

# National Women's Annual Clinical Report 2007

## Contact Details

Marjet Pot, Project Manager  
[marjetp@adhb.govt.nz](mailto:marjetp@adhb.govt.nz)

Lynn Sadler, Epidemiologist  
[lynns@adhb.govt.nz](mailto:lynns@adhb.govt.nz)

Jenny McDougall, Clinical Director Obstetrics  
[jennymcd@adhb.govt.nz](mailto:jennymcd@adhb.govt.nz)

Mahesh Harilall, Clinical Director Gynaecology  
[maheshh@adhb.govt.nz](mailto:maheshh@adhb.govt.nz)

Malcolm Battin, Clinical Director Newborn Service  
[malcolmb@adhb.govt.nz](mailto:malcolmb@adhb.govt.nz)

## **Reproduction of material**

National Women's, Auckland District Health Board, permits the reproduction of material from this publication without prior notification, provided that all of the following conditions are met: the information must not be distorted or changed, and National Women's must be acknowledged as the source.

## **Disclaimer**

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

## **Acknowledgements**

### **Steering Committee**

|                   |   |
|-------------------|---|
| Kay Hyman         | General Manager Clinical Services - Women's & Children's Health, Cardiac Services, ADHB Operating Rooms & Anaesthesia |
| Carolynn Whiteman | Service Manager Newborn Service Paediatric Intensive Care, Paediatric & Congenital Cardiac Service                    |
| Kirsty Walsh      | Service Manager Women's Health  |
| Denys Court       | Clinical Leader Women's Health  |
| Malcolm Battin    | Clinical Director Newborn Service   |

### **Project Team**

|                   |  |
|-------------------|--|
| Marjet Pot        | Project Co-ordinator                   |
| Lynn Sadler       | Epidemiologist                         |
| Andrea Hickman    | Data Management/Analyst                |
| Shirley Beer      | Maternity Clinical Information         |
| Vazhkudai Kumaran | Neonatologist , Newborn Service        |
| Dr Martin Sowter  | Obstetrician and Gynaecologist, Editor |

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

Special thanks to all who provide, enter and check data used in this Annual Clinical Report, and especially to Julie Porfiridis, Coralee Jones, Claire McKay, Joanna Chua, Denny Wood and Coila Bevan. Thanks also to those who have provided chapter comments, especially Dr Janet Rowan, Dr Emma Parry, Dr Jenny McDougall, Dr Mahesh Harilall, Dr Tim Dawson, Dr Renuka Sekar, Dr Martin Sowter, Dr Lucille Wilkinson, Dr Denys Court, Margaret Berry, Susie Bonifant, Margaret Merrilees, Pauline Fakalata, Marcia Roberts, Dr Anne Dezoete, Janice Taylor. Dr Lesley McCowan, Dr Peter Stone, Dr Lois Eva, Deborah Smith, Dr Karen Buckingham, Anne Standen, Dr Ai Ling Tan, Yvonne Kaeppli.

ISSN 1175-6667

This document is available on the NW website  
<http://www.adhb.govt.nz/nwhealthinfo>

It is my pleasure to present the 2007 National Women's Annual Clinical Report. This year we have included a section which provides some background and context of the environment in which we provide services, and some of the challenges we have managed during 2007. We hope this is informative to readers.

Continuous quality improvement is of great importance to us and we regard the presentation of this report as an opportunity to share with our colleagues and to receive valued feedback. Review and audit of the services we provide assists by guiding us to areas where we may focus our attention in the future.

My thanks go to all members of National Women's staff who continue to work to ensure high quality care provision to the women and their babies that we care for. My particular thanks go to those staff who contribute their enthusiasm to ensure this report is the comprehensive document you see here.

Thank you for sharing in our Annual Clinical Report.

Kay Hyman  
General Manager  
NW Health

# TABLE of CONTENTS

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>INTRODUCTION.....</b>  | <b>15</b> |
| 1.1      | PURPOSE OF THIS REPORT .....  | 15        |
| 1.2      | REPORT STRUCTURE.....   | 15        |
| 1.3      | DESCRIPTION OF MOTHERS AND BABIES .....                             | 16        |
| 1.4      | DATA SOURCES.....   | 16        |
| 1.5      | DATA QUALITY .....  | 17        |
| 1.6      | ANALYTICAL AND STATISTICAL METHODS .....                            | 18        |
| 1.7      | CLINICAL INDICATORS.....  | 18        |
| <b>2</b> | <b>SERVICE PROVISION.....</b>                                       | <b>21</b> |
| 2.1      | MATERNITY SERVICES .....  | 21        |
| 2.2      | WARDS AND CLINICS IN THE MATERNITY SERVICE .....                    | 22        |
| 2.3      | GYNACEOLOGY SERVICE .....   | 23        |
| 2.4      | WARDS AND CLINICS IN THE GYNACEOLOGY SERVICE .....                  | 24        |
| 2.5      | UNIVERSITY OF AUCKLAND.....   | 25        |
| 2.6      | NEWBORN SERVICE.....  | 26        |
| 2.7      | LEAD MATERNITY CARER SERVICES .....                                 | 27        |
| 2.8      | DISTRICT ANNUAL PLAN OBJECTIVES .....                               | 28        |
| 2.9      | CONSUMER FEEDBACK .....   | 31        |
| 2.10     | CONSUMER COMMENTS.....  | 31        |
| 2.11     | ISSUES .....  | 32        |
| <b>3</b> | <b>SUMMARY STATISTICS .....</b>                                     | <b>35</b> |
| 3.1      | MOTHER AND BABY NUMBERS: NW 2007 .....                              | 35        |
| 3.2      | SUMMARY OF MATERNAL OUTCOMES 2007 .....                             | 36        |
| 3.3      | SUMMARY OF NEONATAL OUTCOMES 2007 .....                             | 38        |
| 3.4      | MATERNAL CLINICAL INDICATORS.....                                   | 40        |
| <b>4</b> | <b>MATERNAL DEMOGRAPHY .....</b>                                    | <b>45</b> |
| 4.1      | MATERNAL DOMICILE.....  | 45        |
| 4.2      | MATERNAL AGE, PARITY, AND ETHNICITY .....                           | 45        |
| 4.3      | LEAD MATERNITY CARER AND MATERNAL DEMOGRAPHIC CHARACTERISTICS ..... | 48        |
| 4.4      | SMOKING.....  | 49        |
| 4.5      | BODY MASS INDEX.....  | 50        |
| 4.6      | STANDARD PRIMIPARA.....   | 52        |
| <b>5</b> | <b>ANTENATAL COMPLICATIONS .....</b>                                | <b>57</b> |
| 5.1      | PRETERM BIRTH.....  | 57        |
| 5.2      | SMALL FOR GESTATIONAL AGE BABIES.....                               | 60        |
| 5.3      | MULTIPLE PREGNANCY .....  | 62        |
| 5.4      | DIABETES .....  | 65        |
| 5.5      | ANTEPARTUM HAEMORRHAGE.....   | 69        |
| 5.6      | HYPERTENSIVE DISEASE.....   | 70        |
| <b>6</b> | <b>LABOUR AND BIRTH .....</b>                                       | <b>75</b> |
| 6.1      | INDUCTION OF LABOUR .....   | 75        |
| 6.2      | USE OF SYNTOCINON .....   | 80        |
| 6.3      | MODE OF BIRTH .....   | 81        |
| 6.4      | SPONTANEOUS VERTEX BIRTH .....                                      | 84        |
| 6.5      | CAESAREAN SECTION.....  | 85        |
| 6.6      | INSTRUMENTAL VAGINAL BIRTH .....                                    | 89        |
| 6.7      | BREECH BIRTH.....   | 90        |
| 6.8      | OBSTETRIC ANALGESIA.....  | 91        |
| 6.9      | CLINICAL GOVERNANCE .....   | 93        |
| 6.10     | LABOUR AND BIRTH AT BIRTHCARE AUCKLAND.....                         | 97        |

|           |   |            |
|-----------|---|------------|
| <b>7</b>  | <b>LABOUR AND BIRTH OUTCOMES.....</b>                             | <b>101</b> |
| 7.1       | PERINEAL TRAUMA .....   | 101        |
| 7.2       | POSTPARTUM HAEMORRHAGE .....                                      | 103        |
| 7.3       | EMERGENCY PERIPARTUM HYSTERECTOMY .....                           | 105        |
| 7.4       | NEONATAL OUTCOMES BY MODE OF BIRTH.....                           | 106        |
| <b>8</b>  | <b>POSTNATAL CARE.....</b>  | <b>109</b> |
| 8.1       | INFANT FEEDING.....   | 109        |
| 8.2       | POSTNATAL ADMISSIONS .....  | 115        |
| <b>9</b>  | <b>NEWBORN SERVICES .....</b>                                     | <b>121</b> |
| 9.1       | INBORN LIVE BIRTH AT NATIONAL WOMEN'S 1959-2007 .....             | 122        |
| 9.2       | NICU OCCUPANCY .....  | 123        |
| 9.3       | ADMISSIONS TO NICU.....   | 124        |
| 9.4       | CARE AND COMPLICATIONS.....                                       | 128        |
| 9.5       | OUTCOMES.....   | 137        |
| 9.6       | CHILD DEVELOPMENT UNIT .....                                      | 145        |
| <b>10</b> | <b>PERINATAL MORTALITY.....</b>                                   | <b>151</b> |
| 10.1      | PERINATAL AND PERINATAL-RELATED MORTALITY RATES .....             | 152        |
| 10.2      | GESTATIONAL AGE AND PERINATAL-RELATED LOSS .....                  | 153        |
| 10.3      | MULTIPLE BIRTHS AND PERINATAL MORTALITY .....                     | 153        |
| 10.5      | LEAD MATERNITY CARER (LMC) AT BIRTH AND PERINATAL MORTALITY ..... | 155        |
| 10.6      | CAUSES OF PERINATAL-RELATED DEATHS.....                           | 155        |
| 10.7      | NEONATAL DEATHS .....   | 156        |
| 10.8      | NECROPSY .....  | 157        |
| <b>11</b> | <b>GYNAECOLOGY .....</b>  | <b>161</b> |
| 11.1      | FERTILITY PLUS .....  | 161        |
| 11.2      | RECURRENT PREGNANCY LOSS.....                                     | 163        |
| 11.3      | EARLY PREGNANCY ASSESSMENT UNIT.....                              | 166        |
| 11.4      | TERMINATION OF PREGNANCY.....                                     | 167        |
| 11.5      | HYSTERECTOMY .....  | 169        |
| 11.6      | GYNAECOLOGIC ONCOLOGY SURGICAL SERVICES .....                     | 172        |
| <b>12</b> | <b>APPENDICES.....</b>  | <b>175</b> |
|           | APPENDIX 1. METHODOLOGY.....                                      | 177        |
|           | APPENDIX 2. SUMMARY STATISTICS.....                               | 181        |
|           | APPENDIX 3. MATERNAL DEMOGRAPHY .....                             | 182        |
|           | APPENDIX 4. ANTENATAL COMPLICATIONS.....                          | 188        |
|           | APPENDIX 5. LABOUR AND BIRTH .....                                | 194        |
|           | APPENDIX 6. LABOUR AND BIRTH OUTCOMES .....                       | 204        |
|           | APPENDIX 7. POSTNATAL CARE .....                                  | 206        |
|           | APPENDIX 8. NEWBORN SERVICES .....                                | 209        |
|           | APPENDIX 9. PERINATAL MORTALITY.....                              | 222        |
|           | APPENDIX 10. TERMINATION OF PREGNANCY.....                        | 224        |
|           | APPENDIX 11. GLOSSARY OF ABBREVIATIONS.....                       | 225        |
|           | APPENDIX 12. DEFINITIONS .....                                    | 226        |

## LIST of TABLES

|   |     |
|---|-----|
| Table 1: Mother and baby numbers: National Women's 2007 .....   | 35  |
| Table 2: Contribution of multiple births to mother and baby numbers:.....                                 | 35  |
| Table 3: Mode of onset of birth .....   | 36  |
| Table 4: Mode of birth .....  | 36  |
| Table 5: Maternal postpartum outcomes .....   | 37  |
| Table 6: Neonatal outcomes among babies born at National Women's in 2007.....                             | 38  |
| Table 7: Perinatal mortality 2007 .....   | 38  |
| Table 8: NW maternity indicators 2007 benchmarked against WHA 2005-2006 .....                             | 40  |
| Table 9: Perinatal indicators 2007 benchmarked against WHA 2005-2006.....                                 | 41  |
| Table 10: Smoking status at booking and at birth . .....  | 49  |
| Table 11: Maternal BMI.....   | 50  |
| Table 12: Rates of preterm birth <37 completed weeks (1994 – 2007) .....                                  | 57  |
| Table 13: Rates of preterm birth <32 completed weeks (1994–2007) .....                                    | 58  |
| Table 14: Perinatal outcome of preterm births by gestation (n=904) .....                                  | 59  |
| Table 15: Interventions and outcomes among SGA , LGA and AGA babies .....                                 | 60  |
| Table 16: Interventions and outcomes among SGA, LGA and AGA babies born preterm .....                     | 60  |
| Table 17: Interventions and outcomes among SGA, LGA and AGA babies at term .....                          | 61  |
| Table 18: Multiple pregnancy rates.....   | 62  |
| Table 19: Fetal/neonatal outcomes of multiple pregnancies .....   | 62  |
| Table 20: Mode of onset of birth among twin pregnancies.....  | 63  |
| Table 21: Mode of birth among twin pregnancies.....   | 63  |
| Table 22: Fetal/newborn outcomes of twin babies .....   | 64  |
| Table 23: Perinatal-related deaths in twin pregnancies by gestation .....                                 | 64  |
| Table 24: Rates of postnatal glucose tolerance testing (GTT) among women with GDM (1999-2007).....        | 67  |
| Table 25: Results of postnatal glucose tolerance testing (GTT) among women with GDM (1999-2007).....      | 67  |
| Table 26: Neonatal outcomes among babies of women with diabetes .....                                     | 68  |
| Table 27: Antepartum haemorrhage incidence.....   | 69  |
| Table 28: Hypertensive disease in pregnancy (2007) .....  | 70  |
| Table 29: Mode of birth for women with hypertensive disease.....  | 71  |
| Table 30: Perinatal outcomes and hypertensive complications of pregnancy (babies) .....                   | 71  |
| Table 31: Maternal demographic characteristics by onset of birth at term .....                            | 77  |
| Table 32: Use of syntocinon by onset of labour and parity.....  | 80  |
| Table 33: Mode of birth trends (1992-2007) .....  | 81  |
| Table 34: Spontaneous vertex birth rates (2004-2007) .....  | 84  |
| Table 35: Caesarean section rates (1993-2007) .....   | 85  |
| Table 36: NW Modified Robson 10-Group Classification 1997-2007 .....                                      | 86  |
| Table 37: VBAC: Parity 1, all gestations by mode of onset of birth .....                                  | 87  |
| Table 38: VBAC: Parity 1, singleton, cephalic, term, by mode of onset of birth .....                      | 88  |
| Table 39: VBAC: Parity 1, all gestations by LMC at birth .....  | 88  |
| Table 40: Mode of birth by breech presentation (singletons) .....   | 90  |
| Table 41: Analgesia use by parity and mode of onset of birth.....   | 91  |
| Table 42: GA use and mode of birth.....   | 92  |
| Table 43: Demographic characteristics of women labouring at Birthcare by place of birth.....              | 97  |
| Table 44: Interventions and outcomes by parity among women commencing labour at Birthcare .....           | 98  |
| Table 45: Episiotomy rates .....  | 101 |
| Table 46: Postpartum haemorrhage rate (1992-2007) .....   | 103 |
| Table 47: Blood transfusion .....   | 104 |
| Table 48: Postpartum blood loss by mode of birth .....  | 104 |
| Table 49: Neonatal morbidity overall and by mode of birth (all gestations).....                           | 106 |
| Table 50: Neonatal morbidity by mode of birth in term or post term (> 37 weeks) babies .....              | 106 |
| Table 51: Neonatal morbidity in term or post term (> 37 weeks) babies (2000-2007) .....                   | 106 |
| Table 52: Maternal destination immediately after birth.....   | 115 |
| Table 53: Reason for admission to NW postnatal wards among women having a spontaneous vaginal birth ..... | 117 |
| Table 54: Length of stay by mode of birth among admissions to NW wards .....                              | 117 |
| Table 55: Reasons for readmission .....   | 118 |

|  |     |
|--|-----|
| Table 56: Reasons for admission where birth occurred at other facilities .....                     | 118 |
| Table 57: Characteristics of <32 week or <1500 g babies by ANZNN status .....                      | 122 |
| Table 58: Occupancy (baby days) on NICU (1999 – 2007).....   | 123 |
| Table 59: NICU admissions by year .....  | 125 |
| Table 60: Details of Hypoxic Ischaemic Encephalopathy Stages 2 or 3. ....                          | 128 |
| Table 61: Number of babies on assisted ventilation.....  | 130 |
| Table 62: HFOV and inhaled nitric oxide (iNO) use and survival (1998-2007) .....                   | 136 |
| Table 63: Outcome Categories for infants under 30 months of age.....                               | 145 |
| Table 64: Outcome Categories at 18 months for children under 1500g born in 2005 .....              | 146 |
| Table 65: Outcome of children <1500g born in 2005 at 18 months by gestational age groups           | 146 |
| Table 66: Outcome of children <1500g born in 2005 at 18 months by birth weight groups .....        | 146 |
| Table 67: Outcome categories at 4 years.....   | 147 |
| Table 68: Outcome categories at 4 years for children under 1500g born 2003 (n = 98).....           | 148 |
| Table 69: Inborn and BBA deaths.....   | 152 |
| Table 70: Gestational age and perinatal related mortality .....                                    | 153 |
| Table 71: Multiple births and perinatal related mortality .....                                    | 153 |
| Table 72: Maternal characteristics and perinatal related mortality .....                           | 154 |
| Table 73: LMC and perinatal related mortality.....   | 155 |
| Table 74: Stillbirth and neonatal death by cause (PSANZ-PDC) 2007 .....                            | 155 |
| Table 75: Neonatal deaths by neonatal cause (PSANZ-NDC) and gestational age .....                  | 156 |
| Table 76: Fertility PLUS IVF/ICSI clinical outcomes.....   | 161 |
| Table 77: Demographic details of women referred to the RPLC in 2007 .....                          | 163 |
| Table 78: Demographic details of women referred to the RPLC in 2007 (continued) .....              | 164 |
| Table 79: Pregnancy outcome by RPL diagnosis (2007) .....  | 164 |
| Table 80: Pregnancy outcomes by maternal characteristics .....                                     | 165 |
| Table 81: Reasons for visits to EPAU.....  | 166 |
| Table 82: Number of terminations .....   | 167 |
| Table 83: Number of counselling sessions .....   | 167 |
| Table 84: Characteristics of women undergoing hysterectomy by indication during 2007 .....         | 169 |
| Table 85: Clinical details of women undergoing a hysterectomy.....                                 | 170 |
| Table 86: Route of hysterectomy among non-malignant hysterectomies (2000-2007).....                | 170 |
| Table 87: Complications among inpatient surgeries for gynaecologic cancer in 2007 .....            | 173 |
| Table 88: Mode of birth (1998-2007) .....  | 181 |
| Table 89: Domicile of women giving birth at National Women's (2002-2007).....                      | 182 |
| Table 90: Maternal age distribution (2000-2007).....   | 182 |
| Table 91: Maternal age and parity .....  | 182 |
| Table 92: Time trends in nulliparity and multiparity (Data for 2001-2003 not available) .....      | 182 |
| Table 93: Prioritised ethnicity of women giving birth at National Women's .....                    | 183 |
| Table 94: Maternal ethnicity and age.....  | 183 |
| Table 95: Maternal ethnicity and parity.....   | 183 |
| Table 96: Ethnicity of women birthing at NW.....   | 184 |
| Table 97: BMI and age categories .....   | 184 |
| Table 98: BMI and parity.....  | 184 |
| Table 99: Maternal ethnicity and BMI .....   | 184 |
| Table 100: Smoking status at booking by ethnicity and maternal age .....                           | 185 |
| Table 101: Smoking status at birth among NZ European women .....                                   | 185 |
| Table 102: Smoking status at birth among Maori women .....   | 185 |
| Table 103: Smoking status at birth among Pacific women.....  | 185 |
| Table 104: Smoking status at birth among Asian women .....   | 186 |
| Table 105: LMC at birth .....  | 186 |
| Table 106: LMC at birth and maternal age .....   | 186 |
| Table 107: LMC at birth and maternal ethnicity .....   | 186 |
| Table 108: LMC at birth and parity .....   | 187 |
| Table 109: Demographic characteristics of standard and non-standard primipara.....                 | 187 |
| Table 110: Preterm birth and maternal demographic characteristics .....                            | 188 |
| Table 111: Demography of mothers of SGA babies as defined by customised birth centiles....         | 189 |
| Table 112: Women with diabetes attending diabetes clinic and delivering > 20 weeks gestation ..... | 190 |
| Table 113: Perinatal deaths (1993 – 2007) among babies of women with diabetes.....                 | 190 |
| Table 114: Demographic characteristics of women with diabetes.....                                 | 190 |

|   |     |
|---|-----|
| Table 115: Maternal outcomes among women with diabetes .....  | 191 |
| Table 116: Characteristics of pregnancies complicated by antepartum haemorrhage .....   | 191 |
| Table 117: Maternal outcomes of pregnancies complicated by antepartum haemorrhage.....  | 192 |
| Table 118: Fetal/neonatal outcomes of pregnancies complicated by antepartum haemorrhage .....   | 192 |
| Table 119: Demographic characteristics of women with hypertensive disease .....   | 193 |
| Table 120: Onset of birth among women with hypertensive disease .....   | 193 |
| Table 121: Induction of labour rates (1992-2007) .....  | 194 |
| Table 122: Rates of indication for induction by parity (term births) .....  | 194 |
| Table 123: Indication for induction (all births) .....  | 195 |
| Table 124: Rates of indication for induction by age among nulliparous women (all gestations) .....  | 195 |
| Table 125: Rates of indication for induction by age among multiparous women (all gestations) .....  | 195 |
| Table 126: Induction rate by indication and ethnicity among nulliparous women .....   | 196 |
| Table 127: Induction rate by indication and ethnicity among multiparous women .....   | 196 |
| Table 128: Mode of birth at term by onset of birth and parity (excluding women with prior CS) among intended vaginal births) .....        | 196 |
| Table 129: Mode of birth at term among nulliparous women by indication for induction .....  | 196 |
| Table 130: Mode of birth at term among multiparous women by indication for induction .....  | 197 |
| Table 131: Gestation at birth among women whose primary indication for induction was 'post dates' .....                                   | 197 |
| Table 132: Dilatation at start of syntocinon infusion among labouring women by induction status .....                                     | 197 |
| Table 133: Mode of birth by parity and previous caesarean section status .....  | 198 |
| Table 134: Mode of birth by ethnicity .....   | 198 |
| Table 135: Mode of birth by maternal age .....  | 198 |
| Table 136: Mode of birth by BMI.....  | 198 |
| Table 137: Mode of birth by LMC at birth-primipara .....  | 199 |
| Table 138: Mode of birth by LMC at birth – standard primipara .....   | 199 |
| Table 139: Mode of birth by LMC at birth among multipara –no previous caesarean.....  | 199 |
| Table 140: Indication for elective and not in labour emergency caesarean section by gestation .....                                       | 200 |
| Table 141: Indication for elective and not in labour emergency caesarean section by parity ....   | 200 |
| Table 142: Operative vaginal birth rates.....   | 201 |
| Table 143: Type of operative vaginal birth: (1993-2007) .....   | 201 |
| Table 144: Mode of birth by ethnicity – nullipara .....   | 201 |
| Table 145: Mode of birth by ethnicity - multipara.....  | 202 |
| Table 146: Breech birth (1996-2007) .....   | 202 |
| Table 147: Mode of birth by type of breech (singletons only).....   | 202 |
| Table 148: Mode of birth by type of breech (multiples only).....  | 202 |
| Table 149: Epidural use among women with spontaneous and induced labour (2000-2007) ...   | 203 |
| Table 150: Analgesic use and maternal age among nulliparous labour.....   | 203 |
| Table 151: Analgesic use and LMC type among nulliparous labours .....   | 203 |
| Table 152: Analgesic use and ethnicity among nulliparous labours.....   | 203 |
| Table 153: Perineal trauma by mode of birth, parity and LMC .....   | 204 |
| Table 154: Episiotomy rates in spontaneous vertex birth (excluding breech, all gestations) .....  | 204 |
| Table 155: Episiotomy rates in spontaneous (non operative) vertex birth (excluding breech, all gestations) .....                          | 204 |
| Table 156: 3 <sup>rd</sup> and 4 <sup>th</sup> degree tears in spontaneous (non operative) vaginal birth by LMC at birth and parity ..... | 205 |
| Table 157: Postpartum transfusion rates by recorded blood loss at birth .....   | 205 |
| Table 158: Demography of infant feeding on discharge from NW.....   | 206 |
| Table 159: Method of Infant Feeding at Discharge from NW .....  | 206 |
| Table 160: Demography of infant feeding on discharge from NW (continued) .....  | 207 |
| Table 161: Maternal destination following birth by mode of birth .....  | 207 |
| Table 162: Maternal destination following birth by LMC.....   | 207 |
| Table 163: Maternal destination following birth by ethnicity .....  | 208 |
| Table 164: Postnatal readmission reason by maternal destination following birth.....  | 208 |
| Table 165: Postnatal readmission by LMC at birth.....   | 208 |
| Table 166: Occupancy (baby days) for NICU by gestational age.....   | 209 |
| Table 167: Occupancy (baby-days) for NICU by birth weight .....   | 209 |



|  |     |
|--|-----|
| Table 168: Admissions of inborn babies to NICU by gestational age groups .....   | 209 |
| Table 169: Live births at National Women's by birthweight (includes BBA) .....   | 209 |
| Table 170: Admissions of inborn babies to NICU by birth weight .....   | 210 |
| Table 171: Admissions of inborn babies to NICU by gestational age .....  | 210 |
| Table 172: Admissions of outborn babies to NICU by gestational age .....   | 211 |
| Table 173: Admissions of outborn babies to NICU by birth weight .....  | 211 |
| Table 174: Admissions of outborn babies to NICU by gestational age groups .....  | 211 |
| Table 175: Domicile of mother of all babies admitted to NICU .....   | 212 |
| Table 176: DHB of mothers of all babies admitted to NICU .....   | 212 |
| Table 177: Ethnicity of babies admitted to NICU .....  | 212 |
| Table 178: Main reason for admission to NICU .....   | 213 |
| Table 179: Percentage receiving antenatal corticosteroids by birth weight among ANZNN assigned babies .....  | 213 |
| Table 180: Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies .....   | 213 |
| Table 181: Organisms causing serious infection .....   | 214 |
| Table 182: Late onset serious infection (Septicaemia and Meningitis) .....   | 214 |
| Table 183: Intraventricular haemorrhage by birth weight .....  | 215 |
| Table 184: Intraventricular haemorrhage by gestation .....   | 215 |
| Table 185: Intraventricular haemorrhage in all <1250g babies admitted to NICU 1985-2007 ...  | 215 |
| Table 186: High Frequency Oscillatory Ventilation .....  | 216 |
| Table 187: Inhaled Nitric Oxide (iNO) .....  | 216 |
| Table 188: iNO plus HFOV .....   | 216 |
| Table 189: Reason for ventilation and CPAP in term and post-term infants .....   | 216 |
| Table 190: Numbers and survival by gestational age of babies <32 weeks gestation in 2007 ..  | 216 |
| Table 191: Retinopathy of prematurity by birth weight in babies surviving to 36 weeks gestation (ANZNN assigned babies) .....  | 217 |
| Table 192: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks gestation (ANZNN assigned babies) .....   | 217 |
| Table 193: Chronic lung disease by birth weight (inborn babies <32weeks) .....   | 217 |
| Table 194: Chronic lung disease by gestational age (inborn babies <32weeks) .....  | 217 |
| Table 195: Necrotising enterocolitis (NEC) by birth weight .....   | 218 |
| Table 196: Necrotising enterocolitis by gestational age .....  | 218 |
| Table 197: Patent Ductus Arteriosus by birth weight <1500g .....   | 218 |
| Table 198: Patent Ductus Arteriosus by gestational age .....   | 218 |
| Table 199: Pneumothorax by birth weight .....  | 219 |
| Table 200: Pneumothorax by gestational age .....   | 219 |
| Table 201: Inborn babies receiving postnatal corticosteroids by birth weight .....   | 219 |
| Table 202: Inborn babies receiving postnatal corticosteroids by gestational age .....  | 219 |
| Table 203 Inborn neonatal and post-neonatal deaths prior to discharge .....  | 220 |
| Table 204: Outborn neonatal and post-neonatal deaths prior to discharge .....  | 221 |
| Table 205: Postnatal transfer deaths .....   | 222 |
| Table 206: Perinatal and perinatal- related deaths (1992 – 2007) .....   | 222 |
| Table 207: Perinatal mortality rate (per 1000 births) and perinatal-related mortality rate (per 1000 births) adjusted for lethal and terminated fetal abnormalities* ..... | 222 |
| Table 208: Cause of death (2000-2007) (2000-2004 ANZACPM;2005-2007 PSANZ-PDC) ....   | 223 |
| Table 209: Cause of death (PSANZ-PDC) among terminations of pregnancy .....  | 223 |
| Table 210: Perinatal deaths by cause (PSANZ-PDC) and gestational age .....   | 223 |
| Table 211: Perinatal full necropsy rates (%) .....   | 223 |
| Table 212: Demography and characteristics of women attending EDU .....   | 224 |
| Table 213: Level 2 prioritisation of ethnicity as outlined in 'Ministry of Health. 2004. Ethnicity Data Protocols for the Health and Disability Sector.' .....             | 227 |

## LIST of FIGURES

|  |     |
|--|-----|
| Figure 1: Numbers of women birthing and babies born at National Women's (1991-2007) .....  | 36  |
| Figure 2: Mode of birth (1998-2007) .....  | 37  |
| Figure 3: Perinatal mortality rate, perinatal related loss rate, stillbirth rate and neonatal mortality rate 1991-2007 (all rates expressed as deaths/1000 births) ..... | 39  |
| Figure 4: Domicile of women birthing at NW (2002-2007) .....   | 45  |
| Figure 5: Maternal age distribution (1991-2007) .....  | 46  |
| Figure 6: Parity distribution (1992-2007) .....  | 46  |
| Figure 7: Maternal age among European, Maori, Pacific, Asian and Indian ethnicities .....  | 47  |
| Figure 8: Parity distribution by maternal ethnicity (2007) .....   | 47  |
| Figure 9: LMC at birth and maternal age .....  | 48  |
| Figure 10: LMC at birth and maternal ethnicity .....   | 49  |
| Figure 11: LMC at birth and parity .....   | 49  |
| Figure 12: Smoking status by age and ethnicity .....   | 50  |
| Figure 13: Distribution of BMI categories by age .....   | 51  |
| Figure 14: Rates of high BMI (>25) by ethnicity .....  | 51  |
| Figure 15: Rates of high BMI (>25) by ethnicity and age .....  | 52  |
| Figure 16: Parity and BMI .....  | 52  |
| Figure 17: Ethnicity by primiparous risk status .....  | 53  |
| Figure 18: LMC at birth by primiparous risk status .....   | 53  |
| Figure 19: Spontaneous and iatrogenic preterm birth rates (<37 weeks) by ethnicity .....   | 58  |
| Figure 20: Twin perinatal mortality 1997-2007 with 95% confidence intervals .....  | 63  |
| Figure 21: Incidence of diabetes (% of all inborn and BBA births) (1991-2007) .....  | 65  |
| Figure 22: Incidence of diabetes by ethnic group (2007) .....  | 66  |
| Figure 23: Mode of birth among women with GDM (1999-2007) .....  | 66  |
| Figure 24: Onset of birth and hypertensive disorders of pregnancy .....  | 70  |
| Figure 25: Induction of labour rates (1992-2007) .....   | 75  |
| Figure 26: Pathways to birth by gestation and parity .....   | 76  |
| Figure 27: Primary indication for induction as a percentage of all births .....  | 78  |
| Figure 28: Primary indication for induction at term by parity (as a percentage of term births) .....   | 78  |
| Figure 29: Mode of birth among intended vaginal births at term by parity and onset of labour ..  | 79  |
| Figure 30: Dilatation at commencement of syntocinon infusion among labouring women by induction status .....   | 80  |
| Figure 31: Mode of birth (1991-2007) .....   | 81  |
| Figure 32: Caesarean section rates at term by parity and previous caesarean status (1996 – 2007) .....   | 82  |
| Figure 33: Mode of birth by ethnicity among nullipara .....  | 82  |
| Figure 34: Mode of birth by ethnicity among multipara .....  | 83  |
| Figure 35: Mode of birth by maternal age .....   | 83  |
| Figure 36: Mode of birth by LMC at birth among standard primipara .....  | 84  |
| Figure 37: Mode of birth by LMC at time of birth among multipara with no previous caesarean ..   | 84  |
| Figure 38: Contribution of parity to principal indications for labour caesarean section at term ..   | 85  |
| Figure 39: Operative vaginal birth (1992-2007) .....   | 89  |
| Figure 40: Analgesic use and maternal age among nulliparous labours .....  | 91  |
| Figure 41: Analgesic use and LMC type among nulliparous labours .....  | 92  |
| Figure 42: Analgesic use and ethnicity among nulliparous labours .....   | 92  |
| Figure 43: Indication for emergency caesarean section by status of LMC at birth: .....   | 95  |
| Figure 44: Duration of active pushing by parity among women having emergency caesarean for obstruction .....   | 95  |
| Figure 45: Decision to birth interval (minutes) by indication for emergency caesarean .....  | 96  |
| Figure 46: Perineal trauma rates .....   | 101 |
| Figure 47: Episiotomy associated with spontaneous vaginal birth by LMC at birth and parity ...   | 102 |
| Figure 48: Postpartum haemorrhage transfusion rates (1992-2007) .....  | 103 |
| Figure 49: Emergency peripartum hysterectomy rates/1000 births (1992-2007) .....   | 105 |
| Figure 50: Method of infant feeding at discharge from NW (2003-2007) .....   | 109 |
| Figure 51: Exclusive breastfeeding by mode of birth .....  | 110 |
| Figure 52: Infant feeding at discharge from NW by maternal age .....   | 110 |
| Figure 53: Exclusive breastfeeding rates by age (2004-2007) .....  | 111 |
| Figure 54: Exclusive breastfeeding rates by ethnicity (2004-2007) .....  | 111 |

|  |     |
|--|-----|
| Figure 55: Infant feeding at discharge from NW by gestation at birth .....   | 112 |
| Figure 56: Infant feeding at discharge from NW by fetal birthweight.....   | 112 |
| Figure 57: Infant feeding at discharge from NW by LMC .....  | 112 |
| Figure 58: Exclusive breastfeeding rate at discharge from NW by LMC (2004-2007) .....  | 113 |
| Figure 59: Change in combined exclusive and fully breastfeeding rate from hospital discharge to<br>Homecare .....                        | 113 |
| Figure 60: Maternal destination immediately after birth by mode of birth.....  | 115 |
| Figure 61: Postnatal destination immediately after birth by LMC .....  | 116 |
| Figure 62: Postnatal destination immediately after birth by ethnicity.....   | 116 |
| Figure 63: Number of inborn live-births $\leq 1500$ g from 1959 to 2007 (excludes BBAs) .....  | 123 |
| Figure 65: Occupancy (baby days per year) of NICU by birth weight .....  | 124 |
| Figure 66: Admissions to NICU 1981-2007 .....  | 124 |
| Figure 67: Admissions to NICU by gestational age .....   | 125 |
| Figure 68: Admissions to NICU by birth weight .....  | 125 |
| Figure 69: Admissions to NICU of $<1500$ g babies (VLBW) by place of birth .....   | 126 |
| Figure 70: Admissions to NICU by maternal domicile .....   | 126 |
| Figure 71: Any antenatal corticosteroids at 24-27 weeks.....   | 127 |
| Figure 73: Intraventricular haemorrhage in all $<1250$ g infants admitted to NICU from 1985 to<br>2007 .....                             | 129 |
| Figure 74: Any IVH at 24-27 weeks .....  | 130 |
| Figure 75: Severe (G3-4) IVH at 24-27 weeks .....  | 130 |
| Figure 76: Any IVH at 28-31 weeks .....  | 130 |
| Figure 77: Severe (G3-4) IVH at 28-31 weeks .....  | 130 |
| Figure 78: Median ventilation days on IPPV and CPAP and IPPV+CPAP by gestational age<br>among survivors in 2007 .....                    | 131 |
| Figure 79: Median days on IPPV .....   | 132 |
| Figure 80: Median days on CPAP .....   | 132 |
| Figure 81: Median days on CPAP + IPPV .....  | 132 |
| Figure 82: Number on IPPV .....  | 133 |
| Figure 83: Number on CPAP .....  | 133 |
| Figure 84: Number on CPAP + IPPV .....   | 133 |
| Figure 85: Percentage on IPPV (24-27 weeks ANZNN assigned) .....   | 134 |
| Figure 86: Percentage on CPAP (24-27 weeks ANZNN assigned).....  | 134 |
| Figure 87: Median days on IPPV (24-27 weeks ANZNN assigned) .....  | 134 |
| Figure 88: Median days on CPAP (24-27 weeks ANZNN assigned).....   | 134 |
| Figure 89: Percentage on IPPV (28-31 weeks ANZNN assigned) .....   | 135 |
| Figure 90: Percentage on CPAP (28-31 weeks ANZNN assigned).....  | 135 |
| Figure 91: Median days on IPPV (28-31 weeks ANZNN assigned) .....  | 135 |
| Figure 92: Median days on CPAP (28-31 weeks ANZNN assigned).....   | 135 |
| Figure 93: HFOV at 24-27 weeks (ANZNN assigned babies) .....   | 136 |
| Figure 94: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies) .....   | 136 |
| Figure 95: Number of term and post term babies needing assisted ventilation .....  | 137 |
| Figure 96: Neonatal survival (0-28 days) of $\leq 1500$ g inborn live births from 1959 to 2007 .....                                     | 137 |
| Figure 97: Numbers of live inborn babies 23 to 31 weeks gestation in 2000-2007 .....   | 139 |
| Figure 98: Survival of live inborn babies 23-31 weeks 2000-2007 (n = 1451) .....   | 139 |
| Figure 99: Survival of inborn babies admitted to NICU from 1995 to 2007 .....  | 139 |
| Figure 100: Survival at 24-25 weeks gestation compared with ANZNN data.....  | 140 |
| Figure 101: Survival at 26-27 weeks compared with ANZNN data .....   | 140 |
| Figure 102: ROP at 24-27 weeks.....  | 141 |
| Figure 103: ROP at 28-31 weeks.....  | 141 |
| Figure 104: Chronic lung disease at 24-27weeks .....   | 141 |
| Figure 105: Chronic lung disease at 28-31weeks .....   | 141 |
| Figure 106: NEC in ANZNN assigned babies under 28 weeks gestation compared with the<br>incidence in ANZNN 1995-2007 .....                | 142 |
| Figure 107: Percentage receiving postnatal dexamethasone by gestational age .....  | 143 |
| Figure 108: Percentage receiving postnatal dexamethasone by birth weight .....   | 143 |
| Figure 110: Perinatal mortality rate, perinatal related mortality rate, stillbirth rate and neonatal<br>mortality rate (1991-2007) ..... | 152 |
| Figure 111: Contribution to perinatal death by obstetric antecedent cause (PSANZ-PDC) and<br>gestation at birth .....                    | 156 |

|  |     |
|--|-----|
| Figure 112: Necropsy rates (1991-2007) .....   | 157 |
| Figure 113: Ethnicity of women having a termination in 2007 .....                            | 168 |
| Figure 114: Age of women having a termination in 2007 .....                                  | 168 |
| Figure 115: Route of hysterectomy among non malignant hysterectomies (2000-2007).....        | 170 |
| Figure 116: Use of gynaecologic databases to calculate key performance indicators 2007 ..... | 172 |

# Chapter **1**

## INTRODUCTION



---

# 1 INTRODUCTION

---

## 1.1 Purpose of this report

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

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

## 1.2 Report structure

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

### **Chapter 1: Introduction**

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

### **Chapter 2: Service provision**

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

### **Chapter 3: Summary statistics**

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

### **Chapter 4: Maternal demography**

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

### **Chapter 5: Antenatal complications**

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

### **Chapter 6: Labour and birth**

This chapter focuses on induction of labour, mode of birth, and neonatal and maternal outcomes associated with birthing. It includes details of activities of the Labour and Birth Clinical Governance Group. It also provides data on outcomes of women labouring at Birthcare Auckland.

### **Chapter 7: Labour and birth outcomes**

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

## **Chapter 8: Postnatal care**

This chapter focuses on postnatal care, including feeding.

## **Chapter 9: Newborn services**

This chapter describes interventions and outcomes for the babies cared for in the Neonatal Intensive Care Unit in 2007, including benchmarking with the Australian and New Zealand Neonatal Network (ANZNN). It includes a report of activity of the Child Development Unit.

## **Chapter 10: Perinatal mortality**

This chapter provides information and analysis about babies who died at NW.

## **Chapter 11: Gynaecology**

This chapter provides limited information on Fertility services, Early Pregnancy Assessment Unit, Recurrent Pregnancy Loss Clinic, Termination of pregnancy, hysterectomy, and key performance indicators in gynaecologic oncology.

## **Appendices**

The appendices provide additional detailed statistical tables for the chapters, and abbreviations and definitions.

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

The maternity section of this Annual Clinical Report includes data pertaining to women giving birth to babies at and beyond 20 weeks gestation at NW during the 2007 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. It also includes the 3 women and their babies who birthed at home under the care of a NW Domino midwife. Data in the Newborn section pertain to all babies admitted to and cared for at the NW Neonatal Intensive Care Unit if born during the 2007 calendar year. This includes babies transferred from other units or home.

# **1.4 Data sources**

Data for this report have been extracted from the NW clinical maternity database (Healthware IBA Health) and from stand-alone databases for Neonatology, Perinatal Mortality, Fertility Plus, Epsom Day Unit, Gynaecologic Oncology and from the Decision Support Unit (DSU) who produce ICD-10 coded data on all inpatient admissions, and from data collected manually by the Early Pregnancy Assessment Unit (EPAU).

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

## **1.4.1 Healthware**

The majority of booking data on mothers with non-NW LMCs are entered into Healthware by one Healthware administrator. Booking data for NW bookings, and all antenatal, birth, and postnatal data are entered by clerks and NW midwives. Recurrent Pregnancy Loss Clinic data are entered by the specialist nurse in that service.



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

For the 2004 -2007 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.

#### **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 again the principal source of hysterectomy data in 2007.

#### **1.4.3 Neonatology database**

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

### **1.5 Data quality**

#### **1.5.1 Maternity data quality**

Specific cleaning queries were run and identified discrepancies were checked and corrected prior to analysis of the data for the 2007 NW Annual Clinical Report. These are listed in Appendix 1.

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

Services or individuals wishing to use the 2007 data for further analysis should be aware that areas not mentioned may not have been cleaned. For further advice please contact the NW Health Intelligence Department.

#### **1.5.2 Neonatal data quality**

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

The introduction of comprehensive computerised clinical records (CRIS, Concerto, Éclair and Impax) by ADHB has aided data collection, checks on data integrity and clinical audit tremendously. Authorised clinical staff can access the complete clinical

record electronically so that no clinical record is lost and there are no delays inherent in the old paper-based system.

## **1.6 Analytical and statistical methods**

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

## **1.7 Clinical indicators**

We have for some years contributed data to the WHA (Women's Health Australasia) benchmarking initiative. This year we have presented our 2007 data compared to WHA mean data for maternity units with level 3 neonatal intensive care units for June 2005-June 2006.

# Chapter **2**

## SERVICE PROVISION



---

## 2 SERVICE PROVISION

---

### 2.1 Maternity services

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

#### 2.1.1 National Services

##### Maternal

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

##### Fetal/Neonatal

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

##### Other

- Transfers of mothers and babies from regions outside ADHB when more proximate NICUs and maternity facilities are full.
- National Women's is currently the only training centre for obstetricians training in maternal fetal medicine in New Zealand.
- **Proposed** national service for laser ablation of fetal vessels in twin-twin transfusion. It is believed there would be 10-15 of these annually. These cases currently are transferred to Brisbane for care.

#### 2.1.2 Regional Services

##### Maternal

- Gestational and pre-existing diabetes in pregnancy services to WDHB.
- Pre-pregnancy counselling for diabetic and high risk women. These services are currently performed in maternity clinics though not funded.
- Care for pregnant women with HIV infection from CMDHB and WDHB. With the rollout of the National HIV screening in pregnancy programme, these caseloads may increase but numbers will be small in absolute terms.

##### Fetal/Neonatal

- Diagnosis and management of major fetal abnormalities, including provision of mid-trimester termination services. This service is also provided to hospitals in

the Mid Central DHB on an ad hoc basis due to limitations in the service provided from Waikato.

## **2.2 Wards and clinics in the maternity service**

The following wards and clinics make up the maternity service:

### **2.2.1 Labour and Birthing Suite**

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

### **2.2.2 High Dependency Unit (HDU)**

- HDU is a level 1 Intensive Care Unit with some level 2 facilities. It manages approximately 200 admissions per year. Forty percent of these are for hypertensive disease, and 25% for excessive blood loss. Other reasons for admission include sepsis and cardiac conditions. The midwifery and nursing staff in this unit work hard to maintain a strong focus on the woman's experience to ensure healthy mother and baby bonding and to encourage breastfeeding.

### **2.2.3 Women's Assessment Unit (WAU)**

- This service is open 24 hours a day, 7 days a week and provides acute care for women experiencing pregnancy and gynaecological complications.
- Day assessment unit is a service provided from within WAU, and provides appointment-based care to women with complex pregnancies in an endeavour to reduce the need for admission.
- Induction of labour is booked through WAU and induction performed in this unit. Women are transferred to Labour and Birthing Suite at the onset of labour.
- WAU provide a service for women requiring second trimester termination of pregnancy and for women who have suffered an intrauterine death.
- An External Cephalic Version (ECV) clinic is provided at the Day Assessment Unit twice weekly.

#### **2.2.4 Antenatal and Postnatal Wards**

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

#### **2.2.5 Community clinics, home visits and outreach clinics**

##### **High Risk Medical Service (including Diabetes Service)**

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

##### **Community Services**

- Community and Domino clinics are held at Green Lane Clinical Centre, along with antenatal clinics in 14 General Practice facilities in the ADHB catchment area.
- DOMINO midwives provide continuity of midwifery care to low risk women
- Community midwifery clinics and postnatal home visits provide continuity of midwifery care during the antenatal and postnatal period with labour and birth midwifery services provided by core midwives in Labour and Birthing Suite.
- Clinics staffed by publically funded obstetricians are held 4 times a week at Green Lane Clinical Centre seeing women under the care of community and DOMINO midwifery care and reviewing secondary referrals from private LMCs.
- Clinics staffed by obstetric physician are held two times per week.
- A midwifery staffed Walk in Centre acts as a first point of contact and triage for pregnant women. These women access the centre by phone or by turning up, either with or without an appointment, and are made aware of their choices for maternity care .If presenting with an acute problem, they are referred to obstetric care as necessary.

### **2.3 Gynaecology service**

The general gynaecology service provides care to the women residing in the ADHB area of Central Auckland. NW also provides regional specialist gynaecological services.

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

### **2.3.1 Regional Services**

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

### **2.3.2 District Services**

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

## **2.4 Wards and clinics in the Gynaecology service**

### **2.4.1 High Dependency Unit**

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

### **2.4.2 Ward 97**

This is a 22 bed ward providing care for women with acute gynaecology problems, pre and post operative care for gynaecology and breast surgical patients, and gynaecology and breast complications. It also provides care to women with early pregnancy complications and medical terminations up to 20 weeks gestation.

This ward accommodates outliers when the hospital is full. This has an impact on the provision of gynaecology services as the beds are taken up with non gynaecology patients.

### **2.4.3 Outpatient clinics**

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

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

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



#### **2.4.4 Early Pregnancy Assessment Unit (EPAU)**

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

#### **2.4.5 Fertility Services**

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

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

- Donor insemination (DI)
- (IUI) intrauterine insemination with or without superovulation
- In vitro fertilisation (IVF)
- Intracytoplasmic sperm injection (ICSI)
- Pre-implantation genetic diagnosis (PGD)
- Reproductive endocrinology
- Private tertiary infertility service
- Recurrent pregnancy loss clinic which looks after women until 14 weeks gestation

#### **2.4.6 Gynaecologic Oncology**

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

### **2.5 University of Auckland**

NW has close associations with the University of Auckland. This involves support and involvement in research, clinical teaching, and particular projects. The Obstetrics and Gynaecology Department in association with the School of Population Health Department of Epidemiology and Biostatistics run a program teaching Trainee Interns to undertake clinical audit. Some of these projects are undertaken at NW, and these are of value to the students, clinicians and hospital services.

## **2.6 Newborn service**

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

### **2.6.1 Regional and District Services**

The Newborn Service is contracted to provide:

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

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

### **2.6.2 Neonatal Clinics and support services**

The Newborn Service is supported by:-

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

### **2.6.3 University Links**

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

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

### **2.6.4 Dr Carl Kuschel**

The resignation of the Clinical Director, Dr Carl Kuschel, in late 2007, was the forecast for a number of changes in clinical leadership for the Service.

Dr Kuschel led the newborn team in the planning and design detail for the new NICU at Auckland City Hospital. Based on principles within the Developmental Care framework and the international standards of NICU design, ADHB was able to achieve a neonatal intensive care environment of world class standard. Since migration a large number of staff from other neonatal units have toured the unit, to look at the model of care and to receive information that may be relevant for their own design processes.

Another significant achievement during Dr Kuschel's tenure, was the development of the Newborn Service website. Changes to the website over the past eighteen months include significant formatting changes, so that the site complies with the standard for New Zealand Government websites, the addition of a "Parent Support" area that includes information pamphlets, integrated clinical guidelines, as well as the development of the drug and other calculators designed to reduce treatment errors. In October 2007 a snapshot of the website usage was undertaken. During this month there were 1.38 million visits to the website from fifty countries, with an average of 44,610 hits per day and an average of 2,567 visitors per day. The most "popular hits" were for Teaching Resources / Dermatology; 42.9% of hits from the United States, with California, Virginia, Georgia, New Jersey and New York with 2,000 or more visitors per state utilizing the website clinical guidelines. Other countries with high usage were the United Kingdom, Canada, Australia and Spain.

The significant achievements of Dr Kuschel during his Clinical Director years have contributed to the development of a high quality neonatal service within the DHB, regionally and nationally. We congratulate Dr Kuschel on his appointment as Medical Director at the Royal Women's Hospital in Melbourne.

## **2.7 Lead Maternity Carer services**

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

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

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

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

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

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

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

### **2.7.1 Funding of Maternity Services**

- Funding for primary maternity care is claimed via Section 88. It is module based (i.e. per trimester, labour and birth and for postnatal care) and is a fixed amount per woman per module.
- Secondary and tertiary services are funded as a fee per birth to a maternity facility.
- Labour and birth funding is a fee paid to a maternity facility for every woman who births in the facility.
- Postnatal facility funding is a fee paid to a maternity facility for every woman who has a postnatal stay at the facility of greater than 12 hours.

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

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

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

## **2.8 District annual plan objectives**

The District Health Board prepares a list of objectives each year in a District Annual Plan and this is signed off by the Ministry of Health. Some but not all of the objectives signed off for the Auckland DHB in 2007 which relate to the provision of maternity services are discussed below.

### **2.8.1 Increasing breastfeeding rates, (Baby Friendly Hospital Initiative)**

The Baby Friendly Hospital Initiative (BFHI) is a joint World Health Organisation and UNICEF project aimed at promoting, protecting and supporting breastfeeding throughout the world and the implementation of the Ten Steps to Successful Breastfeeding within all maternity services. The BFHI project was launched at a ceremony at National Women's at the Green Lane site on the 8<sup>th</sup> August 2003 during World Breastfeeding Week. Over the intervening years the Hospital moved to the Auckland City Hospital site, education of all Maternity Services staff was ongoing, and the aims and implementation of the Ten Steps and the practices necessary to fulfil obligations under the WHO Code on the Marketing of Breast Milk Substitutes continued. The Breastfeeding Policy was taken to the community for widespread consultation. During 2007 75% or more mothers achieved "exclusive breastfeeding on discharge from the facility", the education targets were met, and an audit for the BFHI was completed by the NZ Breastfeeding Authority. The multidisciplinary approach, the work of the lactation consultants, improvements in consistency of breastfeeding advice, changes in practice by maternity staff all culminated in the successful completion of the audit, and award of the Baby Friendly Hospital certificate.

### **2.8.2 Family Violence Intervention**

ADHB recognises that Family Violence is a major health issue and has committed resources within the DHB to address it. ADHB is also contracted to the Ministry of Health to implement a Family Violence Intervention programme within ADHB. The Family Violence Team at ADHB brings together team members from multidisciplinary backgrounds to enhance and develop relationships throughout the DHB. It comprises of three ADHB co-ordinators, one co-ordinator from Preventing Violence in the Home (PVH, Auckland NGO) and a Preventing Violence in the Home ADHB Family Violence advocate. ADHB and Preventing Violence in the Home have a Memorandum of Understanding recognising the importance of intersectoral collaboration. Annual Family Violence Routine Screening has been initiated at ADHB Women's Health Services in 2006 for all women clients between 16 and 65yrs. The routine screening consists of a Framing statement to introduce Family Violence and three questions to assess whether Family Violence is occurring for this client. Family Violence Training is received by all clinical staff prior to their commencing routine screening in Women's Health. The Family Violence team continue to be involved in Women's Health in a supportive role also providing annual Family Violence updates in all areas. Since 2006, 171 clinical staff (midwives, nurses, ward clerks) from Women's Health have been trained in Family Violence Routine Screening (not including annual update). Each area is unique and it is important to realise specific areas have different complexities when it comes to screening women for Family Violence.

### **2.8.3 Immunisation**

#### **National Immunisation Register**

Maternity data, along with well child provider and LMC name, collected in Healthware (IBA Health maternity database) provide core data to the National Immunisation Register (NIR). The NIR was developed by the Ministry of Health through the Public Health Service, and aims to collect and maintain the immunisation status of all children in NZ. GPs populate the NIR with vaccination details through Med Tech software. The NIR sends reminder letters when vaccinations are due. Maintenance of this software, NIR upgrades and cleaning of data require a considerable amount of time from the Maternity Service.

#### **2.8.4 Smoking**

National Women's was one of the services within ADHB which had a contract with an external provider, Education for Change, to run smoking cessation programs. Smoking has a significant impact on the health of the unborn and newborn. NW LMCs and many independent LMCs screened women who entered the maternity service and referred smokers to the smoking cessation program. All staff and many independent LMCs underwent training to encourage and assist screening of all women. Women were asked their smoking status when they booked with an LMC and when they became an inpatient. The smoking cessation program also attempted to collect the smoking status of the partner and the household. These data have been difficult to collect in the required format. The smoking cessation program will in 2008 become part of the ADHB service. This will hopefully aid data collection and analysis to measure the effectiveness of the service.

#### **2.8.5 HIV**

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

#### **2.8.6 Clinical Governance**

The provision of appropriate clinical governance structures is crucial to ensuring clinical involvement in continuous quality improvement initiatives and the delivery of quality care. Our focus for 2007 has been on clinical governance within the Labour & Birthing Suite. One aspect of this work has been the development of a normal birth pathway aimed at ensuring intervention is minimised but where appropriate best practice intervention occurs at the appropriate time.

#### **2.8.7 Body Mass Index**

National Women's and its access holders have put considerable energy into collecting accurate BMI data for its maternity population. The "rising BMI" epidemic has been an issue for a number of years now and having good data on 90% of women who birth at NW will enable NW to educate women on the effect that a high BMI has on them and their babies' outcomes. NW is the first hospital in NZ to fully collect these data. The Ministry of Health now requires all hospitals to collect BMI for their birthing population but at this point do not have a mechanism to receive the data from hospitals.

#### **2.8.8 GP Liaison**

Dr Diana Good has worked with Women's Health as a General Practitioner Liaison during 2007. The role of GP Liaison is focussed on improving the information flow between primary and secondary care.

## 2.9 Consumer feedback

Consumer feedback information at Women's Health ADHB is collected from a number of sources.

Currently *Tell us what you think* feedback forms are available in some areas and provide verbatim comment on consumers' experience of the service. However uptake of this method of feedback is variable across the services in Women's Health, from over 750 returned in 2007 in Epsom Day Unit to less than 10 in some areas. The data obtained from these is qualitative, some contain several themes and analysis is inconsistent.

The *Patient Satisfaction Survey* is a national survey. A random sample of approximately 37 inpatients and 16 outpatients, discharged in the previous 14 days, are drawn from the monthly discharge list. They are sent a questionnaire containing 17 questions, 16 of which relate to quality of care. The questionnaire has a low response rate (18% in 2007). While the majority of responses received are positive, no conclusions can be drawn due to the low return rate.

Formal complaints from consumers are referred to the Consumer Liaison Department at ADHB for co-ordination of the response to the consumer. Good data are available on the type, number of, and responses to complaints. There were 71 formal complaints received by the Women's Health Service in 2007, 32 of which described issues within one complaint category, 34 within 2 categories and 13 complaints were assigned 3 categories. Care and treatment was the most frequently assigned complaint category (46), the majority of which related to quality of care (27). Communication was the next most common category (28), with the majority of these relating to information about medical condition or plan of care (15). Attitude & courtesy and accessibility categories each accounted for 18 complaints. Twenty eight complaints were completed within the required 30 days, another 31 were closed within 60 days. The remainder of complaints were closed between 61 and 364 days. The median time to closure was 37 days. Reasons for the delay to closure include complexity of issues raised staff on leave and vacancies in both the Women's Health Service and the Consumer Liaison department.

Some work is required to coordinate the various forms of feedback to provide a complete picture of consumer's experience at NW. A Consumer Feedback Plan will be put together to outline the purpose, design and analysis of feedback.

## 2.10 Consumer comments

It is entirely appropriate for there to be the inclusion of some consumer commentary in this 2007 Annual Report as we commemorate the 20<sup>th</sup> Anniversary of the Cartright Inquiry.

This inquiry has had a significant impact in the way consumers are now involved in planning their care in all parts of the health and disability sector, and these rights – which are enshrined in the HDC Code of Rights – have become embedded in modern obstetric and gynaecologic practice.

In a risk averse society this has resulted in these Rights being used to justify unnecessary medical procedures on the basis of "choice." This is something that health professionals and consumers have all bought into with the aim of guaranteeing perfection. An event-free pregnancy, a pain-free birth and settled babies with full

tummies are the expectations of the modern woman and there are times when the reality of pregnancy, birthing and parenting bites. In these times, families, who have exercised their right to make a choice, struggle with the reality of taking some responsibility for those decisions.

We talk about birth being a normal physiological event for well women and their babies, but do health professionals walk the talk? With the increasing numbers of unwell women, IVF pregnancies and older mothers, birthing in the 2000's is being redefined into something that is largely a medical event to be managed – and here is the biggest challenge of all – with women exercising informed compliance rather than truly exercising their right to give informed consent.

The challenge for all of us working within women's health is to remember the principles arising out of the Cartright Inquiry and to reflect honestly on our individual role in ensuring that these Rights are not a token gesture but are truly embraced and that women are not only encouraged, but are empowered, to exercise them.

With realistic expectations and health professionals empowering women to be informed and responsible for their decisions, I am confident that the drift towards the complete medicalisation of birth – and in fact life – can be halted.

Jennie Valgre  
Maternity Services Consumer Council

## **2.11 Issues**

A range of issues always affects the provision of any service throughout a year and in 2007 National Women's Health has had the following issues to work through:

### **Midwifery shortage**

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

### **Industrial action**

During 2007 there was industrial action as a result of failure to settle Multi Employer Collective Agreements for Laboratory Workers. The impact of this industrial action went beyond the patients impacted on the strike days as services were cut to manage with reduced laboratory resource.

### **Theatre Space**

A shortage of theatre space has meant that since mid-2007 NW has no longer able to provide an elective service for the surgical management of women with a miscarriage. This service has been contracted out to a private provider. This may have significant implications for registrar training. Women requiring emergency surgery are still treated in the level nine theatre complex at ACH.



# Chapter **3**

## SUMMARY STATISTICS



## 3 SUMMARY STATISTICS

### 3.1 Mother and baby numbers: NW 2007

**Table 1: Mother and baby numbers: National Women's 2007**

|  |             |
|--|-------------|
| Total number of mothers birthing at National Women's | 7671        |
| Mothers birthing before arrival (BBA)                | 24          |
| <b>Total number of mothers</b>                       | <b>7695</b> |
| Total number of babies born at National Women's      | 7851        |
| Babies born before arrival (BBA)                     | 24          |
| <b>Total number of babies</b>                        | <b>7875</b> |

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.

Five women gave birth twice during the calendar year 2007 and are therefore counted twice in the above table and throughout this report.

3 women gave birth at home with a NW Domino midwife in attendance and are included in this report with NW mothers and babies.

**Table 2: Contribution of multiple births to mother and baby numbers: National Women's 2007**

|                                   |            | <b>Mothers</b> | <b>Babies</b> |
|-----------------------------------|------------|----------------|---------------|
| National Women's births           | Singletons | 7494           | 7494          |
|                                   | Twins      | 174            | 348           |
|                                   | Triplets   | 3              | 9             |
| <b>Totals (not including BBA)</b> |            | <b>7671</b>    | <b>7851</b>   |
| BBA                               | Singletons | 24             | 24            |
|                                   | Twins      | 0              | 0             |
|                                   | Triplets   | 0              | 0             |
| <b>Totals (including BBA)</b>     |            | <b>7695</b>    | <b>7875</b>   |

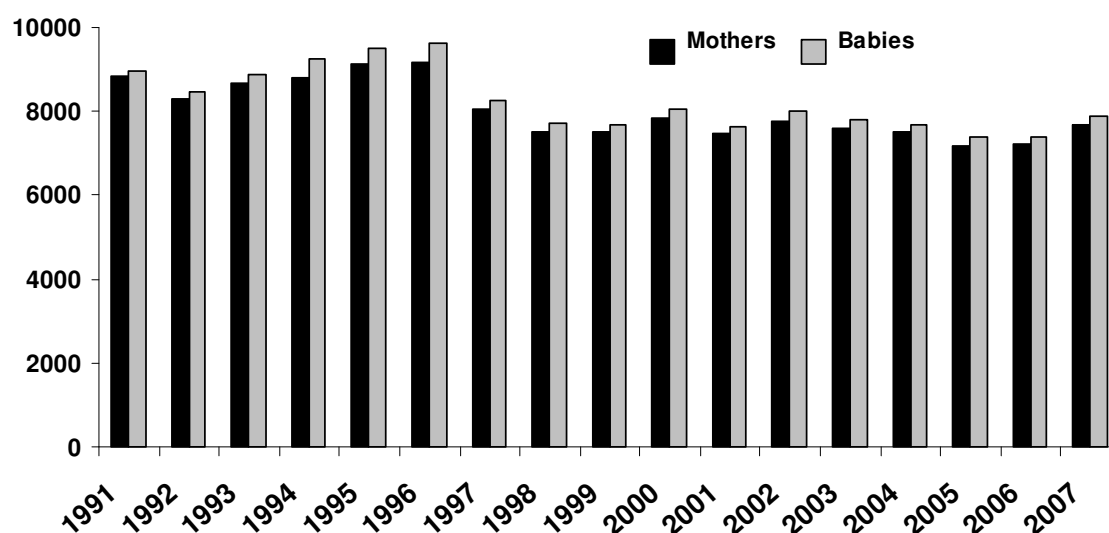


Figure 1: Numbers of women birthing and babies born at National Women's (1991-2007)

### 3.2 Summary of maternal outcomes 2007

Table 3: Mode of onset of birth

|                                     |  | Birthing Mothers<br>n=7695 |      |
|-------------------------------------|--|----------------------------|------|
|                                     |  | n                          | %    |
| Spontaneous onset of labour         |  | 4490                       | 58.3 |
| Iatrogenic                          |  | 3214                       | 41.8 |
| CS elective                         |  | 1030                       | 13.4 |
| Emergency CS before onset of labour |  | 278                        | 3.6  |
| Induction of labour                 |  | 1906                       | 24.8 |

Table 4: Mode of birth

|                          | Birthing mothers<br>n=7695 |      | Nullipara<br>n=3752 |      | Multipara<br>n=3943 |      |
|--------------------------|----------------------------|------|---------------------|------|---------------------|------|
|                          | n                          | %    | n                   | %    | n                   | %    |
| Spontaneous vertex birth | 4212                       | 54.7 | 1722                | 45.9 | 2490                | 63.2 |
| Vaginal breech birth     | 70                         | 0.9  | 33                  | 0.9  | 37                  | 0.9  |
| Operative vaginal birth  | 975                        | 12.6 | 772                 | 20.6 | 203                 | 5.2  |
| Forceps                  | 287                        | 3.7  | 224                 | 6.0  | 63                  | 1.6  |
| Ventouse                 | 688                        | 8.9  | 548                 | 14.6 | 140                 | 3.6  |
| Caesarean section        | 2438                       | 31.7 | 1225                | 32.7 | 1213                | 30.5 |
| CS elective              | 1030                       | 13.4 | 310                 | 8.3  | 720                 | 18.3 |
| CS emergency             | 1408                       | 18.3 | 915                 | 24.4 | 493                 | 12.5 |

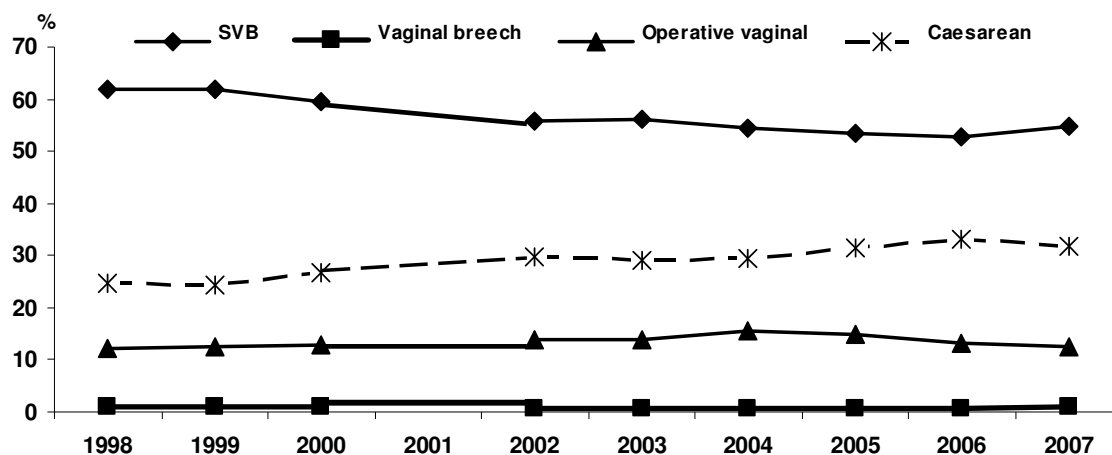


Figure 2: Mode of birth (1998-2007)

Table 5: Maternal postpartum outcomes

|   | Birthing mothers | n    | %    |
|---|------------------|------|------|
| <b>PPH <math>\geq 1000</math>mls</b>  | 7695             | 410  | 5.3  |
| SVB   | 4282             | 128  | 3.0  |
| Instrumental vaginal birth  | 975              | 44   | 4.5  |
| Caesarean section   | 2438             | 238  | 9.8  |
| <b>Episiotomy among vaginal births</b>  | 5257             | 1130 | 21.5 |
| <b>Third/ fourth degree tears among vaginal births</b>                                    | 5257             | 161  | 3.1  |
| <b>Postpartum blood transfusions</b>  | 7695             | 169  | 2.2  |
| <b>Infant Feeding at discharge from NW facility</b><br>(excludes babies admitted to NICU) |                  |      |      |
| Exclusive breastfeeding   | 6570             | 5064 | 77.1 |
| Fully breastfeeding   | 6570             | 348  | 5.3  |
| Partial breastfeeding   | 6570             | 929  | 14.1 |
| Artificial feeding  | 6570             | 229  | 3.5  |

## Maternal deaths

In 2007 there were 5 maternal deaths. Only one woman died while an inpatient at National Women's. Two women died in the second trimester, one of meningitis and one of complications of undiagnosed diabetes. The remaining three women died postpartum, one of cardiomyopathy, one of pulmonary embolism and one due to complications of a pheochromocytoma. Details of these maternal deaths have been sent to the national Perinatal and Maternal Mortality Review Committee (PMMRC)

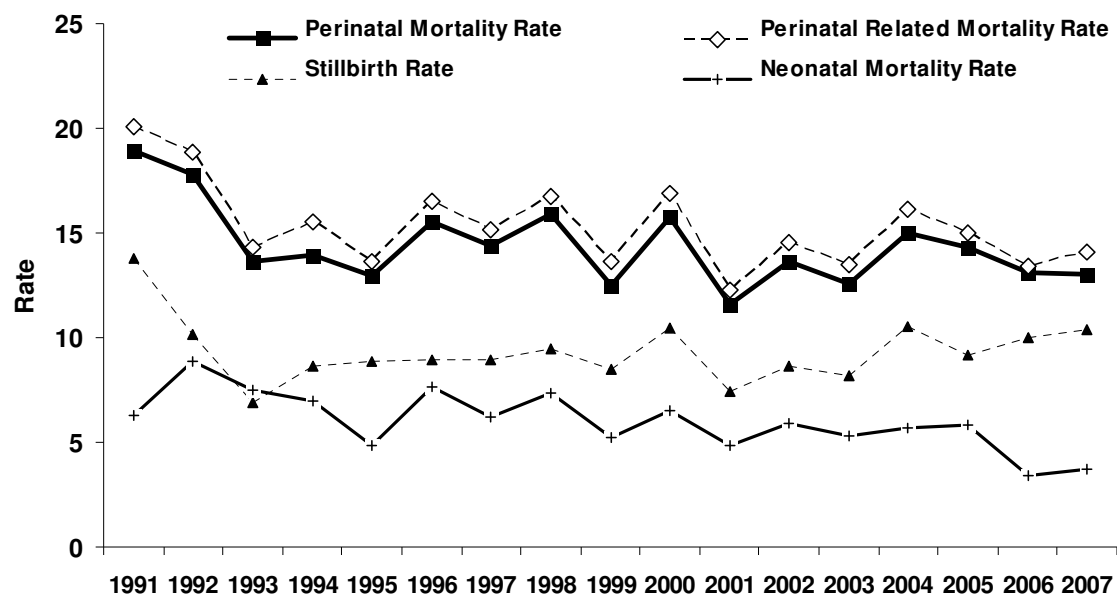
### 3.3 Summary of neonatal outcomes 2007

**Table 6: Neonatal outcomes among babies born at National Women's in 2007**

|                                    | <b>Babies born<br/>n=7875</b> |          |
|------------------------------------|-------------------------------|----------|
|                                    | <b>n</b>                      | <b>%</b> |
| <b>Gender</b>                      |                               |          |
| Male                               | 4162                          | 52.8     |
| Female                             | 3713                          | 47.2     |
| <b>Preterm birth</b>               |                               |          |
| 20-27 weeks                        | 121                           | 1.5      |
| 28-31 weeks                        | 116                           | 1.5      |
| 32-36 weeks                        | 667                           | 8.5      |
| <b>Term birth</b>                  |                               |          |
| 37-41 weeks                        | 6804                          | 86.4     |
| 42+ weeks                          | 167                           | 2.1      |
| <b>5 minute Apgar &lt;7</b>        |                               |          |
| Preterm                            | 37                            | 0.5      |
| Term                               | 45                            | 0.6      |
| <b>SGA (by Customised Centile)</b> |                               |          |
| Preterm                            | 266                           | 3.4      |
| At term                            | 690                           | 8.8      |
| <b>Admission to NICU</b>           |                               |          |
| Preterm                            | 543                           | 6.9      |
| Term                               | 322                           | 4.1      |

**Table 7: Perinatal mortality 2007**

|   | <b>Babies born<br/>n=7875</b> |
|---|-------------------------------|
| <b>Number of fetal deaths (stillbirths &amp; TOPs)</b>  | 82                            |
| <b>Number of early neonatal deaths</b>  | 29                            |
| <b>Number of late neonatal deaths</b>   | 9                             |
| <b>Perinatal mortality rate (/1000)</b>   | 13.0                          |
| <b>Perinatal mortality rate (excluding lethal and terminated fetal abnormalities) (/1000)</b> | 8.0                           |
| <b>Perinatal-related loss rate (/1000)</b>  | 14.1                          |



**Figure 3: Perinatal mortality rate, perinatal related mortality rate, stillbirth rate and neonatal mortality rate 1991-2007 (all rates expressed as deaths/1000 births)**

## 3.4 Maternal clinical indicators

### Methods

The tables present National Women's data for the calendar year 2007 compared to WHA means for contributing New Zealand and Australian maternity units with level 3 neonatal intensive care units for June 2005-June 2006<sup>1</sup>. WHA indicators are not presented if the required data could not be extracted from the NW dataset with accuracy. The data for NW are presented with 95% confidence intervals. Where the 95% confidence interval does not include the mean for WHA units, it can be assumed that our rates differ significantly. These have been bolded in the table.

**Table 8: NW maternity indicators 2007 benchmarked against WHA 2005-2006**

| Maternal indicators                       | Definition   | WHA mean<br>2005-2006 | NW 2007     |                  |
|---|--|-----------------------|-------------|------------------|
|   |  | %                     | %           | (95% CI)         |
| Caesarean section                         | Mothers delivering by caesarean section/Mothers giving birth                                 | 28.4                  | <b>31.7</b> | <b>30.6-32.7</b> |
| VBAC                                      | P1 previous caesarean  | 7.54                  | <b>10.7</b> | <b>10.0-11.4</b> |
|   | Prelabour repeat caesarean/P1 previous caesarean   | 59.3                  | 59.4        | 55.9-62.7        |
|   | VBAC/induced or spontaneous labour P1 previous caesarean                                     | 49.1                  | 52.4        | 46.9-57.9        |
|   | VBAC/P1 previous caesarean   | NA <sup>2</sup>       | 21.3        | 18.5-24.2        |
| Peripartum hysterectomy                   | Hysterectomy at same admission as birth/Mothers giving birth                                 | 0.113                 | 0.117       | 0.053-0.222      |
| Instrumental vaginal birth                | Forceps births/All vaginal births  | 4.4                   | 4.2         | 3.7-4.8          |
|   | Ventouse births/All vaginal births   | 8.98                  | <b>13.0</b> | <b>12.1-14.0</b> |
|   | Double instrumental/All vaginal births   | 0.877                 | <b>1.3</b>  | <b>0.99-1.6</b>  |
| Maternal age                              | Age 35 or more/Mothers giving birth  | 21.9                  | <b>30.7</b> | <b>29.7-31.7</b> |
|   | Age 40 or more/Mothers giving birth  | 4.35                  | <b>5.9</b>  | <b>5.4-6.5</b>   |
| Vaginal birth with regional anaesthesia   | Any regional anaesthetic/All vaginal births  | 24.9                  | <b>43.9</b> | <b>42.5-45.2</b> |
| General anaesthesia for caesarean section | General anaesthetic for Caesarean section/All caesarean sections                             | 9.73                  | <b>7.6</b>  | <b>6.6-8.7</b>   |
| Episiotomy                                | Mothers having an episiotomy/Mothers giving birth vaginally                                  | 17.6                  | <b>21.5</b> | <b>20.4-22.6</b> |
| Third and fourth degree tears             | 3 <sup>rd</sup> and 4 <sup>th</sup> degree tears/Mothers giving birth vaginally              | 2.3                   | <b>3.1</b>  | <b>2.6-3.6</b>   |
| Postpartum haemorrhage                    | Blood loss $\geq$ 500ml and $<$ 1500ml/Mothers giving birth vaginally                        | 9.54                  | <b>12.9</b> | <b>12.0-13.9</b> |
|   | Blood loss $\geq$ 1500ml/Mothers giving birth vaginally                                      | 1.03                  | 1.12        | 0.86-1.45        |
|   | Blood loss $\geq$ 500ml and $<$ 1500ml/Mothers giving birth by Caesarean                     | 41.6                  | <b>69.2</b> | <b>67.4-71.1</b> |
|   | Blood loss $\geq$ 1500ml/Mothers giving birth by Caesarean                                   | 2.54                  | <b>3.32</b> | <b>2.65-4.11</b> |
| Blood transfusion                         | Postpartum blood transfusion/Mothers giving birth  | 1.64                  | <b>2.2</b>  | <b>1.88-2.55</b> |
| Maternal admission to intensive care unit | Admitted to intensive care unit during same hospital admission as birth/Mothers giving birth | 0.214                 | 0.23        | 0.14-0.37        |
| Breastfeeding                             | Exclusive breastfeeding/Live born singleton term births                                      | 76                    | <b>70.3</b> | <b>69.0-71.7</b> |

<sup>1</sup> Benchmarking Maternity Care Supplementary Report 2005-2006

<sup>2</sup> Data not available

P1=parity 1, only previous birth by caesarean section



**Table 9: Perinatal indicators 2007 benchmarked against WHA 2005-2006**

| Perinatal indicators                              | Definition  | WHA mean<br>2005-2006 | NW 2007      |                    |
|---|---|-----------------------|--------------|--------------------|
|   |   | %                     | %            | (95% CI)           |
| Preterm birth                                     | Babies born before 37 weeks/Inborn babies                       | 13.3                  | <b>11.5</b>  | <b>10.8-12.2</b>   |
|   | Babies born before 32 weeks/Inborn babies                       | 4.04                  | <b>3.0</b>   | <b>2.7-3.4</b>     |
| Perinatal Mortality                               | Stillbirth and neonatal death up to 28 days/Inborn babies       | 1.44                  | 1.41         | 1.17-1.69          |
|   | Neonatal deaths up to 7 days (ENND)/Inborn babies               | 0.457                 | <b>0.254</b> | <b>0.164-0.392</b> |
|   | Neonatal deaths up to 28 days (ENND+LNND)/Inborn babies         | 0.527                 | 0.368        | 0.257-0.528        |
|   | Stillbirths/Inborn babies                                       | 0.915                 | 1.041        | 0.84-1.291         |
| Five minute Apgar of <=4                          | Babies with 5 minute Apgar<=4/Inborn babies                     | 0.187                 | <b>0.38</b>  | <b>0.26-0.54</b>   |
| Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3 | Hypoxic Ischaemic Encephalopathy (HIE) Grades 2&3/Inborn babies | 0.164                 | 0.089        | 0.036-0.18         |

This is the first year that perinatal indicators benchmarked against other Australasian Women's Health organisations have been reported. National Women's is a member organisation of Women's Hospitals Australasia (WHA) which conducts one of the largest contemporaneous data collection exercises world-wide<sup>1</sup>. Conclusions from the simple comparison of such benchmark data should be drawn with caution. Data reliability may vary and casemix differences such as ethnicity, socio-economic status, age and BMI may not be apparent. For example, the proportion of our maternity population over the age of 35 years is significantly greater (30.7%) than the mean for WHA contributing hospitals (21.9%). Nonetheless, it allows us to compare rates and identify areas where we may wish to further analyse our own data or conduct clinical audit or service planning in future.

