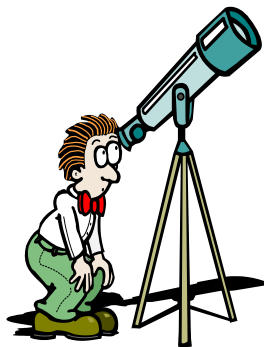


**A PLAN FOR  
SPECIALIZED PERINATAL  
SERVICES IN BC**

**June 13, 2005**



**Developed by:**  
BCs Specialized Perinatal Services Committee

# A PLAN FOR SPECIALIZED PERINATAL SERVICES IN BC

Working Copy June 13, 2005

## Executive Summary

This report identifies and quantifies the need for additional neonatal and obstetrical beds to support both current needs and a projected increase in births between now and 2020. It includes a summary of historical birth trends and the current status of specialized obstetrical and neonatal beds in BC. Through the development of a planning model, current and future need for obstetrical and neonatal beds have been estimated and compared to existing numbers and distribution of beds. The analysis builds on work completed by Dr. Shoo Lee et al in April 2002 and summarized in a report entitled *Report on Tertiary Neonatal Care in BC*. While the methodologies and timelines for data analysis that were used by Dr. Shoo Lee (benchmark comparisons of numbers of beds per capita) and the one used to define bed needs in this paper (use of BC specific CIHI data) differ, the conclusion is the same – additional neonatal beds are required to enable effective functioning of the existing and future provincial system of neonatal (and obstetrical) care. Additional obstetrical beds are also identified to be required in the future to meet projected increases in births.

An important accompaniment to this paper is the recently developed BC Levels of Perinatal Care document (April 2005). The BC Levels of Perinatal Care document provides guidelines for the scope of services and treatments required to provide care within Level 1, 2 and 3 (L1, 2 & 3) centres. The Levels of Care document was utilized in the development of the planning model to project bed requirements and will be an important resource in the next phase of the process when resources are aligned with the numbers and types of beds.

### Historical Birth Trends

With the exception of two brief periods (1960 – 1967 and 1995 – 2002), the number of births to BC women has been increasing steadily over the years (albeit at a much slower rate than the growth in the potential child-bearing female population). The decline experienced between 1995 and 2002 appears to have reversed and a 14% increase in births (40,300 – 46,200 births) is projected between now and 2020. The health authorities (HAs) that are projected to have the highest percentage increase in births to 2020 are the Interior (IHA) and Fraser Health (FH).

Despite the relative decline in the number of births between 1995 and 2002, indicators suggest a steady rise in the level of maternal and newborn acuity, including higher rates of multiple births, cesarean sections, discharges meeting MOHS maternity tertiary

criteria, low birth weight babies, pre term babies and L2 and 3 babies in MOHS designated L2 and L2/L3 centres. Much of this increase in acuity rates is attributable to changes in the proportion of births to older women (aged 35+) versus younger women (<35 years), as age is a well documented risk factor in the provision of perinatal care. The recent trend towards higher proportions of births to older versus younger women is anticipated to level off and remain relatively constant at 20% of births to women aged 35+ and 80% to women < 35 years old through to at least 2015. This leveling is expected to steady the rise in acuity rates that have been experienced over the past several years.

The data suggests that most HAs are relatively self-sufficient<sup>1</sup> in meeting their obstetrical and neonatal needs. For all HAs except FH, at least 92% of maternity patient days and 78% of neonatal days are spent in home HA hospitals. For FH these figures are 76% and 74% respectively. The issues around FH are complex and highly influenced by the geographic proximity to BC Women's (PHSA) and Vancouver Coastal Health Authority (VCHA) hospitals. Further work needs to be done to identify and quantify specific factors that contribute to the high use of non-FH hospitals by FH residents. Shifting the flow of FH women and babies from VCH/PHSA to FH hospitals will require considerable effort by FH and VCH/PHSA, a cooperative plan, shared targets and a joint commitment to implement the plan.

### Neonatal Bed Needs

The most significant challenge of this planning exercise was to estimate the actual number of L2/L3 babies cared for in BC hospitals. While a significant amount of BC data is available through the CIHI Discharge Abstract Data (DAD) system, classification of the data using this system (Case Mixed Groups) does not align with the classification levels used in BC. In the absence of such an alignment, a methodology that was developed for use in Ontario (CIHI/HAY Consulting Group methodology) was utilized to establish the "size of the pie" for this planning exercise.

The definitions used in the CIHI/HAY methodology, however, were considered by many to be "generous" and represent the outer limits of use/need for L2/L3 beds in BC. In applying the CIHI/HAY methodology, a proportion of babies that would be classified as L1B in BC were classified as L2 using the CIHI/HAY methodology; similarly a proportion of babies that would be classified as L2 in BC were classified as L3 when the CIHI/HAY methodology was applied. As accurate census data was available on the use of L3 beds in BC, an adjustment factor could be applied to correct the L2/L3 anomaly. Similar census data was not available on the use of L1B/L2 beds so L1/L2 bed requirements were consolidated and identified in this report as L2. **Further study is recommended to identify the circumstances surrounding the relatively high proportion of L1 babies in L2/L3 nurseries and determine whether other options for care might exist that would benefit mothers and babies and might result in more appropriate utilization of L2/L3 beds.**

---

<sup>1</sup> "Self sufficient" in this paper means services for women and babies are received in the health authority in which the women and babies reside (i.e., in their home health authority).

Application of the CIHI/HAY methodology indicates that managing existing neonatal volumes of 154 L2/L3 babies per day at 75% occupancy (desired occupancy) requires 206 L2/L3 beds. This compares to the current provincial capacity of 141 MOHS designated and 38 non-designated beds (total: 179 beds), for a difference of 27 beds.<sup>2</sup> **In order to effectively operate the provincial system of neonatal care, it is recommended that the 27 L2/L3 beds identified as required be designated, staffed and funded appropriately to meet existing need.** In addition to designating, staffing and funding the 27 L2/L3 beds required to “right size” the system, the model was used to project L2/L3 bed requirements in 2010 and 2020. Application for this purpose **suggests the need for an additional 7 L2/L3 beds between now and 2010 and a further 21 beds between 2010 and 2020.**

Three scenarios were considered for the locations of L3 neonatal centres in BC. The scenarios included L3 centres in either three or four health authorities, each of which involved varying combinations of PHSA/VCH, FH, VIHA and IHA. While NHA was considered as a potential location, it was ruled out for reasons of insufficient patient volumes to maintain competence, efficiency/costs and availability of skilled personnel.

**Following a review of the pros and cons of each scenario, continuation of the existing scenario of three L3 centers (VIHA, FH and PHSA) is recommended.** While the combined volume of L2/L3 babies in the IHA would justify the establishment of an L3 centre, this option was not recommended for several reasons, including transportation patterns (infant transport team and commercial flight operations) and the need to consolidate many of the outlying L2 beds into the L2/L3 centre if the centre was to be viable. It was agreed that a re-evaluation of the numbers of L3 neonatal centers needs to be undertaken again in another 10 – 15 years to identify new variables and their potential impacts (e.g., changes in service delivery patterns and population needs and the impact of medical schools operating outside the Lower Mainland).

Unlike L3 services, L2 services are available in all HAs. **Continued provision of L2 services in this way is recommended, with an increase in the level of self-sufficiency within individual HAs where desirable and feasible.** While limited potential exists to increase levels of self-sufficiency in IHA, VIHA or NHA, significant opportunities exist in FH. The impact of a FH 87% self-sufficiency rate (FHs stated goal) on bed requirements is discussed in this report. Achievement of the latter would require considerable planning, effort and cooperation amongst FH, VCH and PHSA.

### **Obstetrical Bed Needs**

While there is some concentration of specialized obstetrical services in BC, it is much less intense than that for neonatal services. Most of the HAs appear to be fairly self-sufficient for the majority of their obstetrical cases (even relatively complex cases), although there continues to be a need to concentrate complex obstetrical cases in centres

---

<sup>2</sup> These figures do not include L2/L3 beds that are scheduled to open in FH (3 beds at each of MSA and Surrey Memorial), VIHA (4 beds in Nanaimo) and NHA (3 beds in Prince George) in 2005/06/07 and a further 4 beds in FH (MSA) in 2008 (total: 17 beds).

with specialized obstetrical and neonatal personnel and beds. The most logical concentration is for the tertiary obstetrical centres to align with the L2/L3 neonatal centres.

In the absence of information to the contrary and as per the expressed opinion of experts on the PSPS, this exercise assumed that the current number of open obstetrical beds was adequate, although there was no excess capacity in open beds to accommodate future growth. **Application of the planning model to anticipate future need suggests an additional 16 obstetrical beds are required between now and 2010 and a further 43 beds by 2020 (total: 59 beds).** The PHSA survey (March 2005) suggests some or all of these bed needs might be able to be met through opening closed beds.

While some opportunities exist to increase the self-sufficiency of HAs in managing obstetrical cases (e.g., fetal fibronectin testing), the impact on bed requirements for IHA, VIHA and NHA is not anticipated to be substantive. **Similar to L2/L3 neonatal services, significant opportunities exist for increasing self-sufficiency rates for FH and further exploration of the potential is recommended.**

### **Recommendations**

1. Operate the specialized perinatal system of care as a provincial program to assure provincial consistency, standardization, and accountability, in collaboration with effective and efficient regional systems.
2. Establish regional perinatal coordinating structures within each HA to support perinatal planning, development of effective and efficient regional systems and implementation of provincial initiatives.
3. Regional perinatal coordinating structures to work within the provincial perinatal structure to clearly designate centres and beds available for L1, L2A, L2B and L3 level care within their HA, utilizing the data and directions within this report.
4. Develop processes to monitor the census, capacity to accept new patients and reasons for being unable to accept new patients on a daily basis at all MOHS designated and non-designated sites identified on the PHSA survey. Summarize the results in a monthly report to the PSPS Committee and augment with information on patterns of patient transfer within and across HAs.

### *Neonatal Beds*

5. Provincially, increase the number of neonatal beds as follows (figures are above and beyond the existing 141 MOHS designated and 38 non-designated beds):
  - a. Between now and 2010: 34 beds (27 required immediately and 7 to accommodate future growth)
  - b. Between 2010 and 2020: 21 beds

6. Continue to centralize L3 neonatal beds within 3 health authorities (VIHA, PHSA and FH), with quaternary level services being provided at BCWs/BC Children's.
7. Continue to offer L2 neonatal services within each health authority, with a goal to increase the level of self-sufficiency within individual HAs; where desirable and feasible, develop a target rate, phased-in implementation plan and timeline.

Two extremes for distributing L2/L3 beds are shown on the table below; one assumes current referral patterns and one assumes aggressive repatriation.

