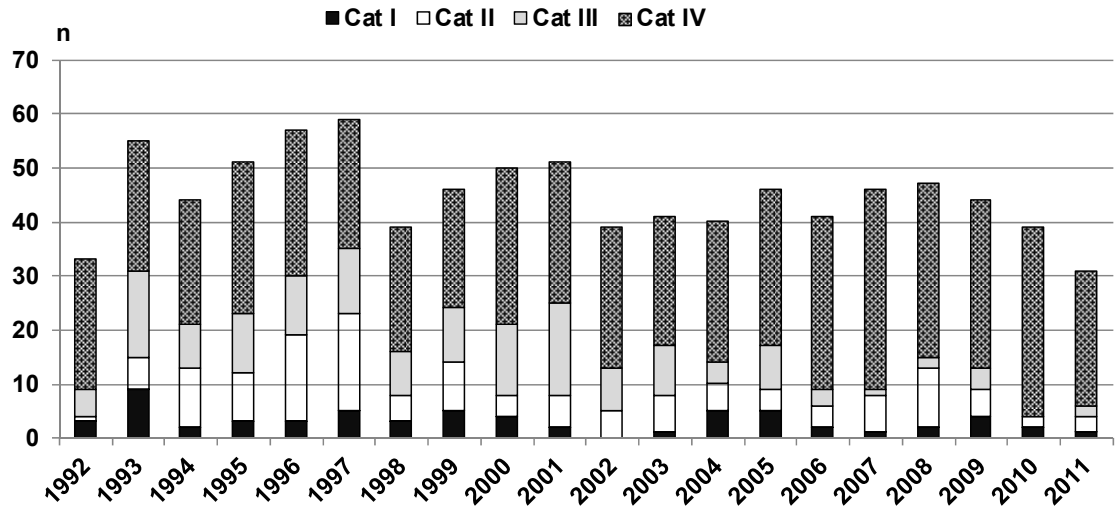


Figure 137: Outcome at 24 months (corrected age) of children <1000g birthweight born 1992-2011 NWH

9.9.2 Development at 4 years of children under 1500g born in 2009 NWH

One hundred and thirty nine children born in 2009 who weighed less than 1500 grams were cared for in the Newborn Service and survived to hospital discharge. There were 49 infants (35%) weighing less than 1000 grams.

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

At four years chronological age, data were obtained for 92 children. Of the 41 not assessed 18 (44%) were overseas or in other centres in New Zealand. Seventeen families (41%) declined or could not be traced. Six appointments (15%) are recorded as "DNA".

At four 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 79: Outcome categories at 4 years

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

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

Table 80: Outcome categories at 4 years for children under 1500g born 2009 (n =92)

	Number	Description
Category I	5 (5%)	1 child with grade 4 IVH, shunted hydrocephalus, spectacles and global developmental delay. 2 children with moderate motor delays and with Cognitive scores greater than 2 standard deviations below the mean. 2 children (twins) with diagnosed Autistic Spectrum Disorder and Cognitive scores greater than 2 standard deviations below the mean.
Category II	7 (8%)	1 child with left hemiplegia and low Cognitive scores. 3 children with low Cognitive and Motor scores, increased activity levels and poor attention span. 3 children with low Cognitive scores.
Category III	2 (2%)	1 child with spastic diplegia. 1 child with low Motor score.
Category IV	78 (85%)	

Summary

Babies weighing less than 1500 grams at birth are at risk for developmental problems. Data obtained from the follow-up of 83 children born in 2011, and at age two years (corrected) when assessed, showed that 2.5% had severe disability. Eighty-five percent of this population was within the average range for cognition and motor development.

For children born in 2009, 5% had severe disability. Seventy-eight percent were within the average range for cognitive and motor disabilities.

Chapter 10

PERINATAL RELATED MORTALITY

10 PERINATAL RELATED MORTALITY

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

NW has a pregnancy loss counsellor who provides support for 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 Perinatal Death Classification (PSANZ-PDC) is used to identify the single most important factor which led to the chain of events that resulted in the death. PSANZ Neonatal Death Classification (PSANZ-NDC) 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 at NWH 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 live born baby, of at least 20 weeks of gestation at issue or at least 400 grams birth weight if gestation is unknown, 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 live born baby of at least 20 weeks of gestation at issue or at least 400 grams birth weight if gestation is unknown 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 or from congenital abnormality. This is calculated by excluding fetal deaths where the primary PDC classification was congenital abnormality and neonatal deaths where the primary PDC and/or NDC classification was congenital abnormality.

All perinatal related deaths are reviewed monthly by a multidisciplinary team comprising an obstetrician (MFM subspecialist and perinatal mortality meeting convenor), neonatologist, midwife, perinatal pathologist and administrator. This group classifies the cause of death and summarises recommendations for management if there is a future pregnancy. They also complete the documentation for the PMMRC including assigning contributing factors and determining whether the death was potentially avoidable.

10.1 Perinatal and perinatal related mortality rates

Table 81: Inborn and BBA deaths NWH 2000-2013

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Fetal deaths	20-22 wks	33	20	30	23	25	26	24	24	29	24	33	41	33	24
	23-24 wks	12	10	10	8	18	11	12	15	11	14	9	16	11	18
	25-26 wks	9	2	4	6	3	3	6	7	4	4	8	5	9	6
	27-28 wks	3	1	2	1	10	6	3	5	8	6	5	2	4	4
	29-38 wks	27	15	17	24	13	17	24	19	21	19	24	26	14	20
	>38 wks		9	6	2	13	5	5	12	3	8	4	7	7	5
Total fetal deaths		**84**	**57**	**69**	**64**	**82**	**68**	**74**	**82**	**76**	**75**	**83**	**97**	**77**	**77**
Neonatal deaths	Early neonatal deaths (≤7 days)	43	32	40	34	33	38	23	20	26	27	26	21	37	28
	Late neonatal deaths (8-28 days)	9	5	7	7	9	5	2	9	8	10	8	2	9	9
Total neonatal deaths		**52**	**37**	**47**	**41**	**42**	**43**	**25**	**29**	**34**	**37**	**34**	**23**	**46**	**37**
Total deaths		136	94	116	105	124	111	99	111	110	112	117	120	123	114
Perinatal mortality rate/1000		15.8	11.6	13.6	12.6	15.0	14.4	13.1	13.0	13.2	12.9	13.9	15.3	14.5	14.2
Perinatal related mortality rate/1000		16.9	12.3	14.5	13.5	16.2	15.0	13.4	14.1	14.2	14.2	14.9	15.6	15.6	15.5
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	9.2	72/ 7335 =9.8

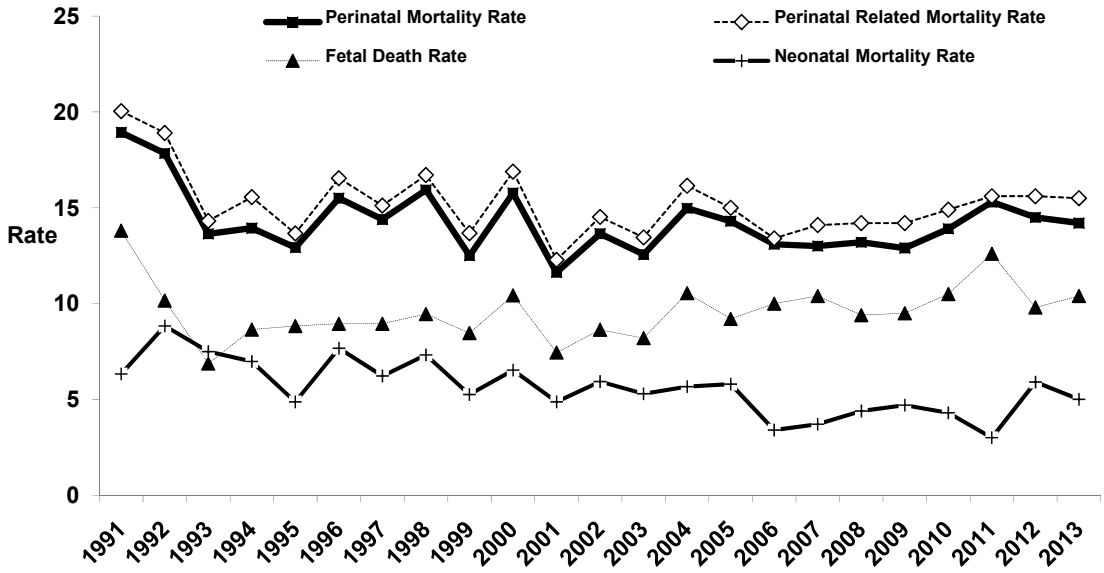


Figure 138: Perinatal mortality rate, perinatal related mortality rate, fetal death rate and neonatal mortality rate NWH 1991-2013 (all rates expressed as deaths/1000 births).

Perinatal mortality at NWH has remained stable over the last 3 years.

Table 82: Perinatal related loss and DHB of residence NWH 2013

DHB of residence	TOP n=33		Stillbirth n=51		Neonatal death n=30		Perinatal related death n=114	
	n	%	n	%	n	%	n	%
Auckland	25	76	23	45	11	37	59	52
Counties Manukau	2	6	8	16	6	20	16	14
Waitemata	3	9	13	25	5	17	21	18
Other	3	9	7	14	8	27	18	16

*due to rounding not all % columns add to 100

Forty eight 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 2013 was (59/5015) 11.8/1000 total births which is similar to the rate last year of 13.3/1000 total births.

10.2 Gestational age and perinatal related mortality

Table 83: Gestational age and perinatal related mortality NWH 2013

	Births N=7377		Fetal deaths n=77		Neonatal deaths n=37		Total perinatal related deaths n=114	
	n	%	n	% FD risk*	n	% NND rate **	n	% Perinatal related mortality risk***
<24 weeks	49	0.7	36	47 4.9	12	32 923	48	42 6.5
24-27 weeks	54	0.7	13	17 1.8	4	11 97.6	17	15 2.3
28-31 weeks	103	1.4	12	16 1.6	3	8 33.0	15	13 2.1
32-36 weeks	568	7.7	9	12 1.3	7	19 12.5	16	14 2.2
37-40 weeks	5789	78.5	7	9 1.1	10	27 1.7	17	15 2.6
≥41 weeks	814	11.0	0		1	3 †	1	1 †

* Fetal death risk = number of fetal deaths per 1000 babies remaining in utero
** NND rate = number of deaths per 1000 live births in that gestation category
*** Perinatal related death risk = number of perinatal related deaths per 1000 babies remaining in utero
† not calculated due to small numbers

10.3 Multiple births and perinatal related mortality

Table 84: Multiple births and perinatal related mortality NWH 2013

	Births N=7377		Fetal deaths n=77		Neonatal deaths n=37		Total perinatal related deaths n=114	
	n	%	n	% FD rate*	n	% NND rate‡	n	% Perinatal related mortality rate†
Singleton	7072	95.9	63	82 8.9	35	95 5.0	98	86 13.9
Multiple	305	4.1	14	18 45.9	2	5 6.9	16	14 52.5

* 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 remains several times higher than the rate for singleton pregnancies, confirming the high risk nature of these pregnancies especially in mono-chorionic di-amniotic twin pregnancies. Details regarding the cause of death in multiple pregnancies are found in section 5.3. The perinatal mortality in multiples in 2013 (52.5/1000) is very similar to what it was in 2012 (54.5/1000).

10.4 Lead maternity carer (LMC) and perinatal related mortality

Table 85: LMC at birth and perinatal related mortality NWH 2012

	Births N=7377		Fetal deaths n=77			Neonatal deaths n=37			Total perinatal related deaths n=114		
	N	%	n	%	FD rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Independent Midwife	3483	47.2	27	35	7.8	9	24	2.6	36	32	10.3
Private Obstetrician	1913	25.9	16	21	8.4	6	16	3.2	22	19	11.5
G.P.	17	0.2									
NW Community	1374	18.6	17	22	12.4	6	16	4.4	23	20	16.7
NW Diabetes	203	2.8				1	3	∞	1	1	∞
NW Medical	323	4.4	10	13	31.0	10	27	31.9	20	18	61.9
Other DHB	33	0.5	2	3	60.6	3	8	96.8	5	4	151.5
Unbooked	31	0.4	5	6	161.3	2	5	76.9	7	6	225.8

* 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
∞ Not calculated due to small numbers

There are 3 outlying groups in the above table, namely unbooked women, women booked in other DHBs and those attending the medical clinic. As has been found in other reports, unbooked women have the highest perinatal related mortality (226/1000) reflecting acute transfers often at very preterm gestations.

Perinatal deaths among mothers attending the medical clinic also include deaths in the fetal medicine service. Five of the 20 deaths (25%) were terminations of pregnancy. The commonest causes of perinatal related death among women attending the Medical clinic were: congenital abnormality 11 (55%) and specific perinatal conditions 3 (15%). The remainder died from fetal growth restriction (2), antepartum haemorrhage (1), hypertension (1), spontaneous preterm birth (1), and maternal conditions (1).

10.5 Causes of perinatal related deaths

Table 86: Perinatal death by Perinatal Death Classification (PSANZ-PDC) NWH 2013

	Fetal deaths n=77			Neonatal deaths n=37			Total n=114		
	n	%	Rate*	n	%	Rate**	n	%	Rate*
Congenital abnormality	23	30	3.1	15	41	2.1	38	33	5.2
Perinatal infection	4	5	0.5	2	5	0.3	6	5	0.8
Antepartum haemorrhage	11	14	1.5	4	11	0.5	15	13	2.0
Maternal conditions	1	1	0.1	3	8	0.4	4	4	0.5
Hypertension	1	1	0.1	2	5	0.3	3	3	0.4
Specific perinatal conditions	17	22	2.3	4	11	0.5	21	18	2.8
Hypoxic peripartum death	0			2	5	0.3	2	2	0.3
Fetal growth restriction	8	10	1.1	0			8	7	1.1
Spontaneous preterm	4	5	0.5	5	14	0.7	9	8	1.2
Unexplained antepartum death	8	10	1.1	0			8	7	1.1

* Rate: per 1000 births (n=7377 in 2013) ** Rate: per 1000 live births (n=7300 in 2013)

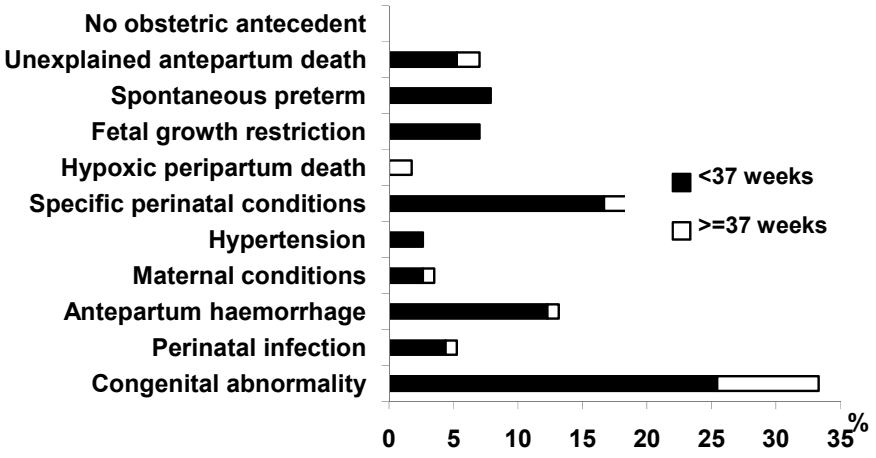


Figure 139: Contribution to perinatal related death by obstetric antecedent cause (PSANZ-PDC) and gestation at birth NWH 2013

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

10.6 Neonatal deaths

Table 87: Neonatal deaths by neonatal classification (PSANZ-NDC) and gestational age NWH 2013

	Total neonatal deaths		< 37 weeks		≥ 37 weeks	
	N	%	n	%	n	%
Total	37		26		11	
Extreme prematurity	8	22	8	31		
Congenital abnormality	16	43	8	31	8	7
Infection	5	14	5	19		
Gastrointestinal			1	4		
Neurological	4	11	2	8	2	18
Cardio-respiratory disorders	2	5	1	4	1	6
Other	1	3	1	4		

The large majority of neonatal deaths (43%) are due to congenital abnormality with the second commonest classification being extreme prematurity (22%).

10.7 Postmortem

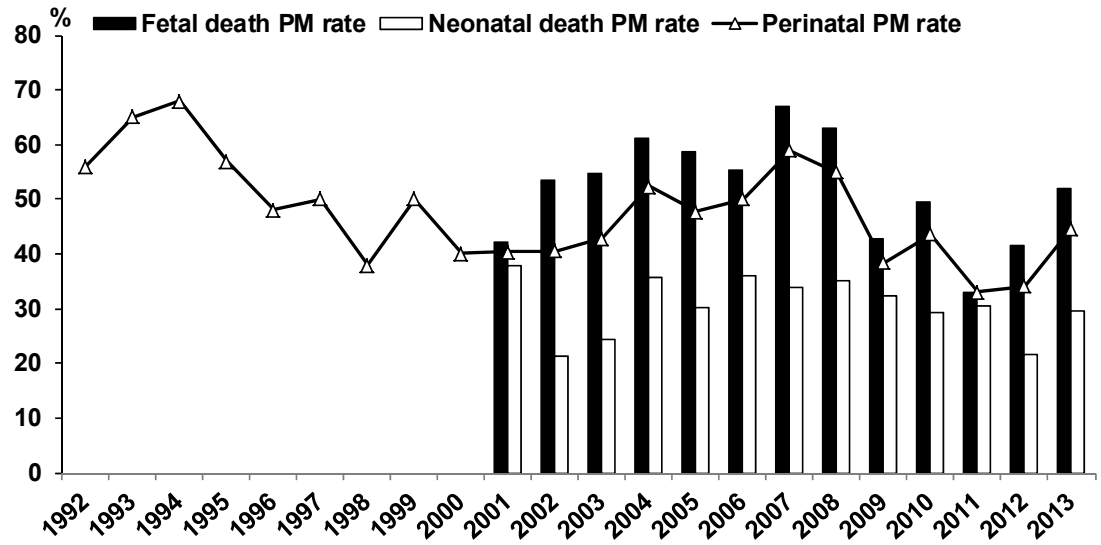


Figure 140: Postmortem rates NWH 1992-2013

Postmortem is the gold standard investigation for perinatal related death. NWH is fortunate to have access to a world-class perinatal pathology service provided by Drs Kate Bartlett, Kate Strachan and Jane Zuccollo. The post-mortem rate was 45% in 2013, less 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 114 deaths in 2013. This classification is **only** used when there is antenatal diagnosis of FGR or where pre-specified pathological criteria for FGR are identified.

However, of singleton perinatal deaths, 19/35 (54%) of stillbirths and 6/19 (32%) of neonatal deaths were small for gestational age by customised centiles.

National data from the PMMRC show that fewer than a quarter of non-anomalous SGA infants who are stillborn after 24 weeks of gestation were recognised to be SGA before birth. These data are not currently available for National Women's. Customised antenatal growth charts (GROW) were developed as a tool to increase detection of SGA infants before birth. A customised antenatal growth chart is now automatically generated for women booked at NWH and fundal heights and estimated fetal weights (if any growth scans are performed) are automatically recorded on the GROW chart. A recent publication from Adelaide reported that utilisation of GROW in routine practice doubled antenatal detection of SGA infants. (Roex A et al; Aust NZ J Obstet Gynaecol 2012) Antenatal detection needs to be accompanied by careful surveillance and timely delivery in order to improve outcomes in SGA infants. A reduction in stillbirth in three regions in the UK, where there has been widespread training and utilisation of GROW, has recently been reported. (Gardosi BMJ Open2013;3:e003942.doi) If SGA is suspected before birth best practice management is described in the recently published NZMFM SGA guideline (www.nzmfm.health.nz).

Chapter 11

SEVERE MATERNAL MORBIDITY

11 MATERNAL MORTALITY AND SEVERE MORBIDITY

This chapter provides data on maternal deaths and severe maternal morbidities among women giving birth at NW during 2013.

11.1 Maternal Mortality

In 2013 there were two maternal deaths among women who birthed at National Women's. These deaths have been referred to the Perinatal and Maternal Mortality Review Committee for independent review.

11.2 Emergency peripartum hysterectomy

Methods

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

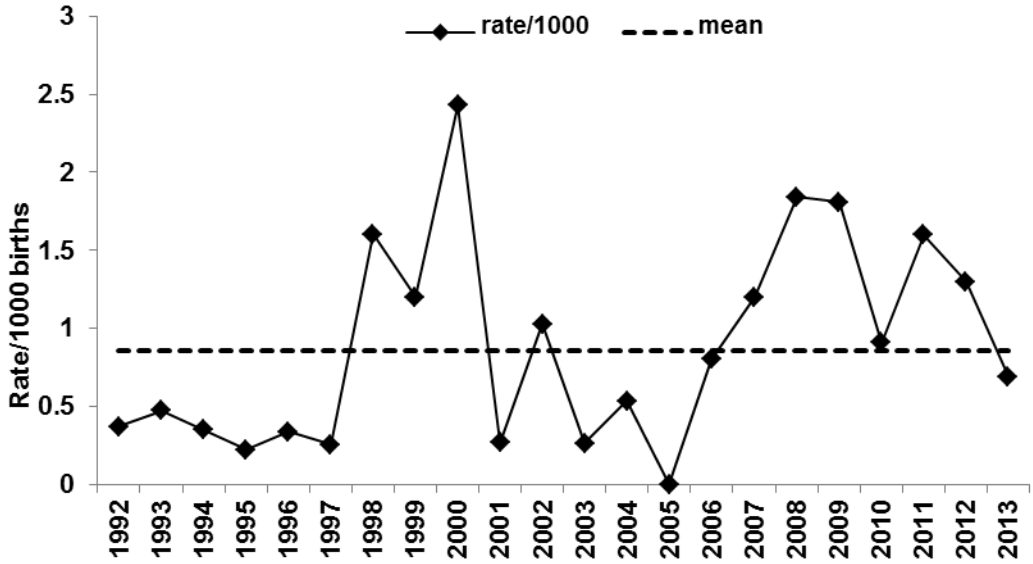


Figure 141: Emergency peripartum hysterectomy rates/1000 births NWH 1992-2013 (horizontal dotted line represents mean rate for 1992-2013)

Findings

There were 5 emergency peripartum hysterectomies in 2013 (0.69/1000 births), which is consistent with rates over the past 20 years, and is consistent with international rates. In the year 2000, there was a significantly higher rate than in the surrounding years.

11.3 Other Severe Maternal Morbidity

11.3.1 AMOSS reportable severe maternal morbidities

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

The current set of reportable conditions includes antenatal pulmonary embolism, amniotic fluid embolism, rheumatic heart disease in pregnancy, and gestational breast cancer. The conditions collected may vary from year to year. Data collection started in NZ in January 2010.

Rheumatic heart disease is defined as all pregnant women with rheumatic heart disease (RHD) diagnosed before or during the index pregnancy, using the following criteria:

1 Pregnant and confirmed rheumatic heart disease RHD* on echo *or*

2 Pregnant and an historic echo diagnosis of definite RHD* where recent echo details are not available

Table 88: Incidence (rate or ratio) of AMOSS reportable severe maternal morbidities NWH 2011-2013

	Women birthing 2011 n=7523		Women birthing 2012 n=7695		Women birthing 2013 n=7223	
Diagnosis	**n**	**/1000**	**n**	**/1000**	**n**	**/1000**
Antenatal pulmonary embolism	2	0.27	1	0.1	ND	
Amniotic fluid embolism	3	0.40	0		1	0.14
Eclampsia	2	0.27	0		3	0.42
Placenta accreta/percreta/increta	10	1.33	11	1.4	ND	
Rheumatic heart disease	ND		ND		20	2.8

ND=not collected in specified year

11.3.2 Admission to Intensive Care (Critical care or cardiovascular intensive care)

In 2013, there were again 20 admissions of pregnant or postpartum women to the department of critical care medicine (DCCM) or the cardiovascular intensive care unit (CVICU) at Auckland City Hospital. Five women were admitted antenatally, 14 postpartum, and 1 women had admissions in the antenatal and postpartum periods.

All of these mothers gave birth at Auckland City Hospital and so the admission rate in 2013 was 20/7223 = 2.8/1000 births. In 2011 there were 19 admissions of mothers who gave birth at Auckland City Hospital (2.5/1000 births) and in 2012 there were 20 (2.2/1000 births).

Of the 20 admissions, 7 women resided in ADHB area, 4 Counties Manukau, 2 Waitemata, 3 other DHB areas, and 4 women were non-resident from Pacific Islands.

The most common reasons for admission were pre-existing cardiac condition (7), infection (5), and postpartum haemorrhage (3). Cumulative length of stay ranged from 0.4 days to 23 days, with a mean stay of 2.8 days and a median stay of 1.1 days. Eleven women stayed for less than one day.

Chapter 12

GYNAECOLOGY

12 GYNAECOLOGY

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

12.1 Fertility PLUS

The DHBs in the Northern region have recently reviewed the public provision of fertility services. As a result of this review, Fertility PLUS has maintained its volumes of the public contract. The public volumes previously provided by Fertility Associates Auckland (FAA) have now been split between FAA and Repromed (another private fertility provider in Auckland). The public contract covers a full range of fertility services including Pre-implantation Genetic Diagnosis (PGD).

Fertility PLUS continues to provide private fertility treatment for those seeking an alternative private provider. Many GPs are unaware that Fertility PLUS can provide private IVF treatment.

Ethnicity of women presenting at Fertility PLUS for IVF/ICSI 2003 and 2013

Table 89: Ethnicity for IVF/ICSI cycles Fertility PLUS 2003-2013

	2003 N=301		2013 N=655	
	n	%	n	%
New Zealand European	139	46	300	46
Maori	11	4	15	2
Asian	43	14	100	15
Indian	35	12	100	15
Pacific Island	20	7	14	2
Other	32	10	74	11
Other European	21	7	52	8

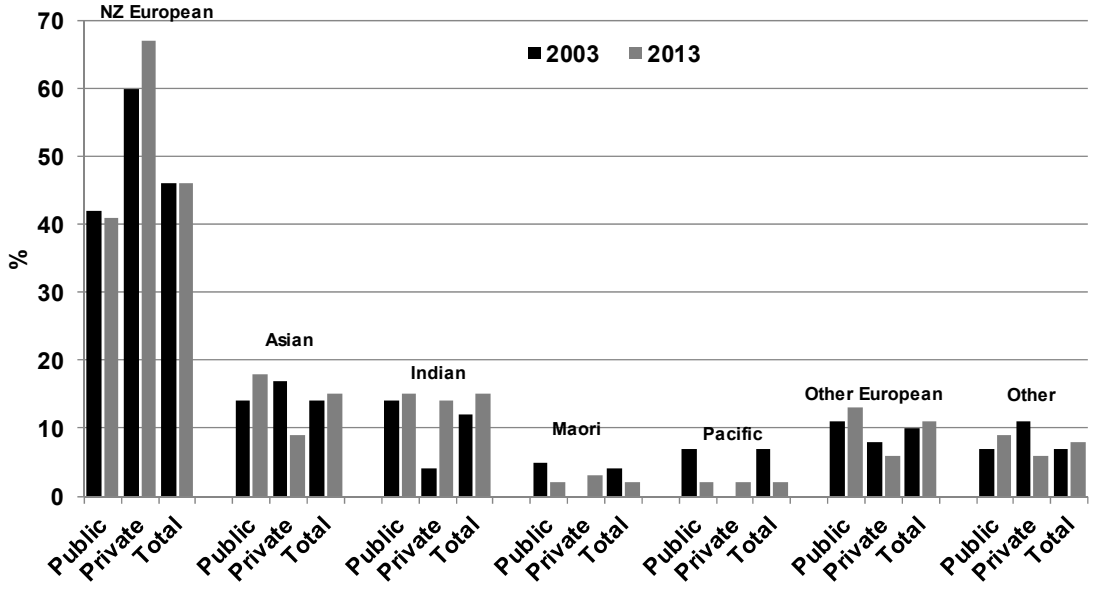


Figure 142: Ethnicity of women presenting for IVF/ICSI by funding and ethnicity Fertility PLUS 2003 and 2013

There is a perception that the ethnicity of women presenting for IVF/ICSI at Fertility PLUS has been changing over time. However, on checking the database there have not

been any major changes between 2003 and 2013. In both 2003 and 2013, women identifying themselves as New Zealand European accounted for 46% of the total (64% of private IVF cycles and 41% of public cycles). There was likewise very little difference in the 10 years in the proportion of women identifying themselves as Maori, Pacific Island, Asian, Indian, Other and Other European.

We are aware Maori women are under-represented in IVF/ICSI treatment cycles. In 2003, 4% of women identified themselves as Maori and in 2013 it was only 2%. Every year at our Strategic Planning Day, Fertility PLUS has sought advice from Maori GPs and other health care professionals as to ways we can ensure that Maori women are properly informed on fertility options and that they have access to consultations and treatment. This year, in collaboration with the Northern Regional Fertility Service (NRFS) Fertility PLUS is going to explore ways to ensure that Maori women in Northland are better informed and if we find barriers to treatment for these women, we will attempt to help them resolve the issues.

Single Embryo transfers (SET) and multiple birth rates 2003/2013:

Fresh IVF/ICSI cycles:
In 2003, almost all women who had two or more embryos available had two embryos transferred and if there were any other good quality embryos, they were frozen on Day three.

In 2003, only 6% of women under 36 years old had a single embryo transfer (SET). In all cases, this was because there was only one embryo available so it was not an elective SET. The Double Embryo Transfers (DET) in this age group resulted in 33% of the pregnancies being multiple births - all twins.

It then became mandatory for women under 36 years old having a first or second publicly funded transfer to have SET. This resulted in Fertility PLUS cautiously introducing extended culture to Day 5 or 6 so that a single blastocyst could be transferred.

In 2013, 91% of women under 36 years old had SET. There was only one twin pregnancy and this was the result of a single embryo transfer. The embryo had divided after transfer, giving rise to monozygotic (identical) twins. In the 9% of cases where two embryos were transferred there was one singleton birth and no twin births, reflecting the quality of the embryos transferred and the reason for the DET.

Table 90: Fertility PLUS: SET and multiple pregnancy NWH 2003-2013

	women <36 years receiving IVF n=376	SET n (%)	Twinning rate n (%)
2003	125	8 (6)	13 (33)
2013	251	228 (91)	1 (1*)

* From SET

When looking at fresh embryo transfers for all ages, moving to SET on Day 5 has seen the overall twinning rate at Fertility PLUS drop from 26% to just over 1%.

Table 91: Fertility PLUS: Frozen/thawed cycles NWH 2003-2013

	Women receiving IVF/ICSI N=410	Women having SET n (%)	Twinning rate n (%)
2003	117	19 (16)	3 (10)
2013	293	267 (91)	1 (1)

In 2003 the women having a single thawed embryo transferred only had one embryo, whereas in 2013 there was elective SET of a single blastocyst.

Male/female birth ratio:

There was some concern expressed when moving to Day 5 transfers that this could distort the male/female ratio as it was considered that male embryos develop faster than female, and would therefore reach the blastocyst stage earlier and be preferentially chosen for transfer. In 2012 which is the last year for which we have full birth details, the male/female ratio at birth after IVF/ICSI was 52% male, 48% female, which is the same as for the overall ratio of births at National Women's.

Volumes:

There has been a big increase in workload at Fertility PLUS between 2003 and 2013.

Table 92: Fertility PLUS: Frozen/thawed cycles NWH 2003-2013

	OPU for IVF/ICSI N	Thawed embryo cycles N	IUI (Intrauterine Inseminations) N
2003	246	145	128
2013	596	303	287

12.2 Termination of pregnancy

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

Epsom Day Unit provides both medical and surgical termination services. A medical termination involves the use of medications and is performed without the need for surgery and involves two appointments two days apart. The first appointment includes psychosocial, medical, legal certification and contraceptive education before the first medication is taken. Women return to EDU 48hrs later to take the second medication before going home to complete the process at home. Criteria for medical termination must be met.

The surgical termination service is also a two-day service but can cater for a one day system depending on a woman's circumstances. On day one, assessment is undertaken, including psychosocial, medical, legal certification, contraceptive prescription and education. The women will meet with a nurse, community doctor and a social worker if required. On day two a second certifying assessment is undertaken and, if certified, the surgical termination of pregnancy occurs.

Approximately 40% of women accessing the service in 2012 were resident in Counties Manukau DHB area, 30% from within ADHB and 30% from Waitemata DHB area. Interpreters were required by 5% of women accessing the service.

