National Women's

Annual Clinical Report 2005

Cover artwork:

Chris Charteris, 2004. Unconditional love. Medium: Gold-lipped mother of pearl with bright yellow and red pigment.
Chris Charteris, 2004. The unborn child and its connection to the universe. Medium: Mother of pearl in silver.

Te Ao Marama Ngarimu, 2004. Kete Whakairo. Medium: Woven flax fibre.

NICU and National Women's Health are deeply indebted to FHE Galleries (Auckland), Kathlene Fogarty, and the artists for providing the artwork installed in NICU (http://www.fhegalleries.com).

National Women's Annual Clinical Report 2005

Contact Details

Marjet Pot, Project Manager
marjetp@adhb.govt.nz

Lynn Sadler, Epidemiologist
lynns@adhb.govt.nz

Shirley Beer, Maternity Clinical Information
sbeer@adhb.govt.nz

David Knight, Clinical Leader
davidk@adhb.govt.nz

Carl Kuschel, Clinical Director Neonatal Paediatrics
carlk@adhb.govt.nz

Denys Court, Clinical Director Obstetrics and Gynaecology
denysc@adhb.govt.nz

Disclaimer

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

Acknowledgements

Project team

Marjet Pot	Project Co-ordinator
Lynn Sadler	Epidemiologist
Andrea Hickman	Data Manager/Analyst
Shirley Beer	Maternity Clinical Information
David Knight	Clinical Leader NW
Carl Kuschel	Clinical Director Newborn Service
Denys Court	Clinical Director Obstetrics and Gynaecology

Many people have assisted in the production of this publication which has been appreciated by the project team

Special thanks to all who provide, enter and check data used in this Annual Clinical Report, especially Julie Porfiriadis, Coralee Jones, and Coila Bevin, and to the clinicians who have provided chapter comments, especially Professor Peter Stone, Professor Cindy Farquhar, Associate Professor Lesley McCowan, Dr Janet Rowan, Dr Rose Elder, Dr Jenny MacDougall, Dr Renuka Bhat, Margaret Berry, Dr Claire McLintock, Margaret Merrilees, Dr Guy Gudex, Heidi Anderson, Lee Neale, Julie Arthur, Ann Yates, Marcia Roberts.

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

Welcome to our 2005 Annual Clinical Report, which is the thirteenth in our series. Our Annual Clinical Report provides an opportunity for us to analyse and review our performance. The opportunity to share our information with colleagues and compare our results is valued.

Understanding our service in relation to others provides us with opportunities to both improve in some areas of service delivery and also consolidate our performance in others. Our main focus, as always, remains on improving services to women and the newborn.

2005 was our first full year for our inpatient services at Auckland City Hospital. The National Women's Health facilities at Level 9 and Level 10 have been greatly appreciated by women and staff alike. Outpatient based services on the Greenlane Clinical Centre Campus moved to improved facilities in the early part of 2005. These new facilities have also provided enhanced environments for the women who access our services.

Thank you for sharing in our Annual Clinical Report.

Kay Hyman
General Manager National Women's

TABLE of CONTENTS

LIST of TABLES

LIST OF FIGURES

section 1 INTRODUCTION

1 INTRODUCTION

1.1 Purpose of this Report

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

- To chronicle the care provided at National Women's (NW) during 2005
- To demonstrate trends in the population, service provision, and outcomes over time
- To stimulate further analysis and thus 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

This year we have tried to present the report in a more descriptive style and have changed the format from previous years. The chapters 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 the methodology.

Chapter 2: Summary statistics
This chapter provides, for the obstetric and neonatal population at NW, the summary data on principal outcomes.

Chapter 3: Maternal demography
This chapter provides information on domicile, age, ethnicity, parity, smoking behaviour, and LMC for the women who birthed at National Women's. It also provides data on the characteristics of standard primipara at NW.

Chapter 4: Antenatal complications
This chapter focuses on the following antenatal complications: diabetes, preterm birth, multiple pregnancy, antepartum haemorrhage, growth restriction, hypertensive disease and cervical cerclage.

Chapter 5: Labour and birth
This chapter focuses on birth interventions including induction of labour, mode of birth, and neonatal and maternal outcomes associated with birthing.

Chapter 6: Postnatal care
This chapter focuses on feeding outcomes and provision of postnatal care.

Chapter 7: Newborn services
This chapter describes interventions and outcomes for the babies cared for in the neonatal intensive care unit in 2005. It includes a report of activity of the Child Development Unit.

Chapter 8: Maternal and perinatal mortality
This chapter provides information and analysis about mothers and babies who died at National Women's.

Chapter 9: Fertility
This chapter documents the IVF and ICSI clinical outcomes from Fertility Plus in 2005 and a discussion on recent advances in the service.

Chapter 10: Gynaecology
This chapter provides limited information on inpatient services provided at NW including care for women with hyperemesis, ectopic pregnancy and those undergoing hysterectomy.

Chapter 11: Termination of pregnancy
This chapter provides information on the number and demographic characteristics of women who have a termination at Epsom Day Unit.

Appendices
The appendices provide additional detailed statistical tables for the chapters. The appendices are numbered consistently with the chapters to which they apply.

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

The Maternity section of this Annual Clinical Report includes data pertaining to women giving birth to their babies at and beyond 20 weeks gestation at National Women's during the 2005 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 Neonatal section pertain to all babies admitted to and cared for at the NW Neonatal Intensive Care Unit if born during the 2005 calendar year. This includes babies transferred from other units or home.

1.4 Data sources

Data for this report have been extracted from Healthware (*ibahealth*) and from stand-alone databases for Neonatology, Perinatal Mortality, Fertility Plus, Epsom Day Unit, and from the Decision Support Unit (DSU) who collect ICD-10 coded data on all inpatient admissions. Data from electronic discharges have also been used to reconcile gynaecology inpatient data.

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

In 2001, Healthware was introduced to National Women's to replace the clinical database system AMSIS. The implementation process was difficult and no systems were initially put in place for data extraction and cleaning. As a result, not all 2001 births were recorded. Further, data on all births were captured in 2002 and 2003, but these data were cleaned only sporadically with the focus directed to claiming via Section 88.

Since 2004, Information Services staff have modified and developed early Healthware data extraction tools allowing improved flexibility. This has greatly enhanced clinical data management.

The majority of booking data on mothers with non-National Women's LMCs are entered into Healthware by one Healthware administrator. Booking data for NW bookings, and all antenatal, birth, and postnatal data are entered by clerks and NW midwives.

Cleaning is undertaken daily for birth numbers. On a monthly basis, cleaning of place and mode of birth and reconciliation with Birthcare numbers is undertaken. Further to this, monthly cleaning is undertaken for Section 88 claiming. This is primarily cleaning of missing data.

For the 2004 and 2005 years, the data have been cleaned for the purpose of 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.

Data on gynaecological inpatient visits have been collected during the 2006 year and will be reported in our next Annual Clinical Report.

1.4.2 Decision Support Unit (DSU)

DSU data were used, along with Healthware data, to clean hypertension, antepartum and postpartum haemorrhage, blood transfusion and medical history data. DSU data were the principal source of general gynaecology data in 2005.

1.4.3 PIMS Theatre database

The PIMS Theatre Database includes details of operative procedures and anaesthesia use in obstetrics and gynaecology. These data were reconciled with Healthware records as part of routine data cleaning.

1.4.4 Neonatology database

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

1.5 Data quality

1.5.1 Maternity data quality

Specific cleaning queries were run and identified discrepancies were checked and corrected prior to analysis of the data for the 2005 National Women's Annual Clinical Report. These are listed in Appendix 1.
It should be acknowledged that these cleaning efforts, while 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 2005 data for further analysis should be aware that areas not mentioned may not have been cleaned.

1.5.2 Neonatal data quality

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

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

1.6 Derived definitions (maternity)

The definitions given here are for derived variables (as opposed to variables collected directly by the Healthware database system). Definitions of variables within Healthware are given in Appendix 1.

Maternal age
Defined as age at birth.

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.

The gestation derived by this definition was then compared with the gestation entered into Healthware on examination of the baby at birth. Where this gestation differed from that defined above by at least 2 weeks, gestation was manually checked against the

clinical record and data in Healthware amended where appropriate. Further checking was undertaken against gestation recorded in the perinatal mortality database for perinatal deaths and the neonatal database for all neonatal unit admissions. The clinical record was checked where gestation varied by at least 1 week in these instances.

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.

Ethnicity
Ethnicity is collected at registration at the hospital with the standard census 2001 question. Three options are input into the CMS (Case Management System) database. In preparing the data for this report, each mother has been allocated to a single ethnic group. When more than one ethnic group is recorded, the prioritised ethnicity system outlined in 'Ministry of Health. 2004. *Ethnicity Data Protocols for the Health and Disability Sector*. Wellington: Ministry of Health.' (available online at *http://www.nzhis.govt.nz/documentation/ethnicity/index.html)* has been used.

The most summarised (Level 1) prioritisation is as follows: Maori, Pacific peoples, Asian, other groups except NZ European, NZ European. To this, we have added 'Other European' and split 'Indian' from Asian, either because these are a large group in our population and/or because their obstetric risk profile is significantly different from the remaining women in the 'Other' or 'Asian' category. In the majority of figures in this document, these categories are recombined, and the small category of women with 'Unstated' ethnicity has been excluded. Level 2 prioritisation is given in Appendix 1.

Standard primipara
A woman with

- no prior birth $\geq$ 20 weeks,
- aged 20-34 years at index birth,
- with a singleton pregnancy,
- cephalic presentation,
- gestation 37-41 weeks,
- baby not small for gestational age (customised centile $\geq 10^{th}$),
- no medical disease (defined as no history of cardiac disease, renal disease, mental health disorder, SLE, HIV infection, or CVA/TIA) diabetes or hypertension,
- no gestational diabetes in index pregnancy,
- no pregnancy associated hypertensive disease in index pregnancy,
- and no antepartum haemorrhage during index pregnancy.

Onset of birth
This variable has been redefined from the 2004 report to include a 4^{th} pathway 'emergency Caesarean before the onset of labour' which was previously included with spontaneous onset of birth. There are 4 pathways to birth included in this report: (1) elective caesarean section, (2) emergency caesarean before the onset of labour, (3) induction of labour, and (4) spontaneous onset of labour.

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 cephalic vaginal.

1.7 Analytical and statistical methods

The data in Maternity and Neonatology have been analysed using Access, Excel, StatView, EpiInfo, and STATA9.
Tables are formatted with either column or row percentages as appropriate.

1.8 Clinical indicators

Clinical indicators in maternity are largely only appropriate for use in benchmarking. There is inadequate evidence in many of the areas of greatest interest in obstetric care to determine what ideal rates should be for interventions and so use of clinical indicators to drive practice improvement is limited. Clinical intervention and outcome rates in obstetrics are also hugely affected by case-mix, as the data presented in this report even in relation to simple variables such as parity and age clearly demonstrate. Unless obstetric facilities can adjust for case-mix, benchmarking is of limited value.

At NW we have discussed various clinical indicator systems in current use, and for some years have contributed data to the WHA (Women's Health Australasia) benchmarking initiative. Ideally, we would establish a system to allow us to benchmark within New Zealand, and this is a goal which is increasingly achievable as obstetric clinical database systems become standardised across the country.

section 2

SUMMARY STATISTICS

2 SUMMARY STATISTICS

2.1 Mother and baby numbers: National Women's 2005

Table 1: Mother and baby numbers: National Women's 2005

Total number of mothers birthing at National Women's	7178
Mothers birthing before arrival* (BBA's)	16
Total number of mothers	**7194**
Total number of babies born at National Women's	7368
Babies born before arrival (BBA's)	16
Total number of babies	**7384**

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.

One woman gave birth twice during the calendar year 2005 & is therefore counted twice in the above table and throughout this report.

Table 2: Mother and baby numbers by plurality: National Women's 2005

		Mothers	Babies
National Women's births	Singletons	7007	6994
	Twins	184	368
	Triplets	3	9
Totals (not including BBA's)		**7178**	**7368**
BBA's	Singletons	16	16
	Twins	0	0
	Triplets	0	0
Totals (including BBA's)		**7194**	**7384**

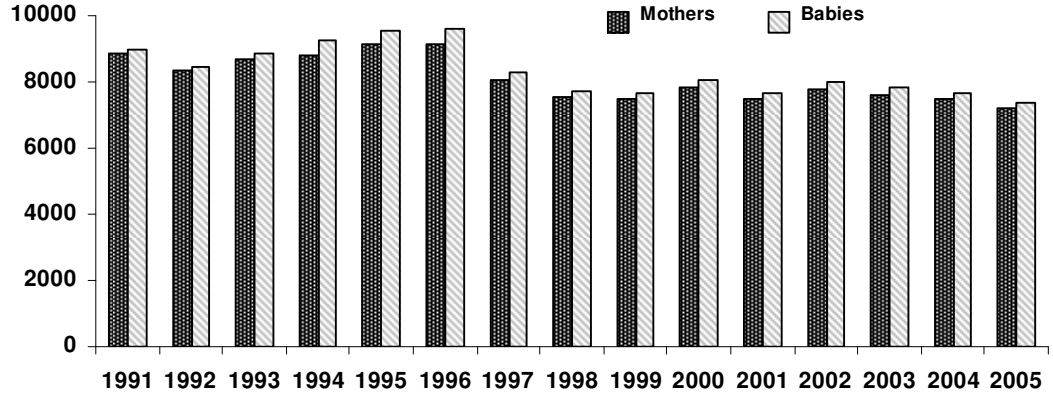

Figure 1: Numbers of women birthing and babies born at National Women's 1991-2005

2.2 Summary of maternal outcomes 2005

Table 3: Mode of onset of birth

	Birthing mothers n=7194	
	n	**%**
Spontaneous	4246	59.0
Iatrogenic		
CS elective	833	11.6
CS before onset labour	221	3.1
Induction of labour	1894	26.3

Table 4: Mode of birth

	Birthing mothers n=7194	
	n	**%**
Spontaneous cephalic birth	3845	53.4
Vaginal breech birth	54	0.7
Operative birth	1022	14.2
Forceps	294	4.1
Ventouse	728	10.1
Caesarean section	2273	31.6
CS elective	833	11.6
CS emergency	1440	20.0

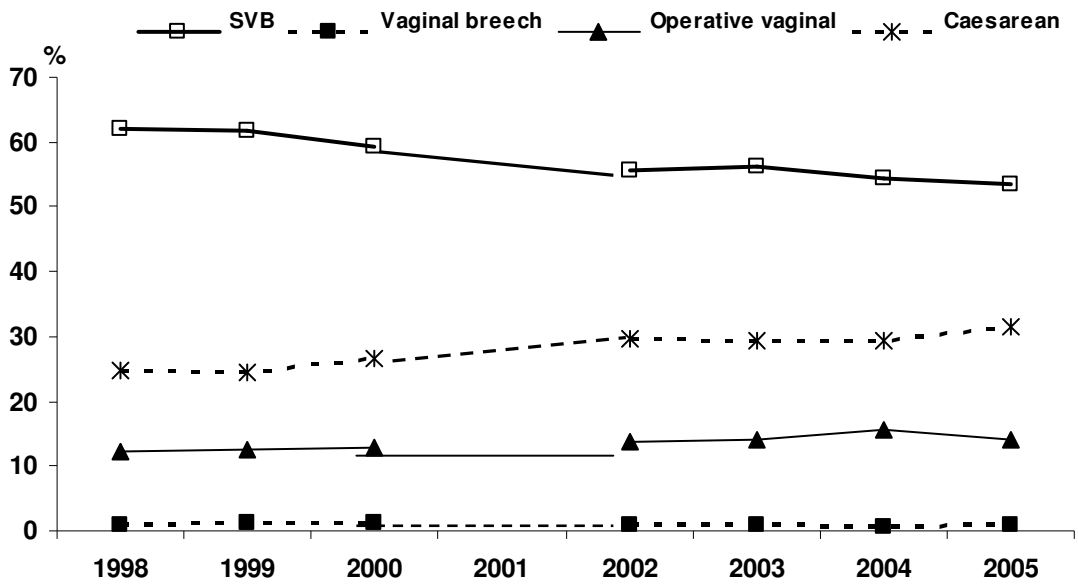

Figure 2: Mode of birth 1998-2005

Table 5: Postpartum outcome summary

	Birthing mothers	n	%
PPH ≥1000mls	7194	367	5.1
SVD	3845	97	2.5
Instrumental vaginal birth	1022	35	3.4
Caesarean section	2273	235	10.3
Episiotomy	4921	1093	22.2
Third/ fourth degree tears	4921	99	2.0
Postpartum blood transfusions	7194	139	1.9
Infant Feeding at discharge from NW facility	5765		
Exclusive breastfeeding		3686	63.9
Fully breastfeeding		485	8.4
Partial breastfeeding		1375	23.9
Artificial feeding		219	3.8

2.3 Summary of neonatal outcomes 2005

Table 6: Neonatal outcomes of babies born at National Women's in 2005

	Babies born n=7384	
	n	%
Gender		
Male	3880	52.6
Female	3503	47.4
Preterm birth		
20-27 weeks	108	1.5
28-31 weeks	139	1.9
32-36 weeks	559	7.6
Term birth		
37-41 weeks	6408	86.8
42+ weeks	170	2.3
5 minute Apgar < 7		
Preterm	52	0.7
At term	48	0.7
SGA (by Customised Centile)		
Preterm	258	3.5
At term	693	9.4
Admission to NICU		
Preterm	453	6.1
At term	346	4.7

Table 7: Perinatal mortality 2005

	Babies born n=7384
Number of fetal deaths	68
Number of early neonatal deaths	38
Number of late neonatal deaths	5
Perinatal mortality rate	14.4
Perinatal-related loss rate	15.0

section 3

MATERNAL DEMOGRAPHY

3 MATERNAL DEMOGRAPHY

This chapter describes the demographic characteristic of the women birthing at National Women's including those for each of the LMC groups and for standard primipara. Additional data pertaining to this chapter can be found in Appendix 3.

3.1 Maternal domicile

In 2005, 69% of women giving birth at National Women's were from the Auckland District Health Board area. Births of women from within our own area have slowly increased from 65% in 2002. This has been associated with a steady decrease in births of women from Waitemata and Counties Manukau District Health Board areas, whose births comprised 14% and 15% respectively in 2005. Small numbers of births (138 in total) among women from other areas made up the total of 7194 birthing mothers in 2005.

3.2 Maternal age

The trend towards increasing age among women giving birth at National Women's continues. The proportion of births to women in all age groups below 30 continues to fall while rising among women over 30. Since the late 90s, the most common age category for parturients whether nulliparous or multiparous has been 31-35 years. The second most frequent age category is 26-30 year old women although if the current trend continues this is likely to be 36-40 year old women within the next 2 years.

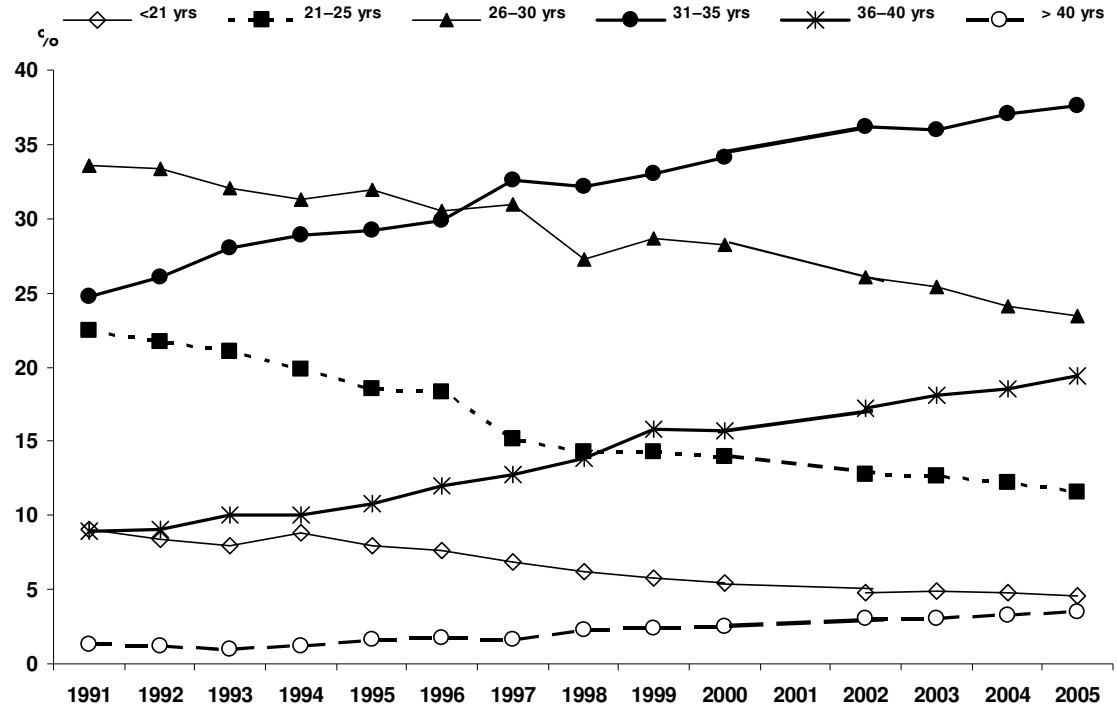

Figure 3: Maternal age distribution (1991-2005)

3.3 Parity

There was no apparent change in the proportion of nullipara to multipara birthing at National Women's in the period 1992-2000. Unfortunately, the data from 2001-2003 are unreliable and have not been presented. In 2004 and 2005, the ratio of nullipara to multipara appears to have increased from the previous steady rate of around 0.8:1 to 0.96:1. This trend combined with the trend to increasing maternal age is likely impacting on maternal and neonatal outcomes and on interventions in pregnancy and birth.

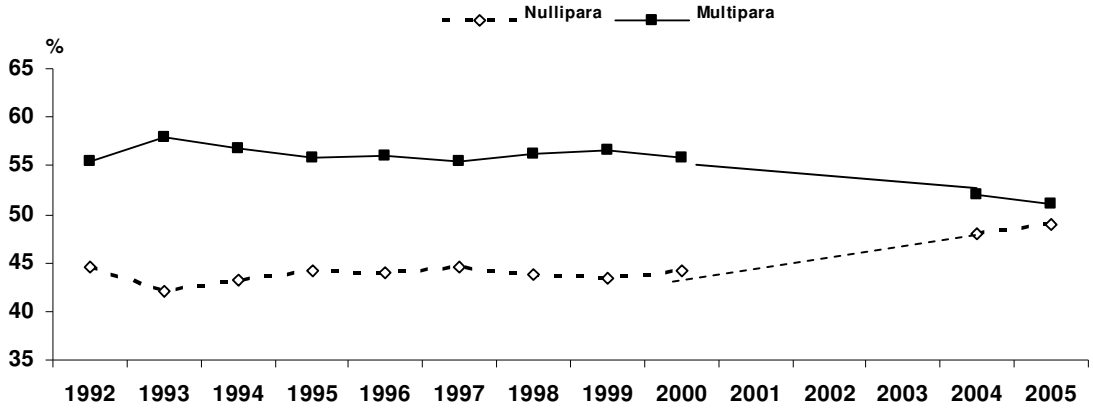

Figure 4: Parity distribution (1992-2005)

3.4 Maternal ethnicity

There have been small shifts in the ethnic distribution of mothers giving birth at National Women's over the past 5 years, probably reflecting the domicile of birthing mothers. In 2005, 48.4% of mothers identified as European (NZ or other), 7.6% as Maori, 13.6% as Pacific, 7.6% as Indian, 10.7% as Chinese, and 5.0% as other Asian.

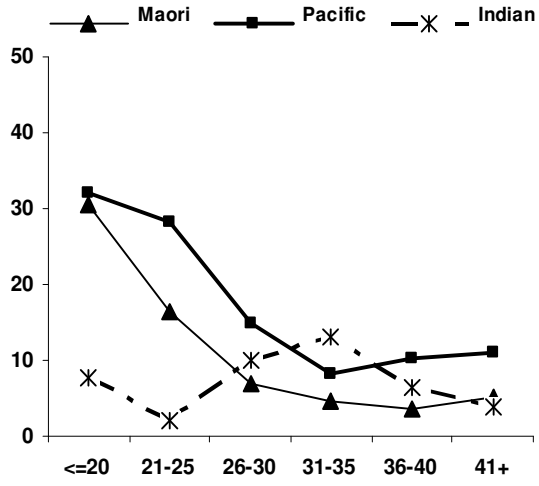

Figure 5: Maternal age among Maori, Pacific and Indian ethnicities

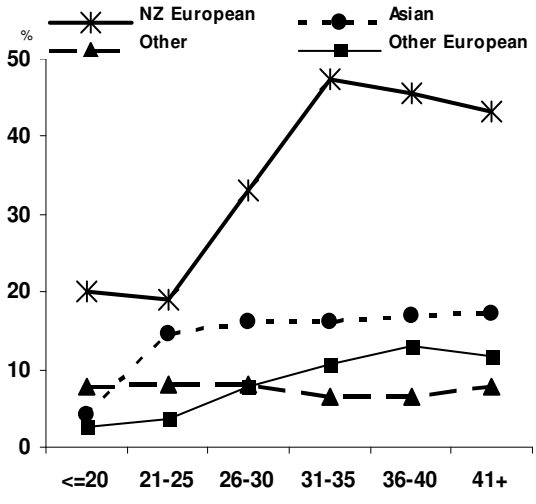

Figure 6: Maternal age among NZ European, Asian, Other European and Other ethnicities

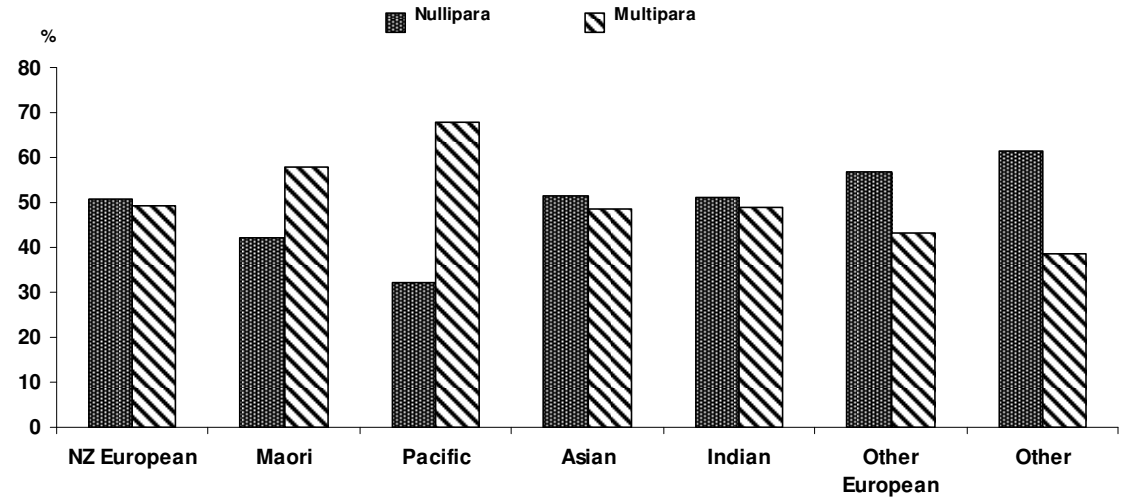

Figure 7: Parity distribution by maternal ethnicity

Age and parity distributions vary widely by ethnicity. Maori and Pacific mothers are younger than European and Asian and are more likely to be multiparous. Consideration should be given to age and parity standardisation of outcomes among these groups to account for associated differences in risk by age and parity.

3.5 Lead Maternity Carer and maternal demographic characteristics

In 2005, 42% of mothers were booked with independent midwives (IMW) at birth, 22% with private obstetricians, 16% with National Women's Community clinics, 8% with National Women's Domino midwives, 8% with National Women's specialist medical and diabetic clinics. Overall, 66% of women who gave birth at NW in 2005 were booked with private Lead Maternity Carers. These proportions are unchanged from 2004.

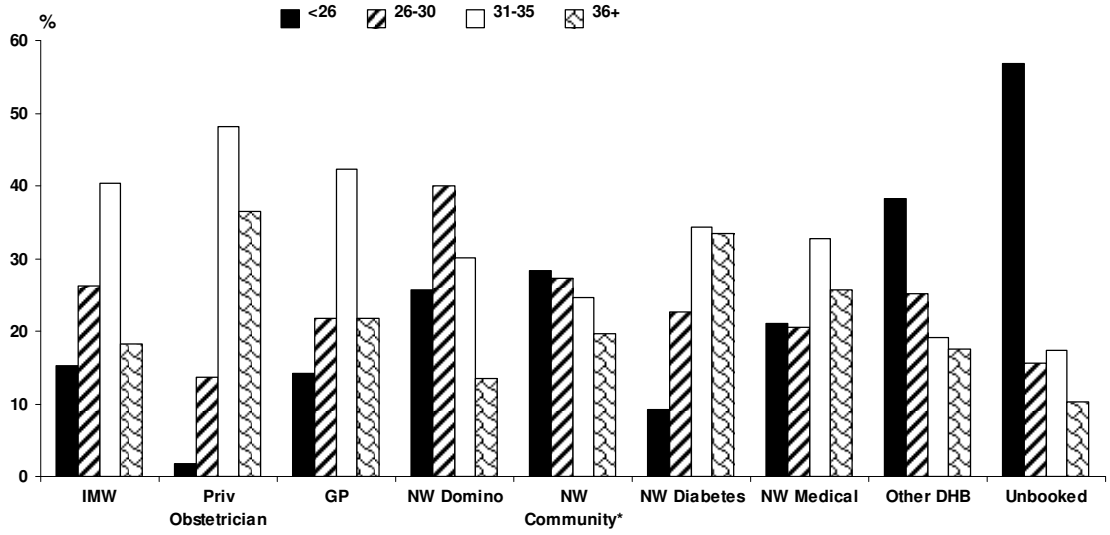

Figure 8: LMC at birth and maternal age
*NW Community includes women from the ADAPT service

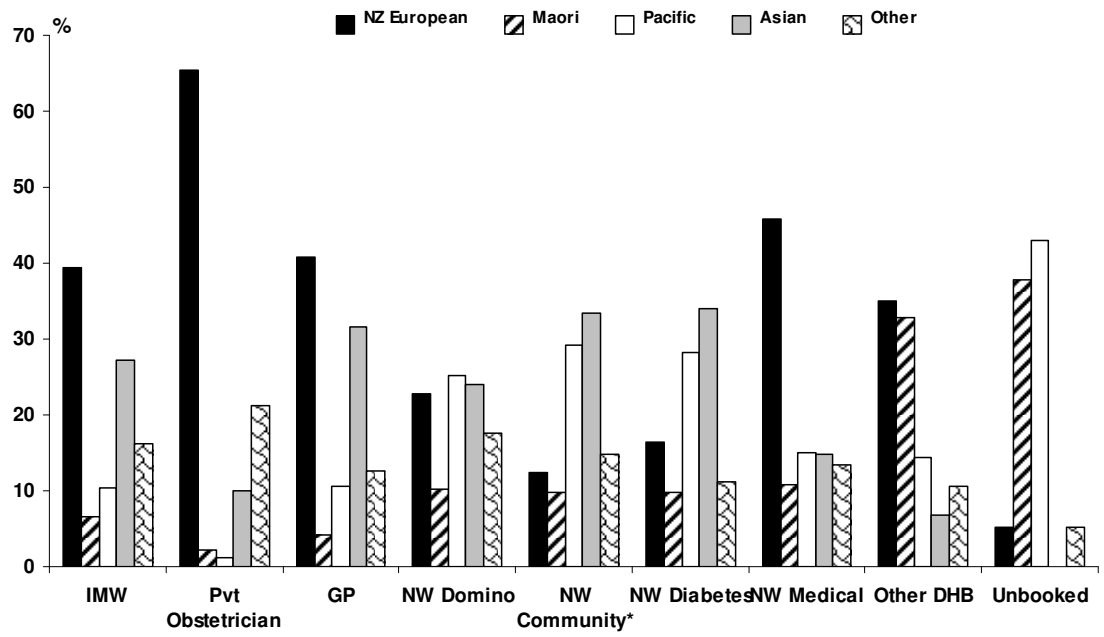

Figure 9: LMC at birth and maternal ethnicity

The women cared for by different LMC groups vary considerably in their demography. Women booked with private obstetricians are on average older and more often European. Women cared for by National Women's community clinics are younger, more often multiparous, and more often Maori, Pacific and Indian. Women cared for by Independent midwives are intermediate between these two former groups and also care for the largest proportion of Asian (non-Indian) women. There is an over-representation of Maori and Pacific among women who are unbooked at birth and women transferred from other DHB areas for birth.

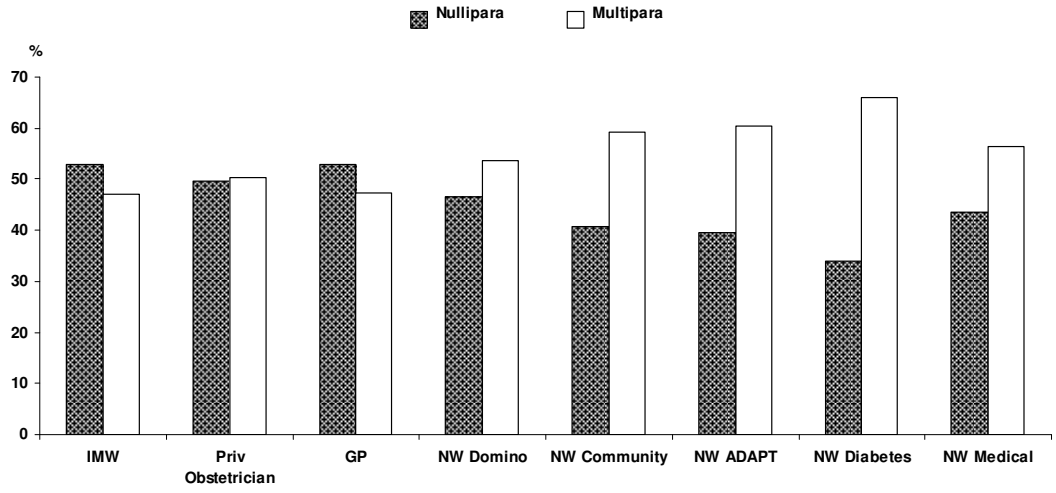

Figure 10: LMC at birth and parity

3.6 Smoking

In 2004, smoking status data were missing for 21% of women. In 2005, due to almost complete collection of smoking data on the antenatal summary, which is completed at the time of birth, only 5% of smoking status data are missing. The smoking rate among women with known smoking status in 2005 was 8.2%, consistent with the 8.1% in 2004, suggesting that missing data does not indicate non-smoking.

Significantly, more complete data have revealed a considerably higher rate of known smoking among Maori mothers (37% in 2005 compared with 28% reported in 2004) and among mothers under 20, a large proportion of whom are Maori.

It was difficult to reconcile data entered in early pregnancy with data at birth. These data should allow us to ascertain how effective smoke change interventions are in our service.

3.7 Body mass index

These data continue to be inadequate for reporting with 46% of height data and 38% of weight data missing allowing only 52% of BMI to be calculated.

3.8 Standard primipara

Standard primipara were defined as they were in 2004, although our collection and cleaning of hypertensive disease and antepartum haemorrhage data were improved this year. The definition is given in the introductory chapter.

The objective in describing the standard primipara is to determine the outcomes and interventions for women in this pre-defined "low risk" group. This allows for comparison between institutions and between LMC groups.

Only 34% of our primipara were defined as standard this year, compared to 45% in 2004. This is in the most part due to improved data cleaning around hypertensive disease and antepartum haemorrhage and revised definition of small for gestational age from customised centiles. There is also a contribution from the increasing age of the obstetric population.

The proportion of primipara who were aged 20-34 years at birth, with a singleton pregnancy, cephalic presentation, gestation 37 – 41 weeks (i.e. 37+0 days – 40+6 days) in 2005 was 49.5%.

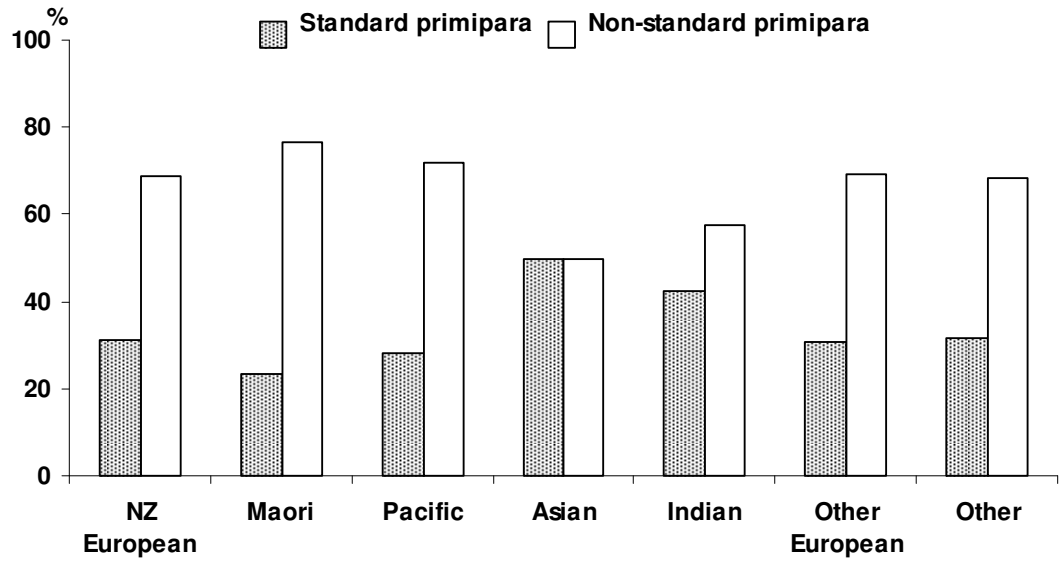

Figure 11: Ethnicity of standard primpara

Standard primipara status varies by ethnicity. The low rate of standard primipara status among Maori primipara is in large part due to their young age. The distribution of standard primipara is also very different by caregiver at birth, which supports the use of this definition in the comparison of outcomes and interventions by caregiver group.

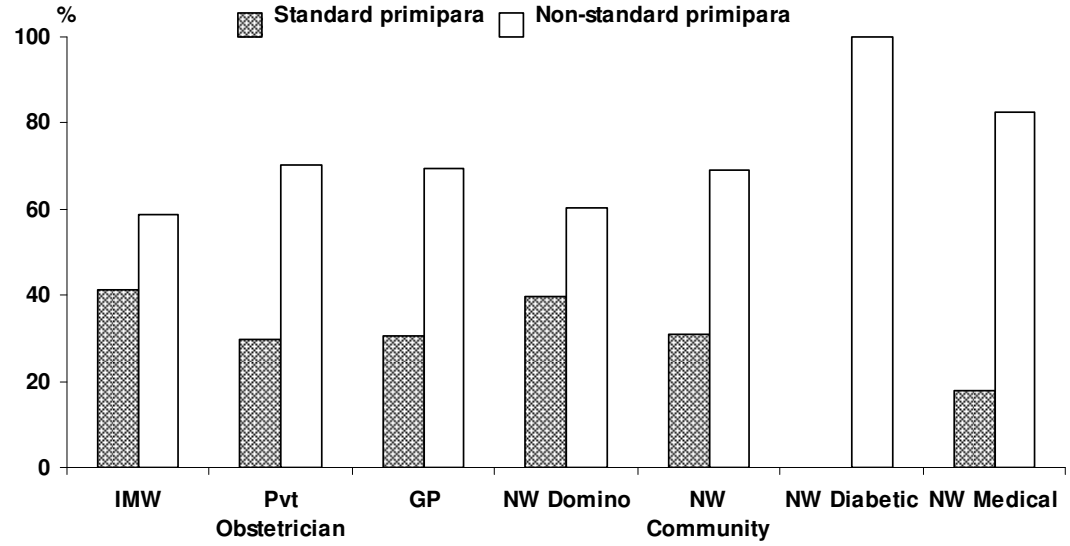

Figure 12: LMC at birth of standard primpara

section 4

ANTENATAL COMPLICATIONS

4 ANTENATAL COMPLICATIONS

This chapter provides data and analysis on the complications and diseases which affect some women in the antenatal period, namely preterm birth, growth restriction, multiple pregnancy, antepartum haemorrhage, hypertensive disease and cervical cerclage. Additional data on these complications can be found in Appendix 4.

4.1 Preterm birth

Methods

Iatrogenic preterm birth has been defined as induction of labour, elective caesarean section and emergency caesarean before the onset of labour. In the 2004 data, emergency caesarean before onset of labour was included with spontaneous onset of birth. Prior to 2001, elective caesareans were not defined at data entry but derived based on a definition of caesarean section before the onset of contractions.

Findings

Table 8: Rates of preterm birth <37 completed weeks (1994 – 2005)

	1994	1995	1996	1997	1998	1999	2000	2004	2005
Total number of women	8812	9125	9157	8055	7492	7501	7827	7491	7194
Women birthing preterm	852	913	911	906	852	850	912	756	685
Incidence %	†	†	†	†	10.9	11.3	11.7	10.1	9.5
Spontaneous <37 wk						350	385	498	448
Incidence %						4.7	4.9	6.6	6.2*
Iatrogenic <37 wk						500	527	258	322
Incidence %						6.7	6.7	3.4	4.5*
Total babies <37 weeks	1010	1052	1085	1047	991	984	1062	886	806

† Note denominators pre-1998 include postnatal transfers and therefore incidence has not been calculated
* Changes in rates of spontaneous and iatrogenic preterm births from the 1999-2000 to the 2004-2005 years are likely to be related to definition and data collection changes rather than real differences. See methods above.

Among these preterm births before 37 weeks were 115 sets of twins and 3 sets of triplets. Of these, 72 sets were iatrogenic preterm births (61%) and 46 were spontaneous preterm births (39%). Of the singleton preterm births 290/567 were iatrogenic preterm births (51%) and 277/567 were spontaneous preterm births (49%). The singleton preterm birth rate was 567/7007 (8.1%).

Table 9: Rates of preterm birth <32 completed weeks (1994–2005)

	1994	1995	1996	1997	1998	1999	2000	2004	2005
Total number of women	8812	9125	9157	8055	7492	7501	7827	7491	7194
Women birthing < 32 wks	208	245	241	207	212	229	244	220	211
Incidence %	†	†	†	†	2.6	3.1	3.1	2.9	2.9
Spontaneous <32 wk						86	107	162	151
Incidence %						1.1	1.4	2.2	2.1
Iatrogenic <32 wk						143	137	58	60
Incidence %						1.9	1.8	0.8	0.9
Total babies <32 wks						271	287	250	247

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

Among these preterm births before 32 weeks were 34 sets of twins and 1 set of triplets. Of these, 18 sets were iatrogenic preterm births (52%) and 17 were spontaneous preterm births (49%). Of the singleton preterm births before 32 weeks 100/176 were iatrogenic preterm births (57%) and 76/176 were spontaneous preterm births (43%). The singleton preterm birth rate <32 weeks was 176/7007 (2.5%).

There are no statistically significant differences in preterm birth rate by age. However, preterm birth was more common among Maori mothers and less common among Asian compared to NZ European. Maori mothers were more likely to experience spontaneous preterm birth and Asian less likely to be delivered early, consistent with 2004 data. The increase in spontaneous preterm birth among Maori mothers may be related to young age and smoking.

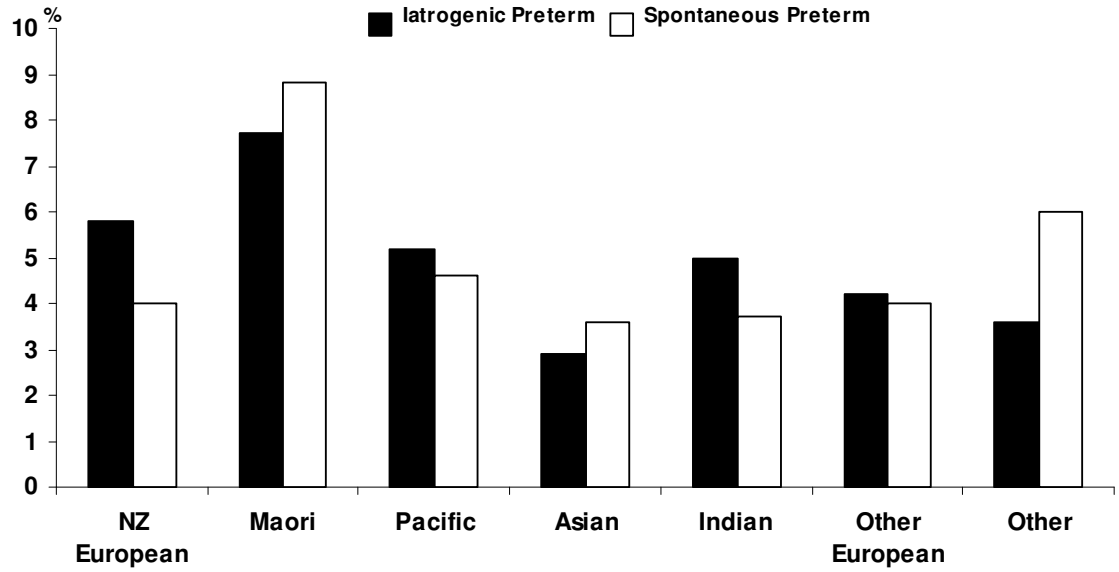

Figure 13: Spontaneous and iatrogenic preterm birth (<37 weeks) by ethnicity

Spontaneous preterm birth was more common among nullipara (7.15%) than among multipara (5.4%). The 7.1% nulliparous spontaneous preterm birth rate is a huge challenge for obstetric care as these women have no obstetric history with which to

predict risk. It may be useful to explore the reasons for consistently lower spontaneous preterm birth rates among multipara birthing at NW.

Table 10: Perinatal outcome of preterm births by gestation (n=7384)

Gestation	Births	Fetal deaths	Livebirths	% Liveborn	Neonatal death	% of Livebirths surviving > 28 days
20	10	9	1	10	1	0
21	16	9	7	44	7	0
22	11	7	4	36	4	0
23	10	7	3	30	2	33
24	19	3	16	84	7	56
25	12	0	12	100	1	92
26	8	3	5	62	0	100
27	8	1	7	87	2	71
28	25	5	20	80	1	95
29	38	2	36	94	0	100
30	27	1	26	96	0	100
31	27	1	26	96	0	100
32	36	1	35	97	1	97
33	36	2	34	94	0	100
34	75	1	74	99	1	99
35	108	2	106	98	1	99
36	219	1	218	99	1	99

The data given in the table above are of value when counselling women at risk of preterm birth. It would be useful to combine data over a number of years and to determine outcomes for spontaneous and iatrogenic preterm births. For further comment on prognosis, see Chapter 7, Newborn.

Summary/Implications

- Singleton preterm birth rate was 8.1%.
- Preterm birth is associated with multiple pregnancy, ethnicity, smoking, and nulliparity.
- Local data on survival are useful for counselling at risk mothers. It would be useful to compile several years data for this purpose.

4.2 Small for gestational age (SGA)

Methods

Up until 2004 the National Women's Annual Clinical reports had defined small for gestational age according to a nomogram published by Beeby (J Paed Child Health 1996) which is largely derived from Caucasian births. A customised birth weight centile calculator has been developed for New Zealand women (Aust NZ J Obstet Gynaecol 2004). This calculator individualises birth weight centiles adjusting for gestation at birth, gender, maternal ethnicity, height, booking weight, and parity. The resulting definition of small for gestational age reclassifies as normal many babies who are born to small mothers. It more accurately predicts adverse perinatal outcomes and is thought to identify babies with growth restriction.

Height data were available for only 54% and weight data for 62% of mothers giving birth at NW in 2005. For women without height and/or weight data, mean height and/or weight for women of the same ethnicity has been used. The lack of complete data on maternal height and weight may reduce the accuracy of the customised birth centile data in this year's report. In our 2004 report babies who were small by customised birthweight centiles had high rates of perinatal morbidity whereas babies that were small by population centiles but normally grown by customised birthweight centiles had extremely low morbidity. This year size at birth is only classified using customised centiles.

In 2005 significantly more babies had birth-weight $<10^{th}$ customised centile compared with 2004, 12.9% vs 10.9% p=0.0002. This is likely due to a different method of entering gestation in calculating the customised centile in 2005. In 2005 gestation was calculated precisely in weeks and days. In 2004 gestation was used in completed weeks only. Customised birthweight centiles were developed in a "normal population" and the 12.9% SGA rate in our population is consistent with the rate reported in an unselected general Swedish population (Gardosi personal communication).

Findings

Young women under 25 years of age had an increased risk of having an SGA baby as did those of Maori or Pacific ethnicity. Multivariate analysis is necessary to determine whether these are independent risk factors for SGA or whether they might be explained by other variables such as smoking.

Compared with non smoking women, current smokers, those with unknown smoking status and those who stopped smoking in pregnancy had higher rates of SGA babies. The increased rate of SGA in those who reported to have stopped smoking in pregnancy compared to non smokers may reflect that for at least some of these women smokefree status was not achieved until late in pregnancy. It might also reflect that self reporting of smoking status is not reliable and that some of these women continued to smoke.

Women who had SGA babies were more likely to be induced and to have emergency prelabour Caesarean sections compared with women who had babies with birthweight $\geq 10^{th}$%. They were not at increased risk of elective Caesarean section. The higher rate of induction and prelabour Caesarean reflects antenatal diagnosis of a portion of these SGA babies. It is not possible to determine the rate of antenatal diagnosis of SGA from the National Women's database currently. Published data show that fewer than 50% of SGA babies are diagnosed antenatally. Use of customised antenatal growth charts (GROW) increases the rate of antenatal diagnosis and it is recommended that these are utilised in routine antenatal care.

Table 11: Interventions and outcomes among SGA babies

	Customised birthweight <10th%(SGA) n=951	Customised birthweight ≥ 10th% n=6433	RR(95%CI)*
	n %	n %	
Onset of birth			
Spontaneous Labour	433 45.5	3868 60.1	0.76 (0.70-0.81)
Induction	332 34.9	1612 25.1	1.39 (1.26-1.53)
Emergency CS before labour	92 9.7	158 2.5	3.94 (3.07-5.05)
Elective caesarean	94 9.9	795 12.4	1.17 (0.96-1.44)
Mean birth weight (sd)	2442 (734)	3460 (595)	
Gestation at birth			
Mean gestation (sd)	37.0 (4.5)	38.7 (2.4)	
Term	693 72.9	5885 91.5	0.80 (0.77-0.83)
Preterm	258 27.1	548 8.5	3.18 (2.79-3.63)
Preterm < 32 wks	107 11.3	140 2.2	5.17 (4.06-6.59)
NICU admission			
Any stay	247 26.0	552 8.6	3.03 (2.65-3.46)
≥ 2 days	226 23.8	479 7.4	3.19 (2.77-3.68)
Apgar at 5 mins <7	26 2.7	74 1.2	2.38 (1.53-3.70)
Stillbirth	41 4.3	27 0.4	10.3 (6.4-16.6)
Neonatal death	18 1.9	25 0.4	4.87 (2.67-8.89)

*Relative risk of outcome (e.g. spontaneous labour, induction, preterm birth etc) for babies with SGA compared to appropriately grown babies.

SGA babies were more likely to be born preterm or extremely preterm. Of the extremely preterm SGA babies, 82% were iatrogenic preterm births compared to 42% of appropriately grown extremely preterm babies.

Stillborn babies and babies that died in the neonatal period were about 4 times more likely to be SGA compared with babies that survived. Sixty percent of stillborn babies and 42% of neonatal deaths were SGA.

Summary/Implications

- Maternal height and booking weight are very important data which we urge all LMCs to collect and send in with their bookings. These data have several uses. They enable calculation of a customised antenatal growth chart using GROW (Brit J Obstet Gynaecol 1999). The weights of previous babies can also be entered into the GROW program enabling generation of a customised centile for these babies. If a previous baby is recognised as being SGA, low dose aspirin therapy can be prescribed to reduce the risk of recurrence, and fetal growth can be monitored using ultrasound. After delivery a customised birthweight centile can be produced for the baby.
- Height and weight is also used to calculate body mass index. Elevated body mass index (>30) is an important risk factor for many pregnancy complications. Calculation of a body mass index can therefore also help with risk selection early in pregnancy.

4.3 Multiple pregnancy

This section describes the characteristics and outcomes of mothers who gave birth to twins and triplets at NW during 2005 and the outcomes of their babies.

Findings

Table 12: Multiple pregnancy rates (per 100 births)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total number of multiple pregnancies	185	172	194	210	182	172	218	179	208	191	188	187
Incidence %					2.4	2.3	2.8	2.4	2.7	2.5	2.5	2.6
Number of twin pregnancies	181	169	187	204	176	166	207	175	201	184	188	184
Number of triplet pregnancies	4	2	7	6	5	6	11	4	7	7	0	3
Number of quadruplet pregnancies	0	1	0	0	1	0	0	0	0	0	0	0

There has been no change in rate of multiple birth since 1998, suggesting that the assisted reproduction programmes contributing births to NW are well regulated.

Table 13: Fetal/neonatal outcomes of multiple pregnancies (per 100 babies born)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total number of babies born in a multiple pregnancy	356	348	395	426	371	350	445	362	421	384	376	377
Incidence %					4.8	4.6	5.3	4.7	5.3	4.9	4.9	5.1
Number of multiple pregnancies where one or more babies died	16	10	23	20	12	12	14		26	11	15	13
Incidence % (no. of multiple pregnancies where a baby died/number of multiple pregnancies)	8.6	5.4	11.9	9.5	6.6	7.0	6.4		12.5	5.8	8.0	7.0
Number of babies who died in a multiple pregnancy	22	12	36	30	25	22	23				23	17
Twin perinatal mortality rate*	61.8	34.5	91.1	61.3	51.1	63.3	48.3				61.2	43.5

*Perinatal twin deaths/1000 twin babies born

Table 14: Mode of onset of birth among twin pregnancies

	Term births n=69		Preterm births n=115	
	n	%	n	%
Mode of onset of birth				
CS elective	24	35	28	24
CS emergency before labour	2	3	27	23
Induction of labour	34	49	14	12
Spontaneous labour	9	13	46	40

Of the 38% of twin pregnancies reaching term, 38% were delivered by elective caesarean or prior to onset of labour. Only 13% went into spontaneous labour.

Table 15: Mode of birth among twin pregnancies

	Twin pregnancies					
	2000 n=207		2004 n=188		2005 n=184	
	n	%	n	%	n	%
Spontaneous vaginal birth/vaginal breech both twins	84	41	52	28	53	29
Spontaneous vaginal birth 1st twin, operative vaginal 2nd twin	7	3	4	2	8	4.3
Operative vaginal 1st twin, spontaneous vaginal 2nd twin	9	4	8	4	5	2.7
Instrumental vaginal birth both twins	11	5	7	4	7	3.8
Spontaneous vaginal birth 1st twin, caesarean section 2nd twin	4	2	4	2	1	0.5
Operative vaginal birth 1st twin, caesarean section 2nd twin	2	1	5	3	0	
CS elective both twins	90	44	48	26	52	28.3
CS emergency both twins			60	32	58	31.5

The twin pregnancies which result in vaginal birth of the first twin followed by caesarean for the second twin are those best avoided for safety of baby and mother. There was only one twin birth where this occurred in 2005. However, there was also little risk of this outcome as 60% of all twin pregnancies were delivered by caesarean. There is currently no good evidence that caesarean section is necessary or beneficial for twin pregnancy per se.

Table 16: Fetal/newborn outcomes of twin babies

	Twin babies n=368	
	n	**%**
Small for gestational age (<10th customised centile)	136	37
Apgar <7 at 5 minutes	10	3
Admission to NICU	162	44
≤34 weeks	115	31
>34 - <37	37	10
≥37 weeks	10	3
Admission to NICU ≥ 2 days	153	42
≤34 weeks	112	30
>34 - <37	34	9
≥37 weeks	7	2

Customised centile charts have not been validated for twins. Twin growth trajectory in dichorionic diamniotic twins is similar to singletons up to 28 weeks, but tends to be slower after 28 weeks.