**Table 1: Comparison of Calculated (Existing Referral Patterns & Aggressive Repatriation) & Available Neonatal Beds: Current, 2010 and 2020**

HA of Tx	Calculated Need for Beds (using the Planning Model)						Available Beds (current)		
	Existing Referral Patterns			Aggressive Repatriation			MOHS Desig	Non- Desig Beds	Total Beds
	Current	2010	2020	Current	2010	2020			
IHA	17	20	21	20	24	25	7	6	13
FHA	62	64	74	79	81	95	48	8	56
VCHA/PHSA	91	93	99	66	67	69	57	19	76
VIHA	26	26	29	28	28	31	19	5	24
NHA	10	10	11	13	13	14	10	0	10
<b>Total</b>	<b>206</b>	<b>213</b>	<b>234</b>	<b>206</b>	<b>213</b>	<b>234</b>	<b>141</b>	<b>38</b>	<b>179</b>

**Table 2: Difference in the Calculated (Existing Referral Patterns & Aggressive Repatriation) & Available Neonatal Beds: Current, 2010 and 2020**

HA of Tx	Dif, Calculated vs Available Beds; + = surplus; ( ) = shortfall					
	Existing Referral Patterns			Aggressive Repatriation		
	Current	2010	2020	Current	2010	2020
IHA	(4)	(7)	(8)	(7)	(11)	(12)
FHA	(6)	(8)	(18)	(23)	(25)	(39)
VCHA/PHSA	(15)	(17)	(23)	10	9	7
VIHA	(2)	(2)	(5)	(4)	(4)	(7)
NHA	0	0	(1)	(3)	(3)	(4)
<b>Total</b>	<b>(27)</b>	<b>(34)</b>	<b>(55)</b>	<b>(27)</b>	<b>(34)</b>	<b>(55)</b>

8. Review the staffing levels (and related funding) of MOHS designated L2/L3 neonatal beds to ensure sufficient baseline staffing to accommodate occupancy levels of 80% and above.
9. Examine the circumstances surrounding the relatively high proportion of L1 babies occupying L2/L3 beds and determine whether other options for care might exist that would benefit mothers and babies and might result in more appropriate utilization of L2/L3 beds.

10. Work with community based programs to further develop strategies to support the care of special need babies in the community (e.g., programs for home oxygen and intensive feeding support).

*Obstetrical Beds*

11. Provincially, increase the number of obstetrical beds as follows:
  - a. Between now and 2010: 16 L1/L2/L3 obstetrical beds.
  - b. Between 2010 and 2020: 43 L1/L2/L3 obstetrical beds.
12. Continue to centralize complex obstetrical cases in tertiary centres which align with the specialized neonatal beds (VIHA, PHSA and FH).
13. PHSA/VCH to work with FH to identify mechanisms to increase self-sufficiency rates in FH for obstetrical services; where desirable and feasible, develop a target rate, phased-in implementation plan and timeline.

Two extremes for distributing new obstetrical beds are shown on the table below; one assumes current referral patterns and one assumes aggressive FH repatriation (to achieve FHs stated goal of 87% self-sufficiency).

**Table 3: Comparison of Calculated Incremental Bed Need, Existing Referral Patterns & 87% FH Self-Sufficiency Rate: Current, 2010 and 2020**

	Current Referral Patterns			FH 87% Self Sufficiency		
	( ) = shortfall; + = surplus			( ) = shortfall; + = surplus		
	2010 vs Current	2020 vs 2010	2020 vs Current	2010 vs Current	2020 vs 2010	2020 vs Current
IHA	(10)	(5)	(15)	(10)	(5)	(15)
FHA	(5)	(21)	(26)	(25)	(25)	(50)
VCH/PHSA	1	(12)	(11)	21	(8)	13
VIHA	(1)	(4)	(5)	(1)	(4)	(5)
NHA	(1)	(1)	(2)	(1)	(1)	(2)
<b>TOTAL, ALL</b>	<b>(16)</b>	<b>(43)</b>	<b>(59)</b>	<b>(16)</b>	<b>(43)</b>	<b>(59)</b>

14. Pursue mechanisms that enable perinatal women to remain in their home HA to the extent possible (e.g., fetal fibronectin testing).

The next step in this process will be for individual HAs to review these recommendations and their respective bed requirements, identify a preferred configuration for L2/L3 neonatal and obstetrical beds within each HA and develop an implementation plan, timeline and budget to meet their bed requirements. With the establishment of the HA structure and the Provincial Specialized Perinatal Service Committee (PSPS), BC is well positioned to ensure timely implementation of these recommendations.

# A PLAN FOR SPECIALIZED PERINATAL SERVICES IN BC

<b>EXECUTIVE SUMMARY .....</b>	<b>2</b>
<b>1.0 BACKGROUND.....</b>	<b>9</b>
<b>2.0 HISTORICAL BIRTH TRENDS .....</b>	<b>11</b>
2.1 BIRTH NUMBERS & LOCATIONS.....	11
2.1.1 <i>Birth Numbers</i> .....	11
2.1.2 <i>Births by Location of Home Residence, 2003/04</i> .....	12
2.1.3 <i>Births by Location of Hospital, 2003/04</i> .....	12
2.1.4 <i>Location of Home Residence and Location of Hospital, 2003/04</i> .....	13
2.2 BIRTH ACUITY AND SERVICE UTILIZATION .....	14
<b>3.0 BIRTH PROJECTIONS (TO 2020) .....</b>	<b>17</b>
3.1 BIRTH PROJECTIONS FOR BRITISH COLUMBIA.....	17
3.2 BIRTH PROJECTIONS BY HEALTH AUTHORITY OF RESIDENCE.....	18
<b>4.0 LEVEL 2 &amp; 3 NEONATAL &amp; OBSTETRICAL BED REQUIREMENTS IN BC.....</b>	<b>19</b>
4.1 NEONATAL BEDS.....	19
4.1.1 <i>Neonatal Beds Used to Support L2/L3 Babies</i> .....	19
4.1.1.1 MOHS L2/L3 Designated Beds .....	20
4.1.1.2 Non-Designated L2/L3 Beds (Estimated).....	22
4.1.2 <i>Current &amp; Projected Need for L2/L3 Beds</i> .....	23
4.1.2.1 Current Need for L2/L3 Beds .....	23
4.1.2.2 Projected Need for L2/L3 Beds.....	24
4.2 OBSTETRICAL BEDS .....	24
4.2.1 <i>Existing Numbers of Obstetrical Beds</i> .....	24
4.2.2 <i>Projected Need for Obstetrical Beds Using the Planning Model</i> .....	25
<b>5.0 GUIDING PRINCIPLES FOR SYSTEM DESIGN.....</b>	<b>26</b>
<b>6.0 HEALTH AUTHORITY LEVEL 2 &amp; 3 NEONATAL &amp; OBSTETRICAL BED REQUIREMENTS</b>	<b>28</b>
6.1 NEONATAL BEDS.....	28
6.1.1 <i>Locations of L3 Centres</i> .....	28
6.1.2 <i>Potential and Anticipated Shifts in Referral Patterns</i> .....	30
6.1.2.1 Bed Requirements Assuming Existing Referral Patterns.....	30
6.1.2.2 Impact of Changes in Referral Patterns (Repatriation) on Bed Requirements .....	31
6.1.2.3 Range of Bed Requirements, Existing Referral Patterns through to Aggressive Repatriation .....	33
6.2 OBSTETRICAL BEDS .....	33
6.2.1 Bed Requirements Assuming Existing Referral Patterns .....	34
6.2.2 Impact of Changes in Referral Patterns (Repatriation) on Bed Requirements.....	34
6.2.3 Range of Bed Requirements, Existing Referral Patterns through to Aggressive Repatriation in FH .....	35
<b>7.0 RECOMMENDATIONS .....</b>	<b>35</b>
<b>8.0 SUMMARY .....</b>	<b>38</b>
APPENDIX 1: HIGHLIGHTS OF RELEVANT REPORTS .....	39
APPENDIX 2: BIRTH TRENDS, 1995 & 2003 .....	43
APPENDIX 3: NEWBORN DISCHARGES AND DAYS AT MOHS DESIGNATED LEVEL 2 & 3 CENTRES.....	45
APPENDIX 4: SUMMARY OF ASSUMPTIONS USED IN THE PLANNING MODEL.....	46
APPENDIX 5: ESTIMATE OF PROPORTIONS OF L1, L2 & L3 BABIES .....	47
APPENDIX 6: MATERNITY BEDS IN BC.....	50

# A PLAN FOR SPECIALIZED PERINATAL SERVICES IN BC

## 1.0 Background

In December 2001, the Provincial Health Services Authority (PHSA) was mandated by the Ministry of Health Services to undertake the development of a plan for specialized perinatal services in BC. PHSA delegated the executive lead for the development of this plan to BC Women's.

With the assistance of a provincial advisory group,<sup>3</sup> a high level plan was developed and documented in the report titled *Provincial Tertiary Perinatal Services Plan* (October 2002). The report recommended the establishment of a provincial specialized perinatal program, with the goal of formalizing relationships among facilities, developing and implementing standards of care and practice, collecting common provincial data and developing an appropriate human resources strategy. This plan was accepted by the provincial Leadership Council for implementation in December 2003. During that period, and in follow-up, a number of additional reports have been completed that have focused on various aspects of perinatal planning for the province of BC (a summary of each report is provided in Appendix 1).

In April, 2002, a report was completed by Dr. Shoo Lee, et al, entitled *Report on Tertiary Neonatal Care in BC*. The purpose of this report was to create an inventory of the current level 2 and 3 neonatal beds, and to determine any service gaps, based on quantifiable benchmarks. The results of this study identified that there were sufficient level 3 neonatal beds in BC to meet provincial demands until 2010. The study also determined that there was an overall shortage of between 24 and 44 L2 neonatal beds to meet current or future demands. The report was completed using 1996/97 NICU data, and focused on MOHS designated L2 and L3 beds.

It was agreed that while the report completed by Dr. Shoo Lee, et al provided an excellent basis for future planning, it was important that both the L2 and L3 neonatal demand and supply data be updated to reflect current status, and that the impact of future demand on obstetrical services also be considered. To complete this exercise, an external company, Healthcor Inc, was contracted to work with the Provincial Specialized Perinatal Services (PSPS) Committee and a sub-group of the PSPS, the Expert Working Group, to identify current and future (to 2020) perinatal requirements in BC. While the highlights of this effort are incorporated into this paper, details are available in a technical paper under a

---

<sup>3</sup> This Advisory Group was the precursor to the Provincial Specialized Perinatal Services (PSPS) and included representatives from all Health Authorities (HAs) and the Ministry of Health Services (MOHS).

separate cover (*Level 2 and 3 Perinatal Hospital Utilization Projections for BC, May 2005*).

This report builds identifies and quantifies the need for additional neonatal and obstetrical beds to support a projected increase in births between now and 2020. The report includes a summary of historical birth trends and the current status of specialized obstetrical and neonatal beds in BC. Through the application of a planning model, current and future need for obstetrical and neonatal beds are estimated and compared to existing numbers and distribution of beds. Recommendations are provided to address the shortfall of beds, including an estimate of the financial resources required to meet the shortfall.