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

Table 93: Number of terminations NWH 2003-2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total number of terminations	5960	5809	5598	5548	5558	5550	5391	5049	4949	4535	4213

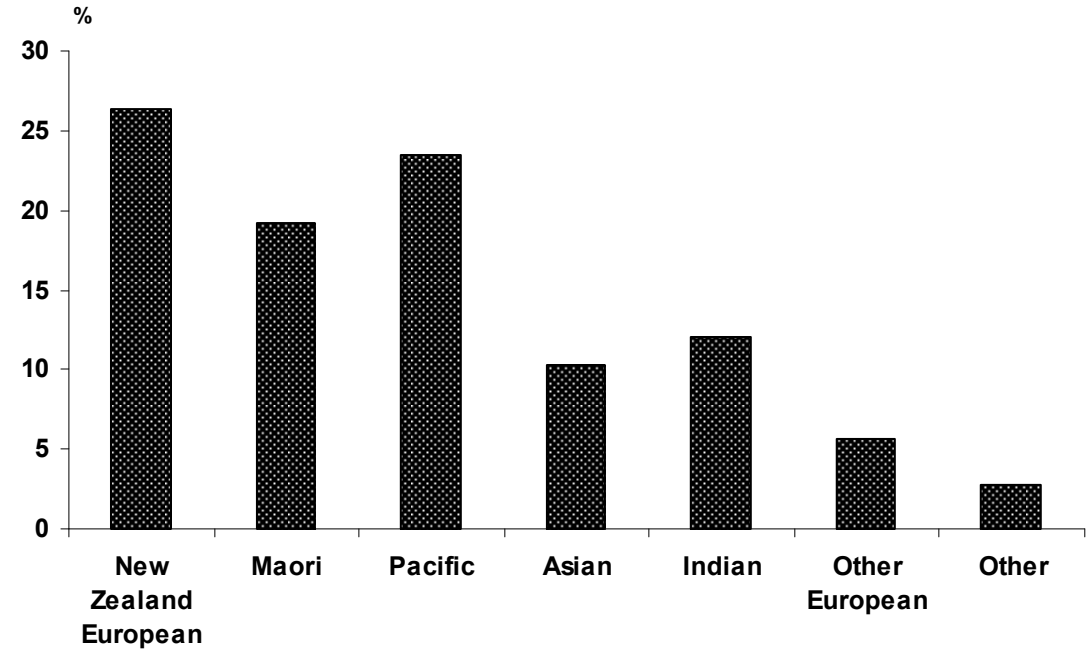
Table 94: Number of counselling sessions NWH 2003-2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
	n	n	n	n	n	n	n	n	n	n	n
Post op counselling	10	22	35	33	23	25	22	33	32	18	41
Pregnancy option counselling	70	92	89	87	86	99	102	84	76	64	84
Declines %	2.1	2.5	2.4	2.8	2.2	2.5	2.7	2.8	3.0	2.9	2.9

Pregnancy option counselling refers to an appointment a woman had with a social worker prior to her assessing appointment.

Declines refer to the number of women who do not meet the legal criteria for abortion as agreed by two certifying consultants.

Figure 143: Ethnicity of women having a first trimester termination of pregnancy NWH 2013



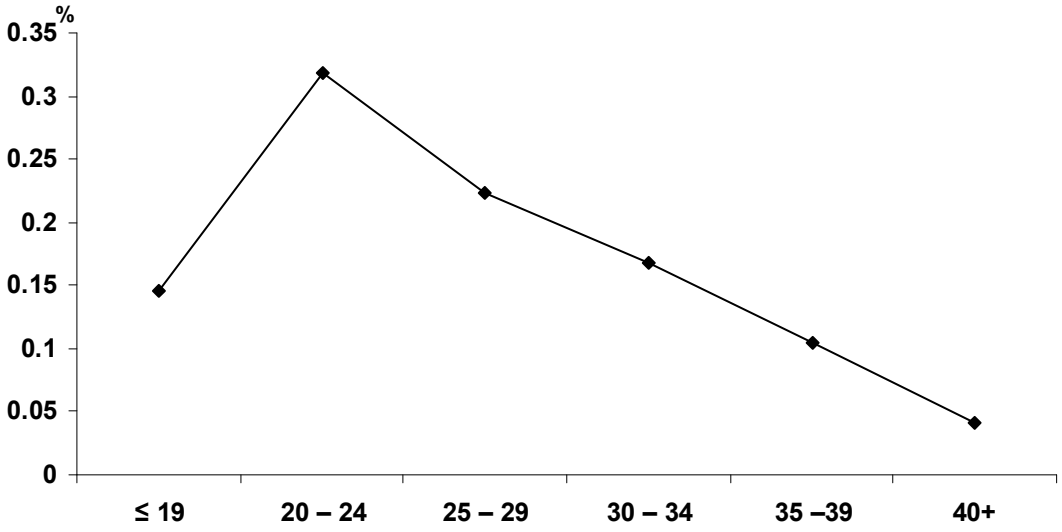


Figure 144: Age of women having a first trimester termination of pregnancy NWH 2013

There has been a 30% reduction in the number of first trimester termination of pregnancy procedures performed at Epsom Day unit since 2003. This reflects either, or a combination of, improved community education and knowledge with respect to planned pregnancy, improved access to family planning services, and subsidised long acting reversible contraceptive methods (including intrauterine devices and sub dermal implant devices). The majority of Jadelle sub-dermal implants are inserted at EDU by our nursing staff.

12.3 Second trimester termination of pregnancy

Methods:

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

Findings:

Table 95: Characteristics of women undergoing second trimester medical termination of pregnancy NWH 2009-2013

DHB of residence	2009 N=59		2010 N=46		2011 N=69		2012 N=52		2013 N=40	
	n	%	n	%	n	%	n	%	n	%
Auckland	53	90	37	80	56	81	44	85	32	80
Counties Manukau	4	7	3	7	9	13			6	15
Waikato	2	3	0				3	6		
Waitemata			3	7	3	4	3	6	2	5
Other			3	7	1	1	2	4		
Indication for termination of pregnancy										
Fetal anomaly	16	27	21	16	24	35	27	52	14	35
Intrauterine death	16	27	7	15	19	28	8	15	8	20
Maternal mental health	17	29	14	30	20	29	10	19	13	33
Spontaneous rupture of membranes	10	17	4	9	6	9	7	13	5	13
Gestation (wks)										
12					1	1	1	2		
13			3	7	4	6				
14	9	15	5	11	13	19	3	6	4	10
15	4	7	1	2	6	9	6	12	4	10
16	11	19	12	26	12	17	10	19	10	25
17	11	19	4	9	11	16	11	21	1	3
18	14	24	10	22	8	12	8	15	10	25
19	10	17	11	24	12	17	13	25	11	28
20					1	1				
21					1	1				

Forty women had a medical termination of pregnancy between 12 and 19 weeks in 2013.

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

The most common indications for second trimester medical termination of pregnancy were fetal anomaly and maternal mental health in 2013.

Table 96: Clinical details and outcomes of second trimester medical termination NWH 2009-2013

	2009 N=59		2010 N=46		2011 N=69		2012 N=52		2013 N=40	
	n	%	n	%	n	%	n	%	n	%
Mifegynae	47	80	44	96	64	93	46	88	36	90
PV misoprostol	55	93	45	98	68	99	50	96	38	95
Oral misoprostol										
Not given	12	20	4	9	23	33	8	15	6	15
1 dose	19	32	20	43	26	38	19	37	22	55
2 dose	13	22	11	24	9	13	10	19	4	10
3 doses	9	15	5	11	5	7	9	20	3	8
≥ 4 doses	6	10	6	13	6	9	6	12	5	13
Syntocinon infusion	9	15	7	15	6	9	5	10	4	10
Manual removal of placenta	6	10	7	15	3	4	3	6	3	8
Retained products of conception	1	2	3	7	4	6	6	12	4	10
Transfusion	1	2	3	7	0		0		2	5
Nights in hospital										
0	19	32	13	28	39	57	24	46	23	58
1	33	56	27	59	26	38	24	46	13	33
2-3	6	10	4	9	4	6	3	6	3	8
>3	1	2	4	9			1	2	1	3

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

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

Two women needed blood transfusions:

One woman had a retained placenta and ongoing bleeding and required one unit of blood in theatre.

The second woman had a complex medical history, ongoing bleeding, required uterine artery embolisation, admission to intensive care and blood transfusions.

12.4 Gynaecology inpatient surgery

Methods:

The data presented in this section are collected in a stand-alone Access database. Data are entered on all inpatient gynaecologic surgeries from Ward 97, excluding those performed by the Gynaecologic Oncology team (whose data are collected in a separate database and presented in Section 12.9). It is the intention of the service that surgical data are entered by the surgeon at point of care, and complications are entered later by the ward clerical staff. The data were compared to data from the PIMS Theatre database and from clinical coding in an attempt to improve accuracy. The numbers relate to episodes of surgery rather than individuals. Some individuals had more than one surgical episode in the year.

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

Findings:

In 2013, there were 1657 admissions to Ward 97 for general gynaecologic surgery; 1606 (96.9%) of these were for primary procedures, 44 (2.7%) were admissions for repeat surgery as a result of complications of surgery at ACH and 7 (0.4%) 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 97: Primary indication for primary inpatient gynaecologic surgery NWH 2009-2013

	2009* N=1224		2010 N=1569		2011 N=1628		2012 N=1528		2013 N=1606	
	n	%	n	%	n	%	n	%	n	%
Primary indication for surgery										
Abnormal bleeding, non-pregnant	241	19.7	280	17.9	384	25.1	379	23.3	359	22.4
Miscarriage / Termination	246	20.1	419	26.7	301	19.7	343	21.1	333	20.7
Urogynaecology / prolapse	170	13.9	205	13.1	202	13.2	203	12.5	218	13.6
Ovarian cyst	114	9.3	139	8.9	123	8.1	165	10.1	126	7.9
Abscess	56	4.6	73	4.7	60	3.9	72	4.4	45	2.8
Pain, cause unknown	61	5.0	70	4.5	82	5.4	95	5.8	88	5.5
Cancer / Pelvic mass	59	4.8	68	4.3	94	6.2	72	4.4	63	3.9
Endometriosis	100	8.2	116	7.4	94	6.2	98	6.0	77	4.8
Ectopic pregnancy	74	6.1	68	4.3	63	4.1	101	6.2	84	5.2
Infertility	21	1.7	33	2.1	21	1.4	21	1.3	42	2.6
Sterilisation	8	0.7	20	1.3	3	0.2	6	0.4	3	0.2
Other, please specify	74	6.1	78	4.9	101	6.6	73	4.5	168	10.5

* includes admissions for repeat surgery for complications

Abnormal bleeding in the non-pregnant patient remains the most common cause for gynaecologic surgery in 2013.

Table 98: Primary surgical procedure and timing of surgery among inpatient primary surgeries NWH 2013

		Timing of surgery			
	Total	Acute		Elective	
	N	n	%	n	%
Total	**1606**	**375**	**23.4**	**1231**	**76.7**
Ovarian and /or tubal surgery	173	91	52.6	82	47.4
Hysteroscopy	315	26	8.3	289	91.8
Evacuation retained products conception	162	113	69.8	49	30.3
Surgical termination of pregnancy	166	7	4.2	159	95.8
Urogynaecology procedure	198	4	2.0	194	98.0
Hysterectomy	188	6	3.2	182	96.8
Diagnostic laparoscopy	115	46	40.0	69	60.0
Endometriosis surgery	70	5	7.1	65	92.9
Other vulval procedure	60	411	68.3	19	31.7
Other uterine/cervical	100	22	22.0	78	78.0
Fibroid embolisation	17	1	5.9	16	94.1
Other	41	13	31.7	28	68.3
No surgery (deferred)	1				

Table 99: Demographic details of women having inpatient gynaecologic primary surgery NWH 2009-2013

	2009 N=1224		2010 N=1569		2011 N=1628		2012 N=1528		2013 N=1606	
	n	%	n	%	n	%	n	%	n	%
Ethnicity										
NZ European	478	39.1	590	37.6	615	37.8	578	37.8	635	39.5
Maori	133	10.9	174	11.1	167	10.3	154	10.1	168	10.5
Pacific	221	18.1	263	16.8	286	17.6	260	17.0	246	15.3
Other Asian	122	10.0	174	11.1	220	13.5	174	11.4	194	12.1
Indian	95	7.8	125	8.0	124	7.6	137	9.0	132	8.2
Other European	129	10.5	187	11.9	164	10.1	159	10.4	173	10.8
Other	36	2.9	47	3.0	44	2.7	57	3.7	51	3.2
Not stated	10	0.8	9	0.6	8	0.5	9	0.6	7	0.4
Age										
≤20	76	6.2	114	7.3	94	5.7	84	5.5	85	5.3
21-30	235	19.2	356	22.7	361	22.2	312	20.4	340	21.2
31-40	400	32.7	473	30.1	478	29.4	432	28.3	446	27.8
41-50	259	21.2	305	19.4	342	21.0	357	23.4	375	23.4
51-60	127	10.4	146	9.3	191	11.9	170	11.1	179	11.2
>60	127	10.4	175	11.2	161	9.9	170	11.1	179	11.2
Missing							3	0.2	2	0.1
BMI										
<19	27	2.2	47	3.0	59	3.6	44	2.9	66	4.1
19-25	356	29.1	589	37.5	648	39.8	636	41.6	681	42.4
26-30	221	18.1	311	19.8	335	20.6	350	22.9	360	22.4
31-35	114	9.3	178	11.3	196	12.0	203	13.3	197	12.3
>35	204	16.7	239	15.2	287	17.6	251	16.4	258	16.1
Missing	302	24.7	205	13.1	103	6.3	44	2.9	44	2.7
Smoking status										
Currently smoking	179	14.6	260	16.6	288	17.7	267	17.5	237	14.8
Past smoker	118	9.6	177	11.3	215	13.2	185	12.1	173	10.8
Never	675	55.2	988	63.0	1121	68.9	1074	70.3	1192	74.2
Unknown	252	20.6	144	9.2	4	0.3	2	0.1	4	0.2
DHB of residence										
Auckland	961	78.5	1231	78.5	1346	82.7	1236	80.9	1308	81.4
Counties Manukau	89	7.3	117	7.5	114	7.0	118	7.7	120	7.5
Waitemata	143	11.7	163	10.4	135	8.3	123	8.1	132	8.2
Other	31	2.5	58	3.7	615	37.8	51	3.3	38	2.4
Unknown									8	0.5

In 2013, 15% of patients admitted to being a current smoker – this figure is relatively unchanged over the last 5 years. Absence of clear documentation of smoking status in this unit is 0.2%.

BMI and smoking status are predictors of post-surgical morbidity and mortality.

Almost one in five patients having elective gynaecologic surgery at ADHB are domiciled outside the ADHB area.

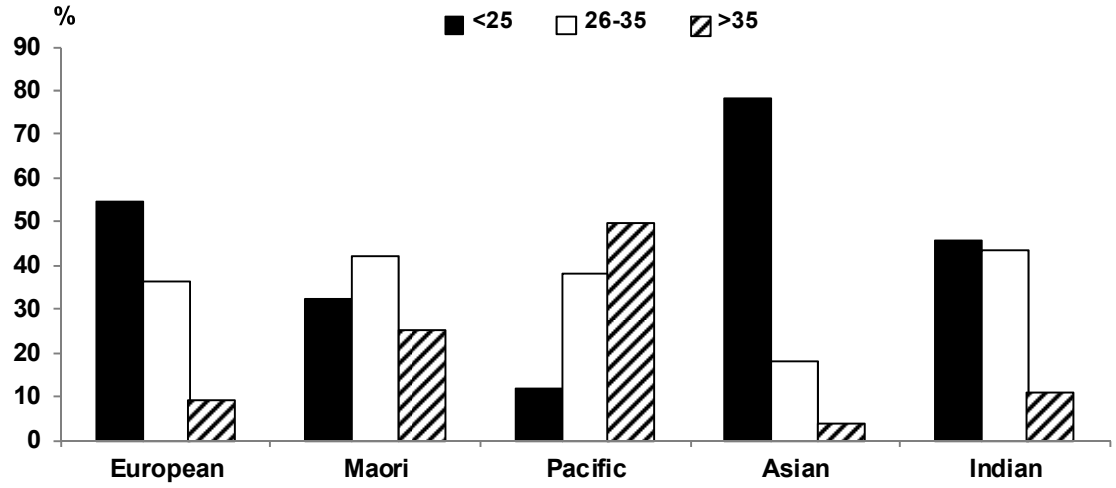


Figure 145: BMI by ethnicity among women having inpatient gynaecology surgery NWH 2013 (missing data removed)

Fifty-one percent of our elective surgical population in 2013 were overweight, and 16% were morbidly obese.

Data for height and weight were unavailable for 2.7% of patients in 2013.

Table 100: Intra operative injury at primary surgery NWH 2012-2013

	2012		2013	
	N=1528		N=1606	
	n	%	n	%
Bladder	7	0.5	10	0.6
Bowel	4	0.3	6	0.4
Ureter	2	0.13	2	0.1

Table 101: Postoperative complications among primary inpatient surgeries by PRIMARY surgical procedure NWH 2013. (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		Thrombo-embolic complication		Other significant complication		Admission to DCCM	
	n	N	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1606**	**219**	**13.6**	**19**	**1.2**	**18**	**1.1**	**58**	**3.6**	**20**	**1.2**	**21**	**1.3**	**121**	**7.5**	**11**	**0.7**	**3**	**0.2**	**22**	**1.4**	**10**	**0.6**
Ovarian and /or tubal surgery	174	21	12.1	0	0.0	3	1.7	8	4.6	1	0.6	0	0.0	9	5.2	3	1.7	0	0.0	1	0.6	2	1.1
Hysteroscopy	315	27	8.6	6	1.9	0	0.0	3	1.0	1	0.3	1	0.3	16	5.1	3	1.0	0	0.0	2	0.6	1	0.3
Urogynaecology procedure	198	27	13.6	1	0.5	5	2.5	1	0.5	2	1.0	1	0.5	20	10.1	1	0.5	0	0.0	3	1.5	0	0.0
Hysterectomy	188	54	28.7	1	0.5	6	3.2	16	8.5	12	6.4	8	4.3	31	16.5	1	0.5	2	1.1	9	4.8	2	1.1
Endometriosis surgery	70	5	7.1	0	0.0	2	5.7	0	0.0	2	2.9	1	1.4	3	4.3	1	1.4	0	0.0	0	0.0	0	0.0
Fibroid embolisation	17	4	23.5	0	0.0	0	0.0	1	5.9	1	5.9	1	5.9	3	17.6	0	0.0	0	0.0	1	5.9	0	0.0
Surgical termination of pregnancy	166	8	4.8	0	0.0	0	0.0	2	1.2	0	0.0	1	0.6	7	4.2	0	0.0	0	0.0	1	0.6	1	0.6
Evacuation retained products of conception	162	25	15.4	2	1.2	0	0.0	14	8.6	0	0.0	1	0.6	10	6.2	0	0.0	0	0.0	1	0.6	1	0.6
Diagnostic laparoscopy†	115	17	14.8	3	2.6	1	0.9	3	2.6	0	0.0	2	1.7	9	7.8	1	0.9	0	0.0	2	1.7	1	0.9
Other vulval procedure	59	3	5.1	0	0.0	0	0.0	0	0.0	1	1.7	2	3.4	2	3.4	0	0.0	0	0.0	0	0.0	0	0.0
Other uterine/cervical	100	18	18.0	3	3.0	0	0.0	7	7.0	0	0.0	2	2.0	8	8.0	0	0.0	1	1.0	1	1.0	0	0.0
Other	41	9	22.0	2	4.9	1	2.4	3	7.3	0	0.0	1	2.4	2	4.9	0	0.0	0	0.0	1	2.4	2	4.9
No surgery - abandoned	1	1	100.0	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0	1	100.0	0	0.0	0	0.0	0	0.0

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

Definitions of complications:

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

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

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

Other significant complications: Includes gastrointestinal complications (ileus, bowel obstruction), fistulae.

ACHS Gynaecology Indicators: Injury to major viscus		ACHS 2009	ACHS 2010	ACHS 2011	ACHS 2012	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**% (95% CI)**
Numerator	Injury to major viscus, with repair, during or up to 2 weeks post operation	0.32	0.32	0.40	0.38	0.32	0.98	4/1569 =0.25	11/1643 =0.67	13/1528 =0.85	18/1606 =1.12 (0.67-1.77)
Denominator	Gynaecological surgeries										

Table 102: Complications of surgery by timing of surgery NWH 2013

	Acute admission N=375		Elective admission N=1231	
	n	**%**	**n**	**%**
Any complication	66	17.6	153	12.4
Failure to complete planned procedure	2	0.5	18	1.5
Intra operative injury to internal organs	1	0.3	17	1.4
Significant post op infection	2	0.5	18	1.5
Anaesthetic complication	2	0.5	9	0.7
Other significant complication	4	1.1	18	1.5
Thromboembolic complication	1	0.3	2	0.2
Unplanned return to theatre in 6 weeks	6	1.6	15	1.2
Admission to DCCM	7	1.9	3	0.2
Readmission in 6 weeks (postop complication or planned)	26	6.9	95	7.7
Transfusion	35	9.3	23	1.9

12.5 Gynaecology laparoscopic procedures

Methods

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

Table 103: Primary surgery performed, and timing of surgery among women having inpatient primary laparoscopic procedures NWH 2013

Primary procedure	Surgery in 2013 N=377	Acute admission		Elective admission	
	n	n	%	n	%
Total	**377**	**126**	**33.4**	**251**	**66.6**
Ovarian/tubal	133	75	56.4	58	43.6
Diagnostic laparoscopy	102	42	41.2	60	58.8
Endometriosis surgery	65	5	7.7	60	92.3
Hysterectomy	41	0		41	100
Other uterine/cervical procedure	5	2	40	3	60
Hysteroscopy	27	2	7.4	25	92.6
Urogynaecology	2	0		2	
Other	2	0		2	

Table 104: Primary indication for surgery by timing of surgery among women having primary inpatient laparoscopic procedures NWH 2013

Primary indication	Surgery in 2013 N=377	Acute admission		Elective admission	
	n	n	%	n	%
Total	**377**	**126**	**33.4**	**251**	**66.6**
Endometriosis	74	4	5.4	70	94.6
Ovarian cyst	80	25	31.3	55	68.8
Ectopic pregnancy	74	2	2.7	72	97.3
Pain, cause unknown	65	24	36.9	41	63.1
Abnormal bleeding	32	0		32	
Infertility	25	0		25	
Cancer/pelvic mass	9	0		9	
Sterilisation	3	0		3	
Other	15	1	6.7	14	93.3

In 2013, there were 377 laparoscopic procedures, 251 elective and 126 acute procedures. Sixty percent of gynaecologic laparoscopic surgeries in 2012 were for endometriosis, ovarian cysts or ectopic pregnancy.

ACHS Gynaecology Indicators: Injury to MAJOR VISCUS during a laparoscopic procedure							
Numerator	Injury to major viscus during laparoscopic procedure, with repair, during or up to 2 weeks post operation	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Denominator	Laparoscopic procedures	**%**	**%**	**%**	**%**	**%**	**%**
	ACHS	**0.67**	**0.59**	**0.51**	**0.62**	**0.68**	
	NW	**1.6**	**1.6**	**0**	**0.95**	**0.29**	**6/377 =1.6 (0.6-3.4)**

Table 105: Complications of primary inpatient gynaecologic laparoscopic surgery NWH 2013

	Total N=377	
	n	%
ANY COMPLICATION	**44**	**11.7**
Blood transfusion	9	2.4
Intra operative injury	4	1.1
Failure to complete procedure	3	0.8
Anaesthetic complications	4	1.1
Significant post-operative infection	4	1.1
Unplanned return to theatre	6	1.6
Admission to DCCM	1	0.3
Readmission to hospital	34	9.0
Post op complications	22	5.8
Planned re admission	2	0.5
Other	10	2.7
Other significant complications	3	0.8

In 2013 there were four major intra-operative injuries sustained at laparoscopic surgery.

Bladder injury:

1. Recognised at time of Total laparoscopic hysterectomy (TLH) in a patient with three previous lower segment Caesarean sections, repaired intraoperatively via laparoscopy, and
2. A delayed presentation thought to be related to a 5mm suprapubic port injury, which was managed successfully conservatively with a catheter for 7 days.

Bowel injury:

Two clinical cases where a bowel injury was sustained, both in patients with stage 4 advanced deep infiltrative endometriosis.

1. One recognised and repaired intra operatively, and
2. Delayed presentation at day 4 - requiring laparotomy, bowel resection and interval ileostomy.

The surgical management of severe endometriosis frequently involves bowel surgery and a forum for pre-operative multidisciplinary discussion has now been established.

There were nine perioperative transfusions, eight associated with haemoperitoneum (seven ruptured ectopic pregnancies, one bleeding from a corpus luteal cyst). The final case had intraoperative bleeding at myomectomy.

Three cases were not completed as planned; in all these cases they were re-scheduled due to extensive endometriosis.

There were 34 readmissions following surgery. The majority were related to pain, ten of whom were seen and discharged from Women's Assessment Unit (WAU), and five cases who required return to theatre (three for drainage of vault haematoma, one for laparotomy and bowel resection and one for ruptured ectopic post methotrexate (in whom the criteria for methotrexate treatment were met)).

Readmissions were not increased following the introduction of the enhanced recovery after surgery program in gynaecology (ERAS) in 2012 but remain an area where improvement could occur.

12.6 Hysterectomy

Methods

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

Findings

Table 106: Characteristics of women undergoing hysterectomy as primary surgery (excluding gynaecologic oncology) NWH 2012-2013

	2012 N=175		2013 N=205	
	n	%	n	%
Age				
≤20	0		1	2.5
21-30	1	0.6	1	2.5
31-40	37	21.7	26	12.7
41-50	85	48.6	100	48.8
51-60	28	16.0	45	22.0
>60	24	13.7	31	15.1
Unknown			1	0.5
Ethnicity				
NZ European	62	35.4	75	36.6
Maori	16	9.1	23	11.2
Pacific	28	16.0	36	17.6
Other Asian	23	13.1	26	12.7
Indian	22	12.6	25	12.2
Other European	21	12.0	16	7.8
Other	2	1.1	2	1.0
Not Stated	1	0.6	2	1.0
District Health Board of residence				
Auckland	158	90.3	194	94.6
Counties Manukau	6	3.4	2	1.0
Waitemata	7	4.0	6	2.9
Other	4	2.3	2	1.0
Unknown			1	0.5
BMI				
<18.5	2	1.1	7	3.4
18.5-24.99	51	29.1	50	24.4
25-29.99	54	30.9	62	30.2
30-34.99	37	21.1	42	20.5
35-39.99	19	10.9	30	14.6
>=40	12	6.7	14	6.8
Missing	0			
Smoking				
Currently smoking	29	16.6	32	15.6
Past smoker	23	13.1	18	8.8
Never smoked	123	70.3	155	75.6
Unknown	0		0	

There were 30 more women undergoing hysterectomy in 2013 than in 2012. The ethnicity of the women undergoing hysterectomy in 2012 and 2013 does not reflect the ethnicity of the population who reside within the AHDB region. The proportion of women who underwent hysterectomy who are NZ European is lower (36%)

compared to 52% in the ADHB region. This may be due to higher proportions of NZ European women seeking private medical care. In 2013 72% of women who underwent hysterectomy had a BMI ≥ 25 and 21% had a BMI ≥35. There were seven women who had a hysterectomy who were aged under 35 and the reasons were failed medical treatment in two women, two women with endometrial hyperplasia, one woman with a large complex ovarian cyst in associated with large uterus, one woman with gender change request, and one woman with a complicated ectopic pregnancy.

Table 107: Surgical details of hysterectomies (excluding gynaecologic oncology) NWH 2009-2013

	2009 N=162		2010 N=173		2011 N=166		2012 N=175		2013 N=205	
	n	%	n	%	n	%	n	%	n	%
Approach										
Laparotomy	104	63	90	52.0	107	64.5	107	61.1	105	51.2
Total laparoscopic hysterectomy	9	6	20	11.6	15	9.0	24	13.7	34	16.6
Laparoscopic assisted vaginal	7	4	15	8.7	12	7.2	8		8	3.9
Laparoscopic converted to laparotomy	5	3	2	1.2	3	1.8	6	3.4	2	1.0
Vaginal	37	23	46	26.6	29	17.5	30	17.1	56	27.3
Timing of surgery										
Elective	155	96	170	98.3	164	98.8	173	98.9	198	96.6
Acute	7	4	3	1.7	2	1.2	2	1.1	7	3.4
Primary indication for surgery										
Abnormal bleeding, non-pregnant	72	44	76	43.9	75	45.2	84	48.0	98	47.8
Cancer /pelvic mass	40	24	37	21.4	37	22.3	43	24.6	40	19.5
Urogynaecology / prolapse	24	15	41	23.7	25	15.1	21	12.0	36	17.6
Pain, cause unknown	4	2	2	1.2	6	3.6	8	4.6	6	2.9
Endometriosis	6	4	9	5.2	5	3.0	5	2.9	5	2.4
Ovarian cyst	9	6	3	1.7	12	7.2	6	3.4	6	2.9
Other	7	4	5	2.9	6	3.6	8	4.6	14	6.8
ASA rating										
1	51	31	58	33.5	57	34.3	65	37.1	66	32.2
2	71	44	72	41.6	81	48.8	86	49.1	98	47.8
3	9	6	24	13.9	20	12.1	17	9.7	35	17.1
5	0		0		0		0		0	
Missing	31	19.1	19	11.0	8	4.8	7	4.0	6	2.9
LENGTH OF STAY	**Median(IQR)**		**Median(IQR)**		**Median(IQR)**		**Median(IQR)**		**Median(IQR)**	
All hysterectomies	4	**(3-5)**	4	(3-5)	4	(3-5)	3	(3-4)	3	(2-4)
By approach:										
Laparotomy	4	(4-5)	4	(3-5)	4	(4-5)	3	(3-4)	3	(3-4)
Laparoscopy	3	(2-3)	3	(2-4)	3	(3-5)	3	(2-3.5)	2	(2-2)
Vaginal	3	(3-4)	3	(3-4)	3	(2-3)	3	(2-4)	3	(2-3)

There were 26 more vaginal hysterectomies performed in 2013 compared to 2012. There was also an increase in the number of women who had a primary indication for surgery of prolapse and abnormal bleeding. The increase in vaginal hysterectomy is likely to be explained by the increase in women undergoing prolapse repair.

Table 108: Route of hysterectomy among non-malignant hysterectomies NWH 2005-2013

	2005 N=161		2006 N=131		2007 N=189		2008 N=150		2009 N=162		2010 N=173		2011 N=166		2012 N=175		2013 N=205	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Abdominal	86	53	81	61.8	109	57.7	88	58.7	109	67	92	53.2	110	66.3	113	64.6	107	52.2
Vaginal	54	34	36	27.5	67	35.4	45	30.0	37	23	46	26.6	29	17.5	30	17.1	56	27.3
Laparoscopic	21	13.0	14	10.7	13	6.9	17	11.3	16	10	35	20.2	27	16.3	32	18.3	42	20.5

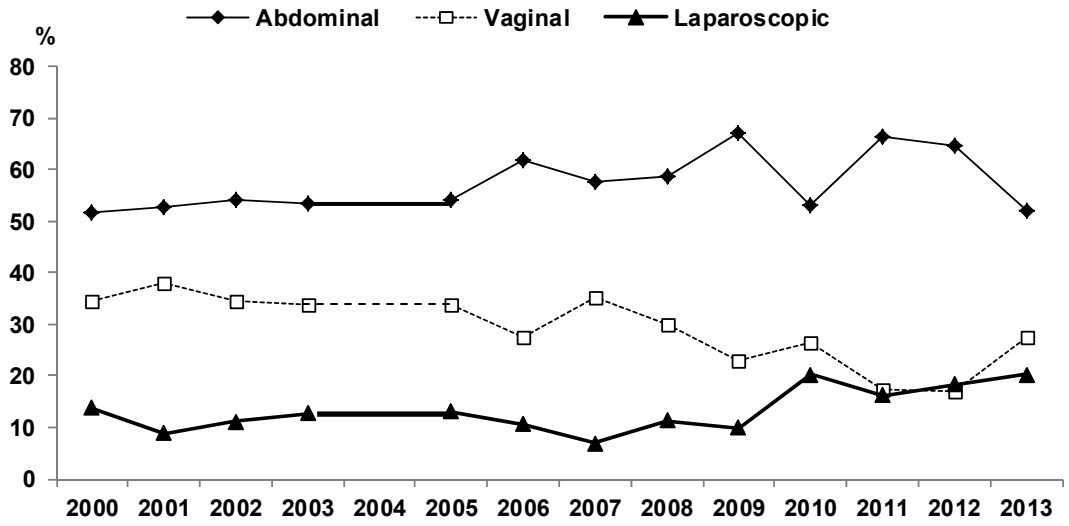


Figure 146: Route of hysterectomy among non-malignant hysterectomies NWH 2000-2013

ACHS Gynaecology Indicators: Injury to URETER during a LAPAROSCOPIC HYSTERECTOMY								
Numerator	Injury to ureter during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation		**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Denominator	Laparoscopic hysterectomy procedures		**%**	**%**	**%**	**%**	**%**	**%**
		ACHS	**0.57**	**0.23**	**0.18**	**0.066**	**0.32**	
		NW	**0/17**	**0/16**	**0**	**0/27**	**0/32**	**0/42**

ACHS Gynaecology Indicators: Injury to BLADDER during a LAPAROSCOPIC HYSTERECTOMY								
Numerator	Injury to bladder during a laparoscopic hysterectomy, with repair, during or up to 2 weeks post operation		**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Denominator	Laparoscopic hysterectomy procedures		**%**	**%**	**%**	**%**	**%**	**%**
		ACHS	**0.48**	**0.78**	**0.64**	**0.27**	**1.0**	
		NW	**0/17**	**0/16**	**0**	**0/27**	**0/32**	**1/42 =2.4**

There was one case of bladder injury and no cases of ureteric injury reported in the past six years of laparoscopic hysterectomy.

