



HEALTH WORKFORCE PROJECTIONS MODELLING 2010

NEONATAL NURSING WORKFORCE

Prepared for Health Workforce New Zealand by
Health Workforce Information Programme (HWIP)

A sector collaborative activity



Neonatal Nurses at a Glance

	Number of neonatal nurses	Growth in supply (per-annum)	Growth in demand (per-annum)
2010	708	-6.7%	0.7%
2030	568	0.3%	0.6%

Acknowledgements

District Health Boards' collaborative Health Workforce Information Programme (HWIP) has prepared these estimates of the size of the New Zealand neonatal nursing workforce for Health Workforce New Zealand.

Projections from the forecasting model of the future balance of the neonatal nursing workforce supply compared with demand are made 20 years into the future using a forecast model based on the HWIP forecasting framework.

The Nursing Council of New Zealand's Annual Practising Certificate database provided the main source of data for the forecast.

Summary

This report has been written for Health Workforce New Zealand (formerly the Clinical Training Agency) in collaboration with the Nursing and Midwifery Workforce Strategy Group. It includes a workforce forecast for neonatal nursing numbers in New Zealand.

The supply of neonatal nurses is at risk, due to the relatively high levels of outflows of nurses; the workforce is younger, and thus more mobile than average, but does not recruit a large number of graduates.

Demand for Neonatal Nurses is not expected to change significantly over the forecast period. Despite a static demand, maintaining a stable workforce could prove challenging over the next twenty years.

Neonatal nurses require specific knowledge and skills to provide optimal care for premature or sick newborn babies admitted to neonatal units and their families.

The neonatal nursing workforce has a significant component of younger nurses (aged under 30) who have a high likelihood of leaving to other nursing subspecialties. Many of the recruits to neonatal nursing have transferred from other subspecialties. The proportion of new graduates employed in neonatal units is somewhat smaller than the general nursing workforce and a smaller proportion of nurses are over 55 years of age. This reduces the retirement rate, and partly offsets the outflow of nurses.

Unless outflows are balanced the workforce will decline by about 47 nurses (6.7 percent) per annum. The projected decline slows in later years, but only because there are fewer nurses left to leave.

The number of nurses needed to cover the net outflow (109 in 2030) is larger than the number of new recruits (25 by 2030). Increasing neonatal nursing numbers will require recruiting from graduate nurses, nurses returning to the workforce, and from nurses working in other areas.

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Background

Defining Neonatal Nursing

Neonatal nurses provide specialist nursing care to critically ill or highly dependent newborn children (infants) and their families and whanau, integrating new technological equipment into care within a neonatal intensive care or specialist setting

The Neonatal Nurses College Aotearoa defines neonatal nurses as having “specific knowledge and skills to provide optimal care for premature or sick newborn babies and their families”.ⁱ Neonatal nurses deliver specialised care to the neonate, whanau and family, working in hospital and community settings and working across the care continuum to promote optimal health outcomesⁱⁱ.

Neonatal nurses include nurses who work in Neonatal Intensive Care Units (NICUs), and in Special Care Baby Units (SCBUs), sometimes referred to as a neonatal unit. They also include outreach/outlying and community work, where the outreach work is part of a nurse’s role within a NICU or SCBU. Examples include transfer and retrieval services and home visiting as outreach services from units.

The Australian and New Zealand Standard Classification of Occupations (ANZSCO) coding system, which identifies occupational grouping and specialisations, describes neonatal nurses as a specialisation under the occupational grouping of Registered Nurses working in Critical Care and Emergency. Annual Practising Certificate data from the New Zealand Nursing Council does not differentiate between neonatal nurses and paediatric nurses, having one category for child health.

Defining a Neonate

In health settings the term neonate is often used to describe a newborn less than a month old. Neonatal care is more general than the care provided by specialised neonatal nurses. An extremely

ⁱ Neonatal Nursing Standards, New Zealand Nurse’s Organisation, Neonatal Nurses College Aotearoa, February 2006, *document updated October 2008*, pg 17.

ⁱⁱ Neonatal Nursing Standards, New Zealand Nurse’s Organisation, Neonatal Nurses College Aotearoa, February 2006, *document updated October 2008*, pg 4.

premature or sick baby may spend months in a neonatal unit or under the care of outreach homecare services after transferring home.

The Neonatal Nurses College of Aotearoa's definition is wider than the general definition to describe "a baby less than 28 days older than their due date of birth".

Defining Neonatal Units

Specialist neonatal services are stratified into three tiers, each providing consecutively more specialised and intensive careⁱⁱⁱ. Requirements for each level of service provision are detailed in the Ministry of Health Service Specification Framework for 'Tier Two Specialist Neonatal Inpatient and Home Care Services' which are purchased by DHBs and apply to secondary and tertiary inpatient specialist neonatal services and neonatal homecare services, and are outlined below. The concept of tiered services is also used outside New Zealand.

These three tiers of service (from lowest to highest intensity) are level one, level two (special care baby unit or SCBU, including level two plus), and level three (neonatal intensive care unit, or NICU). All levels of care provide support and health promotion to families and whanau.

Level Three Services

Level three, or neonatal intensive care units, provide care for critically ill babies, babies weighing less than 1000 grams, or those requiring significant neonatal surgery¹. (Neonatal intensive care units and special care baby units allocate cots according to the level of care provided within the unit). NICUs provide the most intensive care and will usually include cot spaces for level three and level two neonates.

Some larger NICUs may also allocate level one cots within the unit for the care of babies admitted at level two or Level three, and who are becoming well, and for babies requiring short term care before returning to the postnatal wards.

Two-plus Services

Level two-plus services are for neonates with moderate to severe complications, including babies weighing more than 1000 grams². Level two-plus services sometimes 'stretch' to accommodate level three neonates during cot shortages.

Level Two

Level two, or special care baby units, provide care for neonates with moderate complications and greater than 31 weeks gestation³. SCBUs provide care for premature and highly dependent neonates. The staff within level two units must also be able to stabilise neonates before transfer to a higher level unit.

ⁱⁱⁱ Tier 2 Specialist Neonatal Inpatients and Home Care Service Specification. Ministry of Health, 2004

Level One Services

Level one services provide care for neonates with minimal complications and greater than 35 weeks gestation⁴. In neonatal units that do not have allocated level one cots, neonates will be cared for on the postnatal or paediatric wards, sometimes under the oversight of the neonatal unit. Only level one neonates cared for by neonatal nurses within a level two or three unit or overseen by a neonatal nurse are included in this report.

Home Care Services

The current Ministry of Health Service Specification allows for specialist neonatal homecare in complex cases. Neonatal homecare services may be provided to support management of chronic respiratory conditions (including oxygen dependency), congenital anomalies and terminal care, infants with feeding/ complex needs, and apnoea monitoring. Homecare services may be provided for on average three months for complex cases or on average six months for babies on apnoea monitoring. Families and whanau are supported through the resourcing and facilitation of health promotion activities within the home environment, breastfeeding advice and support, and facilitating parents to learn infant resuscitation.

Neonatal homecare services provide a case management role in discharge planning and community care, undertake the co-ordination of resources for effective care, liaise with other health professionals as appropriate on the babies/families' behalf, and provide consultative Neonatal Homecare Service to other lower level services. There are currently two to four homecare nurses in each of the tertiary hospitals. These numbers are expected to increase as babies are discharged earlier.

Current National Service Configuration

Table one provides current data on the number of Ministry of Health funded level two and three cots at hospitals throughout the country as at May 2010^{iv}.