In the above context, it is pleasing to note that the neonatal death rate up to 7 days is lower at National Women's. Although we record significantly more Apgar scores <=4 at 5 minutes, we do not have an increased rate of hypoxic ischaemic encephalopathy.

The double instrumental rate is significantly higher at NW than the WHA mean. It is universally accepted that double instrumental use needs to be minimised. As double instrumentation usually involves failed ventouse followed by successful forceps birth, it is likely that higher rates indicate poor instrument choice. This issue will be audited by the Labour and Birth Clinical Governance Group.

Similarly, we should be concerned that we have a higher rate of third and fourth degree perineal tears. The issues are discussed further in Chapter 8. However, there is potential for under-reporting of third degree tears and comparison between units is therefore fraught. It should be noted that our 2006 rate was similar to that of the WHA 2005-06 rate. Improving the reliability of these data is important and audit may be indicated.

Although the poor reliability of blood loss estimation suggests caution in concluding that we have a higher PPH rate, our postpartum blood transfusion rate is also higher which would suggest that we do have a higher degree of severe PPH. Guidelines for the management of PPH are currently undergoing review.



# Chapter 4

## MATERNAL DEMOGRAPHY



---

## 4 MATERNAL DEMOGRAPHY

---

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

### 4.1 Maternal domicile

In 2007, 70% of women giving birth at National Women's were from the Auckland District Health Board area. This proportion has changed little over the last five years rising slowly from 65% in 2002. Interestingly, despite a new birthing suite in South Auckland and a gradual expansion of services in Waitemata, 30% of our clientele are from outside the ADHB catchment area. For a few women this is because they require tertiary services but many choose to deliver under our care for non-clinical reasons. This will be an important issue to explore if in future any plans to restrict choice of hospital are considered.

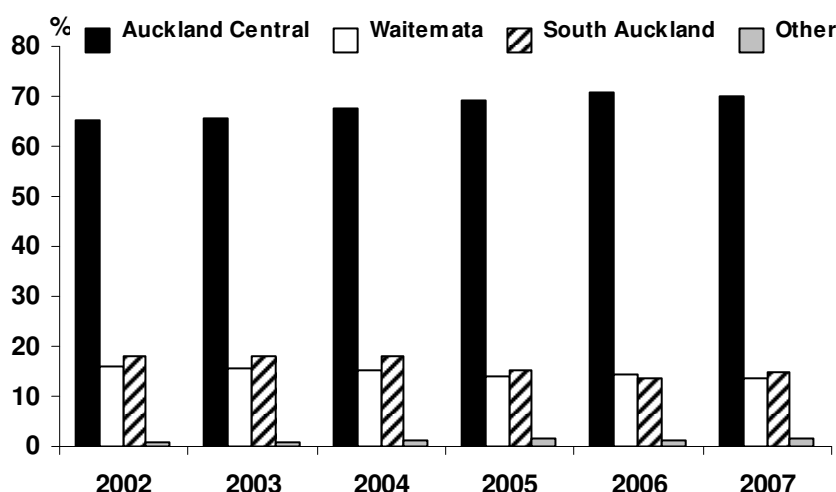
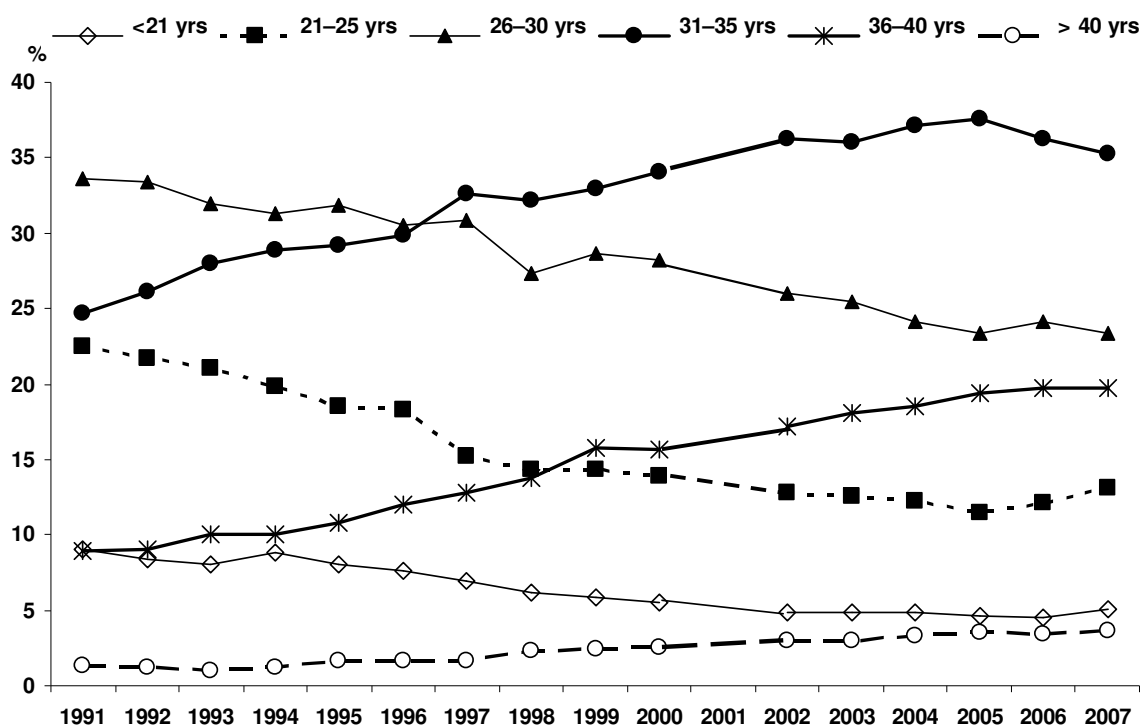


Figure 4: Domicile of women birthing at NW (2002-2007)

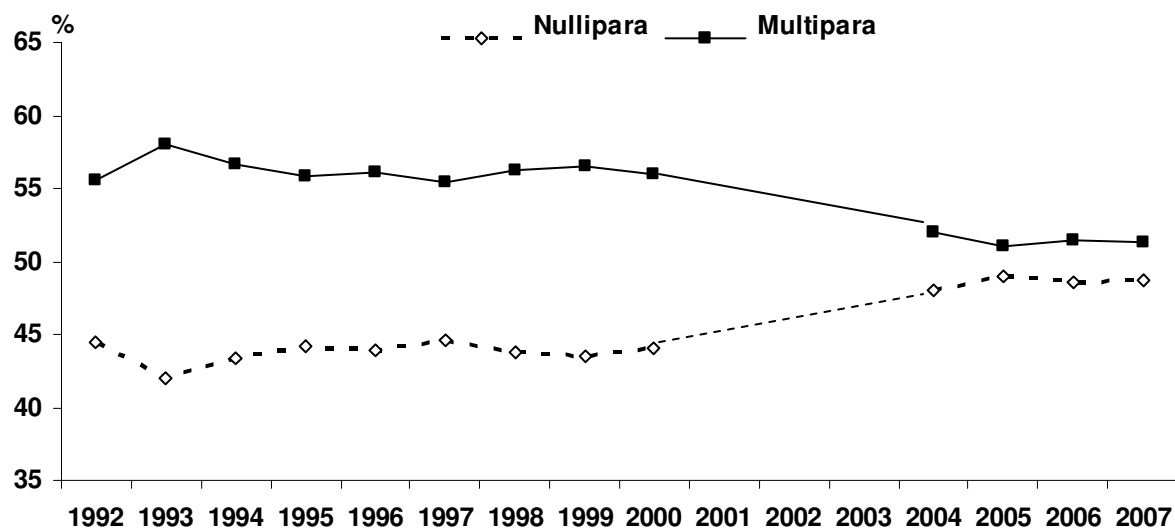
### 4.2 Maternal age, parity, and ethnicity

Comment has been made in every report over the last ten years about the upward trend in maternal age and this has continued with the proportion of women aged 26 to 30 at birth falling steadily and the proportion of women aged 36 to 40 rising. This older group will soon be the second most common age category. Similarly at the extremes of maternal age the proportion of women aged over 40 will soon be greater than those under 21. This continuing trend has implications for pregnancy screening programmes and will continue to have a subtle but important effect on intervention rates.



**Figure 5: Maternal age distribution (1991-2007)**

The ratio of nulliparous to multiparous women has remained fairly constant over the last three years at 0.96 to 1.0. The trend over the last decade towards nulliparous women making up a larger proportion of our clientele than multiparous women has halted. However, these proportions are very different to those apparent during the 1990s and probably also different from other DHB s in Auckland.



**Figure 6: Parity distribution (1992-2007)**

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

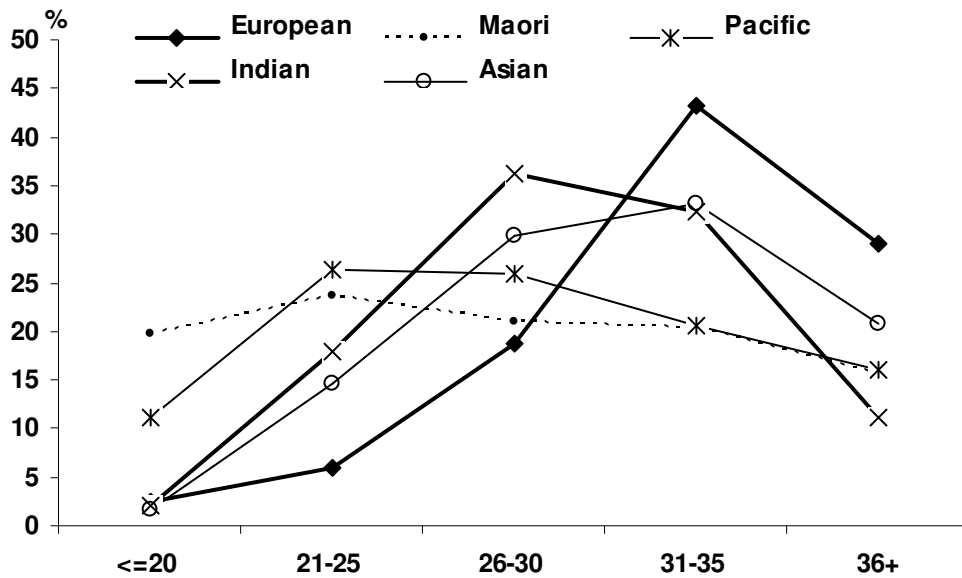


Figure 7: Maternal age among European, Maori, Pacific, Asian and Indian ethnicities

As in previous years Maori and Pacific Island mothers are more likely to be multiparous than European and Asian mothers. Nulliparous European women now outnumber multiparous European women, a dramatic difference from the proportions of nulliparous and multiparous Pacific Island women.

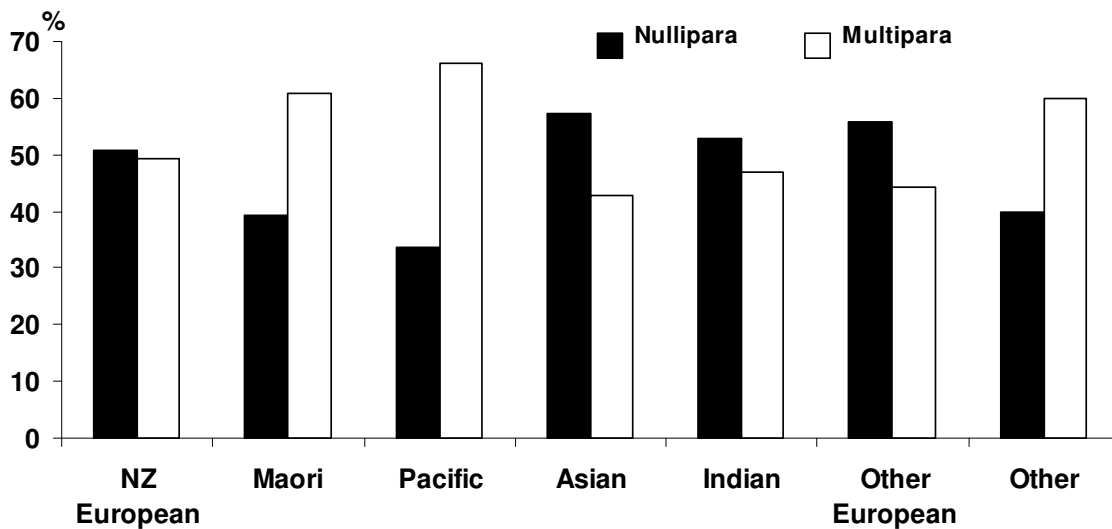


Figure 8: Parity distribution by maternal ethnicity (2007)

### 4.3 Lead Maternity Carer (LMC) and maternal demographic characteristics

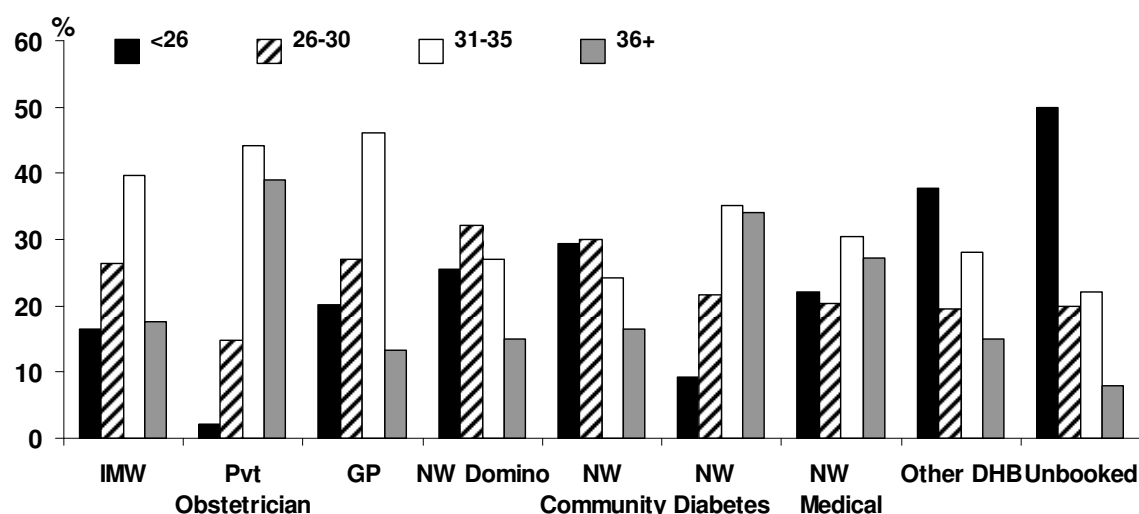


Figure 9: LMC at birth and maternal age

In 2007 38% of women were booked with Independent Midwives at birth, 24% with Private Obstetricians, 20% with National Women's Community clinics, 6% with National Women's DOMINO midwives, 8% with National Women's specialist medical and diabetes clinics. Overall 65% of women who gave birth at NW in 2007 were booked with a private Lead Maternity Carer. Over the last 10 years these proportions have been surprisingly constant with 66% of women booking with a private LMC in 1997.

NW Community includes 48 women who are cared for by the alcohol, drug and psychiatric team (ADAPT).

Women booking with a private obstetrician were more likely to be older, particularly over 35, and of European origin compared to other LMCs. Both Private Obstetricians and Independent Midwives have a significantly lower proportion of non-European women booking with them compared to the National Women's Domino and Community teams.

Maori and Pacific Island women are greatly over represented amongst the unbooked population – unbooked women are at substantially greater risk of poor pregnancy outcomes than women who receive antenatal care.



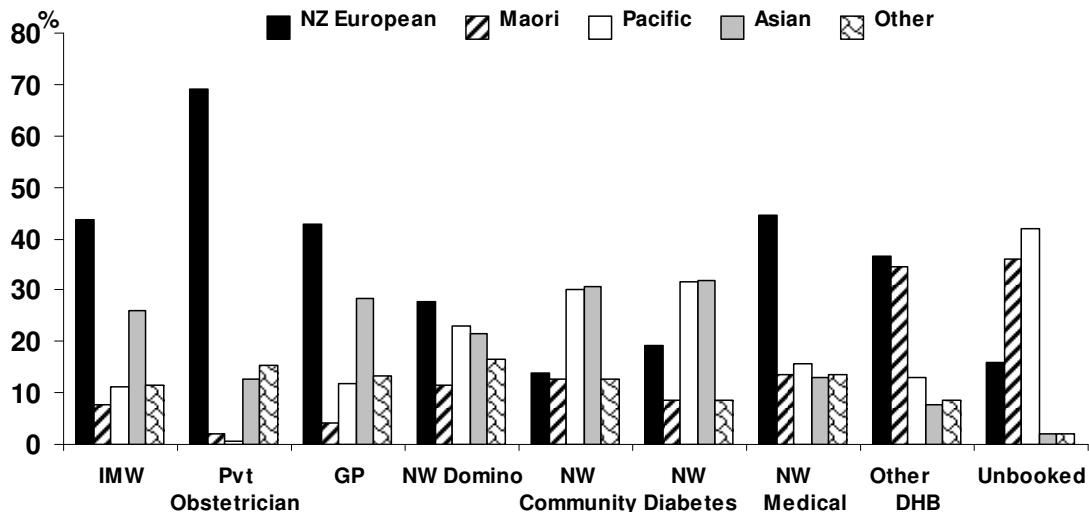


Figure 10: LMC at birth and maternal ethnicity

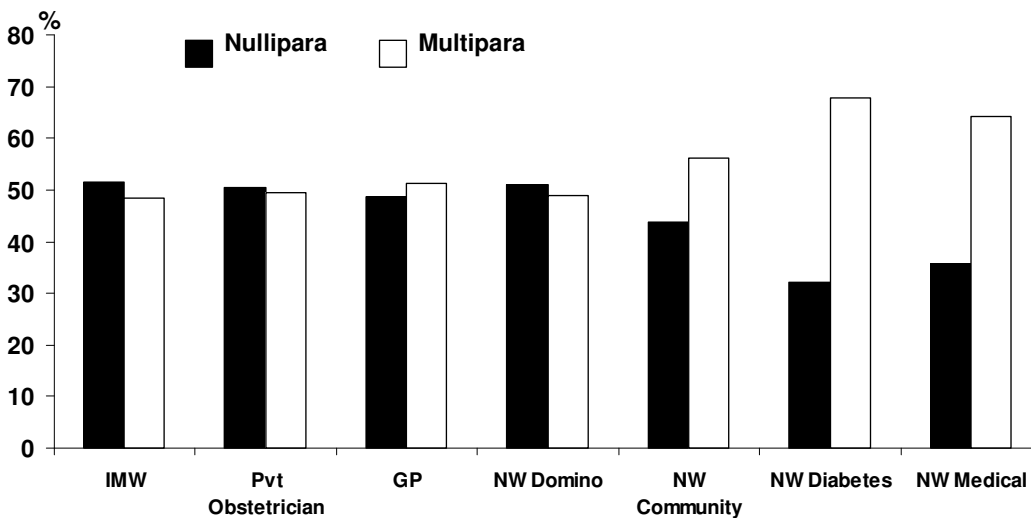


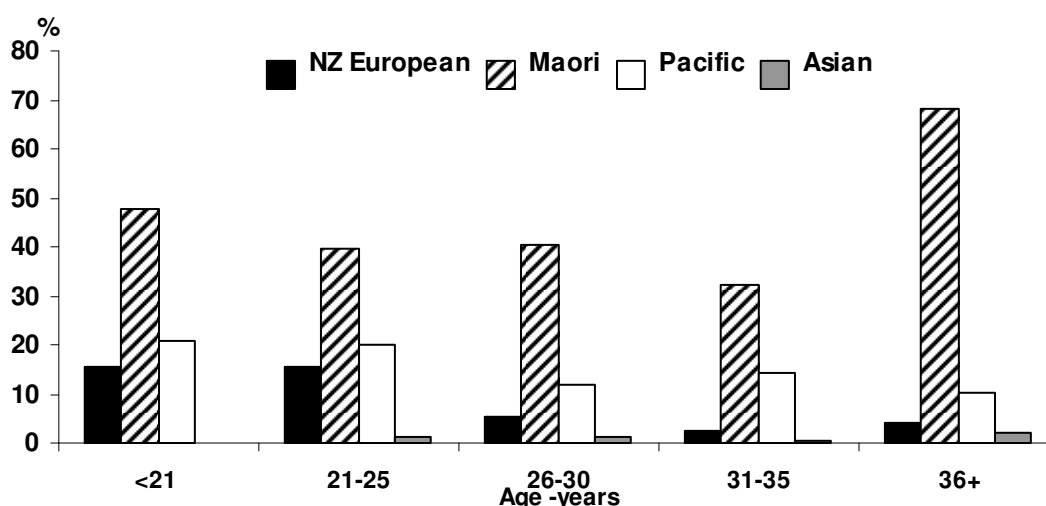
Figure 11: LMC at birth and parity

## 4.4 Smoking

In 2007, smoking data were missing at booking for 12% of women. Among women with smoking data available, 633/6765 (9.4%) women replied yes to smoking within the previous month. At birth, data were missing for 29% of women. Of the women with missing data at birth, 8.5% had responded yes to smoking at booking. Of those with data at birth, 420/5465 (7.7%) responded yes to smoking within the previous month, and 53 (1.0%) responded that they had stopped in pregnancy.

Table 10: Smoking status at booking and at birth (excluding women with missing data).

|                    | Women with data | Yes within past month |     | Not in past month |      | Stopped in pregnancy |     |
|--------------------|-----------------|-----------------------|-----|-------------------|------|----------------------|-----|
|                    | n               | n                     | %   | n                 | %    | n                    | %   |
| Smoking at booking | 6765            | 633                   | 9.4 | 6132              | 90.6 |                      |     |
| Smoking at birth   | 5465            | 420                   | 7.7 | 4992              | 91.3 | 53                   | 1.0 |



**Figure 12: Smoking status at birth by age and ethnicity**

Smoking rates remain substantially different amongst different ethnic groups with rates among Maori women 38% compared to 5% or less for European women. Disappointingly, amongst Maori women smoking rates show no decline with increasing maternal age. In other ethnic groups smoking rate tends to fall with age. Significant resources have been devoted to smoking cessation programmes in pregnancy and it is now time to assess their cost effectiveness. It would appear to be time for a rethink on how we help Maori women stop smoking in pregnancy.

The data in the appendix and figures in the printed version of the 2007 Annual Clinical Report relate to smoking at birth.

## 4.5 Body mass index

This is the second annual report to include BMI data. The most recent CEMACH report published in 2007 included these data for the first time and highlights how important BMI is as a risk factor for poor maternal outcome. Nearly one third of women booking at National Women's have a BMI of 26 or over and 5.9% have a BMI over 35. In the most recent CEMACH report obese women were markedly overrepresented in maternal mortality report particularly for thrombo-embolism and sepsis. Obese women have greater rates of induction, caesarean section and postpartum sepsis. Their babies are more likely to be stillborn or have a congenital abnormality.

Obesity is increasing steadily in our community and it will be important to observe trends in obesity rates in future reports. A particularly high risk group are older obese women with 40 per cent of women over 40 having a BMI over 25. BMIs well over 40 are no longer rare and it is probably time for multi-disciplinary protocols on the care of these "super-obese" women.

**Table 11: Maternal BMI**

| Mothers      |        |      |
|--------------|--------|------|
|              | n=7695 | %    |
| <19          | 388    | 5.0  |
| 19-25        | 4129   | 53.7 |
| 26-35        | 1940   | 25.2 |
| >35          | 452    | 5.9  |
| Missing data | 786    | 10.2 |

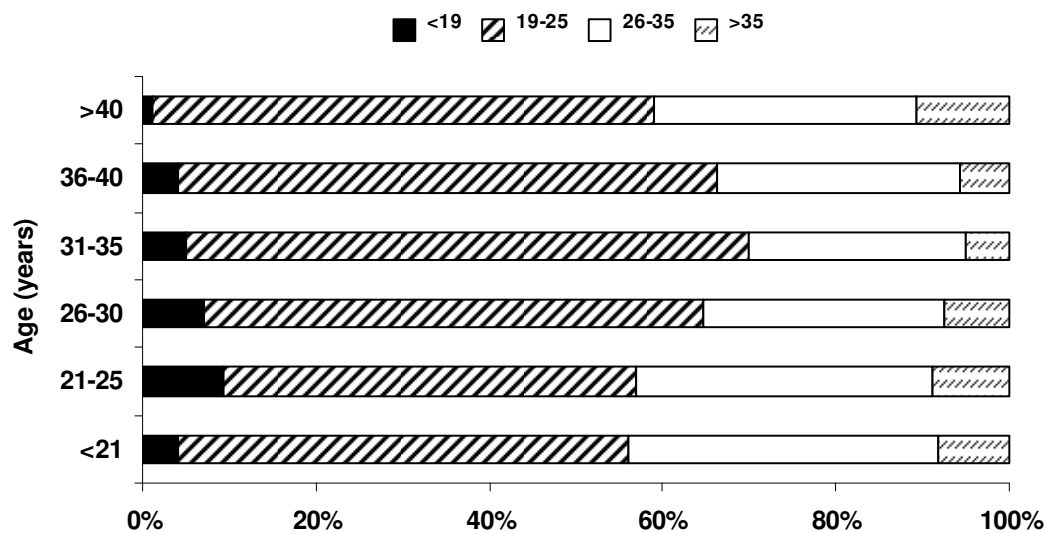


Figure 13: Distribution of BMI categories by age (missing data excluded)

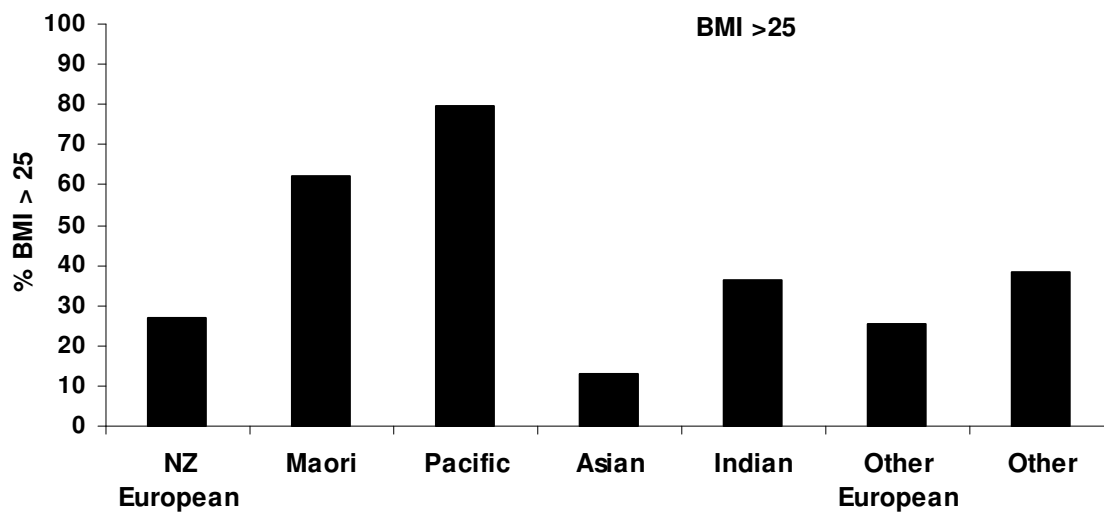


Figure 14: Rates of high BMI (>25) by ethnicity

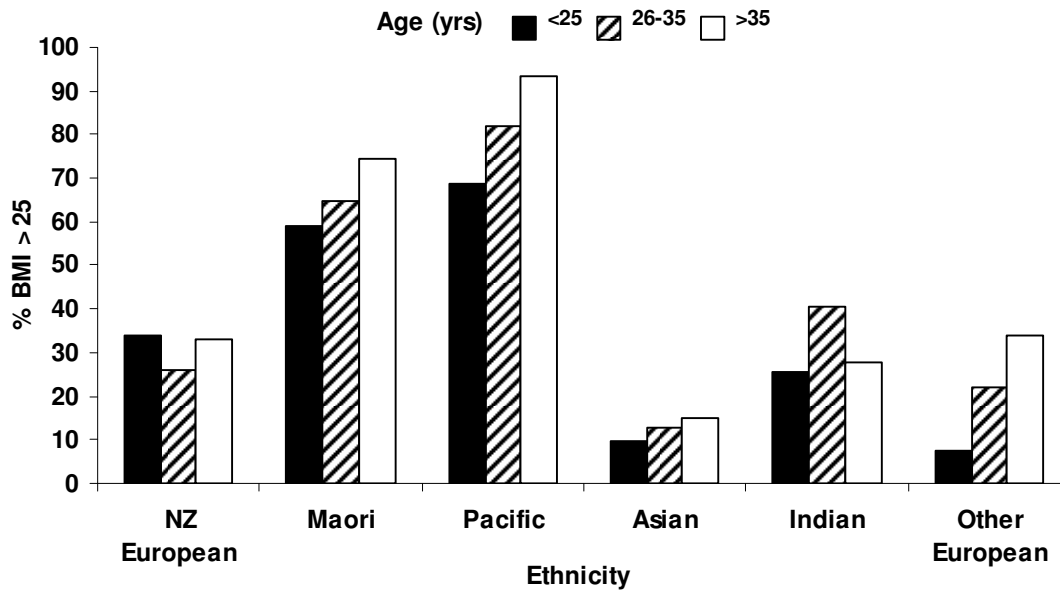


Figure 15: Rates of high BMI (>25) by ethnicity and age

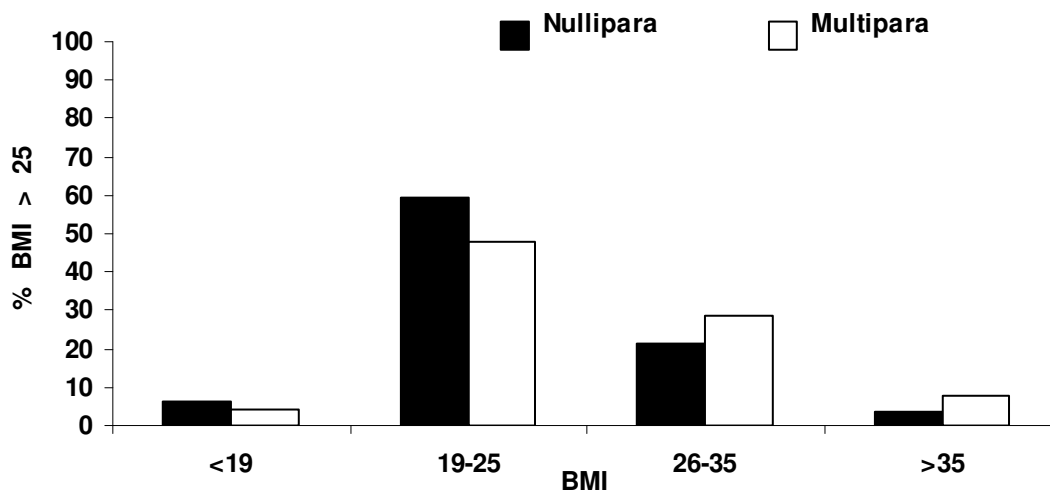


Figure 16: Parity and BMI

## 4.6 Standard primipara

The definition for standard primipara is given in the appendix. The objective of reporting outcomes for this tightly defined sub-group is to permit comparison between individual caregivers within National Women's and to compare outcomes with those in other institutions.

In 2007, 33% of primiparous women were in this group with lower proportions amongst European and Maori women compared to Asian and Indian women

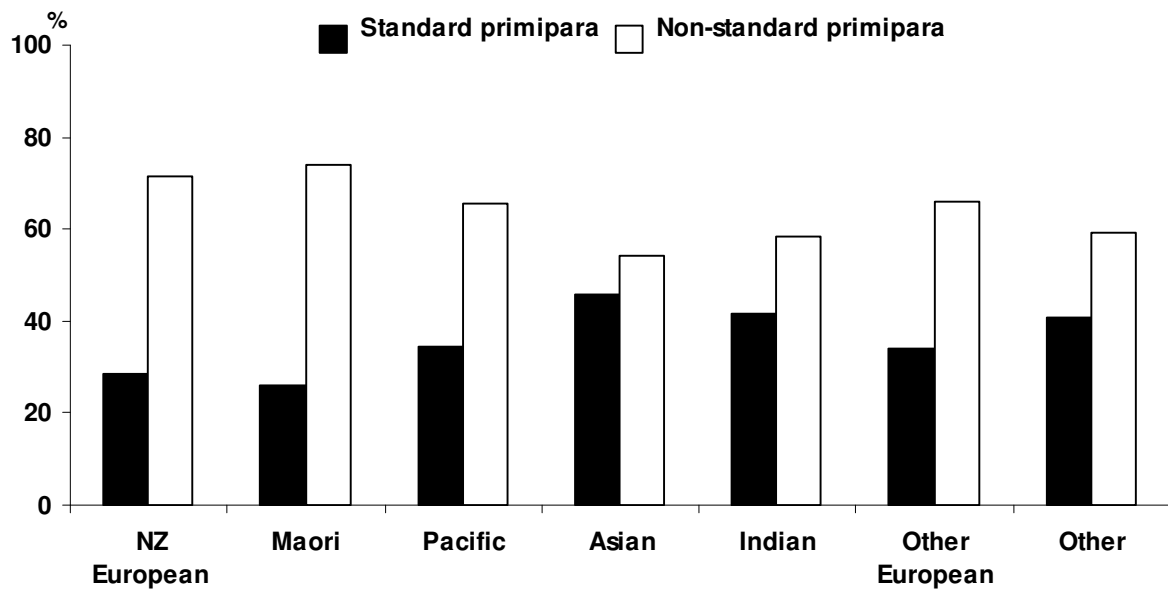


Figure 17: Ethnicity by primiparous risk status

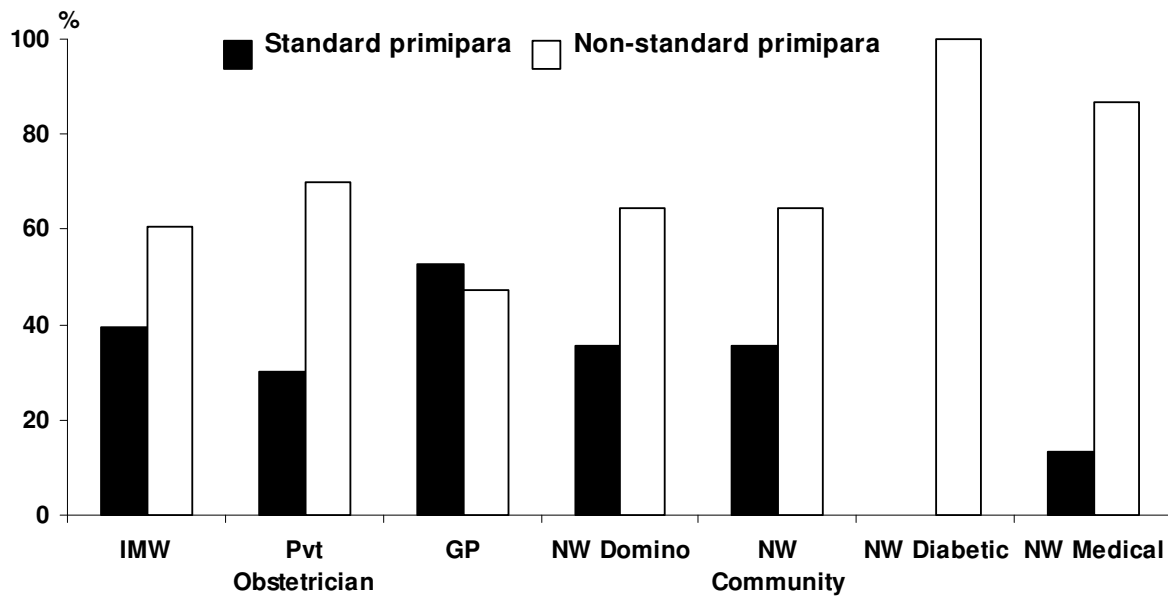


Figure 18: LMC at birth by primiparous risk status



# Chapter **5**

## ANTENATAL COMPLICATIONS





## 5 ANTENATAL COMPLICATIONS

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

### 5.1 Preterm birth

#### Methods

Preterm birth is defined as birth prior to 37 completed weeks. Since 2004, iatrogenic birth has been defined as induction of labour, elective caesarean section and emergency caesarean before the onset of labour. Prior to 2001, elective caesareans were not defined at data entry but derived based on a definition of caesarean section before the onset of contractions.

#### Comments

Preterm birth has many causes and therefore one must be careful when drawing conclusions about obstetric care and risks for women.

**Table 12: Rates of preterm birth <37 completed weeks (1994 – 2007)**

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

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

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

At NW the rate of preterm birth has remained around 10% over the last 9 years. This is reassuring as in many units in the developed world rates are rising. This puts extra pressure on resources. The main resource issues are for preterm births at lower gestations. When looking at the NW data for preterm births less than 32 completed weeks, the rates have also remained static at around 3%.

Typically one-third of preterm birth is iatrogenic and the remaining two-thirds are spontaneous. The most common reasons for iatrogenic preterm birth are fetal growth restriction, pre-eclampsia, bleeding and induction following premature prelabour rupture of membranes. We now have three years of consistent data on spontaneous and iatrogenic preterm birth. The number of spontaneous preterm births is similar to the number of

iatrogenic preterm births, suggesting that we have more iatrogenic deliveries at NW than are seen in other populations.

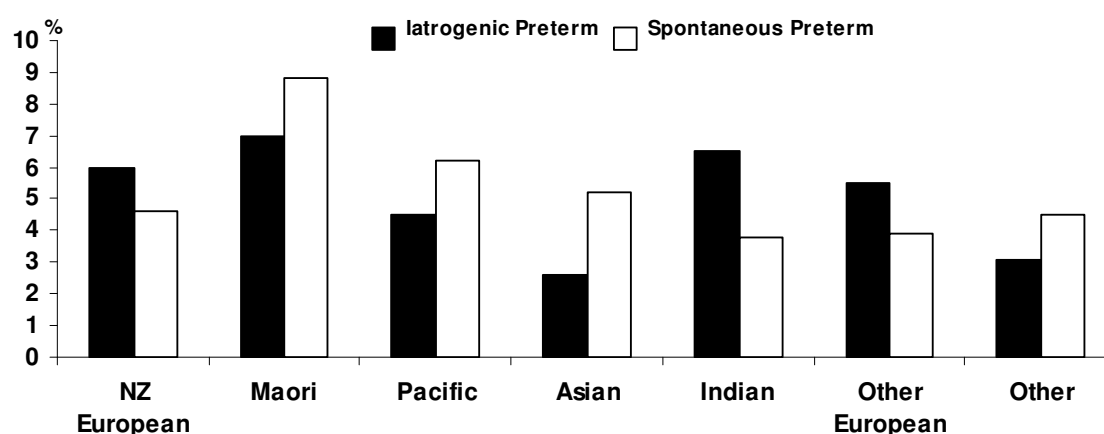
The incidence of spontaneous preterm birth has remained static over the last 3 years across all gestations. A number of changes have taken place which we would hope would reduce the rate, but these do not appear to be having a major effect at the moment. These include introduction of the Smokechange programme, a move to single embryo transfer in IVF cycles, the use of cervical scanning and the identification and treatment of bacterial vaginosis for women at high risk of preterm labour.

The maternal demographics show that spontaneous preterm birth is more common in mothers who are young, have a multiple pregnancy and smoke. As in previous years there is an increased risk of spontaneous preterm labour amongst our Maori population. These data, however, are not controlled for any of the other risk factors already mentioned and may represent different maternal demographics amongst Maori mothers.

**Table 13: Rates of preterm birth <32 completed weeks (1994–2007)**

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

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



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

The rate of iatrogenic preterm birth has also remained static. Looking at the maternal demographics, iatrogenic preterm birth is more common in older women. This most likely reflects a higher risk of developing placental pathology such as pre-eclampsia and fetal growth restriction. Smokers have a higher risk of iatrogenic preterm birth, which is probably related to placental reasons, including the association seen with antepartum haemorrhage.

Multiple pregnancy is a significant risk factor for iatrogenic preterm birth which may reflect complications such as discordant growth and twin to twin transfusion syndrome, but also clinician attitude to the definition of term in a multiple pregnancy.

**Table 14: Perinatal outcome of preterm births by gestation (n=904)**

| <b>Gestation</b> | <b>Births</b> | <b>Fetal deaths</b> | <b>Live births</b> | <b>% Live born</b> | <b>Neonatal death</b> | <b>% of live births surviving &gt;28 days</b> |
|------------------|---------------|---------------------|--------------------|--------------------|-----------------------|---|
| <b>20</b>        | 12            | 12                  | 0                  | 0                  | 0                     | 0   |
| <b>21</b>        | 9             | 5                   | 4                  | 44                 | 4                     | 0   |
| <b>22</b>        | 11            | 7                   | 4                  | 36                 | 3                     | 25  |
| <b>23</b>        | 12            | 7                   | 5                  | 42                 | 1                     | 80  |
| <b>24</b>        | 16            | 7                   | 9                  | 38                 | 3                     | 67  |
| <b>25</b>        | 15            | 2                   | 13                 | 87                 | 2                     | 85  |
| <b>26</b>        | 23            | 5                   | 18                 | 78                 | 0                     | 100   |
| <b>27</b>        | 23            | 3                   | 20                 | 87                 | 1                     | 95  |
| <b>28</b>        | 24            | 2                   | 22                 | 88                 | 1                     | 95  |
| <b>29</b>        | 28            | 1                   | 27                 | 96                 | 0                     | 100   |
| <b>30</b>        | 30            | 1                   | 29                 | 97                 | 0                     | 100   |
| <b>31</b>        | 34            | 1                   | 33                 | 97                 | 1                     | 97  |
| <b>32</b>        | 50            | 2                   | 48                 | 96                 | 0                     | 100   |
| <b>33</b>        | 68            | 1                   | 67                 | 99                 | 0                     | 100   |
| <b>34</b>        | 119           | 0                   | 119                | 100                | 1                     | 99  |
| <b>35</b>        | 152           | 2                   | 150                | 99                 | 3                     | 98  |
| <b>36</b>        | 278           | 2                   | 276                | 99                 | 1                     | 99  |
| <b>Totals</b>    | 904           | 60                  | 844                | 93                 | 21                    | 98  |

### **Summary / Implications**

During 2007, babies born alive at or beyond 26 weeks, had good survival rates. Prior to 26 weeks, rates of survival up to 28 days are lower. In the extreme preterm group (<24 weeks) there were 5 babies surviving to 28 days out of a total of 13 live births. In 2006 only one baby out of 16 live births in this category survived to 28 days. This is an interesting observation, given babies at these gestations were not resuscitated in the past.

## 5.2 Small for gestational age babies

### Methods

Until 2004, the NW Annual Clinical Reports defined small for gestational age (SGA) according to a nomogram of population centiles published by Beeby et al (Journal of Paediatrics & Child Health. 1996;32:512-8), which is largely derived from Caucasian births. A customised birth weight centile calculator has been developed for New Zealand women (McCowan et al, Aust N Z J Obstet Gynaecol 2004;44:428-31). This adjusts size at birth for gestation, gender, maternal ethnicity, height, booking weight, and parity. The resulting definition of SGA reclassifies as normal many babies with low rates of morbidity who are born to small mothers and reclassifies as small a group of babies with high morbidity and mortality who are born to overweight women. Customised centiles are thought to more reliably identify babies with growth restriction than population centiles.

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

### Findings

**Table 15: Interventions and outcomes among SGA , LGA and appropriate grown (AGA) babies**

|                                      | Customised birthweight<br><10 <sup>th</sup> % (SGA)<br>n=956<br>n % | Customised birthweight<br>≥10 <sup>th</sup> % & ≤ 90 <sup>th</sup> % (AGA)<br>n=6123<br>n % | Customised birthweight<br>> 90 <sup>th</sup> % (LGA)<br>n=796<br>n % |
|--------------------------------------|---|---|--|
| <b>Median birth weight (IQR) (g)</b> | 2620 (2118-2900))   | 3420 (3120-3720)  | 4100 (3803-4410)   |
| <b>Gestation at birth</b>            |   |   |  |
| Term                                 | 690 72.2  | 5568 90.9   | 713 89.6   |
| Preterm                              | 266 27.8  | 555 9.1   | 83 10.4  |
| Preterm <32 wks                      | 105 11.0  | 118 1.9   | 14 1.8   |
| <b>Median gestation (IQR),weeks</b>  | 38 (36-40)  | 39 (38-40)  | 39 (38-40)   |

**Table 16: Interventions and outcomes among SGA, LGA and AGA babies born preterm**

|   | Customised birthweight<br><10 <sup>th</sup> % (SGA)<br>n=266<br>n % | Customised birthweight<br>≥10 <sup>th</sup> % & ≤ 90 <sup>th</sup> % (AGA)<br>n=555<br>n % | Customised birthweight<br>> 90 <sup>th</sup> % (LGA)<br>n=83<br>n % |
|---|---|--|---|
| <b>Onset of birth - preterm</b>           |   |  |   |
| Spontaneous labour                        | 84 31.6   | 310 55.9   | 50 60.2   |
| Induction and pre labour CS               | 182 68.4  | 245 44.1   | 33 39.8   |
| <b>NICU admission</b>                     |   |  |   |
| Any stay                                  | 178 66.9  | 332 59.8   | 33 39.8   |
| ≥2 days                                   | 177 66.5  | 320 57.7   | 31 37.4   |
| <b>Apgar at 5 mins &lt;7</b>              | 16 6.0  | 36 6.5   | 7 8.4   |
| <b>Stillbirth (n/ 1000)</b>               | 43 161.7  | 17 30.6  | 4 58.1  |
| <b>Neonatal death(n/1000 live births)</b> | 10 44.8   | 10 18.6  | 2 25.3  |

**Table 17: Interventions and outcomes among SGA, LGA and AGA babies at term**

|  | Customised birthweight<br><10 <sup>th</sup> % (SGA)<br>n=690 | Customised birthweight<br>≥10 <sup>th</sup> % & ≤ 90 <sup>th</sup> % (AGA)<br>n=5568 | Customised birthweight<br>> 90 <sup>th</sup> % (LGA)<br>n=713 |
|--|--|--|---|
|  | n %  | n %  | n %   |
| <b>Onset of birth</b>                      |  |  |   |
| Spontaneous labour                         | 333 48.3   | 3356 60.3  | 416 58.4  |
| Induction and pre labour CS                | 357 51.7   | 2212 39.7  | 297 41.7  |
| <b>NICU admission</b>                      |  |  |   |
| Any stay                                   | 60 8.7   | 213 3.8  | 49 6.9  |
| ≥2 days                                    | 53 7.7   | 180 3.2  | 38 5.3  |
| <b>Apgar at 5 mins &lt;7</b>               | 7 1.0  | 32 0.6   | 6 0.8   |
| <b>Stillbirth (n/1000)</b>                 | 10 14.5  | 7 1.3  | 1 1.4   |
| <b>Neonatal death (n/1000 live births)</b> | 0  | 7 1.3  | 0   |

### Summary / Implications

These data again suggest that babies who are SGA by customised centiles have higher rates of morbidity and mortality than their AGA counterparts. This applies both to babies born at term and preterm. Induction and pre-labour LSCS is also increased in these SGA babies whether born at term or preterm. This is likely due to antenatal recognition of SGA and also associated conditions such as preeclampsia.

Women who smoke clearly have higher rates of SGA than non smokers and women who stop smoking in pregnancy. There is a suggestion that Maori and Pacific women have higher rates of SGA than European women, and that young age and high BMI are also associated with SGA. However, further statistical analysis would be required to clarify whether these factors are independent of smoking.

## 5.3 Multiple pregnancy

This section describes the characteristics and outcomes of mothers who gave birth to twins and triplets at NW during 2007 and the outcomes of their babies.

### Findings

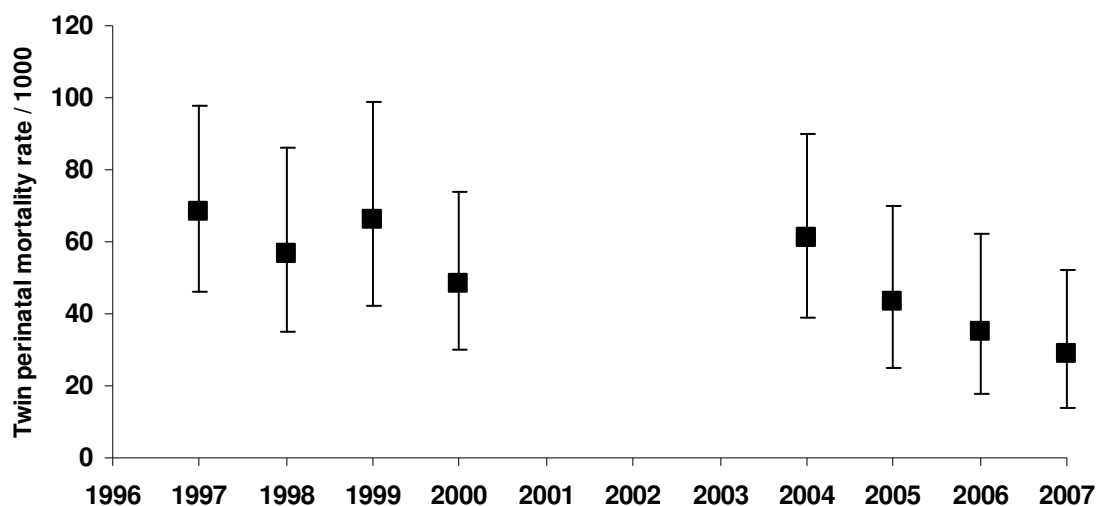
**Table 18: Multiple pregnancy rates**

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

**Table 19: Fetal/neonatal outcomes of multiple pregnancies**

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

\*Perinatal twin deaths/1000 twin babies born



**Figure 20: Twin perinatal mortality 1997-2007 with 95% confidence intervals**

The rate of multiple pregnancy remains stable. In 2007 there was a 5.1% chance of a perinatal death per pregnancy, highlighting the high risk nature of multiple pregnancy. The perinatal mortality rate among twins is 28.7/1000 which is just over twice the rate in singleton pregnancy (13.3/1000). There has been an apparent reduction in the perinatal mortality rate for twins over the last ten years but this is not statistically significant.

**Table 20: Mode of onset of birth among twin pregnancies**

|                               | Preterm births<br>n=102 |      | Term births<br>n=72 |      |
|-------------------------------|-------------------------|------|---------------------|------|
|                               | n                       | %    | n                   | %    |
| <b>Mode of onset of birth</b> |                         |      |                     |      |
| CS elective                   | 24                      | 23.5 | 22                  | 30.6 |
| CS emergency before labour    | 19                      | 18.6 | 7                   | 9.7  |
| Induction of labour           | 14                      | 13.7 | 31                  | 43.1 |
| Spontaneous labour            | 45                      | 44.1 | 12                  | 16.7 |

**Table 21: Mode of birth among twin pregnancies**

|  | Twin pregnancies |    |               |    |               |    |               |    |               |    |
|--|------------------|----|---------------|----|---------------|----|---------------|----|---------------|----|
|  | 2000<br>n=207    |    | 2004<br>n=188 |    | 2005<br>n=184 |    | 2006<br>n=157 |    | 2007<br>n=174 |    |
|  | n                | %  | n             | %  | n             | %  | n             | %  | n             | %  |
| Spontaneous vaginal birth/vaginal breech both twins                                    | 84               | 41 | 52            | 28 | 53            | 29 | 38            | 24 | 47            | 27 |
| Spontaneous vaginal birth 1 <sup>st</sup> twin, operative vaginal 2 <sup>nd</sup> twin | 7                | 3  | 4             | 2  | 8             | 4  | 7             | 4  | 3             | 2  |
| Operative vaginal 1 <sup>st</sup> twin, spontaneous vaginal 2 <sup>nd</sup> twin       | 9                | 4  | 8             | 4  | 5             | 3  | 5             | 3  | 6             | 3  |
| Instrumental vaginal birth both twins  | 11               | 5  | 7             | 4  | 7             | 4  | 3             | 2  | 11            | 6  |
| Spontaneous vaginal birth 1 <sup>st</sup> twin, caesarean section 2 <sup>nd</sup> twin | 4                | 2  | 4             | 2  | 1             | 1  | 1             | 1  | 2             | 1  |
| Operative vaginal birth 1 <sup>st</sup> twin, caesarean section 2 <sup>nd</sup> twin   | 2                | 1  | 5             | 3  | 0             |    | 0             |    | 0             |    |
| CS elective both twins   | 90               | 43 | 48            | 26 | 52            | 28 | 46            | 29 | 46            | 26 |
| CS emergency both twins  |                  |    | 60            | 32 | 58            | 31 | 57            | 36 | 59            | 34 |

Only 16.7% of term twin pregnancies go into spontaneous labour. The ideal timing of birth for twin pregnancies is debatable and is the focus of a study “Twins: Timing of birth at term”. NW is a recruitment site for this study.

Vaginal birth of both twins is achieved in 38% of pregnancies. Only 26% of twin pregnancies have an elective caesarean. Both of these rates are stable. 1% of women have a caesarean section for birth of the second twin which is very reassuring when counselling women about the complications of vaginal birth.

**Table 22: Fetal/newborn outcomes of twin babies**

|   | Twin babies<br>n=348 |          |
|---|----------------------|----------|
|   | n                    | %        |
| <b>Apgar &lt;7 at 5 minutes</b>                   | 10                   | 2.9      |
| <b>Admission to NICU <math>\geq</math> 2 days</b> | 146                  | 42.0     |
| $\leq$ 34 weeks                                   | 114                  | 107 92.2 |
| 35-36   | 90                   | 30 33.3  |
| $\geq$ 37 weeks                                   | 144                  | 9 6.3    |

**Table 23: Perinatal-related deaths in twin pregnancies by gestation**

| Gestation<br>(weeks) | Twin pregnancies     |         |                        |           |
|----------------------|----------------------|---------|------------------------|-----------|
|                      | One twin died<br>n=6 |         | Both twins died<br>n=2 |           |
|                      | n                    | Outcome | n                      | Outcome   |
| <b>20 – 23</b>       | 1                    | ENND    | 1                      | ENND/ENND |
| <b>24 – 27</b>       |                      |         | 1                      | IFD/IFD   |
| <b>28 – 31</b>       | 1                    | LFD     |                        |           |
| <b>32 – 36</b>       | 1                    | LFD     |                        |           |
| <b>37 – 40</b>       | 1                    | LFD     |                        |           |
|                      | 1                    | LFD     |                        |           |
| <b>41+</b>           | 1                    | LFD     |                        |           |

## Summary / Implications

Women with a monochorionic diamniotic twin pregnancy who develop twin to twin transfusion syndrome are given the option of going to Australia for laser treatment. It is hoped this will soon be an option in Auckland making it more accessible for women.

Neonatal advances continue and are likely to be a major contributor to the decline in perinatal mortality rate in multiple pregnancy.



## 5.4 Diabetes

### Methods

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

### Findings

In addition to these data the diabetes service also cared for 67 pre-pregnancy referrals compared to 40 in 2006.

The figure below shows a similar incidence to the previous year. A universal offer of screening is recommended at National Women's. In the hospital database, screening results are not documented in approximately 25% of women.

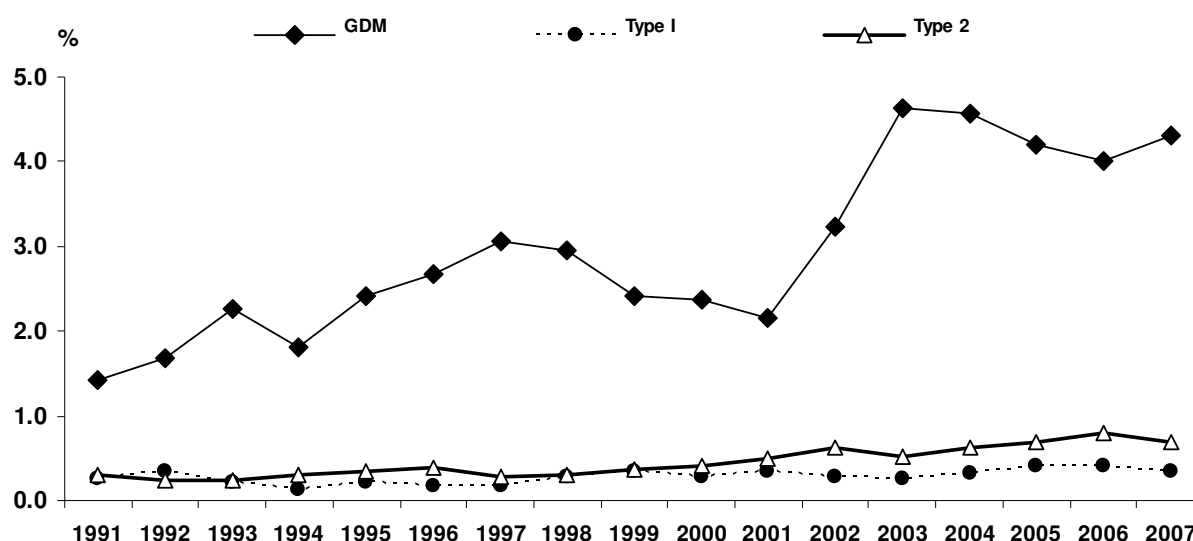


Figure 21: Incidence of diabetes (% of all inborn and BBA births) (1991-2007)

### 5.4.1 Demographics of women with diabetes

The demographics again demonstrate the increased rates of GDM in non-European ethnicities, with the incidence ranging from 2% in NZ Europeans to almost 12% in Indian women. We are looking to see why Pacific and Maori women are relatively under-represented, as we would expect rates of GDM to be higher than other groups, their rates of Type 2 diabetes being higher. We do see that at diagnosis (the 75g OGTT test result), Pacific women have significantly higher fasting glucose levels than the other ethnic groups and significantly lower 2 hour results than Indian and Asian women. It may be that the glucose load in the 50g polycose test and at 75g OGTT is not enough to determine accurately whether they do have GDM. We are exploring this further. The results of the HAPO (Hyperglycemia and Adverse Pregnancy Outcomes) study suggest that risks of adverse pregnancy outcomes increase at a lower fasting and 2 hour level than those currently used in NZ to diagnose GDM. Whether this means we need to change our criteria for diagnosis is not yet clear. Any change will impact on the apparent incidence of GDM.

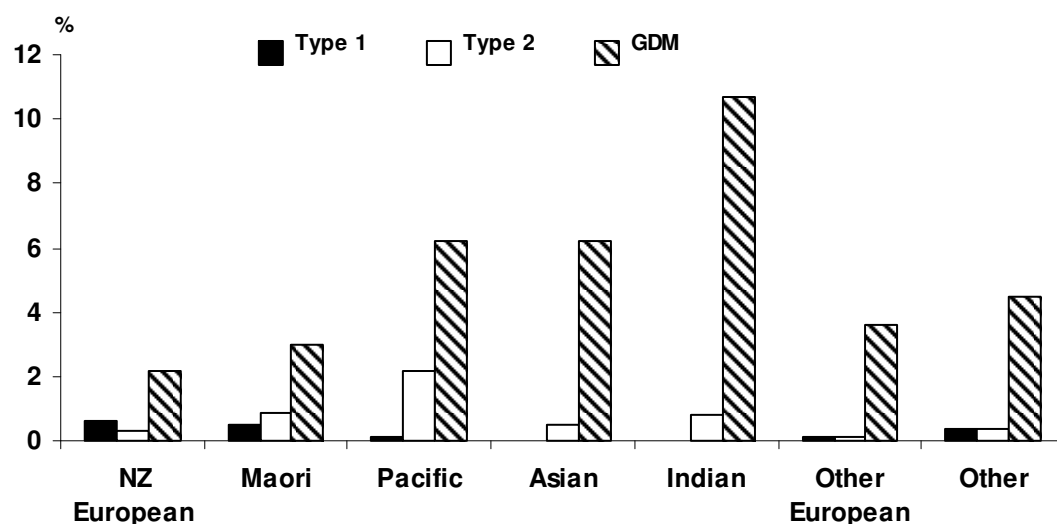


Figure 22: Incidence of diabetes by ethnic group (2007)

#### 5.4.2 Outcomes of pregnancies complicated by diabetes

##### Maternal outcomes

The rates of caesarean section have been around 40% for the past 9 years.

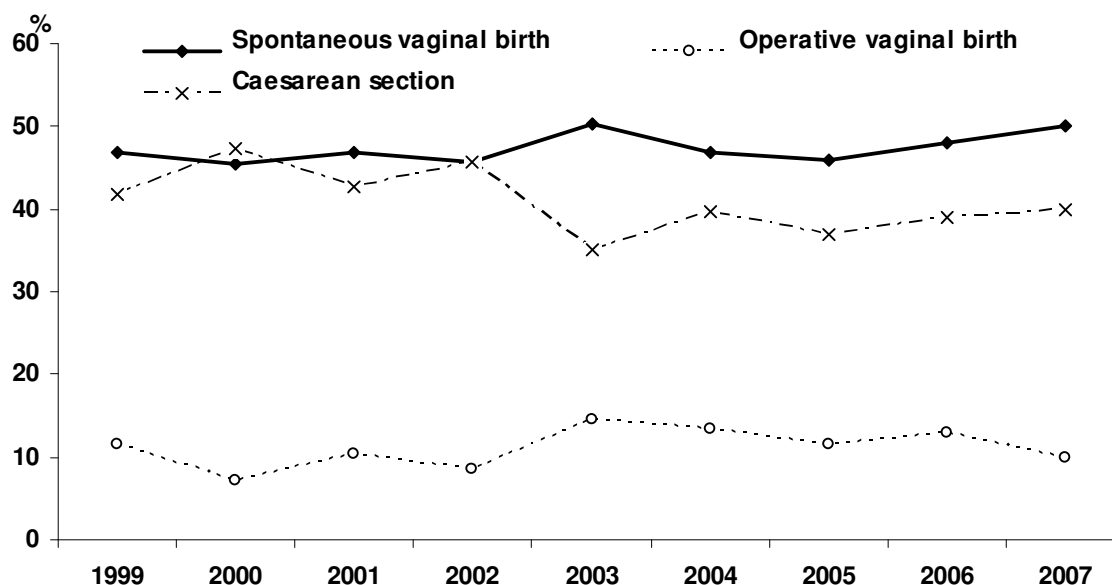


Figure 23: Mode of birth among women with GDM (1999-2007)

### 5.4.3 Maternal postpartum glucose tolerance testing

**Table 24: Rates of postnatal glucose tolerance testing (GTT) among women with GDM (1999-2007)**

|                         | 1999<br>n=183 |    | 2000<br>n=180 |    | 2001<br>n=163 |    | 2002<br>n=253 |    | 2003<br>n=352 |    | 2004<br>n=342 |    | 2005<br>n=304 |    | 2006<br>n=286 |    | 2007<br>n=331 |    |
|-------------------------|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|
|                         | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  |
| <b>Postnatal GTT</b>    | 129           | 70 | 121           | 67 | 132           | 81 | 171           | 68 | 260           | 74 | 260           | 76 | 238           | 78 | 206           | 72 | 249           | 75 |
| <b>No postnatal GTT</b> | 54            | 30 | 59            | 33 | 31            | 19 | 82            | 32 | 92            | 26 | 82            | 24 | 66            | 22 | 80            | 28 | 82            | 25 |

We continue to have excellent rates of postpartum glucose tolerance testing compared to many other centres. We know from the Metformin in Gestational Diabetes (MiG) trial (Rowan J, et al. N Engl J Med 2008;358:2003-15) that women who do not do a postpartum test are at higher risk of type 2 diabetes than those who do the test. We encourage all women to continue follow up with their General Practitioners.

**Table 25: Results of postnatal glucose tolerance testing (GTT) among women with GDM (1999-2007)**

|                  | 1999<br>n=129 |    | 2000<br>n=121 |    | 2001<br>n=130 |    | 2002<br>n=169 |    | 2003<br>n=260 |    | 2004<br>n=260 |    | 2005<br>n=238 |    | 2006<br>n=206 |    | 2007<br>n=249 |    |
|------------------|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|---------------|----|
|                  | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  | n             | %  |
| <b>Normal</b>    | 89            | 69 | 89            | 74 | 90            | 69 | 116           | 69 | 196           | 75 | 194           | 75 | 190           | 80 | 158           | 77 | 175           | 70 |
| <b>IFG/ IGT*</b> | 22            | 17 | 17            | 14 | 23            | 18 | 37            | 22 | 39            | 15 | 49            | 19 | 34            | 14 | 39            | 19 | 50            | 21 |
| <b>Type 2</b>    | 18            | 14 | 15            | 12 | 17            | 13 | 16            | 9  | 25            | 10 | 17            | 7  | 14            | 6  | 9             | 4  | 24            | 10 |

\*IFG =Impaired fasting glucose

IGT= Impaired glucose tolerance

### 5.4.4 Perinatal losses

Nine women with diabetes had perinatal losses during 2007. There were two peripartum losses at term in women with good diabetes control, one due to abruption following induction of labour, and the second due to uterine rupture following induction of a woman with a history of previous caesarean. Two women presented with preterm labour prior to viability. Two pregnancies were terminated at 20 weeks; one for severe SGA and the other poor diabetes control. Three women with poor diabetic control had fetal deaths in the second trimester, one associated with a fetal anomaly, one with pre-eclampsia, and another with SGA.

### 5.4.5 Neonatal outcomes among babies of women with diabetes in pregnancy

Neonatal outcomes are similar to previous years. In 2006, 50% of women with type 1 diabetes delivered before 37 weeks, with associated increased rates of morbidity. This year outcomes have improved to rates we have previously reported in this population. The increased rate of SGA infants in women with type 2 diabetes is a consistent finding and will include four of the perinatal losses outlined above.

**Table 26: Neonatal outcomes among babies of women with diabetes**

|   | Type 1<br>n=26   | Type 2<br>n=54   | GDM<br>n=313     | Postnatally<br>diagnosed<br>Type 2<br>n=24 | No diabetes<br>n=7458 |
|---|------------------|------------------|------------------|--|-----------------------|
|   | n %              | n %              | n %              | n %  | n %                   |
| <b>Birthweight (Median(IQR))</b>          | 3550 (3200-3850) | 3100 (2480-3485) | 3260 (2905-3625) | 3233 (2793-3623)                           | 3400 (3015-3760)      |
| <1500g                                    | 0                | 4 7.4            | 12 3.8           | 1 4.2                                      | 210 2.8               |
| <2500g                                    | 1 3.8            | 14 25.9          | 29 9.3           | 5 20.8                                     | 675 9.1               |
| <b>SGA &lt;10<sup>th</sup> Percentile</b> | 0 0.0            | 12 22.2          | 26 8.3           | 4 16.7                                     | 914 12.3              |
| <b>LGA &gt;90<sup>th</sup> Percentile</b> | 13 50.0          | 12 22.2          | 46 14.7          | 5 20.8                                     | 720 9.7               |
| <b>Admission to NICU</b>                  |                  |                  |                  |  |                       |
| Any admission                             | 7 26.9           | 12 22.2          | 53 16.9          | 2 8.3                                      | 791 10.6              |
| ≥2 days                                   | 5 19.2           | 12 22.2          | 50 16.0          | 2 8.3                                      | 730 9.8               |
| <b>Hypoglycaemia &lt;2.3 mmol/l</b>       | 8 30.8           | 12 22.2          | 27 8.6           | 4 16.7                                     |                       |
| <b>Hypoglycaemia &lt;2.6 mmol/l</b>       | 9 34.6           | 14 25.9          | 41 13.1          | 6 25.0                                     |                       |
| <b>IV Dextrose</b>                        | 3 11.5           | 6 11.1           | 22 7.0           | 1 4.2                                      |                       |

### The MiG Trial

The MiG (metformin in gestational diabetes) trial concluded that metformin (alone or with supplemental insulin) is an effective and safe treatment for GDM in those who meet the usual criteria for insulin. In our clinic, women are now offered the option of metformin or insulin. We recognise that almost half of those women who are prescribed metformin will require supplementary insulin. Often these women can be successfully treated with an intermediate overnight insulin only, avoiding the need for additional meal time insulin. Dr Janet Rowan was the principal investigator on this trial and National Women's its largest recruitment centre. Long term follow up of children is under way.

### Summary

The diabetes service is consistent in its outcomes. This year there were nine perinatal losses in women with diabetes, but in a number of these women, the diabetes had not been appropriately identified or treated prior to the fetal loss. It is possible that outcomes could have been improved for some women if they had attended for pre-pregnancy care.

### Recommendations

1. Continue current multidisciplinary care.
2. Promote pre-pregnancy counselling for women with diabetes.
3. Provide further education to primary practice and other LMCs about timely identification of diabetes/GDM.
4. Implement the findings of the MiG trial.
5. Plan for increased numbers of referrals associated with improved screening and possible change of diagnostic criteria over the next 1-2 years.

## 5.5 Antepartum haemorrhage

### Methods

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

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

### Findings

**Table 27: Antepartum haemorrhage incidence**

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

In 2007, 6.9% of women were recorded as having an antepartum haemorrhage or placenta praevia without bleeding. This figure has remained more or less the same over recent years. In most cases the bleeding was of unknown origin, the incidence of proven placenta praevia and placental abruption remaining steady at around 1% and 0.6% respectively.

Placenta praevia was seen more often in women with a previous caesarean section, as well as in those women older than 35 years. Placental abruption was associated with a previous caesarean section as well as with preeclampsia. Interestingly, maternal smoking did not appear to be associated with an increased rate of abruption, although the smoking status was unknown in 30% of all pregnancies.

It is clear that both placenta praevia and placental abruption lead to an increased rate of caesarean section. As expected most caesareans for abruption were emergency procedures. It is noted, however, that we continue to deliver around 40% of placenta praevia cases by emergency caesarean section. Whether this reflects missed diagnoses or inappropriate timing of planned birth would be worth investigating. Maternal blood transfusion rates are greatly increased in both placenta praevia and placental abruption.

All sub-groups of antepartum haemorrhage, particularly placental abruption, were associated with adverse neonatal outcomes. These included preterm birth, low birthweight, SGA, NICU admission and perinatal death. Antepartum haemorrhage, of all types, was associated with 22/102 (22%) perinatal deaths, demonstrating the importance of these conditions as risk factors in pregnancy.

## 5.6 Hypertensive disease

### Methods

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

- **Gestational hypertension:** diastolic BP  $\geq 90$ mmHg without proteinuria, when diastolic BP  $< 90$ mmHg at booking.
- **Pre-eclampsia:** diastolic BP  $\geq 90$ mmHg with proteinuria  $> '+'$  or  $> 0.3$ g/24h, when diastolic  $< 90$ mmHg at booking.
- **Chronic hypertension:** diastolic BP  $\geq 90$ mmHg at booking or a medical history of essential hypertension. Includes women with superimposed pre-eclampsia

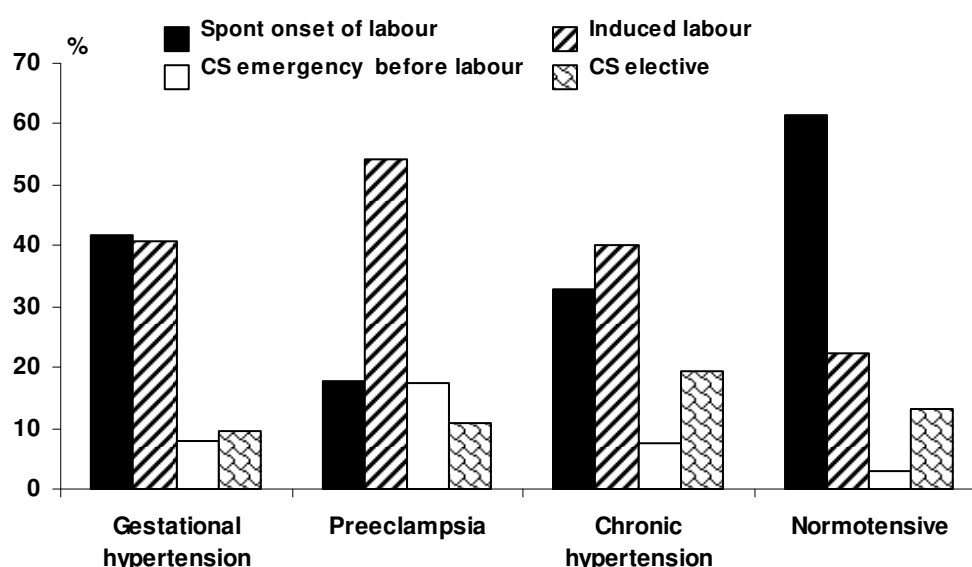
The cleaning of hypertension data involves reconciling data from booking history, indication for induction and operative birth, reason for admission to the ward or to High Dependency Unit, data collected at birth and coded data from the Decision Support Unit.

### Findings

The rates of hypertensive disease in pregnancy have not changed significantly from 2006. Notably, 10% of all women birthing at NW will have some form of hypertensive disease, making this a very common medical disorder in pregnancy. Chronic hypertension is more common in the multiparous population, with gestational hypertension and preeclampsia being predominant in the nullip. There were no reported cases of eclampsia in 2007.

**Table 28: Hypertensive disease in pregnancy (2007)**

|                                 | All women<br>n=7695 |      | Nullipara<br>n=3752 |      | Multipara<br>n=3943 |     |
|---------------------------------|---------------------|------|---------------------|------|---------------------|-----|
|                                 | n                   | %    | n                   | %    | n                   | %   |
| <b>Any hypertensive disease</b> | 766                 | 10.0 | 445                 | 11.9 | 321                 | 8.1 |
| Chronic hypertension            | 222                 | 2.9  | 78                  | 2.1  | 144                 | 3.7 |
| Gestational hypertension        | 255                 | 3.3  | 165                 | 4.4  | 90                  | 2.3 |
| Preeclampsia                    | 289                 | 3.8  | 202                 | 5.4  | 87                  | 2.2 |



**Figure 24: Onset of birth and hypertensive disorders of pregnancy**

Hypertensive disease is associated with an increase in interventions to interrupt pregnancy. Sixty two percent of normotensive women went into labour spontaneously, compared with only 42%, 18% and 33% of the women with gestational hypertension, pre-eclampsia or chronic hypertension respectively. Hypertensive women continue to have a much higher rate of caesarean section than the normotensive pregnant population.

**Table 29: Mode of birth for women with hypertensive disease**

|                      | Gestational hypertension<br>n=255 |      | Pre-eclampsia<br>n=289 |      | Chronic hypertension<br>n=222 |      | Normotensive<br>n=6929 |      |
|----------------------|-----------------------------------|------|------------------------|------|-------------------------------|------|------------------------|------|
|                      | n                                 | %    | n                      | %    | n                             | %    | n                      | %    |
| <b>Mode of birth</b> |                                   |      |                        |      |                               |      |                        |      |
| Normal vaginal       | 120                               | 47.1 | 96                     | 33.3 | 100                           | 45.1 | 3966                   | 57.2 |
| Operative vaginal    | 45                                | 17.7 | 41                     | 13.9 | 17                            | 7.7  | 872                    | 12.6 |
| CS elective          | 24                                | 9.4  | 32                     | 11.1 | 43                            | 19.4 | 931                    | 13.4 |
| CS emergency         | 66                                | 25.9 | 120                    | 41.7 | 62                            | 27.9 | 1160                   | 16.7 |

**Table 30: Perinatal outcomes and hypertensive complications of pregnancy (babies)**

|                                  | Gestational hypertension<br>n=266 |      | Pre-eclampsia<br>n=303 |      | Chronic hypertension<br>n=222 |      | Normotensive<br>n=7084 |      |
|----------------------------------|-----------------------------------|------|------------------------|------|-------------------------------|------|------------------------|------|
|                                  | n                                 | %    | n                      | %    | n                             | %    | n                      | %    |
| <b>Gestation at birth</b>        |                                   |      |                        |      |                               |      |                        |      |
| <37 weeks                        | 31                                | 11.7 | 102                    | 33.7 | 37                            | 16.7 | 734                    | 10.4 |
| <32 weeks                        | 2                                 | 0.8  | 28                     | 9.2  | 8                             | 3.6  | 199                    | 2.8  |
| <b>SGA</b>                       | 46                                | 17.3 | 90                     | 29.7 | 43                            | 19.4 | 777                    | 11.0 |
| <b>NICU Admission</b>            | 34                                | 12.8 | 81                     | 26.7 | 32                            | 14.4 | 718                    | 10.1 |
| <b>≥2 days in NICU</b>           | 33                                | 12.4 | 79                     | 26.1 | 30                            | 13.5 | 657                    | 9.3  |
| <b>Apgars &lt;7 at 5 mins</b>    | 4                                 | 1.5  | 10                     | 3.3  | 2                             | 0.9  | 88                     | 1.2  |
| <b>Perinatal deaths (n/1000)</b> | 1                                 | 0.4  | 3                      | 1.0  | 4                             | 1.8  | 94                     | 1.3  |

Hypertensive disease in pregnancy is associated with a range of adverse perinatal complications. Very preterm birth (<32 weeks) is significantly more common in women who have preeclampsia (9.2% of deliveries compared to 2.8% of normotensive pregnancies). SGA is also increased in all hypertensive groups, as is NICU admission and prolonged NICU stay. This is most pronounced in the preeclamptic group, probably reflecting the increased risk of prematurity and SGA in this group. The perinatal mortality rates given may not reflect the true risk, because of the small numbers in each hypertensive group. There were 8 perinatal deaths in the hypertensive group, with three babies affected by congenital abnormalities. The remaining affected pregnancies were delivered between 20 and 28 weeks gestation, and all babies were significantly growth restricted, highlighting SGA as a major determinant for risk of perinatal death in hypertensive disease.