Table 17: Perinatal-related deaths in multiple pregnancies by gestation

	Twin pregnancies			
	One twin died n=9		Both twins died n=4	
Gestation (weeks)	**n**	**Outcome**	**n**	**Outcome**
20 – 23	0		3	ENND /ENND
				Stillbirth / Stillbirth
				Stillbirth / Stillbirth
24 – 27	5	ENND	1	ENND/ENND
28 – 31	1	ENND	0	
32 – 36	2	Stillbirth	0	
		ENND		
37 – 40	1	LNND	0	
41+	0		0	

Thirteen pregnancies suffered a perinatal loss. These 13 pregnancies included 9 spontaneous and 4 assisted conceptions. Of the 13 pregnancies suffering a perinatal loss, 5 were monochorionic twins. Of these 5, 3 suffered twin-to-twin transfusion syndrome (TTTS). These were clearly unrecognised monochorionic pregnancies or were seen too late to offer effective treatment to prevent TTTS-related death.

Of the 9 pregnancies in which one twin died, 2 died of extreme prematurity, 2 from TTTS, 1 from infection, 3 from congenital abnormalities, and one from discordant growth.

Of the 4 pregnancies where both twins died, the cause of death was extreme prematurity in 2 pregnancies, TTTS in 1, and one was terminated for maternal reasons.

Summary/Implications

- Overall rate of multiple pregnancy is stable.
- Fertility treatments are not leading to high rates of multiple pregnancy.
- Collection of more specific data on multiple pregnancy characteristics would allow teasing out of the associations between these characteristics e.g. type of twinning and complications, interventions and outcome.
- Early recognition of monochorionic twins and subsequent twin-to-twin transfusion syndrome is a key issue for improving twin outcome.
- Twins have a high operative birth rate at NW.
- It is not known if customised birth centiles will be appropriate for monitoring and assessing growth in twin pregnancy.

4.4 Diabetes

Methods

The statistics given below relate to women with a diagnosis of pre-existing or gestational diabetes who delivered at National Women's.

Findings

In 2005, all women with a diagnosis of pre-existing or gestational diabetes who delivered at National Women's had some input from the Diabetes Clinic staff although not all were cared for exclusively with the Diabetes Clinic as their LMC. In addition, the team cared for 8 women with type 1 diabetes and 16 women with type 2 diabetes who booked, but had losses prior to 20 weeks or moved away and 11 women with GDM who delivered elsewhere.

The pre-pregnancy service continues to grow and 57 new referrals were seen in 2005 compared with 40 in 2004. Next year we plan to report the HbA1c level at conception and compare it with HbA1c levels at the pre-pregnancy assessment.

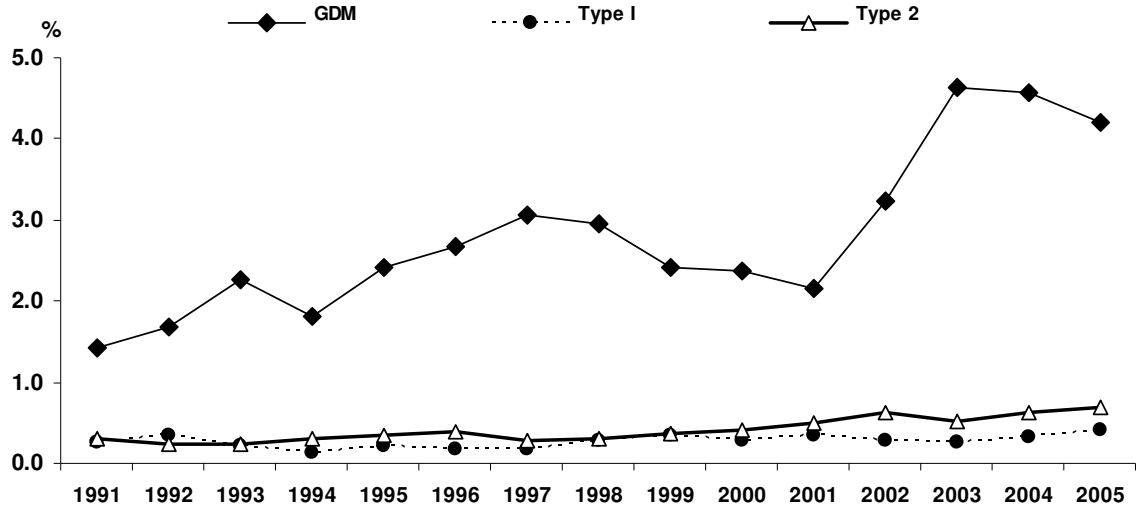

Figure 14: Incidence of diabetes (% of all inborn and BBA births) time trends

Over the past 3 years there has been a plateau in numbers compared with a marked increase over the previous 2 years. The explanation for this is unclear. We suspect rates of GDM are still increasing, but that women are not diagnosed because screening is inconsistent. In a recent audit of macrosomic babies born at NWH, only 50% of the mothers had been screened for GDM, supporting the contention that a prevalence of 5% (Figure 1) is an underestimate. In 2005, two significant publications confirmed that treatment of GDM is associated with improved perinatal outcomes (N Engl Med J 2005; Am J Obstet Gynecol 2005). Efforts should be directed to ensure all pregnant women are offered screening for GDM so that those with GDM are diagnosed and benefit from intervention. A document outlining the screening process is available from the diabetes service. More women with both type 1 and type 2 diabetes diagnosed prior to pregnancy are also being seen by the service.

4.4.1 Demographics of women with diabetes

Of women with GDM and type 2 diabetes, 38.2% and 38.5% respectively are over the age of 35 years compared with 22.1% of the rest of the delivery population. Almost 12% of women who delivered at National Women's over the age of 40 years had underlying type 2 diabetes or GDM.

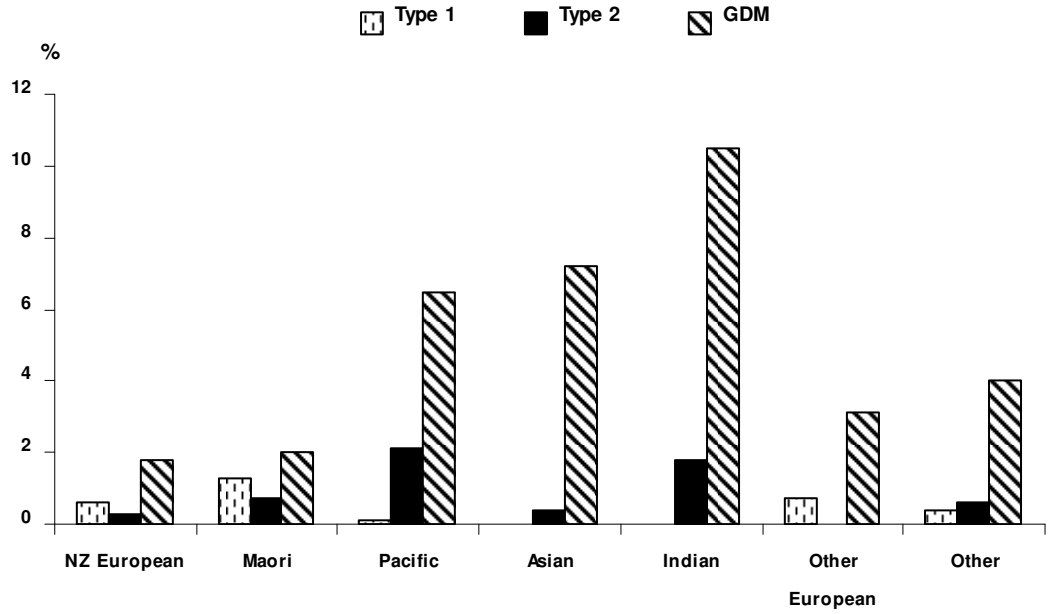

Figure 15: Incidence of diabetes by ethnic group 2005

The ethnicity of women with type 1 diabetes is predominantly European in contrast to women with GDM or type 2 diabetes, who are more likely to be Pacific Island Polynesians or Indian or Asian women.

The graph above, at first glance, seems to suggest that the incidence of GDM varies greatly by ethnic group. However, it also reflects different rates of screening. As highlighted in the 2004 Annual Report, screening for GDM in Maori and Pacific Island women is likely to be inadequate, as we would expect higher rates of GDM in populations with higher rates of type 2 diabetes. Unfortunately, this is still a problem, but we hope this will improve with increasing education about the benefits of identifying GDM.

Over 10% of Indian women are diagnosed with GDM. The population is known to be at increased risk, partly because they are more insulin resistant at lower BMIs than European and Polynesian populations. This relates to differences in body composition, with increased central fat mass and lower muscle mass at any given BMI.

This year, some data are available on the booking weight of women attending diabetes clinic. Unfortunately, due to differences in weights between different ethnicities, absolute values are not meaningful. However, it appears that weights are increasing in these populations of GDMs and type 2 diabetics. If complete weight and height data are available, we intend to evaluate BMI data for different ethnic groups.

4.4.2 Outcomes of pregnancies complicated by diabetes

The induction rate is over 50% in women with diabetes, double the rate in the background population. Women with GDM in particular are not routinely induced. If they have a normally grown fetus, good glycaemic control and no other specific risk factors (e.g. advanced maternal age, pre-eclampsia) we anticipate the onset of normal labour, but will induce in the 41st week of gestation. Many women have several indications for delivery prior to 40 weeks. It is recognised that obesity is associated with increased rates of induction and caesarean section, independently of diabetes. Obese women have increased perinatal risks and may have delayed onset of labour. This is a further factor in our induction rates.

Rates of spontaneous vaginal, operative vaginal, and caesarean births appear relatively stable among women with GDM. This year, the caesarean section rate in women with type 1 diabetes (74.2%) was higher than other years, but numbers are small. The type 2 caesarean rate of just under 20% elective and 40% emergency is similar to other years and other centres report similar results.

Women with type 1 and 2 diabetes have increased rates of postpartum haemorrhage requiring transfusion compared to other women.

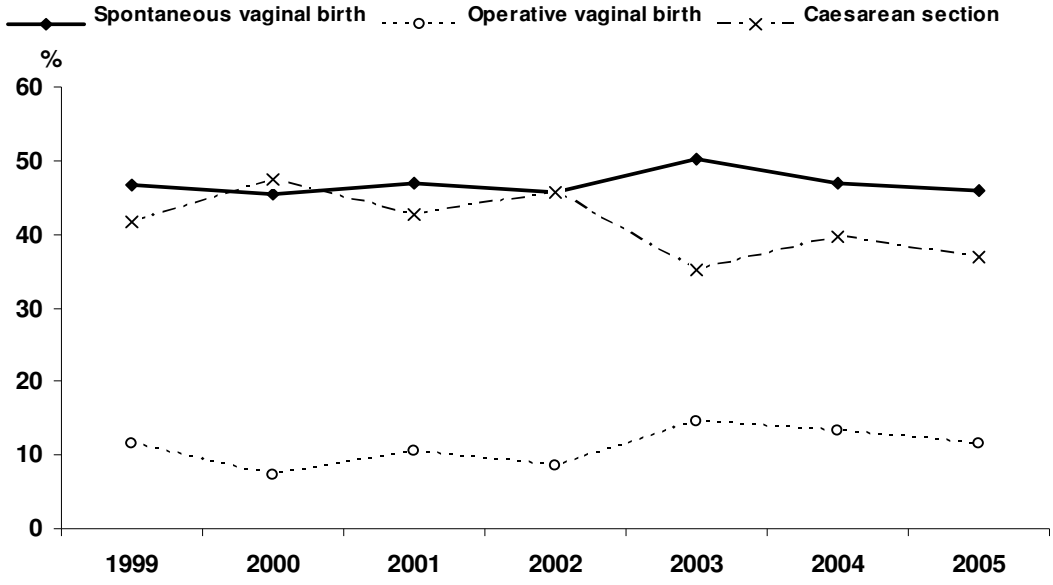

Figure 16: Mode of birth among women with GDM 1999-2005

The preterm birth rate <32 weeks (2.3%) is not significantly different from the non-diabetic population (3.0%), but there is an increase in preterm deliveries <37 weeks in women with pre-existing diabetes (18.1%, vs 9.3% for the non-diabetic population). This typically relates to women with significant vascular complications from their diabetes or women who are poorly adherent to diabetes management.

4.4.3 Maternal postpartum glucose tolerance testing

Table 18: Rates of postnatal glucose tolerance testing (GTT) among women with GDM (1999-2005)

	1999 n=183		2000 n=180		2001 n=163		2002 n=253		2003 n=352		2004 n=342		2005 n=304	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Postnatal GTT	129	70	121	67	132	81	171	68	260	74	260	76	238	78
No postnatal GTT	54	30	59	33	31	19	82	32	92	26	82	24	65	22

Table 19: Results of postnatal glucose tolerance testing (GTT) among women with GDM (1999-2005)

	1999 n=129		2000 n=121		2001 n=132		2002 n=171		2003 n=260		2004 n=260		2005 n=238	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Normal	89	69	89	74	90	68	116	68	196	75	194	74	190	80
IFG/ IGT	22	17	17	14	23	17	37	22	39	15	49	19	34	14
Type 2	18	14	15	12	17	13	16	9	25	10	17	7	14	6

The rate of postnatal glucose tolerance testing is very high (78%), with more than 20% abnormal at that time. The women who do not perform follow-up testing are often women that we anticipate will have undiagnosed type 2 diabetes, which has implications for ongoing health status.

4.4.4 Neonatal outcomes among babies of women with diabetes in pregnancy

It is difficult to compare outcomes in infants of women with diabetes between centres, as often different definitions are used (e.g. for hypoglycaemia). Postnatal care of infants varies between centres, particularly in the use of supplemental feeds. Biochemical hypoglycaemia (<2.6mmol/L) is common in infants of diabetic mothers, occurring in 47.8% of infants. However, only 10.6% of infants required intravenous dextrose infusions.

The LGA and SGA rates in women with type 2 diabetes are surprising. Whilst we would expect a high rate of LGA, it is only 13%. However, the SGA rate of almost 21% is higher than previous years. It may relate to small numbers in part, and to calculations from customised growth charts (which may not be as reliable in obese populations). As a woman's weight increases, the 10^{th} percentile for birth weight increases, but when does this become abnormal? Is the 10^{th} percentile cut off too high in these women? Treatment of diabetes reduces the exposure of the fetus to excess nutrients and reduces birth weight. Whilst this may be a favourable shift, it may lead to an increased diagnosis of SGA using customised weights derived from an obese population. These data require further attention, as it is important that we do not increase the rate of SGA infants with our management. Some women with type 2 diabetes have risk factors, such as vasculopathy, for SGA infants, but this is also seen in women with type 1 diabetes who do not have increased rates of SGA reported. The population of women with type 1 diabetes is less obese and more European, and it is possible the customised charts are more accurate for that population. The increase in SGA in women with type 2 diabetes is unlikely to relate to tight glycaemic control, as their HbA1c levels are higher than women with GDM who have a similar rate of SGA to the non-diabetic population. This area warrants further investigation.

Table 20: Neonatal outcomes among babies of women with diabetes

	Type I n=30	Type 2 n=56	GDM n=307	Postnatally diagnosed Type 2 n=17	No diabetes n=6991
	n %	n %	n %	n %	n %
Birthweight (Mean(sd))	3505(829)	3185(736)	3259(636)	3461(888)	3332(704)
<1500g	1 3.2	3 5.7	3 5.7	0	207 3.0
<2500g	3 9.7	7 13.2	25 8.5	1 7.1	632 9.0
SGA <10th Percentile	1 3.2	11 20.8	39 13.2	3 21.4	897 12.8
LGA > 90th Percentile	16 51.6	7 13.2	38 12.9	1 7.1	587 8.4
Admission to NICU					
< 2 days	14 45.1	13 24.5	43 14.6	6 42.9	723 10.3
≥ 2 days	11 35.5	12 22.6	39 13.2	6 42.9	637 9.1
Respiratory distress	4 12.9	5 9.4	9 3.0	1 7.1	
Hypoglycaemia < 2.3 mmol/l	14 45.1	22 41.5	96 32.5	9 64.3	
Hypoglycaemia < 2.6 mmol/l	16 51.6	32 60.4	126 42.7	11 78.6	
IV Dextrose	10 32.3	11 20.8	15 5.1	5 35.7	

The perinatal loss rate remains low for this population. The two losses reported in women with diabetes during 2005 were in women with poorly controlled type 2 diabetes who had not been cared for by the diabetes clinic. One fetus had lethal renal agenesis; the other was referred at 25 weeks from another centre, was noted to have a fetal bradycardia, and did not receive active treatment.

Summary

The diabetes service continues to grow with respect to numbers of women with pre-existing diabetes and women referred for pre-pregnancy counselling. Numbers of women with GDM are currently stable. Penetration of screening for GDM is still inadequate in Polynesian populations in particular. Our focus on improving screening has been further raised since the recent publication of papers showing the positive effect of treatment on the mother and the baby, even in those patients considered by some to have mild GDM.

Maternal outcomes are good and the caesarean section rate in women with GDM remains lower than it was a few years ago. Neonatal outcomes are also good. There are interesting data with respect to rates of SGA infants in women with type 2 diabetes that raise questions about customised growth charts in obese populations and our management of these women. The perinatal losses highlight the importance of pre-pregnancy counselling in women with diabetes.

Recommendations

- Investigate the change in HbA1c levels in women who come for pre-pregnancy counselling from baseline to conception.
- Provide further education about the importance of screening for GDM.
- Review the customised growth charts in relation to obese populations.
- Undertake a detailed audit of the women with type 2 diabetes and assess management, birth size and other neonatal morbidity.
- Evaluate breast feeding rates and whether early supplemental feeds are indicated, especially in infants with capillary glucose >2.3 mmol/l.

4.5 Antepartum haemorrhage

Antepartum haemorrhage was last reported in the NW Annual Clinical Report in 2000. These data are collected in our new database and with that comes the possibility that the numbers are not comparable with data prior to 2001.

Methods

Antepartum haemorrhage has been defined as vaginal bleeding beyond 20 weeks during pregnancy and labour. Also included in this definition are women with placenta praevia who did not experience bleeding. In cleaning antepartum haemorrhage data, data from the antenatal summary and intrapartum data have been reconciled with the details of any pregnancy where antepartum haemorrhage was given as an indication for induction or operative delivery. Data from Decision Support Unit (DSU) have also been reconciled with Healthware data.

Findings

Table 21: Antepartum haemorrhage incidence

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

In 2005, 5.5% of mothers were recorded as experiencing an episode of bleeding after 20 weeks. In the majority of cases the reason for the bleeding was unknown. Approximately 1% of mothers were reported to have placenta praevia and half this number to have had an abruption.

The known association between placenta praevia and previous caesarean section is evident in our data, with 26% of women with placenta praevia having a history of previous caesarean compared with 12-14% among women with other causes of antepartum haemorrhage and women without a history of bleeding.

Placenta praevia is associated with maternal age over 35. Placental abruption is associated with maternal smoking and hypertension. Hypertension is also associated with antepartum haemorrhage of unknown origin.

Praevia, abruption, and other bleeding are all associated with increased rates of preterm birth, maternal blood transfusion and caesarean section. Bleeding was associated with preterm birth in 18% of preterm births < 37 weeks, and with preterm birth <32 weeks in 43% of cases. Consistent with the increased rate of preterm birth, bleeding in pregnancy is associated with low birth weight and increased NICU admission. Abruption and unknown origin bleeding are also associated with growth restriction and perinatal mortality.

4.6 Cervical cerclage

Preterm birth is a leading cause of perinatal morbidity and mortality. We still do not have a full understanding of the events that lead to early delivery.

Cervical cerclage is not the usual treatment for threatened preterm delivery, but may be offered to women suspected of cervical incompetence. These women usually fall into one of three groups:

1. They have a history of second trimester pregnancy losses. Often the presenting symptoms are not clear cut and the losses may not be painless as is classically described for cervical incompetence.
2. They have ultrasound findings of shortening or funnelling of the cervix in the second trimester on a routine scan.
3. They present for the first time with 'silent', i.e. painless dilatation and effacement of the cervix.

Findings

In the year 2005, 24 women underwent cervical cerclage. Twelve were placed for women with a history of second trimester loss, 10 for ultrasound identified cervical changes, and 3 for painless dilatation of the cervix.

Table 22: Clinical characteristics of women undergoing cerclage in 2005 by gravidity

	Nulligravid N=3	Multigravid N=21
Parity		
0	3	5
≥1	-	16
Previous history		
Previous cerclage	0	8
Previous cervical surgery (LLETZ or Cone)	0	3*
Previous spontaneous first trimester miscarriage	-	11
Previous TOP	-	6
Previous mid-trimester loss	-	13
Previous preterm birth	-	10
Indication for cerclage		
Elective cerclage	0	10
Emergency/unplanned cerclage	3	10
Cerclage in situ from previous pregnancy	0	1
Neonatal outcome †		
Fetal loss	2	3
Birth <24 wks	2	3
Birth 24-28 weeks	0	2
Birth 28-36 weeks	1	1
Birth >36 weeks	0	15
SGA	2	7

* all had LLETZ and one also had a cone biopsy
† 25 babies (one set of twins gave birth >36wks)

Two women had abnormal swab results reported after their cervical suture was inserted (Chlamydia and Trichomonas on one and bacterial vaginosis on the other), raising the possibility of infection as the cause of cervical dilatation in these cases.

There were 3 abdominally placed sutures. One had been left in situ after a laparoscopic placement in a previous pregnancy and two were placed at laparotomy at 13 and 15 weeks. Of the sutures placed abdominally in the current pregnancy, one

had had a Manchester operation for utero-vaginal prolapse followed by several pregnancy losses and the other had a LLETZ and a cone biopsy for AIS and a previous failed attempt at a vaginally placed suture. Both these women achieved a viable pregnancy and were delivered by caesarean section.

Of the 13 unplanned sutures placed vaginally, 4 failed to prolong the pregnancy to viability. All of these had a dilated cervix and membranes bulging through the cervix at presentation. There was one 'emergency' stitch in a case of twins. This was placed at 26 weeks for an ultrasound finding of shortening and dilatation of the cervix. She delivered at term by caesarean section. Of the remaining 9, a further 2 delivered preterm (27 and 32 weeks).

Of the 10 planned sutures, one pregnancy was terminated for fetal anomaly. Of the remainder there were two preterm births (24 and 32 weeks).

One mother laboured, unrecognised, on the ward and delivered through her stitch, resulting in bilateral cervical tears requiring suturing.

All 5 deaths were of babies born before 24 weeks. One was iatrogenic for multiple fetal abnormalities. The remaining 4 had unplanned cerclage after effacement and dilatation of the cervix with bulging membranes. Two of these cases were later found to have infection on vaginal swabs. These positive swabs suggest that labour had already started and this is usually difficult to stop. The insertion of a suture in these cases was, in retrospect, inappropriate.

In summary, of 24 women in whom a suture was placed, there were 5 pre-24 week deaths (21%), and a total of 9 preterm births (38%). There were 9 growth restricted babies (38%), 6 of whom were preterm births.

Summary

Cervical cerclage may have been helpful in the appropriately selected patients described above. The process of preterm labour is complex and has multifactorial aetiology. It is important to establish that cervical changes are due to a mechanical cause rather than an inflammatory cause as cerclage may not be beneficial in the latter situation. Cerclage may cause harm by scarring or by causing cervical incompetence. History, combined with a meaningful examination, is the best diagnostic tool. Prevention of preterm birth remains a major challenge.

The Cochrane Review on this topic, which includes 6 randomised trials and a total of 2175 women, found no conclusive evidence that inserting a cervical suture in women perceived to be at risk of preterm birth or second trimester pregnancy loss attributed to cervical factors, reduces the risk of pregnancy loss, preterm birth or morbidity associated with preterm birth.

Recommendations

We consider there is probably a role for cervical cerclage in women considered very high risk of second trimester miscarriage due to a cervical factor. However selection is critical as it is difficult to predict which women will miscarry and cerclage is an invasive procedure with risks for the pregnancy.

4.7 Hypertensive disorders of pregnancy

Hypertensive disorders of pregnancy include gestational hypertension, preeclampsia and chronic hypertension and complicate approximately 10% of all pregnancies. These disorders are associated with increased maternal and perinatal morbidity and are one of the commonest causes for iatrogenic preterm birth.

Methods

The definitions of the hypertensive disorders of pregnancy used in the Annual Clinical Report are not as rigorous as those used in clinical research. In addition, adherence to the definitions as used has not been formally audited.

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

- **Gestational hypertension**: diastolic BP >90mmHg without proteinuria, when diastolic BP < 90mmHg at booking.
- **Preeclampsia**: diastolic BP > 90mmHg with proteinuria > '+' or >0.3g/24h, when diastolic <90mmHg at booking.
- **Chronic hypertension**: diastolic BP > 90mmHg at booking or a medical history of essential hypertension.

2005 is the first year since 2000 that the hypertension data has been thoroughly checked in NW data. This involved reconciling indications for induction and operative delivery, past medical history, and data from DSU (Decision Support Unit).

Findings

The rate of gestational hypertension in the population of women who delivered at National Women's in 2005 is unchanged from 2000 (5.9% in 2005 v 5.6% in 2000). Conversely, there has been a small, but significant increase in rates of pre-eclampsia (3.8% in 2005 v 2.4% in 2000) and chronic hypertension (2.3% in 2005 v 1.5% in 2000). Four nulliparous women suffered eclampsia in 2005.

Table 23: Hypertensive disease in pregnancy 2005

	All women n=7194		Nullipara n=3522		Multipara n=3672	
	N	%	n	%	n	%
Any hypertensive disease						
Chronic hypertension	163	2.3	66	1.9	97	2.6
Gestational hypertension	421	5.9	258	7.3	163	4.4
Preeclampsia	275	3.8	199	5.7	76	2.1
Eclampsia antepartum	1		1		0	
Eclampsia postpartum	3		3		0	

As expected, the rates of gestational hypertension and pre-eclampsia are higher in nullipara, while chronic hypertension is more common among multipara. Women over 35 years were more likely to develop gestational hypertension or have chronic hypertension than younger women but this association with age was not apparent among women with pre-eclampsia.

All hypertensive disorders of pregnancy were less common among women of Asian ethnicity compared to women of other ethnicities. A similar trend was apparent in rates of chronic hypertension, although numbers are small. The rates of hypertensive disorders of pregnancy did not differ significantly across other ethnic groups. The

lower rate among Asian women may be explained by confounding risk factors such as body mass index, age or parity.

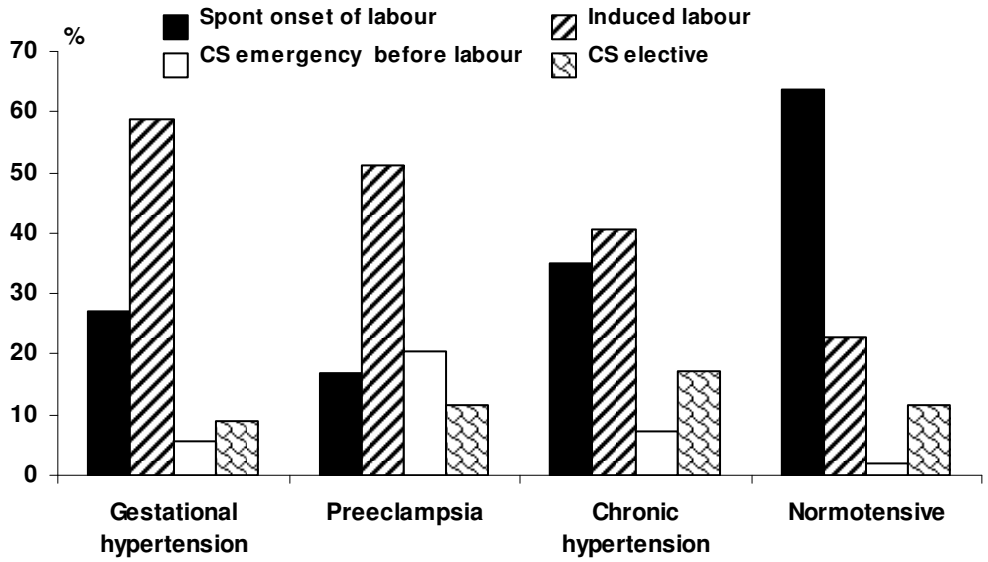

Figure 17: Onset of birth and hypertensive disorders of pregnancy

Table 24: Mode of birth for women with hypertensive disease

	Gestational hypertension n=421		Preeclampsia n=275		Chronic hypertension n=163		Normotensive n=6335	
	n	%	n	%	n	%	n	%
Mode of birth								
Normal vaginal	181	43.0	77	28.0	62	38.0	3539	55.9
Vaginal breech	0	0	2	0.7	2	1.2	41	0.7
Operative vaginal	70	16.6	39	14.4	20	12.3	888	14.0
CS elective	37	8.8	32	11.6	28	17.2	736	11.6
CS emergency	133	31.6	125	45.5	51	31.3	1131	17.9

As would be anticipated, fewer women with hypertensive disorders of pregnancy went into spontaneous labour. Similarly, women with hypertensive disorders had a lower rate of vaginal birth and higher rate of caesarean section.

Table 25: Perinatal outcomes and hypertensive complications of pregnancy

	Gestational hypertension n=431		Preeclampsia n=301		Chronic hypertension n=167		Normotensive n=6485	
	n	%	n	%	n	%	n	%
Gestation at birth								
< 37 weeks	56	13.0	117	38.9	36	21.6	597	9.2
< 32 weeks	8	1.9	28	9.3	17	10.2	194	3.0
SGA	74	17.2	87	28.9	40	24.0	750	11.6
NICU Admission	56	13.0	91	30.2	32	19.2	620	9.6
≥ 2 days in NICU	49	11.4	88	29.2	27	16.2	541	6.3
Apgars < 7 at 5 mins	6	1.4	3	1.0	6	3.6	85	1.3
Perinatal deaths	2	4.6	4	1.3	6	3.6	99	1.5

Very preterm birth (<32 weeks) occurred more frequently in women who developed pre-eclampsia or had chronic hypertension detected during pregnancy. Of infants born to women who developed preeclampsia, 9.3% were delivered prior to 32 weeks gestation compared to 3.0% of infants born to normotensive women. Ten percent of women with chronic hypertension gave birth prior to 32 weeks. The rate of birth prior to 32 weeks was not significantly different in women who developed gestational hypertension (1.9%) compared to those who remained normotensive.

Small for gestational age birth measured using customised birthweight centiles was more common in women who developed hypertensive disorders of pregnancy. Growth restriction was evident in 23/28 (82%) of babies of pre-eclamptic mothers born before 32 weeks (compared to 35% of normotensive pre 32 week births). Of babies of pre-eclamptic mothers born at term 17% were growth restricted compared with 10% of babies born to normotensive mothers.

Summary

Rates of hypertensive disorders in pregnancy have increased since the last analysis was carried out in 2000. There are insufficient data to address why this increase has occurred. Possible explanations include increasing maternal age, BMI, and rates of gestational and type 2 diabetes. In particular, data relating to maternal BMI would be important to gather as studies show a two-fold increased risk of preeclampsia in women with a BMI >25 kg/m^2 with the risk increasing to almost three-fold in women with a BMI >30 kg/m^2.

Use of more robust definitions of the hypertensive disorders of pregnancy would allow effective comparison of maternal and fetal outcomes in these disorders to other tertiary level centres.

Implications

- Multivariate analysis would be required to fully assess the independent role of maternal risk factors in the development of hypertensive disorders of pregnancy and their impact on maternal and fetal outcomes.
- The relationship between maternal BMI and hypertensive disorders of pregnancy plays an essential role in interpretation of these clinical data and must be collected for future reports.

section 5

LABOUR and BIRTH

5 LABOUR AND BIRTH

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

5.1 Induction of labour

Methods

A fourth pathway to birth has been added in this 2005 report by splitting "emergency caesarean section prior to the onset of labour" from "spontaneous onset of labour". Comparisons with 2004 data can be made by recombining these two groups.

The 4 pathways to birth described in this report 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, she has been categorised as an induced labour for the purposes of this section.

Collection of data on induction of labour in the Healthware database requires active opening of an induction screen. We suspect this is not consistently done, especially if 'inductions' are performed on the Labour and Birth Unit. To improve capture of these inductions, clinical notes were reviewed if the indication for ARM (artificial rupture of membranes) was induction or if an ARM was performed or syntocinon commenced before the onset of contractions. However, the possibility remains that the numbers given *under*-represent the true induction rate for 2004 and 2005 and are not comparable with rates prior to 2001. To improve capture in the future consideration could be given to adding a Boolean (yes/no) field for induction of labour.

Findings

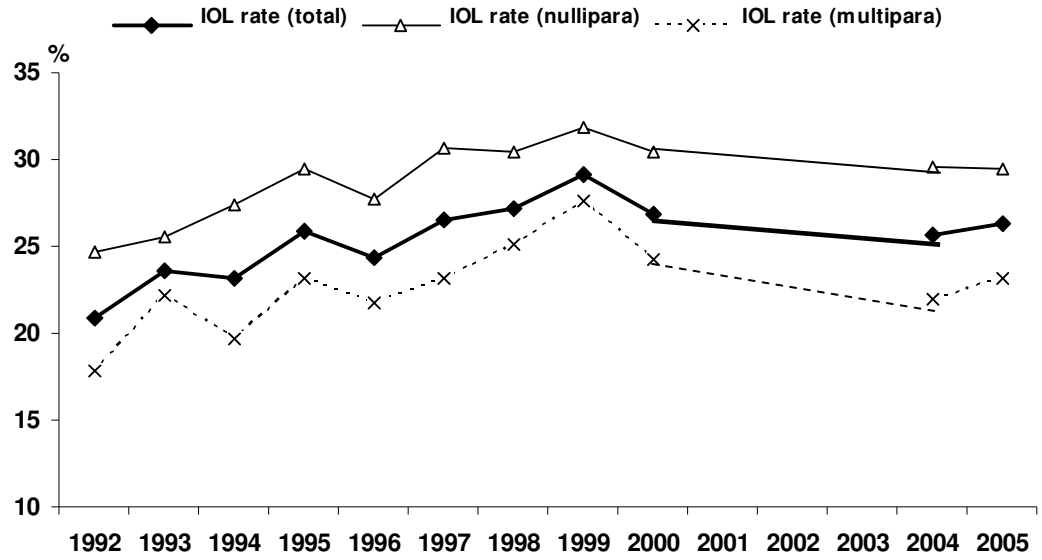

Figure 18: Induction of labour rates (1992-2005)

The IOL rate has remained stable at 26-27% of all births since 1997. It was 26.3% in 2005, 29.6% among nullipara and 23.2% among multipara.

Rates of induction vary by LMC, maternal age and ethnicity. Induction rates are lowest among women with independent midwifery, National Women's Community and Domino midwifery LMCs (21%, 26% and 22% respectively), and highest among diabetic clinic and medical clinic LMCs (63% and 42%) with private obstetricians being between these (33%). These latter three LMC groups also have the highest rates of elective caesarean section (17%, 20% and 25%) and consequently the lowest rates of spontaneous onset of labour (20%, 37% and 39%).

Induction of labour increased in frequency with increasing maternal age, from 21% among mothers up to age 20 to 40% of women over 40, while spontaneous onset of labour dropped from 77% to 27% in these age groups. There were also differences by ethnicity with NZ European mothers least likely to experience spontaneous onset of birth and 14-15% less likely than Pacific or Maori mothers.

These differences are unadjusted however, and apparent differences would likely narrow after age, parity, ethnicity, and obstetric risk factors were taken into account.

Indication for induction

Indication for induction is prioritised at data entry to primary and secondary indication.

The indications for induction both by gestation and by parity remain largely unchanged from 2004. Post dates is cited (most commonly) as the primary reason for induction at term (26%), followed by hypertension (15%) and term PROM (12%). Maternal request was the fifth most commonly cited primary indication for induction at term (131 inductions, 8%).

Indication for induction also varies by ethnicity and age. There is an increasing rate of induction for post dates with increasing age until age 35. Over 35, SGA, hypertension, and maternal request become more common indications. Term PROM appears consistent across all age groups.

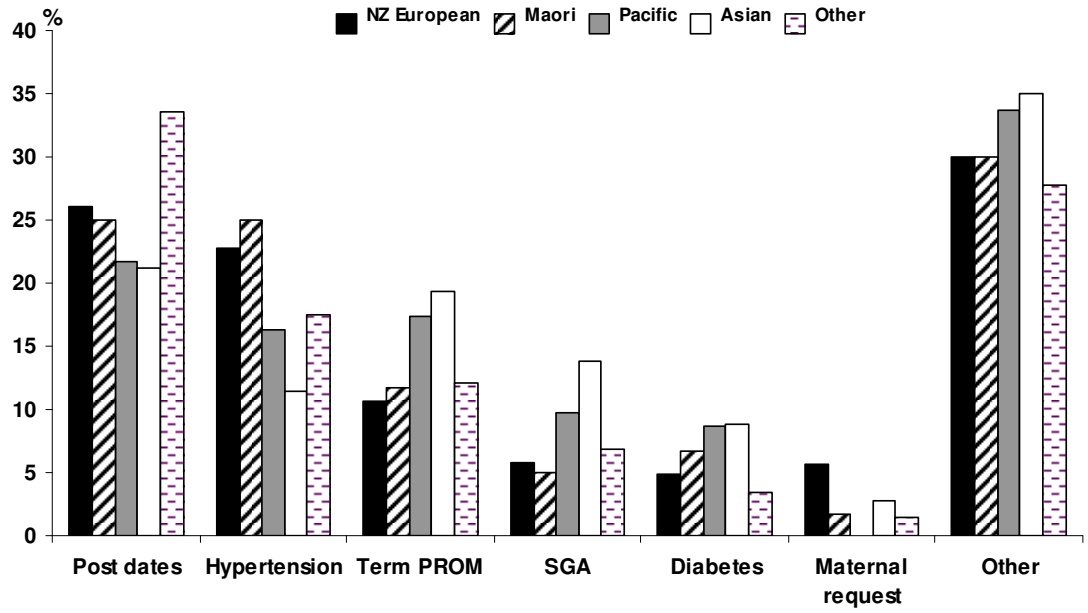

Figure 19: Indication for induction by ethnicity among nulliparous women (all gestations)

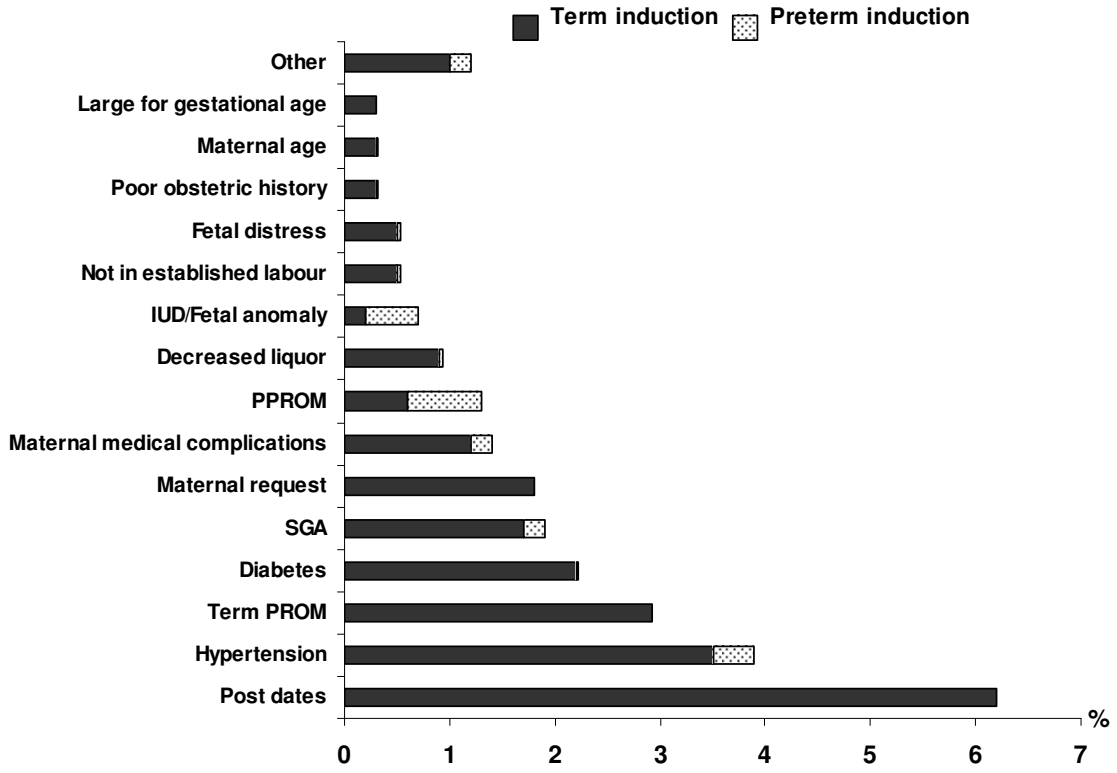

Figure 20: Primary indication for induction as a percentage of all births (n=1733 inductions /7194 birthing mothers)

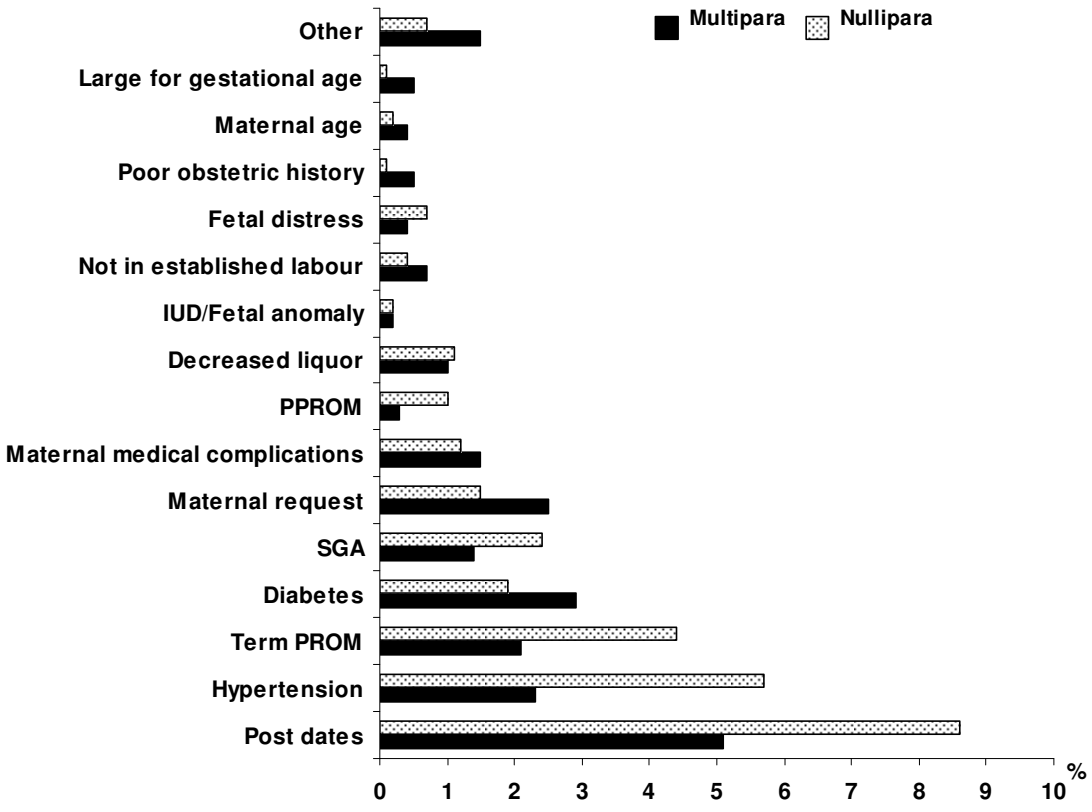

Figure 21: Primary indication for induction at term by parity (as a percentage of term births)

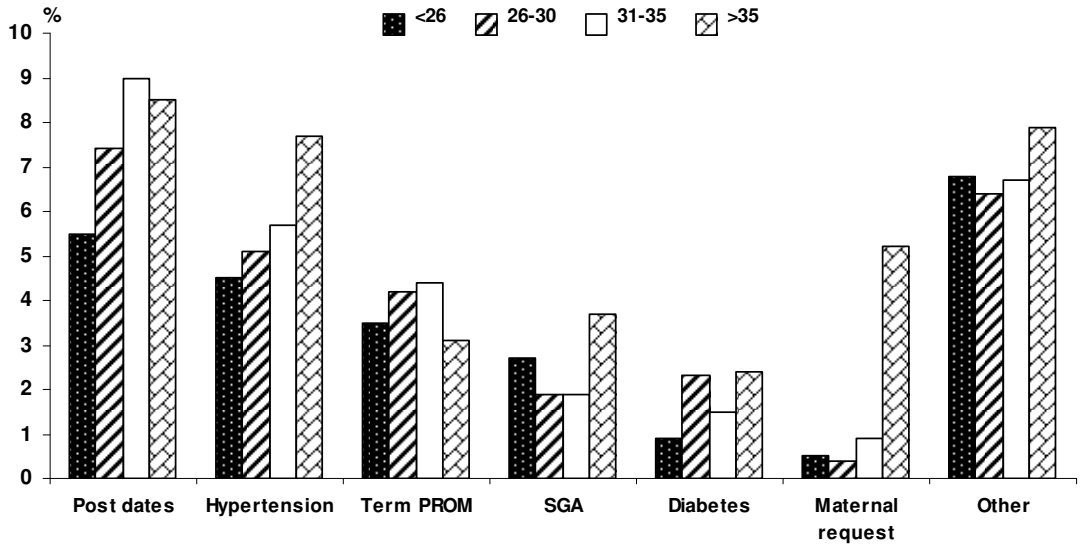

Figure 22: Indication for induction by maternal age among nulliparous women (all gestations)

Induction for post dates resulted in birth prior to 41 weeks in 21.8% of post dates inductions. Fifty-two of these 99 "prior to post-dates" post dates inductions occurred in women under 35 years of age. The majority (58%) of post dates inductions were undertaken between 41weeks and 0 days and 41 weeks and 6 days.

Outcomes following induction

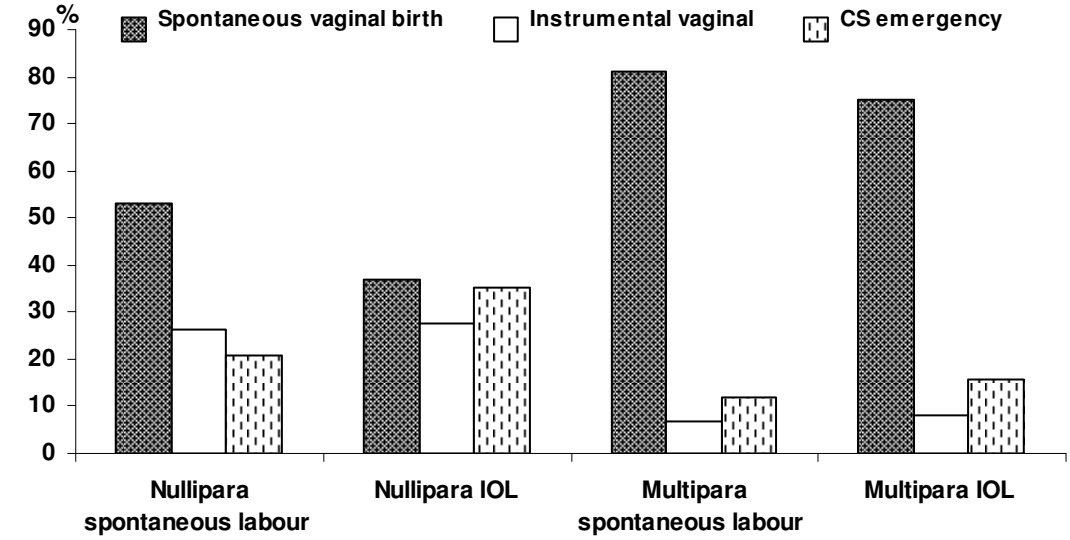

Figure 23: Mode of birth among intended vaginal births at term by parity and onset of labour (IOL=induction of labour)

Rates of caesarean section are substantially higher among nullipara following induction of labour than following spontaneous labour. Emergency caesarean section follows induction in 35% of nullipara compared to 21% following spontaneous labour. This difference in caesarean section rate is apparent for all indications for induction including post dates. This is contrary to published literature which suggests that women induced for post dates are more likely than spontaneous post-date births to deliver vaginally.

This year, the emergency Caesarean section rate among multipara was also higher following induction than spontaneous labour (16% compared to 12%). This difference was not apparent in 2004 data, and may be related to a change in induction practice. This is currently being investigated.

Epidural rates were consistently higher among induced labours (73.6%) than among spontaneous labours (49.9%) for all indications and irrespective of parity. Data are not currently available on indication for epidural and it is possible that a proportion of these epidurals were inserted after a decision for emergency caesarean section was made.

5.2 Use of Syntocinon

Table 26: Use of syntocinon by onset of labour and parity

	Total births	Syntocinon	
	N	n	%
Total	7194	2467	34.3
Induction of labour			
Nullipara	1042	708	68.0
Multipara	852	472	55.4
Spontaneous onset of birth			
Nullipara	2113	945	44.7
Multipara	2133	338	15.9

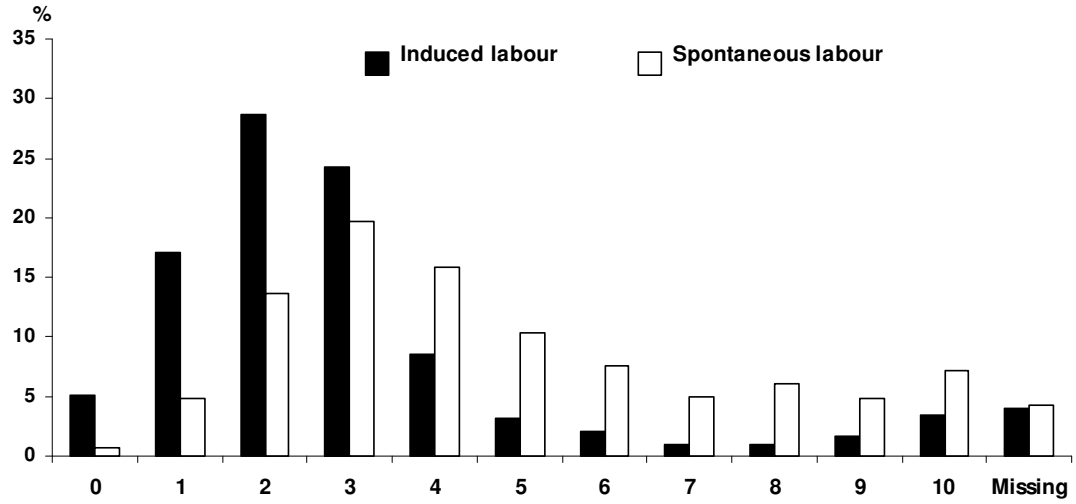

Figure 24: Dilatation at commencement of syntocinon infusion among nulliparous induced and spontaneous labour

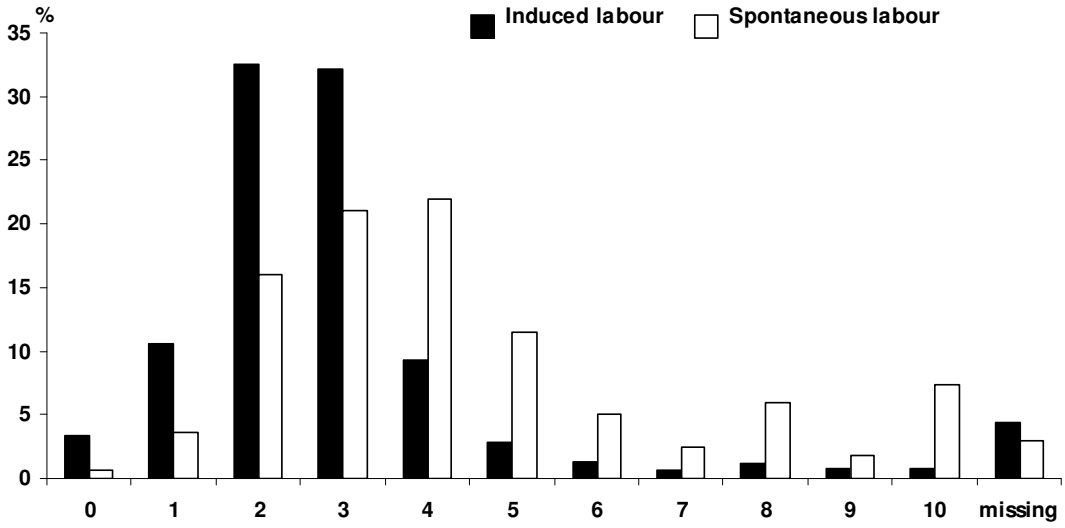

Figure 25: Dilatation at commencement of syntocinon infusion in multiparous induced and spontaneous labour

Use of syntocinon is high in spontaneous labours (45% of nullipara and 16% of multipara). 18% of the nullipara and 20% of the multipara who received syntocinon for augmentation in spontaneous labour started syntocinon before 3cm dilatation.

Summary

- The induction rate appears to be stable
- Induction is associated with European ethnicity, high risk NW clinic care and private obstetrician care. It is associated with age and parity.
- The most common indications for term induction are post dates, hypertension, and premature rupture of the membranes.
- Emergency caesarean section and epidural more often follow induced than spontaneous labour.
- 22% of inductions for post dates result in birth before 41 weeks and 0 days; 16% in women under 35; 36% in women 35 and older.

Implications

- The increased rate of intervention following induction of labour should be discussed with women, especially nullipara.
- Evidence based guidelines for management of post dates pregnancy should be established at NW.
- 18% of the nullipara and 20% of the multipara who received syntocinon for augmentation in spontaneous labour started syntocinon before 3cm dilatation. The impact of syntocinon on labour outcomes among women receiving syntocinon at this early stage requires investigation.
- Standard definitions for “diagnosis of labour” and “induction of labour” should be adopted.

5.3 Mode of birth

Findings

Table 27: Mode of birth trends 1991-2005 (n = mothers).

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of births	8833	8315	8690	8812	9125	9157	8055	7531	7501	7827	7452	7775	7611	7491	7194
	%	%	%	%	%	%	%	%	%	%		%	%	%	%
Spontaneous vaginal	67.9	68.8	68.0	67.4	65.9	65.5	63.5	62.0	61.8	59.4		55.7	56.1	54.4	53.5
Vaginal breech	1.8	1.8	1.2	1.1	1.0	1.1	1.1	1.0	1.1	1.1		0.8	0.8	0.7	0.8
Forceps/ ventouse	14.4	12.2	12.1	12.5	12.3	12.8	13.1	12.3	12.6	12.9		13.9	14.0	15.6	14.2
Caesarean	16.6	17.2	18.6	19.0	20.8	20.8	22.3	24.7	24.5	26.6		29.6	29.2	29.3	31.6
Elective														10.4	11.6
Emergency														18.8	20.0

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.