Table 109: Complications of surgery among women undergoing hysterectomy (excluding gynaecologic oncology) NWH 2010-2013

	2010 N=173		2011 N=166		2012 N=175		2013 N=205	
	n	%	n	%	n	%	n	%
Any complication	**45**	**26.0**	**48**	**28.9**	**50**	**28.6**	**58**	**28.3**
Blood transfusion	18	10.4	14	8.4	19	10.9	18	8.8
Intraoperative injury	2	1.2	7	4.2	4	2.3	6	2.9
Anaesthetic complications	2	1.2	1	0.6	2	1.1	1	0.5
Significant postoperative infection	5	2.9	5	3.0	2	1.1	12	5.9
Other significant complications	11	6.4	8	4.8	6	3.4	11	5.4
Unplanned return to theatre	7	4.1	8	4.8	3	1.7	9	4.4
Admission to DCCM	2	1.2	2	1.2	2	1.1	2	1.0
Readmission to hospital for post-op complications	19	11.0	29	17.5	30	17.1	28	13.7
Failed to complete planned surgery	1	0.6	2	1.2	3	1.7	1	0.5

The blood transfusion rate in 2013 continues to be high (8.8%) and is not explained by high BMI as only 6 of the 60 hysterectomies who required a blood transfusion had a BMI ≥35. The proportion of women with any complications has not changed over the past four years. There was a small increase in the number of intraoperative injuries in 2013 compared with 2012. The intraoperative injuries in 2013 included two bowel injuries and three bladder injuries and one ureteric tear (requiring stenting). There were nine patients with an unplanned return to theatre, including two women with a wound dehiscence (one in association with infection) and 4 who required drainage of a haematoma. There was an increase in the number of post-operative infections including 6 women who also had a pelvic collection. Two patients were admitted to the Department of Critical Care, one was a woman with a BMI of 60 and wound infection following a hysterectomy for heavy bleeding and the second woman was admitted overnight following surgery for a Stage 1 endometrioid adenocarcinoma of the endometrium and a number of comorbidities including BMI of 50.

Of the 205 patients who underwent hysterectomy in 2013, 44 (21%) had a BMI ≥35. Of women with BMI ≥35, 6 (14%) had a blood transfusion, 2 had an intraoperative injury, 3 had pelvic and wound infections, 1 had a wound dehiscence, there were no unplanned returns to theatre and 7 (19%) had a readmission. The indications for hysterectomy in women with a BMI ≥35 were abnormal bleeding in 16 (36%), pelvic mass in 12 (27%) and urogynaecology/prolapse in 6 (14%).

Summary / Implications

Although the proportion of abdominal hysterectomy has declined this is explained by the increase in the number of women with prolapse. The proportion of women requiring blood transfusion at the time of hysterectomy remains high and this should continue to be audited. The length of stay has declined in all women undergoing hysterectomy for benign causes.

We have over the last 6 months been working closely with our colleagues from the ADHB blood transfusion committee to set up an iron infusion pathway across primary, secondary and tertiary Gynaecology services. We hope to see this translate directly into reduced transfusion rates in Gynaecology services by the next annual report.

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. From 2012, urogynaecology procedures were categorised as: procedures including hysterectomy; incontinence tape procedures; prolapse repairs using synthetic mesh augmentation; 'other' prolapse repairs.

Findings

Table 110: Demography of women undergoing primary inpatient urogynaecology surgery NWH 2012-2013

	2012 N=175		2013 N=235	
	n	%	n	%
Age				
≤ 30	1	0.5	5	2.1
31-40	12	5.7	15	6.4
41-50	40	18.9	58	24.7
51-60	61	28.8	60	25.5
>60	98	46.2	97	41.3
Ethnicity				
NZ European	115	54.3	133	56.6
Maori	17	8.0	20	8.5
Pacific	17	8.0	20	8.5
Other Asian	13	6.1	12	5.1
Indian	8	3.8	20	8.5
Other European	32	15.1	26	11.1
Other	9	4.3	4	1.7
Not stated	1	0.5		
District Health Board of residence				
Auckland	175	82.6	201	85.5
Counties Manukau	11	5.2	6	2.6
Waitemata	13	6.1	10	4.3
Other	13	6.1	18	7.7
BMI				
<18.5	2	0.9	2	0.9
18.5-24.99	65	30.7	64	27.2
25-29.99	70	33.0	81	34.5
30-34.99	50	23.6	52	22.1
35-39.99	11	5.2	23	9.8
>=40	14	6.6	13	5.5
Smoking				
Currently smokes	19	9.0	23	9.8
Past smoker	31	14.6	31	13.2
Never smoked	162	76.4	181	77.0
Length of stay Median (IQR)	2	(1-3)	2	(1-3)

In 2013, 235 women had an urogynaecology procedure as a primary admission. A further seven urogynaecology procedures were performed as post discharge procedures, six after primary procedures at ACH and one after a primary procedure at another hospital.

Of the 235 primary admissions, there were 109 TVTs, 9 mesh repairs, 133 prolapse repairs, and 62 other urogynaecology procedures. Fifty six women had two urogynaecology procedures and 7 had three procedures at primary surgery.

Thirty eight women also had a hysterectomy at the time of their primary admission for urogynaecology surgery.

ACHS Gynaecology Indicators: Injury to MAJOR VISCUS during a pelvic floor repair procedure							
Numerator	Injury to major viscus during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Denominator	Pelvic floor repair procedures*	**%**	**%**	**%**	**%**	**%**	**%**
	ACHS	**1.03**	**0.81**	**0.85**	**0.80**	**1.0**	
	NW	**1.2**	**2.3**	**0.5**	**0.9**	**3.3**	**5/235= 2.1 (0.7-4.9)**

* includes isolated incontinence procedures

ACHS Gynaecology Indicators: Injury to URETER during a pelvic floor repair procedure							
Numerator	Injury to ureter during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Denominator	Pelvic floor repair procedures*	**%**	**%**	**%**	**%**	**%**	**%**
	ACHS	**0.55**	**0.046**	**0.037**	**0.16**	**0.15**	
	NW	**0**	**0**	**0**	**0**	**0.9**	**0**

* includes isolated incontinence procedures

ACHS Gynaecology Indicators: Injury to BLADDER during a pelvic floor repair procedure							
Numerator	Injury to bladder during pelvic floor repair procedure, with repair, during or up to 2 weeks post operation	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Denominator	Pelvic floor repair procedures*	**%**	**%**	**%**	**%**	**%**	**%**
	ACHS	**0.94**	**0.37**	**0.48**	**0.40**	**0.53**	
	NW	**0.6**	**2.3**	**0.5**	**0.9**	**1.9**	**5/235= 2.1 (0.7-4.9)**

* includes isolated incontinence procedures

Table 111: Complications of primary urogynaecologic surgery procedures NWH 2013

	N=235	
	n	%
Total complications	**37**	**15.7**
Blood transfusion	5	2.1
Intra-operative injury to internal organs	5	2.1
Failure to complete planned surgery	1	0.4
Anaesthetic complications	1	0.4
Significant postoperative infection	5	2.1
Other significant complications	4	1.7
Unplanned return to theatre	4	1.7
Admission to DCCM	0	
Readmission to hospital	33	14.0
Postoperative complication	19	8.1
Planned re-admission	9	3.8
Other	5	2.1

The complications summarised in the table above were seen in a total of 37 women who underwent urogynaecological surgery. As the figures indicate, some individuals had more than one complication recorded.

The urogynaecology case mix has been similar to previous years, however following the controversy in the United States we continue to be more cautious using mesh for vaginal prolapse surgery. There were only 9 prolapse repairs that required placement of mesh. Eight meshes were placed vaginally and one patient had mesh placed abdominally.

The operative complications have been analyzed.

There were no injuries to ureters or bowel reported this year.

There were five bladder injuries.

1. One was a cystotomy at dissection in a lady who had had previous prolapse surgery. This was repaired without complication and she had a vaginal mesh placed. The indwelling catheter remained for a week. She had a normal cystogram to confirm bladder integrity after which the catheter was removed.
2. There were four bladder injuries sustained at placement of TVT trocars - This is a rate of 3.6%. The Cochrane database quotes a rate of 6%. The patients had the trocars replaced correctly and were then catheterized for between 1 and 3 days and all made a good recovery.

There were five women who required blood transfusion for symptomatic anaemia, four associated with vaginal hysterectomy and one women had a pre-operative hemoglobin of 75g/l and then went on to have a hysteroscopy and D&C for menorrhagia and a prolapse repair. She only lost 200mls of blood but was still symptomatic post operatively.

Two women required to return to theatre to evacuate a vault haematoma. One of these also went back a second time to release a sacrospinous suture due to pain. A third woman was readmitted for pain and signs of infection and had a vault haematoma drained radiologically. The final woman had bleeding from the vaginal vault post operatively and this was halted by vaginal packing on the ward.

There were two other women who required a return to theatre. They went back at 2 and 4 weeks for release of TVT due to the inability to pass urine. Both women were able to pass urine once their catheters were removed. Women are usually counseled

of a 5% chance of voiding dysfunction following a tension free vaginal tape procedure, although not all of these will require release of tape.

Nine women had a planned post-operative readmission for trial of removal of catheter and a further 19 readmissions were due to post-operative complications. Eleven of these were for infection, and the remainder for pain, catheter issues, constipation, and side effects from medications.

In summary, 2013 has seen more vaginal hysterectomies, increasing from 21 to 38, and an improvement in major viscus injuries in that there were no ureter or bowel injuries. There were however more bladder injuries. These were at the lower end of the severity spectrum and all patients recovered well. The concern this year is that we have had more patients who required blood transfusion. One patient was admitted anaemic but four required blood transfusion after hysterectomy. This is a big jump from last year and gives a rate of 10.5%. This does compare with the rest of gynaecology but is still a high rate.

12.8 Colposcopy

Methods:

The data presented in this section arise from data collected from 2009-2011 into Healthware and data collected into the (Solutions Plus) Colposcopy database from July 2012. Data are not included for the transition period from January-July 2012.

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

Follow up colposcopies are not included in the data analysis, although there were 553 follow up and 247 follow up after treatment appointments in 2013, giving a total of 2206 colposcopies performed within the department in 2013.

In addition to this there were 363 treatments, 122 discussion appointments and 2506 virtual appointments. This gives a total of 5197 patient episodes for the year.

Findings:

Table 112: Demographic details of women having an initial colposcopic examination in NWH 2009-2013

	Initial colposcopy in 2009 N=993		Initial colposcopy in 2010 N=1214		Initial colposcopy in 2011 N=1289		Initial colposcopy July-Dec 2012 N=759		Initial colposcopy in 2013 N=1406	
	n	%	n	%	n	%	n	%	n	%
Ethnicity										
NZ European	427	43.0	543	44.7	569	44.1	305	40.2	682	48.5
Maori	95	9.6	113	9.3	121	9.4	51	6.7	105	7.5
Pacific	104	10.5	109	9.0	126	9.8	83	10.9	131	9.3
Indian	37	3.7	63	5.2	56	4.3	45	5.9	56	4.0
Other Asian	158	15.9	198	16.3	198	15.4	112	14.8	198	14.1
Other European	131	13.2	145	11.9	180	14.0	139	18.3	173	12.3
Other	20	2.0	16	1.3	14	1.1	24	3.2	61	4.3
Not stated	21	2.1	13	13	25	1.9	0		0	
Age (yrs)										
≤20	28	2.8	29	2.4	40	3.1	10	1.3	7	0.5
21-25	422	42.5	422	34.8	535	41.5	312	41.1	281	20.0
26 -30									271	19.3
31-40	245	24.7	389	32.0	374	29.0	199	26.2	447	31.8
41-50	195	19.6	218	18.0	189	14.7	128	16.9	216	15.4
51-60	76	7.7	106	8.7	108	8.4	87	11.5	136	9.7
>60	27	2.7	50	4.1	43	3.3	23	3.0	48	3.4
Smoking status										
Currently smoking	228	23.0	266	21.9	279	21.6	64	8.4	131	9.3
Not currently smoking	757	76.2	943	77.7	981	76.1	174	22.9	467	33.2
Unknown	8	0.8	5	0.4	29	2.3	521	68.6	808	57.5
Referral to smoking cessation	223	22.5	255	21.0	259	20.1	NA	NA	NA	NA
DHB of residence										
Auckland	927	93.4	1131	93.2	1188	92.2	709	93.4	1317	93.7
Counties Manukau	18	1.8	25	2.1	22	1.7	14	1.8	27	1.9
Waitemata	33	3.3	39	3.2	48	3.7	25	3.3	38	2.7
Other	15	1.5	49	4.0	31	2.4	11	1.4	24	1.7

NA=not available

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

this only makes up 6.3% of the total new referrals, generally these are divided between 2 clinicians and with follow ups, make up a significant proportion of these clinics. Long term strategic planning must include succession planning and expansion of FTE in this area.

The number of women under 20 being seen in the clinic is now minimal, with only seven referred, and it is reassuring that NZ guidelines are increasingly being adhered to. However this is still seven too many.

The smoking data are incomplete and reflect that this is not a mandatory field in the database. This should have been addressed at the upgrade of the database, which was planned for the end of 2013, but has been delayed due to the upgrade of the hospital system to Windows 7. It is hoped that this will now be achieved by the end of 2014.

Colposcopy Standards: Documentation of adequacy of examination		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013
	Definition	%	%	%	%	%	%	%
Numerator	Documented that entire squamo-columnar junction is seen and whether the upper limit of any cervical lesion is seen	100	97	99.9	93	95.7	100	100
Denominator	All colposcopic examinations							

Table 113: Documentation of adequacy of colposcopic examination by type of colposcopic visit NWH 2013

	Total N=2260		Follow up visit N=219		Initial visit N=1406	
	n	%	n	%	n	%
Satisfactory examination	1943	86.0	168	76.7	1252	89.0
Unsatisfactory examination	286	12.7	35	16.0	154	11.0
Not applicable	31	1.4	16	7.3	0	0.0

This standard has been met following the introduction of mandatory fields in electronic data collection.

Table 114: Clinical characteristics of women presenting for initial colposcopy NWH 2013

	Initial visit N=1406	
	n	%
Referral reason		
Abnormal Screening Smear	879	62.5
Positive High risk HPV test	284	20.2
Abnormal Smear After Colposcopy	118	8.4
Bleeding	76	5.4
Unusual Appearing Cervix	37	2.6
Clinically Suspicious Cervix	3	0.2
Other	9	0.6
Referral smear cytology		
High grade	324	23.0
Low grade	936	66.6
Atypical Glandular	10	0.7
Unsatisfactory	4	0.3
Other	7	0.5
Normal	113	8.0
No smear Taken	12	0.9

The referral patterns have changed from previous years, in line with the change in National Standards and referral guidelines. Twenty percent of referrals are now due to the presence of HrHPV, and we are seeing increasing test of cure HPV results return with negative smears.

It would be useful to audit these referrals to see if our pick up of persistent disease is in line with the expected data worldwide.

Table 115: Histology of biopsy at initial examination NWH 2013

	Initial visit biopsies N=1406	
	n	**%**
Invasive	2	0.1
High Grade	228	16.2
Low grade	236	16.8
Dysplasia NOS	32	2.3
HPV	101	7.2
Inflammation	76	5.4
Insufficient sample	14	1.0
Normal	143	10.2
No biopsy taken	574	40.8

Colposcopy Standards: Biopsy rate in women with high grade cytology		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Biopsy taken	>95	76	76	80	82	83.3	79.9
Denominator	Women referred with high grade cytology for initial colposcopy examination							

Table 116: Histological diagnosis (biopsy at initial colposcopy) by referral smear cytology NWH 2013

Referral smear cytology	Total Colposcopies	Histological diagnosis															
		No biopsy		Invasive		High Grade		Low Grade		Dysplasia NOS		Condyloma/ inflammation		HPV		Insufficient Sample		Normal	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1406**	**574**	**40.8**	**2**	**0.1**	**228**	**16.2**	**236**	**16.8**	**32**	**2.3**	**76**	**5.4**	**101**	**7.2**	**14**	**1.0**	**143**	**10.2**
High grade	324	65	20.1	1	0.3	153	47.2	46	14.2	9	2.8	14	4.3	15	4.6	3	0.9	18	5.6
Low grade	936	393	42.0	0		70	7.5	186	19.9	20	2.1	58	6.2	83	8.9	9	1.0	117	12.5
Atypical glandular	10	3	30.0	1	10.0	3	30.0	0		0		0		1	10.0	0		2	20.0
Unsatisfactory	4	2	50.0	0		0		1	25.0	0		0		0		0		1	25.0
Other	7	7	100.0	0		0		0		0		0		0		0		0	
Normal	113	94	83.2	0		2	1.8	3	2.7	3	2.7	3	2.7	1	0.9	2	1.8	0	
No Smear	12	10	83.3	0		0		0		0		1	8.3	1	8.3	0	0.0	0	

Overall the biopsy rate still remains relatively low at about 60%. Previously the biopsy rate has been commented on and thought to be too low. The biopsy rate for high grade patients has also decreased and does not meet the standard. Clinicians are encouraged to take more biopsies, as this can increase the sensitivity of colposcopy for detection of high grade disease.

Review of the 65 patients referred with a high grade smear but no biopsy at colposcopy, shows that nearly a third had a normal colposcopy with a negative repeat smear. A further 15% had a normal colposcopy with a low grade repeat smear and were discharged. Nearly a quarter of patients were pregnant and had biopsies postnatally. Seven patients went straight to LLETZ, as either did not tolerate the colposcopy or had had biopsies taken in private and were referred purely for treatment. One patient had a prolapse causing her ASC-H smear and was very atrophic, which resolved after treatment, one was unfit for biopsy and the remainder had biopsies taken at a subsequent visit, usually after oestrogen treatment.

All patients who were referred with a high grade smear without biopsy were managed appropriately according to their clinical situation and so the low rate is skewed by the numerator and is slightly misleading.

Colposcopy Standard: Predictive value of a colposcopic high grade diagnosis		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012	NW 2013
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	High grade histology	65	65	55	56	52	58	62
Denominator	Initial satisfactory colposcopies where colposcopic diagnosis is high grade							

Table 117: Cervical histology findings by colposcopic diagnosis (at initial colposcopy if satisfactory) NWH 2013

Colposcopic diagnosis	Total Colposcopies	Histological diagnosis																	
		No biopsy		Invasive		High Grade		Low Grade		Dysplasia NOS		Condyloma/ inflammation		HPV		Insufficient Sample		Normal	
		n	%	n	%	n	%	n	%	n	%	N	%	n	%	n	%	n	%
Total	**1406**	**574**	**40.8**	**2**	**0.1**	**228**	**16.2**	**236**	**16.8**	**32**	**2.3**	**76**	**5.4**	**101**	**7.2**	**14**	**1.0**	**143**	**10.2**
Invasive	3	1	33.3	0		2	66.7	0		0		0		0		0		0	
High grade	219	9	4.1	2	0.9	133	60.7	33	15.1	7	3.2	7	3.2	9	4.1	1	0.5	18	8.2
Low grade	630	86	13.7	0		86	13.7	185	29.4	18	2.9	57	9.0	83	13.2	7	1.1	108	17.1
Condyloma/ inflammation	36	13	36.1	0		2	5.6	7	19.4	1	2.8	2	5.6	4	11.1	2	5.6	5	13.9
Other	51	33	64.7	0		2	3.9	2	3.9	6	11.8	0		2	3.9	2	3.9	4	7.8
Normal	467	432	92.5	0		3	0.6	9	1.9	0		10	2.1	3	0.6	2	0.4	8	1.7

Colposcopic prediction of high grade disease has improved compared to the past three years, but still does not meet the standard, although is now close. There has been reduced staff turnover in this year which may have helped to raise the quality of colposcopy. C-QUIP accreditation and reaccreditation is now in progress through RANZCOG and it is expected that all colpscopists will self-audit as part of the QA process.

The one patient with invasive disease without a recorded biopsy, went straight to EUA and wedge biopsy and so was not captured by the system. The nine high grade patients with no biopsy comprised of four pregnant patients, three had biopsies in private prior to referral for treatment and two patients refused to have a biopsy taken in the clinic.

The use of the photographic record, particularly at MDM review has allowed re-evaluation and peer review of the colposcopic appearance of the cervix in cases of discordant results and is proving valuable.

Table 118: Histological diagnosis (biopsy at initial colposcopy) by referral reason NWH 2013

Colposcopic diagnosis	Total Colposcopies	Histological diagnosis																	
		No biopsy		Invasive		High Grade		Low Grade		Dysplasia NOS		Condyloma/ inflammation		HPV		Insufficient Sample		Normal	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	**1406**	**574**	**40.8**	**2**	**2.0**	**228**	**16.2**	**236**	**16.8**	**32**	**2.3**	**76**	**5.4**	**101**	**7.2**	**14**	**1.0**	**143**	**10.2**
Abnormal Screening Smear	879	295	33.6	2	0.2	190	21.6	162	18.4	18	2.0	47	5.3	62	7.1	7	0.8	96	10.9
Positive High risk HPV test	284	130	45.8	0	0.0	22	7.7	51	18.0	8	2.8	14	4.9	26	9.2	3	1.1	30	10.6
Abnormal Smear After Colposcopy	118	48	40.7	0	0.0	13	11.0	19	16.1	3	2.5	10	8.5	11	9.3	2	1.7	12	10.2
Bleeding	76	61	80.3	0	0.0	2	2.6	3	3.9	0	0.0	4	5.3	2	2.6	1	1.3	3	3.9
Unusual Appearing Cervix	37	30	81.1	0	0.0	0	0.0	1	2.7	3	8.1	1	2.7	0	0.0	1	2.7	1	2.7
Other	9	8	88.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	11.1
Clinically Suspicious Cervix	3	2	66.7	0	0.0	1	33.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Post coital bleeding or “unusual appearing cervix” are not good predictors of high grade disease, as most of these referrals were ectropions, cervical polyps or Nabothian follicles. In July 2013, the NSCP changed the guidelines, reflecting this and recommended that these patients are referred to gynaecology clinic and do not necessarily require colposcopy. Therefore patients who are referred to colposcopy with these issues are now redirected to general gynaecology at triage and are not offered colposcopy.

The general gynaecology department should be aware that if the smear and macroscopic appearance of the cervix are negative, then colposcopy is unlikely to reveal anything significant.

Table 119: Cervical treatments NWH 2008 - 2013

	2008 N=212		2009 N=199		2010 N=198		2011 N=236		July-Dec 2012 N=133		2013 N=363	
	n	%	n	%	n	%	n	%	n	%	n	%
LLETZ	197	92.9	187	94.0	185	92.9	220	93.2	118	88.7	296	81.5
Cold knife cone	11	5.2	9	4.5	11	5.6	16	6.8	11	8.3	27	7.4
Diathermy	2	1.0	1	0.5	0		0				0	
Hysterectomy	1	0.5	1	0.5	2	1.0	0		1	0.8	10	2.8
Laser ablation	0		1	0.5	1*	0.5	0				0	
Laser cone	1	0.5	0		0		0				0	
Other									3	2.3	10	2.8

In 2013 Other = vaginal/vulval excision of VAIN/VIN; Mirena insertion

Seventy six percent of LLETZ were performed under a local anaesthetic in clinic, which has dropped from 87% last year.

This requires further investigation and should be audited, as this falls outside the 80% target. The national target has been reduced to 80% this year, recognising that due to increasing obesity rates, safe access for treatments is becoming more of an issue and investigation to see whether this is the case at ADHB would be useful.

The number of women under 25 being treated has fallen. The PRINCESS trial is recruiting slowly, but it is hoped that this will reduce the treatment rates further.

12.6.1 Post treatment follow up

Colposcopy Standard: Follow up after treatment		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012
Indicator	**Definition**	%	%	%	%	%	%
Numerator	Follow up visit no later than 8 months following treatment	>90	88	88	81	92	87
Denominator	All treatments						

This standard has slipped slightly, however 100% of women were offered appropriate follow up within the time frame.

Table 120: Timing of follow up colposcopy (ACH) after treatments (2007-2010, 2012)

	2007 N=191		2008 N=213		2009 N=199		2010 N=198		2012 N=133	
	n	%	n	%	n	%	n	%	n	%
≤ 8 months	168	88.0	182	85.5	162	81.4	182	91.9	115	87
> 8 months	3	1.6	3	1.4	4	2.0	2	1.0	11	8
No follow up	20	10.5	28	13.2	33	16.6	14	7.1	7	5

The seven women with no follow up all were offered appointments, but did not attend repeatedly and were managed as per the standard DNA protocol.

The 11 seen outside of the 8 months were offered appointments within the timeframe, but rearranged their appointments for various reasons. Some patients moved out of our area, but all were referred to local DHBs and seen locally. All of their follow up smears were negative.

Colposcopy Standards: Dyskaryosis* after treatment		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Treated women with no dyskaryosis* following treatment	>90%	90	92	76	81†	81†
Denominator	All treatments						

*HSIL or LSIL on cytology
† excludes ASCUS

Table 121: Post treatment follow up findings

	2013 treatments N=133	
	N	**%**
Cytology findings at post treatment follow up		
Normal	94	71
High grade	6	4.5
Low grade	19	14.2
ASCUS	1	0.8
Other	4	3.0
NA	9	7
Histology findings at post treatment follow up		
No biopsy taken	116	87
HG	0	
LG	4	3.0
HPV	1	0.8
Condyloma/inflammation	2	1.6
Normal	3	2.3
NA	7	5

The standard regarding no dyskaryosis in follow up smears after LLETZ treatment, has remained constant, although is still outside of the standard. However there was no high grade histology found in any of these patients and no further treatment was required.

Of the six patients with follow up high grade smears, all of these were reported as ASC-H, and subsequent smears were either low grade or normal, and all patients were discharged. Resolution of persistent infection, with subsequent return to normal cytology, or overcall by the laboratory are possible explanations.

Colposcopy Standard: Primary haemorrhage after treatment		Standard	NW 2008	NW 2009	NW 2010	NW 2011	NW 2012
Indicator	**Definition**	**%**	**%**	**%**	**%**	**%**	**%**
Numerator	Treated women who require treatment for primary haemorrhage	<5%	1	0.5	0	1.7	0.75
Denominator	All treatments						

One case of primary haemorrhage occurred in 2012, which is well within the target.

12.8.1 Waiting times for first appointment/DNA rates (Data from NSU monthly data reports) NWH 2009-2013

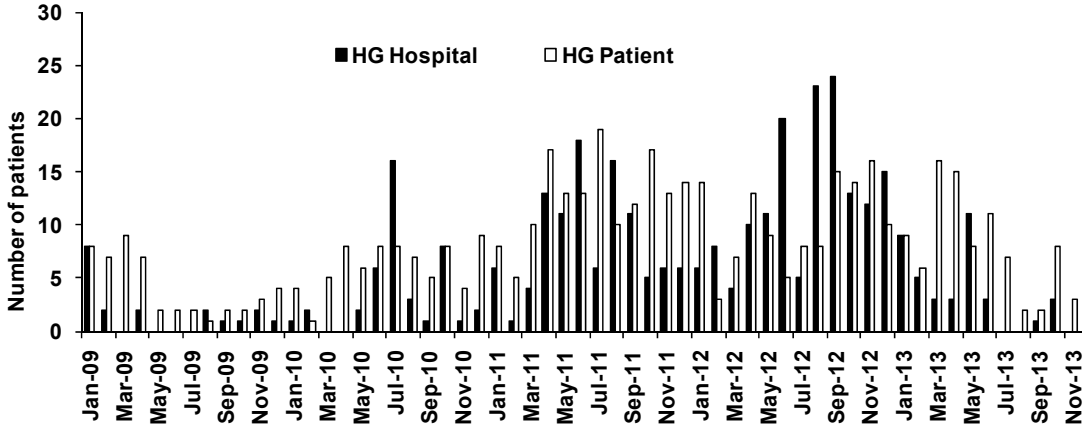


Figure 147: High grade referrals outside NSU Targets NWH 2009-2012: Hospital vs patient related delays

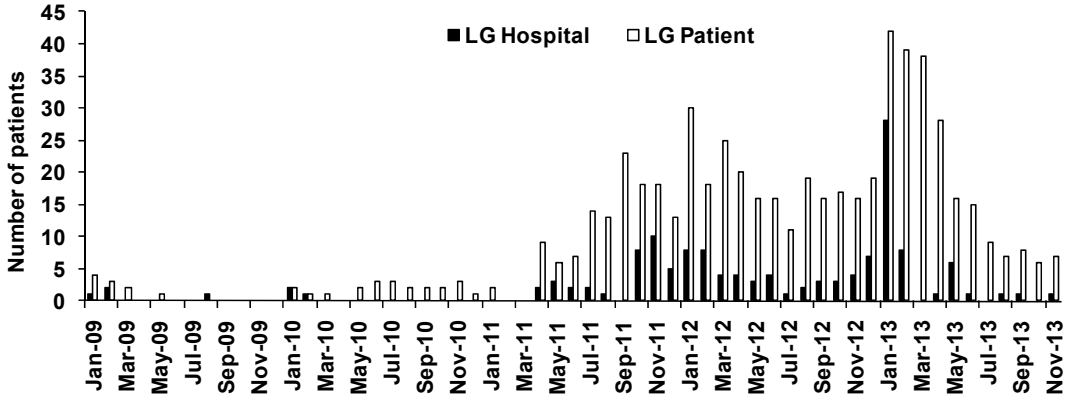


Figure 148: Low grade referrals outside NSU Targets NWH 2009-2013: Hospital vs patient related delays

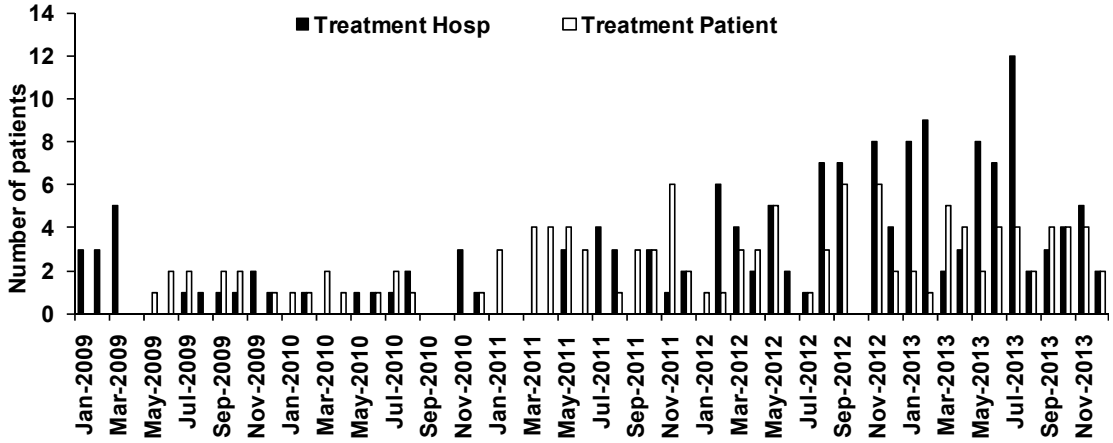


Figure 149: Treatments outside NSU Targets NWH 2009-2013: Hospital vs patient related delays

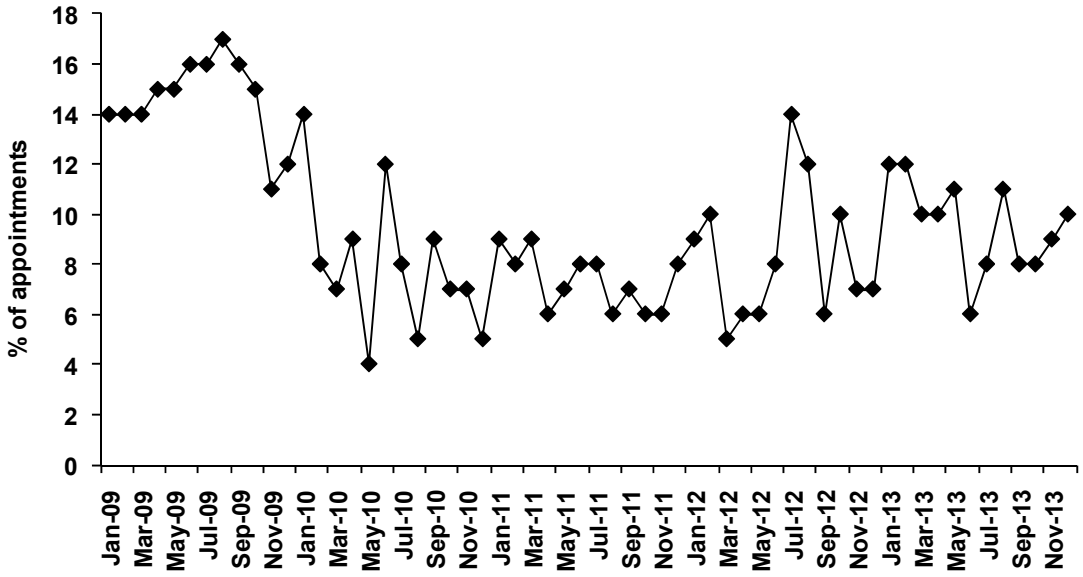


Figure 150: Patient did not attend (DNA) Rate NWH 2009-2013

Summary

Waiting times have improved dramatically in 2013, in particular in the second half of the year when virtually all patients were offered appointments within the standards' timeframe.

This has been due to replacement of FTE within the department and the use of Fellows who have completed colposcopy accreditation to run clinics to support the service. The treatment times however have increased and this is due to inadequate resources within the Pathology department leading to increased turnaround time of results and MDM review. The consequence of this is treatment appointments often being more than 8 weeks from the initial colposcopy. This has been raised with the pathology service as a significant clinical risk and unfortunately is out of the control of the clinic.

Treatment deadlines can be impacted upon by delay in MDM review, and given the increasing numbers of referrals to the monthly colposcopy MDM, which is currently averaging 30-40 cases per month, adequate planning in cytology and histopathology resources is paramount.

The DNA rate is still below the standard of 15%, although it has crept up slightly.

The frustration this year has been the delay in upgrading the Solutions Plus system, whilst waiting for the problems with the Windows 7 upgrade to be resolved. When eventually achieved, the upgrade will allow electronic communication with the NCSP, which will free up a large amount of the clinic's administrative time, which is already stretched. It is also hoped that this will lead to automatic generation of clinic letters, which will remove the need for transcription service for uncomplicated appointments and improve turnaround time of communications with referrers.