## Summary / Implications

A 10% rate of antenatal hypertensive disease at NW continues to be high by international standards. This may be because of better ascertainment and NW role as a tertiary centre. It may also reflect an aging and more obese population. The negative pregnancy outcomes, associated with hypertensive conditions, are again reflected in the 2007 data. This reemphasises the need to monitor hypertensive pregnancies closely.





# Chapter **6**

## LABOUR and BIRTH



## 6 LABOUR AND BIRTH

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

### 6.1 Induction of labour

#### Methods

The four pathways to birth 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 followed by elective caesarean, she has been categorised as an induced labour for the purposes of this section.

Input of induction-related data to the Healthware database requires active opening of an induction screen. We suspect this is not consistently done, especially if 'inductions' are performed on the Labour and Birthing Suite. To improve capture of these inductions, clinical notes were reviewed if the indication for ARM (artificial rupture of membranes) was induction or if an ARM was performed or syntocinon commenced before the onset of contractions. However, the possibility remains that the numbers given *under-represent* the true induction rate. Indication for induction is prioritised at data entry to primary and secondary indication. Primary indications are given here.

#### Findings

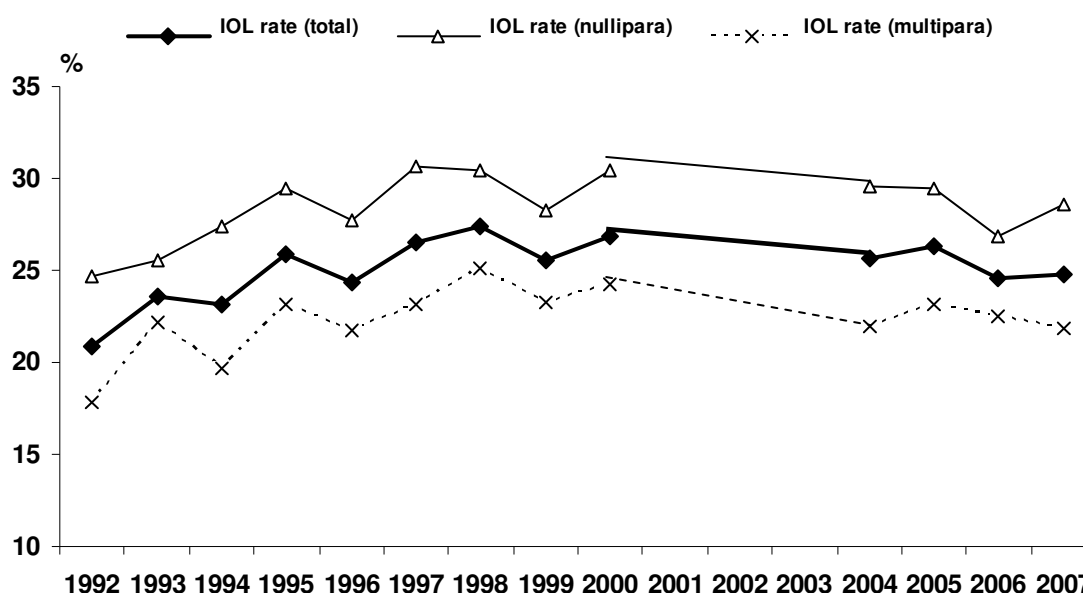


Figure 25: Induction of labour rates (1992-2007)

Induction of labour (IOL) was performed in 24.8% of all births in 2007, a figure almost identical to that of the previous year. The induction rate was similar for preterm and term deliveries, although the predominant indications for induction differed between these two groups. However, it should be noted that pre labour Caesarean section rates rose, so that the rate of interruption of pregnancy before onset of spontaneous labour rose in 2007. At term 41% of pregnancies ended prior to spontaneous onset of labour.

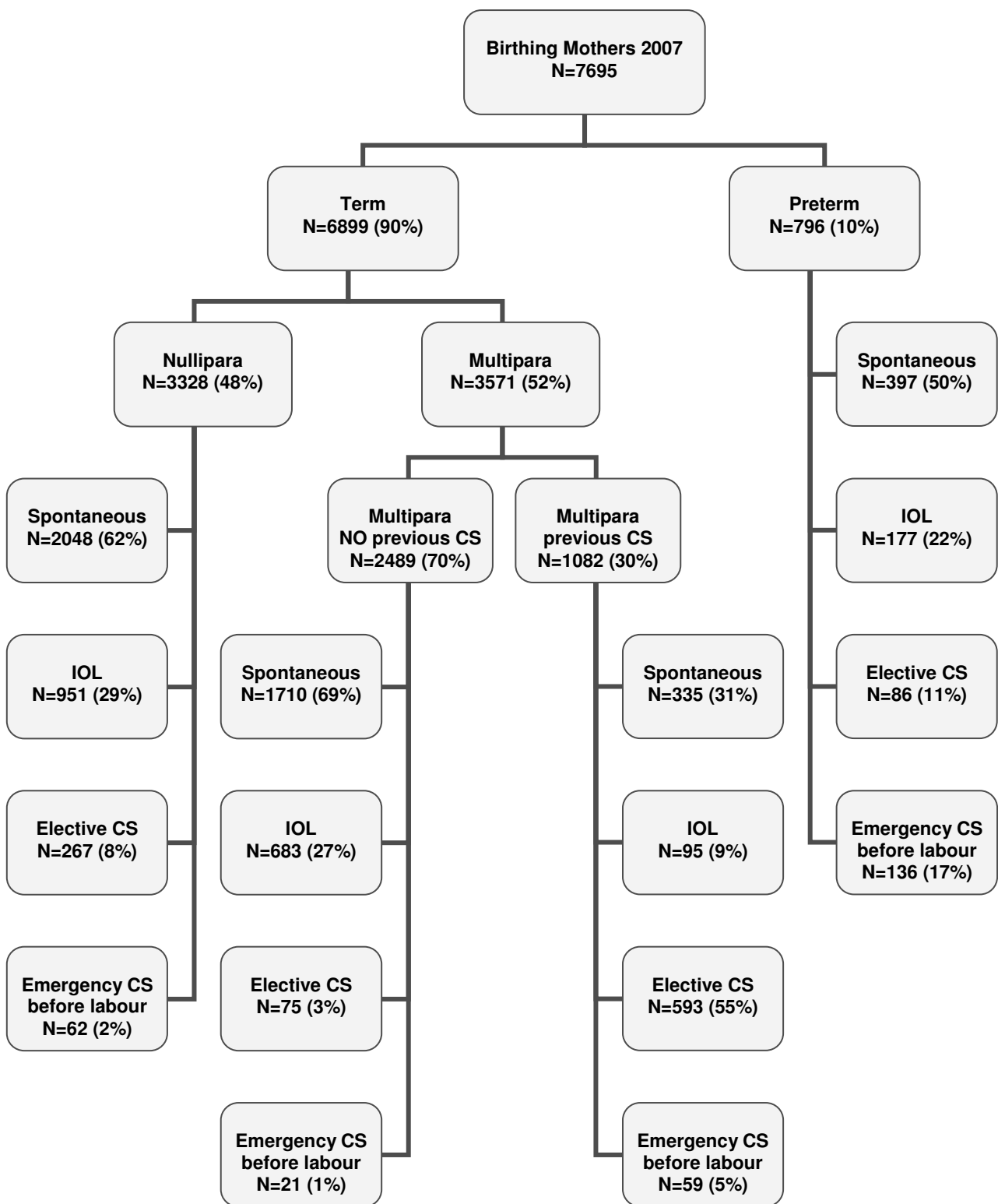


Figure 26: Pathways to birth by gestation and parity

**Table 31: Maternal demographic characteristics by onset of birth at term**

|                      | Total | Spontaneous labour |      | Induced labour |      | CS elective |      | CS emergency before labour |      |
|----------------------|-------|--------------------|------|----------------|------|-------------|------|----------------------------|------|
|                      | N     | n                  | %    | n              | %    | n           | %    | n                          | %    |
| <b>Total</b>         | 6899  | 4093               | 59.3 | 1729           | 25.1 | 935         | 13.6 | 142                        | 2.1  |
| <b>Maternal age</b>  |       |                    |      |                |      |             |      |                            |      |
| ≤ 20                 | 331   | 248                | 74.9 | 72             | 21.8 | 2           | 0.6  | 9                          | 2.7  |
| 21-25                | 888   | 644                | 72.5 | 183            | 20.6 | 44          | 5.0  | 17                         | 1.9  |
| 26-30                | 1626  | 1082               | 66.5 | 396            | 24.4 | 121         | 7.4  | 27                         | 1.7  |
| 31-35                | 2472  | 1408               | 57.0 | 617            | 25.0 | 395         | 16.0 | 52                         | 2.1  |
| 36-40                | 1344  | 652                | 48.5 | 378            | 28.1 | 288         | 21.4 | 26                         | 1.9  |
| 41+                  | 238   | 59                 | 24.8 | 83             | 34.9 | 85          | 35.7 | 11                         | 4.6  |
| <b>Ethnicity</b>     |       |                    |      |                |      |             |      |                            |      |
| NZ European          | 2825  | 1490               | 52.7 | 778            | 27.5 | 493         | 17.5 | 64                         | 2.3  |
| Maori                | 540   | 337                | 62.4 | 150            | 27.8 | 44          | 8.2  | 9                          | 1.7  |
| Pacific              | 983   | 658                | 66.9 | 235            | 23.9 | 69          | 7.0  | 21                         | 2.1  |
| Asian                | 1248  | 863                | 69.2 | 233            | 18.7 | 130         | 10.4 | 22                         | 1.8  |
| Indian               | 467   | 267                | 57.2 | 121            | 25.9 | 66          | 14.1 | 13                         | 2.8  |
| Other European       | 630   | 351                | 55.7 | 160            | 25.4 | 107         | 17.0 | 12                         | 1.9  |
| Other                | 206   | 127                | 61.7 | 52             | 25.2 | 26          | 12.6 | 1                          | 0.5  |
| <b>BMI</b>           |       |                    |      |                |      |             |      |                            |      |
| <19                  | 356   | 249                | 69.9 | 63             | 17.7 | 39          | 11.0 | 5                          | 1.4  |
| 19-25                | 3786  | 2321               | 61.3 | 894            | 23.6 | 502         | 13.3 | 69                         | 1.8  |
| 26-35                | 1750  | 950                | 54.3 | 492            | 28.1 | 271         | 15.5 | 37                         | 2.1  |
| >35                  | 402   | 176                | 43.8 | 153            | 38.1 | 58          | 14.4 | 15                         | 3.7  |
| Missing              | 605   | 397                | 65.6 | 127            | 21.0 | 65          | 10.7 | 16                         | 2.6  |
| <b>LMC at birth</b>  |       |                    |      |                |      |             |      |                            |      |
| IMW                  | 2736  | 1967               | 71.9 | 587            | 21.5 | 159         | 5.8  | 23                         | 0.8  |
| Private Obstetrician | 1642  | 629                | 38.3 | 473            | 28.8 | 485         | 29.5 | 55                         | 3.4  |
| GP                   | 131   | 96                 | 73.3 | 24             | 18.3 | 10          | 7.6  | 1                          | 0.8  |
| NW Community         | 460   | 350                | 76.1 | 85             | 18.5 | 21          | 4.6  | 4                          | 0.9  |
| NW Domino            | 1418  | 876                | 61.8 | 328            | 23.1 | 181         | 12.8 | 33                         | 2.3  |
| NW Medical           | 190   | 25                 | 13.2 | 129            | 67.9 | 27          | 14.2 | 9                          | 4.7  |
| NW Diabetes          | 250   | 97                 | 38.8 | 94             | 37.6 | 49          | 19.6 | 10                         | 4.0  |
| Other DHB            | 32    | 19                 | 59.4 | 6              | 18.8 | 1           | 3.1  | 6                          | 18.8 |
| Unbooked             | 40    | 34                 | 85.0 | 3              | 7.5  | 2           | 5.0  | 1                          | 2.5  |

**Indication for induction**

Nulliparous women were induced at a higher rate than multiparous (28.6 vs 21.8%), although this largely reflects a reluctance to induce multipara with a history of previous caesarean section.

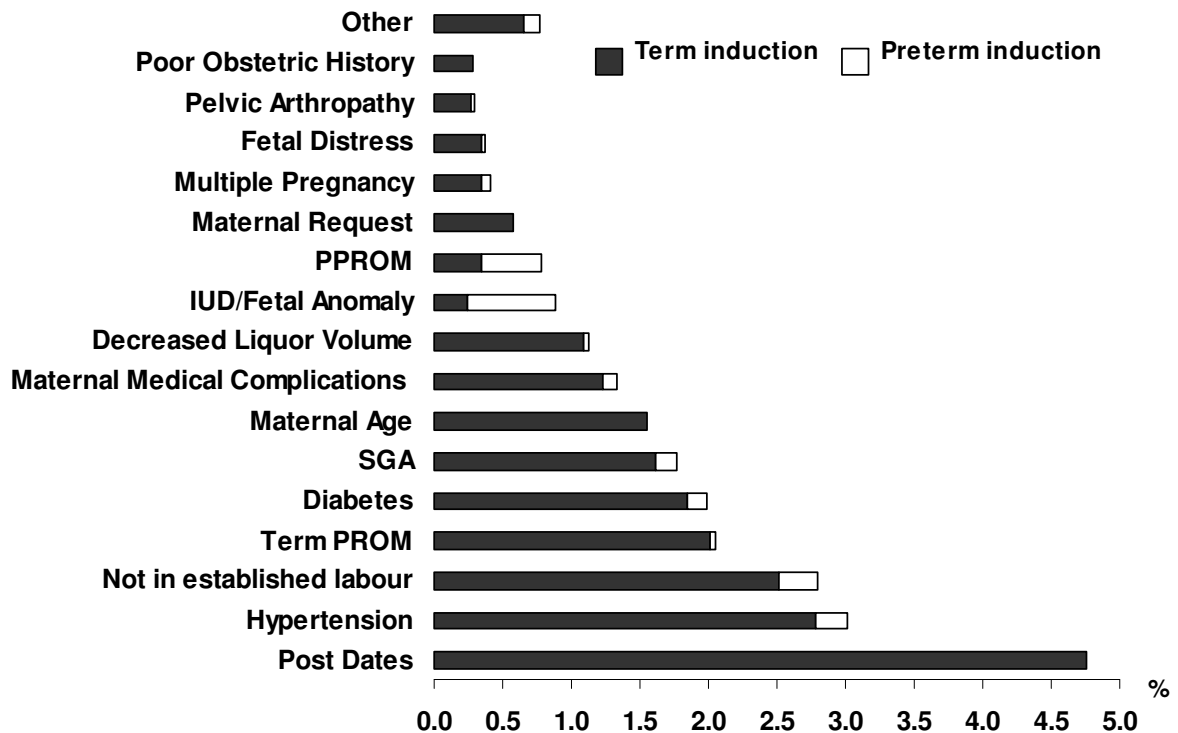


Figure 27: Primary indication for induction as a percentage of all births (n=1906 inductions / 7695 birthing mothers)

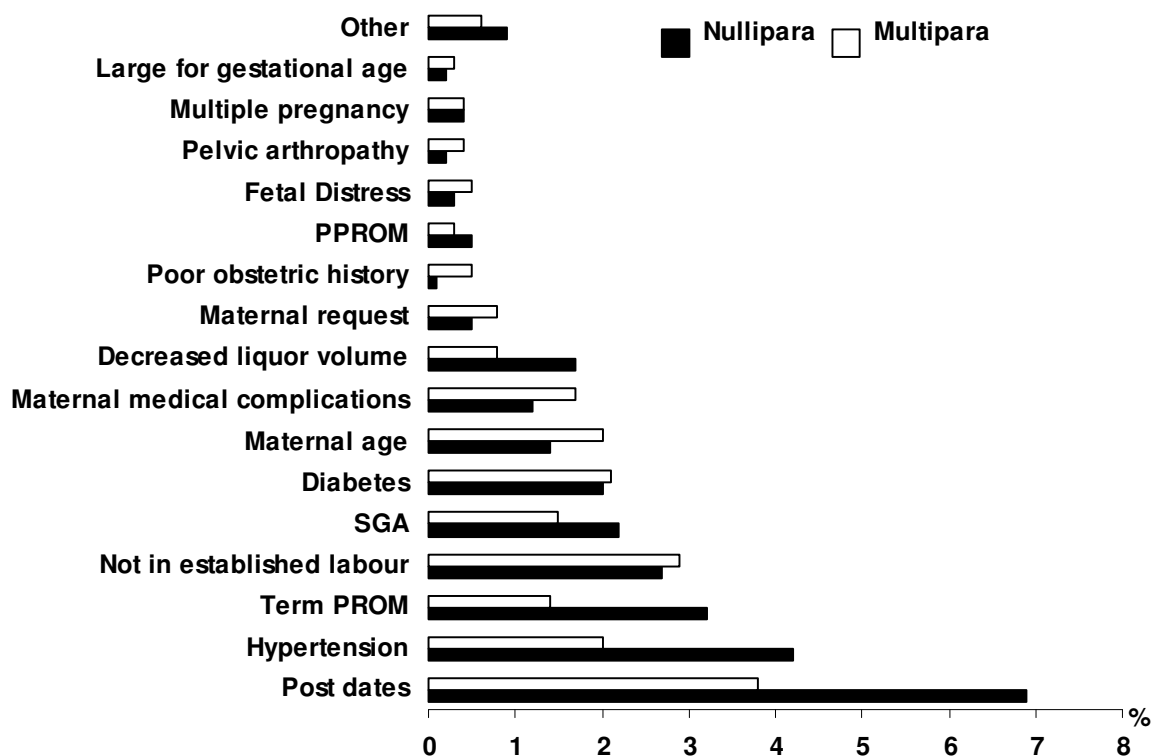


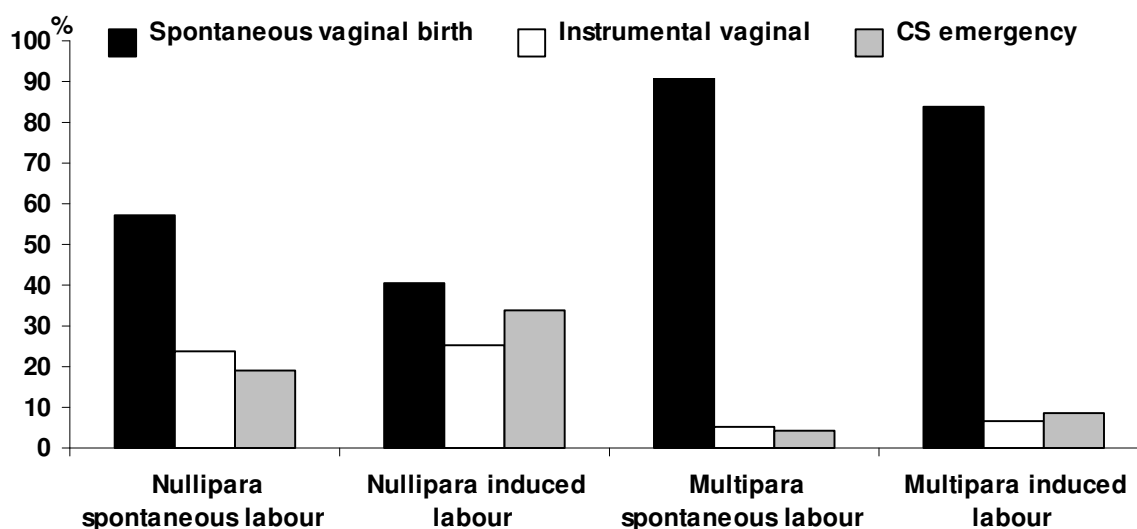
Figure 28: Primary indication for induction at term by parity (as a percentage of term births)

There was an increased induction rate with advancing maternal age, more pronounced in the multiparous group, where the rate of induction in women older than 35 years was over 60%. Given the earlier definition of 'post-dates' used in older women, it is not surprising that

this is the main indication accounting for the higher rate of induction with increasing age. Comparing induction rates among ethnic groups suggests that Asian women, both nulliparous and multiparous, had the lowest overall rate of induction.

As was the case last year we have again further analysed the birth gestation of women induced for 'post-dates pregnancy'. The numbers induced inappropriately at less than 40 weeks 6 days were very small, although all such inductions were of women aged less than 35 years. A considerable percentage of women over 35 were delivered after 42 weeks gestation. It is unknown whether extra surveillance of fetal wellbeing occurred prior to induction.

#### **Mode of birth following induced and spontaneous onset of labour (excludes previous caesarean)**



**Figure 29: Mode of birth among intended vaginal births at term by parity and onset of labour (excludes previous caesarean)**

The emergency caesarean rate among induced multipara without previous caesarean is double that among multipara with spontaneous labour. Among nulliparous women induction was associated with a spontaneous vaginal birth (SVB) rate of 40% compared with 57% following spontaneous labour. This decreased rate of spontaneous birth is entirely accounted for by an increased rate of emergency caesarean section, with no real change seen in the rate of instrumental birth.

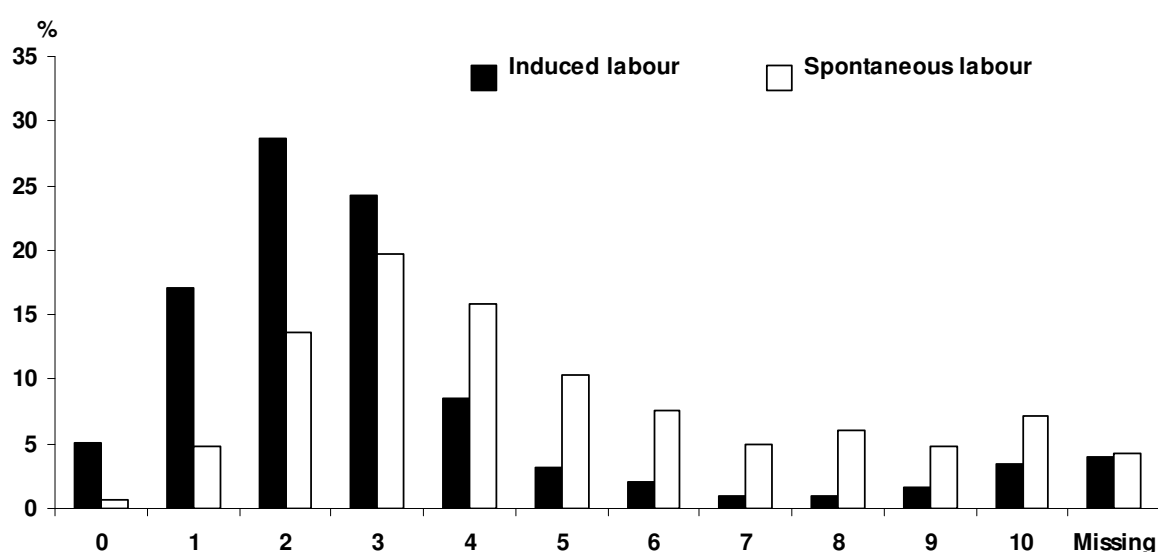
Reviewing specific indications for induction there are two areas that perhaps deserve mention. In nulliparous women induced for hypertension the emergency caesarean rate was 40% (and SVB rate only 34%) which is at odds with what is often anecdotally expected when hypertensive women are induced. Conversely in the nulliparous women induced because they were 'not in established labour' we have seen an SVB rate of 50% and a caesarean rate of only 22%. This is a group of women traditionally thought to labour poorly when induced and the results are therefore of interest.

## 6.2 Use of syntocinon

**Table 32: Use of syntocinon by onset of labour and parity**

|                           | Total births | Syntocinon |      |
|---------------------------|--------------|------------|------|
|                           | N            | n          | %    |
| <b>Total</b>              | 7695         | 2596       | 33.7 |
| <b>Induced labour</b>     |              |            |      |
| Nullipara                 | 1047         | 754        | 72.0 |
| Multipara                 | 859          | 538        | 62.6 |
| <b>Spontaneous labour</b> |              |            |      |
| Nullipara                 | 2271         | 999        | 44.0 |
| Multipara                 | 2219         | 303        | 13.7 |

2 women had syntocinon followed by elective CS prior to onset of labour



**Figure 30: Dilatation at commencement of syntocinon infusion among labouring women by induction status**

The use of syntocinon in spontaneous labour occurred in 44% of nulliparous and 13.7% of multiparous women. In one third of cases syntocinon commenced before reaching 4 cms dilatation, suggesting an induction rather than augmentation of labour. These data will be more rigorously checked in 2008. There is work being done looking at the feasibility of providing an alternative area for an initial assessment of women when they present to hospital in early labour. It is thought that this may help keep women out of the labour and birthing suite until actively labouring and thus avoid inappropriate early intervention.

### Summary / Implications

Among nulliparous women, induction of labour continues to be associated with a decreased likelihood of spontaneous birth and a greater chance of caesarean section. In multiparous women without previous caesarean there is a doubling in the emergency caesarean rate for induced versus spontaneous labour. The emphasis therefore needs to be on limiting nulliparous induction of labour to necessary indications. In practical terms, the availability of induction spaces in the Women's Assessment Unit is often such that inductions are not started unless properly indicated.



## 6.3 Mode of birth

### Findings

The rate of spontaneous vertex birth increased in 2007, with a corresponding decrease in the caesarean section rate. Although modest, these trends have not occurred since 2003 and are promising.

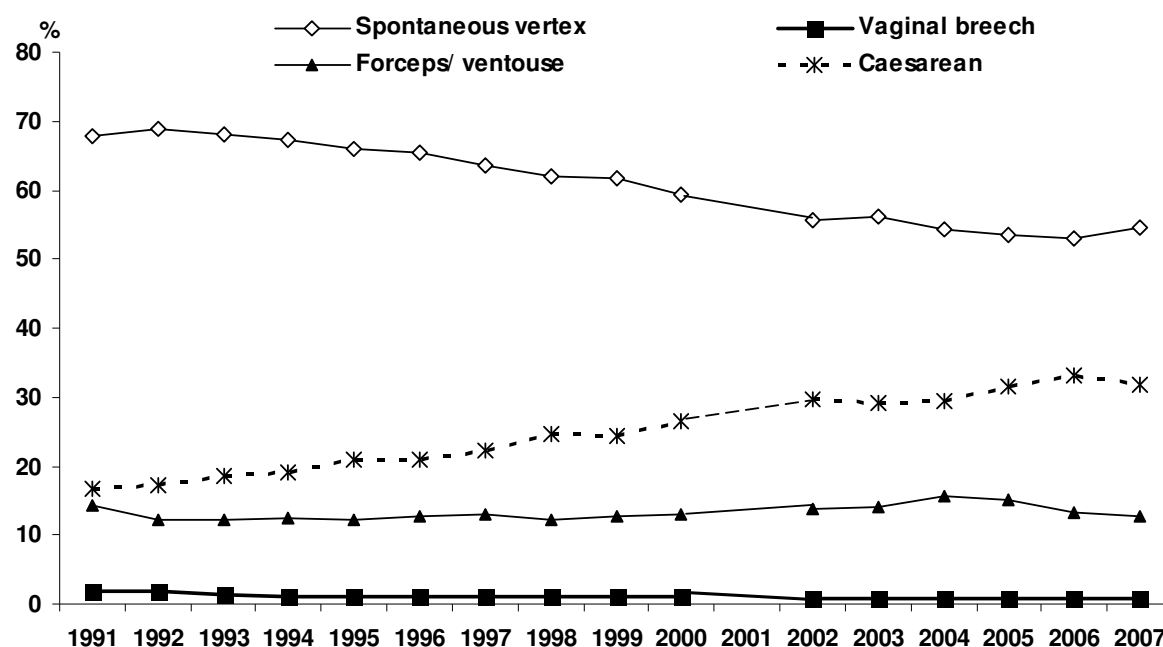
**Table 33: Mode of birth trends (1992-2007) (n = mothers)**

|                           | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Number of births</b>   | 8315 | 8690 | 8812 | 9125 | 9157 | 8055 | 7531 | 7501 | 7827 | 7452 | 7775 | 7611 | 7491 | 7194 | 7212 | 7695 |
|                           | %    | %    | %    | %    | %    | %    | %    | %    | %    |      | %    | %    | %    | %    | %    | %    |
| <b>Spontaneous vertex</b> | 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 | 52.9 | 54.7 |
| <b>Vaginal breech</b>     | 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  | 0.7  | 0.9  |
| <b>Forceps/ventouse</b>   | 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 | 13.3 | 12.6 |
| <b>Caesarean</b>          | 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 | 33.1 | 31.7 |
| Elective                  |      |      |      |      |      |      |      |      |      |      |      |      | 10.4 | 11.6 | 12.8 | 13.4 |
| Emergency                 |      |      |      |      |      |      |      |      |      |      |      |      | 18.8 | 20.0 | 20.3 | 18.3 |

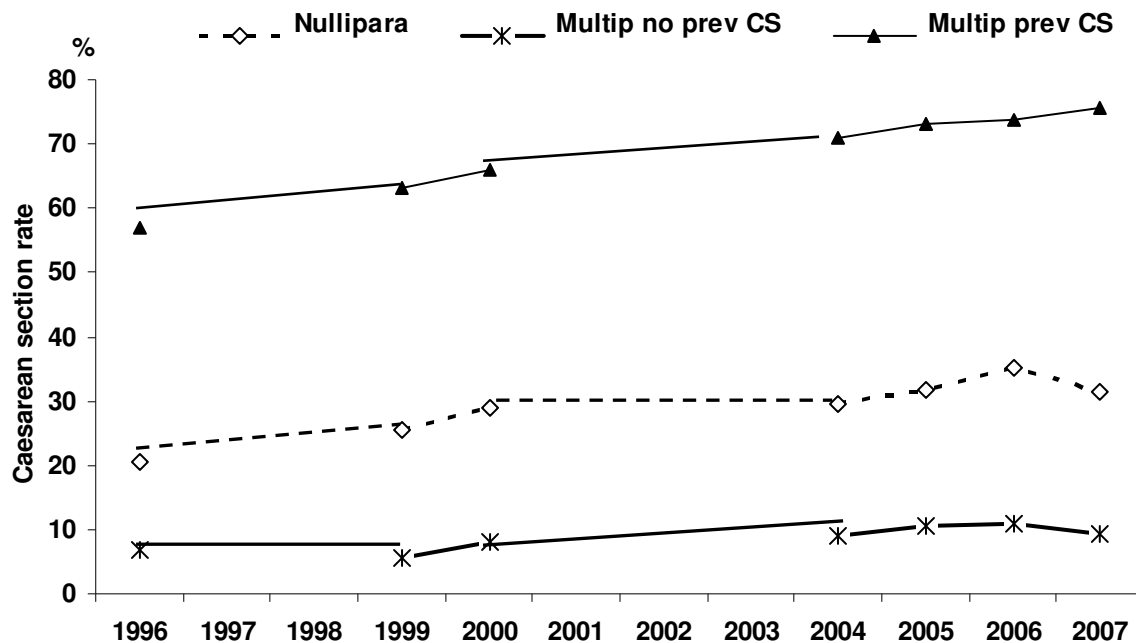
From 1998, data exclude postnatal transfers.

In the case of twins only one mode of birth is given and mode of birth is prioritised as caesarean, forceps/ventouse, vaginal breech, then spontaneous vaginal.

Data from 2001 are not available.

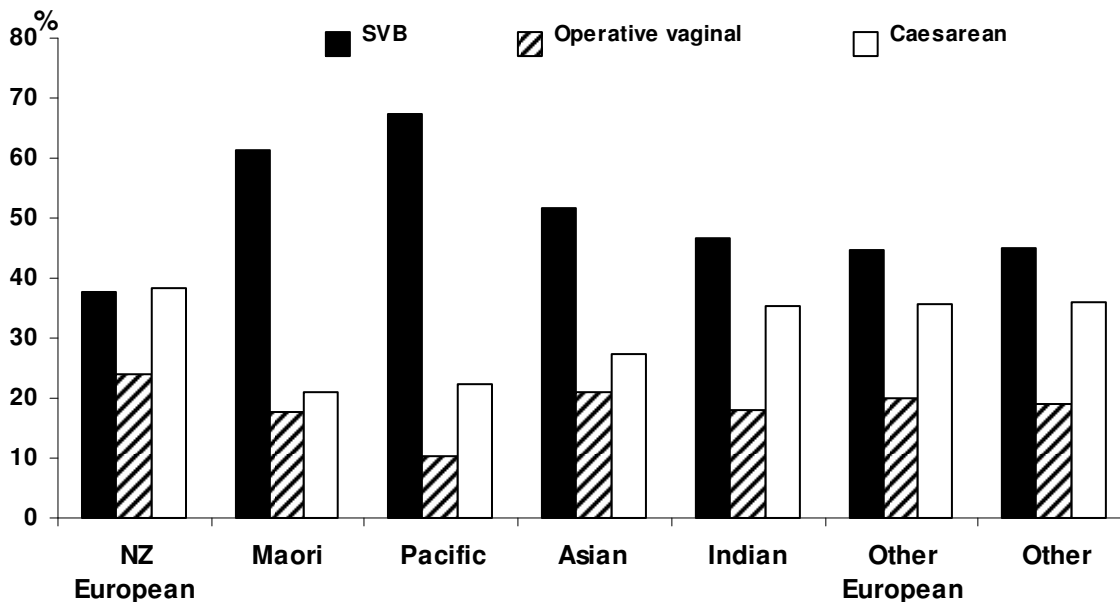


**Figure 31: Mode of birth (1991–2007)**

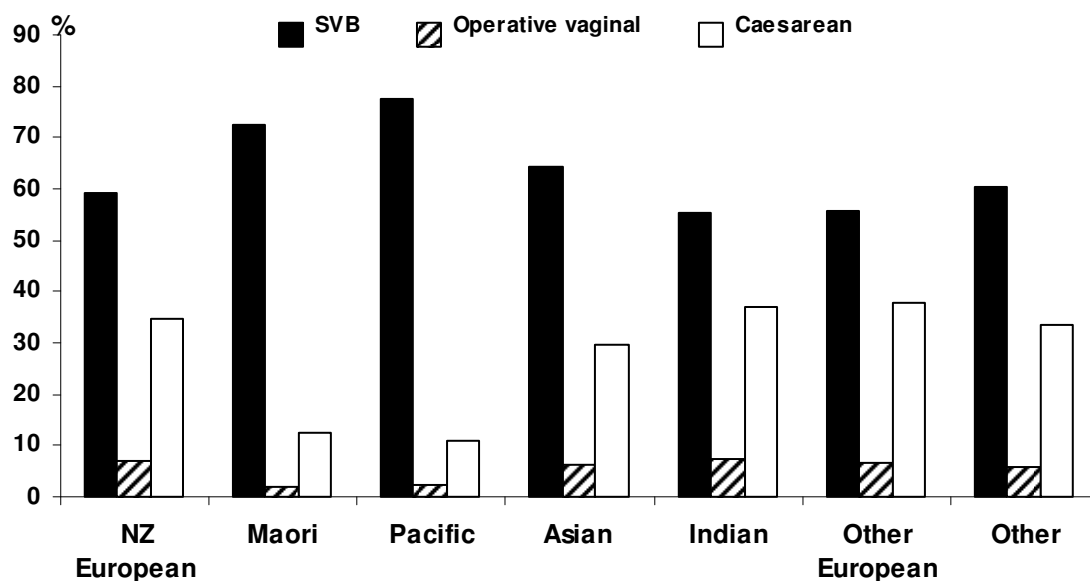


**Figure 32: Caesarean section rates at term by parity and previous caesarean status (1996 – 2007)**

There continues to be an increase in those multiparous women birthing by repeat caesarean section.



**Figure 33: Mode of birth by ethnicity among nullipara**



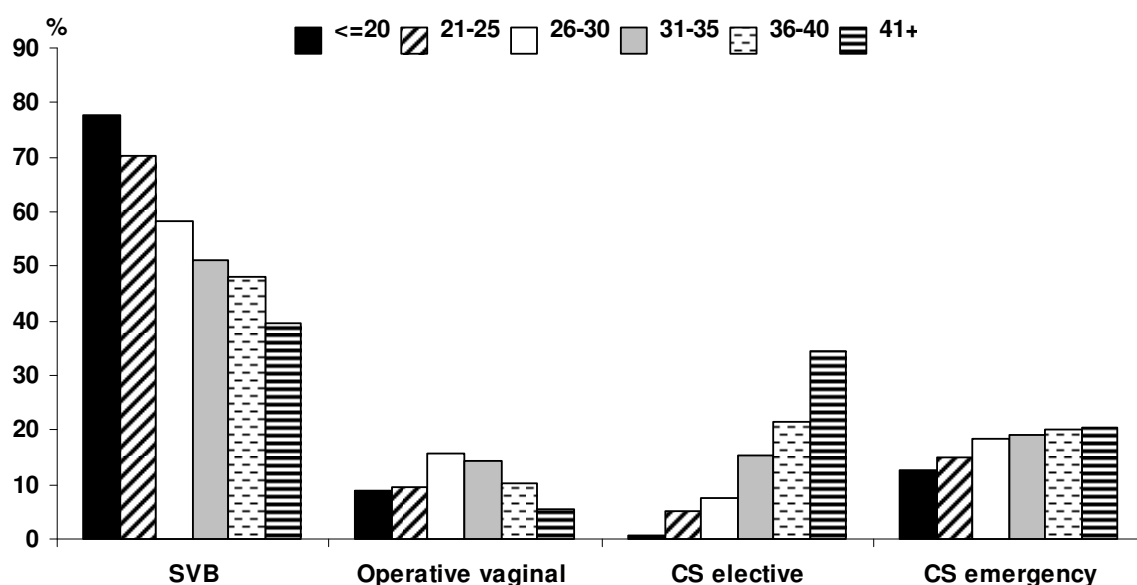
**Figure 34: Mode of birth by ethnicity among multipara**

Among different ethnic groups, Maori and Pacific Island women achieve the highest rates of vaginal birth.

There is a reduction in spontaneous vaginal birth with increasing maternal age. This correlates closely with increasing rates of caesarean section, largely electives. Interestingly the largest rise in elective caesareans is seen in the 31-35 year group, relative to those women less than 31 years.

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

Comparing mode of birth among LMC groups again shows marked differences, even for the 'standard primipara', with rates of spontaneous birth ranging from 35.8% to 76.1%. There is much less LMC variation in mode of birth for multiparous women.



**Figure 35: Mode of birth by maternal age**

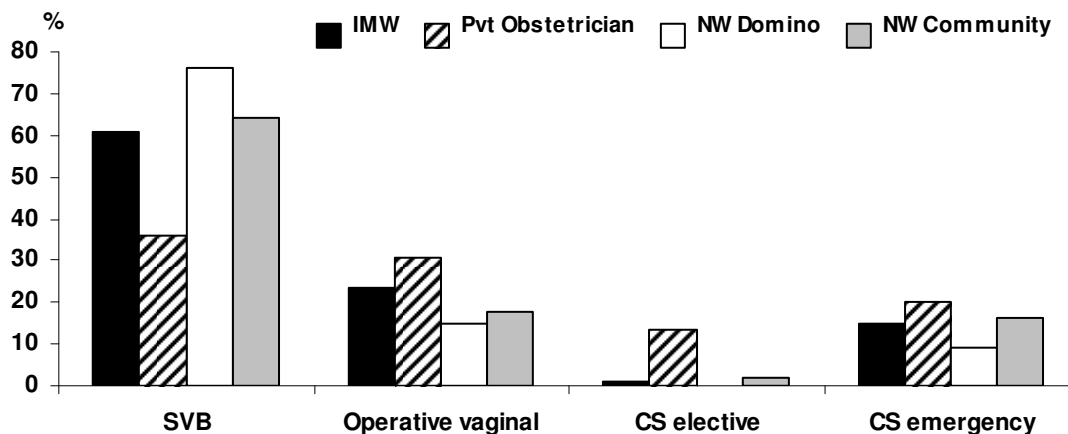


Figure 36: Mode of birth by LMC at birth among standard primipara

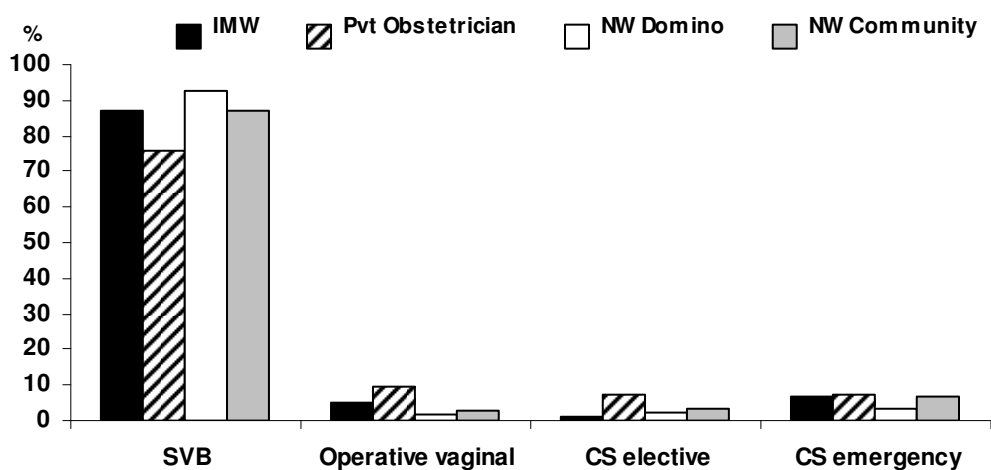


Figure 37: Mode of birth by LMC at time of birth among multipara with no previous caesarean

## 6.4 Spontaneous vertex birth

Table 34: Spontaneous vertex birth rates (2004-2007)

|                          | 2004 | 2005 | 2006 | 2007 |
|--------------------------|------|------|------|------|
|                          | n    | n    | n    | n    |
| Total births (mothers)   | 7491 | 7194 | 7212 | 7695 |
| Spontaneous vertex birth | 4073 | 3845 | 3815 | 4212 |
| Incidence %              | 54.4 | 53.5 | 52.9 | 54.7 |
| Total nullipara          | 3597 | 3522 | 3499 | 3752 |
| Spontaneous vertex birth | 1584 | 1535 | 1484 | 1722 |
| Incidence %              | 44.0 | 43.6 | 42.4 | 45.9 |
| Total multipara          | 3894 | 3672 | 3713 | 3943 |
| Spontaneous vertex birth | 2489 | 2331 | 2331 | 2490 |
| Incidence %              | 63.9 | 63.5 | 62.8 | 63.2 |

## 6.5 Caesarean section

### Methods

Since 2004, we have collected data on elective and emergency caesarean. An elective caesarean is defined as a caesarean which was scheduled in advance and 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 35: Caesarean section rates (1993-2007)**

|                               | 1993        | 1994        | 1995        | 1996        | 1997        | 1998        | 1999        | 2000        | 2001        | 2002        | 2003        | 2004        | 2005        | 2006        | 2007        |
|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Total births (mothers)</b> | <b>8690</b> | <b>8812</b> | <b>9125</b> | <b>9157</b> | <b>8055</b> | <b>7492</b> | <b>7501</b> | <b>7827</b> | <b>7471</b> | <b>7775</b> | <b>7611</b> | <b>7491</b> | <b>7194</b> | <b>7212</b> | <b>7695</b> |
| <b>Caesarean sections</b>     | 1620        | 1670        | 1900        | 1905        | 1797        | 1851        | 1837        | 2084        |             | 2301        | 2219        | 2193        | 2273        | 2390        | 2438        |
| <b>Incidence %</b>            | 18.6        | 19.0        | 20.8        | 20.8        | 22.3        | 24.6        | 24.5        | 26.6        |             | 29.6        | 29.2        | 29.3        | 31.6        | 33.1        | 31.7        |
| <b>Total nullipara</b>        | <b>3649</b> | <b>3814</b> | <b>4037</b> | <b>4018</b> | <b>3591</b> | <b>3263</b> | <b>3262</b> | <b>3454</b> |             |             |             | <b>3597</b> | <b>3522</b> | <b>3499</b> | <b>3752</b> |
| <b>Caesarean</b>              | 755         | 790         | 936         | 888         | 912         | 900         | 898         | 1047        |             |             |             | 1118        | 1178        | 1253        | 1225        |
| <b>Incidence %</b>            | 20.7        | 20.7        | 23.2        | 22.1        | 25.4        | 27.6        | 27.5        | 30.3        |             |             |             | 31.1        | 33.4        | 35.8        | 32.6        |
| <b>Elective %</b>             |             |             |             |             |             |             |             |             |             |             |             | 6.5         | 7.0         | 8.5         | 8.2         |
| <b>Emergency %</b>            |             |             |             |             |             |             |             |             |             |             |             | 24.6        | 26.4        | 27.4        | 24.4        |
| <b>Total multipara</b>        | <b>5041</b> | <b>4998</b> | <b>5088</b> | <b>5139</b> | <b>4464</b> | <b>4229</b> | <b>4239</b> | <b>4372</b> |             |             |             | <b>3894</b> | <b>3672</b> | <b>3713</b> | <b>3943</b> |
| <b>Caesarean</b>              | 865         | 880         | 964         | 1017        | 885         | 951         | 939         | 1037        |             |             |             | 1075        | 1095        | 1137        | 1213        |
| <b>Incidence %</b>            | 17.2        | 17.6        | 18.9        | 19.8        | 19.8        | 22.5        | 22.2        | 23.7        |             |             |             | 27.6        | 29.8        | 30.6        | 30.8        |
| <b>Elective %</b>             |             |             |             |             |             |             |             |             |             |             |             | 14.1        | 15.9        | 16.9        | 18.3        |
| <b>Emergency %</b>            |             |             |             |             |             |             |             |             |             |             |             | 13.5        | 13.9        | 13.7        | 12.5        |

From 1998, data excludes postnatal transfers

### Findings

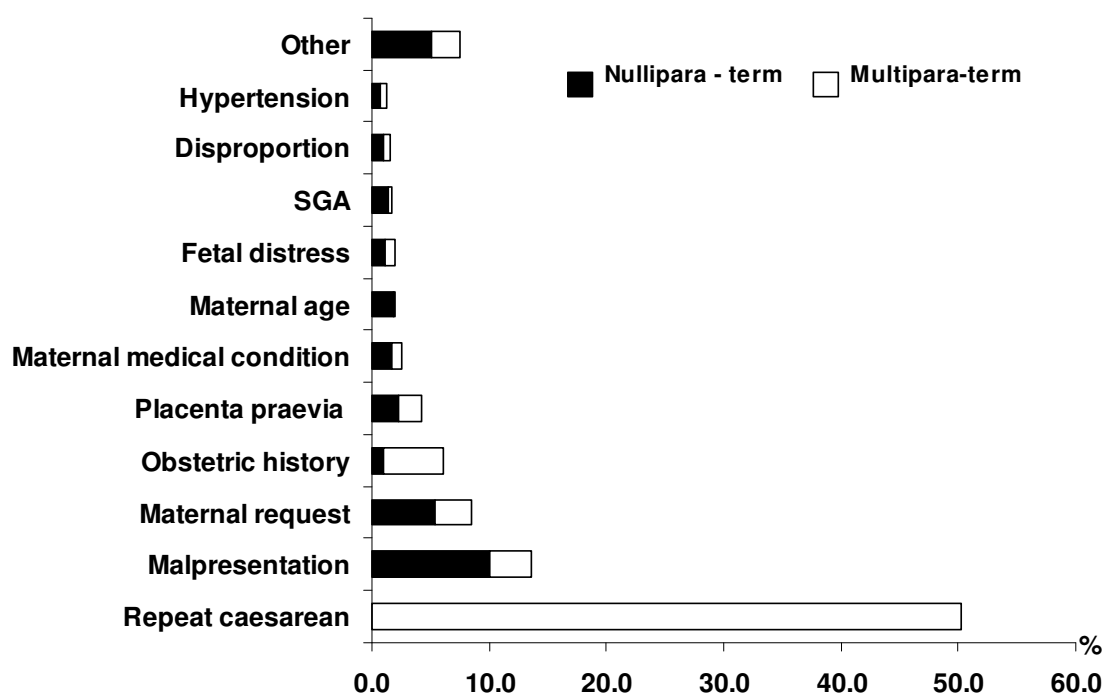
Among nulliparous women the overall caesarean section rate was lower than in 2006 (32.7% vs 35.8%). The majority of this decrease comes from a reduction in emergency cases. The caesarean rate was static in multiparous women, although there was a reduction in caesarean rate among women who laboured and a 2% increase in elective caesarean rate.

**Table 36: NW Modified Robson 10-Group Classification 1997-2007**

|   | NW 1997 |              |         | NW 2000 |              |         | NW 2004 |              |         | NW 2005 |              |         | NW 2006 |              |         | NW 2007 |              |         | Contrib ution to CS rate |
|---|---------|--------------|---------|---------|--------------|---------|---------|--------------|---------|---------|--------------|---------|---------|--------------|---------|---------|--------------|---------|--------------------------|
|   | CS      | Total Births | CS Rate | CS      | Total Births | CS Rate | CS      | Total Births | CS Rate | CS      | Total Births | CS Rate | CS      | Total Births | CS Rate | CS      | Total Births | CS Rate |                          |
|   | n       | n            | %       | n       | n            | %       | n       | n            | %       | n       | n            | %       | n       | n            | %       | n       | n            | %       |                          |
| <b>Totals</b>   | 1801    | 8055         | 22.4    | 2084    | 7827         | 26.6    | 2193    | 7491         | 29.3    | 2273    | 7194         | 31.6    | 2390    | 7212         | 33.1    | 2438    | 7695         | 31.7    | 31.8                     |
| Nullip, singleton, cephalic, term, spontaneous labour                 | 274     | 1991         | 13.8    | 319     | 1896         | 16.8    | 338     | 1955         | 17.3    | 359     | 1892         | 19.0    | 396     | 1920         | 20.6    | 353     | 2007         | 17.6    | 4.6                      |
| Nullip, singleton cephalic, term, induced                             | 243     | 883          | 27.5    | 268     | 839          | 31.9    | 326     | 932          |         | 330     | 931          | 35.4    | 316     | 845          | 37.4    | 315     | 929          | 33.9    | 4.1                      |
| Nullip, singleton, cephalic, term, prelabour CS                       |         | 100          |         |         | 135          |         |         | 124          |         |         | 149          |         |         | 179          |         |         | 200          |         | 2.6                      |
| Multip, singleton, cephalic, no previous CS, term, spontaneous labour | 63      | 2280         | 2.8     | 60      | 2084         | 2.9     | 63      | 1805         | 3.5     | 76      | 1607         | 4.7     | 79      | 1601         | 4.9     | 56      | 1688         | 3.3     | 0.7                      |
| Multip, singleton, cephalic, no previous CS, term, induced            | 42      | 703          | 6.0     | 61      | 723          | 8.4     | 55      | 631          | 8.7     | 60      | 652          | 9.2     | 59      | 646          | 9.1     | 55      | 666          | 8.3     | 0.7                      |
| Multip, singleton, cephalic, no previous CS, term, prelabour cs       |         | 61           |         |         | 58           |         |         | 44           |         |         | 48           |         |         | 68           |         |         | 69           |         | 0.9                      |
| Multip, previous CS, singleton, cephalic, term, spontaneous labour    | 93      | 372          | 25      | 141     | 363          | 38.8    | 159     | 379          | 42.0    | 131     | 340          | 38.5    | 143     | 342          | 41.8    | 120     | 324          | 37.0    | 1.6                      |
| Multip, previous CS, singleton, cephalic, term, induced               | 59      | 165          | 35.8    | 74      | 151          | 49.0    | 57      | 123          | 46.3    | 58      | 106          | 54.7    | 38      | 98           | 38.8    | 35      | 92           | 38.0    | 0.5                      |
| Multip, previous CS, singleton, cephalic, term, prelabour cs          |         | 265          |         |         | 303          |         |         | 419          |         |         | 449          |         |         | 496          |         |         | 593          |         | 7.7                      |
| Nullip, singleton, breech, term                                       |         |              |         | 122     | 132          | 92.4    | 126     | 130          | 96.9    | 136     | 136          | 100     | 148     | 150          | 98.7    | 149     | 149          | 100.0   | 1.9                      |
| Multip singleton, breech, term  |         |              |         | 93      | 104          | 89.4    | 86      | 91           | 94.5    | 87      | 89           | 97.8    | 80      | 82           | 97.6    | 83      | 89           | 93.3    | 1.1                      |
| Multiples, term   |         |              |         | 31      | 79           | 39.2    | 35      | 58           | 60.3    | 32      | 69           | 46.4    | 34      | 47           | 72.3    | 44      | 72           | 61.1    | 0.6                      |
| Abnormal lie, term  |         |              |         | 43      | 48           | 89.6    | 43      | 44           | 97.7    | 36      | 41           | 87.8    | 21      | 22           | 95.5    | 21      | 21           | 100.0   | 0.3                      |
| All preterm   |         | 906          |         | 376     | 912          | 41.2    | 318     | 756          | 42.1    | 322     | 685          | 47.0    | 334     | 716          | 46.6    | 345     | 796          | 43.3    | 4.5                      |

Examination of the analysis by 'Modified Robson 10-group classification' reveals several points of interest. The caesarean rate in the most favourable nulliparous group is 4% higher than in 1997. The rate of caesarean section for cephalic, term multipara with a previous section is similar following spontaneous or induced labour.

### 6.5.1 Indication for elective and pre labour emergency caesarean section



**Figure 38: Contribution of parity to principal indications for labour caesarean section at term (as a proportion of all elective and emergency not in labour CS n=1076)**

Fifty percent of all elective and not in labour emergency caesarean sections at term were performed for the indication of 'repeat caesarean section'. When looking specifically at multiparous women, 72% of elective and not in labour caesarean sections were due to previous caesarean alone.

### 6.5.2 Vaginal birth after caesarean section

**Table 37: VBAC: Parity 1, all gestations by mode of onset of birth (n=822)**

|               | Parity 1, previous caesarean, all gestations |      |                        |      |                      |          |
|---------------|--|------|------------------------|------|----------------------|----------|
|               | Spontaneous labour<br>n=268                  |      | Induced labour<br>n=66 |      | CS elective<br>n=428 |          |
|               | CS emergency before onset of labour<br>n=60  |      | Total<br>n=822         |      |                      |          |
|               | n  | %    | n                      | %    | n                    | n %      |
| Vaginal birth | 143  | 53.4 | 32                     | 48.5 |                      | 175 21.3 |
| CS elective   | 0  |      | 0                      |      | 428                  | 428 52.1 |
| CS emergency  | 125  | 46.6 | 34                     | 51.5 | 60                   | 219 26.6 |

Analysis of the VBAC data for 2007 shows that for women of all gestations there was a VBAC rate of 53% if labouring spontaneously and one of 49% if induced. While some of the 488 women having caesarean sections prior to labour would not have been appropriate to attempt

VBAC, it would seem likely that a significant number would have delivered vaginally if labour had occurred. It can be seen that the rate of elective caesarean section in women with one previous (caesarean) birth varies widely by LMC.

**Table 38: VBAC: Parity 1, singleton, cephalic, term, by mode of onset of birth (n=705)**

| Parity 1, previous caesarean, singleton, cephalic, term |                             |      |                        |      |                      |  |   |                |
|---|-----------------------------|------|------------------------|------|----------------------|--|---|----------------|
|   | Spontaneous labour<br>n=237 |      | Induced labour<br>n=56 |      | CS elective<br>n=376 | CS emergency before onset of labour n=36 |   | Total<br>n=705 |
|   | n                           | %    | n                      | %    | n                    | n  | % | n %            |
| <b>Vaginal birth</b>                                    | 126                         | 53.2 | 25                     | 44.6 | 0                    | 0  |   | 151 21.4       |
| <b>CS elective</b>                                      | 0                           |      | 0                      |      | 376                  | 0  |   | 376 53.3       |
| <b>CS emergency</b>                                     | 111                         | 46.8 | 31                     | 55.4 | 0                    | 36                                       |   | 178 25.2       |

**Table 39: VBAC: Parity 1, all gestations by LMC at birth (n=822)**

| Parity 1, previous caesarean, all gestations |                              |      |                               |      |            |                            |
|--|------------------------------|------|-------------------------------|------|------------|----------------------------|
|  | Independent midwife<br>n=227 |      | Private Obstetrician<br>n=293 |      | GP<br>n=15 | National Women's*<br>n=287 |
|  | n                            | %    | n                             | %    | n %        | n %                        |
| <b>Vaginal birth</b>                         | 64                           | 28.2 | 30                            | 10.2 | 5 33.3     | 76 26.5                    |
| <b>CS elective</b>                           | 83                           | 36.6 | 210                           | 71.7 | 7 46.7     | 128 44.6                   |
| <b>CS emergency</b>                          | 80                           | 35.2 | 53                            | 18.1 | 3 20.0     | 83 28.9                    |

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

In 2007 191 women had 2 or more prior caesarean sections. Of these , 167 were at term with singleton baby and cephalic presentation and 98% of these women went on to have a further caesarean section.



## 6.6 Instrumental vaginal birth

The rate of instrumental birth has varied little since 1992 and this remains the case for 2007 where 13.8% of births occurred in this way. The individual rates for nulliparous and multiparous women remain very similar to recent years at 21% and 5% respectively. The ventouse was the instrument of choice in the majority of these cases, irrespective of parity or maternal ethnicity.

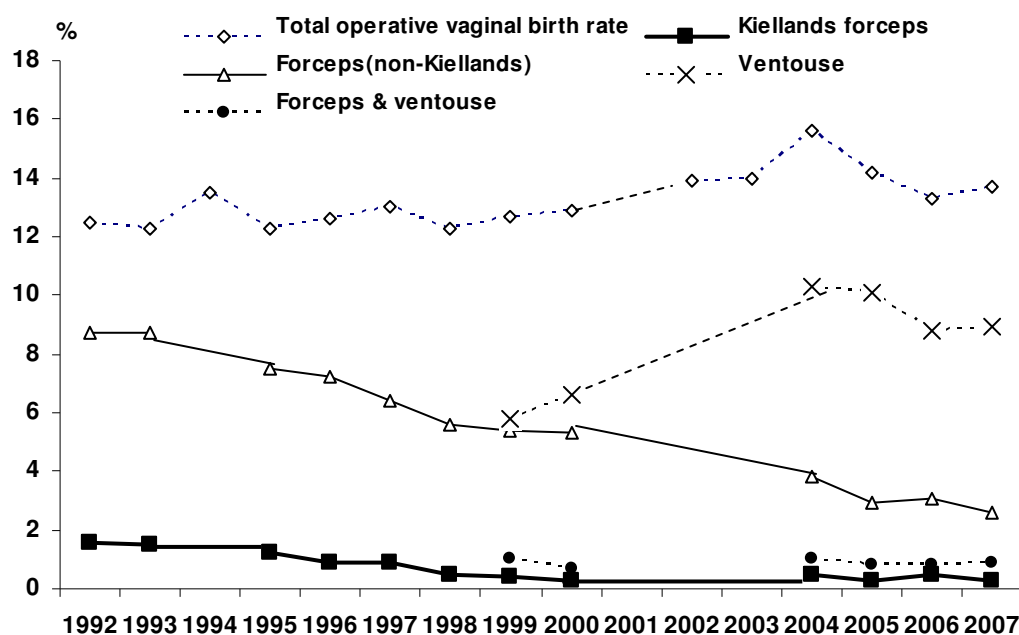


Figure 39: Operative vaginal birth (1992-2007)

## 6.7 Breech birth

**Table 40: Mode of birth by breech presentation (singletons)**

|                               | N    | Total breech | % Breech /total singleton births | Breech & CS | % CS/ total breech |
|-------------------------------|------|--------------|----------------------------------|-------------|--------------------|
| <b>Total singleton births</b> | 7518 | 351          | 4.7                              | 301         | 85.8               |
| <b>20-31 weeks</b>            | 189  | 64           | 33.9                             | 27          | 42.2               |
| <b>32-36 weeks</b>            | 502  | 49           | 9.8                              | 44          | 89.8               |
| <b>≥37 weeks</b>              | 6827 | 238          | 3.5                              | 230         | 96.6               |

As commented on in last year's report, the influence of the term breech trial are evident in our figures. Almost all breech births at term were by caesarean section. Among breech births at 32-36 weeks the percentage of caesarean section deliveries is almost 90%, suggesting a possible extrapolation of the term breech trial results to this population, which is not evidence-based.

### Summary / Implications

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

The mode of birth in women with one previous caesarean section continues to be predominantly by elective caesarean. This is despite a successful VBAC rate of more than 50% with spontaneous or induced labour. Although not all cases are equally suitable for a trial of labour it is likely that with increased promotion of a VBAC attempt there would be a considerable decrease in the overall caesarean birth rate.

## 6.8 Obstetric analgesia

### Methods

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

### Findings

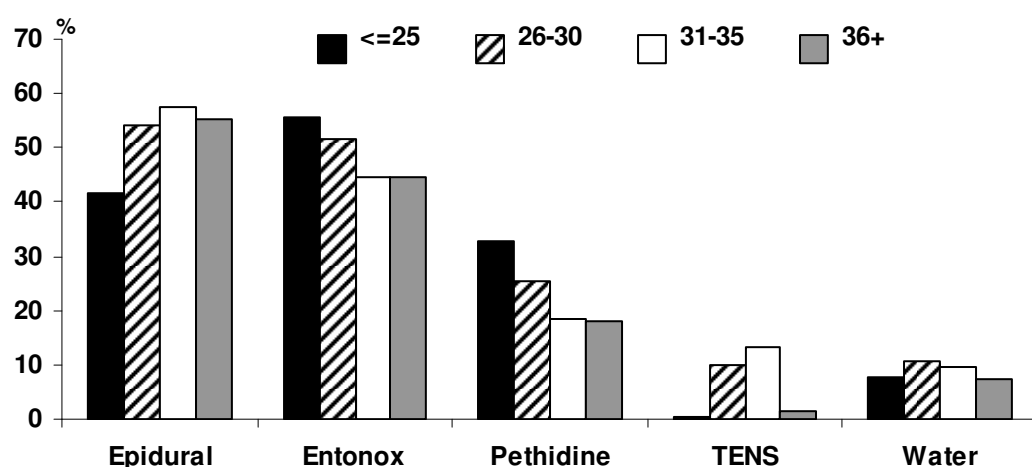
**Table 41: Analgesia use by parity and mode of onset of birth**

|                                  | Total<br>N  | Epidural<br>n %  | Entonox<br>n %   | Pethidine<br>n % | TENS<br>n %   | Water<br>n %    |
|----------------------------------|-------------|------------------|------------------|------------------|---------------|-----------------|
| <b>All women</b>                 | <b>7695</b> | <b>4612 59.9</b> | <b>3117 40.5</b> | <b>1443 18.8</b> | <b>59 0.8</b> | <b>583 7.6</b>  |
| <b>Mode of onset of birth</b>    |             |                  |                  |                  |               |                 |
| CS elective                      | 1021        | 993 97.3         | 12† 1.2          | 5† 0.5           | 0             | 1 0.1           |
| CS emergency before onset labour | 278         | 236 84.9         | 5† 1.8           | 1† 0.4           | 0             | 1 0.4           |
| <b>Labouring women*</b>          | <b>6396</b> | <b>3383 52.9</b> | <b>3100 48.5</b> | <b>1437 22.5</b> | <b>59 0.9</b> | <b>581 9.1</b>  |
| Nullipara                        | 3318        | 2176 65.6        | 1738 52.4        | 952 28.7         | 36 1.1        | 422 12.7        |
| Multipara                        | 3078        | 1207 39.2        | 1362 44.3        | 485 15.8         | 23 0.8        | 159 5.2         |
| <b>Induced labour</b>            | <b>1906</b> | <b>1326 69.6</b> | <b>811 42.5</b>  | <b>434 22.8</b>  | <b>16 0.8</b> | <b>86 4.5</b>   |
| Nullipara                        | 1047        | 852 81.4         | 458 43.7         | 280 26.7         | 10 1.0        | 64 6.1          |
| Multipara                        | 859         | 474 55.2         | 353 41.1         | 154 17.9         | 6 0.7         | 22 2.6          |
| <b>Spontaneous labour</b>        | <b>4490</b> | <b>2057 45.8</b> | <b>2289 51.0</b> | <b>1003 22.3</b> | <b>43 1.0</b> | <b>495 11.0</b> |
| Nullipara                        | 2271        | 1324 58.3        | 1280 56.4        | 672 29.6         | 26 1.1        | 358 15.8        |
| Multipara                        | 2219        | 733 33.0         | 1009 45.5        | 331 14.9         | 17 0.8        | 137 6.2         |

\* Excludes elective caesarean and emergency caesarean before onset of labour.

† Pain relief given prior to caesarean

Entonox and epidural analgesia are used more than other methods of pain relief in labour. Water is being increasingly used, particularly in spontaneous labour. The epidural rate among labouring women was 53% in 2007, 70% if induced and 46% if labouring spontaneously. There was greater epidural use in nulliparous than multiparous women, although less so in younger nullipara.



**Figure 40: Analgesic use and maternal age among nulliparous labours**

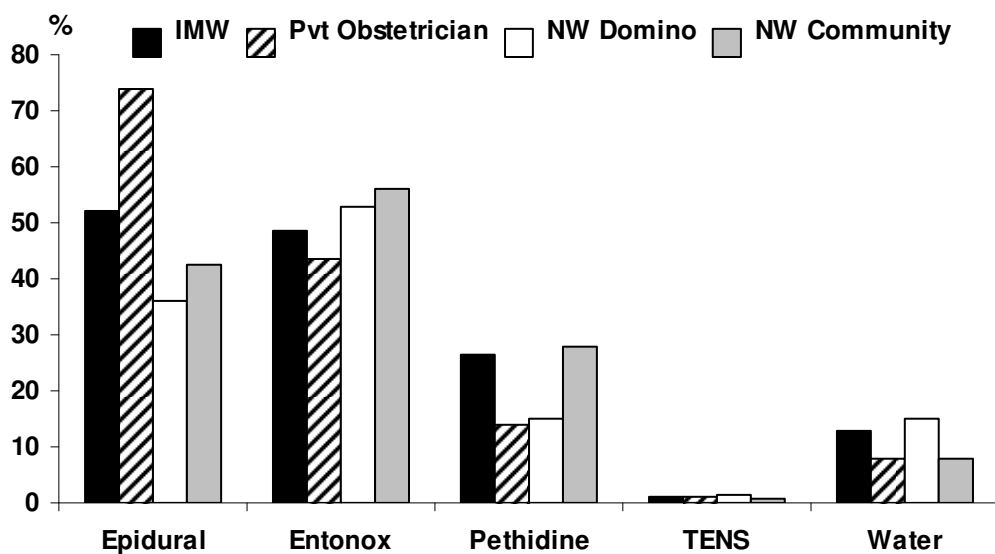


Figure 41: Analgesic use and LMC type among nulliparous labours

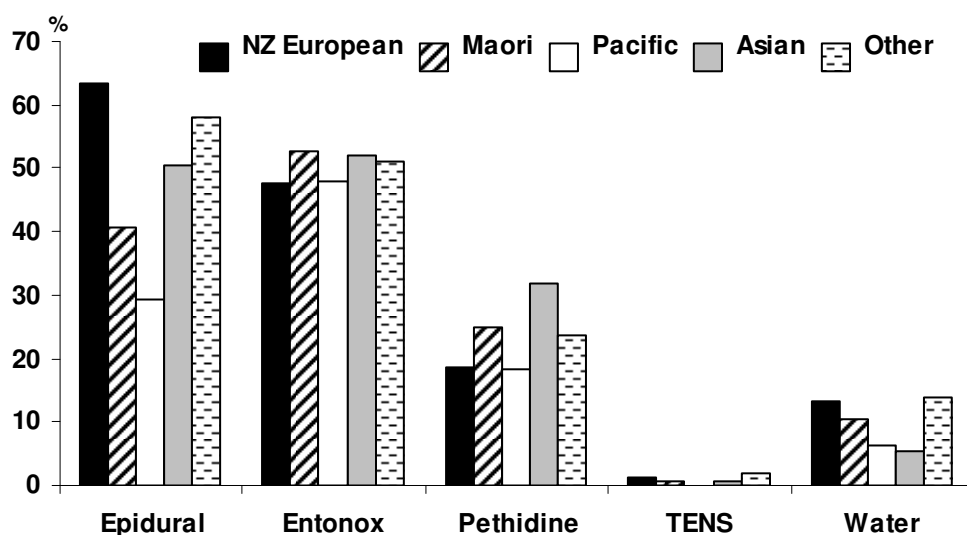


Figure 42: Analgesic use and ethnicity among nulliparous labours

Table 42: GA use and mode of birth

|                          | TTotal | GA* only |     | GA* + epidural |     | Total GA* |      |
|--------------------------|--------|----------|-----|----------------|-----|-----------|------|
|                          | N      | n        | %   | n              | %   | n         | %    |
| <b>Total</b>             | 7695   | 187      | 2.4 | 65             | 0.8 | 252       | 3.3  |
| <b>Vaginal birth</b>     | 4282   | 48       | 1.1 | 6              | 0.1 | 54        | 1.3  |
| <b>Operative vaginal</b> | 975    | 6        | 0.6 | 7              | 0.7 | 13        | 1.3  |
| <b>CS elective</b>       | 1030   | 29       | 2.8 | 9              | 0.9 | 38        | 3.7  |
| <b>CS emergency</b>      | 1408   | 104      | 7.4 | 43             | 3.1 | 147       | 10.4 |

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

## 6.9 Clinical governance

The Labour and Birth Clinical Governance group was instigated in December 2006, consisting variously of two to three obstetricians, three midwives, a clinical epidemiologist, and the service clinical effectiveness advisor. The group meet every two weeks. The purpose of this team is to create an environment which supports objectivity of decision-making in labour and birth care provision and to support individual professionals to effect evidence based practice change where such is indicated. The aim is to provide the safest possible care to mothers and babies in the safest possible environment for both women and staff. The work streams of the group are consistent with the pillars of clinical governance, namely clinical, risk management, communication, resource, strategic, and learning effectiveness, and patient experience.

In 2007, the Labour and Birth Clinical Governance group work included:

- Audit of caesarean section with feedback to staff as indicated
- Education
- Introduction of a new list of indications for emergency caesarean section
- Improvement of collection of routine maternity data such as collection of time at decision for caesarean section so audit of decision to birth interval is possible.
- Staff survey and education re fetal blood sampling with lactate
- Development of a structured approach to registrar junior/senior roles
- Introduction of Risk Monitor Pro reporting specific to Labour and Birthing in an attempt to better record infrequent morbidity eg uterine rupture, shoulder dystocia, emergency peripartum hysterectomy
- Development of an algorithm for feedback to clinical supervisors regarding practice issues
- Use of the pillars to strengthen the skills of the Clinical Charge Midwives
- Update of existing policies

### 6.9.1 The caesarean section audit:

The caesarean section audit was introduced as the basis of a quality improvement process that seeks to optimise the care of women and optimise their outcomes through the systematic review of care against explicit criteria and to implement change. Indicated changes may be at an individual, team or service level. Further monitoring aims to confirm improvement in healthcare delivery.

#### Methods

Audit of emergency caesarean sections began late in 2006 with a pilot data collection instrument and process. Adequate data were collected from 1 March 2007. Therefore data from 1 March to 31 December are reported here.

While an attempt was made to audit all emergency in labour caesareans from Labour and Birthing Suite for singleton term cephalic births, on some occasions notes were missing or the woman was felt not to fit the criteria. e.g emergency in labour sections are reclassified as in labour elective if an elective section is booked.

Data were collected on induction of labour, dilatation on admission, onset of active labour, use of syntocinon, second stage management, use of fetal blood sampling, decision making around caesarean section and cord blood gases.

Indications for caesarean were classified within the main indications of fetal, inefficient uterine action, efficient uterine action and non medical, into subgroups that provide more meaningful information. These subgroups, based on Michael Robson's classification, are as follows, and have since been adopted as the recorded indication for emergency in labour caesarean for all such births at NW.

#### Classification of indications for caesarean section in labour (based on Robson)

1. **Fetal indication**
  - a. Fetal distress: abnormal CTG in normally progressing labour or before augmentation
  - b. Other fetal indication: all other fetal indications where the CTG is not necessarily abnormal (eg APH, cord presentation, breech either undiagnosed or undergoing planned trial of labour, suspected scar rupture)
2. **Inefficient uterine action**
  - a. Fetal intolerance of augmented labour: inadequate progress with no fetal problems until oxytocin is started. Does not include hyperstimulation.
  - b. Augmentation causes hyperstimulation: inadequate progress but overcontracts when oxytocin started; does not reach maximum dose of oxytocin as per protocol. Definition of hyperstimulation is > 4:10 regardless of CTG.
  - c. Poor uterine response to optimal augmentation: inadequate progress which does not improve after being treated with maximum dose of oxytocin according to the protocol
  - d. Suboptimal augmentation: inadequate progress which for whatever reason has not been treated with maximal dose of oxytocin according to protocol.
  - e. Inefficient uterine action; no oxytocin: inadequate progress which for whatever reason has not been treated with oxytocin
3. **Efficient uterine action/Obstructed labour.** (primigravida or multipara): despite efficient uterine action, progress arrests and vaginal birth not possible: includes adequate but arrested progress in both 1<sup>st</sup> stage and 2<sup>nd</sup> stage. (In nulliparous women this diagnosis requires augmentation in either 1<sup>st</sup> or 2<sup>nd</sup> stage).
4. **Non-medical indication: Where there is no obvious clinical indication.**
  - a. Maternal request
  - b. No obvious indication, no record of maternal request

Data collected by audit have been merged and analysed in association with routinely collected maternity data.

#### **Findings**

Seven hundred and eighteen (718) emergency in labour caesarean sections were audited between 1 March and 31 December 2007.

#### **Indication for emergency caesarean section among singleton cephalic term births**

The figure below demonstrates the distribution of indications for emergency caesarean. The highlighted box includes subgroups of inefficient uterine action. There are only small differences by whether LMC at birth was private or public. There is some overlap between private and public as independent midwives and General Practitioners may seek private or public assistance prior to caesarean. The only significant difference shown here is the higher rate of emergency caesarean for non-medical indication among women under private LMC care at onset of labour.

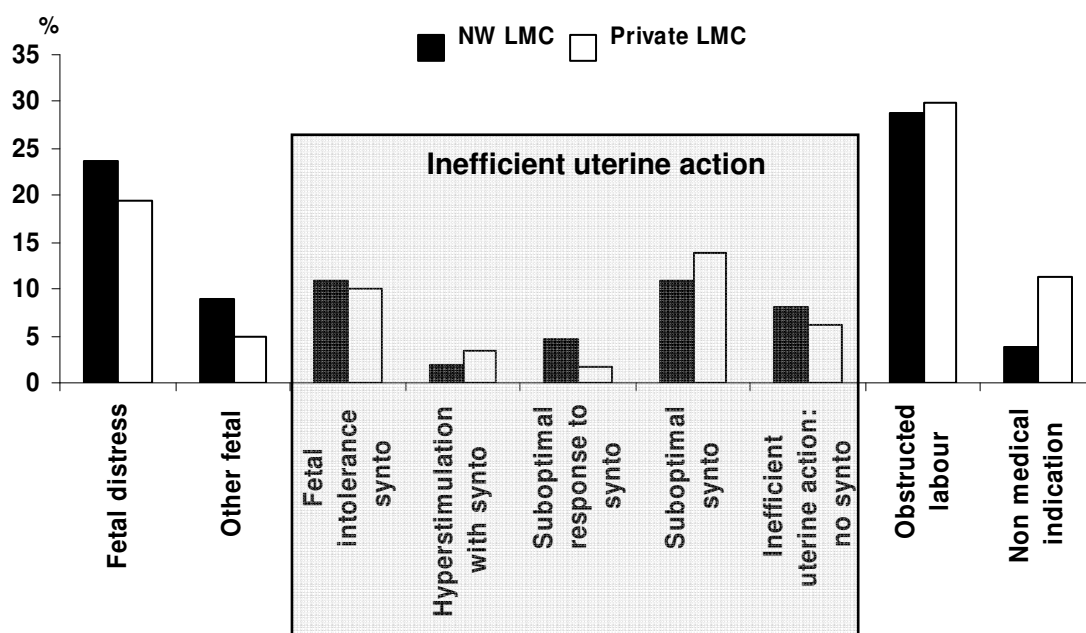


Figure 43: Indication for emergency caesarean section by status of LMC at birth: Mar-Dec 2007.

### Use of fetal scalp sampling for assessment of abnormal CTG in labour

Fetal scalp sampling for lactate or pH occurred in 30% of cases where the indication for emergency caesarean in labour was recorded as fetal distress or fetal intolerance of syntocinon. There was a significant difference between pH sampling of women under the care of NW (47%) at onset of labour compared to women under the care of private LMCs (19%).

### Consultant review at full dilatation

Consultant review prior to emergency caesarean at full dilatation occurred for only 38% of women under the care of NW team at the onset of labour.