This planning initiative runs in parallel to several other provincial specialized perinatal service initiatives, including collaborative planning with BC Ambulance Service and BC Bedline to make improvements to the transportation system and the province-wide implementation of ACoRn (Acute Care of at-Risk Newborns), a new Canadian neonatal stabilization education program that is designed for care providers who may be called upon to care for at-risk babies and their families, regardless of experience or training in neonatal emergencies.

An important accompaniment to this paper is the recently developed BC Levels of Perinatal Care document (May 2005). This document was developed by members of the PSPS and is based on work done by Dr. Shoo Lee which has been submitted to the Canadian Pediatric Society for consideration to adopt nationally.<sup>4</sup> The BC Levels of Perinatal Care document provides guidelines for the scope of services and treatments required to provide care within Level 1, 2 and 3 centres. The Levels of Care document was utilized in the development of the planning model to project bed requirements (topic of this paper) and will be an important resource in the next phase of the process when resources are aligned with the numbers and types of beds.

*Note: Throughout this report, there are places where rounding up or down in the figures may result in a 1 to 2 bed discrepancy in the total. These small inconsistencies in the totals are not significant for the purposes of this exercise.*

---

<sup>4</sup> Lee, Shoo, Canadian Pediatric Society, Fetus & Newborn Committee Statement, *Levels of Neonatal Care* (Draft), 2004

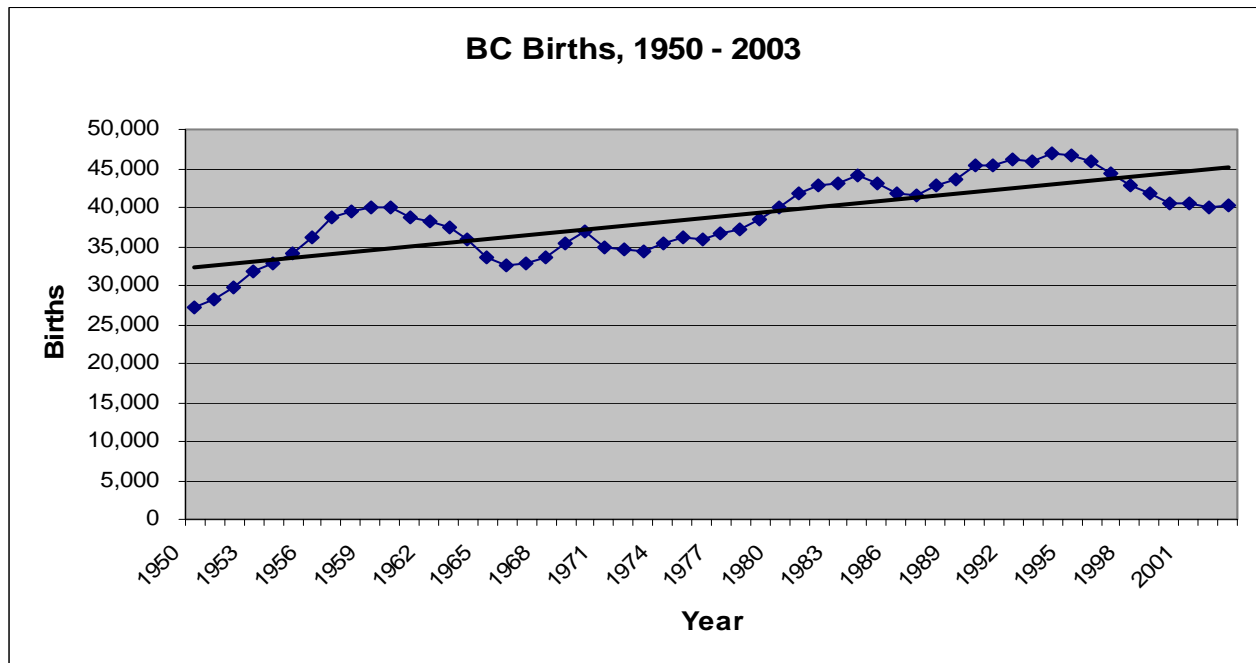
## 2.0 Historical Birth Trends

### 2.1 Birth Numbers & Locations

#### 2.1.1 Birth Numbers

With the exception of two brief periods (1960 – 1967 and 1995 – 2002), the number of births to BC women has been increasing steadily over the years (albeit at a much slower rate than the growth in the potential child-bearing female population). The decline experienced between 1995 and 2002 appears to have reversed and a steady increase is projected into the future (see later discussion).

Table 4: BC Births, 1950 - 2003



Source: Vital Statistics, 2003 Annual Report

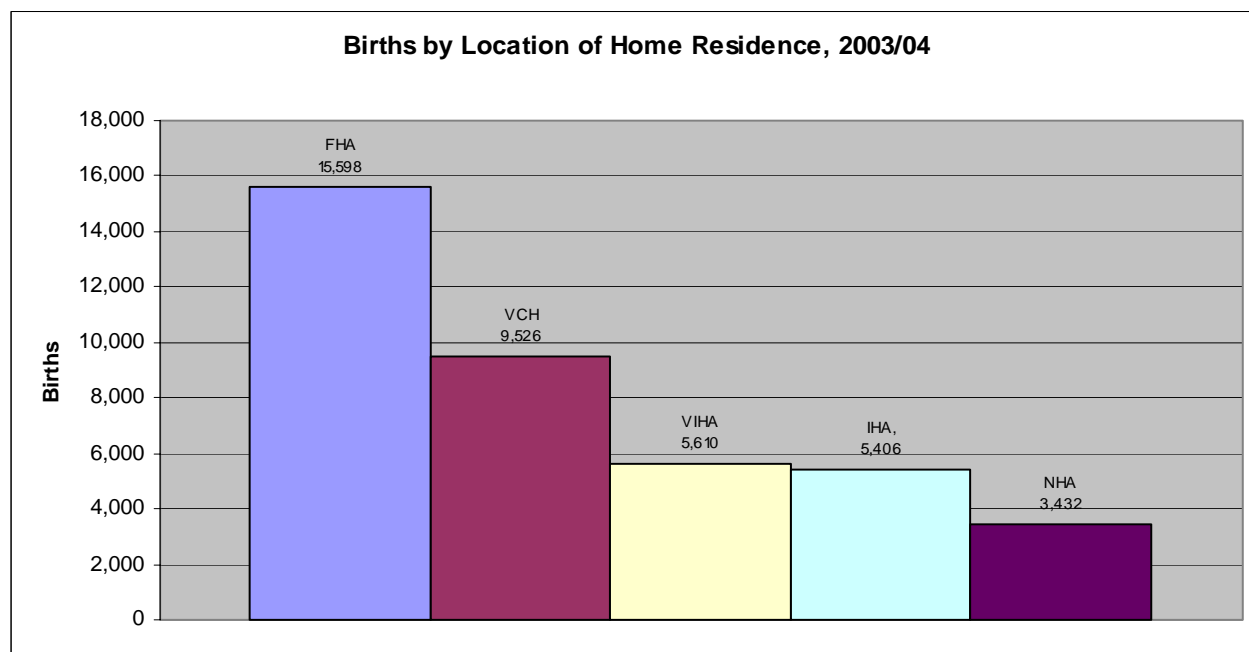
Between 1995 and 2002, the number of births to women living in all health authorities declined. The percentage decline was highest in IHA (24%), NHA (24%) and VIHA (21%). VCH and FH experienced 15% and 7% declines respectively. This decline appears to have leveled off in 2003 and in 2004 and 2005 the number of births is again on the increase.

Consistent with the decline in the number of births to BC women, the number of births performed in hospitals within each health authority also decreased between 1995 and 2002. IHA, VHA, VIHA and VCHA experienced >20% decline in the number of births performed in their hospitals, while PHSA and FH experienced a 7 - 8% reduction.

## 2.1.2 Births by Location of Home Residence, 2003/04

Of the 39,870<sup>5</sup> in-hospital births to BC women in 2003/04, the highest proportion were to women living in the FH area (15,600 or 40% of births), followed by VCH (9,500), VIHA (5,600), IHA (5,400) and NHA (3,400).<sup>6</sup>

Table 5: Births by Location of Home Residence, 2003/04



Source: Ministry of Health, DAD Dataset.

## 2.1.3 Births by Location of Hospital, 2003/04

In 2003/04, births occurred in 58 BC hospitals.<sup>7</sup> This compares to 75 hospitals in 1995/96, a reduction of 17 or 23%. Most of the hospitals where births are no longer occurring are those that performed <100 births per year in 1995/96. Interestingly the number of births performed in the remaining BC centres has not increased,<sup>8</sup> suggesting the impact of the reduction in the number of hospitals that provide maternity services has been offset by the reduction in the number of provincial births.

Of the 39,870 in-hospital births to BC mothers in 2003/04, the highest proportion were born in hospitals in the FH area (13,300 or 33% of births), followed by PHSA (7,200), VIHA (5,600),

<sup>5</sup> Figure excludes 450 home births.

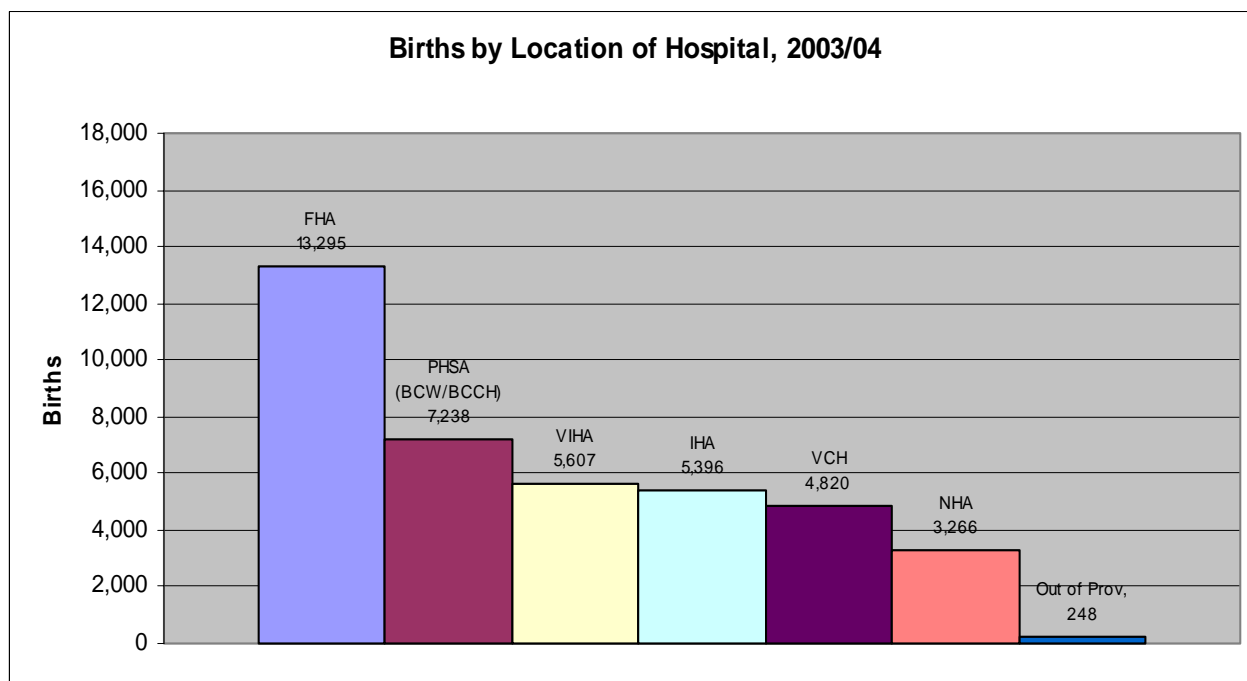
<sup>6</sup> Figure excludes a small number of births for which the place of residence is not known (n=298).