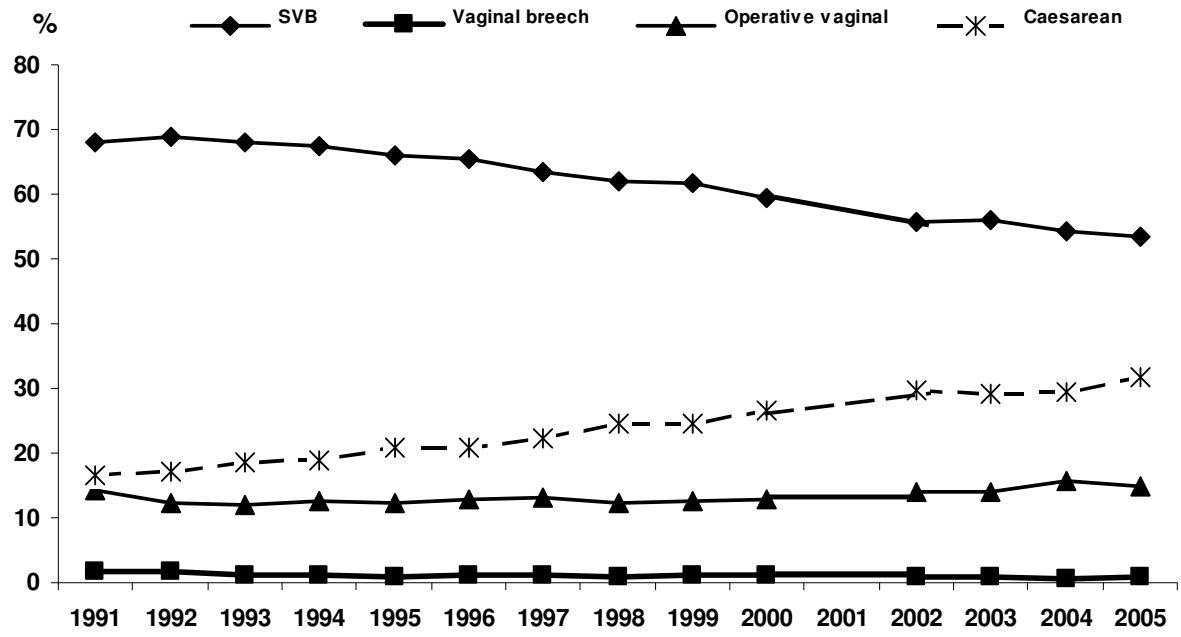

Figure 26: Mode of birth (1991–2005)

Caesarean section rates continue to rise at National Women's, consistent with worldwide trends. The increase in operative birth is at the expense of spontaneous vaginal birth. This increase is apparent among both nullipara and multipara, including women with a history of previous caesarean section. The lower rate of caesarean section among Maori and Pacific mothers at National Women's has previously been shown to be accounted for by lower age and higher parity among these ethnic groups. There is a clear trend of increasing caesarean section rate with increasing maternal age though this can explain only part of the increasing caesarean section rate at National Women's where maternal age continues to rise (as shown in the Chapter 3, Maternal Demography)

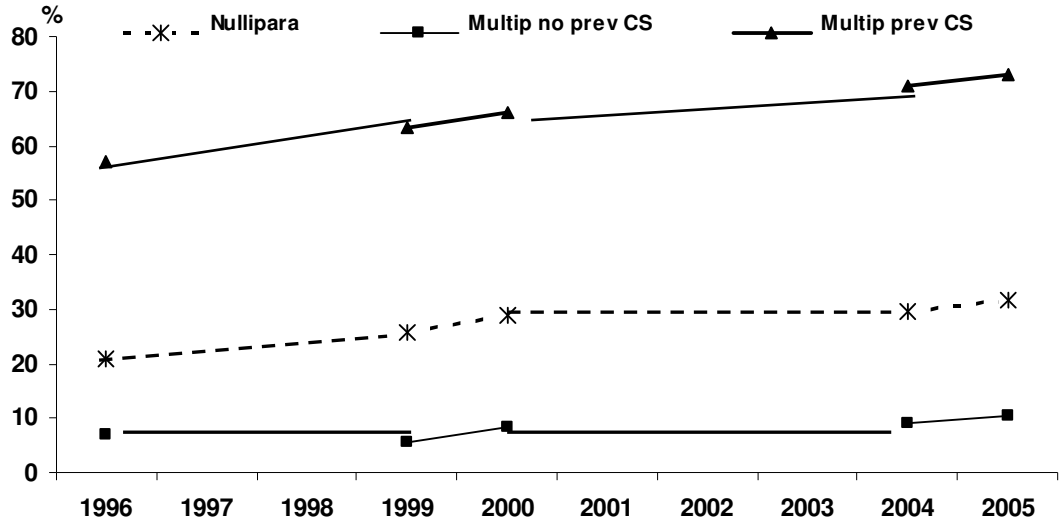

Figure 27: Caesarean section rates at term by parity and previous caesarean status (1996 – 2005)

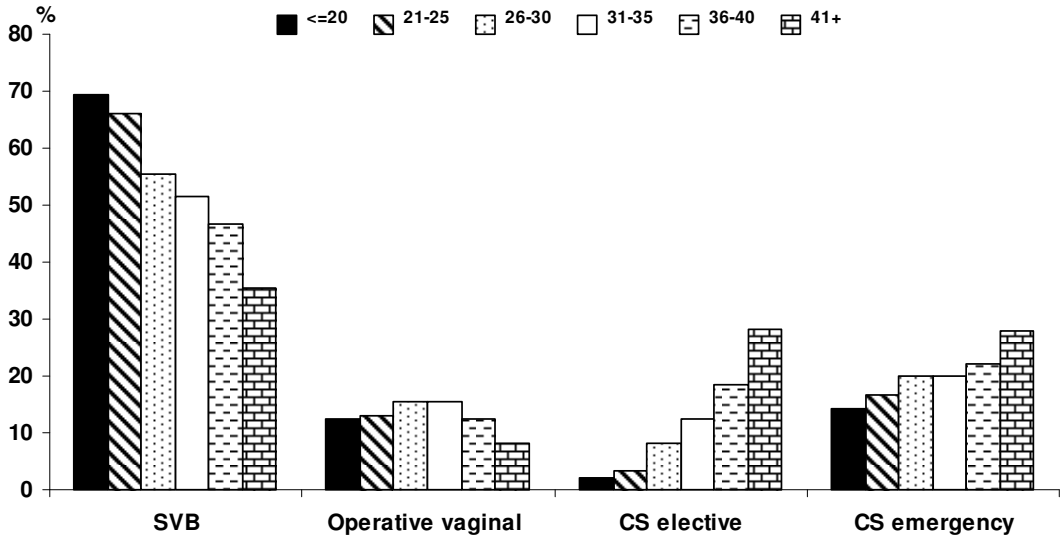

Figure 28: Mode of birth by maternal age

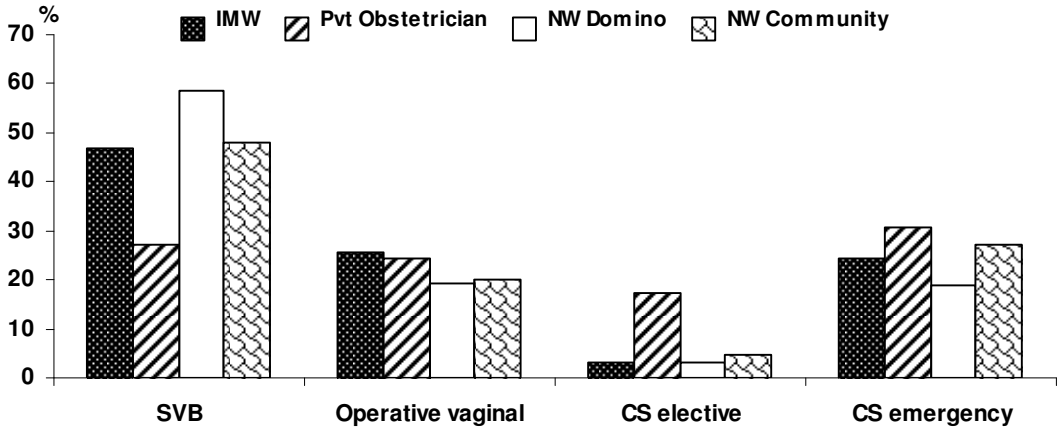

Figure 29: Mode of birth by LMC among primipara

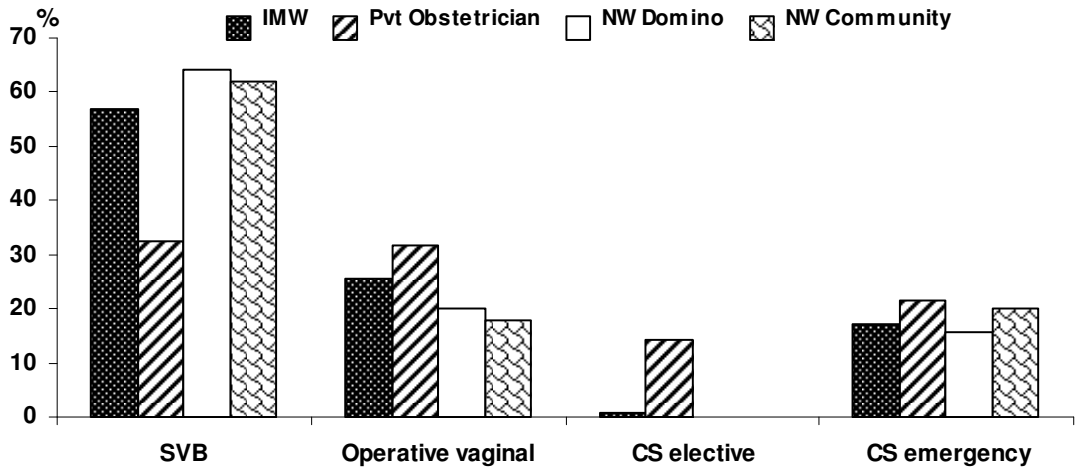

Figure 30: Mode of birth by LMC at birth among standard primipara

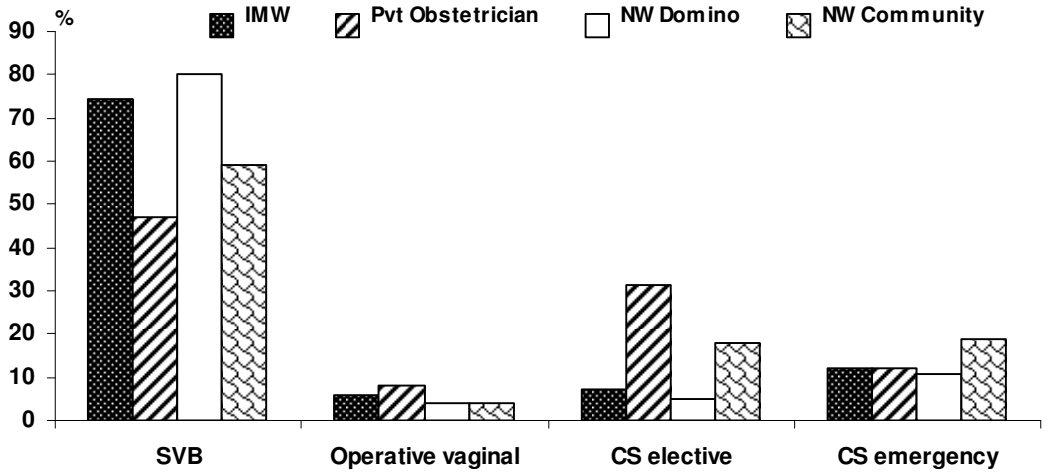

Figure 31: Mode of birth by LMC at time of birth among multipara

There is a lower spontaneous vaginal birth rate among women cared for by private obstetricians, and this difference is apparent even among standard primipara. Although the definition of standard primipara may not exclude all women at higher risk of operative birth, these data suggest that there are practice differences and/or patient preference differences between these women and women cared for by midwifery-led LMC groups.

On the subsequent page are a series of "Run Charts" showing rate of spontaneous vaginal birth and caesarean section according to caregiver group. National Women's (NW) LMC includes all women for whom a NW clinic is LMC (i.e. Community, Medical, Diabetic, ADAPT, Domino, Other DHB (transfers), and unbooked). Non-NW includes women with a private LMC (i.e. Independent midwife, private obstetrician, GP).

Run charts are a method of analysing trends over time and help to identify where a particular rate is outside limits expected within the system analysed. One of the simplest ways to identify a change in rate is to plot the data over time along with the median and then count how many data points consecutively fall above or below the median. If 8 or more points fall on one side of the median, a "special cause" is deemed to have occurred. If fewer than 8 points lie on one side of the line, the variation in rate is said to be "within the limits expected in the process".

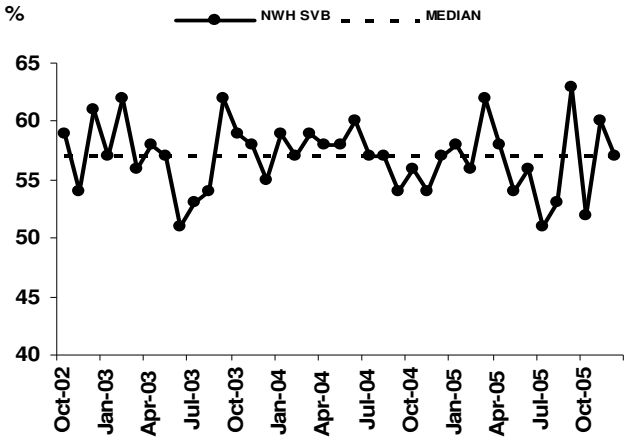

Figure 32: Spontaneous vaginal birth rate among NW LMC October 2002-December 2005

There is no change in rate of spontaneous vaginal births over the period presented among mothers cared for by National Women's LMCs. There is, however, normal variation around the median from month to month.

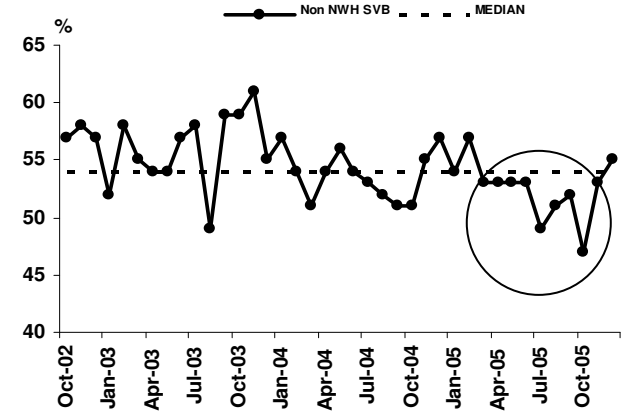

Figure 33: Spontaneous vaginal birth rate among Non-NW LMC October 2002-December 2005

There is a period between March and November 2005(circled) where the rate of spontaneous vaginal births is lower among mothers cared for by non-National Women's LMCs.

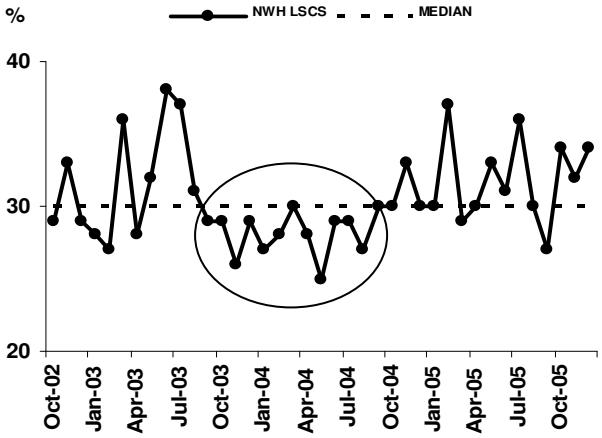

Figure 34: Caesarean section rate among NW LMC October 2002- December 2005

This run chart shows a significant period during 2004 when the caesarean section rate was below the median. Prior and since this period the rate has varied around the median.

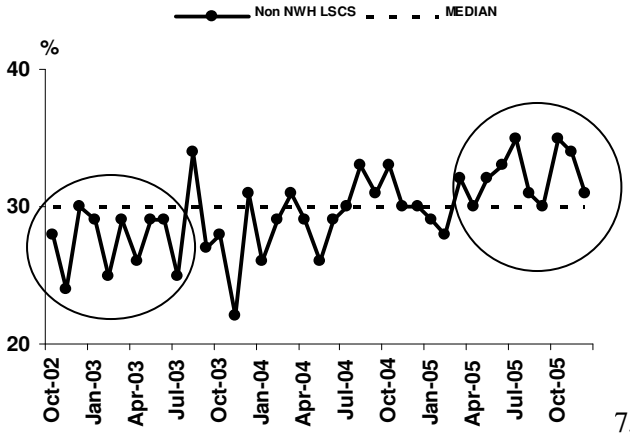

Figure 35: Caesarean section rate among Non-NW LMC October 2002- December 2005

There has been a significant increase in the use of caesarean section over time among mothers cared for by Non-NW LMCs.

5.4 Caesarean section

Methods

In 2004 and 2005, we have collected data on elective and emergency caesarean. An elective caesarean is defined as a caesarean which was scheduled in advance and prior to the onset of labour. Therefore, caesarean sections performed after the onset of labour but scheduled electively prior to labour are included with elective caesareans. Conversely, unscheduled caesarean section prior to onset of labour has been classified as emergency caesarean section.

Table 28: Caesarean section rates

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total births (mothers)	**8315**	**8690**	**8812**	**9125**	**9157**	**8055**	**7531**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**
Caesarean sections	1420	1620	1670	1900	1905	1797	1851	1837	2084		2301	2219	2193	2273
Incidence %	17.1	18.6	19.0	20.8	20.8	22.3	24.6	24.5	26.6		29.6	29.1	29.3	31.6
Total nullipara	**3700**	**3649**	**3814**	**4037**	**4018**	**3591**	**3263**	**3262**	**3454**				**3597**	**3522**
Caesarean	726	755	790	936	888	912	900	898	1047				1118	1178
Incidence %	19.6	20.7	20.7	23.2	22.1	25.4	27.6	27.5	30.3				31.1	33.4
Elective %													6.5	7.0
Emergency %													24.6	26.4
Total multipara	**4615**	**5041**	**4998**	**5088**	**5139**	**4464**	**4229**	**4238**	**4372**				**3894**	**3672**
Caesarean	694	865	880	964	1017	885	951	939	1037				1075	1095
Incidence %	15	17.2	17.6	18.9	19.8	19.8	22.5	22.2	23.7				27.6	29.8
Elective %													14.1	15.9
Emergency%													13.5	13.9

From 1998, data excludes postnatal transfers

As noted in the previous section, the caesarean section rate is increasing. The overall rate in 2005 was 31.6%, 33.4% among nullipara and 29.8% among multipara.

5.4.1 Vaginal birth after caesarean section

Table 29: VBAC: parity 1, all gestations by mode of onset of labour (n=680)

	Parity 1, previous caesarean, all gestations									
	Spontaneous n=258		**Induced n=87**		**CS elective n=303**		**CS emergency before onset of labour n=32**		**Total n=680**	
	n	**%**	**n**	**%**	n		**n**		**n**	**%**
SVB	79	30.6	19	21.8					98	14.4
Vaginal breech	1	0.4	2	2.3					3	0.4
Forceps	11	4.3	3	3.5					14	2.1
Ventouse	43	16.7	11	12.6					54	7.9
CS elective			1[φ]		303				304	44.4
CS emergency	124	48.1	51	59.8			32		207	30.6

[φ] This mother had an elective caesarean for maternal request after the start of induction.

Of the 3672 multipara delivering at NW in 2005, 1052 (28.7%) had a history of prior caesarean section (890 had a history of one prior caesarean, 128 two and 34 three or more). These women with a history of caesarean section accounted for 14.6% of women delivering in 2005.

Table 30: VBAC: Parity 1, singleton, cephalic, term, by mode of onset of labour (n=584)

	Parity 1, previous caesarean, singleton, cephalic, term				
	Spontaneous n=233	Induced n=72	CS elective n=255	CS emergency before onset of labour n=24	Total n=584
	n %	n %	n	n	n %
SVB	72 30.9	13 18.1			85 14.5
Forceps	11 4.7	9 12.5			14 2.4
Ventouse	43 18.5	3 4.2			52 8.9
CS elective			255		255 43.7
CS emergency	107 45.9	47 65.3		24	178 30.5

Vaginal birth after caesarean section continues at a low rate. In 2005, among the 680 mothers with a history of one prior caesarean and no previous vaginal births, the vaginal birth rate (VBAC) was 24.9%. Even among mothers with a history of one prior caesarean and no previous vaginal births with a singleton, cephalic, term birth, the VBAC rate was only 25.9%.

The majority of caesarean births were elective. Among women who have a spontaneous onset of labour after one prior caesarean and no prior vaginal birth, more than 50% achieved a vaginal birth.

These data challenge whether National Women's actively supports vaginal birth after caesarean section.

In 2005, 150 mothers gave birth after 2 or more prior caesarean sections. Of these women, 125 had an elective caesarean, 19 an emergency caesarean, and 6 had vaginal births.

5.4.2 Indication for caesarean section

The distribution of primary indications for caesarean section has not changed since 2004. The most common primary indication for caesarean section is failure to progress (28%) followed by repeat caesarean (18.5%), fetal distress (16.9%), and malpresentation (11.9%). All other indications account for fewer than 10% of caesareans overall.

Among nullipara at term, 55% of emergency caesareans are performed for failure to progress and 27% for fetal distress, while the most common indications for elective caesareans are malpresentation (38%) and maternal request (25%). Among multipara at term, the most common indications for emergency caesarean are the same as for nullipara, but repeat caesarean section accounts for 65% of primary indications for elective caesarean.

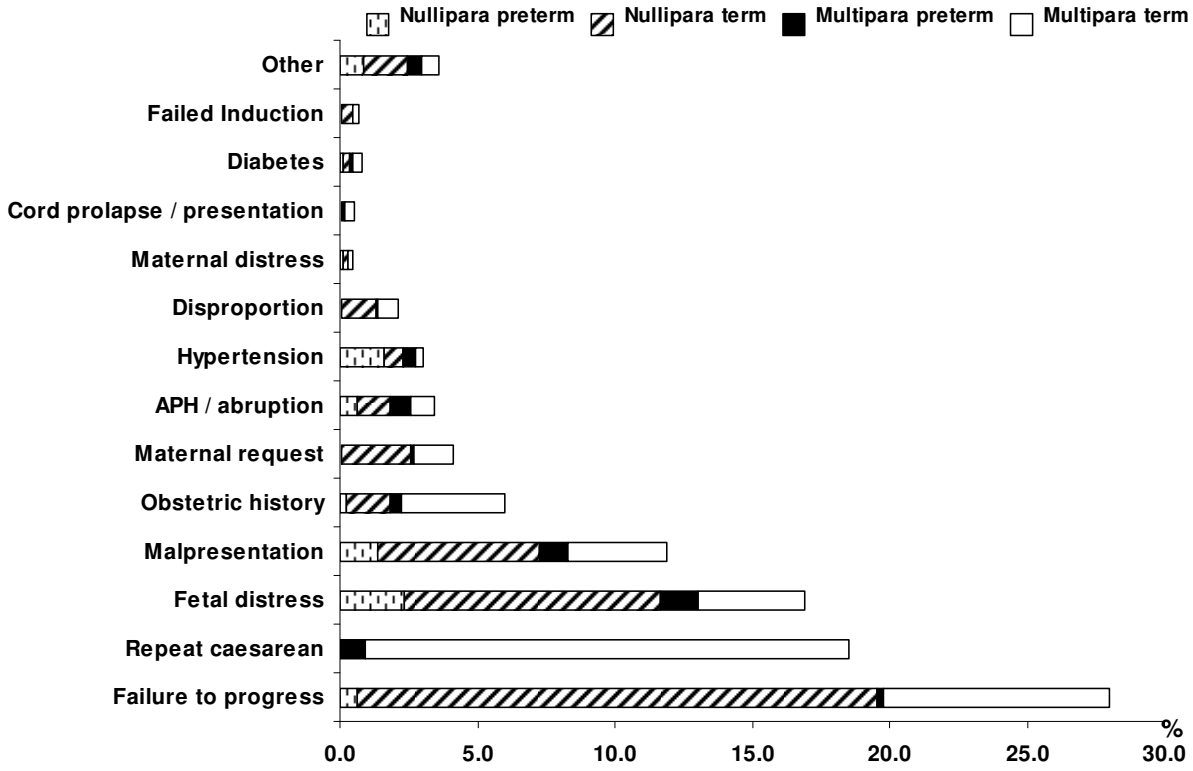

Figure 36: Contribution of gestation and parity to principal indications for caesarean section

5.5 Instrumental vaginal birth

This section describes mothers who gave birth after successful vaginal instrumental intervention. It does not include women who gave birth by caesarean after failed vaginal instrumentation.

Data are presented for mothers, so this section does not include those multiple births where one baby was born by vaginal instrumentation and a later baby by caesarean. The experience of these mothers is described more accurately in Chapter 4

The total operative vaginal birth rate was 14.2% in 2005 compared to 15.6% in 2004. This is elevated from the years 1992-2000 when the rate fluctuated from 12.3% - 13.5% but is not apparently continuing to rise.

Ventouse continues to be the instrument of choice accounting for 9% of all births and 64% of instrumental vaginal births. Sixty vaginal births (1% of all births) in 2005 were effected by forceps following an attempt at ventouse, as in 2004.

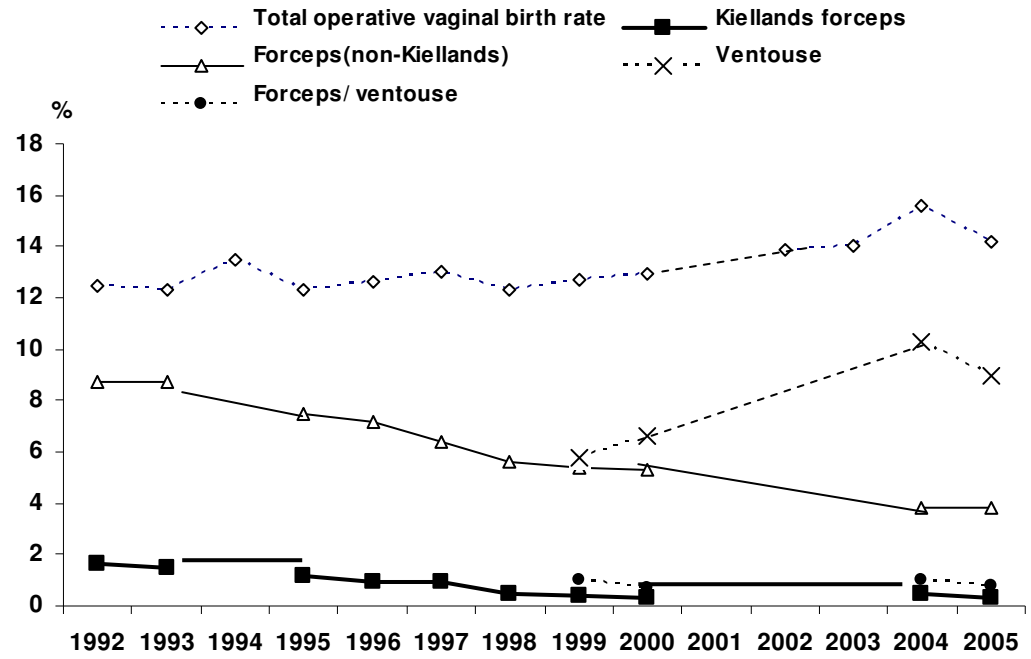

Figure 37: Operative vaginal birth (1992-2005)

The majority of operative vaginal births were performed for failure to progress. Given morbidity associated with operative vaginal birth, change might be targeted at this apparent difficulty mothers are experiencing in achieving spontaneous vaginal birth.

Table 31: Indication for operative vaginal birth by parity and gestation at birth

	Nullipara term n=772		Nullipara preterm n=37		Multipara term n=201		Multipara preterm n=12		Total n=1022	
	n	%	n	%	n	%	n	%	n	%
Failure to progress	460	59.6	16	43.2	115	57.2	2	16.7	593	58.0
Fetal distress	270	35.0	18	48.7	71	35.3	7	58.3	366	35.8
Maternal distress	24	3.1	2	5.4	10	5.0	1	8.3	37	3.6
Maternal request	6	0.8	0		0		0		6	0.6
Other	12	1.7	1	2.7	5	2.5	2	16.7	20	2.0

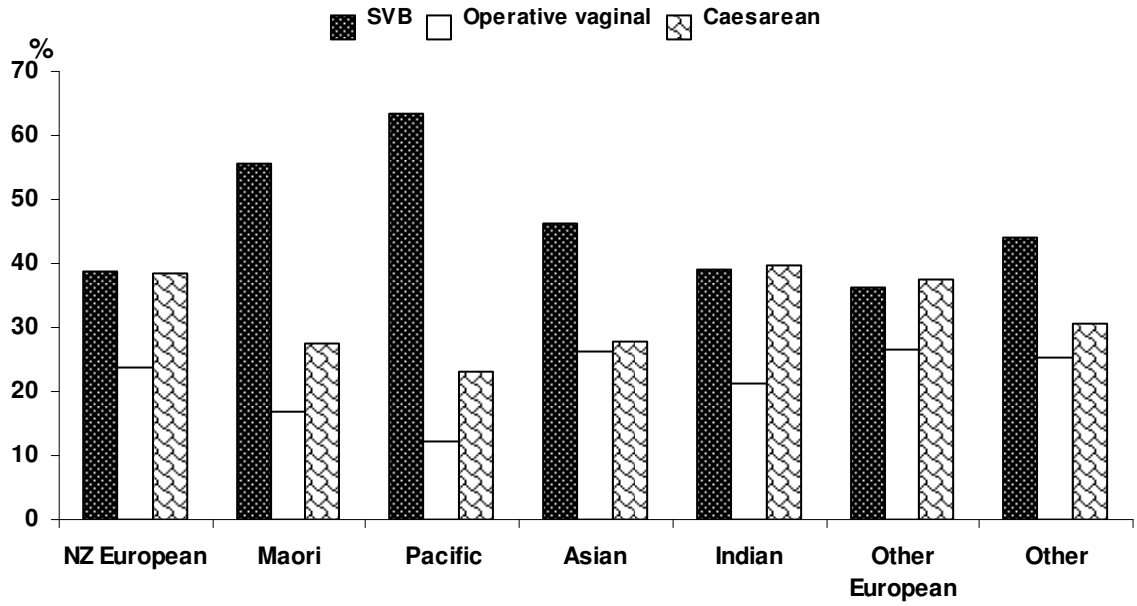

Figure 38: **Mode of birth by ethnicity among nullipara**

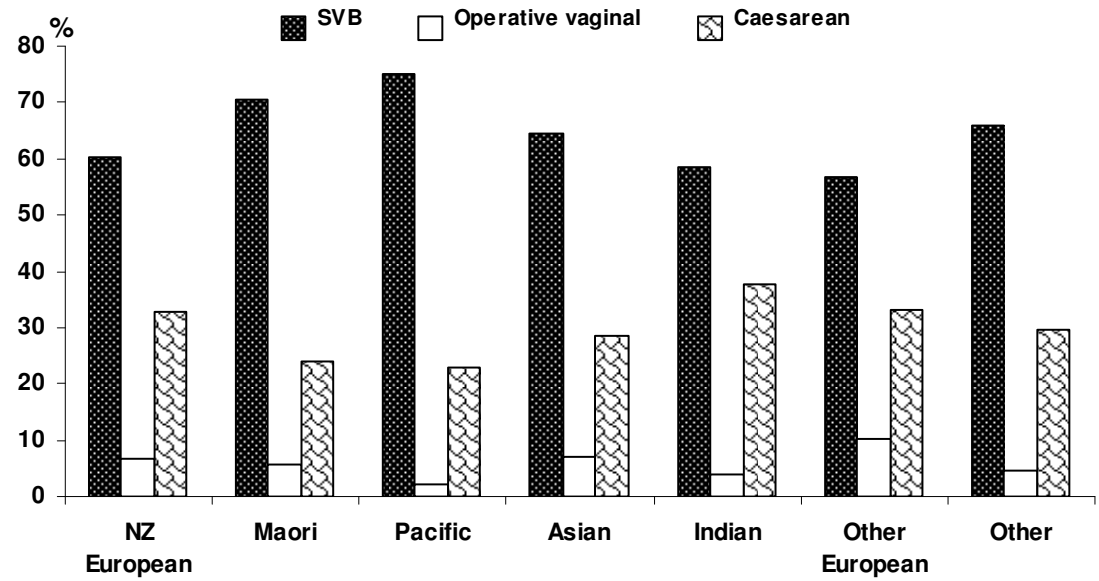

Figure 39: Mode of birth by ethnicity among multipara

There is a striking association between instrumental vaginal birth and ethnicity. Pacific mothers are the least likely to undergo instrumental vaginal birth. In Pacific women the lower instrumental birth rate is not at the expense of a higher caesarean rate as the caesarean section rate is also lowest among Pacific women.

The bar graphs (figures27-30) in the mode of birth section demonstrate that instrumental vaginal birth is not obviously associated with age. There is no strong association with LMC at birth, although instrumental vaginal birth appears to be marginally more common among mothers giving birth at National Women's with a private obstetrician or an independent midwife as their LMC.

5.6 Breech birth

In 2005, 432 (5.9%) of all babies born at National Women's were born by the breech. Of these babies, 328 were singletons, 225 of whom were born at term. Of these term singleton breech births, all but 2 were born by caesarean section.

Seventy-eight (78) external cephalic versions (ECVs) were attempted for breech presentation at National Women's among women delivering in 2005. These were performed between 35 and 41 weeks gestation. Of these 78 ECVs, 40 (51%) were successful. Of the 40 successful ECVs, 30 (75%) delivered vaginally and 10 by emergency caesarean section (including two breech presentations).

Table 32: Mode of birth by breech presentation (singletons)

	N	Total breech	% Breech /total singleton births	Breech & CS	% CS/ total breech
Total singleton births	7007	328	4.7	289	88.1
20-31 weeks	176	63	35.8	32	50.8
32-36 weeks	391	40	10.2	34	85.0
≥37 weeks	6440	225	3.5	223	99.1

5.7 Obstetric analgesia

Methods

Currently data are not collected on indication for epidural at National Women's so we are unable to separate epidurals inserted primarily for pain relief from epidurals inserted for operative delivery or other indications.

Findings

Table 33: Analgesia use by parity and mode of onset of birth

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
All women	**7194**	**4480**	**62.3**	**2750**	**38.2**	**1215**	**16.9**	**101**	**1.4**	**512**	**7.1**
Mode of onset of birth											
CS elective	833	809	97.1	5†	0.6	2†	0.2	0		0	
CS emergency before onset labour	221	190	86.0	1†	0.45	4†	1.8	0		0	
Labouring women*	**6140**	**3483**	**56.7**	**2744**	**44.7**	**1209**	**19.7**	**101**	**1.6**	**512**	**8.3**
Nullipara	3155	2205	69.9	1473	46.7	739	23.4	72	2.3	375	12.0
Multipara	2985	1278	42.8	1271	42.6	470	15.8	29	1.0	137	4.6
Induced labour	**1894**	**1374**	**72.5**	**735**	**38.8**	**357**	**18.9**	**19**	**1.0**	**108**	**5.7**
Nullipara	1042	857	82.2	406	39.0	231	22.2	12	1	80	7.7
Multipara	852	517	60.7	329	38.6	126	14.8	7	1	28	3.3
Spontaneous labour	**4246**	**2109**	**49.7**	**2009**	**47.3**	**852**	**20.1**	**82**	**1.9**	**404**	**9.5**
Nullipara	2113	1348	63.8	1067	50.5	508	24.0	60	3	295	14.0
Multipara	2133	761	35.7	942	44.2	344	16.1	22	1	109	5.1

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

Epidural analgesia or anaesthesia was used by 57% of mothers overall in 2005 up from 52% in 2000, in part explained by the 4% increase in caesarean section since 2000. Increases in epidural use are also evident in spontaneous and induced labours. The rate of epidural use was 45% among spontaneous labours in 2000 and 50% in 2004 and 2005; 66% among induced labours in 2000 and 73% in 2004 and 2005. Rates of use of all methods of analgesia reported are higher among nullipara.

Water was used in labour by 14% of spontaneously labouring nullipara and 8% of nullipara with induced labour. The use of water for pain relief in labour did not vary by maternal age among nullipara.

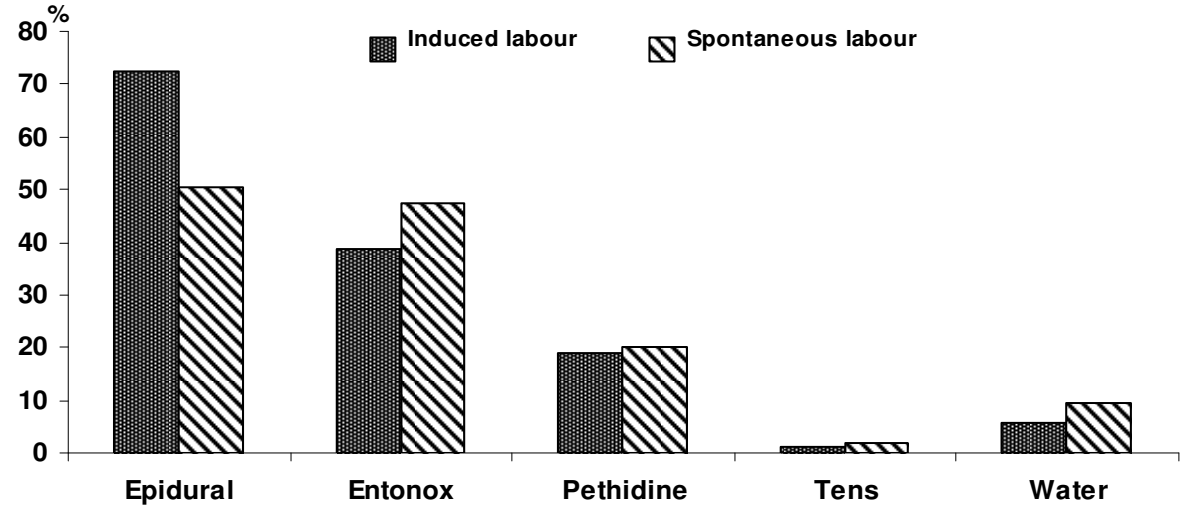

Figure 40: Analgesia use by induction status among spontaneous and induced labours

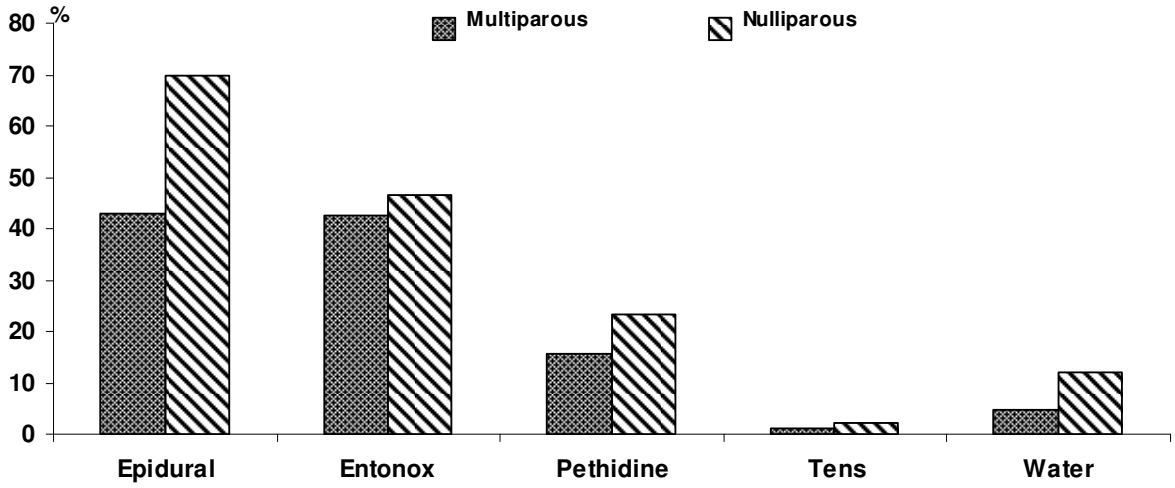

Figure 41: Use of analgesia by parity among spontaneous and induced labours

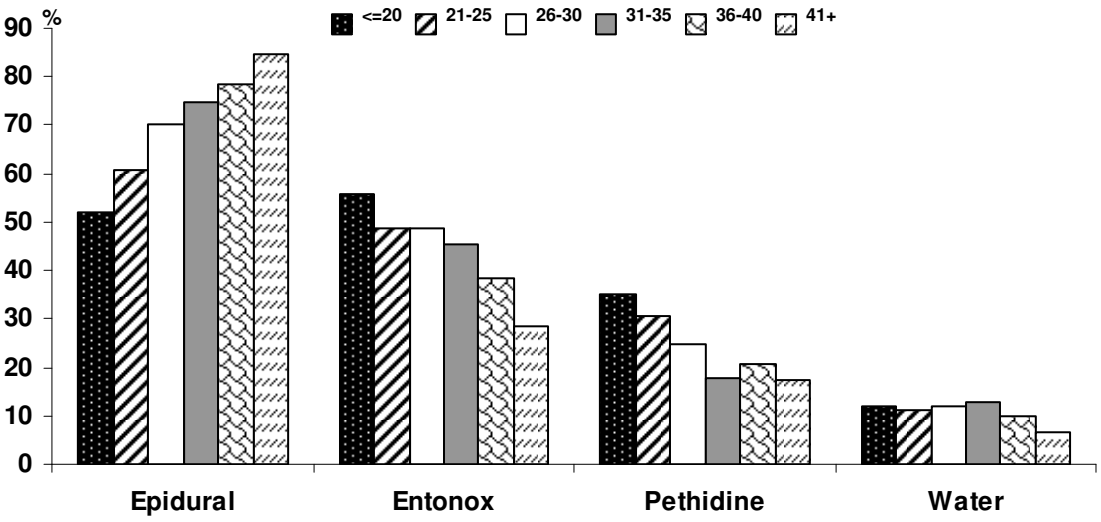

Figure 42: Analgesic use and maternal age among nulliparous labours

Younger women are less likely to choose epidurals and more likely to choose entonox and pethidine in labour. It is difficult to be certain to what extent age itself determines analgesic choices among labouring women at National Women's. There are competing influences due to the associations between age and ethnicity, induction, and choice of LMC.

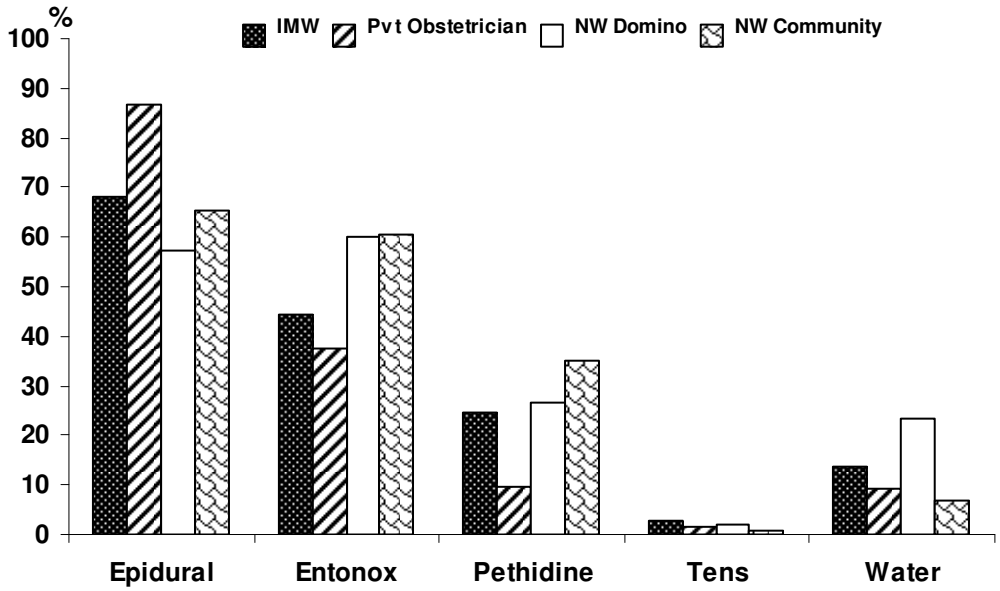

Figure 43: Analgesic use and LMC type among nulliparous labours

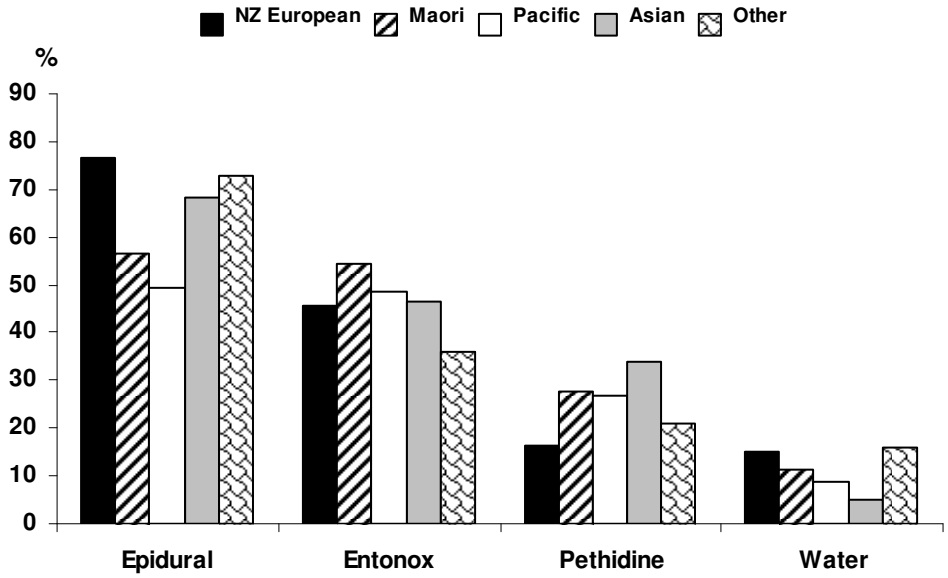

Figure 44: Analgesic use and ethnicity among nulliparous labours

Summary/Implications

- There is a need to collect better data on epidural use and explore its impact on labour outcomes at National Women's.

5.8 Perineal trauma

Table 34: Episiotomy rates (n=vaginal births)

	1995 n=7224	1996 n=7250	1997 n=6253	1998 n=5676	1999 n=5661	2000 n=5739	2004 n=5298	2005 n=4921
Number of episiotomies	1473	1434	1252	1195	1251	1367	1181	1093
Incidence %	20.4	19.8	20.0	21.1	22.1	23.8	22.3	22.2
Episiotomy with 3rd/4th degree tear	14	25	8	9	5	17	15	23
Incidence %	0.2	0.3	0.1	0.2	0.1	0.3	0.3	0.5
All 3rd/4th degree tears	47	61	41	35	29	47	72	97
Incidence %	0.7	0.8	0.7	0.6	0.5	0.8	1.3	2.0

The overall rate of episiotomy among vaginal births at National Women's has changed little over the past 10 years. It was around 20% in the mid 90s and has been steady at around 22% since 1999. However, during this time there has been a tripling of the rate of third or fourth degree tears from 0.7% of vaginal births to 2%. This may be a reporting issue.

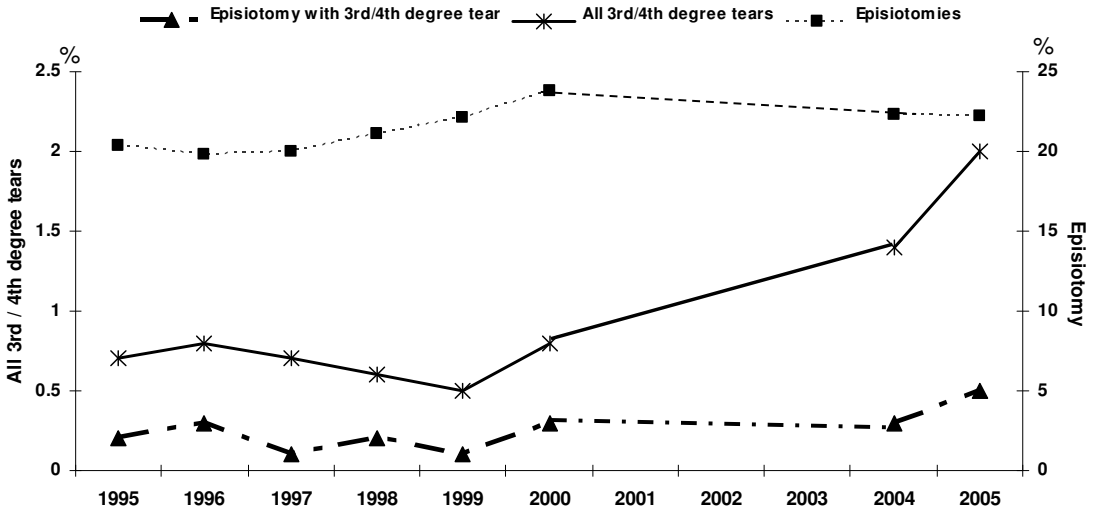

Figure 45: Episiotomy rates

As expected, higher perineal trauma rates are associated with primiparity and instrumental vaginal birth. In 2005, 23% of primiparous spontaneous vaginal births were associated with episiotomy and 8% of multiparous spontaneous vaginal births. Third or fourth degree tear rates among spontaneous vaginal births were 2.3% and 0.9% respectively. However, it is surprising, in a background of evidence of harm associated with perineal trauma, that there are differences in episiotomy rate by LMC group. The episiotomy rate for nullipara having spontaneous vaginal births was 30% among women under the care of a private obstetrician, 28% among women under the care of an Independent midwife 19% among National Women's community midwifery clinics, and 12% among women cared for by National Women's Domino midwifery service. Multiparous rates varied similarly by caregiver group.

There is a suggestion that third and fourth degree tears were more common among midwifery-led care groups, but numbers are too small to be sure. This is counter to available evidence that a policy of expectant episiotomy is associated with lower rates of third and fourth degree tears. It may also be that completeness of reporting of third and fourth degree tears varies by caregiver group.

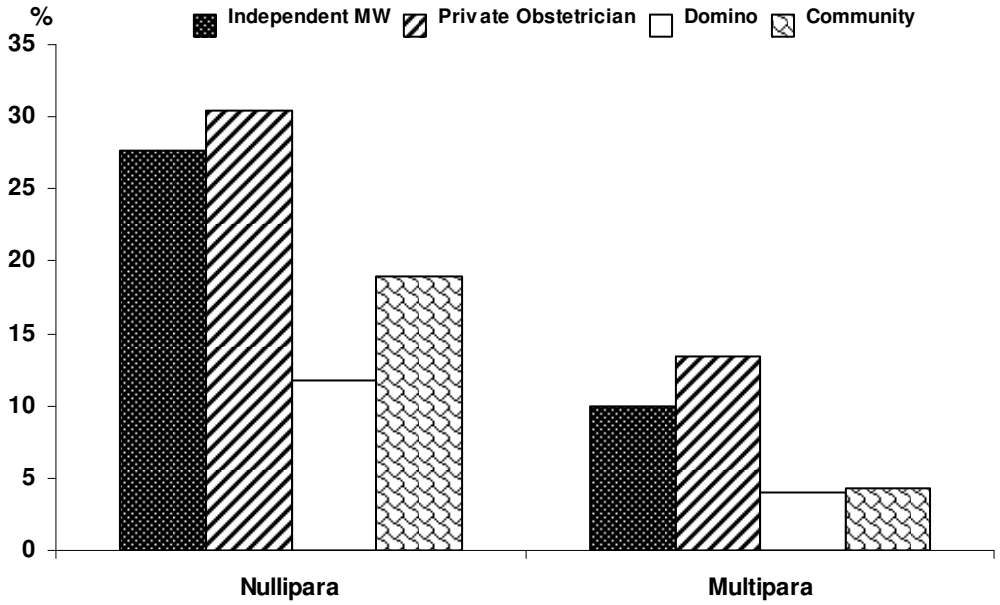

Figure 46: Episiotomy associated with spontaneous vaginal birth by LMC at birth and parity

5.9 Postpartum haemorrhage

In 2005, total blood loss has been calculated as blood loss recorded at birth plus any further major loss recorded in the postnatal admission screen. Postpartum transfusion includes transfusion recorded at any postnatal admission. Data on blood loss were unable to be obtained for 19 women (7 spontaneous vaginal births, 5 operative vaginal births and 7 caesarean sections).

Table 35: Postpartum haemorrhage rate (1992-2005)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2004	2005
Total Births	8315	8690	8812	9125	9157	8055	7531	7501	7827	7491	7194
Primary PPH (≥500mls)	881	1211	1390	1655	1633	1882	1818	1921	2088	2056	2158
Incidence %	10.6	13.9	15.8	18.1	17.8	23.4	24.1	25.6	26.7	27.4	30.0
Primary PPH (≥1000mls)	127	249	227	267	344	303	318	381	423	262	366
Incidence (%)	1.5	2.9	2.6	2.9	3.8	3.8	4.2	5.1	5.4	3.5	5.1

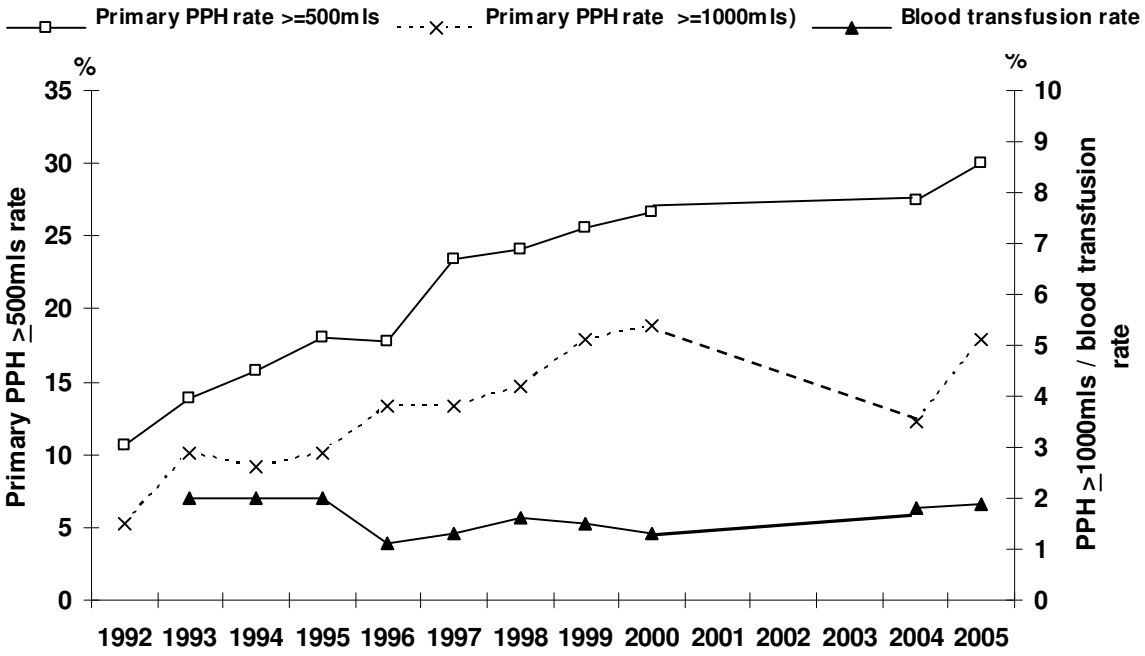

Figure 47: Postpartum haemorrhage rates (1992-2005)

In 2005, as in previous years, there is a rise in the recorded incidence of blood loss of 500 mls or more at birth. The increase in blood loss of 1000 mls or more is of a similar magnitude (i.e about 3 times in 2006 what it was in 1992). This is an expected outcome in an environment of increasing caesarean birth. However, there is no change in combined pregnancy and postpartum transfusion rate over the 13 years reported here. The data do not tell us whether this disparity is due to increasing over-estimation of blood loss, to an increased ability of our mothers to sustain increased blood losses, or due to an increasingly higher threshold for transfusion.