### Second stage management

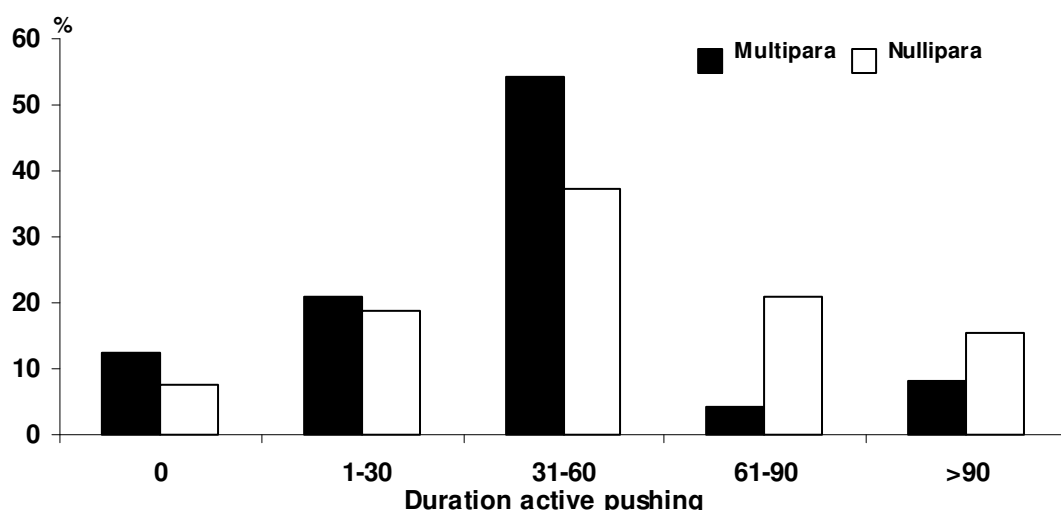
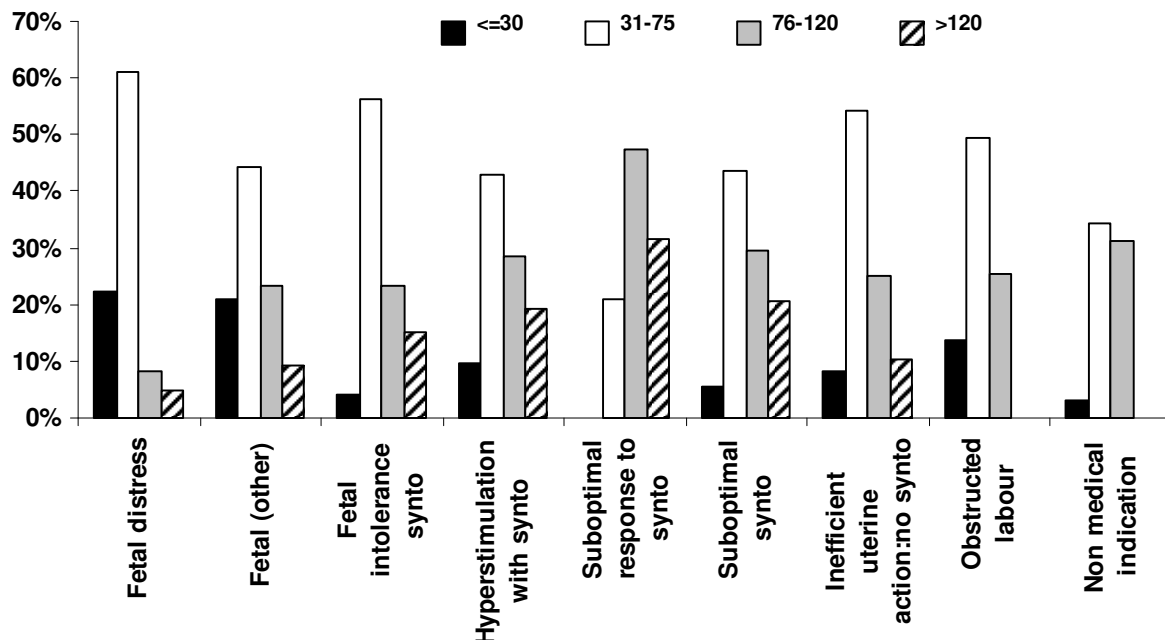


Figure 44: Duration of active pushing by parity among women having emergency caesarean for obstruction (n=115)

There is wide variation in management of the second stage among clinicians. Not all practices are evidence-based, with some women not being allowed sufficient time for the baby's head to descend prior to pushing, for example. As can be seen in the figure above,

there appears to be adherence to the commonly accepted, but not evidence based, policy of 60 minutes (or less) active pushing. It is intended that up to date guidelines for this area of management will be adopted.

#### 7.9.4 Decision to birth interval



**Figure 45: Decision to birth interval (minutes) by indication for emergency caesarean**

For some indications it would appear that emergency caesarean section is not available as expeditiously as may be appropriate, e.g. all fetal distress and obstructed labour emergency caesareans should probably be performed within 75 minutes.

In 2008, we have begun to collect routine data on “urgency” of emergency caesarean (using RANZCOG categories) so we can more accurately audit whether decision to birth interval was appropriate.

#### Summary

The audit has highlighted a number of areas where change was/is required. For example:

- It is apparent that non-induced women are frequently admitted to Labour and Birth when they are not by definition in labour.
- Inductions are undertaken in Labour and Birthing Suite and not recorded as such. This may not be the most appropriate place for these inductions and may increase intervention if the different pattern of progress following induction is not appreciated.
- Fetal scalp sampling is seldom used in the management of abnormal CTG tracings in labour.
- Obstetrician review prior to caesarean section at full dilatation does not occur despite this being Labour and Birthing Suite policy.
- Caesarean section is performed at full dilatation for “obstructed labour” without active pushing having occurred.
- There is a need to more effectively manage syntocinon augmented labours.
- There is poor or lack of documentation by all disciplines.
- Education on the interpretation of CTGs is ongoing.



## 6.10 Labour and birth at Birthcare Auckland

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

### Methods

The data for mothers birthing at Birthcare (n=393) during 2007 were provided by Birthcare. The data on mothers transferred to NW in labour and birthing at NW and for mothers transferred to NW after birthing at Birthcare have been obtained from the NW clinical database Healthware.

**Table 43: Demographic characteristics of women labouring at Birthcare by place of birth**

|                        | Birth at Birthcare<br>n=393 |    | Intrapartum<br>transfer to NW<br>n=61 |    | Total<br>n=454 |    |
|------------------------|-----------------------------|----|---------------------------------------|----|----------------|----|
|                        | n                           | %  | n                                     | %  | n              | %  |
| <b>Parity</b>          |                             |    |                                       |    |                |    |
| Nullipara              | 164                         | 42 | 48                                    | 79 | 212            | 47 |
| Multipara              | 229                         | 58 | 13                                    | 21 | 242            | 53 |
| <b>Age</b>             |                             |    |                                       |    |                |    |
| <21                    | 3                           | 1  | 7                                     | 11 | 10             | 2  |
| 21-25                  | 45                          | 12 | 1                                     | 2  | 46             | 10 |
| 26-30                  | 87                          | 22 | 19                                    | 31 | 106            | 24 |
| 31-35                  | 145                         | 37 | 22                                    | 36 | 167            | 38 |
| 36-40                  | 97                          | 25 | 10                                    | 16 | 107            | 24 |
| >40                    | 16                          | 4  | 2                                     | 3  | 18             | 4  |
| <b>Ethnicity</b>       |                             |    |                                       |    |                |    |
| NZ European            | 191                         | 49 | 30                                    | 49 | 221            | 50 |
| Maori                  | 40                          | 10 | 9                                     | 15 | 49             | 11 |
| Pacific                | 61                          | 16 | 3                                     | 5  | 64             | 14 |
| Asian                  | 19                          | 5  | 4                                     | 7  | 23             | 5  |
| Indian                 | 13                          | 3  | 0                                     |    | 13             | 3  |
| Other European         | 56                          | 14 | 13                                    | 21 | 69             | 16 |
| Other                  | 13                          | 3  | 2                                     | 3  | 15             | 3  |
| <b>DHB of Domicile</b> |                             |    |                                       |    |                |    |
| Auckland               | 285                         | 73 | 46                                    | 75 | 333            | 74 |
| Counties Manukau       | 45                          | 11 | 6                                     | 10 | 51             | 11 |
| Waitemata              | 59                          | 15 | 9                                     | 15 | 68             | 15 |
| Northland              | 2                           | 1  | 0                                     |    | 0              |    |
| Waikato                | 2                           | 1  | 0                                     |    | 2              | 0  |

**Table 44: Interventions and outcomes by parity among women commencing labour at Birthcare (includes 61 intrapartum transfers to National Women's)\***

|                                   | Nullipara<br>n=212 |      | Multipara<br>n=242 |      |
|-----------------------------------|--------------------|------|--------------------|------|
|                                   | n                  | %    | n                  | %    |
| <b>Intrapartum transfer to NW</b> | 48                 | 22.6 | 13                 | 5.4  |
| <b>Analgesia</b>                  |                    |      |                    |      |
| Epidural                          | 41                 | 19.3 | 9                  | 3.7  |
| Pethidine                         | 18                 | 8.5  | 3                  | 1.2  |
| Entonox                           | 81                 | 38.2 | 70                 | 28.9 |
| TENS                              | 1                  | 0.5  | 1                  | 0.4  |
| Water                             | 56                 | 26.4 | 65                 | 26.9 |
| <b>Syntocinon</b>                 | 34                 | 70.8 | 3                  | 23.1 |
| <b>Mode of birth</b>              |                    |      |                    |      |
| Normal vaginal                    | 182                | 85.8 | 238                | 98.3 |
| Operative vaginal                 | 16                 | 7.5  | 1                  | 0.4  |
| Emergency caesarean               | 14                 | 6.6  | 3                  | 1.2  |
| <b>Perineal trauma</b>            |                    |      |                    |      |
| Episiotomy                        | 20                 | 9.4  | 11                 | 4.5  |
| Third/fourth degree tear          | 5                  | 2.4  | 7                  | 2.9  |
| Vaginal wall tear                 | 5                  | 2.4  | 3                  | 1.2  |
| <b>Blood Loss</b>                 |                    |      |                    |      |
| ≥500 mls                          | 21                 | 9.9  | 13                 | 5.4  |
| <b>Perinatal outcomes</b>         |                    |      |                    |      |
| Still birth                       | 1                  |      | 0                  |      |

\* Many of these interventions occurred at National Women's

Four hundred and forty four women began their labour care at Birthcare. This is an increase of 100 women from 2006. The transfer rate to NW was 23% among nullipara and 5% among multipara.

## Chapter **7**

# LABOUR and BIRTH OUTCOMES



## 7 LABOUR and BIRTH OUTCOMES

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

### 7.1 Perineal trauma

Table 45: Episiotomy rates (Denominator is vaginal births)

|  | 1995<br>n=7224 | 1996<br>n=7250 | 1997<br>n=6253 | 1998<br>n=5676 | 1999<br>n=5661 | 2000<br>n=5739 | 2004<br>n=5298 | 2005<br>n=4921 | 2006<br>n=4822 | 2007<br>n=5257 |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Number of episiotomies                                       | 1473           | 1434           | 1252           | 1195           | 1251           | 1367           | 1181           | 1093           | 1103           | 1130           |
| Incidence %  | 20.4           | 19.8           | 20.0           | 21.1           | 22.1           | 23.8           | 22.3           | 22.2           | 22.9           | 21.5           |
| Episiotomy with 3 <sup>rd</sup> /4 <sup>th</sup> degree tear | 14             | 25             | 8              | 9              | 5              | 17             | 15             | 23             | 47             | 49             |
| Incidence %  | 0.2            | 0.3            | 0.1            | 0.2            | 0.1            | 0.3            | 0.3            | 0.5            | 1.0            | 0.9            |
| All 3 <sup>rd</sup> /4 <sup>th</sup> degree tears            | 47             | 61             | 41             | 35             | 29             | 47             | 72             | 97             | 103            | 161            |
| Incidence %  | 0.7            | 0.8            | 0.7            | 0.6            | 0.5            | 0.8            | 1.3            | 2.0            | 2.1            | 3.1            |

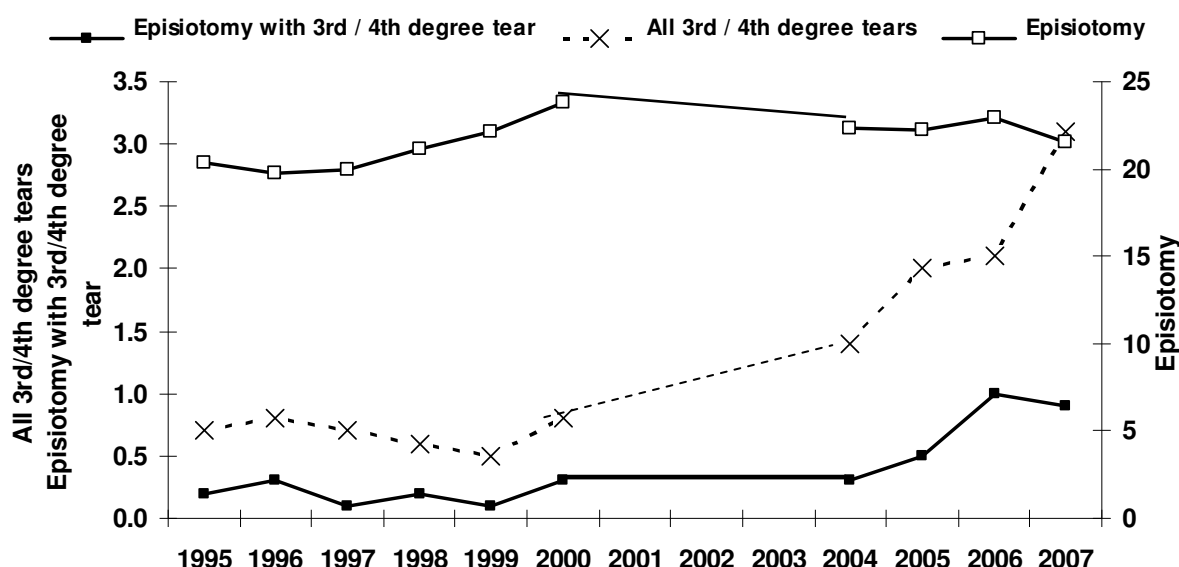


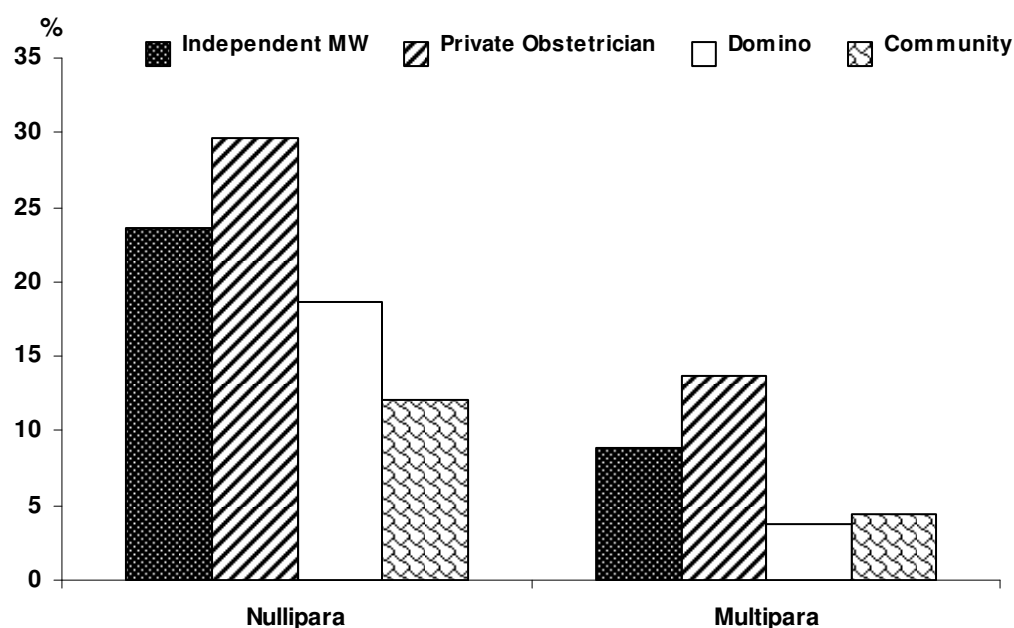
Figure 46: Perineal trauma rates

The episiotomy rate remains higher than the mean (17.58%) for those hospitals with level 3 NICU who benchmark with Women's Hospitals of Australasia (WHA). Of greater concern, the rising incidence of women suffering third and fourth degree tears continues. The possibility of improved reporting has been raised in last year's report but although this may exaggerate the apparent rise of incidence over previous years, the rise in the total rate to 3.1% of all vaginal births from 2.1% last year is likely to be real. In contrast, the total incidence of 3<sup>rd</sup> and 4<sup>th</sup> degree tears in hospitals reporting to WHA remains steady at 2.1%. Although the incidence of 3<sup>rd</sup> and 4<sup>th</sup> degree tears in association with episiotomy has reduced slightly in 2007, it occurs in 4.3% of all episiotomies.

The internationally published incidence for 3<sup>rd</sup> and 4<sup>th</sup> degree tears is up to 6% of all vaginal births<sup>1</sup>. However, up to 40% of women who sustain an anal sphincter injury report problems with anal incontinence six months after birth<sup>2</sup> and approximately 10% of those may need a secondary repair of their anal sphincter<sup>1</sup>. Given this long-term morbidity, despite our rate being within those reported internationally, there is a case for an audit of 3<sup>rd</sup> and 4<sup>th</sup> degree tears to determine whether steps can be taken to reduce our increasing rate. The issues are complex and possibly interdependent. For example, although private obstetricians have the highest episiotomy rates (31% cf 21% over all) they have the lowest (reported) 3<sup>rd</sup> and 4<sup>th</sup> degree (1.5% cf 3.1%) and vaginal wall tear rates (2.8% cf 3.8%)—see Appendix 6.

<sup>1</sup>Uustal Fornell E et al. Obstetric anal sphincter injury ten years after: subjective and objective long term effects. Br J Obstet Gynaecol 2005; 112: 312-316

<sup>2</sup>Fornell EK et al. Clinical consequences of anal sphincter rupture during vaginal birth. J Am Coll Surg 1996; 183: 553-558



**Figure 47: Episiotomy rate associated with spontaneous vaginal birth by LMC at birth and parity**

## 7.2 Postpartum haemorrhage

### Methods:

The data provided in the table below for postpartum haemorrhage are derived from data entered into the Labour and Birth database screen. The blood loss in labour and birth has not been combined with blood loss recorded postnatally as in numerous cases the total blood loss has been recorded in both places. This has had an increasing impact on reported PPH rates since 2005 when data began to be entered postnatally. **The impact of this is on the accuracy of reports of PPH rate in the 2005 and 2006 reports.** These data have been amended in this report. It is possible that the rates reported here using the current methodology underestimate PPH rate as bleeding in the postnatal ward may not be included.

### Findings

Table 46: Postpartum haemorrhage rate (1992-2007)

|                        | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2004 | 2005* | 2006* | 2007* |
|------------------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| Total Births           | 8315 | 8690 | 8812 | 9125 | 9157 | 8055 | 7531 | 7501 | 7827 | 7491 | 7194  | 7212  | 7695  |
| Primary PPH (≥500mls)  | 881  | 1211 | 1390 | 1655 | 1633 | 1882 | 1818 | 1921 | 2088 | 2056 | 2139  | 2302  | 2507  |
| Incidence %            | 10.6 | 13.9 | 15.8 | 18.1 | 17.8 | 23.4 | 24.1 | 25.6 | 26.7 | 27.4 | 29.7  | 31.9  | 32.6  |
| Primary PPH (≥1000mls) | 127  | 249  | 227  | 267  | 344  | 303  | 318  | 381  | 423  | 262  | 350   | 351   | 410   |
| Incidence %            | 1.5  | 2.9  | 2.6  | 2.9  | 3.8  | 3.8  | 4.2  | 5.1  | 5.4  | 3.5  | 4.9   | 4.9   | 5.3   |

\* Data corrected in 2007. See methodology above.

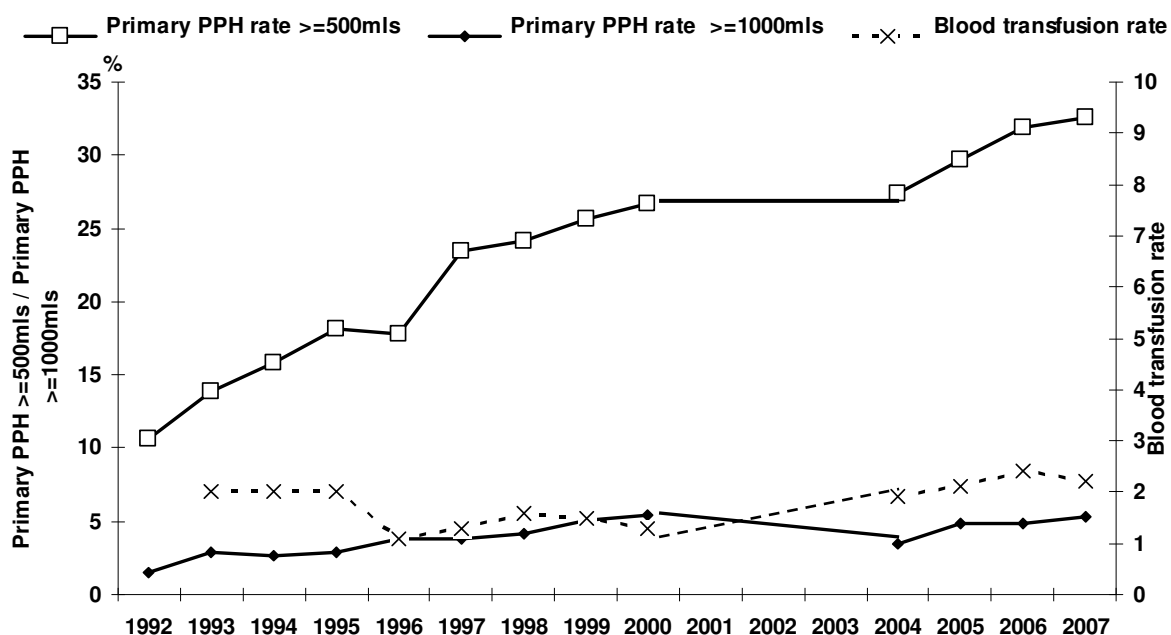


Figure 48: Postpartum haemorrhage transfusion rates (1992-2007)

Last year's report raised concern about the continuing rise in the rate of 1000ml primary PPH rates. While a slow increase in rate appears to have occurred, this is probably consistent with the concurrent increase in caesarean section rates. Postpartum transfusion occurred in only 2.2% of women with blood loss between 500 and 999 mls, but 24.6% of women with loss of 1000ml or greater.

The rise in the  $\geq 500\text{ml}$  rate, considered in the context of a relatively stable rate of  $\geq 1000\text{ml}$  PPH is likely to be in part explained by an increasing clinical acceptance that average blood loss for caesarean section is at least 500ml.

**Table 47: Blood transfusion**

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

**Table 48: Postpartum blood loss by mode of birth**

|   | <b>Spontaneous vaginal birth<br/>n=4282</b> |      | <b>Operative vaginal birth<br/>n=975</b> |      | <b>CS emergency<br/>n=1408</b> |      | <b>CS elective<br/>n=1030</b> |      | <b>Total<br/>n=7695</b> |      |
|---|---|------|--|------|--------------------------------|------|-------------------------------|------|-------------------------|------|
|   | n   | %    | n  | %    | n                              | %    | n                             | %    | n                       | %    |
| <b>PPH <math>\geq 500\text{mls}</math></b>  | 514   | 12.0 | 224                                      | 25.0 | 1071                           | 76.1 | 698                           | 67.8 | 2507                    | 32.6 |
| <b>PPH <math>\geq 1000\text{mls}</math></b> | 128   | 3.0  | 44                                       | 4.5  | 166                            | 11.8 | 72                            | 7.0  | 410                     | 5.3  |
| <b>Post partum blood transfusion</b>        | 55  | 1.3  | 35                                       | 3.6  | 57                             | 4.1  | 22                            | 2.1  | 169                     | 2.2  |



## 7.3 Emergency peripartum hysterectomy

### Methods

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

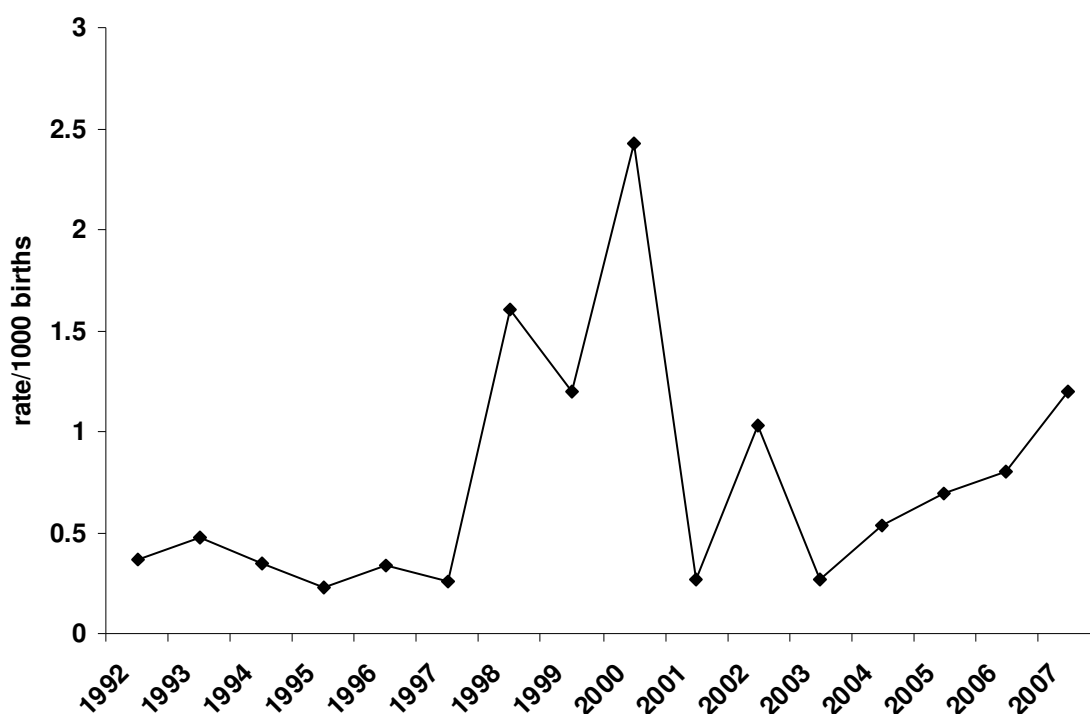


Figure 49: Emergency peripartum hysterectomy rates/1000 births (1992-2007)

### Findings

There were 9 emergency peripartum hysterectomies in 2007. This is a rate of 1.2/1000 births, which is consistent with rates before and following the period from 1998-2000, and is consistent with international rates.

## 7.4 Neonatal outcomes by mode of birth

### Methods

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

**Table 49: Neonatal morbidity overall and by mode of birth (all gestations)**

|                     | Spontaneous vertex<br>n=4268 |     | Vaginal breech<br>n=72 |      | Forceps birth<br>n=289 |      | Ventouse birth<br>n=697 |      | CS elective<br>n=1078 |      | CS emergency<br>n=1471 |      | Total<br>n=7875 |      |
|---------------------|------------------------------|-----|------------------------|------|------------------------|------|-------------------------|------|-----------------------|------|------------------------|------|-----------------|------|
|                     | n                            | %   | n                      | %    | n                      | %    | n                       | %    | n                     | %    | n                      | %    | n               | %    |
| 1 min Apgar <4      | 31                           | 0.7 | 14                     | 19.4 | 7                      | 2.4  | 6                       | 0.9  | 9                     | 0.8  | 69                     | 4.7  | 136             | 1.7  |
| 1 min Apgar <7      | 228                          | 5.3 | 31                     | 43.1 | 31                     | 10.7 | 80                      | 11.5 | 68                    | 6.3  | 251                    | 17.1 | 689             | 8.8  |
| 5 min Apgar <7      | 34                           | 0.8 | 8                      | 11.1 | 1                      | 0.4  | 4                       | 0.6  | 6                     | 0.6  | 51                     | 3.5  | 104             | 1.3  |
| Admitted to NICU    | 322                          | 7.5 | 33                     | 45.8 | 29                     | 10.0 | 41                      | 5.9  | 124                   | 11.5 | 316                    | 21.5 | 865             | 11.0 |
| ≥2 days in NICU     | 290                          | 6.8 | 32                     | 44.4 | 27                     | 9.3  | 35                      | 5.0  | 118                   | 11.0 | 297                    | 20.2 | 799             | 10.2 |
| Stillbirths (/1000) | 47                           | 11  | 22                     | 30.6 | 2                      | 7    | 1                       | 1    | 3                     | 3    | 7                      | 0.5  | 82              | 1.0  |

**Table 50: Neonatal morbidity by mode of birth in term or post term (≥ 37 weeks) babies**

|                     | Spontaneous vertex<br>n=3897 |     | Vaginal breech<br>n=13 |      | Forceps birth<br>n=260 |     | Ventouse birth<br>n=665 |      | CS elective<br>n=965 |     | CS emergency<br>n=1171 |      | Total<br>n=6971 |     |
|---------------------|------------------------------|-----|------------------------|------|------------------------|-----|-------------------------|------|----------------------|-----|------------------------|------|-----------------|-----|
|                     | n                            | %   | n                      | %    | n                      | %   | n                       | %    | n                    | %   | n                      | %    | n               | %   |
| 1 min Apgar <4      | 21                           | 0.5 | 2                      | 15.4 | 2                      | 0.8 | 6                       | 0.9  | 7                    | 0.7 | 35                     | 3.0  | 73              | 1.1 |
| 1 min Apgar <7      | 161                          | 4.1 | 6                      | 46.2 | 24                     | 9.2 | 77                      | 11.6 | 47                   | 4.9 | 139                    | 11.9 | 454             | 6.5 |
| 5 min Apgar <7      | 17                           | 0.4 | 1                      | 7.7  | 0                      |     | 4                       | 0.6  | 3                    | 0.3 | 20                     | 1.7  | 45              | 0.7 |
| Admitted to NICU    | 130                          | 3.3 | 3                      | 23.1 | 10                     | 3.9 | 29                      | 4.4  | 55                   | 5.7 | 95                     | 8.1  | 322             | 4.6 |
| ≥2 days in NICU     | 104                          | 2.7 | 3                      | 23.1 | 8                      | 3.1 | 24                      | 3.6  | 50                   | 5.2 | 82                     | 7.0  | 271             | 3.9 |
| Stillbirths (/1000) | 11                           | 0.3 | 0                      |      | 1                      | 0.4 | 1                       | 0.2  | 2                    | 0.2 | 3                      | 0.3  | 18              | 0.3 |

**Table 51: Neonatal morbidity in term or post term (≥ 37 weeks) babies (2000-2007)**

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

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

# Chapter 8

## POSTNATAL CARE



## 8 POSTNATAL CARE

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

### 8.1 Infant feeding

#### Baby Friendly Hospital Certificate awarded

Breastfeeding statistics for 2007 reflect the significant educational focus on implementing the World Health Organisation (WHO) and UNICEF's Ten Steps to Successful Breastfeeding. The training of all maternity services staff in breastfeeding management appropriate to their area of work was achieved. The increase to 77.1% exclusive breastfeeding on discharge demonstrated National Women's had reached the Global Criteria for application for a Baby Friendly Hospital Initiative audit. The audit was completed in December 2007, and the Baby Friendly Certificate awarded in early 2008.

#### Methods

The breastfeeding status of infants born at National Women's is collected at the time of discharge from the hospital, irrespective of whether this is immediately postpartum from Labour and Birthing Suite, or following a post natal stay. Babies admitted to the Neonatal Intensive Care Unit are excluded from the data presented here. There were 329 (4.8%) women for whom discharge breastfeeding data were unavailable. These women have been excluded from the analyses presented here.

Data are also collected at the time of postnatal care discharge for those women and babies who have midwifery post discharge care provided by National Women's. This is approximately 5-6 weeks post birth.

#### Findings

In 2007, the exclusive breastfeeding rate on discharge exceeded the Ministry of Health target of 75%.

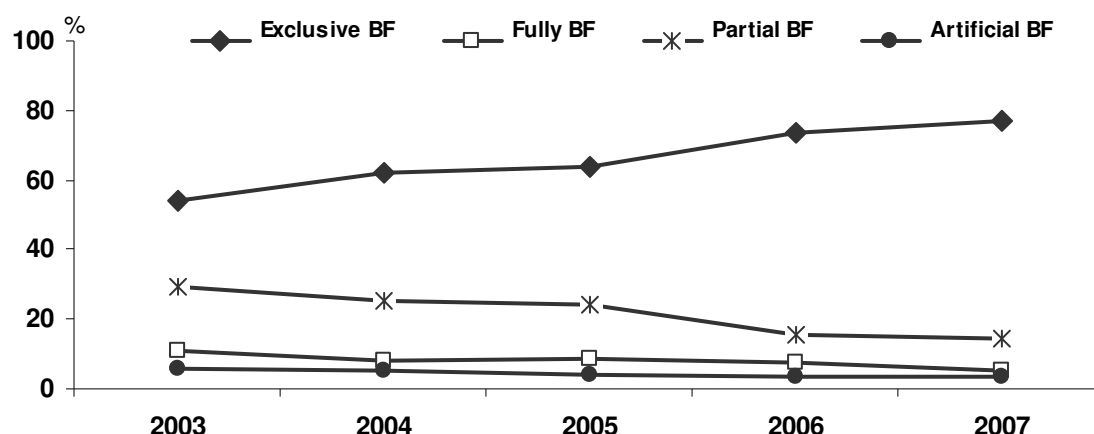


Figure 50: Method of infant feeding at discharge from NW (2003-2007)

Initiatives to reach the target included:

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

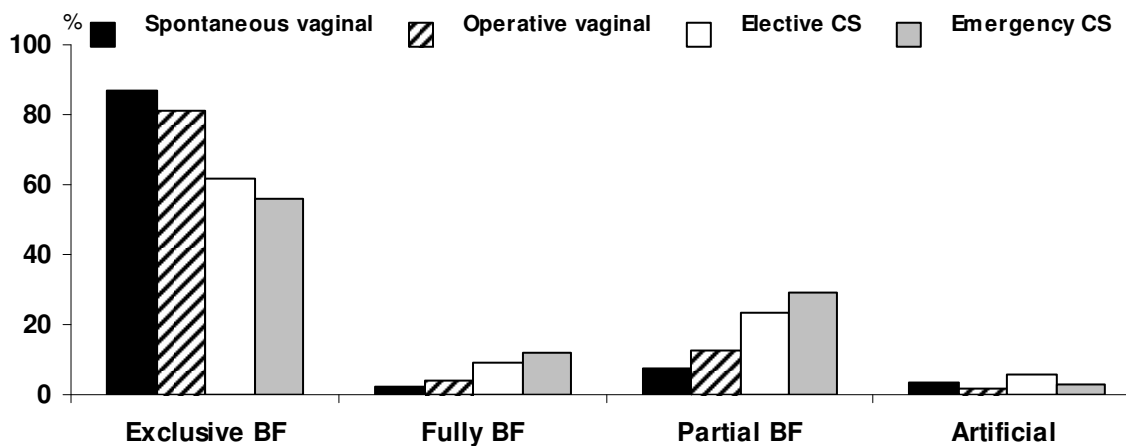


Figure 51: Exclusive breastfeeding by mode of birth

The increase in exclusive breastfeeding is demonstrated across all modes of birth and reflects the culture of early initiation of breastfeeding. A reduction in the use of supplements during the short recovery stage has contributed to the increase in exclusive breastfeeding for women having an elective caesarean section.

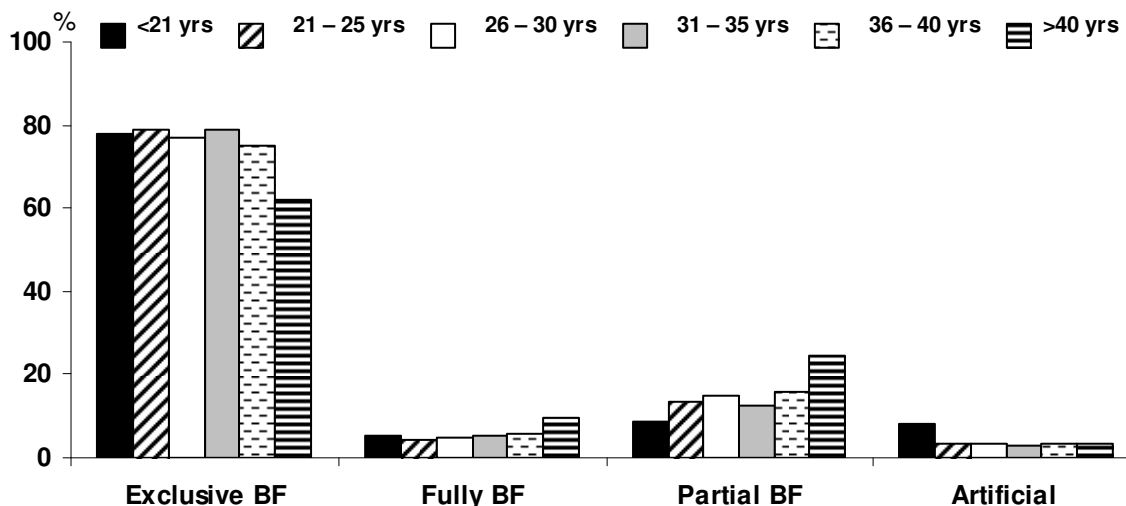


Figure 52: Infant feeding at discharge from NW by maternal age.

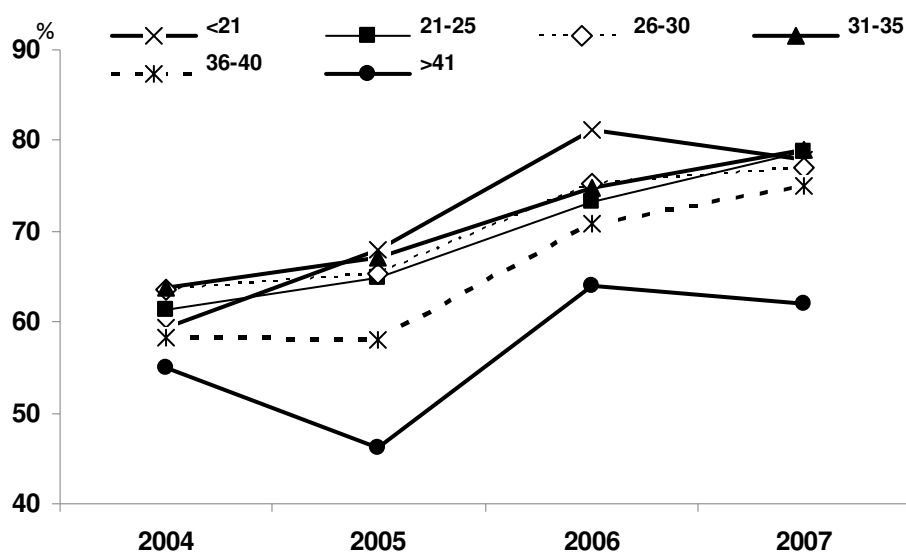


Figure 53: Exclusive breastfeeding rates by age (2004-2007)

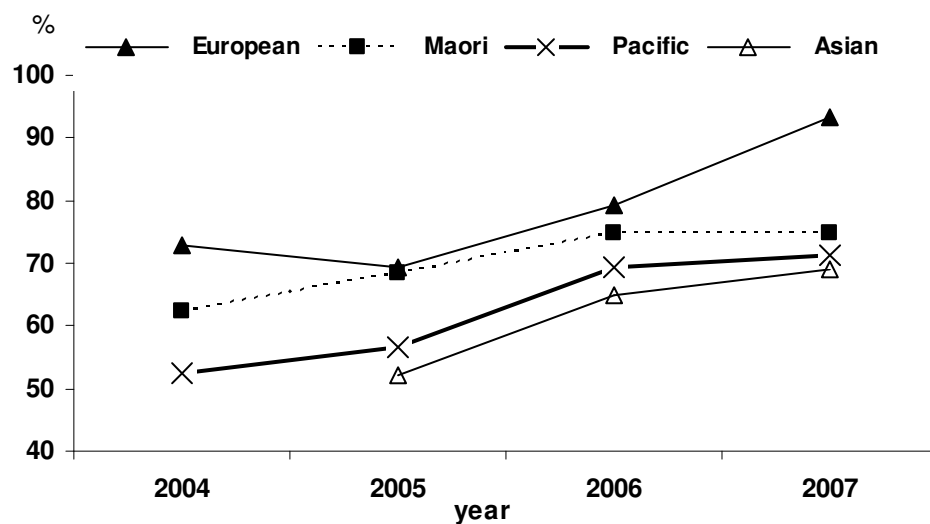


Figure 54: Exclusive breastfeeding rates by ethnicity (2004-2007)

The increase in exclusive breastfeeding over the years is spread across all maternal ages and ethnicities.

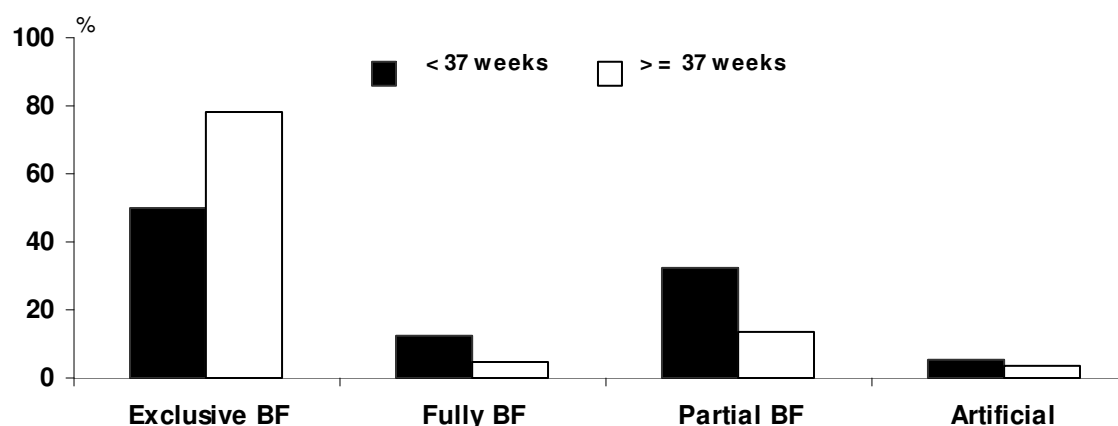


Figure 55: Infant feeding at discharge from NW by gestation at birth

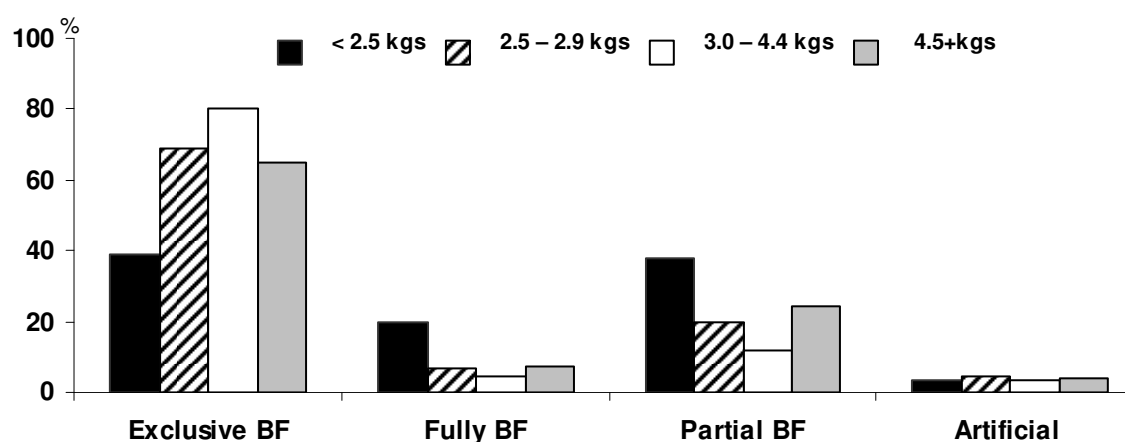


Figure 56: Infant feeding at discharge from NW by fetal birthweight

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

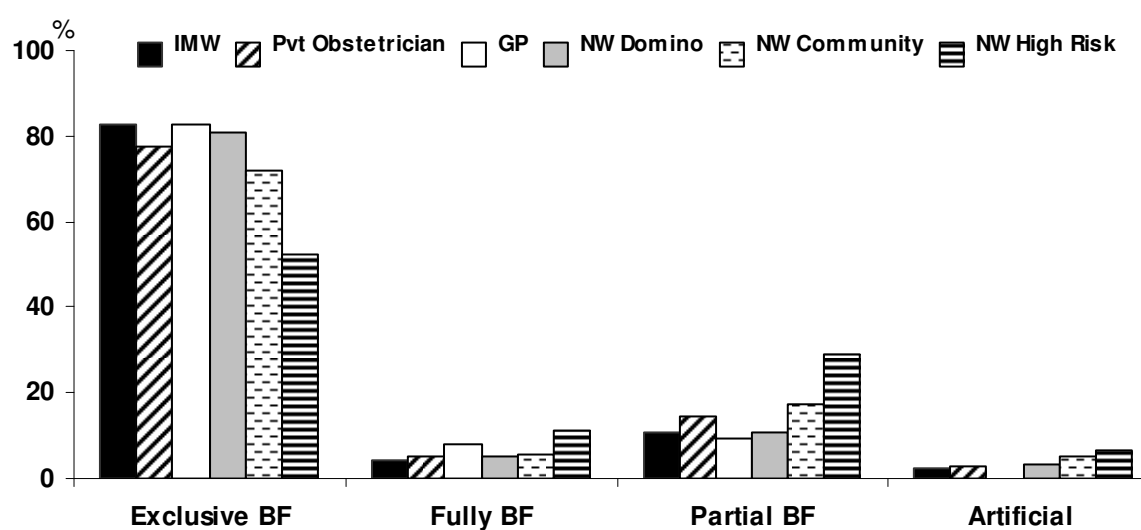
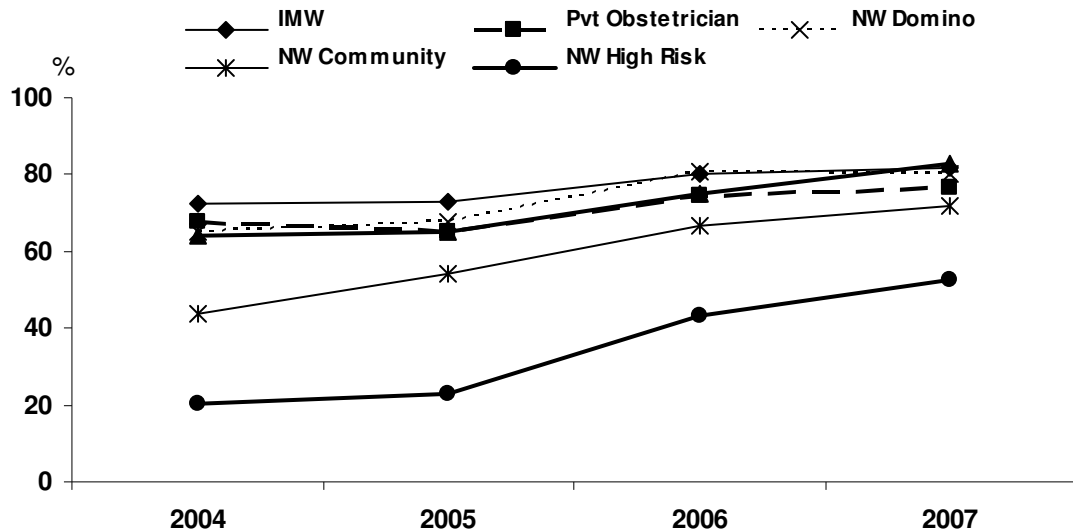


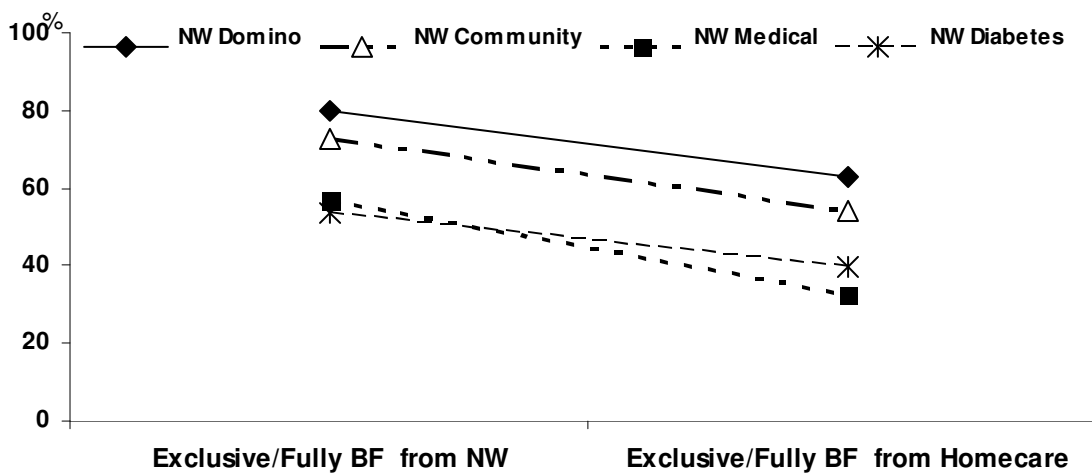
Figure 57: Infant feeding at discharge from NW by LMC





**Figure 58: Exclusive breastfeeding rate at discharge from NW by LMC (2004-2007)**

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



**Figure 59: Change in combined exclusive and fully breastfeeding rate from hospital discharge to Homecare (4-6 weeks) discharge.**

This figure demonstrates the extent to which full and exclusive breastfeeding rates drop by the time of Homecare discharge. The figure only includes those women cared for by NW Homecare services.

The increase in exclusive breastfeeding rates on discharge from the facility are associated with a similar increase in breastfeeding rates at discharge from Homecare for all NW LMC groups compared to 2006 data. In line with this, the proportion of women artificial feeding at Homecare discharge is lower than in 2006.

With the introduction of the Healthy Eating Health Action MOH project and support for further community based breastfeeding support it is anticipated the needs of women after discharge home will be further addressed in the future.

## **Summary**

National Women's are proud to have achieved Baby Friendly Hospital status. This followed hard work by the BFHI Implementation Committee. Some of this work was staff education, recording community consultation on the Breastfeeding Policy, creating educational displays on breastfeeding, and providing appropriate information in each woman's room to assist with establishing breastfeeding. The appointment of two Lactation Consultants to the ADHB Bureau for casual additional shifts enabled the 2 Maternity Services (1.8FTE) and 1 NICU (0.6FTE) Lactation Consultants to focus on preparing for the BFHI audit in December.

The Breast Milk Substitutes Room remains locked and access to bottles and teats is restricted to prevent the inappropriate use of supplements or bottles and teats. The WHO Code on the Marketing of Breast Milk Substitutes is fully implemented at National Women's. Following the aims of the Baby Friendly Hospital Initiative women who for various reasons decide to artificially feed their babies are also given the information they need to make an informed decision, informed of the risks of formula use and how to safely prepare formula to reduce the risks of contamination.

The achievement of 77.1% exclusive breastfeeding on discharge from the National Women's facility remains a significant milestone.

## 8.2 Postnatal admissions

### Methods

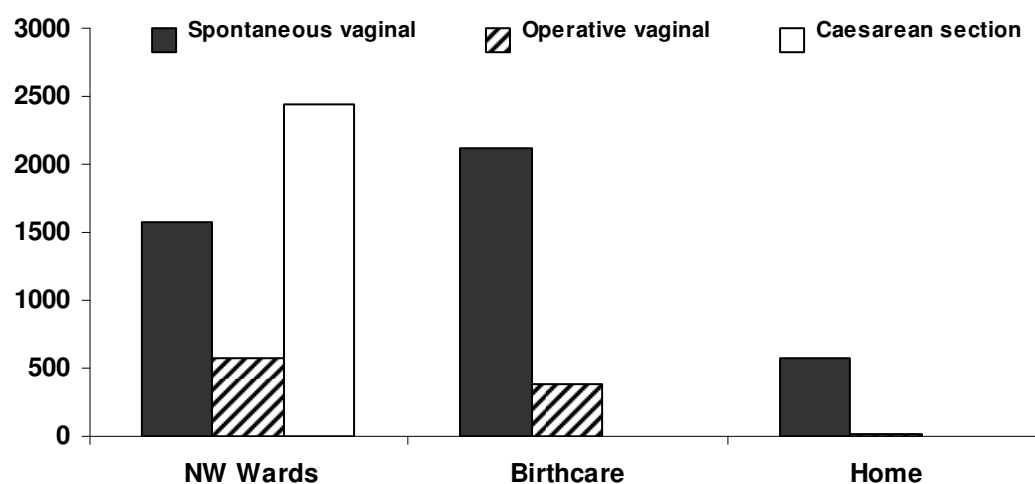
Postnatal care following birth is provided at National Women's for women requiring secondary care or closer observation for themselves or their babies. The contractual arrangement for Birthcare Auckland to provide postnatal primary care continues as before.

### Findings

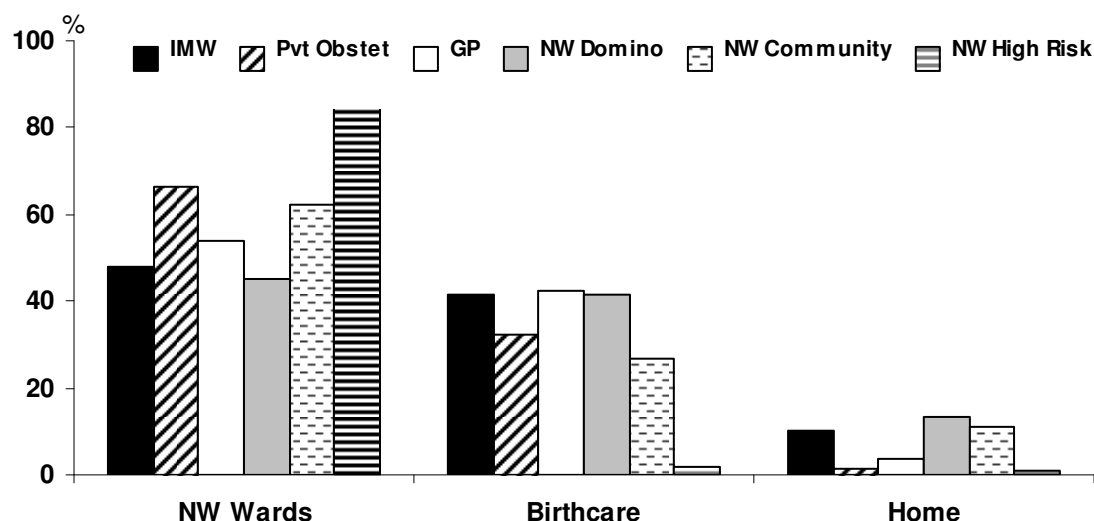
**Table 52: Maternal destination immediately after birth**

|                    | 2004<br>n = 7491 |      | 2005<br>n = 7194 |      | 2006<br>n = 7212 |      | 2007<br>n = 7695 |      |
|--------------------|------------------|------|------------------|------|------------------|------|------------------|------|
|                    | n                | %    | n                | %    | n                | %    | n                | %    |
| <b>NW Wards</b>    | 4618             | 61.6 | 4286             | 59.6 | 4384             | 60.8 | 4590             | 59.6 |
| <b>Birthcare</b>   | 2245             | 29.9 | 2354             | 32.7 | 2322             | 32.2 | 2493             | 32.4 |
| <b>Home</b>        | 539              | 7.2  | 510              | 7.1  | 483              | 6.7  | 587              | 7.6  |
| <b>Other Units</b> | 89               | 1.2  | 44               | 0.6  | 23               | 0.3  | 25               | 0.3  |

The increased number of births in 2007 has resulted in an increase of 4.7% in the number of women cared for on the postnatal wards. An overall increase of 11.7% in the number of transfers to Birthcare include 171 more women directly from Labour & Birth Suite, and 174 more transferring after a postnatal stay at National Women's.

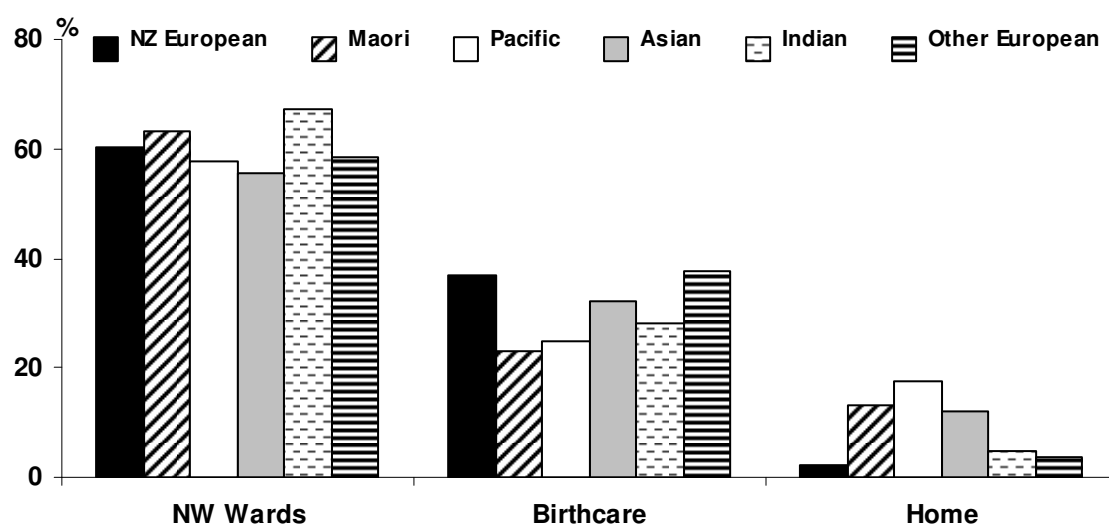


**Figure 60: Maternal destination immediately after birth by mode of birth**



**Figure 61: Postnatal destination immediately after birth by LMC**

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



**Figure 62: Postnatal destination immediately after birth by ethnicity**

The percentage of Pacific women staying at National Women's has reduced by 4.6% with a corresponding increase of 4.3% for those going home directly following birth. Maori and Pacific women remain underrepresented among women transferring to Birthcare immediately postpartum.

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

Changes to collection and increased checking of the reasons for postnatal admission have given a more accurate picture as to why women having spontaneous vaginal births are admitted to National Women's postnatally rather than transferring to Birthcare.

**Table 53: Reason for admission to NW postnatal wards among women having a spontaneous vaginal birth**

|                                   | n= 1745 |      |
|-----------------------------------|---------|------|
|                                   | n       | %    |
| Neonatal reason*                  | 759     | 43.4 |
| Postpartum haemorrhage            | 326     | 18.7 |
| Diabetes                          | 100     | 5.7  |
| Hypertensive disorder             | 87      | 5.0  |
| Perineal trauma                   | 151     | 8.6  |
| Retained placenta/products        | 37      | 2.1  |
| Fainting /dizziness               | 37      | 2.1  |
| Other listed reasons <sup>†</sup> | 248     | 14.2 |

\* includes admission to NICU, low birth weight (<2500g), requiring paediatrician care, stillbirth, neonatal death.

<sup>†</sup> includes epidural complications, infection, tubal ligation, psychiatric disorders, social reasons, medical history of PPH and lack of beds at Birthcare.

**Table 54: Length of stay by mode of birth among admissions to NW wards**

|   | n= 4590 |      | Length of stay<br>Days |
|---|---------|------|------------------------|
|   | n       | %    | Median                 |
| Caesarean section birth - discharged to home                  | 2132    | 46.4 | 4.2                    |
| Caesarean section birth - transferred to Birthcare            | 229     | 5.0  | 1.3                    |
| Caesarean section birth - transferred to other destinations   | 77      | 1.7  | 4.8                    |
| Operative vaginal birth - discharged to home                  | 337     | 7.3  | 3                      |
| Operative vaginal birth - transferred to Birthcare            | 230     | 5.0  | 0.7                    |
| Operative vaginal birth - transferred to other destinations   | 10      | 0.2  | 2.5                    |
| Spontaneous vaginal birth - discharged to home                | 1195    | 26.0 | 2.1                    |
| Spontaneous vaginal birth - transferred to Birthcare          | 308     | 6.7  | 0.7                    |
| Spontaneous vaginal birth - transferred to other destinations | 72      | 1.6  | 2.1                    |

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

### 8.2.1 Postnatal readmissions

In 2007 any readmission less than 3 hours duration was considered a postnatal assessment and is not included in this section.

In 2007, 362 (4.7%) women of the 7695 women who gave birth at National Women's had postnatal readmissions, either after their initial postnatal stay or after being discharged to home or other postnatal facilities. There were 390 readmissions: 335 women had one readmission, 26 women had two readmissions and 1 woman had three readmissions. Primipara were more likely to be readmitted than multipara.

The length of time between birth and readmission varied from 8 hours to 74 days with a median of 7.4 days, with the length of stay varying from 3 hours to 14.8 days with a median of 1.8 days.

**Table 55: Reasons for readmission**

|                              | n= 390 |      |
|------------------------------|--------|------|
|                              | n      | %    |
| Neonatal admission*          | 107    | 27.4 |
| Infection <sup>†</sup>       | 76     | 19.5 |
| Breast <sup>‡</sup>          | 56     | 14.4 |
| Wound breakdown <sup>§</sup> | 32     | 8.2  |
| Postpartum haemorrhage       | 45     | 11.5 |
| Hypertensive disorder        | 10     | 2.6  |
| Retained products            | 17     | 4.4  |
| Epidural complications       | 5      | 1.3  |
| Other <sup>¶</sup>           | 42     | 10.8 |

\* includes babies requiring admission to NICU and babies admitted to the wards for phototherapy or feeding problems

<sup>†</sup> includes infected caesarean section wound, urinary tract infection and other conditions where infection is suspected/diagnosed eg endometritis

<sup>‡</sup> includes mastitis, breast abscess or other conditions of the breast requiring hospital admission

<sup>§</sup> breakdown of caesarean section or perineal wound requiring further medical intervention

<sup>¶</sup> other reasons for readmission include abdominal pain, anaemia, psychiatric reasons, deep vein thrombosis, other maternal conditions e.g. cardiac complications, asthma.

Improved data checking has reduced the number of “other” with a corresponding increase in specified reasons for admission.

### 8.2.2 Postnatal admissions where births occurred at other facilities

Of the 95 postnatal admissions of women who birthed elsewhere 33% birthed at Waitemata DHB facilities, 12% at Counties Manukau facilities and 18% at Birthcare with the remainder coming from outside the greater Auckland area. Three women had two admissions.

**Table 56: Reasons for admission where birth occurred at other facilities**

|                        | n= 95 |      |
|------------------------|-------|------|
|                        | n     | %    |
| Neonatal admission     | 72    | 75.9 |
| Postpartum haemorrhage | 4     | 4.2  |
| Breast                 | 4     | 4.2  |
| Retained products      | 4     | 4.2  |
| Obstetric trauma       | 3     | 3.2  |
| Infection              | 2     | 2.1  |
| Other                  | 6     | 6.3  |

**Chapter**

**9**

## **NEWBORN SERVICES**





---

## 9 NEWBORN SERVICES

---

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

Admissions and all other data in this chapter except occupancy relate to babies born in the 2007 calendar year. Occupancy data relate to the unit occupancy for each day in 2007.

In the presentation of the data in this chapter there are a number of comparisons with matched data from other sources. Consequently the denominator used variably relates to (1) all babies born in 2007 and admitted to the NW NICU, (2) inborn (NW) babies and (3) babies born in 2007 assigned to NW by the Australia New Zealand Neonatal Network (ANZNN).

### **Australia New Zealand Neonatal Network (ANZNN)**

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

- <1500g birth weight,
- <32 weeks gestation,
- requires assisted ventilation (IPPV, CPAP or HFOV) or
- has major surgery (defined as opening of a body cavity).

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

ANZNN was established in 1994. 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.

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

**Table 57: Characteristics of <32 week or <1500 g babies by ANZNN status**

| <32 weeks or <1500g  |                |      |                |      |                   |      |
|----------------------|----------------|------|----------------|------|-------------------|------|
|                      | Total<br>n=220 |      | ANZNN<br>n=199 |      | Non ANZNN<br>n=21 |      |
| Gestation (weeks)    | n              | %    | n              | %    | n                 | %    |
| <24                  | 5              | 2.3  | 5              | 100  | 0                 | 0    |
| 24-25                | 28             | 12.7 | 18             | 64.3 | 10                | 35.7 |
| 26-27                | 47             | 21.4 | 41             | 87.2 | 6                 | 12.8 |
| 28-29                | 55             | 25.0 | 53             | 96.4 | 2                 | 3.6  |
| 30-31                | 64             | 29.1 | 61             | 95.3 | 3                 | 4.7  |
| 32-36                | 21             | 9.5  | 21             | 21   | 0                 | 0    |
| Weight (g)           |                |      |                |      |                   |      |
| <500                 | 1              | 0.5  | 1              | 100  | 0                 |      |
| 500-749              | 27             | 12.3 | 19             | 70.4 | 8                 | 29.6 |
| 750-999              | 48             | 21.8 | 42             | 87.5 | 6                 | 12.5 |
| 1000-1249            | 53             | 24.1 | 49             | 92.5 | 4                 | 7.6  |
| 1250-1499            | 5              | 2.3  | 54             | 98.2 | 1                 | 1.9  |
| 1500-1999            | 33             | 15.0 | 31             | 93.9 | 2                 | 6.1  |
| 2000-2499            | 3              | 1.4  | 3              | 100  | 0                 | 0    |
| Birthplace           |                |      |                |      |                   |      |
| National Women's     | 186            | 84.5 | 186            | 100  | 0                 |      |
| Born before arrival  | 4              | 1.8  | 3              | 75.0 | 1                 | 25.0 |
| Northland            | 5              | 2.3  | 5              | 100  | 0                 |      |
| Waitemata DHB        | 3              | 1.4  | 3              | 100  | 0                 |      |
| Counties Manukau DHB | 11             | 5.0  | 0              |      | 11                | 100  |
| Waikato              | 2              | 0.9  | 0              |      | 2                 | 100  |
| Wellington           | 2              | 0.9  | 0              |      | 2                 | 100  |
| Christchurch         | 3              | 1.4  | 0              |      | 3                 | 100  |
| Dunedin              | 1              | 0.5  | 0              |      | 1                 | 100  |
| Palmerston North     | 1              | 0.5  | 0              |      | 1                 |      |
| Wanganui             | 2              | 0.9  | 2              |      | 0                 |      |

## 9.1 Inborn live birth at National Women's 1959-2007

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

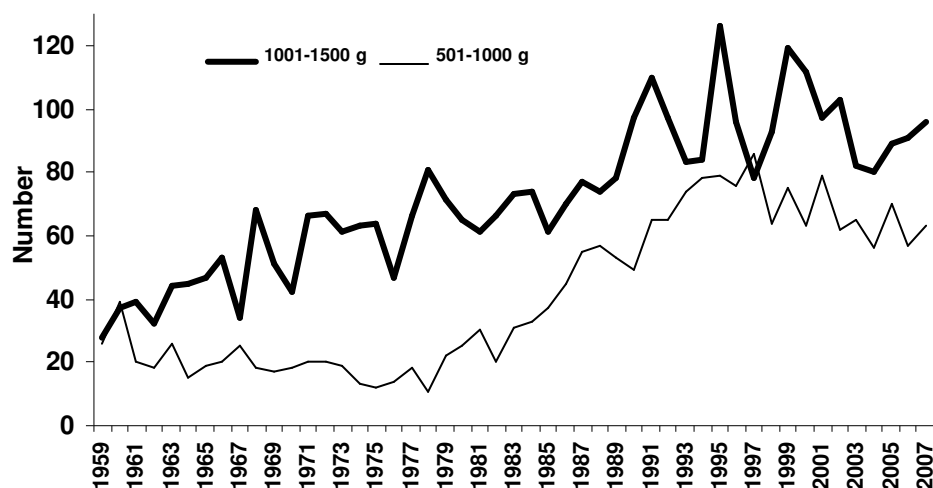


Figure 63: Number of inborn live-births ≤1500g from 1959 to 2007 (excludes BBAs).

## 9.2 NICU occupancy

For 2007, there has been a modest increase in occupancy that includes both an increase in bed-days for inborn infants born before 28 weeks gestation and from 32-36 weeks gestation.

Table 58: Occupancy (baby days) on NICU (1999 – 2007)

|                  | 1999  | 2000  | 2001  | 2002  | 2003  | 2004  | 2005  | 2006  | 2007  |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>Baby days</b> | 18407 | 20652 | 20108 | 20551 | 19249 | 14958 | 14541 | 14212 | 15228 |

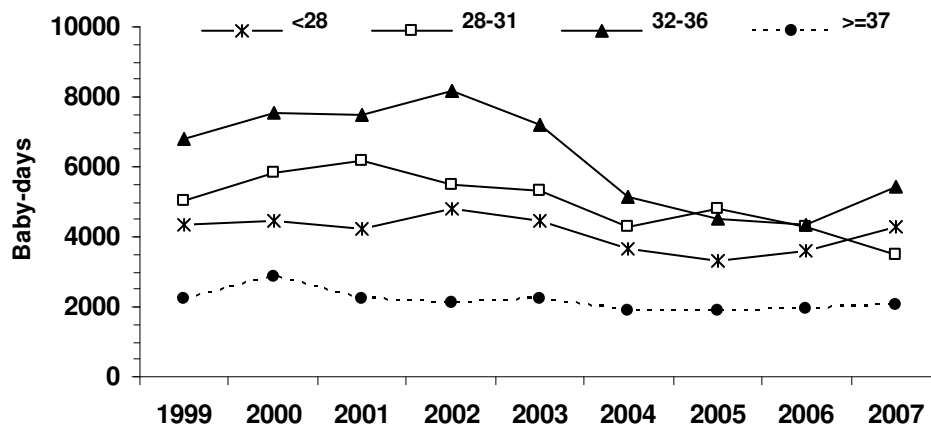


Figure 64: Occupancy (baby days per year) of NICU by gestational age

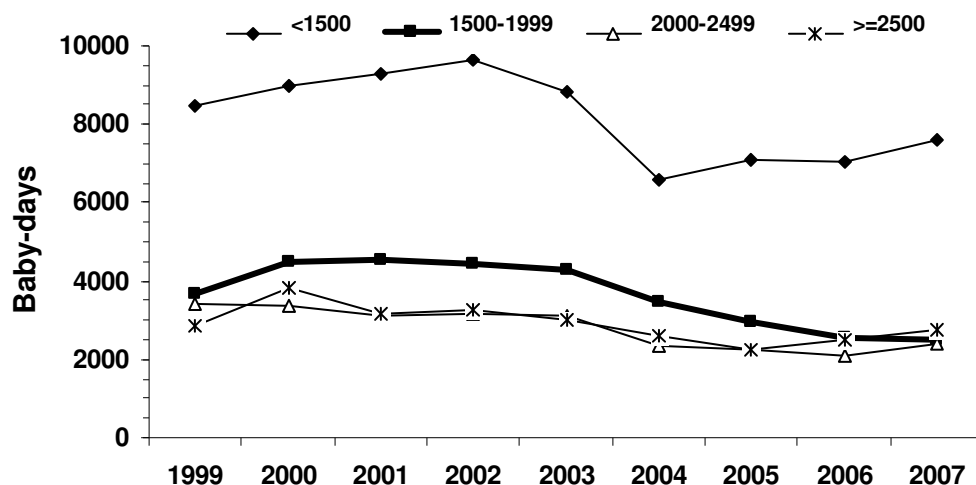


Figure 65: Occupancy (baby days per year) of NICU by birth weight

### 9.3 Admissions to NICU

The admissions to NW NICU peaked in the mid 1990s and had fallen somewhat for several years after this. However, the opening of two local Level 2 neonatal units was the chief reason for the decreased number of admissions in 2004-6. In 2007 there was a small increase in admissions, compared with the preceeding two years.

The North Shore Hospital Neonatal Unit opened in October 2003 and Waitakere Hospital in July 2004. These two Waitemata units admit babies >1500g and >31 weeks gestation and will administer CPAP.

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

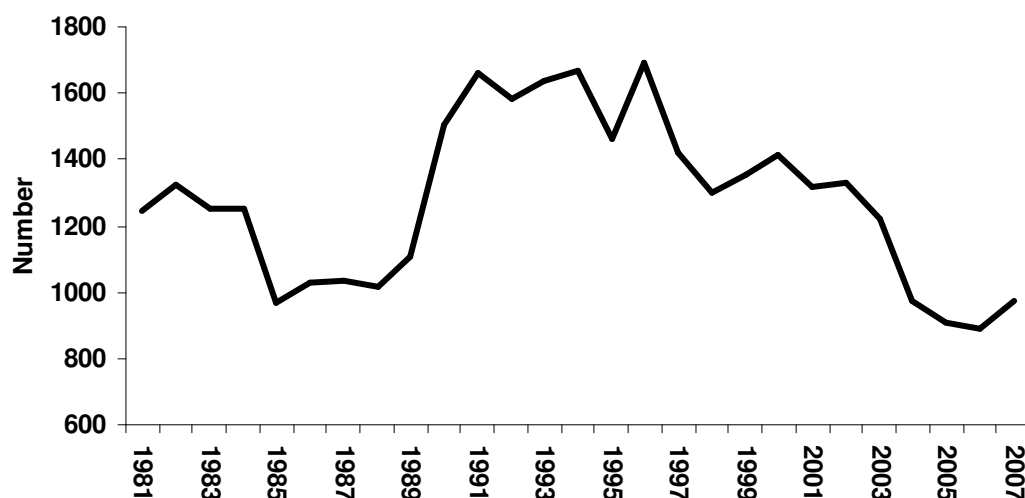


Figure 66: Admissions to NICU 1981-2007

Table 59: NICU admissions by year

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

### 9.3.1 Admissions to NICU by gestation and birth weight

Review of admissions by gestational age and birth weight category demonstrates that the previously mentioned reduction in admissions is largely due to fewer admissions of babies  $\geq 32$  weeks gestation. The rate of admission for babies below 32 weeks gestation or below 1500g birth weight has been fairly constant over the last decade.

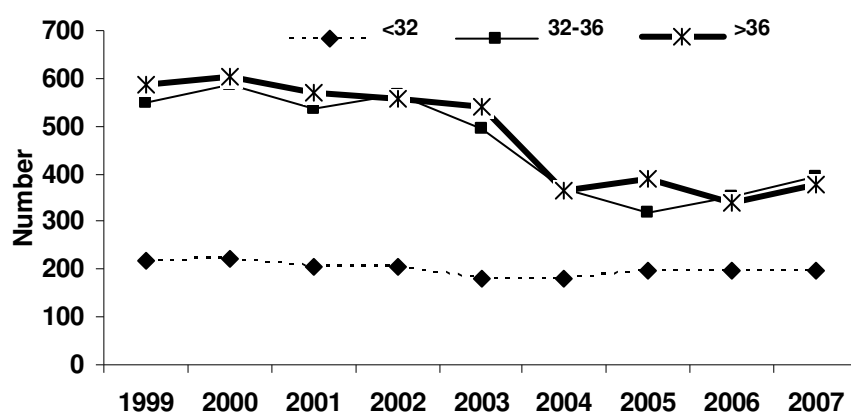


Figure 67: Admissions to NICU by gestational age

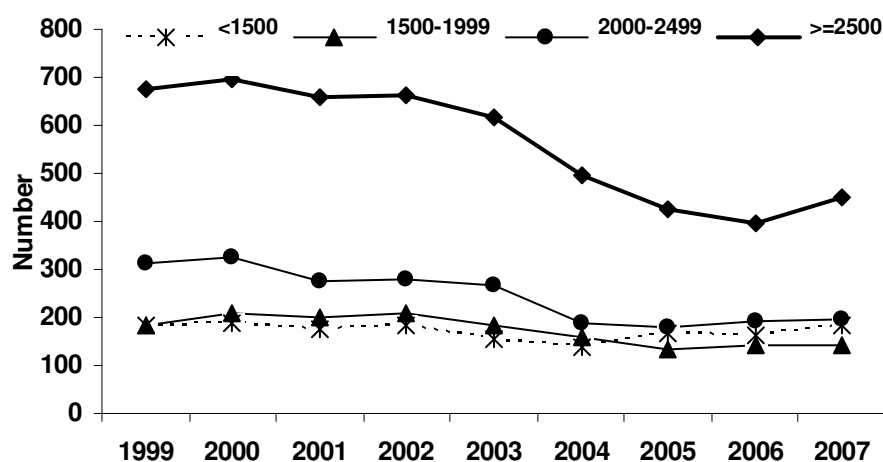
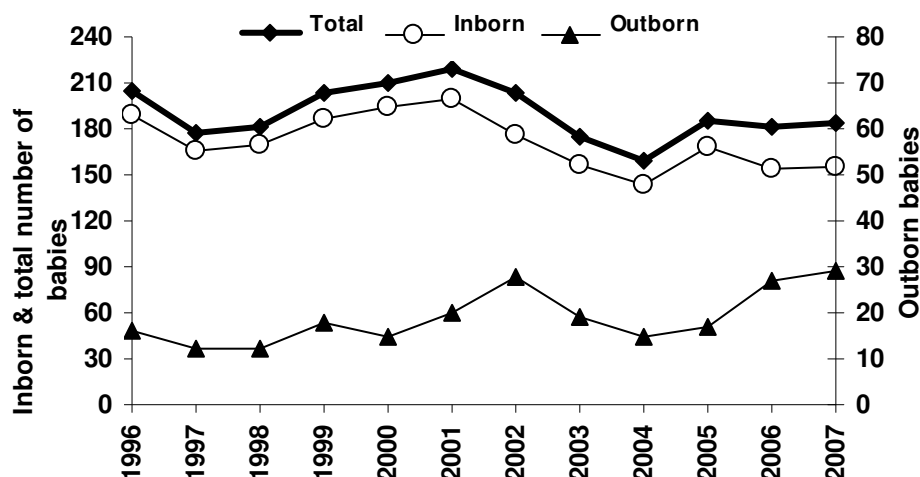


Figure 68: Admissions to NICU by birth weight

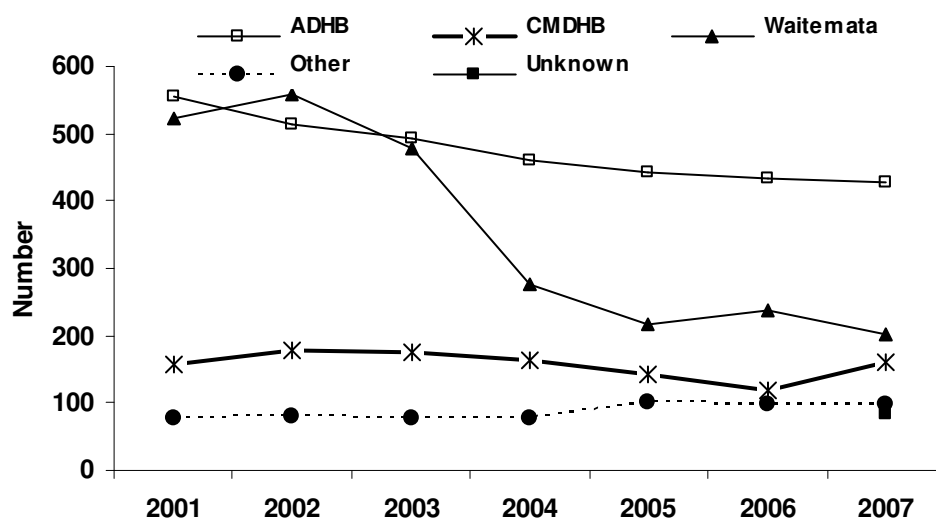


**Figure 69: Admissions to NICU of <1500g babies (VLBW) by place of birth** (outborn includes BBAs).

The number of VLBW infants admitted to NW peaked in 2001 and then fell over the next three years. However, this decrease appears to have come to an end with total admissions in this group remaining stable over the last three years. The proportion of outborn infants is low but increased to 17% for 2007.