<sup>7</sup> Figure includes hospitals where the number of births was >10.

<sup>8</sup> Exceptions to this statement where the number of births have increased since 1995/96: MSA (+273), Langley Memorial (+195), Surrey Memorial (+74), Ft St John (+17) and St John (+18) hospitals.

IHA (5,400), VCH (4,800) and NHA (3,266) A small proportion were born at out of province hospitals (248 or .6%).

**Table 6: Births by Location of Hospital, 2003/04**



Source: Ministry of Health, DAD Dataset.

#### 2.1.4 Location of Home Residence and Location of Hospital, 2003/04

The data suggests that most HAs are relatively self-sufficient in meeting their obstetrical and neonatal needs. For all HAs except FH, at least 92% of maternity patient days and 78% of neonatal days are spent in home HA hospitals. For FH these figures are 76% and 74% respectively. The issues around FH are complex and highly influenced by the geographic proximity to BC Women's and Vancouver Coastal Health Authority (VCHA) hospitals. Some opportunity exists to re-direct cases back to home HAs and these are discussed in the various scenarios.

A breakdown by levels of HA self-sufficiency for births and patient days is shown on the next table.

**Table 7: Location of Women's Home Residence & Location of Hospital of Birth (2003/04)**

Health Authority	Women Delivering in a Hospital in their Home HA		Within the HA, % of Births to Women that Live in HA		Notes re Tertiary Centres
	% of Births	% of Patient Days	% of Births	% of Patient Days	
IHA	98%	94%	98%	97%	
FH	82%	76%	96%	92%	96.8% of births at RCH were to women living in FH; physician job action may have impacted the RCH numbers for several months during this period.
VCH/PHSA	95%	95%	75%	74%	70.9% of births at BCW were to women living in VCH & 27% to women living in FH.
VIHA	99%	98%	99%	97%	99.2% of births at Vic Gen were to women living in VIHA
NHA	96%	92%	99%	99%	

Source: Ministry of Health, DAD Dataset (births) and Level 2 and 3 Perinatal Hospital Utilization Projections for BC (Technical Report, May 2005, patient days).

As expected, the level of self sufficiency of each health authority in the care of neonates was lower and is shown on the next table.

**Table 8: Location of Neonatal Home Residence & Location of the Hospital (2003/04)**

Health Authority	% of Neonatal Days in Home HA	Within the HA, % of Neonatal Days Utilized for Neonates Living in the HA
IHA	85%	97%
FH	74%	89%
VCH/PHSA	94%	61%
VIHA	95%	97%
NHA	78%	100%

Source: Level 2 and 3 Perinatal Hospital Utilization Projections for BC (Technical Report, May 2005).

## 2.2 Birth Acuity and Service Utilization

In BC there is no single accepted measure of acuity encompassing both maternal and neonatal trends. As there is no single measure, several measures are often used as “proxies.”

Examples of “proxy measures” which suggest increasing maternal and newborn levels of acuity between 1995 and 2003 are provided on the next table. Details are available in Appendices 2 & 3. Levels of significance have not been assessed.

Sources of data to develop this table were as follows:

1. Vital Statistics 1995 & 2003 *Annual Reports* (used unless otherwise stated)
2. MOHS DAD database
3. *Giving Birth in Canada, A Regional Profile*, CIHI, 2004

**Table 9: “Proxy Measures” of Increasing Acuity, 1995 to 2003**

<b>Trend</b>	<b>Comparison, 1995 to 2003</b>
Increasing maternal age	The number of births to women aged 35+ increased by 1,720 or 21%; The percentage of total births to women aged 35+ increased from 16% to 25%.
Higher rate of multiple births	The percentage of multiple births increased from 2.1% to 2.9% of total births.
Higher cesarean section rate	The percentage of cesarean sections increased from 19.9% to 28.2%.
Lower spontaneous vertex delivery rate	The percentage of spontaneous vertex deliveries decreased from 68% to 61%.
Higher rate of live births with maternal complications	The percentage of live births with maternal complications increased from 46.4% to 51.4%.
Higher rate of discharges meeting MOHS maternity tertiary criteria <sup>9</sup> at BCWs, RCH & VGH  (MCC 14 Pregnancy & Childbirth)  Source: <i>MOH DAD database</i> .	<p>The % of tertiary to total maternity patients has increased (3% reduction in the number of discharges meeting the maternity tertiary criteria, 15% reduction in births, representing a “real” increase in the % of tertiary to total maternity patients).</p> <p>Length of stays for tertiary patients has decreased, likely related to the start up of antepartum care at home programs &amp; earlier transfers back to “home” hospitals (3% reduction in the number of discharges but 22% reduction in the number of patient days).</p> <p>The number of tertiary discharges and days decreased at BCWs and increased at RCH and Victoria General.</p> <p>Data does not include discharges from non tertiary designated hospitals; however, given the increase in overall acuity indicators (e.g., age, etc), it is likely that higher numbers of tertiary cases are being cared for outside the tertiary centres.</p>
Higher rate of low birth weight babies	<p>The percentage of babies weighing &lt;1,500 grams increased from .3% to .9%. The percentage weighing between 1,500 and 2,499 remained the same.</p> <p>The admission to L2/L3 nursery rate is very high for low birth weight babies. Almost two-thirds (62%) of babies weighing 1,500 – 2,400 grams at birth were admitted to a L2/L3 nursery 2001/02. For babies weighing &lt;1,500 grams, 82% spent time in a L2/L3 nursery (source: <i>Giving Birth in Canada, A Regional Profile</i>, CIHI, 2004).</p>

<sup>9</sup> MOHS maternity tertiary criteria includes MCC (pregnancy & childbirth) antepartum, delivery and postpartum discharges; tertiary criteria is only designated in BCW, RCH and Victoria General; although other centres may treat patients who meet the clinical definition of “tertiary,” they will not be designated as tertiary unless discharged from one of the specified hospitals; tertiary flag data at BCW, RCH and Victoria General is not available for 2003/04.

Trend	Comparison, 1995 to 2003
Higher rate of low birth weight babies cont'd	The length of stay of low birth weight babies in L2/L3 nurseries continues to increase. In 2001/02, the median LOS for babies weighing 1,500 – 2,400 grams was 7 days and 23 days for babies <1,500 g (source: <i>Giving Birth in Canada, A Regional Profile</i> , CIHI, 2004). In BC, the length of stay for babies weighing <1,000 grams increased from 24 to 40 days between 1995/96 and 2003/04 (source <i>MOHS DAD database</i> ).
Higher rate of pre term babies	The percentage of pre-term babies delivered at 28 - 36 weeks increased from 6.1% to 6.7%.
<p>Higher rate of L2/L3 babies at MOHS “formally designated” L2&amp;3 centres<sup>10</sup></p> <p>Source: <i>MOH DAD database</i>.</p>	<p>The numbers of L2/L3 discharges decreased by 2%, the numbers of L2/L3 days increased by 5.3%, all at the same time the numbers of births dropped by 15%.</p> <p>The length of stays for L2/L3 babies has increased (2% reduction in the number of L2/L3 discharges but 5% increase in the number of days), likely reflecting an increase in the number and length of stay of premature babies.</p> <p>The use of L2/L3 beds has increased by 6 per day (increase of 9.5 per day for L2 and reduction of 3.5 per day for L3 babies). The use of L2 beds has increased by 15%, while the use of L3 beds has decreased by 8%.</p> <p>The average daily L2/L3 census in 2003/04 was 114 per day, equating to an average occupancy of 81% ; this compares to an average occupancy of 77% in 1995/96.</p> <p>If the demand on MOHS designated L2&amp;3 centres has increased, it is reasonable to assume that the demand on non-designated L2&amp;3 centres has also increased. The latter includes St Paul’s, Lion’s Gate, Richmond, Burnaby, Kelowna and Nanaimo Hospitals. Data is not available on this group of hospitals.</p>

Despite the relative decline in the number of births between 1995 and 2002, indicators suggest a steady rise in the level of maternal and newborn acuity, including higher rates of multiple births, cesarean sections, discharges meeting MOHS maternity tertiary criteria, low birth weight babies, pre term babies and L2 and 3 babies in MOHS designated L2L3 centres. Much of this increase in acuity rates is attributable to changes in the proportion of births to older women (aged 35+) versus younger women (<35 years), as age is a well documented risk factor in the provision of perinatal care. Interesting, however, is that the recent trend towards higher proportions of births to older versus younger women is anticipated to level off and remain relatively constant at 20% of births to women aged 35+ and 80% to women < 35 years old through to at least 2015. This leveling is expected to steady the rise in acuity rates that have been experienced over the past several years (details are provided in the technical paper *Level 2 and 3 Perinatal Hospital Utilization Projections for BC*, May 2005).