^{iv} New Zealand Nurses Organisation Neonatal Nurses College

Table 1: National Funded Cot Numbers

Unit	Level 3	Level 2
Whangarei Hospital <i>Special Care Baby Unit</i>		8
North Shore Hospital <i>Newborn Special Care Unit</i>		12
Waitakere Hospital <i>Special Care Baby Unit</i>		12
Auckland Hospital <i>Newborn Intensive Care Unit</i>	16 & 2 isolation Beds	30
Middlemore Hospital <i>Newborn Intensive Care Unit</i>	14	22
Waikato Hospital <i>Newborn Intensive Care Unit</i>	17	24
Tauranga Hospital <i>Special Care Baby Unit</i>		12
Rotorua Hospital <i>Special Care Baby Unit</i>		10
Whakatane Hospital <i>Special Care Baby Unit</i>		4
Gisborne Hospital <i>Newborn Intensive Care Unit</i>		6
Hawkes Bay Hospital <i>Special Care Baby Unit</i>	2	10
Taranaki Base Hospital <i>Newborn Intensive Care Unit</i>	2	4
Palmerston North Hospital <i>Newborn Intensive Care Unit</i>		12 (Level 2A)
Wanganui Hospital <i>Special Care Baby Unit</i>		4
Wairarapa Hospital <i>Special Care Baby Unit</i>		2 (Level1)
Wellington Hospital <i>Newborn Intensive Care Unit</i>	20	20
Hutt Hospital <i>Special Care Baby Unit</i>		12
Nelson Hospital <i>Special Care Baby Unit</i>		10
Christchurch Hospital <i>Neonatal Intensive Care Unit</i>	10	28 (L2/L1)
Timaru Hospital <i>Special Care Baby Unit</i>		2
Dunedin Hospital <i>Neonatal Intensive Care Unit</i>	5	11
Southland Hospital <i>Special Care Baby Unit</i>		5

Some level two and most level one cots are not staffed by neonatal nurses, but nursed on paediatric wards with a designated space; therefore the care of these neonates is not included in the workforce numbers forecast in this report. The Minister of Health has recently approved the development of a new neonatal unit at Dunedin Hospital, increasing overall cot numbers from 16 to 19.

Admissions

Criteria for admission to Neonatal Units

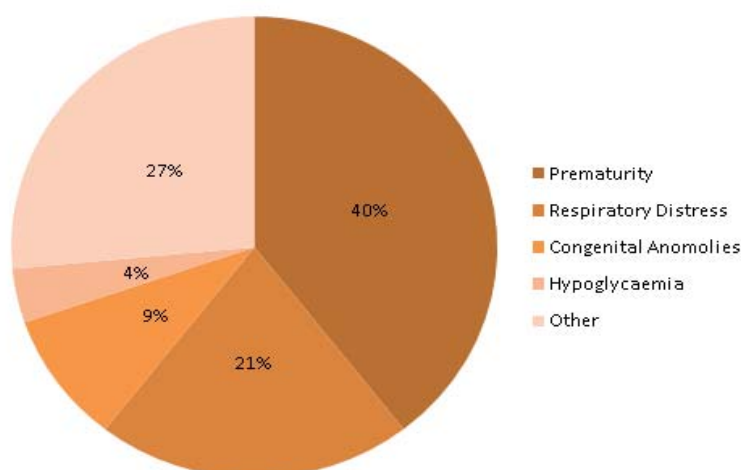
There are specific criteria for admission to the different levels of care, but this may also depend on the service available at the nearest hospital. Pathways to admission include:

- Booked admissions for those with congenital or other abnormalities diagnosed prior to birth
- Acute admission due to preterm delivery or problems during delivery direct from delivery suite
- Admission from another DHB that does not provide the level of care provided. These babies are then transferred back to their domicile DHB once their condition has improved
- Admission from home due to deterioration in condition following discharge or home birth

Reasons for Admissions to Neonatal Units

The need for neonatal admission depends on a variety of factors, including diagnosis. The main reasons for admission to a neonatal unit include prematurity, respiratory distress and conditions, congenital abnormalities and hypoglycaemia^{v5}. As presented in graph one, the largest category at 40 percent of all neonatal admissions is for gestational maturity – or low gestational age at birth⁶.

Graph 1: Reasons for admission to neonatal unit



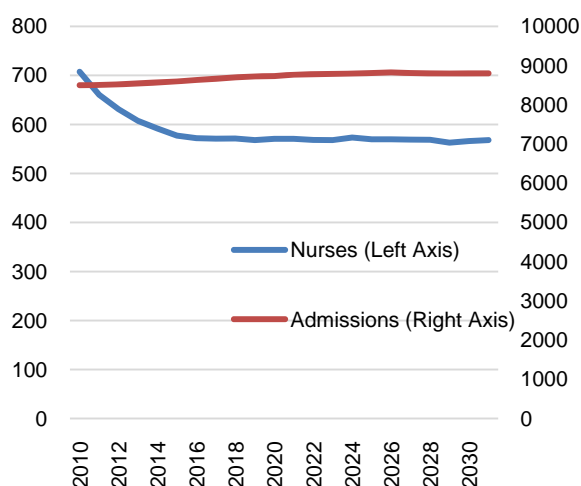
^vANZNN (Australian and New Zealand Neonatal Network) 2009. Report of the Australian and New Zealand Neonatal Network 2006. Sydney, ANZNN.

Forecasts

Major Finding

The demand for neonatal admissions is estimated to remain static while the neonatal nursing workforce supply is estimated to undergo significant decline over the next 20 years (graph 2).

Graph 2: Neonatal Nursing Workforce projections by neonatal admissions



Demand for Neonatal Nurses

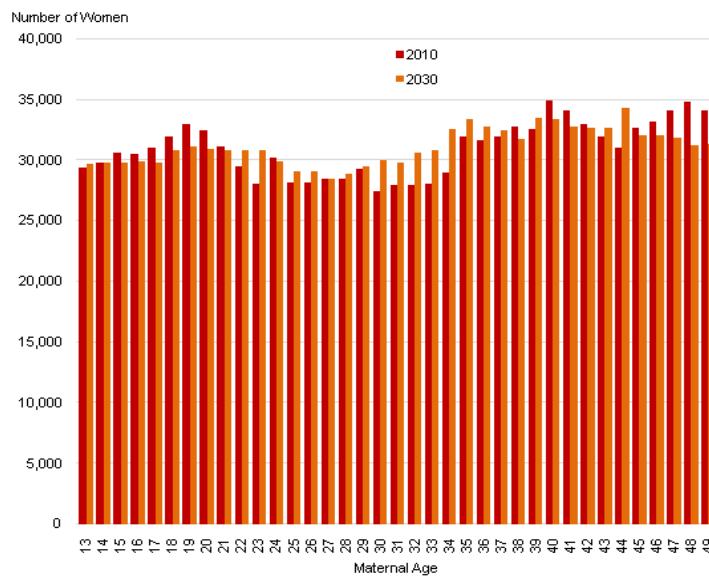
The demand for neonatal nursing services over the next 20 years is primarily determined by the expected volume of neonatal admissions which, in turn, most depends on factors within the general female population such as childbearing, ethnicity, single and multiple pregnancies.

Other factors such as changes in technology, increasing acuity of neonates, changes in the model of care, and the way services are configured, will also influence the demand for neonatal nurses.

Population Growth

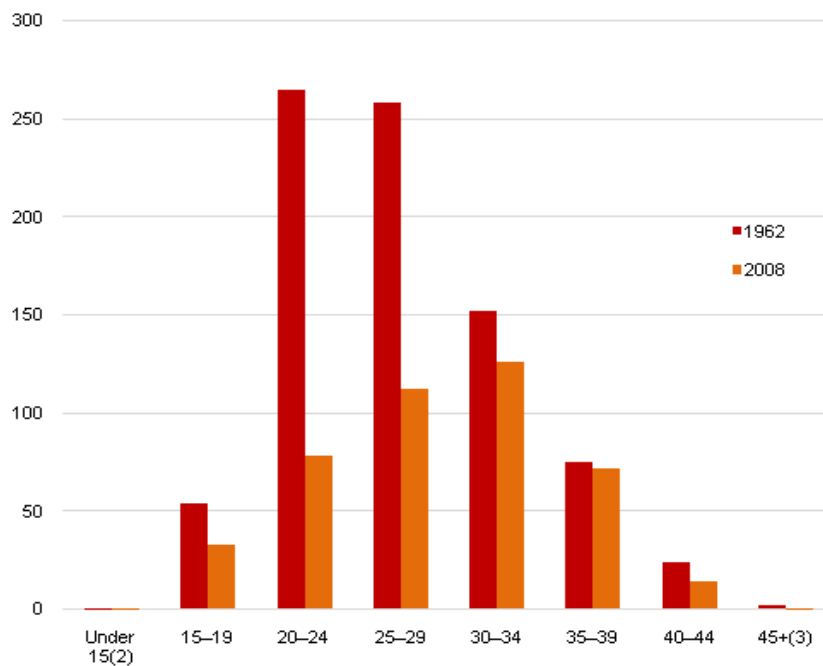
The population of interest to this workforce concerns neonates and their mothers. Since the population of women of childbearing age (13-49 years) is not expected to change significantly in the next 20 years (graph 3), changes in the number of births will largely depend on assumptions made about changes, if any, to current fertility rates over the next 20 years.