### 9.3.2 Admissions to NICU by domicile of mother

In addition to the fall in admissions of babies whose mothers are domiciled in the Waitemata District Health Board area there has been a modest decline in admissions of babies whose mothers live in the Auckland District Health Board area since 2001.



**Figure 70: Admissions to NICU by maternal domicile**

### 9.3.3 Admissions to NICU by ethnicity of baby

The majority of NICU admissions are NZ European; however the percentage has fallen from 54% to 41.3% overall including 41% of preterm and 41.8% of term infants respectively. The next largest single ethnic group is Maori with 15.7% of admissions, which is increased from 13% in 2006. As in 2006, Maori ethnicity is more commonly associated with preterm

admission (16.5%) compared with term admission (13.8%). Pacific people also represented a greater proportion of overall admissions than in 2006 (14.3% c.f. 12%) with 13.8% of preterm and 15.1% of term admissions. These changes in ethnicity are probable due to baby's ethnicity being used this year not the mother's ethnicity.

### 9.3.4 Reasons for admission to NICU

Prematurity (44%) and respiratory distress (23%) remain the commonest reasons for admission to NICU. However, 78 babies (8%) were admitted because of congenital anomalies. Twenty-six babies (2.7%) including 21 term infants were admitted primarily for hypoglycaemia. The full list is presented in Appendix 8.

### 9.3.5 Antenatal corticosteroids (benchmarked with ANZNN)

Antenatal steroid use has been consistently high in the Network (ANZNN) and NW over the last five years. In 2007 98% of NW babies <32 weeks gestation received some antenatal corticosteroids before birth and 56% received an optimally timed course starting between 24 hours and seven days before birth.

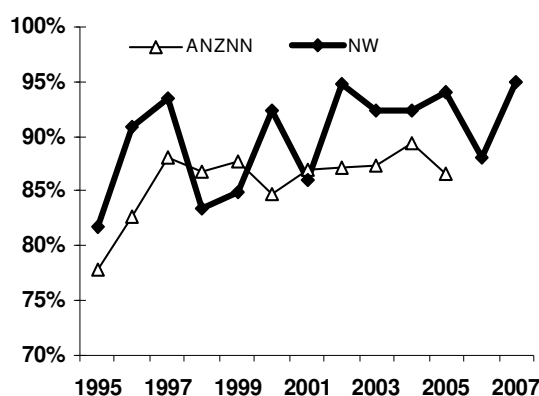


Figure 71: Any antenatal corticosteroids at 24-27 weeks

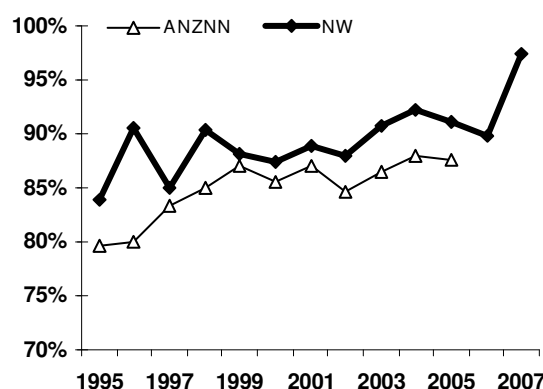


Figure 72: Any antenatal corticosteroids at 28-31 weeks

## 9.4 Care and complications

### 9.4.1 Infection (all admissions)

In 2007 there were 6 early-onset culture proven septicaemias compared with 5 in 2006, and 31 late-onset septicaemia infections compared with 34 in 2006. For early-onset infection (1<sup>st</sup> 48 hrs) the organism was *Group B Streptococcus* (4), *E. coli* (1) and *Streptococcus viridans* (1). *Staphylococcus epidermidis* and coagulase negative *Staphylococcus* continues to make up the majority of late onset sepsis (31%). However, there were 2 cases of late *Group B Streptococcus*, 3 cases of late *Staphylococcus aureus* and 5 late *E. coli* infections. One baby developed a combined infection of *Serratia* and *Citrobacter* and one other developed *Candida* and *B cereus* infection.

Four of the 27 babies who developed serious infections died, two of whom died as a result of severe infection. These babies were 23 weeks (1) and 24 weeks (3) gestation.

Three early infections were in babies <32 weeks gestation, one in a 36 week baby and the other two in term babies. Two babies developed a late culture proven meningitis, with *E. coli* and Group B *Streptococcus*.

### 9.4.2 Hypoxic ischaemic encephalopathy (all admissions)

Eight inborn babies developed significant stage 2 or 3 hypoxic ischaemic encephalopathy (HIE) in 2007, giving an incidence of 1/1000 term live births. The incidences were 0.6, 1.6, 0.5 and 0.9/1000 term live births in 2003, 2004, 2005 and 2006. In 2006 four planned home births had significant HIE but there were no cases of significant HIE in home births for 2007.

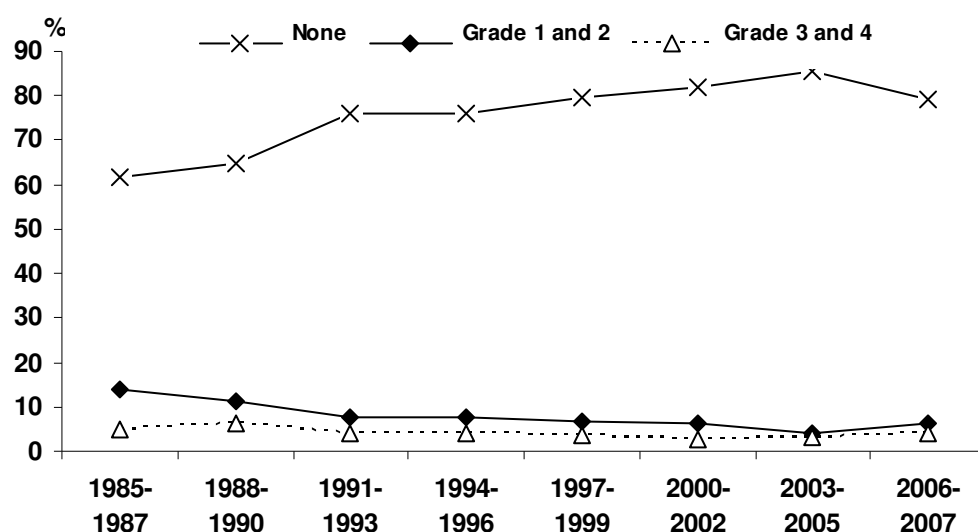
**Table 60: Details of Hypoxic Ischaemic Encephalopathy Stages 2 or 3.**

| Born at     | Gestation | Birth Weight | HIE stage | Apgar 1/5 | Day died | Comment   |
|-------------|-----------|--------------|-----------|-----------|----------|---|
| NW          | 32        | 1800         | 3         | 8 / 7     |          | MCDA twin, the other twin died in utero, flat trace, emergency LSCS         |
| NW          | 32        | 2460         | 2         | 2 / 2     |          | Decreased fetal movements, foetal distress                                  |
| NW          | 36        | 1935         | 3         | 0/0       | 1        | SGA, true knot in the cord, plus tight nuchal cord                          |
| NW          | 38        | 3335         | 3         | 0 / 0     | 1        | Abruption, emergency LSCS   |
| NW          | 39        | 2475         | 2         | 3 / 7     |          | Decreased fetal movements, meconium stained liquor, non-reassuring CTG      |
| Northland   | 37        | 3000         | 3         | 5 / 9     | 2        | Postnatal asphyxial event at 2 hours of age                                 |
| Waitakere   | 39        | 3680         | 2         | 1 / 7     |          | Decreased fetal movements, Decreased variability, feto-maternal haemorrhage |
| North Shore | 39        | 3410         | 2         | 0 / 0     |          | Cord prolapse   |
| NW          | 39        | 3320         | 2         | 7 / 9     |          | Postnatal asphyxial event at one and a half hours of age                    |
| NW          | 40        | 3770         | 2         | 3 / 7     |          | Meconium stained liquor, emergency LSCS                                     |
| NW          | 43        | 4150         | 2         | 3 / 5     |          | Decreased fetal movements, decreased variability, emergency LSCS            |

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



### 9.4.3 Intraventricular haemorrhage in all very low birth weight infants admitted to NICU from 1985 to 2007



**Figure 73: Intraventricular haemorrhage in all <1250g infants admitted to NICU from 1985 to 2007** (Babies with unknown IVH status have been removed from the denominator.)

Since 2005, the criteria for routine cerebral ultrasound scanning at NW has been <30 weeks or <1250g. This was changed from <32 weeks or <1500g due to the very low incidence of significant abnormalities in the larger more mature infants.

Over the years the number of babies with no IVH has been steadily increasing. The rates of severe IVH (Grade 3 & 4) are low but have not fallen greatly in the last decade (Fig 72) despite advances in neonatal care. This may reflect the active treatment of extremely premature babies; included in this are a consistent but small number of outborn babies who have not had tertiary level antenatal care. On the whole, NW data for rates of IVH compare favourably with ANZNN data (Fig 73-76).

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

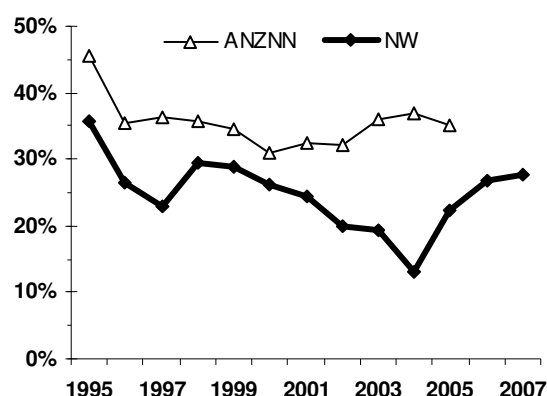


Figure 74: Any IVH at 24-27 weeks

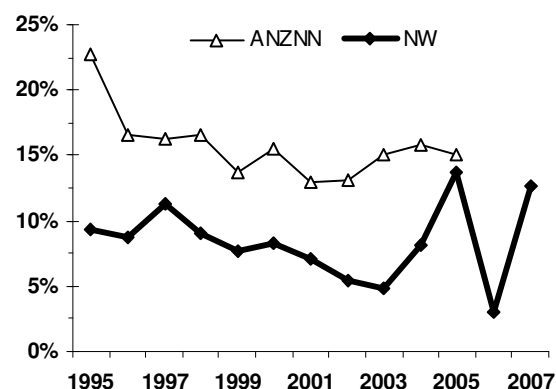


Figure 76: Any IVH at 28-31 weeks

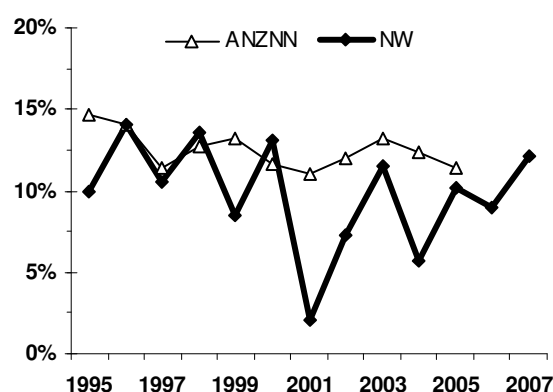


Figure 75: Severe (G3-4) IVH at 24-27 weeks

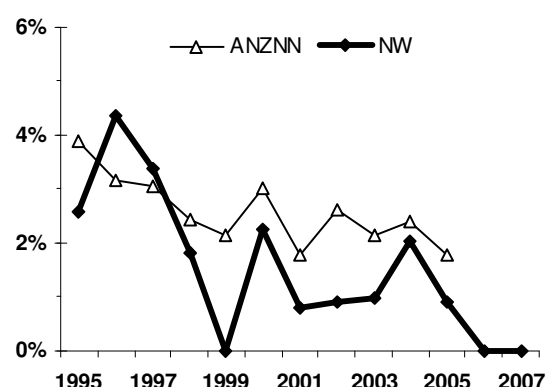


Figure 77: Severe (G3-4) IVH at 28-31 weeks

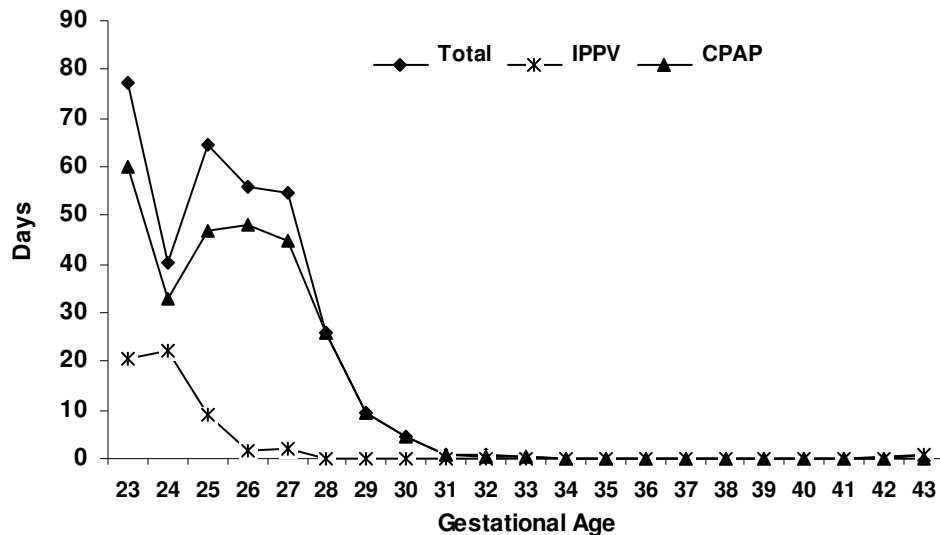
#### 9.4.5 Assisted ventilation (all admissions)

#### 9.4.6 Use and duration of assisted ventilation

Data in this section are presented for all inborn babies born at NW, excluding babies transferred in postnatally. This allows more meaningful comparisons of postnatal care at NW over time.

Table 61: Number of babies on assisted ventilation

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



**Figure 78: Median ventilation days on IPPV and CPAP and IPPV+CPAP by gestational age among survivors in 2007**

NW NICU has used CPAP as the primary mode of respiratory support for a decade. Although the majority of infants born below 26 weeks gestation receive a period of positive pressure ventilation, there is a steady decrease in the proportion receiving such support from 26 to 32 weeks gestation. There is a similar pattern in the decreasing use of CPAP with increasing gestation; however for CPAP use the decrease starts later from 28 weeks onwards with a steady reduction from 31 to 35 weeks gestation. These data are important clinically as they inform discussion on timing of birth for mildly preterm babies.

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

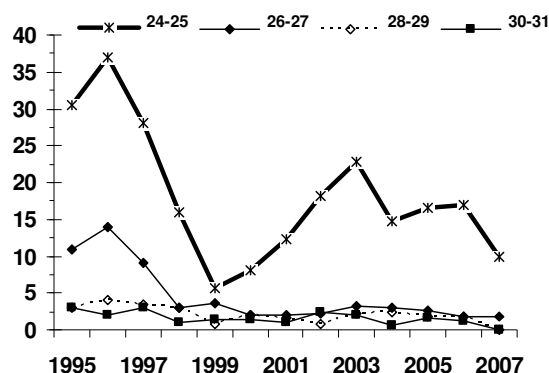


Figure 79: Median days on IPPV

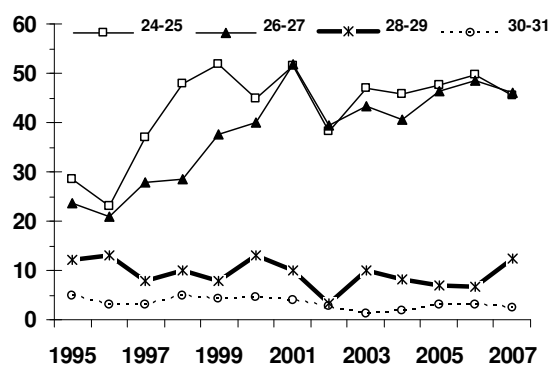


Figure 80: Median days on CPAP

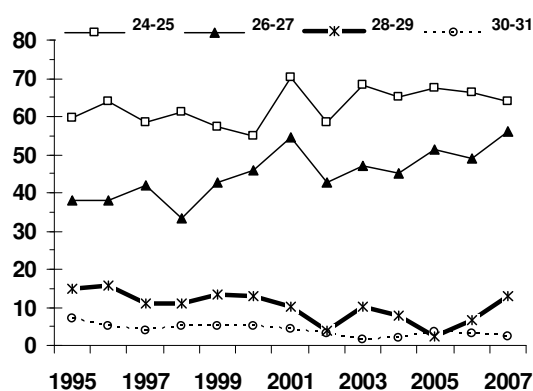


Figure 81: Median days on CPAP + IPPV

The shift in 1997 to a CPAP-based approach heralded a dramatic decrease in the time ventilated for infants under 28 weeks gestation. For babies of 24 and 25 weeks gestation, this fell from a median of 37 days to just 6 days by 1999. However the next 4 years saw a gradual increase in median number of days on IPPV to 23 days in 2003. Since then there has been a more gradual trend towards a shorter duration of IPPV with a decrease again in 2007 to 10 days.

The introduction of CPAP also resulted in a decline in the median number of days on IPPV for infants 26-27 weeks gestation. Since 1999 this has remained fairly constant below 5 days. Of note the number of infants 25 weeks and below is low, with an average of 22 babies per year which explains some of the year-to-year variation.

As time on IPPV has decreased the time on CPAP has increased, particularly for the most immature babies but also for babies of 26 and 27 weeks gestation.

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

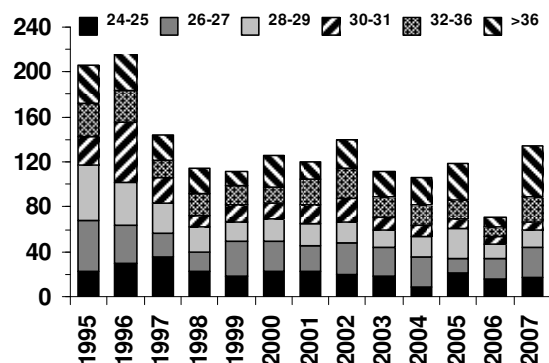


Figure 82: Number on IPPV

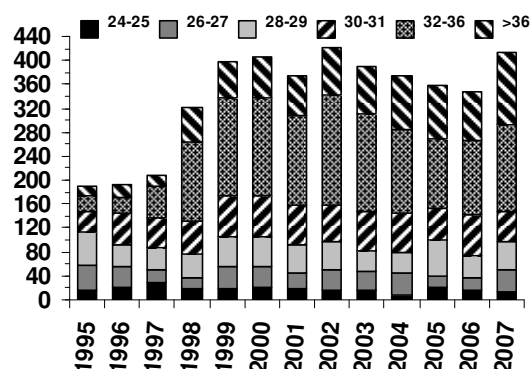


Figure 83: Number on CPAP

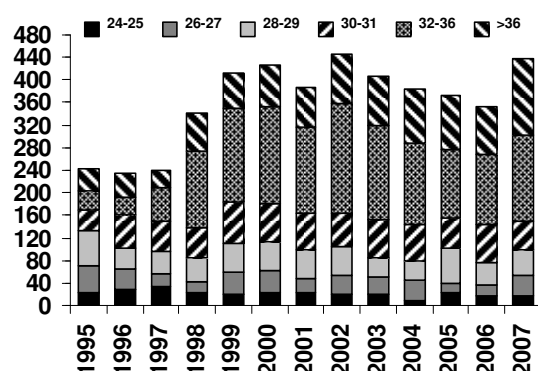


Figure 84: Number on CPAP + IPPV

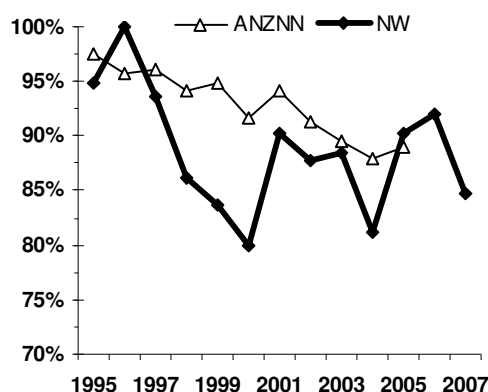
These figures show the number of babies requiring respiratory support at NW over the last 13 years.

The effect of introducing double short-pronged Hudson® CPAP in 1997 is clear with a reduction in number receiving intubation and assisted ventilation.

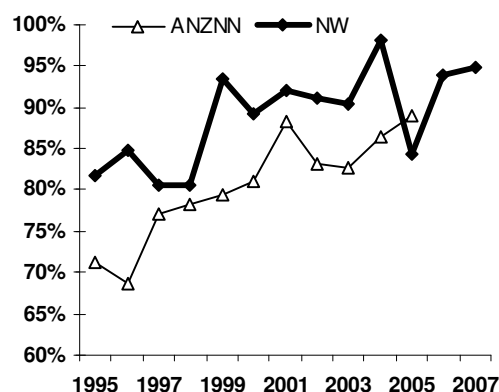
Head-box oxygen administration was also phased out and all babies requiring oxygen were placed on CPAP. There was a concomitant increase in the use of CPAP, particularly in babies from 32-36 weeks gestation.

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

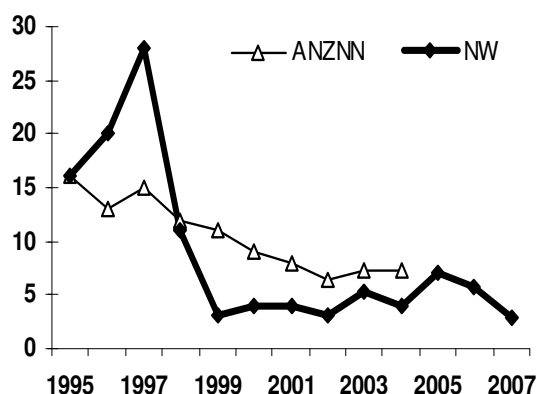
These data compare the use of IPPV and CPAP in NW and across the Australia and New Zealand Neonatal Network. The Network collects standardised data from all NICU in Australia and New Zealand.



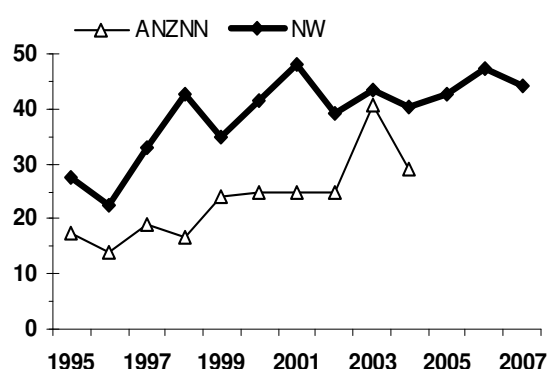
**Figure 85: Percentage on IPPV (24-27 wks ANZNN assigned)**



**Figure 86: Percentage on CPAP (24-27 wks ANZNN assigned)**



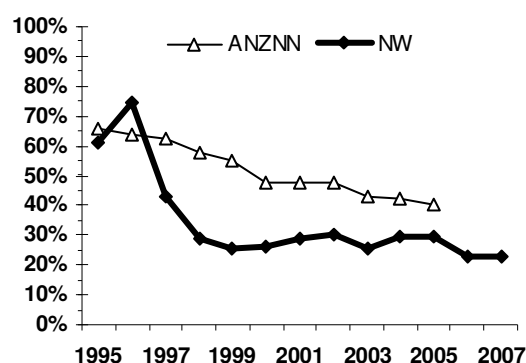
**Figure 87: Median days on IPPV (24-27 wks ANZNN assigned)**



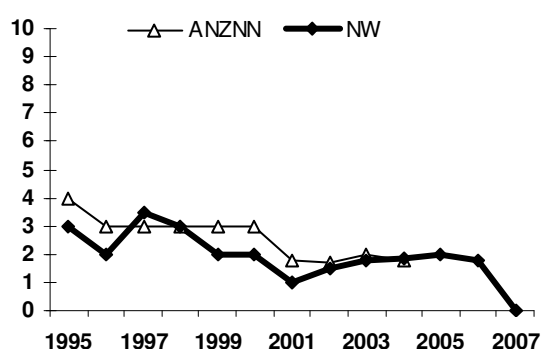
**Figure 88: Median days on CPAP (24-27 wks ANZNN assigned)**

Since NW changed its policy on ventilatory support in 1997 the use of CPAP has been high and IPPV use and duration has tended to be lower relative to ANZNN. In 2007 the NW data are consistent with previous years but 2007 ANZNN data are not as yet available for comparison

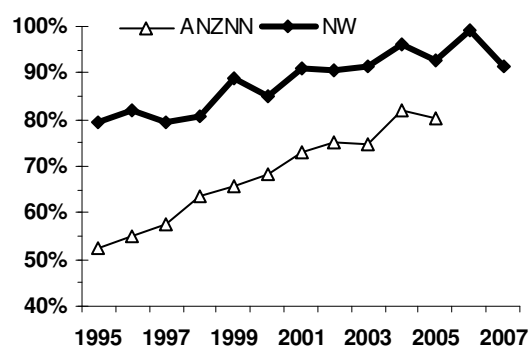
#### 9.4.10 Positive pressure ventilation and CPAP use in NW and across Australia and New Zealand at 28-31 weeks gestation (ANZNN benchmarking)



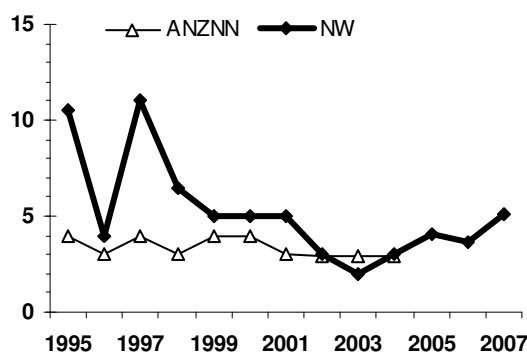
**Figure 89: Percentage on IPPV (28-31 wks ANZNN assigned)**



**Figure 91: Median days on IPPV (28-31 wks ANZNN assigned)**



**Figure 90: Percentage on CPAP (28-31 wks ANZNN assigned)**



**Figure 92: Median days on CPAP (28-31 wks ANZNN assigned)**

The pattern of respiratory support in NW babies of 28-31 weeks gestation parallels that seen in the less mature babies. Again 2007 ANZNN data are not as yet available for comparison.

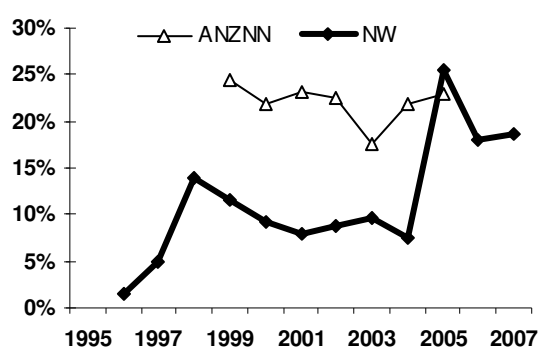
### 9.4.11 High frequency oscillatory ventilation and inhaled nitric oxide

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

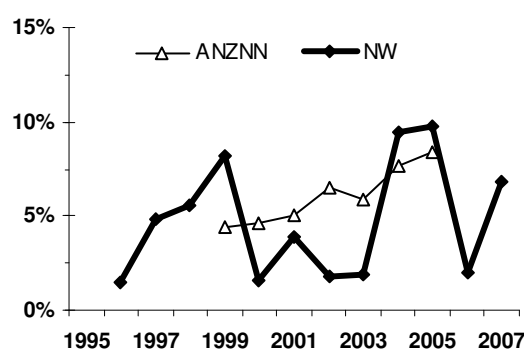
High frequency oscillatory ventilation (HFOV) is used only for 'rescue' treatment at NW. Hence, babies treated with HFOV are the sickest babies in NICU who would be expected to have a very poor outlook whatever the treatment. At all gestations, mortality in these infants is high. Term babies do better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

**Table 62: HFOV and inhaled nitric oxide (iNO) use and survival (1998-2007)**

|                     | HFOV |         | iNO |         | HFOV + iNO |         |
|---------------------|------|---------|-----|---------|------------|---------|
|                     | n    | % alive | n   | % alive | n          | % alive |
| <b>Total</b>        | 165  | 60      | 186 | 66      | 83         | 58      |
| <b>&lt;28 weeks</b> | 82   | 57      | 33  | 39      | 20         | 35      |
| <b>28-31 weeks</b>  | 22   | 59      | 16  | 44      | 9          | 44      |
| <b>32-36 weeks</b>  | 15   | 33      | 30  | 53      | 14         | 43      |
| <b>≥36 weeks</b>    | 44   | 73      | 107 | 81      | 40         | 78      |



**Figure 93: HFOV at 24-27 (ANZNN assigned babies)**



**Figure 94: Inhaled nitric oxide at 24-27 weeks (ANZNN assigned babies)**

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



### 9.4.12 Term/post-term infants on assisted ventilation from 1995 to 2007

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

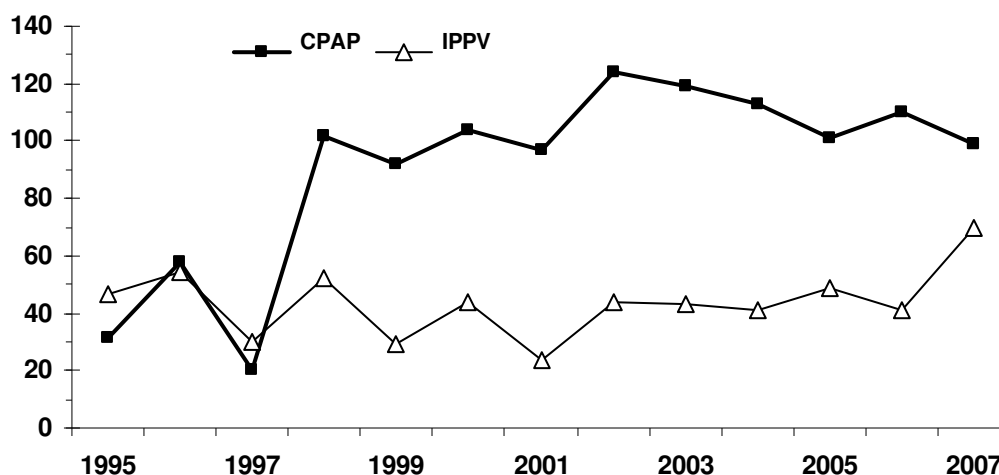


Figure 95: Number of term and post term babies needing assisted ventilation

In 2007, as with previous years, the most common reasons for ventilating term infants were meconium aspiration or persistent pulmonary hypertension of the newborn (PPHN) (see table 182 in appendix 8).

In 2007, the most common reason for using CPAP was transient tachypnoea of the newborn with 76 babies on CPAP (>50% of CPAP use at term), followed by meconium aspiration (see table 182 in appendix 8).

## 9.5 Outcomes

### 9.5.1 Survival of NW inborn babies by birthweight

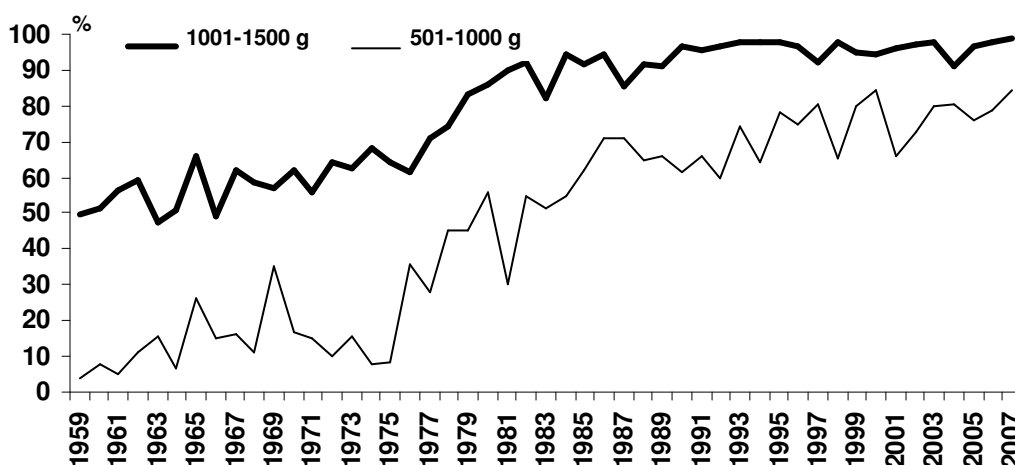


Figure 96: Neonatal survival (0-28 days) of ≤1500g inborn live births from 1959 to 2007

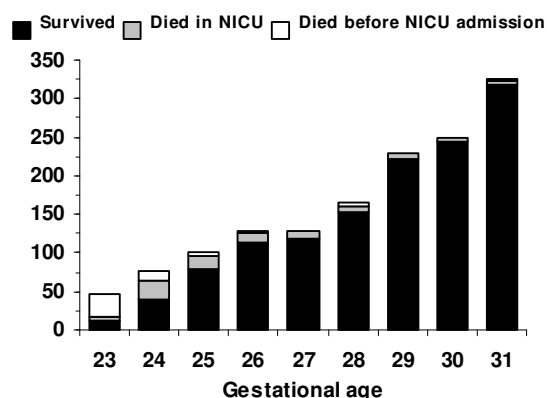
Over the years the definitions used have been the same, counting all babies, including those who died soon after birth, if they showed signs of life.

The 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 (500-1000g, ELBW).

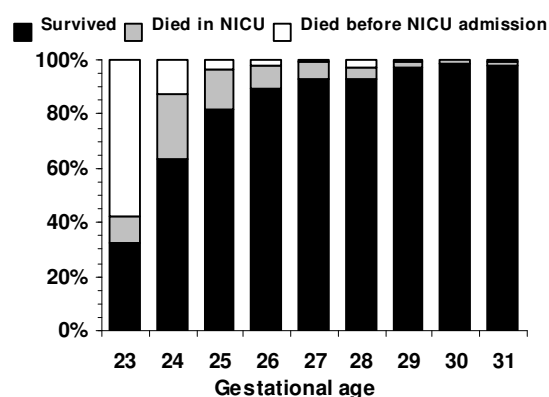
There has been an enormous improvement in the results of perinatal and neonatal intensive care over this time period. In the first three years (1959-61) only 5/85 (6%) ELBW babies survived to 28 days compared to 143/183 (78%) in the last three years.

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

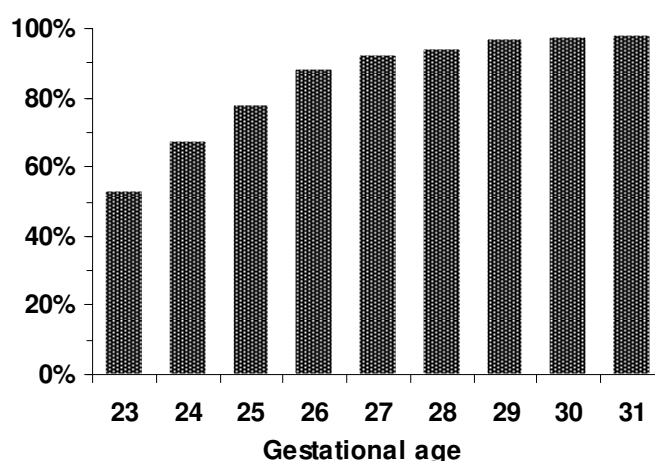
## 9.5.2 Survival of inborn babies (23 to 31 weeks) by gestational age



**Figure 97: Numbers of live inborn babies 23 to 31 weeks gestation in 2000-2007**



**Figure 98: Survival of live inborn babies 23-31 weeks 2000-2007 (n = 1395)**

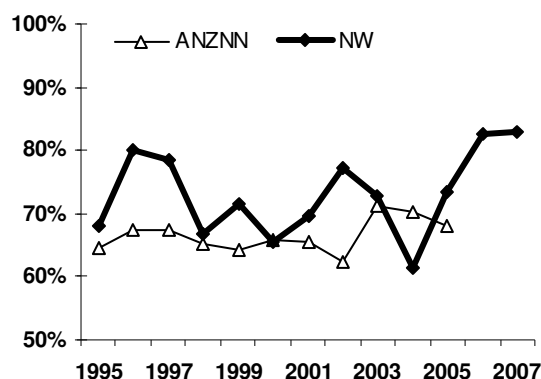


**Figure 99: Survival of live inborn babies admitted to NICU from 1995 to 2007 (n = 2334)**

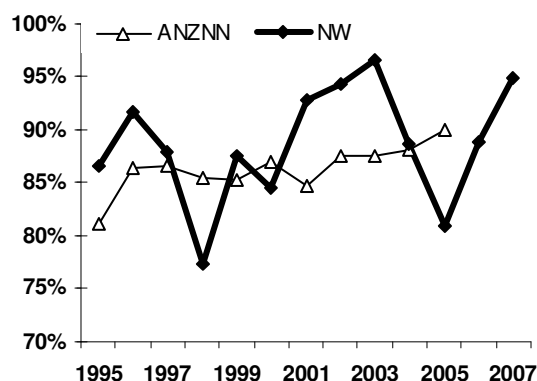
The number of infants born at 23 weeks gestation who survive in a single year is low. However, there is a step increase in survival between 23 and 27 weeks gestational age at birth. The data are useful in informing our guidelines on management of borderline viability. The NW rates are very comparable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

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

### 9.5.3 Survival of 24-27 week babies (benchmarked with ANZNN)



**Figure 100: Survival at 24-25 weeks gestation compared with ANZNN data**



**Figure 101: Survival at 26-27 weeks compared with ANZNN data**

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

### 9.5.4 Cystic periventricular leukomalacia (PVL)

None of the babies born in NW developed Cystic PVL in 2007.

### 9.5.5 Retinopathy of prematurity benchmarked with ANZNN

There was a striking rise in the incidence of ROP in 2006, which was very likely due to a different screening technique undertaken by a new ophthalmologist. A large proportion of the increase was due to increased detection of milder grades (Stage 1 and 2) that do not have any short or long-term consequences. For the past 2 years 41% (2007) and 58% (2006) of infants screened had Stage 1 or 2 ROP, compared with 4% and 6% in 2005 and 2004, respectively. Likewise, the rates of significant (Stage 3 or 4) ROP have also increased to 5% and 6% in 2007 and 2006, compared with 1% in both 2005 and 2004.

In 2007, eight babies received laser therapy for advanced ROP. This is also an increase on previous years, and relates to both an increase in more severe grades of ROP as well as lower treatment thresholds in response to results of contemporaneous research.

NICU also provides a regional service for babies requiring laser treatment, and three infants were transferred specifically for treatment with established ROP. Four of the 8 babies that required laser therapy were inborn at NW. The other 4 were transferred in for laser therapy. Of the eight babies, 3 were 23 weeks gestation, 3 were 24 weeks, and two were 26 weeks gestation.

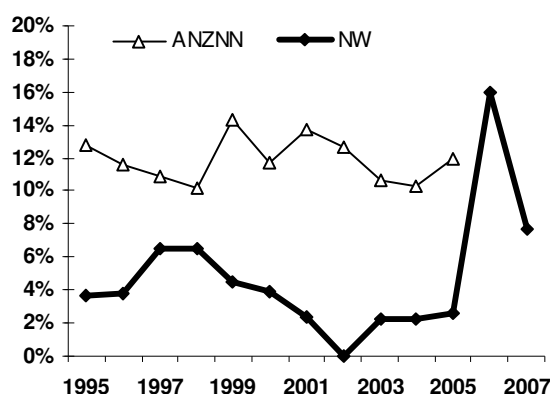


Figure 102: ROP at 24-27 weeks

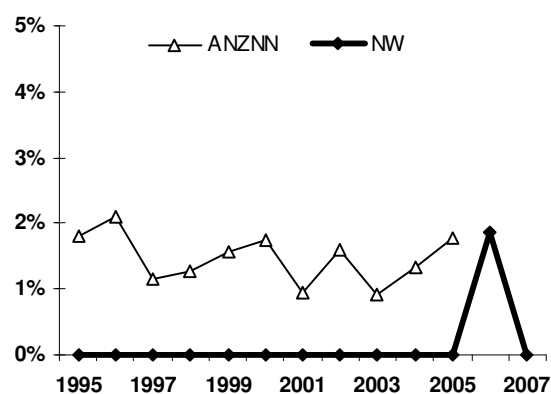


Figure 103: ROP at 28-31 weeks

### 9.5.6 Chronic lung disease benchmarked with ANZNN

The ANZNN definition of chronic lung disease is used: *CLD is the requirement for oxygen or any form of respiratory support (CPAP or IPPV) at 36 weeks post menstrual age*. In some publications, the definition is only a requirement for supplemental oxygen. Including respiratory support in the definition increases the incidence.

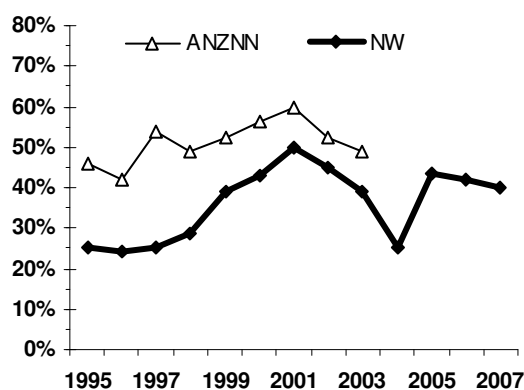


Figure 104: Chronic lung disease at 24-27 weeks

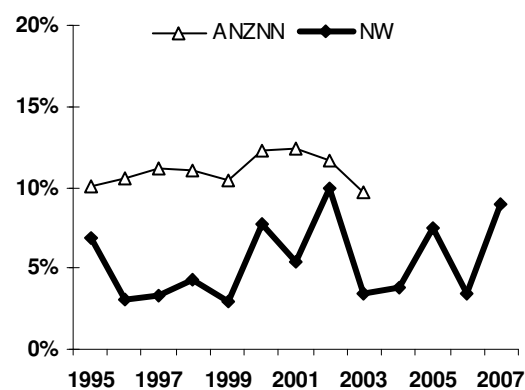


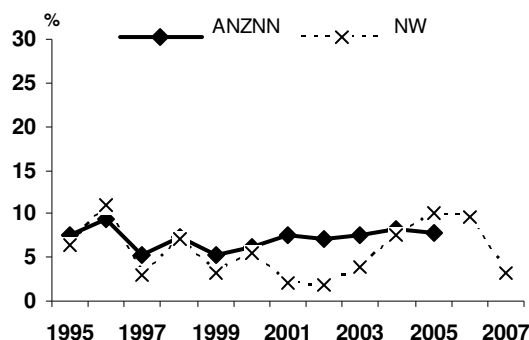
Figure 105: Chronic lung disease at 28-31 weeks

Overall ANZNN data demonstrate that for infants 24-27 weeks gestation there was an increase in the rate of CLD in the late 1990s. NW data seem to mirror this pattern and the subsequent relative decrease in CLD that occurred up to 2003. However, both in this group and in 28-31 week gestation infants the incidence of CLD at NW compares favourably with the Network data overall. Unfortunately comparison with ANZNN data for subsequent years is not possible due to changes in reporting and unavailable data.

The definition of CLD is not entirely satisfactory, as the condition is defined by the treatment being given. Particularly when there have been changes in the way treatments have been applied. An example of this is the use of pulse oximetry. The target oxygen saturation levels increased in the late 1990s, only to fall again in 2002 with the presentation of the BOOST trial of oxygen saturation in CLD. It is likely that much of the temporal trend in the incidence of CLD is due to change in treatment used rather than any changes in underlying lung disease.

### 9.5.7 Necrotising enterocolitis benchmarked with ANZNN

In 2007, 2/155 (1%) of VLBW infants and 2/165 (1%) of <32 week gestation infants developed NEC. Although the incidence was low overall, there seemed to be an increase in the incidence between 2002 and 2005 in infants under 28 weeks gestation. However this was not statistically significant and can be attributed to random variation.



**Figure 106: NEC in ANZNN assigned babies under 28 weeks gestation compared with the incidence in ANZNN 1995-2007**

Three babies were transferred in for NEC related surgery from other centres. None of the babies died as a result of NEC in 2007.

### 9.5.8 Patent Ductus Arteriosus (ANZNN babies)

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

For the year 2007, babies who were recruited for the INDUCE study were included in the data set as “treated with Indomethacin”.

In 2007, 36 inborn and 11 outborn babies were treated with indomethacin. No babies over 30 weeks gestation or 1500g birth weight were treated. Ten babies were recruited into the INDUCE trial and the rest were treated with Indomethacin as per the existing protocol (Short and long courses). The protocol was streamlined in mid 2007 to a 6 day course of Indomethacin. Only three babies received two courses as against 6 babies in 2006

In 2007, two babies had PDA ligated. Both of them were under 1000g and <27 weeks gestation.

### 9.5.9 Pneumothorax needing drainage (ANZNN babies)

Seven inborn babies developed a pneumothorax that needed drainage in 2007. An additional nine outborn babies had pneumothoraces drained. Six of the sixteen babies were born at <28 weeks gestation.

### 9.5.10 Postnatal corticosteroids (ANZNN babies)

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

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

In 2007, 6% of inborn babies <32 weeks gestation were treated with dexamethasone. The rates of those treated clearly decreased with advancing gestational age from 22% in those between 23 and 25 weeks gestation (note: the Figure 106 below does not include the babies born at 23 weeks. Three out of the four babies that were born at 23 weeks received postnatal steroids) to 2% among those at 28-29 weeks gestation.

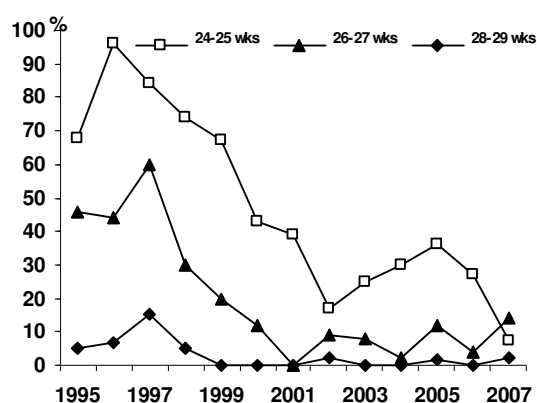


Figure 107: Percentage receiving postnatal dexamethasone by gestational age

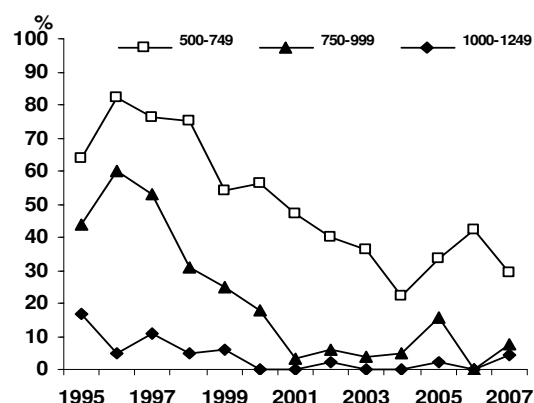


Figure 108: Percentage receiving postnatal dexamethasone by birth weight

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

There were 28 neonatal and infant deaths in 2007. These include all deaths before 28 days or up to hospital discharge (whichever is the greater) of babies admitted to NICU. Eighteen of the 28 infants who died were born in NW.

At NW, parents who are expected to deliver very preterm are counselled about the likelihood of survival and long term problems. The guidelines used to counsel parents are available on the Newborn website<sup>1</sup>. Parents are advised that the outcomes of babies at 23 weeks gestation are poor, both in terms of a low chance of survival and high chance of survivors having significant developmental problems. It is recommended that such babies are not actively treated. Treatment is not offered at 22 weeks gestation. At 24 weeks gestation the outcomes are better and most parents elect to have their baby actively treated at birth.

In 2007, only four of the twelve infants born <25 weeks who died were actively treated and admitted to NICU. Eleven deaths (39%) occurred in babies of <28 weeks gestation. This included 4 outborn babies. Two babies died as a result of severe infection. Both were outborn babies.

Two moderately premature infants (28-36 weeks gestation) without anomalies died. One baby was an outborn infant with non-immune hydrops secondary to Twin-Twin transfusion. The other baby born at 36 weeks gestation died of severe Hypoxic ischemic encephalopathy.

One term infant without malformation died. This baby died of severe Hypoxic ischemic encephalopathy.

Thirteen infants (46%) with serious congenital anomalies died in 2007. Nine of them had complex congenital cardiac anomalies.

---

<sup>1</sup> (<http://www.adhb.govt.nz/newborn/Guidelines/Admission/BorderlineViability.htm>)



## 9.6 Child Development Unit

### 9.6.1 Follow up at 18 months (corrected) of Children under 1500 grams born in 2005

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

Seven infants with congenital abnormalities were assessed but were excluded from the following tables. One infant died at 6 months. No further infants were known to have died after discharge from National Women's Health. Fourteen children were lost to followup of whom three weighed less than 1000 grams. Three were from other centres in New Zealand, five lived overseas, and six did not attend appointments. Data were obtained for 123 (90%) children.

One hundred and four children received individual assessment at the Child Development Unit, and when this was not possible (mainly because of distance from home to National Women's), 19 reports were obtained from paediatricians and other professionals monitoring 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 (corrected 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 63 Outcome Categories for infants under 30 months of age**

|                       |  |
|-----------------------|--|
| <b>Category I</b>     | <b>(Severe disability): one or more of the following</b>   |
|                       | (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)                       |
| <b>Category II</b>    | <b>One or more of the following</b>  |
|                       | (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  |
| <b>Category III**</b> | <b>Presence of tone disorder or motor delay</b>  |
|                       | (Bayley* Motor Score more than 1 standard deviation below mean) but adjusted Mental score within average range |
| <b>Category IV</b>    | <b>Normal development</b>  |
|                       | (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 64: Outcome Categories at 18 months for children under 1500g born in 2005 (n=123)**

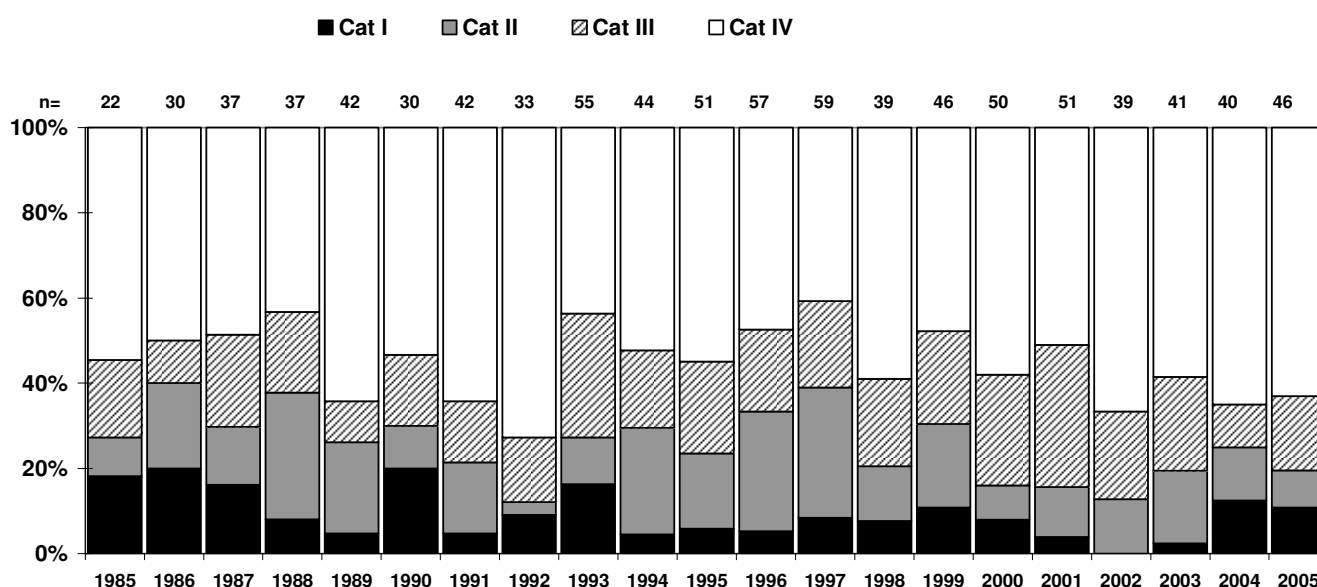
|                     | Number     | Description  |
|---------------------|------------|--|
| <b>Category I</b>   | 7 (5.7%)   | 2 with slow cognitive and motor development and tonal abnormalities (1 with Cerebral Palsy)<br>3 with slow cognitive and motor development (1 had a tracheostomy & gastrostomy)<br>2 with low cognitive scores   |
| <b>Category II</b>  | 15 (12.2%) | 1 with low cognitive and motor scores and truncal hypotonia<br>4 with low cognitive and motor scores<br>2 with low motor scores and tonal abnormalities (1 with hemiplegia)<br>7 with slow cognitive development<br>1 with global delay and tracheostomy |
| <b>Category III</b> | 13 (10.6%) | 13 with motor delay (1 child had shunted hydrocephalus)  |
| <b>Category IV</b>  | 88 (71.5%) |  |

**Table 65: Outcome of children <1500g born in 2005 at 18 months by gestational age groups (n=123)**

| Outcome Category | Gestational age (weeks) |      |                    |      |             |      |
|------------------|-------------------------|------|--------------------|------|-------------|------|
|                  | 24-28 weeks n=54        |      | 29 – 36 weeks n=69 |      | Total n=123 |      |
|                  | n                       | %    | n                  | %    | n           | %    |
| <b>I</b>         | 4                       | 7.4  | 3                  | 4.4  | 7           | 5.7  |
| <b>II</b>        | 9                       | 16.7 | 6                  | 8.7  | 15          | 12.2 |
| <b>III</b>       | 6                       | 11.1 | 7                  | 10.1 | 13          | 10.6 |
| <b>IV</b>        | 35                      | 64.8 | 53                 | 76.8 | 88          | 71.5 |

**Table 66: Outcome of children <1500g born in 2005 at 18 months by birth weight groups (n=123)**

| Outcome Category | Birthweight (grams) |      |                   |      |             |      |
|------------------|---------------------|------|-------------------|------|-------------|------|
|                  | <1000g n=46         |      | 1000 – 1499g n=77 |      | Total n=123 |      |
|                  | n                   | %    | n                 | %    | n           | %    |
| <b>I</b>         | 5                   | 10.9 | 2                 | 2.6  | 7           | 5.7  |
| <b>II</b>        | 4                   | 8.7  | 11                | 14.3 | 15          | 12.2 |
| <b>III</b>       | 8                   | 17.4 | 5                 | 6.5  | 13          | 10.6 |
| <b>IV</b>        | 29                  | 63.0 | 59                | 76.6 | 88          | 71.5 |



**Figure 109: Outcome at 18 months of children <1000g birth weight born 1985-2005**

### 9.6.2 Development at 4 years of children under 1500g born in 2003

One hundred and forty-two children born in 2003, who weighed less than 1500 grams and were cared for in the Newborn Service, survived to hospital discharge. There were 48 infants less than 1000grams. Five children had congenital abnormalities and were not included in the analyses of data.

No infant was known to have died after discharge from hospital.

At 4 years, data were obtained for 98 children. Of the 39 not assessed 24 (62%) were overseas or in other centres in New Zealand.

At 4 years a registered psychologist interviewed parents, administered standardised tests and carried out clinical assessments with the children on an individual basis. Accordingly they were placed in Outcome Categories as set out in the next table.

**Table 67: Outcome categories at 4 years**

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

\* The Stanford-Binet Intelligence Scales 5<sup>th</sup> edition.

† Vineland Adaptive Behavior Scales, 2005 : Motor Skills Domain.

**Table 68: Outcome categories at 4 years for children under 1500g born 2003 (n = 98)**

|                     | Number     | Description   |
|---------------------|------------|---|
| <b>Category I</b>   | 5 (5.0%)   | 1 child with spastic quadriplegia<br>1 child with severe visual impairment, slow development and paralysed vocal chords<br>1 child with sensorineural hearing loss and bilateral hearing aids<br>2 children with low cognitive scores   |
| <b>Category II</b>  | 21 (21.5%) | 1 child with bilateral hearing aids (? conductive hearing loss), severe sub-glottic stenosis, delayed speech and development<br>1 child with low cognitive scores and convergent squint left eye<br>6 children with slow cognitive and motor development<br>13 children with slow cognitive development |
| <b>Category III</b> | 4 (4.1%)   | 4 children with motor scores below the average range  |
| <b>Category IV</b>  | 68 (69.4%) |   |

### Summary

Babies weighing less than 1500g at birth are at risk for developmental problems. However, only 7 (6%) of children born in 2005 and examined around 18 months corrected age, had severe disability. Seventy-two percent were within the average range for cognitive and motor development.

For children born in 2003, and assessed at 4 years, 5 percent had severe disability. Sixty-nine percent were within the average range or above for cognitive and motor abilities.

# Chapter 10

## PERINATAL MORTALITY



---

## 10 PERINATAL MORTALITY

---

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

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

### Methods

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

The classification of perinatal deaths uses the Perinatal Society of Australia and New Zealand (PSANZ) system which was first released in May 2003 and updated in November 2004. It includes a classification system by antecedent cause (PSANZ-PDC) and, in addition for neonatal deaths, by conditions in the neonatal period, or prior to discharge home, leading to death using the PSANZ-NDC. PSANZ-PDC (PSANZ Perinatal Death Classification) is to identify the single most important factor which led to the chain of events which resulted in the death. PSANZ-NDC (PSANZ Neonatal Death Classification) is in addition to the PSANZ-PDC to identify the single most important factor in the neonatal period which caused the death. Two associated factors can also be recorded by each of these systems, but these associated factors are not included in the analysis provided in this report. The PSANZ system was developed because of apparent shortcomings in ICD10 coding alone and in the Whitfield classification system.

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

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

All perinatal deaths are reviewed by a multidisciplinary team comprising an obstetrician (MFM subspecialist), neonatologist, midwife, pregnancy loss counsellor and perinatal pathologist. This group classifies the cause of death and summarises recommendations for management in a future pregnancy. Any issues requiring further investigation are referred to the Maternal Clinical Review Committee.

For privacy reasons vignettes are not provided in this chapter.

## 10.1 Perinatal and perinatal-related mortality rates

Table 69: Inborn and BBA deaths

|   |  | 2000        | 2001        | 2002        | 2003        | 2004        | 2005        | 2006        | 2007        |
|---|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Fetal deaths</b>   | 20-22 weeks                            | 33          | 20          | 30          | 23          | 25          | 26          | 24          | 24          |
|   | 23-24 weeks                            | 12          | 10          | 10          | 8           | 18          | 11          | 12          | 15          |
|   | 25-26 weeks                            | 9           | 2           | 4           | 6           | 3           | 3           | 6           | 7           |
|   | 27-28 weeks                            | 3           | 1           | 2           | 1           | 10          | 6           | 3           | 5           |
|   | 29-38 weeks                            | 27          | 15          | 17          | 24          | 13          | 17          | 24          | 19          |
|   | >38 weeks                              |             | 9           | 6           | 2           | 13          | 5           | 5           | 12          |
| <b>Total fetal deaths</b>   |  | <b>84</b>   | <b>57</b>   | <b>69</b>   | <b>64</b>   | <b>82</b>   | <b>68</b>   | <b>74</b>   | <b>82</b>   |
| <b>Neonatal deaths</b>  | Early neonatal deaths ( $\leq 7$ days) | 43          | 32          | 40          | 34          | 33          | 38          | 23          | 20          |
|   | Late neonatal deaths (8-28 days)       | 9           | 5           | 7           | 7           | 9           | 5           | 2           | 9           |
| <b>Total neonatal deaths</b>  |  | <b>52</b>   | <b>37</b>   | <b>47</b>   | <b>41</b>   | <b>42</b>   | <b>43</b>   | <b>25</b>   | <b>29</b>   |
| <b>Total deaths</b>   |  | <b>136</b>  | <b>94</b>   | <b>116</b>  | <b>105</b>  | <b>124</b>  | <b>111</b>  | <b>99</b>   | <b>111</b>  |
| <b>Perinatal mortality rate/1000</b>  |  | <b>15.8</b> | <b>11.6</b> | <b>13.6</b> | <b>12.6</b> | <b>15.0</b> | <b>14.4</b> | <b>13.1</b> | <b>13.0</b> |
| <b>Perinatal related mortality rate/1000</b>  |  | <b>16.9</b> | <b>12.3</b> | <b>14.5</b> | <b>13.5</b> | <b>16.2</b> | <b>15.0</b> | <b>13.4</b> | <b>14.1</b> |
| <b>Perinatal related mortality rate (excluding lethal &amp; terminated fetal abnormalities)</b> |  | <b>12</b>   | <b>8.4</b>  | <b>9.4</b>  | <b>8.9</b>  | <b>12.4</b> | <b>9.9</b>  | <b>8.4</b>  | <b>8.0</b>  |

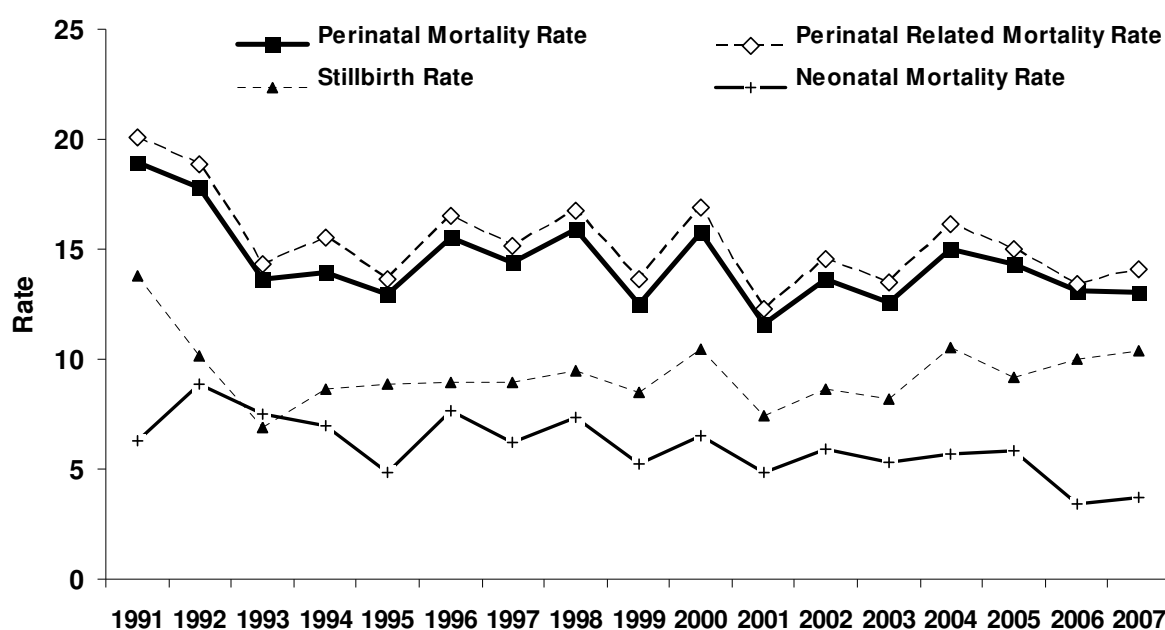


Figure 110: Perinatal mortality rate, perinatal related mortality rate, stillbirth rate and neonatal mortality rate (1991-2007) (all rates expressed as deaths/1000 births)

The rate of fetal deaths and perinatal mortality appear to be static. However early neonatal death rate seems to be falling without a commensurate increase in late neonatal deaths. This could be random or represent a real improvement.



## 10.2 Gestational age and perinatal-related loss

Table 70: Gestational age and perinatal related mortality

|             | Births |      | Stillbirths |      | Neonatal deaths |    | Total perinatal related deaths |             | Perinatal related mortality risk*** |      |      |
|-------------|--------|------|-------------|------|-----------------|----|--------------------------------|-------------|-------------------------------------|------|------|
|             | n      | %    | n           | %    | SB rate*        | n  | %                              | NND rate ** |                                     | n    | %    |
| 20-27 weeks | 121    | 1.5  | 49          | 59.8 | 6.2             | 15 | 51.7                           | 208.3       | 64                                  | 57.7 | 8.1  |
| 28-31 weeks | 116    | 1.5  | 7           | 8.5  | 0.9             | 2  | 6.9                            | 18.3        | 9                                   | 8.1  | 1.2  |
| 32-36 weeks | 667    | 8.5  | 8           | 9.8  | 1.0             | 5  | 17.2                           | 7.6         | 13                                  | 11.7 | 1.7  |
| 37-40 weeks | 5721   | 72.6 | 16          | 19.5 | 2.3             | 6  | 20.7                           | 1.1         | 22                                  | 19.8 | 3.2  |
| ≥41 weeks   | 1250   | 15.9 | 2           | 2.4  | 1.6             | 1  | 3.4                            | 0.8         | 3                                   | 2.7  | 2.4  |
| Total       | 7875   | 100  | 82          |      | 10.4            | 29 |                                | 3.7         | 111                                 |      | 14.1 |

\* 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

## 10.3 Multiple births and perinatal mortality

Table 71: Multiple births and perinatal related mortality

|           | Births |      | Stillbirths |      | Neonatal deaths |    | Total perinatal related deaths |                       | Perinatal related mortality rate <sup>†</sup> |      |      |
|-----------|--------|------|-------------|------|-----------------|----|--------------------------------|-----------------------|---|------|------|
|           | n      | %    | n           | %    | SB rate*        | n  | %                              | NND rate <sup>‡</sup> |   | n    | %    |
| Singleton | 7518   | 95.5 | 74          | 90.2 | 9.8             | 26 | 89.7                           | 3.5                   | 100   | 90.1 | 13.3 |
| Multiple  | 357    | 4.5  | 8           | 9.8  | 22.4            | 3  | 10.3                           | 8.6                   | 11  | 9.9  | 30.8 |
| Total     | 7875   |      | 82          |      | 10.4            | 29 |                                | 3.7                   | 111   |      | 14.1 |

\* Stillbirth rate = number of stillbirths per 1000 births

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

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

In multiple pregnancy the perinatal mortality rate is 2-3 times greater than the rate for singleton pregnancies, confirming the high risk nature of these pregnancies.

## 10.4 Maternal characteristics and perinatal mortality

**Table 72: Maternal characteristics and perinatal related mortality**

|                                 | Births<br>n=7875 |      | Stillbirths<br>n=82 |      | Neonatal deaths<br>n=29 |      | Perinatal related<br>deaths<br>n=111 |      | RR (95%CI) <sup>§</sup> |
|---------------------------------|------------------|------|---------------------|------|-------------------------|------|--------------------------------------|------|-------------------------|
|                                 | n                | %    | n                   | %    | n                       | %    | n                                    | %    |                         |
| <b>Maternal Ethnicity</b>       |                  |      |                     |      |                         |      |                                      |      |                         |
| NZ European                     | 3247             | 41.2 | 34                  | 41.5 | 10                      | 34.5 | 44                                   | 39.6 | Ref                     |
| Maori                           | 665              | 8.4  | 10                  | 12.2 | 6                       | 20.7 | 16                                   | 14.4 | <b>1.8 (1.0-3.1)</b>    |
| Pacific                         | 1126             | 14.3 | 16                  | 19.5 | 6                       | 20.7 | 22                                   | 19.8 | 1.4 (0.9-2.4)           |
| Asian                           | 1368             | 17.4 | 6                   | 7.3  | 3                       | 10.3 | 9                                    | 8.1  | <b>0.5 (0.0-0.8)</b>    |
| Indian                          | 528              | 6.7  | 5                   | 6.1  | 1                       | 3.4  | 6                                    | 5.4  | 0.8 (0.3-1.8)           |
| Other European                  | 714              | 9.1  | 9                   | 11.0 | 2                       | 6.9  | 11                                   | 9.9  | 1.1 (0.6-2.2)           |
| Other                           | 227              | 2.9  | 2                   | 2.4  | 1                       | 3.4  | 3                                    | 2.7  | 1.0 (0.3-3.1)           |
| <b>Parity</b>                   |                  |      |                     |      |                         |      |                                      |      |                         |
| Nullipara                       | 3852             | 48.9 | 45                  | 54.9 | 12                      | 41.4 | 57                                   | 51.4 | Ref                     |
| Multipara                       | 4023             | 51.1 | 37                  | 45.1 | 17                      | 58.6 | 54                                   | 48.6 | 0.9 (0.6-1.3)           |
| <b>Maternal Age</b>             |                  |      |                     |      |                         |      |                                      |      |                         |
| <25                             | 1420             | 18.0 | 22                  | 26.8 | 10                      | 34.5 | 32                                   | 28.8 | <b>1.9 (1.2-2.9)</b>    |
| 26-34                           | 4023             | 51.1 | 35                  | 42.7 | 13                      | 44.8 | 48                                   | 43.2 | Ref                     |
| ≥35                             | 2432             | 30.9 | 25                  | 30.5 | 6                       | 20.7 | 31                                   | 27.9 | 1.1 (0.7-1.7)           |
| <b>Maternal Smoking</b>         |                  |      |                     |      |                         |      |                                      |      |                         |
| Currently smoking               | 428              | 5.4  | 15                  | 18.3 | 6                       | 20.7 | 21                                   | 18.9 | <b>3.4 (2.1-5.5)</b>    |
| No or not smoking in last month | 5092             | 64.7 | 58                  | 70.7 | 15                      | 51.7 | 73                                   | 65.8 | Ref                     |
| Stopped in pregnancy            | 53               | 0.7  | 0                   |      | 1                       | 3.4  | 1                                    | 0.9  | 1.3 (0.2-9.3)           |
| Missing                         | 2302             | 29.2 | 9                   | 11.0 | 7                       | 24.1 | 16                                   | 14.4 | 0.5 (0.3-0.8)           |
| <b>Maternal BMI</b>             |                  |      |                     |      |                         |      |                                      |      |                         |
| <19                             | 391              | 5.0  | 4                   | 4.9  | 2                       | 6.9  | 6                                    | 5.4  | 1.1 (0.5-2.6)           |
| 19-25                           | 4214             | 53.5 | 42                  | 51.2 | 15                      | 51.7 | 57                                   | 51.4 | Ref                     |
| 26-35                           | 1988             | 25.2 | 26                  | 31.7 | 8                       | 27.6 | 34                                   | 30.6 | 1.3 (0.8-1.9)           |
| >35                             | 461              | 5.9  | 5                   | 6.1  | 3                       | 10.3 | 8                                    | 7.2  | 1.3 (0.6-2.7)           |
| Missing                         | 821              | 10.4 | 5                   | 6.1  | 1                       | 3.4  | 6                                    | 5.4  | 0.5 (0.2-1.2)           |

\* Stillbirth rate = number of stillbirths per 1000 births

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

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

§ Relative Risk of perinatal death for each category compared to referent category (ref)

Despite perinatal mortality being a rare event with only 111 deaths in 2007, there are some maternal characteristics which are statistically significantly associated with increased risk. Young women, Maori women and women who smoke are at an increased risk of perinatal mortality. Women who smoke are 3-4 times more likely to have a perinatal mortality. Studies confirm that smoke change interventions reduce adverse outcomes in pregnancy even when instituted after booking of the woman.

Last year women with a BMI >35 also had a significant increase in stillbirth risk. Women of Asian ethnicity have a low rate of perinatal mortality.

## 10.5 Lead maternity carer (LMC) at birth and perinatal mortality

Table 73: LMC and perinatal related mortality

|                      | Births |      | Stillbirths |      | Neonatal deaths |    | Total perinatal related deaths |           |
|----------------------|--------|------|-------------|------|-----------------|----|--------------------------------|-----------|
|                      | n      | %    | n           | %    | SB rate*        | n  | %                              | NND rate† |
| Independent Midwife  | 2936   | 37.3 | 24          | 29.3 | 8.2             | 5  | 17.2                           | 1.7       |
| Private Obstetrician | 1897   | 24.1 | 16          | 19.5 | 8.4             | 4  | 13.8                           | 2.1       |
| G.P.                 | 137    | 1.7  | 1           | 1.2  | 7.3             | 0  | 0.0                            | 0.0       |
| NW Domino            | 492    | 6.2  | 4           | 4.9  | 8.1             | 2  | 6.9                            | 4.1       |
| NW Community         | 1597   | 20.3 | 11          | 13.4 | 6.9             | 5  | 17.2                           | 3.1       |
| NW Diabetes          | 238    | 3.0  | 5           | 6.1  | 21.0            | 2  | 6.9                            | 8.6       |
| NW Medical           | 412    | 5.2  | 16          | 19.5 | 38.8            | 8  | 27.6                           | 20.2      |
| Other DHB            | 115    | 1.5  | 3           | 3.7  | 26.1            | 2  | 6.9                            | 17.9      |
| Unbooked             | 51     | 0.6  | 2           | 2.4  | 39.2            | 1  | 3.4                            | 20.4      |
| Total                | 7875   |      | 82          |      | 10.4            | 29 |                                | 3.7       |

\* Stillbirth rate = number of stillbirths per 1000 births

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

‡ Perinatal related mortality rate = number of perinatal related deaths per 1000 births

Women who are unbooked have a perinatal mortality rate similar to the most high risk women confirming these women are a high risk group.

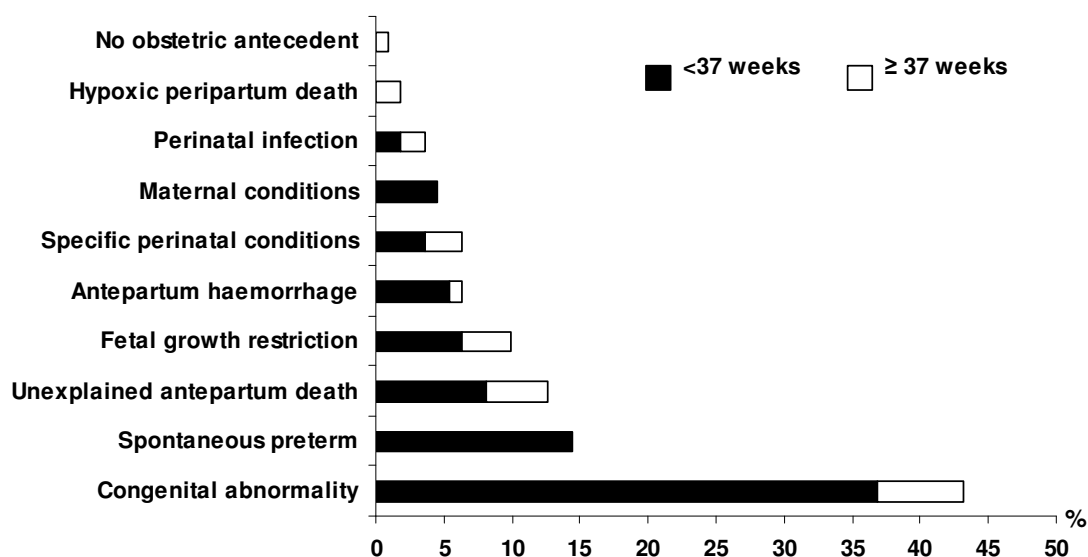
## 10.6 Causes of perinatal-related deaths

Table 74: Stillbirth and neonatal death by cause (PSANZ-PDC) 2007

|                               | Fetal deaths<br>n=82 |      |       | Neonatal deaths<br>n=29 |      |        | Total<br>n=111 |      |       |
|-------------------------------|----------------------|------|-------|-------------------------|------|--------|----------------|------|-------|
|                               | n                    | %    | Rate* | n                       | %    | Rate** | n              | %    | Rate* |
| Congenital abnormality        | 36                   | 43.9 | 4.6   | 12                      | 41.4 | 1.5    | 48             | 43.2 | 6.1   |
| Perinatal infection           | 4                    | 4.9  | 0.5   | 0                       |      |        | 4              | 3.6  | 0.5   |
| Antepartum haemorrhage        | 6                    | 7.3  | 0.8   | 1                       | 3.4  | 0.1    | 7              | 6.3  | 0.9   |
| Maternal conditions           | 5                    | 6.1  | 0.6   | 0                       |      |        | 5              | 4.5  | 0.6   |
| Specific perinatal conditions | 5                    | 6.1  | 0.6   | 2                       | 6.9  | 0.3    | 7              | 6.3  | 0.9   |
| Hypoxic peripartum death      | 2                    | 2.4  | 0.3   | 0                       |      |        | 2              | 1.8  | 0.3   |
| Fetal growth restriction      | 10                   | 12.2 | 1.3   | 1                       | 3.4  | 0.1    | 11             | 9.9  | 1.4   |
| Spontaneous preterm           | 4                    | 4.9  | 0.5   | 12                      | 41.4 | 1.5    | 16             | 14.4 | 2.0   |
| Unexplained antepartum death  | 10                   | 12.2 | 1.3   | 0                       |      |        | 10             | 9.0  | 1.3   |
| No obstetric antecedent       | 0                    |      |       | 1                       | 3.4  | 0.1    | 1              | 0.9  | 0.1   |

\* Rate: per 1000 births (n=7875 in 2007)

\*\* Rate: per 1000 live births (n=7793 in 2007)



**Figure 111: Contribution to perinatal death by obstetric antecedent cause (PSANZ-PDC) and gestation at birth**

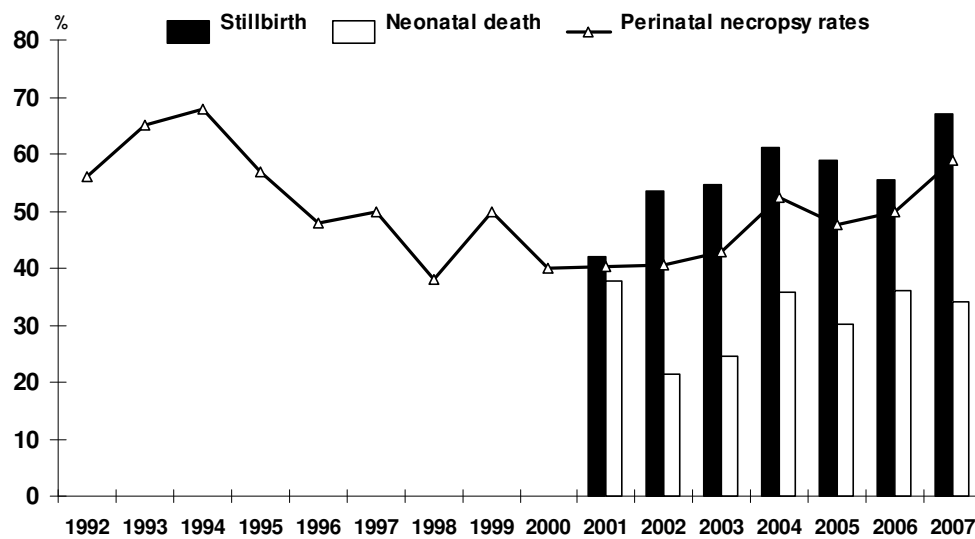
The majority of perinatal deaths are secondary to congenital anomaly, which is in keeping with previous years.