The proportion of virtual appointments and discussion visits is encouraging, as this means the communication of results to patients without the need for a repeat clinic visit

is working, thereby freeing up clinic space for new patients who need to be seen and has helped bring the waiting times back into target.

The PRINCESS study, looking at conservative management of CIN2 in women under the age of 25, has been underway throughout New Zealand for the past couple of years and ADHB site opened in 2013 and has recruited 12 into the study to date. Tarryn Nicholson, lead colposcopy nurse is coordinating the data for the study and it is hoped that speed of recruitment will increase.

In summary the colposcopy unit has improved this year, with waiting times finally being brought back into check following a brief hiatus, which was due to temporary inadequate FTE. Effort must be made to maintain current staffing levels and realise that there is very little slack in the system, and unexpected absence of even one colposcopist can affect the entire department's results.

It is hoped that the upgraded version of the Solutions Plus database, when installed, will allow for more efficient work practices and remove the need for dictation and transcription of standard clinic letters.

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 122: Primary site of Gynaecologic Oncology cases, including MDM (Multidisciplinary meeting) reviewed cases and surgical cases NWH 2010-2013

	Total 2010 N=707		Total 2011 N=681		Total 2012 N=749		Total 2013 N=803	
	n	%	n	%	n	%	n	%
Primary site								
Ovary	194	27.4	204	30	185	24.7	229	28.5
Uterus	78	11	31	4.6	46	6.1	35	4.4
Endometrium	192	27.2	170	25	190	25.4	225	28.0
Cervix	81	11.5	83	12.2	114	15.2	97	12.1
Vulva	46	6.5	48	7.1	53	7.1	50	6.2
Placenta			57	8.4	70	9.4	55	6.8
Vagina			17	2.5	8	1.1	9	1.1
Fallopian tube			10	1.5	6	0.8	11	1.4
Mullerian			6	0.9	12	1.6	24	3.0
Prophylactic gynae	116	16.4	13	1.9	3	0.4	10	1.2
Unknown			9	1.3	16	2.1	4	0.5
Peritoneal			4	0.6	3	0.4	13	1.6
Non gynae cancer			27	4	37	4.9	41	5.1
Other/not stated/benign			2	0.3	6	0.8		

In 2013, once again the workload of the department has increased, with an 11% rise in MDM referrals.

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

Table 123: ADHB Gynaecologic Oncology MDM: New referrals and MDM discussions 2007 – 2013

Year	2007	2008	2009	2010	2011	2012	2013
New referrals	448*	494*	611	756	788	840	923
Total MDM discussions			1000	1348	1577	1700	1893

* molar pregnancies not included

If all the databases are combined this gives a total of 923 patients, and 1893 individual MDM episodes, during 2013, which is once again, nearly a 20% increase in administrative and clinical workload over the past 2 years.

Table 124: DHB of residence, age, and prioritised ethnicity by primary site among MDM reviewed cases NWH 2013

	Total N=803		Ovarian n=229		Endometrium /Uterus n=260		Cervix n=97		Vulva n=50		Other n=167	
	n	%	n	%	n	%	n	%	n	%	n	%
DHB												
Auckland	226	28.1	61	26.6	68	26.2	29	29.9	15	30.0	53	31.7
Counties Manukau	190	23.7	50	21.8	75	28.8	21	21.6	11	22.0	33	19.8
Waitemata	172	21.4	49	21.4	46	17.7	19	19.6	9	18.0	49	29.3
Northland	62	7.7	24	10.5	21	8.1	7	7.2	0	0.0	10	6.0
Bay of Plenty	65	8.1	24	10.5	22	8.5	4	4.1	5	10.0	10	6.0
Other	88	11.0	21	9.2	28	10.8	17	17.5	10	20.0	12	7.2
Age (yrs)												
≤25	31	3.9	11	4.8	2	0.8	5	5.2	1	2.0	12	7.2
26-35	110	13.7	22	9.6	22	8.5	29	29.9	5	10.0	32	19.2
36-45	128	15.9	45	19.7	33	12.7	21	21.6	7	14.0	22	13.2
46-55	144	17.9	49	21.4	43	16.5	15	15.5	5	10.0	32	19.2
56-65	162	20.2	40	17.5	80	30.8	13	13.4	7	14.0	22	13.2
66-75	134	16.7	32	14.0	55	21.2	9	9.3	10	20.0	28	16.8
>75	94	11.7	30	13.1	25	9.6	5	5.2	15	30.0	19	11.4
Ethnicity												
NZ European	333	41.5	98	42.8	93	35.8	31	32.0	32	64.0	79	47.3
Maori	145	18.1	49	21.4	39	15.0	26	26.8	9	18.0	22	13.2
Pacific	113	14.1	25	10.9	63	24.2	11	11.3	1	2.0	13	7.8
Other Asian	71	8.8	19	8.3	16	6.2	15	15.5	0	0.0	21	12.6
Indian	29	3.6	11	4.8	12	4.6	0	0.0	0	0.0	6	3.6
Other European	83	10.3	21	9.2	25	9.6	11	11.3	7	14.0	19	11.4
Other/not stated	29	3.6	6	2.6	12	4.6	3	3.1	1	2.0	7	4.2

The number of ovarian and endometrial cancers has risen significantly in the past year (185 Ovarian, 236 Endometrial 2012). Surgery for ovarian cancer has become more radical over the past years, and it would not be unusual for one case to take up most of one list and therefore this will have a significant impact on surgical resources. Cervical cancers have fallen from 114 in 2012, whereas the number of vulval and other cancers is stable.

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.

The National Standards were published by the Ministry and the 62 day target (from referral to definitive treatment) is due to come into force in July 2014 and so these KPIs will become obsolete. Given the timeframe of the new targets is much tighter than the existing KPIs, with current resources we will fail to meet these targets.

Table 125: Key Performance Indicator: Time from referral to first multidisciplinary meeting (MDM) or clinic (includes new referrals and referrals for new site or recurrence. Excludes referrals for molar pregnancy and consideration of prophylactic surgery).

Goal: 90% in less than 14 days. NWH 2008-2013

	2008 N=494		2009 N=497		2010 N=580		2011 N=563		2012 N=625		2013 N=708	
	n	%	n	%	n	%	n	%	n	%	n	%
<14 days	284	57.5	351	70.6	426	73.4	413	73.4	519	83.1	653	92.2
=14 days	21	4.3	28	5.6	34	5.9	30	5.3	39	6.2	17	2.4
>14 days	172	34.8	113	22.7	118	20.3	115	20.4	67	10.7	38	5.4
Missing data	17	3.4	5	1.0	2	0.3	1					
Deceased							4					

For the first time the KPI has been met. Of the 38 outliers, 23 were delayed due to shutdown at Christmas, which is a resourcing issue that needs to be addressed.

It appears that the encouragement to referring units to follow a standard referral procedure has virtually eliminated the delay in receiving referrals caused by dictated referrals to individual clinicians. It is hoped that introduction of a new database with electronic referrals with streamline the process further.

In order to meet this KPI, the MDM weekly discussion numbers has swelled and has become untenable in the current timeframe and form. A radical reorganisation of the entire MDM process has now become necessary and this project is underway. This will require significant additional resource.

Table 126: Key Performance Indicator: Time from MDM or clinic to first surgery (new referrals of patients with malignancy who had surgery in 2012) Goal: 90% within 56 days. NWH 2008-2013

	2008 N=164		2009 N=233		2010 N=228		2011 N=173		2012 N=190		2013 N=213	
	n	%	n	%	n	%	n	%	n	%	n	%
≤ 56 days	115	70	165	71	188	82	139	80.4	165	86.8	166	77.9
≤30 days									101	53.2	79	37.1
31-56 days									64	33.7	87	40.8
> 56 days	43	26	65	28	40	18	34	19.7	25	13.2	47	22.1
Missing data	6	4	3	1								

Surgical numbers of malignant cases are relatively stable, however the waiting time to get to surgery has increased. This is a reflection of the increasing complexity of some surgery, which takes more time. The move internationally for more radical debulking for ovarian cancer and the rise in obesity leading to endometrial cancer has a direct effect on operating time and increased capacity is needed to accommodate this change in practice.

A significant number of the outliers were awaiting further medical workup, which again reflects the complexity of our patients. The increasing co-morbidities, in particular the rising obesity rate, directly affects both anaesthetic and surgical time, thereby reducing capacity further.

Table 127: Time from MDM or clinic to first surgery (new referrals of patients with gynaecologic malignancy who had surgery in 2012) by primary site. NWH 2013

	Total	≤ 56 days		>56 days	
	n	n	%	n	%
Totals	**213**	**166**	**77.9**	**47**	**22.1**
Cervix	34	28	82.4	6	17.6
Endometrium/Uterus	94	72	76.6	22	23.4
Ovary	50	39	78.0	11	22.0
Vulva	19	15	78.9	4	21.1
Other	16	12	75.0	4	25.0

Other factors affecting the patients not meeting the timelines include patients initially refusing treatment, delay for fertility treatment prior to surgery, patients operated on by general gynaecology services and then referred back for completion or more extensive surgery and delay in surgery whilst receiving pre-operative chemotherapy or radiotherapy.

However the department is at the limits of what can be offered with current surgical staffing levels and an increase in SMO FTE and theatre capacity is indicated, given the persistent annual rise in referral numbers.

The recent National Service Configuration planning document has recommended to the Ministry that there should be three Gynaecological Cancer Centres within New Zealand, located in Auckland, Wellington and Christchurch. This will mean Auckland absorbing the workload from Waikato. Although the cervical and vulval cancers have always been referred to Auckland, as there is not currently a Gynaecological Oncologist in the Midland Region, if the ovarian and high risk endometrial cancers are to be treated through our centre, this requires an increase in capacity across our service and needs to be addressed urgently.

12.9.2 Gynaecologic oncology surgeries

This section describes the surgery and short term outcomes of women undergoing inpatient surgery in 2013 under the care of the gynaecologic oncology team. Unfortunately we still do not have the facility for collection of long term outcome data or survival reporting.

Table 128: Ethnicity and cancer status of women undergoing gynaecologic oncology inpatient surgery NWH 2012-2013

	2012 N=406		2013 N=463	
	n	%	n	%
Ethnicity				
NZ European	200	49.3	200	43.2
Maori	50	12.3	86	18.6
Pacific	64	15.8	62	13.4
Other Asian	30	7.4	32	6.9
Indian	13	3.2	23	5.0
Other European	44	10.8	55	11.9
Other	5	1.2	2	0.4
Not stated			3	0.6
Status at time of surgery				
Benign	15	3.7	21	4.5
Pre malignant	52	12.8	62	13.4
Malignant	229	56.4	275	59.4
Prophylactic	4	1	8	1.7
Unknown prior to surgery	106	26.1	97	21.0

Table 129: Debulking rates in ovarian malignancy NWH 2012 - 2013

	2012 N=52		2013 N=77	
	n	%	n	%
Residual disease				
None	42	80	53	69
< 1cm	8	15	9	11
≥ 1cm	2	4	16	20
Bowel surgery				
Yes	6	12	11	14
No	44	85	66	86
NA	2	4	0	0

Surgical activity has increased by 13% over the past year.

The number of procedures includes minor procedures generated by the colposcopy and vulval clinics, as well as brachytherapy, as there is no dedicated radiation oncology list and these patients take up a significant portion of operating lists, which is having an impact on waiting times. Use of day stay for minor procedures and a separate brachytherapy list would improve the efficiency of the limited main theatre resource, but also requires additional personnel, as well as list space. This has been raised in previous years, but a solution has not currently been found. The need to resolve this issue is becoming more urgent, as we now have evidence that this is impacting adversely on waiting times, and we will be in breach of the Faster Cancer Treatment (FCT) 62 day target, due to become one of the Minister's Targets in July 2014.

The optimal debulking rates have fallen, but the number of patients undergoing debulking surgery has increased by 50%, which reflects the changing attitudes to ovarian cancer and surgical treatment, with more radical debulking leading to better overall survival. However this often involves extensive surgery, often with multidisciplinary input and one case may take up most of a full day list. This needs to be considered in future capacity planning.

Table 130: Key Performance indicator: Clinical Outcomes among inpatient surgeries in malignant cases by gynaecologic oncology team in 2013. Goal: Comparative year to year data. NWH 2008-2013

	2008 N=246*		2009 N=259*		2010 N=353*		2011 N=299*		2012 N=297*		2013 N=350*	
Complication	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Transfusion	19	8	30	12	40	11	32	10.7	35	12	37	10.6
Febrile morbidity	11	4	32	12	28	8	19	6.4	20	7	12	3.4
Wound infection	-		22	8	20	6	14	4.7	11	4	9	2.6
Thromboembolism	2	1	3	1	2	1	2	0.7	0	0	2	0.6
Cardiovascular	2	1	6	2	3	1	3	1	3	1	5	1.4
Gastro-intestinal	7	3	17	7	12	3	11	3.7	14	5	13	3.7
Urinary retention	-		12	5	12	3	8	2.7	11	4	13	3.7
Return to theatre within 6 wks	6	2	14	5	18	5	8	3	9	3	3	0.9
Readmission with complications within 6 weeks	17	7	25	10	24	7	15	5	26	9	21	6.0
Death	2	1	2	1	5	1	1	0	2	1	1	0.3
Intraoperative complications*									21	7	23	6.6
>1000ml blood loss									12	4	12	3.4
Bowel injury									2	1	6	1.7
Bladder injury									1	0	1	0.3
Ureteric injury									2	1	1	0.3
Anaesthetic problem									1	0	1	0.3
Other									3	1	4	1.1

* complications are not mutually exclusive; missing data are all assumed to be “no”

Most inpatient complication rates have fallen, with a significant reduction in the return to theatre rate to less than 1%. This is despite an increase in the radicality of surgery and is encouraging. Use of interventional radiology may also have contributed to this and we are lucky to have such support within the hospital. It is disappointing however that we are still unable to report long term outcome. As a tertiary service, many of our patients with complications after discharge will be readmitted locally and this will not be captured within this set of data.

Summary/Implications

The workload of the department is consistently increasing and is now at capacity. A business case is underway for a significant increase in resources. The MDM is no longer tenable in its current form, and supported by Ministry funding, a new single MDM is close to being established. This is the culmination of more than 5 years’ work towards this goal and will be a significant achievement. It is hoped that the teleconferencing facilities will lead to better regional communication and streamline referral processes.

It is hoped that a new MDM web-based database will also be established and planning for this is underway, if funding can be secured. With the support of the Medical Director,

funding has been secured from the Ministry to map the referral processes and identify bottlenecks, which hopefully will allow us to plan for the FCT targets due in 2014, which currently we will be unable to meet.

Pathology support remains a significant high risk area and with the increasing workload year by year this situation has now become critical and requires urgent attention at high level. Pathology review is the cornerstone of the MDM and delays will impact on our ability to meet the 62 day target, regardless of streamlining performance within the department.

The National Standards were published by the Ministry in December 2013 and audit against these standards will show specific areas where we are lacking and where improvement needs to be made. A decision around service configuration is due to be made by the Ministry in 2014 and will have direct impact on us. A more formal arrangement of Centres and Units around the country will directly lead to improved patient outcomes and quality of service, provided adequate resources back the proposals. In particular nursing staff (CNS) FTE is currently inadequate and should be a priority during future planning. This position is supported within the service configuration and Standards documents and the NZ Gynae Cancer Group has recently endorsed nurse led clinics and this should be explored to free SMO FTE.

The figures within this chapter 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 is the case at WDHB. MDM pathology review however is still recommended.

This is an exciting and intermittently frustrating time for the department. The service configuration process has identified the fragility of Gynaecologic Oncology services throughout the country and succession planning has been highlighted as a particular issue. We need to plan for the future and training the next generation is paramount if we wish to be able to maintain a service beyond the next 5-10 years. Establishing fellow positions and becoming a recognised training centre with RANZCOG needs to be part of our future, and this can only happen with adequate resources in place.

The department will be the largest Gynaecologic Oncology Centre in New Zealand and this position needs to be recognised and supported. Progress has been made, but there is still a long way to go.

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.

Lead Maternity Carer
Check all LMC have correct LMC type and group
Check all unbooked women that LMC screen is correct
Check that all women have a LMC screen at birth
If women have booked after 13 weeks with NW LMC check that there is a reason for late booking

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.
BMI (Body Mass Index) Calculated from earliest weight recorded, as weight (kg)/height(m)^2. If BMI <17 or >40, check height and weight or any mismatch of data

Antenatal Complications

If Antenatal Admission for Hypertension, APH or Diabetes, check Labour and birth mother screen, medical conditions is not = missing &/or check data is consistent.
If Induction Indication is Hypertension, APH or Diabetes, check Labour and birth mother screen medical conditions is not = missing &/or check data is consistent.
If Reason for Operative Birth is Hypertension, APH or Diabetes, check Labour and birth mother 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.
Eclampsia = Yes in check Labour and birth mother screen
Antenatal Diabetes screen without a PN Diabetes Screen & vice versa.
Newborn Diabetes; Newborn Discharge Summary, check for missing diabetic data.
Height and weight, check all fields are complete
Smoking, check all women have smoking status at booking and at birth. Check all women who smoke have been offered smoking cessation

Induction of Labour

If SROM at term and syntocinon is given before established labour then reason for induction is prolonged latent phase
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 Syntocinion is started before 3 cms dilated check for 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.
Induction indication rupture of membranes at term but gestation is preterm
Induction indication PPROM but baby is term
Induction indication multiple pregnancy but baby is singleton
Induction indication maternal age but baby is preterm
Induction indication is poor Ob Hx but baby is preterm

Pregnancy/Birth

Homebirths & BBA's (babies born before arrival at hospital when intended birth in hospital) All checked as appropriately classified.
Check all transfers in labour from Birthcare
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)
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.
Check all in established labour CS
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 that elective CS does not have a reason for CS as failed induction
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 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.
Analgesia with elective CS
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.
If woman has placenta praevia but not a elective CS

Postnatal

Mothers Destination to Ward is somewhere within Auckland City Hospital but PN screen does not reflect this.
Mothers and baby's destination are not null
Mothers destination not NWH's & PN Admission screen entered
PN Adm - Missing 'Admitted to ward time', 'CMS Discharge date' or 'Admission Type'
PN Adm - 1° Reason for PN Admission is Other & Comment
PN Adm - 1° Reason for PN Admission is Null or SVD
Mothers Destination to Ward & Admitted to (PN Admission Screen) do not match or is null
If reason for admission is CS or instrumental birth but none of these occurred
PN Admission - missing Admission Type
Baby Destination (L&B Baby) is a NWH location, check Discharge Time & Discharge to & Discharge Care (Newborn Discharge Summary) is not null
Newborn Discharge Summary Missing Data (If DHB is ADHB & LMC is NWH LMC)
Discharge Care - Postnatal Admission is NWH Homecare (includes Diabetic etc) but missing Postnatal Homecare Summary or Newborn Discharge Summary
Discharge Care - Postnatal Admission NOT NWH, but Postnatal Homecare Summary Screen
Postnatal Homecare Missing Data
Breast Feeding Baby Unknown or missing fields from Immediate Newborn Assessment & Newborn Discharge Summary Screen.

Baby

Birth weight – check if <400g or >5kg.
If gestation <35 weeks, check birth weight if >2500g.
If gestation >35 weeks, check birth weight if <2500g.
Gestation: check if < 20wks or > 44 wks.
If indication for induction is post term, check gestation if gestation is < 40 weeks.
Gestation to Neonatal Gestation (Immediate Newborn Assessment screen) > 1 week difference if <28 weeks and >2 weeks difference if $\geq$ 28 weeks.
Perinatal mortality database for perinatal deaths gestation to derived gestation > 1 week difference
Neonatal database gestation to derived gestation > 1 week difference.
(Because of the incomplete reconciliation of data sets, there may be a minimal number of cases where gestation varies in reporting of the neonatal and maternity data.)
Gestational Age (Immediate Newborn Assessment) Is Null.
Days in NICU/PIN/Paed care on Ward are not null or check if >30.
Missing Apgars.
Live birth with Apgars 1min or Apgars 5 min of 0.

Data Checks with Other Sources

CMS/ Coding data to ensure correct birth numbers.

Neonatology database; fields checked include Birthweight, Gestation, Apgars & Days in NICU.

Perinatal related deaths database fields cross-referenced with Healthware include; ethnicity, gestation – LMP/EDD, LMC, Gravida/Parity, Height/Weight/BMI, Outcome, Apgars, Sex, Gestation, Birth Weight, PSANZ-PDC & PSANZ-NDC classifications, customised centile.

PIMs theatre data checked against Healthware for epidural and GA, blood loss, operative vaginal birth and CS

ATLAS coding data cross checked with Healthware for hypertension, APH, diabetes, perineal trauma, mode of birth

APPENDIX 2. SUMMARY STATISTICS

Table 131: Numbers of mothers and babies 2003-2013

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Mothers	7610	7491	7194	7212	7695	7589	7735	7709	7523	7695	7223
Babies	7804	7679	7384	7379	7875	7753	7897	7866	7690	7863	7377

Table 132: Mode of birth NWH 1998-2012

	Total births	Spontaneous vertex birth		Vaginal breech		Operative vaginal		Caesarean section	
Year	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
1998	**7492**	4645	62.0	75	1.0	922	12.3	1850	24.7
1999	**7501**	4635	61.8	83	1.1	945	12.6	1838	24.5
2000	**7827**	4650	59.4	87	1.1	1010	12.9	2080	26.6
2002	**7775**	4327	55.7	66	0.8	1081	13.9	2301	29.6
2003	**7611**	4269	56.1	58	0.8	1065	14.0	2219	29.1
2004	**7491**	4073	54.4	54	0.7	1171	15.6	2193	29.3
2005	**7194**	3845	53.4	54	0.7	1022	14.2	2273	31.6
2006	**7212**	3815	52.9	51	0.7	956	13.3	2390	33.1
2007	**7695**	4212	54.7	70	0.9	975	12.6	1428	31.7
2008	**7589**	4218	55.5	62	0.8	937	12.3	2372	31.3
2009	**7735**	4313	55.8	61	0.8	947	12.3	2414	31.2
2010	**7709**	4217	54.7	59	0.8	942	12.2	2491	32.3
2011	**7523**	4183	55.6	60	0.8	832	11.1	2448	32.5
2012	**7695**	4173	54.2	45	0.6	907	11.8	2570	33.4
2013	**7223**	3828	53.0	56	0.8	833	11.5	2506	34.7

Table 133: Term births by gestation NWH 2005-2013

Gestation	2005	2006	2007	2008	2009	2010	2011	2012	2013
37 wks	616	616	628	648	638	630	626	616	608
38 wks	1216	1291	1405	1488	1565	1546	1539	1536	1550
39 wks	1794	1817	1847	1802	1965	1983	2078	2172	2055
40 wks	1811	1699	1841	1827	1813	1810	1664	1744	1575
41 wks	971	958	1083	943	992	977	864	877	754
>=42 wks	170	162	167	182	150	133	132	98	61

APPENDIX 3. MATERNAL DEMOGRAPHY

3.1 DHB of residence

Table 134: DHB of domicile of mothers giving birth at National Women's 2003-2013

	2004 n=7491		2005 n=7194		2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735		2010 n=7709	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	5055	67.5	4985	69.3	5100	70.7	5382	69.9	5267	69.4	5551	71.8	5392	69.9
Waitemata	1068	14.3	982	13.7	994	13.8	1043	13.6	1127	14.9	1054	13.6	1110	14.4
Counties Manukau	1240	16.6	1089	15.1	994	13.8	1136	14.8	1060	14.0	991	12.8	1082	14.0
Northland	37	0.5	31	0.4	40	0.6	41	0.5	40	0.5	40	0.5	43	0.6
North Island Other	72	1.0	93	1.3	69	1.0	73	0.9	71	0.9	79	1.0	64	0.8
South Island	12	0.2	9	0.1	13	0.2	14	0.2	18	0.2	15	0.2	17	0.2
Overseas	7	0.1	5	0.1	2	0.03	6	0.1	6	0.1	5	0.1	1	0.01

	2011 n=7523		2012 n=7695		2013 n=7223	
DHB	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	5176	68.8	5302	68.9	4937	68.4
Waitemata	1220	16.2	1126	14.6	1057	14.6
Counties Manukau	1009	13.4	1113	14.5	1079	14.9
Northland	40	0.5	39	0.5	38	0.5
North Island Other	52	0.7	91	1.2	86	1.2
South Island	18	0.2	14	0.2	12	0.2
Overseas	6	0.1	10	0.1	11	0.2

3.2 Maternal Age

Table 135: Maternal age distribution NWH 2000-2013

		≤20 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	N	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
2000	7827	431	5.5	1091	13.9	2204	28.2	2670	34.1	1232	15.7	199	2.5
2002	7775	376	4.8	998	12.8	2018	26.0	2816	36.2	1335	17.2	232	3.0
2003	7611	372	4.9	959	12.6	1933	25.4	2738	36.0	1380	18.1	229	3.0
2004	7491	357	4.8	913	12.2	1809	24.1	2781	37.1	1384	18.5	247	3.3
2005	7194	330	4.6	828	11.5	1685	23.4	2702	37.6	1395	19.4	254	3.5
2006	7212	323	4.5	869	12.0	1735	24.1	2619	36.3	1421	19.7	245	3.4
2007	7695	386	5.0	1005	13.1	1798	23.4	2710	35.2	1514	19.7	282	3.7
2008	7589	394	5.2	963	12.7	1863	24.5	2519	33.2	1570	20.7	280	3.7
2009	7735	400	5.2	992	12.8	1916	24.8	2552	33.0	1600	20.7	275	3.6
2010	7709	335	4.3	943	12.2	1998	25.9	2516	32.6	1644	21.3	273	3.5
2011	7523	325	4.3	878	11.6	1918	25.4	2576	34.2	1534	20.3	292	3.9
2012	7695	267	3.5	862	11.2	2065	26.8	2606	33.8	1555	20.2	340	4.4
2013	7223	254	3.5	790	10.9	1874	25.9	2525	35.0	1463	20.3	317	4.3

Table 136: Maternal age and parity NWH 2013

	Total		<=20 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	N=7223		n=	254	n=	790	n=	1874	n=	2525	n=	1463	n=	317
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	3441	47.6	192	75.6	463	58.6	1112	59.3	1122	44.4	459	31.4	93	29.3
Multipara	3782	52.4	62	24.4	327	41.4	762	40.7	1403	55.6	1004	68.6	224	70.7

3.3 Parity

Table 137: Time trends in nulliparity and multiparity (Data for 2001-2003 not available) **NWH1994-2013**

	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of births	8812	9125	9157	8055	7492*	7501	7827	7491	7194	7212	7695	7589	7735	7709	7523	7695	7223
Nullipara	3814	4037	4018	3591	3263	3262	3455	3597	3522	3499	3752	3623	3811	3650	3539	3778	3441
%	43.3	44.2	43.9	44.6	43.6	43.5	44.1	48.0	49.0	48.5	48.8	47.7	49.3	47.3	47.0	49.1	47.6
Multipara	4998	5088	5139	4464	4229	4239	4372	3894	3672	3713	3943	3966	3924	4059	3984	3917	3782
%	56.7	55.8	56.1	55.4	56.4	56.5	55.9	52.0	51.0	51.5	51.2	52.3	50.7	52.7	52.9	50.9	52.4

*Does not include 39 BBA's

3.4 Ethnicity

Table 138: Prioritised ethnicity of women giving birth at National Women's 2013
(for information on assigning ethnicity and prioritising ethnicity, see Appendix 12)

	2013 n=7223	
	n	%
New Zealand European	2548	35.3
Chinese	962	13.3
Other European	655	9.1
Maori	532	7.4
Indian	620	8.6
Samoan	319	4.4
Tongan	312	4.3
Other Asian	345	4.8
Southeast Asian	203	2.8
European NFD	121	1.7
Middle Eastern	116	1.6
Cook Island Maori	105	1.5
African	71	1.0
Niuean	82	1.1
Asian NFD	66	0.9
Fijian	51	0.7
Latin American	74	1.0
Other Pacific Peoples	32	0.4
Tokelauan	3	0.0
Other Ethnicity	6	0.1

Table 139: Maternal ethnicity and age NW 2013

	Total	NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
Age	**N**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total	7223	2548	35.3	532	7.4	904	12.5	1576	21.8	620	8.6	776	10.7	267	3.7
<=20	254	44	17.3	77	30.3	106	41.7	15	5.9	4	1.6	3	1.2	5	2.0
21-25	790	137	17.3	130	16.5	241	30.5	118	14.9	70	8.9	42	5.3	52	6.6
26-30	1874	458	24.4	124	6.6	230	12.3	575	30.7	253	13.5	152	8.1	82	4.4
31-35	2525	1044	41.3	121	4.8	175	6.9	577	22.9	196	7.8	335	13.3	77	3.0
36-40	1463	712	48.7	65	4.4	122	8.3	236	16.1	87	5.9	195	13.3	46	3.1
>40	317	153	48.3	15	4.7	30	9.5	55	17.4	10	3.2	49	15.5	5	1.6

Table 140: Maternal ethnicity and parity NW 2013

		NZ European		Maori		Pacific		Other Asian		Indian		Other European		Other	
		n=2548		n=532		n=904		n=1576		n=620		n=776		n=267	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	3441	1218	47.8	192	36.1	296	32.7	860	54.6	333	53.7	420	54.1	122	45.7
Multipara	3782	1330	52.2	340	63.9	608	67.3	716	45.4	287	46.3	356	45.9	145	54.3

Table 141: Ethnicity of women birthing at NWH 2006-2013

	2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735		2010 n=7709		2011 n=7523		2012 n=7695		2013 n=7223	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
NZ European	3034	42.1	3161	41.1	2995	39.5	2967	38.4	2898	37.6	2712	36.0	2696	35.0	2548	35.3
Other European	682	9.5	695	9.0	713	9.4	707	9.1	856	11.1	851	11.3	847	11.0	776	10.7
Maori	597	8.3	641	8.3	641	8.4	670	8.7	579	7.5	597	7.9	534	6.9	532	7.4
Niuean	81	1.1	105	1.4	111	1.5	94	1.2	96	1.2	95	1.3	74	1.0	82	1.1
Cook Islander	113	1.6	157	2.0	137	1.8	135	1.7	112	1.5	112	1.5	123	1.6	105	1.5
Samoan	384	5.3	372	4.8	433	5.7	400	5.2	422	5.5	380	5.1	368	4.8	319	4.4
Tongan	346	4.8	347	4.5	349	4.6	394	5.1	378	4.9	342	4.5	346	4.5	312	4.3
Fijian	60	0.8	81	1.1	58	0.8	57	0.7	46	0.6	59	0.8	73	0.9	51	0.7
Other Pacific Islands	37	0.5	38	0.5	44	0.6	35	0.5	34	0.4	29	0.4	39	0.5	35	0.5
Chinese	707	9.8	881	11.4	874	11.5	995	12.9	950	12.3	984	13.1	1171	15.2	962	13.3
Indian	520	7.2	521	6.8	505	6.7	520	6.7	539	7.0	548	7.3	553	7.2	620	8.6
Other Asian	408	5.7	473	6.1	478	6.3	440	5.7	526	6.8	545	7.2	588	7.6	614	8.5
Other	243	3.4	223	2.9	251	3.3	321	4.1	273	3.5	269	3.6	283	3.7	267	3.7
Not Stated	0		0	0.0	0	0.0	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 NWH 2013

		Smoking at booking		Not currently smoking	
	N	n	%	n	%
Total	**7223**	**415**	**5.7**	**6799**	**94.3**
Ethnicity					
NZ European	2548	93	3.6	2453	96.3
Maori	532	172	32.3	358	67.3
Pacific	904	120	13.3	780	86.3
Asian	1576	11	0.7	1565	99.3
Indian	620	4	0.6	616	99.4
Other European	776	10	1.3	766	98.7
Other	267	5	1.9	261	97.8
Age					
<=20	254	63	24.8	190	74.8
21-25	790	123	15.6	664	84.1
26-30	1874	93	5.0	1779	94.9
31-35	2525	73	2.9	2450	97.0
>=36	1780	63	3.5	1716	96.4

Missing data (n=9)

Table 143: Smoking status at booking by LMC at birth NWH 2013

	Independent midwife		Private Obstetrician		GP		NWH Community		NWH High Risk		Other DHB	
	n=3446		n=1862		n=17		n=1336		n=501		n=33	
	n	%	n	%	n	%	n	%	n	%	n	%
Smoking at booking	158	4.6	12	0.6	0	0.0	170	12.7	54	10.8	10	30.3
Not smoking	3285	95.3	1850	99.4	17	100.0	1163	87.1	0	0.0	21	63.6
Missing data	3	0.1	0	0.0	0	0.0	3	0.2	447	89.2	2	6.1

NWH High Risk includes women booked under the Diabetes and Medical teams.