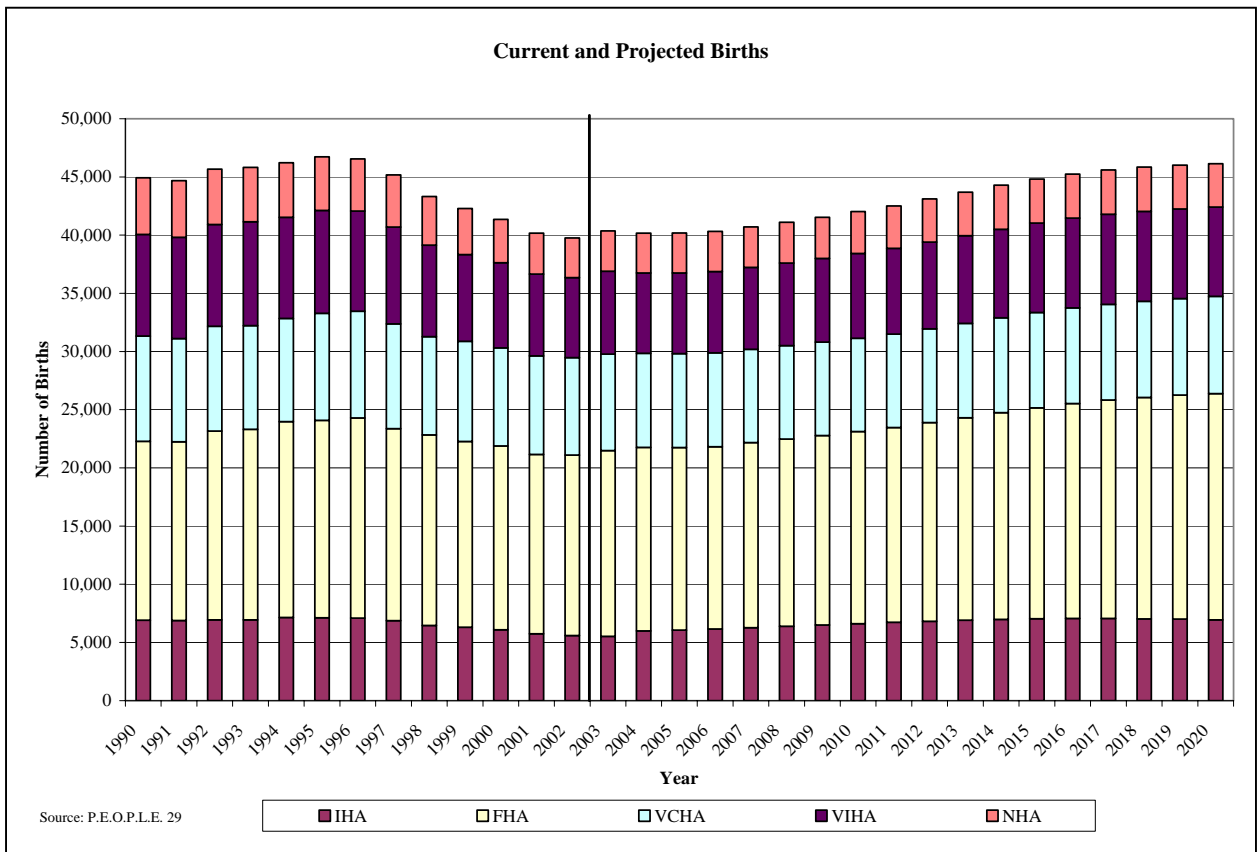
<sup>10</sup> MOHS “formally designated” L2&3 centres are BCW/BCCH, Royal Columbian, Surrey Memorial, Victoria General, Royal Inland, MSA and Prince George Hospitals.

### 3.0 Birth Projections (to 2020)

#### 3.1 Birth Projections for British Columbia

The number of births is anticipated to have “bottomed out” in 2003 (40,300) and to increase every year thereafter. The projected number of BC births in 2010 is 42,000 and increases to 46,200 in 2020 (4% increase between 2003 and 2010 and a 10% increase between 2010 and 2020, for a total increase of 14% between 2003 and 2020).

**Table 10: Birth Estimates & Projections by Census Year (July – June) by HA, 1990 – 2020**



Source: BC STATS (via the MOHS Health Data Warehouse) & is based on PEOPLE 29.

### 3.2 Birth Projections by Health Authority of Residence

During the next 15 years, the increase and % increase in the number of births is projected to be highest for IHA residents, followed by FH and VIHA. Of note is a 20% increase for IHA between 2003 and 2010 and an 18% increase for FH between 2010 and 2020. The only HA in which a significant increase is not anticipated during this period is VCH.

**Table 11: Births by Health Authority, 2003/04, 2010/11 & 2019/20**

HA	2003	2010	2020	# Change			% Change		
				2003 - 2010	2010 - 2020	Total, 2003 - 2020	2003 - 2010	2010 - 2020	Total, 2003 - 2020
IHA	5,523	6,615	6,944	1,092	329	1,421	20%	5%	26%
FH	15,958	16,515	19,447	557	2,932	3,489	3%	18%	22%
VCH	9,572	9,152	9,366	(420)	214	(206)	(4%)	2%	(2%)
VIHA	5,830	6,145	6,658	315	513	828	5%	8%	14%
NHA	3,471	3,587	3,736	116	149	265	3%	4%	8%
<b>Total</b>	<b>40,354</b>	<b>42,014</b>	<b>46,151</b>	<b>1,660</b>	<b>4,137</b>	<b>5,797</b>	<b>4%</b>	<b>10%</b>	<b>14%</b>

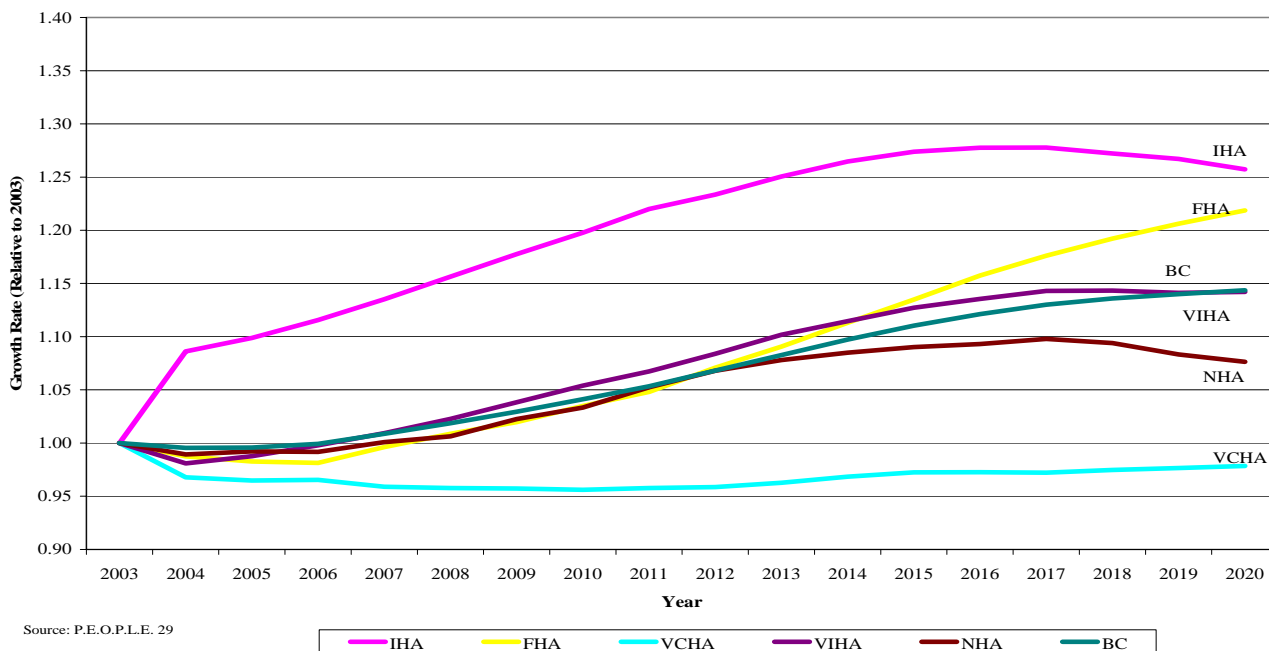
Note: All figures are as of July 1st of each year (i.e., data period 2003/04 represents July 1, 2002 – July 1, 2003)

Source: BC STATS & is based on PEOPLE 29.

Graphically the projected increases in births over 2003 levels by HA are shown on the next table.

**Table 12: Projected Increases in Births over 2003 Levels by HA**

**Growth Rate in Births from 2003**



Source: P.E.O.P.L.E. 29

## **4.0 Level 2 & 3 Neonatal & Obstetrical Bed Requirements in BC**

While the PEOPLE 29 data provides projections of births through to 2020, the data does not project the hospital at which the birth will occur (treatment site) or the related service requirements (neonatal and obstetrical beds).

In order to project the treatment site and related service requirements, a planning model was developed using the services of an external company, Healthcor Inc, and guided by the Provincial Specialized Perinatal Services (PSPS) Committee and a sub-group of the PSPS, the Expert Working Group. The external consultant utilized was that the same one that developed the planning model for the Providence Health Care (PHC) legacy (redevelopment) project and is currently working with the Fraser Health and Vancouver Coastal Health Authorities on other planning related work. The perinatal planning model builds on the PHC model already developed, with refinements made to tailor the model more specifically to perinatal services.

The planning model utilizes data from BC Stats (PEOPLE 29) to project future demand (i.e., births) and CIHI DAD to estimate and project current and future service needs (patient days and beds). Refinements to the model were made and were based on several core assumptions agreed to by the Expert Working Group (e.g., age of mothers, case mix groups, length of stay and caesarean section rates). While the model projects activity to the level of individual Local Health Areas (LHAs) and hospitals, the focus of this exercise was on projections of demand and need for services at a Health Authority (HA) level, with the understanding that the next step would be for HAs to review and develop their own plans to meet their HA requirements.

Some of the key assumptions used in the planning model are outlined in Appendix 4 and further details are described in the technical paper available under a separate cover (*Level 2 and 3 Perinatal Hospital Utilization Projections for BC*, May 2005).

The next section provides information on existing numbers of neonatal beds as well as current and projected bed requirements in BC.

### **4.1 Neonatal Beds**

#### **4.1.1 Neonatal Beds Used to Support L2/L3 Babies**

The most significant challenge of this planning exercise was to estimate the actual number of L2/L3 babies cared for in BC hospitals. While a significant amount of BC data is available through the CIHI Discharge Abstract Data (DAD) system, classification of the data using this system (Case Mixed Groups) does not align with the classification levels used in BC. In the absence of such an alignment, a methodology that was developed for use in Ontario (CIHI/HAY Consulting Group methodology) was utilized to establish the “size of the pie” for this planning exercise. Details of the methodology are

described in a technical paper which is available under a separate cover (*Level 2 and 3 Perinatal Hospital Utilization Projections for BC*, May 2005).

The definitions used in the CIHI/HAY methodology, however, were considered by many to be “generous” and represent the outer limits of use/need for L2/L3 beds in BC. In applying the CIHI/HAY methodology, a proportion of babies that would be classified as L1B in BC were classified as L2 using the CIHI/HAY methodology; similarly a proportion of babies that would be classified as L2 in BC were classified as L3 when the CIHI/HAY methodology was applied. As accurate census data was available on the use of L3 beds in BC, an adjustment factor could be applied to correct the L2/L3 anomaly. Similar census data was not available on the use of L1B/L2 beds so L1/L2 bed requirements were consolidated and identified in this report as L2.

While not used in the estimates or projections, efforts were made to estimate the breakdown of L1, L2A and L2B babies through a site survey and data review (albeit very limited data was available). Details of the methodology and outcome are available in Appendix 5. Provincially, the analysis suggests that 45% of L2/L3 beds are used to care for L1 babies, 15% for L2A babies, 13% for L2B babies and 27% for L3 babies. Further study is recommended to identify the circumstances surrounding the relatively high proportion of L1 babies in L2/L3 nurseries and determine whether other options for care might exist that would benefit mothers and babies and might result in more appropriate utilization of L2/L3 beds.