## 10.7 Neonatal deaths

**Table 75: Neonatal deaths by neonatal cause (PSANZ-NDC) and gestational age**

|                                     | Total neonatal deaths | < 37 weeks |      | ≥ 37 weeks |      |
|-------------------------------------|-----------------------|------------|------|------------|------|
|                                     |                       | n          | %    | n          | %    |
| <b>Total</b>                        | 29                    | 22         | 75.9 | 7          | 24.1 |
| <b>Extreme prematurity</b>          | 10                    | 9          | 90   | 1          | 10   |
| <b>Congenital abnormality</b>       | 12                    | 8          | 67   | 4          | 33   |
| <b>Infection</b>                    | 1                     | 1          | 100  | 0          |      |
| <b>Neurological</b>                 | 3                     | 3          | 100  | 0          |      |
| <b>Cardio-respiratory disorders</b> | 1                     | 1          | 100  | 0          |      |
| <b>Other</b>                        | 2                     | 0          |      | 2          | 100  |

## 10.8 Necropsy



**Figure 112: Necropsy rates (1991-2007)**

Post-mortem is the gold standard investigation for perinatal death. NW is fortunate to have access to a world-class perinatal pathology service provided by Dr Jane Zuccollo and Dr Jeanette MacFarlane. The post-mortem rate has increased slightly over the past years. A number of babies are now having MRI carried out if consent is not given for a post-mortem. This has provided additional useful information in a number of these cases.



# Chapter 11

## GYNAECOLOGY





## 11 GYNAECOLOGY

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

### 11.1 Fertility Plus

This section documents the IVF and ICSI clinical outcomes from Fertility Plus in 2007 and a discussion on recent advancements in the service.

**Table 76: Fertility PLUS IVF/ICSI clinical outcomes**

|  | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005  | 2006 | 2007  |
|--|------|------|------|------|------|------|-------|------|-------|
| Number of cycles started   | 132  | 125  | 289  | 309  | 306  | 316  | 398   | 440  | 458   |
| Number of cycles stopped   |      |      |      |      |      | 41   | 41    | 67   | 63    |
| Percent cycles stopped   |      |      |      |      |      | 13%  | 10%   | 15%  | 12%   |
| <b>NPSU 2000 benchmark for cycles stopped</b>                          |      | 10%  | 10%  | 10%  | 10%  | 10%  | 10%   | 10%  | 10%*  |
| Number of Cycles reaching Oocyte pick up (OPU)                         | 100  | 115  | 230  | 247  | 246  | 275  | 357   | 373  | 405   |
| Number of cycles reaching embryo replacement                           | 80   | 99   | 189  | 201  | 206  | 237  | 304   | 313  | 364   |
| Percent cycles reaching embryo replacement                             |      |      |      |      |      | 86%  | 85%   | 84%  | 90%   |
| <b>NPSU 2002 benchmark for replacement</b>                             |      |      |      | 87%  | 87%  | 87%  | 87%   | 87%  | 83%*  |
| Number of clinical pregnancies   | 23   | 24   | 57   | 65   | 67   | 83   | 96    | 124  | 130   |
| Clinical pregnancy rate/cycle started                                  |      |      |      |      |      | 26%  | 24%   | 28%  | 28%   |
| <b>NPSU 2000 benchmark for clinical pregnancy rate/cycle started</b>   |      | 24%  | 24%  | 24%  | 24%  | 24%  | 24%   | 24%  | 24%*  |
| Clinical pregnancy rate/OPU  | 23%  | 21%  | 25%  | 26%  | 27%  | 30%  | 27%   | 33%  | 32%   |
| <b>NPSU 2002 benchmark clinical Pregnancy rate /OPU</b>                |      |      |      | 26%  | 26%  | 26%  | 26%   | 26%  | 27%*  |
| Clinical pregnancy rate/embryo replacement                             | 29%  | 24%  | 30%  | 32%  | 33%  | 35%  | 32%   | 40%  | 36%   |
| Clinical pregnancy rate/embryo replacement (women ≤35yrs with FSH<9)   |      |      |      |      |      | 45%  | 36%   | 42%  | 41%   |
| Clinical pregnancy rate/ER in women having single blastocyst transfer. |      |      |      |      |      |      |       | 56%  | 52%   |
| <b>NPSU 2002 benchmark clinical pregnancy rate/embryo replacement</b>  |      |      |      | 31%  | 31%  | 31%  | 31%   | 31%  | 32%*  |
| Twin pregnancy rate  |      |      |      |      |      | 20%  | 12.5% | 9.6% | 10%   |
| <b>NPSU 2002 benchmark twin pregnancy rate</b>                         |      |      |      | ≤20% | ≤20% | ≤20% | ≤20%  | ≤20% | ≤12%* |

- 2006 Benchmarking figures

#### Pre-implantation genetic diagnosis (PGD)

As reported in 2006, we are now able to screen embryos for some genetic diseases by using PGD. There have been far fewer couples presenting at Fertility PLUS for PGD than was anticipated, with only two couples presenting in 2007.

It is interesting that there has been recent media publicity around the Bioethics Committee approving PGD for sex selection for family balancing reasons. These people

would not require IVF to become pregnant and would therefore be undergoing a highly technical procedure solely to have a child of a sex they desired. At present we must obtain approval from ECART (Ethics Committee for Assisted Reproductive Technology) for all new procedures, and they do not approve this practice. The Government has not approved funding for sex selection, and our accrediting body, RTAC, does not permit PGD for sex selection. Fertility PLUS would therefore not be using PGD for this purpose.

#### **Thawed embryo cycles:**

As reported in 2006, our standard practice is now to freeze 'spare' embryos as blastocysts on day 5 or 6 after fertilisation to avoid freezing embryos which do not have the potential to form a blastocyst and therefore could not give rise to a pregnancy. Our clinical pregnancy rate per embryo transfer for thawed blastocysts in 2007 was **37%**. The 2006 NPSU benchmark for clinical pregnancy rate per embryo transfer for thawed embryos was **21%** so we are reassured that we have adopted best practice in freezing at the blastocyst stage.

## 11.2 Recurrent pregnancy loss

### Methods

The data presented in this section were extracted from Healthware and relate to registrations with the Recurrent Pregnancy Loss Clinic (RPLC) in 2007 and to completed pregnancies among women registered with the RPLC.

**Table 77: Demographic details of women referred to the RPLC in 2007**

| Women referred in 2007<br>n=91 |    |    |
|--------------------------------|----|----|
|                                | n  | %  |
| <b>Ethnicity</b>               |    |    |
| NZ European                    | 47 | 52 |
| Maori                          | 4  | 4  |
| Pacific                        | 9  | 10 |
| Asian                          | 12 | 13 |
| Other European                 | 10 | 11 |
| Other                          | 6  | 7  |
| Not stated                     | 3  | 3  |
| <b>Age</b>                     |    |    |
| ≤30                            | 21 | 23 |
| 31-35                          | 37 | 41 |
| 36-40                          | 33 | 36 |
| <b>Gravidity</b>               |    |    |
| 3                              | 26 | 29 |
| 4                              | 30 | 33 |
| 5                              | 14 | 15 |
| >5                             | 21 | 23 |
| <b>Parity</b>                  |    |    |
| 0                              | 45 | 49 |
| 1                              | 32 | 35 |
| 2+                             | 14 | 15 |

The Recurrent Pregnancy Loss Clinic is provided by the Reproductive Endocrinology & Infertility (REI) Unit located in Fertility Plus at the Greenlane Clinical Centre.

The clinic provides investigation and information regarding management options for couples and appropriate support during early pregnancy, including the following services:

- Pregnancy clinic, supported by a specialist and nurse
- Access to a pregnancy counsellor on an individual or group basis
- Weekly relaxation, support and education sessions
- A seven day per week telephone advisory service between the hours of 8.30-15.30
- Acute medical assessment, seven days per week for clinical emergencies.

The referral criteria are as follows:

- 3 **consecutive** first trimester pregnancy losses\*
- 2 **consecutive** second trimester pregnancy losses\*
- Maternal age under 40yrs
- Resident in Auckland, Waitemata, Counties Manukau DHB area.

(\* pregnancy loss includes miscarriage, ectopic pregnancy, molar pregnancy but not termination of pregnancy)

**Table 78: Demographic details of women referred to the RPLC in 2007 (continued)**

| Women referred in 2007<br>n=91 |    |    |
|--------------------------------|----|----|
|                                | n  | %  |
| <b>Smoking</b>                 |    |    |
| Current                        | 12 | 13 |
| Past/Never                     | 78 | 76 |
| Unknown                        | 1  | 1  |
| <b>BMI</b>                     |    |    |
| <19                            | 1  | 1  |
| 19-25                          | 38 | 42 |
| 26-30                          | 16 | 18 |
| >30                            | 16 | 18 |
| Unknown                        | 20 | 22 |
| <b>Infertility history</b>     |    |    |
| Yes                            | 24 | 7  |
| No                             | 61 | 67 |
| Unknown                        | 6  | 26 |
| <b>Final diagnosis</b>         |    |    |
| Chromosomal                    | 1  | 1  |
| Structural abnormalities       | 4  | 4  |
| Thrombophilia                  | 6  | 7  |
| Unexplained                    | 79 | 87 |
| Other                          | 1  | 1  |

Some women attending the RPLC are offered the opportunity to participate in the SPIN study, which is a randomised trial to determine whether women who have had two or more consecutive pregnancy losses have a greater chance of pregnancy success if they take low dose Aspirin and Clexane during pregnancy along with intense surveillance of their pregnancy compared to intense surveillance alone.

### Pregnancy outcomes in 2007

During 2007, there were 69 completed pregnancies among 62 women previously registered with the RPLC, including seven women who completed 2 pregnancies each. Among these 69 pregnancies were 46 births (67%), 3 ectopics (4%) and 20 miscarriages (29%).

**Table 79: Pregnancy outcome by RPL diagnosis (2007)**

| Diagnosis              | N  | Birth $\geq$ 20 wks |     | Ectopic |    | Miscarriage |    |
|------------------------|----|---------------------|-----|---------|----|-------------|----|
|                        |    | n                   | %   | n       | %  | n           | %  |
| Chromosomal            | 3  | 2                   | 67  | 0       |    | 1           | 33 |
| Structural Abnormality | 4  | 0                   |     | 2       | 50 | 2           | 50 |
| Thrombophilia          | 2  | 2                   | 100 |         |    | 0           |    |
| Unexplained            | 57 | 39                  | 68  | 1       | 2  | 17          | 30 |
| Unknown/Missing        | 3  | 3                   | 100 | 0       |    | 0           |    |

**Table 80: Pregnancy outcomes by maternal characteristics**

|              | N  | Birth ≥20 wks |    | Ectopic |    | Miscarriage |    |
|--------------|----|---------------|----|---------|----|-------------|----|
|              |    | n             | %  | n       | %  | n           | %  |
| Parity       |    |               |    |         |    |             |    |
| 0            | 32 | 20            | 63 | 3       | 9  | 9           | 28 |
| 1            | 30 | 21            | 70 | 0       |    | 9           | 30 |
| 2+           | 7  | 5             | 71 | 0       |    | 2           | 29 |
| Gravidity    |    |               |    |         |    |             |    |
| 3            | 19 | 13            | 68 | 1       | 5  | 5           | 26 |
| 4            | 23 | 18            | 78 | 0       |    | 5           | 22 |
| 5            | 14 | 10            | 71 | 0       |    | 4           | 29 |
| ≥6           | 13 | 5             | 38 | 2       | 15 | 6           | 46 |
| Maternal age |    |               |    |         |    |             |    |
| ≤30          | 9  | 7             | 78 | 0       |    | 2           | 22 |
| 31-35        | 28 | 19            | 68 | 1       | 4  | 8           | 29 |
| 36-40        | 32 | 20            | 63 | 2       | 6  | 10          | 31 |
| BMI          |    |               |    |         |    |             |    |
| 19-25        | 26 | 19            | 73 | 0       |    | 7           | 27 |
| 26-30        | 16 | 9             | 56 | 1       | 6  | 6           | 38 |
| >30          | 10 | 6             | 60 | 1       | 10 | 3           | 30 |
| Missing      | 17 | 12            | 71 | 1       | 6  | 4           | 24 |

Women seen at RPLC for the years 2004-2007 have similar live birth rates (68% vs 67%) overall. The pregnancy data compares favourably with results in the reported literature, where the prognosis for a successful future pregnancy in patients with recurrent pregnancy loss is 71-77%.

## 11.3 Early pregnancy assessment unit

The Early Pregnancy Assessment Unit (EPAU) is a nurse-led outpatient service, with social worker and medical support, which has been open since 2003. Situated on level 6 at the Greenlane Clinical Centre it caters for patients referred from GPs, Specialists, Midwives or Women's Assessment Unit.

There were 1238 patient visits to EPAU in 2007. These numbers do not cover all patient interaction time as follow-up phone discussions constitute a significant element of EPAU work. These phone consultations will be recorded separately to better describe the EPAU workload in 2008.

Of visits to EPAU, 26% related to referrals requesting miscarriage management for women who have already been diagnosed. These women are given the management options appropriate and available to them, and are supported in their choice. The options available are to allow their miscarriage to complete spontaneously (conservative management with follow-up and monitoring), to have medical intervention (potentially with follow-up and monitoring), or surgical intervention. If surgical evacuation of the uterus is the preferred management option a visit is organised for surgery. Prior to November 2007 these procedures were performed at the Short Stay Surgical Unit at GLCC. In November 2007 the contract for surgical evacuations was transferred to Auckland City Surgical Services in Remuera.

A further 27% of all visits followed referrals for diagnosis or confirmation of miscarriage, viability of pregnancy, and/or location of pregnancy. This group of women usually require a lot of empathetic support as they may need to wait, with the assistance of follow-up and monitoring, to find out whether their pregnancy was ongoing or has failed.

Follow-up and monitoring, either following diagnosis or to confirm pregnancy status, accounted for a further 40% of EPAU visits. This is the core work of the unit and includes follow up of patients with Molar Pregnancy.

EPAU is the referral point for requests for consideration of termination of second-trimester pregnancy for women living in the ADHB area. EPAU co-ordinates the arrangements for counselling, specialist support and appropriate referral for ongoing care for both surgical and medical terminations. Whilst this represents only 8% of all EPAU visits, the resource required for these women is out of proportion to their numbers.

**Table 81: Reasons for visits to EPAU**

|   | <b>Total<br/>n=1238</b> |          |
|---|-------------------------|----------|
|   | <b>n</b>                | <b>%</b> |
| <b>Diagnosed miscarriage: For management or management planning</b>                               | 322                     | 26.0     |
| <b>Diagnosis requested: Confirmation of miscarriage or viability and/or location of pregnancy</b> | 330                     | 26.5     |
| <b>Follow-up and monitoring: Clinical review/USS/BHCG/histology</b>                               | 489                     | 39.5     |
| <b>2<sup>nd</sup> Trimester TOP consultation: For Medical or Surgical Termination</b>             | 97                      | 8.0      |

## 11.4 Termination of pregnancy

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

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

Approximately 37% of the women are resident in Counties Manukau DHB area, 30% are from within ADHB and 31% are from Waitemata DHB. Interpreters were required by 11.4% women accessing the service.

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

**Table 82: Number of terminations**

|                                     | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|-------------------------------------|------|------|------|------|------|------|------|------|
| <b>Total number of terminations</b> | 5835 | 5557 | 5775 | 5960 | 5809 | 5598 | 5548 | 5594 |

**Table 83: Number of counselling sessions**

|                                     | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|-------------------------------------|------|------|------|------|------|------|------|
|                                     | n    | n    | n    | n    | n    | n    | n    |
| <b>Post op counselling</b>          | 51   | 36   | 10   | 22   | 35   | 33   | 23   |
| <b>Pregnancy option counselling</b> | 78   | 90   | 70   | 92   | 89   | 87   | 86   |
| <b>Declines %</b>                   | 2.0  | 1.4  | 1.8  | 2.6  | 2.7  | 3.0  | 2.1  |

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

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

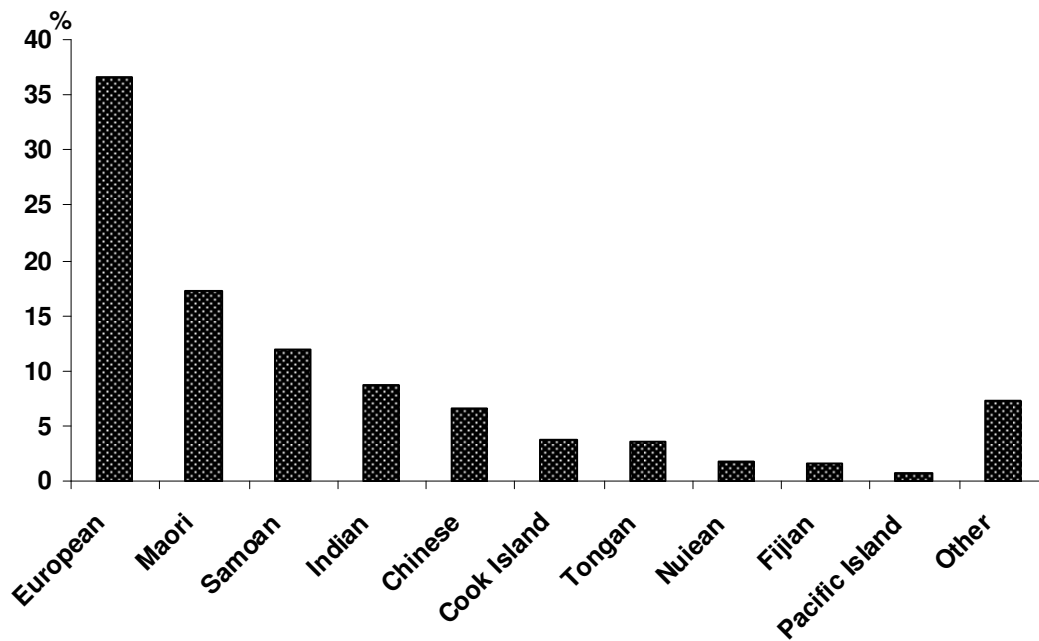


Figure 113: Ethnicity of women having a termination in 2007

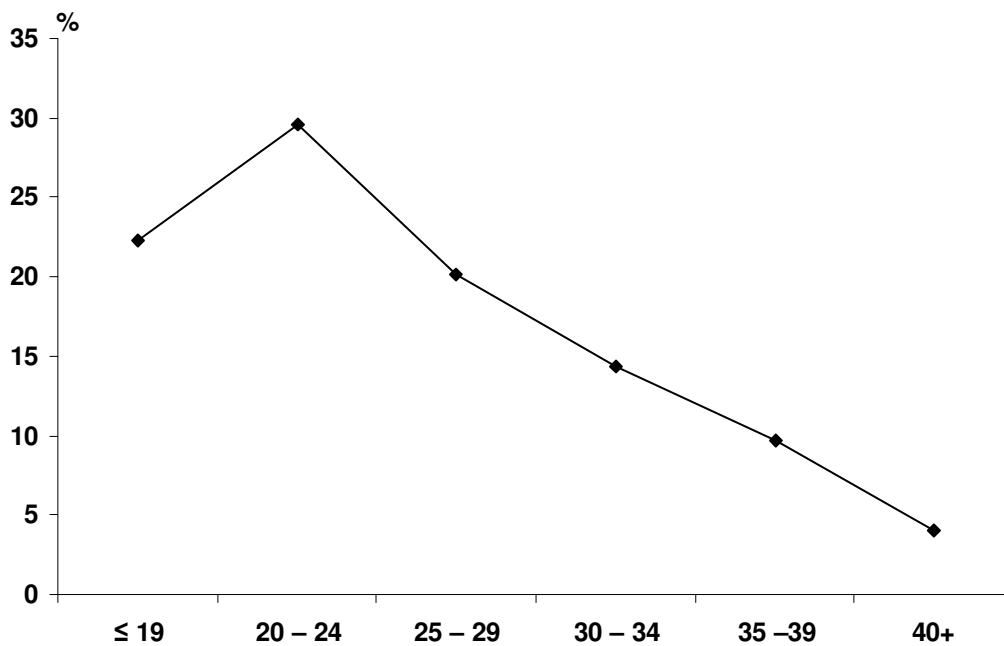


Figure 114: Age of women having a termination in 2007



## 11.5 Hysterectomy

### Methods

These data were sourced from inpatient coding data. They include all inpatient admissions to the gynaecology service during 2007 coded with hysterectomy as a procedure.

The definition of malignant indication for hysterectomy is hysterectomy procedure in a woman with a diagnosis code of gynaecological cancer in the same admission.

### Findings

**Table 84: Characteristics of women undergoing hysterectomy by indication during 2007**

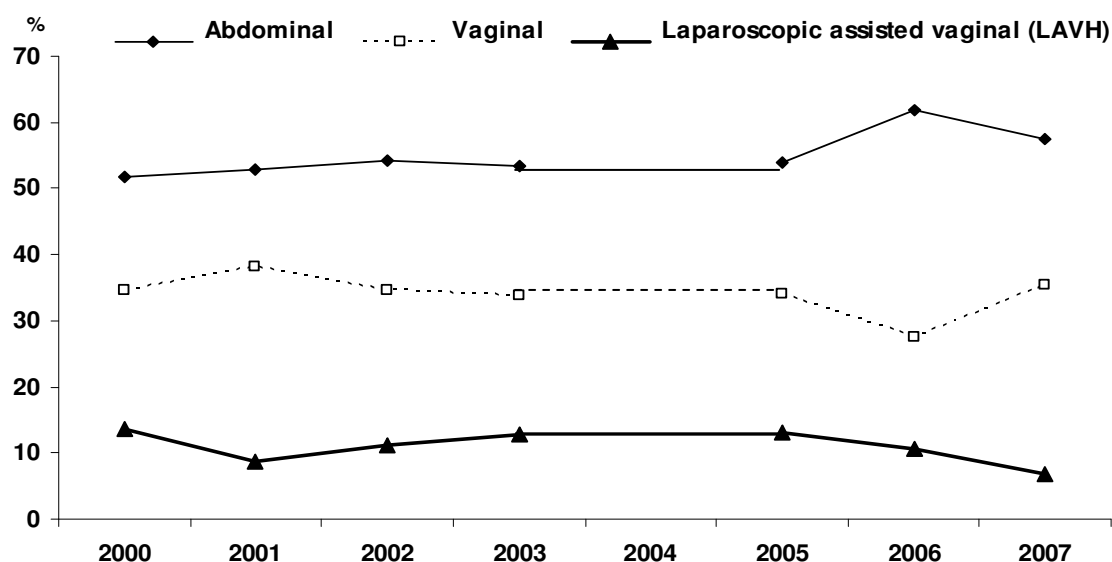
|   | Malignant indication<br>n=84 | Non malignant<br>indication<br>n=189 |
|---|------------------------------|--------------------------------------|
|   | n %                          | n %                                  |
| <b>Age</b>                                |                              |                                      |
| <35                                       | 8 9.5                        | 5 2.6                                |
| 35-45                                     | 15 17.9                      | 71 37.6                              |
| 46-55                                     | 16 19.0                      | 57 30.2                              |
| 56-65                                     | 23 27.4                      | 32 16.9                              |
| >65                                       | 22 26.2                      | 24 12.7                              |
| <b>Ethnicity</b>                          |                              |                                      |
| NZ European                               | 43 51.2                      | 67 35.4                              |
| Maori                                     | 7 8.3                        | 20 10.6                              |
| Pacific                                   | 16 19.0                      | 23 12.2                              |
| Asian                                     | 2 2.4                        | 21 11.1                              |
| Indian                                    | 5 6.0                        | 19 10.1                              |
| Other European                            | 7 8.3                        | 18 9.5                               |
| Other                                     | 4 4.8                        | 12 6.3                               |
| Not stated                                | 0                            | 9 4.8                                |
| <b>District Health Board of residence</b> |                              |                                      |
| Auckland                                  | 31 36.9                      | 157 83.1                             |
| Counties Manukau                          | 15 17.9                      | 9 4.8                                |
| Waitemata                                 | 24 28.6                      | 14 7.4                               |
| Other                                     | 14 16.7                      | 9 4.8                                |
| <b>Smoking</b>                            |                              |                                      |
| Current                                   | 12 14.3                      | 33 17.5                              |
| Past                                      | 9 10.7                       | 27 14.3                              |

**Table 85: Clinical details of women undergoing a hysterectomy**

|   | Malignant indication<br>n=84 |      | Non malignant<br>indication<br>n=189 |      |
|---|------------------------------|------|--------------------------------------|------|
|   | n                            | %    | n                                    | %    |
| <b>Type of hysterectomy</b>                     |                              |      |                                      |      |
| Abdominal                                       | 84                           | 100  | 109                                  | 57.7 |
| Vaginal   | 0                            |      | 67                                   | 35.4 |
| Laparoscopic assisted vaginal<br>(LAVH)         | 0                            |      | 13                                   | 6.9  |
| <b>Length of stay (days)</b>                    |                              |      |                                      |      |
| 0-5   | 51                           | 60.7 | 152                                  | 80.4 |
| 6-10  | 33                           | 39.3 | 32                                   | 16.9 |
| >10   | 0                            |      | 5                                    | 2.6  |
| <b>Number of women having a<br/>transfusion</b> |                              |      |                                      |      |
|   | 14                           | 16.7 | 13                                   | 6.9  |

**Table 86: Route of hysterectomy among non-malignant hysterectomies (2000-2007)**

|   | 2000<br>n=197 |      | 2001<br>n=170 |      | 2002<br>n=208 |      | 2003<br>n=187 |      | 2005<br>n=161 |      | 2006<br>n=131 |      | 2007<br>n=189 |      |
|---|---------------|------|---------------|------|---------------|------|---------------|------|---------------|------|---------------|------|---------------|------|
|   | n             | %    | n             | %    | n             | %    | n             | %    | n             | %    | n             | %    | n             | %    |
| <b>Abdominal</b>                                    | 102           | 51.8 | 90            | 52.9 | 113           | 54.3 | 100           | 53.5 | 84            | 54   | 81            | 61.8 | 109           | 57.7 |
| <b>Vaginal</b>                                      | 68            | 34.5 | 65            | 38.2 | 72            | 34.6 | 63            | 33.7 | 54            | 34   | 36            | 27.5 | 67            | 35.4 |
| <b>Laparoscopic<br/>assisted vaginal<br/>(LAVH)</b> | 27            | 13.7 | 15            | 8.8  | 23            | 11.1 | 24            | 12.8 | 21            | 13.0 | 14            | 10.7 | 13            | 6.9  |



**Figure 115: Route of hysterectomy among non malignant hysterectomies (2000-2007)**

## **Summary / Implications**

The total number of non-malignant hysterectomies performed at National Women's has remained fairly stable since 1999, averaging about 180/year. This is despite newer modalities of treatment of heavy menstrual bleeding becoming more available such as Mirena intrauterine system and third generation endometrial ablation techniques.

In this report the vaginal hysterectomy rate of 42.3% (combined vaginal 35.4% and LAVH 6.9%) is commendable. Vaginal hysterectomy is the safest and most cost effective mode of hysterectomy.

The blood transfusion rate is still high at 6.9% of non-malignant hysterectomies and needs to be monitored.

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

For the 2008 Annual Report, we must include data on operative complications including visceral injury, unexpected return to theatre, infective and thrombo-embolic complications. Data relating to these complications are now being collected.

## 11.6 Gynaecologic oncology surgical services

### Reporting to Gynaecologic Oncology Key Performance Indicators (KPI)

Key Performance Indicators were agreed with regional service partners as part of the regional service provision project in 2007. The goals were set based on internal audit of current practice and specialist advice with regard to agreed best practice.

#### Methods

Not all KPI are reported for 2007 as not all necessary data are currently collected. The data have been put together from (1) an ACCESS database recording gynaecologic oncology referrals and information relating to referral; (2) an EXCEL spreadsheet recording all women entered onto the surgical waiting list for "Oncology"; and (3) an ACCESS database of all inpatient surgeries among women with a confirmed malignancy (i.e. exclusive of molar pregnancies, pre-cancers and surgery for suspected tumours which are found to be benign).

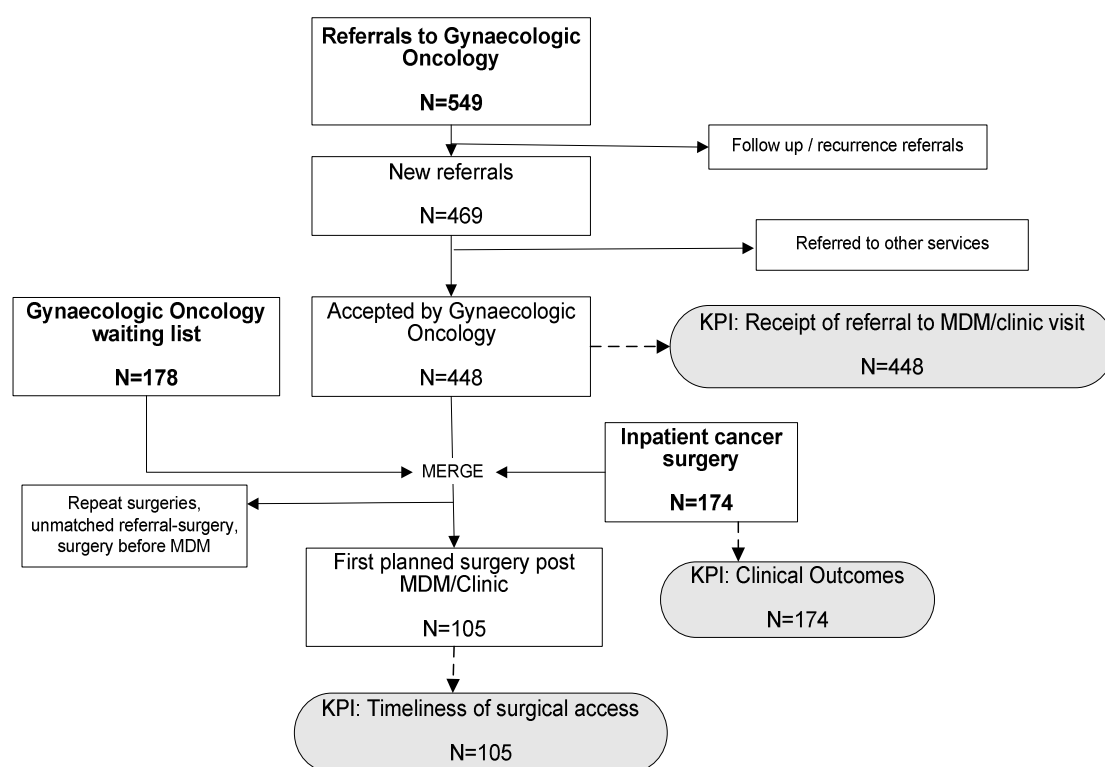


Figure 116: Use of Gynaecologic Oncology Databases to calculate KPI (inclusions and exclusions).

#### Findings

**KPI** Receipt of referral to MDM or first clinic visit

**Goal** <14 days for 90%

There were 448 new referrals accepted to Gynaecologic Oncology in 2007. 292 (65%) were seen in less than 14 days. A further 22 (5%) were seen at 14 days.

**KPI Timeliness of accessing planned surgical care**  
**Goal 90% within 56 days**  
**Goal In the case of ovarian cancer <14 days**

*Aggregated:*

Of women known to have had inpatient surgery for confirmed cancer or on the waiting list for oncology service, 118 were referred in 2007. Of these, 105 had inpatient surgery performed after referral to MDM or clinic. Of these 96, (91%) had surgery performed within 56 days.

*By cancer:*

Ovarian 25/26 in under 56 days, 8/26 (31%) in under 14 days.  
 Endometrium 22/22 in under 56 days  
 Cervix 14/15 in under 56 days  
 Vulva 7/9 in under 56 days

**KPI Group 3: Clinical outcomes**

**Goal: Review year to year trend data**

This analysis includes the 174 inpatient surgeries in 2007 where a diagnosis of cancer was confirmed and data were entered into the Gynaecologic Oncology database. Nine women had two surgeries in 2007. Data were incomplete in 3-16% of fields. It is believed that these missing data are likely to be distributed similarly to complications among cases with known data or to be less frequent.

**Table 87: Complications among inpatient surgeries for gynaecologic cancer in 2007**

| Complication                                  | Surgeries with data | Complication rate |    |
|---|---------------------|-------------------|----|
|   |                     | n                 | %  |
| Transfusion                                   | 169                 | 18                | 11 |
| Febrile morbidity <sup>1</sup>                | 167                 | 16                | 10 |
| Thromboembolism <sup>2</sup>                  | 167                 | 2                 | 1  |
| Cardiovascular                                | 158                 | 2                 | 1  |
| Gastro-intestinal <sup>3</sup>                | 162                 | 2                 | 1  |
| Return to theatre within 6 weeks              | 153                 | 5                 | 3  |
| Readmission with complications within 6 weeks | 150                 | 10                | 7  |

<sup>1</sup> 3 chest, 5 urinary, 8 wound

<sup>2</sup> deep vein thrombosis

<sup>3</sup> 1 ileus, 1 obstruction

**Summary/Implications**

These are the first published data on key performance indicators from our regional unit. It is evident that some of the agreed KPI are not currently calculable. In some areas the service is meeting it's goals and in other areas there is variance. Resourcing within the service and process issues are possible contributors.



# Chapter 12

## APPENDICES





---

## APPENDIX 1. METHODOLOGY

---

### 1.1 Data cleaning queries

The following is a list of the data cleaning and validation queries which were carried out for the production of this report. This list is not exhaustive and some further ad hoc cleaning was carried out during analysis.

#### Antenatal

Ethnicity is Not Stated or Other

Check parity if parity is less than parity at previous live birth (although previously parity was defined as 2 for twins). Check that obstetric history has been completed for women with a gravidity >1.

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

LMC is Other Please Specify, Null, NW Obstetrician or charge midwives.

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

#### Antenatal Complications

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

If Antenatal Admission for Hypertension, APH or Diabetes, check AN Summary screen medical conditions is not = missing &/or check data is consistent.

If Induction Indication is Hypertension, APH or Diabetes, check AN Summary screen medical conditions is not = missing &/or check data is consistent.

If Reason for Operative Birth is Hypertension, APH or Diabetes, check AN Summary screen medical conditions is not = missing &/or check data is consistent.

If HDU Admission for Hypertension, APH or Diabetes, check AN or PN screen medical conditions & blood loss/ transfusion is not = missing &/or data is consistent.

Medical History Screen; Previous Medical Conditions = Chronic Hypertension, Diabetes Type 1 or Diabetes Type 2 & AN Summary screen medical conditions is not = missing &/or check data is consistent.

Antenatal Summary - Hypertension Fields can not be Null (Eclampsia, Gestational Hypertension, Pre eclampsia, Other Current Med Surg Cond).

Antenatal Summary; Current Medications (prior to labour or elective cs) = Antihypertensives then check Hypertension Fields are not Null &/or data is consistent. (Eclampsia, Gestational Hypertension, Pre eclampsia, Other Current Med Surg Cond).

Antenatal Diabetes Screen fields - Hypertension, Chronic HT pre preg or Antihypertensive Treatment pre preg indicate Hypertension, check Antenatal Summary Hypertension fields are not null &/or data is consistent.

Eclampsia = Yes (Boolean in Antenatal Summary).

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

Antenatal Summary screen; Reason for Specialist Consultation = Diabetes, check Sugar Tolerance = is not null.

If Antenatal Summary Sugar Tolerance indicates Diabetes check Diabetic Screens AN or PN = missing.

Antenatal Diabetes screen without a PN Diabetes Screen & vice versa.

Newborn Diabetes; Newborn Discharge Summary, check for missing diabetic data.

## Induction of Labour

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

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

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

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

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

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

## Pregnancy/Birth

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

Check 'Delivered by' is not missing.

Check that admission to Labour & Birth Suite/Operating Theatre/WAU is before birth time (unless is recorded as BBA).

If birth location is BBA, then birth time is before admission.

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

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

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

Full Dilatation Time should not be null if Birth Method is a vaginal birth.

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

Syntocinon time is before birth time.

Membranes ruptured time is not null.

Membranes ruptured time is before birth time.

Time of epidural insertion is before birth time.

Full dilatation time is before birth time.

Birth time is always before birth of placenta time.

Placenta birth time is not null.

Check all Classical Caesareans to ensure they are authentic.

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

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

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

If indication for operative birth is fetal distress, then fetal distress variable (in Labour & Birth Baby) is yes or meconium was present.

Check if failure to progress is the primary indication for operative birth & mode of birth is elective caesarean.

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

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

If Birth method is breech, then presentation is breech.

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

If Birth method is 'Elective CS' then Dilatation at Syntocinon should be null.

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

If ARM check there is an indication for ARM.

If vaginal birth, membranes method should not be At time of C/S.

Birth Presentation is null.

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

If Time of Epidural is not Null then Anaesthesia should show Epidural Lumbar or Epidural Spinal.

If caesarean is mode of birth, anaesthesia is not missing.

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

If there is postpartum transfusion and blood loss is < 1000 mls, check blood loss.

Blood Loss is not out of range ie: <50, >1500 or is null.

Blood Loss >=1500 & Blood Transfusion = No.

Blood Loss <1500 & Blood Transfusion =Yes.

Vaginal Birth & Lacerations is Null.

Sutured by Is Not Null, Lacerations Is Null.

If Instrumental Birth (Forceps) then check for Episiotomy.

## **Postnatal**

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

Mothers and baby's destination are not null

Mothers destination not NW's & PN Admission screen entered

PN Adm - Missing 'Admitted to ward time', 'CMS Discharge date' or 'Admission Type'

PN Adm - 1 ° Reason for PN Admission is Other & Comment

PN Adm - 1 ° Reason for PN Admission is Null or SVD

Mothers Destination to Ward & Admitted to (PN Admission Screen) do not match or is null

PN Admission - missing Admission Type

Baby Destination (L&B Baby) is a NW location, check Discharge Time & Discharge to & Discharge Care (Newborn Discharge Summary) is not null

Newborn Discharge Summary Missing Data (If DHB is ADHB & LMC is NW LMC)

Discharge Care - Postnatal Admission is NW Homecare (includes Domino, Diabetic etc) but missing Postnatal Homecare Summary or Newborn Discharge Summary

Discharge Care - Postnatal Admission NOT NW, but Postnatal Homecare Summary Screen

Postnatal Homecare Missing Data

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

## **Baby**

Birth weight – check if <400g or >5kg.

If gestation <35 weeks, check birth weight if >2500g.

If gestation >35 weeks, check birth weight if <2500g.

Gestation: check if < 20wks or > 44 wks.

If indication for induction is post term, check gestation if gestation is < 40 weeks.

Gestation to Neonatal Gestation (Immediate Newborn Assessment screen) > 1 week difference if <28 weeks and >2 weeks difference if  $\geq$  28 weeks.

Perinatal mortality database for perinatal deaths gestation to derived gestation > 1 week difference

Neonatal database gestation to derived gestation > 1 week difference.  
(Because of the incomplete reconciliation of data sets, there may be a minimal number of cases where gestation varies in reporting of the neonatal and maternity data.)

Gestational Age (Immediate Newborn Assessment) Is Null.

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

Missing Apgars.

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

## **Data Checks with Other Sources**

CMS/ Coding data to ensure correct birth numbers.

Neonatology database; fields checked include Birthweight, Gestation, Apgars & Days in NICU.

Perinatal database fields cross-referenced with Healthware include; ethnicity, gestation – LMP/EDD, LMC, Gravida/Parity, Height/Weight/BMI, Outcome, Apgars, Sex, Gestation, Birth Weight, PSANZ-PDC & PSANZ-NDC classifications, customised centile.

PIMs theatre data checked against Healthware for epidural and GA

## APPENDIX 2. SUMMARY STATISTICS

Table 88: Mode of birth (1998-2007)

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

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

## APPENDIX 3. MATERNAL DEMOGRAPHY

**Table 89: Domicile of women giving birth at National Women's (2002-2007)**

|                           | 2002<br>n=7775 |      | 2003<br>n=7611 |      | 2004<br>n=7491 |      | 2005<br>n=7194 |      | 2006<br>n=7212 |      | 2007<br>n=7695 |      |
|---------------------------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|
|                           | n              | %    | n              | %    | n              | %    | n              | %    | n              | %    | n              | %    |
| <b>Auckland Central</b>   | 5085           | 65.4 | 5007           | 65.8 | 5055           | 67.5 | 4985           | 69.3 | 5100           | 70.7 | 5382           | 69.9 |
| <b>Auckland Waitemata</b> | 1180           | 15.2 | 1138           | 15   | 1068           | 14.3 | 982            | 13.7 | 994            | 13.8 | 1043           | 13.6 |
| <b>Auckland South</b>     | 1408           | 18.1 | 1368           | 18   | 1240           | 16.6 | 1089           | 15.1 | 994            | 13.8 | 1136           | 14.8 |
| <b>North of Auckland</b>  | 29             | 0.4  | 38             | 0.5  | 37             | 0.5  | 31             | 0.4  | 40             | 0.6  | 41             | 0.5  |
| <b>North Island Other</b> | 68             | 0.9  | 42             | 0.6  | 72             | 1.0  | 93             | 1.3  | 69             | 1.0  | 73             | 0.9  |
| <b>South Island</b>       | 5              | 0.1  | 13             | 0.2  | 12             | 0.2  | 9              | 0.1  | 13             | 0.2  | 14             | 0.2  |
| <b>Overseas</b>           |                |      | 5              | 0.1  | 7              | 0.1  | 5              | 0.1  | 2              | 0.03 | 6              | 0.08 |

**Table 90: Maternal age distribution (2000-2007)**

|             | <21 yrs |         | 21-25 yrs |   | 26-30 yrs |   | 31-35 yrs |   | 36-40 yrs |   | >40 yrs |   |
|-------------|---------|---------|-----------|---|-----------|---|-----------|---|-----------|---|---------|---|
|             | N       | n %     | n         | % | n         | % | n         | % | n         | % | n       | % |
| <b>2000</b> | 7827    | 431 5.5 | 1091 13.9 |   | 2204 28.2 |   | 2670 34.1 |   | 1232 15.7 |   | 199 2.5 |   |
| <b>2002</b> | 7775    | 376 4.8 | 998 12.8  |   | 2018 26.0 |   | 2816 36.2 |   | 1335 17.2 |   | 232 3.0 |   |
| <b>2003</b> | 7611    | 372 4.9 | 959 12.6  |   | 1933 25.4 |   | 2738 36.0 |   | 1380 18.1 |   | 229 3.0 |   |
| <b>2004</b> | 7491    | 357 4.8 | 913 12.2  |   | 1809 24.1 |   | 2781 37.1 |   | 1384 18.5 |   | 247 3.3 |   |
| <b>2005</b> | 7194    | 330 4.6 | 828 11.5  |   | 1685 23.4 |   | 2702 37.6 |   | 1395 19.4 |   | 254 3.5 |   |
| <b>2006</b> | 7212    | 323 4.5 | 869 12.0  |   | 1735 24.1 |   | 2619 36.3 |   | 1421 19.7 |   | 245 3.4 |   |
| <b>2007</b> | 7695    | 386 5.0 | 1005 13.1 |   | 1798 23.4 |   | 2710 35.2 |   | 1514 19.7 |   | 282 3.7 |   |

**Table 91: 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       | %    |
| <b>Nullipara</b> | 3752  | 317     | 82.1 | 611       | 60.8 | 1037      | 57.7 | 1202      | 44.4 | 507       | 33.5 | 78      | 27.7 |
| <b>Multipara</b> | 3943  | 69      | 17.9 | 394       | 39.2 | 761       | 42.3 | 1508      | 55.6 | 1007      | 66.5 | 204     | 72.3 |

**Table 92: Time trends in nulliparity and multiparity** (Data for 2001-2003 not available)

|                         | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998  | 1999 | 2000 | 2004 | 2005 | 2006 | 2007 |
|-------------------------|------|------|------|------|------|------|-------|------|------|------|------|------|------|
| <b>Number of births</b> | 8315 | 8690 | 8812 | 9125 | 9157 | 8055 | 7492* | 7501 | 7827 | 7491 | 7194 | 7212 | 7695 |
| <b>Nullipara</b>        | 3700 | 3649 | 3814 | 4037 | 4018 | 3591 | 3263  | 3262 | 3455 | 3597 | 3522 | 3499 | 3752 |
| <b>%</b>                | 44.5 | 42.0 | 43.3 | 44.2 | 43.9 | 44.6 | 43.6  | 43.5 | 44.1 | 48.0 | 49.0 | 48.5 | 48.8 |
| <b>Multipara</b>        | 4615 | 5041 | 4998 | 5088 | 5139 | 4464 | 4229  | 4239 | 4372 | 3894 | 3672 | 3713 | 3943 |
| <b>%</b>                | 55.5 | 58.0 | 56.7 | 55.8 | 56.1 | 55.4 | 56.4  | 56.5 | 55.9 | 52.0 | 51.0 | 51.5 | 51.2 |

\*Does not include 39 BBA's

**Table 93: Prioritised ethnicity of women giving birth at National Women's**  
(for information on assigning ethnicity and prioritising ethnicity, see Appendix 1)

| <b>2007</b>              |            |
|--------------------------|------------|
| <b>n=7695</b>            |            |
|                          | <b>n %</b> |
| NZ European              | 3161 41.1  |
| Chinese                  | 881 11.4   |
| Maori                    | 641 8.3    |
| Other European           | 580 7.5    |
| Indian                   | 521 6.8    |
| Samoan                   | 372 4.8    |
| Tongan                   | 347 4.5    |
| Other Asian              | 340 4.4    |
| Cook Island Maori        | 157 2.0    |
| European NFD             | 115 1.5    |
| Middle Eastern           | 107 1.4    |
| Niuean                   | 105 1.4    |
| South East Asian         | 82 1.1     |
| Fijian                   | 81 1.1     |
| African                  | 75 1.0     |
| Asian NFD                | 51 0.7     |
| Latin American/ Hispanic | 39 0.5     |
| Other Pacific Island     | 33 0.4     |
| Tokelauan                | 5 0.1      |
| Other                    | 2 0.0      |

**Table 94: Maternal ethnicity and age**

|               | <b>Total</b> | <b>NZ European</b> |          | <b>Maori</b> |          | <b>Pacific</b> |          | <b>Asian</b> |          | <b>Indian</b> |          | <b>Other European</b> |          | <b>Other</b> |          |
|---------------|--------------|--------------------|----------|--------------|----------|----------------|----------|--------------|----------|---------------|----------|-----------------------|----------|--------------|----------|
|               | <b>N</b>     | <b>n</b>           | <b>%</b> | <b>n</b>     | <b>%</b> | <b>n</b>       | <b>%</b> | <b>n</b>     | <b>%</b> | <b>n</b>      | <b>%</b> | <b>n</b>              | <b>%</b> | <b>n</b>     | <b>%</b> |
| <b>Total</b>  | 7695         | 3161               | 41.1     | 641          | 8.3      | 1100           | 14.3     | 1354         | 17.6     | 521           | 6.8      | 695                   | 9.0      | 223          | 2.9      |
| <b>&lt;21</b> | 386          | 90                 | 2.9      | 126          | 19.7     | 122            | 11.1     | 23           | 1.7      | 11            | 2.1      | 5                     | 0.7      | 9            | 4.0      |
| <b>21-25</b>  | 1005         | 184                | 5.8      | 151          | 23.6     | 290            | 26.4     | 197          | 14.5     | 94            | 18.0     | 48                    | 6.9      | 41           | 18.4     |
| <b>26-30</b>  | 1798         | 582                | 18.4     | 134          | 20.9     | 285            | 25.9     | 404          | 29.8     | 189           | 36.3     | 141                   | 20.3     | 63           | 28.3     |
| <b>31-35</b>  | 2710         | 1378               | 43.6     | 130          | 20.3     | 227            | 20.6     | 449          | 33.2     | 169           | 32.4     | 293                   | 42.2     | 64           | 28.7     |
| <b>36-40</b>  | 1514         | 790                | 25.0     | 88           | 13.7     | 136            | 12.4     | 231          | 17.1     | 53            | 10.2     | 180                   | 25.9     | 36           | 16.1     |
| <b>41+</b>    | 282          | 137                | 4.3      | 12           | 1.9      | 40             | 3.6      | 50           | 3.7      | 5             | 1.0      | 28                    | 4.0      | 10           | 4.5      |

**Table 95: Maternal ethnicity and parity**

|           | NZ European<br>n=3161 |      | Maori<br>n=641 |     | Pacific<br>n=1100 |     | Asian<br>n=1354 |     | Indian<br>n=521 |     | Other<br>European<br>n=695 |     | Other<br>n=223 |     |      |
|-----------|-----------------------|------|----------------|-----|-------------------|-----|-----------------|-----|-----------------|-----|----------------------------|-----|----------------|-----|------|
|           | N                     | n    | %              | n   | %                 | n   | %               | n   | %               | n   | %                          | n   | %              | n   | %    |
| Nullipara | 3752                  | 1602 | 50.7           | 251 | 39.2              | 372 | 33.8            | 775 | 57.2            | 276 | 53.0                       | 387 | 55.7           | 89  | 39.9 |
| Multipara | 3943                  | 1559 | 49.3           | 390 | 60.8              | 728 | 66.2            | 579 | 42.8            | 245 | 47.0                       | 308 | 44.3           | 134 | 60.1 |

Table 96: Ethnicity of women birthing at NW

|                              | 2000<br>n=7827 |      | 2002<br>n=7775 |      | 2003<br>n=7611 |      | 2004<br>n=7491 |      | 2005<br>n=7194 |      | 2006<br>n=7212 |      | 2007<br>n=7695 |      |
|------------------------------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|
|                              | n              | %    | n              | %    | n              | %    | n              | %    | n              | %    | n              | %    | n              | %    |
| <b>NZ European</b>           | 3988           | 51.0 | 3362           | 43.2 | 3224           | 42.4 | 2911           | 38.9 | 2802           | 39.0 | 3034           | 42.1 | 3161           | 41.1 |
| <b>Other European</b>        | *              |      | 642            | 8.3  | 608            | 8.0  | 548            | 7.3  | 674            | 9.4  | 682            | 9.5  | 695            | 9.0  |
| <b>Maori</b>                 | 629            | 8.0  | 547            | 7.0  | 486            | 6.4  | 509            | 6.8  | 545            | 7.6  | 597            | 8.3  | 641            | 8.3  |
| <b>Niuean</b>                | 138            | 1.8  | 108            | 1.4  | 108            | 1.4  | 106            | 1.4  | 111            | 1.5  | 81             | 1.1  | 105            | 1.4  |
| <b>Cook Islander</b>         | 176            | 2.2  | 160            | 2.1  | 159            | 2.1  | 140            | 1.9  | 106            | 1.5  | 113            | 1.6  | 157            | 2.0  |
| <b>Samoaan</b>               | 546            | 7.0  | 531            | 6.8  | 439            | 5.8  | 425            | 5.7  | 339            | 4.7  | 384            | 5.3  | 372            | 4.8  |
| <b>Tongan</b>                | 498            | 6.4  | 432            | 5.6  | 406            | 5.3  | 355            | 4.7  | 315            | 4.4  | 346            | 4.8  | 347            | 4.5  |
| <b>Fijian</b>                | 55             | 0.7  | 50             | 0.6  | 42             | 0.6  | 47             | 0.6  | 62             | 0.9  | 60             | 0.8  | 81             | 1.1  |
| <b>Other Pacific Islands</b> | 33             | 0.4  | 40             | 0.5  | 36             | 0.5  | 37             | 0.5  | 47             | 0.7  | 37             | 0.5  | 38             | 0.5  |
| <b>Chinese</b>               | 763            | 9.7  | 780            | 10.0 | 811            | 10.7 | 871            | 11.6 | 769            | 10.7 | 707            | 9.8  | 881            | 11.5 |
| <b>Indian</b>                | 347            | 4.4  | 467            | 6.0  | 548            | 7.2  | 540            | 7.2  | 545            | 7.6  | 520            | 7.2  | 521            | 6.8  |
| <b>Other Asian</b>           | 386            | 4.9  | 422            | 5.4  | 438            | 5.8  | 404            | 5.4  | 354            | 4.9  | 408            | 5.7  | 473            | 6.1  |
| <b>Other</b>                 | 268            | 3.4  | 229            | 2.9  | 298            | 3.9  | 471            | 6.3  | 521            | 7.2  | 243            | 3.4  | 223            | 2.9  |
| <b>Not Stated</b>            |                |      | 5              | 0.1  | 8              | 0.1  | 127            | 1.7  | 3              |      | 0              |      | 0              |      |

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

### 3.1 Body mass index

Table 97: BMI and age categories

|                     |      | <21 yrs<br>n=386 |      | 21-25 yrs<br>n=1005 |      | 26-30 yrs<br>n=1798 |      | 31-35 yrs<br>n=2710 |      | 36-40 yrs<br>n=1514 |      | >40 yrs<br>n=282 |      |
|---------------------|------|------------------|------|---------------------|------|---------------------|------|---------------------|------|---------------------|------|------------------|------|
|                     | N    | n                | %    | n                   | %    | n                   | %    | n                   | %    | n                   | %    | n                | %    |
| <b>&lt;19</b>       | 388  | 12               | 3.1  | 79                  | 7.9  | 115                 | 6.4  | 123                 | 4.5  | 56                  | 3.7  | 3                | 1.1  |
| <b>19-25</b>        | 4129 | 154              | 39.9 | 402                 | 40.0 | 940                 | 52.3 | 1624                | 59.9 | 860                 | 56.8 | 149              | 52.8 |
| <b>26-35</b>        | 1940 | 106              | 27.5 | 289                 | 28.8 | 452                 | 25.1 | 628                 | 23.2 | 387                 | 25.6 | 78               | 27.7 |
| <b>&gt;35</b>       | 452  | 24               | 6.2  | 75                  | 7.5  | 123                 | 6.8  | 122                 | 4.5  | 80                  | 5.3  | 28               | 9.9  |
| <b>Missing data</b> | 786  | 90               | 23.3 | 160                 | 15.9 | 168                 | 9.3  | 213                 | 7.9  | 131                 | 8.7  | 24               | 8.5  |

Table 98: BMI and parity

|                  | Total | <19 |     | 19-25 |      | 26-35 |      | >35 |     | Missing |      |
|------------------|-------|-----|-----|-------|------|-------|------|-----|-----|---------|------|
|                  | N     | n   | %   | n     | %    | n     | %    | n   | %   | n       | %    |
| <b>Nullipara</b> | 3752  | 224 | 6.0 | 2232  | 59.5 | 804   | 21.4 | 137 | 3.7 | 355     | 9.5  |
| <b>Multipara</b> | 3943  | 164 | 4.2 | 1897  | 48.1 | 1136  | 28.8 | 315 | 8.0 | 431     | 10.9 |

Table 99: Maternal ethnicity and BMI

|                     | Total | NZ European<br>n=3161 |      | Maori<br>n=641 |      | Pacific<br>n=1100 |      | Asian<br>n=1354 |      | Indian<br>n=521 |      | Other European<br>n=695 |      | Other<br>n=223 |      |
|---------------------|-------|-----------------------|------|----------------|------|-------------------|------|-----------------|------|-----------------|------|-------------------------|------|----------------|------|
|                     | N     | n                     | %    | n              | %    | n                 | %    | n               | %    | n               | %    | n                       | %    | n              | %    |
| <b>&lt;19</b>       | 388   | 107                   | 3.4  | 10             | 1.6  | 12                | 1.1  | 186             | 13.7 | 40              | 7.7  | 28                      | 4.0  | 5              | 2.2  |
| <b>19-25</b>        | 4129  | 2015                  | 63.8 | 171            | 26.7 | 178               | 16.2 | 927             | 68.5 | 263             | 50.5 | 454                     | 65.3 | 121            | 54.3 |
| <b>26-35</b>        | 1940  | 699                   | 22.1 | 226            | 35.3 | 475               | 43.2 | 157             | 11.6 | 166             | 31.9 | 145                     | 20.9 | 72             | 32.3 |
| <b>&gt;35</b>       | 452   | 89                    | 2.8  | 69             | 10.8 | 256               | 23.3 | 5               | 0.4  | 8               | 1.5  | 18                      | 2.6  | 7              | 3.1  |
| <b>Missing data</b> | 786   | 251                   | 7.9  | 165            | 25.7 | 179               | 16.3 | 79              | 5.8  | 44              | 8.5  | 50                      | 7.2  | 18             | 8.1  |



## 3.2 Smoking

**Table 100: Smoking status at booking by ethnicity and maternal age (excluding women with missing data).**

missing data).

|                | Women<br>with data<br>n | Yes within<br>past month<br>n % |      | Not in past<br>month<br>n % |      |
|----------------|-------------------------|---------------------------------|------|-----------------------------|------|
| Ethnicity      |                         |                                 |      |                             |      |
| NZ European    | 2786                    | 170                             | 6.1  | 2616                        | 93.9 |
| Maori          | 521                     | 211                             | 40.5 | 310                         | 59.5 |
| Pacific        | 964                     | 188                             | 19.5 | 776                         | 80.5 |
| Asian          | 1223                    | 29                              | 2.4  | 1194                        | 97.6 |
| Indian         | 454                     | 3                               | 0.7  | 451                         | 99.3 |
| Other European | 621                     | 26                              | 4.2  | 595                         | 95.8 |
| Other          | 196                     | 6                               | 3.1  | 190                         | 96.9 |
| Age            |                         |                                 |      |                             |      |
| ≤ 20           | 322                     | 109                             | 33.9 | 213                         | 66.2 |
| 21-25          | 853                     | 163                             | 19.1 | 690                         | 80.9 |
| 26-30          | 1592                    | 138                             | 8.7  | 1454                        | 91.3 |
| 31-35          | 2412                    | 130                             | 5.4  | 2282                        | 94.6 |
| > 36           | 1586                    | 93                              | 5.9  | 1493                        | 94.1 |

**Table 101: Smoking status at birth among NZ European women**

|                                 |      | <21 yrs<br>n=64 |      | 21-25 yrs<br>n=129 |      | 26-30 yrs<br>n=428 |      | 31-35 yrs<br>n=1032 |      | 36-40 yrs<br>n=574 |      | >40 yrs<br>n=93 |      |
|---------------------------------|------|-----------------|------|--------------------|------|--------------------|------|---------------------|------|--------------------|------|-----------------|------|
|                                 | N    | n               | %    | n                  | %    | n                  | %    | n                   | %    | n                  | %    | n               | %    |
| No or not smoking in last month | 2193 | 48              | 75.0 | 104                | 80.6 | 401                | 93.7 | 1002                | 97.1 | 547                | 95.3 | 91              | 97.8 |
| Stopped in Pregnancy            | 21   | 6               | 9.4  | 5                  | 3.9  | 4                  | 0.9  | 3                   | 0.3  | 2                  | 0.3  | 1               | 1.1  |
| Currently smoking               | 106  | 10              | 15.6 | 20                 | 15.5 | 23                 | 5.4  | 27                  | 2.6  | 25                 | 4.4  | 1               | 1.1  |

**Table 102: Smoking status at birth among Maori women**

|                                 |     | <21 yrs<br>n=88 |      | 21-25 yrs<br>n=101 |      | 26-30 yrs<br>n=89 |      | 31-35 yrs<br>n=89 |      | 36-40 yrs<br>n=61 |      | >40 yrs<br>n=9 |      |
|---------------------------------|-----|-----------------|------|--------------------|------|-------------------|------|-------------------|------|-------------------|------|----------------|------|
|                                 | N   | n               | %    | n                  | %    | n                 | %    | n                 | %    | n                 | %    | n              | %    |
| No or not smoking in last month | 261 | 41              | 46.6 | 59                 | 58.4 | 52                | 58.4 | 61                | 68.5 | 45                | 73.8 | 3              | 33.3 |
| Stopped in Pregnancy            | 9   | 5               | 5.7  | 2                  | 2.0  | 1                 | 1.1  | 0                 |      | 1                 | 1.6  | 0              |      |
| Currently smoking               | 167 | 42              | 47.7 | 40                 | 39.6 | 36                | 40.4 | 28                | 31.5 | 15                | 24.6 | 6              | 66.6 |

**Table 103: Smoking status at birth among Pacific women**

|                                 |     | <21 yrs<br>n=87 |      | 21-25 yrs<br>n=188 |      | 26-30 yrs<br>n=188 |      | 31-35 yrs<br>n=153 |      | 36-40 yrs<br>n=95 |      | >40 yrs<br>n=22 |      |
|---------------------------------|-----|-----------------|------|--------------------|------|--------------------|------|--------------------|------|-------------------|------|-----------------|------|
|                                 | N   | n               | %    | n                  | %    | n                  | %    | n                  | %    | n                 | %    | n               | %    |
| No or not smoking in last month | 602 | 64              | 73.6 | 141                | 75.0 | 165                | 87.8 | 129                | 84.3 | 85                | 89.5 | 18              | 81.8 |
| Stopped in Pregnancy            | 19  | 5               | 5.7  | 9                  | 4.8  | 1                  | 0.5  | 2                  | 1.3  | 1                 | 1.1  | 1               | 4.5  |
| Currently smoking               | 112 | 18              | 20.7 | 38                 | 20.2 | 22                 | 11.7 | 22                 | 14.3 | 9                 | 9.5  | 3               | 13.6 |

**Table 104: Smoking status at birth among Asian women**

|                                 |     | <21 yrs<br>n=15 |      | 21-25 yrs<br>n=150 |      | 26-30 yrs<br>n=299 |      | 31-35 yrs<br>n=313 |      | 36-40 yrs<br>n=168 |      | >40 yrs<br>n=35 |     |
|---------------------------------|-----|-----------------|------|--------------------|------|--------------------|------|--------------------|------|--------------------|------|-----------------|-----|
|                                 | N   | n               | %    | n                  | %    | n                  | %    | n                  | %    | n                  | %    | n               | %   |
| No or not smoking in last month | 962 | 14              | 93.3 | 146                | 97.3 | 293                | 98.0 | 311                | 99.4 | 163                | 97.0 | 35              | 100 |
| Stopped in Pregnancy            | 2   | 1               | 6.7  | 1                  | 0.7  | 0                  |      | 0                  |      | 0                  |      | 0               |     |
| Currently smoking               | 16  | 0               |      | 3                  | 2.0  | 6                  | 2.0  | 2                  | 0.6  | 5                  | 3.0  | 0               |     |

### 3.3 Lead Maternity Carer (LMC) and maternal demographic characteristics

**Table 105: LMC at birth**

|                      | n=7695 |      |
|----------------------|--------|------|
|                      | n      | %    |
| Independent Midwife  | 2923   | 38.0 |
| Private Obstetrician | 1830   | 23.8 |
| General Practitioner | 137    | 1.8  |
| NW Domino            | 489    | 6.4  |
| NW Community         | 1546   | 20.1 |
| NW Diabetic          | 235    | 3.1  |
| NW Medical           | 378    | 4.9  |
| Other DHB            | 106    | 1.4  |
| Unbooked             | 51     | 0.7  |

**Table 106: 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                | 7695  | 386 | 5.0  | 1005  | 13.1 | 1798  | 23.4 | 2710  | 35.2 | 1514  | 19.7 | 282 | 3.7 |
| Independent Midwife  | 2923  | 107 | 3.7  | 384   | 13.1 | 790   | 27.0 | 1095  | 37.5 | 495   | 16.9 | 52  | 1.8 |
| Private Obstetrician | 1830  | 6   | 0.3  | 40    | 2.2  | 266   | 14.5 | 818   | 44.7 | 576   | 31.5 | 124 | 6.8 |
| General Practitioner | 137   | 1   | 0.7  | 12    | 8.8  | 40    | 29.2 | 60    | 43.8 | 23    | 16.8 | 1   | 0.7 |
| NW Domino            | 489   | 52  | 10.6 | 77    | 15.8 | 133   | 27.2 | 149   | 30.5 | 69    | 14.1 | 9   | 1.8 |
| NW Community         | 1546  | 172 | 11.1 | 366   | 23.7 | 397   | 25.7 | 355   | 23.0 | 215   | 13.9 | 41  | 2.7 |
| NW Diabetes          | 235   | 4   | 1.7  | 29    | 12.3 | 59    | 25.1 | 78    | 33.2 | 48    | 20.4 | 17  | 7.2 |
| NW Medical           | 378   | 22  | 5.8  | 57    | 15.1 | 82    | 21.7 | 112   | 29.6 | 72    | 19.1 | 33  | 8.7 |
| Other DHB            | 106   | 18  | 17.0 | 22    | 20.8 | 14    | 13.2 | 34    | 32.1 | 14    | 13.2 | 4   | 3.8 |
| Unbooked             | 51    | 4   | 7.8  | 18    | 35.3 | 17    | 33.3 | 9     | 17.7 | 2     | 3.9  | 1   | 2.0 |

**Table 107: 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                | 7695  | 3161        | 41.1 | 641   | 8.3  | 1100    | 14.3 | 1354  | 17.6 | 521    | 6.8  | 695            | 9.0  | 223   | 2.9 |
| Independent Midwife  | 2923  | 1214        | 41.5 | 203   | 6.9  | 297     | 10.2 | 743   | 25.4 | 115    | 3.9  | 302            | 10.3 | 49    | 1.7 |
| Private Obstetrician | 1830  | 1270        | 69.4 | 43    | 2.4  | 27      | 1.5  | 166   | 9.1  | 69     | 3.8  | 222            | 12.1 | 33    | 1.8 |
| General Practitioner | 137   | 68          | 49.6 | 3     | 2.2  | 13      | 9.5  | 32    | 23.4 | 9      | 6.6  | 7              | 5.1  | 5     | 3.7 |
| NW Domino            | 489   | 124         | 25.4 | 50    | 10.2 | 143     | 29.2 | 60    | 12.3 | 57     | 11.7 | 32             | 6.5  | 23    | 4.7 |
| NW Community         | 1546  | 225         | 14.6 | 211   | 13.7 | 452     | 29.2 | 274   | 17.7 | 214    | 13.8 | 79             | 5.1  | 91    | 5.9 |
| NW Diabetes          | 235   | 55          | 23.4 | 16    | 6.8  | 71      | 30.2 | 40    | 17.0 | 34     | 14.5 | 10             | 4.3  | 9     | 3.8 |
| NW Medical           | 378   | 163         | 43.1 | 63    | 16.7 | 58      | 15.3 | 30    | 7.9  | 18     | 4.8  | 33             | 8.7  | 13    | 3.4 |
| Other DHB            | 106   | 40          | 37.7 | 31    | 29.3 | 13      | 12.3 | 8     | 7.6  | 5      | 4.7  | 9              | 8.5  | 0     |     |
| Unbooked             | 51    | 2           | 3.9  | 21    | 41.2 | 26      | 51.0 | 1     | 2.0  | 0      |      | 1              | 2.0  | 0     |     |

**Table 108: LMC at birth and parity**

|                             | Total | Nullipara |      | Multipara |      |
|-----------------------------|-------|-----------|------|-----------|------|
|                             | N     | n         | %    | n         | %    |
| <b>Total</b>                | 7695  | 3752      | 48.8 | 3943      | 51.2 |
| <b>Independent Midwife</b>  | 2923  | 1531      | 52.4 | 1392      | 47.6 |
| <b>Private Obstetrician</b> | 1830  | 919       | 50.2 | 911       | 49.8 |
| <b>General Practitioner</b> | 137   | 66        | 48.2 | 71        | 51.8 |
| <b>NW Domino</b>            | 489   | 204       | 41.7 | 285       | 58.3 |
| <b>NW Community</b>         | 1546  | 721       | 46.6 | 825       | 53.4 |
| <b>NW Diabetes</b>          | 235   | 88        | 37.5 | 147       | 62.6 |
| <b>NW Medical</b>           | 378   | 151       | 40.0 | 227       | 60.1 |
| <b>Other DHB</b>            | 106   | 54        | 50.9 | 52        | 49.1 |
| <b>Unbooked</b>             | 51    | 18        | 35.3 | 33        | 64.7 |

### 3.4 Standard primipara

**Table 109: Demographic characteristics of standard and non-standard primipara**

|                                 | Total       | Standard primipara |             | Non-standard primipara |             |
|---------------------------------|-------------|--------------------|-------------|------------------------|-------------|
|                                 | N           | n                  | %           | n                      | %           |
| <b>Total</b>                    | <b>3752</b> | <b>1222</b>        | <b>32.6</b> | <b>2530</b>            | <b>67.4</b> |
| <b>Age</b>                      |             |                    |             |                        |             |
| < 21                            | 317         | 48                 | 15.1        | 269                    | 84.9        |
| 21-25                           | 611         | 275                | 45.0        | 336                    | 55.0        |
| 26-30                           | 1037        | 489                | 47.2        | 548                    | 52.8        |
| 31-35                           | 1202        | 410                | 34.1        | 792                    | 65.9        |
| 36-40                           | 507         | 0                  |             | 507                    | 100.0       |
| 41+                             | 78          | 0                  |             | 78                     | 100.0       |
| <b>Ethnicity</b>                |             |                    |             |                        |             |
| NZ European                     | 1602        | 437                | 27.3        | 1165                   | 72.7        |
| Maori                           | 251         | 51                 | 20.3        | 200                    | 79.7        |
| Pacific                         | 372         | 129                | 34.7        | 243                    | 65.3        |
| Asian                           | 775         | 346                | 44.7        | 429                    | 55.4        |
| Indian                          | 276         | 112                | 40.6        | 164                    | 59.4        |
| Other European                  | 387         | 113                | 29.2        | 274                    | 70.8        |
| Other                           | 89          | 34                 | 38.2        | 55                     | 61.8        |
| <b>LMC at Birth</b>             |             |                    |             |                        |             |
| Independent Midwife             | 1531        | 584                | 38.2        | 947                    | 61.9        |
| Private Obstetrician            | 919         | 257                | 28.0        | 662                    | 72.0        |
| General Practitioner            | 66          | 27                 | 40.9        | 39                     | 59.1        |
| NW Domino                       | 204         | 67                 | 32.8        | 137                    | 67.2        |
| NW Community                    | 721         | 253                | 35.1        | 468                    | 64.9        |
| NW Diabetic                     | 88          | 0                  |             | 88                     | 100.0       |
| NW - Medical                    | 151         | 24                 | 15.9        | 127                    | 84.1        |
| Other DHB                       | 54          | 5                  | 9.3         | 49                     | 90.7        |
| Unbooked                        | 18          | 5                  | 27.8        | 13                     | 72.2        |
| <b>Smoking</b>                  |             |                    |             |                        |             |
| Currently smoking               | 160         | 33                 | 20.6        | 127                    | 79.4        |
| Stopped in pregnancy            | 36          | 10                 | 27.8        | 26                     | 72.2        |
| No or not smoking in last month | 2570        | 885                | 34.4        | 1685                   | 65.6        |
| Missing                         | 986         | 294                | 29.8        | 692                    | 70.2        |

## APPENDIX 4. ANTENATAL COMPLICATIONS

### 4.1 Preterm birth

**Table 110: Preterm birth and maternal demographic characteristics**

|                         | Total | Total preterm birth |      | Iatrogenic preterm |      | Spontaneous preterm |      |
|-------------------------|-------|---------------------|------|--------------------|------|---------------------|------|
|                         | N     | n                   | %    | n                  | %    | n                   | %    |
| <b>Total</b>            | 7595  | 796                 |      | 399                |      | 397                 |      |
| <b>Age</b>              |       |                     |      |                    |      |                     |      |
| ≤20                     | 386   | 55                  | 14.3 | 20                 | 5.2  | 35                  | 9.1  |
| 21-25                   | 1005  | 117                 | 11.6 | 71                 | 7.1  | 76                  | 7.6  |
| 26-30                   | 1798  | 172                 | 9.6  | 84                 | 4.7  | 88                  | 4.9  |
| 31-35                   | 2710  | 238                 | 8.8  | 118                | 4.4  | 120                 | 4.4  |
| 36-40                   | 1514  | 170                 | 11.2 | 77                 | 5.1  | 63                  | 4.2  |
| 41+                     | 282   | 44                  | 15.6 | 29                 | 10.3 | 15                  | 5.3  |
| <b>Ethnicity</b>        |       |                     |      |                    |      |                     |      |
| NZ European             | 3161  | 336                 | 10.6 | 191                | 6.0  | 145                 | 4.6  |
| Maori                   | 641   | 101                 | 15.8 | 45                 | 7.0  | 56                  | 8.7  |
| Pacific                 | 1100  | 117                 | 10.6 | 49                 | 4.5  | 68                  | 6.2  |
| Asian                   | 1354  | 106                 | 7.8  | 35                 | 2.6  | 71                  | 5.2  |
| Indian                  | 521   | 54                  | 10.4 | 34                 | 6.5  | 20                  | 3.8  |
| Other European          | 695   | 65                  | 9.4  | 38                 | 5.5  | 27                  | 3.9  |
| Other                   | 223   | 17                  | 7.6  | 7                  | 3.1  | 10                  | 4.5  |
| <b>Parity</b>           |       |                     |      |                    |      |                     |      |
| Nulliparous             | 3752  | 424                 | 11.3 | 201                | 5.4  | 223                 | 5.9  |
| Multiparous             | 3943  | 372                 | 9.4  | 198                | 5.0  | 174                 | 4.4  |
| <b>Plurality</b>        |       |                     |      |                    |      |                     |      |
| Singleton               | 7518  | 691                 | 9.2  | 340                | 4.5  | 351                 | 4.7  |
| Twins                   | 174   | 102                 | 58.6 | 57                 | 32.8 | 45                  | 25.9 |
| Triplets                | 3     | 3                   | 100  | 2                  | 66.6 | 1                   | 33.3 |
| <b>Smoking</b>          |       |                     |      |                    |      |                     |      |
| Currently smoking       | 420   | 71                  | 16.9 | 31                 | 7.4  | 40                  | 9.5  |
| Stopped in Pregnancy    | 53    | 8                   | 15.1 | 4                  | 7.5  | 4                   | 7.5  |
| No or not in last month | 4992  | 409                 | 8.2  | 199                | 4.0  | 210                 | 4.2  |
| Unknown                 | 2230  | 308                 | 13.8 | 165                | 7.4  | 143                 | 6.4  |
| <b>BMI</b>              |       |                     |      |                    |      |                     |      |
| <19                     | 388   | 32                  | 8.2  | 14                 | 3.6  | 18                  | 4.6  |
| 19-25                   | 4129  | 343                 | 8.3  | 178                | 4.3  | 165                 | 4.0  |
| 26-35                   | 1940  | 190                 | 9.8  | 109                | 5.6  | 81                  | 4.2  |
| >35                     | 452   | 50                  | 11.1 | 24                 | 5.3  | 26                  | 5.8  |
| Missing                 | 786   | 181                 | 23.0 | 74                 | 9.4  | 107                 | 13.6 |

## 4.2 Small for Gestational Age Babies

**Table 111: Demography of mothers of SGA babies as defined by customised birth centiles (this table includes mothers of twins twice)**

|                                 | Total Babies | Customised birthweight <10 <sup>th</sup> % (SGA) |      | Customised birthweight ≥10 <sup>th</sup> % & ≤ 90 <sup>th</sup> % (AGA) |      | Customised birthweight > 90 <sup>th</sup> % (LGA) |      |
|---------------------------------|--------------|--|------|---|------|---|------|
|                                 | N            | n  | %    | n   | %    | n   | %    |
| <b>Total</b>                    | 7875         | 956  | 12.1 | 6123  | 77.8 | 796   | 10.1 |
| <b>Maternal Age</b>             |              |  |      |   |      |   |      |
| ≤ 20                            | 397          | 58   | 14.6 | 305   | 76.8 | 34  | 8.6  |
| 21-25                           | 1023         | 145  | 14.2 | 783   | 76.5 | 95  | 9.3  |
| 26-30                           | 1827         | 217  | 11.9 | 1403  | 76.8 | 207   | 11.3 |
| 31-35                           | 2771         | 309  | 11.2 | 2183  | 78.8 | 279   | 10.1 |
| 36-40                           | 1573         | 187  | 11.9 | 1234  | 78.5 | 152   | 9.7  |
| >40                             | 284          | 40   | 14.1 | 215   | 75.7 | 29  | 10.2 |
| <b>Ethnicity</b>                |              |  |      |   |      |   |      |
| NZ European                     | 3247         | 322  | 9.9  | 2565  | 79.0 | 360   | 11.1 |
| Maori                           | 665          | 113  | 17.0 | 485   | 72.9 | 67  | 10.1 |
| Pacific                         | 1126         | 166  | 14.7 | 841   | 74.7 | 119   | 10.6 |
| Asian                           | 1368         | 172  | 12.7 | 1098  | 80.3 | 98  | 7.2  |
| Indian                          | 528          | 69   | 13.1 | 407   | 77.1 | 52  | 9.9  |
| Other European                  | 714          | 92   | 12.9 | 562   | 78.7 | 60  | 8.4  |
| Other                           | 227          | 22   | 9.7  | 165   | 72.7 | 40  | 17.6 |
| <b>Parity</b>                   |              |  |      |   |      |   |      |
| Multipara                       | 4023         | 452  | 11.2 | 3140  | 78.1 | 431   | 10.7 |
| Primipara                       | 3852         | 504  | 13.1 | 2983  | 77.4 | 365   | 9.5  |
| <b>Smoker</b>                   |              |  |      |   |      |   |      |
| Currently smoking               | 428          | 100  | 23.4 | 297   | 69.4 | 31  | 7.2  |
| Stopped in pregnancy            | 53           | 5  | 9.4  | 42  | 79.3 | 6   | 11.3 |
| No or not smoking in last month | 5092         | 541  | 10.6 | 4051  | 79.6 | 500   | 9.8  |
| Unknown                         | 2302         | 310  | 13.5 | 1733  | 75.3 | 259   | 11.3 |
| <b>BMI</b>                      |              |  |      |   |      |   |      |
| <19                             | 391          | 40   | 10.2 | 326   | 83.4 | 25  | 6.4  |
| 19-25                           | 4214         | 450  | 10.7 | 3344  | 79.4 | 420   | 10.0 |
| 26-35                           | 1988         | 240  | 12.1 | 1540  | 77.5 | 208   | 10.5 |
| >35                             | 461          | 71   | 15.4 | 314   | 68.1 | 76  | 16.5 |
| Missing data                    | 821          | 155  | 18.9 | 599   | 73.0 | 67  | 8.2  |
| <b>Plurality</b>                |              |  |      |   |      |   |      |
| Singleton                       | 7518         | 835  | 11.1 | 5897  | 78.4 | 786   | 10.5 |