3.6 Socio economic deprivation

Table 144: BMI >25 by deprivation quintile and prioritised maternal ethnicity NWH 2013

		All ethnicities		European*			Maori			Pacific			Other Asian			Indian		
Dep 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	1232	363	29.5	787	244	31.0	44	16	36.4	29	21	72.4	281	51	18.1	47	19	40.4
2	1392	496	35.6	805	254	31.6	69	39	56.5	95	74	77.9	289	60	20.8	98	53	54.1
3	1519	581	38.2	723	268	37.1	74	51	68.9	107	88	82.2	381	72	18.9	165	71	43.0
4	1583	723	45.7	645	246	38.1	131	87	66.4	228	205	89.9	352	70	19.9	172	88	51.2
5	1339	775	57.9	307	129	42.0	179	135	75.4	409	362	88.5	259	63	24.3	126	60	47.6
Total	**7076**	**2945**	**41.6**	**3267**	**1141**	**34.9**	**497**	**328**	**66.0**	**877**	**757**	**86.3**	**1564**	**316**	**20.2**	**608**	**291**	**47.9**

* Includes NZ European and Other European

There are 146 women who had a missing quintile who are not represented in this table

Table 145: Deprivation Quintile (NZ Dep06) by prioritised maternal ethnicity NWH 2013

	NZ European		Other European		Maori		Pacific		Other Asian		Indian		Other	
	n=2547		n=776		N=532		n=904		n=1576		n=620		n=267	
Quintile	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
1	583	22.9	215	27.7	44	8.3	30	3.3	282	17.9	50	8.1	44	16.5
2	638	25.0	181	23.3	70	13.2	97	10.7	291	18.5	100	16.1	36	13.5
3	557	21.9	175	22.6	80	15.0	113	12.5	385	24.4	167	26.9	70	26.2
4	521	20.5	136	17.5	139	26.1	232	25.7	356	22.6	175	28.2	58	21.7
5	248	9.7	69	8.9	199	37.4	422	46.7	260	16.5	128	20.6	59	22.1
Missing	0	0.0	0	0.0	0	0.0	10	1.1	2	0.1	0	0.0	0	0.0

Table 146: Smoking and socio economic deprivation (NZ Dep06) NWH 2013

Deprivation decile	Total	Smoking at booking	
	7223	n=	415
	N	n	%
1	468	5	1.1
2	780	11	1.4
3	781	19	2.4
4	632	21	3.3
5	683	26	3.8
6	865	33	3.8
7	712	44	6.2
8	905	69	7.6
9	533	56	10.5
10	852	129	15.1
Missing	12	2	16.7

Table 147: Deprivation Quintile (NZ Dep06) and maternal age NWH 2013

	<=20		21-25		26-30		31-35		36-40		>40	
	n=254		n=790		n=1874		n=2525		n=1463		n=317	
Deprivation quintile	n	%	n	%	n	%	n	%	n	%	n	%
1	15	5.9	75	9.5	243	13.0	486	19.2	344	23.5	85	26.8
2	25	9.8	100	12.7	327	17.4	559	22.1	332	22.7	70	22.1
3	35	13.8	144	18.2	453	24.2	550	21.8	299	20.4	67	21.1
4	69	27.2	182	23.0	459	24.5	556	22.0	299	20.4	52	16.4
5	109	42.9	287	36.3	387	20.7	373	14.8	186	12.7	43	13.6
Missing	1	0.4	2	0.3	5	0.3	1	0.0	0	0.0	0	0.0

Table 148: Deprivation decile (NZ Dep 06) by LMC NWH 2013

Deprivation decile	Independent Midwife		Private Obstetrician		General Practitioner		NWH Community		NWH Diabetes		NWH Medical		Other DHB		Unbooked	
	n=3446		n=1862		n=17		n=1336		n=201		n=301		n=33		n=28	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	183	5.3	235	12.6	0	0.0	29	2.2	6	3.0	14	4.7	1	3.0	0	2.7
2	344	10.0	339	18.2	0	0.0	62	4.6	10	5.0	23	7.7	1	3.0	1	3.6
3	340	9.9	301	16.2	2	11.8	99	7.4	16	8.0	19	6.3	3	9.1	1	3.571
4	301	8.7	198	10.6	1	5.9	95	7.1	16	8.0	18	6.0	1	3.0	2	7.1
5	358	10.4	214	11.5	1	5.9	70	5.2	11	5.5	26	8.7	1	3.0	2	7.1
6	456	13.2	172	9.2	2	11.8	170	12.7	17	8.5	38	12.7	4	12.1	6	21.4
7	378	11.0	136	7.3	1	5.9	133	10.0	29	14.4	32	10.7	3	9.1	0	0.0
8	470	13.6	127	6.8	4	23.5	203	15.2	40	19.9	50	16.7	5	15.2	6	21.4
9	274	8.0	64	3.4	3	17.6	135	10.1	24	11.9	26	8.7	7	21.2	0	0.0
10	341	9.9	75	4.0	3	17.6	340	25.4	32	15.9	46	15.3	6	18.2	9	32.1

3.7 Lead Maternity Carer (LMC)

Table 149: LMC at birth NWH 2006-2013

	2006 n=7212		2007 n=7695		2008 n=7589		2009 n=7735		2010 n=7709		2011 n=7523		2012 n=7695		2013 n=7223	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
IMW	2850	39.5	2923	38.0	3150	41.5	3422	44.2	3552	46.1	3552	47.2	3654	47.5	3446	47.7
Pvt Obst	1710	23.7	1830	23.8	1759	23.2	1718	22.2	1734	22.5	1672	22.2	1823	23.7	1862	25.8
GP	152	2.1	137	1.8	128	1.7	115	1.5	94	1.2	56	0.7	45	0.6	17	0.2
NW Community	1808	25.1	2035	26.4	1734	22.8	1702	22.0	1505	19.5	1387	18.4	1447	18.8	1336	18.5
NW Diabetes	230	3.2	235	3.1	293	3.9	304	3.9	325	4.2	422	5.6	280	3.6	201	2.8
NW Medical	319	4.4	378	4.9	389	5.1	377	4.9	379	4.9	377	5.0	354	4.6	300	4.2
Other DHB	93	1.3	106	1.4	86	1.1	39	0.5	63	0.8	50	0.7	42	0.5	33	0.5
Unbooked	50	0.7	51	0.7	50	0.7	58	0.7	57	0.7	37	0.5	50	0.6	28	0.4

Table 150: LMC at birth and maternal age NWH 2013

	Total	<=20		21-25		26-30		31-35		36-40		>40	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Total	7223	254	3.5	790	10.9	1874	25.9	2525	35.0	1463	20.3	317	4.4
Independent Midwife	3446	94	2.7	400	11.6	1017	29.5	1256	36.4	597	17.3	82	2.4
Private Obstetrician	1862	5	0.3	38	2.0	336	18.0	758	40.7	571	30.7	154	8.3
General Practitioner	17	0	0.0	4	23.5	1	5.9	9	52.9	3	17.6	0	0.0
NW Community	1336	125	9.4	285	21.3	370	27.7	326	24.4	194	14.5	36	2.7
NW Diabetes	201	2	1.0	13	6.5	53	26.4	69	34.3	44	21.9	20	10.0
NW Medical	300	20	6.7	37	12.3	80	26.7	93	31.0	47	15.7	23	7.7
Other DHB	33	5	15.2	5	15.2	10	30.3	8	24.2	4	12.1	1	3.0
Unbooked	28	3	10.7	8	28.6	7	25.0	6	21.4	3	10.7	1	3.6

Table 151: LMC at birth and parity NWH 2013

	Total	Nullipara		Multipara	
	N	n	%	n	%
Total	7223	3441	47.6	3782	52.4
Independent Midwife	3446	1735	50.3	1711	49.7
Private Obstetrician	1862	954	51.2	908	48.8
General Practitioner	17	8	47.1	9	52.9
NW Community	1336	534	40.0	802	60.0
NW Diabetes	201	66	32.8	135	67.2
NW Medical	300	117	39.0	183	61.0
Other DHB	33	17	51.5	16	48.5
Unbooked	28	10	35.7	18	64.3

Table 152: LMC at birth and prioritised maternal ethnicity NWH 2013

		NZ						Other				Other			
	Total	European		Maori		Pacific		Asian		Indian		European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7223	2548	35.3	532	7.4	904	12.5	1576	21.8	620	8.6	776	10.7	267	3.7
Independent Midwife	3446	1206	35.0	229	6.6	329	9.5	879	25.5	293	8.5	401	11.6	109	3.2
Private Obstetrician	1862	1030	55.3	54	2.9	28	1.5	350	18.8	88	4.7	268	14.4	44	2.4
General Practitioner	17	2	11.8	0	0.0	3	17.6	12	70.6	0	0.0	0	0.0	0	0.0
NW Community	1336	169	12.6	151	11.3	417	31.2	264	19.8	168	12.6	68	5.1	99	7.4
NW Diabetes	201	24	11.9	22	10.9	61	30.3	34	16.9	41	20.4	12	6.0	7	3.5
NW Medical	300	101	33.7	55	18.3	46	15.3	35	11.7	29	9.7	27	9.0	7	2.3
Other DHB	33	14	42.4	13	39.4	4	12.1	2	6.1	0	0.0	0	0.0	0	0.0
Unbooked	28	2	7.1	8	28.6	16	57.1	0	0.0	1	3.6	0	0.0	1	3.6

3.8 Standard primipara

Table 153: Demographic characteristics of standard and non-standard primipara NWH 2013

	Total primipara	Standard primipara		Non-standard primipara	
	N	n	%	n	%
Total	**3441**	**1195**	**34.7**	**2246**	**65.3**
Age					
<=20	192	27	14.1	165	85.9
21-25	463	220	47.5	243	52.5
26-30	1112	520	46.8	592	53.2
31-35	1122	428	38.1	694	61.9
36-40	459	0	0.0	459	100.0
>40	93	0	0.0	93	100.0
Ethnicity (prioritised)					
NZ European	1218	370	30.4	848	69.6
Maori	192	41	21.4	151	78.6
Pacific	296	93	31.4	203	68.6
Asian	860	364	42.3	496	57.7
Indian	333	154	46.2	179	53.8
Other European	420	128	30.5	292	69.5
Other	122	45	36.9	77	63.1
LMC at Birth					
Independent Midwife	1735	679	39.1	1056	60.9
Private Obstetrician	954	308	32.3	646	67.7
General Practitioner	8	1	12.5	7	87.5
NWH Community	534	187	35.0	347	65.0
NWH Diabetes	66	0	0.0	66	100.0
NWH Medical	117	17	14.5	100	85.5
Other DHB	17	0	0.0	17	100.0
Unbooked	10	3	30.0	7	70.0
Smoking					
Smoking at booking	132	37	28.0	95	72.0
No or not smoking in last month	3305	1157	35.0	2148	65.0
Missing	4	1	25.0	3	75.0

APPENDIX 4. ANTENATAL COMPLICATIONS

4.1 Preterm birth

Table 154: Preterm birth and maternal demographic characteristics NWH 2013

	Total	Total preterm birth		Iatrogenic preterm		Spontaneous preterm	
	N	n	%	n	%	n	%
Total	**7223**	**673**	**9.3**	**408**	**5.6**	**265**	**3.7**
Age							
<=20	254	40	15.7	18	7.1	22	8.7
21-25	790	74	9.4	42	5.3	32	4.1
26-30	1874	155	8.3	83	4.4	72	3.8
31-35	2525	213	8.4	125	5.0	88	3.5
36-40	1463	148	10.1	100	6.8	48	3.3
41+	317	43	13.6	40	12.6	3	0.9
Ethnicity							
NZ European	2547	229	9.0	148	5.8	81	3.2
Maori	532	85	16.0	46	8.6	39	7.3
Pacific	904	92	10.2	59	6.5	33	3.7
Asian	1576	120	7.6	68	4.3	52	3.3
Indian	620	68	11.0	35	5.6	33	5.3
Other European	776	55	7.1	38	4.9	17	2.2
Other	267	24	9.0	14	5.2	10	3.7
Parity							
Nulliparous	3441	328	9.5	186	5.4	142	4.1
Multiparous	3782	345	9.1	222	5.9	123	3.3
Plurality							
Singleton	7072	575	8.1	335	4.7	240	3.4
Twins	147	94	63.9	69	46.9	25	17.0
Triplets	4	4	100.0	4	100.0	0	0.0
Smoking at booking							
Currently smoking	415	68	16.4	35	8.4	33	8.0
No or not in past month	6799	604	8.9	373	5.5	231	3.4
Unknown	1	1	100.0	0	0.0	1	100.0
BMI							
<18.5	255	18	7.1	10	3.9	8	3.1
18.5-24.99	3826	294	7.7	176	4.6	118	3.1
25-29.99	1679	161	9.6	102	6.1	59	3.5
30-34.99	699	68	9.7	40	5.7	28	4.0
35-39.99	367	61	16.6	38	10.4	23	6.3
>=40	250	35	14.0	29	11.6	6	2.4
Missing	147	36	24.5	13	8.8	23	15.6
Deprivation quintile (NZ Dep 06)							
1	1248	112	9.0	77	6.2	35	2.8
2	1413	112	7.9	73	5.2	39	2.8
3	1548	147	9.5	87	5.6	60	3.9
4	1617	145	9.0	86	5.3	59	3.6
5	1385	152	11.0	81	5.8	71	5.1

4.2 Diabetes

Table 155: Women with diabetes birthing at NWH at or beyond 20 weeks gestation 1992-2013

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Type I	29	19	12	19	15	14	21	26	22	26	21
Type 2	19	21	26	32	35	22	23	28	32	37	49
GDM	140	197	160	221	245	247	221	181	186	161	251
Total	188	237	198	272	295	283	265	235	240	224	321

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Type I	20	25	31	33	26	31	47	30	33	40	29
Type 2	40	47	52	57	54	63	71	55	70	64	69
GDM	352	343	304	286	331	457	480	545	821	662	613
Total	412	415	387	376	411	551	598	630	924	766	711

Table 156: Perinatal deaths (1994 – 2013) among births complicated by diabetes

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

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total number of perinatal related losses	2	8	9	1	4	10	5	10	6
Perinatal related loss rate /1000 births	5	21	22	2	7	16	5	13	16

Table 157: DHB of domicile of women with diabetes birthing at NWH 2013

	Type 1 n=29		Type 2 n=69		GDM n=613		No Diabetes n=6512	
DHB	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Auckland	8	27.6	35	50.7	371	60.5	4523	69.46
Waitemata	19	65.5	24	34.8	125	20.4	889	13.7
Counties Manukau	1	3.4	9	13.0	109	17.8	960	14.7
Other	1	3.4	1	1.4	8	1.3	140	2.1

Table 158: Demographic characteristics of women with diabetes NWH 2013

		Type 1		Type 2		GDM		No Diabetes	
		n=	40	n=	64	n=	662	n=	6929
	N	n	%	n	%	n	%	n	%
Age									
<=20	254	2	0.8	0	0.0	5	2.0	247	97.2
21-25	790	1	0.1	2	0.3	48	6.1	739	93.5
26-30	1874	9	0.5	16	0.9	179	9.6	1670	89.1
31-35	2525	14	0.6	22	0.9	204	8.1	2285	90.5
36-40	1463	3	0.2	21	1.4	135	9.2	1304	89.1
41+	317	0	0.0	8	2.5	42	13.2	267	84.2
Ethnicity									
NZ European	2548	14	0.5	5	0.2	95	3.7	2434	95.5
Maori	532	6	1.1	10	1.9	40	7.5	476	89.5
Pacific	904	4	0.4	28	3.1	83	9.2	789	87.3
Asian	1576	0	0.0	7	0.4	118	7.5	1359	86.2
Indian	620	1	0.2	13	2.1	118	19.0	488	78.7
Other European	776	4	0.5	3	0.4	43	5.5	726	93.6
Other	267	0	0.0	3	1.1	24	9.0	240	89.9
BMI									
<18.5	255	0	0.0	0	0.0	7	2.7	248	97.3
18.5-24.99	3826	10	0.3	5	0.1	229	6.0	3582	93.6
>=25-29.99	1679	10	0.6	17	1.0	173	10.3	1479	88.1
30-34.99	699	5	0.7	14	2.0	93	13.3	587	84.0
35-39.99	367	1	0.3	16	4.4	46	12.5	304	82.8
≥40	250	3	1.2	17	6.8	61	24.4	169	67.6
missing	147	0	0.0	0	0.0	4	2.7	143	97.3
Smoking									
Smoking at booking	415	2	0.5	13	3.1	24	5.8	376	90.6
Not currently smoking	6799	27	0.4	56	0.8	588	8.6	6128	90.1
Missing	9	0	0.0	0	0.0	1	11.1	8	88.9

Table 159: Maternal outcomes among women with diabetes NWH 2013

	Type 1		Type 2		GDM		Postnatally Diagnosed Type 2		No diabetes	
	n=	29	n=	69	n=	601	n=	12	n=	6512
	n	%	n	%	n	%	n	%	n	%
Induction of labour	16	55.2	33	47.8	352	58.6	8	66.7	2029	31.2
Mode of Birth										
Spontaneous vaginal birth	11	37.9	25	36.2	291	48.4	7	58.3	3550	54.5
Ventouse	1	3.4	1	1.4	43	7.2	2	16.7	494	7.6
Forceps	2	6.9	1	1.4	26	4.3	0	0.0	263	4.0
CS emergency	7	24.1	24	34.8	129	21.5	2	16.7	1117	17.2
CS elective	8	27.6	18	26.1	112	18.6	1	8.3	1088	16.7
Gestation at birth										
<32 weeks	0	0.0	8	11.6	10	1.7	0	0.0	167	2.6
<37 weeks	11	37.9	22	31.9	69	11.5	1	8.3	570	8.8
PPH >=500mls	17	58.6	40	58.0	239	39.8	5	41.7	2262	34.7
PPH >=1000 mls	6	20.7	9	13.0	69	11.5	2	16.7	615	9.4
Postpartum transfusion	2	6.9	2	2.9	20	3.3	0	0.0	183	2.8

4.3 Antepartum haemorrhage

Table 160: Characteristics of pregnancies complicated by antepartum haemorrhage NWH 2013

		Placenta praevia		Placental abruption		APH uncertain origin		No APH	
		n=	66	n=	50	n=	344	n=	6761
	Total	n	%	n	%	n	%	n	%
Maternal age									
<=20	254	0	0.0	1	0.4	18	7.1	235	92.5
21-25	790	2	0.3	12	1.5	40	5.1	735	93.0
26-30	1874	9	0.5	10	0.5	99	5.3	1756	93.7
31-35	2525	26	1.0	16	0.6	113	4.5	2369	93.8
36-40	1463	18	1.2	8	0.5	61	4.2	1376	94.1
>40	317	11	3.5	3	0.9	13	4.1	290	91.5
Parity									
Nulliparous	3441	29	0.8	27	0.8	162	4.7	3223	93.7
Multip previous CS	1146	16	1.4	10	0.9	57	5.0	1062	92.7
Mullip no previous CS	2636	21	0.8	13	0.5	125	4.7	2476	93.9
Multiple pregnancy									
Multiple	151	0		3	2.0	7	4.6	141	93.4
Singleton	7072	66	0.9	49	0.7	337	4.8	6620	93.6
Smoking status at booking									
Currently smoking	415	3	0.7	5	1.2	34	8.2	373	89.9
Not currently smoking	6799	63	0.9	45	0.7	309	4.5	6380	93.8
Unknown	9	0	0.0	0	0.0	1	11.1	8	88.9
BMI									
<18.5	255	2	0.8	1	0.4	17	6.7	235	92.2
18.5-24.99	3826	36	0.9	21	0.5	177	4.6	3592	93.9
>=25-29.99	1679	19	1.1	17	1.0	71	4.2	1572	93.6
30-34.99	699	7	1.0	2	0.3	34	4.9	656	93.8
35-39.99	367	1	0.3	3	0.8	21	5.7	341	92.9
>=40	250	1	0.4	2	0.8	12	4.8	234	93.6
missing	147	0	0.0	4	2.7	12	8.2	131	89.1
Hypertensive disease									
Gestational hypertension	219	2	0.9	1	0.5	16	7.3	200	91.3
Chronic hypertension	138	3	2.2	1	0.7	9	6.5	125	90.6
Chronic hypertension with superimposed preeclampsia	14	0	0.0	1	7.1	0	0.0	13	92.9
Preeclampsia	153	0	0.0	2	1.3	4	2.6	147	96.1
Nil	6699	61	0.9	45	0.7	315	4.7	6276	93.7

4.4 Hypertensive disease

Table 161: Onset of birth among women with hypertensive disease NWH 2013

	Gestational hypertension		Chronic hypertension		Superimposed preeclampsia		Preeclampsia		Normotensive	
	n=	219	n=	138	n=	14	n=	153	n=	6699
	n	%	n	%	n	%	n	%	n	%
Spontaneous onset of labour	48	21.9	25	18.1	1	7.1	19	12.4	3088	46.1
Induced labour	131	59.8	60	43.5	4	28.6	83	54.2	2250	33.6
CS emergency before onset of labour	13	5.9	14	10.1	5	35.7	27	17.6	228	3.4
CS elective	27	12.3	39	28.3	4	28.6	24	15.7	1133	16.9

Table 162: Demographic characteristics of women with hypertensive disease NWH 2013

		Gestational hypertension n=219		Chronic hypertension n=138		Superimposed preeclampsia n=14		Preeclampsia n=153		Normotensive n=6699	
	Total	n	%	n	%	n	%	n	%	n	%
Ethnicity (prioritised)											
NZ European	2548	91	3.6	54	2.1	8	0.3	50	2.0	2345	92.0
Maori	532	24	4.5	13	2.4	3	0.6	22	4.1	470	88.3
Pacific	904	32	3.5	29	3.2	1	0.1	28	3.1	814	90.0
Asian	1576	27	1.7	18	1.1	1	0.1	24	1.5	1506	95.6
Indian	620	17	2.7	10	1.6	0	0.0	13	2.1	580	93.5
Other European	776	21	2.7	8	1.0	1	0.1	10	1.3	736	94.8
Other	267	7	2.6	6	2.2	0	0.0	6	2.2	248	92.9
Maternal age (nullipara)											
<=20	192	7	3.6	0	0.0	0	0.0	9	4.7	176	91.7
21-25	463	17	3.7	4	0.9	0	0.0	19	4.1	423	91.4
26-30	1112	45	4.0	16	1.4	2	0.2	26	2.3	1023	92.0
31-35	1122	43	3.8	13	1.2	3	0.3	26	2.3	1037	92.4
36-40	459	27	5.9	11	2.4	3	0.7	15	3.3	403	87.8
41+	93	2	2.2	5	5.4	1	1.1	6	6.5	79	84.9
Maternal age (multipara)											
<=20	62	0	0.0	2	3.2	0	0.0	0	0.0	60	96.8
21-25	327	6	1.8	5	1.5	0	0.0	5	1.5	311	95.1
26-30	762	16	2.1	14	1.8	0	0.0	7	0.9	725	95.1
31-35	1403	35	2.5	27	1.9	3	0.2	17	1.2	1321	94.2
36-40	1004	17	1.7	26	2.6	1	0.1	19	1.9	941	93.7
41+	224	4	1.8	15	6.7	1	0.4	4	1.8	200	89.3
Smoking											
Currently smoking	415	12	2.9	11	2.7	3	0.7	10	2.4	379	91.3
Not currently smoking	6799	207	3.0	127	1.9	11	0.2	143	2.1	6311	92.8
Unknown	9	0	0.0	0	0.0	0	0.0	0	0.0	9	100.0
BMI											
<18.5	255	4	1.6	2	0.8	0	0.0	2	0.8	247	96.9
18.5-24.99	3826	77	2.0	33	0.9	5	0.1	60	1.6	3651	95.4
25-29.99	1679	58	3.5	39	2.3	3	0.2	46	2.7	1533	91.3
30-34.99	699	41	5.9	21	3.0	5	0.7	20	2.9	612	87.6
35-39.99	367	17	4.6	17	4.6	0	0.0	15	4.1	318	86.6
>=40	250	19	7.6	26	10.4	1	0.4	9	3.6	195	78.0
Missing	147	3	2.0	0	0.0	0	0.0	1	0.7	143	97.3

4.5 Body Mass Index

Table 163: LMC at birth and BMI NWH 2013

	Total	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n	n	%	n	%	n	%	n	%	n	%	n	%
Totals	**7076**	**255**	**3.6**	**3826**	**54.1**	**1679**	**23.7**	**699**	**9.9**	**367**	**5.2**	**250**	**3.5**
IMW	3383	132	3.9	1925	56.9	784	23.2	308	9.1	149	4.4	85	2.5
Pvt Obst	1843	77	4.2	1254	68.0	381	20.7	88	4.8	33	1.8	10	0.5
NWH Comm	1315	34	2.6	505	38.4	357	27.1	211	16.0	126	9.6	82	6.2
NWH Diabetes	201	1	0.5	33	16.4	54	26.9	38	18.9	28	13.9	47	23.4
NWH Medical	286	7	2.4	92	32.2	92	32.2	48	16.8	25	8.7	22	7.7
GP	17	3	17.6	8	47.1	4	23.5	2	11.8	0	0.0	0	0.0
Other DHB	20	1	5.0	7	35.0	4	20.0	3	15.0	3	15.0	2	10.0
Unbooked	11	0	0.0	2	18.2	3	27.3	1	9.1	3	27.3	2	18.2

Table 164: Demographic characteristics and BMI NWH 2013 (excludes missing data)

	Total	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Totals	**7076**	**255**	**3.6**	**3826**	**54.1**	**1679**	**23.7**	**699**	**9.9**	**367**	**5.2**	**250**	**3.5**
Ethnicity													
NZ European	2504	49	2.0	1529	61.1	616	24.6	180	7.2	81	3.2	49	2.0
Maori	497	5	1.0	160	32.2	158	31.8	82	16.5	49	9.9	43	8.7
Pacific	877	7	0.8	109	12.4	206	23.5	235	26.8	180	20.5	140	16.0
Asian	1564	138	8.8	1098	70.2	258	16.5	51	3.3	17	1.1	2	0.1
Indian	608	29	4.8	283	46.5	203	33.4	68	11.2	17	2.8	8	1.3
Other European	763	15	2.0	508	66.6	161	21.1	59	7.7	13	1.7	7	0.9
Other	263	12	4.6	139	52.9	77	29.3	24	9.1	10	3.8	1	0.4
Age													
<=20	245	10	4.1	79	32.2	70	28.6	55	22.4	26	10.6	5	2.0
21-25	765	36	4.7	304	39.7	199	26.0	109	14.2	67	8.8	50	6.5
26-30	1834	98	5.3	1015	55.3	374	20.4	171	9.3	115	6.3	61	3.3
31-35	2475	81	3.3	1467	59.3	558	22.5	206	8.3	87	3.5	76	3.1
36-40	1444	22	1.5	811	56.2	392	27.1	122	8.4	54	3.7	43	3.0
>40	313	8	2.6	150	47.9	86	27.5	36	11.5	18	5.8	15	4.8
Parity													
Nullipara	3371	159	4.7	2022	60.0	735	21.8	277	8.2	117	3.5	61	1.8
Multipara	3705	96	2.6	1804	48.7	944	25.5	422	11.4	250	6.7	189	5.1
Smoking status at booking													
Smoking*	391	6	1.5	114	29.2	108	27.6	74	18.9	45	11.5	44	11.3
Not currently smoking	6683	249	3.7	3712	55.5	1570	23.5	625	9.4	321	4.8	206	3.1

*smoking status missing for two women

Table 165: Pregnancy complications and BMI NWH 2013

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n	%	n	%	n	%	n	%	n	%	n	%
Totals	**255**	**3.6**	**3826**	**54.1**	**1679**	**23.7**	**699**	**9.9**	**367**	**5.2**	**250**	**3.5**
Diabetes												
GDM	7	2.7	229	6.0	173	10.3	93	13.3	46	12.5	61	24.4
Type 1	0	0.0	10	0.3	10	0.6	5	0.7	1	0.3	3	1.2
Type 2	0	0.0	5	0.1	17	1.0	14	2.0	16	4.4	17	6.8
No diabetes*	248	97.3	3582	93.6	1479	88.1	587	84.0	304	82.8	169	67.6
Hypertension												
Chronic hypertension	2	0.8	33	0.9	39	2.3	21	3.0	17	4.6	26	10.4
Gestational hypertension	4	1.6	77	2.0	58	3.5	41	5.9	17	4.6	19	7.6
Pre-eclampsia	2	0.8	60	1.6	46	2.7	20	2.9	15	4.1	9	3.6
Superimposed pre-eclampsia	0	0.0	5	0.1	3	0.2	5	0.7	0	0.0	1	0.4
No hypertension	247	96.9	3651	95.4	1533	91.3	612	87.6	318	86.6	195	78.0

*includes women who have not had diabetes screening in pregnancy

Table 166: Postpartum haemorrhage associated with spontaneous vaginal birth (N=379) by BMI NWH 2013

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n	%	n	%	n	%	n	%	n	%	n	%
Totals	**n**	**150**	**n**	**2023**	**n**	**865**	**n**	**384**	**n**	**224**	**n**	**152**
PPH>=1000mls	7	4.7	118	5.8	61	7.0	46	11.9	19	8.5	15	9.9
PPH>=1500mls	3	2.0	42	2.1	25	2.9	26	6.8	11	4.9	6	3.9

Table 167: Postpartum haemorrhage associated with Caesarean section (N=418) by BMI NWH 2013

	<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	n	%	n	%	n	%	N	%	n	%	n	%
Totals	**n**	**67**	**n**	**1280**	**n**	**643**	**N**	**253**	**n**	**129**	**n**	**89**
PPH>=1000mls	3	4.5	125	9.8	98	15.2	41	16.2	23	17.8	29	32.6
PPH>=1500mls	0	0.0	32	2.5	30	4.7	19	7.5	4	3.1	14	15.7

Table 168: Neonatal outcomes by BMI NWH 2013

	TOTAL		<18.5		18.5-24.99		25-29.99		30-34.99		35-39.99		>=40	
	N=7224*		n=257		n=3891		n=1727		n=715		n=376		n=258	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Preterm	733	10.1	19	7.4	337	8.7	195	11.3	75	10.5	67	17.8	40	15.5
Iatrogenic preterm	469	6.5	11	4.3	211	5.4	126	7.3	44	6.2	42	11.2	33	12.8
Spontaneous preterm	264	3.7	8	3.1	126	3.2	69	4.0	31	4.3	25	6.6	7	2.7
Term	6491	89.9	238	92.6	3554	91.3	1532	88.7	640	89.5	309	82.2	218	84.5
Iatrogenic term	3644	50.4	111	43.2	1847	47.5	875	50.7	376	52.6	189	50.3	160	62.0
Spontaneous term	2847	39.4	127	49.4	1707	43.9	657	38.0	264	36.9	120	31.9	58	22.5
SGA	1052	14.6	37	14.4	514	13.2	249	14.4	116	16.2	80	21.3	56	21.7
≥2 days NICU	625	8.7	15	5.8	290	7.5	162	9.4	70	9.8	54	14.4	34	13.2
Perinatal deaths (n/1000)	109	15.1	4	15.6	44	11.3	26	15.1	11	15.4	14	37.2	10	38.8

* BMI of mother missing for 153 babies

Table 169: Maternal interventions and birth outcomes by BMI NWH 2013

	BMI<18.5		BMI 18.5-24.99		BMI >=25-29.99		BMI 30-34.99		BMI 35-39.99		BMI >=40	
	n=	255	n=	3826	n=	1679	n=	699	n=	367	n=	250
	n	%	n	%	n	%	n	%	n	%	n	%
Onset of birth												
Spontaneous labour	135	52.9	1823	47.6	716	42.6	292	41.8	143	39.0	64	25.6
Induced labour	82	32.2	1203	31.4	578	34.4	273	39.1	150	40.9	129	51.6
Emergency CS before labour	11	4.3	128	3.3	79	4.7	25	3.6	18	4.9	19	7.6
Elective CS	27	10.6	672	17.6	306	18.2	109	15.6	56	15.3	38	15.2
Mode of birth												
Spontaneous vaginal birth	150	58.8	2023	52.9	865	51.5	384	54.9	224	61.0	152	60.8
Operative vaginal	38	14.9	523	13.7	171	10.2	62	8.9	14	3.8	9	3.6
Elective CS	27	10.6	672	17.6	306	18.2	109	15.6	56	15.3	38	15.2
Emergency CS	40	15.7	608	15.9	337	20.1	144	20.6	73	19.9	51	20.4

APPENDIX 5. LABOUR AND BIRTH

5.1 Induction of labour

Table 170: Induction of labour rates 1994-2013 No data available on induction rates for 2001-2003

	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total Births	**8812**	**9125**	**9157**	**8055**	**7531***	**7501**	**7827**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**
Women Induced	2033	2366	2225	2135	2053	1910	2106	1922	1894	1776	1906	2203	2238	2214	2463	2483	2438
Incidence (%)	**23.1**	**25.9**	**24.3**	**26.5**	**27.3**	**25.5**	**26.9**	**25.7**	**26.3**	**24.6**	**24.8**	**29.0**	**28.9**	**28.7**	**32.7**	**32.3**	**33.8**
Total Nullipara	3814	4037	4018	3591	3263	3262	3455	3597	3522	3499	3752	3623	3811	3650	3539	3778	3441
Nullipara Induced	1046	1191	1112	1104	992	923	1049	1064	1042	940	1047	1207	1260	1226	1330	1382	1337
Incidence (%)	**27.4**	**29.5**	**27.7**	**30.7**	**30.4**	**28.3**	**30.4**	**29.6**	**29.6**	**26.9**	**27.9**	**33.3**	**33.1**	**33.5**	**37.6**	**36.5**	**38.9**
Total Multipara	4998	5088	5139	4464	4229	4239	4372	3894	3672	3713	3943	3966	3924	4059	3984	3917	3782
Multipara Induced	987	1175	1113	1031	1061	987	1057	858	852	836	859	996	978	988	1133	1101	1101
Incidence (%)	**19.7**	**23.1**	**21.7**	**23.1**	**25.1**	**23.3**	**24.2**	**22.0**	**23.2**	**22.5**	**21.8**	**25.1**	**24.9**	**24.3**	**28.4**	**28.1**	**29.1**