Table 36: Blood transfusion

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

Table 37: Postpartum blood loss by mode of birth

	Spontaneous vaginal birth n=3845		Vaginal breech n=54		Ventouse birth n=728		Forceps birth n=294		CS emergency n=1440		CS elective n=833		Total N=7194	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
PPH ≥500mls	347	9.0	9	16.7	101	13.9	50	17.0	1052	73.1	598	71.8	2157	30.0
PPH ≥1000mls	97	2.5	1	1.9	24	3.3	11	3.7	139	9.6	96	11.5	367	5.1
Post partum blood transfusion	44	1.1	13	1.8	1	2.0	1	2.0	57	4.0	15	1.8	139	1.9

Spontaneous vaginal birth is associated with the lowest blood losses and caesarean section with the highest. Women are most likely to receive blood transfusion following emergency caesarean section.

5.10 Emergency peripartum hysterectomy

Methods

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

There were 5 emergency peripartum hysterectomies in 2005. This is a rate of 0.7/1000 births, which is consistent with rates before and following the period from 1998-2000.

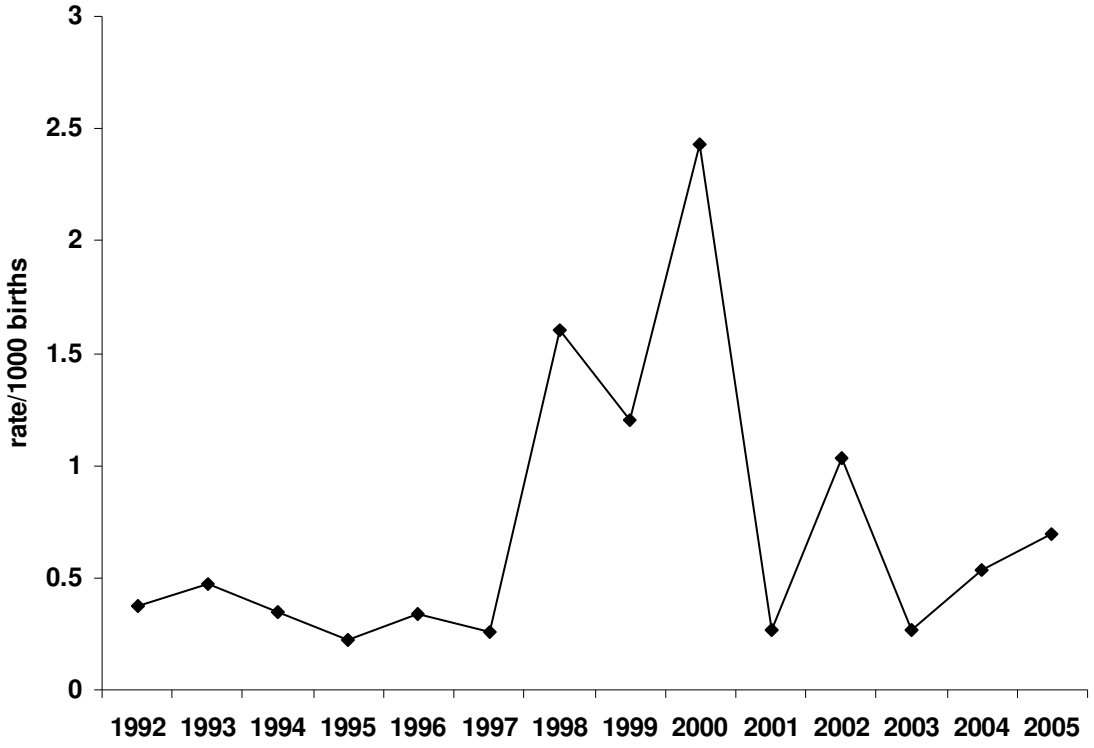

Figure 48: Emergency peripartum hysterectomy rates/1000 births (1992-2005)

5.11 Neonatal outcomes by mode of birth

Methods

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

Table 38: Neonatal morbidity overall and by mode of birth (all gestations)

	SVB n=3911		Vaginal breech n=57		Forceps birth n=297		Ventouse birth n=732		CS elective n=889		CS emergency n=1498		Total n=7384	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <7	212	5.4	17	29.8	38	12.8	79	10.8	68	7.7	240	16.0	654	8.9
1 min Apgar <4	45	1.2	8	14.0	9	3.0	8	1.1	6	0.7	52	3.5	128	1.7
5 min Apgar <7	35	0.9	9	15.8	8	2.7	10	1.4	3	0.3	35	2.3	100	1.4
Admitted to NICU	281	7.2	10	17.5	34	11.5	54	7.4	109	12.3	311	20.8	799	10.8
≥ 2 days in NICU	241	6.2	10	17.5	32	10.8	37	5.1	97	10.9	288	19.2	705	9.6
Assisted ventilation	113	2.9	5	8.9	13	4.4	12	1.6	54	6.1	181	12.1	378	5.1
Stillbirths	34	0.9	29	50.9	1		1		0		3		68	0.9

Table 39: Neonatal morbidity (by mode of birth) in term or post term (≥ 37 weeks) babies

	SVB n=3605		Vaginal breech n=10		Forceps birth n=276		Ventouse birth n=704		CS elective n=781		CS emergency n=1202		Total n=6578	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1 min Apgar <7	160	4.4	3	30.0	31	11.2	74	10.5	41	5.3	145	12.1	454	6.9
1 min Apgar <4	22	0.6	1	10.0	6	2.2	7	1.0	1		32	2.7	69	1.1
5 min Apgar <7	13	0.4	1	10.0	5	1.8	9	1.3	0		20	1.7	48	0.7
Admitted to NICU	142	3.9	1	10.0	22	8.0	41	5.8	41	5.3	99	8.2	346	5.3
≥ 2 days in NICU	116	3.2	1	10.0	20	7.3	26	3.7	32	4.1	80	6.7	275	4.2
Assisted ventilation	41	1.1	1	10.0	8	2.9	10	1.4	12	1.5	26	2.2	98	1.5
Stillbirth	6	0.2			1		1				1		9	0.1

Table 40: Neonatal morbidity in term or post term (≥ 37 weeks) babies 2000-2005

	2000 n=6915		2001	2002	2003	2004 n=7679		2005 n=6578	
	n	%				n	%	n	%
1 min apgar <7	553	8.0				507	7.5	454	6.9
1 min apgar <4	106	1.5				68	1.0	69	1.1
Admitted to NICU	405	5.9				349	5.1	346	5.3
≥ 2 days in NICU	*					254	3.7	275	4.2
Assisted ventilation	86	1.2				99	1.5	98	1.5

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

In 2005, the rate of 1 minute Apgar less than 7 was 6.9% and the rate of 1 minute Apgars less than 4 was 1.1% among term babies born at National Women's. These rates are significantly lower than the rates recorded in 2000.

There has been a small reduction in admission of term babies to NICU since 2000.

5.12 Labour and birth at Birthcare

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

Methods

The data for mothers birthing at Birthcare (n=275) during 2005 were provided by Birthcare. The data on mothers transferred to National Women's in labour and birthing at National Women's and for mothers transferred to National Women's after birthing at Birthcare have been obtained from Healthware.

Table 41: Demographic characteristics of women labouring at Birthcare by place of birth

	Birthed at Birthcare n=275		Intrapartum transfer to NW n=58		Total n=333	
	n	%	n	%	n	%
Parity						
Nullipara	82	30	44	76	126	38
Multipara	192	70	14	24	206	62
Age						
<21	5	2	3	5	8	2
21-25	30	11	11	19	41	12
26-30	69	25	16	28	85	26
31-35	103	37	22	38	125	38
36-40	64	23	6	10	70	21
>40	4	1			4	1.2
Ethnicity						
NZ European	148	54	30	52	178	53
Maori	33	12	3	5	36	11
Pacific	47	17	7	12	54	16
Asian	10	4	3	5	13	4
Indian	3	1	0		3	1
Other European	29	11	13	22	42	13
Other	5	2	2	3	7	2

Three hundred and thirty-three women began their labour care at Birthcare. Of these, 275 gave birth at Birthcare, and 58 (17%) of women were transferred from Birthcare to NW for birth. Nullipara were more likely to transfer to NW (35%) than Multipara (7%). All women who gave birth at Birthcare were under the care of Independent Midwives. The largest number of women cared for and birthed by any LMC at Birthcare was 19, and 59 different Independent midwives cared for women who birthed at Birthcare.

Table 42: Interventions and outcomes by parity among women commencing labour at Birthcare (includes 58 intrapartum transfers to NW)*

	Nullipara n=126		Multipara n=206	
	n	%	n	%
Intrapartum transfer to NW	44	35	14	7
Analgesia				
Epidural	40	32	8	4
Pethidine	14	11	7	3
Entonox	67	53	17	8
TENS	4	3	2	1
Water	58	46	94	46
Syntocinon	28	22	2	1
Mode of birth				
Normal vaginal	90	72	143	69
Waterbirth	9	7	57	28
Operative vaginal	17	12	1	
Emergency caesarean	10	8	4	2
Perineal trauma				
Episiotomy	13	11	7	3
Third/fourth degree tear	1	1	0	
Blood Loss				
$\geq$ 500 mls	22	18	10	5
$\geq$ 1000 mls	5	4	2	1
Apgars				
1min < 7	5	4	8	4
1min < 4	0		1	
5min < 7	0		1	
NICU admission	4	3	1	
NICU admission $\geq$ 2days	4	3	0	
Postpartum transfer to NW	2	2	3	1

* Many of these interventions occurred at National Women's

Gestation at birth was 37-42 weeks in all cases.

There are clear differences in management of labour and obstetric outcomes for women whose labour care is provided at Birthcare. Of nullipara commencing labour at Birthcare, 32% ultimately had an epidural compared to 67% among standard nullipara cared for at NW; 22% had syntocinon during spontaneous labour compared to 45%, 11% had an episiotomy compared to 29%, and 92% had vaginal births compared to 79%.

There were 2 perinatal deaths among women commencing labour at Birthcare. One was an early neonatal death associated with maternal death due to massive maternal amniotic fluid embolism. The other was an unexplained stillbirth at 39 weeks.

Summary

- The caesarean section rate at NW is continuing to increase. This is more apparent among non-NW LMCs, and caesarean rates vary by caregiver even with "apparently low risk" standard primipara.
- The increased caesarean section rate is at the expense of spontaneous vaginal birth.
- Operative vaginal birth continues at a consistent rate around 15% despite increases in caesarean section.
- VBAC and breech vaginal births occur at low rates at NW and thus contribute to the high caesarean section rate.
- Episiotomy rates are stable at 22% overall although rates of third and fourth degree perineal tear have significantly increased. There are large differences in rate of episiotomy by caregiver group among spontaneous vaginal births to both nullipara and multipara.
- Postpartum haemorrhage rates are increasing overall although blood transfusion rates have not increased.
- Rates of epidural use at NW are high (62% of all women birthing at NW).
- Inadequate data are collected on the use and implications of use of epidural analgesia in normal labour.
- There has been a significant reduction between 2000 and 2005 in the proportion of term babies born with Apgars <7 at 1 minute and <4 at 1 minute, suggesting improved outcomes.
- Mothers cared for by Independent midwives at Birthcare have lower rates of intervention and higher rates of vaginal birth than standard primipara at NW. Intrapartum transfer rates from Birthcare to NW were 35% among nullipara and 7% among multipara.

Implications

- NW needs to address whether an organisational response is required to rising rates of intervention at its obstetric facility.
- A policy for perineal management in spontaneous vaginal birth should be developed at NW consistent with available evidence.
- There is a need for better collection of labour analgesia data.

section 6

POSTNATAL CARE

6 POSTNATAL CARE

This chapter provides information on infant feeding and postnatal admissions.

6.1 Infant feeding

Breastfeeding remains a vital health promotion strategy to improve the health of Aucklanders. Breastfeeding contributes positively to five of the 13 population health objectives in the New Zealand health strategy, improving nutrition, reducing obesity, reducing the incidence and impact of cancer, cardiovascular disease and diabetes. National Women's continues to focus on increasing the exclusive breastfeeding rate and implementing processes to become a Baby Friendly Hospital.

Methods

National Women's breastfeeding statistics are collected for infants birthed in the facility whether they remain for postnatal care or are discharged to Birthcare or home within a few hours of the birth. Babies admitted to NICU are excluded from the data presented here and are included in the Newborn chapter.

Data are collected at the time of discharge from the facility. Data are also collected at 5-6 weeks postpartum for women whose post discharge care was provided by NW. Data collection at discharge from the facility improved in 2005.

Findings

Statistics on infant feeding are prepared monthly and the figures for all feeding groups remained static for the first nine months of 2005 with a rise in exclusive breastfeeding and a fall in fully breastfeeding in the last three months. The increase in exclusive breastfeeding is continuing in 2006. This is possibly related to the employment of a second lactation consultant in September 2005.

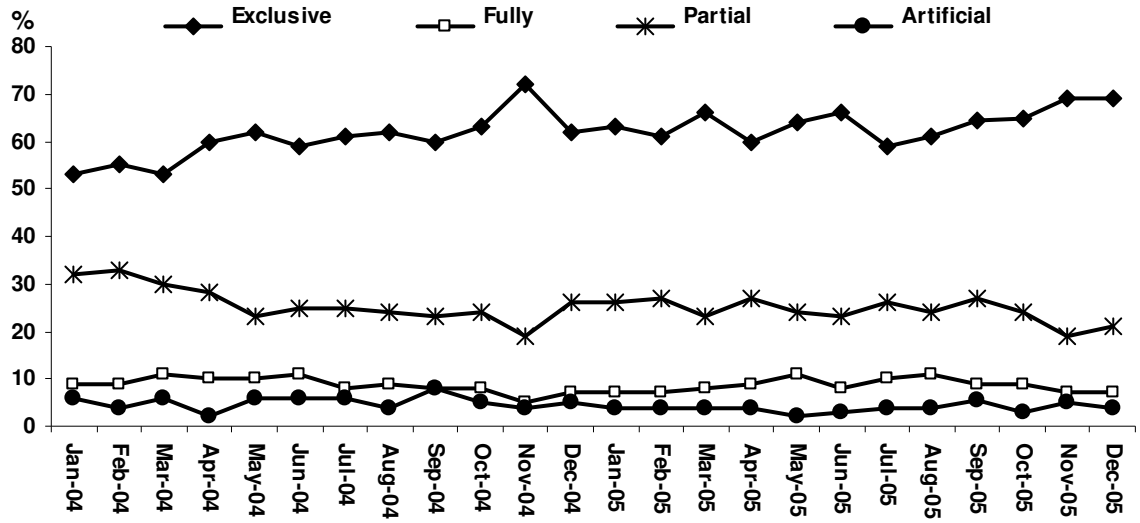

Figure 49: Method of infant feeding at discharge in 2005

In 2005 63.9% exclusive breastfeeding was achieved, a 10% increase over two years. The trend towards a reduction in artificial feeding has continued with only 3.8% of mothers artificial feeding on discharge in 2005.

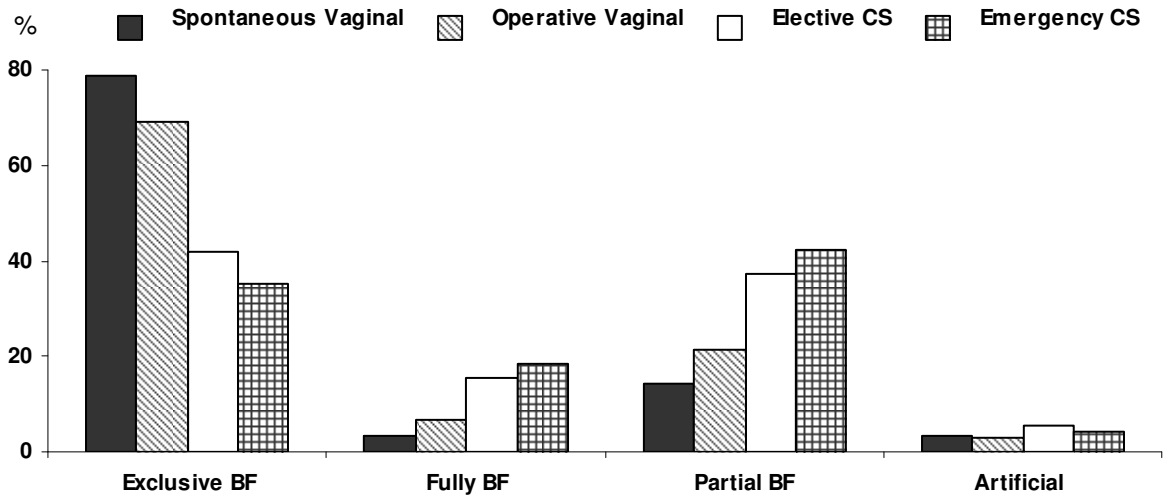

Figure 50: Infant feeding at discharge from NW by mode of birth

Table 43: Exclusive breastfeeding by mode of birth

	2004	2005
	%	%
Spontaneous vaginal	74.2	78.6
Operative vaginal	64.9	69.1
Caesarean section	38.6	38.6

Mode of birth remains a significant factor in breastfeeding outcomes. There have been noticeable improvements in exclusive breastfeeding among women having vaginal births.

Medications given during birth and operative procedures impact on the mother's response to her baby's feeding cues. They also result in dependence on staff to achieve attachment, and they delay initiation of the second phase of lactogenesis. The second phase of lactogenesis is triggered by the baby regularly stimulating and stretching the areola and nipple. These issues pose challenges for the future in our path to becoming a Baby Friendly Hospital.

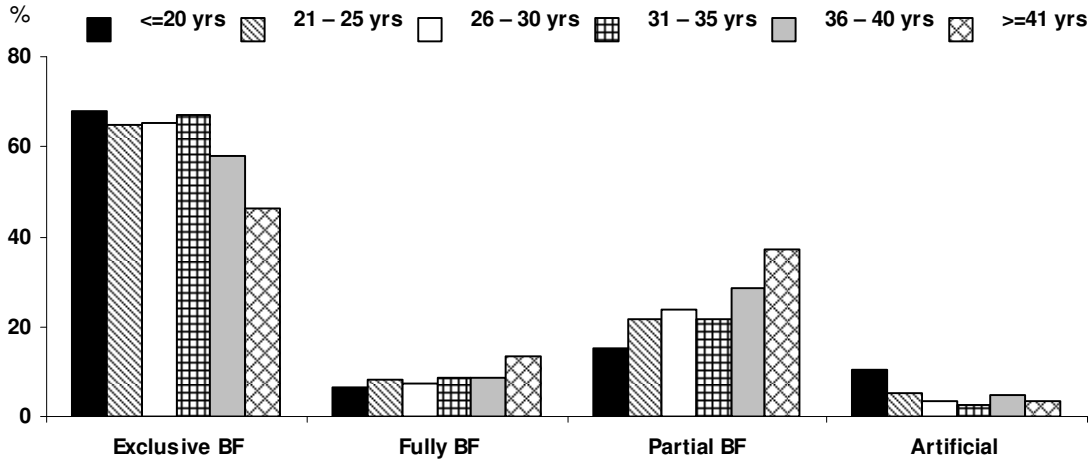

Figure 51: Infant feeding at discharge from NW by maternal age

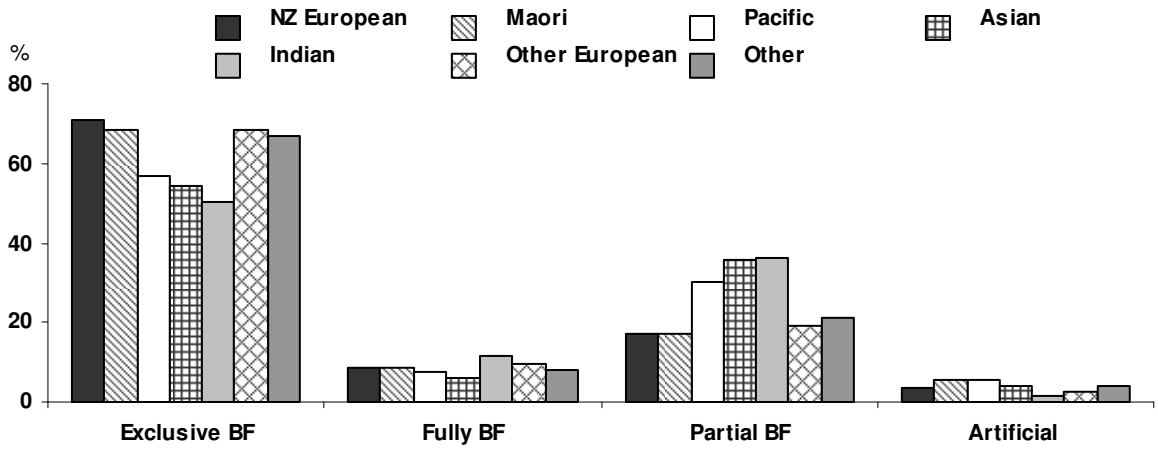

Figure 52: Infant feeding at discharge from NW by maternal ethnicity

The number of Maori women exclusively breastfeeding has increased by 6% to 68.4%, and is associated with a reduction in artificial feeding from 9.9% in 2004 to 5.6% in 2005. These figures support the health messages and work of the Maori health team members and LMCs.

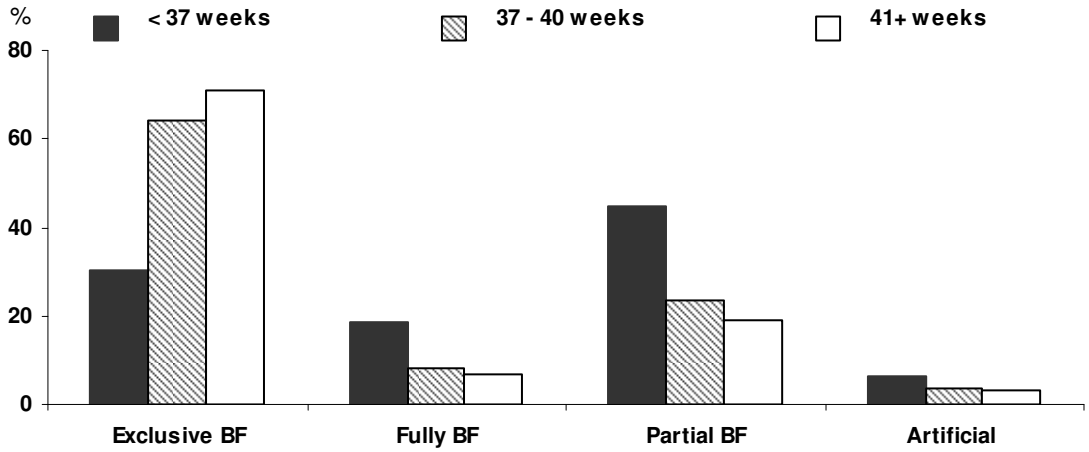

Figure 53: Infant feeding at discharge from NW by gestation at birth

There have been small improvements in exclusive breastfeeding rates in babies < 37 weeks (1.9%) and 37–40 weeks (1.7%) with a more significant improvement of 5.1% to a rate of 70.9% in the 41+ weeks group. While this is a smaller group it does represent 16.9% of the available breastfeeding data.

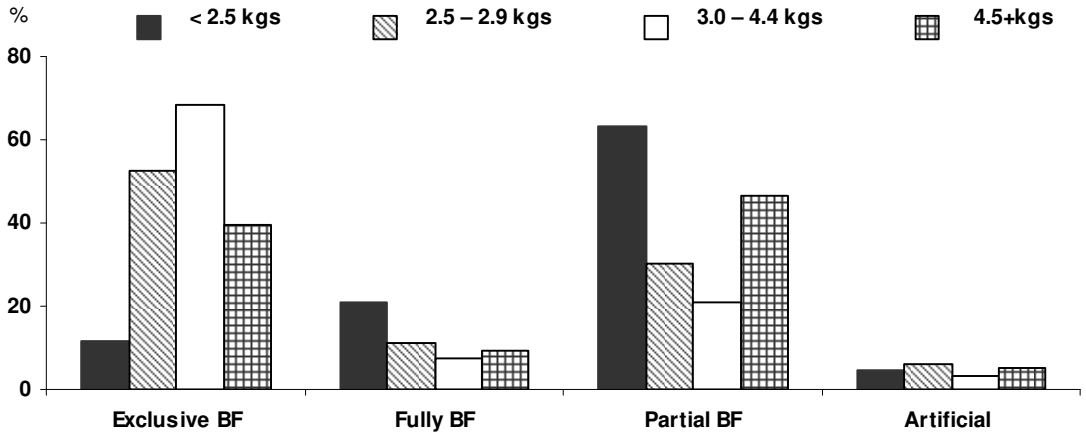

Figure 54: Infant feeding at discharge from NW by fetal birthweight

While the <2.5kg group represents a small number of babies (149) it is disappointing to see a drop of 7.7% in the rate of exclusive breastfeeding. However the proportion of mothers fully and partial breastfeeding their babies has increased with a drop from 7.9% to 4.7% in the artificial feeding rates. Thus more small babies are getting at least some breast milk prior to discharge.

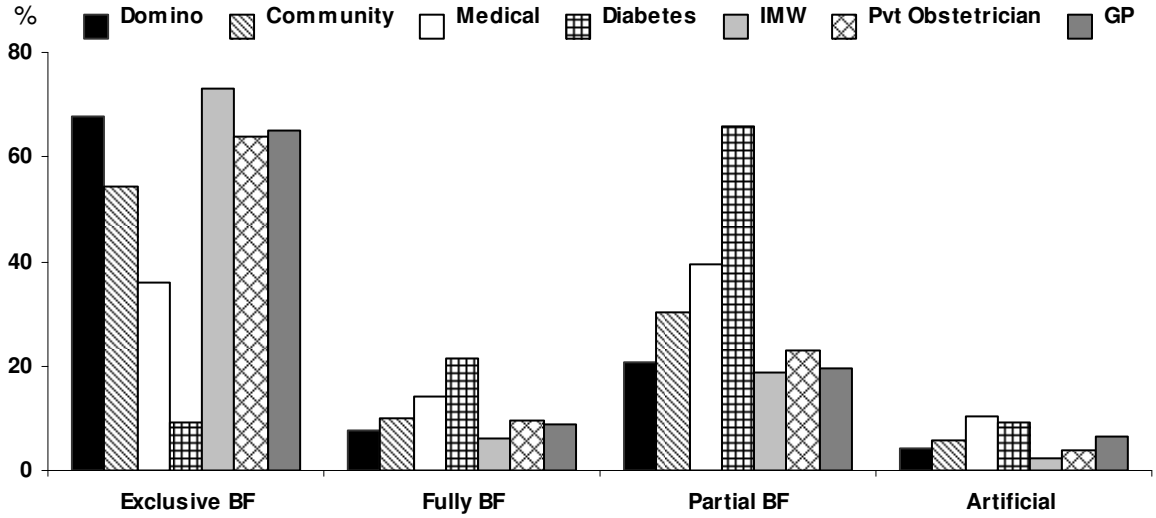

Figure 55: Infant feeding at discharge from NW by LMC

The LMC at birth reflects diversity in client base, with the community clinics located in lower cost housing areas with larger immigrant populations, and the complexity of medical and diabetic referrals includes residents outside the ADHB area. There has been an increase in exclusive breastfeeding among women with NW community LMCs of 10%, Domino 2.6%, and Medical 4%.

Babies of diabetic mothers have risk factors which have tended to lead to supplementation; this has lead to a number of initiatives to address the issues. The number of diabetic babies discharged artificially feeding has reduced by almost 50% with this trend being maintained through to discharge from Homecare. This may have significant implications for improving long term health outcomes.

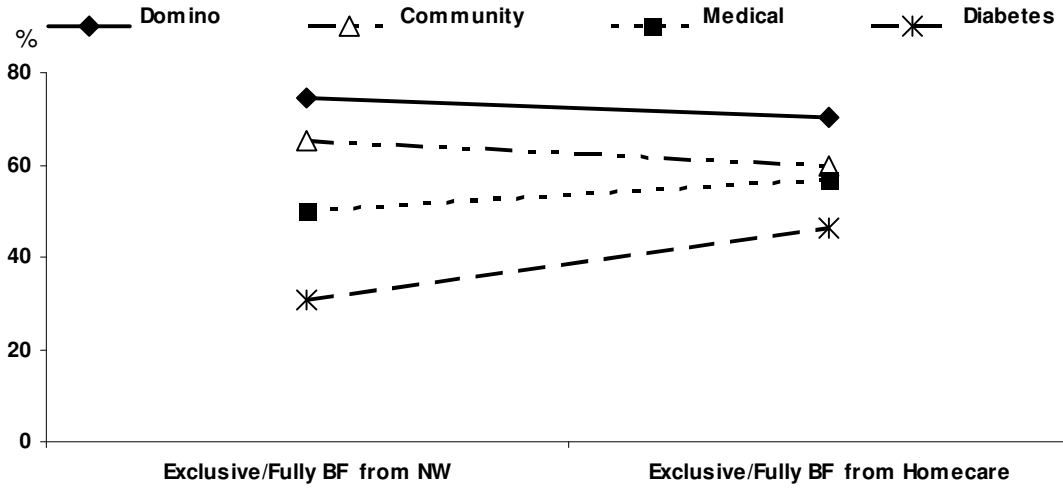

Figure 56: Comparison of exclusive and fully breastfeeding rates at discharge from NW facility and discharge from NW Homecare

Exclusive and fully breastfeeding are added together in these graphs as some babies had minimal amounts of formula in the first few days then breastfed well after discharge. The

increase in numbers in the Medical and Diabetes groups, from discharge from NW to discharge from Homecare, reflects a number of babies who were partial breastfeeding on discharge but have gone on to establish successful breastfeeding.

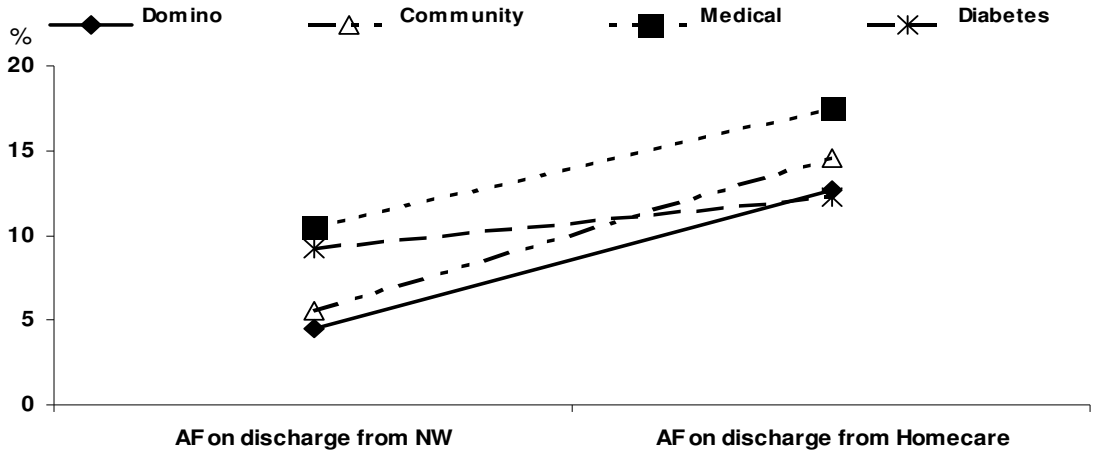

Figure 57: Artificial feeding at discharge from NW facility and discharge from NW Homecare

Summary/Implications

Breastfeeding rates at NW continue to rise particularly among

- Vaginal births – both spontaneous and operative
- Mothers under 35 years and more particularly in younger mothers
- Maori mothers
- Babies with gestation of 41 or more weeks
- Mothers with Community Midwives as LMC

There are challenges for improvements among

- Caesarean Section Births
- Mothers over 40 years
- Pacific, Asian and Indian mothers
- Mothers with Diabetes or Medical teams as LMC

Towards the end of 2005 a second Lactation Consultant was appointed part time to assist progress towards achieving the Baby Friendly Hospital Award. Work has commenced to provide additional staff education to provide the support necessary to assist an increasing number of mothers to achieve their goals for exclusive breastfeeding.

Women who have identified breastfeeding problems and are inpatients, or a history of previous breastfeeding difficulties, and mothers of babies on the Neonatal Unit can be referred to the Lactation Consultant. The Lactation Consultants work with staff and the mothers to assess and assist to overcome challenges. Mothers with medical conditions that make exclusive breastfeeding difficult to achieve are assisted to reach positive outcomes, and are fully supported with establishing expressing routines and information to assist transition to home.

Readmissions for mastitis or breast abscess, and outpatient antenatal and postnatal referrals are seen within the hospital. Telephone advice is also available.

6.2 Postnatal admissions

Postnatal care following birth is provided at Auckland City Hospital for those women requiring secondary care or closer observation for themselves or their babies. Women requiring only primary care in the postnatal period and with well babies are transferred to Birthcare Auckland, or other primary units nearer their own home or, if they wish, are discharged home.

Methods

Additional analysis and cleaning of data this year have enabled us to report on postnatal readmissions.

Findings

Table 44: Maternal destination immediately following birth

	2004		2005	
	N = 7491		N = 7194	
	n	%	n	%
NW Wards	4618	61.6	4286	59.6
Birthcare	2245	29.9	2354	32.7
Home	539	7.2	510	7.1
Other Units	89	1.2	44	0.6

The transfer of women from NW to Birthcare postnatally is a contractual agreement. There has been concern that insufficient numbers of women are transferred to meet this contract, and so it is good to see a 2.8% increase in 2005. A further 491 women, 11.5% of postnatal admissions to NW wards, transferred to Birthcare for ongoing postnatal care after initial care at National Women's. Transfers to other units have halved, possibly because fewer women from the Howick/Botany area are booking at National Women's since the move to Auckland City Hospital.

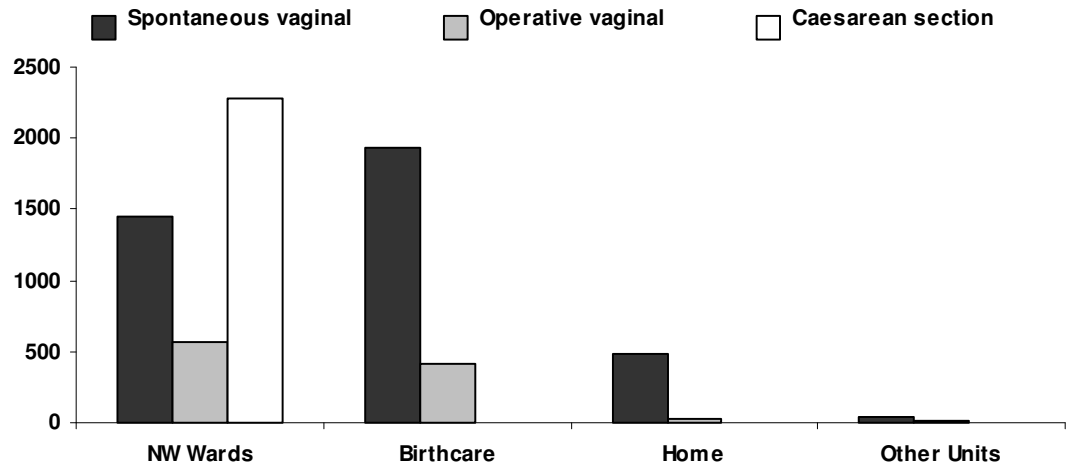

Figure 58: Maternal destination by mode of birth

50.4% of all spontaneous vaginal births and 40.6% of operative vaginal births transferred to Birthcare with only 7.7% of all births going home after birth.

Of the 2013 women with vaginal births initially cared for postnatally at NW, 1086 (54%) can be identified from Healthware as having a neonatal reason for their stay. These reasons include

- neonatal admission to NICU,
- low birth weight (<2500gms) and/or requiring paediatrician care on the ward
- stillbirth or neonatal death

A further 265 women (13%) had postpartum haemorrhages but we are unable to specify the indication for the remaining 662 (33%).

Increased transfers of women following vaginal births to Birthcare combined with the increasing Caesarean section rate at NW have impacted on the workload on the postnatal wards. The proportion of post caesarean patients among immediate postpartum admissions to NW wards was 47.5% in 2004 and 53.1% in 2005.

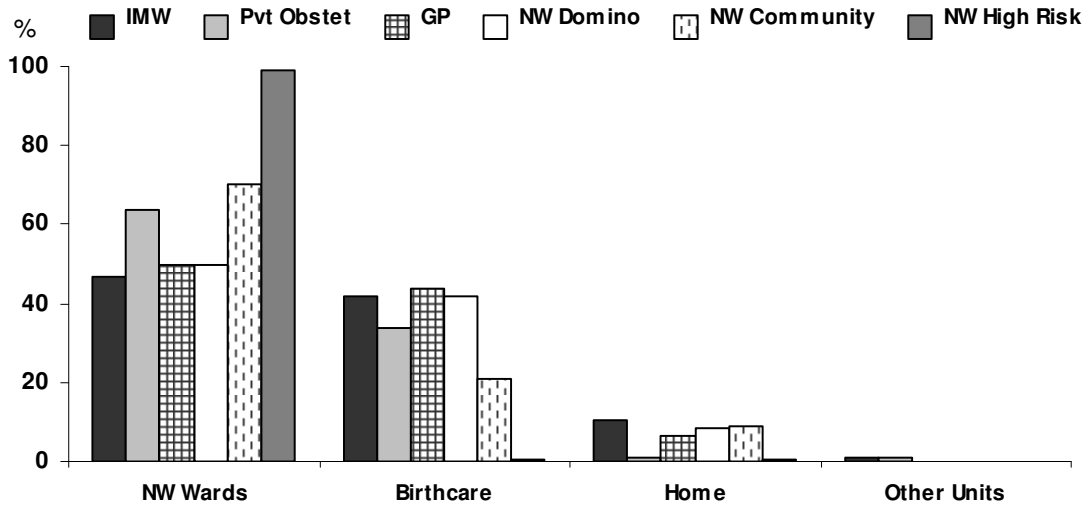

Figure 59: Postnatal destination by LMC

Late in 2004 NW Community midwives began seeing women for whom they were the LMC at Birthcare in the postnatal period. This is reflected in an increase from 10.6% to 21.1% in NW Community transfers to Birthcare immediately following birth.

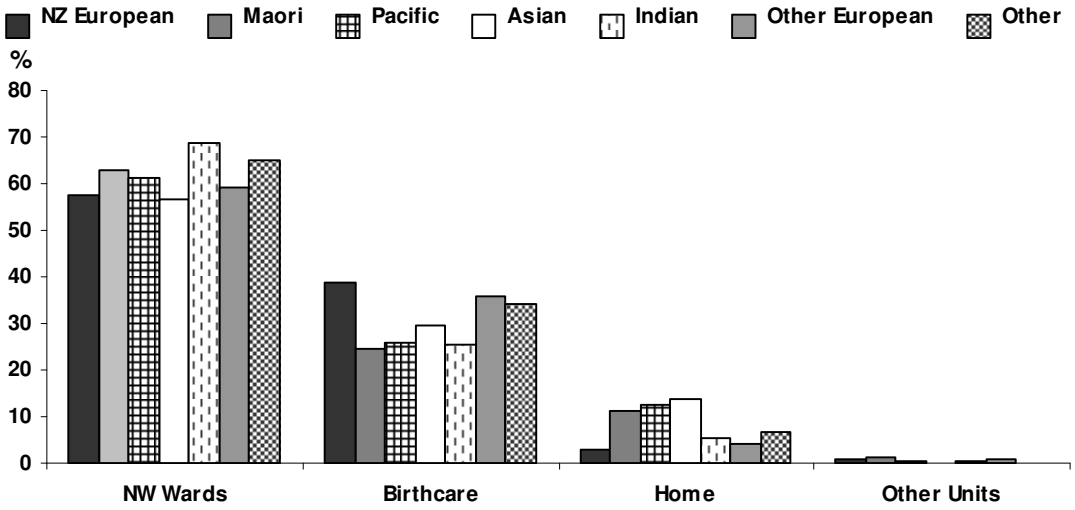

Figure 60: Postnatal destination by ethnicity

The higher percentage of Indian women remaining at NW reflects the higher caesarean section rate in this group of women. As in previous years higher numbers of European women transfer to Birthcare whereas Maori, Pacific Island and Asian women predominate among discharges to home.

Table 45: Length of stay by mode of birth among admissions to NW wards

	N = 4286		Length of stay Days
	n	%	Median
Caesarean section birth - discharged to home	2067	48.2	4.3
Caesarean section birth - transferred to Birthcare	144	3.4	1.0
Caesarean section birth - transferred to other destinations	62	1.4	5.5
Operative vaginal birth - discharged to home	407	9.5	2.8
Operative vaginal birth - transferred to Birthcare	140	3.3	0.4
Operative vaginal birth - transferred to other destinations	18	0.4	2.6
Spontaneous vaginal birth - discharged to home	1193	27.8	2.0
Spontaneous vaginal birth - transferred to Birthcare	189	4.4	0.4
Spontaneous vaginal birth - transferred to other destinations	66	1.5	2.9

6.2.1 Postnatal readmissions

A total of 335 women of the 7194 women who gave birth at NW had postnatal readmissions in 2005 (4.7%), either after their initial postnatal stay or after being discharged to other postnatal facilities or to their home. These women had 360 readmissions, as follows

- 311 had one readmission
- 23 had two readmissions
- 1 had three readmissions

Of the women readmitted, 55.8% were primipara and 44.3% were multipara.
The length of stay varied from 1 hour to 10.1 days with a median of 1.76 days.

Table 46: Reasons for readmission

	N = 360	
	n	%
Neonatal Admission[1]	77	21.4
Infection[2]	75	20.8
Breast[3]	60	16.7
Wound breakdown[4]	27	7.5
Postpartum haemorrhage	29	8.1
Hypertension	17	4.7
Retained products	12	3.3
Epidural complications	12	3.3
Other[5]	51	14.2

12 women had a repeat readmission for a separate indication

[1] includes babies requiring admission to NICU and babies admitted to the wards for phototherapy or feeding problems
[2] includes infected caesarean section wound, urinary tract infection and other conditions where infection is suspected/diagnosed eg endometritis
[3] includes mastitis, breast abscess or other conditions of the breast requiring hospital admission
[4] breakdown of caesarean section or perineal wound requiring further medical intervention
[5] Other reasons for readmission included abdominal pain, anaemia, psychiatric reasons, deep vein thrombosis, other maternal conditions e.g. cardiac complications, asthma.

The rate of re-admission is half that reported nationally (*Report on Maternity Maternal and Newborn Information 2003, available at http://www.moh.govt.nz*) although this may merely reflect different sources of data with national data derived from coding data rather than a specific clinical database such as NW maintains.

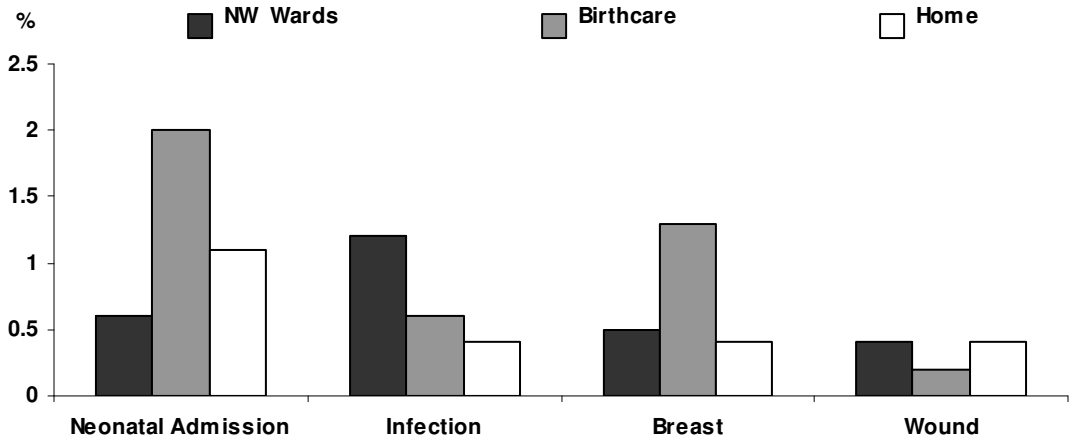

Figure 61: Rates of re-admission indication by maternal destination following birth.

Women were more likely to be re-admitted from Birthcare for neonatal reasons and for breast problems and from NW care for infection. Increased neonatal admissions from Birthcare likely reflect the lack of availability of paediatric review at Birthcare, while the excess infection re-admissions of women under NW postnatal care likely reflects the predominance of operative births among women receiving postnatal care at NW. The reason for increased re-admission for breast problems from Birthcare is not immediately obvious.

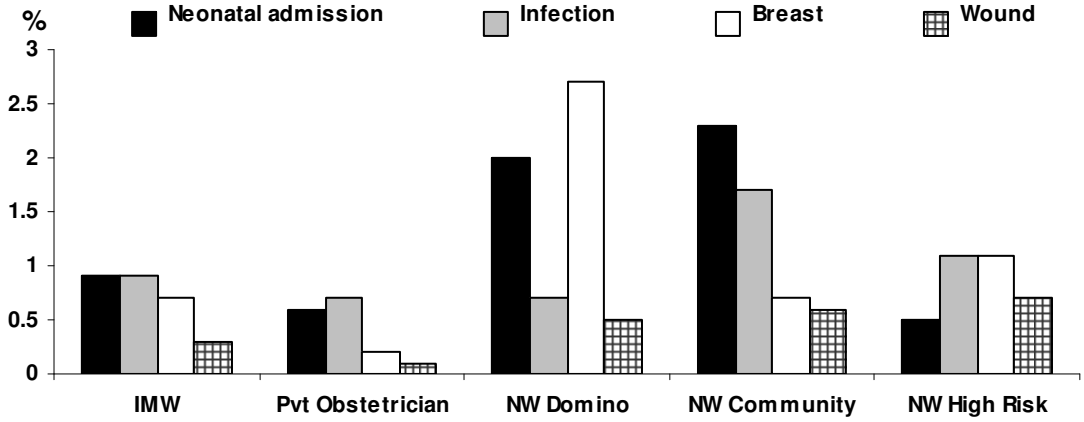

Figure 62: Indication for readmission by LMC group at time of birth

There is a striking difference in re-admission by LMC with high rates among NW Domino and Community mothers. This may reflect both the demography of this group and the lack of 24 hour midwifery availability among the community midwifery mothers.

Postnatal admissions where births occurred at other facilities

As a secondary and tertiary facility NW admits women requiring further care for themselves but more frequently for postnatal care when their baby requires admission to NICU or Starship. Of 44 women admitted after the birth of their babies at other facilities 37 (84%) were accompanying their babies with a further 4 (9%) admitted for retained products or PPH. The majority of these admissions (84%) came from DHBs within the greater Auckland area.

section 7

NEWBORN SERVICES

7 NEWBORN SERVICES

This chapter provides data on the outcomes of babies cared for at the Neonatal Intensive Care Unit. Additional data can be found in Appendix 7.

7.1 Admissions to the Newborn Intensive Care Unit

Neonatal unit admissions have been falling for several years. Over the last two years this has been because of the opening of two local Level 2 neonatal units. In July 2004, Waitakere Hospital opened a 10-cot Level 2 Neonatal Unit. The North Shore Hospital Neonatal Unit opened in October 2003. This resulted in a decreased number of admissions to the ACH NICU in 2004-5. Because of these developments, Auckland City Hospital has decreased its cot numbers from 59 to 46 over the last two years

The Waitemata units admit babies >1500 gm and >31 weeks gestation and will administer CPAP. Auckland City Hospital continues to be the level 3 referral unit for the two Waitemata hospitals and for Northland Base Hospital.

Table 47: Admissions to the Newborn Intensive Care Unit

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number	1635	1666	1464	1690	1420	1300	1352	1412	1312	1331	1220	975	906

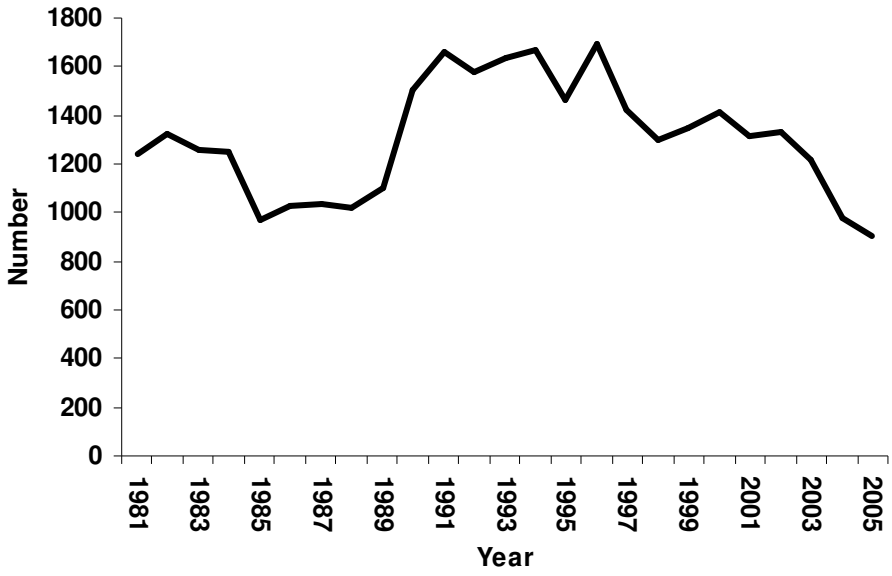

Figure 63: Admissions to NICU 1981-2005

7.1.1 Admissions to the Newborn Intensive Care Unit by gestation and birth weight

The reduction in admissions has occurred in the group of babies ≥32 weeks gestation as many of these babies are now being born and stay in North Shore and Waitakere Hospitals.

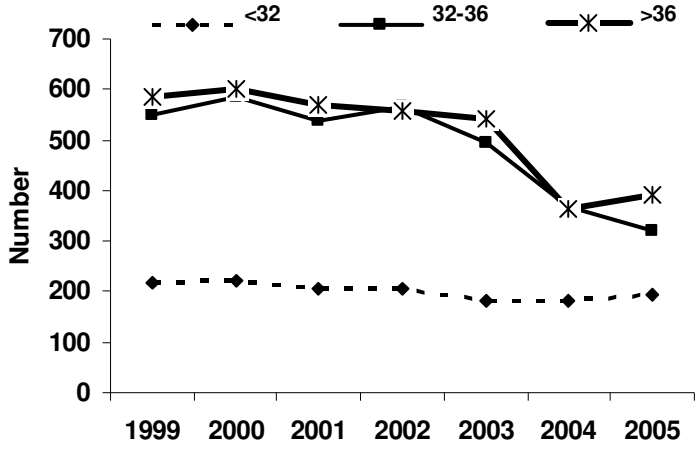

Figure 64: Admissions to NICU by gestational age

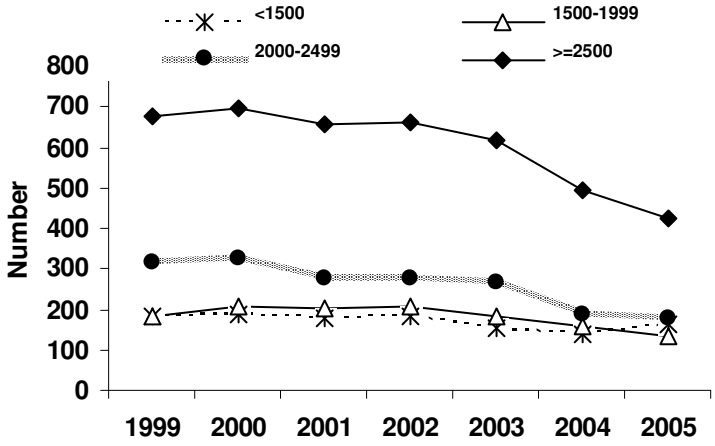

Figure 65: Admissions to NICU by birth weight

7.1.1 Admissions to NICU by domicile of mother

The fall in admissions is mainly from babies whose mothers are domiciled in the Waitemata District Health Board area. However, there is also a steady decline in admissions of babies whose mothers live in the local Auckland District Health Board area.

The decrease in admission numbers was mostly in the larger, more mature babies. The number of admissions of babies whose mothers were domiciled in the Waitemata area fell by 58% overall but by only 16% in babies <32 weeks gestation or <1500gm birth weight. Overall, there was a 30% decrease in admission numbers since 1999 but only a 6% decrease in the smaller, less mature babies.

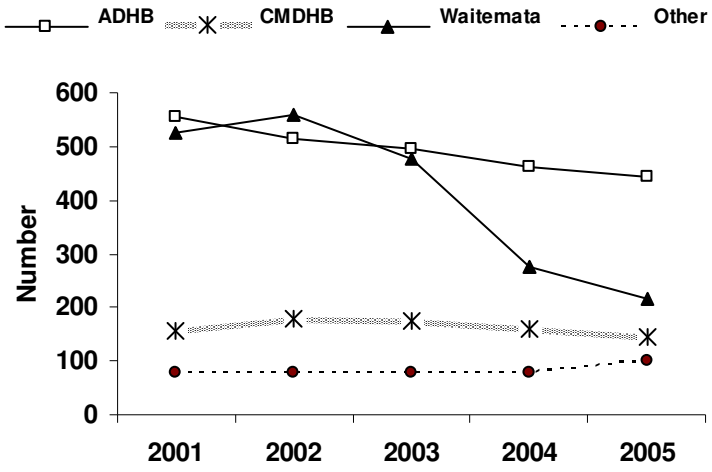

Figure 66: Admissions to NICU by maternal domicile

7.1.2 Newborn Unit occupancy

There has been a 29% decrease in bed occupancy since 2002 because the are fewer admissions and now many premature babies whose mothers are domiciled in the Waitemata and Counties Manukau DHB areas are transferred to their local level 2 unit once they are stable and of a certain size and gestation.

Table 48: Occupancy (baby days) on NICU from 1999

	1999	2000	2001	2002	2003	2004	2005
Baby days	18407	20652	20108	20551	19249	14958	14541

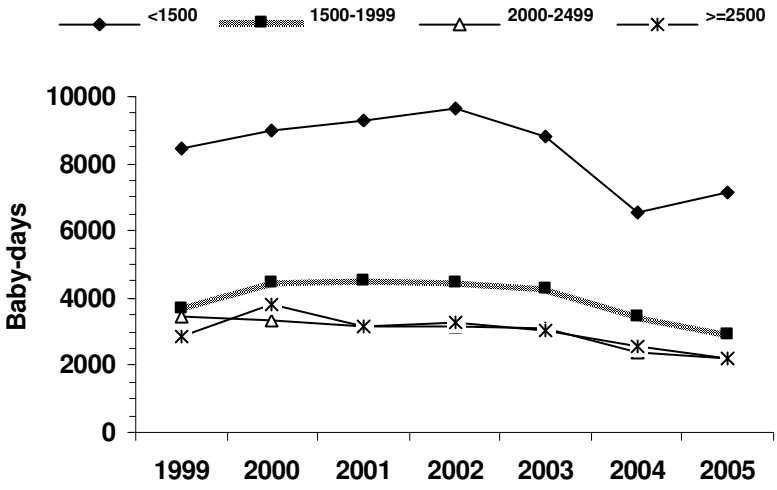

Figure 67: Occupancy (baby days per year) of NICU by gestational age

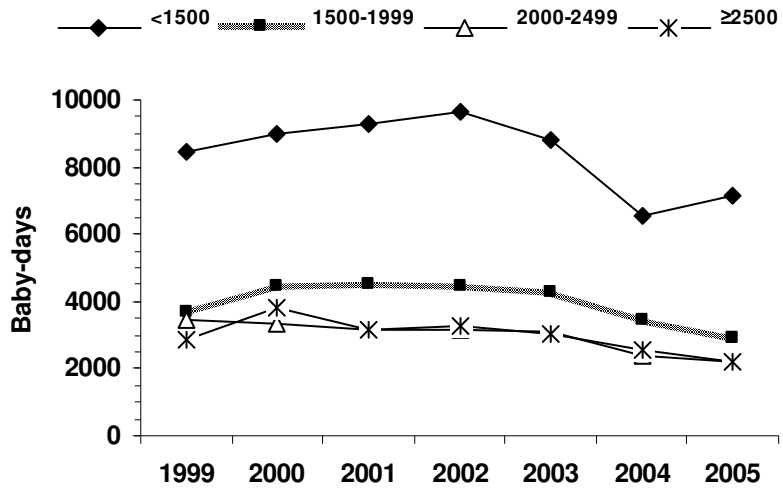

Figure 68: Occupancy (baby days per year) of NICU by birth weight

7.1.3 Ethnicity of mothers

Not unexpectedly, the majority of NICU admissions are European (52%, 54% of preterm and 50% of term infants). The next largest single ethnic group is Maori with 11% of admissions. These are predominantly preterm (14% of preterm admissions compared with only 8% of term admissions).