## 4.3 Diabetes

**Table 112: Women with diabetes attending diabetes clinic and delivering  $\geq 20$  weeks gestation**

|               | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Type 1</b> | 23   | 29   | 19   | 12   | 19   | 15   | 14   | 21   | 26   | 22   | 26   | 21   | 20   | 25   | 31   | 33   | 26   |
| <b>Type 2</b> | 26   | 19   | 21   | 26   | 32   | 35   | 22   | 23   | 28   | 32   | 37   | 49   | 40   | 47   | 52   | 57   | 54   |
| <b>GDM</b>    | 125  | 140  | 197  | 160  | 221  | 245  | 247  | 221  | 181  | 186  | 161  | 251  | 352  | 343  | 304  | 286  | 331  |
| <b>Total</b>  | 174  | 188  | 237  | 198  | 272  | 295  | 283  | 265  | 235  | 240  | 224  | 321  | 412  | 415  | 387  | 376  | 411  |

**Table 113: Perinatal deaths (1993 – 2007) among babies of women with diabetes**

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

**Table 114: Demographic characteristics of women with diabetes**

|                                    | <b>N</b> | <b>Type 1<br/>n=26<br/>n %</b> | <b>Type 2<br/>n=54<br/>n %</b> | <b>GDM<br/>n=331<br/>n %</b> | <b>No diabetes<br/>n=7284<br/>n %</b> |
|------------------------------------|----------|--------------------------------|--------------------------------|------------------------------|---------------------------------------|
| <b>Age</b>                         |          |                                |                                |                              |                                       |
| ≤ 20                               | 386      | 0                              | 0                              | 4 1.0                        | 382 99.0                              |
| 21-25                              | 1005     | 6 0.6                          | 6 0.6                          | 24 2.4                       | 969 96.4                              |
| 26-30                              | 1798     | 9 0.5                          | 8 0.4                          | 71 3.9                       | 1710 95.1                             |
| 31-35                              | 2710     | 9 0.3                          | 19 0.7                         | 140 5.2                      | 2542 93.8                             |
| 36-40                              | 1514     | 2 0.1                          | 13 0.9                         | 73 4.8                       | 1426 94.2                             |
| 41+                                | 282      | 0                              | 8 2.8                          | 19 6.7                       | 255 90.4                              |
| <b>Ethnicity</b>                   |          |                                |                                |                              |                                       |
| NZ European                        | 3151     | 20 0.6                         | 11 0.3                         | 69 2.2                       | 3061 97.1                             |
| Maori                              | 641      | 3 0.5                          | 6 0.9                          | 19 3.0                       | 613 95.6                              |
| Pacific                            | 1100     | 1 0.1                          | 24 2.2                         | 68 6.2                       | 1007 91.5                             |
| Asian                              | 1354     | 0                              | 7 0.5                          | 84 6.2                       | 1263 93.3                             |
| Indian                             | 521      | 0                              | 4 0.8                          | 56 10.7                      | 461 88.5                              |
| Other European                     | 695      | 1 0.1                          | 1 0.1                          | 25 3.6                       | 668 96.1                              |
| Other                              | 223      | 1 0.4                          | 1 0.4                          | 10 4.5                       | 211 94.6                              |
| <b>BMI</b>                         |          |                                |                                |                              |                                       |
| <19                                | 388      | 0                              | 1 0.3                          | 10 2.6                       | 377 97.2                              |
| 19-25                              | 4129     | 15 0.4                         | 5 0.1                          | 109 2.6                      | 4000 96.9                             |
| 26-35                              | 2069     | 10 0.5                         | 29 1.4                         | 134 6.5                      | 1767 85.4                             |
| >35                                | 452      | 1 0.2                          | 17 3.8                         | 69 15.3                      | 365 80.8                              |
| Missing                            | 786      | 0                              | 2 0.3                          | 9 1.1                        | 775 98.6                              |
| <b>Smoking</b>                     |          |                                |                                |                              |                                       |
| Currently smoking                  | 420      | 5 1.2                          | 8 1.9                          | 24 5.7                       | 383 91.2                              |
| Stopped in Pregnancy               | 53       | 0                              | 0                              | 5 9.4                        | 48 90.6                               |
| No or not in last month            | 4992     | 11 0.2                         | 24 0.5                         | 189 3.8                      | 4768 95.5                             |
| Missing                            | 2230     | 10 0.5                         | 22 1.0                         | 113 5.1                      | 2085 93.5                             |
| <b>Body weight at booking (kg)</b> |          |                                |                                |                              |                                       |
| Median (IQR)                       |          | 68.6<br>(63.3 -73)             | 83.2<br>(71.7 -101.3)          | 80.0<br>(68 -100)            |                                       |

**Table 115: Maternal outcomes among women with diabetes**

|                               | Type 1<br>n=26 |      | Type 2<br>n=54 |      | GDM<br>n=308 |      | Postnatally<br>Diagnosed<br>Type 2<br>n=23 |      | No<br>diabetes<br>n=7284 |      |
|-------------------------------|----------------|------|----------------|------|--------------|------|--|------|--------------------------|------|
|                               | n              | %    | n              | %    | n            | %    | n  | %    | n                        | %    |
| <b>Induction of labour</b>    | 13             | 50.0 | 30             | 55.6 | 160          | 52.0 | 14   | 60.9 | 1689                     | 23.2 |
| <b>Mode of birth</b>          |                |      |                |      |              |      |  |      |                          |      |
| SVB                           | 5              | 19.2 | 26             | 48.1 | 155          | 50.3 | 9  | 39.1 | 4087                     | 56.1 |
| Ventouse                      | 3              | 11.5 | 1              | 1.9  | 24           | 7.8  | 3  | 13.0 | 657                      | 9.0  |
| Forceps                       | 1              | 3.9  | 1              | 1.9  | 6            | 2.0  | 1  | 4.4  | 278                      | 3.8  |
| CS emergency                  | 12             | 46.2 | 15             | 27.8 | 72           | 23.4 | 6  | 26.1 | 1303                     | 17.9 |
| CS elective                   | 5              | 19.2 | 11             | 20.4 | 51           | 16.6 | 4  | 17.4 | 959                      | 13.2 |
| <b>Gestation at birth</b>     |                |      |                |      |              |      |  |      |                          |      |
| <32 weeks                     | 1              | 3.9  | 6              | 11.1 | 9            | 2.9  | 1  | 4.4  | 195                      | 2.7  |
| <37 weeks                     | 8              | 30.8 | 18             | 33.3 | 40           | 13.0 | 5  | 21.7 | 725                      | 10.0 |
| <b>PPH ≥500 mls</b>           | 12             | 46.2 | 29             | 53.7 | 130          | 42.2 | 11   | 47.8 | 2596                     | 35.6 |
| <b>PPH ≥1000 mls</b>          | 4              | 15.4 | 9              | 16.7 | 48           | 15.6 | 2  | 8.7  | 693                      | 9.5  |
| <b>Postpartum transfusion</b> | 0              |      | 2              | 3.7  | 9            | 2.9  | 1  | 4.3  | 165                      | 2.3  |

#### 4.4 Antepartum haemorrhage

**Table 116: Characteristics of pregnancies complicated by antepartum haemorrhage**

|                             | Placenta<br>praevia<br>n=94 |      | Placental<br>abruption<br>n=58 |      | APH<br>unknown<br>origin<br>n=381 |      | No APH<br>n=7162 |      |
|-----------------------------|-----------------------------|------|--------------------------------|------|-----------------------------------|------|------------------|------|
|                             | n                           | %    | n                              | %    | n                                 | %    | n                | %    |
| <b>Maternal age</b>         |                             |      |                                |      |                                   |      |                  |      |
| ≤20                         | 0                           | 0.0  | 2                              | 3.5  | 30                                | 7.9  | 354              | 4.9  |
| 21-25                       | 5                           | 5.3  | 5                              | 8.6  | 63                                | 16.5 | 932              | 13.0 |
| 26-30                       | 16                          | 17.0 | 16                             | 27.6 | 80                                | 21.0 | 1686             | 23.5 |
| 31-35                       | 36                          | 38.3 | 19                             | 32.8 | 138                               | 36.2 | 2517             | 35.1 |
| 36-40                       | 30                          | 31.9 | 15                             | 25.9 | 55                                | 14.4 | 1414             | 19.7 |
| 41+                         | 7                           | 7.5  | 1                              | 1.7  | 15                                | 3.9  | 259              | 3.6  |
| <b>Parity</b>               |                             |      |                                |      |                                   |      |                  |      |
| Nulliparous                 | 42                          | 44.7 | 28                             | 48.3 | 193                               | 50.7 | 3489             | 48.7 |
| Multiparous                 | 52                          | 55.3 | 30                             | 51.7 | 188                               | 49.3 | 3673             | 51.3 |
| <b>Previous CS</b>          | 26                          | 27.7 | 15                             | 25.9 | 70                                | 18.4 | 1107             | 15.5 |
| <b>Smoker</b>               |                             |      |                                |      |                                   |      |                  |      |
| Current                     | 5                           | 5.3  | 3                              | 5.2  | 29                                | 7.6  | 383              | 5.4  |
| Stopped in pregnancy        | 0                           | 0.0  | 1                              | 1.7  | 6                                 | 1.6  | 46               | 0.6  |
| No or not in last month     | 51                          | 54.3 | 35                             | 60.3 | 238                               | 62.5 | 4668             | 65.2 |
| Unknown                     | 38                          | 40.4 | 19                             | 32.8 | 108                               | 28.4 | 2065             | 28.8 |
| <b>Hypertensive disease</b> |                             |      |                                |      |                                   |      |                  |      |
| Gestational hypertension    | 4                           | 4.3  | 2                              | 3.5  | 14                                | 3.7  | 235              | 3.3  |
| Preeclampsia                | 1                           | 1.1  | 7                              | 12.1 | 16                                | 4.2  | 265              | 3.7  |
| Chronic hypertension        | 5                           | 5.3  | 0                              | 0.0  | 9                                 | 2.4  | 208              | 2.9  |

**Table 117: Maternal outcomes of pregnancies complicated by antepartum haemorrhage**

|                             | Placenta praevia<br>n=94 |      | Placental abruption<br>n=58 |      | APH unknown origin<br>n=381 |      | No APH<br>n=7162 |      |
|-----------------------------|--------------------------|------|-----------------------------|------|-----------------------------|------|------------------|------|
|                             | n                        | %    | n                           | %    | n                           | %    | n                | %    |
| <b>Mode of birth</b>        |                          |      |                             |      |                             |      |                  |      |
| Normal vaginal              | 3                        | 3.2  | 9                           | 15.5 | 218                         | 57.4 | 4052             | 56.6 |
| Operative vaginal           | 2                        | 2.1  | 7                           | 12.1 | 50                          | 12.9 | 916              | 12.8 |
| CS elective                 | 51                       | 54.3 | 5                           | 8.6  | 35                          | 9.2  | 939              | 13.1 |
| CS emergency                | 38                       | 40.4 | 37                          | 63.8 | 78                          | 20.5 | 1255             | 17.5 |
| <b>Maternal transfusion</b> | 25                       | 26.6 | 9                           | 15.5 | 8                           | 2.1  | 135              | 1.9  |

**Table 118: Fetal/neonatal outcomes of pregnancies complicated by antepartum haemorrhage (babies)**

|                                   | Placenta praevia<br>n=100 |      | Placental abruption<br>n=61 |    | APH unknown origin<br>n=394 |      | No APH<br>n=7320 |      |
|-----------------------------------|---------------------------|------|-----------------------------|----|-----------------------------|------|------------------|------|
|                                   | n                         | %    | n                           | %  | n                           | %    | n                | %    |
| <b>Gestation at birth</b>         |                           |      |                             |    |                             |      |                  |      |
| <37 weeks                         | 29                        | 47.5 | 38                          | 38 | 101                         | 25.6 | 628              | 8.6  |
| <32 weeks                         | 6                         | 9.8  | 17                          | 17 | 51                          | 12.9 | 163              | 2.2  |
| <b>Birthweight</b>                |                           |      |                             |    |                             |      |                  |      |
| Medium (IQR)                      | 3100(2395-3475)           |      | 2490(1650-2870)             |    | 3150(2560-3620)             |      | 3410(3040-3770)  |      |
| <2500g                            | 27                        | 44.3 | 31                          | 31 | 92                          | 23.4 | 574              | 7.8  |
| <1500g                            | 5                         | 8.2  | 12                          | 12 | 48                          | 12.2 | 162              | 2.2  |
| <b>Small for gestational age</b>  | 13                        | 21.3 | 16                          | 16 | 75                          | 19.0 | 852              | 11.6 |
| <b>Perinatal deaths (n /1000)</b> | 2                         | 3.3  | 2                           | 2  | 18                          | 4.6  | 80               | 11   |
| <b>Admission to NICU</b>          | 30                        | 49.2 | 35                          | 35 | 89                          | 22.6 | 711              | 9.7  |
| <b>≥2 days in NICU</b>            | 29                        | 47.5 | 35                          | 35 | 83                          | 21.1 | 652              | 8.9  |



## 4.5 Hypertensive disease

**Table 119: Demographic characteristics of women with hypertensive disease**

|                                   |       | Gestational hypertension |      | Preeclampsia |      | Chronic hypertension |      | Normotensive |      |
|-----------------------------------|-------|--------------------------|------|--------------|------|----------------------|------|--------------|------|
|                                   | Total | n                        | %    | n            | %    | n                    | %    | n            | %    |
| <b>Ethnicity</b>                  |       |                          |      |              |      |                      |      |              |      |
| NZ European                       | 3161  | 120                      | 47.1 | 118          | 40.8 | 123                  | 55.4 | 2800         | 40.4 |
| Maori                             | 641   | 17                       | 6.7  | 41           | 14.2 | 22                   | 9.9  | 561          | 8.1  |
| Pacific                           | 1100  | 42                       | 16.5 | 55           | 19.0 | 33                   | 14.9 | 970          | 14.0 |
| Asian                             | 1354  | 37                       | 14.5 | 28           | 9.7  | 15                   | 6.8  | 1274         | 18.4 |
| Indian                            | 521   | 13                       | 5.1  | 23           | 8.0  | 8                    | 3.6  | 477          | 6.9  |
| Other European                    | 695   | 21                       | 8.2  | 21           | 7.3  | 20                   | 9.0  | 633          | 9.1  |
| Other                             | 223   | 5                        | 2.0  | 3            | 1.0  | 1                    | 0.5  | 214          | 3.1  |
| <b>Maternal age (nullipara)</b>   |       |                          |      |              |      |                      |      |              |      |
| ≤20                               | 317   | 15                       | 9.1  | 24           | 11.9 | 1                    | 1.3  | 277          | 8.4  |
| 21-25                             | 611   | 16                       | 9.7  | 35           | 17.3 | 9                    | 11.5 | 551          | 16.7 |
| 26-30                             | 1037  | 51                       | 30.9 | 45           | 22.3 | 12                   | 15.4 | 929          | 28.1 |
| 31-35                             | 1202  | 59                       | 35.8 | 59           | 29.2 | 30                   | 38.5 | 1054         | 31.9 |
| 36-40                             | 507   | 17                       | 10.3 | 38           | 18.8 | 23                   | 29.5 | 429          | 13.0 |
| 41+                               | 78    | 7                        | 4.2  | 1            | 0.5  | 3                    | 3.9  | 67           | 2.0  |
| <b>Maternal age (multiparous)</b> |       |                          |      |              |      |                      |      |              |      |
| ≤20                               | 69    | 0                        |      | 2            | 2.3  | 0                    |      | 67           | 1.9  |
| 21-25                             | 394   | 8                        | 8.9  | 6            | 6.9  | 7                    | 4.9  | 373          | 10.3 |
| 26-30                             | 761   | 15                       | 16.7 | 26           | 29.9 | 18                   | 12.5 | 702          | 19.4 |
| 31-35                             | 1508  | 34                       | 37.8 | 28           | 32.2 | 47                   | 32.6 | 1399         | 38.6 |
| 36-40                             | 1007  | 26                       | 28.9 | 18           | 20.7 | 43                   | 29.9 | 920          | 25.4 |
| 41+                               | 204   | 7                        | 7.8  | 7            | 8.1  | 29                   | 20.1 | 161          | 4.5  |
| <b>Smoker</b>                     |       |                          |      |              |      |                      |      |              |      |
| Currently smoking                 | 420   | 17                       | 6.7  | 17           | 5.9  | 17                   | 7.7  | 369          | 5.3  |
| Stopped in pregnancy              | 53    | 0                        | 0.0  | 1            | 0.4  | 4                    | 1.8  | 48           | 0.7  |
| No or not in past month           | 4992  | 176                      | 69.0 | 168          | 58.1 | 133                  | 59.9 | 4515         | 65.2 |
| Unknown                           | 2230  | 62                       | 24.3 | 103          | 35.6 | 68                   | 30.6 | 1997         | 28.8 |
| <b>BMI</b>                        |       |                          |      |              |      |                      |      |              |      |
| <19                               | 388   | 2                        | 0.8  | 5            | 1.7  | 7                    | 3.2  | 374          | 5.4  |
| 19-25                             | 4129  | 122                      | 47.8 | 111          | 38.4 | 66                   | 29.7 | 3830         | 55.3 |
| 26-35                             | 1940  | 91                       | 35.7 | 93           | 32.2 | 97                   | 43.7 | 1659         | 23.9 |
| >35                               | 452   | 23                       | 9.0  | 25           | 8.7  | 38                   | 17.1 | 366          | 5.3  |
| Unknown                           | 786   | 17                       | 6.7  | 55           | 19.0 | 14                   | 6.3  | 700          | 10.1 |

**Table 120: Onset of birth among women with hypertensive disease**

|                                     | Gestational hypertension<br>n=255 |      | Pre-eclampsia<br>n=289 |      | Chronic hypertension<br>n=222 |      | Normotensive<br>n=6929 |      |
|-------------------------------------|-----------------------------------|------|------------------------|------|-------------------------------|------|------------------------|------|
|                                     | n                                 | %    | n                      | %    | n                             | %    | n                      | %    |
| Spontaneous onset of labour         | 107                               | 42.0 | 51                     | 17.7 | 73                            | 32.9 | 4259                   | 61.5 |
| Induced labour                      | 104                               | 40.8 | 157                    | 54.3 | 89                            | 40.1 | 1556                   | 22.5 |
| CS emergency before onset of labour | 20                                | 7.8  | 50                     | 17.3 | 17                            | 7.7  | 191                    | 2.8  |
| CS elective                         | 24                                | 9.4  | 31                     | 10.7 | 43                            | 19.4 | 923                    | 13.3 |

## APPENDIX 5. LABOUR AND BIRTH

### 5.1 Induction of labour

**Table 121: Induction of labour rates (1992-2007)** No data available on induction rates for 2001-2003

|                          | 1992        | 1993        | 1994        | 1995        | 1996        | 1997        | 1998        | 1999        | 2000        | 2004        | 2005        | 2006        | 2007        |
|--------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Total Births</b>      | 8315        | 8690        | 8812        | 9125        | 9157        | 8055        | 7531*       | 7501        | 7827        | 7491        | 7194        | 7212        | 7695        |
| <b>Women Induced</b>     | 1734        | 2049        | 2033        | 2366        | 2225        | 2135        | 2053        | 1910        | 2106        | 1922        | 1894        | 1776        | 1906        |
| <b>Incidence (%)</b>     | <b>20.9</b> | <b>23.6</b> | <b>23.1</b> | <b>25.9</b> | <b>24.3</b> | <b>26.5</b> | <b>27.4</b> | <b>27.2</b> | <b>26.9</b> | <b>25.7</b> | <b>26.3</b> | <b>24.6</b> | <b>24.8</b> |
| <b>Total Nullipara</b>   | 3700        | 3649        | 3814        | 4037        | 4018        | 3591        | 3263        | 3262        | 3455        | 3597        | 3522        | 3499        | 3752        |
| <b>Nullipara Induced</b> | 914         | 931         | 1046        | 1191        | 1112        | 1104        | 992         | 923         | 1049        | 1064        | 1042        | 940         | 1047        |
| <b>Incidence (%)</b>     | <b>24.7</b> | <b>25.5</b> | <b>27.4</b> | <b>29.5</b> | <b>27.7</b> | <b>30.7</b> | <b>30.4</b> | <b>28.3</b> | <b>30.4</b> | <b>29.6</b> | <b>29.5</b> | <b>26.9</b> | <b>28.0</b> |
| <b>Total Multipara</b>   | 4615        | 5041        | 4998        | 5088        | 5139        | 4464        | 4229        | 4239        | 4372        | 3894        | 3672        | 3713        | 3943        |
| <b>Multipara Induced</b> | 820         | 1118        | 987         | 1175        | 1113        | 1031        | 1061        | 987         | 1057        | 858         | 852         | 836         | 859         |
| <b>Incidence (%)</b>     | <b>17.8</b> | <b>22.2</b> | <b>19.7</b> | <b>28.7</b> | <b>21.7</b> | <b>23.1</b> | <b>25.1</b> | <b>23.3</b> | <b>24.2</b> | <b>22.0</b> | <b>23.2</b> | <b>22.5</b> | <b>21.8</b> |

\*Does not include 39 BBA's

**Table 122: Rates of indication for induction by parity (term births)**

|                                | Nullipara<br>n=3328 |      | Multipara<br>n=3571 |      |
|--------------------------------|---------------------|------|---------------------|------|
|                                | n                   | %    | n                   | %    |
| <b>Total</b>                   | 951                 | 28.6 | 778                 | 21.9 |
| Post dates                     | 230                 | 6.9  | 136                 | 3.8  |
| Not in established labour      | 90                  | 2.7  | 103                 | 2.9  |
| Diabetes                       | 67                  | 2.0  | 75                  | 2.1  |
| Hypertension                   | 141                 | 4.2  | 73                  | 2.0  |
| Maternal age                   | 48                  | 1.4  | 71                  | 2.0  |
| Maternal medical complications | 39                  | 1.2  | 56                  | 1.6  |
| SGA                            | 72                  | 2.2  | 52                  | 1.5  |
| Term PROM                      | 106                 | 3.2  | 49                  | 1.4  |
| Decreased liquor volume        | 55                  | 1.7  | 29                  | 0.8  |
| Maternal request               | 16                  | 0.5  | 28                  | 0.8  |
| Poor obstetric history         | 3                   | 0.1  | 19                  | 0.5  |
| Fetal Distress                 | 10                  | 0.3  | 17                  | 0.5  |
| Pelvic arthropathy             | 6                   | 0.2  | 15                  | 0.4  |
| Multiple pregnancy             | 14                  | 0.4  | 13                  | 0.4  |
| PPROM                          | 18                  | 0.5  | 9                   | 0.3  |
| Large for gestational age      | 5                   | 0.2  | 9                   | 0.3  |
| IUD/Fetal anomaly              | 11                  | 0.3  | 8                   | 0.2  |
| APH                            | 10                  | 0.3  | 4                   | 0.1  |
| Other                          | 10                  | 0.3  | 12                  | 0.3  |

**Table 123: Indication for induction (all births)**

|                                | <b>Preterm<br/>n= 796</b> |          | <b>Term<br/>n=6899</b> |          |
|--------------------------------|---------------------------|----------|------------------------|----------|
|                                | <b>n</b>                  | <b>%</b> | <b>n</b>               | <b>%</b> |
| <b>Total</b>                   | 177                       | 22.2     | 1729                   | 25.1     |
| Post Dates                     | 0                         |          | 366                    | 5.3      |
| Hypertension                   | 18                        | 2.3      | 214                    | 3.1      |
| Not in established labour      | 22                        | 2.8      | 193                    | 2.8      |
| TermPROM                       | 3                         | 0.4      | 155                    | 2.2      |
| Diabetes                       | 11                        | 1.4      | 142                    | 2.1      |
| SGA                            | 12                        | 1.5      | 124                    | 1.8      |
| Maternal Age                   | 0                         |          | 119                    | 1.7      |
| Maternal Medical Complications | 8                         | 1        | 95                     | 1.4      |
| Decreased Liquor Volume        | 3                         | 0.4      | 84                     | 1.2      |
| Maternal Request               | 0                         |          | 44                     | 0.6      |
| PPROM                          | 33                        | 4.1      | 27                     | 0.4      |
| Multiple Pregnancy             | 5                         | 0.6      | 27                     | 0.4      |
| Fetal Distress                 | 2                         | 0.3      | 27                     | 0.4      |
| Poor Obstetric History         | 0                         |          | 22                     | 0.3      |
| Pelvic Arthropathy             | 2                         | 0.3      | 21                     | 0.3      |
| IUD/Fetal Anomaly              | 49                        | 6.2      | 19                     | 0.3      |
| Other                          | 9                         | 1.1      | 50                     | 0.7      |

**Table 124: Rates of indication for induction by age among nulliparous women (all gestations)**

|                                      | <b>≤25<br/>n=928</b> |          | <b>26-30<br/>n=1037</b> |          | <b>31-35<br/>n=1202</b> |          | <b>&gt;35<br/>n=585</b> |          |
|--------------------------------------|----------------------|----------|-------------------------|----------|-------------------------|----------|-------------------------|----------|
|                                      | <b>n</b>             | <b>%</b> | <b>n</b>                | <b>%</b> | <b>n</b>                | <b>%</b> | <b>n</b>                | <b>%</b> |
| <b>Total</b>                         | 220                  | 23.7     | 272                     | 26.2     | 356                     | 29.6     | 199                     | 34.0     |
| <b>Post dates</b>                    | 56                   | 6.0      | 52                      | 5.0      | 94                      | 7.8      | 28                      | 4.8      |
| <b>Hypertension</b>                  | 31                   | 3.3      | 42                      | 4.1      | 60                      | 5.0      | 20                      | 3.4      |
| <b>Not in established labour</b>     | 13                   | 1.4      | 30                      | 2.9      | 42                      | 3.5      | 14                      | 2.4      |
| <b>Term PROM</b>                     | 21                   | 2.3      | 42                      | 4.1      | 60                      | 5.0      | 20                      | 3.4      |
| <b>SGA</b>                           | 20                   | 2.2      | 24                      | 2.3      | 23                      | 1.9      | 12                      | 2.1      |
| <b>Diabetes</b>                      | 20                   | 2.2      | 23                      | 2.2      | 16                      | 1.3      | 14                      | 2.4      |
| <b>Maternal medical complication</b> | 9                    | 1.0      | 10                      | 1.0      | 18                      | 1.5      | 5                       | 0.9      |
| <b>Other</b>                         | 50                   | 5.4      | 49                      | 4.7      | 43                      | 3.6      | 86                      | 14.7     |

**Table 125: Rates of indication for induction by age among multiparous women (all gestations)**

|                                      | <b>≤25<br/>n=463</b> |          | <b>26-30<br/>n=761</b> |          | <b>31-35<br/>n=1508</b> |          | <b>&gt;35<br/>n=1211</b> |          |
|--------------------------------------|----------------------|----------|------------------------|----------|-------------------------|----------|--------------------------|----------|
|                                      | <b>n</b>             | <b>%</b> | <b>n</b>               | <b>%</b> | <b>n</b>                | <b>%</b> | <b>n</b>                 | <b>%</b> |
| <b>Total</b>                         | 73                   | 15.8     | 167                    | 21.9     | 313                     | 20.8     | 306                      | 25.3     |
| <b>Maternal Age</b>                  | 0                    | 0.0      | 0                      | 0.0      | 1                       | 0.1      | 70                       | 5.8      |
| <b>Post dates</b>                    | 15                   | 3.2      | 30                     | 3.9      | 57                      | 3.8      | 34                       | 2.8      |
| <b>Hypertension</b>                  | 9                    | 1.9      | 20                     | 2.6      | 25                      | 1.7      | 25                       | 2.1      |
| <b>Not in established labour</b>     | 7                    | 1.5      | 22                     | 2.9      | 55                      | 3.6      | 30                       | 2.5      |
| <b>Term PROM</b>                     | 3                    | 0.6      | 11                     | 1.4      | 22                      | 1.5      | 14                       | 1.2      |
| <b>SGA</b>                           | 12                   | 2.6      | 10                     | 1.3      | 22                      | 1.5      | 13                       | 1.1      |
| <b>Diabetes</b>                      | 2                    | 0.4      | 21                     | 2.8      | 31                      | 2.1      | 26                       | 2.1      |
| <b>Maternal medical complication</b> | 7                    | 1.5      | 13                     | 1.7      | 28                      | 1.9      | 13                       | 1.1      |
| <b>Other</b>                         | 18                   | 3.9      | 40                     | 5.3      | 72                      | 4.8      | 81                       | 6.7      |

**Table 126: Induction rate by indication and ethnicity among nulliparous women (all gestations)**

|              | NZ<br>European<br>n=1602 |      | Maori<br>n=251 |      | Pacific<br>n=372 |      | Asian<br>n=775 |      | Indian<br>n=276 |      | Other<br>European<br>n=387 |      | Other<br>n=89 |      |
|--------------|--------------------------|------|----------------|------|------------------|------|----------------|------|-----------------|------|----------------------------|------|---------------|------|
|              | n                        | %    | n              | %    | n                | %    | n              | %    | n               | %    | n                          | %    | n             | %    |
| <b>Total</b> | 503                      | 31.4 | 75             | 29.9 | 83               | 22.3 | 162            | 20.9 | 91              | 33.0 | 105                        | 27.1 | 28            | 31.5 |

**Table 127: Induction rate by indication and ethnicity among multiparous women (all gestations)**

|              | NZ<br>European<br>n=1559 |      | Maori<br>n=390 |      | Pacific<br>n=728 |      | Asian<br>n=579 |      | Indian<br>n=245 |      | Other<br>European<br>n=308 |      | Other<br>n=134 |      |
|--------------|--------------------------|------|----------------|------|------------------|------|----------------|------|-----------------|------|----------------------------|------|----------------|------|
|              | n                        | %    | n              | %    | n                | %    | n              | %    | n               | %    | n                          | %    | n              | %    |
| <b>Total</b> | 358                      | 23.0 | 95             | 24.4 | 175              | 24.0 | 87             | 15.0 | 49              | 20.0 | 69                         | 22.4 | 26             | 19.4 |

## 5.2 Outcomes following induction

**Table 128: Mode of birth at term by onset of birth and parity (excluding women with prior CS) among intended vaginal births**

|                      | Nullipara                       |      |                            |      | Multipara (no previous CS)      |      |                            |      |
|----------------------|---------------------------------|------|----------------------------|------|---------------------------------|------|----------------------------|------|
|                      | Spontaneous<br>labour<br>n=2048 |      | Induced<br>labour<br>n=951 |      | Spontaneous<br>labour<br>n=1710 |      | Induced<br>labour<br>n=683 |      |
|                      | n                               | %    | n                          | %    | n                               | %    | n                          | %    |
| <b>Mode of birth</b> |                                 |      |                            |      |                                 |      |                            |      |
| SVB                  | 1167                            | 57.0 | 384                        | 40.3 | 1552                            | 90.8 | 572                        | 83.8 |
| Forceps              | 133                             | 6.5  | 72                         | 7.6  | 30                              | 1.8  | 13                         | 1.9  |
| Ventouse             | 357                             | 17.4 | 167                        | 17.6 | 57                              | 3.3  | 32                         | 4.7  |
| CS emergency         | 391                             | 19.1 | 321                        | 33.8 | 71                              | 4.2  | 60                         | 8.8  |
| CS elective          | 0                               |      | 7                          | 0.7  |                                 |      | 1                          | 0.2  |
| <b>Epidural</b>      | 1225                            | 59.8 | 796                        | 83.7 | 445                             | 26.0 | 361                        | 52.9 |

**Table 129: Mode of birth at term among nulliparous women by indication for induction**

|                      | Post dates<br>n=230 |      | Hypertension<br>n=141 |      | Term<br>PROM<br>n=106 |      | Not in<br>established<br>labour<br>n=90 |      | Diabetes<br>n=67 |      | SGA<br>n=72 |      | Other<br>n= 245 |      |
|----------------------|---------------------|------|-----------------------|------|-----------------------|------|---|------|------------------|------|-------------|------|-----------------|------|
|                      | n                   | %    | n                     | %    | n                     | %    | n                                       | %    | n                | %    | n           | %    | n               | %    |
| <b>Mode of birth</b> |                     |      |                       |      |                       |      |   |      |                  |      |             |      |                 |      |
| SVB                  | 90                  | 39.1 | 48                    | 34.0 | 44                    | 41.5 | 45                                      | 50.0 | 31               | 46.3 | 35          | 48.6 | 91              | 37.1 |
| Operative vaginal    | 58                  | 25.2 | 35                    | 24.8 | 25                    | 23.6 | 25                                      | 27.8 | 15               | 22.4 | 16          | 22.2 | 65              | 26.5 |
| CS elective          | 1                   | 0.4  | 1                     | 0.7  | 0                     |      | 0                                       |      | 1                | 1.5  | 1           | 1.4  | 3               | 1.2  |
| CS emergency         | 81                  | 35.2 | 57                    | 40.4 | 37                    | 34.9 | 20                                      | 22.2 | 20               | 29.9 | 20          | 27.8 | 86              | 35.1 |
| <b>Epidural</b>      | 189                 | 82.2 | 115                   | 87.6 | 93                    | 87.7 | 77                                      | 85.6 | 53               | 79.1 | 56          | 77.8 | 213             | 86.9 |

**Table 130: Mode of birth at term among multiparous women by indication for induction**

|                      | Post dates<br>n=136 |      | Diabetes<br>n=75 |      | SGA<br>n=52 |      | Not in<br>established<br>labour<br>n=103 |      | Maternal<br>Age<br>n=71 |      | Hypertension<br>n=73 |      | Other<br>n= 268 |      |
|----------------------|---------------------|------|------------------|------|-------------|------|--|------|-------------------------|------|----------------------|------|-----------------|------|
|                      | n                   | %    | n                | %    | n           | %    | n  | %    | n                       | %    | n                    | %    | n               | %    |
| <b>Mode of birth</b> |                     |      |                  |      |             |      |  |      |                         |      |                      |      |                 |      |
| SVB                  | 109                 | 80.2 | 58               | 77.3 | 49          | 94.2 | 82                                       | 79.6 | 55                      | 77.5 | 57                   | 78.1 | 209             | 77.9 |
| Operative vaginal    | 11                  | 8.0  | 4                | 5.3  | 2           | 3.8  | 10                                       | 9.8  | 3                       | 4.2  | 4                    | 5.5  | 27              | 10.0 |
| CS elective          | 0                   |      | 0                |      | 0           |      | 0  |      | 1                       | 1.4  | 0                    |      | 0               |      |
| CS emergency         | 16                  | 11.8 | 13               | 17.3 | 1           | 1.9  | 11                                       | 10.7 | 12                      | 16.9 | 12                   | 16.4 | 32              | 11.9 |
| <b>Epidural</b>      | 60                  | 44.1 | 30               | 40.0 | 23          | 44.2 | 10                                       | 9.7  | 41                      | 57.7 | 33                   | 45.2 | 137             | 51.1 |

**Table 131: Gestation at birth among women whose primary indication for induction was 'post dates'**

| Gestation at birth         | Total<br>n=366 |      | Age <35<br>n=273 |      | Age ≥35<br>n=93 |      |
|----------------------------|----------------|------|------------------|------|-----------------|------|
|                            | n              | %    | n                | %    | n               | %    |
| <b>40 – 40<sup>b</sup></b> | 6              | 1.6  | 6                | 2.2  | 0               |      |
| <b>41 – 41<sup>b</sup></b> | 264            | 72.1 | 191              | 70.0 | 73              | 78.5 |
| <b>42 – 42<sup>b</sup></b> | 89             | 24.3 | 69               | 25.3 | 20              | 21.5 |
| <b>43 – 43<sup>b</sup></b> | 7              | 1.9  | 7                | 2.6  | 0               |      |

### 5.3 Use of Syntocinon

**Table 132: Dilatation at start of syntocinon infusion among labouring women by induction status**

|                | Induced labour<br>n=1292 |      | Spontaneous labour<br>n=1302 |      |
|----------------|--------------------------|------|------------------------------|------|
|                | n                        | %    | n                            | %    |
| <b>0</b>       | 54                       | 4.2  | 15                           | 1.2  |
| <b>1</b>       | 186                      | 14.4 | 49                           | 3.8  |
| <b>2</b>       | 373                      | 28.9 | 127                          | 9.8  |
| <b>3</b>       | 347                      | 26.9 | 226                          | 17.4 |
| <b>4</b>       | 119                      | 9.2  | 199                          | 15.3 |
| <b>5</b>       | 53                       | 4.1  | 153                          | 11.8 |
| <b>6</b>       | 19                       | 1.5  | 92                           | 7.1  |
| <b>7</b>       | 13                       | 1.0  | 76                           | 5.8  |
| <b>8</b>       | 9                        | 0.7  | 70                           | 5.4  |
| <b>9</b>       | 12                       | 0.9  | 76                           | 5.8  |
| <b>10</b>      | 29                       | 2.2  | 136                          | 10.5 |
| <b>Missing</b> | 78                       | 6.0  | 83                           | 6.4  |

## 5.4 Mode of birth

**Table 133: Mode of birth by parity and previous caesarean section status**

|                                | Nullipara<br>preterm<br>n=424 |      | Nullipara<br>term<br>n=3328 |      | Multipara<br>no prev CS<br>preterm<br>n=236 |      | Multipara<br>no prev CS<br>term<br>n=2489 |      | Multipara<br>prev CS<br>preterm<br>n=136 |      | Multipara<br>prev CS<br>term<br>n=1082 |      |
|--------------------------------|-------------------------------|------|-----------------------------|------|---|------|---|------|--|------|--|------|
|                                | n                             | %    | n                           | %    | n   | %    | n   | %    | n  | %    | n                                      | %    |
| <b>Spontaneous vertex</b>      | 172                           | 40.6 | 1550                        | 46.6 | 139   | 58.9 | 2119                                      | 85.1 | 26                                       | 19.1 | 206                                    | 19.0 |
| <b>Vaginal breech</b>          | 32                            | 7.6  | 1                           | 0.03 | 20  | 8.5  | 10  | 0.4  | 5  | 3.7  | 2                                      | 0.2  |
| <b>Operative vaginal birth</b> | 43                            | 10.1 | 729                         | 21.9 | 9   | 3.8  | 132                                       | 5.3  | 5  | 3.7  | 57                                     | 5.3  |
| Ventouse                       | 24                            | 5.7  | 524                         | 15.8 | 4   | 1.7  | 89  | 3.6  | 2  | 1.5  | 45                                     | 4.2  |
| Forceps                        | 19                            | 4.5  | 205                         | 6.2  | 5   | 2.1  | 43  | 1.7  | 3  | 2.2  | 12                                     | 1.1  |
| <b>Caesarean section</b>       | 177                           | 41.8 | 1048                        | 31.5 | 68  | 28.8 | 228                                       | 9.2  | 100                                      | 73.5 | 817                                    | 75.5 |
| Emergency                      | 141                           | 33.3 | 774                         | 23.3 | 54  | 22.9 | 152                                       | 6.1  | 63                                       | 46.3 | 224                                    | 20.7 |
| Elective                       | 36                            | 8.5  | 274                         | 8.2  | 14  | 5.9  | 76  | 3.1  | 37                                       | 27.2 | 593                                    | 54.8 |

**Table 134: Mode of birth by ethnicity**

|                           | NZ<br>European<br>n=3161 |      | Maori<br>n=641 |      | Pacific<br>n=1100 |      | Asian<br>n=1354 |      | Indian<br>n=521 |      | Other<br>European<br>n=695 |      | Other<br>n=223 |      |
|---------------------------|--------------------------|------|----------------|------|-------------------|------|-----------------|------|-----------------|------|----------------------------|------|----------------|------|
|                           | n                        | %    | n              | %    | n                 | %    | n               | %    | n               | %    | n                          | %    | n              | %    |
| <b>Spontaneous vertex</b> | 1498                     | 47.4 | 427            | 66.6 | 798               | 72.6 | 767             | 56.7 | 264             | 50.7 | 339                        | 48.8 | 119            | 53.4 |
| <b>Vaginal breech</b>     | 29                       | 0.9  | 9              | 1.4  | 17                | 1.6  | 7               | 0.5  | 1               | 0.2  | 5                          | 0.7  | 2              | 0.9  |
| <b>Forceps</b>            | 153                      | 4.8  | 15             | 2.3  | 15                | 1.4  | 41              | 3.0  | 27              | 5.2  | 29                         | 4.2  | 7              | 3.1  |
| <b>Ventouse</b>           | 326                      | 10.3 | 36             | 5.6  | 41                | 3.7  | 157             | 11.6 | 41              | 7.9  | 69                         | 9.9  | 18             | 8.1  |
| <b>CS elective</b>        | 544                      | 17.2 | 54             | 8.4  | 80                | 7.3  | 136             | 10.0 | 73              | 14.0 | 115                        | 16.6 | 28             | 12.6 |
| <b>CS emergency</b>       | 611                      | 19.3 | 100            | 15.6 | 149               | 13.6 | 246             | 18.2 | 115             | 22.1 | 138                        | 19.9 | 49             | 22.0 |

**Table 135: Mode of birth by maternal age**

|                           | ≤20<br>n=386 |      | 21-25<br>n=1005 |      | 26-30<br>n=1798 |      | 31-35<br>n=2710 |      | 36-40<br>n=1514 |      | 41+<br>n=282 |      |
|---------------------------|--------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|--------------|------|
|                           | n            | %    | n               | %    | n               | %    | n               | %    | n               | %    | n            | %    |
| <b>Spontaneous vertex</b> | 290          | 75.1 | 699             | 69.6 | 1036            | 57.6 | 1365            | 50.4 | 715             | 47.2 | 107          | 37.9 |
| <b>Vaginal breech</b>     | 10           | 2.6  | 6               | 0.6  | 15              | 0.8  | 19              | 0.7  | 15              | 1.0  | 5            | 1.8  |
| <b>Forceps</b>            | 10           | 2.6  | 27              | 2.7  | 77              | 4.3  | 119             | 4.4  | 48              | 3.2  | 6            | 2.1  |
| <b>Ventouse</b>           | 24           | 6.2  | 70              | 7.0  | 205             | 11.4 | 272             | 10.0 | 108             | 7.1  | 9            | 3.2  |
| <b>CS elective</b>        | 3            | 0.8  | 51              | 5.1  | 135             | 7.5  | 420             | 15.5 | 324             | 21.4 | 97           | 34.4 |
| <b>CS emergency</b>       | 49           | 12.7 | 152             | 15.1 | 330             | 18.4 | 515             | 19.0 | 304             | 20.1 | 58           | 20.6 |

**Table 136: Mode of birth by BMI**

|                           | <19<br>n=388 |      | 19-25<br>n=4129 |      | 26-35<br>n=1940 |      | >35<br>n=452 |      | Missing<br>n=786 |      |
|---------------------------|--------------|------|-----------------|------|-----------------|------|--------------|------|------------------|------|
|                           | n            | %    | n               | %    | n               | %    | n            | %    | n                | %    |
| <b>Spontaneous vertex</b> | 236          | 60.8 | 2187            | 53.0 | 1056            | 54.4 | 261          | 57.7 | 472              | 60.1 |
| <b>Vaginal breech</b>     | 1            | 0.3  | 35              | 0.9  | 17              | 0.9  | 5            | 1.1  | 12               | 1.5  |
| <b>Forceps</b>            | 13           | 3.4  | 184             | 4.5  | 62              | 3.2  | 10           | 2.2  | 18               | 2.3  |
| <b>Ventouse</b>           | 45           | 11.6 | 454             | 11.0 | 120             | 6.2  | 17           | 3.8  | 52               | 6.6  |
| <b>CS elective</b>        | 41           | 10.6 | 548             | 13.3 | 297             | 15.3 | 65           | 14.4 | 79               | 10.1 |
| <b>CS emergency</b>       | 52           | 13.4 | 721             | 17.5 | 388             | 20.0 | 94           | 20.8 | 153              | 19.5 |

**Table 137: Mode of birth by LMC at birth-primipara**

|                         | Total | Spontaneous vertex |      | Vaginal breech |      | Operative vaginal |      | CS elective |      | CS emergency |      |
|-------------------------|-------|--------------------|------|----------------|------|-------------------|------|-------------|------|--------------|------|
|                         | n     | n                  | %    | n              | %    | n                 | %    | n           | %    | n            | %    |
| <b>Total</b>            | 3752  | 1722               | 45.9 | 33             | 0.9  | 772               | 20.6 | 310         | 8.3  | 915          | 24.4 |
| <b>IMW</b>              | 1531  | 787                | 51.4 | 6              | 0.4  | 343               | 22.4 | 48          | 3.1  | 347          | 22.7 |
| <b>Pvt Obstetrician</b> | 919   | 239                | 26.0 | 7              | 0.8  | 213               | 23.2 | 199         | 21.7 | 261          | 28.4 |
| <b>GP</b>               | 66    | 28                 | 42.4 | 1              | 1.5  | 12                | 18.2 | 2           | 3.0  | 23           | 34.9 |
| <b>NW Domino</b>        | 204   | 123                | 60.3 | 1              | 0.5  | 39                | 19.1 | 4           | 2.0  | 37           | 18.1 |
| <b>NW Community</b>     | 721   | 412                | 57.1 | 7              | 1.0  | 123               | 17.1 | 31          | 4.3  | 148          | 20.5 |
| <b>NW Diabetes</b>      | 88    | 32                 | 36.4 | 1              | 1.1  | 20                | 22.7 | 6           | 6.8  | 29           | 33.0 |
| <b>NW Medical</b>       | 151   | 59                 | 39.1 | 6              | 4.0  | 19                | 12.6 | 17          | 11.3 | 50           | 33.1 |
| <b>Other DHB</b>        | 54    | 28                 | 51.9 | 2              | 3.7  | 3                 | 5.6  | 3           | 5.6  | 18           | 33.3 |
| <b>Unbooked</b>         | 18    | 14                 | 77.8 | 2              | 11.1 | 0                 |      | 0           |      | 2            | 11.1 |

**Table 138: Mode of birth by LMC at birth – standard primipara** (Definition of standard primipara is given in Appendix 12)

|                         | Total | Spontaneous vertex |      | Operative vaginal |      | CS elective |      | CS emergency |      |
|-------------------------|-------|--------------------|------|-------------------|------|-------------|------|--------------|------|
|                         | n     | n                  | %    | n                 | %    | n           | %    | n            | %    |
| <b>Total</b>            | 1222  | 698                | 57.1 | 283               | 23.2 | 46          | 3.8  | 195          | 16.0 |
| <b>IMW</b>              | 584   | 354                | 60.6 | 137               | 23.5 | 6           | 1.0  | 87           | 14.9 |
| <b>Pvt Obstetrician</b> | 257   | 92                 | 35.8 | 79                | 30.7 | 34          | 13.2 | 52           | 20.2 |
| <b>GP</b>               | 27    | 16                 | 59.3 | 7                 | 25.9 | 0           |      | 4            | 14.8 |
| <b>NW Domino</b>        | 67    | 51                 | 76.1 | 10                | 14.9 | 0           |      | 6            | 9.0  |
| <b>NW Community</b>     | 253   | 162                | 64.0 | 45                | 17.8 | 5           | 2.0  | 41           | 16.2 |
| <b>NW Diabetes</b>      | 0     | 0                  |      | 0                 |      | 0           |      | 0            |      |
| <b>NW Medical</b>       | 24    | 13                 | 54.2 | 5                 | 20.8 | 1           | 4.2  | 5            | 20.8 |
| <b>Other DHB</b>        | 5     | 5                  | 100  | 0                 |      | 0           |      | 0            |      |
| <b>Unbooked</b>         | 5     | 5                  | 100  | 0                 |      | 0           |      | 0            |      |

**Table 139: Mode of birth by LMC at birth among multipara –no previous caesarean**

|                         | Total | Spontaneous vertex |      | Operative vaginal |      | CS elective |     | CS emergency |      |
|-------------------------|-------|--------------------|------|-------------------|------|-------------|-----|--------------|------|
|                         | n     | n                  | %    | n                 | %    | n           | %   | n            | %    |
| <b>Total</b>            | 2725  | 2288               | 84.0 | 141               | 5.2  | 90          | 3.3 | 206          | 7.6  |
| <b>IMW</b>              | 1094  | 953                | 87.1 | 58                | 5.3  | 12          | 1.1 | 71           | 6.5  |
| <b>Pvt Obstetrician</b> | 513   | 388                | 75.6 | 50                | 9.8  | 38          | 7.4 | 37           | 7.2  |
| <b>GP</b>               | 52    | 45                 | 86.5 | 7                 | 13.5 | 0           |     | 0            |      |
| <b>NW Domino</b>        | 239   | 221                | 92.5 | 4                 | 1.7  | 6           | 2.5 | 8            | 3.4  |
| <b>NW Community</b>     | 524   | 456                | 87.0 | 15                | 2.9  | 17          | 3.2 | 36           | 6.9  |
| <b>NW Diabetes</b>      | 88    | 63                 | 71.6 | 2                 | 2.3  | 5           | 5.7 | 18           | 20.5 |
| <b>NW Medical</b>       | 149   | 110                | 73.8 | 5                 | 3.4  | 9           | 6.0 | 25           | 16.8 |
| <b>Other DHB</b>        | 39    | 27                 | 69.2 | 0                 |      | 2           | 5.1 | 10           | 25.6 |
| <b>Unbooked</b>         | 27    | 25                 | 92.6 | 0                 |      | 1           | 3.7 | 1            | 3.7  |

## 5.5 Operative births

**Table 140: Indication for elective and not in labour emergency caesarean section by gestation**

|                            | Preterm<br>n=222 |      | Term<br>n=1076 |      |
|----------------------------|------------------|------|----------------|------|
|                            | n                | %    | n              | %    |
| Repeat caesarean           | 31               | 14.0 | 541            | 50.3 |
| Malpresentation            | 18               | 8.1  | 146            | 13.6 |
| Maternal request           | 5                | 2.3  | 92             | 8.6  |
| Obstetric history          | 9                | 4.1  | 66             | 6.1  |
| Placenta praevia           | 11               | 5.0  | 45             | 4.2  |
| Maternal medical condition | 18               | 8.1  | 27             | 2.5  |
| Maternal age               | 0                |      | 21             | 2.0  |
| Fetal distress             | 25               | 11.3 | 21             | 2.0  |
| SGA                        | 22               | 9.9  | 18             | 1.7  |
| Disproportion              | 0                |      | 16             | 1.5  |
| Hypertension               | 24               | 10.8 | 14             | 1.3  |
| Multiple pregnancy         | 16               | 7.2  | 10             | 0.9  |
| Diabetes                   | 6                | 2.7  | 8              | 0.7  |
| APH / abruption            | 20               | 9.0  | 6              | 0.6  |
| Failure to progress        | 0                |      | 4              | 0.4  |
| Other                      | 17               | 7.7  | 41             | 3.8  |

**Table 141: Indication for elective and not in labour emergency caesarean section by parity**

|                            | Term Nullipara<br>n=329 |      | Term Multipara<br>n=747 |      |
|----------------------------|-------------------------|------|-------------------------|------|
|                            | n                       | %    | n                       | %    |
| Repeat caesarean           | 0                       |      | 541                     | 72.4 |
| Malpresentation            | 108                     | 32.8 | 38                      | 5.1  |
| Maternal request           | 58                      | 17.6 | 34                      | 4.6  |
| Obstetric history          | 10                      | 3.0  | 56                      | 7.5  |
| Placenta praevia           | 25                      | 7.6  | 20                      | 2.7  |
| Maternal medical condition | 18                      | 5.5  | 9                       | 1.2  |
| Maternal age               | 20                      | 6.1  | 1                       | 0.1  |
| Fetal distress             | 12                      | 3.7  | 9                       | 1.2  |
| SGA                        | 15                      | 4.6  | 3                       | 0.4  |
| Disproportion              | 11                      | 3.3  | 5                       | 0.7  |
| Hypertension               | 8                       | 2.4  | 6                       | 0.8  |
| Multiple pregnancy         | 5                       | 1.5  | 5                       | 0.7  |
| Diabetes                   | 4                       | 1.2  | 4                       | 0.5  |
| APH / abruption            | 4                       | 1.2  | 2                       | 0.3  |
| Failure to progress        | 2                       | 0.6  | 2                       | 0.3  |
| Other                      | 29                      | 8.8  | 12                      | 1.6  |



**Table 142: Operative vaginal birth rates**

|   | 1993        | 1994        | 1995        | 1996        | 1997        | 1998        | 1999        | 2000        | 2001        | 2002        | 2003        | 2004        | 2005        | 2006        | 2007        |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Total births (mothers)</b>                       | <b>8690</b> | <b>8812</b> | <b>9125</b> | <b>9157</b> | <b>8055</b> | <b>7492</b> | <b>7501</b> | <b>7827</b> | <b>7471</b> | <b>7775</b> | <b>7611</b> | <b>7491</b> | <b>7194</b> | <b>7212</b> | <b>7695</b> |
| <b>Total operative vaginal births</b>               | 1070        | 1190        | 1120        | 1156        | 1051        | 925         | 949         | 1006        |             | 1081        | 1065        | 1171        | 1022        | 956         | 975         |
| <b>Incidence %</b>                                  | 12.3        | 13.5        | 12.3        | 12.6        | 13.0        | 12.3        | 12.7        | 12.9        |             | 13.9        | 14.0        | 15.6        | 14.2        | 13.3        | 12.7        |
| <b>Total nullipara</b>                              | <b>3649</b> | <b>3814</b> | <b>4037</b> | <b>4018</b> | <b>3591</b> | <b>3263</b> | <b>3262</b> | <b>3455</b> |             |             |             | <b>3597</b> | <b>3522</b> | <b>3499</b> | <b>3752</b> |
| <b>Operative vaginal births</b>                     | 700         | 893         | 850         | 895         | 776         | 704         | 722         | 733         |             |             |             | 875         | 809         | 737         | 772         |
| <b>Nulliparous operative vaginal birth rate (%)</b> | 19.2        | 23.4        | 21.1        | 22.3        | 21.6        | 21.6        | 22.1        | 21.2        |             |             |             | 24.3        | 23.0        | 21.1        | 20.6        |
| <b>Total multipara</b>                              | <b>5041</b> | <b>4998</b> | <b>5088</b> | <b>5139</b> | <b>4464</b> | <b>4229</b> | <b>4239</b> | <b>4372</b> |             |             |             | <b>3894</b> | <b>3672</b> | <b>3713</b> | <b>3943</b> |
| <b>Operative vaginal births</b>                     | 370         | 297         | 270         | 261         | 275         | 221         | 227         | 273         |             |             |             | 296         | 213         | 219         | 203         |
| <b>Multiparous operative vaginal birth rate (%)</b> | 7.3         | 5.9         | 5.3         | 5.1         | 6.2         | 5.2         | 5.4         | 6.2         |             |             |             | 7.6         | 5.8         | 5.9         | 5.1         |

**Table 143: Type of operative vaginal birth: (1993-2007)**

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

**Table 144: Mode of birth by ethnicity – nullipara**

|                       | Spontaneous vertex |          | Vaginal breech |         | Operative forceps |          | Operative ventouse |     | CS elective |     | CS emergency |     |
|-----------------------|--------------------|----------|----------------|---------|-------------------|----------|--------------------|-----|-------------|-----|--------------|-----|
|                       | N                  | n %      | n %            | n %     | n %               | n %      | n %                | n % | n %         | n % | n %          | n % |
| <b>NZ European</b>    | 1602               | 591 36.9 | 15 0.9         | 126 7.9 | 258 16.1          | 196 12.2 | 416 26.0           |     |             |     |              |     |
| <b>Maori</b>          | 251                | 151 60.2 | 3 1.2          | 13 5.2  | 31 12.4           | 11 4.4   | 42 16.7            |     |             |     |              |     |
| <b>Pacific</b>        | 372                | 244 65.6 | 7 1.9          | 8 2.2   | 30 8.1            | 10 2.7   | 73 19.6            |     |             |     |              |     |
| <b>Asian</b>          | 775                | 398 51.4 | 4 0.5          | 28 3.6  | 134 17.3          | 32 4.1   | 179 23.1           |     |             |     |              |     |
| <b>Indian</b>         | 276                | 129 46.7 | 0              | 19 6.9  | 31 11.2           | 20 7.3   | 77 27.9            |     |             |     |              |     |
| <b>Other European</b> | 387                | 170 43.9 | 3 0.8          | 25 6.5  | 52 13.4           | 35 9.0   | 102 26.4           |     |             |     |              |     |
| <b>Other</b>          | 89                 | 39 43.8  | 1 1.1          | 5 5.6   | 12 13.5           | 6 6.7    | 26 29.2            |     |             |     |              |     |

**Table 145: Mode of birth by ethnicity - multipara**

|                       |      | Spontaneous vertex |      | Vaginal breech |     | Operative forceps |     | Operative ventouse |     | CS elective |      | CS emergency |      |
|-----------------------|------|--------------------|------|----------------|-----|-------------------|-----|--------------------|-----|-------------|------|--------------|------|
|                       | N    | n                  | %    | n              | %   | n                 | %   | n                  | %   | n           | %    | n            | %    |
| <b>NZ European</b>    | 1559 | 907                | 58.2 | 14             | 0.9 | 27                | 1.7 | 68                 | 4.4 | 348         | 22.3 | 195          | 12.5 |
| <b>Maori</b>          | 390  | 276                | 70.8 | 6              | 1.5 | 2                 | 0.5 | 5                  | 1.3 | 43          | 11.0 | 58           | 14.9 |
| <b>Pacific</b>        | 728  | 554                | 76.1 | 10             | 1.4 | 7                 | 1.0 | 11                 | 1.5 | 70          | 9.6  | 76           | 10.4 |
| <b>Asian</b>          | 579  | 369                | 63.7 | 3              | 0.5 | 13                | 2.3 | 23                 | 4.0 | 104         | 18.0 | 67           | 11.6 |
| <b>Indian</b>         | 245  | 135                | 55.1 | 1              | 0.4 | 8                 | 3.3 | 10                 | 4.1 | 53          | 21.6 | 38           | 15.5 |
| <b>Other European</b> | 308  | 169                | 54.9 | 2              | 0.7 | 4                 | 1.3 | 17                 | 5.5 | 80          | 26.0 | 36           | 11.7 |
| <b>Other</b>          | 134  | 80                 | 59.7 | 1              | 0.8 | 2                 | 1.5 | 6                  | 4.5 | 22          | 16.4 | 23           | 17.2 |

**Table 146: Breech birth (1996-2007)**

|                                    | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Total nos of babies born</b>    | 9612 | 8270 | 7721 | 7679 | 8054 | 7654 | 7988 | 7804 | 7679 | 7384 | 7379 | 7875 |
| Total breech births                | 479  | 434  | 400  | 440  | 484  |      |      |      | 421  | 432  | 419  | 449  |
| Percent of total births            | 5.0  | 5.2  | 5.2  | 5.7  | 6.0  |      |      |      | 5.5  | 5.9  | 5.7  | 5.7  |
| <b>Total singleton babies</b>      |      |      |      | 7329 | 7609 |      |      |      | 7303 | 7007 | 7050 | 7518 |
| Total singleton breech births      |      |      |      | 341  | 363  |      |      |      | 318  | 328  | 328  | 351  |
| Percent of singleton births        |      |      |      | 4.7  | 4.8  |      |      |      | 4.4  | 4.7  | 4.7  | 4.7  |
| <b>Total multiple birth babies</b> |      |      |      | 350  | 445  |      |      |      | 376  | 377  | 329  | 357  |
| Total multiple breech births       |      |      |      | 99   | 121  |      |      |      | 103  | 104  | 91   | 98   |
| Percent of multiple birth babies   |      |      |      | 28.3 | 27.2 |      |      |      | 27.4 | 27.6 | 27.7 | 27.5 |

**Table 147: Mode of birth by type of breech (singletons only)**

|                          | Extended leg<br>n=189 |      | Flexed leg<br>n=94 |      | Unspecified<br>n=68 |      | Total breech<br>n= 351 |      |
|--------------------------|-----------------------|------|--------------------|------|---------------------|------|------------------------|------|
|                          | n                     | %    | n                  | %    | n                   | %    | n                      | %    |
| <b>Vaginal breech</b>    | 22                    | 11.6 | 15                 | 16.0 | 11                  | 16.2 | 48                     | 13.7 |
| <b>Caesarean section</b> | 167                   | 88.3 | 79                 | 84.0 | 57                  | 83.8 | 303                    | 86.3 |
| CS emergency             | 84                    | 44.4 | 33                 | 35.1 | 32                  | 47.1 | 149                    | 42.5 |
| CS elective              | 83                    | 43.9 | 46                 | 48.9 | 25                  | 36.8 | 154                    | 43.9 |

**Table 148: Mode of birth by type of breech (multiples only)**

|                          | Extended leg<br>n=36 |      | Flexed leg<br>n=32 |      | Unspecified<br>n=30 |      | Total breech<br>n= 98 |      |
|--------------------------|----------------------|------|--------------------|------|---------------------|------|-----------------------|------|
|                          | n                    | %    | n                  | %    | n                   | %    | n                     | %    |
| <b>Vaginal breech</b>    | 10                   | 27.8 | 11                 | 34.4 | 3                   | 10.0 | 24                    | 24.5 |
| <b>Caesarean section</b> | 26                   | 72.2 | 21                 | 65.6 | 27                  | 90.0 | 74                    | 75.5 |
| CS emergency             | 9                    | 25.0 | 9                  | 28.1 | 20                  | 66.7 | 38                    | 38.8 |
| CS elective              | 17                   | 47.2 | 12                 | 37.5 | 7                   | 23.3 | 36                    | 36.7 |

## 5.6 Analgesia/anaesthesia

**Table 149: Epidural use among women with spontaneous and induced labour (2000-2007)**

|                                      | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|--------------------------------------|------|------|------|------|------|------|------|------|
| Number of births                     | 7827 |      |      |      | 7491 | 7194 | 7212 | 7695 |
| Number women with spontaneous labour | 4820 |      |      |      | 4817 | 4246 | 4256 | 4490 |
| Spontaneous labour and epidural      | 2143 |      |      |      | 2434 | 2138 | 2168 | 2057 |
| %                                    | 44.5 |      |      |      | 50.5 | 50.4 | 50.9 | 45.8 |
| Number of women with induced labour  | 2002 |      |      |      | 1922 | 1894 | 1776 | 1906 |
| Induced labour and epidural          | 1313 |      |      |      | 1412 | 1373 | 1269 | 1326 |
| %                                    | 65.6 |      |      |      | 73.5 | 72.5 | 71.5 | 69.6 |

**Table 150: Analgesic use and maternal age among nulliparous labour**

| Maternal age (years) | Total<br>N | Epidural<br>n % | Entonox<br>n % | Pethidine<br>n % | TENS<br>n % | Water<br>n % |
|----------------------|------------|-----------------|----------------|------------------|-------------|--------------|
| ≤20                  | 371        | 157 42.3        | 213 57.4       | 126 34.0         | 0           | 43 11.6      |
| 21-25                | 925        | 384 41.5        | 511 55.2       | 262 28.3         | 4 0.4       | 60 6.5       |
| 26-30                | 1609       | 868 54.0        | 827 51.4       | 410 25.5         | 10 0.6      | 171 10.6     |
| 31-35                | 2197       | 1261 57.4       | 975 44.4       | 407 18.5         | 24 1.1      | 210 9.6      |
| 36-40                | 1127       | 626 55.6        | 516 45.8       | 201 17.8         | 19 1.7      | 88 7.8       |
| 41+                  | 167        | 87 52.1         | 58 34.7        | 31 18.6          | 2 1.2       | 9 5.4        |

**Table 151: Analgesic use and LMC type among nulliparous labours**

| LMC type         | Total<br>n | Epidural<br>n % | Entonox<br>n % | Pethidine<br>n % | TENS<br>n % | Water<br>n % |
|------------------|------------|-----------------|----------------|------------------|-------------|--------------|
| IMW              | 2453       | 1283 52.3       | 1187 48.4      | 652 26.6         | 30 1.2      | 314 12.8     |
| Pvt Obstetrician | 990        | 733 74.0        | 430 43.4       | 140 14.1         | 10 1.0      | 76 7.7       |
| GP               | 117        | 65 55.6         | 64 54.7        | 24 20.5          | 0           | 11 9.4       |
| NW Domino        | 414        | 149 36.0        | 218 52.7       | 62 15.0          | 6 1.5       | 62 15.0      |
| NW Community     | 1143       | 487 42.6        | 641 56.1       | 319 27.9         | 7 0.6       | 90 7.9       |
| NW Diabetes      | 103        | 72 69.9         | 47 45.6        | 21 20.4          | 0           | 0            |
| NW Medical       | 193        | 86 44.6         | 105 54.4       | 45 23.3          | 0           | 4 2.1        |
| Other DHB        | 80         | 29 36.3         | 38 47.5        | 16 20.0          | 0           | 2 2.5        |
| Unbooked         | 39         | 5 11.4          | 17 38.6        | 4 9.1            | 0           | 0            |

**Table 152: Analgesic use and ethnicity among nulliparous labours**

|                | Total<br>N | Epidural<br>n % | Entonox<br>n % | Pethidine<br>n % | TENS<br>n % | Water<br>n % |
|----------------|------------|-----------------|----------------|------------------|-------------|--------------|
| NZ European    | 2138       | 1358 63.5       | 1018 47.6      | 396 18.5         | 28 1.3      | 286 13.4     |
| Maori          | 468        | 191 40.8        | 246 52.6       | 117 25.0         | 3 0.6       | 49 10.5      |
| Pacific        | 809        | 237 29.3        | 387 47.8       | 149 18.4         | 1 0.1       | 52 6.4       |
| Asian          | 1096       | 525 47.9        | 567 51.7       | 361 32.9         | 7 0.6       | 59 5.4       |
| Indian         | 378        | 222 58.7        | 198 52.4       | 107 28.3         | 1 0.3       | 22 5.8       |
| Other European | 483        | 299 61.9        | 241 49.9       | 103 21.3         | 11 2.3      | 78 16.2      |
| Other          | 165        | 77 46.7         | 90 54.6        | 50 30.3          | 2 1.2       | 13 7.9       |

## APPENDIX 6. LABOUR and BIRTH OUTCOMES

### 6.1 Perineal trauma

Table 153: Perineal trauma by mode of birth, parity and LMC

|                             | Total | Episiotomy |      | 3 <sup>rd</sup> /4 <sup>th</sup> tear |     | Vaginal wall tear |     |
|-----------------------------|-------|------------|------|---------------------------------------|-----|-------------------|-----|
|                             | N     | n          | %    | n                                     | %   | n                 | %   |
| <b>Total vaginal births</b> | 5257  | 1130       | 21.5 | 161                                   | 3.1 | 197               | 3.8 |
| <b>Mode of birth</b>        |       |            |      |                                       |     |                   |     |
| Normal vaginal              | 4212  | 541        | 12.5 | 91                                    | 2.2 | 147               | 3.5 |
| Vaginal breech              | 70    | 4          | 5.7  | 0                                     |     | 0                 |     |
| Ventouse                    | 688   | 355        | 51.6 | 44                                    | 6.4 | 36                | 5.2 |
| Forceps                     | 287   | 230        | 80.1 | 26                                    | 9.1 | 14                | 4.9 |
| <b>Parity</b>               |       |            |      |                                       |     |                   |     |
| Nulliparous                 | 2527  | 844        | 33.4 | 128                                   | 5.1 | 149               | 5.9 |
| Multiparous                 | 2730  | 286        | 10.5 | 33                                    | 1.2 | 48                | 1.8 |
| <b>LMC</b>                  |       |            |      |                                       |     |                   |     |
| Independent Midwife         | 2250  | 531        | 23.6 | 77                                    | 3.4 | 77                | 3.4 |
| Private Obstetrician        | 941   | 292        | 31.0 | 14                                    | 1.5 | 26                | 2.8 |
| General Practitioner        | 100   | 28         | 28.0 | 3                                     | 3.0 | 3                 | 3.0 |
| NW Domino                   | 410   | 64         | 15.6 | 10                                    | 2.4 | 16                | 3.9 |
| NW Community                | 1103  | 170        | 15.4 | 45                                    | 4.1 | 64                | 5.8 |
| NW Diabetes                 | 132   | 19         | 14.4 | 5                                     | 3.8 | 2                 | 1.5 |
| NW Medical                  | 211   | 20         | 9.5  | 7                                     | 3.3 | 8                 | 3.8 |
| Other DHB                   | 66    | 5          | 7.6  | 0                                     |     | 1                 | 1.5 |
| Unbooked                    | 44    | 1          | 2.3  | 0                                     |     | 0                 |     |

Table 154: Episiotomy rates in spontaneous vertex birth (excluding breech, all gestations)

|                             | Nullipara |          | Multipara |          |
|-----------------------------|-----------|----------|-----------|----------|
|                             | Total     | n %      | Total     | n %      |
| <b>Total</b>                | 2527      | 844 33.4 | 2730      | 286 10.5 |
| <b>Independent Midwife</b>  | 1136      | 404 35.6 | 1114      | 127 11.4 |
| <b>Private Obstetrician</b> | 459       | 207 45.1 | 482       | 85 17.6  |
| <b>General Practitioner</b> | 41        | 20 48.8  | 59        | 8 13.6   |
| <b>NW Domino</b>            | 163       | 51 31.3  | 247       | 13 5.3   |
| <b>NW Community</b>         | 542       | 131 24.2 | 561       | 39 7.0   |
| <b>NW Diabetes</b>          | 53        | 18 34.0  | 79        | 1 1.3    |
| <b>NW Medical</b>           | 84        | 11 13.1  | 127       | 9 7.1    |
| <b>Other DHB</b>            | 33        | 1 3.0    | 33        | 4 12.1   |
| <b>Unbooked</b>             | 16        | 1 6.3    | 28        | 0        |

Table 155: Episiotomy rates in spontaneous (non operative) vertex birth (excluding breech, all gestations)

|                             | Nullipara |          | Multipara |         |
|-----------------------------|-----------|----------|-----------|---------|
|                             | Total     | n %      | Total     | n %     |
| <b>Total</b>                | 1722      | 349 20.3 | 2490      | 192 7.7 |
| <b>Independent Midwife</b>  | 787       | 183 23.6 | 1025      | 91 8.9  |
| <b>Private Obstetrician</b> | 239       | 71 29.7  | 410       | 56 13.7 |
| <b>General Practitioner</b> | 28        | 11 39.3  | 49        | 5 10.2  |
| <b>NW Domino</b>            | 123       | 23 18.7  | 239       | 9 3.8   |
| <b>NW Community</b>         | 412       | 50 12.1  | 520       | 23 4.4  |
| <b>NW Diabetes</b>          | 32        | 6 18.8   | 73        | 0       |
| <b>NW Medical</b>           | 59        | 4 6.8    | 117       | 6 5.1   |
| <b>Other DHB</b>            | 28        | 0        | 30        | 2 6.7   |
| <b>Unbooked</b>             | 14        | 1 7.1    | 27        | 0       |

**Table 156: 3<sup>rd</sup> and 4<sup>th</sup> degree tears in spontaneous (non operative) vaginal birth by LMC at birth and parity** (Other DHB and unbooked LMC groups are not included as values =0)

|                             | Nullipara |    |      | Multipara |    |     |
|-----------------------------|-----------|----|------|-----------|----|-----|
|                             | Total     | n  | %    | Total     | n  | %   |
| <b>Total</b>                | 1722      | 67 | 3.9  | 2490      | 24 | 1.0 |
| <b>Independent Midwife</b>  | 787       | 35 | 4.5  | 1025      | 13 | 1.3 |
| <b>GP</b>                   | 28        | 3  | 10.7 | 49        | 0  |     |
| <b>Private Obstetrician</b> | 239       | 2  | 0.8  | 410       | 1  | 0.2 |
| <b>NW Domino</b>            | 123       | 3  | 2.4  | 239       | 2  | 0.8 |
| <b>NW Community</b>         | 412       | 21 | 5.1  | 520       | 6  | 1.2 |
| <b>NW Medical</b>           | 59        | 2  | 3.4  | 117       | 2  | 1.7 |
| <b>Diabetes</b>             | 32        | 1  | 3.1  | 73        | 0  |     |

**Table 157: Postpartum transfusion rates by recorded blood loss at birth**

|   | Postpartum transfusion<br>n=169 |     |      |
|---|---------------------------------|-----|------|
|   | Total                           | n   | %    |
| <b>Blood loss &lt;500mls</b>              | 5165                            | 21  | 0.4  |
| <b>PPH <math>\geq</math>500- &lt;1000</b> | 2097                            | 47  | 2.2  |
| <b>PPH <math>\geq</math>1000mls</b>       | 410                             | 101 | 24.6 |
| <b>Blood loss unknown</b>                 | 23                              | 0   |      |
| <b>Manual removal placenta</b>            | 116                             | 13  | 11.2 |

## APPENDIX 7. POSTNATAL CARE

### 7.1 Infant Feeding

**Table 158: Demography of infant feeding on discharge from NW**

|                      | Total<br>N | Exclusive BF<br>n % | Fully BF<br>n % | Partial BF<br>n % | Artificial<br>n % |
|----------------------|------------|---------------------|-----------------|-------------------|-------------------|
| <b>Total</b>         | 6570       | 5064 77.1           | 348 5.3         | 929 14.1          | 229 3.5           |
| <b>Mode of birth</b> |            |                     |                 |                   |                   |
| Spontaneous vaginal  | 3631       | 3151 86.8           | 90 2.5          | 261 7.2           | 129 3.6           |
| Operative vaginal    | 851        | 693 81.4            | 35 4.1          | 109 12.8          | 14 1.7            |
| Elective CS          | 949        | 585 61.6            | 87 9.2          | 225 23.7          | 52 5.5            |
| Emergency CS         | 1139       | 635 55.8            | 136 11.9        | 334 29.3          | 34 3.0            |
| <b>LMC at birth</b>  |            |                     |                 |                   |                   |
| IMW                  | 2526       | 2089 82.7           | 108 4.3         | 267 10.6          | 62 2.5            |
| Private Obstetrician | 1596       | 1238 77.6           | 82 5.1          | 234 14.7          | 42 2.6            |
| GP                   | 127        | 105 82.7            | 10 7.9          | 12 9.5            | 0                 |
| NW Community         | 1395       | 1005 72.0           | 77 5.5          | 240 17.2          | 73 5.2            |
| NW Domino            | 453        | 366 80.8            | 24 5.3          | 49 10.8           | 14 3.1            |
| NW Medical           | 212        | 113 53.3            | 25 11.8         | 57 26.9           | 17 8.0            |
| NW Diabetes          | 193        | 100 51.8            | 21 10.9         | 62 32.1           | 10 5.2            |
| Unbooked             | 41         | 29 70.7             | 0               | 4 9.8             | 8 19.5            |
| Other DHB            | 27         | 19 70.4             | 1 3.7           | 4 14.8            | 3 11.1            |
| <b>Maternal age</b>  |            |                     |                 |                   |                   |
| ≤ 20                 | 306        | 238 77.8            | 16 5.2          | 27 8.8            | 25 8.2            |
| 21-25                | 853        | 672 78.8            | 37 4.3          | 115 13.5          | 29 3.4            |
| 26-30                | 1538       | 1185 77.1           | 76 4.9          | 227 14.8          | 50 3.3            |
| 31-35                | 2336       | 1845 79.0           | 122 5.2         | 296 12.7          | 73 3.1            |
| 36-40                | 1313       | 985 75.0            | 75 5.7          | 209 15.9          | 44 3.4            |
| 41+                  | 224        | 139 62.1            | 22 9.8          | 55 24.6           | 8 3.6             |

**Table 159: Method of Infant Feeding at Discharge from NW**

|                                | 2003<br>n = 5177 |      | 2004<br>n = 5938 |      | 2005<br>n = 5765 |      | 2006<br>n = 6158 |      | 2007<br>n = 6570 |      |
|--------------------------------|------------------|------|------------------|------|------------------|------|------------------|------|------------------|------|
|                                | n                | %    | n                | %    | n                | %    | n                | %    | n                | %    |
| <b>Exclusive breastfeeding</b> | 2789             | 53.9 | 3673             | 61.9 | 3686             | 63.9 | 4546             | 73.8 | 5064             | 77.1 |
| <b>Fully breastfeeding</b>     | 562              | 10.9 | 464              | 7.8  | 485              | 8.4  | 441              | 7.2  | 348              | 5.3  |
| <b>Partial breastfeeding</b>   | 1521             | 29.4 | 1497             | 25.2 | 1375             | 23.9 | 958              | 15.6 | 929              | 14.1 |
| <b>Artificial feeding</b>      | 305              | 5.9  | 304              | 5.1  | 219              | 3.8  | 213              | 3.5  | 229              | 3.5  |