*Does not include 39 BBA's

Table 171: Indication for induction by gestation NWH 2013

	Preterm		Term	
	n=	673	n=	6550
	n	%	n	%
Total	165	24.5	2273	34.7
Other	3	0.4	112	1.7
APH	1	0.1	23	0.4
Maternal Request	0	0.0	24	0.4
Poor Obstetric History	0	0.0	36	0.5
Multiple Pregnancy	10	1.5	22	0.3
Fetal wellbeing	5	0.7	140	2.1
PPROM	62	9.2	2	0.0
IUD/Fetal Anomaly	46	6.8	34	0.5
Maternal Medical Complications	1	0.1	106	1.6
Maternal Age	0	0.0	91	1.4
Small for Gestational Age	13	1.9	294	4.5
Prolonged latent phase	2	0.3	172	2.6
Diabetes	8	1.2	309	4.7
Hypertension	11	1.6	160	2.4
Post Dates	0	0.0	305	4.7
TermPROM	3	0.4	443	6.8

Table 172: Indication for induction by parity (term births) NWH 2013

	Multipara		Nullipara	
	n=	3437	n=	3113
	n	%	n	%
Total	1016	29.6	1255	40.3
Other	58	1.7	54	1.7
APH	10	0.3	13	0.4
IUD/Fetal Anomaly	21	0.6	13	0.4
Multiple Pregnancy	15	0.4	7	0.2
Poor Obstetric History	32	0.9	4	0.1
Maternal Request	16	0.5	8	0.3
Fetal wellbeing	44	1.3	96	3.1
Maternal Age	52	1.5	39	1.3
Maternal Medical Complications	57	1.7	49	1.6
Small for Gestational Age	141	4.1	153	4.9
Diabetes	164	4.8	145	4.7
hypertension	54	1.6	106	3.4
Prolonged latent phase	76	2.2	96	3.1
Post Dates	117	3.4	188	6.0
TermPROM	159	4.6	284	9.1

Table 173: Rates of induction by age and ethnicity (prioritised) among term nullipara and multipara (excluding previous Caesarean) NWH 2013

	Term Nullipara	Induction of labour		Term Multipara no prev CS	Induction of labour	
	N	n	%	N	n	%
Total	**3113**	**1257**	**40.4**	**2414**	**906**	**37.5**
Age						
<=25	586	216	36.9	295	91	30.8
26-30	1016	422	41.5	534	176	33.0
31-35	1036	407	39.3	878	308	35.1
>=35	475	212	44.6	707	331	46.8
Ethnicity						
NZ European	1101	440	40.0	790	326	41.3
Maori	161	71	44.1	226	83	36.7
Pacific	266	97	36.5	427	175	41.0
Asian	790	296	37.5	486	133	27.4
Indian	294	148	50.3	177	77	43.5
Other European	392	156	39.8	210	86	41.0
Other	109	49	45.0	98	26	26.5

5.2 Outcomes following induction

Table 174: Mode of birth at term by onset of birth and parity (excluding women with prior CS) among intended vaginal births NWH 2013

	Nullipara				Multipara			
	Spontaneous labour n=1435		Induced labour n=1257		Spontaneous labour n=1371		Induced labour n=906	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB	855	59.6	493	39.2	1282	93.5	757	83.6
Operative vaginal	338	23.6	310	24.7	49	3.6	62	6.8
CS emergency in labour	242	16.9	306	24.3	40	2.9	51	5.6
CS emergency not in labour*	0	0.0	148	11.8	0	0.0	36	4.0
Epidural	827	57.6	1048	83.4	301	22.0	496	54.7

*failed induction rate

Table 175: Mode of birth at term among nullipara by indication for induction NWH 2013

	Post dates n=188		Term PROM n=284		Hypertension n=106		Prolonged latent phase n=96		Diabetes n=145		SGA n=153		Other n=189	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	64	34.0	121	42.6	39	36.8	40	41.7	56	38.6	74	48.4	62	32.8
Operative vaginal	44	23.4	74	26.1	25	23.6	27	28.1	33	22.8	36	23.5	49	25.9
CS emergency in labour	63	33.5	71	25.0	30	28.3	23	24.0	35	24.1	21	13.7	41	21.7
CS emergency not in labour*	17	9.0	18	6.3	12	11.3	6	6.3	21	14.5	22	14.4	36	19.0
Epidural	53	28.2	72	25.4	26	24.5	47	49.0	56	38.6	62	40.5	160	84.7

*failed induction rate

Table 176: Mode of birth at term among multiparous (excluding previous Caesarean) women by indication for induction NWH 2013

	Post dates n=107		TermPROM n=143		Hypertension n=50		Prolonged latent phase n=68		Diabetes n=144		SGA n=123		Other n=271	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth														
SVB	83	77.6	121	84.6	44	88.0	61	89.7	117	81.3	111	90.2	220	81.2
Operative vaginal	8	7.5	14	9.8	4	8.0	2	2.9	8	5.6	7	5.7	19	7.0
CS emergency in labour	12	11.2	5	3.5	0	0.0	4	5.9	8	5.6	2	1.6	20	7.4
CS emergency not in labour	4	3.7	3	2.1	2	4.0	1	1.5	11	7.6	3	2.4	12	4.4
Epidural	53	49.5	72	50.3	26	52.0	47	69.1	56	38.9	62	50.4	160	59.0

*failed induction rate

5.3 Use of Syntocinon

Table 177: Dilatation at start of syntocinon infusion among labouring women by induction status NWH 2013

	Induced labour n=1702		Spontaneous labour n=652	
Dilatation	**n**	**%**	**n**	**%**
0	82	4.8	1	0.2
1	166	9.8	0	0.0
2	471	27.7	2	0.3
3	486	28.6	75	11.5
4	194	11.4	140	21.5
5	50	2.9	98	15.0
6	17	1.0	82	12.6
7	15	0.9	50	7.7
8	10	0.6	49	7.5
9	12	0.7	35	5.4
10	32	1.9	63	9.7
Missing	167	9.8	57	8.7

5.4 Mode of birth

Table 178: Mode of birth by parity and previous Caesarean section status NWH 2013

	Nullipara preterm n=328		Nullipara term n=3113		Multipara no prev CS preterm n=222		Multipara no prev CS term n=2414		Multipara prev CS preterm n=123		Multipara prev CS term n=1023	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Spontaneous vertex	135	41.2	1344	43.2	120	54.1	2030	84.1	24	19.5	175	17.1
Vaginal breech	18	5.5	4	0.1	19	8.6	9	0.4	6	4.9	0	0.0
Operative vaginal birth	26	7.9	648	20.8	3	1.4	111	4.6	3	2.4	42	4.1
Ventouse	9	2.7	433	13.9	2	0.9	70	2.9	1	0.8	26	2.5
Forceps	17	5.2	215	6.9	1	0.5	41	1.7	2	1.6	16	1.6
Caesarean section	149	45.4	1117	35.9	80	36.0	264	10.9	90	73.2	806	78.8
Emergency	103	31.4	767	24.6	53	23.9	156	6.5	50	40.7	150	14.7
Elective	46	14.0	350	11.2	27	12.2	108	4.5	40	32.5	656	64.1

Table 179: LMC by parity and previous Caesarean section status NWH 2013

	IMW n=3446		Pvt Obstetrician n=1862		GP n=17		NWH n=1837		Other DHB n=33		Unbooked n=28	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Primipara	1735	50.3	954	51.2	8	47.1	717	39.0	17	51.5	10	35.7
Standard primip	679	19.7	308	16.5	1	5.9	204	11.1	0	0.0	3	10.7
Multipara	1711	49.7	908	48.8	9	52.9	1120	61.0	16	48.5	18	64.3
Previous CS	365	10.6	402	21.6	2	11.8	370	20.1	4	12.1	3	10.7
No prev CS	1346	39.1	506	27.2	7	41.2	750	40.8	12	36.4	15	53.6

Table 180: Mode of birth by LMC at birth (term nullipara) NWH 2013

	IMW n=1623		PVT Obstetrician n=858		GP n=8		NWH n=613		Other DHB n=4		Unbooked n=7	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	792	48.8	236	27.5	4	50.0	306	49.9	1	25.0	5	71.4
Vaginal breech	4	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Forceps	131	8.1	44	5.1	0	0.0	38	6.2	1	25.0	1	14.3
Ventouse	241	14.8	127	14.8	1	12.5	63	10.3	0	0.0	1	14.3
CS elective	86	5.3	228	26.6	0	0.0	35	5.7	1	25.0	0	0.0
CS emergency	369	22.7	223	26.0	3	37.5	171	27.9	1	25.0	0	0.0

Table 181: Mode of birth at term by LMC at birth (standard primipara) NWH 2013

	IMW n=679		PVT Obstetrician n=308		GP n=1		NWH n=204		Unbooked n=3	
	n	%	n	%	n	%	n	%	n	%
SVD	379	55.8	119	38.6	1	100.0	113	55.4	2	66.7
Forceps	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ventouse	55	8.1	17	5.5	0	0.0	19	9.3	1	33.3
CS elective	113	16.6	44	14.3	0	0.0	31	15.2	0	0.0
CS emergency	10	1.5	57	18.5	0	0.0	8	3.9	0	0.0

Table 182: Mode of birth at term by LMC at birth (multipara, no previous CS) NWH 2013

	IMW n=1263		Pvt Obstetrician n=464		GP n=6		NWH n=665		Other DHB n=5		Unbooked n=11	
	n	%	n	%	n	%	n	%	n	%	n	%
SVD	1100	87.1	350	75.4	6	100.0	558	83.9	5	100.0	11	100.0
Vaginal breech	3	0.2	0	0.0	0	0.0	6	0.9	0	0.0	0	0.0
Forceps	21	1.7	9	1.9	0	0.0	11	1.7	0	0.0	0	0.0
Ventouse	34	2.7	24	5.2	0	0.0	12	1.8	0	0.0	0	0.0
CS elective	32	2.5	47	10.1	0	0.0	29	4.4	0	0.0	0	0.0
CS emergency	73	5.8	34	7.3	0	0.0	49	7.4	0	0.0	0	0.0

Table 183: Mode of birth at term by LMC (multipara, previous CS) NWH 2013

	IMW n=343		Pvt Obstetrician n=372		GP n=2		NWH n=305		Other DHB n=0		Unbooked n=1	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	97	28.3	18	4.8	1	50.0	58	19.0	0	NA	1	100.0
Vaginal breech	0	0.0	0	0.0	0	0.0	0	0.0	0	NA	0	0.0
Forceps	6	1.7	4	1.1	0	0.0	6	2.0	0	NA	0	0.0
Ventouse	9	2.6	4	1.1	0	0.0	13	4.3	0	NA	0	0.0
CS elective	173	50.4	309	83.1	1	50.0	173	56.7	0	NA	0	0.0
CS emergency	58	16.9	37	9.9	0	0.0	55	18.0	0	NA	0	0.0

Table 184: Mode of birth by ethnicity NWH 2013

	NZ European n=2548		Maori n=532		Pacific n=904		Other Asian n=1576		Indian n=620		Other European n=776		Other n=267	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	1200	47.1	336	63.2	638	70.6	881	55.9	285	46.0	350	45.1	138	51.7
Vaginal breech	20	0.8	9	1.7	3	0.3	9	0.6	6	1.0	4	0.5	5	1.9
Forceps	110	4.3	9	1.7	20	2.2	55	3.5	39	6.3	47	6.1	12	4.5
Ventouse	187	7.3	26	4.9	20	2.2	144	9.1	62	10.0	81	10.4	21	7.9
CS elective	584	22.9	65	12.2	81	9.0	232	14.7	69	11.1	161	20.7	35	13.1
CS emergency	447	17.5	87	16.4	142	15.7	255	16.2	159	25.6	133	17.1	56	21.0

Table 185: Mode of birth by ethnicity (nullipara) NWH 2013

	NZ European n=1218		Maori n=192		Pacific n=296		Other Asian n=860		Indian n=333		Other European n=420		Other n=122	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	479	39.3	93	48.4	189	63.9	399	46.4	128	38.4	144	34.3	47	38.5
Vaginal breech	11	0.9	2	1.0	0	0.0	4	0.5	4	1.2	1	0.2	0	0.0
Forceps	85	7.0	6	3.1	14	4.7	47	5.5	31	9.3	38	9.0	11	9.0
Ventouse	151	12.4	20	10.4	15	5.1	122	14.2	48	14.4	72	17.1	14	11.5
CS elective	185	15.2	13	6.8	15	5.1	92	10.7	16	4.8	62	14.8	13	10.7
CS emergency	307	25.2	58	30.2	63	21.3	196	22.8	106	31.8	103	24.5	37	30.3

Table 186: Mode of birth by ethnicity (multipara) NWH 2013

	NZ European n=1330		Maori n=340		Pacific n=608		Other Asian n=716		Indian n=287		Other European n=356		Other n=145	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	721	54.2	243	71.5	449	73.8	482	67.3	157	54.7	206	57.9	91	62.8
Vaginal breech	9	0.7	7	2.1	3	0.5	5	0.7	2	0.7	3	0.8	5	3.4
Forceps	25	1.9	3	0.9	6	1.0	8	1.1	8	2.8	9	2.5	1	0.7
Ventouse	36	2.7	6	1.8	5	0.8	22	3.1	14	4.9	9	2.5	7	4.8
CS elective	399	30.0	52	15.3	66	10.9	140	19.6	53	18.5	99	27.8	22	15.2
CS emergency	140	10.5	29	8.5	79	13.0	59	8.2	53	18.5	30	8.4	19	13.1

Table 187: Mode of birth by maternal age (nullipara) NWH 2013

	<=20 n=192		21-25 n=463		26-30 n=1112		31-35 n=1122		36-40 n=459		>40 n=93	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	141	73.4	261	56.4	516	46.4	423	37.7	126	27.5	12	12.9
Vaginal breech	1	0.5	3	0.6	9	0.8	7	0.6	2	0.4	0	0.0
Forceps	5	2.6	31	6.7	75	6.7	84	7.5	35	7.6	2	2.2
Ventouse	10	5.2	45	9.7	143	12.9	185	16.5	49	10.7	10	10.8
CS elective	3	1.6	17	3.7	93	8.4	140	12.5	101	22.0	42	45.2
CS emergency	32	16.7	106	22.9	276	24.8	283	25.2	146	31.8	27	29.0

Table 188: Mode of birth by maternal age (multipara) NWH 2013

	<=20 n=62		21-25 n=327		26-30 n=762		31-35 n=1403		36-40 n=1004		>40 n=224	
	n	%	n	%	n	%	n	%	n	%	n	%
Spontaneous vertex	55	88.7	262	80.1	531	69.7	860	61.3	536	53.4	105	46.9
Vaginal breech	1	1.6	1	0.3	11	1.4	10	0.7	10	1.0	1	0.4
Forceps	0	0.0	3	0.9	13	1.7	25	1.8	15	1.5	4	1.8
Ventouse	0	0.0	7	2.1	18	2.4	38	2.7	30	3.0	6	2.7
CS elective	1	1.6	21	6.4	109	14.3	327	23.3	293	29.2	80	35.7
CS emergency	5	8.1	33	10.1	80	10.5	143	10.2	120	12.0	28	12.5

5.5 Operative births

Table 189: Primary indication for elective or pre labour emergency Caesarean section (all gestations) NWH 2013

	Total N=1735		Nullipara n=683		Multipara n=1052	
	n	%	n	%	n	%
Abruption/APH	36	2.1	14	2.0	22	2.1
Diabetes	13	0.7	6	0.9	7	0.7
Disproportion	10	0.6	4	0.6	6	0.6
Failed Induction	71	4.1	48	7.0	23	2.2
Fetal Distress	131	7.6	94	13.8	37	3.5
Hypertension	21	1.2	12	1.8	9	0.9
Malpresentation	197	11.4	129	18.9	68	6.5
Maternal Age	23	1.3	21	3.1	2	0.2
Maternal Medical Condition	74	4.3	49	7.2	25	2.4
Maternal Request	192	11.1	138	20.2	54	5.1
Multiple Pregnancy	43	2.5	22	3.2	21	2.0
Obstetric History	35	2.0	13	1.9	22	2.1
Placenta Praevia with or without bleeding	50	2.9	24	3.5	26	2.5
Repeat Caesarean Section	659	38.0		0.0	659	62.6
Small for Gestational Age	33	1.9	19	2.8	14	1.3
Other (please specify)	147	8.5	90	13.2	57	5.4

Table 190: Indication for in labour emergency Caesarean section all gestations (spontaneous or induced onset of labour) (n=771) NWH 2013

	n=771	
	n	%
1a Fetal distress	104	13.5
1b Other fetal indication	231	30.0
2a Fetal intolerance of augmented labour	109	14.1
2b Augmentation causes hyperstimulation	22	2.9
2c Poor uterine response to optimal augmentation	41	5.3
2d Suboptimal augmentation	34	4.4
2e Inefficient uterine action - no oxytocin	19	2.5
3 Efficient uterine action - obstructed labour	182	23.6
4b Maternal request	6	0.8
4a Other non-medical	10	1.3
Missing	13	1.7

Table 191: Operative vaginal birth rates 1999-2013

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total births (mothers)	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7735**	**7709**	**7523**	**7695**	**7223**
Total operative vaginal births	949	1006		1081	1065	1171	1022	956	975	937	947	942	832	907	833
Incidence %	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3	12.2	12.2	11.1	11.8	11.5
Total nullipara	**3262**	**3455**				**3597**	**3522**	**3499**	**3752**	**3623**	**3811**	**3650**	**3539**	**3778**	**3441**
Operative vaginal births	722	733				875	809	737	772	722	753	752	643	744	674
Nulliparous operative vaginal birth rate (%)	22.1	21.2				24.3	23.0	21.1	20.6	19.9	19.8	20.6	18.2	19.7	19.6
Total multipara	**4239**	**4372**				**3894**	**3672**	**3713**	**3943**	**3966**	**3924**	**4059**	**3984**	**3917**	**3782**
Operative vaginal births	227	273				296	213	219	203	215	194	190	189	163	159
Multiparous operative vaginal birth rate (%)	5.4	6.2				7.6	5.8	5.9	5.1	5.4	4.9	4.7	4.7	4.2	4.2

Table 192: Type of operative vaginal birth 1997-2013

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total births	**7492**	**7501**	**7827**	**7471**	**7755**	**7611**	**7491**	**7194**	**7212**	**7695**	**7589**	**7753**	**7709**	**7523**	**7695**	**7223**
Total operative vaginal births	925	949	1006		1081	1065	1171	1022	956	975	937	947	942	832	907	833
% of all births	12.3	12.7	12.9		13.9	14.0	15.6	14.2	13.3	12.7	12.3	12.2	12.2	11.1	11.8	11.5
Total forceps alone	464	439	435		391	352	323	234	256	222	301	339	308	288	267	256
% of all births	6.2	5.9	5.6		5.0	4.6	4.3	3.3	3.5	2.9	4.0	4.0	4.0	3.8	3.5	3.5
Kiellands forceps	41	33	21				36	22	33	22	29	42	38	25	22	31
% of all births	0.5	0.4	0.3				0.5	0.3	0.5	0.3	0.4	0.5	0.5	0.3	0.3	0.4
Other forceps	423	406	414				287	212	223	200	272	297	270	263	245	225
% of all births	5.6	5.4	5.3				3.8	2.9	3.1	2.6	3.6	3.8	3.5	3.5	3.2	3.1
Ventouse or forceps /ventouse	461	510	571		690	713	848	788	700	753	677	650	634	544	640	577
% of all births	6.2	6.8	7.3		8.9	9.4	11.3	11.0	9.7	9.8	8.9	8.4	8.3	7.2	8.3	8.0
Ventouse alone		436	516				771	728	639	686	636	608	584	509	606	540
% of all births		5.8	6.6				10.3	10.1	8.9	8.9	8.4	7.8	7.6	6.8	7.9	7.5
Forceps/ ventouse		74	55				77	60	61	67	41	35	50	35	34	37
% of all births		1.0	0.7				1.0	0.8	0.8	0.9	0.5	0.5	0.6		0.4	0.5

Table 193: Breech birth 1998-2013 Note no data in 2001-2003

	1998	1999	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total babies born	7721	7679	8054	7679	7384	7379	7875	7753	7897	7866	7690	7863	7377
Total breech births	400	440	484	421	432	419	449	439	335	434	406	463	401
Percent of total births	5.2	5.7	6.0	5.5	5.9	5.7	5.7	5.7	4.2	5.5	5.2	5.9	5.4
Total singleton babies		7329	7609	7303	7007	7050	7518	7427	7576	7556	7360	7533	7072
Total singleton breech		341	363	318	328	328	351	346	335	340	310	356	319
Percent of singletons		4.7	4.8	4.4	4.7	4.7	4.7	4.7	4.4	4.3	4.2	4.7	4.5
Total multiple babies		350	445	376	377	329	357	324	321	310	330	330	305
Total multiple breech		99	121	103	104	91	98	93	89	94	96	107	82
Percent of multiple births		28.3	27.2	27.4	27.6	27.7	27.5	28.7	27.7	30.3	34.3	32.4	26.9

Table 194: Mode of birth by type of breech (singletons only) NWH 2013

	Extended leg n=190		Flexed leg n=82		Unspecified n=47		Total breech n=319	
	n	%	n	%	n	%	n	%
Vaginal breech	22	11.6	4	4.9	12	25.5	38	11.9
Caesarean								
CS emergency	46	24.2	31	37.8	18	38.3	95	29.8
CS elective	122	64.2	47	57.3	17	36.2	186	58.3

Table 195: Mode of birth by type of breech (multiples only NWH 2013

	Extended leg n=40		Flexed leg n=21		Unspecified n=21		Total breech n=82	
	n	%	n	%	n	%	n	%
Vaginal breech	7	17.5	4	19.1	9	42.9	20	24.4
Caesarean								
CS emergency	10	25.0	6	28.6	7	33.3	23	28.1
CS elective	23	57.5	11	52.4	5	23.8	39	47.6

Table 196: Referral for ECV (women at term with singleton breech presentation or attempted ECV) by demographic and clinical characteristics NWH 2013

	Singleton breech at term or attempted ECV N=261	ECV n=88		No ECV n=173	
		n	%	n	%
Age (years					
≤ 20	3	1	33	2	67
21-30	75	37	49	38	51
31-40	159	46	29	113	71
≥ 41	24	4	17	20	83
Ethnicity (prioritised)					
NZ/Other European	154	39	25	115	75
Maori/ Pacific Island	41	15	37	26	63
Other Asian	50	27	54	23	46
Indian	10	4	40	6	60
Other	6	3	50	3	50
BMI					
<18.5	5	1	20	4	80
18.5-24.99	147	53	36	94	64
>=25-29.99	60	27	45	33	55
30-34.99	20	5	25	15	75
35-39.99	12	1	8	11	92
>=40	10	0	0	10	100
missing	7	1	14	6	86
LMC at birth					
Independent MW	129	64	50	65	50
NWH Community	28	9	32	19	68
NWH Diabetes/Medical	21	4	19	17	81
Private Obstetrician	82	11	13	71	87
Previous CS					
Yes	48	2	4	46	96
No	213	86	40	127	60

5.6 Obstetric Analgesia

Table 197: Epidural use among women with spontaneous and induced labour 2000-2013

	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of births	7827	7491	7194	7212	7695	7589	7753	7709	7523	7695	7223
Number women with spontaneous labour	4820	4817	4246	4256	4490	4070	4125	4007	3628	3666	3270
Spontaneous labour and epidural	2143	2434	2138	2168	2057	1743	1717	1686	1483	1571	1297
%	44.5	50.5	50.4	50.9	45.8	42.8	41.6	42.1	40.9	42.9	39.7
Number of women with induced labour	2002	1922	1894	1776	1906	2203	2238	2214	2463	2485	2438
Induced labour and epidural	1313	1412	1373	1269	1326	1550	1599	1557	1707	1780	1709
%	65.6	73.5	72.5	71.5	69.6	70.4	71.4	70.3	69.3	71.6	70.1

Table 198: Analgesic use and LMC at birth among labouring nulliparous women NWH 2013

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
IMW	1600	1025	64.1	1022	63.9	175	10.9	26	1.6	171	10.7
Pvt Obstetrician	650	530	81.5	306	47.1	55	8.5	12	0.8	48	7.4
GP	8	6	75.0	3	37.5	0	0.0	0	0.0	0	0.0
NWH_Community	496	308	62.1	332	66.9	61	12.3	4	0.8	27	5.4
NWH_Diabetes	55	44	80.0	31	56.4	7	12.7	1	1.8	0	0.0
NWH_Medical	86	54	62.8	44	51.2	9	10.5	0	0.0	3	3.5
Other DHB	11	3	27.3	6	54.5	0	0.0	0	0.0	0	0.0
Unbooked	9	4	44.4	4	44.4	0	0.0	0	0.0	1	11.1

Table 199: Analgesic use and ethnicity (prioritised) among labouring nulliparous women NWH 2013

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
NZ European	979	696	71.1	576	58.8	94	9.6	27	2.8	115	11.7
Maori	167	104	62.3	105	62.9	16	9.6	0	0.0	19	11.4
Pacific	274	143	52.2	170	62.0	20	7.3	2	0.7	23	8.4
Asian	742	503	67.8	448	60.4	90	12.1	6	0.8	26	3.5
Indian	305	197	64.6	191	62.6	42	13.8	1	0.3	13	4.3
Other European	344	254	73.8	193	56.1	27	7.8	7	2.0	49	14.2
Other	104	77	74.0	65	62.5	18	17.3	0	0.0	5	4.8

Table 200: Analgesic use and maternal age among labouring nulliparous women NWH 2013

Maternal age	Total	Epidural		Entonox		Pethidine		TENS		Water	
(years)	N	n	%	n	%	n	%	n	%	n	%
<=20	183	81	44.3	122	66.7	20	10.9	0	0.0	19	10.4
21-25	429	262	61.1	286	66.7	57	13.3	0	0.0	38	8.9
26-30	991	678	68.4	603	60.8	115	11.6	13	1.3	79	8.0
31-35	932	666	71.5	550	59.0	83	8.9	24	2.6	88	9.4
36-40	337	251	74.5	160	47.5	28	8.3	4	1.2	25	7.4
>40	43	36	83.7	27	62.8	4	9.3	2	4.7	1	2.3

APPENDIX 6. LABOUR and BIRTH OUTCOMES

6.1 Perineal trauma

Table 201: Episiotomy rates in vaginal births, all gestations by LMC at birth and parity NWH 2013

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	2153	899	41.8	2511	297	11.8
Independent Midwife	1237	516	41.7	1329	140	10.5
Private Obstetrician	443	251	56.7	432	99	22.9
General Practitioner	5	1	20.0	8	1	12.5
National Women's	468	131	28.0	742	57	7.7

Table 202: Episiotomy rates in spontaneous (non operative) vertex (not breech) birth, all gestations by LMC at birth and parity NWH 2013

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1482	390	26.3	2355	216	9.2
Independent Midwife	858	215	25.1	1258	102	8.1
Private Obstetrician	262	127	48.5	391	80	20.5
General Practitioner	4	0	0.0	8	1	12.5
National Women's	358	48	13.4	698	33	4.7

Table 203: 3rd and 4th degree tears in spontaneous (non operative) vertex birth by LMC at birth and parity NWH 2013

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1482	52	3.5	2355	25	1.1
Independent Midwife	858	33	3.8	1258	11	0.9
Private Obstetrician	262	3	1.1	391	1	0.3
GP	4	0	0.0	8	0	0.0
National Women's	358	16	4.5	698	13	1.9

Table 204: Postpartum transfusion rates by recorded blood loss at birth NWH 2013

	Total	Postpartum transfusion	
		n	%
Total	**7223**	**196**	**2.7**
Blood loss <500	4648	9	0.2
PPH 500-999	1862	26	1.4
PPH 1000-1499	436	44	10.1
PPH 1500-2499	216	77	35.6
PPH >=2500	49	39	79.6
Blood loss unknown	12	1	8.3

Table 205: Third stage management by PPH risk among vaginal births NWH 2013

	Total	Physiological		Active syntocinon		Active syntometrine		Other		Unknown	
	n	n	%	n	%	n	%	n	%	n	%
TOTAL	**4717**	**325**	**6.9**	**2329**	**49.4**	**1905**	**40.4**	**8**	**0.2**	**150**	**3.2**
Spontaneous vagina birth	3890	323	8.3	132	3.4	1851	47.6	6	0.2	132	3.4
Operative vaginal birth	827	2	0.2	18	2.2	478	57.8	2	0.2	18	2.2
BMI											
<18.5	188	15	8.0	88	46.8	80	42.6	0	0.0	5	2.7
18.5-24.99	2546	207	8.1	1266	49.7	992	39.0	4	0.2	77	3.0
>=25-29.99	1036	64	6.2	512	49.4	421	40.6	2	0.2	37	3.6
30-34.99	446	21	4.7	229	51.3	182	40.8	1	0.2	13	2.9
35-39.99	238	5	2.1	98	41.2	127	53.4	1	0.4	7	2.9
>=40	161	2	1.2	76	47.2	76	47.2	0	0.0	7	4.3
missing	102	11	10.8	60	58.8	27	26.5	0	0	4	3.9
Previous CS	250	11	4.4	134	53.6	96	38.4	1	0.4	8	3.2
Hypertension											
No hypertension	4457	314	7.0	2111	47.4	1882	42.2	7	0.2	143	3.2
Gestational Hypertension	124	6	4.8	103	83.1	11	8.9	1	0.8	3	2.4
Chronic hypertension	64	2	3.1	50	78.1	10	15.6	0	0.0	2	3.1
Superimposed preeclampsia	3	1	33.3	2	66.7	0	0.0	0	0.0	0	0.0
Preeclampsia	77	1	1.3	71	92.2	4	5.2	0		1	1.3
Singleton	4657	323	6.9	2299	49.4	1877	40.3	8	0.2	150	3.2
Multiple	60	2	3.3	30	50.0	28	46.7	0	0.0	0	0.0

APPENDIX 7. POSTNATAL CARE

7.1 Infant Feeding

Table 206: Method of Infant feeding at discharge from NWH 2003-2013

	2003 n = 5177		2004 n = 5938		2005 n = 5765		2006 n = 6158		2007 n = 6570		2008 n =6636	
	n	%	n	%	n	%	n	%	n	%	n	%
Exclusive breastfeeding	2789	53.9	3673	61.9	3686	63.9	4546	73.8	5064	77.1	5254	79.2
Fully breastfeeding	562	10.9	464	7.8	485	8.4	441	7.2	348	5.3	304	4.6
Partial breastfeeding	1521	29.4	1497	25.2	1375	23.9	958	15.6	929	14.1	871	13.1
Artificial feeding	305	5.9	304	5.1	219	3.8	213	3.5	229	3.5	207	3.1

	2009 n = 6928		2010 n =6941		2011 n = 6723		2012 n = 6862		2013 n = 6452	
	n	%	n	%	n	%	n	%	n	%
Exclusive breastfeeding	5659	81.7	5736	82.6	5439	80.9	5508	80.3	5094	79.0
Fully breastfeeding	287	4.1	260	3.8	285	4.2	243	3.5	256	4.0
Partial breastfeeding	824	11.9	755	10.9	841	12.5	957	13.9	963	14.9
Artificial feeding	158	2.3	190	2.7	158	2.4	154	2.2	138	2.1

Table 207: Infant feeding on discharge from NWH by mode of birth, LMC and maternal age NWH 2013

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total *	6452	5094	79.0	256	4.0	963	14.9	138	2.1
Mode of birth									
Spontaneous vaginal	3577	3112	87.0	84	2.3	306	8.6	74	2.1
Operative vaginal	762	637	83.6	16	2.1	98	12.9	11	1.4
Elective CS	1095	712	65.0	83	7.6	262	23.9	38	3.5
Emergency CS	1018	633	62.2	73	7.2	297	29.2	15	1.5
LMC at birth									
IMW	3155	2652	84.1	94	3.0	367	11.6	41	1.3
Private Obstetrician	1712	1371	80.1	51	3.0	254	14.8	36	2.1
GP	16	10	62.5	1	6.3	5	31.3	0	0.0
NWH Community	1221	880	72.1	77	6.3	228	18.7	36	2.9
NWH Medical	164	88	53.7	18	11.0	44	26.8	14	8.5
NWH Diabetes	161	76	47.2	14	8.7	62	38.5	9	5.6
Unbooked	19	15	78.9	1	5.3	1	5.3	2	10.5
Other DHB	4	2	50.0	0	0.0	2	50.0	0	0
Maternal age									
≤ 20	200	164	82.0	6	2.5	20	10.0	11	5.8
21-25	687	540	78.6	31	4.5	96	14.0	20	2.2
26-30	1683	1322	78.6	72	4.3	255	15.2	34	1.8
31-35	2280	1852	81.2	81	3.6	614	13.8	33	1.7
36-40	1319	1027	77.9	50	3.8	212	16.1	29	3.1
>40	283	189	66.5	17	6.0	66	23.3	11	4.9

*Breastfeeding status 'missing' for 1 baby

Table 208: Infant feeding on discharge from NWH by prioritised maternal ethnicity, gestation, birthweight and among standard primpara NWH 2013

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Ethnicity									
NZ European	2279	1921	84.3	78	3.4	238	10.4	41	1.8
Māori	435	327	75.2	29	6.7	60	13.8	19	4.4
Pacific	794	597	75.2	34	4.3	128	16.1	35	4.4
Other Asian	1464	1065	72.7	57	3.9	324	22.1	18	1.2
Indian	537	385	71.7	34	6.3	113	21.0	5	0.9
Other European	706	611	86.5	18	2.5	61	8.6	16	2.3
Other	237	188	79.3	6	2.5	39	16.5	4	1.7
Gestation									
< 37 weeks	253	87	34.4	63	24.9	95	37.5	8	3.2
≥37 weeks	6199	5007	80.8	193	3.1	868	14.0	130	2.1
Birth weight									
< 2.5 kgs	181	55	30.4	35	19.3	86	47.5	4	2.2
2.5 - 2.9 kgs	1041	720	69.2	78	7.5	214	20.6	29	2.8
3.0 - 4.4 kgs	5116	4239	82.9	137	2.7	635	12.4	105	2.1
≥ 4.5 kgs	114	80	70.2	6	5.3	28	24.6	0	0.0
Primipara									
Standard	1146	985	86.0	25	2.2	127	11.1	9	0.8
Non standard	5306	4109	77.4	231	4.4	836	15.8	129	2.6
Quintile									
1	1152	927	80.5	36	3.1	153	13.3	20	1.7
2	1307	1035	79.2	48	3.7	199	15.2	10	0.8
3	1402	1100	78.5	52	3.7	202	14.4	30	2.1
4	1470	1133	77.1	66	4.5	214	14.6	37	2.5
5	1209	898	74.3	54	4.5	195	16.1	40	3.3