Graph 3: Demographic projection of women by age 2010 – 2030



Fertility rates have fallen dramatically in the 20th century due to birth control, increases in the number of women in the workforce, and a tendency for women to delay having their first child. Graph four shows a reduction in fertility rates across all age groups.

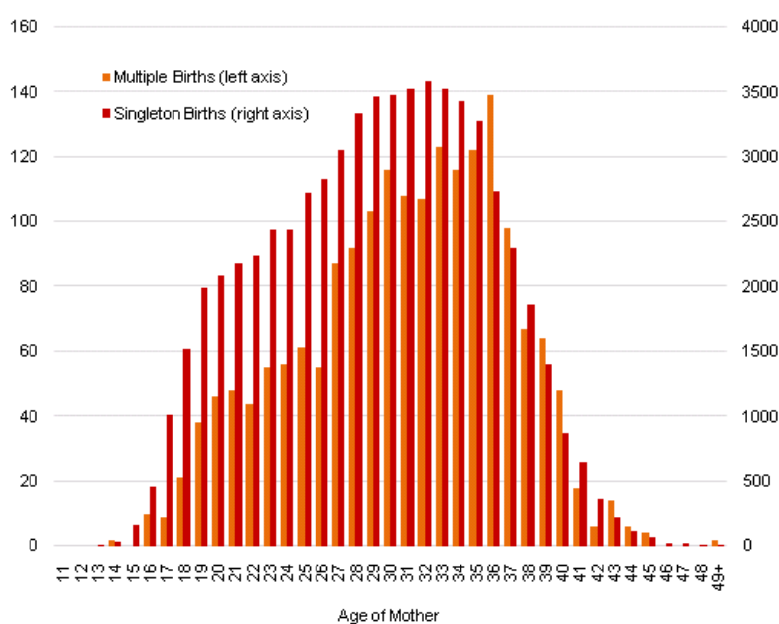
Graph 4: Birth rates by maternal age (1962 - 2008)



However, fertility rates and birth rates in New Zealand have climbed in the past decade after the decline in birth rates prevalent through most of the previous century. The increase in fertility rates are thought to have been caused by economic disincentives to work: changes in family support payments, high effective marginal tax rates, and availability of child care; as well as medical factors – primarily the availability of fertility treatments.

The occurrence of multiple births rises according to age (graph 5). The increase in multiple birth rates in particular has been strongly influenced by the use of multiple embryo in-vitro fertilisation treatments.

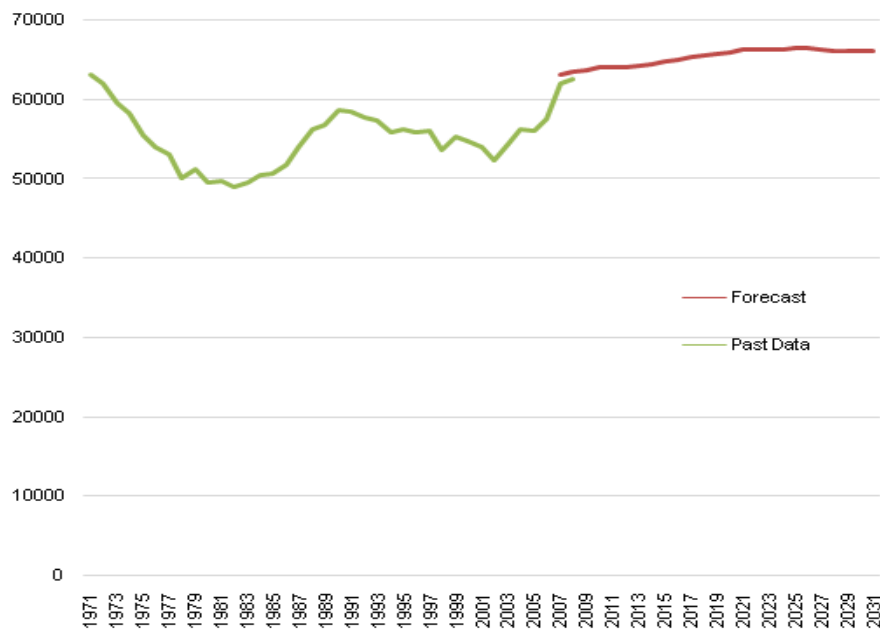
Graph 5: Multiple Births by Age of Mother



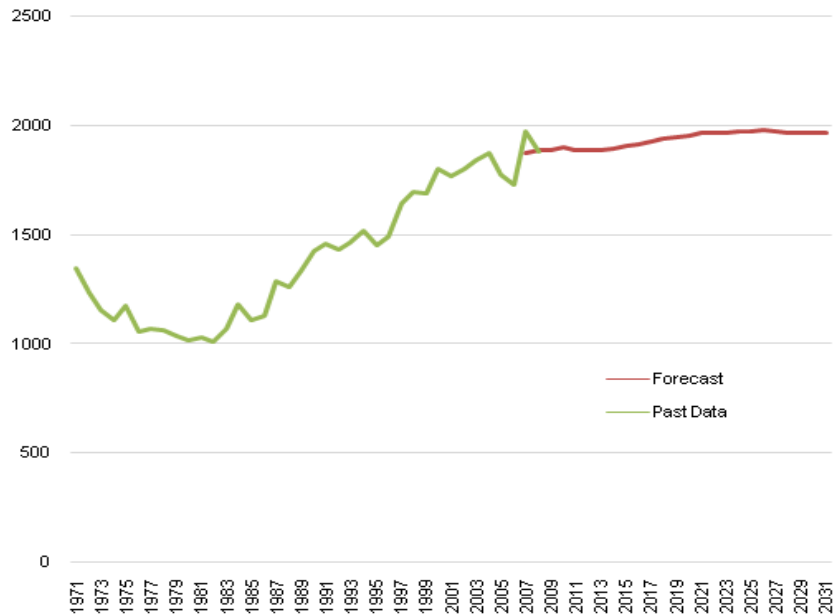
The use of multiple embryo in-vitro fertilisation (IVF) treatments became increasingly common in the 1980s and 1990s and has only recently fallen out of favour and been superseded by multiple uses of single embryo implantation. This influenced the change in government policy to fund two cycles of IVF treatment, whereas previously only one cycle was publicly funded.

The demand for neonatal nursing services due to multiple births is projected to reduce over the forecast period. Graphs 6 and 7 show the current birth rates for both singleton and multiple births, and project births per year for the next 20 years.

Graph 6: Singleton Births, Historic and Projected

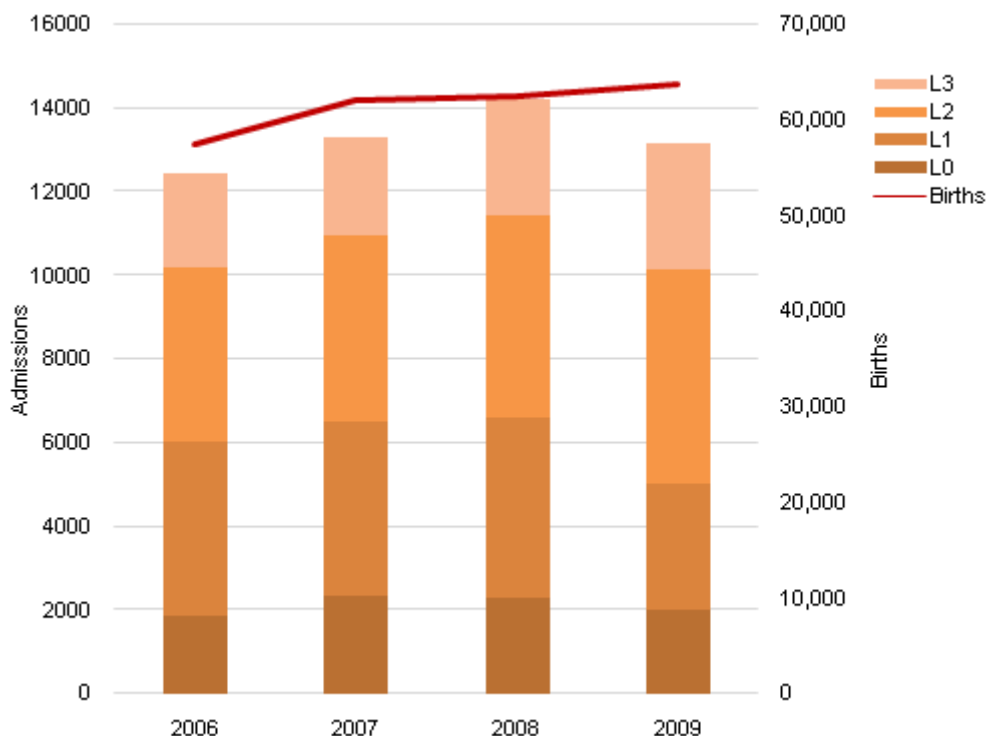


Graph 7: Multiple Births, Historic and Projected



Admission Rates

Graph 8: Admissions and Births



The number of neonates admitted to neonatal units between 1995 and 2001 increased by about two percent per annum.^{vi} “The increasing rate in premature delivery is thought to be partly due to couples choosing to have babies at an older maternal age, which is increasing the risk of premature births, the use of assisted conception due to increasing infertility, and multiple births.”^{vii}

Admission rates climbed slightly from 11.0 percent (of all births) in 2006 to 12.7 percent in 2009 (graph 9). In the demand projections we use an average rate of 11.6 percent to extrapolate from births to level two and three admissions.