Application of the CIHI/HAY methodology described above indicates that approximately 154 L2/L3 babies per day are cared for in the equivalent of 190 neonatal beds @ 81% occupancy in BC (2003/04 figures).

Care for these L2/L3 babies is provided in one of two types of beds:

1. MOHS designated beds: Beds designated and funded by the MOHS several years ago as L2/L3 beds (141 beds, which are distributed across 7 established L2/L3 nurseries).
2. Non-designated beds: Beds not formally designated as L2/L3 beds by the MOHS but have been established by HAs in response to system need. While the majority of these beds are distributed across 6 established L1/L2 nurseries (38 beds), the data suggests there are also “pockets” of L2/L3 activity in other centres scattered across the province (11 bed equivalents).

The next section provides details on the existing numbers and use of these two types of beds.

#### **4.1.1.1 MOHS L2/L3 Designated Beds**

Several years ago, the MOHS designated and funded 7 centres in BC as L2 or L2/L3 centres (referred to as MOHS designated sites/beds). Of these 7 centres, 4 are designated as L2 centres and 3 as L2/3 centres, resulting in a provincial total of 93 MOHS designated L2 beds and 48 L3 beds (141 L2/L3 beds). As MOHS designated sites, these

sites are required to track L2 and L3 babies and days in the CIHI DAD system and reliable occupancy data is available.

A review of 2003/04 occupancy data indicates an average of 114 patients per day in these 141 MOHS designated beds, which equates to an 81% occupancy rate (80% for L2 beds and 83% for L3 beds). Occupancy rates range significantly between sites, from 61% (Prince George Regional Hospital) to 88% (BC Women's).

**Table 13: MOHS Designated L2/L3 Neonatal Beds, Patient Days & Occupancy in BC, 2003/04**

		Beds		Patient Days		Occupancy		
		L2	L3	L2	L3	L2	L3	Total
IHA	Royal Inland	7		2,071		81%		81%
FH	MSA General	5		1,466		80%		80%
	Royal Columbian	16	12	5,517	2,543	94%	58%	79%
	Surrey Memorial	15		4,273	38	79%		79%
VIHA	Victoria General	16	3	3,977	1,311	68%	120%	76%
NHA	Prince George	10		2,217		61%		61%
PHSA	BC Women's	24	33	7,708	10,659	88%	88%	88%
<b>Total</b>		<b>93</b>	<b>48</b>	<b>27,229</b>	<b>14,551</b>	<b>80%</b>	<b>83%</b>	<b>81%</b>

Notes:

1. The recent increase of 6 L2 beds in FH are not reflected in the above figures (3 beds at MSA and 3 at SMH).
2. Physician job action may have impacted the numbers at RCH for several months during the 2003/04 year.
3. Patient days are categorized according to highest level of care on a given day.
4. Includes all acute discharges with L2 and/or L3 days, regardless of patient service.

Sources: Number of beds obtained through 2005 survey of HAs; Patient days obtained from MOHS DAD dataset.

A review of baseline nursing staffing levels at these sites suggests a relationship between occupancy, acuity and baseline staffing levels. On average, the baseline nursing staffing for MOHS designated beds is 2.5 beds per RN (range: 2.3 – 3.3 beds per RN). It appears that some sites appear to staff for 80 – 100% occupancy (and adjust downward if the need is lower), while others staff for 60 – 80% occupancy (and adjust upward if the need is higher). The difficulty with the latter approach is that that daily bed availability is contingent on additional (casual) staff being available and that is often not the case. Lack of available nursing staff (not beds) is the most significant factor impacting daily system capacity and is often the reason for transfer of babies outside their home HA. Staffing for 80 – 100% occupancy is recommended for all sites.

**Table 14: Baseline Bed/RN Ratios at MOHS Designated Sites**

HA	Hospital	MOHS Desig			24/7 RNs	Beds/RN	Comments
		L2	L3	Total			
IHA	Royal Inland	7 <sup>11</sup>		7	3	2.3	
FH	Surrey	15		15	5	3.0	
	Royal Columbian	16	12	28	11	2.5	Excludes 24/7 Charge RN
	MSA	5		5	2	2.5	
VIHA	Vic General	16	3	19	7	2.7	
NHA	Prince George	10		10	3	3.3	
PHSA	BCWs	24	33	57	25	2.3	Excludes 2x24/7 Charge RNs
<b>Total</b>		<b>93</b>	<b>48</b>	<b>141</b>	<b>57</b>	<b>2.5</b>	

Source: PHSA March 2005 telephone survey of sites.

#### 4.1.1.2 Non-Designated L2/L3 Beds (Estimated)

Unfortunately the full L2/L3 need cannot be identified through solely reviewing activity at MOHS designated L2/L3 centres. As system needs have increased, beds have been “informally” added to the system to support the care of L1+ and L2 babies. Some of these beds are used for reverse transfers of L1+ and L2 babies from L2/L3 centres while others are used for “transitional babies” who require L1B/2A levels of care that is not available on a regular maternity unit.

A PHSA survey of HAs (March 2005) indicated that 38 non-designated L2 beds are available in established nurseries throughout the province, with a distribution as shown on the next table. In addition to these beds, the data suggests there are also “pockets” of L2/L3 activity scattered throughout other centres across the province (11 bed equivalents).

**Table 15: Non-Designated L2/L3 Neonatal Beds Identified through PHSA Survey (March 2005)**

HA	Site	L2 Beds
IHA	Kelowna	6
FH	Burnaby	8
VCHA	St Paul's	8
	Richmond	3
	Lion's Gate	8
VIHA	Nanaimo	5
<b>Non-designated beds in established nurseries</b>		<b>38</b>
<b>Non-designated beds scattered throughout BC</b>		<b>11</b>
<b>Total, Non-designated beds</b>		<b>49</b>

Source: PHSA March 2005 survey of sites.

<sup>11</sup> Original MOHS designation was for 10 L2 beds; 7 beds are currently staffed and in operation.

Staffing levels in non-designated sites reflect lower acuity babies than that cared for in the MOHS designated centres. On average, the baseline nursing staffing for non-designated beds is 3.5 beds per RN (range: 2.5 – 4 beds per RN), which is significantly lower than staffing levels for MOHS designated beds (2.5 beds per RN) and significantly lower than what would be expected for L2 beds. Similar comments to the approach to staffing apply to these sites as the MOHS designated beds.

**Table 16: Baseline Bed/RN Ratios at MOHS Designated Sites**

HA	Hospital	Non Desig L2	24/7 RNs	Beds/RN
IHA	Kelowna	6	2	3.0
FH	Burnaby	8	2	4.0
VCH	St Paul's	8	2	4.0
	Richmond	3	1	3.0
	Lion's Gate	8	2	4.0
VIHA	Nanaimo	5	2	2.5
<b>Total</b>		<b>38</b>	<b>11</b>	<b>3.5</b>

Source: PHSA March 2005 telephone survey of sites.

In summary, the best estimate of bed equivalents currently used to support the 154 L2/L3 babies per day in BC is 190 @ 81% occupancy (2003/04 figures). These beds include both MOHS designated (141 beds, all of which are in established L2/L3 nurseries) and non-designated (49 beds, 38 of which are in established L1/L2 nurseries).

The next section discusses current and projected bed requirements in BC.

## 4.1.2 Current & Projected Need for L2/L3 Beds

### 4.1.2.1 Current Need for L2/L3 Beds

The current occupancy rate for the 190 beds used to support the 154 L2/L3 babies per day in BC is 81%. An occupancy rate of 75% was recommended by members of the Provincial Specialized Perinatal Steering Committee and other pediatric/neonatology specialists as a desired target for BC. A 75% occupancy rate provides the flexibility to manage peaks and troughs of activity, while at the same time provides a reasonable level of efficiency. This occupancy rate is close to that experienced in 1995/96 (77%).

In order to manage existing neonatal volumes of 154 L2/L3 babies per day at 75% occupancy, 206 L2/L3 beds are required. This compares to the current provincial capacity of 141 MOHS designated and 38 non-designated beds (total: 179 beds), for a difference of 27 beds. These figures do not include L2/L3 beds that are scheduled to open in FH (3 beds at each of MSA and Surrey Memorial), VIHA (4 beds in Nanaimo) and NHA (3 beds in Prince George) in 2005/06/07 and a further 4 beds in FH (MSA) in 2008 (total: 17 beds).

In order to effectively operate the provincial system of neonatal care, it is recommended that the 27 L2/L3 beds identified as required be designated, staffed and funded appropriately to meet existing need. While it could be argued that these beds are already in use and therefore funded (the use of L2 neonatal beds are not “discretionary” and cannot be deferred on the basis of available resources), lack of a “formal” L2 designation and dedicated core staffing currently limits the availability of these beds on a consistent basis to the provincial system of care.

The impact of the lack of “designated” beds on a consistent basis is twofold:

- (1) Babies are cared for in HA beds that are non-designated and potentially under-resourced for the level of care required (or alternatively resources are diverted from other areas of perinatal care to provide for these babies).
- (2) Babies are transferred outside their home HA for care that could potentially have been provided in their home HA (most often to BC Women’s).

The proposed allocation of the additional beds across HAs is discussed in section 6.1 (neonatal bed requirements).

#### **4.1.2.2 Projected Need for L2/L3 Beds**

In addition to designating and staffing the 27 L2/L3 beds required to “right size” the system, the model was used to project L2/L3 bed requirements in 2010 and 2020. Application of the model for this purpose suggests the need for an additional 7 beds (6 L2 and 1 L3) between now and 2010 and a further 21 beds (15 L2 and 6 L3) between 2010 and 2020 (total: 28 beds between now and 2020).

The proposed allocation of the additional beds across HAs is discussed in section 6.1 (neonatal bed requirements).

## **4.2 Obstetrical Beds**

### **4.2.1 Existing Numbers of Obstetrical Beds**

Identification of numbers of L2/L3 obstetrical beds is much less clear cut than for neonatal beds. Challenges to estimating the current number and use of L2/L3 obstetrical beds include:

- ≠# There is no segregation of L1, L2 or L3 obstetrical beds in BC hospitals.
- ≠# Obstetrical beds are located in multiple locations (triage, labour/delivery rooms, single room maternity care and antepartum/post partum beds).
- ≠# Availability of obstetrical beds ebbs and flows with demand, especially in smaller centres (thus availability of beds is likely over-stated on some days).

While the existing number of L2/L3 obstetrical beds is not available, information on the *combined* number of L1/L2/L3 obstetrical beds was obtained through a PHSA survey

(March 2005) of maternity providing hospitals. The survey reveals a total of 707 obstetrical beds open in BC which include 47 triage, 145 labour/delivery, 110 single-room maternity and 405 antepartum/postpartum beds, the breakdown by HA of which is shown on the next table (details by hospital are available in Appendix 6).