Table 209: Infant feeding on discharge from NWH Homecare NWH 2013

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Community	860	435	50.6	96	11.2	222	25.8	107	12.4
Medical	72	35	48.6	9	12.5	15	20.8	13	18.1
Diabetes	64	25	39.1	9	14.1	18	28.1	12	18.8

7.2 Postnatal Admissions

Table 210: Maternal destination following birth by mode of birth NWH 2013

	Total n=7223	NWH Wards		Birthcare Auckland		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Total	**7223**	**4617**	**63.9**	**2251**	**31.2**	**336**	**4.65**	**19**	**0.3**
Spontaneous vaginal	3884	1585	40.8	1961	50.5	325	8.37	13	0.3
Operative vaginal	833	529	63.5	290	34.8	11	1.32	3	0.4
CS Elective	1227	1225	99.8	0	0.0	0	0.00	2	0.2
CS Emergency	1279	1278	99.9	0	0.0	0	0.00	1	0.1

Table 211: Maternal destination following birth by prioritised maternal ethnicity NWH 2013

	Total	NWH Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
NZ European	2548	1596	62.6	887	34.8	57	2.2	8	0.3
Maori	532	364	68.4	124	23.3	43	8.1	1	0.2
Pacific	904	606	67.0	224	24.8	71	7.9	3	0.3
Other Asian	1576	939	59.6	515	32.7	119	7.6	3	0.2
Indian	620	453	73.1	148	23.9	19	3.1	0	0.0
Other European	776	490	63.1	268	34.5	14	1.8	4	0.5
Other	267	169	63.3	85	31.8	13	4.9	0	0.0

Table 212: Maternal destination following birth by LMC at birth NWH 2013

	Total	NWH Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Total	7223	4617	63.9	2251	31.2	336	4.7	19	0.3
Independent Midwife	3446	1843	53.5	1376	39.9	216	6.3	11	0.3
Private Obstetrician	1862	1279	68.7	552	29.6	26	1.4	5	0.3
General Practitioner	17	10	58.8	6	35.3	1	5.9	0	0.0
NWH Community	1336	950	71.1	302	22.6	84	6.3	0	0.0
NWH High Risk	501	481	96.0	12	2.4	5	1.0	3	0.6
Other DHB	33	32	97.0	0	0.0	1	3.0	0	0.0
Unbooked	28	22	78.6	3	10.7	3	10.7	0	0.0

Table 213: Postnatal readmission reason by maternal destination following birth NWH 2013

	NWH Wards		Birthcare		Home	
	n=213		n=93		n=8	
	n	%	n	%	n	%
Neonatal admission	31	14.6	17	18.3	3	37.5
Postpartum haemorrhage	17	8.0	6	6.5	2	25.0
Infection	35	16.4	9	9.7	1	12.5
Breast	35	16.4	32	34.4	1	12.5
Wound	13	6.1	0	0.0	0	0.0
Other	82	38.5	29	31.2	1	12.5

Table 214: Place of birth for women admitted postnatally who did not birth at NWH 2013

	n=107	
	n	%
Birthcare	29	27.1
Home	2	1.9
Middlemore	12	11.2
North Shore	20	18.7
Waitakere	21	19.6
Other	23	21.5

APPENDIX 8. NEWBORN SERVICES

8.1 NICU Occupancy

Table 215: Occupancy (baby-days) for NICU by gestational age 1999-2013

Gestation (weeks)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	18407	20652	20108	20551	19249	14958	14541	14212	15228	15296	15236	14982
<28	4337	4471	4237	4772	4466	3639	3328	3612	4282	4546	4129	4133
28-31	5054	5807	6159	5483	5331	4265	4774	4322	3490	4170	4137	4230
32-36	6776	7543	7496	8198	7204	5150	4535	4326	5423	4750	4844	4519
≥37	2240	2831	2216	2098	2248	1904	1904	1952	2033	1830	2126	2100

Gestation (weeks)	2011	2012	2013
Total	15122	14661	14296
<28	4312	3563	3774
28-31	3344	3684	3228
32-36	4659	4752	4713
≥37	2507	2462	2581

Table 216: Occupancy (baby-days) for NICU by birth weight 1999-2013

Weight(g)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	18407	20652	20108	20580	19249	14958	14505	14212	15228	15296	15236	14982
<1500	8444	9003	9281	9658	8837	6563	7115	7034	7618	7584	7996	7563
1500-1999	3669	4485	4526	4460	4295	3457	2942	2568	2489	3071	2620	2662
2000-2499	3427	3362	3135	3173	3097	2360	2221	2111	2384	2432	1953	2005
≥2500	2867	3802	3166	3289	3020	2578	2227	2499	2737	2209	2667	2752

Weight (g)	2011	2012	2013
Total	15122	14461	14296
<1500	7005	6583	6517
1500-1999	2669	2951	2606
2000-2499	2804	2009	2031
≥2500	2644	2918	3142

8.2 Admissions to NICU

Table 217: Admissions of inborn babies to NICU by gestational age groups 2000-2013

	2000		2001		2002		2003		2004		2005	
	n	%	n	%	n	%	n	%	n	%	n	%
Total	1154		1104		1098		1004		861		825	
20-27	68	5.9	55	5.0	57	5.2	50	5.0	53	6.2	50	6.1
28-31	138	12.0	128	11.6	119	10.8	110	11.0	104	12.1	126	15.3
32-36	531	46.0	488	44.2	522	47.3	449	44.7	349	40.5	295	35.8
≥ 37	417	36.1	433	39.2	400	36.2	395	39.3	355	41.2	354	42.9

	2007		2008		2009		2010		2011		2012		2013	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	870		822		820		791		839		872		831	
20-27	58	6.7	58	7.1	57	7.0	58	7.3	43	5.0	40	4.6	39	4.7
28-31	107	12.3	122	14.8	91	11.1	110	13.9	81	9.7	102	11.7	88	10.6
32-36	377	43.3	331	40.3	315	38.4	280	35.3	305	36.4	334	38.3	308	37.1
≥ 37	328	37.7	311	37.8	357	43.5	342	43.2	410	48.9	396	45.4	396	47.7

Table 218: Live births at National Women's by birth weight (includes BBA) 2013

Birth weight (g)	2013 N=7300	
Total	n	%
<500	9	0.1
500-749	18	0.3
750-999	33	0.5
1000-1499	75	1.0
1500-1999	113	1.6
2000-2499	332	4.6
2500-2999	1156	15.8
3000-3999	4776	65.4
≥4000	787	10.8

Table 219: Admissions of inborn babies to NICU by birth weight 2000-2013

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total	**1154**	**1104**	**1098**	**1004**	**861**	**825**	**791**	**870**	**822**	**820**	**791**	**839**	**872**	**831**
<500	0	1	1	0	0	0	0	1	0	0	2	0	1	0
500-749	22	23	14	20	11	25	19	19	19	15	23	20	14	13
750-999	41	37	37	32	37	34	24	37	37	42	29	24	25	32
1000-1249	45	47	47	31	38	47	34	47	35	31	39	25	35	29
1250-1499	64	48	56	53	36	42	57	51	52	49	50	42	48	46
1500-1999	193	186	193	164	138	120	130	130	135	126	110	110	132	112
2000-2499	291	243	256	238	177	170	182	188	180	155	135	176	169	152
2500-2999	182	199	184	156	147	119	125	139	118	117	126	129	118	115
3000-3999	239	232	221	237	208	215	183	198	212	246	226	259	277	270
≥4000	77	88	89	73	69	53	37	60	34	39	51	54	53	62

Table 220: Admissions of inborn babies to NICU by gestational age 2000-2013

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total	**1154**	**1104**	**1098**	**1004**	**861**	**825**	**791**	**870**	**822**	**820**	**791**	**839**	**872**	**831**
23	5	7	1	1	0	1	1	5	0	1	0	2	0	1
24	4	10	8	9	3	15	9	4	8	9	13	8	7	7
25	21	12	13	10	8	14	9	13	16	12	15	8	13	10
26	23	12	15	15	18	11	13	18	17	15	10	14	7	13
27	15	14	20	15	24	9	12	18	17	20	20	11	13	8
28	18	21	19	18	18	23	16	21	13	19	16	16	16	21
29	34	29	32	18	19	41	25	26	29	20	21	15	31	15
30	32	36	32	31	35	29	29	27	37	22	36	22	25	21
31	54	42	36	43	32	33	49	33	43	30	33	28	30	31
32	78	58	67	49	42	42	63	46	40	42	29	42	34	43
33	98	77	100	78	65	38	50	63	48	65	59	44	53	66
34	135	125	138	137	79	83	88	114	90	82	90	96	96	77
35	106	116	125	96	84	70	82	82	83	69	55	68	81	62
36	114	112	92	89	79	62	48	72	70	57	51	55	70	60
37	88	77	84	71	61	70	58	59	54	64	58	72	61	65
38	93	101	98	88	86	83	69	81	86	89	93	84	111	92
39	77	88	61	85	68	72	52	68	68	77	67	107	99	92
40	109	106	78	90	84	80	78	74	70	83	78	78	76	98
41	44	55	66	52	51	39	37	39	23	38	41	59	41	46
42	6	6	13	9	5	9	3	6	10	6	6	10	8	3
43	0	0	0	0	0	1	0	1	0	0	0	0	0	0

Table 221: Admissions of outborn babies to NICU by gestational age 2000-2013

Gestation (weeks)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total	**258**	**209**	**228**	**216**	**114**	**81**	**99**	**102**	**117**	**137**	**111**	**124**	**128**	**99**
22	0	0	0	0	0	0	0	0	0	0	1	0	0	0
23	0	1	1	0	0	0	0	0	1	0	0	1	0	1
24	4	1	3	0	3	3	3	5	3	4	4	6	1	1
25	1	1	2	2	0	0	8	6	7	3	4	1	4	4
26	0	3	1	2	1	2	5	5	5	11	3	5	3	5
27	2	5	2	2	1	1	3	6	5	4	7	4	4	2
28	3	2	3	3	3	4	2	3	2	10	7	3	5	2
29	1	1	4	7	2	3	6	5	4	6	5	6	4	3
30	5	8	12	3	4	3	4	1	8	2	2	4	4	4
31	1	3	4	3	5	3	2	3	2	3	0	3	2	6
32	2	8	5	8	4	7	5	2	8	3	3	4	3	3
33	6	3	1	5	4	7	1	4	1	7	4	6	6	1
34	5	10	7	13	10	5	6	4	6	3	3	4	7	4
35	9	7	10	5	6	4	9	4	8	5	4	5	4	6
36	33	19	19	16	6	2	2	4	4	10	5	4	7	5
37	19	17	16	20	6	7	3	9	8	11	9	8	13	12
38	38	28	22	23	13	5	5	10	5	8	12	9	17	5
39	24	21	35	29	13	8	9	9	8	5	9	15	13	13
40	61	42	49	43	19	12	17	9	22	30	17	19	18	19
41	33	27	30	30	10	3	8	9	7	11	11	17	12	2
42	11	2	2	2	3	2	1	4	3	1	1	0	1	1
43+	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Table 222: Admissions of outborn babies to NICU by gestational age groups 2000-2013

	2001 n=209		2002 n=228		2003 n=216		2004 n=114		2005 n=81		2006 n=99	
	n	%	n	%	n	%	n	%	n	%	n	%
20-27	11	5.3	9	3.9	6	2.8	5	4.4	6	7.4	19	19.2
28-31	14	6.7	23	10.1	16	7.4	14	12.3	13	16.0	14	14.1
32-36	47	22.5	42	18.4	47	21.8	30	26.3	25	30.9	23	23.2
≥ 37	137	65.6	154	67.5	147	68.1	65	57.0	37	45.7	43	43.4

	2007 n=102		2008 n=117		2009 n=137		2010 n=111		2011 n=124		2012 n=128		2013 n=99	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
20-27	22	21.6	21	17.9	22	16.1	19	17.1	17	13.7	12	9.4	13	13.1
28-31	12	11.8	16	13.7	21	15.3	14	12.6	16	12.9	15	11.7	15	15.2
32-36	18	17.6	27	23.1	28	20.4	19	17.1	23	18.5	27	21.1	19	19.2
≥ 37	50	49.0	53	45.3	66	48.2	59	53.1	68	54.8	74	57.8	52	52.5

Table 223: Admissions of outborn babies to NICU by birth weight 2000-2013

Birth Weight (g)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total	**258**	**209**	**228**	**216**	**114**	**81**	**99**	**102**	**117**	**137**	**111**	**124**	**128**	**99**
<500									1		1	0	1	0
500-749	3	5	3	2	3	2	10	8	7	4	5	3	4	2
750-999	3	6	10	4	4	5	5	11	7	17	11	10	5	9
1000-1249	2	3	4	8	3	4	7	6	13	15	8	10	7	4
1250-1499	7	6	11	5	5	6	5	4	7	8	7	5	8	9
1500-1999	14	15	14	18	18	15	13	10	16	8	10	15	13	12
2000-2499	35	34	21	28	11	10	8	8	12	12	10	14	9	12
2500-2999	37	32	34	29	13	10	15	13	13	12	10	14	22	16
3000-3999	120	87	101	91	43	22	26	33	31	50	37	41	50	27
≥4000	37	21	30	31	14	7	9	9	10	11	12	12	9	8

8.2.1 Admissions to NICU by domicile of mother

Table 224: Domicile of mother of all babies admitted to NICU 2002-2013

	2002 n=1331		2003 n=1222		2004 n=975		2005 n=906		2006 n=890		2007 n=972		2008 n=939	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Northern Region	1280	96.2	1177	96.3	934	95.8	834	91.9	826	92.8	824	84.8	841	89.6
Auckland	515	40.2	494	40	461	49.4	441	52.9	435	52.7	428	51.9	473	56.2
Counties Manukau	179	14.0	174	14.8	162	17.3	144	17.3	120	14.5	161	19.5	135	16.1
Waitemata	558	43.6	477	40.5	275	29.4	217	26	237	28.7	201	24.4	199	23.7
Northland	28	2.2	32	2.7	36	3.9	32	3.8	34	4.1	34	4.1	34	4.0
Midland Region	36	2.7	19	1.6	14	1.4	34	3.8	34	3.8	63	6.5	30	3.2
Central Region	8	0.6	9	0.7	16	1.6	23	2.5	17	1.9	0	0.0	13	1.4
Southern Region	6	0.5	13	1.1	7	0.7	8	0.9	12	1.3	0	0.0	19	2.0
Overseas	1	0.1	4	0.3	4	0.4	5	0.6	1	0.1	1	0.1	4	0.4
Missing	0	0.0	0	0.0	0	0.0	2	0.2	0	0.0	84	8.6	32	3.4

	2009 n=957		2010 n=902		2011 n=963		2012 n=1000		2013 n=930	
	%	n	%	n	%	n	%	n	%	N
Northern Region	872	91.1	847	92.1	892	92.6	915	91.5	856	92.0
Auckland	509	58.4	435	48.2	491	51.0	489	48.9	449	48.3
Counties Manukau	123	14.1	115	12.8	121	12.6	141	14.1	141	15.2
Waitemata	206	23.6	253	28.1	239	24.8	236	23.6	222	23.9
Northland	34	3.9	44	4.9	41	4.3	49	4.9	44	4.7
Midland Region	50	5.2	23	2.5	24	2.5	33	3.3	24	2.6
Central Region	15	1.6	16	1.8	12	1.2	23	2.3	26	2.8
Southern Region	16	1.7	15	1.7	15	1.6	20	2.0	11	1.2
Overseas	0	0.0	1	0	0		0		0	
Missing	4	0.4	0		20	2.0	9	0.9	13	1.4

Table 225: DHB of mothers of all babies admitted to NICU 2013

	2013 n=930			2013 n=930	
DHB	**n**	**%**	**DHB**	**n**	**%**
Auckland	449	48.3	**Whanganui**	2	0.2
Counties Manukau	141	15.2	**Mid-Central**	3	0.3
Waitemata	222	23.9	**Hawkes Bay**	9	1.0
Northland	44	4.7	**Capital & Coast**	6	0.7
Waikato	11	1.2	**Nelson Marlborough**	3	0.3
Bay of Plenty	7	0.8	**Canterbury**	4	0.4
Wairarapa	2	0.2	**Otago**	2	0.2
Tairawhiti	1	0.1	**Southland**	0	
Taranaki	2	0.2	**West Coast**	1	0.1
Lakes	3	0.3	**Overseas**	0	

*9 missing DHB

8.2.3 Admissions to NICU by ethnicity of baby

Table 226: Prioritised ethnicity of babies admitted to NICU 2013

	Preterm (<37 weeks) N=482		Term N=448		Total N=930	
	n	**%**	**n**	**%**	**n**	**%**
NZ European	178	36.9	159	35.5	337	36.2
Maori	85	17.6	67	15.0	152	16.3
Pacific	63	13.1	66	14.7	129	13.9
Other Asian	76	15.8	64	14.3	140	15.1
Indian	46	9.5	45	10.0	91	9.8
Other European	17	3.5	30	6.7	47	5.1
Other	17	3.5	17	3.8	34	3.7

8.2.4 Reason for admission to NICU

Table 227: Main reason for admission to NICU 2013

	Preterm N=482		Term N=448		Total N=930	
	n	%	n	%	n	%
Prematurity	328	68.0	0	0.0	328	35.3
Respiratory distress	67	13.9	190	42.4	257	27.6
Congenital abnormality	26	5.4	109	24.3	135	14.5
Hypoglycaemia	11	2.3	34	7.6	45	4.8
Depression at birth	7	1.5	24	5.4	31	3.3
SGA	23	4.8	3	0.7	26	2.8
Cyanotic episode	0	0.0	10	2.2	10	1.1
Suspected infection	2	0.4	11	2.5	13	1.4
Neurological problem	1	0.2	6	1.3	7	0.8
Haemolytic disease	2	0.4	11	2.5	13	1.4
Feeding difficulty	3	0.6	3	0.7	6	0.6
Bile stained vomiting	3	0.6	3	0.7	6	0.6
Jaundice	0	0.0	6	1.3	6	0.6
Other	9	1.9	38	8.5	47	5.1

One unknown at term is included with other

8.2.5 Antenatal corticosteroids

Table 228: Percentage receiving antenatal corticosteroids by birth weight among ANZNN assigned babies 2003-2013

Birth weight (g)	2003			2004			2005			2006		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	%	%	n	%	%
Total	136	42	90	121	54	91	148	57	95	134	74	128
<500												
500-749	20	50	95	11	64	91	25	52	100	19	12	18
750-999	32	47	91	37	59	95	34	56	94	24	11	23
1000-1249	31	52	100	38	58	95	47	57	98	34	20	34
1250-1499	53	30	81	35	40	83	42	60	90	57	31	53

Birth weight (g)	2007			2008			2009			2010		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	%	%	n	%	%
Total	155	55	96	149	54	87	150	53	88	154	60	90
<500	1	100	100	0	0	0	0	0	0	2	100	100
500-749	19	53	84	19	58	79	15	73	87	25	64	88
750-999	37	54	97	38	45	92	42	55	100	31	68	90
1000-1249	47	49	100	38	58	87	39	51	79	41	66	95
1250-1499	51	61	96	54	56	87	54	46	85	55	49	85

Birth weight (g)	2011			2012			2013		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	n(%)	n(%)	n	n(%)	n(%)	n	n(%)	n(%)
Total	121	53	91	139	94(68)	126(91)	134	75(56)	118(88)
<500	0	0	0	1	1(100)	1(100)	0		
500-749	22	54	95	14	9(64)	14(100)	14	9(64)	14(100)
750-999	26	61	92	29	20(69)	26(90)	36	20(56)	32(89)
1000-1249	28	57	89	40	29(73)	38(95)	31	20(65)	29(94)
1250-1499	45	47	89	55	35(64)	47(85)	53	26(49)	43(81)

Table 229: Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies (2003-2013)

Gestation (weeks)	2003			2004			2005			2006		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	%	%	n	%	%
Total	160	42	93	157	53	92	176	55	94	163	48	94
<24	1	100	100	0			1	0	100	1	0	0
24-25	19	53	95	11	73	91	29	55	97	18	56	100
26-27	30	47	93	42	57	93	20	55	100	25	44	100
28-29	36	42	97	37	51	95	64	47	94	41	56	98
30-31	74	36	89	67	48	91	62	40	94	78	45	91

Gestation (weeks)	2007			2008			2009			2010		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	%	%	n	%	%
Total	165	56	98	189	51	88	157	50	90	175	57	91
<24	5	40	60	0	0	0	1	0	0	1	0	0
24-25	17	53	94	25	36	80	20	70	95	30	57	87
26-27	36	69	100	36	50	86	37	54	95	31	65	94
28-29	47	45	98	45	60	87	45	56	89	42	62	88
30-31	60	60	100	83	52	93	54	37	89	71	52	96

Gestation (weeks)	2011			2012			2013		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
	n	%	%	n	%	%	n	%	%
Total	139	70(50)	123(88)	161	105(65)	145(90)	144	80(56)	130(90)
<24	3	0	3(100)	0			2	0	2(100)
24-25	17	5(29)	16(94)	23	13(57)	20(87)	19	10(53)	17(89)
26-27	28	19(68)	25(89)	24	15(63)	23(96)	25	10(40)	22(88)
28-29	37	17(46)	32(86)	54	35(65)	49(91)	40	24(60)	36(90)
30-31	54	29(54)	47(87)	60	42(70)	53(88)	58	36(62)	53(91)

8.3 Care and complications

8.3.1 Infection

Table 230: Organisms causing serious infection in NICU 2013

Organism	Early Infection	Late Infection
Staph epidermidis + Ecoli	0	0
E Coli	4	2
Staph aureus	0	2
Staph epidermidis	0	8
Coagulase negative *staphylococcus*	0	2
Enterococcus	0	0
Enetrobacter	0	0
Candida	0	2
Citrobacter	0	0
Group B Strep	1	2
Listeria monocytogenes	0	0
Klebsiella	0	2
Pseudomonas	0	1
Other / Unknown	01	2

8.3.2 Intraventricular haemorrhage

8.3.2.1 Intraventricular haemorrhage

Table 231: Intraventricular haemorrhage by birth weight 2013 (benchmarked with ANZNN)

Birth Weight (g)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**167**	**52**	**88**	**13**	**8**	**1**	**5**
<500	0	0	0	0	0	0	0
500-749	14	2	9	2	0	0	1
750-999	36	3	23	6	0	1	3
1000-1249	31	2	23	3	3	0	0
1250-1499	53	26	21	1	4	0	1
1500-1999	31	17	12	1	1	0	0
2000-2499	2	2	0	0	0	0	0

Table 232: Intraventricular haemorrhage by gestation 2013 (benchmarked with ANZNN)

Gestation (weeks)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	**167**	**52**	**88**	**13**	**8**	**1**	**5**
<24	2	0	0	0	0	0	2
24-25	19	2	11	3	1	1	1
26-27	25	1	18	4	1	0	1
28-29	40	2	31	2	4	0	1
30-31	58	32	21	3	2	0	0
32-36	23	15	7	1	0	0	0
>36	0						

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

Table 233: Intraventricular haemorrhage in all <1250g babies admitted to NICU 1990-2013

Year	Total	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
1990	98	16	59	8	5	4	6
1991	125	14	81	16	4	2	8
1992	103	11	68	8	4	7	5
1993	114	7	82	6	10	3	6
1994	117	13	75	13	8	4	4
1995	121	11	82	12	8	1	7
1996	127	10	95	7	3	3	9
1997	117	12	82	9	4	3	7
1998	90	7	66	7	4	0	6
1999	121	6	93	13	3	0	6
2000	116	5	88	7	5	2	9
2001	122	5	95	16	4	0	2
2002	116	3	97	7	3	1	5
2003	97	0	85	2	3	0	7
2004	96	1	83	4	1	3	4
2005	117	3	94	4	10	3	3
2006	99	8	75	8	3	0	5
2007	129	5	95	7	10	4	8
2008	101	0	77	14	3	3	4
2009	124	17	85	3	7	3	9
2010	118	18	80	5	7	5	3
2011	92	12	56	8	2	7	7
2012	92	13	63	9	4	0	3
2013	89	8	58	12	3	3	5

8.3.3 Assisted ventilation

Table 234: High Frequency Oscillatory Ventilation 2004-2013

Gestation (wks)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	%
Total	5/10	15/21	12/15	19/23	15/27	15/29	21/28	18/20	21/29	19/25	160/227	70
<28	2/6	9/14	6/9	11/14	9/17	8/18	12/18	11/12	6/10	11/14	85/132	64
28-31	-	3/3	2/2	3/4	0/1	2/3	3/3	1/1	3/5	1/2	18/24	75
32-36	0/1	0/1	1/1	1/1	3/4	3/5	2/3	1/1	1/1	2/3	14/21	67
≥37	3/3	3/3	2/2	4/4	3/5	2/3	4/4	5/6	11/13	5/6	42/49	86

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

Table 235: Inhaled Nitric Oxide (iNO) 2004-2013

Gestation (wks)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	%
Total	7/13	13/16	8/10	26/29	15/18	10/20	32/36	20/26	26/33	25/29	182/230	79
<28	1/6	2/5	0/1	4/5	3/5	2/7	7/9	4/6	2/4	6/7	31/55	56
28-31	-	1/1	1/1	2/3	2/2	0/2	3/4	1/2	3/4	0/1	13/20	65
32-36	-	3/3	1/1	5/6	2/2	2/3	4/5	6/6	0/0	3/5	26/31	84
≥37	6/7	7/7	6/7	15/15	8/9	6/8	18/18	9/12	21/25	16/16	112/124	90

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

Table 236: iNO plus HFOV 2004-2013

Gestation (weeks)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	%
Total	2/6	6/8	3/4	10/12	6/9	5/12	12/15	9/11	15/19	11/14	79/110	72
<28	0/4	2/3	0/1	3/4	2/4	2/6	5/7	4/5	2/4	5/6	25/44	57
28-31	-	1/1	-	2/3	-	0/1	2/2	1/1	3/3	0/1	9/12	75
32-36	-	0/1	1/1	1/1	2/2	2/3	1/2	1/1	0/0	1/2	9/13	69
≥37	2/2	3/3	2/2	4/4	2/3	1/2	4/4	3/4	10/12	5/5	36/41	88

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

Table 237: Reason for ventilation and CPAP in term and post-term infants 2003-2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
TTN/RDS	3/46	6/61	2/42	3/55	8/76	3/84	8/100	7/88	8/96	9/111	10/108
Infection	0/15	1/12	2/8	2/10	3/7	-/10	1/16	2/9	2/18	3/14	0/11
Meconium	9/20	4/13	7/16	8/15	9/19	4/13	4/15	10/14	13/30	15/32	12/21
Anomaly	8/5	4/6	9/10	7/7	8/6	10/8	6/5	9/8	7/9	5/4	4/6
PPHN	3/4	8/7	4/6	3/3	7/4	5/6	5/6	9/10	4/4	7/4	7/7
Encephalopathy	14/7	8/8	9/4	4/1	8/7	6/2	7/8	11/1	8/5	1/2	13/2
Support for surgery						14/8	10/3	13/6	9/3	15/4	23/9
Other					21/25	6/13	17/36	21/24	14/30	17/35	20/43
Missing reason					3/2		1/0				0/1

Numbers in each cell are IPPV/CPAP. Some babies from 2003 – 2006 with other diagnoses are not included in this table.

8.4.1 Survival

Table 238: Numbers of survivors by gestational age of babies <32 weeks gestation 2013

Gestation (weeks)	20	21	22	23	24	25	26	27	28	29	30	31
Born alive in NWH	2	7	1	3	10	11	12	8	22	14	19	36
Died at birth in NWH				2	2	0	0	0	0	0	0	0
Born alive at NWH and admitted to NICU	0	0	0	1	8	11	12	8	22	14	19	36
Born alive at NWH and survived	0	0	0	1	6	10	12	8	21	13	18	36
Outborn admitted	0	0	0	1	1	4	5	2	2	3	4	6

8.5 Outcomes

8.5.1 Retinopathy of prematurity

Table 239: Retinopathy of prematurity by birth weight in babies surviving to 36 weeks gestation (ANZNN assigned babies) 2013

Birth Weight(g)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**120**	**32**	**42**	**26**	**13**	**7**	**0**
<500	0						
500-749	12	0	1	3	4	4	0
750-999	34	1	12	9	9	3	0
1000-1249	31	7	15	9	0	0	0
1250-1499	33	20	8	5	0	0	0
1500-1999	10	4	6	0	0	0	0

Table 240: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks gestation (ANZNN assigned babies) 2013

Gestation (wks)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	**120**	**32**	**42**	**26**	**13**	**7**	**0**
<24	1	0	0	1	0	0	0
24-25	17	0	2	1	10	4	0
26-27	25	0	11	9	2	3	0
28-29	38	3	22	12	1	0	0
30-31	24	17	5	2	0	0	0
>31	15	12	2	1	0	0	0

8.5.2 Chronic lung disease

Table 241: Chronic lung disease by birth weight (inborn babies <1500gms) 2013

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	**120**	**4**	**123**	**5**	**18**	**29**	**52**	**41**	**42**
500-749	13	1	12	1	6	5	12	92	100
750-999	32	1	31	2	11	10	23	72	74
1000-1249	29	0	29	0	0	6	6	21	21
1250-1499	46	1	45	1	1	5	7	15	16

Table 242: Chronic lung disease by gestational age (inborn babies <32weeks) 2013

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	**127**	**4**	**123**	**5**	**18**	**29**	**52**	**41**	**42**
<24	1	0	1	0	0	1	1	100	100
24-25	17	1	16	2	7	6	9	53	56
26-27	21	0	21	1	7	9	17	81	81
28-29	36	2	34	0	3	8	11	31	32
30-31	52	1	51	2	1	5	8	15	16

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 243: Necrotising enterocolitis (NEC) by birth weight 2002-2013 ANNZN <1500g

Weight (g)	2002			2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**154**	**2**	**1**	**136**	**3**	**2**	**121**	**4**	**3**	**148**	**6**	**4**	**134**	**3**	**2**	**155**	**2**	**1**
<500																1	0	0
500-749	14	0		20	1	5	11	0	0	25	4	16	19	2	10	19	1	5
750-999	37	1	3	32	1	3	37	3	8	34	1	3	24	0	0	37	1	3
1000-1249	47	1	2	31	0		38	1	3	47	1	2	34	1	3	47	0	0
1250-1499	56	0		53	1	2	35	0		42	0		57	0		51	0	0

Weight (g)	2008			2009			2010			2011			2012			2013		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**149**	**4**	**3**	**150**	**6**	**4**	**154**	**7**	**5**	**121**	**5**	**4**	**139**	**3**	**2**	**134**	**1**	**1**
<500	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0
500-749	19	2	11	15	1	7	25	0	0	22	2	9	14	1	7	14	0	0
750-999	38	1	3	42	4	10	31	1	3	26	2	8	29	1	3	36	1	3
1000-1249	38	1	3	39	0	0	41	4	10	28	1	4	40	1	3	31	0	0
1250-1499	54	0	0	54	1	2	55	2	4	45	0	0	55	0	0	53	0	0

Table 244: Necrotising enterocolitis by gestational age ANNZN <32wks 2002-2013

Gestation (weeks)	2002			2003			2004			2005			2006			2007		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**174**	**3**	**2**	**160**	**4**	**3**	**157**	**4**	**3**	**175**	**6**	**3**	**162**	**3**	**2**	**165**	**2**	**1**
<24																5	0	0
24-25	21	1	5	20	1	4	11	1	9	29	4	14	18	1	6	17	1	6
26-27	33	0		30	1	3	42	3	7	20	0		25	2	8	36	1	3
28-29	52	1	2	36	1	3	37	0		64	0		41	0	0	47	0	0
30-31	68	1	1	74	1	1	67	0		62	1	2	78	0	0	60	0	0

Gestation (weeks)	2008			2009			2010			2011			2012			2013		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	**189**	**4**	**2**	**157**	**6**	**4**	**175**	**7**	**4**	**139**	**6**	**15**	**161**	**3**	**2**	**144**	**1**	**1**
<24	0	0	0	1	0	0	1	0	0	3	1	33	0	0	0	2	1	50
24-25	25	3	12	20	1	5	30	0	0	17	2	12	23	2	9	19	0	0
26-27	36	1	3	37	5	14	31	2	7	28	2	7	24	0	0	25	0	0
28-29	45	0	0	45	0	0	42	4	10	37	1	3	54	1	2	40	0	0
30-31	83	0	0	54	0	0	71	1	1	54	0	0	60	0	0	58	0	0

8.5.4 Pneumothorax (All babies <1500g)

Table 245: Pneumothorax requiring drainage by birth weight (<1500g) 2004-2013

Birth weight (g)	2004			2005			2006			2007			2008		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <1500g	**121**	**1**	**1**	**148**	**8**	**5**	**134**	**1**	**0.7**	**155**	**7**	**5**	**149**	**7**	**5**
<500										1	0	0	0	0	0
500-749	11	0		25	1	4	19	0	0	19	1	5	19	2	11
750-999	37	0		34	1	3	24	0	0	37	4	11	38	1	3
1000-1249	38	1	3	47	3	6	34	0	0	47	1	2	38	0	0
1250-1499	35	0		42	3	7	57	1	2	51	1	2	54	4	7