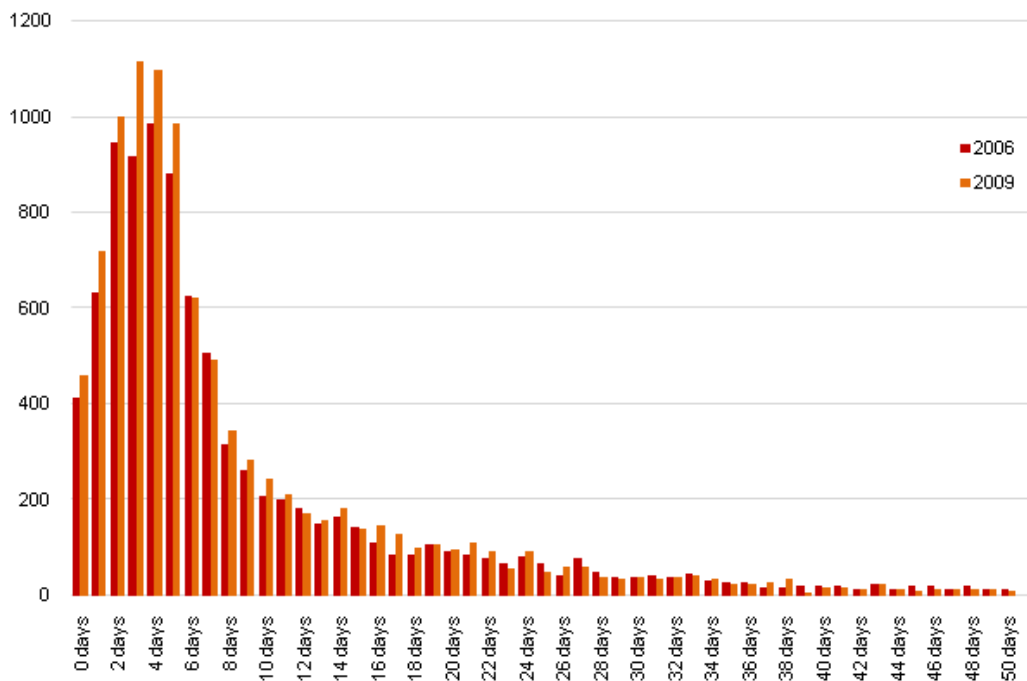
The average length of stay of a neonate in 2009 was 11.0 days, little different from 11.2 days in 2006, as shown in graph 9. But the impact of length of stay on neonatal units is complex: the distribution of length of stay is highly skewed. The median length of stay is only 5 days – half of neonates are discharged in under 6 days – yet half of the total cot-days are accumulated by neonates who stay

^{vi} A Review of Neonatal Intensive Care Provision in New Zealand February 2004, Ministry of Health. Wellington.

^{vii} A Review of Neonatal Intensive Care Provision in New Zealand February 2004, Ministry of Health. Wellington, citing Craig ED, Thompson JMD, Mitchell EA. 2002. Socioeconomic status and preterm birth: New Zealand trends, 1980 to 1999. Archives of Disease in Childhood Foetal and Neonatal 86: F142-6 (pg 4).

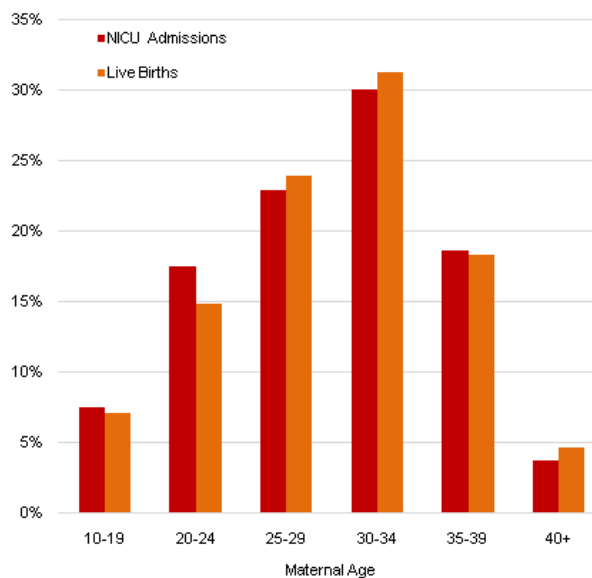
longer than 11 days. Therefore, it is not informative to compare or consider changes in length of stay across the breadth of neonatal admissions or between different units.

Graph 9: Neonatal Length of Stay



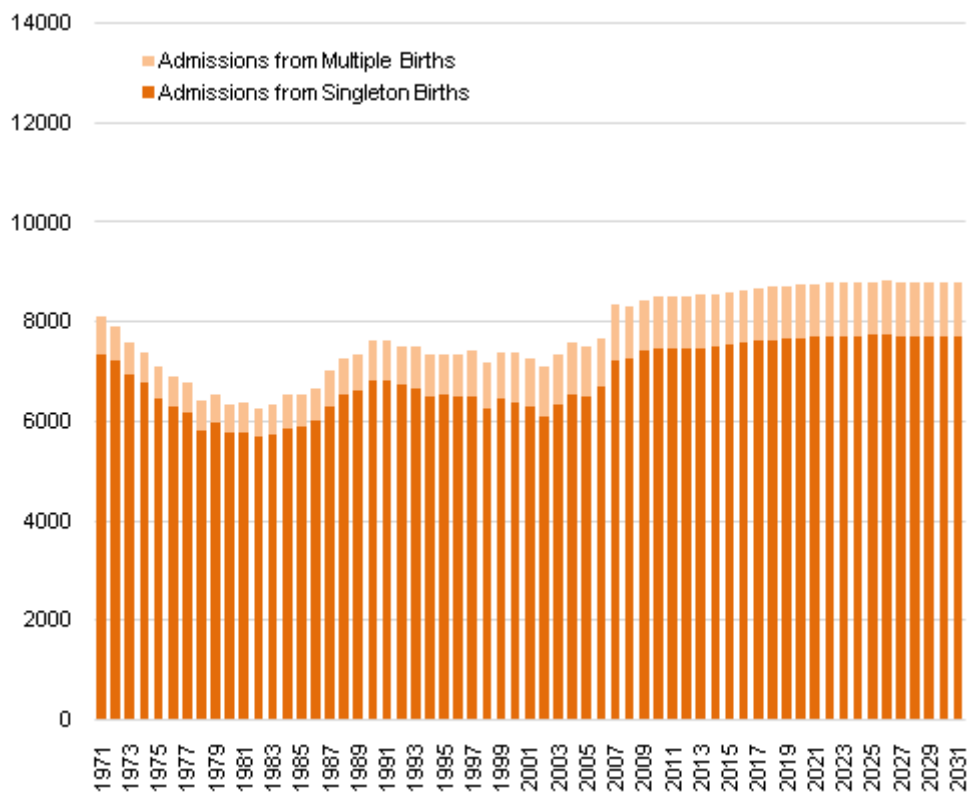
NICU admission rates are somewhat higher for neonates born to women under 25, or born to women over 40 (graph 10). Given that the age distribution of mothers is not expected to change in the next 20 years, this should have little impact on admission rates.

Graph 10: Neonatal Admissions vs. Births, by Maternal Age



Combining maternal age, birth rates and admission rates produces an expected increase in level two and level three admissions of 3.6 percent by 2030, as shown in graph 11.