Grouping ethnicities together, Asian (including Indian) represent 15% of admissions (15% of preterm and 18% of term admissions). Pacific represents 13%, (12% of preterm and 14% of term admissions).

7.1.4 Reasons for admission to NICU

Prematurity (46%) and respiratory distress (17%) are much the commonest reasons for admission to NICU. Eighty-two babies (9%) were admitted because of congenital anomalies. Sixty-two babies (7%) were admitted for hypoglycaemia. The full list is presented in the appendix.

7.2 Infection

There were 7 early-onset infections (culture proven septicaemia in the 1st 48 hours) and 25 late-onset infections. Early infection is predominantly from Group B *Streptococcus* (3) and *E. coli (*2*). Staphylococcus epidermidis and* Coagulase negative *Staphylococcus* continue to make up the majority of late onset sepsis (52%).

Four of the 21 babies who developed serious infections died but in only one of these deaths was the death directly related to the infection.

Five early infections were in babies <32 weeks gestation and the other two in term babies. The 25 late infections occurred in 17 babies.

No baby developed a culture proven meningitis although there were cases of suspected meningitis with positive blood cultures and abnormal CSFs that were taken after antibiotics were started.

7.3 Immunisation

A number of babies are still in NICU when they are due their first immunisation at 6 weeks, and a few when their 2nd immunisation is due at 3 months. In 2005 74 of 86 babies (86%) still in NW on day 42 were immunised before going home. Three babies were very unwell and died within a few days and were not immunised. Five parents of 6 babies declined to have their babies immunised. One baby was transferred to a level II unit at 45 days of age with the recommendation to obtain parental consent when they were available. Immunisation was contraindicated in one baby on immunosuppressive drugs.

Sixteen of 18 babies (89%) still in NICU at 3 months of age received their 2nd immunisation before discharge. Parents declined immunisation in the other two.

In 2004, 96% of babies in ACH at 42 days were immunised compared with 86% in 2005. At 3 months, 100% were immunised in 2004 and 89% in 2005.

Of note, five of the 69 parents of these 80 babies refused immunisations despite strong recommendations. In 2004, no parents declined consent.

7.4 Infant feeding in NICU admissions

Data are presented on babies admitted to NICU who were either discharged to a ACH post-natal ward or to home. In NICU all VLBW infants receive human milk fortifier as this is considered a 'standard of care' for such infants. According to the Ministry definitions, all these infants would be classified as having received breast milk substitutes and therefore be classified as being fully or partially rather than exclusively breast milk fed. However, for this report, human milk fortifier has not been included as a formula supplement.

Overall 88% of babies were discharged receiving some breast milk. Sixty-six percent were discharged receiving only breast milk and 35% were exclusively breast fed (up from 18% in 2004)

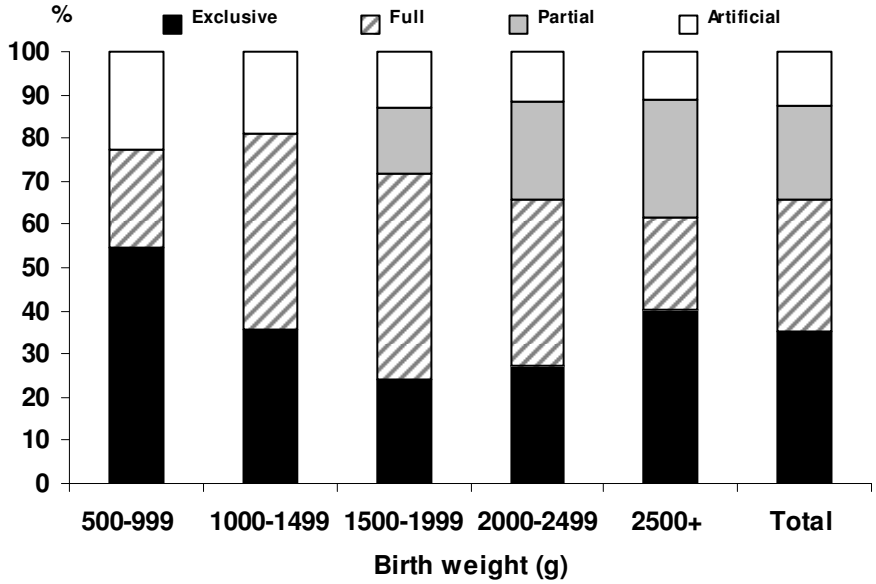

Figure 69: Infant feeding on discharge from NICU by birth weight

Data on babies discharged home or to postnatal wards only. Babies transferring to other units/hospitals excluded.

Exclusive = only received breast milk during stay or received only breast milk plus human milk fortifier.

Fully = received some formula during stay but discharge on breast milk only

Partial = receiving both breast milk and infant formula at discharge.

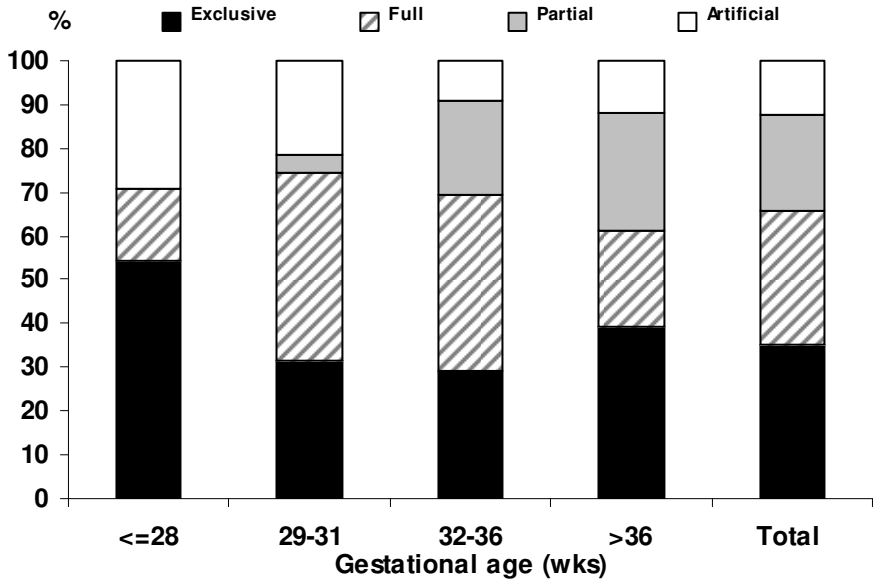

Figure 70: Infant feeding on discharge from NICU by gestational age

There are different challenges to achieve high breastfeeding rates in the different groups of babies. Very preterm infants are in hospital for several months. It is important to achieve maximum growth. Their mothers have to express breast milk for many weeks before their babies are ready to suckle. In this group, 71% are discharged fully or exclusively breastfed. This approximates the breastfeeding rate at 2-4 months of age (the usual age of discharge). This represents a considerable achievement by their mothers and the staff helping them.

Moderately preterm babies are usually not as sick as the less mature infants. The time taken to achieve satisfactory sucking feeds is usually the main determinant of the length of stay. Sixty-nine percent of babies 32-36 weeks gestation are discharged exclusively or fully breastfeeding and only 9% are not receiving any breast milk. However only 29% of these babies were exclusively breast fed.

As most term infants are only in NICU for a few days, the aim is to get the babies back with their mothers. The mother may be unwell herself and unable to be with her baby as much as desirable. The majority of babies (61%) in this group receive some formula feeds however 61% are exclusively or fully breast fed on discharge.

7.5 Hypoxic ischaemic encephalopathy (HIE)

Only 4 inborn babies (three at term) developed significant stage 2 or 3 encephalopathy in 2005 giving an incidence of 0.5/1000 term live-births. The incidence was 1.6/1000 term live births in 2004 and 0.6/1000 term live births in 2003.

Table 49: Details of Hypoxic Ischaemic Encephalopathy Stages 2 or 3.

Born at	Gestation	Birth Weight	Apgar 1/5	HIE Stage	Day died	Comment
ACH	36	2205	6 / 8	2		SRM and fetal distress. Emergency caesarean.
ACH	39	3970	1 / 0	3	1	Spontaneous labour and delivery. Decelerations with good recovery only.
ACH	40	3940	0 / 2	2		Shoulder dystocia.
ACH	41	4680	0 / 0	3	0	Amniotic fluid embolus, delivered during maternal resuscitation attempt in Emergency Dept.
Home	39	4035	2 / 3	2		Unplanned precipitous delivery at home
Home	42	3560	3 / 5	3	1	No known fetal distress
Whangarei Hosp	40	2945	3 / 6	2		Probable placental abruption

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

7.6 Assisted ventilation

7.6.1 Number of babies receiving and duration of assisted ventilation

Data in this section are presented for babies born at ACH, excluding babies transferred in postnatally. Excluding postnatal transfers allows more meaningful comparisons of postnatal care at NW/ACH across the years.

Table 50: Number of babies on assisted ventilation

	2001	2002	2003	2004	2005
CPAP or IPPV	393	446	404	402	395
IPPV	126	140	109	123	140
CPAP	379	421	388	388	367

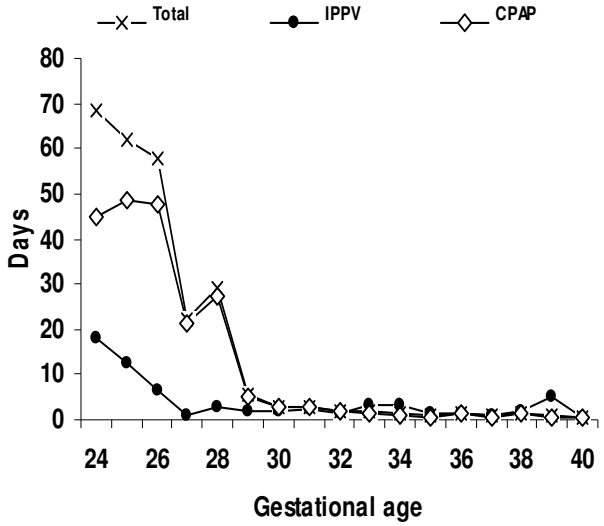

Figure 71: Median ventilation days on IPPV and CPAP and IPPV+CPAP by gestational age among survivors (2005)

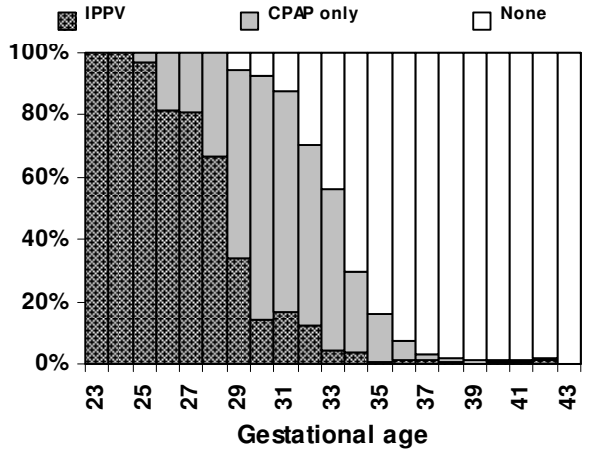

Figure 72: Proportion of babies receiving assisted ventilation (excluding for surgery or a congenital anomaly) 2003-2005

Denominator is all inborn babies from 2003-2005, excluding delivery room deaths. n = 23089

There is a dramatic reduction in the time on positive pressure ventilation from 27 weeks gestation onwards. There is a similar decrease in the time on CPAP from 29 weeks onwards. These data are important in deciding on timing of delivery for mildly preterm babies.

While NICU has adopted CPAP as the primary mode of respiratory support, most babies ≤28 weeks' gestation will receive a period of positive pressure ventilation. There is a steady reduction in the need for positive pressure ventilation from 26 to 32 weeks and for the need for CPAP from 31 to 35 weeks.

7.6.2 Trends in use of assisted ventilation among <32 week survivors (inborn babies only)

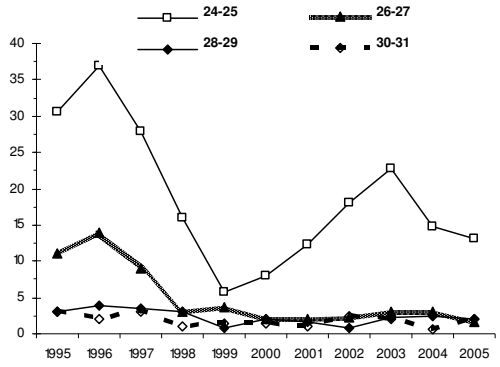

Figure 73: Median days on IPPV

With the change in 1997 to a CPAP-based approach, there was a dramatic decrease in the time ventilated for infants under 28 weeks' gestation. For babies of 24 and 25 weeks' gestation, this fell from a median of 37 days to 6 days by 1999.

However the median number of days on IPPV then increased to 23 days in 2003 and has settled to 13 days in 2005. Numbers in this group are low, with an average of 22 babies per year. This explains some of the year-to-year variation.

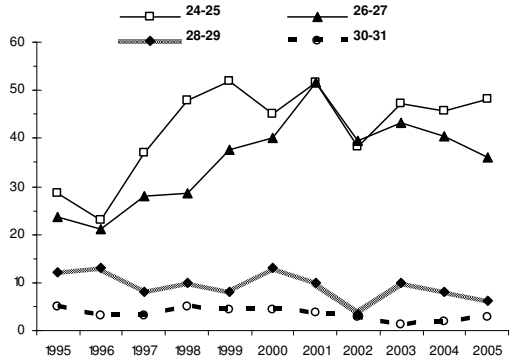

Figure 74: Median days on CPAP

In 2000, two audits of the incidence of chronic lung disease (CLD) were conducted. These showed that the incidence of CLD had not fallen with the change a CPAP based approach. This has resulted in a less aggressive approach to the extubation of the most immature babies. NW has participated in the COIN trial of ventilation or CPAP in very premature infants to help determine the optimal approach to ventilation in very preterm infants.

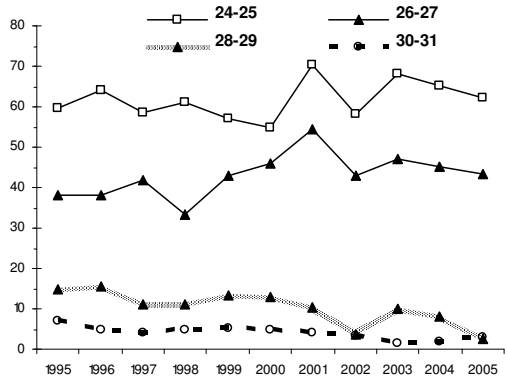

Figure 75: Median days on CPAP + IPPV

Time on CPAP has increased in the most immature babies in parallel with the decrease in time on IPPV. There has also been an increase in CPAP time for babies of 26 and 27 weeks gestation.

Overall there has been no change in total ventilation time, although the balance of types of ventilation has varied over the years.

7.6.3 Trends in the use of assisted ventilation over the last eleven years. Data on all infants born in NW

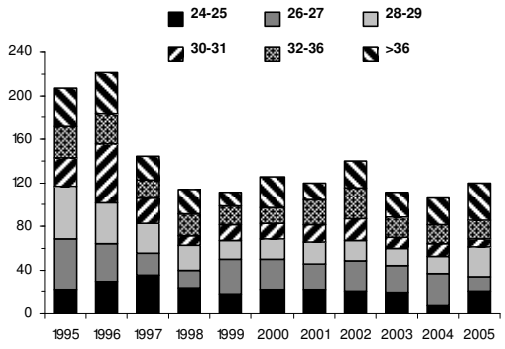

Figure 76: Number on IPPV

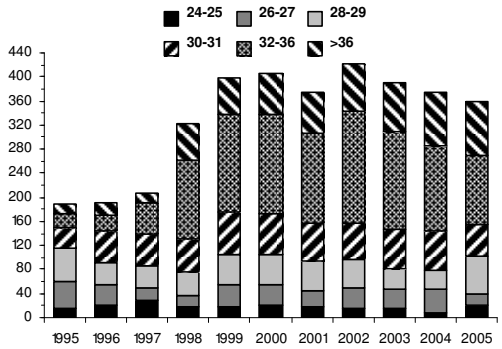

Figure 77: Number on CPAP

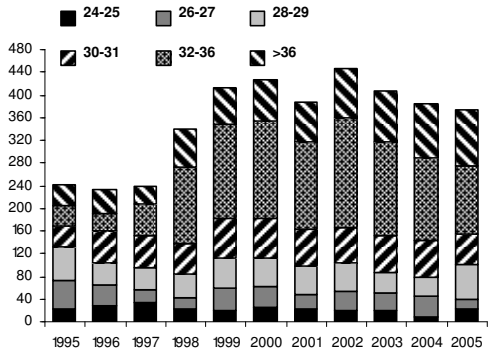

Figure 78: Number on CPAP + IPPV

These figures show the number of babies requiring assisted ventilation at ACH/NW over the last 10 years.

In 1997, double short-pronged Hudson® CPAP was introduced and aspects of the "Columbia approach" to respiratory support were adopted.

This resulted in a dramatic reduction in the number of infants needing intubation and assisted ventilation. There was a concomitant increase in the use of CPAP, particularly in babies from 32-36 weeks gestation.

Head-box oxygen administration was phased out and all babies requiring oxygen were placed on CPAP.

7.6.4 Positive pressure ventilation and CPAP use in NW and across Australia and New Zealand at 24-27 weeks' gestation

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 NICUs in Australia and New Zealand.

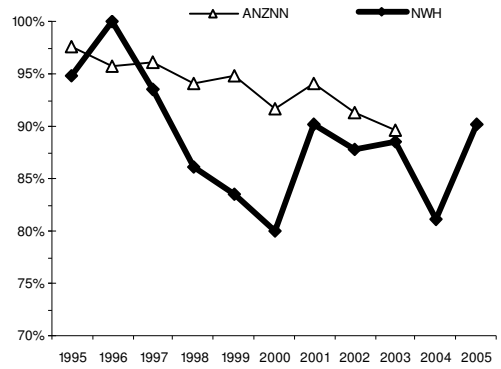

Figure 79: Percentage on IPPV

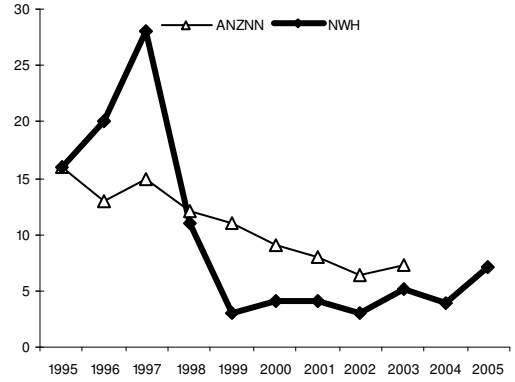

Figure 81: Median days on IPPV

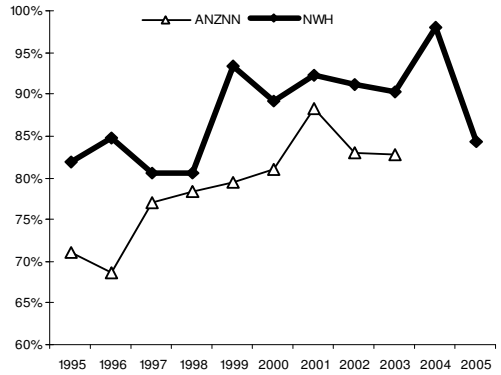

Figure 80: Percentage on CPAP

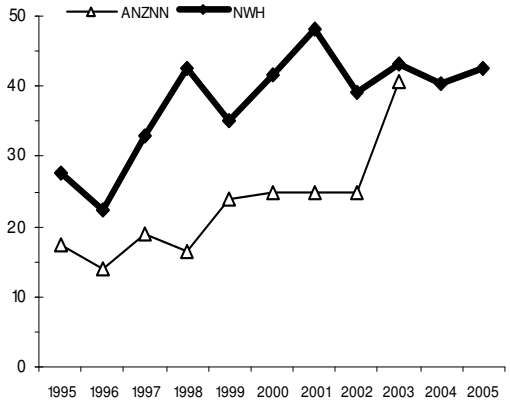

Figure 82: Median days on CPAP

NW changed its policy on ventilatory support of preterm infants in 1997 to put a greater emphasis on CPAP use. The percentage of very immature infants treated with IPPV and the duration on IPPV declined to below the median of the of the Network overall. However, most of these infants require IPPV at some stage in their hospitalisation.

CPAP use has always been high at NW. There has been a steady increase over the years. Its use in the rest of the Network is comparatively lower.

7.6.5 Positive pressure ventilation and CPAP use in NW and across Australia and New Zealand at 28-31 weeks' gestation

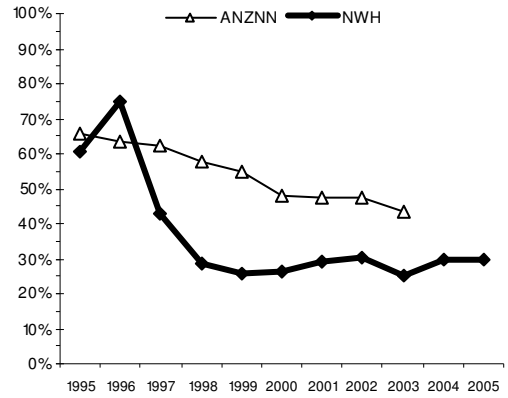

Figure 83: Percentage on IPPV

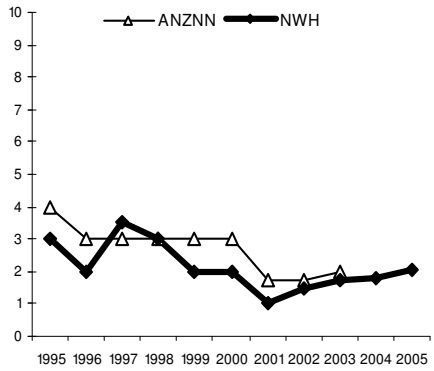

Figure 85: Median days on IPPV

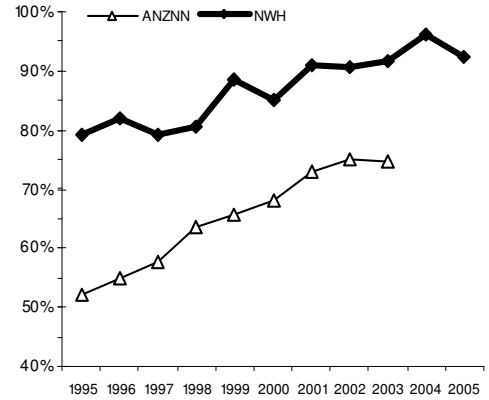

Figure 84: Percentage on CPAP

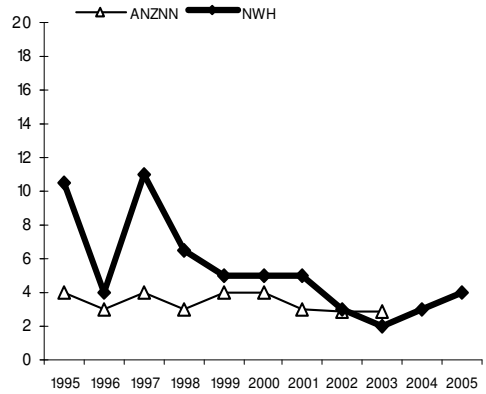

Figure 86: Median days on CPAP

The changing use of assisted ventilation in babies of 28-31 weeks' gestation parallels that seen in the less mature babies. Fewer babies are ventilated for a shorter time. CPAP use at NW has always been high. However, the time spent on CPAP in babies of 28-31 weeks gestation has fallen since a peak in 1997.

7.6.6 High frequency oscillatory ventilation and inhaled nitric oxide

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

High frequency oscillatory ventilation (HFOV) is used only for 'rescue' treatment at National Women's. Hence, babies treated with HFOV are the sickest babies in NICU who would be expected to have a very poor outlook whatever the treatment. At all gestations, mortality in these infants is high. Term babies do slightly better than preterm infants.

Table 51: HFOV and inhaled nitric oxide (iNO) use and survival over the last 10 years

	HFOV		iNO		HFOV + iNO	
	n	%Survived	n	%Survived	n	%Survived
Total	136	53	177	62	74	51
<28 weeks	63	49	31	35	18	28
28-31 weeks	18	56	14	43	7	43
32-36 weeks	14	29	27	48	12	33
≥37 weeks	41	66	105	76	37	70

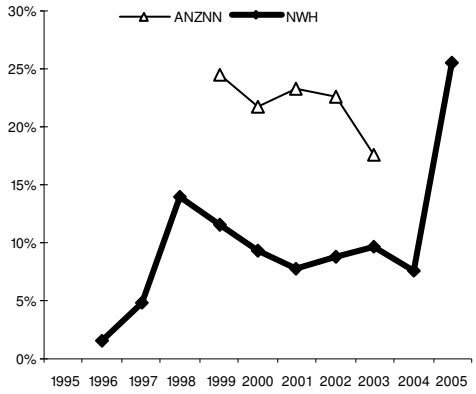

Figure 87: HFOV at 24-7 weeks

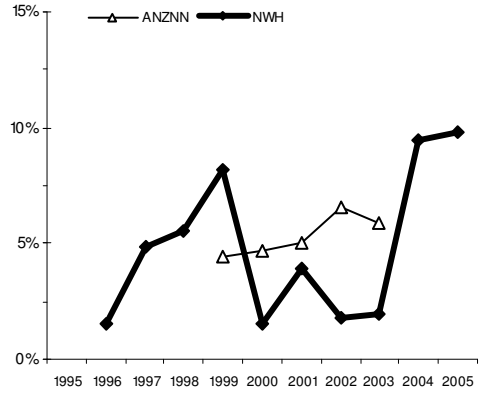

Figure 88: Inhaled nitric oxide at 24-7 weeks

These two figures compare the use of HFOV and iNO at NW with their use across the Australia and New Zealand Neonatal Network. The Network only presents data on preterm infants, despite both treatments being more commonly used in term babies. Generally, NW use has been low, but use of both in very premature infants increased in 2005.

7.6.7 Term/post-term infants on assisted ventilation from 1995 to 2005

This figure shows the number of term infants ventilated or treated with CPAP. Inborn and outborn infants are included. There has been a significant increase in CPAP use and little change in numbers on IPPV.

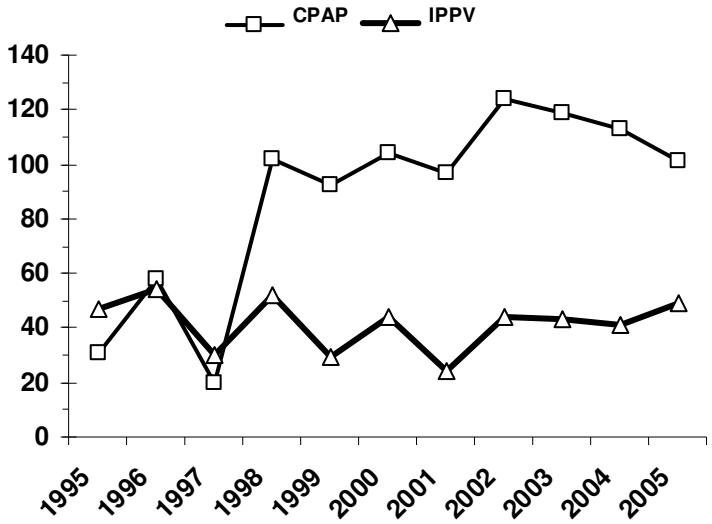

Figure 89: Number of term and post term babies needing assisted ventilation

In 1996, the largest group of term infants needing IPPV was those with meconium aspiration syndrome (MAS) and persistent pulmonary hypertension (PPHN). In 1996, 24 infants were ventilated for these indications. This number fell to 11 in 2005. However, there was a rise in CPAP use in babies with MAS and PPHN from 15 to 22.

The largest increase in CPAP use is in those infants with transient tachypnoea or respiratory distress syndrome. In 1996-7, 20 infants with these conditions were treated with CPAP and 8 ventilated. In 2004-5, the numbers were 103 babies received CPAP and 8 ventilated, reflecting the change in unit policy in 1997-98.

7.7 Very low birth weight infants

There was a peak of VLBW infants at NW in 2001 and then a reduction over the next three years. That decline in numbers seems to have halted in 2005. Overall the proportion of outborn babies is low, representing only 9% both over the entire 10 years and in 2005.

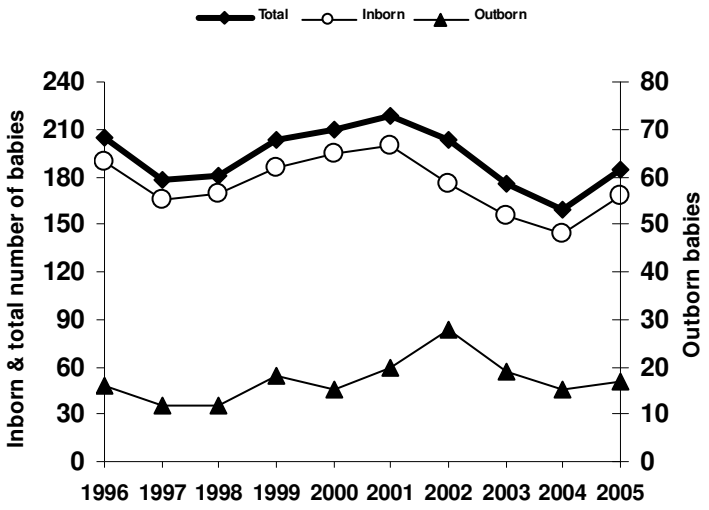

Figure 90: Number of VLBW who were born elsewhere and admitted to NICU, or were born in ACH and alive at birth

These numbers include outborn babies who were transferred to NW and babies who were born alive but died at birth and who were either >20 weeks gestation or >400gms birth weight. In 2005, 20 of the 168 inborn infants <1500 grams died at or soon after birth. Fifteen of these 20 were ≤24 weeks gestation.

7.7.1 Number of deliveries of inborn live-births 501-1500g birth weight from 1959

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

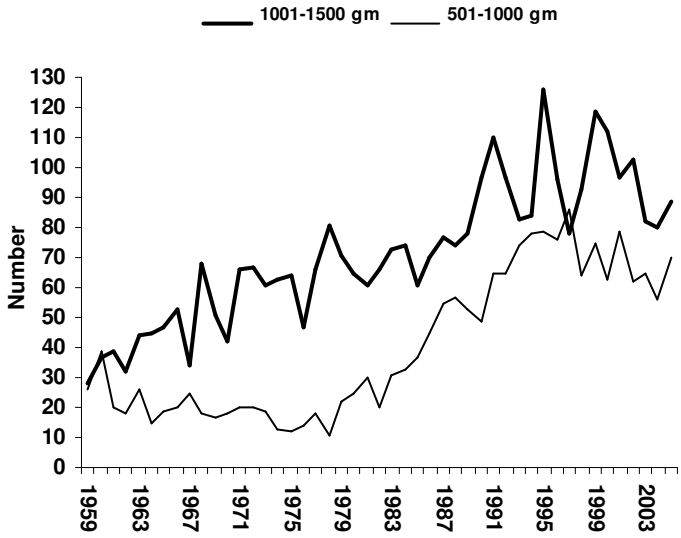

Figure 91: Number of inborn live-births ≤1500g from 1959 to 2005

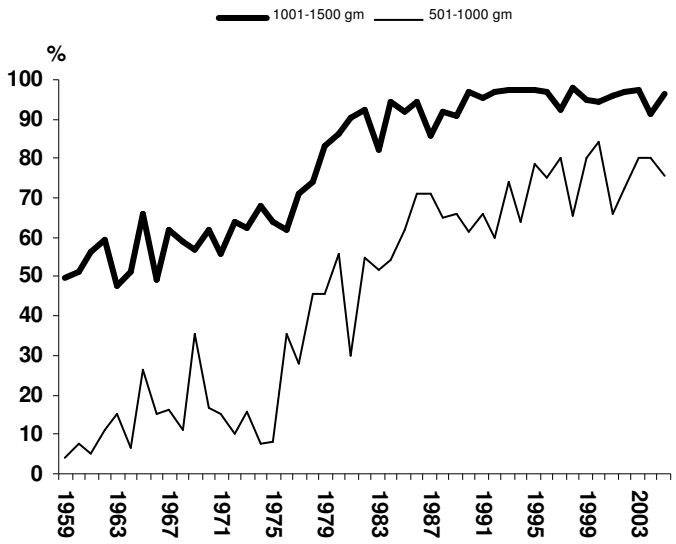

Figure 92: Neonatal survival (0-28 days) of ≤1500g inborn live-births from 1959 to 2005

In 2005, the majority of deaths in infants between 501 and 1000 gm were at birth (59%), either from extreme prematurity (9) or a lethal anomaly (1). However there were 2 infant deaths of premature babies who were still in hospital after 28 days that are not included in this figure. Over the years the definitions used have been the same, with all deaths at birth included if they showed signs of life.

The number 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 (501-1000gms) (ELBW).

There has been an enormous improvement in the results of perinatal and neonatal intensive care over this time period. In the first three years (1959-61) only 5/85 (6%) ELBW babies survived to 28 days compared to 150/191 (79%) in the last three years.

The biggest improvements happened in the late 1970s and early 1980s with the beginning of modern intensive care and the introduction of techniques for ventilatory support. The trend of increasing survival in the ELBW group continues over the last 20 years. Artificial surfactant treatment was introduced in 1990.

7.8 Survival of babies from 23 to 31 weeks gestational age born in National Women's

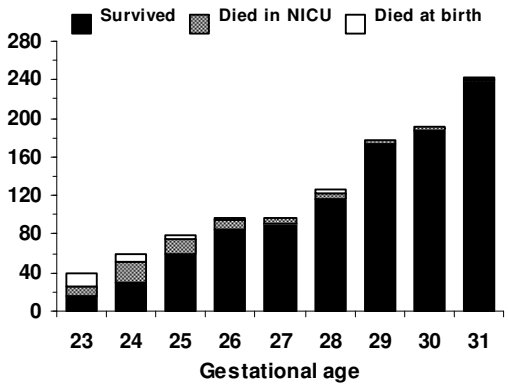

Figure 93: Numbers of babies born alive at 23 to 31 weeks gestation in 2000-2005

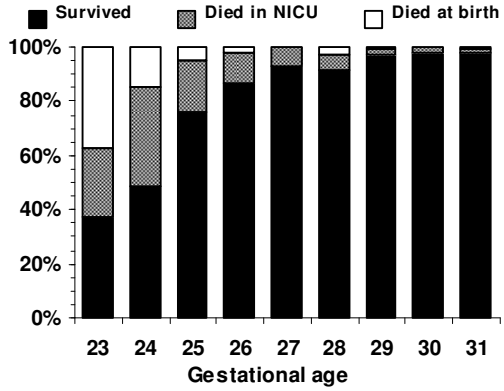

Figure 94: Survival to discharge home of babies born in 2000-2005. (n= 1113)

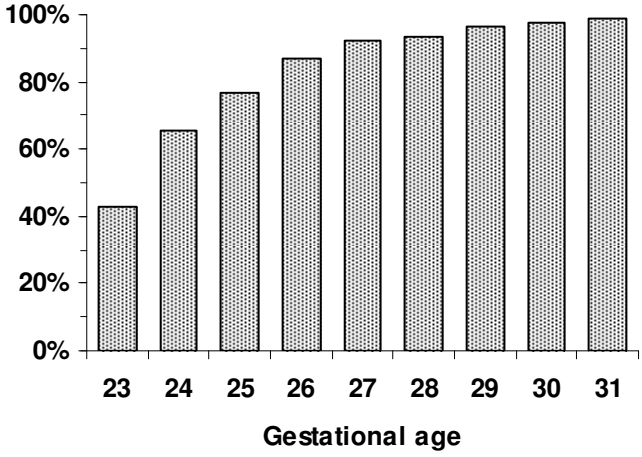

Figure 95: Survival of babies born in National Women's and admitted to NICU from 1995 to 2005 (n = 1972)

Survival in very preterm infants has been fairly steady over the last decade. The NW/ACH data is confirmed by outcomes published by the ANZNN, which approximate population data. There is no overall increase in survival of these very preterm infants.

The number of in each group in each year is small. The present survival rate is not significantly different to those of earlier years in any gestation category.

7.9 Intraventricular haemorrhage in all very low birth weight infants admitted to NICU from 1985 to 2005

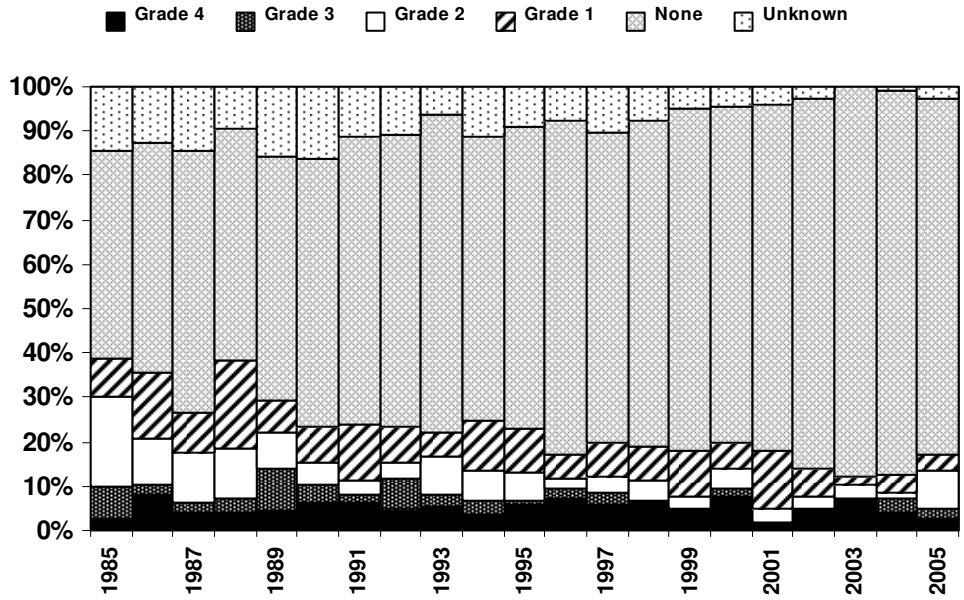

Figure 96: Intraventricular haemorrhage in all <1250 gm infants admitted to NICU from 1985 to 2005

In 2005, the criteria for routine ultrasound scanning in very low birth weight infants changed at ACH from scanning all those <32 weeks or <1500gms to only scanning those <30 wks or <1250gms. This was done because the incidence of significant abnormalities being found in the larger more mature infants was very low. This figure differs from previous years as it has been redrawn to include only those infants <1250gms.

Since 1985, the incidence of any degree of IVH has fallen from 45% to 17%, with that of severe IVH (grade 3 or 4) falling from 12% to 5% in 2005. The number of infants who were not scanned has also fallen from 14% to 3%.

7.10 Morbidity of inborn very low birth weight infants and babies <32 weeks gestation admitted to NICU

The number in the following sections and the tables in the appendix are of all inborn very low birth weight infants and babies <32 weeks gestational age. The figures in this section are for babies 'assigned' to NW by the ANZNN (see below).

7.10.1 Benchmarking against the Australia and New Zealand Neonatal Network

In this section, results are benchmarked against the ANZNN. ANZNN collects standardised data from all NICU in Australia and New Zealand. A dataset is collected for each baby admitted to a NICU who is either:

<1500gm birth weight,

<32 weeks gestation,

requires assisted ventilation (IPPV, CPAP or HFOV) or

has major surgery (defined as opening of a body cavity).

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 that care is in several hospitals.

ANZNN was established in 1994. NW has supplied data since 1995. De-identified data is sent electronically to the Sydney secretariat. Prior to NW joining ANZNN, approval to send data was obtained from the North Health Ethics Committee.

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.

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

The numbers each year from NW in the following figures are relatively small. The data from 1995 to 2003 for ANZNN and for NW have been totalled and confidence intervals (95%CI) calculated for NW outcomes calculated.

These comparisons are univariate comparisons only. They indicate that the NW outcomes are good compared with those of the Network. However, this may reflect population differences or other factors that are not controlled for.

7.10.2 Survival

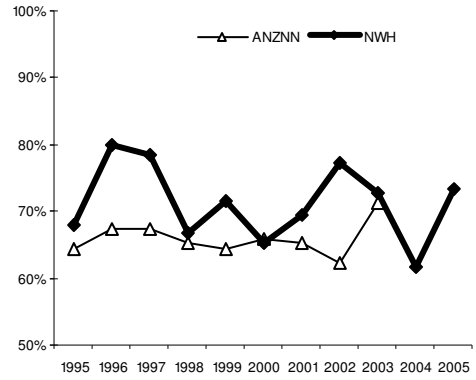

Figure 97: Survival at 24-5 wks gestation

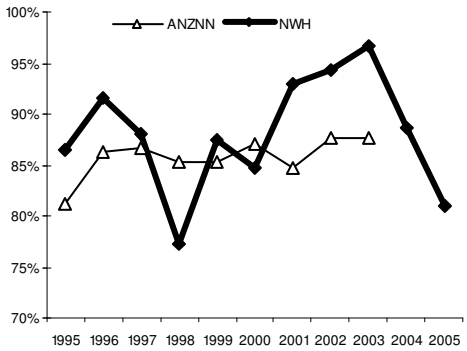

Figure 98: Survival at 26-7 weeks

1995-2003	ANZNN	66%.
	NW	72% (CI 66%-78%).

1995-2003	ANZNN	86%.
	NW	89% (CI 85%-92%).

Survival at NW at these immature gestations is consistently good. The relatively small numbers at 24-25 weeks gestation accounts for the year to year variation at NW. Over the 11 years, there were between 21 and 37 babies per year. These data are for all babies admitted, including those with lethal malformations but excluding deaths in the delivery room.

7.10.3 Intraventricular haemorrhage

Overall, 14% of VLBW infants had any degree of IVH in 2005. Because of the change in scanning policy, 19 (13%) mainly larger infants were not scanned. These babies are unlikely to have had an IVH. In the group under 32 weeks' gestation, the incidence of any degree of IVH was also 14%.

Six babies had more severe grades of IVH (grade 3 or 4). Four of these were under 1000gms and 5 were under 26 weeks' gestation. Three of these 6 babies died.

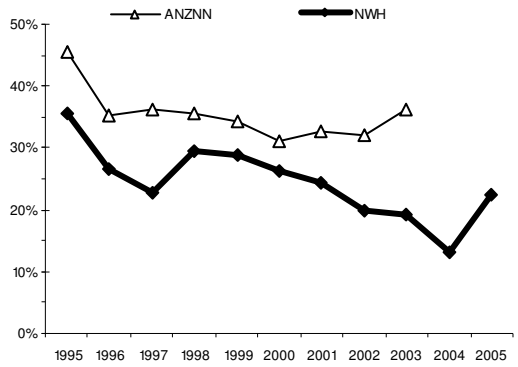

Figure 99: Any IVH at 24-7 weeks

1995-2003 ANZNN 35%.
NW 26% (CI 23%-30%).

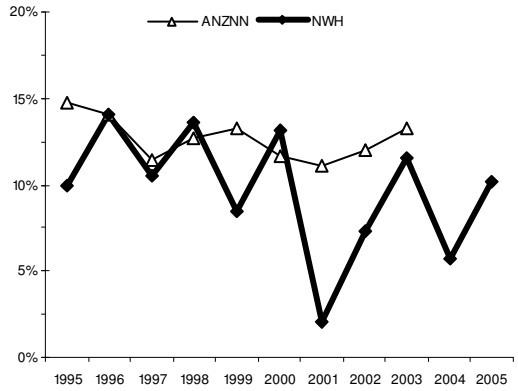

Figure 100: Severe (G3-4) IVH at 24-7 weeks

1995-2003 ANZNN 13%.
NW 10% (CI 8%-13%).

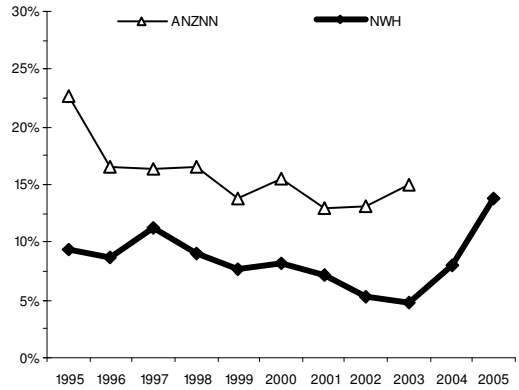

Figure 101: Any IVH at 28-31 weeks

1995-2003 ANZNN 16%.
NW 8% (CI 6%-10%).

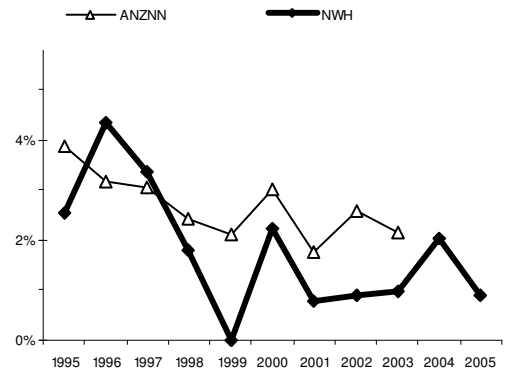

Figure 102: Severe (G3-4) IVH at 28-31 weeks

1995-2003 ANZNN 3%.
NW 1% (CI 1%-3%).

The incidence of all grades is falling both in the Network and at NW. NW rates are consistently lower than the overall rate in the rest of ANZNN.

7.10.4 Cystic periventricular leukomalacia

Two babies developed cystic PVL in 2005. One was an unusual presentation at birth of a baby of 24 weeks gestation, with PVL confirmed at post-mortem examination. The other occurred in a baby of 29 weeks gestation weighing 1000gms.

7.10.5 Retinopathy of prematurity

From 1995 to 1997 the denominator for the ROP data was the number of infants alive at 42 days of age (ANZNN definition). From 1998 onwards, it is those alive at 36 weeks post-menstrual age. This definition change makes very little difference to the results.

In 2005, NW changed its screening policy. Therefore there is an increase in the number of larger infants who were not screened. Prior to 2005, babies <1500gms or <32 weeks were screened. This has changed to babies <1250gms or <30 weeks gestation.

Only one baby developed Stage 3 ROP in 2005. This baby was born at 25 weeks gestation weighing 790gms. He developed stage 3 “plus” ROP prior to treatment.

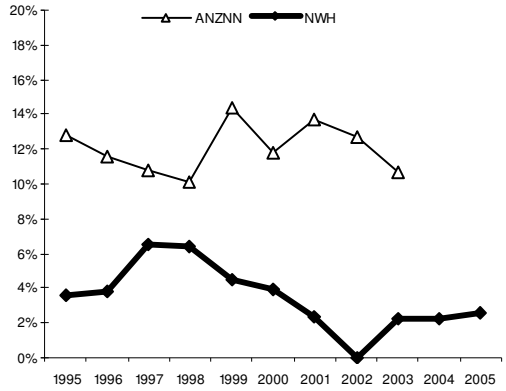

Figure 103: ROP at 24-7 weeks

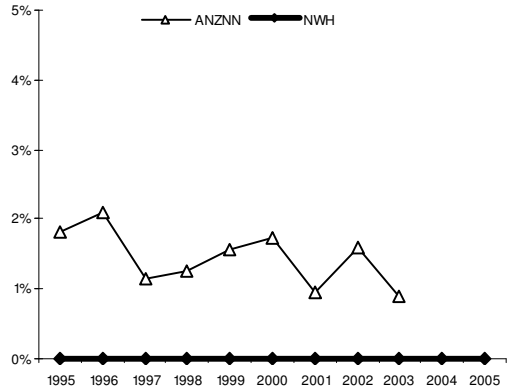

Figure 104: ROP at 28-31 weeks

1995-2003	ANZNN	12%.
	NW	4% (CI 2%-6%).

1995-2003	ANZNN	1%.
	NW	0% (CI 0%-0.5%).

Retinopathy of prematurity is largely confined to very immature infants. Severe stages remain very uncommon at NW. This may in part be related to the examination method used. Indentation of the eye to examine the periphery of the retina has not been used in the past but has been introduced in 2006

Over eleven years, no baby with a gestational age of 28 weeks or more has been diagnosed with severe ROP at NW.

7.10.6 Chronic lung disease

The ANZNN definition of chronic lung disease is used. CLD is the requirement for oxygen or any form of respiratory support (CPAP or IPPV) at 36 weeks post menstrual age. In some publications, the definition is only a requirement for supplemental oxygen. Including respiratory support in the definition increases the incidence. If the definition of "in oxygen" was used, the incidence of CLD in the <1500gm infants would fall from 18% of survivors to 14%.

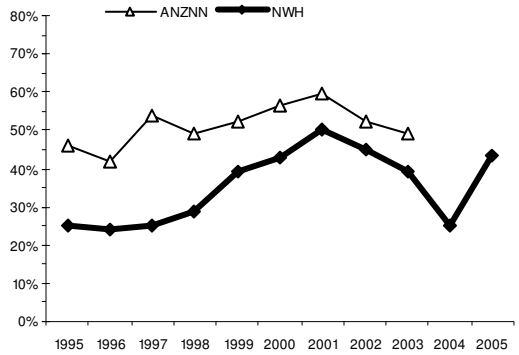

Figure 105: Chronic lung disease at 24-27wks

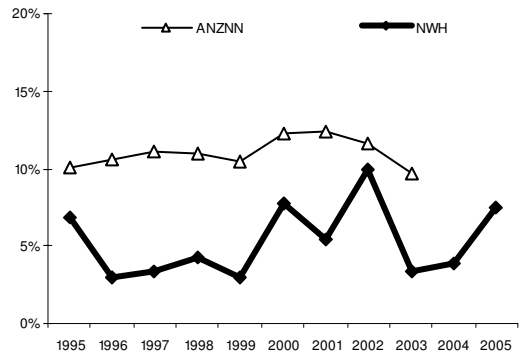

Figure 106: Chronic lung disease at 28-31wks

1995-2003	ANZNN	51%.
	NW	34% (CI 31%-39%).

1995-2003	ANZNN	11%.
	NW	5% (CI 4%-6%).

The rate of chronic lung disease seems to have increased over the 1990s, despite changes in treatment and 'advances' in care. The incidence fell from 2002-3, probably related to a change in oxygen saturation targets. The low rate in 2004 was because of a higher proportion of more mature babies in this 24-27 week cohort.

The incidence of CLD in 28-31 week gestation infants is lower at NW than in the rest of the Network, although the Network rate is falling.

The definition of CLD has never been totally satisfactory, as the condition is defined by the treatment being given. There have been changes in the way these treatments have been applied. In early years oxygen requirement was determined by a variety of inaccurate methods. Pulse oximetry was introduced in the early 1990s. The oxygen saturation level targeted increased in the late 1990s, only to fall again in 2002 with the presentation of the BOOST trial of oxygen saturation in CLD. It is likely that much of the temporal trend in the incidence of CLD is due to change in treatment used rather than any changes in underlying lung injury.

7.10.7 Necrotising enterocolitis

In 2005 4% of VLBW infants and 3% of <32 week gestation infants developed NEC. Although the incidence remains low overall, there seems to have been an increase in the incidence over the last three years. This is particularly evident in infants under 28 weeks' gestation. In 2005, four of the eight deaths in admitted babies at 24-5 weeks' gestation were due to NEC.

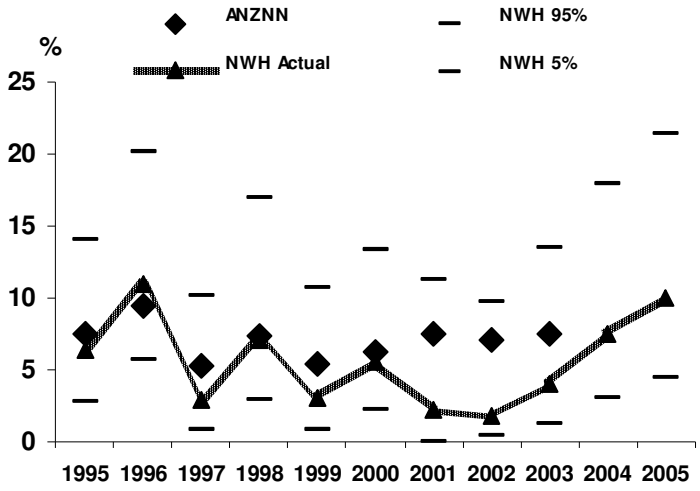

Figure 107: NEC in babies under 28 weeks gestation (with 95% confidence intervals) compared with the incidence in the ANZNN 1995-2005

In view of this apparent increase, a detailed case controlled study has been undertaken to attempt to identify factors that are associated with NEC. Concurrent and historical controls were used to try to identify any changes in treatment that may be important. This study showed few changes in care. Some babies who developed NEC had a more rapid increase in oral feeds (breast milk). It is unclear whether there is a causal relationship between this and the occurrence of NEC.

7.10.8 Patent Ductus Arteriosus

The incidence of PDA requiring treatment remains steady, with the treatment rate in VLBW infants varying between 26% and 29% over the last 5 years. In infants,<1000gm, the treatment rate has varied between 46% and 59%.

In 2005, 41 inborn and three outborn babies were treated with indomethacin. In the VLBW infants, 39/148 (26%) were treated. At under 31 weeks gestation, 41/176 infants (23%) were treated. Treatment was size and gestation related, with 85% of the treated infants being <1000gm birth weight and 78% being <28 weeks' gestation. No babies over 31 weeks' gestation or 1500gm birth weight were treated.

Twenty-nine of the 41 inborn babies received an initial long (7-day) course of indomethacin. Eleven received a short course. Five babies received two courses and one three courses. Indomethacin was started on day 1-2 in 7 babies, day 3-4 in 20 and day 5-6 in 5. Six babies were first treated in the second week and three in the third week.

In 2005, one inborn and two outborn infants had surgical ligation of the PDA. All had been treated previously with indomethacin.

7.10.9 Pneumothorax needing drainage

Thirteen inborn babies developed a pneumothorax that needed drainage in 2005. An additional five outborn babies had pneumothoraces drained.

7.10.10 Antenatal corticosteroids

Antenatal steroid use is high in the Network and NW. In babies <32 weeks' gestation, 94% receive corticosteroids before birth. However, only just over half receive optimally timed course.

There is a pleasing increasing trend in the use of antenatal steroids, both at NW in the ANZ Network.

The ANZNN defines corticosteroids given 1 to 7 days before birth as "optimal" antenatal corticosteroids. Any corticosteroid refers to babies who had corticosteroids at any time before birth and includes those receiving an optimal course.

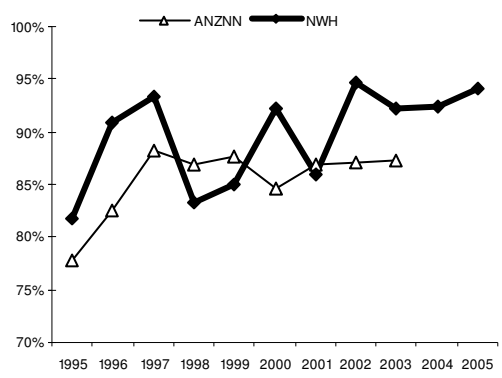

Figure 108: Antenatal corticosteroids at 24-7 weeks

1995-2003	ANZNN	87%.
	NW	88% (CI 86%-91%).