**Table 17: Numbers and Locations of Obstetrical Beds as per PHSA Survey 2005**

HA	Maternity Beds Open					Maternity Beds Closed				
	Triage	L/D	Single Rm	AP/PP	Total Open	Triage	L/D	Single Rm	AP/PP	Total Closed
Interior	4	41	22	68	<b>135</b>	1	1	7	22	<b>31</b>
Fraser	18	25	49	86	<b>178</b>	0	1	9	16	<b>26</b>
Van Coastal	6	16	20	42	<b>84</b>	0	0	0	9	<b>9</b>
Van Island	5	24	4	84	<b>117</b>	0	0	0	5	<b>5</b>
North	8	26	7	56	<b>97</b>	0	1	0	9	<b>10</b>
PHSA	6	13	8	69	<b>96</b>	0	0	0	20	<b>20</b>
<b>Total</b>	<b>47</b>	<b>145</b>	<b>110</b>	<b>405</b>	<b>707</b>	<b>1</b>	<b>3</b>	<b>16</b>	<b>81</b>	<b>101</b>

*Source: Number of beds obtained through 2005 survey of health authorities*

Unfortunately neither the levels of care (L1, L2 or L3) nor location of care (triage, labour & delivery, single room or ante/post partum) is tracked through the CIHI DAD system and therefore reliable utilization data by level of care or location of care is not available. In the absence of definitive census data, a similar methodology (CIHI/HAY methodology) to that used to identify numbers of L2/L3 babies was utilized to estimate the number of L1/L2/L3 obstetrical beds in use daily.

Application of the described CIHI/HAY methodology suggests that approximately 355 women per day are cared for in the equivalent of 444 obstetrical beds in BC @ an estimated 80% occupancy. Nearly two-thirds (220 women per day) of these women were identified as L2 or L3 and the remaining one-third (135 women per day) were identified as L1.

#### **4.2.2 Projected Need for Obstetrical Beds Using the Planning Model**

While the model provides reasonable estimates of current L2 and L3 neonatal bed utilization, it is more limited in its ability to estimate current obstetrical bed utilization for the reasons discussed in the preceding section (lack of segregation of L1 from L2 or L3 obstetrical beds in BC hospitals, multiple locations of obstetrical beds within a hospital and frequent ebbs and flows in obstetrical bed availability that depend upon demand, especially in smaller centres).

In the absence of information to the contrary and as per the expressed opinion of experts on the PSPS, the following assumptions were made in projecting obstetrical bed needs:

- ⌘ Complex obstetrical cases will continue to be concentrated in centres with specialized obstetrical and neonatal personnel and beds (as per Perinatal Levels of Care document).
- ⌘ Highly specialized (ICU level) beds and resources will continue to be available in FH, VIHA and PHSA/VCH for use by high acuity obstetrical patients.
- ⌘ Projections will include L1, L2 and L3 bed needs since in reality L2 and L3 obstetrical beds are not separated from L1 obstetrical bed needs.
- ⌘ The current number of obstetrical beds is sufficient to meet current needs but additional beds will be required to meet future needs (existing beds are operating at full capacity<sup>12</sup>).
- ⌘ The desired occupancy rate for obstetrical beds is 80%. This figure was determined through a modeling exercise done at BC Women's which identified 80% as the rate which provides the flexibility to manage peaks and troughs of activity, while at the same time provides a reasonable level of efficiency. This figure was validated by members of the Provincial Specialized Perinatal Steering Committee and other specialists working in obstetrics.

Using the assumptions listed above, the model was used to project additional obstetrical beds (L1/L2/L3) that will be required in the future. Application of the model suggests the need for an additional 16 obstetrical beds between now and 2010 and a further 43 beds by 2020 (total: 59 beds between now and 2020). The proposed allocation of the additional beds across HAs is discussed in section 6.2 (obstetrical bed requirements).

## 5.0 Guiding Principles for System Design

The Provincial Specialized Perinatal Services (PSPS) Committee has identified a number of overarching principles for system redesign. These are:

**General Principles** (refer to *Perinatal Levels of Care* document, May 2005)

1. There will be three levels of maternal and newborn care in BC (as per Dr. Shoo Lee's recommendation to the Canadian Pediatric Society, 2004):
  - ⌘ Level 1 A & B            Primary Care/Normal Newborn Care
  - ⌘ Level 2 A & B            Secondary Care/High Dependency Neonatal Care
  - ⌘ Level 3 A, B & C        Tertiary Care/Neonatal Intensive Care
2. Centres designated as L1 will provide both L1 maternal and L1 newborn care; similarly, hospitals designated as L2 centres will provide L2 maternal and L2 newborn care and L3 centres will provide L3 maternal and L3 newborn care. In cases

---

<sup>12</sup> Existing beds refer to those that are opened and staffed. Closed beds that are not open or staffed are not included in these figures (but are a potential source of beds to satisfy future need).

where this is not feasible, centres will be located as close together as possible and will operate as one system of care.

3. There will be guidelines for minimum and maximum expectations of care at each of L1, 2 & 3 centres (see Perinatal Levels of Care document). In order that care can be provided in the appropriate setting, centres are not intended to exceed their expected level of care. Exceptions may occur on a planned basis for specific patients and following consultation with specialists at L2 or 3 centres (shared care), most often to accommodate issues of geographic distances and/or isolation.
4. In addition to their role within the provincial system of care, L1, 2 & 3 centres will provide care to women and babies within their own health authority (and local communities). Therefore, L2 centres will provide care for L1 & L2 women and babies and L3 centres will provide care for L1, 2 & 3 women and babies.
5. All providers of maternal and newborn care services will collaborate on the provision of clinical services, as well as on coordinating education and conducting research, in BC.
6. A framework for system evaluation will be developed which includes qualitative and quantitative data and will be used to monitor and respond to issues of access, quality, integration and coordination of maternal/newborn services in BC.

### **Principles for the Distribution of L2/L3 Services**

7. Women and babies will receive services as close to home as possible, with consideration to balancing effectiveness (quality), efficiency (quantity) and cost and the availability of skilled personnel, appropriate facilities/equipment and transportation systems.
8. Health authorities will establish regional systems to facilitate care being provided to women and babies as close to home as possible, where the care is within the scope of practice, resources and/or expertise of the HA. Hospitals within a health authority will work collaboratively to achieve this end. Some variation of this principle will exist in the Lower Mainland, given the geographic proximity and historical referral patterns.
9. All HAs are expected to accept the timely transfer of women and babies receiving care in other HAs, where the care is within the scope of practice, resources and/or expertise of the HA.
10. The distribution of L2/L3 beds in BC will consider the availability of both neonatal and obstetrical resources. If L2 and/or L3 neonatal beds are to be designated at a particular site, the corresponding obstetrical resources will be available.

11. The high intensity end of L3 neonatal services (often referred to as quaternary services) will continue to be centralized at PHSA (BC Women’s). Such services might include complex sub-specialty surgery, extra-corporeal membrane oxygenation and specialty consultation for complex congenital anomalies and other complications.
12. Unit sizes of nurseries will balance effectiveness (quality), efficiency (quantity), cost and access. In general, the higher the level of acuity, the larger the critical mass required to facilitate optimization of effectiveness (quality), efficiency (quantity), cost and availability of skilled personnel.

## 6.0 Health Authority Level 2 & 3 Neonatal & Obstetrical Bed Requirements

### 6.1 Neonatal Beds

The level of need for L2/L3 beds within individual HAs requires focused attention in two key areas:

- ∄# Location of L3 neonatal centres.
- ∄# Potential shifts in referral patterns of L2/L3 babies

#### 6.1.1 Locations of L3 Centres

Three scenarios were considered for the locations of L3 neonatal centres in BC. The scenarios included L3 centres in either three or four health authorities, each of which involved varying combinations of PHSA/VCH, FH, VIHA and IHA. While NHA was considered as a potential location, it was ruled out for reasons of insufficient patient volumes to maintain competence, efficiency/costs and availability of skilled personnel.

The scenarios identified and the factors considered in developing a recommendation for locations of L3 neonatal centres were the same as those outlined in the *Report on Tertiary Neonatal Care in BC (Shoo Lee et al, April 2002)*. A summary of the factors and the relative pros and cons of each scenario is provided on the next table.

**Table 18: Pros and Cons of Potential Scenarios for the Location of L3 Centres**

Location of L3 Centres	Scenario A	Scenario B	Scenario C
	FH, PHSA, VIHA	IHA, FH, PHSA	IHA, FH, PHSA, VIHA
Adequate patient volumes	++	+++	++
Efficiency/costs	++	+++	+
Safety	++	++	+
Lab/specialist support	+++	++	++
Proximity to quaternary center	++++	+++	++
Available skilled personnel	+++	++	+
Patient access to facilities	++	+++	++++
Convenience to families	++	+++	++++

**Scenario A (recommended)** offers adequate patient volumes at all sites to maintain efficiency, effectiveness and rapid access to specialized medical support, is most likely to be successful at attracting skilled personnel, and is the best option for maintaining a world class academic center in BC. Patient access and convenience are not as high in this scenario as in scenarios B and C.

**Scenario B** offers better patient access (especially in bad weather) and convenience for IHA and NHA residents, and potentially lower costs than scenario A. This scenario is less likely to be successful at attracting and retaining skilled personnel, particularly sub specialists (neonatal and obstetrical). This scenario would require consolidation of some of the outlying L2 beds into the L2/L3 centre in order to create a sufficient critical mass to efficiently offer an L3 service. Of note is that L2/L3 babies living outside the community in which the L3 centre is located would still require transportation (mothers, babies and families) and transportation (infant transport or commercial transport) may be no easier for patients or families within IHA than between IHA cities and Vancouver.

**Scenario C** offers the best patient access and convenience but is the most expensive option, least efficient or safe, and least likely to be successful at attracting and retaining skilled personnel. This scenario would split the limited supply of highly skilled personnel between 4 sites.

**Following a review of the pros and cons of each scenario, continuation of the existing scenario of three L3 centers (VIHA, FH and PHSA) is recommended.** While the combined volume of L2/L3 babies in the IHA would justify the establishment of an L3 centre, this option was not recommended for several reasons, including transportation patterns (infant transport team and commercial flight operations) and the need to consolidate many of the outlying L2 beds into the L2/L3 centre if the centre was to be viable. It was agreed that a re-evaluation of the numbers of L3 neonatal centers needs to be undertaken again in another 10 – 15 years to identify new variables and their potential impacts (e.g., changes in service delivery patterns and population needs and the impact of medical schools operating outside the Lower Mainland).

The next section discusses the second area that requires focused attention in planning the distribution of L2/L3 neonatal beds, namely potential shifts in referral patterns. The scenarios that follow assume continuation of the existing locations of L3 centres (VIHA, FH and PHSA).

## 6.1.2 Potential and Anticipated Shifts in Referral Patterns

The second factor that impacts the level of need for neonatal beds within individual HAs is referral patterns. The potential to change referral patterns and increase rates of self-sufficiency varies by HA.