Graph 11: Projected Neonatal Admissions



Staff Ratios

Level three neonatal intensive care requires 1:1, or even 2:1 care for short periods but this is offset by stable neonates receiving CPAP who may require 1:2 or even 1:2.5 nurse-to-neonate ratios. Level two units provide 1:4 or 1:5 nurse-to-baby ratios. Staff ratios are determined by Unit Nurse Managers and Clinical Directors in light of staff experience and patient needs.^{viii} Many of the decisions about ratios are also often based on availability of staff.

Occupancy Rates

In response to increasing concern over a shortage of level two and level three cots nationally, a review of Neonatal Intensive Care Provision was undertaken by the Ministry of Health in 2004. The review found that neonatal units often operate at full capacity. The review identified a number of reasons for the increased demand for Neonatal Intensive Care Services, including the increase in premature births, increased survival of premature infants, and an increase in premature multiple

^{viii} A Review of Neonatal Intensive Care Provision in New Zealand February 2004, Ministry of Health. Wellington, pg 23

births. Empirically calculated cot to live births ratios were used by the Ministry of Health based on a number of international sources.^{ix}

- For NICU level three cots the ratio used was 1.5 and 2 cots to 1000 live births.
- For NICU level two cots the ratio used was 4.5 to 1000 live births

There are currently no plans to do another review. There has been considerable change in many of the DHBs to neonatal service delivery since 2004, but there is no comprehensive national source of information regarding changes.

A UK study of staffing levels in neonatal units recommended an optimum occupancy rate of about 75% to allow for acute admissions and reduce the need to transport acutely sick neonates. The study also suggested a higher clinical risk in units operating at full capacity. The Ministry of Health in New Zealand recommends an occupancy rate of about 75% (Expert Advisory Group). The Minister of Health recently announced construction of a new neonatal unit at Dunedin Hospital, increasing the level two and three cot numbers there from 16 to 19 to accommodate expected trends in demand.

Changing Models of Care and the impact of technology

Models of care identify the “*purpose and shape of care; care pathways for groups of patients within particular clinical contexts; to foster agreements about best practice/care management; and to increase transparency within health-care*” (p.1)^x

The expert advisory group did not foresee significant changes to the current model of care, or the potential for technology to significantly affect demand for neonatal nurses in the near future. Some increase in the numbers of neonates discharged under the care of home care nurses is likely, and has occurred overseas in response to budget constraints. There is a possibility that with improved and different technology neonates may be able to be discharged earlier and cared for successfully with monitoring and supervision in the home environment. However, despite the availability of telehealth services between Grey and Canterbury Hospitals, for example, this has not changed the way care is provided. Most preterm infants admitted to NICUs and SCBUs are from 32-36 weeks gestation^{xi}. Survival rates for babies as young as 22 weeks have increased recently due to advances in

ixA Review of Neonatal Intensive Care Provision in New Zealand, February 2004, Ministry of health Wellington, April 2005 citing British Association of Perinatal Medicine. 2001. Standards for Hospitals Providing Neonatal Intensive and High Dependency Care (2nd edition). The Scottish Office. NHS policies for children 1974 – 1988: An overview. Neonatal care. URL: www.scotland.gov.uk/deleted/library/documents6/chilpol-04p11.htm.

x Walsh, K. & Moss, C. (2007). Blending practice development methods with social science research: An example of pushing new practice research boundaries. *Journal of Research in Nursing*.

xi ANZNN (Australian and New Zealand Neonatal Network) 2009. Report of the Australian and New Zealand Neonatal Network 2006. Sydney, ANZNN.

technology (e.g. improved modes of ventilation), the use of antenatal steroids and surfactant replacement, and better antenatal nursing care. Current international literature supports the supposition that these neonates are anatomically and physiologically on the cusp of survival. Neonates under 22 weeks gestation are offered compassionate care, those at 23-24 weeks are treated if the neonate's clinical condition indicates, and all over 24 weeks are actively treated. The main goal in future will likely be to improve the quality of current in-hospital and post discharge care in order to improve the long-term outcomes of very preterm infants.

It is also the Expert Advisory Group's opinion that new technological changes are unlikely to increase the viability of babies born younger than 22 weeks gestation. New interventions will probably be developed that improve the likelihood of higher acuity babies being successfully treated, which this may further increase the average length of stay. This increasing intervention rate is already having an impact on occupancy rates.

The Expert Advisory Group noted a big increase recently in the time required by nurses to spend on family social issues, in conjunction with Children and Young Persons (CYFS). Social Worker hours have increased in many units to assist with this, but there is still a considerable impact on nurses' time.

Supply of Neonatal Nurses

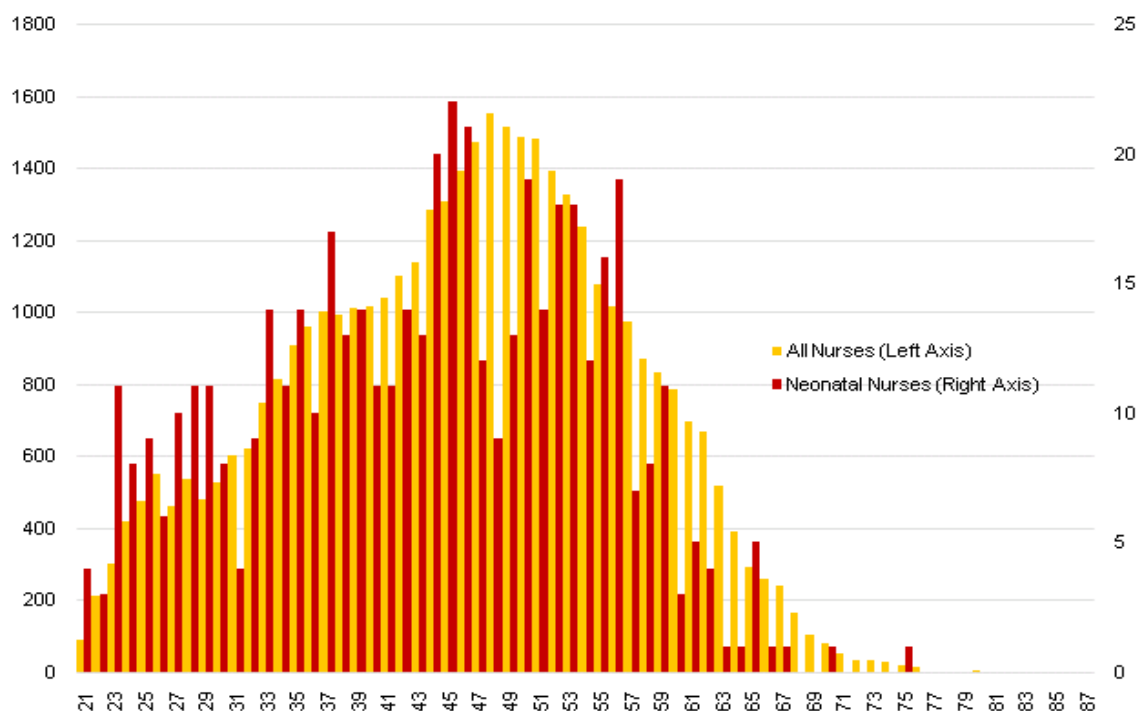
The number of neonatal nurses is estimated to be 708 in 2010. This represents about 1.7% of the national regulated nursing workforce, according to the Nursing Council of New Zealand data collection. Almost all neonatal nurses are registered nurses.

Casual nurses comprise between 0 and 17 percent of the roster in neonatal units surveyed, with smaller units having the greatest variation (the highest and lowest proportions) of casual staff. Overall, approximately four percent of rostered-hours surveyed were undertaken by casual nurses, implying the use of nearly 30 full-time equivalents nationwide, in addition to the existing full-time workforce.

Two special care baby units (at Greymouth and Westport) do not employ specialist neonatal nurses.

Compared with the rest of the national regulated workforce, the neonatal specialist workforce has a larger proportion of nurses under 30, and a smaller proportion aged over 55. Neonatal nurses are slightly (about two years) younger than the average age of the entire nursing workforce, as shown in graph 12.

Graph 12: Neonatal vs. All Nurses by Age



Effects of Recruitment and Retention

Evidence suggests recruitment of nurses to neonatology relies on existing nurses who enter from other nursing positions, return to work from a period of not working as a nurse, or are immigrant nurses. This workforce attracts relatively few graduate nurses in their first year of practice.

Measuring Changes in Nursing Workforce

The estimates of changes in the nursing workforce in the graphs and tables below are broken down into the following components:

New Nurses are either new graduate nurses or immigrants who have never worked in New Zealand before. Only eight years data is available, and the year in which a nurse graduated used to calculate this number is only an estimate, even for past data.