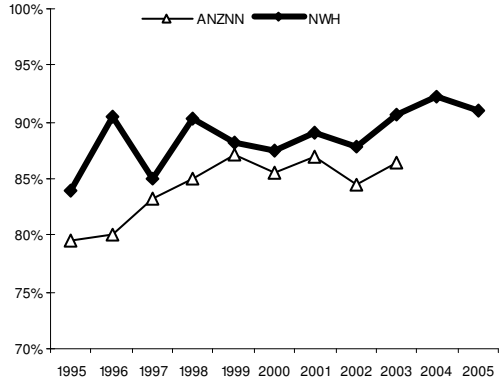

Figure 109: Antenatal corticosteroids at 28-31 weeks

1995-2003	ANZNN	84%.	
	NW	88%	(CI 86%-90%)

7.10.11 Postnatal corticosteroids

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

In the mid-1990s, dexamethasone became an accepted and proven treatment to lessen the severity of CLD. However, use then declined when concerns were raised as to whether dexamethasone may increase the rate of cerebral palsy in survivors. In the last few years it has become clearer which babies may benefit from postnatal dexamethasone. With this, the use of dexamethasone has increased slightly over the last three years.

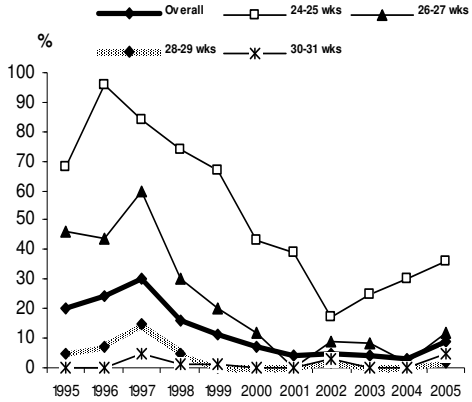

Figure 110: Percentage receiving postnatal dexamethasone by gestational age

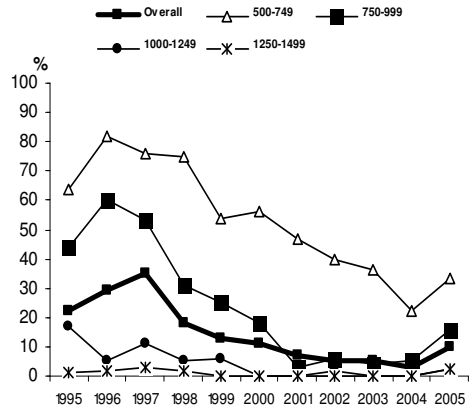

Figure 111: Percentage receiving postnatal dexamethasone by birth weight

In 2005, 9% of babies <32 weeks gestation were treated with dexamethasone, with the rates decreasing with advancing gestational age from 36% in those of 24-25 weeks gestation to 5% of those at 30 -31 weeks gestation.

7.10.12 Caesarean section for babies <32 weeks gestation

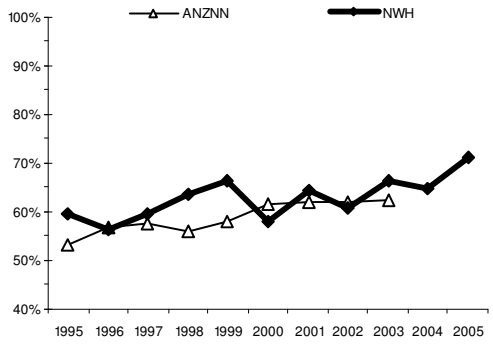

Figure 112: Caesarean section at 24-31wks

1995-2003 ANZNN 59%.
NW 61% (CI 59%-64%).

Approximately 60% of these very immature infants are delivered by Caesarean. Caesarean section rates are slowly increasing in both the Network and at NW.

7.11 Death of babies born in or admitted to National Women's in 2005

There were 56 neonatal and infant deaths in 2005. These include all deaths of babies born in NW or admitted to NICU before 28 days or up to hospital discharge, whichever is the greater. Forty-nine of the 56 infants who died were born in ACH.

Thirty-two deaths (57%) were in babies of <28 weeks' gestation. Twenty-eight of these were in babies without serious anomalies. Sixteen of the 28 (57%) infants who died were not resuscitated because of their extreme prematurity and died in the delivery room. Resuscitation was unsuccessful in one baby who was also not admitted to NICU.

Only eleven of the 32 extremely premature infants who died were actively treated and admitted to NICU. Seven of these were born at 24 weeks' gestation. Their causes of death were respiratory failure in 3, necrotising enterocolitis in 4 and severe intraventricular haemorrhage or periventricular leukomalacia in 4.

At NW, parents who are expected to deliver very preterm are counselled about the likelihood of survival and long term problems. The guidelines that are used to counsel parents are on the Newborn website[6]. Parents are advised that the outcomes of babies at 23 weeks' gestation are poor, both in terms of a low chance of survival and high chance of survivors having significant developmental problems. The recommended action is that such babies not be actively treated. Treatment is not offered at 22 weeks' gestation. At 24 weeks gestation the outcomes are better and most parents elect to have their baby actively treated at birth.

The second largest group of babies who died are the 21 infants with serious congenital anomalies. Eight of these babies died despite active treatment. Six had cardiac malformations, one a diaphragmatic hernia, one scimitar syndrome and one idiopathic pulmonary hypoplasia.

Thirteen babies had anomalies that were severe enough not to be offered treatment or to have treatment withdrawn when the extent of the anomalies was appreciated. Three of these babies were induced at 20-24 weeks' gestation because of the anomaly and died at birth. Eleven of the babies were delivered at NW and two transferred postnatally.

Three moderately premature infants (28-36 weeks' gestation) and four term infants died. Only two of the term infants who died of neonatal problems were born in NW.

Two term babies who had been born at ACH died in the neonatal period after readmission to Starship Hospital. One had severe bronchiolitis. The other was in a moribund state and found to have a significant congenital cardiac disease.

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

7.12 Child Development Unit

7.12.1 Follow up at 18 months of children under 1500 grams born in 2003

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

Five infants had congenital abnormalities that were considered to warrant exclusion from the following tables although most children were assessed.
Fourteen children were lost to followup, three weighed under 1000 grams. Seven were from other centres in New Zealand, three lived overseas, and four were in Auckland but unable to attend appointments. Data were obtained for 123 (90%) children.

Children received individual assessment at the Child Development Unit, and when this was not possible (mainly because of distance from home to National Women's), reports were obtained from professionals monitoring their progress.

The *Bayley Scales of Infant Development-II* were administered by a registered psychologist as close as possible to the child reaching 18 months chronological age. Mental and Motor scores were adjusted/corrected for the length of time the child was born preterm. Neurological examinations were carried out by paediatricians. Children were placed in outcome categories as set out in the table below.

Table 52: Outcome Categories for Infants under 30 Months of Age

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

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

* Bayley Scales of Infant Development II – all scores adjusted for gestational age.

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

Table 53: Outcome Categories at 18 Months for Children Under 1500g

	Number	Description
Category I	3 (2.4%) .	1 with cognitive and motor impairment and severe visual impairment; 1 with spastic quadriplegia, developmental delay and squint; 1 with low cognitive and motor scores
Category II	17 (13.8%)	1 with cognitive and motor impairment and tonal abnormality, 1 with cognitive and motor delays and squint (spectacles); 6 with low cognitive and motor scores; 9 with low cognitive scores.
Category III	20 (16.3%)	3 with low motor scores and tonal abnormalities, 17 with motor delay.
Category IV	83 (67.5%)	

Table 54: Outcome of children <1500g born in 2003 at 18 months by gestational age groups (n = 123)

	Gestational Age (Weeks)					
Outcome	**24-27 Weeks N=44**		**28 – 36 Weeks N=79**		**Total N=123**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	1	2	2	3	3	2
II	6	14	11	14	17	14
III	9	20	11	14	20	16
IV	28	64	55	70	83	68

Table 55: Outcome of children <1500g born in 2003 at 18 months by birth weight groups (n=123)

	Birthweight (Grams)					
Outcome	**<1000gms N=41**		**1000 – 1499 gms N=82**		**Total N=123**	
Category	**n**	**%**	**n**	**%**	**n**	**%**
I	1	2	2	2	3	2
II	7	17	10	12	17	14
III	9	22	11	13	20	16
IV	24	59	59	72	83	68

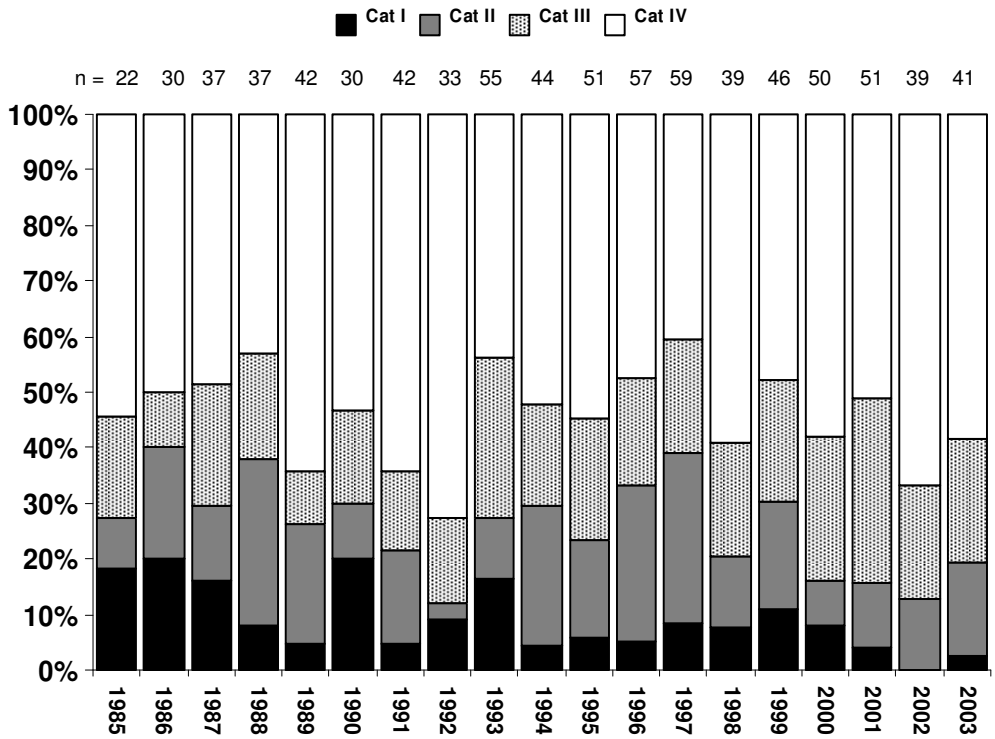

Figure 113: Outcome at 18 months of children <1000g birth weight with known outcomes born 1985-2003. N = 805

7.12.2 Development at 4 years of children under 1500g born in 2001

One hundred and fifty-three children born in 2001, who weighed less than 1500 grams and were cared for in the Newborn Service, survived to hospital discharge. Six children had congenital abnormalities and were not included in the analyses of data.

Between the collating of information at 18 months, and assessment at 4 years, one child died at 3 years.

At 4 years, 92 children were assessed at the Child Development Unit. Of the 54 not seen, 36 (67%) were known to be overseas or in other centres in New Zealand. (Ten children born in 2001 were lost to follow-up at 18 months, but the remaining 44 who were not assessed at 4 had outcome data recorded at 18 months. One child was in Category I, 4 in Category II, 11 in Category III and 28 in Category IV).

When the children turned 4 years, two registered psychologists 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 56: 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 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 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 Scale 4th edition.*
† *Vineland Adaptive Behavior Scales, 1984* : Motor Skills Domain.

Table 57: Outcome categories at 4 years for children under 1500g born 2001 (n = 92)

	Number	Description
Category I	8 (8.7%)	One child with spastic quadriplegia and cognitive impairment One child with mild cerebral palsy, cognitive and motor impairment 6 children with cognitive impairment and low motor scores.
Category II	15 (16.3%)	11 with low cognitive and motor scores 3 with low cognitive scores and motor skills within the average range 1 child with cerebral palsy and a low motor score.
Category III	17 (18.5%)	When tested, these children were within the average range for cognitive performance but below average for motor ability.
Category IV	52 (56.5%)	

Summary

- Admission numbers have decreased in response to regional changes in bed numbers and development of local Level 2 services. However, the number of infants admitted who weigh <1500g or are <32 weeks gestation at birth is stable.
- Survival in infants <1500g has been stable over the past decade.
- There is little or no decrease in major neurological or respiratory morbidity in survivors.
- NW NICU outcomes to discharge compare favourably to those reported by ANZNN.
- Severe neurodevelopmental morbidity into childhood occurs in a minority of surviving infants. Most surviving children will have a normal developmental outcome at follow-up at 18 months and 4 years.

Implications

- Audit of both short- and long-term outcomes, with appropriate investigation of trends and comparison to ANZNN benchmarking data, will be ongoing.

section 8

PERINATAL MORTALITY

8 PERINATAL MORTALITY

This chapter provides information on perinatal and maternal deaths. Further data tables can be found in Appendix 8.

National Women's has a Bereavement team who care for women experiencing pregnancy loss, termination for fetal abnormality, intrauterine death and neonatal loss.

The Bereavement team comprises of: midwifery, nursing and medical staff, pregnancy loss counsellors, chaplaincy, pathology team and the funeral directors.

The aim of the service is to provide safe, respectful, culturally sensitive and holistic woman and whanau focused care; ensuring the legalities are completed. As a team we believe the care given to parents should be responsive to their individual feelings and needs. Parents should be able to feel in control and should be supported in making their own decisions about what happens to them and to their baby. We acknowledge that all communication with parents should be clear, sensitive and honest.

We believe that all those who care for families who experience loss of a pregnancy or baby's death should be well informed, have access to support for themselves and be given opportunities to develop their knowledge, understanding and skills.

All women experiencing acute pregnancy loss will be seen on Women's Assessment Unit (WAU). If under 20 wks and stable they will be transferred to the Gynaecology ward. If over 20wks they will remain on WAU. Those women having a Termination of Pregnancy over 20wks for fetal abnormality will be cared for on WAU. Women under 20wks will be cared for in Ward 97. WAU has a specified bereavement room which is homely in design and encourages whanau involvement. The Quiet Room for National Women's is situated on WAU and open to everyone. It is also available for small farewell ceremonies and a quiet area for families to come together and say goodbye. The Rose Room is a facility for keeping babies nearer their parents and facilitates the grieving process and allows parents to see their baby when they wish.

All perinatal deaths are reviewed by a multidisciplinary team comprising an obstetrician (MFM subspecialist), neonatologist, midwife, and perinatal pathologist. The pregnancy loss counsellor has recently joined this team. This group classifies the cause of death, summarises recommendations for management in a future pregnancy and if necessary makes recommendations about changes in systems and education for practitioners.

8.1 Perinatal and perinatal–related mortality rates

Table 58: Inborn and BBA deaths

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

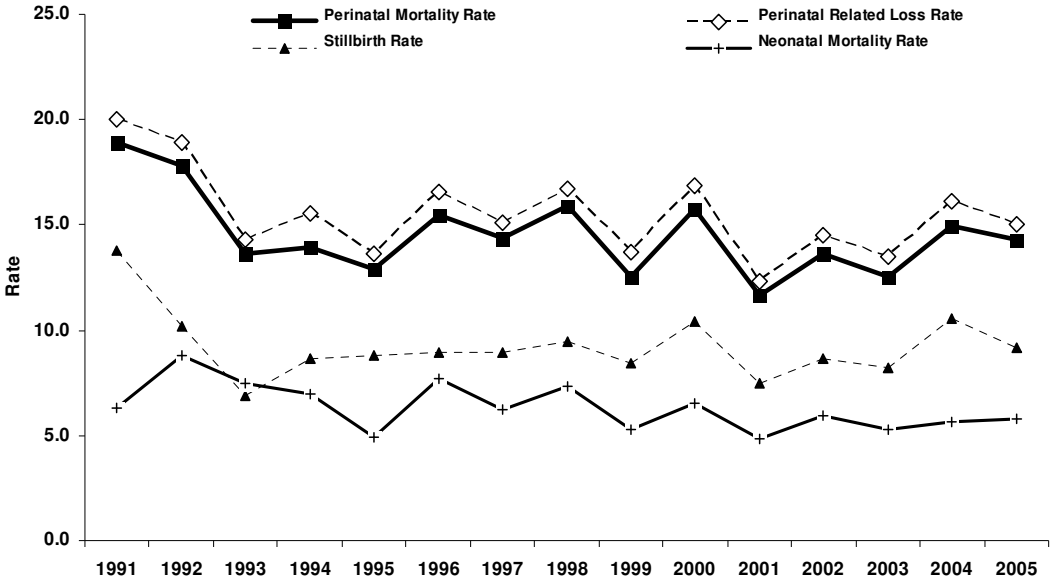

Figure 114: Perinatal mortality rate, perinatal related loss rate, stillbirth rate and neonatal mortality rate 1991-2005 (all rates expressed as deaths/1000 births)

All babies born at National Women's who were transferred out of National Women's and died within 7 days of birth have been included in the perinatal death rate, and those who died within 28 days of birth have been included in the perinatal related death rates.
The stillbirth and neonatal mortality rates have remained stable over the last 5 years at National Women's.

8.2 Gestational age and perinatal-related loss

Table 59: Gestational age and perinatal related mortality

	Births		Stillbirths			Neonatal deaths			Total perinatal related deaths		
	n	%	n	%	SB rate*	n	%	NND rate **	n	%	Perinatal related death risk***
20-27 weeks	108	1.5	41	61	5.6	27	63	402.9	68	61	9.2
28-31 weeks	139	1.9	9	13	1.2	2	5	15.4	11	10	1.5
32-36 weeks	559	7.6	8	12	1.1	6	14	10.9	14	12.6	2.0
37-40 weeks	5437	73.6	9	13	1.4	5	12	0.9	14	12.6	2.1
≥41 weeks	1141	15.5	1	1	0.9	3	7	2.6	4	4	3.5
Total	7384	100	68	100	9.2	43	100	5.9	111	100	15.0

* Stillbirth rate = number of stillbirths per 1000 fetuses 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 at that gestation bracket

8.3 Maternal characteristics and perinatal mortality

In 2005 as in 2004, both Maori and Pacific women had higher perinatal mortality than European where as Asian women had a reduced rate. In Maori the increased rate was predominantly due to higher neonatal mortality. These cases were reviewed in more detail and were found to be heterogeneous. Four (40%) died due to extreme prematurity, 4 had lethal fetal abnormalities and 2 babies died at 24 weeks from Twin to Twin Transfusion Syndrome.

In Pacific women the high perinatal mortality was due to an increased number of stillbirths. These 18 stillbirths have been reviewed individually. Nine (50%) were Samoan, 5 (28%) Tongan, and 4 (22%) other Pacific ethnicity. BMI was available in 13/18 cases and in 9 women was >35 and in 4 of these women was >40. Seven (39%) of Pacific stillbirths were due to fetal abnormalities, and 4 (22%) were unexplained. In 2 cases sub-dural and/or intra-cerebral haemorrhage was confirmed and in a further case it was suspected on scan but no post-mortem was performed.

The increased stillbirth rate in Pacific women appears to be multi-factorial. As confirmed in our data maternal obesity (BMI >30) is a known risk factor for stillbirth. Large prospective studies with complete data on body mass index are needed to determine whether Pacific ethnicity is an independent risk factor for stillbirth.

Sub-dural haemorrhage is a rare cause of stillbirth almost totally confined to Pacific island babies. This condition was seen more commonly in the 1970s and 1980s. The aetiology is unknown but some women have reported traditional Pacific Island massage during an affected pregnancy. In the 2 confirmed and one suspected case of fetal sub-dural there was no reported history of maternal traditional massage.

BMI data was available in 50% of stillbirths and 58 % of neonatal deaths. Given these limited data, obesity (BMI>30) was associated with a 2 fold increase in perinatal death which is consistent with overseas data showing a 2-5 fold increase in obese women.

Current smoking and unknown smoking status were associated with an increased perinatal death rate. A small number of women with perinatal deaths were reported to have stopped smoking during pregnancy and they had a trend to increased perinatal deaths. Overseas data suggests that if women become smoke free by 16 weeks that in our data the risk of perinatal loss is similar to non smokers. The explanation for the observed trend might be: small numbers, that some of these women were not truly smoke free or that they did not become smokefree early enough in pregnancy to impact on the risk of perinatal death. Women transferred to National Women's and unbooked women are over-represented among women without smoking data. These women have other risk factors, including high rates of preterm birth for perinatal loss

8.4 Plurality and perinatal mortality

Table 60: Plurality and perinatal related mortality

	Births		Stillbirths			Neonatal deaths		Total perinatal related deaths	
	n	%	n	%	SB rate*	n	% NND rate‡	n	% Perinatal related death rate†
Singleton	7007	94.9	63	92	9.0	31	72 4.5	94	85 13.4
Multiple	377	5.1	5	7	13.3	12	28 32.3	17	15 45.1
Total	7384		68		9.2	43	5.9	111	15.0

* Stillbirth rate = number of stillbirths per 1000 births

‡ Neonatal Death rate = number of deaths per 1000 live births

† Perinatal-related Death rate = number of perinatal related deaths per 1000 births

Multiple pregnancies had a 3 fold higher risk of perinatal death compared with singleton pregnancies. The causes of death in multiples were: preterm birth (n=7, 41%), twin to twin transfusion syndrome (n=5, 29%), fetal abnormality (n=3, 18%) and one termination for a severe maternal medical condition (n=2, 12%)

8.5 Lead maternity carer (LMC) at birth and perinatal mortality

Table 61: LMC and perinatal related mortality

	Births		Stillbirths			Neonatal deaths			Total perinatal related deaths		
	n	%	n	%	SB rate*	n	%	NND rate‡	N	%	Perinatal related death rate†
Independent Midwife	3023	41.1	15	22.0	5.0	15	34.9	5.0	30	27.0	9.9
Private Obstetrician	1651	22.5	9	13.2	5.5	4	9.3	2.4	13	11.7	7.9
G.P.	172	2.3	1	1.5	5.8	0	0	0	1	0.9	5.8
NW Medical	375	5.1	9	13.2	24	10	23.2	27.3	19	17.1	50.7
NW Diabetes	216	2.9	2	2.9	9.2	1	2.3	4.7	3	2.7	13.9
NW Domino	596	8.1	2	2.9	7.3	0	0	0	2	1.8	3.4
NW Community	1098	14.9	8	11.8	7.3	6	14.0	5.5	14	12.6	12.8
NW ADAPT	79	1.1	2	2.9	25.3	0	0	0	2	1.8	25.3
Other DHB	145	2.0	16	23.6	110	5	11.6	38.8	21	18.9	144.8
Unbooked	55	0.7	4	5.8	73	2	4.7	39.2	6	5.4	109
Total	7384	100	68	100	9.2	43	100	5.9	111	100	15.0

* Stillbirth rate = number of stillbirths per 1000 births
‡ Neonatal Death rate = number of deaths per 1000 live births
† Perinatal related death rate = number of perinatal related deaths per 1000 births

The high perinatal mortality rate in the fetal medicine/medical clinics likely largely reflects the increased death rate in babies with severe congenital abnormalities.

8.6 Causes of perinatal-related deaths

Table 62: Stillbirth and neonatal death by cause (PSANZ-PDC) 2005

	Fetal deaths			Neonatal deaths			Total		
	n	%	Rate*	n	%	Rate**	n	%	Rate*
Congenital abnormality	25	37	3.4	13	30	1.8	38	34	5.1
Perinatal infection	6	9	0.8	5	12	0.7	11	10	1.5
Hypertension	3	4	0.4	0	0	0	3	3	0.4
Antepartum haemorrhage	3	4	0.4	3	7	0.4	6	5	0.8
Maternal conditions	7	10	0.9	1	2	0.1	8	7	1.1
Specific perinatal conditions	5	7	0.7	5	12	0.7	10	9	1.4
Hypoxic peripartum death	1	1	0.1	3	7	0.4	4	4	0.5
Fetal growth restriction	1	1	0.1	0	0	0	1	1	0.1
Spontaneous preterm	7	10	0.9	13	30	1.8	20	18	2.7
Unexplained antepartum death	10	15	1.4	0	0	0	10		1.4
Total	68	100	9.2	43	100	5.9	111	100	15.0

* Rate: per 1000 births (n=7384 in 2005) ** Rate: per 1000 livebirths (n=7316 in 2005)

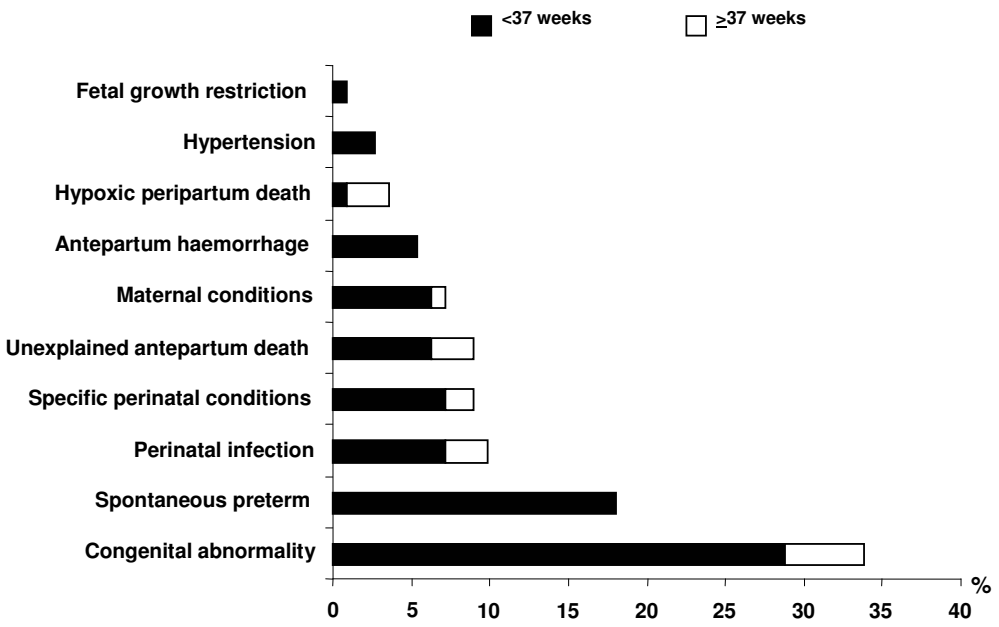

Figure 115: Contribution to perinatal death by cause (PSANZ-PDC) and gestation at birth

8.7 Neonatal deaths

Table 63: Neonatal deaths by cause (PSANZ-NDC) and gestational age

	Total neonatal deaths	< 37 weeks		≥ 37 weeks	
		n	%	n	%
Total	43	35	81	8	19
Extreme prematurity	17	17	100	0	
Congenital abnormality	11	7	64	4	36
Infection	5	4	80	1	20
Neurological	5	3	60	2	40
Cardio-respiratory disorders	4	3	75	1	25
Gastrointestinal	1	1	100	0	

In recent years the commonest category of perinatal deaths after 37 weeks has been unexplained antepartum death. This year there were 3 perinatal deaths due to infection, 2 late stillbirths had E coli cultured from the lungs and one baby died in the neonatal period after hospital discharge from an unspecified viral infection.

8.8 Necropsy

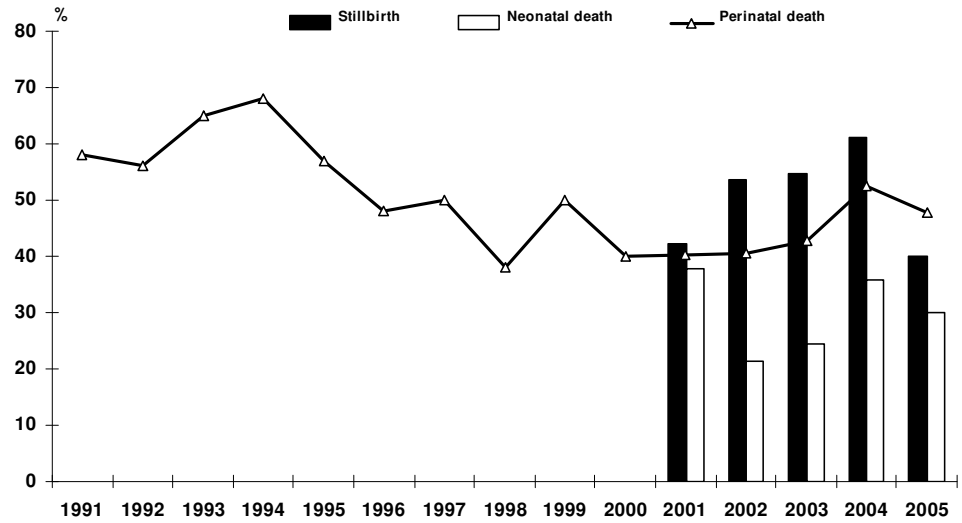

Figure 116: Necropsy rates 1991-2005

8.9 Maternal deaths

In 2005 there were 2 maternal deaths, one associated with hyperemesis in the antenatal period and one with an amniotic fluid embolism intrapartum. These deaths have been reviewed by a subgroup of the Maternal Clinical Review Committee.

section 9 FERTILITY SERVICES

9 FERTILITY SERVICES

This chapter documents the IVF and ICSI clinical outcomes from Fertility Plus in 2005 and a discussion on recent advancements in the service

Table 64: Fertility Plus IVF/ICSI clinical outcomes

	1999	2000	2001	2002	2003	2004	2005
Number of Cycles started	132	125	289	309	306	316	398
Number of Cycles stopped						41	41
Percent cycles stopped						13%	10%
NPSU 2000 benchmark for cycles stopped		10%	10%	10%	10%	10%	10%
Number of Cycles reaching Oocyte Pick Up (OPU)	100	115	230	247	246	275	357
Number of Cycles reaching Embryo Replacement	80	99	189	201	206	237	304
Percent cycles reaching Embryo Replacement						86%	85%
NPSU 2002 benchmark for replacement				87%	87%	87%	87%
Number of Clinical Pregnancies	23	24	57	65	67	83	96*
Clinical pregnancy rate/cycle started						26%	24%*
NPSU 2000 benchmark for clinical pregnancy rate/cycle started		24%	24%	24%	24%	24%	24%
Clinical Pregnancy rate/OPU	23%	21%	25%	26%	27%	30%	27%*
NPSU 2002 benchmark Clinical pregnancy rate /OPU				26%	26%	26%	26%
Clinical Pregnancy rate/Embryo Replacement	29%	24%	30%	32%	33%	35%	32%*
Clinical Pregnancy rate/Embryo Replacement (women ≤35yrs with FSH<9)						45%	36%*
NPSU 2002 benchmark Clinical pregnancy rate/embryo replacement				31%	31%	31%	31%
Twin Pregnancy rate						20%	12.5%*
NPSU 2002 benchmark Twin Pregnancy rate				≤20%	≤20%	≤20%	≤20%

*See single embryo transfer policy below

Single embryo transfer policy

In 2005, women under 36 who were having a first or second embryo transfer with at least one good quality embryo, were required to have only one embryo transferred. This was a Government initiative when public funding for a second cycle of treatment was introduced and was an attempt to decrease the twinning rate because multiple pregnancies carry risks to mothers, babies and relationships. There is also an increased cost to the Government because of the time babies spend in NICU.

As expected, the replacement of only one embryo in these younger women resulted in a decrease in their pregnancy rate, in the overall pregnancy rate, and in the twinning rate for the year. However, the percentage of embryos replaced that resulted in a pregnancy did not decrease. This is the Implantation Rate and was 20% in both 2004 and 2005.

Preimplantation genetic diagnosis (PGD)

Government funding has recently been made available for screening of embryos before transfer. Preimplantation genetic diagnosis (PGD) is currently being developed at fertility PLUS. PGD allows couples at risk of passing on a genetic disease to have a child that does not carry the genes for the disease and that is fully related to them. It is a diagnostic test generally performed on day 3 embryos (8 cell stage) to detect known genetic diseases or chromosomal abnormalities.

Previously, options for screening included amniocentesis and chorionic villus sampling, but these techniques pose couples with the dilemma of whether or not to terminate the pregnancy if a genetic abnormality is present. PGD facilitates diagnosis before embryos are replaced allowing for the transfer of unaffected embryos only.

PGD is most useful for patients who are at risk of passing on single gene defects like Cystic Fibrosis, Thalassemia, Tay Sachs, Spinal Muscular Atrophy or Huntington's disease. It is also useful for detecting the chromosomal abnormalities (aneuploidy) that result in Down Syndrome (an extra chromosome 21), Kleinfelter syndrome (47XXY) or Turner Syndrome (45X).

IVF or ICSI is required in order to perform PGD. On Day 3 the embryos are "biopsied" to remove a cell. A small hole is made in the shell of the embryo (zona pellucida) using a laser and 1 or 2 cells are gently removed from the embryo. The cells from each embryo are then analysed to look for abnormalities by either PCR (Polymerase Chain Reaction) or FISH (Fluorescence in situ Hybridisation). PCR is mainly used for detecting single gene defects. Multiple copies of the piece of DNA coding for the gene in question are made using PCR. They are then analysed for the presence of mutations. FISH is used to detect sex-linked disorders, chromosomal abnormalities and aneuploidies. A fluorescent marker is attached to chromosome-specific DNA probes and mixed with the DNA obtained from the removed cells. Fluorescence microscopy is then used to detect coloured spots corresponding to specific chromosomes thus allowing abnormal chromosomes to be detected.

Currently, after embryo biopsy, the cells will be sent to Australia for analysis. The results will be available within 48 hours, during which time, the remaining embryo will stay in New Zealand and be cultured to the blastocyst stage. Embryo(s) not affected by the disease will be transferred to the uterus on Day 5 or 6. Any "spare" normal embryos can be frozen at the blastocyst stage.

section 10 GYNAECOLOGY

10 GYNAECOLOGY

10.1 Hyperemesis

Methods

These data were sourced from DSU. They include all inpatient admissions to the gynaecology or obstetric services during 2005 coded with a diagnosis of hyperemesis within the first six diagnostic codes. The numbers were reconciled against Electronic Discharge data for the gynaecology inpatient service. This process revealed a further 2 hyperemesis visits. These visits are not included in the tables below.

Data for re-admissions have been presented but these data do not include repeat admissions if these occurred in 2004 and 2006. Therefore re-admissions are likely to have been underestimated.

Findings

Table 65: Demographic characteristics of women admitted with hyperemesis

	Total N=177		Single admission n=115		Multiple admissions n=62	
	n	%	n	%	n	%
Maternal age						
≤ 20	15	8.5	11	9.6	4	6.5
21-25	48	27.1	30	26.1	18	29.0
26-30	47	26.6	33	28.7	14	22.6
31-35	39	22.0	22	19.1	17	27.4
>35	28	15.8	19	16.5	9	14.5
Ethnicity		0.0				0.0
NZ European	47	26.6	34	29.6	13	21.0
Māori	7	4.0	5	4.3	2	3.2
Pacific	50	28.2	29	25.2	21	33.9
Asian	17	9.6	12	10.4	5	8.1
Indian	30	16.9	19	16.5	11	17.7
Other European	6	3.4	2	1.7	4	6.5
Other	19	10.7	13	11.3	6	9.7
Unstated	1	0.6	1	0.9	0	0.0
District Health Board						0.0
Auckland	151	85.3	95	82.6	56	90.3
Counties Manukau	10	5.6	8	7.0	2	3.2
Waitemata	14	7.9	10	8.7	4	6.5
Other DHB	2	1.1	2	1.7	0	0.0
Number of admissions						
1	177		115	100		
2					38	61
3					12	19
4 -7					11	18
Length of stay (median (IQR))			1.5(0.5-2.2)		2.9(1.6-4.2)*	

* Based on 174 admissions

Seven women admitted with hyperemesis are recorded as having had an enteral infusion.

Summary /Implications

Hyperemesis is a challenging problem for all involved. It is significant that one third of women have more than one admission. The establishment of a day stay facility for these women has been proposed in the past and should be given further consideration especially for those women requiring repeat admissions. During the day stay the patients could have their electrolytes checked, be given intra-venous fluids and have their medications reviewed.

10.2 Ectopic pregnancy

Methods

These data were sourced from the Decision Support Unit coding data (DSU). They include all inpatient admissions to the gynaecology service during 2005 coded with a diagnosis of ectopic pregnancy within the first six diagnostic codes. The numbers were reconciled against Electronic Discharge data for the gynaecology inpatient service. This process revealed a further 1 ectopic visit.

Table 66: Demography and clinical characteristics of inpatient admissions with ectopic pregnancy during 2005

	Women n=106	
	n	%
Maternal age		
≤ 20	7	7
21-25	16	15
26-30	27	26
31-35	34	32
≥35	22	21
Ethnicity		
NZ European	29	27
Māori	8	8
Pacific	20	19
Asian	19	18
Indian	6	6
Other European	13	12
Other	8	8
District Health Board		
Auckland	88	83
Counties Manukau	4	4
Waitemata	11	10
Northland	1	1
Overseas	2	2
Mode of treatment‡		
Expectant*	35	33
Medical	11	10
Surgical**	60	57
No of admissions		
1	79	74.5
2	18	17.0
3	3	2.8
4-6	6	5.7

‡ The data given here denote management during inpatient stay. See text below for outcomes among these women.
*Expectant means that no medical or surgical treatment has been coded during an inpatient admission for this woman.
**Two of these women were first managed medically prior to surgery.

Six further cases were identified from the Early Pregnancy Assessment Unit (EPAU). These cases are not included in the tables of inpatient care given below. Further data on management of women managed conservatively during their inpatient visit were obtained from checking the clinical records in CRIS.

Data for re-admissions have been presented but these data do not include re-admissions if these occurred in 2004 and 2006. Therefore multiple admissions are likely to have been underestimated.

Findings

Of the 35 expectant management cases identified from the DSU data and reported in the table above, 5 ultimately did not have an ectopic pregnancy, 3 further cases were managed with surgery (one of whom then required Methotrexate), 12 were treated with Methotrexate alone, 2 were managed elsewhere by unknown method and 13 had no treatment recorded.

Of the 6 additional cases identified from EPAU records, two were treated with methotrexate and 4 were managed conservatively.

In total, therefore, of 107 apparently confirmed cases of ectopic pregnancy treated within our service (both gynaecology inpatient service and EPAU) in 2005, 25 were managed solely with Methotrexate (23%), and 63 primarily with surgery (59%), two were managed in other places and the remaining 17 women were managed conservatively.

Table 67: Length of stay among all inpatient admissions for ectopic pregnancy (n=151)

	Expectant n= 78	**Medical n=13**	**Surgical n=60**
Length of stay (days)			
Median (IQR)	0.2(0.2-0.9)	0.3(0.2-0.9)	2.5(1.9-3.1)

Of all 106 women admitted as inpatients with a diagnosis of ectopic pregnancy, 9 (8%) were recorded as having had a blood transfusion. All of these women received surgical treatment for their ectopic.

Summary /Implications

Although these data are welcome, they are limited in that the tables do not accurately reflect what happened during the clinical care of these women with an ectopic pregnancy. We do not collect data on their presentation, their management, the HCG levels, their ultrasound findings or their final outcomes.

The current criteria for medical management is a diagnosis of ectopic pregnancy with a β-hCG level <5000 IU/L, an adnexal mass ≤ 3.5 cm and no evidence of tubal rupture (a small amount of fluid in the pouch of Douglas is allowed) in a patient who is haemodynamically stable.

The real quality issue is to find whether or not women who meet the criteria for conservative and medical management with methotrexate are being offered it. We can not judge that from these data. In 2001, almost 90% of women who met the criteria were offered methotrexate and nearly one quarter of women were managed medically which is similar to the 2005 figures. In an audit of 673 women with ectopic pregnancies managed at NWH from 1996-2001. surgery was the primary management in 80% (Aust NZ J Obstet Gynaecol 2002). A laparoscopic procedure was performed in 86.5% (465/533) and 10.9% (51/465) converted to laparotomy. The proportion of women who met the criteria for methotrexate varied from 27% to 54% over the six year period.

10.3 Hysterectomy

Methods

These data were sourced from DSU coding data. They include all inpatient admissions to the gynaecology service during 2005 coded with hysterectomy as a procedure within the first four procedure codes. The numbers were reconciled against Electronic Discharge data for the gynaecology inpatient service. This process revealed a further 4 hysterectomies. These cases are included in the clinical tables below but not in the length of stay data.

The definition "Malignant indication" is not equivalent to "Oncology" as used in the hysterectomy review data presented in the 2000 and 2001-2003 annual clinical reports. "Oncology" in 2000 and 2001-2003 was defined as patients operated on by surgeons working in the oncology service plus by other surgeons with cancer as an indication for surgery. This year the definition is based only on indication for hysterectomy because surgeon is not a variable in the DSU dataset. Our oncology surgeons also provide a service for difficult surgical cases and therefore do perform non-malignant hysterectomies. Therefore, it is likely that the proportion of cases described as oncological this year will be smaller than in the previous years.

Findings

Table 68: Characteristics of women undergoing hysterectomy during 2005 by indication

	Malignant indication n=82		Non malignant n=161	
	n	%	n	%
Maternal age				
<35	5	6	10	6
35-45	14	17	66	41
46-55	19	23	43	27
56-65	24	29	14	9
>65	20	24	28	17
Ethnicity				
NZ European	33	40	62	39
Māori	8	10	17	11
Pacific	15	18	24	15
Asian	4	5	19	12
Indian	4	5	12	7
Other European	12	15	13	8
Other	6	7	11	7
Not stated			3	2
District Health Board				
Auckland	28	34	146	91
Counties Manukau	15	18	5	3
Waitemata	24	29	8	5
Bay of Plenty	10	12	1	1
Other	5	6	1	1

Table 69: Primary indication for hysterectomy (non malignant)

	Non malignant n=161
	n %
Type of hysterectomy	
Total abdominal	77 48
Subtotal abdominal	9 6
Vaginal	54 34
Laparoscopic assisted vaginal (LAVH)	21 13
Indication for hysterectomy	
Excessive frequent menstruation	47 29
Fibroids	34 21
Prolapse	29 18
Benign neoplasm ovary	10 6
Postmenopausal bleeding	8 5
Endometriosis	7 4
Carcinoma in situ-cervix	6 4
Carcinoma in situ/hyperplasia-endometrium	5 3
Dysmenorrhoea/other pain	5 3
Other bleeding	2 1
Other	8 5

Table 70: Length of stay for women having a hysterectomy

	Malignant indication n=82	Non malignant n=157
	Median (IQR)	Median (IQR)
Length of stay	6.3(5.2-7.5)	4.2(3.2-5.2)

Table 71: Length of stay by type of hysterectomy (n=239)

	Total abdominal	Subtotal abdominal	Vaginal	LAVH
	Median(IQR)	Median(IQR)	Median(IQR)	Median(IQR)
Length of stay	5.2(4.2-7)	4.3(3.7-4.9)	3.3(3.1-4.3)	2.5(2.3-4.6)

Summary /Implications

The mode of hysterectomy has not changed since the last audit 4 years ago. Vaginal hysterectomy is considered the safest and most cost effective option (Surgical approach to hysterectomy for benign gynaecological disease; The Cochrane Database of Systematic Reviews 2006) and in some centres accounts for at least 50% of the hysterectomies performed. Continued audit of hysterectomies should occur along with an initiative to increase the number of vaginal hysterectomies. Data should be collected on adherence to antibiotic and anticoagulant guidelines and on complications including return to theatre.

section 11

TERMINATION of PREGNANCY

11 TERMINATION OF PREGNANCY

Epsom Day Unit is the Auckland Regional, first trimester, termination of pregnancy service. 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 administration support team.

Epsom Day Unit provides a two day service. Day one for assessment - psychosocial, medical, legal certification, contraceptive prescription and education. The women will meet with a social worker, community doctor and staff nurse. Day two - 2nd certifying assessment and if certified, the surgical termination of pregnancy.

Approximately one third of the women come from Central Auckland, one third from South Auckland and the final third from North and West Auckland. The percentage of interpreters required for women accessing the service was 10%.

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

Table 72: Number of terminations

	2000	2001	2002	2003	2004	2005
Total number of terminations	5835	5557	5775	5960	5809	5598

Table 73: Number of counselling sessions

	2001	2002	2003	2004	2005
	n	n	n	n	n
Post op counselling	51	36	10	22	35
Pregnancy option counseling	78	90	70	92	89
Declines (%)	2	1.4	1.8	2.6	2.7

Pregnancy Option Counselling refers to an appointment a woman had with a social worker prior to her assessing appointment.

Declines refer to the number of women who don't meet the legal criteria of abortion as agreed by 2 certifying consultants.

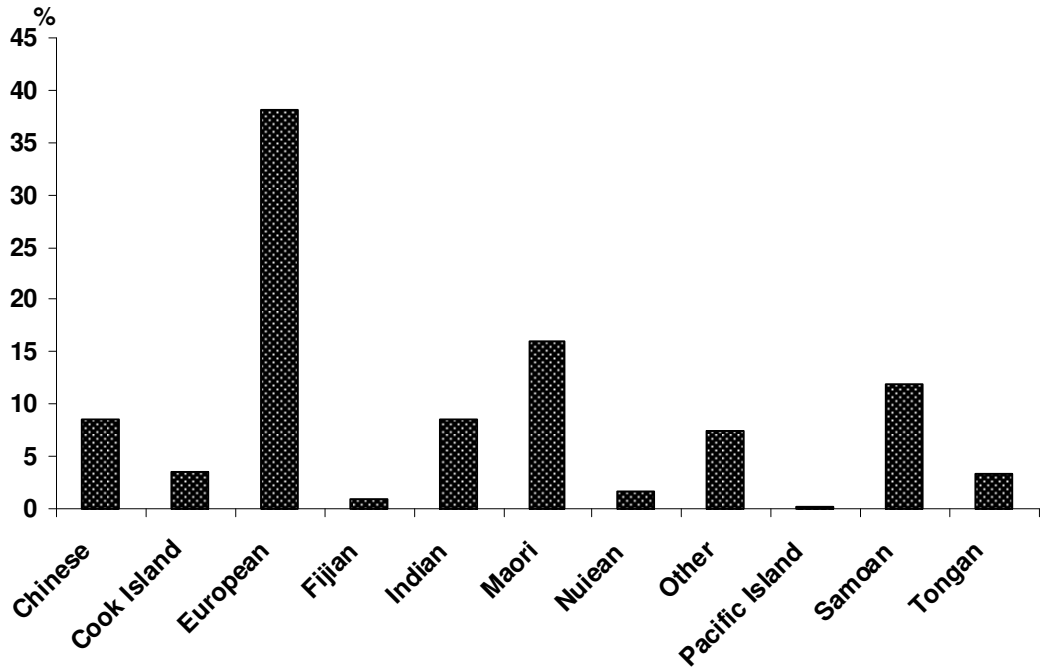

Figure 117: Ethnicity of women having a termination in 2005

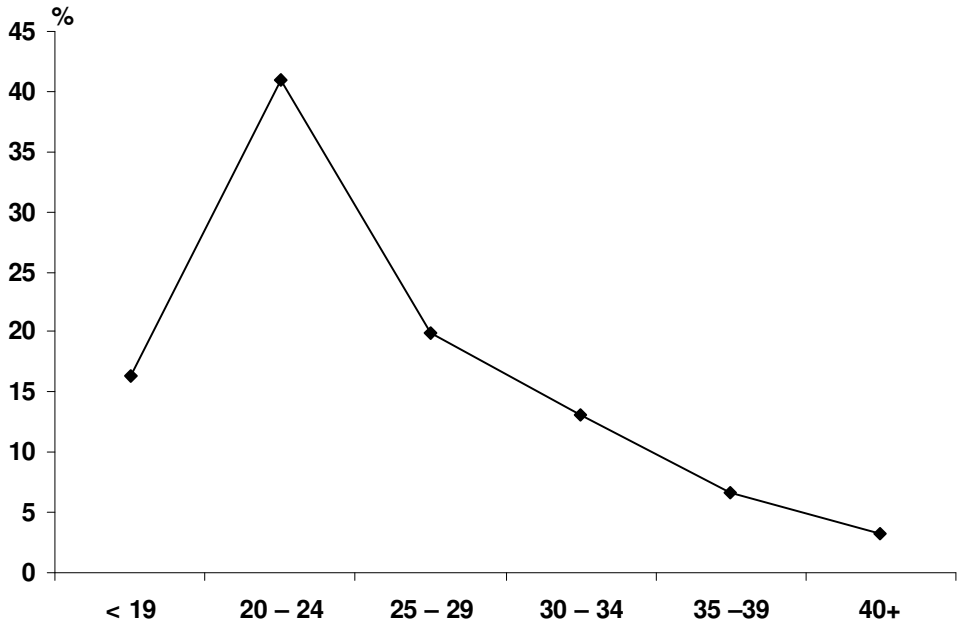

Figure 118: Age of women having a termination in 2005

section 12

APPENDICES

APPENDIX 1. METHODOLOGY

1.2 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.

Antenatal Data

LMC is Other Please Specify, Null or charge midwives, etc.

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.

Homebirths & BBA's (babies born before arrival at hospital when intended birth in hospital) All checked as appropriately classified.

BMI (Body Mass Index) Calculated from earliest weight recorded, as weight (kg)/height(m)^2. If BMI <17 or >40, check height and weight.

Previous Caesarean
If indication for caesarean section=repeat caesarean, previous Caesar=yes and parity is > 0.

Medical Conditions: If delivered at NW HDU (High Dependency Unit), any DCC (Department of Critical Care) or ICU (Intensive Care Unit), then antenatal summary medical conditions is not = missing.

Antenatal Summary - Hypertension Fields Is Null (Eclampsia, Gestational Hypertension, Pre eclampsia, Other Current Med Surg Cond).

Eclampsia = Yes (Boolean in Antenatal Summary).

Diastolic greater than or equal to 90, but no Hypertension entered in AN Summary fields.

Antenatal Admission: Reason for Admission is Other & Comment Field.

Induction of Labour

If time at ARM is earlier than onset of contraction time, assume this is an induction.

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

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

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

If an induction occurred, there is an Induction Indication entered.

Indication for Induction Is Other Please Specify and Comment fields for checking.

Pregnancy/Birth

Patient's Mother Pregnancy Number on the Baby ID screen does not match the Gravida on the Pregnancy screen.

Number of fetuses (Pregnancy Screen) does not match Birth Order (Labour & Delivery Baby Screen) i.e. the number of fetuses does not match the number of babies born.

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.

If indication for induction is SROM then rupture of membrane time should be before induction start time which in turn is before onset of contraction time.

Onset of contraction time is before full dilatation which is in turn before Birth time (sometimes there is no onset of contraction time because of pre-labour caesarean).

There should be NO onset of contraction time if method of Birth is Elective Caesarean not in labour or Emergency Caesarean not in labour.

Onset of contraction time should **not** be missing if method of Birth is Caesarean (elective or emergency) in labour.

Check all Classical Caesareans to ensure they are authentic.

If Delivery Method is a SVD or Spontaneous Breech Delivery, check there is NO reason for operative delivery.

Full Dilatation Time should not be null if Delivery Method is a vaginal delivery.

If Delivery Method is 'Elective CS' then Dilatation at Syntocinon should be null.

Syntocinon Time is before Delivery Time.

Membranes Ruptured Time is null.

Membranes ruptured time is before delivery time.

Membrane method is SRM but has indication for ARM, check.

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.

If ARM check there is an indication for ARM.

Placenta Delivery Time is not null.

Delivery Presentation is null.

If had an epidural, then dilatation at last VE is not missing and time of epidural is not missing.

A Caesarean Section (CS) must have an option from the expanded tree to describe what type of CS. Cannot be just Lower Segment Caesarean Section or Classical Caesarean Section.

If indication for caesarean is breech or malpresentation, then presentation is NOT cephalic.

Delivery Method is anything other than SVD or Spontaneous Breech Delivery, check there is a reason for Operative Delivery.

If Delivery Presentation is Breech, should not be a Spontaneous Vertex Delivery.

If Indication for Operative Delivery Is Repeat Caesarean Section then Women is not a Primipara & has a CS in her Obstetric History.

Indication for Operative Delivery Is Other Please Specify + Comment fields - for checking.

If indication for operative delivery is fetal distress, then fetal distress variable (in 802) is yes or meconium was present.

Check Birth Methods fields 1 & 2 are consistent.

Birth time is always before delivery of placenta time.

If Birth method is breech, then presentation is breech.

Time of epidural insertion is before birth time.

If caesarean is mode of birth, anaesthesia 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 Delivery & Lacerations is Null.

Sutured by Is Not Null, Lacerations Is Null.

Mothers Destination to Ward is somewhere within Auckland City Hospital but PN screen does not reflect this.

Breast Feeding Baby Unknown or missing fields from Immediate Newborn Assessment & Newborn Discharge Summary Screen.

If Dilatation at Epidural is not Null then Anaesthesia should show Epidural Lumbar or Epidural Spinal.

Anaesthesia

The Anaesthetic Department's Pain Database, which includes details of obstetric general anaesthetics was checked against Healthware. Any record of a general anaesthetic in the Pain Database and not in Healthware was checked.

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.

Days in NICU/PIN/Paed care on Ward are not null or check if >30.

Derived Gestation to Neonatal Gestation (Immediate Newborn Assessment screen) >2 weeks difference.

Gestational Age (Immediate Newborn Assessment) Is Null.

Missing Apgars.

Live birth with Apgars 1min or Apgars 5 min of 0.

Admissions
HDU (High Dependency Unit) Admission (i.e. Admission Time &/or Admission from) but reason for Admission Is Null.

Antenatal Admission - Primary Reason for Admission is Null.

Antenatal Assessment - Referral Reason for is Null.