**Table 160: Demography of infant feeding on discharge from NW (continued)**

|   | Total<br>N | Exclusive BF<br>n % | Fully BF<br>n % | Partial BF<br>n % | Artificial<br>n % |
|---|------------|---------------------|-----------------|-------------------|-------------------|
| <b>Ethnicity</b>                                |            |                     |                 |                   |                   |
| NZ European                                     | 2680       | 2213 82.6           | 138 5.2         | 255 9.5           | 74 2.8            |
| Māori   | 513        | 387 75.4            | 24 4.7          | 58 11.3           | 44 8.6            |
| Pacific   | 945        | 678 71.8            | 55 5.8          | 153 16.2          | 59 6.2            |
| Asian   | 1198       | 817 68.2            | 57 4.8          | 292 24.4          | 32 2.7            |
| Indian  | 445        | 316 71.0            | 35 7.9          | 91 20.5           | 3 0.7             |
| Other European                                  | 594        | 507 85.4            | 30 5.1          | 48 8.1            | 9 1.5             |
| Other   | 195        | 146 74.9            | 9 4.6           | 32 16.4           | 8 4.1             |
| <b>Gestation</b>                                |            |                     |                 |                   |                   |
| < 37 weeks                                      | 269        | 134 49.8            | 34 12.6         | 87 32.3           | 14 5.2            |
| ≥37 weeks                                       | 6301       | 4930 78.2           | 314 5.0         | 842 13.4          | 215 3.4           |
| <b>Weight</b>                                   |            |                     |                 |                   |                   |
| < 2.5 kgs                                       | 169        | 66 39.0             | 33 19.5         | 64 37.9           | 6 3.6             |
| 2.5 - 2.9 kgs                                   | 985        | 679 68.9            | 67 6.8          | 197 20.0          | 42 4.3            |
| 3.0 - 4.4 kgs                                   | 5254       | 4214 80.2           | 236 4.5         | 629 12.0          | 175 3.3           |
| ≥ 4.5 kgs                                       | 162        | 105 64.8            | 12 7.4          | 39 24.1           | 6 3.7             |
| <b>Standard / Non standard Primipara</b>        |            |                     |                 |                   |                   |
| Standard  | 1092       | 914 83.7            | 31 2.8          | 128 11.7          | 19 1.7            |
| Non standard                                    | 2058       | 1478 71.8           | 163 7.9         | 372 18.1          | 45 2.2            |
| <b>Breastfeeding at discharge from Homecare</b> |            |                     |                 |                   |                   |
| Community                                       | 1112       | 807 72.6            | 57 5.1          | 194 17.5          | 54 4.9            |
| Domino  | 422        | 338 80.1            | 22 5.2          | 48 11.4           | 14 3.3            |
| Medical   | 92         | 52 56.5             | 8 8.7           | 24 26.1           | 8 8.7             |
| Diabetes  | 93         | 50 53.8             | 7 7.5           | 29 31.2           | 7 7.5             |

## 7.2 Postnatal Admissions

**Table 161: Maternal destination following birth by mode of birth**

|                     | NW Wards<br>n=4590 |      | Birthcare<br>n=2493 |      | Home<br>n=587 |      | Other Units<br>n=25 |      |
|---------------------|--------------------|------|---------------------|------|---------------|------|---------------------|------|
|                     | n                  | %    | n                   | %    | n             | %    | n                   | %    |
| Spontaneous vaginal | 1578               | 34.4 | 2112                | 84.7 | 570           | 97.1 | 22                  | 88.0 |
| Operative vaginal   | 574                | 12.5 | 381                 | 15.3 | 17            | 2.9  | 3                   | 12.0 |
| CS Elective         | 1030               | 22.4 | 0                   | 0    | 0             | 0    | 0                   | 0    |
| CS Emergency        | 1408               | 30.7 | 0                   | 0    | 0             | 0    | 0                   | 0    |

**Table 162: Maternal destination following birth by LMC**

|                      | Total<br>N | NW Wards |      | Birthcare |      | Home |      | Other Units |     |
|----------------------|------------|----------|------|-----------|------|------|------|-------------|-----|
|                      |            | n        | %    | n         | %    | n    | %    | n           | %   |
| Independent Midwife  | 2923       | 1396     | 47.8 | 1215      | 41.6 | 298  | 10.2 | 14          | 0.5 |
| Private Obstetrician | 1830       | 1215     | 66.4 | 588       | 32.1 | 24   | 1.3  | 3           | 0.2 |
| General Practitioner | 137        | 74       | 54.0 | 58        | 42.3 | 5    | 3.6  | 0           | 0.0 |
| NW Domino            | 489        | 220      | 45.0 | 202       | 41.3 | 66   | 13.5 | 1           | 0.2 |
| NW Community         | 1546       | 962      | 62.2 | 412       | 26.6 | 170  | 11.0 | 2           | 0.1 |
| NW High Risk         | 613        | 596      | 97.2 | 12        | 2.0  | 5    | 0.8  | 0           | 0.0 |
| Other DHB            | 106        | 95       | 89.6 | 3         | 2.8  | 3    | 2.8  | 5           | 4.7 |
| Unbooked             | 51         | 32       | 62.7 | 3         | 5.9  | 16   | 31.4 | 0           | 0.0 |

**Table 163: Maternal destination following birth by ethnicity**

|                       | Total | NW Wards |      | Birthcare |      | Home |      | Other Units |     |
|-----------------------|-------|----------|------|-----------|------|------|------|-------------|-----|
|                       | N     | n        | %    | n         | %    | n    | %    | n           | %   |
| <b>NZ European</b>    | 3161  | 1906     | 60.3 | 1168      | 37.0 | 75   | 2.4  | 12          | 0.4 |
| <b>Maori</b>          | 641   | 406      | 63.3 | 148       | 23.1 | 85   | 13.3 | 2           | 0.3 |
| <b>Pacific</b>        | 1100  | 633      | 57.5 | 272       | 24.7 | 191  | 17.4 | 4           | 0.4 |
| <b>Asian</b>          | 1354  | 753      | 55.6 | 435       | 32.1 | 161  | 11.9 | 5           | 0.4 |
| <b>Indian</b>         | 521   | 350      | 67.2 | 147       | 28.2 | 24   | 4.6  | 0           | 0.0 |
| <b>Other European</b> | 695   | 405      | 58.3 | 262       | 37.7 | 26   | 3.7  | 2           | 0.3 |
| <b>Other</b>          | 223   | 137      | 61.4 | 61        | 27.4 | 25   | 11.2 | 0           | 0.0 |

**Table 164: Postnatal readmission reason by maternal destination following birth**

|                           | NW Wards<br>n=4590 |     | Birthcare<br>n=2493 |     | Home<br>n=587 |     |
|---------------------------|--------------------|-----|---------------------|-----|---------------|-----|
|                           | n                  | %   | n                   | %   | n             | %   |
| <b>Neonatal admission</b> | 55                 | 1.2 | 43                  | 1.7 | 8             | 1.4 |
| <b>Infection</b>          | 57                 | 1.2 | 15                  | 0.6 | 4             | 0.7 |
| <b>Breast</b>             | 37                 | 0.8 | 12                  | 0.5 | 6             | 1.0 |
| <b>Wound</b>              | 24                 | 0.5 | 7                   | 0.3 | 1             | 0.2 |

**Table 165: Postnatal readmission by LMC at birth**

|                             | Total | Neonatal admission |     | Infection |     | Breast |     | Wound |     |
|-----------------------------|-------|--------------------|-----|-----------|-----|--------|-----|-------|-----|
|                             | N     | n                  | %   | n         | %   | n      | %   | n     | %   |
| <b>Independent Midwife</b>  | 2923  | 34                 | 1.2 | 21        | 0.7 | 16     | 0.5 | 11    | 0.4 |
| <b>Private Obstetrician</b> | 1830  | 16                 | 0.9 | 11        | 0.6 | 5      | 0.3 | 4     | 0.2 |
| <b>NW Domino</b>            | 489   | 10                 | 2.0 | 8         | 1.6 | 9      | 1.8 | 1     | 0.2 |
| <b>NW Community</b>         | 1546  | 31                 | 2.0 | 29        | 1.9 | 15     | 1.0 | 12    | 0.8 |
| <b>NW High Risk</b>         | 613   | 12                 | 2.0 | 3         | 0.5 | 9      | 1.5 | 4     | 0.7 |



## APPENDIX 8. NEWBORN SERVICES

### 8.1 NICU Occupancy

**Table 166: Occupancy (baby days) for NICU by gestational age**

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

**Table 167: Occupancy (baby-days) for NICU by birth weight**

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

### 8.2 Admissions to NICU

**Table 168: Admissions of inborn babies to NICU by gestational age groups**

|              | 2000 |      | 2001 |      | 2002 |      | 2003 |      | 2004 |      | 2005 |      | 2006 |      | 2007 |      |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|              | n    | %    | n    | %    | n    | %    | n    | %    | n    | %    | n    | %    | n    | %    | n    | %    |
| <b>Total</b> | 1154 |      | 1104 |      | 1098 |      | 1004 |      | 861  |      | 825  |      | 791  |      | 870  |      |
| 20-27        | 68   | 5.9  | 55   | 5.0  | 57   | 5.2  | 50   | 5.0  | 53   | 6.2  | 50   | 6.1  | 44   | 5.6  | 58   | 6.7  |
| 28-31        | 138  | 12.0 | 128  | 11.6 | 119  | 10.8 | 110  | 11.0 | 104  | 12.1 | 126  | 15.3 | 119  | 15.0 | 107  | 12.3 |
| 32-36        | 531  | 46.6 | 488  | 44.2 | 522  | 47.5 | 449  | 44.7 | 349  | 40.5 | 295  | 35.8 | 331  | 41.8 | 377  | 43.3 |
| ≥ 37         | 417  | 36.1 | 433  | 39.2 | 400  | 36.4 | 395  | 39.3 | 355  | 41.2 | 354  | 42.9 | 297  | 37.5 | 328  | 37.7 |

**Table 169: Live births at National Women's by birthweight (includes BBA)**

| Birth weight (g) | 2007 |
|------------------|------|
| <b>Total</b>     | 7793 |
| <500             | 6    |
| 500-749          | 25   |
| 750-999          | 39   |
| 1000-1249        | 47   |
| 1250-1499        | 51   |
| 1500-1999        | 132  |
| 2000-2499        | 357  |
| 2500-2999        | 1174 |
| 3000-3999        | 4937 |
| ≥4000            | 1025 |

**Table 170: Admissions of inborn babies to NICU by birth weight**

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

**Table 171: Admissions of inborn babies to NICU by gestational age**

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

**Table 172: Admissions of outborn babies to NICU by gestational age**

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

**Table 173: Admissions of outborn babies to NICU by birth weight**

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

**Table 174: Admissions of outborn babies to NICU by gestational age groups**

|              | 2000 |      | 2001 |      | 2002 |      | 2003 |      | 2004 |      | 2005 |      | 2006 |      | 2007 |      |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|              | n    | %    | n    | %    | n    | %    | n    | %    | n    | %    | n    | %    | n    | %    | n    | %    |
| <b>Total</b> | 258  |      | 209  |      | 228  |      | 216  |      | 114  |      | 81   |      | 99   |      | 102  |      |
| <b>20-27</b> | 7    | 2.7  | 11   | 5.3  | 9    | 3.9  | 6    | 2.8  | 5    | 4.4  | 6    | 7.4  | 19   | 19.2 | 22   | 21.6 |
| <b>28-31</b> | 10   | 3.9  | 14   | 6.7  | 23   | 10.1 | 16   | 7.4  | 14   | 12.3 | 13   | 16.0 | 14   | 14.1 | 12   | 11.8 |
| <b>32-36</b> | 55   | 21.3 | 47   | 22.5 | 42   | 18.4 | 47   | 21.8 | 30   | 26.3 | 25   | 30.9 | 23   | 23.2 | 18   | 17.6 |
| <b>≥ 37</b>  | 186  | 72.1 | 137  | 65.6 | 154  | 67.5 | 147  | 68.1 | 65   | 57.0 | 37   | 45.7 | 43   | 43.4 | 50   | 49.0 |

## 8.2.1 Admissions to NICU by domicile of mother

**Table 175: Domicile of mother of all babies admitted to NICU**

|                        | 2002 |     | 2003 |     | 2004 |     | 2005 |     | 2006 |      | 2007 |      |
|------------------------|------|-----|------|-----|------|-----|------|-----|------|------|------|------|
|                        | n    | %   | n    | %   | n    | %   | n    | %   | n    | %    | n    | %    |
| <b>Total</b>           | 1331 |     | 1222 |     | 975  |     | 906  |     | 890  |      | 972  |      |
| <b>Northern Region</b> | 1280 | 96  | 1177 | 96  | 934  | 96  | 833  | 92  | 826  | 92.8 | 824  | 84.8 |
| Auckland               | 515  | 39  | 494  | 40  | 461  | 47  | 441  | 49  | 435  | 48.9 | 428  | 44.0 |
| Counties Manukau       | 179  | 13  | 174  | 14  | 162  | 17  | 144  | 16  | 120  | 13.5 | 161  | 16.6 |
| Waitemata              | 558  | 42  | 477  | 39  | 275  | 28  | 217  | 24  | 237  | 26.6 | 201  | 20.7 |
| Northland              | 28   | 2.1 | 32   | 2.6 | 36   | 3.7 | 32   | 3.5 | 34   | 3.8  | 34   | 3.5  |
| <b>Midland Region</b>  | 36   | 2.7 | 19   | 1.6 | 14   | 1.4 | 34   | 3.8 | 34   | 3.8  |      |      |
| <b>Central Region</b>  | 8    | 0.6 | 9    | 0.7 | 16   | 1.6 | 23   | 2.5 | 17   | 1.9  | 63   | 6.5  |
| <b>Southern Region</b> | 6    | 0.5 | 13   | 1.1 | 7    | 0.7 | 8    | 0.9 | 12   | 1.3  |      |      |
| <b>Overseas</b>        | 1    | 0.1 | 4    | 0.3 | 4    | 0.4 | 5    | 0.6 | 1    | 0.1  | 1    | 0.1  |
| <b>Missing</b>         |      |     |      |     |      |     |      |     |      |      | 84   | 8.6  |

**Table 176: DHB of mothers of all babies admitted to NICU**

| 2007 n=972              |     |      |                            |    |     |
|-------------------------|-----|------|----------------------------|----|-----|
| DHB                     | n   | %    | DHB                        | n  | %   |
| <b>Auckland</b>         | 428 | 44.1 | <b>Mid-Central</b>         | 4  | 0.4 |
| <b>Counties Manukau</b> | 161 | 16.6 | <b>Hawkes Bay</b>          | 2  | 0.2 |
| <b>Waitemata</b>        | 201 | 20.6 | <b>Capital &amp; Coast</b> | 8  | 0.8 |
| <b>Northland</b>        | 34  | 3.5  | <b>Nelson Marlborough</b>  | 2  | 0.2 |
| <b>Waikato</b>          | 20  | 2.1  | <b>Canterbury</b>          | 4  | 0.4 |
| <b>Bay of Plenty</b>    | 11  | 1.1  | <b>Otago</b>               | 3  | 0.3 |
| <b>Taranaki</b>         | 3   | 0.3  | <b>Overseas</b>            | 1  | 0.1 |
| <b>Lakes</b>            | 3   | 0.3  | <b>Missing</b>             | 84 | 8.7 |
| <b>Wanganui</b>         | 3   | 0.3  |                            |    |     |

## 8.2.3 Admissions to NICU by ethnicity of baby

**Table 177: Ethnicity of babies admitted to NICU**

|                       | Preterm (<37 weeks) |      | Term  |      | Total |      |
|-----------------------|---------------------|------|-------|------|-------|------|
|                       | n=594               |      | n=378 |      | n=972 |      |
|                       | n                   | %    | n     | %    | n     | %    |
| <b>NZ European</b>    | 243                 | 40.9 | 158   | 41.8 | 401   | 41.3 |
| <b>Maori</b>          | 100                 | 16.8 | 52    | 13.8 | 152   | 15.7 |
| <b>Pacific</b>        | 82                  | 13.8 | 57    | 15.1 | 139   | 14.3 |
| <b>Asian</b>          | 62                  | 10.4 | 37    | 9.8  | 99    | 10.2 |
| <b>Indian</b>         | 33                  | 5.6  | 27    | 7.1  | 60    | 6.2  |
| <b>Other European</b> | 38                  | 6.4  | 25    | 6.6  | 63    | 6.5  |
| <b>Other</b>          | 29                  | 4.9  | 18    | 4.8  | 47    | 4.8  |
| <b>Not Stated</b>     | 7                   | 1.2  | 4     | 1.1  | 11    | 1.1  |

## 8.2.4 Reason for admission to NICU

**Table 178: Main reason for admission to NICU**

|                                     | Preterm |      | Term |      | Total |      |
|-------------------------------------|---------|------|------|------|-------|------|
|                                     | n       | %    | n    | %    | n     | %    |
| <b>Total</b>                        | 594     | 100  | 378  | 100  | 972   | 100  |
| <b>Prematurity</b>                  | 430     | 72.4 | 0    |      | 430   | 44.2 |
| <b>Respiratory distress</b>         | 86      | 14.5 | 139  | 36.8 | 225   | 23.1 |
| <b>Congenital abnormality</b>       | 12      | 2.0  | 66   | 17.5 | 78    | 8.0  |
| <b>Hypoglycaemia</b>                | 5       | 0.8  | 21   | 5.6  | 26    | 2.7  |
| <b>Depression at birth</b>          | 10      | 1.7  | 28   | 7.4  | 38    | 3.9  |
| <b>SGA</b>                          | 17      | 2.9  | 12   | 3.2  | 29    | 3.0  |
| <b>Other</b>                        | 15      | 2.5  | 39   | 10.3 | 54    | 5.6  |
| <b>Cyanotic episode</b>             | 6       | 1.0  | 20   | 5.3  | 26    | 2.7  |
| <b>Suspected infection</b>          | 0       |      | 11   | 2.9  | 11    | 1.1  |
| <b>Jaundice</b>                     | 3       | 0.5  | 18   | 4.8  | 21    | 2.2  |
| <b>Haemolytic disease</b>           | 6       | 1.0  | 3    | 0.8  | 9     | 0.9  |
| <b>Feeding difficulty</b>           | 1       | 0.2  | 4    | 1.1  | 5     | 0.5  |
| <b>Bile stained vomiting</b>        | 2       | 0.3  | 6    | 1.6  | 8     | 0.8  |
| <b>Neurological problem</b>         | 1       | 0.2  | 6    | 1.6  | 7     | 0.7  |
| <b>Neonatal abstinence syndrome</b> | 0       |      | 3    | 0.8  | 3     | 0.3  |
| <b>Vomiting</b>                     | 0       |      | 2    | 0.5  | 2     | 0.2  |
| <b>Maternal diabetes mellitus</b>   | 0       |      | 0    |      | 0     |      |

## 8.2.5 Antenatal corticosteroids

**Table 179: Percentage receiving antenatal corticosteroids by birth weight among ANZNN assigned babies**

| Birth weight (g) | 2003   |           |          | 2004   |           |          | 2005   |           |          | 2006   |           |             | 2007   |              |             |
|------------------|--------|-----------|----------|--------|-----------|----------|--------|-----------|----------|--------|-----------|-------------|--------|--------------|-------------|
|                  | N<br>n | 1-7d<br>n | Any<br>n | N<br>n | 1-7d<br>n | Any<br>n | N<br>n | 1-7d<br>n | Any<br>n | N<br>n | 1-7d<br>n | Any<br>n(%) | N<br>n | 1-7d<br>n(%) | Any<br>n(%) |
| <b>Total</b>     | 136    | 42        | 90       | 121    | 54        | 91       | 148    | 57        | 95       | 134    | 74        | 128(96)     | 155    | 85(55)       | 149(96)     |
| <b>&lt;500</b>   |        |           |          |        |           |          |        |           |          |        |           |             | 1      | 1(100)       | 1(100)      |
| <b>500-749</b>   | 20     | 50        | 95       | 11     | 64        | 91       | 25     | 52        | 100      | 19     | 12        | 18(95)      | 19     | 10(53)       | 16(84)      |
| <b>750-999</b>   | 32     | 47        | 91       | 37     | 59        | 95       | 34     | 56        | 94       | 24     | 11        | 23(96)      | 37     | 20(54)       | 36(97)      |
| <b>1000-1249</b> | 31     | 52        | 100      | 38     | 58        | 95       | 47     | 57        | 98       | 34     | 20        | 34(100)     | 47     | 23(49)       | 47(100)     |
| <b>1250-1499</b> | 53     | 30        | 81       | 35     | 40        | 83       | 42     | 60        | 90       | 57     | 31        | 53(93)      | 51     | 31(61)       | 49(96)      |

**Table 180: Percentage receiving antenatal corticosteroids by gestational age among ANZNN assigned babies**

| Gestation (weeks) | 2003   |           |          | 2004   |           |          | 2005   |           |          | 2006   |           |          | 2007   |              |             |
|-------------------|--------|-----------|----------|--------|-----------|----------|--------|-----------|----------|--------|-----------|----------|--------|--------------|-------------|
|                   | N<br>n | 1-7d<br>n | Any<br>n | N<br>n | 1-7d<br>n | Any<br>n | N<br>n | 1-7d<br>n | Any<br>n | N<br>n | 1-7d<br>n | Any<br>n | N<br>n | 1-7d<br>n(%) | Any<br>n(%) |
| <b>Total</b>      | 160    | 42        | 93       | 157    | 53        | 92       | 176    | 55        | 94       | 163    | 48        | 94       | 165    | 93(56)       | 161(98)     |
| <b>&lt;24</b>     | 1      | 100       | 100      | 0      |           |          | 1      | 0         | 100      | 1      | 0         | 0        | 5      | 2(40)        | 3(60)       |
| <b>24-25</b>      | 19     | 53        | 95       | 11     | 73        | 91       | 29     | 55        | 97       | 18     | 56        | 100      | 17     | 9(53)        | 16(94)      |
| <b>26-27</b>      | 30     | 47        | 93       | 42     | 57        | 93       | 20     | 55        | 100      | 25     | 44        | 100      | 36     | 25(69)       | 36(100)     |
| <b>28-29</b>      | 36     | 42        | 97       | 37     | 51        | 95       | 64     | 47        | 94       | 41     | 56        | 98       | 47     | 21(45)       | 46(98)      |
| <b>30-31</b>      | 74     | 36        | 89       | 67     | 48        | 91       | 62     | 40        | 94       | 78     | 45        | 91       | 60     | 36(60)       | 60(100)     |

## 8.3 Care and complications

### 8.3.1 Infection

**Table 181: Organisms causing serious infection**

| Organism                                 | Early Infection | Late Infection |
|--|-----------------|----------------|
| <i>Strep agalactiae</i>                  | 4               | 3              |
| <i>E Coli</i>                            | 1               | 5              |
| <i>Staph aureus</i>                      | 0               | 3              |
| <i>Staph epidermidis</i>                 | 0               | 7              |
| Coagulase negative <i>staphylococcus</i> | 0               | 3              |
| <i>Strep viridans</i>                    | 1               | 0              |
| <i>Enterococcus</i>                      | 0               | 1              |
| <i>Klebsiella</i>                        | 0               | 1              |
| <i>Pseudomonas</i>                       | 0               | 2              |
| <i>Enterobacter</i>                      | 0               | 2              |
| <i>Bacillus Cereus</i>                   | 0               | 1              |
| <i>Citrobacter</i>                       | 0               | 1              |
| <i>Serratia</i>                          | 0               | 1              |
| <i>Candida</i>                           | 0               | 1              |

**Table 182: Late onset serious infection (Septicaemia and Meningitis)**

| Gestation (weeks) | Birth Weight (g) | Type                         | Gestation (weeks) | Birth Weight (g) | Type                   |
|-------------------|------------------|------------------------------|-------------------|------------------|------------------------|
| 23                | 500              | <i>E coli</i> d10            | 27                | 610              | <i>St aureus</i> d31   |
| 24                | 615              | <i>Serratia</i> d112         | 27                | 1040             | <i>E coli</i> d14      |
| 24                | 615              | <i>E coli</i> d76 Meningitis | 27                | 1255             | GBS d40                |
| 24                | 615              | <i>Citrobacter</i> d112      | 28                | 1270             | <i>St aureus</i> d8    |
| 24                | 790              | CONS d7                      | 28                | 1080             | <i>Pseudomonas</i> d8  |
| 24                | 695              | <i>St epi</i> d17            | 28                | 1080             | <i>St aureus</i> d8    |
| 24                | 705              | <i>E coli</i> d7             | 30                | 1200             | <i>St epi</i> d8       |
| 25                | 800              | <i>Candida</i> d5            | 32                | 1730             | <i>St epi</i> d36      |
| 25                | 800              | <i>B cereus</i> d23          | 32                | 1380             | CONS d3                |
| 25                | 815              | <i>St epi</i> d5             | 34                | 2555             | <i>Enterobacter</i> d8 |
| 25                | 735              | <i>St epi</i> d143           | 34                | 2515             | <i>St epi</i> d35      |
| 25                | 850              | CONS d27                     | 35                | 1800             | GBS d13                |
| 25                | 850              | <i>Enterobacter</i> d4       | 36                | 2590             | GBS d10                |
| 26                | 800              | <i>Pseudomonas</i> d12       | 36                | 2590             | GBS d10 Meningitis     |
| 26                | 1025             | GBS d88                      | 40                | 3280             | <i>Klebsiella</i> d26  |
| 27                | 850              | <i>S epi</i> d12             | 40                | 3505             | <i>E coli</i> d3       |

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

## 8.3.2 Intraventricular haemorrhage

### 8.3.2.1 Intraventricular haemorrhage (benchmarked with ANZNN)

**Table 183: Intraventricular haemorrhage by birth weight**

| Birth Weight (g) | n   | Unknown | None | Grade 1 | Grade 2 | Grade 3 | Grade 4 |
|------------------|-----|---------|------|---------|---------|---------|---------|
| Total (%)        | 165 | 7       | 12   | 11      | 7       | 4       | 5       |
| <500             | 1   | 0       | 1    | 0       | 0       | 0       | 0       |
| 500-749          | 19  | 0       | 13   | 2       | 0       | 2       | 2       |
| 750-999          | 42  | 1       | 30   | 3       | 5       | 1       | 2       |
| 1000-1249        | 49  | 3       | 42   | 1       | 1       | 1       | 1       |
| 1250-1499        | 54  | 13      | 35   | 5       | 1       | 0       | 0       |

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

**Table 184: Intraventricular haemorrhage by gestation**

| Gestation (weeks) | n   | Unknown | None | Grade 1 | Grade 2 | Grade 3 | Grade 4 |
|-------------------|-----|---------|------|---------|---------|---------|---------|
| Total (%)         | 178 | 28      | 119  | 15      | 7       | 4       | 5       |
| <24               | 5   | 0       | 1    | 1       | 1       | 2       | 0       |
| 24-25             | 18  | 1       | 8    | 3       | 3       | 1       | 2       |
| 26-27             | 41  | 0       | 34   | 1       | 2       | 1       | 3       |
| 28-29             | 5   | 0       | 48   | 4       | 1       | 0       | 0       |
| 30-31             | 61  | 27      | 28   | 6       | 0       | 0       | 0       |

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

**Table 185: Intraventricular haemorrhage in all <1250g babies admitted to NICU 1985-2007**

| Year | Total | Unknown | None | Grade 1 | Grade 2 | Grade 3 | Grade 4 |
|------|-------|---------|------|---------|---------|---------|---------|
| 1985 | 70    | 10      | 33   | 6       | 14      | 5       | 2       |
| 1986 | 87    | 11      | 45   | 13      | 9       | 2       | 7       |
| 1987 | 98    | 14      | 58   | 9       | 11      | 2       | 4       |
| 1988 | 97    | 9       | 51   | 19      | 11      | 3       | 4       |
| 1989 | 113   | 18      | 62   | 8       | 9       | 11      | 5       |
| 1990 | 98    | 16      | 59   | 8       | 5       | 4       | 6       |
| 1991 | 125   | 14      | 81   | 16      | 4       | 2       | 8       |
| 1992 | 103   | 11      | 68   | 8       | 4       | 7       | 5       |
| 1993 | 114   | 7       | 82   | 6       | 10      | 3       | 6       |
| 1994 | 117   | 13      | 75   | 13      | 8       | 4       | 4       |
| 1995 | 121   | 11      | 82   | 12      | 8       | 1       | 7       |
| 1996 | 127   | 10      | 95   | 7       | 3       | 3       | 9       |
| 1997 | 117   | 12      | 82   | 9       | 4       | 3       | 7       |
| 1998 | 90    | 7       | 66   | 7       | 4       | 0       | 6       |
| 1999 | 121   | 6       | 93   | 13      | 3       | 0       | 6       |
| 2000 | 116   | 5       | 88   | 7       | 5       | 2       | 9       |
| 2001 | 122   | 5       | 95   | 16      | 4       | 0       | 2       |
| 2002 | 116   | 3       | 97   | 7       | 3       | 1       | 5       |
| 2003 | 97    | 0       | 85   | 2       | 3       | 0       | 7       |
| 2004 | 96    | 1       | 83   | 4       | 1       | 3       | 4       |
| 2005 | 117   | 3       | 94   | 4       | 10      | 3       | 3       |
| 2006 | 99    | 8       | 75   | 8       | 3       | 0       | 5       |
| 2007 | 129   | 5       | 95   | 7       | 10      | 4       | 8       |

### 8.3.3 Assisted ventilation

**Table 186: High Frequency Oscillatory Ventilation**

| Gestation (wks) | 1998 | 1999 | 2000  | 2001 | 2002  | 2003 | 2004 | 2005  | 2006  | 2007  | Total  | %  |
|-----------------|------|------|-------|------|-------|------|------|-------|-------|-------|--------|----|
| <b>Total</b>    | 8/14 | 7/18 | 11/20 | 3/10 | 12/25 | 7/9  | 5/10 | 15/21 | 12/15 | 19/23 | 99/165 | 60 |
| <b>&lt;28</b>   | 5/7  | 2/7  | 4/8   | 2/5  | 2/7   | 4/5  | 2/6  | 9/14  | 6/9   | 11/14 | 47/82  | 57 |
| <b>28-31</b>    | 1/2  | 2/6  | -     | 1/2  | 1/3   | -    | -    | 3/3   | 2/2   | 3/4   | 13/22  | 59 |
| <b>32-36</b>    | 1/2  | 1/2  | 2/3   | 0/2  | 0/3   | -    | 0/1  | 0/1   | 1/1   | 1/1   | 5/15   | 33 |
| <b>≥37</b>      | 1/3  | 2/3  | 5/9   | 0/1  | 9/12  | 3/4  | 3/3  | 3/3   | 2/2   | 4/4   | 32/44  | 73 |

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

**Table 187: Inhaled Nitric Oxide (iNO)**

| Gestation (wks) | 1998  | 1999  | 2000  | 2001  | 2002  | 2003 | 2004 | 2005  | 2006 | 2007  | Total   | %  |
|-----------------|-------|-------|-------|-------|-------|------|------|-------|------|-------|---------|----|
| <b>Total</b>    | 11/22 | 12/21 | 16/25 | 11/16 | 13/24 | 6/10 | 7/13 | 13/16 | 8/10 | 26/29 | 123/186 | 66 |
| <b>&lt;28</b>   | 0/2   | 3/6   | 1/3   | 1/2   | 0/1   | 1/2  | 1/6  | 2/5   | 0/1  | 4/5   | 13/33   | 39 |
| <b>28-31</b>    | 0/1   | 0/3   | 0/2   | 2/2   | 1/3   | -    | -    | 1/1   | 1/1  | 2/3   | 7/16    | 44 |
| <b>32-36</b>    | 1/5   | 2/2   | 2/3   | 0/3   | 1/6   | 1/1  | -    | 3/3   | 1/1  | 5/6   | 16/30   | 53 |
| <b>≥37</b>      | 10/14 | 7/10  | 13/17 | 8/9   | 11/14 | 4/7  | 6/7  | 7/7   | 6/7  | 15/15 | 87/107  | 81 |

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

**Table 188: iNO plus HFOV**

| Gestation (weeks) | 1998 | 1999 | 2000 | 2001 | 2002  | 2003 | 2004 | 2005 | 2006 | 2007  | Total | %  |
|-------------------|------|------|------|------|-------|------|------|------|------|-------|-------|----|
| <b>Total</b>      | 2/5  | 4/10 | 8/12 | 0/4  | 10/18 | 3/4  | 2/6  | 6/8  | 3/4  | 10/12 | 48/83 | 58 |
| <b>&lt;28</b>     | 0/1  | 1/4  | 1/2  | 0/1  | -     | -    | 0/4  | 2/3  | 0/1  | 3/4   | 7/20  | 35 |
| <b>28-31</b>      | -    | 0/2  | -    | -    | 1/3   | -    | -    | 1/1  | -    | 2/3   | 4/9   | 44 |
| <b>32-36</b>      | 1/2  | 1/1  | 2/3  | 0/2  | 0/3   | -    | -    | 0/1  | 1/1  | 1/1   | 6/14  | 43 |
| <b>≥37</b>        | 1/2  | 2/3  | 5/7  | 0/1  | 9/12  | 3/4  | 2/2  | 3/3  | 2/2  | 4/4   | 31/40 | 78 |

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

**Table 189: Reason for ventilation and CPAP in term and post-term infants**

|                       | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007  |
|-----------------------|------|------|------|------|------|------|------|------|------|------|-------|
| <b>TTN/RDS</b>        | 4/7  | 2/44 | 4/19 | 1/24 | 4/47 | 2/45 | 3/46 | 6/61 | 2/42 | 3/55 | 8/76  |
| <b>Infection</b>      | 4/2  | 4/14 | 5/27 | 3/31 | 1/17 | 3/17 | 0/15 | 1/12 | 2/8  | 2/10 | 3/7   |
| <b>Meconium</b>       | 1/5  | 9/18 | 4/15 | 7/21 | 1/15 | 6/25 | 9/20 | 4/13 | 7/16 | 8/15 | 9/19  |
| <b>Anomaly</b>        | 8/0  | 16/4 | 8/9  | 13/9 | 11/8 | 14/9 | 8/5  | 4/6  | 9/10 | 7/7  | 8/6   |
| <b>PPHN</b>           | 7/4  | 6/4  | 6/4  | 9/5  | 5/6  | 9/12 | 3/4  | 8/7  | 4/6  | 3/3  | 7/4   |
| <b>Encephalopathy</b> | 6/1  | 7/12 | 1/4  | 7/1  | 2/4  | 1/1  | 14/7 | 8/8  | 9/4  | 4/1  | 8/7   |
| <b>Other</b>          |      |      |      |      |      |      |      |      |      |      | 21/25 |
| <b>Missing reason</b> |      |      |      |      |      |      |      |      |      |      | 3/2   |

Numbers in each cell are IPPV/CPAP. Some babies from 1997-2006 with other diagnoses are not included in this table.

### 8.4.1 Survival

**Table 190: Numbers and survival by gestational age of babies <32 weeks gestation in 2007**

| Gestation (weeks)                            | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|--|----|----|----|----|----|----|----|----|----|
| <b>Born alive in NW</b>                      | 4  | 6  | 13 | 18 | 19 | 22 | 26 | 28 | 33 |
| <b>Died at birth in NW</b>                   | 0  | 2  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |
| <b>Born alive at NW and admitted to NICU</b> | 4  | 4  | 13 | 18 | 19 | 21 | 26 | 28 | 33 |
| <b>Born alive at NW and survived</b>         | 3  | 3  | 11 | 17 | 19 | 21 | 26 | 28 | 32 |
| <b>Outborn admitted</b>                      | 0  | 5  | 6  | 5  | 6  | 3  | 5  | 1  | 3  |
| <b>Outborn survived</b>                      |    | 3  | 6  | 5  | 5  | 2  | 5  | 1  | 3  |



## 8.5 Outcomes

### 8.5.1 Retinopathy of prematurity

**Table 191: Retinopathy of prematurity by birth weight in babies surviving to 36 weeks gestation (ANZNN assigned babies)**

| Birth Weight(g)  | n   | Unknown | None | Stage 1 | Stage 2 | Stage 3 | Stage 4 |
|------------------|-----|---------|------|---------|---------|---------|---------|
| <b>Total</b>     | 155 | 48      | 29   | 47      | 24      | 7       | 0       |
| <b>&lt;500</b>   | 1   | 0       | 0    | 0       | 1       | 0       | 0       |
| <b>500-749</b>   | 19  | 4       | 1    | 5       | 6       | 3       | 0       |
| <b>750-999</b>   | 37  | 3       | 7    | 16      | 7       | 4       | 0       |
| <b>1000-1249</b> | 47  | 10      | 12   | 18      | 7       | 0       | 0       |
| <b>1250-1499</b> | 51  | 31      | 9    | 8       | 3       | 0       | 0       |

**Table 192: Retinopathy of prematurity by gestational age in babies surviving to 36 weeks gestation (ANZNN assigned babies)**

| Gestation (wks) | n   | Unknown | None | Stage 1 | Stage 2 | Stage 3 | Stage 4 |
|-----------------|-----|---------|------|---------|---------|---------|---------|
| <b>Total</b>    | 165 | 63      | 27   | 45      | 23      | 7       | 0       |
| <b>&lt;24</b>   | 5   | 2       | 0    | 0       | 0       | 3       | 0       |
| <b>24-25</b>    | 17  | 4       | 1    | 5       | 5       | 2       | 0       |
| <b>26-27</b>    | 36  | 2       | 3    | 15      | 14      | 2       | 0       |
| <b>28-29</b>    | 47  | 6       | 15   | 22      | 4       | 0       | 0       |
| <b>30-31</b>    | 60  | 49      | 8    | 3       | 0       | 0       | 0       |

### 8.5.2 Chronic lung disease

**Table 193: Chronic lung disease by birth weight (inborn babies <32weeks)**

| Birth Weight (g) | n   | Dead by 36 wks | Alive at 36 wks | In O <sub>2</sub> | O <sub>2</sub> + CPAP/ IPPV | CPAP/ IPPV | CLD | CLD in All % | CLD if Alive % |
|------------------|-----|----------------|-----------------|-------------------|-----------------------------|------------|-----|--------------|----------------|
| <b>Total</b>     | 155 | 6              | 149             | 12                | 13                          | 8          | 33  | 21           | 22             |
| <b>&lt;500</b>   | 1   | 0              | 1               | 1                 | 0                           | 0          | 1   | 100          | 100            |
| <b>500-749</b>   | 19  | 3              | 16              | 0                 | 7                           | 4          | 11  | 58           | 69             |
| <b>750-999</b>   | 37  | 2              | 35              | 6                 | 4                           | 3          | 13  | 35           | 37             |
| <b>1000-1249</b> | 47  | 1              | 46              | 3                 | 2                           | 0          | 5   | 11           | 11             |
| <b>1250-1499</b> | 51  | 0              | 51              | 2                 | 0                           | 1          | 3   | 6            | 6              |

**Table 194: Chronic lung disease by gestational age (inborn babies <32weeks)**

| Gestation (weeks) | n   | Dead by 36 wks | Alive at 36 wks | In O <sub>2</sub> | O <sub>2</sub> +CPAP/ IPPV | CPAP/ IPPV | CLD | %CLD in All | %CLD if Alive |
|-------------------|-----|----------------|-----------------|-------------------|----------------------------|------------|-----|-------------|---------------|
| <b>Total</b>      | 178 | 8              | 170             | 12                | 13                         | 9          | 34  | 19          | 20            |
| <b>&lt;24</b>     | 5   | 2              | 3               | 0                 | 1                          | 1          | 2   | 40          | 67            |
| <b>24-25</b>      | 18  | 3              | 15              | 3                 | 2                          | 2          | 7   | 39          | 47            |
| <b>26-27</b>      | 41  | 1              | 42              | 4                 | 9                          | 2          | 15  | 37          | 36            |
| <b>28-29</b>      | 53  | 1              | 52              | 5                 | 1                          | 4          | 10  | 19          | 19            |
| <b>30-31</b>      | 61  | 1              | 60              | 0                 | 0                          | 0          | 0   | 0           | 0             |

### 8.5.3 Necrotising enterocolitis ANNZN

The data in the two tables below is for babies with confirmed NEC and therefore does not include babies with probable NEC.

**Table 195: Necrotising enterocolitis (NEC) by birth weight**

| Weight (g)       | 2002 |   |   | 2003 |   |   | 2004 |   |   | 2005 |   |    | 2006 |   |    | 2007 |   |   |
|------------------|------|---|---|------|---|---|------|---|---|------|---|----|------|---|----|------|---|---|
|                  | N    | n | % | N    | n | % | N    | n | % | N    | n | %  | N    | n | %  | N    | n | % |
| <b>Total</b>     | 157  | 2 | 1 | 136  | 3 | 2 | 121  | 4 | 3 | 148  | 6 | 4  | 134  | 3 | 2  | 155  | 2 | 1 |
| <b>&lt;500</b>   |      |   |   |      |   |   |      |   |   |      |   |    |      |   |    | 1    | 0 | 0 |
| <b>500-749</b>   | 14   | 0 |   | 20   | 1 | 5 | 11   | 0 | 0 | 25   | 4 | 16 | 19   | 2 | 10 | 19   | 1 | 5 |
| <b>750-999</b>   | 37   | 1 | 3 | 32   | 1 | 3 | 37   | 3 | 8 | 34   | 1 | 3  | 24   | 0 | 0  | 37   | 1 | 3 |
| <b>1000-1249</b> | 47   | 1 | 2 | 31   | 0 |   | 38   | 1 | 3 | 47   | 1 | 2  | 34   | 1 | 3  | 47   | 0 | 0 |
| <b>1250-1499</b> | 56   | 0 |   | 53   | 1 | 2 | 35   | 0 |   | 42   | 0 |    | 57   | 0 |    | 51   | 0 | 0 |

**Table 196: Necrotising enterocolitis by gestational age**

| Gestation (weeks) | 2002 |   |   | 2003 |   |   | 2004 |   |   | 2005 |   |    | 2006 |   |   | 2007 |   |   |
|-------------------|------|---|---|------|---|---|------|---|---|------|---|----|------|---|---|------|---|---|
|                   | N    | n | % | N    | n | % | N    | n | % | N    | n | %  | N    | n | % | N    | n | % |
| <b>Total</b>      | 175  | 3 | 2 | 160  | 4 | 3 | 121  | 4 | 3 | 176  | 6 | 3  | 163  | 3 | 2 | 165  | 2 | 1 |
| <b>&lt;24</b>     |      |   |   |      |   |   |      |   |   |      |   |    |      |   |   | 5    | 0 | 0 |
| <b>24-25</b>      | 21   | 1 | 5 | 20   | 1 | 4 | 11   | 1 | 9 | 29   | 4 | 14 | 18   | 1 | 6 | 17   | 1 | 6 |
| <b>26-27</b>      | 33   | 0 |   | 30   | 1 | 3 | 42   | 3 | 7 | 20   | 0 |    | 25   | 2 | 8 | 36   | 1 | 3 |
| <b>28-29</b>      | 52   | 1 | 2 | 36   | 1 | 3 | 37   | 0 |   | 64   | 0 |    | 41   | 0 | 0 | 47   | 0 | 0 |
| <b>30-31</b>      | 68   | 1 | 1 | 74   | 1 | 1 | 67   | 0 |   | 62   | 1 | 2  | 78   | 0 | 0 | 60   | 0 | 0 |

### 8.5.4 Patent Ductus Arteriosus

**Table 197: Patent Ductus Arteriosus by birth weight <1500g**

Indo = treated with indomethacin. Ligate = surgical ligation of PDA. Indo includes all ligated  
Indo includes all categories, 1 course, 2 courses, indo, long course, short course, induce  
Induce is a randomised trial indo vs placebo

| Birth weight (g) | 2003 |      |        | 2004 |      |        | 2005 |      |        | 2006 |      |        | 2007 |           |             |
|------------------|------|------|--------|------|------|--------|------|------|--------|------|------|--------|------|-----------|-------------|
|                  | N    | Indo | Ligate | N    | Indo | Ligate | N    | Indo | Ligate | N    | Indo | Ligate | N    | Indo n(%) | Ligate n(%) |
| <b>Total</b>     | 136  | 40   | 7      | 121  | 34   | 2      | 148  | 39   | 0      | 134  | 25   | 2      | 155  | 36(23)    | 2(1)        |
| <b>&lt;500</b>   |      |      |        |      |      |        |      |      |        |      |      |        | 1    | 1(100)    | 0           |
| <b>500-749</b>   | 20   | 15   | 6      | 11   | 4    | 1      | 25   | 20   | 0      | 19   | 10   | 2      | 19   | 7(37)     | 0           |
| <b>750-999</b>   | 32   | 11   | 0      | 37   | 18   | 0      | 34   | 15   | 0      | 24   | 9    | 0      | 37   | 17(46)    | 2(5)        |
| <b>1000-1249</b> | 31   | 10   | 0      | 38   | 11   | 1      | 47   | 3    | 0      | 34   | 4    | 0      | 47   | 8(17)     | 0           |
| <b>1250-1499</b> | 53   | 4    | 1      | 35   | 1    | 0      | 42   | 1    | 0      | 57   | 2    | 0      | 51   | 3(6)      | 0           |

**Table 198: Patent Ductus Arteriosus by gestational age**

| Gestation (weeks) | 2003 |      |        | 2004 |      |        | 2005 |      |        | 2006 |      |        | 2007 |           |             |
|-------------------|------|------|--------|------|------|--------|------|------|--------|------|------|--------|------|-----------|-------------|
|                   | N    | Indo | Ligate | N    | Indo | Ligate | N    | Indo | Ligate | N    | Indo | Ligate | N    | Indo n(%) | Ligate n(%) |
| <b>Total</b>      | 160  | 43   | 6      | 157  | 35   | 2      | 176  | 41   | 1      | 163  | 25   | 2      | 165  | 36(22)    | 2(1)        |
| <b>&lt;24</b>     | 1    | 1    | 1      | 0    |      |        | 1    | 1    | 0      | 1    | 1    | 0      | 5    | 3(60)     | 1(20)       |
| <b>24-25</b>      | 19   | 15   | 4      | 11   | 6    | 1      | 29   | 23   | 0      | 18   | 13   | 2      | 17   | 10(59)    | 0           |
| <b>26-27</b>      | 30   | 13   | 1      | 42   | 19   | 0      | 20   | 8    | 0      | 25   | 9    | 0      | 36   | 19(53)    | 1(3)        |
| <b>28-29</b>      | 36   | 6    | 0      | 37   | 7    | 1      | 64   | 6    | 0      | 41   | 1    | 0      | 47   | 4(9)      | 0           |
| <b>30-31</b>      | 74   | 8    | 1      | 67   | 3    | 0      | 62   | 3    | 1      | 78   | 1    | 0      | 60   | 0         | 0           |

## 8.5.5 Pneumothorax

**Table 199: Pneumothorax by birth weight**

| Birth weight<br>(g)   | 2003       |          |          | 2004       |          |          | 2005       |          |          | 2006       |          |            | 2007       |          |          |
|-----------------------|------------|----------|----------|------------|----------|----------|------------|----------|----------|------------|----------|------------|------------|----------|----------|
|                       | N          | n        | %        | N          | n        | %        | N          | n        | %        | N          | n        | %          | N          | n        | %        |
| <500                  |            |          |          |            |          |          |            |          |          |            |          |            | 1          | 0        | 0        |
| 500-749               | 20         | 2        | 10       | 11         | 0        |          | 25         | 1        | 4        | 19         | 0        | 0          | 19         | 1        | 5        |
| 750-999               | 32         | 0        |          | 37         | 0        |          | 34         | 1        | 3        | 24         | 0        | 0          | 37         | 4        | 11       |
| 1000-1249             | 31         | 1        | 3        | 38         | 1        | 3        | 47         | 3        | 6        | 34         | 0        | 0          | 47         | 1        | 2        |
| 1250-1499             | 53         | 0        |          | 35         | 0        |          | 42         | 3        | 7        | 57         | 1        | 2          | 51         | 1        | 2        |
| <b>Total &lt;1500</b> | <b>136</b> | <b>3</b> | <b>2</b> | <b>121</b> | <b>1</b> | <b>1</b> | <b>148</b> | <b>8</b> | <b>5</b> | <b>134</b> | <b>1</b> | <b>0.7</b> | <b>155</b> | <b>7</b> | <b>5</b> |

**Table 200: Pneumothorax by gestational age**

| Gestation<br>(weeks) | 2003       |          |          | 2004       |          |          | 2005       |           |          | 2006       |          |            | 2007       |          |          |
|----------------------|------------|----------|----------|------------|----------|----------|------------|-----------|----------|------------|----------|------------|------------|----------|----------|
|                      | N          | n        | %        | N          | n        | %        | N          | n         | %        | N          | n        | %          | N          | n        | %        |
| <24                  | 1          |          |          | 0          |          |          | 1          | 0         |          | 1          | 0        | 0          | 5          | 0        | 0        |
| 24-25                | 19         | 2        | 11       | 11         | 0        | 0        | 29         | 1         | 3        | 18         | 0        | 0          | 17         | 2        | 1        |
| 26-27                | 30         | 0        | 0        | 42         | 1        | 2        | 20         | 3         | 15       | 25         | 0        | 0          | 36         | 2        | 6        |
| 28-29                | 36         | 1        | 3        | 37         | 0        | 0        | 64         | 5         | 8        | 41         | 1        | 2          | 47         | 3        | 6        |
| 30-31                | 74         | 0        | 0        | 67         | 2        | 3        | 62         | 2         | 3        | 78         | 0        | 0          | 60         | 0        | 0        |
| <b>Total &lt;32</b>  | <b>160</b> | <b>3</b> | <b>2</b> | <b>157</b> | <b>3</b> | <b>2</b> | <b>176</b> | <b>11</b> | <b>6</b> | <b>163</b> | <b>1</b> | <b>0.6</b> | <b>165</b> | <b>7</b> | <b>4</b> |

**Table 201: Inborn babies receiving postnatal corticosteroids by birth weight**

| Birth weight (g) | N          | n         | %        |
|------------------|------------|-----------|----------|
| <b>Total</b>     | <b>151</b> | <b>10</b> | <b>7</b> |
| <500             | 1          | 1         | 100      |
| 500-749          | 17         | 5         | 29       |
| 750-999          | 35         | 2         | 6        |
| 1000-1249        | 47         | 2         | 4        |
| 1250-1499        | 51         | 0         |          |

**Table 202: Inborn babies receiving postnatal corticosteroids by gestational age**

| Gestation(weeks) | N          | n         | %        |
|------------------|------------|-----------|----------|
| <b>Total</b>     | <b>161</b> | <b>10</b> | <b>6</b> |
| <24              | 4          | 3         | 75       |
| 24-25            | 14         | 1         | 7        |
| 26-27            | 36         | 5         | 14       |
| 28-29            | 47         | 1         | 2        |
| 30-31            | 60         | 0         |          |

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

**Table 203 Inborn neonatal and post-neonatal deaths prior to discharge**

| Born at                      | Gest age | Birth Weight | Apgar 1/5 | Twin   | Age at death (d) | Cause of death  |
|------------------------------|----------|--------------|-----------|--------|------------------|---|
| NW Labour and Birthing Suite | 23       | 500          | 6 / 8     | Twin 1 | 29               | Severe CLD  |
| NW Labour and Birthing Suite | 23       | 535          | 7 / 7     | Twin 2 | 1                | Pulmonary haemorrhage<br>Bilateral Grade 3 IVH                                      |
| NW Labour and Birthing Suite | 24       | 695          | 2 / 3     | No     | 140              | Severe CLD  |
| NW Labour and Birthing Suite | 24       | 710          | 2 / 5     | No     | 2                | Severe RDS, Grade4 IVH  |
| NW Labour and Birthing Suite | 25       | 890          | 2 / 3     | No     | 2                | Pulmonary haemorrhage, Grade 4 IVH  |
| NW Labour and Birthing Suite | 25       | 900          | 3 / 5     | No     | 0                | Pulmonary hypoplasia  |
| NW Theatre                   | 26       | 570          | 2 / 7     | Twin 1 | 168              | Severe CLD  |
| NW Labour and Birthing Suite | 31       | 1165         | 1 / 5     | No     | 8                | Arthrogryposis multiplex,<br>Eventration of the diaphragm,<br>Duodenal atresia      |
| NW Theatre                   | 34       | 1980         | 9 / 10    | No     | 194              | Hypoplastic Left Ventricle,<br>PAPVD, Arch Hypoplasia                               |
| NW Labour and Birthing Suite | 34       | 1830         | 6 / 9     | No     | 19               | Diaphragmatic hernia,<br>Coarctation of Aorta,<br>Oesophageal atresia               |
| NW Theatre                   | 35       | 2050         | 7 / 10    | No     | 10               | Right Ventricular hypoplasia,<br>VSD, Aneurismal atrial septum                      |
| NW Labour and Birthing Suite | 35       | 2595         | 4 / 6     | No     | 0                | Laryngeal atresia   |
| NW Theatre                   | 36       | 1935         | 0 / 0     | No     | 1                | HIE   |
| NW Theatre                   | 37       | 2910         | 2 / 6     | No     | 18               | Right sided Diaphragmatic<br>hernia, Hypoplastic lungs                              |
| NW Theatre                   | 37       | 3490         | 9 / 9     | No     | 26               | Hypoplastic left ventricle, Aorto-<br>Pulmonary collaterals,<br>Dysmorphism         |
| NW Theatre                   | 38       | 3335         | 0 / 1     | No     | 1                | HIE stage 3   |
| NW Theatre                   | 38       | 2720         | 3 / 7     | Twin 1 | 35               | TAPVD   |
| NW Labour and Birthing Suite | 41       | 4310         | 3 / 9     | No     | 24               | Pulmonary valve atresia,<br>Hypoplastic Right ventricle,<br>Coronary artery fistula |

## 8.7 Details of deaths prior to discharge among outborn babies admitted to NICU

**Table 204: Outborn neonatal and post-neonatal deaths prior to discharge**

| Born at     | Gest age | Birth Weight | Apgar 1/5 | Twin   | Age at death (d) | Cause of death  |
|-------------|----------|--------------|-----------|--------|------------------|---|
| Waikato     | 24       | 615          | 5 / 7     | No     | 132              | Presumed infective endocarditis, septicaemia (Serratia)   |
| Middlemore  | 24       | 705          | 7 / 8     | No     | 10               | E coli Septicemia   |
| Middlemore  | 27       | 615          | 8 / 10    | No     | 103              | Bilateral grade 4 IVH, hydrocephalus, respiratory failure   |
| BBA/NW      | 27       | 975          | 7 /10     | No     | 25               | Chronic lung disease  |
| Waikato/BBA | 28       | 1590         | 2 / 8     | No     | 5                | Multiple congenital abnormalities, Tetralogy of Fallot with absent pulmonary valve, probable bronchomalacia                                     |
| Northshore  | 33       | 2690         | 3 / 6     | Twin 2 | 1                | Twin-twin transfusion syndrome, non-immune hydrops  |
| Hastings    | 34       | 2294         | 8 / 8     | No     | 45               | Multiple abnormalities, segmental field defect involving chest wall, ribs, abdominal musculature and vertebrae resulting in respiratory failure |
| Northland   | 37       | 3000         | 5 / 9     | No     | 2                | Postnatal asphyxia  |
| Northshore  | 38       | 4660         | 2 / 4     | No     | 3                | Hypertrophic cardiomyopathy, pericardial tamponade  |
| Northland   | 40       | 3790         | 3 / 5     | No     | 0                | Cardiac failure, single right coronary artery   |

## APPENDIX 9. PERINATAL MORTALITY

**Table 205: Postnatal transfer deaths (these are babies born elsewhere who transferred to NW for postnatal care)**

|                              |             | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|------------------------------|-------------|------|------|------|------|------|------|------|------|
| <b>Early neonatal deaths</b> | ≤ 7 days    | 6    | 1    | 3    | 3    | 3    | 3    | 3    | 5    |
| <b>Late neonatal deaths</b>  | 8 – 28 days | 0    | 1    | 0    | 0    | 0    | 3    | 3    | 2    |
| <b>Total deaths</b>          |             | 6    | 2    | 3    | 3    | 3    | 6    | 6    | 7    |

**Table 206: Perinatal and perinatal- related deaths (1992 – 2007)**

|   | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Total number of perinatal related losses</b> | 168  | 133  | 147  | 131  | 165  | 128  | 133  | 105  | 136  | 94   | 116  | 105  | 124  | 111  | 99   | 111  |
| <b>Fetal death</b>                              | 86   | 61   | 80   | 84   | 86   | 74   | 73   | 65   | 84   | 57   | 69   | 64   | 82   | 68   | 74   | 82   |
| <b>Early neonatal death</b>                     | 65   | 60   | 49   | 39   | 63   | 45   | 50   | 31   | 43   | 32   | 40   | 34   | 33   | 38   | 23   | 20   |
| <b>Late neonatal death</b>                      | 9    | 6    | 15   | 7    | 10   | 6    | 6    | 9    | 9    | 5    | 7    | 7    | 9    | 5    | 2    | 9    |
| <b>Perinatal mortality rate /1000</b>           | 11.6 | 9.4  | 9.3  | 7.6  | 10.1 | 9.4  | 9.8  | 12.5 | 15.8 | 11.6 | 13.6 | 12.6 | 15.0 | 14.4 | 13.1 | 13.0 |
| <b>Perinatal related mortality rate /1000</b>   | 19.7 | 14.3 | 15.6 | 13.7 | 16.5 | 14.7 | 16.1 | 13.7 | 16.9 | 12.3 | 14.5 | 13.5 | 16.1 | 16.1 | 13.4 | 14.1 |

**Table 207: Perinatal mortality rate (per 1000 births) and perinatal-related mortality rate (per 1000 births) adjusted for lethal and terminated fetal abnormalities\***

|  | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007                 |           |
|--|------|------|------|------|------|------|------|----------------------|-----------|
|  | Rate | Rate | Rate | Rate | Rate | Rate | Rate | n                    | Rate/1000 |
| <b>Perinatal mortality rate</b>  | 15.8 | 11.6 | 13.6 | 12.6 | 15.0 | 14.4 | 13.1 | 102 / 7875           | 13.0      |
| <b>Perinatal mortality rate (excluding lethal &amp; terminated fetal abnormalities)</b>    | 11.5 | 8.0  | 8.9  | 8.2  | 11.4 | 9.7  | 8.4  | (102-41) / (7875-41) | 7.8       |
| <b>Perinatal related loss rate</b>   | 16.9 | 12.3 | 14.5 | 13.5 | 16.2 | 15.0 | 13.4 | 111 / 7875           | 14.1      |
| <b>Perinatal related loss rate (excluding lethal &amp; terminated fetal abnormalities)</b> | 12   | 8.4  | 9.4  | 8.9  | 12.4 | 9.9  | 8.4  | (111-48) / (7875-48) | 8.0       |

\*Defined as PDC-major=congenital abnormality for fetal deaths and NDC-major=congenital abnormality for neonatal deaths

**Table 208: Cause of death (2000-2007) (2000-2004 ANZACPM;2005-2007 PSANZ-PDC)**

| Classification*                      | 2000  | 2001  | 2002  | 2003  | 2004  | 2005  | 2006  | 2007    |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|---------|
|                                      | n %   | n %   | n %   | n %   | n %   | n %   | n %   | n %     |
| <b>Congenital abnormality</b>        | 37 25 | 28 30 | 42 36 | 36 34 | 36 34 | 38 34 | 37 37 | 48 43.2 |
| <b>Perinatal infection</b>           | 11 8  | 5 5   | 7 6   | 6 6   | 6 6   | 11 10 | 9 9   | 4 3.6   |
| <b>Hypertension</b>                  | 5 4   | 3 3   | 3 3   | 4 4   | 4 4   | 3 3   | 3 3   | 0       |
| <b>Antepartum haemorrhage</b>        | 10 8  | 10 11 | 3 3   | 5 5   | 5 5   | 6 5   | 4 4   | 7 6.3   |
| <b>Maternal conditions</b>           | 5 4   | 3 3   | 8 7   | 8 7   | 8 7   | 8 7   | 6 6   | 5 4.5   |
| <b>Specific perinatal conditions</b> | 22 17 | 16 17 | 18 16 | 5 5   | 5 5   | 10 9  | 7 7   | 7 6.3   |
| <b>Hypoxic peripartum death</b>      | 2 2   | 2 2   | 1 1   | 3 3   | 3 3   | 4 4   | 0     | 2 1.8   |
| <b>Fetal growth restriction</b>      | 10 8  | 6 6   | 4 3   | 6 6   | 6 6   | 1 1   | 8 8   | 11 9.9  |
| <b>Spontaneous preterm</b>           | 23 17 | 12 13 | 17 15 | 23 22 | 23 22 | 20 18 | 13 13 | 16 14.4 |
| <b>Unexplained antepartum death</b>  | 11 8  | 9 10  | 13 11 | 9 8   | 9 8   | 10 9  | 12 12 | 10 9.0  |
| <b>No obstetric antecedent</b>       |       |       |       |       | 0     | 0     | 0     | 1 0.9   |
| <b>Total</b>                         | 136   | 94    | 116   | 105   | 124   | 111   | 99    | 111     |

**Table 209: Cause of death (PSANZ-PDC) among terminations of pregnancy**

| Classification                  | Termination of pregnancy<br>n=37 |      |
|---------------------------------|----------------------------------|------|
|                                 | n                                | %    |
| <b>Congenital abnormality</b>   | 32                               | 86.5 |
| <b>Maternal conditions</b>      | 2                                | 5.4  |
| <b>Antepartum haemorrhage</b>   | 1                                | 2.7  |
| <b>Spontaneous preterm</b>      | 1                                | 2.7  |
| <b>Fetal growth restriction</b> | 1                                | 2.7  |

**Table 210: Perinatal deaths by cause (PSANZ-PDC) and gestational age**

| Classification                       | Total<br>n=111<br>n % | < 37 weeks<br>n=86<br>n % | ≥ 37 weeks<br>n=25<br>n % |
|--------------------------------------|-----------------------|---------------------------|---------------------------|
|                                      |                       |                           |                           |
| <b>Congenital abnormality</b>        | 48 43.2               | 41 47.7                   | 7 28.0                    |
| <b>Perinatal infection</b>           | 4 3.6                 | 2 2.3                     | 2 8.0                     |
| <b>Antepartum haemorrhage</b>        | 7 6.3                 | 6 7.0                     | 1 4.0                     |
| <b>Maternal conditions</b>           | 5 4.5                 | 5 5.8                     | 0                         |
| <b>Specific perinatal conditions</b> | 7 6.3                 | 4 4.7                     | 3 12.0                    |
| <b>Hypoxic peripartum death</b>      | 2 1.8                 | 0                         | 2 8.0                     |
| <b>Fetal growth restriction</b>      | 11 9.9                | 7 8.1                     | 4 16.0                    |
| <b>Spontaneous preterm</b>           | 16 14.4               | 16 18.6                   | 0                         |
| <b>No obstetric antecedent</b>       | 1 0.9                 | 0 0.0                     | 1 4.0                     |
| <b>Unexplained antepartum death</b>  | 10 9.0                | 5 5.8                     | 5 20.0                    |

**Table 211: Perinatal full necropsy rates (%)**

|                                     | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|-------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Perinatal necropsy rates (%)</b> | 58   | 56   | 65   | 68   | 57   | 48   | 50   | 38   | 50   | 40   | 40   | 41   | 43   | 52   | 48   | 50   | 59   |

## APPENDIX 10. TERMINATION OF PREGNANCY

**Table 212: Demography and characteristics of women attending EDU**

|   | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|------|------|------|------|------|------|------|------|
| <b>Ethnicity</b>                        | %    | %    | %    | %    | %    | %    | %    | %    |
| Chinese                                 | 7    | 7    | 6.5  | 8    | 7.4  | 8.5  | 8.0  | 6.5  |
| Cook Island                             | 4    | 3.5  | 3.5  | 3    | 3.2  | 3.5  | 3.6  | 3.8  |
| European                                | 41   | 39.5 | 38.5 | 40   | 39.2 | 38.1 | 37.9 | 36.7 |
| Fijian                                  | 1    | 1    | 1    | 1    | 0.5  | 1.0  | 0.7  | 1.6  |
| Indian                                  | 6    | 6    | 6.5  | 7.6  | 8.7  | 8.6  | 9.0  | 8.7  |
| Maori                                   | 17   | 17.5 | 18.5 | 16.7 | 16.4 | 15.9 | 16.7 | 17.3 |
| Nuiean                                  | 1    | 1.5  | 1.5  | 2    | 1.4  | 1.6  | 1.8  | 1.7  |
| Other                                   | 7    | 7.5  | 7    | 8    | 7.7  | 7.4  | 6.2  | 7.3  |
| Pacific Island                          | 0    | 0.5  | 0.5  | 0    | 0.2  | 0.1  | 0.1  | 0.7  |
| Samoan                                  | 13   | 13   | 13   | 11   | 12.6 | 11.9 | 12.3 | 12.0 |
| Tongan                                  | 3    | 3    | 3.5  | 2.7  | 2.7  | 3.4  | 3.5  | 3.5  |
| <b>Age</b>                              |      |      |      |      |      |      |      |      |
| ≤ 19                                    | 18   | 19   | 18   | 18   | 19.3 | 16.3 | 21.5 | 22.3 |
| 20 – 24                                 | 29   | 29   | 29   | 31   | 28.9 | 41   | 29.7 | 29.6 |
| 25 – 29                                 | 21   | 21   | 23   | 21   | 20.9 | 19.9 | 20.7 | 20.1 |
| 30 – 34                                 | 17   | 17   | 16   | 17   | 16.1 | 13.1 | 14.4 | 14.3 |
| 35 – 39                                 | 11   | 11   | 10   | 10   | 10.9 | 6.6  | 9.5  | 9.7  |
| 40+                                     | 4    | 3    | 4    | 3    | 3.9  | 3.3  | 3.9  | 4.0  |
| <b>Gestation (weeks) at termination</b> |      |      |      |      |      |      |      |      |
| 7                                       | 4    | 2.5  | 1    | 0.8  | 1.0  | 0.4  | 0.3  | 0.2  |
| 8                                       | 15   | 14   | 9    | 6.8  | 17.3 | 10.5 | 11.1 | 8.8  |
| 9                                       | 21   | 19.5 | 20   | 18   | 23.9 | 20.9 | 22.2 | 20.8 |
| 10                                      | 22   | 21.5 | 23   | 24   | 21.4 | 22.7 | 24.2 | 25.1 |
| 11                                      | 20   | 21   | 22.5 | 25   | 20.8 | 24.0 | 23.6 | 24.1 |
| 12                                      | 15   | 18.5 | 21   | 22.4 | 14.5 | 20.2 | 17.6 | 20.9 |
| ≥13                                     | 3    | 3    | 3.5  | 3    | 1.2  | 1.3  | 0.8  | 0.1  |



## APPENDIX 11. GLOSSARY OF ABBREVIATIONS

|       |   |        |  |
|-------|---|--------|--|
| ABA   | American Board of Anaesthetologists                         | IUD    | Intrauterine death                               |
| ACL   | Anticardiolipin antibody                                    | ICSI   | Intracytoplasmic sperm injection                 |
| ADAPT | Alcohol, Drugs and Pregnancy Team                           | IVF    | In vitro fertilisation                           |
| AMSIS | Auckland Maternity Services Information System              | IVH    | Intraventricular haemorrhage                     |
| ANA   | Antinuclear antibody  | LB     | Live birth                                       |
| ANZNN | Australia and New Zealand Neonatal Network                  | Ligate | Surgical ligation of PDA                         |
| APH   | Antepartum haemorrhage                                      | LMP    | Last menstrual period                            |
| ARM   | Artificial rupture of membranes                             | LNND   | Late neonatal death                              |
| AUT   | Auckland University of Technology                           | LSCS   | Lower segment Caesarean section                  |
| BBA   | (Baby) Born Before Arrival (not a planned home birth)       | LV     | Left ventricle                                   |
| BP    | Blood Pressure  | MAS    | Meconium aspiration syndrome                     |
| BPD   | Bronchopulmonary dysplasia                                  | MCDA   | Monochorionic diamniotic twin                    |
| CDU   | Child Development Unit                                      | MCMA   | Monochorionic monoamniotic                       |
| CHD   | Congenital Heart Disease                                    | N/R    | Not resuscitated                                 |
| CI    | Confidence Interval   | NAS    | Neonatal abstinence syndrome                     |
| CLD   | Chronic lung disease  | NEC    | Necrotising enterocolitis                        |
| CPAP  | Continuous positive airways pressure                        | NFD    | Not further defined                              |
| CRIS  | Clinical Records Information System                         | NICU   | Neonatal Intensive Care Unit                     |
| CS    | Caesarean section   | NIDDM  | Non-insulin dependent diabetes mellitus          |
| CVA   | Cerebro Vascular Accident                                   | NW     | National Women's                                 |
| CVS   | Chorionic villus sampling                                   | NPSU   | National perinatal statistics unit (Australia)   |
| DCCM  | Department of Critical Care Medicine                        | OP     | Occiput posterior                                |
| DCDA  | Dichorionic diamniotic twin                                 | OPU    | Oocyte pick up                                   |
| DHB   | District Health Board                                       | PDA    | Patent ductus arteriosus                         |
| DIC   | Disseminated intravascular coagulopathy                     | PE/PET | Pre-eclampsia                                    |
| DORV  | Double outlet right ventricle                               | PG     | Prostaglandin                                    |
| DRG   | Diagnosis related groups                                    | PIN    | Parent Infant Nursery                            |
| ECMO  | Extra Corporeal Membrane Oxygenation                        | PM     | Postmortem                                       |
| EDU   | Epsom Day Unit  | PMR    | Perinatal mortality rate                         |
| ENND  | Early neonatal death  | PPHN   | Persistent pulmonary hypertension of the newborn |
| FH    | Fetal heart   | PRLR   | Perinatal related loss rate                      |
| FTE   | Fulltime equivalent   | PROM   | Prolonged rupture of membranes                   |
| GA    | General anaesthetic   | PVL    | Periventricular leukomalacia                     |
| GDM   | Gestational diabetes mellitus                               | RDS    | Respiratory distress syndrome                    |
| GH    | Gestational hypertension                                    | ROP    | Retinopathy of prematurity                       |
| GLH   | Green Lane Hospital   | RR     | Relative risk                                    |
| GP    | General Practitioner  | SCBU   | Special Care Baby Unit                           |
| GPH   | Gestational proteinuric hypertension                        | SGA    | Small for gestational age                        |
| GTT   | Glucose tolerance test                                      | SLE    | Systemic Lupus Erythematosus                     |
| Hb    | Haemoglobin   | SRM    | Spontaneous rupture of membranes                 |
| HbA1c | Glycosylated haemoglobin                                    | SVB    | Spontaneous vaginal birth                        |
| HDU   | High Dependency Unit  | TCM    | Transcutaneous oxygen monitor                    |
| HELLP | Hemolysis, Elevated Liver Enzymes, Low Platelets (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 Immunodeficiency Virus                                | US/USS | Ultrasound/ultrasound scan                       |
| HMD   | Hyaline Membrane Disease                                    | VBAC   | Vaginal birth after caesarean                    |
| ICH   | Intracerebral haemorrhage                                   | VLBW   | Very low birth weight                            |
| IDDM  | Insulin dependent diabetes mellitus                         | VSD    | Ventricular septal defect                        |
| Indo  | Treated with indomethacin                                   | WAU    | Women's Assessment Unit                          |
| iNO   | Inhaled nitrous oxide                                       | wks    | weeks  |
| IPPV  | Intermittent positive pressure ventilation                  | WHO    | World Health Organisation                        |
| IOL   | Induction of labour   |        |  |

---

## APPENDIX 12. DEFINITIONS

---

### **Antepartum haemorrhage (APH)**

Vaginal bleeding from any cause at or beyond 20 weeks during pregnancy and labour, and includes placenta praevia without bleeding.

### **Augmentation**

Describes use of oxytocin or ARM to accelerate spontaneous labour.

### **Breastfeeding**

**Exclusive breastfeeding:** The infant has never, to the mother's knowledge, had any water, formula or other liquid or solid food. Only breastmilk, from the breast or expressed, and prescribed (as per Medicines Act 1981) medicines have been given from birth.

**Fully breastfeeding:** The infant has taken breastmilk only, no other liquids or solids except a minimal amount of water or prescribed medicines, in the past 48 hours.

**Partial breastfeeding:** The infant has taken some breastmilk and some infant formula or other solid food in the past 48 hours.

**Artificial feeding:** The infant has had no breastmilk but has had alternative liquid such as infant formula with or without solid food in the past 48 hours.

### **Chronic hypertension (CH)**

Diastolic BP  $\geq 90$  mmHg at booking or a medical history of essential hypertension.

### **Early Neonatal Death (ENND)**

Death of a live born baby of  $\geq 20$  weeks gestation or  $\geq 400$ g if gestation is unknown.

### **Elective caesarean section:**

An elective caesarean is defined as a caesarean which was scheduled in advance and scheduled prior to the onset of labour. Therefore, caesarean sections performed after the onset of labour but booked prior to labour are included with elective caesarean.

### **Ethnicity**

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

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

**Table 213: 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              | Samoaan                                  |
| 8              | Other Pacific Island                     |
| 9              | Pacific Island NFD (Not Further Defined) |
| 10             | South East Asian                         |
| 11             | Indian                                   |
| 12             | Chinese                                  |
| 13             | Other Asian                              |
| 14             | Asian NFD                                |
| 15             | Latin American / Hispanic                |
| 16             | African                                  |
| 17             | Middle Eastern                           |
| 18             | Other                                    |
| 19             | Other European                           |
| 20             | European NFD                             |
| 21             | NZ European                              |

#### **Fetal Death**

Stillbirth of a baby of at least 20 weeks gestation at issue or at least 400 grams birth weight if gestation is unknown.

#### **Gestation**

The gestation used in the maternity section of this report is derived from Best Estimate of date of birth (EDD Best) calculated by Healthware at booking based on Last Menstrual Period (LMP), scan data (overriding LMP data based on scan accuracy data sourced from the Australasian Society for Ultrasound Medicine), or clinical override of these dates as deemed appropriate. Healthware does not include gestation calculated from these data into its dataset, so this gestation, in weeks, is derived by taking the integer value of  $40 + (\text{date of birth} - \text{EDD Best}) / 7$ .

#### **Gestational Diabetes (GDM)**

This diagnosis is based on either a fasting glucose  $> 5.5\text{mmol/L}$  or a 2 hour glucose  $> 9.0\text{mmol/L}$  after a 75 gram oral glucose tolerance test.

#### **Gestational hypertension (GH)**

Diastolic BP  $\geq 90\text{mmHg}$  without proteinuria, when diastolic BP  $< 90\text{mmHg}$  at booking.

#### **Infant Death**

Death of a baby born alive before the age of 1 year.

#### **Large for Gestational Age (>90th percentile)**

Birth weight greater than 90th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31).

#### **Late Neonatal Death (LNND)**

Death of a baby after the 7th day and before completion of 28 days of life.

#### **Lead Maternity Carer (LMC)**

The Lead Maternity Carer is the practitioner or caregiver service selected by the woman to have the legal professional and practical responsibility for ensuring the woman and her baby are given clinically appropriate care.

#### **Live birth**

Birth of a baby showing signs of life if  $\geq 20$  weeks gestation or  $\geq 400\text{g}$  if gestation unknown

### **National Women's LMC services**

**DOMINO Midwives** are the LMCs for low risk women. Women self refer to this service. Domino midwives work in partnership with another midwife and provide continuity of antenatal, intrapartum and postnatal care.

**Community Midwives** are the LMC for women who either self refer or are referred to NW for maternity care. The midwives provide continuity of antenatal and postnatal care to woman who live in NW geographical boundary. Labour and birth care is provided by NW core Labour and Birthing Suite midwives.

**Diabetic Midwives** are the LMC for women who are referred to the Diabetic Service for secondary/tertiary and LMC care. The midwives provide continuity of antenatal and postnatal care to woman who live in NW geographical boundary. The Diabetic Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.

**Medical Midwives** are the LMC for women who are referred to the Medical Service for secondary/tertiary and LMC care. These women have complex medical needs. The midwives provide continuity of antenatal and postnatal care to woman who live in NW geographical boundary. The Medical Midwives are not the LMC for all women referred to this service as some women will have an Independent LMC.

### **Self-employed LMC services**

#### **Independent midwife**

**General Practitioner** (arranges private or hospital midwifery care)

**Private Specialist** (arranges private or hospital midwifery care)

### **Other LMC services**

**Unbooked** Women who present at NW, usually in labour or pre-labour, and who do not have an LMC.

**Other DHB.** These women are usually transferred to NW in late pregnancy, and remain with their original LMC. This LMC might be another District Health Board LMC or a non-NW access holder (e.g. a private obstetrician or independent midwife without access rights at NW or a homebirth midwife without access rights at NW).

### **Maternal age**

Defined as mother's age at her baby's birth.

### **Mode of birth for multiple pregnancies**

For analyses where the denominator is mothers, mode of birth is represented as the mode of birth of the baby requiring most intervention. Mode of birth has been prioritised as emergency caesarean, elective caesarean, forceps, ventouse, vaginal breech, then spontaneous vertex birth.

### **Onset of birth**

Onset of birth has been defined by the 4 pathways to birth: (1) elective caesarean section, (2) emergency caesarean before the onset of labour, (3) induction of labour, and (4) spontaneous onset of labour.

### **Neonatal hypoglycaemia**

Blood glucose < 2.3mmol/L.

### **Neonatal Death**

Death of a live born baby of  $\geq 20$  weeks gestation  $\geq 400$ g birthweight if gestation unknown, within the first 28 days of life.

### **Neonatal Death Rate**

Early and late neonatal deaths per 1000 live births.

### **Parity**

The number of times a woman has given birth to a liveborn baby of any birth weight or gestation or to a stillborn infant after 20 weeks gestation or where the infant weighed 400g or more and gestation is unknown. Multiple birth adds only one to parity total.

**Perinatal Mortality Rate (PMR)**

Fetal and early neonatal deaths per 1000 total births.

**Perinatal Related Mortality Rate (PRLR)**

Fetal and early and late neonatal deaths per 1000 total births.

**Postnatally (or newly) Diagnosed Type 2 Diabetes**

Type 2 diabetes diagnosed by postnatal glucose tolerance test (GTT) in a woman diagnosed as a gestational diabetic (GDM) during pregnancy.

**Postpartum haemorrhage (PPH)**

Primary PPH is  $\geq 500$ mls blood loss from the genital tract within the first 24 hours of birth.

Secondary PPH is  $\geq 500$ mls blood loss from the genital tract after 24 hours up to 6 weeks postpartum.

**Preeclampsia (PE or PET)**

Diastolic BP  $\geq 90$ mmHg with proteinuria  $> '+'$  or 0.3g/24h, when diastolic BP  $< 90$ mmHg at booking.

**PSANZ-PDC (PSANZ Perinatal Death Classification)**

Identifies the single most important factor which led to the chain of events which resulted in the perinatal death.

**PSANZ-NDC (PSANZ Neonatal Death Classification)**

Used in addition to the PSANZ-PDC to identify the single most important factor in the neonatal period which caused a neonatal death.

**Small for gestational age (SGA)**

Birthweight less than 10th percentile for gestation, gender, ethnicity, maternal height, weight, age and parity, calculated using a customised birth centile calculator (McCowan L et al, Aust N Z J Obstet Gynaecol 2004;44:428-31)

**Standard primipara**

A woman with

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

**Vaginal birth after caesarean section**

Vaginal birth in a pregnancy subsequent to one in which birth was by caesarean section

**Very Low Birth weight**

Birth weight less than 1500g