Returns are nurses returning to nursing in New Zealand, including nurses returning from overseas. The work area to which a nurse returns is not always the area they left. Nurses returning will have been out of the workforce for at least a year. Shorter-term changes in employment are not recorded.

Inflows are movements of nurses between one work area and another. This includes movement between work specialties (e.g. from a medical ward to an ED department), as well as movements between employer type. Only net movements are reported – some work areas (such as medical and surgical) have net outflows of nurses.

Exits of nurses include permanent and temporary exits from the nursing workforce. Separate estimates are available, but even for past data precise determination of whether an exit is permanent or not is not possible (Table 2).

Table 2: Net Inflows and Outflows of Neonatal Nurses

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2025	2030
Nurses	708	660	631	607	592	577	572	571	571	568	570	566
Exits	72	71	67	66	66	65	64	61	65	65	64	65
New Entries	27	26	26	25	26	26	26	25	26	26	26	25
Returns	31	32	31	32	32	31	33	31	33	33	32	33
Outflow	142	133	126	117	120	116	111	111	113	111	110	109
Inflow	109	116	113	111	114	118	116	115	115	119	118	118

New Zealand is one of many countries facing the challenges of an aging population. As the size of the labour pool shrinks, worldwide demand for nurses will increase.

Education and Qualifications

The undergraduate pre-registration programme for nurses in New Zealand provides graduate nurses with a comprehensive set of beginning practice skills. Some, but not all, beginning nurses have had clinical exposure to the neonatal environment. Likewise neonatal specific knowledge and skills is not necessarily a requirement for a position as a neonatal nurse. In-house, on-the-job training may or may not be supported by formal education.

Historically nurses have had to self-fund, secure external scholarships, or have employer support in order to study. It is not possible to measure how many neonatal nurses have undertaken postgraduate study in a neonatal related course funded by these means as postgraduate qualifications are self reported on the Annual Practising Certificate. This information is not always recorded on the APC. From 2006 postgraduate neonatal nursing courses have been supported by the Clinical Training Agency (CTA) (now Health Workforce New Zealand). There were 51 Registered Nurses who completed a neonatal nursing-related CTA funded postgraduate course in 2007/ 2008.

A common pathway for specific skill level acquisition in a nursing sub-specialty is on entry to the sub-specialty orientation programmes. This develops the new nurse to a stage of practice (advanced beginner). Clinical experience and ongoing education within a professional development and recognition programme (PDRP) enable these nurses to acquire additional skills to the recognised level of 'competence'⁷.

Postgraduate neonatal intensive care specific education is crucial to the provision of optimal patient care in NICU environments throughout New Zealand. Neonatal Nurses may practise in a variety of clinical contexts, depending on educational preparation and practice experience. Practice experience entails the neonatal nurse's cognitive, integrative and technical abilities, and involves putting into practice ethically and culturally safe approaches to procedures, protocols and practice guidelines.

Neonatal nurses use their expertise to manage, teach, evaluate and research nursing practice. Conditions placed on the scope of practice of neonatal nurses, according to their qualifications or experience, limit them to a specific area of practice^{xii}.

Historically, training for neonatal nurses is provided by in-house courses through tertiary hospitals, for the entire region. The courses are aimed at developing skills particularly in the area of neonatal intensive care. Over time, in response to changing needs, the courses have continued to change to support the development of expertise in neonatal nursing and advanced neonatal nursing practice as both PDRP and tertiary study at postgraduate levels.

About two years of experience and participation in a PDRP are required to become a competent neonatal nurse, and the completion of a post registration/postgraduate course that meets the New Zealand Standards for Neonatal Nursing Education to become a proficient neonatal nurse. It takes about five years to gain the necessary experience and postgraduate education for a role as a Neonatal Coordinator.

Neonatal nurses caring for level three neonates are expected and encouraged to study to at least postgraduate certificate level. However, a minimum of one year's experience in a level three neonatal unit is required before further education is expected.

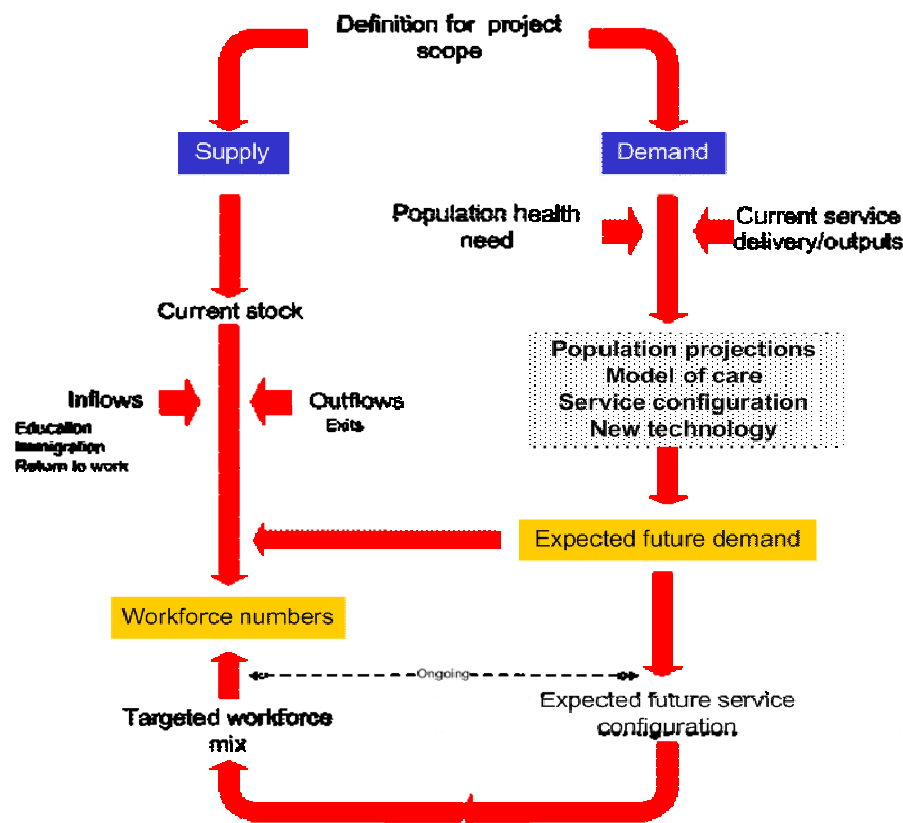
Postgraduate programmes are now also available at a number of universities, and provide opportunities for advanced neonatal care study at a postgraduate certificate, diploma, and masters levels. Intensive care postgraduate courses are provided by Massey and Victoria Universities for nurses with at least one year's experience in neonatal care. There is also a national transport retrieval course available to experienced nurses.

^{xii} Neonatal Education Policy, Standards and Career Development, 2008. Neonatal Nurses College Aotearoa.

Methodology

The neonatal nursing forecast model has been developed from the HWIP Forecasting framework (figure 1). The HWIP Forecasting framework is a type of supply - demand framework and is based on assumptions from the compilation of scenarios based upon likely circumstances.

Figure 1: HWIP Forecasting Framework (simplified)



Using the HWIP Forecasting Framework, the first step in forecasting model development is to define the scope of the workforce group being analysed.

Supply of nurses comprises current numbers (stock) of neonatal nurses, and entries and exits of neonatal nurses. It is the headcount plus net inflow (inflow less outflow) calculated iteratively.

Inflows are allocated to workforce areas (employer and occupation) in proportion to past data, while outflow is a proportion of the existing workforce, based on known numbers of exits in previous years, and taking into account age, gender, ethnicity and occupation. Identification of neonatal nurses makes it possible to determine specific exit rates for neonatal nurses. The proportion of nurses that will return to the workforce is estimated from past data, and this estimate is added to the inflow.

The four entry and exit models are based on binary logistic (regression) models (for a further discussion about logistic regression models refer to the supplementary document about technical methodology). The interflow models are a mix of logistic regression and simple averages. As with other workforce areas the inflow of rural nurses will be exogenous. The supply is taken from a

separate forecast of the total number of new nurses and the model is used to apportion nurses to various work areas (refer to the supplementary document for the technical report of this analysis). The exit model takes into account exits, re-entries and transitions between work areas, and is an endogenous model – dependent on the current nursing workforce.