1.3 Derived definitions – maternity

Ethnicity

Table 74: 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

APPENDIX 2. SUMMARY STATISTICS

Table 75: Mode of birth 1998-2005

	1998 n=7531		1999 n=7501		2000 n=7827		2001 n=7654	2002 n=7775		2003 n=7611		2004 n=7491		2005 n=7194	
	n	%	n	%	n	%		n	%	n	%	n	%	n	%
SVB	4670	62	4635	61.8	4650	59.4		4327	55.7	4269	56.1	4073	54.4	3845	53.4
Vaginal breech	75	1	83	1.1	87	1.1		66	0.8	58	0.8	54	0.7	54	0.7
Operative vaginal	926	12.3	945	12.6	1010	12.9		1081	13.9	1065	14.0	1171	15.6	1022	14.2
Caesarean	1860	24.7	1838	24.5	2080	26.6		2301	29.6	2219	29.1	2193	29.3	2273	31.6

APPENDIX 3. MATERNAL DEMOGRAPHY

Table 76: Domicile of women giving birth at National Women's 2002-2005

	2002 n=7775		2003 n=7611		2004 n=7491		2005 n=7194	
	n	%	n	%	n	%	n	%
Auckland Central	5085	65.4	5007	65.8	5055	67.5	4985	69.3
Auckland Waitemata	1180	15.2	1138	15	1068	14.2	982	13.7
Auckland South	1408	18.1	1368	18	1240	16.6	1089	15.1
North of Auckland	29	0.4	38	0.5	37	0.5	31	0.4
North Island Other	68	0.9	42	0.6	72	1.0	93	1.3
South Island	5	0.1	13	0.2	12	0.2	9	0.1
Overseas			5	0.1	7	0.1	5	0.1

Table 77: Maternal age distribution 2000-2005

		<21 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	N	n	%	n	%	n	%	n	%	n	%	n	%
2000	7827	431	5.5	1091	13.9	2204	28.2	2670	34.1	1232	15.7	199	2.5
2002	7775	376	4.8	998	12.8	2018	26.0	2816	36.2	1335	17.2	232	3.0
2003	7611	372	4.9	959	12.6	1933	25.4	2738	36.0	1380	18.1	229	3.0
2004	7491	357	4.8	913	12.2	1809	24.1	2781	37.1	1384	18.5	247	3.3
2005	7194	330	4.6	828	11.5	1685	23.4	2702	37.6	1395	19.4	254	3.5

Table 78: Maternal age and parity

	Total	<21 yrs		21-25 yrs		26-30 yrs		31-35 yrs		36-40 yrs		>40 yrs	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	3522	264	7.5	518	14.7	992	28.2	1216	34.5	454	12.9	78	2.2
Multipara	3672	66	1.8	310	8.4	693	18.9	1486	40.5	941	25.6	176	4.8

Table 79: Time trends in Nulliparity and Multiparity (Data for 2001-2003 not available)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2004	2005
Number of births	8315	8690	8812	9125	9157	8055	7797	7501	7827	7491	7194
Nullipara	3700	3649	3814	4037	4018	3591	3413	3262	3455	3597	3522
%	44.5	42.0	43.3	44.2	43.9	44.6	43.8	43.5	44.1	48.0	49.0
Multipara	4615	5041	4998	5088	5139	4464	4384	4239	4372	3894	3672
%	55.5	58.0	56.7	55.8	56.1	55.4	56.2	56.5	55.9	52.0	51.0

Table 80: Prioritised ethnicity of women giving birth at National Women's
(for information on assigning ethnicity and prioritising ethnicity, see Appendix 1

	2005 n=7194	
	n	**%**
NZ European	2802	38.9
Chinese	769	10.7
Maori	545	7.6
Indian	545	7.6
Other European	537	7.5
Other	344	4.8
Samoan	339	4.7
Tongan	315	4.4
Other Asian	248	3.5
European NFD	137	1.9
Niuean	111	1.5
Cook Island Maori	107	1.5
African	81	1.1
Middle Eastern	73	1.0
South East Asian	63	0.9
Fijian	62	0.9
Asian NFD	43	0.6
Other Pacific Island	31	0.4
Latin American/ Hispanic	23	0.3
Tokelauan	9	0.1
Pacific Island NFD	8	0.1
Not Stated	3	0.04

Table 81: Maternal ethnicity and age

	Total	NZ European		Maori		Pacific		Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7194	2802	38.9	545	7.6	981	13.6	1123	15.6	545	7.6	674	9.4	521	7.2
<21	330	66	20.0	101	30.6	106	32.1	14	4.2	7	2.1	9	2.7	26	7.9
21-25	828	155	18.7	137	16.5	234	28.3	121	14.6	82	9.9	31	3.7	68	8.2
26-30	1685	558	33.1	118	7.0	251	14.9	272	16.1	220	13.1	129	7.7	136	8.1
31-35	2702	1278	47.3	126	4.7	219	8.1	435	16.1	173	6.4	292	10.8	179	6.6
36-40	1395	635	45.5	50	3.6	143	10.3	237	17.0	54	3.9	183	13.1	92	6.6
41+	254	110	43.3	13	5.1	28	11.0	44	17.3	9	3.5	30	11.8	20	7.9

Table 82: Ethnicity of women birthing at NW

	2000 n=7827		2002 n=7775		2003 n=7611		2004 n=7491		2005 n=7194	
	n	%	n	%	n	%	n	%	n	%
NZ European	3988	51.0	3362	43.2	3224	42.4	2911	38.9	2802	38.9
Other European			642	8.3	608	8.0	548	7.3	674	9.4
Maori	629	8.0	547	7.0	486	6.4	509	6.8	545	7.6
Niuean	138	1.8	108	1.4	108	1.4	106	1.4	111	1.5
Cook Islander	176	2.2	160	2.1	159	2.1	140	1.9	106	1.5
Samoan	546	7.0	531	6.8	439	5.8	425	5.7	339	4.7
Tongan	498	6.4	432	5.6	406	5.3	355	4.7	315	4.4
Fijian	55	0.7	50	0.6	42	0.6	47	0.6	62	0.9
Other Pacific Islands	33	0.4	40	0.5	36	0.5	37	0.5	4748	0.7
Chinese	763	9.7	780	10.0	811	10.7	871	11.6	769	10.7
Indian	347	4.4	467	6.0	548	7.2	540	7.2	545	7.6
Other Asian	386	4.9	422	5.4	438	5.8	404	5.4	354	4.9
Other	268	3.4	229	2.9	298	3.9	471	6.3	521	7.2
Not Stated			5	0.1	8	0.1	127	1.7	3	

Table 83: Maternal ethnicity and parity

	NZ European n=2802		Maori n=545		Pacific n=981		Asian n=1123		Indian n=545		Other European n=674		Other n=521	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Nullipara	1419	50.6	230	42.2	315	32.1	576	51.3	277	50.8	383	56.8	321	61.6
Multipara	1383	49.4	315	57.8	666	67.9	547	48.7	268	49.2	291	43.2	200	38.4

3.1 Lead Maternity Carer and maternal demographic characteristics

Table 84: LMC at birth

	n=7194	
	n	%
Independent Midwife	2996	41.6
Private Obstetrician	1577	21.9
General Practitioner	142	2.0
NW Domino	591	8.2
NW Community	1060	14.7
NW Community/ADAPT	76	1.1
NW Diabetic	212	2.9
NW Medical	351	4.9
Other DHB	131	1.8
Unbooked	58	0.8

Table 85: LMC at birth and maternal age

	Total	<21		21-25		26-30		31-35		36-40		41+	
	N	n	%	n	%	n	%	n	%	n	%	n	%
Total	7194	330	4.6	828	11.5	1685	23.4	2702	37.6	1395	19.4	254	3.5
Independent Midwife	2996	125	4.2	332	11.1	785	26.2	1208	40.3	485	16.2	61	2.0
Private Obstetrician	1577	5	0.3	24	1.5	214	13.6	758	48.1	476	30.2	100	6.3
General Practitioner	142	4	2.8	16	11.3	31	21.8	60	42.3	26	18.3	5	3.5
NW Domino	591	40	6.8	111	18.8	183	31.0	178	30.1	71	12.0	8	1.4
NW Community	1060	87	8.2	214	20.2	289	27.3	261	24.6	169	15.9	40	3.8
NW Community/ADAPT	76	9	11.8	14	18.4	21	27.6	14	18.4	17	22.4	1	1.3
NW Diabetes	212	6	2.8	14	6.6	48	22.6	73	34.4	56	26.4	15	7.1
NW Medical	351	24	6.8	50	14.3	72	20.5	115	32.8	71	20.2	19	5.4
Other DHB	131	20	15.3	30	22.9	33	25.2	25	19.1	19	14.5	4	3.1
Unbooked	58	10	17.2	23	39.7	9	15.5	10	17.3	5	8.6	1	1.7

Table 86: LMC at birth and maternal ethnicity

	Total	NZ European		Maori		Pacific		Asian		Indian		Other European		Other	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	7194	2802	39.0	545	7.6	981	13.6	1123	15.6	545	7.6	674	9.4	521	7.2
Independent Midwife	2996	1182	39.5	197	6.6	314	10.5	648	21.6	168	5.6	299	10.0	187	6.2
Private Obstetrician	1577	1032	65.4	34	2.2	19	1.2	105	6.7	53	3.4	228	14.5	106	6.7
General Practitioner	142	58	40.9	6	4.2	15	10.6	41	28.9	4	2.8	11	7.8	7	4.9
NW Domino	591	135	22.8	60	10.2	149	25.2	63	10.7	79	13.4	54	9.1	51	8.6
NW Community	1060	131	12.4	105	9.9	311	29.3	189	17.8	165	15.6	39	3.7	118	11.1
NW Community/ ADAPT	76	21	27.6	17	22.4	19	25.0	8	10.5	4	5.3	4	5.3	3	4.0
NW Diabetes	212	35	16.5	21	9.9	60	28.3	30	14.2	42	19.8	10	4.7	14	6.6
NW Medical	351	161	45.9	38	10.8	53	15.1	29	8.3	23	6.6	22	6.3	25	7.1
Other DHB	131	45	34.4	44	33.6	16	12.2	5	3.8	7	5.3	6	4.6	8	6.1
Unbooked	58	2	3.5	23	39.7	25	43.1	5	8.6	0		1	1.7	2	3.5

Table 87: LMC at birth and parity

	Total	Nullipara		Multipara	
	N	n	%	n	%
Total	7194	3522	48.9	3672	51.0
Independent Midwife	2996	1589	53.0	1407	47.0
Private Obstetrician	1577	784	49.7	793	50.3
General Practitioner	142	75	52.8	67	47.2
NW Domino	591	275	46.5	316	53.5
NW Community	1060	432	40.8	628	59.2
NW Community/ADAPT	76	30	39.5	46	60.5
NW Diabetes	212	72	34.0	140	66.0
NW Medical	351	153	43.6	198	56.4
Other DHB	131	85	64.9	46	35.1
Unbooked	58	27	46.6	31	53.5

3.2 Smoking

Table 88: Smoking status and ethnicity

	NZ European n=2802		Maori n=545		Pacific n=981		Asian n=1123		Indian n=545		Other European n=674		Other n=521	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Current	164	5.9	204	37.4	160	16.3	10	0.9	8	1.5	27	4.0	19	3.7
Stopped in pregnancy	23	0.8	16	2.9	28	2.9	3	0.3	3	0.6	6	0.9	5	1.0
Not currently smoking	2,482	88.6	275	50.5	731	74.5	1060	94.4	510	93.6	604	89.6	470	90.2
Missing	133	4.8	50	9.2	62	6.3	50	4.5	24	4.4	37	5.5	27	5.2

Table 89: Smoking and age

	<21 n=330		21-25 n=828		26-30 n=1685		31-35 n=1702		36-40 n=1395		41+ n=254	
	n	%	n	%	n	%	n	%	n	%	n	%
Current	98	29.7	129	15.6	145	8.6	117	4.3	86	6.2	17	6.7
Stopped in pregnancy	12	3.6	21	2.5	18	1.1	18	0.7	12	0.9	3	1.2
Not currently smoking	189	57.3	626	75.6	1425	84.6	2439	90.3	1230	88.2	224	88.2
Missing	31	9.4	52	6.3	97	5.8	128	4.7	67	4.8	10	3.9

3.3 Standard primipara

Table 90: Demographic characteristics of standard and non-standard primipara

	Total	Standard primipara		Non-standard primipara	
	N	n	%	n	%
Total	**3522**	**1209**	**34.3**	**2313**	**65.7**
Age					
< 21	264	42	15.9	222	84.1
21-25	518	232	44.8	286	55.2
26-30	992	452	45.6	540	54.4
31-35	1216	483	39.7	733	60.3
36-40	454	0		454	100.0
41+	78	0		78	100.0
Ethnicity					
NZ European	1419	442	31.1	977	68.9
Maori	230	54	23.5	176	76.5
Pacific	315	88	27.9	227	72.1
Asian	576	288	50.0	288	50.0
Indian	277	118	42.6	159	57.4
Other European	383	118	30.8	265	69.2
Other	321	102	31.8	219	68.2
Not stated	1	0		1	100.0
LMC at Birth					
Independent Midwife	1589	658	41.4	931	58.6
Private Obstetrician	784	232	29.6	552	70.4
General Practitioner	75	23	30.7	52	69.3
NW Domino	275	109	39.6	166	60.4
NW Community	432	134	31.0	298	69.0
NW Community/ADAPT	30	8	26.7	22	73.3
NW Diabetic	72	0	0	72	100
NW - Medical	153	27	17.7	126	82.4
Other DHB	85	8	9.4	77	90.6
Unbooked	27	11	40.7	16	59.3

APPENDIX 4. ANTENATAL COMPLICATIONS

4.1 Preterm birth

Table 91: Preterm birth rate and demographic characteristics

	Total	Total preterm birth		Iatrogenic preterm		Spontaneous preterm	
	N	n	%	n	%	n	%
Age							
≤20	330	25	7.6	16	4.8	9	2.7
21-25	828	83	10.0	37	4.4	46	5.8
26-30	1685	162	9.6	83	4.9	79	4.7
31-35	2702	304	11.3	209	7.7	95	3.5
36-40	1395	139	10.0	77	5.5	62	4.4
41+	254	31	12.2	22	8.7	9	3.5
Ethnicity							
NZ European	2802	273	9.7	162	5.8	111	4.0
Maori	545	91	16.7	42	7.7	48	8.8
Pacific	981	96	9.8	51	5.2	45	4.6
Asian	1123	73	6.5	33	2.9	40	3.6
Indian	545	47	8.6	27	5.0	20	3.7
Other European	674	55	8.2	28	4.2	27	4.0
Other	521	50	9.6	19	3.6	31	6.0

Table 92: Preterm birth (<37 weeks) by parity, plurality, smoking, and BMI

	Total mothers	Spontaneous preterm		Iatrogenic preterm		Term	
	N	n	%	n	%	n	%
Total	7194	448	6.2	332	4.6	6414	89.2
Parity							
Nulliparous	3522	251	7.1	124	3.5	3147	89.3
Multiparous	3672	197	5.4	115	3.1	3360	91.5
Plurality							
Singleton	7007	375	5.4	192	2.7	6440	91.9
Twins	184	73	39.6	42	22.8	69	37.5
Triplets	3	0	0	3	100	0	0
Smoking							
Current	592	55	9.2	20	3.3	517	87.3
Stopped in Pregnancy	84	9	10.7	5	6.0	70	83.3
Not currently smoking	6133	303	4.9	181	3.0	5649	92.1
Unknown	385	81	21.0	31	8.1	273	70.9

4.2 SGA

Table 93: Demography of mothers of SGA babies as defined by Customised Birth Centiles (this table includes mothers of twins twice)

	Total Babies	Customised SGA <10th%		Customised Birthweight ≥ 10th%		RR(95% CI)
	N	n	%	n	%	
Total	7384	951	12.9	6433	87.1	
Maternal Age						
≤ 20	332	56	16.9	276	83.1	1.49(1.13-1.96)
21-25	853	148	17.4	705	82.7	1.53(1.26-1.87)
26-30	1721	195	11.3	1526	88.7	1
31-35	2767	326	11.8	2441	88.2	1.04(0.88-1.23)
36-40	1446	196	13.6	1250	86.5	1.20(0.99-1.44)
>40	265	30	11.3	235	88.7	1(0.70-1.43)
Ethnicity						
NZ European	2908	348	12.0	2560	88.0	1
Maori	557	90	16.2	467	83.8	1.35(1.09-1.67)
Pacific	1064	180	16.9	884	83.1	1.41(1.20-1.67)
Asian	1073	133	12.4	940	87.6	1.04(0.86-1.25)
Indian	549	75	13.7	474	86.3	1.14(0.90-1.44)
Other European	695	64	9.2	631	90.8	0.77(0.60-0.99)
Other	535	61	11.4	474	88.6	0.95(0.74-1.23)
Unstated	3	0	0	3	100	
Parity						
Multipara	3769	470	12.5	3299	87.5	1
Primipara	3615	481	13.3	3134	86.7	1.07(0.95-1.20)
Smoker						
Current	611	142	23.2	469	76.8	2.06(1.76-2.42)
Stopped in pregnancy	87	16	18.4	71	81.6	1.63(1.04-2.55)
Not currently smoking	6281	708	11.3	5573	88.7	1
Unknown	405	85	21.0	320	79.0	1.86(1.52-2.28)
Plurality						
Singleton	7007	809	11.6	6198	88.5	1
Twins	368	136	37.0	232	63.0	3.20(2.76-3.71)
Triplets	9	6	66.7	3	33.3	5.77(3.62-9.21)

4.3 Diabetes

Table 94: Women with diabetes attending diabetes clinic and delivering ≥ 20 weeks gestation

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Type I	23	29	19	12	19	15	14	21	26	22	26	21	20	25	31
Type 2	26	19	21	26	32	35	22	23	28	32	37	49	40	47	52
GDM	125	140	197	160	221	245	247	221	181	186	161	251	352	343	304
Total	174	188	237	198	270	295	283	265	235	240	224	321	412	414	387

Table 95: Demographic characteristics of women with diabetes

	Type I n=31	Type 2 n=52	GDM n=304	No diabetes n=6807
	n %	n %	n %	n %
Age				
≤ 20	2 6.5	0 0	5 1.6	323 4.8
21-25	2 6.5	6 11.5	12 3.9	808 11.9
26-30	12 38.7	7 13.5	61 20.0	1605 23.6
31-35	9 29.0	19 36.5	111 36.5	2563 37.7
36-40	5 16.1	15 28.9	93 30.6	1282 18.8
41+	1 3.2	5 9.6	22 7.2	226 3.3
Ethnicity				
NZ European	16 51.6	9 17.3	49 16.2	2728 40.1
Maori	7 22.6	4 7.7	11 3.6	523 7.7
Pacific	1 3.2	22 42.3	63 20.7	895 13.2
Asian	0	4 7.7	82 27.1	1037 15.2
Indian	0	10 19.2	57 18.8	477 7.0
Other European	5 16.1	0	21 6.9	648 9.5
Other	2 6.5	3 5.8	21 6.9	495 7.3
Body weight at booking				
Median (IQR)	72.4(61-77.9)	91(72.5-108.3)	77.2(66.6-100.4)	

Table 96: Perinatal deaths 1993 – 2005 among babies of women with diabetes

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

Table 97: Maternal outcomes among women with diabetes

	Type I n=31		Type 2 n=52		GDM n=290		Postnatally Diagnosed Type 2 n=14		No diabetes n=6807	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Induction of labour	13	41.9	32	61.5	153	52.8	8	57.1	1688	24.8
Mode of birth										
SVB	6	19.4	18	34.6	141	48.6	9	64.3	3859	53.6
Ventouse	1	3.2	1	1.9	26	9.0	0		693	10.2
Forceps	1	3.2	2	3.9	9	3.1	0		282	4.1
CS emergency	11	35.5	21	40.4	76	26.2	3	21.4	1440	20.0
CS elective	12	38.7	9	17.3	37	12.8	2	14.3	833	11.6
Gestation at birth	3	9.7	3	5.8	3	1.0	0		202	3.0
<32 weeks	3	9.7	3	5.8	3	1.0	0		202	3.0
<37 weeks	7	22.6	8	15.4	33	11.4	2	14.3	635	9.3
PPH ≥500 mls	18	56.1	24	46.1	107	36.9	2	14.3	2006	29.5
PPH ≥1000 mls	4	12.9	7	13.5	13	4.5	0		343	5.0
Postpartum transfusion	3	9.7	4	7.7	3	1.0	0		129	1.9

4.4 Antepartum haemorrhage

Table 98: Characteristics of pregnancies complicated by antepartum haemorrhage

	Placenta praevia N=81		Placental abruption n=41		APH unknown origin n=276		No APH n=6796	
	n	%	n	%	n	%	n	%
Maternal age								
≤20	3	3.7	4	9.8	19	6.9	304	4.4
21-25	2	2.5	6	14.6	39	14.1	781	11.5
26-30	17	21.0	10	24.4	62	22.5	1596	23.5
31-35	24	29.6	8	19.5	85	30.8	2585	38.0
36-40	29	35.8	6	14.6	62	22.5	1298	19.1
41+	6	7.4	7	17.1	9	3.3	232	3.4
Parity								
Nulliparous	36	44.4	16	39.0	142	51.4	3328	49.0
Multiparous	45	55.6	25	61.0	134	48.6	3468	51.0
Smoker								
Current	2	2.5	8	19.5	29	10.5	553	8.1
Stopped in pregnancy	1	1.2	0		6	2.2	77	1.1
Not currently smoking	68	84.0	30	73.2	216	78.3	5819	85.6
Unknown	10	12.3	3	7.3	25	9.1	347	5.1
Hypertensive disease								
Gestational hypertension	2	2.5	4	9.8	29	10.5	386	5.7
Preeclampsia	2	2.5	3	7.3	10	3.6	260	3.8
Chronic hypertension	0		2	4.9	7	2.5	154	2.3

Table 99: Maternal outcomes of pregnancies complicated by antepartum haemorrhage

	Placenta praevia n=81		Placental abruption n=41		APH unknown origin n=276		No APH n=6796	
	n	%	n	%	n	%	n	%
Gestation								
< 37 weeks	21	25.9	19	46.3	83	30.1	562	8.3
< 32 weeks	5	6.0	9	22.0	40	14.5	40	0.6
Mode of delivery								
Normal vaginal	4	4.9	14	34.1	138	50.0	3703	54.5
Vaginal breech	0	0	1	2.4	9	3.3.	35	0.5
Operative vaginal	4	4.9	3	7.3	35	12.7	975	14.3
CS elective	34	42.0	1	2.4	21	7.6	777	11.4
CS emergency	39	48.0	22	53.7	73	26.4	1306	19.2
Maternal transfusion	20	24.7	6	14.6	9	3.3	153	2.3

Table 100: Fetal/neonatal outcomes of pregnancies complicated by antepartum haemorrhage

	Placenta praevia n=83		Placental abruption n=42		APH unknown origin n=291		No APH n=6968	
	n	%	n	%	n	%	n	%
Birthweight								
Mean (sd)	3085(799)		2535(1008)		2814(978)		3359(674)	
<2500g	16	19.3	17	40.5	88	30.2	547	7.9
<1500g	3	3.6	7	16.7	35	12	171	2.5
Small for gestational age	8	9.6	13	31	63	21.6	867	12.4
Perinatal deaths	0	0	2	4.8	20	6.9	89	1.3
Admission to NICU	18	21.7	16	38.1	70	24.1	695	10.0
≥2 days in NICU	16	19.3	16	38.1	68	23.4	605	8.7
Days in NICU								
Median (IQR)	0(0-0)		0 (0-11)		0(0-0)		0(0-0)	
Mean (sd)	4.4(13.6)		13.0(26.9)		5.3(16.0)		1.4(7.5)	

4.5 Hypertensive disease

Table 101: Demographic characteristics of women with hypertensive disease

		Gestational hypertension		Preeclampsia		Chronic hypertension		Normotensive	
	Total	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Ethnicity									
NZ European	2802	186	6.6	124	4.4	68	2.4	2424	86.5
Maori	545	32	5.9	20	3.7	18	3.3	475	87.2
Pacific	981	53	5.4	46	4.4	27	2.8	855	87.2
Asian	1123	36	3.2	20	1.8	12	1.1	1055	93.9
Indian	545	35	6.4	23	4.2	8	1.5	479	87.9
Other European	674	53	7.9	26	3.9	18	2.7	577	85.6
Other	521	26	5.0	16	3.1	12	2.3	467	89.6
Not stated	3	0		0		0		3	100
Maternal age									
≤20	330	19	5.8	15	4.6	0	0	296	89.7
21-25	828	39	4.7	43	5.2	7	0.9	739	89.3
26-30	1685	96	5.7	67	4.0	21	1.3	1501	89.1
31-35	2702	146	5.4	83	3.1	62	2.3	2411	89.2
36-40	1395	99	7.1	53	3.8	57	4.1	1186	85.0
41+	254	22	8.7	14	5.5	16	6.3	202	79.5
Smoker									
Current	592	40	6.8	22	3.7	12	2.0	518	87.5
Stopped in pregnancy	84	8	9.5	2	2.4	3	3.6	71	84.5
Not currently smoking	6133	357	5.8	228	3.7	139	2.3	5409	88.2
Unknown	385	16	4.2	23	6.0	9	2.3	337	87.5

Table 102: Onset of birth among women with hypertensive disease

	Gestational hypertension n=421		Preeclampsia n=275		Chronic hypertension n=163		Normotensive n=6335	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Spontaneous onset of labour	114	27.1	46	16.7	57	35.0	4029	63.6
Induced labour	247	58.7	141	51.3	66	40.5	1440	22.7
CS emergency before onset of labour	23	5.5	56	20.4	12	7.4	130	2.1
CS elective	37	8.8	32	11.6	28	17.2	736	11.6

APPENDIX 5. LABOUR AND BIRTH

6.1 Induction of labour

Table 103: Induction of labour rates (1992-2005) No data available on induction rates for 2001-2003

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2004	2005
Total Births	8315	8690	8812	9125	9157	8055	7531	7501	7827	7491	7194
Women Induced	1734	2049	2033	2366	2225	2135	2053	2040	2106	1922	1894
Incidence (%)	**20.9**	**23.6**	**23.1**	**25.9**	**24.3**	**26.5**	**27.2**	**27.2**	**26.9**	**25.7**	**26.3**
Total Nullipara	3700	3649	3814	4037	4018	3591	3263	3262	3455	3597	3522
Nullipara Induced	914	931	1046	1191	1112	1104	992	923	1049	1064	1042
Incidence (%)	**24.7**	**25.5**	**27.4**	**29.5**	**27.7**	**30.7**	**30.4**	**28.3**	**30.4**	**29.6**	**29.5**
Total Multipara	4615	5041	4998	4088	5139	4464	4229	4239	4372	3894	3672
Multipara Induced	820	1118	987	1175	1113	1031	1061	987	1057	858	852
Incidence (%)	**17.8**	**22.2**	**19.7**	**28.7**	**21.7**	**23.1**	**25.1**	**23.3**	**24.2**	**22.0**	**23.2**

Table 104: Indication for induction (all births)

	Preterm n= 685		Term n=6509	
	n	**%**	**n**	**%**
Post dates	0	0.0	445	6.8
Hypertension	27	0.4	255	3.9
Term PROM	0	0.0	210	3.2
Diabetes	2	0.03	155	2.4
Maternal request	1	0.01	131	2.0
SGA	15	0.2	121	1.9
Maternal medical complications	11	0.2	86	1.3
Decreased liquor	2	0.03	67	1.0
PPROM	48	0.7	41	0.6
IUD/Fetal anomaly	35	0.5	14	0.2
Fetal distress	2	0.03	37	0.6
Not in established labour	2	0.03	36	0.6
Poor obstetric history	1	0.01	22	0.3
Large for gestational age	0	0.0	22	0.3
Maternal age	1	0.01	19	0.3
Other	14	0.2	72	1.1

Table 105: Rates of indication for induction by parity (term births)

	Multipara n=3362		Nullipara n=3147	
	n	%	n	%
Post dates	173	5.1	272	8.6
Hypertension	77	2.3	178	5.7
Term PROM	70	2.1	140	4.4
SGA	47	1.4	74	2.4
Diabetes	96	2.9	59	1.9
Maternal request	84	2.5	47	1.5
Maternal medical complications	49	1.5	37	1.2
Decreased liquor	33	1.0	34	1.1
PPROM	10	0.3	31	1.0
Fetal distress	15	0.4	22	0.7
Not in established labour	23	0.7	13	0.4
IUD/Fetal anomaly	7	0.2	7	0.2
Maternal age	12	0.4	7	0.2
Large for gestational age	18	0.5	4	0.1
Poor obstetric history	18	0.5	4	0.1
Other	49	1.5	23	0.7

Table 106: Rates of indication for induction by age among nulliparous women (all gestations)

	≤25 n=782		26-30 n=992		31-35 n=1216		>35 n=542	
	n	%	n	%	n	%	n	%
Post dates	43	5.5	73	7.4	110	9.0	46	8.5
Hypertension	35	4.5	51	5.1	69	5.7	42	7.7
Term PROM	27	3.5	42	4.2	54	4.4	17	3.1
SGA	21	2.7	19	1.9	23	1.9	20	3.7
Diabetes	7	0.9	23	2.3	18	1.5	13	2.4
Maternal request	4	0.5	4	0.4	11	0.9	28	5.2
Other	56	7.2	63	6.4	81	6.7	42	7.7

Table 107: Demography of onset of birth at term

	Total	Spontaneous labour		Induction		CS elective		CS emergency before labour	
	N	n	%	n	%	n	%	n	%
Total	6509	3923	60.0	1733	26.7	757	11.6	96	1.5
LMC at birth									
IMW	2838	2069	73.0	604	21.3	141	5.0	24	0.9
Private Obstetrician	1424	556	39.0	467	32.8	358	25.1	43	3.0
GP	132	80	60.6	37	28.0	13	9.9	2	1.5
NW Community	978	580	59.3	256	26.2	123	12.6	19	1.9
ADAPT	63	42	66.7	10	15.9	11	17.5	0	0
NW Domino	559	408	73.0	124	22.2	24	4.3	3	0.5
NW Medical	267	99	37.1	113	42.3	52	19.5	3	1.1
NW Diabetes	183	36	19.8	115	62.8	30	16.4	2	1.1
Unbooked	38	36	94.7	1	2.8	1	2.8	0	0
Other DHB	27	17	63.0	6	22.2	4	14.8	0	0
Maternal age									
≤ 20	281	215	76.5	60	21.4	6	2.1	0	0
21-25	745	541	72.6	174	23.4	27	3.6	3	0.4
26-30	1523	1002	65.8	383	25.1	121	7.9	17	1.1
31-35	2481	1508	60.8	628	25.3	302	12.2	43	1.7
36-40	1256	593	47.2	398	31.7	238	18.9	27	2.2
41+	223	64	28.7	90	40.4	63	28.2	6	2.7
Ethnicity									
NZ European	2529	1361	53.8	738	29.2	390	15.4	40	1.6
Māori	454	305	67.2	112	24.7	32	7.1	5	1.1
Pacific	885	604	68.3	222	25.1	52	5.9	7	0.8
Asian	1050	735	70.0	207	19.7	99	9.4	9	0.9
Indian	498	299	60.0	130	26.1	54	10.8	15	3.0
Other European	619	328	53.0	188	30.4	89	14.4	14	2.3
Other	471	289	61.4	136	28.9	40	8.5	6	1.3
Not stated	3	2	66.7	0	0	1	33.3	0	0

Table 108: Induction rate by indication and ethnicity among nulliparous women (all gestations)

	NZ European n=1419		Maori n=230		Pacific n=315		Asian n=576		Indian n=277		Other European n=383		Other n=321	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total	467	32.9	60	26.1	88	27.9	132	22.9	89	32.1	113	29.5	93	29.0
Post dates	122	8.6	15	6.5	19	6.0	32	5.6	15	5.4	39	10.2	30	9.3
Hypertension	106	7.5	15	6.5	15	4.8	10	1.7	15	5.4	23	6.0	13	4.0
Term PROM	50	3.5	7	3.0	15	4.8	27	4.7	16	5.8	14	3.7	11	3.4
PPROM	33	2.3	4	1.7	4	1.3	5	0.9	4	1.4	3	0.8	2	0.6
SGA	27	1.9	3	1.3	8	2.6	20	3.5	11	4.0	7	1.8	7	2.2
Maternal request	26	1.8	1	0.4	2	0.6	5	0.9	1	0.4	7	1.8	5	1.6
Diabetes	23	1.6	4	1.7	8	2.6	8	1.4	11	4.0	3	0.8	4	1.2
Maternal medical complications	21	1.5	1	0.4	3	1.0	5	0.9	3	1.1	5	1.3	7	2.2
Decreased liquor	14	1.0	0	0.0	3	1.0	6	1.0	4	1.4	6	1.6	2	0.6
Fetal distress	10	0.7	0	0.0	1	0.3	4	0.7	3	1.1	1	0.3	4	1.2
IUD/Fetal anomaly	11	0.8	5	2.2	4	1.3	4	0.7	0	0.0	0	0.0	0	0.0
Not in established labour	5	0.4	1	0.4	2	0.6	1	0.2	0	0.0	1	0.3	4	1.2
Maternal age	4	0.3	0	0.0	0	0.0	0	0.0	0	0.0	2	0.5	1	0.3
Poor obstetric history	3	0.2	1	0.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Large for gestational age	2	0.1	0	0.0	0	0.0	1	0.2	0	0.0	0	0.0	1	0.3
Other	10	0.7	3	1.3	4	1.3	4	0.7	6	2.2	2	0.5	2	0.6

Table 109: Induction rate by indication and age among nulliparous women (all gestations)

	≤20 n=264		21-25 n=518		26-30 n=992		31-35 n=1216		36-40 n=464		41+ n=78	
	n	%	n	%	n	%	n	%	n	%	n	%
Total	58	22.0	135	26.1	275	27.7	366	30.1	176	38.8	32	41.0
Post dates	13	4.9	30	5.2	73	7.4	110	9.0	44	9.5	2	2.6
Hypertension	12	4.5	23	4.0	51	5.1	69	5.7	37	8.0	5	6.4
Term PROM	10	3.8	17	2.9	42	4.2	54	4.4	12	2.6	5	6.4
SGA	4	1.5	17	2.9	19	1.9	23	1.9	17	3.7	3	3.8
Diabetes	2	0.8	5	0.9	23	2.3	18	1.5	12	2.6	1	1.3
Maternal request	0	0.0	4	0.7	4	0.4	11	0.9	17	3.7	11	14.1
PPROM	2	0.8	7	1.2	19	1.9	21	1.7	6	1.3	0	0.0
Maternal medical complications	4	1.5	10	1.7	6	0.6	18	1.5	6	1.3	1	1.3
Decreased liquor	2	0.8	3	0.5	11	1.1	13	1.1	6	1.3	0	0.0
Fetal distress	1	0.4	3	0.5	8	0.8	8	0.7	2	0.4	1	1.3
IUD/Fetal anomaly	3	1.1	8	1.4	5	0.5	3	0.2	5	1.1	0	0.0
Large for gestational age	0	0.0	1	0.2	2	0.2	1	0.1	0	0.0	0	0.0
Maternal age	0	0.0	0	0.0	0	0.0	0	0.0	6	1.3	1	1.3
Not in established labour	1	0.4	3	0.5	3	0.3	5	0.4	2	0.4	0	0.0
Poor obstetric history	0	0.0	0	0.0	0	0.0	3	0.2	1	0.2	0	0.0
Other	4	1.5	4	0.7	9	0.9	9	0.7	3	0.6	2	2.6

6.2 Outcomes following induction

Table 110: Mode of birth at term by onset of birth and parity

	Nullipara				Multipara			
	Spontaneous labour n=1935		Induced labour n=952		Spontaneous labour n=1988		Induced labour n=781	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB + vaginal breech	1027	53.1	353	37.1	1612	81.1	593	75.9
Forceps	139	7.2	86	9.0	30	1.5	18	2.3
Ventouse	369	19.1	178	18.7	107	5.4	46	5.9
CS emergency	400	20.7	335	35.2	239	12.0	124	15.9
Epidural	1255	64.9	801	84.1	702	35.3	475	60.8

Table 111: Mode of birth at term among nulliparous women by most common indications for induction

	Post dates n=272		Term PROM n=140		Hypertension n=178		Other n=362	
	n	%	n	%	n	%	n	%
Mode of birth								
SVB + vaginal breech	101	37.1	58	41.4	53	29.8	141	39.0
Forceps	26	9.6	9	6.4	15	8.4	36	9.9
Ventouse	50	18.4	25	17.9	36	20.2	67	18.5
CS emergency	95	34.9	48	34.3	74	41.6	118	32.6
Epidural	218	80.1	117	83.6	159	89.3	307	84.8

Table 112: Mode of birth at term among multiparous women by most common indications for induction

	Post dates n=173		Diabetes n=96		Maternal request n=84		Term PROM n=70		Hypertension n=78		Other n= 281	
	n	%	n	%	n	%	n	%	n	%	n	%
Mode of birth												
SVB	134	77.5	72	75.0	65	77.4	57	81.4	49	63.6	211	75.1
Vaginal breech	0	0.0	1	1.0	2	2.4	0	0.0	0	0.0	2	0.7
Forceps	5	2.9	0	0.0	2	2.4	1	1.4	2	2.6	8	2.9
Ventouse	9	5.2	2	2.1	7	8.3	2	2.9	8	10.4	18	6.4
CS emergency	25	14.5	21	21.9	8	9.5	10	14.3	18	23.4	42	15.0
Epidural	88	18.5	41	8.6	61	12.8	46	9.7	55	11.6	184	65.5

Table 113: Gestation at birth among women whose primary indication for induction was 'post dates'

Gestation at birth	Induction for post dates n=445		Induction for post dates and age <35 n=316		Induction for post dates and age ≥35 n=129	
	n	%	n	%	n	%
39 – 39^{6}	2	0.5	2	0.6	0	
40 – 40^{6}	97	21.8	50	15.8	47	36.4
41 – 41^{6}	258	58.0	192	60.8	66	51.2
42 – 42^{6}	83	18.7	67	21.2	16	12.4
43 – 43^{6}	5	1.1	5	1.6	0	

6.3 Use of Syntocinon

Table 114: Dilatation at start of syntocinon in induced and spontaneous labour-nullipara

	Induced n=708		Spontaneous onset n=945	
	n	%	n	%
0	36	5.1	7	0.7
1	121	17.1	45	4.8
2	203	28.7	129	13.7
3	172	24.3	186	19.7
4	60	8.5	149	15.8
5	23	3.2	98	10.4
6	14	2.0	72	7.6
7	7	1.0	47	5.0
8	7	1.0	58	6.1
9	12	1.7	45	4.8
10	25	3.5	68	7.2
Missing	28	4.0	41	4.3

Table 115: Dilatation at start of syntocinon in induced and spontaneous labour-multipara

	Induced n=472		Spontaneous n=338	
	n	%	n	%
0	16	3.4	2	0.6
1	50	10.6	12	3.6
2	154	32.6	54	16.0
3	152	32.2	71	21.0
4	44	9.3	74	21.9
5	13	2.8	39	11.5
6	6	1.3	17	5.0
7	3	0.6	8	2.4
8	5	1.1	20	5.9
9	4	0.8	6	1.8
10	4	0.8	25	7.4
Missing	21	4.4	10	3.0

6.4 Mode of birth

Table 116: Mode of birth by parity and previous caesarean section status

	Nullipara preterm n=375		Nullipara term n=3147		Multipara no prev CS preterm n=221		Multipara no prev CS term n=2400		Multipara prev CS preterm n=89		Multipara prev CS term n=962	
	n	%	n	%	n	%	n	%	n	%	n	%
SVB	136	36.3	1378	43.8	111	50.2	2008	83.7	23	25.8	189	19.7
Vaginal breech	19	5.1	2		21	9.5	8	0.3	4	4.5	0	
Operative vaginal birth	37	9.92	772	26.4	8	3.6	132	5.5	4	4.5	69	7.2
Ventouse	21	5.6	547	17.4	4	1.8	99	4.1	3	3.4	54	5.6
Forceps	16	4.3	225	9	4	1.8	33	1.4	1	1.1	15	1.6
Caesarean section	183	48.8	995	31.6	81	36.7	252	10.5	58	65.2	704	73
Emergency	149	39.7	780	24.8	62	28.1	178	7.4	35	39.3	236	24.5
Elective	34	9.1	215	6.8	19	8.6	74	3.1	23	25.8	468	48.7

Table 117: Mode of birth by ethnicity

	NZ European n=2802		Maori n=545		Pacific n=981		Asian n=1123		Indian n=545		Other European n=674		Other n=521	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
SVB	1368	48.8	343	62.9	688	70.1	615	54.8	260	47.7	300	44.5	269	51.6
Vaginal breech	19	0.7	7	1.3	12	1.2	3	0.3	5	0.9	3	0.5	5	1.0
Forceps	145	5.2	14	2.6	11	1.1	31	2.8	22	4.0	44	6.5	27	5.2
Ventouse	284	10.1	43	7.9	45	4.6	158	14.1	47	8.6	88	13.1	63	12.1
CS elective	429	15.3	40	7.3	62	6.3	107	9.5	58	10.6	94	14.0	43	8.3
CS emergency	557	19.9	98	18.0	163	16.6	209	18.6	153	28.1	145	21.5	114	21.8

Table 118: Mode of birth by maternal age

	≤20 n=330		21-25 n=828		26-30 n=1685		31-35 n=2702		36-40 n=1395		41+ n=254	
	n	%	n	%	n	%	n	%	n	%	n	%
SVB	229	69.4	547	66.1	934	55.4	1395	51.6	652	46.8	88	34.6
Vaginal breech	6	1.7	7	0.9	13	0.8	18	0.7	8	0.6	2	0.8
Forceps	9	2.7	20	2.4	72	4.3	127	4.7	60	4.3	6	2.4
Ventouse	32	9.7	87	10.5	191	11.3	292	10.8	111	8.0	15	5.9
CS elective	7	2.1	28	3.4	137	8.1	333	12.3	256	18.4	72	28.3
CS emergency	47	14.2	139	16.8	338	20.1	537	19.9	308	22.1	71	28.0

Table 119: Mode of birth by LMC at time of birth – nullipara

	Total	SVB		Vaginal breech		Operative vaginal		CS elective		CS emergency	
	n	n	%	n	%	n	%	n	%	n	%
Total	3522	1535	43.6	21	6.0	809	23.0	249	7.1	929	26.4
IMW	1589	744	46.8	5	0.3	403	25.4	51	3.2	386	24.3
Pvt Obstetrician	784	214	27.3	2	0.3	192	24.5	137	17.5	239	30.5
GP	75	34	45.3	0		17	22.7	3	4.0	21	28.0
NW Domino	275	161	58.5	0		53	19.3	9	3.3	52	18.9
NW Community	432	206	47.8	2	0.5	86	19.9	20	4.6	118	27.3
NW Community/ADAPT	30	16	53.3	0		5	16.7	2	6.7	7	23.3
NW Diabetes	72	23	31.9	0		17	23.6	6	8.3	26	36.1
NW Medical	153	57	37.2	4	2.6	34	22.2	14	9.2	44	28.8
Other DHB	85	35	41.2	8	9.4	1	1.2	7	8.3	34	40.0
Unbooked	27	24	88.9	0		1	3.7	0		2	7.4

Table 120: Mode of birth by LMC at time of birth – standard primipara (Definition of standard primipara is given in Chapter 1)

	Total	SVB		Operative vaginal		CS elective		CS emergency	
	n	n	%	n	%	n	%	n	%
Total	1210	647	53.5	303	25.0	41	3.4	219	18.0
IMW	658	373	56.7	167	25.4	5	0.8	113	17.2
Pvt Obstetrician	232	75	32.3	74	31.9	33	14.2	50	21.6
GP	23	13	56.5	5	21.7	0		5	21.7
NW Domino	109	70	64.2	22	20.2	0		17	15.6
NW Community	134	83	61.9	24	17.9	0		27	20.2
NW Community/ADAPT	8	6	75.0	1	12.5	0		1	12.5
NW Diabetes	0								
NW Medical	27	11	40.7	9	33.3	2	7.4	5	18.5
Other DHB	8	7	87.5	0		1	12.5	0	
Unbooked	11	9	81.8	1	9.1	0		1	9.1

Table 121: Mode of birth by LMC at time of birth – multipara

	Total	SVB		Vaginal breech		Operative vaginal		CS elective		CS emergency	
	n	n	%	n	%	n	%	n	%	n	%
Total	3672	2331	63.5	33	0.9	213	5.8	584	15.9	511	13.9
IMW	1407	1048	74.5	11	0.8	80	5.7	100	7.1	168	11.9
Pvt Obstetrician	793	373	47.0	9	1.1	65	8.2	250	31.5	96	12.1
GP	67	51	76.1	0	0	2	3.0	10	14.9	4	6.0
NW Domino	316	253	80.1	0	0	13	4.1	16	5.1	34	10.8
NW Community	628	370	58.9	5	0.8	25	4.0	111	17.7	117	18.6
NW Community/ADAPT	46	28	6.1	0		1	2.2	10	21.7	7	15.2
NW Diabetes	140	67	47.9	2	1.4	5	3.6	32	22.9	34	24.3
NW Medical	198	94	47.5	2	1.0	20	10.0	48	24.2	34	17.2
Other DHB	46	20	43.5	1	2.2	2	4.4	6	13.0	17	37.0
Unbooked	31	27	87.1	3	9.7	0		1	3.2	0	

6.5 Operative births

Table 122: Indication for caesarean section by parity and gestation

	Nullipara preterm n=183		Nullipara term n=995		Multipara preterm n=139		Multipara term n=956		Total n=2273	
	n	%	n	%	n	%	n	%	n	%
Failure to progress	14	7.7	430	43.2	6	4.3	186	19.5	636	28.0
Repeat caesarean	NA	NA	NA	NA	21	15.1	400	41.8	421	18.5
Fetal distress	53	29.0	212	21.3	31	22.3	88	9.2	384	16.9
Malpresentation	31	16.9	134	13.6	23	16.6	82	8.6	270	11.9
Obstetric history	5	2.7	36	3.6	10	7.2	85	8.9	136	6.0
Maternal request	1	0.6	57	5.7	3	2.2	33	3.5	94	4.1
APH / abruption	14	7.7	27	2.7	17	12.2	20	2.1	78	3.4
Hypertension	37	20.2	15	1.5	10	7.2	7	0.7	69	3.0
Disproportion	1	0.6	29	2.9	1	0.7	17	1.8	48	2.1
Diabetes	3	1.6	5	0.5	2	1.4	8	0.8	18	0.8
Failed induction	1	0.5	9	0.9	0		5	0.5	15	0.7
Maternal distress	3	1.6	4	0.3	0		3	0.3	10	0.4
Cord prolapse/presentation	1	0.6	0		3	2.2	8	0.8	12	0.5
Other	19	10.4	37	3.7	12	8.6	14	1.5	82	3.6

Table 123: Indication for caesarean section at term by parity and type of caesarean section

	Nullipara CS elective n=215		Nullipara CS emergency n=780		Multipara CS elective n=542		Multipara CS emergency n=414		Total n=1951	
	n	%	n	%	n	%	n	%	n	%
Failure to progress	1	0.5	429	55.0	5	0.9	181	43.7	616	31.5
Repeat caesarean	NA	NA	NA	NA	353	65.1	47	11.4	400	20.5
Fetal distress	0		212	27.2	3	0.6	85	20.5	300	15.4
Malpresentation	82	38.1	52	6.7	42	7.8	40	9.7	216	11.1
Obstetric history	26	12.1	10	1.3	72	13.3	13	3.1	121	6.2
Maternal request	53	24.7	4	0.6	28	5.2	5	1.2	90	4.6
APH / abruption	8	3.7	19	2.4	10	1.9	10	2.4	47	2.4
Disproportion	9	4.2	20	2.6	6	1.1	11	2.7	46	2.4
Hypertension	2	0.9	13	1.7	4	0.7	3	0.7	22	1.1
Failed Induction	0		9	1.1	0		5	1.2	14	0.7
Diabetes	4	1.9	1	0.1	7	1.3	1	0.2	13	0.6
Cord prolapse	0		0		2	0.4	6	1.5	8	0.4
Maternal distress	2	0.9	2	0.3	2	0.4	1	0.2	7	0.4
Maternal age	5	2.3	0		2	0.4	0		7	0.4
Abnormal PH	0	0	2	0.3	0	0	0	0	2	0.1
Other	23	10.9	7	0.9	6	1.1	6	1.4	42	2.2

Table 124: Operative vaginal birth rates

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total births (mothers)	**8315**	**8690**	**8812**	**9125**	**9157**	**8055**	**7531**	**7501**	**7827**	**7471**	**7775**	**7611**	**7491**	**7194**
Total operative vaginal births	1039	1070	1190	1120	1156	1051	925	949	1006		1081	1065	1171	1022
Incidence %	12.5	12.3	13.5	12.3	12.6	13.0	12.3	12.7	12.9		13.9	14.0	15.6	14.2
Total nullipara	**3700**	**3649**	**3814**	**4037**	**4018**	**3591**	**3263**	**3262**	**3455**				**3597**	**3522**
Operative vaginal births	820	70	893	850	895	776	704	722	733				875	809
Nulliparous operative vaginal birth rate (%)	21.2	19.0	22.8	21.1	22.2	21.6	21.6	22.1	21.2				24.3	23.0
Total multipara	**4615**	**5041**	**4998**	**5088**	**5139**	**4464**	**4229**	**4238**	**4372**				**3894**	**3672**
Operative vaginal births	219	370	297	270	261	275	221	227	273				296	213
Multiparous operative vaginal birth rate (%)	4.7	7.3	5.9	5.3	5.1	6.2	5.2	5.4	6.2				7.6	5.8

Table 125: Type of operative vaginal birth: 1992-2005

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total births	**8315**	**8690**	**8812**	**9125**	**9157**	**8055**	**7531**	**7501**	**7827**	**7471**	**7755**	**7611**	**7491**	**7194**
Total operative vaginal births	1039	1070	1190	1120	1156	1051	925	949	1006		1081	1065	1171	1022
% of all births	12.5	12.3	13.5	12.3	12.6	13.0	12.3	12.7	12.9		13.9	14.0	15.6	14.2
Total forceps alone	854	883		795	739	590	464	439	435		391	352	323	292
% of all births	10.3	10.2		8.7	8.1	7.3	6.2	5.9	5.6		5.0	4.6	4.3	4.1
Kiellands forceps	131	123		112	83	73	41	33	21				36	22
% of all births	1.6	1.5		1.2	0.9	0.9	0.5	0.4	0.3				0.5	0.3
Other forceps	723	760		683	656	517	423	406	414				287	270
% of all births	8.7	8.7		7.5	7.2	6.4	5.6	5.4	5.3				3.8	3.8
Ventouse or forceps /ventouse	185	185		325	417	461	461	510	571		690	713	848	962
% of all births	2.2	2.1		3.6	4.6	5.7	6.1	6.8	7.3		8.9	9.4	11.3	13.4
Ventouse alone								436	516				771	651
% of all births								5.8	6.6				10.3	9.0
Forceps/ ventouse								74	55				77	60
% of all births								1.0	0.7				1.0	0.8

Table 126: Mode of birth by ethnicity – nullipara

		SVB		Vaginal breech		Operative forceps		Operative ventouse		CS elective		CS emergency	
	N	n	%	n	%	n	%	n	%	n	%	n	%
NZ European	1420	547	38.5	6	0.4	118	8.3	218	15.4	128	9.0	403	28.4
Maori	230	123	53.5	5	2.2	8	3.5	31	13.5	7	3.0	56	24.4
Pacific	347	205	59.1	4	1.2	9	2.6	41	11.1	14	4.0	74	21.3
Asian	543	256	47.2	0		25	4.6	117	21.6	22	4.1	123	22.7
Indian	277	107	38.6	1	0.4	21	7.6	38	13.7	17	6.1	93	33.6
Other European	383	137	35.8	1	0.3	35	9.1	67	17.5	39	10.2	104	27.2
Other	321	139	43.3	3	0.9	25	7.8	56	17.5	22	6.9	76	23.7

Table 127: Mode of birth by ethnicity - multipara

		SVB		Vaginal breech		Operative forceps		Operative ventouse		CS elective		CS emergency	
	N	n	%	n	%	n	%	n	%	n	%	n	%
NZ European	1383	821	59.5	13	0.9	27	2.0	66	4.8	301	21.8	154	11.1
Maori	315	220	69.8	2	0.6	6	1.9	12	3.8	33	10.5	42	13.3
Pacific	666	493	74.0	7	1.1	4	0.6	10	1.5	53	8.0	99	14.9
Asian	547	349	63.8	3	0.6	4	0.7	35	6.4	80	14.6	76	13.9
Indian	268	153	57.1	4	1.5	1	0.4	9	3.4	41	15.3	60	22.4
Other European	291	163	56.0	2	0.7	9	3.1	21	7.2	55	18.9	41	14.1
Other	200	130	65.0	2	1.0	2	1.0	7	3.5	21	10.5	38	19.0

Table 128: Breech birth 1995-2005

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total nos of babies born	9516	9612	8270	7721	7679	8054	7654	7988	7804	7679	7384
Total breech births	535	479	434	400	440	484				421	432
Percent of total births	5.6	5.0	5.2	5.2	5.7	6.0				5.5	5.9
Total singleton babies					7329	7609				7303	7007
Total singleton breech births					341	363				318	328
Percent of singleton births					4.7	4.8				4.4	4.7
Total multiple birth babies					350	445				376	377
Total multiple breech births					99	121				103	104
Percent of multiple birth babies					28.3	27.2				27.4	27.6

Table 129: Mode of birth by type of breech (singletons only)

	Extended leg n=177		Flexed leg n=89		Unspecified n=62		Total breech n= 328	
	n	%	n	%	n	%	n	%
Vaginal breech	19	10.7	11	12.4	9	14.5	39	11.9
Caesarean section	158	89.3	78	87.6	53	85.5	289	88.1
CS emergency	83	46.9	42	47.2	23	37.1	148	45.1
CS elective	75	42.4	36	40.4	30	48.4	141	43.0

Table 130: Mode of birth by type of breech (multiples only)

	Extended leg n=31		Flexed leg n=33		Unspecified n=40		Total breech n= 104	
	n	%	n	%	n	%	n	%
Spontaneous breech birth	5	15.6	9	27.3	4	10.0	18	17.1
Caesarean section	26	83.9	24	72.7	36	90.0	86	82.7
CS emergency	20	64.5	7	21.2	17	42.5	44	41.9
CS elective	6	19.4	17	51.5	19	47.5	42	40.4

6.6 Analgesia/anaesthesia

Table 131: Epidural use among women with spontaneous and induced labour rates (2000-2005)

	2000	2001	2002	2003	2004	2005
Number of births	7827				7491	7194
Number women with spontaneous labour	4820				4817	4246
Spontaneous labour and epidural	2143				2434	2138
%	44.5				50.5	50.4
Number of women with induced labour	2002				1922	1894
Induced labour and epidural	1313				1412	1373
%	65.6				73.5	72.5

Table 132: Analgesic use and maternal age (among nulliparous spontaneous and induced labours)

Maternal age (years)	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
≤20	251	131	52.2	140	55.8	88	35.1	1	0.4	30	12.0
21-25	493	298	60.5	241	48.9	151	30.6	5	1.0	55	11.2
26-30	912	639	70.1	444	48.7	224	24.6	18	2.0	109	12.0
31-35	1089	813	74.7	496	45.6	193	17.7	38	3.5	142	13.0
36-40	364	285	78.3	139	38.2	75	20.6	10	2.8	36	9.9
41+	46	39	84.8	13	28.3	8	17.4	0		3	6.5

Table 133: Analgesic use and LMC type among nulliparous spontaneous and induced labours

LMC type	Total	Epidural		Entonox		Pethidine		TENS		Water	
	n	n	%	n	%	n	%	n	%	n	%
IMW	1516	1032	68.1	673	44.4	372	24.5	46	3.0	211	13.9
Pvt Obstetrician	601	521	86.7	225	37.4	59	9.8	11	1.8	55	9.2
GP	70	53	75.7	37	52.9	18	25.7	2	2.9	10	14.3
NW Domino	265	152	57.4	159	60.0	71	26.8	5	1.9	62	23.4
NW Community	399	261	65.4	241	60.4	140	35.1	4	1.0	27	6.8
NW Community/ADAPT	26	13	50.0	15	57.7	8	30.8	2	7.7	0	0
NW Diabetes	62	46	74.2	29	46.8	18	29.0	2	3.2	1	1.6
NW Medical	130	92	70.8	61	46.9	29	22.3	0	0	8	6.2
Other DHB	59	25	42.4	22	37.3	21	35.6	0	0	1	1.7
Unbooked	27	10	37.0	11	40.7	3	11.1	0	0	0	0

Table 134: Analgesic use and ethnicity (among nulliparous spontaneous and induced labours)

	Total	Epidural		Entonox		Pethidine		TENS		Water	
	N	n	%	n	%	n	%	n	%	n	%
NZ European	1233	944	76.6	561	45.5	203	16.5	37	3.0	184	14.9
Maori	210	119	56.7	114	54.3	58	27.6	2	1.0	24	11.4
Pacific	300	148	49.3	146	48.7	81	27.0	1	0.3	26	8.7
Asian	540	360	66.7	255	47.2	187	34.6	9	1.7	26	4.8
Indian	249	180	72.3	112	45.0	79	31.7	1	0.4	15	6.0
Other	331	251	75.8	142	42.9	60	18.1	14	4.2	65	19.6
Other European	291	202	69.4	143	49.1	71	24.4	8	2.8	35	12.0