Birth weight (g)	2009			2010			2011			2012			2013		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <1500g	**137**	**6**	**5**	**143**	**2**	**1**	**139**	**0**	**0**	**148**	**0**	**0**	**144**	**2**	**1**
<500	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0
500-749	15	1	7	23	1	4	23	0	0	18	0	0	15	0	0
750-999	42	3	7	29	0	0	34	0	0	30	0	0	41	1	2
1000-1249	31	0	0	39	0	0	35	0	0	42	0	0	33	0	0
1250-1499	49	2	4	50	1	2	47	0	0	56	0	0	55	1	2

Table 246: Pneumothorax requiring drainage by gestation (all babies <32wks) 2004-2013

Gestation (weeks)	2004			2005			2006			2007			2008		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <32wks	**157**	**3**	**2**	**176**	**11**	**6**	**163**	**1**	**1**	**165**	**7**	**4**	**189**	**7**	**4**
<24	0			1	0		1	0	0	5	0	0	0	0	0
24-25	11	0	0	29	1	3	18	0	0	17	2	1	25	2	8
26-27	42	1	2	20	3	15	25	0	0	36	2	6	36	1	3
28-29	37	0	0	64	5	8	41	1	2	47	3	6	45	2	4
30-31	67	2	3	62	2	3	78	0	0	60	0	0	83	2	2

Gestation (weeks)	2009			2010			2011			2012			2013		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total <32wks	**148**	**3**	**2**	**164**	**2**	**1**	**157**	**1**	**1**	**169**	**0**	**0**	**155**	**3**	**2**
<24	1	0	0	0	0	0	3	0	0	0	0	0	2	0	0
24-25	21	1	5	28	0	0	23	0	0	25	0	0	22	0	0
26-27	35	2	6	30	0	0	34	0	0	27	0	0	28	1	4
28-29	39	0	0	37	2	5	40	0	0	56	0	0	41	0	0
30-31	52	0	0	69	0	0	57	1	2	61	0	0	62	3	5

Table 247: Inborn babies receiving postnatal corticosteroids by birth weight 2013 (babies alive at 1 week and less than 1500g)

Birth weight (g)	N	n	%
Total	**120**	**17**	**14**
<500	0		
500-749	13	8	62
750-999	32	7	22
1000-1249	29	2	7
1250-1499	46	0	0

Table 248: Inborn babies receiving postnatal corticosteroids by gestational age 2013 **babies alive at 1 week and less than 32 weeks)**

Gestation (weeks)	N	n	%
Total	**127**	**17**	**13**
<24	1	1	100
24-25	17	13	76
26-27	21	2	10
28-29	36	1	3
30-31	52	0	0

Table 249: Method of feeding at discharge from NICU by gestational age and birth weight 2013 (inborn)

	Total	Exclusive		Fully		Partial		Artificial		Nil Oral	
	n	n	%	n	%	n	%	n	%	n	%
Total	817	365	45	180	22	186	23	53	6	33	4
Gestation (weeks)											
20-24	1	1	100	0	0	0	0	0	0	0	0
25-27	36	22	61	2	6	8	22	4	11	0	0
28-31	88	46	52	13	15	19	22	8	9	2	2
32-36	301	106	35	104	35	67	22	17	6	7	2
37-40*	337	161	48	49	15	84	25	21	6	22	7
≥41	54	29	54	12	22	8	15	3	6	2	4
Birth weight (gms)											
500-749	11	8	73	0	0	3	27	0	0	0	0
750-999	31	16	52	1	3	8	26	6	19	0	0
1000-1249	29	17	59	6	21	3	10	3	10	0	0
1250-1499	45	27	60	5	11	9	20	3	7	1	2
1500-1999	109	47	43	34	31	21	19	6	6	1	1
2000-2499	150	46	31	49	33	43	29	9	6	3	2
2500-2999*	114	44	39	30	26	24	21	10	9	6	5
3000-3999	268	133	50	44	16	60	22	12	4	19	7
>3999	60	27	45	11	18	15	25	4	7	3	5

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

Table 250: Outborn neonatal and post-neonatal deaths prior to discharge 2013

Born at	Gestational age	Birth Weight	Apgar @1 min	Apgar @ 5 min	Age at death (d)	Cause of death
Northland	23	775	3	4	7	NEC
Northland	25	685	8	8	10	Sepsis
Middlemore	35	2300	6	4	5	Multiple congenital anomalies
NSH	31	2100	0	0	0	Perinatal asphyxia

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

Table 251: Inborn neonatal and post-neonatal deaths prior to discharge from NICU 2013

Birthplace	Gestational age	Birth weight	Apgar @1 min	Apgar @ 5 min	Age at death (d)	Main Cause of death
Theatre	35	2620	9	9	51	Congenital cardiac anomaly died SSH
Theatre	34	3860	6	6	9	Congenital cardiac anomaly died SSH
Theatre	38	3330	9	9	97	Congenital cardiac anomaly
Theatre	39	3120	1	3	104	Congenital cardiac anomaly
Theatre	38	3070	9	9	63	Congenital cardiac anomaly died SSH
Delivery suite	38	3520	9	9	11	Congenital cardiac anomaly died SSH
Delivery suite	35	3140	9	9	472	Congenital cardiac anomaly
Delivery suite	39	3030	4	7	9	Congenital cardiac anomaly died SSH
Theatre	39	2490	5	8	246	Multiple anomalies
Theatre	37	3650	8	9	14	Congenital cardiac anomaly died SSH
Theatre	38	3120	3	6	13	Multiple anomalies
Delivery suite	40	3140	7	7	89	Congenital cardiac anomaly
Theatre	37	2170	1	4	7	Multiple anomalies
Theatre	39	3930	9	9	210	Congenital cardiac anomaly
Theatre	39	3240	9	9	34	Complex congenital anomalies
Delivery suite	39	3000	9	9	4	Complex congenital anomalies
Theatre	41	3380	9	9	39	Congenital cardiac anomaly
Theatre	37	4150	4	6	4	Hydrops
Delivery suite	38	3555	6	1	0	Perinatal asphyxia
Theatre	29	1555	2	2	3	Antenatal brain infarction
Delivery suite	32	1990	4	3	0	Bowel perforation
Delivery suite	40	2960	2	4	11	Congenital anomalies
Theatre	33	2400	3	2	5	Large bilateral IVH
Delivery Suite	40	3890	7	6	5	Congenital cardiac anomalies
Delivery suite	41	4170	0	0	3	Perinatal asphyxia
Theatre	25	970	5	5	0	Respiratory
Theatre	32	2310	2	2	0	Sepsis
Theatre	33	2310	2	2	0	Haemolytic anaemia
Theatre	30	1290	3	6	1	Sepsis
Delivery suite	24	580	6	7	170	Chronic lung disease
Theatre	28	670	8	9	17	Viral embryopathy

APPENDIX 9. PERINATAL MORTALITY

Table 252: Postnatal transfer deaths (these are babies born elsewhere who transferred to NWH for postnatal care) 2000-2013

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Early neonatal deaths	< 7 days	6	1	3	3	3	3	3	5	3	4	5	3	4	2
Late neonatal deaths	8 – 28 days	0	1	0	0	0	3	3	2	3	5	1	0	0	2
Total deaths		6	2	3	3	3	6	6	7	6	9	6	3	4	4

Table 253: Maternal characteristics and perinatal related mortality 2013

	Births		Stillbirths			Neonatal deaths			Perinatal related deaths		
	n=7377		n=77			n=37			n=114		
	N	%	n	%	SB rate*	n	%	NND rate‡	n	%	Perinatal related mortality rate†
Maternal ethnicity (prioritised)											
NZ European	2622	35.5	25	32	9.5	9	24	3.5	34	30	13.0
Maori	543	7.4	12	16	22.1	10	27	18.8	22	19	40.5
Pacific	919	12.5	12	16	13.1	8	22	8.8	20	18	21.8
Other Asian	1600	21.7	10	13	6.3	4	11	2.5	14	12	8.8
Indian	630	8.5	8	10	12.7	4	11	6.4	12	11	19.0
Other European	790	10.7	8	10	10.1	1	3	1.3	9	8	11.4
Other	273	3.7	2	3	7.3	1	3	3.7	3	3	11.0
Parity											
Nullipara	3509	47.6	32	42	9.1	12	32	3.5	44	39	12.5
Multipara	3868	52.4	45	58	11.6	25	68	6.5	70	61	18.1
Maternal age											
≤25	1058	14.3	12	16	11.3	10	27	9.6	22	19	20.8
26-34	4001	54.2	32	42	8.0	16	43	4.0	48	42	12.0
≥35	2318	31.4	33	43	14.2	11	30	4.8	44	39	19.0
Maternal smoking at booking											
Currently smoking	423	5.7	10	13	23.6	7	19	16.9	17	15	40.2
Not smoking	6945	94.1	67	87	9.6	30	81	4.4	97	85	14.0
Missing data	9	0.1		0			0		0	0	
Maternal BMI (WHO categories)											
<18.5	257	3.5	2	3	7.8	2	5	7.8	4	4	15.6
18.5-24.99	3891	52.7	34	44	8.7	10	27	2.6	44	39	11.3
25-29.99	1727	23.4	17	22	9.8	9	24	5.3	26	23	15.1
30-34.99	715	9.7	6	8	8.4	5	14	7.1	11	10	15.4
35-39.99	376	5.1	8	10	21.3	6	16	16.3	14	12	37.2
>=40	258	3.5	8	10	31.0	2	5	8.0	10	9	38.8
missing	153	2.1	2	3		3	8		5	4	
NZDep 2006 (quintile)											
1	1282	17.4	14	18	10.9	6	16	4.7		0	0.0
2	1450	19.7	12	16	8.3	6	16	4.2	18	16	12.4
3	1582	21.4	16	21	10.1	5	14	3.2	21	18	13.3
4	1646	22.3	17	22	10.3	8	22	4.9	25	22	15.2
5	1404	19.0	16	21	11.4	12	32	8.6	28	25	19.9
Missing data	13	0.2	2	3			0		2	2	

* 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 254: Perinatal full postmortem rates (%) 1991-2013

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Perinatal postmortem (%)	58	56	65	68	57	48	50	38	50	40	40

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Perinatal postmortem (%)	41	43	52	48	50	59	55	38	44	33	34	45

Table 255: Cause of perinatal-related death (PSANZ-PDC)

Classification (PSANZ-PDC)	2005 N=111		2006 N=99		2007 N=111		2008 N=110		2009 N=112		2010 N=117		2011 N=120		2012 N=123		2013 N=114	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Congenital abnormality	38	34	37	37	48	43	34	31	31	28	48	41	43	36	48	39	38	33
Perinatal infection	11	10	9	9	4	4	5	5	4	4	4	3	4	3	2	2	6	5
Hypertension	3	3	3	3	0		4	4	6	5	4	3	4	3	5	4	3	3
APH	6	5	4	4	7	6	13	12	15	13	11	9	9	8	15	12	15	13
Maternal conditions	8	7	6	6	5	5	3	3	6	5	9	8	8	7	10	8	4	4
Specific perinatal conditions	10	9	7	7	7	6	22	20	16	14	8	7	23	19	14	11	21	18
Hypoxic peripartum death	4	4	0		2	2	1	1	1	1	2	2	1	1	1	1	2	2
Fetal growth restriction	1	1	8	8	11	10	9	8	5	4	2	2	8	7	3	2	8	7
Spontaneous preterm	20	18	13	13	16	14	11	10	19	17	8	7	10	8	15	12	9	8
Unexplained antepartum death	10	9	12	12	10	9	7	6	9	8	0		9	8	10	8	8	7
No obstetric antecedent	0		0		1	1	1	1	0	0	0		1	1	0		0	

Table 256: Cause of death (PSANZ-PDC) among terminations of pregnancy 2013

Classification (PSANZ-PDC)	Termination of pregnancy n=33	
	n	%
Congenital abnormality	23	70
Antepartum haemorrhage	2	6
Perinatal Infection	1	3
Specific perinatal conditions	2	6
Hypertension	1	3
Maternal condition	1	3
Spontaneous preterm	2	6
Fetal growth restriction	1	3

Table 257: Perinatal related deaths by cause (PSANZ-PDC) and gestational age 2013

	Total deaths n=114		Preterm (<37 weeks) n=96		Term (≥ 37 weeks) n=18	
	n	%	n	%	n	%
Congenital abnormality	38	33	29	30	9	50.0
Perinatal infection	6	5	5	5	1	5.6
Antepartum haemorrhage	15	13	14	15	1	5.6
Maternal conditions	4	4	3	3	1	5.6
Hypertension	3	3	3	3	0	
Specific perinatal conditions	21	18	19	20	2	11.1
Hypoxic peripartum death	2	2	0		2	11.1
Fetal growth restriction	8	7	8	8	0	
Spontaneous preterm	9	8	9	9	0	
Unexplained antepartum death	8	7	6	6	2	11.1
No obstetric antecedent	0					

APPENDIX 10. GYNAECOLOGY

10.1 Termination of pregnancy

Table 258: Demography and characteristics of women attending EDU NWH 2002-2013

	2002 n=5775	2003 n=5960	2004 n=5809	2005 n=5598	2006 n=5548	2007 n=5594	2008 n=5550	2009 n=5391	2010 n=5049	2011 n=4949	2012 n=4536	2013 n=4213
Ethnicity	%	%	%	%	%	%	%	%	%	%	%	%
New Zealand European	28.6	27.8	27.4	26.5	27.4	27.6	27.7	26.1	25.7	27.2	27.01	26.42
Maori	19.6	18.2	18.4	19.1	20.4	21.2	20.5	19.9	20.4	19.5	19.25	19.25
Pacific	22.9	23.0	22.8	23.2	23.8	24.5	23.1	24.3	24.1	22.6	24.58	23.52
Other Asian	10.9	12.3	11.6	11.2	11.4	10.5	10.8	10.6	10.3	10.9	11.02	10.33
Indian	6.4	7.4	7.7	8.3	8.2	8.3	9.4	10.2	11.7	11.7	10.63	12.08
Other European	5.1	5.1	5.4	5.7	5.0	4.5	4.8	5.1	5.2	5.7	5.45	5.63
Other	6.5	6.3	6.6	6.0	3.8	3.3	2.6	3.3	2.6	2.4	2.07	2.78
Age												
≤ 19	19.3	18.7	19.3	19.8	21.5	22.3	21.7	22.2	20.7	17.8	16.6	14.62
20 – 24	28.5	30.3	28.9	28.5	29.7	29.6	29.0	29.8	30.6	30.6	31.3	31.78
25 – 29	21.3	20.8	20.9	21.1	20.7	20.1	21.6	20.8	19.9	21.6	21.7	22.29
30 – 34	16.4	15.9	16.1	15.7	14.4	14.3	13.3	13.9	14.1	15.4	16.0	16.78
35 –39	10.4	10.2	10.9	10.7	9.5	9.7	10.1	9.3	10.0	10.2	10.0	10.44
≥40	4.1	4.1	3.9	4.3	3.9	4.0	4.3	4.0	4.7	4.4	4.5	4.08
Gestation (weeks) at termination												
6	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1
7	1.8	1.2	0.9	0.4	0.2	0.2	0.1	0.6	2.7	1.4	1.1	4.4
8	9.8	8.9	17.2	10.5	11.0	8.8	13.0	18.4	33.7	30.3	25.3	17.2
9	21.5	20.0	23.9	20.9	23.1	20.8	23.9	24.5	23.7	26.9	27.4	23.9
10	23.1	23.8	21.4	22.7	24.0	25.1	25.1	24.3	16.8	18.4	18.8	22.8
11	22.5	23.9	20.6	24.0	23.5	24.1	21.3	18.8	13.0	12.6	14.4	16.9
12	18.5	20.0	14.5	20.0	17.6	20.9	16.7	13.2	10.1	9.9	11.7	13.6
≥13	2.9	2.1	1.4	1.3	0.5	0.0	0.2	0.1	0.0	0.4	1.2	1.0

10.2 Gynaecology Inpatient Surgery

Table 259: BMI by ethnicity (prioritised) among women having inpatient gynaecology surgery NWH 2013 (missing data excluded)

	BMI	<19		19-25		26-30		31-35		>35	
	N	n	%	n	%	n	%	n	%	n	%
Total	**1562**	**66**	**4.2**	**681**	**43.6**	**360**	**23.0**	**197**	**12.6**	**258**	**16.5**
NZ European	614	26	4.2	307	50.0	145	23.6	80	13.0	56	9.1
Maori	166	3	1.8	51	30.7	43	25.9	27	16.3	42	25.3
Pacific	243	2	0.8	27	11.1	49	20.2	44	18.1	121	49.8
Other Asian	184	22	12.0	122	66.3	25	13.6	8	4.3	7	3.8
Indian	129	3	2.3	56	43.4	40	31.0	16	12.4	14	10.9
Other European	170	7	4.1	88	51.8	45	26.5	16	9.4	14	8.2
Other	49	3	6.1	25	51.0	13	26.5	6	12.2	2	4.1
Not Stated	7		0.0	5	71.4		0.0		0.0	2	28.6

Table 260: Smoking status by ethnicity (prioritised) among women having inpatient gynaecology surgery NWH 2013

		Currently smoking		Past smoker		Never smoked		Unknown	
	N	n	%	n	%	n	%	n	%
Total	**1657**	**237**	**14.3**	**173**	**10.4**	**1192**	**71.9**	**3**	**0.2**
NZ European	635	93	14.6	74	11.7	466	73.4	1	0.2
Maori	168	67	39.9	25	14.9	75	44.6	1	0.6
Pacific	246	42	17.1	34	13.8	170	69.1	0	0.0
Other Asian	194	11	5.7	4	2.1	179	92.3	0	0.0
Indian	132	2	1.5	4	3.0	126	95.5	0	0.0
Other European	173	19	11.0	30	17.3	123	71.1	1	0.6
Other	51	2	3.9	2	3.9	47	92.2	0	0.0
Not stated	7	1	14.3	0	0.0	6	85.7	0	0.0

Table 261: ASA rating among women having inpatient gynaecology surgery NWH 2013

	Inpatient surgeries 2013 n=1606	
	n	%
ASA Rating		
1	770	48.0
2	562	35.0
3	180	11.2
4	9	0.6
Missing	85	5.3

10.3 Gynaecology Laparoscopic Surgery

Table 262: BMI and Surgical approach NWH 2013 (Missing data excluded)

	Hysteroscopy n=278		Laparoscopy n=366		Laparotomy n=187		Vaginal n=658		Radiologically n=19		Vulval n=53	
BMI	n	%	n	%	n	%	n	%	n	%	n	%
<19	8	2.9	17	4.6	8	4.3	25	3.8	1	5.3	7	13.2
19-25	81	29.1	205	56.0	73	39.0	287	43.6	11	57.9	24	45.3
26-30	62	22.3	83	22.7	42	22.5	155	23.6	5	26.3	13	24.5
31-35	33	11.9	34	9.3	30	16.0	96	14.6	1	5.3	3	5.7
>35	94	33.8	27	7.4	34	18.2	95	14.4	1	5.3	6	11.3

2.7% of BMI data missing in 2013

APPENDIX 11. GLOSSARY OF ABBREVIATIONS

ABA	American Board of Anaesthesiologists	IUD	Intrauterine death
ACH	Auckland City Hospital	ICSI	Intracytoplasmic sperm injection
ACL	Anticardiolipin antibody	IVF	In vitro fertilisation
ACHS	Australian Council Healthcare Standards	IVH	Intraventricular haemorrhage
AMOSS	Australasian maternity outcomes surveillance system	KPI	Key performance indicator
AMSIS	Auckland Maternity Services Information System	LB	Live birth
ANA	Antinuclear antibody	Ligate	Surgical ligation of PDA
ANZNN	Australia and New Zealand Neonatal Network	LLETZ	Large loop excision of the transformation zone
APH	Antepartum haemorrhage	LMP	Last menstrual period
ARM	Artificial rupture of membranes	LNND	Late neonatal death
ASA	American Society of Anaesthesiologists	LSCS	Lower segment Caesarean section
AUT	Auckland University of Technology	LSIL	Low-grade squamous intraepithelial lesion
BBA	(Baby) Born Before Arrival (not a planned home birth)	LV	Left ventricle
BFHI	Baby Friendly Hospital Initiative	MAS	Meconium aspiration syndrome
BMI	Body mass index	MCDA	Monochorionic diamniotic twin
BP	Blood Pressure	MCMA	Monochorionic monoamniotic twin
BPD	Bronchopulmonary dysplasia	MDM	Multi disciplinary meeting
CDU	Child Development Unit	N/R	Not resuscitated
CHD	Congenital Heart Disease	NAS	Neonatal abstinence syndrome
CI	Confidence Interval	NEC	Necrotising enterocolitis
CLD	Chronic lung disease	NFD	Not further defined
CPAP	Continuous positive airways pressure	NICU	Neonatal Intensive Care Unit
CRIS	Clinical Records Information System	NIDDM	Non-insulin dependent diabetes mellitus
CS	Caesarean section	NWH	National Women's
CVA	Cerebro Vascular Accident	NPSU	National perinatal statistics unit (Australia)
CVS	Chorionic villus sampling	NSU	National screening unit
DAU	Day Assessment unit	NZBFA	NZ Breast Feeding Authority
DBP	Diastolic blood pressure	OP	Occiput posterior
DCCM	Department of Critical Care Medicine	OPU	Oocyte pick up
DCDA	Dichorionic diamniotic twin	PCR	Protein Creatinine ratio
DHB	District Health Board	PDA	Patent ductus arteriosis
DIC	Disseminated intravascular coagulopathy	PE/PET	Pre-eclampsia
DNA	Did not attend	PG	Prostaglandin
DORV	Double outlet right ventricle	PIN	Parent Infant Nursery
DRG	Diagnosis related groups	PM	Postmortem
ECMO	Extra Corporeal Membrane Oxygenation	PMMRC	Perinatal & Maternal Mortality Review Committee
EDU	Epsom Day Unit	PMR	Perinatal mortality rate
ENND	Early neonatal death	PPHN	Persistent pulmonary hypertension of the newborn
ERPOC	Evacuation of retained products of conception	PRLR	Perinatal related loss rate
FH	Fetal heart	(P)PROM	(Preterm) prolonged rupture of membranes
FTE	Fulltime equivalent	PROM	Prolonged rupture of membranes
GA	General anaesthetic	PVL	Periventricular leukomalacia
GDM	Gestational diabetes mellitus	RDS	Respiratory distress syndrome
GH	Gestational hypertension	ROP	Retinopathy of prematurity
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	RR	Relative risk
Hb	Haemoglobin	SBP	Systolic blood pressure
HbAIc	Glycosylated heamoglobin	SCBU	Special Care Baby Unit
HDU	High Dependency Unit	SGA	Small for gestational age
HELLP	Hemolysis, Elevated Liver Enzymes, Low Platelets	SRM	Spontaneous rupture of membranes
HiFlow	High flow air oxygen	SLE	Systemic Lupus Erythematosus
HFOV	High frequency oscillatory ventilation	STOP	Surgical termination of pregnancy
HIE	Hypoxic ischaemic encephalopathy	SVB	Spontaneous vaginal birth
HIV	Human Immunodeficiency Virus	TCM	Transcutaneous oxygen monitor
HMD	Hyaline Membrane Disease	TGA	Transposition of the great arteries
HPV	Human papilloma virus	TIA	Transient Ischaemic Attack
ICH	Intracerebral haemorrhage	TOP	Termination of pregnancy
IDDM	Insulin dependent diabetes mellitus	UAC	Umbilical artery catheter
Indo	Treated with indomethacin	US/USS	Ultrasound/ultrasound scan
iNO	Inhaled nitrous oxide	VBAC	Vaginal birth after Caesarean
IPPV	Intermittent positive pressure ventilation	VLBW	Very low birth weight
IOL	Induction of labour	VSD	Ventricular septal defect
IUD	Intrauterine death	WAU	Women's Assessment Unit
ICSI	Intracytoplasmic sperm injection	wks	weeks
IVF	In vitro fertilisation	WHO	World Health Organisation
IVH	Intraventricular haemorrhage		

APPENDIX 12. DEFINITIONS

Antepartum haemorrhage (APH)
Antepartum haemorrhage includes vaginal bleeding from any cause at or beyond 20 weeks during pregnancy and labour, and includes placenta praevia without bleeding. While bleeding before 20 weeks is also important we do not reliably collect these data.

Augmentation
Describes use of oxytocin or artificial rupture of membranes to accelerate established labour.

Breastfeeding

Exclusive breastfeeding: The infant has never, to the mother's knowledge, had any water, formula or other liquid or solid food. Only breast milk, from the breast or expressed, and prescribed (as per Medicines Act 1981) medicines have been given from birth.

Fully breastfeeding: The infant has taken breast milk only, no other liquids or solids except a minimal amount of water or prescribed medicines, in the past 48 hours.

Partial breastfeeding: The infant has taken some breast milk and some infant formula or other solid food in the past 48 hours.

Artificial feeding: The infant has had no breast milk but has had alternative liquid such as infant formula with or without solid food in the past 48 hours.

Chronic hypertension (CH)
Diastolic BP$\geq$90mmHg at booking or a medical history of essential hypertension.

Early Neonatal Death (ENND)
Death of a live born baby in the first week of life before completion of 7 days of life

Elective Caesarean section
An elective Caesarean is defined as a Caesarean which was scheduled in advance and scheduled prior to the onset of labour. Therefore, Caesarean sections performed after the onset of labour but booked prior to labour are included with elective Caesarean.

Ethnicity
Ethnicity is collected at each hospital registration with the standard census 2001 question. The ethnicity used in this report represents the most recent response by an individual to the ethnicity question, and so may not be the ethnicity given at the time of birth admission. Up to three options are input into the CMS (Case Management System) database. In preparing the data for this report, each mother has been allocated to a single ethnic group. When more than one ethnic group is recorded, the prioritised ethnicity system outlined in 'Ministry of Health. 2004. *Ethnicity Data Protocols for the Health and Disability Sector*. Wellington: Ministry of Health.' (available online at *http://www.nzhis.govt.nz/documentation/ethnicity/index.html)* has been used.
The most summarised (Level 1) prioritisation is as follows: Maori, Pacific peoples, Asian, other groups except NZ European, NZ European. To this, we have added 'Other European' and split 'Indian' from Asian, both because these are a large group in our population and because their obstetric risk profile is significantly different from the remaining women in the 'Other' or 'Asian' category. In the majority of figures in this document, these categories are recombined. Level 2 prioritisation is given below.

Table 263: Level 2 prioritisation of ethnicity as outlined in 'Ministry of Health. 2004. Ethnicity Data Protocols for the Health and Disability Sector.'

Priority order	Ethnic Group Code Description
1	Māori
2	Tokelauan
3	Fijian
4	Niuean
5	Tongan
6	Cook Island Maori
7	Samoan
8	Other Pacific Island
9	Pacific Island NFD (Not Further Defined)
10	South East Asian
11	Indian
12	Chinese
13	Other Asian
14	Asian NFD
15	Latin American / Hispanic
16	African
17	Middle Eastern
18	Other
19	Other European
20	European NFD
21	NZ European

Fetal Death
Baby of at least 20 weeks gestation born without any signs of life or at least 400 grams birth weight if gestation is unknown.

Gestation
The gestation used in the maternity section of this report is derived from Best Estimate of date of birth (EDD Best) calculated by Healthware at booking based on Last Menstrual Period (LMP), scan data (overriding LMP data based on scan accuracy data sourced from the Australasian Society for Ultrasound Medicine), or clinical override of these dates as deemed appropriate. Healthware does not include gestation calculated from these data into its dataset, so this gestation, in weeks, is derived by taking the integer value of 40 + (date of birth - EDD Best)/ 7.

Gestational Diabetes (GDM)
This diagnosis is based on either a fasting glucose > 5.5mmol/L or a 2 hour glucose > 9.0mmol/L after a 75 gram oral glucose tolerance test, or glucose >11.0 after a polycose test.

Gestational hypertension (GH)
Gestational hypertension (GH) is a blood pressure systolic ≥140 and or diastolic ≥90 mmHg on two or more consecutive occasions at least 4 hours apart or one measurement systolic ≥170 and or diastolic ≥110 mmHg.

Infant Death
Death of a baby born alive before the age of 1 year.

Large for Gestational Age (>90th customised percentile)
Birth weight greater than 90th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31).

Late Neonatal Death (LNND)
Death of a baby after the 7th day and before completion of 28 days of life.

Lead Maternity Carer (LMC)
The Lead Maternity Carer is the practitioner or caregiver service selected by the woman to have the legal professional and practical responsibility for ensuring the woman and her baby are given clinically appropriate care.

National Women's LMC services
Community Midwives are the LMC for women who either self refer or are referred to NWH for maternity care. The midwives provide continuity of antenatal and postnatal care to women who live in NWH geographical boundary. Labour and birth care is provided by NWH core Labour and Birthing Suite midwives.

Diabetic Midwives are the LMC for women who are referred to the Diabetic Service for secondary/tertiary and LMC care. The midwives provide continuity of antenatal and postnatal care to women who live in NWH geographical boundary. The Diabetic Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.

Medical Midwives are the LMC for women who are referred to the Medical Service for secondary/tertiary and LMC care. These women have complex medical needs. The midwives provide continuity of antenatal and postnatal care to women who live in NWH geographical boundary. The Medical Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.

Self-employed LMC services
Independent midwife
General Practitioner (arranges private or hospital midwifery care)
Private Obstetrician (arranges private or hospital midwifery care)

Other LMC services
Unbooked are women who present at NWH, usually in labour or pre-labour, and who do not have an LMC.

Other DHB: These women are usually transferred to NWH in late pregnancy, and remain with their original LMC. This LMC might be another District Health Board LMC or a non-NWH access holder (e.g. a private obstetrician or independent midwife without access rights at NWH or a homebirth midwife without access rights at NWH).

Live birth
Birth of a baby showing signs of life. In this report, live births are only included if >20 weeks gestation or >400g if gestation unknown.

Maternal age
Defined as mother's age at her baby's birth.

Mode of birth for multiple pregnancies
For analyses where the denominator is mothers, mode of birth is represented as the mode of birth of the baby requiring most intervention. Mode of birth has been prioritised as emergency Caesarean, elective Caesarean, forceps, ventouse, vaginal breech, then spontaneous vertex birth.

Onset of birth
Onset of birth has been defined by the 4 pathways to birth: (1) elective Caesarean section, (2) emergency Caesarean before the onset of labour, (3) induction of labour, and (4) spontaneous onset of labour.

Neonatal hypoglycaemia
Blood glucose < 2.3mmol/L.

Neonatal Death
Death of a live born baby before completion of 28 days of life.

Neonatal Death Rate
Early and late neonatal deaths per 1000 live births.

NZ Deprivation index (2006)
An area-based measure of socioeconomic deprivation derived from variables from the Census of Population and Dwellings 2006. The score is assigned according to most recently recorded maternal place of residence and may not be place of residence at time of birth and is presented as a decile or quintile. Increasing deciles of deprivation, from least deprived (decile 1) to most deprived (decile 10), are associated with higher mortality and rates of many diseases (Salmond and Crampton 2002a, 2002b). Census area unit level data are used throughout this report.

Parity
The number of times a woman has given birth to a live born baby of any birth weight or gestation or to a stillborn infant at or after 20 weeks gestation or where the infant weighed 400g or more and gestation is unknown. Multiple birth adds only one to parity total.

Perinatal Mortality Rate (PMR)
Fetal and early neonatal deaths per 1000 total births.

Perinatal Related Mortality Rate (PRLR)
Fetal and early and late neonatal deaths per 1000 total births.

Postnatally (or newly) Diagnosed Type 2 Diabetes
Type 2 diabetes diagnosed by postnatal glucose tolerance test (GTT) in a woman diagnosed as a gestational diabetic (GDM) during pregnancy.

Postpartum haemorrhage (PPH)
Primary PPH is >500mls blood loss from the genital tract within the first 24 hours of birth.
Secondary PPH is >500mls blood loss from the genital tract after 24 hours up to 6 weeks postpartum.

Preeclampsia (PE or PET)
Gestational hypertension accompanied by proteinuria measured as ≥2+ protein on one dipstick sample or PCR ≥30 on a spot urine sample, or a 24 hour collection ≥0.3g in 24 hours.

PSANZ-PDC (PSANZ Perinatal Death Classification)
Identifies the single most important factor which led to the chain of events which resulted in the perinatal death.

PSANZ-NDC (PSANZ Neonatal Death Classification)
Used in addition to the PSANZ-PDC to identify the single most important factor in the neonatal period which caused a neonatal death.

Small for gestational age (SGA) (customised)
Birthweight less than 10th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31)

Standard primipara
A woman with

- no prior birth $\geq$ 20 weeks,
- aged 20-34 years at index birth,
- with a singleton pregnancy,
- cephalic presentation,
- gestation 37-41 completed weeks,
- baby not small for gestational age (customised centile $\geq 10^{th}$),
- no medical disease, defined as no history of cardiac disease, renal disease, mental health disorder, SLE, HIV infection, CVA/TIA, diabetes or hypertension,
- no gestational diabetes in index pregnancy,
- no pregnancy associated hypertensive disease in index pregnancy,
- no antepartum haemorrhage during index pregnancy.

Vaginal birth after Caesarean section
Vaginal birth in a pregnancy subsequent to one in which birth was by Caesarean section.

Very Low Birth weight
Birth weight less than 1500g