Data Collection

The Nursing Council of New Zealand, which regulates the nursing workforce in New Zealand, collects information on areas of practice as part of the application for an Annual Practising Certificate (APC). Nurses select their main areas of practice and/or a second main area if they are currently employed in more than two employment settings. The APC code most relevant to neonatal nurses is practice code '43' which covers child health, including neonatal nursing and paediatric nursing. It was not possible to use APC codes alone to identify the neonatal nursing workforce, and as a result a workforce survey was sent directly to all DHB Neonatal Units.

The workforce survey was targeted specifically at neonatal units, to allow the separate identification of neonatal nurses. Two units (Timaru and Greymouth) that did not employ specialist neonatal nurses were excluded. Identifying neonatal nurses made it possible to incorporate factors affecting workforce supply, such as the age and experience distribution of neonatal nurses.

Not all units responded to the workforce survey. Estimates for the total number of neonatal nurses are imputed, using numbers of cots in the units with missing data as a denominator.

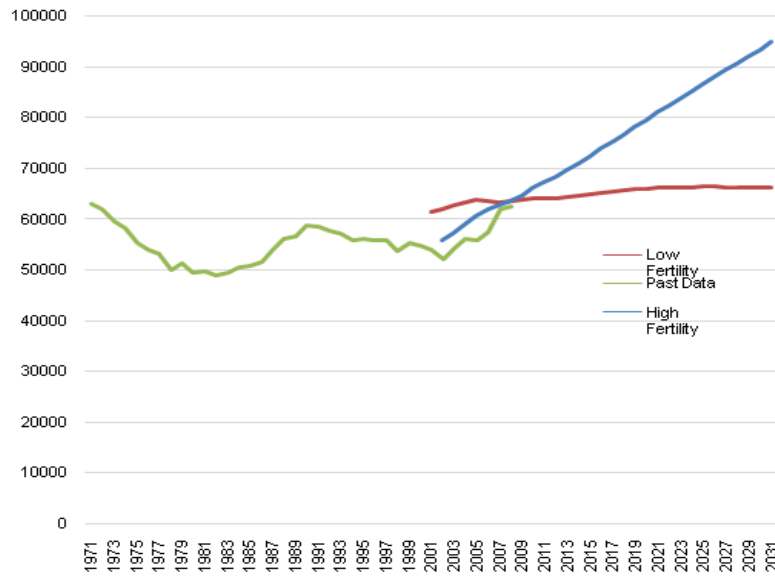
Scenarios for Neonatal Nurses

High Fertility Rates

An alternative scenario to our baseline is that fertility rates will not remain constant over the forecast period, but will continue to increase, as they have done for the past decade (graph 13). Under this scenario the number of mothers remains the same as in the base line scenario, but the increasing fertility rates lead to increases in live births, and thus demand for neonatal services.

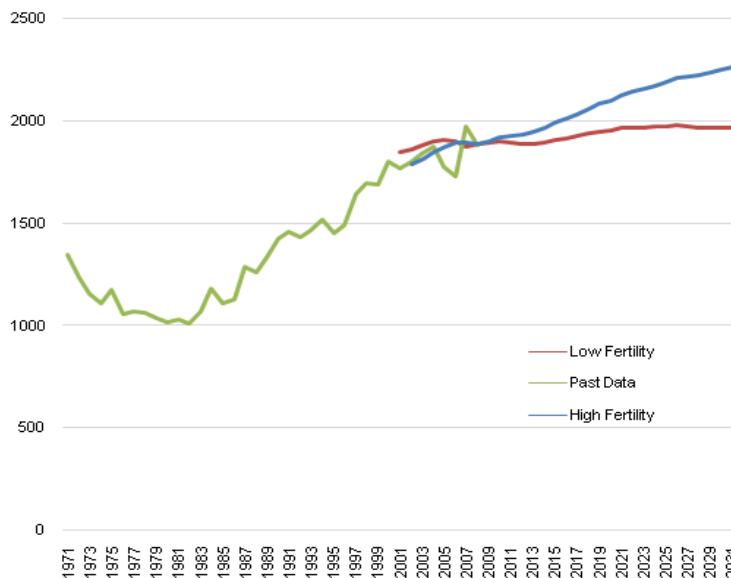
No allowance is made for the secondary impact of grandchildren born in this high fertility scenario; by the end of the forecast period, additional women born during the early part of the forecast period would be reaching childbearing age themselves. Longer term forecasts would need to take account of this potentially exponential growth.

Graph 13: Singleton Births, Alternate Scenario



The high fertility scenario extrapolates from the increases in fertility of the past decade. In 20 years time this increasing fertility would lead to birth rates not seen since the baby boom years after the Second World War, and a 42 percent increase in births.

Graph 14: Multiple Births, Alternate Scenario

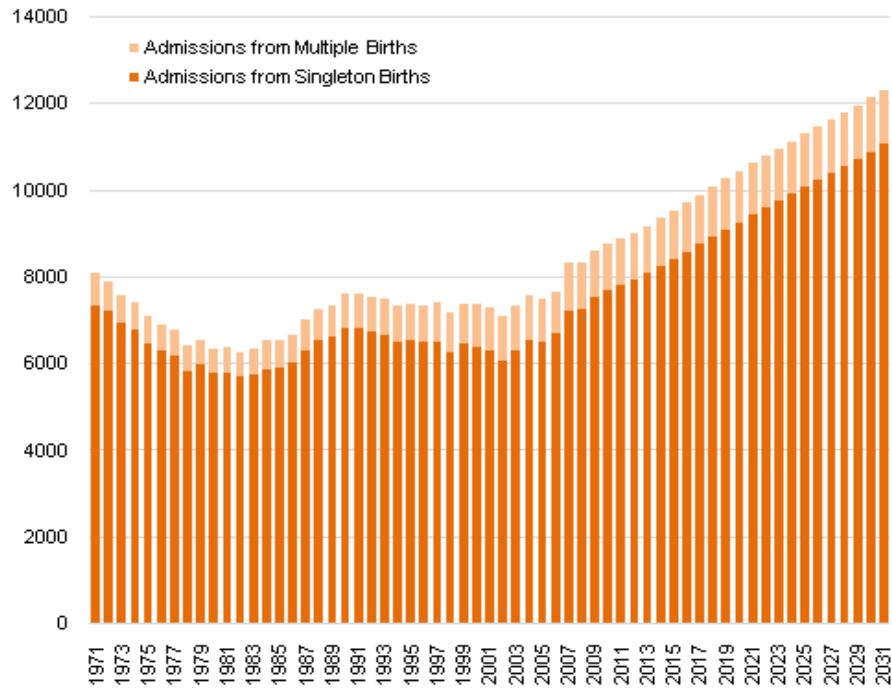


Multiple births are not forecast to grow as fast as total births (graph 14). The growth in multiple birth rates has been slower over the past decade.

Under this alternate scenario shown in graph 15, total live births would climb from 64,000 in 2010, to more than 95,000 each year, by the end of the forecast period. Assuming constant admission rates,

this would lead to a 38.6 percent increase in admissions to level two and three units, and for demand for neonatal nurses.

Graph 15: Neonatal Admissions: Alternate Scenario



Conclusion

Neonatal services are mainly provided by registered nurses who undertake on-the-job training and postgraduate courses once they have the basic skills and experience required to understand advanced practice, which is typically after one year.

The demand for neonatal nurses is likely to remain stable over the next 20 years but supply will not meet demand. Neonatal nurses are younger than the overall nursing workforce and are therefore more likely to leave the subspecialty at higher rates than the general nursing workforce. Increased recruitment and training is needed to help sustain the workforce.

Since the supply data available was collected from Neonatal units rather than from the Nursing Council APC data, this report does not provide turnover rates, as provided in other reports. This would provide an understanding of the 'half-life' of a neonatal nurse and therefore more information on numbers needed to train.

The scenarios analysed in this report note unknown fertility rates, and therefore demand for neonatal nurses, over the next 20 years. Fertility rate trends over the past three decades have not been stable, and are therefore difficult to predict for the next 20 years. Other demand factors noted by the Expert Advisory Group appear to stabilise over the next 20 years.

Notes

¹ Level three provision of services will include ventilation (medium to long term including continuous positive airway pressure; total parental nutrition; consultative services; transfer services to lower level neonatal services; and regional leadership in neonatal care including education and research. Retrieval services are provided as a standalone service from level three units.

² Level two plus services provide moderate term ventilation including CPAP and total parental nutrition and provide intermediate care for level 3 babies and care for babies over 28 weeks.

³ Level two services will include resuscitation and stabilisation prior to transfer; short term ventilation; including CPAP for up to 48 hours; and insertion and care of arterial lines.