6.7 Perineal trauma

Table 135: Perineal trauma by mode of birth, parity and LMC

	Total	Episiotomy		3rd/4th tear*		Vaginal wall tear	
	N	n	%	n	%	n	%
Total vaginal births	4921	1093	22.2	99	2.0	178	3.6
Mode of birth							
Normal vaginal	3845	539	14.0	53	1.4	132	3.4
Vaginal breech	54	2	3.7	0		0	
Ventouse	728	332	45.6	24	3.3	28	3.8
Forceps	294	216	73.5	20	6.8	18	6.1
Parity							
Nulliparous	2344	817	34.9	71	3.0	124	5.3
Multiparous	2577	276	10.7	26	1.0	54	2.1
LMC							
Independent MW	2291	560	24.4	39	1.7	72	3.1
GP	104	28	26.9	2	1.9	5	4.8
Private Obstetrician	855	255	29.8	11	1.3	22	2.6
Domino	480	66	13.8	13	2.7	24	5.0
Community	694	115	16.6	28	4.1	30	4.3
ADAPT/ Community	50	5	10.0	1	2.0	1	2.0
Diabetic	114	21	18.4	2	1.8	10	8.9
Medical	211	38	18.0	4	1.9	10	4.7
Other DHB	67	2	3.0	0		2	2.9
Unbooked	55	3	5.5	0		2	3.6

Table 136: Episiotomy in SVB by LMC at birth and parity

	Nullipara			Multipara		
	Total	n	%	Total	n	%
Total	1514	351	23.2	2331	188	8.1
Independent MW	744	205	27.6	1048	94	10.0
GP	34	8	25.5	51	7	13.8
Private Obstetrician	214	65	30.4	373	50	13.4
Domino	161	19	11.8	253	10	4.0
Community	206	39	18.9	370	16	4.3
ADAPT/ Community	16	1	6.3	28	1	3.6
Diabetic	23	2	8.7	67	6	10.0
Medical	57	8	14.0	94	3	3.2
Other DHB	35	2	5.7	20	0	
Unbooked	24	2	8.3	27	1	3.7

Table 137: 3rd and 4th degree tears in SVB by LMC at birth and parity

	Nullipara			Multipara		
	Total	**n**	**%**	**Total**	**n**	**%**
Total	1514	35	2.3	2331	20	0.9
Independent MW	744	15	2.0	1048	4	0.4
GP	34	0		51	1	2.0
Private Obstetrician	214	2	0.9	373	3	0.8
Domino	161	7	4.3	253	4	1.6
Community	206	9	4.4	370	7	1.9
ADAPT/ Community	16	0		28	0	
Diabetic	23	0		67	1	1.5
Medical	57	2	3.5	94	0	
Other DHB	35	0		20	0	
Unbooked	24	0		27	0	

Table 138: Postpartum transfusion rates by recorded blood loss at birth

		Postpartum transfusion n=133	
	Total	n	%
Blood loss < 500mls	5037	10	0.2
PPH ≥ 500 - <1000	1790	47	2.6
PPH ≥ 1000mls	367	82	22.3
Blood loss unknown	19	0	

APPENDIX 6. POSTNATAL CARE

6.1 Infant feeding

Table 139: Method of infant feeding at discharge from NW

	2003		2004		2005	
	n = 5177		n = 5938		n = 5765	
	n	%	n	%	n	%
Exclusive breastfeeding	2789	53.9	3673	61.9	3686	63.9
Fully breastfeeding	562	10.9	464	7.8	485	8.4
Partial breastfeeding	1521	29.4	1497	25.2	1375	23.9
Artificial feeding	305	5.9	304	5.1	219	3.8

Table 140: Maternal demography and infant feeding on discharge from NW

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total	5765	3686	63.9	485	8.4	1375	23.9	219	3.8
Mode of Birth									
Spontaneous vaginal	3066	2411	78.6	108	3.5	440	14.4	107	3.5
Operative vaginal	805	556	69.1	52	6.5	173	21.5	24	3.0
Elective CS	756	317	41.9	117	15.5	281	37.2	41	5.4
Emergency CS	1138	402	35.3	208	18.3	481	42.3	47	4.1
LMC at birth									
IMW	2506	1829	73.0	156	6.2	467	18.6	54	2.2
Private Obstetrician	1290	842	65.3	121	9.4	295	22.9	50	3.9
GP	123	80	65.0	11	8.9	24	19.5	8	6.5
NW Community	932	505	54.2	91	9.8	283	30.4	53	5.7
NW Domino	478	323	67.6	36	7.5	98	20.5	21	4.4
NW Medical	220	73	33.2	40	18.2	92	41.8	15	6.8
NW Diabetes	153	19	12.4	25	16.3	101	66.0	8	5.2
Unbooked	34	19	55.9	2	5.9	5	14.7	8	23.5
Other DHB	29	14	48.3	3	10.3	10	34.5	2	6.9
Maternal age									
≤ 20	225	153	68.0	15	6.7	34	15.1	23	10.2
21-25	633	411	64.9	53	8.4	136	21.5	33	5.2
26-30	1370	896	65.4	103	7.5	326	23.8	45	3.3
31-35	2184	1466	67.1	185	8.5	476	21.8	57	2.6
36-40	1143	663	58.0	101	8.8	325	28.4	54	4.7
41+	210	97	46.2	28	13.3	78	37.1	7	3.3
Ethnicity									
NZ European	2232	1581	70.8	196	8.8	379	17.0	76	3.4
Māori	393	269	68.4	34	8.7	68	17.3	22	5.6
Pacific	779	442	56.7	58	7.4	236	30.3	43	5.5
Asian	954	517	54.2	59	6.2	339	35.5	39	4.1
Indian	438	221	50.5	51	11.6	159	36.3	7	1.6
Other European	563	385	68.4	55	9.8	108	19.2	15	2.7
Other	403	269	66.7	32	7.9	85	21.1	17	4.2

Table 141: Clinical characteristics and infant feeding on discharge from NW

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Total	5765	3686	63.9	485	8.4	1375	23.9	219	3.8
Gestation									
< 37 weeks	241	73	30.3	45	18.7	108	44.8	15	6.2
37 - 40 weeks	4552	2924	64.2	372	8.2	1081	23.7	175	3.8
41+ weeks	972	689	70.9	68	7.0	186	19.1	29	3.0
Weight									
< 2.5 kgs	149	17	11.4	31	20.8	94	63.1	7	4.7
2.5 - 2.9 kgs	862	452	52.4	95	11.0	262	30.4	53	6.1
3.0 - 4.4 kgs	4633	3169	68.4	348	7.5	963	20.8	153	3.3
≥ 4.5 kgs	121	48	39.7	11	9.1	56	46.3	6	5.0
Infant feeding at discharge from NW Homecare by LMC									
Domino	525	295	56.2	79	15.0	89	17.0	62	11.8
Community	747	331	44.3	123	16.5	187	25.0	106	14.2
Medical	118	37	31.4	28	23.7	30	25.4	23	19.5
Diabetes	69	13	18.8	18	26.1	29	42.0	9	13.0

Table 142: Infant feeding at discharge from NW Homecare by LMC

	Total	Exclusive BF		Fully BF		Partial BF		Artificial	
	N	n	%	n	%	n	%	n	%
Infant feeding at discharge from NW Homecare by LMC									
Domino	525	295	56.2	79	15.0	89	17.0	62	11.8
Community	747	331	44.3	123	16.5	187	25.0	106	14.2
Medical	118	37	31.4	28	23.7	30	25.4	23	19.5
Diabetes	69	13	18.8	18	26.1	29	42.0	9	13.0

6.2 Postnatal admissions

Table 143: Maternal destination following birth by mode of birth

	NW Wards n=4286		Birthcare n=2354		Home n=510		Other Units n=44	
	n	%	n	%	n	%	n	%
Spontaneous vaginal	1396	32.6	1939	82.4	475	93.1	35	79.5
Breech vaginal	52	1.2	0	0	2	0.4	0	0
Operative vaginal	565	13.2	415	17.6	33	6.5	9	20.5
CS elective	834	19.5	0	0	0	0	0	0
CS emergency	1439	33.6	0	0	0	0	0	0

Table 144: Maternal destination following birth by LMC

		NW Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
Independent Midwife	2996	1400	46.7	1259	42.0	314	10.5	23	0.8
Private Obstetrician	1577	1009	64.0	534	33.9	19	1.2	15	1.0
General Practitioner	142	71	50.0	62	43.7	9	6.3	0	0
NW Domino	591	295	49.9	246	41.6	49	8.3	1	0.2
NW Community	1212	847	69.9	256	21.1	107	8.8	2	0.2
NW Diabetes	212	210	99.1	2	0.9	0	0	0	0
NW Medical	351	347	98.9	1	0.3	3	0.9	0	0
Other DHB	131	125	95.4	0	0	3	2.3	3	2.3
Unbooked	58	43	74.1	5	8.6	10	17.2	0	0

Table 145: Maternal destination following birth by ethnicity

	Total	NW Wards		Birthcare		Home		Other Units	
	N	n	%	n	%	n	%	n	%
NZ European	2802	1609	57.4	1091	38.9	79	2.8	23	0.8
Maori	545	344	63.1	133	24.4	62	11.4	6	1.1
Asian	1123	635	56.5	330	29.4	156	13.9	2	0.2
Indian	544	375	68.9	138	25.4	29	5.3	2	0.4
Other European	674	400	59.3	241	35.8	28	4.3	5	0.7
Other	492	319	64.8	169	34.3	32	6.5	1	0.2

Table 146: Postnatal readmission reason by maternal destination following birth

	NW Wards n=4618		Birthcare n=2245		Home n=539	
	n	%	n	%	n	%
Neonatal Admission	27	0.6	44	2.0	6	1.1
Infection	57	1.2	13	0.6	2	0.4
Breast	25	0.5	29	1.3	2	0.4
Wound	18	0.4	5	0.2	2	0.4

Table 147: Postnatal readmission by LMC at birth

		Neonatal Admission		Infection		Breast		Wound	
		n	%	n	%	n	%	n	%
Independent Midwife	2996	27	0.9	26	0.9	22	0.7	10	0.3
Private Obstetrician	1577	10	0.6	11	0.7	3	0.2	1	0.1
NW Domino	591	12	2.0	4	0.7	16	2.7	3	0.5
NW Community	1060	24	2.3	18	1.7	7	0.7	6	0.6
NW High Risk	563	3	0.5	6	1.1	6	1.1	4	0.7

APPENDIX 7. NEWBORN

7.1 Admissions to NICU

Table 148: Admissions to NICU by gestational age of babies born in National Women's

Gestation (weeks)	1999	2000	2001	2002	2003	2004	2005
Total	1108	1154	1104	1098	1004	861	825
23	3	5	7	1	1	0	1
24	3	4	10	8	9	3	15
25	17	21	12	13	10	8	14
26	10	23	12	15	15	18	11
27	29	15	14	20	15	24	9
28	23	18	21	19	18	18	23
29	28	34	29	32	18	19	41
30	35	32	36	32	31	35	29
31	49	54	42	36	43	32	33
32	73	78	58	67	49	42	42
33	72	98	77	100	78	65	38
34	122	135	125	138	137	79	83
35	138	106	116	125	96	84	70
36	98	114	112	92	89	79	62
37	69	88	77	84	71	61	70
38	100	93	101	98	88	86	83
39	74	77	88	61	85	68	72
40	93	109	106	78	90	84	80
41	57	44	55	66	52	51	39
42	14	6	6	13	9	5	9
43	1	0	0	0	0	0	1

Table 149: Admissions to NICU by birth weight of babies born in National Women's

Birth Weight (gms)	1999	2000	2001	2002	2003	2004	2005
Total	1108	1154	1104	1098	1004	861	825
<500	4	0	1	1	0	0	25
500-749	16	22	23	14	20	11	34
750-999	44	41	37	37	32	37	47
1000-1249	48	45	47	47	31	38	42
1250-1499	56	64	48	56	53	36	120
1500-1999	167	193	186	193	164	138	170
2000-2499	285	291	243	256	238	177	119
2500-2999	171	182	199	184	156	147	215
3000-3999	224	239	232	221	237	208	53
≥4000	93	77	88	89	73	69	825

Table 150: Admissions to NICU by gestational age of babies transferred postpartum to National Women's

Gestation (weeks)	1999	2000	2001	2002	2003	2004	2005
Total	244	258	209	228	216	114	81
23	1	0	1	1	0	0	0
24	1	4	1	3	0	3	3
25	2	1	1	2	2	0	0
26	4	0	3	1	2	1	2
27	0	2	5	2	2	1	1
28	3	3	2	3	3	3	4
29	1	1	1	4	7	2	3
30	4	5	8	12	3	4	3
31	3	1	3	4	3	5	3
32	7	2	8	5	8	4	7
33	4	6	3	1	5	4	7
34	3	5	10	7	13	10	5
35	16	9	7	10	5	6	4
36	17	33	19	19	16	6	2
37	14	19	17	16	20	6	7
38	37	38	28	22	23	13	5
39	30	24	21	35	29	13	8
40	51	61	42	49	43	19	12
41	35	33	27	30	30	10	3
42	10	11	2	2	2	3	2
43+	1	0	0	0	0	1	0

Table 151: Admissions by birth weight of babies transferred postpartum to National Women's

Birth Weight (gms)	1999	2000	2001	2002	2003	2004	2005
Total	244	258	209	228	216	114	81
500-749	4	3	5	3	2	3	2
750-999	4	3	6	10	4	4	5
1000-1249	4	2	3	4	8	3	4
1250-1499	5	7	6	11	5	5	6
1500-1999	17	14	15	14	18	18	15
2000-2499	29	35	34	21	28	11	10
2500-2999	44	37	32	34	29	13	10
3000-3999	104	120	87	101	91	43	22
≥4000	33	37	21	30	31	14	7

Table 152: Domicile of mother of all babies admitted to NICU

	2001		2002		2003		2004		2005		% change
	n	%	n	%	n	%	n	%	n	%	
Total	1313		1331		1222		975		906		-30
Northern Region	1274	97	1280	96	1177	96	934	96	833	92	-33
Auckland	554	42	515	39	494	40	461	47	441	49	-15
Counties Manukau	157	12	179	13	174	14	162	17	144	16	-15
Waitemata	524	40	558	42	477	39	275	28	217	24	-58
Northland	39	3.0	28	2.1	32	2.6	36	3.7	32	3.5	-3
Midland Region	24	1.8	36	2.7	19	1.6	14	1.4	34	3.8	+29
Central Region	8	0.6	8	0.6	9	0.7	16	1.6	23	2.5	+176
Southern Region	5	0.4	6	0.5	13	1.1	7	0.7	8	0.9	0
Overseas	2	0.2	1	0.1	4	0.3	4	0.4	5	0.6	+114

Change is from the average of 2001-2003 to 2005 admission numbers.

Table 153: Domicile of mother of babies <32 weeks or <1500gms admitted to NICU

	2001		2002		2003		2004		2005		% change
	n	%	n	%	n	%	n	%	n	%	
Total	230		230		212		187		211		-6
Northern Region	211	92	213	93	197	93	172	92	186	88	-10
Auckland	71	31	71	31	56	26	52	28	59	28	-11
Counties Manukau	29	13	33	14	32	15	34	18	29	14	-7
Waitemata	92	40	93	40	91	43	63	34	77	36	-16
Northland	19	8	16	7	18	8	23	12	21	10	19
Midland Region	12	5	9	4	7	3	11	6	13	6	39
Central Region	3	1	7	3	5	2	2	1	10	5	100
Southern Region	3	1	0	-	3	1	0	-	2	1	0
Overseas	1	0	1	-	0	-	2	1	0		

Change is from the average of 2001-2003 to 2005 admission numbers.

Table 154: Ethnicity of mothers of babies admitted to NICU

	Preterm	Term	Total
European	277	195	472
Maori	72	30	102
Other	38	41	79
Indian	25	33	58
Samoan	28	22	50
Chinese	18	21	39
Other Asian	20	15	35

	Preterm	Term	Total
Tongan	14	13	27
Cook Island	10	9	19
Other Pacific	6	5	11
Niue	3	3	6
Korean	3	1	4
Fiji	1	3	4

Table 155: Occupancy (baby days) for NICU by gestational age

Gestation (weeks)	1999	2000	2001	2002	2003	2004	2005
Total	18407	20652	20108	20551	19249	14958	14541
<28	4337	4471	4237	4772	4466	3639	3328
28-31	5054	5807	6159	5483	5331	4265	4774
32-36	6776	7543	7496	8198	7204	5150	4535
≥37	2240	2831	2216	2098	2248	1904	1904

Table 156: Occupancy (baby-days) for NICU by birth weight

Weight(gms)	1999	2000	2001	2002	2003	2004	2005
Total	18407	20652	20108	20580	19249	14958	14505
<1500	8444	9003	9281	9658	8837	6563	7115
1500-1999	3669	4485	4526	4460	4295	3457	2942
2000-2499	3427	3362	3135	3173	3097	2360	2221
≥2500	2867	3802	3166	3289	3020	2578	2227

Table 157: Reason for admission to NICU

Reason	n
Prematurity	416
Respiratory distress	155
Congenital abnormality	82
Hypoglycaemia	62
Depression at birth	40
Cyanotic episode	27
IU growth restriction	25
Jaundice	23
Other	23

Reason	n
Suspected infection	14
Feeding difficulty	8
Neonatal abstinence syndrome	7
Haemolytic disease	7
Neurological problem	6
Bile stained vomiting	5
Vomiting	3
Maternal diabetes mellitus	3

7.2 Infection

Table 158: Organisms causing serious infection

Organism	Early Infection	Late Infection
Strep agalactiae	3	2
E Coli	2	3
Staph aureus	0	6
Staph epidermidis	0	10
Coagulase negative *staphylococcus*	0	3
Strep pneumoniae	1	0
Seratia	0	1
Strep viridans	1	0

Table 159: Late onset serious infection (septicaemia)

Gestation (weeks)	Birth Weight (gms)	Type	Gestation (weeks)	Birth Weight (gms)	Type
24	705	CONS day 9	25	935	*S. aureus* day 34
24	820	*S. epi* day 9	25	647	*S. aureus* day 55
24	690	*S. aureus* day 16	25	647	GBS day 78
24	750	*S. epi* day 22	26	725	GBS day 65
24	620	*S. aureus* day 26	26	725	CONS day 107
24	750	*S. epi* day 68	28	860	*S. aureus* day 16
24	750	*S. epi* day 77	28	1166	*S. aureus* day 44
24	750	*S. epi* day 90	29	1190	*S. epi* day 5
24	750	*S. epi* day 016	31	1195	*S. epi* day 21
25	647	*E. coli* day 10	33	2135	CONS day 45
25	720	*E. coli* day 14	34	1910	*S. epi* day 10
25	935	*S. epi* day 17	35	2535	*Serratia* day 6
25	720	*E. coli* day 25			

(All septicaemias) CONS = Coagulase negative *Staphylococcus*, GBS = Group B *Streptococcus* or *Strep agalactiae* *S.epi* = *Staph epidermidis*

7.3 Infant feeding in babies discharged from NICU

Note human milk fortifier has not been included as a supplement in the definition used for NICU babies

Table 160: Infant feeding in babies discharged either directly home or to a post-natal ward by gestational age

Gestation (weeks)		Exclusive		Fully		Partial		Artificial	
	N	n	%	n	%	n	%	n	%
Total	658	232	35	201	31	144	22	81	12
≤28	24	13	54	4	17	0	0	7	29
29-31	51	16	31	22	43	2	4	11	22
32-36	260	76	29	105	40	55	21	24	9
>36	323	127	39	70	22	87	27	39	12

Table 161: Infant feeding in babies discharged either directly home or to a post-natal ward by birth weight

Birthweight (gms)		Exclusive		Fully		Partial		Artificial	
	N	n	%	n	%	n	%	n	%
Total	658	232	35	201	31	144	22	81	12
500-999	22	12	55	5	23	0	0	5	23
1000-1499	42	15	36	19	45	0	0	8	19
1500-1999	92	22	24	44	48	14	15	12	13
2000-2499	146	40	27	56	38	33	23	17	12
2500+	356	143	40	77	22	97	27	39	11

7.4 Assisted ventilation

Table 162: Proportion of babies needing assisted ventilation (excluding for surgery or a congenital anomaly) 2003-2005

Gestation (weeks)	No support	%	CPAP only	%	IPPV	%
23	0	0	0	0	2	100
24	0	0	0	0	33	100
25	0	0	1	3	32	97
26	0	0	9	18	40	82
27	0	0	10	19	42	81
28	0	0	23	33	46	67
29	5	5	55	60	31	34
30	8	8	82	78	15	14
31	15	13	85	71	20	17
32	46	30	89	58	19	12
33	88	44	103	52	9	5
34	248	71	91	26	12	3
35	373	84	69	16	2	0
36	750	93	52	6	8	1
37	1657	97	40	2	16	1
38	3726	98	55	1	19	1
39	5446	99	38	1	14	0
40	5633	98	64	1	24	0
41	3233	99	33	1	13	0
42	524	98	5	1	5	1
43	31	100	0	0	0	0

Denominator is all inborn babies from 2003-2005, excluding delivery room deaths. n = 23089

Table 163: High Frequency Oscillatory Ventilation

Gestation (weeks)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	%
Total	1/3	3/6	8/14	7/18	11/20	3/10	12/25	7/9	5/10	15/21	72/136	53
<28	0/1	1/3	5/7	2/7	4/8	2/5	2/7	4/5	2/6	9/14	31/63	49
28-31	1/1	1/1	1/2	2/6	-	½	1/3	-	-	3/3	10/18	56
32-36	-	-	1/2	1/2	2/3	0/2	0/3	-	0/1	0/1	4/14	29
≥37	0/1	1/2	1/3	2/3	5/9	0/1	9/12	3/4	3/3	3/3	27/41	66

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

Table 164: Inhaled Nitric Oxide (iNO)

Gestation (weeks)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	%
Total	10/16	11/14	11/22	12/21	16/25	11/16	13/24	6/10	7/13	13/16	110/177	62
<28	0/1	2/3	0/2	3/6	1/3	½	0/1	1/2	1/6	2/5	11/31	35
28-31	-	2/2	0/1	0/3	0/2	2/2	1/3	-	-	1/1	6/14	43
32-36	2/3	1/1	1/5	2/2	2/3	0/3	1/6	1/1	-	3/3	13/27	48
≥37	8/12	6/8	10/14	7/10	13/17	8/9	11/14	4/7	6/7	7/7	80/105	76

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

Table 165: iNO plus HFOV

Gestation (weeks)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	%
Total	0/2	3/5	2/5	4/10	8/12	0/4	10/18	3/4	2/6	6/8	38/74	51
<28	0/1	1/2	0/1	1/4	1/2	0/1	-	-	0/4	2/3	5/18	28
28-31	-	1/1	-	0/2	-	-	1/3	-	-	1/1	3/7	43
32-36	-	-	1/2	1/1	2/3	0/2	0/3	-	-	0/1	4/12	33
≥37	0/1	1/2	1/2	2/3	5/7	0/1	9/12	3/4	2/2	3/3	26/37	70

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

Table 166: Reason for ventilation and CPAP in term and post-term infants

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
TTN/RDS	4/13	4/7	2/44	4/19	1/24	4/47	2/45	3/46	6/61	2/42
Infection	5/13	4/2	4/14	5/27	3/31	1/17	3/17	0/15	1/12	2/8
Meconium	18/12	1/5	9/18	4/15	7/21	1/15	6/25	9/20	4/13	7/16
Anomaly	12/5	8/0	16/4	8/9	13/9	11/8	14/9	8/5	4/6	9/10
PPHN	6/3	7/4	6/4	6/4	9/5	5/6	9/12	3/4	8/7	4/6
Encephalopathy	8/5	6/1	7/12	1/4	7/1	2/4	1/1	14/7	8/8	9/4

Numbers in each cell are IPPV/CPAP. Some babies each year with other diagnoses are not included in this table.

7.5 Very low birth weight infants

Table 167: Number of VLBW who were born elsewhere and admitted to NICU, or were born in ACH and alive at birth

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total	205	178	181	204	210	219	204	175	159	185
Total Inborn	189	166	169	186	195	199	176	156	144	168
<500 gms	13	11	14	13	13	25	11	12	15	9
500–749 gms	36	47	28	22	30	36	23	28	17	34
750–999 gms	50	33	35	45	42	41	37	32	37	35
1000-1249 gms	47	39	37	49	46	48	47	31	39	48
1250-1499 gms	43	36	55	57	64	49	58	53	36	42
Outborn	16	12	12	18	15	20	28	19	15	17

Table 168: Numbers and survival by gestational age of babies <32 weeks gestation in 2005

Gestation (weeks)	23	24	25	26	27	28	29	30	31
Born Alive in NW	4	19	15	11	9	23	41	29	33
Died at birth	3	4	1	0	0	0	0	0	0
Admitted to NICU	1	15	14	11	9	23	41	29	33
Survived	1	9	13	10	7	22	41	28	33
Outborn Admitted	0	3	0	2	1	4	3	3	3
Outborn Survived		2		2	0	3	3	3	3

7.6 Morbidity of inborn very low birth weight infants and babies <32 weeks gestation admitted to NICU

Table 169: Intraventricular haemorrhage by birth weight

Birth Weight (gms)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total (%)	148	19 (13)	108 (73)	4 (3)	11 (7)	3 (2)	3 (2)
500-749	25	0	18	1	2	2	2
750-999	34	2	28	0	3	1	0
1000-1249	47	1	40	1	4	0	1
1250-1499	42	16	22	2	2	0	0

Table 170: Intraventricular haemorrhage by gestation

Gestation (weeks)	n	Unknown	None	Grade 1	Grade 2	Grade 3	Grade 4
Total	176	26	125	6	13	3	3
<24	1	0	0	1	0	0	0
24-25	29	0	20	0	4	3	2
26-27	20	2	17	0	1	0	0
28-29	64	1	52	4	6	0	1
30-31	62	23	36	1	2	0	0

Table 171: Retinopathy of prematurity by birth weight in babies surviving to 36 weeks' gestation

Birth Weight(gms)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	137	27	104	2	3	1	0
500-749	18	0	16	0	2	0	0
750-999	32	1	28	1	1	1	0
1000-1249	45	6	38	1	0	0	0
1250-1499	42	20	22	0	0	0	0

Table 172: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks' gestation

Gestation (weeks)	n	Unknown	None	Stage 1	Stage 2	Stage 3	Stage 4
Total	164	48	110	2	3	1	0
<24	1	0	1	0	0	0	0
24-25	22	0	18	1	2	1	0
26-27	17	2	14	0	1	0	0
28-29	63	3	59	1	0	0	0
30-31	61	43	18	0	0	0	0

Table 173: Chronic lung disease by birth weight

Birth Weight (gms)	n	Dead by 36 wks	Alive at 36 wks	In O_2	CPAP/ IPPV	CLD	CLD in All	CLD if Alive
Total	148	11	137	19	13	25	17%	18%
500-749	25	7	18	11	7	14	56%	78%
750-999	34	2	32	6	4	8	24%	25%
1000-1249	47	2	45	1	1	2	4%	4%
1250-1499	42	0	42	1	1	1	2%	2%

Table 174: Chronic lung disease by gestational age

Gestation (weeks)	n	Dead by 36 wks	Alive at 36 wks	In O_2	CPAP/ IPPV	CLD	%CLD in All	%CLD if Alive
Total	176	11	165	21	13	27	15	16
<24	1	0	1	1	0	1		
24-25	29	7	22	9	7	13	45	59
26-27	20	3	17	4	0	4	20	24
28-29	64	1	63	4	3	6	10	10
30-31	62	0	62	3	3	3	5	5

Table 175: Necrotising enterocolitis (NEC) by birth weight

Weight (gms)	2001			2002			2003			2004			2005		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	155	1	0.6	157	2	1	136	3	2	121	4	3	148	6	4
500-749	23	1	4	14	0		20	1	5	11	0	0	25	4	16
750-999	37	0		37	1	3	32	1	3	37	3	8	34	1	3
1000-1249	47	0		47	1	2	31	0		38	1	3	47	1	2
1250-1499	48	0		56	0		53	1	2	35	0		42	0	

Table 176: Necrotising enterocolitis by gestational age

Gestation (weeks)	2001			2002			2003			2004			2005		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Total	183	1	0.5	175	3	25	160	4	3	121	4	3	176	6	3
<24	7	0		1	0		1	0		0			1	1	
24-25	22	1	2%	21	1	5	20	1	4	11	1	9	29	4	14
26-27	26	0		33	0		30	1	3	42	3	7	20	0	
28-29	50	0		52	1	2	36	1	3	37	0		64	0	
30-31	78	0		68	1	1	74	1	1	67	0		62	1	2

Table 177: Patent Ductus Arteriosus by birth weight

Indo = treated with indomethacin. Ligate = surgical ligation of PDA.

Birth weight (gms)	2001			2002			2003			2004			2005		
	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate
Total	155	42	4	157	42	4	136	40	7	121	34	2	148	39	0
500-749	23	15	4	14	7	1	20	15	6	11	4	1	25	20	0
750-999	37	19	0	37	19	0	32	11	0	37	18	0	34	15	0
1000-1249	47	7	0	47	9	2	31	10	0	38	11	1	47	3	0
1250-1499	48	1	0	56	7	1	53	4	1	35	1	0	42	1	0

Table 178: Patent Ductus Arteriosus by gestational age

Gestation (weeks)	2001			2002			2003			2004			2005		
	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate	N	Indo	Ligate
Total	183	42	4	175	45	4	160	43	6	157	35	2	176	41	1
<24	7	5	1	1	0	0	1	1	1	0			1	1	0
24-25	22	14	2	21	10	1	19	15	4	11	6	1	29	23	0
26-27	26	13	1	33	16	1	30	13	1	42	19	0	20	8	0
28-29	50	9	0	52	16	2	36	6	0	37	7	1	64	6	0
30-31	78	1	0	68	3	0	74	8	1	67	3	0	62	3	1

Table 179: Pneumothorax by birth weight

Birth weight (gms)	2001			2002			2003			2004			2005		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
500-749	23	1	4	14	2	14	20	2	10	11	0		25	1	4
750-999	37	0	0	37	0		32	0		37	0		34	1	3
1000-1249	47	1	2	47	2	2%	31	1	3	38	1	3	47	3	6
1250-1499	48	0		56	0	-	53	0		35	0		42	3	7
Total <1500	155	2	1	157	4	3%	136	3	2	121	1	1	148	8	5
≥1500	947	7	0.7	944	10	1%	868	11	1	740	5	0.7	677	5	0.7

Table 180: Pneumothorax by gestational age

Gestation (weeks)	2001			2002			2003			2004			2005		
	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
<24	7	0	0	1	0	0	1			0			1	0	
24-25	22	1	5	21	2	10	19	2	11	11	0	0	29	1	3
26-27	26	0	0	33	1	3	30	0	0	42	1	2	20	3	15
28-29	50	1	2	52	0	0	36	1	3	37	0	0	64	5	8
30-31	78	1	1	68	2	3	74	0	0	67	2	3	62	2	3
Total <32	183	3	2	175	5	3	160	3	2	157	3	2	176	11	6
≥32	920	6	0.6	924	9	1.0	844	11	1.3	704	3	0.4	649	2	0.3

Table 181: Percentage receiving antenatal corticosteroids by birth weight

Birth weight (gms)	2001			2002			2003			2004			2005		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
Total	155	59	84	157	64	91	136	42	90	121	54	91	148	57	95
500-749	23	57	83	14	50	93	20	50	95	11	64	91	25	52	100
750-999	37	54	89	37	65	97	32	47	91	37	59	95	34	56	94
1000-1249	47	55	81	47	72	94	31	52	100	38	58	95	47	57	98
1250-1499	48	69	83	56	64	89	53	30	81	35	40	83	42	60	90

Table 182: Percentage receiving antenatal corticosteroids by gestational age

Gestation (weeks)	2001			2002			2003			2004			2005		
	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any	N	1-7d	Any
Total	183	60	87	175	64	92	160	42	93	157	53	92	176	55	94
<24	7	29	86	1	100	100	1	100	100	0			1	0	100
24-25	22	68	86	21	62	100	19	53	95	11	73	91	29	55	97
26-27	26	42	85	33	67	97	30	47	93	42	57	93	20	55	100
28-29	50	56	80	52	60	92	36	42	97	37	51	95	64	47	94
30-31	78	69	94	68	66	87	74	36	89	67	48	91	62	40	94

7.7 Details of babies who died

Table 183: Extremely preterm neonatal and post-neonatal deaths (n = 28)

Born at	Gest age (weeks)	Birth Weight (gms)	Apgar 1/5	Admit NICU	Died dy:hr	Single/ twin	Cause of Death
ACH	21	360	2/1	No	0:0	S	APH, Premature labour. NR
ACH	21	360	2/1	No	0:0	S	Spontaneous labour. NR
ACH	21	365	/	No	0:1	S	Spontaneous labour. NR
ACH	21	410	2/2	No	0:1	S	SROM and labour. NR
ACH	21	440	3/2	No	0:0	S	Spontaneous labour. NR
ACH	21	450	/	No	0:0	T	Spontaneous labour. NR
ACH	22	475	3/2	No	0:0	S	Spontaneous labour. NR
ACH	22	510	1/1	No	0:0	S	Spontaneous labour. NR
ACH	22	530	2/1	No	0:1	S	Spontaneous labour. NR
ACH	22	650	2/1	No	0:1	S	Spontaneous labour. NR
ACH	23	590	/	No	0:0	T	Spontaneous labour. NR
ACH	23	605	2/2	No	0:0	S	Spontaneous labour. NR
ACH	23	610	2/2	No	0:1	S	Spontaneous labour. NR
ACH	24	535	2/2	No	0:0	T	Twin-twin Tx, induced. NR.
ACH	24	550	4/7	Yes	3:0	S	Periventricular leukomalacia
ACH	24	570	2/2	No	0:0	T	Twin-twin Tx, induced. NR.
ACH	24	605	9/10	Yes	0:15	S	Grade 4 IVH, E coli sepsis.
ACH	24	625	2/7	Yes	6:20	T	IVH grade 4
ACH	24	655	4/9	Yes	43:19	T	Renal failure following NEC
ACH	24	700	7/8	Yes	6:9	T	Necrotising enterocolitis
ACH	24	705	3/3	Yes	10:5	S	Overwhelming sepsis, IVH
ACH	24	710	1/1	No	0:1	S	Spontaneous labour. NR
Waitakere	24	770	8/8	Yes	20:13	S	Necrotising enterocolitis
ACH	25	720	1/6	Yes	61:5	S	Necrotising enterocolitis
ACH	25	1030	1/0	No	0:0	T	Failed resuscitation. Infection.
ACH	26	1200	5/9	Yes	1:1	T	Twin/twin Tx/resp. failure
ACH	27	830	2/3	Yes	0:5	T	Twin/twin transfusion, resp. failure
ACH	27	1045	3/6	Yes	0:20	S	Pulmonary hypoplasia/PIE

N/R = not resuscitated

Table 184: Premature neonatal and post-neonatal deaths (n = 3)

Born at	Gest age (weeks)	Birth Weight (gms)	Apgar 1/5	Admit NICU	Died dy:hr	Single/ twin	Cause of Death
ACH	28	810	4/7	Yes	0:0	T	Twin/twin transfusion, resp. failure
MMH	28	1340	6/9	Yes	11:18	S	Necrotising enterocolitis
ACH	32	1670	5/9	Yes	1:1	S	Global severe brain injury (antenatal)

Table 185: Term/post-term neonatal and post-neonatal deaths (n = 4)

Born at	Gest age (weeks)	Birth Weight (gms)	Apgar 1/5	Admit NICU	Died dy:hr	Single/ twin	Cause of Death
ACH	39	3970	1/0	Yes	1:2	S	Perinatal asphyxia, stage 3 encephalopathy
ACH	41	4060	10/10	No	23:6	S	Bronchiolitis, post discharge
ACH	41	4680	0/0	Yes	0:6	S	Perinatal asphyxia, stage 3 encephalopathy
Home	42	3560	3/5	Yes	1:4	S	Perinatal asphyxia, stage 3 encephalopathy

Table 186: Babies with associated anomalies, neonatal and post-neonatal deaths (n = 8)

Born at	Gest age	Birth Weight	Apgar 1/5	Admit NICU	Died dy:hr	Single/ twin	Cause of Death
NSH	27	820	6/6	Yes	45:5	S	Scimitar syndrome
ACH	30	1995	6/8	Yes	53:18	S	Noonan's syndrome, hypertrophic cardiomyopathy, PPHN
Dunedin	34	2050	8/8	Yes	14:0	S	TAPVD and PPHN
ACH	34	2420	4/7	Yes	0:21	S	Right diaphragmatic hernia
ACH	38	2600	9/10	No	12:22	S	VSD, coarctation (diagnosed PM).
ACH	38	2735	9/9	Yes	2:21	S	Heterotaxy syndrome
ACH	39	3580	9/9	Yes	19:22	S	HPLHS, Stage 1 Norwood.
ACH	40	2690	9/10	Yes		S	HPLHS, Stage 1 Norwood. Home.

Associated anomalies are those which had a significant influence on the outcome but for which active treatment was offered.

Table 187: Babies with lethal anomalies, neonatal and post-neonatal deaths (n = 13)

Born at	Gest age	Birth Weight	Apgar 1/5	Admit NICU	Died dy:hr	Single/ twin	Cause of Death
ACH	20	424	2/2	No	0:0	S	CNS abnormality, induced.
ACH	21	350	3/1	No	0:0	S	Camptomelic dysplasia. Induced
ACH	24	750	2/1	No	0:1	S	Multiple anomalies. Induced. NR
ACH	32	1555	6/7	Yes	3:18	T	Multicystic dysplastic kidneys
Wellington	33	1550	3/8	Yes	23:0	S	Laryngeal cleft, duodenal atresia.
ACH	35	2260	5/7	Yes	51:6	T	Freedman Sheldon syndrome
ACH	35	2510	/	No	0:0	S	Trisomy 13
ACH	36	2086	4/6	Yes	15:18	S	Zellweger's syndrome, PPHN
ACH	36	3355	2/1	No	0:0	S	Multiple anomalies
MMH	38	2170	2/9	Yes	31:1	S	Larsen's Syndrome/bronchomalacia
ACH	38	3980	1/0	No	0:0	S	Trisomy 21 + hydrops
ACH	39	2565	9/10	Yes	2:5	S	Hypoplastic L heart, inoperable.
ACH	42	3970	1/0	No	0:1	S	Pulmonary hypoplasia, pneumothorax, failed resuscitation

APPENDIX 8. PERINATAL MORTALITY

Table 188: Postnatal transfer deaths (these are babies born elsewhere who transferred to NW for postnatal care)

		2000	2001	2002	2003	2004	2005
Early neonatal deaths	**≤ 7 days**	6	1	3	3	3	3
Late neonatal deaths	**8 – 28 days**	0	1	0	0	0	3
Total deaths		6	2	3	3	3	6

Table 189: Perinatal and perinatal- related losses 1992 - 2005

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total number of perinatal related losses	168	133	147	131	165	128	133	105	136	94	116	105	124	111
Fetal death	86	61	80	84	86	74	73	65	84	57	69	64	82	68
Early neonatal death	65	60	49	39	63	45	50	31	43	32	40	34	33	38
Late neonatal death	9	6	15	7	10	6	6	9	9	5	7	7	9	5
Perinatal mortality rate /1000	11.6	9.4	9.3	7.6	10.1	9.4	9.8	12.5	15.8	11.6	13.6	12.6	15.0	14.4
Perinatal related loss rate /1000	19.7	14.3	15.6	13.7	16.5	14.7	16.1	13.7	16.9	12.3	14.5	13.5	16.1	16.1

Table 190: Perinatal mortality rate (per 1000 births) and perinatal-related loss rate (per 1000 births) adjusted for termination for fetal abnormalities

	2000	2001	2002	2003	2004	2005	
	Rate	Rate	Rate	Rate	Rate	n	Rate/ 1000
Perinatal mortality rate	15.8	11.6	13.6	12.6	15.0	106/ 7384	14.4
Perinatal mortality rate (excluding lethal & terminated fetal abnormalities)	11.5	8.0	8.9	8.2	11.4	(106-35) /7349	9.7
Perinatal related loss rate	16.9	12.3	14.5	13.5	16.2	111/ 7384	15.0
Perinatal related loss rate (excluding lethal & terminated fetal abnormalities)	12	8.4	9.4	8.9	12.4	(111-38) / 7346	9.9

Table 191: Maternal characteristics and perinatal related mortality

	Births n=7384		Stillbirths n=68			Neonatal deaths n=43		Perinatal related deaths n=111		
	n	%	n	%	SB rate*	n	%	NND rate‡	n	%	Perinatal related death rate†	RR (95%CI)§
Maternal Ethnicity												
NZ European	2906	39.4	26	38	8.9	15	35	5.2	41	37	14.1	Ref
Māori	558	7.5	7	10	12.5	11	26	20.0	18	16	32.3	2.3 (1.3-4.0)
Pacific	999	13.5	16	24	16.0	9	21	9.2	25	23	25.0	1.8 (1.1-3.0)
Asian	1138	15.4	7	10	6.2	1	2	0.9	8	7	7.0	0.5 (0.2-1.1)
Indian	550	7.4	6	9	10.9	3	7	5.5	9	8	16.4	1.2 (0.6-2.4)
Other European	695	9.4	3	4	4.3	3	7	4.3	6	5	8.6	0.6 (0.3-1.4)
Other	535	7.2	3	4	5.6	1	2	1.9	4	3	7.5	0.5 (0.2-1.5)
Maternal Age												
<26	1185	16.0	17	25	14.3	17	40	14.6	34	31	28.7	2.6 (1.6-4.2)
26-30	1721	23.3	17	25	9.9	7	16	4.1	24	22	13.9	1.2 (0.7-2.1)
31-35	2767	37.5	21	31	7.6	10	23	3.6	31	28	11.2	Ref
>35	1711	23.2	13	19	7.6	9	21	5.3	22	20	12.9	1.2 (0.7-2.0)
Maternal Smoking												
Current	611	8.3	4	6	6.5	9	21	14.8	13	12	21.3	1.9 (1.1-3.4)
Not current	6281	85.1	43	63	6.8	28	65	4.5	71	64	11.3	Ref
Stopped in pregnancy	87	1.2	2	3	23.0	1	2	11.8	3	3	34.5	3.1 (1.0-9.5)
Missing	405	5.5	19	28	46.9	5	12	13.0	24	22	59.3	5.2 (3.3-8.2)
Maternal BMI												
<19	169	2.3	0			2	5	11.8	2	2	11.8	0.9 (0.2-3.9)
19-25	2150	29.1	17	25	7.9	10	23	4.7	27	24	12.6	Ref
26-30	784	10.6	9	13	11.5	3	7	3.9	12	11	15.3	1.2 (0.6-2.4)
>30	702	9.5	8	12	11.4	10	23	14.4	18	16	25.6	2.0 (1.1-3.7)
Missing	3579	48.5	34	50	9.5	18	42	5.1	52	47	14.5	1.2 (0.7-1.8)

* Stillbirth rate = number of stillbirths per 1000 births

‡ Neonatal Death rate = number of deaths per 1000 live births

† Perinatal related death rate = number of perinatal related deaths per 1000 births

§ Relative Risk of perinatal death for each category compared to referent category (ref)

Table 192: Cause of death 2000-2005

Classification*	2000		2001		2002		2003		2004		2005	
	n	%	n	%	n	%	n	%	n	%	n	%
Congenital abnormality	37	25	28	30	42	36	36	34	36	34	38	34
Perinatal infection	11	8	5	5	7	6	6	6	6	6	11	10
Hypertension	5	4	3	3	3	3	4	4	4	4	3	3
Antepartum haemorrhage	10	8	10	11	3	3	5	5	5	5	6	5
Maternal conditions	5	4	3	3	8	7	8	7	8	7	8	7
Specific perinatal conditions	22	17	16	17	18	16	5	5	5	5	10	9
Hypoxic peripartum death	2	2	2	2	1	1	3	3	3	3	4	4
Fetal growth restriction	10	8	6	6	4	3	6	6	6	6	1	1
Spontaneous preterm	23	17	12	13	17	15	23	22	23	22	20	18
Unexplained antepartum death	11	8	9	10	13	11	9	8	9	8	10	9
Total	136	100	94	100	116	100	105	100	124	100	111	100

* 2000-2004 ANZACPM 2005 PSANZ-PDC

Table 193: Termination of pregnancy among causes of death 2005

Classification	Termination of pregnancy n=34	
	n	%
Congenital abnormality	22	65
Maternal conditions	6	18
Hypertension	3	9
Specific perinatal conditions	2	6
Fetal growth restriction	1	3

Table 194: Perinatal deaths by cause (PSANZ-PDC) and gestational age

Classification	Total n=111		< 37 weeks n=93		≥ 37 weeks n=18	
	n	%	n	%	n	%
Congenital abnormality	38	34.2	32	34.4	6	33.3
Perinatal infection	11	9.9	8	8.6	3	16.7
Hypertension	3	2.7	3	3.2	0	0
Antepartum haemorrhage	6	5.4	6	6.5	0	0
Maternal conditions	8	7.2	7	7.5	1	5.6
Specific perinatal conditions	10	9.0	8	8.6	2	11.1
Hypoxic peripartum death	4	3.6	1	1.1	3	16.6
Fetal growth restriction	1	0.9	1	1.1	0	0
Spontaneous preterm	20	18.0	20	21.5	0	0
Unexplained antepartum death	10	18.0	7	7.5	3	16.7

Table 195: Necropsy rates 2001 – 2005

	Total	Full necropsy		Incomplete necropsy		No necropsy	
		n	%	n	%	n	%
2001							
Fetal deaths	57	24	42.1	0		33	57.9
Neonatal deaths	37	14	37.8	0		23	62.2
2002							
Fetal deaths	69	37	53.6	3	4.3	29	42.0
Neonatal deaths	47	10	21.3	0	0	37	78.7
2003							
Fetal deaths	64	35	54.7	1	1.6	28	43.8
Neonatal deaths	41	10	24.4	0	0	31	75.6
2004							
Fetal deaths	82	50	61.0	3	3.7	29	35.4
Neonatal deaths	42	15	35.7	2	4.8	25	59.5
2005							
Fetal deaths	68	40	58.8	0		28	41.2
Neonatal deaths	43	13	30.2	1		29	67.4

Table 196: Perinatal full necropsy rates (%)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Perinatal necropsy rates (%)	58	56	65	68	57	48	50	38	50	40	40	41	43	52	48

APPENDIX 9. TERMINATION OF PREGNANCY

Table 197: Demography and characteristics of women attending E.D.U

	2000	2001	2002	2003	2004	2005
Ethnicity	%	%	%	%	%	%
Chinese	7	7	6.5	8	7.4	8.5
Cook Island	4	3.5	3.5	3	3.2	3.5
European	41	39.5	38.5	40	39.2	38.1
Fijian	1	1	1	1	0.5	1.0
Indian	6	6	6.5	7.6	8.7	8.6
Maori	17	17.5	18.5	16.7	16.4	15.9
Nuiean	1	1.5	1.5	2	1.4	1.6
Other	7	7.5	7	8	7.7	7.4
Pacific Island	0	0.5	0.5	0	0.2	0.1
Samoan	13	13	13	11	12.6	11.9
Tongan	3	3	3.5	2.7	2.7	3.4
Age						
≤ 19	18	19	18	18	19.3	16.3
20 – 24	29	29	29	31	28.9	41
25 – 29	21	21	23	21	20.9	19.9
30 – 34	17	17	16	17	16.1	13.1
35 –39	11	11	10	10	10.9	6.6
40+	4	3	4	3	3.9	3.3
Gestation (weeks) at termination						
7	4	2.5	1	0.8	1.0	0.4
8	15	14	9	6.8	17.3	10.5
9	21	19.5	20	18	23.9	20.9
10	22	21.5	23	24	21.4	22.7
11	20	21	22.5	25	20.8	24.0
12	15	18.5	21	22.4	14.5	20.2
13	3	3	3.5	3	1.2	1.3

APPENDIX 10. GLOSSARY OF ABBREVIATIONS

ABA	American Board of Anaestheseologists	IUD	Intrauterine death
ACL	Anticardiolipin antibody	IUGR	Intrauterine growth retardation
ADAPT	Alcohol, Drugs and Pregnancy Team	ICSI	Intracytoplasmic sperm injection
AMSIS	Auckland Maternity Services Information System	IVF	In vitro fertilisation
ANA	Antinuclear antibody	IVH	Intraventricular haemorrhage
ANZNN	Australia and New Zealand Neonatal Network	LB	Live birth
APH	Antepartum haemorrhage	Ligate	Surgical ligation of PDA
ARM	Artificial rupture of membranes	LMP	Last menstrual period
AUT	Auckland University of Technology	LNND	Late neonatal death
BBA	(Baby) Born Before Arrival (not a planned home birth)	LSCS	Lower segment Caesarean section
BP	Blood Pressure	LV	Left ventricle
BPD	Bronchopulmonary dysplasia	MAS	Meconium aspiration syndrome
CDU	Child Development Unit	MCDA	Monochorionic diamniotic twin
CHD	Congenital Heart Disease	MCMA	Monochorionic monoamniotic
CI	Confidence Interval	N/R	Not resuscitated
CLD	Chronic lung disease	NAS	Neonatal abstinence syndrome
CPAP	Continuous positive airways pressure	NEC	Necrotising enterocolitis
CRIS	Clinical Records Information System	NFD	Not further defined
CS	Caesarean section	NICU	Neonatal Intensive Care Unit
CVA	Cerebro Vascular Accident	NIDDM	Non-insulin dependent diabetes mellitus
CVS	Chorionic villus sampling	NVB	Normal vaginal birth
DCCM	Department of Critical Care Medicine	NWH	National Women's Hospital
DCDA	Dichorionic diamniotic twin	OP	Occiput posterior
DHB	District Health Board	OPU	Oocyte pick up
DIC	Disseminated intravascular coagulopathy	PDA	Patent ductus arteriosis
DORV	Double outlet right ventricle	PE/PET	Pre-eclampsia
DRG	Diagnosis related groups	PG	Prostaglandin
ECMO	Extra Corporeal Membrane Oxygenation	PIN	Parent Infant Nursery
EDU	Epsom Day Unit	PM	Postmortem
ENND	Early neonatal death	PMR	Perinatal mortality rate
FH	Fetal heart	PPHN	Persistent pulmonary hypertension of the newborn
FTE	Fulltime equivalent	PRLR	Perinatal related loss rate
GA	General anaesthetic	PROM	Prolonged rupture of membranes
GDM	Gestational diabetes mellitus	PVL	Periventricular leukomalacia
GH	Gestational hypertension	RDS	Respiratory distress syndrome
GLH	Green Lane Hospital	ROP	Retinopathy of prematurity
GP	General Practitioner	SCBU	Special Care Baby Unit
GPH	Gestational proteinuric hypertension	SGA	Small for gestational age
GTT	Glucose tolerance test	SLE	Systemic Lupus Erythematosis
Hb	Haemoglobin	SRM	Spontaneous rupture of membranes
HbAIc	Glycosylated heamoglobin	SVB	Spontaneous vaginal birth
HDU	High Dependency Unit	TCM	Transcutaneous oxygen monitor
HELLP	Hemolysis, Elevated Liver, Low Platelet (syndrome)	TGA	Transposition of the great arteries
HFOV	High frequency oscillatory ventilation	TIA	Transient Ischaemic Attack
HDU	High Dependency Unit	TOP	Termination of pregnancy
HIE	Hypoxic ischaemic encephalopathy	UAC	Umbilical artery catheter
HIV	Human Immuno Deficiency Virus	US/USS	Ultrasound/ultrasound scan
HMD	Hyaline Membrane Disease	VLBW	Very low birth weight
ICH	Intracerebral haemorrhage	VSD	Ventricular septal defect
IDDM	Insulin dependent diabetes mellitus	WAU	Women's Assessment Unit
Indo	Treated with indomethacin	wks	weeks
iNO	Inhaled nitrous oxide	WHO	World Health Organisation
IPPV	Intermittent positive pressure ventilation		
IOL	Induction of labour		

APPENDIX 11. DEFINITIONS

Antepartum Haemorrhage (APH)
Vaginal bleeding at or beyond 20 weeks gestation.

Augmentation
Describes use of oxytocin or ARM to accelerate spontaneous labour.

Breastfeeding (BF) Definitions
The format of data collection was changed during 2001/02 to fit the Ministry of Health definitions as adopted by the New Zealand Breastfeeding Authority.

Exclusive breastfeeding: The infant has never, to the mother's knowledge, had any water, formula or other liquid or solid food. Only breastmilk, from the breast or expressed, and prescribed* medicines have been given from birth.
* Prescribed as per Medicines Act 1981

Fully breastfeeding: The infant has taken breastmilk only, no other liquids or solids except a minimal amount of water or prescribed medicines, in the past 48 hours.

Partial breastfeeding: The infant has taken some breastmilk and some infant formula or other solid food in the past 48 hours.

Artificial feeding: The infant has had no breastmilk but has had alternative liquid such as infant formula with or without solid food in the past 48 hours.

Chronic Hypertension (CH)
Diastolic BP>90mmHg at booking or a medical history of essential hypertension.

Early Neonatal Death (ENND)
Death of a baby between birth and 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 electively prior to labour are included with elective caesarean.

Fetal Death
Stillbirth of a baby of at least 20 weeks gestation at issue or at least 400 grams birth weight if gestation is unknown.

Gestational Diabetes (GDM)
This diagnosis is based on either a fasting glucose > 5.5mmol/L or a 2 hour glucose > 9.0mmol/L after a 75 gram oral glucose tolerance test.

Gestational Hypertension (GH)
Diastolic BP > 90mmHg without proteinuria, when diastolic BP < 90mmHg at booking.

Infant Death
Death of a baby after the 28th day and before completion of 1 year.

Large for Gestational Age (>90th percentile)
Birth weight greater than 90th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31).

Late Neonatal Death (LNND)
Death of a baby after the 7th day and before completion of 28 days of life.

Lead Maternity Carer (LMC)
The Lead Maternity Carer is the practitioner or caregiver service selected by the woman to have the legal professional and practical responsibility for ensuring the woman and her baby are given clinically appropriate care.

National Women's LMC services

Domino Midwives are the LMC for low risk women. Women self refer to this service. Domino midwives work in partnership with another midwife and provide continuity of all care.

Community Midwives are the LMC for women who either self refer or are referred to this service. The midwives provide continuity of antenatal and postnatal care to woman who live in NW geographical boundary.

Diabetic Midwives are the LMC for women who are referred to the Diabetic Service for secondary/tertiary care and LMC care. The midwives provide continuity of antenatal and postnatal care to woman who live in NW geographical boundary. The Diabetic Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.

Medical Midwives are the LMC for women who are referred to the Medical Service for secondary/tertiary care and LMC care. These women have complex medical needs. The midwives provide continuity of antenatal and postnatal care to woman who live in NW geographical boundary. The Medical Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.

Self-employed LMC Services

Independent midwife
General Practitioner (arranges private or hospital midwifery care)
Private Specialist (arranges private or hospital midwifery care)

Unbooked is assigned to those women who present at NW, usually in labour or pre-labour, and who do not have an LMC.

Other Unspecified. These women are usually transferred to NW in late pregnancy, and remain with their original LMC. This LMC might be another District Health Board LMC or a non-NW access holder (e.g. a private obstetrician or independent midwife without access rights at NW or a homebirth midwife without access rights at NW).

Neonatal Hypoglycaemia
Blood glucose < 2.3mmol/L.

Neonatal Death
Death of liveborn babies of any gestation or weight.

Neonatal Death Rate
Early and late neonatal deaths of liveborn babies of any gestation or weight per 1000 total births.

Parity
The number of times a woman has given birth to a liveborn baby of any weight or gestation or to a stillborn infant after 20 weeks gestation or where the infant weighed 400gms 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 Loss 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 than blood loss or more from the genital tract within the first 24 hours of delivery. Secondary PPH is excessive (>1000mls) blood loss from the genital tract 24 hours to 6 weeks postpartum.

Preeclampsia (PE or PET)
Diastolic BP > 90mmHg with proteinuria > '+' or 0.3g/24h, when diastolic BP < 90mmHg at booking.

Small for Gestational Age (SGA)
Birthweight less than 10th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31)