⁴ Level one services include respiratory monitoring; IV fluid therapy; tube feeds and phototherapy, and include a consultative service to lead maternity carers, and assessment and treatment of the neonate.

⁵ Within these groups of reasons there are a wide range of diagnoses such as

- meconium aspiration syndrome,
- effects of maternal gestational diabetes
- jaundice
- congenital abnormalities;
- low birth weight (below 1000 grams for level three care);
- respiratory issues, such as meconium aspiration syndrome, chronic lung disease, air leak;
- low blood sugar;
- infection;
- jaundice;
- neonatal sepsis;
- surgery;
- necrotising enterocolitis;
- intraventricular haemorrhage
- retinopathy of prematurity

⁶ In 2006, there were 979 ANZNN registrants (12.9%) with congenital anomalies. Among them were 494 term babies and 134 babies born before 32 weeks. There were 397 whose anomalies were diagnosed during the antenatal period. Of these, 71.6% were born in a hospital level III NICU. Almost a third (32.8%) of babies born with congenital anomalies were to mothers aged over 35 years (ANZNN Report 2006).

A 2008 article in the New Zealand Medical Journal notes the epidemic levels of gestational diabetes mellitus and type-two diabetes in pregnancy are increasing with the epidemic of obesity. This is associated with high rates of foetal loss, congenital malformations, and other adverse perinatal outcomes (Simmons D, Rowan J, Reid R, Campbell N. Screening, diagnosis and services for women with gestational diabetes mellitus in New Zealand. (Source: New Zealand Medical Journal, 2008. 121:1270)).

⁷ The national framework for nursing professional development and recognition programmes and designated role titles have proposed four levels of practice for Registered Nurses and Enrolled Nurses/Nurse Assistants. As the need for post-graduate training need is relevant to Registered Nurses only, the recommended levels for Registered Nurses include:

- Graduate Registered Nurse – the newly registered nurse in their first year of practice.

- Competent Registered Nurse – demonstrates increasing efficient and effectiveness in practice after the first year post registration.
- Proficient Registered Nurse - has in-depth understanding of the complex factors contributing to client health outcomes
- Expert Registered Nurse – engages in postgraduate studies and practises at a level considered ‘expert’ by their peers.

This levelling process is a recommendation and is not implemented consistently across DHBs and other nursing service providers.

Appendix I - The Team

Background of the HWIP Forecasting Programme

This forecasting report is one of a suite of nursing sub-specialities' projections. The overall project is a national initiative comprising a series of forecasting and workforce modelling exercises on the nursing workforce in New Zealand. The project has developed in response to the widespread need to understand nursing workforce demand, supply, and training requirements. This project will help us understand our national nursing workforce picture now and into the future.

The programme aims to:

- provide a global view of the current status of the nursing workforce
- produce nursing workforce projections based on differing scenarios to inform workforce planning and training decisions
- improve the quality of nursing workforce information within the Ministry and the health and disability sector
- provide a platform to improve the capability of the Ministry and the health and disability sector to undertake nursing workforce planning and funding allocation

The projections will underpin future 'planning', as accurate workforce information is fundamental to the effective management and planning of health and disability services. It is also essential to adequately plan for undergraduate, post-graduate, and post-entry clinical training.

Initial work involved setting up a Stakeholder Reference Group that oversaw development of the Current Status of the Regulated Nursing Workforce document. Each sub-specialty forecast has an Expert Advisory Group, with a member who liaises between the stakeholders' reference group and the particular Expert Advisory Group.

Future Workforce Nursing Strategy Group

Jim Green	Lead CEO, Nursing and Midwifery WSG, CEO Tairāwhiti DHB
Chiquita Hansen	Director of Nursing, Primary Healthcare, MidCentral DHB
Glenda Alexander	CTU Representative
Heather Casey	Director of Nursing, Mental Health, Otago DHB
Helen Pocknall	Director of Nursing and Midwifery, Wairarapa DHB
Jan Adams	Chief Operating Officer, Waikato DHB

Kevin McFadgen	Employment Relations Specialist, DHBNZ
Liz Manning	Project Manager, Future Workforce, DHBNZ
Lynne Collier	Clinical Services Manager, Well Dunedin PHO
Marilyn Rimmer	Manager, Future Workforce, DHBNZ
Christine Andrews	Acting Chief Nurse, Ministry of Health
Mary Gordon	Executive Director of Nursing and Midwifery, Canterbury DHB
Suzanne Rolls	Professional Nursing Advisor, NZNO
<i>Stakeholder Reference Group</i>	
Andrea McCance	Registrations Manager, Nursing Council of New Zealand
Andrew Potts	General Manager, Adult Health Services, Waitemata DHB
Anna Schofield	Nursing Leadership Manager, Te Pou
Daria Martin	Portfolio Manager, CTA
Heather Baker	Senior Lecturer, Nursing School of Nursing, University of Auckland
Jane O'Malley	Director of Nursing and Midwifery, West Coast DHB
Jocelyn Peach	Director of Nursing and Midwifery, Waitemata DHB
Karolyn Kerr	Project Manager, HWIP
Liz Manning	Project Manager, Future Workforce, DHBNZ
Maree Cassidy	Clinical Services Manager and Professional Nurse Advisor, Mercy Ascot Hospital
Maria Baker	Maori Workforce Champion Group
Christine Andrews	Acting Chief Nurse, Ministry of Health
Shona Wilson	Advisor, Workforce Information, HWIP
Vicky Noble	Director of Nursing, Primary Health Care, CCDHB

Expert Advisory Group (EAG) - Neonatal

Debbie O'Donoghue	Neonatal Nurses College Chairperson, Neonatal Nurse Manager, Christchurch Women's Hospital
Jenni Richards	Neonatal Associate Clinical Nurse Manager Waikato Hospital
Jo Dobson	Otago DHB
Dale Garton	Secretary Neonatal Nurses College Aoteroa Neonatal Nurse Manager, Auckland DHB
Wendy Hines	Neonatal Nurses College Executive member and Level 2 representative Special Care Baby Unit, Whangarei Hospital
Anja Hale	Neonatal Nurses College member Neonatal Nurse Specialist Waikato DHB
Cheryl Hanham	NZNO safe staffing representative Senior clinical nurse Christchurch Women's Hospital
Rosemary Escott	Neonatal Nurse Manager Wellington Hospital
Jan Seuseu	Neonatal Nurse Manager Dunedin Hospital

Appendix II - Data Sources

Nursing Council Registration, Annual Practising Certificate, and Survey Database

A workforce questionnaire accompanies the Annual Practising Certificate (APC) application form sent by the NCNZ each year to nurses who are on the register of nurses and who need to update their APC to remain active. The APC workforce survey elicits individual data on a self reporting basis. This provides statistical information about the regulated nursing workforce. As the bulk of the nursing workforce information is within this NCNZ database, this was the major source for analysis. Mercury Project Limited, Wellington, has been recently commissioned by the NCNZ to redesign and implement a contemporary database management system for the nursing registration, annual survey, and APC processes. A copy of the NCNZ database of aggregated and anonymous data was supplied by Mercury Project Limited with permission from the NCNZ for analysis in this project. A contractual arrangement between HWIP and the NCNZ ensured security and anonymity of any data supplied to HWIP.

The NCNZ data collection is based on nurses' individual opinions with regard to their own working situation at the time of APC application using forced choice questions. The quality of the data relies upon the accuracy with which nurses report their situations and the nature of the survey form.

The NCNZ data is the primary data source for the supply estimates for nurses. The NCNZ data records data for over 40,000 individual nurses from 2001 through to the present. This dataset enables the calculation of the influence on entry and exit rates for variables such as age, gender, and ethnicity.

Statistics New Zealand Demographic Projections

Demographic projections of women by age are used as a basis for forecasting.

Numbers of live births (from the Department of Internal Affairs, via Statistics New Zealand), provide the basis for estimating fertility rates for women of different age groups. Fertility rates for each forecast age group are used to derive an estimate of future live births, including separate estimates of singleton and multiple births.

National Minimum Dataset

The national minimum dataset of hospital inpatient events was used to determine numbers of admissions to SCBU and NICU units. Combined with numbers of live births this gives estimates of the admission rates for neonates. Admission rates are applied to estimates of future live births to derive future admission rates.

Neonatal Nurses Workforce Survey

Because neonatal nurses could not be identified from NCNZ data alone, a small survey of neonatal units was undertaken. Neonatal nurses were identified and matched to NCNZ data, allowing the neonatal workforce to be modelled in the same way as other nursing workforces.