The planning exercise discussed a range of options for changing referral patterns, with continuation of existing referral patterns at one end of the range (conservative option) and repatriation of 100% of L2 days (all HAs) and 70% of L3 days (VIHA and FH and only<sup>13</sup>) at the other end (aggressive option). While the opportunities for IHA, VIHA and NHA are limited, opportunities for FH are significant.

Details of bed requirements that assume existing referral patterns are provided in the next section. The impact of potential repatriation of babies to their home HA is discussed.

### 6.1.2.1 Bed Requirements Assuming Existing Referral Patterns

If existing referral patterns continue (conservative option), additional L2/L3 beds are required currently in all HAs with the exception of NHA where the number appears to be sufficient. After “right sizing” the system, further beds are required in all HAs through to 2020, with the most significant being in PHSA/VCH (15 beds now and another 8 beds between now and 2020) and FH (6 beds now and another 12 beds between now and 2020). Details are shown on the next table.

**Table 19: Calculated & Available Neonatal Beds Assuming Existing Referral Patterns: Current, 2010 & 2020**

HA of Tx	Calculated Need for Beds (using Planning Model)									Available Beds (Current)			
	Current			2010			2020			MOHS Desig			Non-Desig
	L2	L3	Total	L2	L3	Total	L2	L3	Total	L2	L3	Total	L2
IHA	17	0	17	20	0	20	21	0	21	7		7	6
FHA	51	11	62	53	11	64	61	13	74	36	12	48	8
VCHA/PHSA	52	39	91	54	39	93	56	43	99	24	33	57	19
VIHA	21	5	26	21	5	26	24	5	29	16	3	19	5
NHA	10	0	10	10	0	10	11	0	11	10		10	0
<b>Total</b>	<b>151</b>	<b>55</b>	<b>206</b>	<b>158</b>	<b>55</b>	<b>213</b>	<b>173</b>	<b>61</b>	<b>234</b>	<b>93</b>	<b>48</b>	<b>141</b>	<b>38</b>

*Note:*

*Available beds do not include beds that are planned to open but have not yet opened: 6 L2/L3 beds in FH (MSA and Surrey Memorial), 3 in NHA (Prince George) and 4 in VIHA (Nanaimo) in 2005/06/07 and a further 4 beds in FH (MSA) in 2008 (total: 17 beds).*

<sup>13</sup> Assumes 30% of L3 patient days are for the provision of high intensity L3 (quaternary) neonatal services which will continue to be centralized at BC Women’s. The 30% estimate was based on the estimate in the *Report on Tertiary Neonatal Care in BC* (Shoo Lee et al, April 2002) and is very close to the current VIHA experience (33%).

**Table 20: Differences, Calculated & Available Neonatal Beds, Existing Referral Patterns: Current, 2010 & 2020**

HA of Tx	Dif, Calculated Need vs Available Beds; + = surplus; ( ) = shortfall								
	Current			2010			2020		
	L2	L3	Total	L2	L3	Total	L2	L3	Total
IHA	(4)	0	(4)	(7)	0	(7)	(8)	0	(8)
FHA	(7)	1	(6)	(9)	1	(8)	(17)	(1)	(18)
VCHA/PHSA	(9)	(6)	(15)	(11)	(6)	(17)	(13)	(10)	(23)
VIHA	0	(2)	(2)	0	(2)	(2)	(3)	(2)	(5)
NHA	0	0	0	0	0	0	(1)	0	(1)
<b>Total</b>	<b>(20)</b>	<b>(7)</b>	<b>(27)</b>	<b>(27)</b>	<b>(7)</b>	<b>(34)</b>	<b>(42)</b>	<b>(13)</b>	<b>(55)</b>

### 6.1.2.2 Impact of Changes in Referral Patterns (Repatriation) on Bed Requirements

The opportunities for IHA, VIHA and NHA to increase levels of self-sufficiency through repatriation of L2/L3 babies are limited, while those for FH are significant.

#### *Interior, Vancouver Island and Northern HAs*

If it was considered desirable and feasible for IHA, VIHA and NHA to repatriate 100% of L2 days and 70%<sup>14</sup> of L3 days (VIHA only<sup>15</sup>) back to their home HA, the respective HAs would require 3, 2 and 3 additional beds respectively in the short-term and further minor adjustments in the long-term. These beds would be in addition to those already identified as required in the current referral pattern scenario (the bed requirement for PHSA/VCH would be reduced accordingly). Details of the calculations for IHA, VIHA and NHA are shown on the next table.

<sup>14</sup> Assumes 30% of L3 patient days are for the provision of high intensity L3 (quaternary) neonatal services which will continue to be centralized at BC Women's. The 30% estimate was based on the estimate in the *Report on Tertiary Neonatal Care in BC* (Shoo Lee et al, April 2002) and is consistent with the current VIHA experience.

<sup>15</sup> Repatriation of L3 days is only possible in FH and VIHA as these are the only HAs other than PHSA/VCH that provide L3 services.

**Table 21: Potential Bed Equivalents that Could be Repatriated to Home HAs: Current Year, 2010 & 2020**

HA of Residence	Neonatal Days per Year Cared for Outside Home HA			Neonatal Beds @ 75% Occupancy											
				Beds Used to Provide Care Outside Home HA (100% L2 & L3)			Potential Beds that Could be Repatriated (100% L2 & 70% L3)								
				Current			Current			2010			2020		
				L2	L3	Total	L2	L3	Total	L2	L3	Total	L2	L3	Total
IHA	954	1,511	2,465	3	6	9	3	0	3	4	0	4	4	0	4
VIHA	137	568	705	1	2	3	1	1	2	1	1	2	1	1	2
NHA	826	1,292	2,118	3	5	8	3	0	3	3	0	3	3	0	3
<b>Total</b>	<b>1,917</b>	<b>3,371</b>	<b>5,288</b>	<b>7</b>	<b>12</b>	<b>19</b>	<b>7</b>	<b>1</b>	<b>8</b>	<b>8</b>	<b>1</b>	<b>9</b>	<b>8</b>	<b>1</b>	<b>9</b>

**Fraser Health Authority**

FH has established 87% as its target self-sufficiency rate for all programs (current rate is 74% for L2/L3 neonatal days). If this target were to be achieved with the current volume of births, bed requirements for FH would increase by 17 beds in addition to the 6 bed shortfall identified in the current referral pattern scenario (total shortfall: 23 beds). Details of shortfalls now through to 2020 if aggressive repatriation were to occur are shown on the next table. Bed requirements for PHS/VCH would reduce accordingly.

**Table 22: Calculated Neonatal Bed Need & Available Beds Assuming FH 87% Self-Sufficiency: Current, 2010 & 2020**

HA of Tx	Calculated Need for Beds (using Planning Model)									Available Beds (Current)			
	Current			2010			2020			MOHS Desig			Non-Desig
	L2	L3	Total	L2	L3	Total	L2	L3	Total	L2	L3	Total	L2
Existing Referral Patterns	51	11	62	53	11	64	61	13	74	36	12	48	8
87% Self-Sufficiency	59	20	79	61	20	81	71	24	95	36	12	48	8
Difference	(8)	(9)	(17)	(8)	(9)	(17)	(10)	(11)	(21)				

**Table 23: Difference, Calculated Neonatal Bed Need & Available Beds Assuming FH 87% Self-Sufficiency: Current, 2010 & 2020**

HA of Tx	Dif, Calculated Need vs Available Beds; + = surplus; ( ) = shortfall								
	Current			2010			2020		
	L2	L3	Total	L2	L3	Total	L2	L3	Total
Existing Referral Patterns	(7)	1	(6)	(9)	1	(8)	(17)	(1)	(18)
87% Self-Sufficiency	(15)	(8)	(23)	(17)	(8)	(25)	(27)	(12)	(39)
Difference	(8)	(9)	(17)	(8)	(9)	(17)	(10)	(11)	(21)

### 6.1.2.3 Range of Bed Requirements, Existing Referral Patterns through to Aggressive Repatriation

The bed requirement for individual HAs depends upon the desirability and feasibility of changing current referral patterns (i.e., degree of repatriation that can be realistically achieved). Factors to consider in determining desired levels of HA self-sufficiency include patient safety, availability of skilled personnel, availability of adequate facilities/space, patient and family convenience and efficiency/costs.

The need for beds in individual HAs is influenced by assumptions made about referral patterns. As these assumptions require additional exploration amongst HAs, the bed allocations provided in the next table offer the extremes of the potential range of need, namely (1) continuation of existing referral patterns; and (2) aggressive repatriation. The difference between the two scenarios is most pronounced for FH and PHSA/VCH.

**Table 24: Calculated Need for Neonatal Beds Assuming Continuation of Existing Referral Patterns & Aggressive Repatriation: Current, 2010 and 2020**

HA of Tx	Calculated Need for Beds (using the Planning Model)						Available Beds (current)		
	Existing Referral Patterns			Aggressive Repatriation			MOHS Desig	Non- Desig Beds	Total Beds
	Current	2010	2020	Current	2010	2020			
IHA	17	20	21	20	24	25	7	6	13
FHA	62	64	74	79	81	95	48	8	56
VCHA/PHSA	91	93	99	66	67	69	57	19	76
VIHA	26	26	29	28	28	31	19	5	24
NHA	10	10	11	13	13	14	10	0	10
<b>Total</b>	<b>206</b>	<b>213</b>	<b>234</b>	<b>206</b>	<b>213</b>	<b>234</b>	<b>141</b>	<b>38</b>	<b>179</b>

*Notes:*

*Aggressive repatriation assumes 100% of L2 and 70% of L3 patient days are repatriated back to IHA, VIHA and NHA and FH achieves an 87% self-sufficiency rate.*

## 6.2 Obstetrical Beds

While there is some concentration of specialized obstetrical services in BC, it is much less intense than that for neonatal services. Most of the HAs appear to be fairly self-sufficient for the majority of their obstetrical cases (even relatively complex cases), although there continues to be a need to concentrate complex obstetrical cases in centres with specialized obstetrical and neonatal personnel and beds. The most logical concentration is for the tertiary obstetrical centres to align with the L2/L3 neonatal centres.

While most HAs appear to be fairly self-sufficient for the majority of their obstetrical cases, opportunities exist from time to time to make further gains in this area. One

example currently being explored is the use of fibronectin testing in selected women in the detection of pre-term labour. This test can be conducted at point of care and has the potential to reduce the number of maternal transfers by 60 – 80 per year (out of a total of 550 - 600 maternal transfers per year that are coordinated through BC Women's).

Suspected pre-term labour is the most common reason for maternal transfer (200 per year). While initiatives such as these need to be pursued for reasons of good practice, the impact on overall obstetrical bed requirements is not anticipated to be significant for the purposes of this planning exercise.

Estimates of bed requirements that assume existing referral patterns are provided in the next section, as well as estimates in the event FH were to achieve its stated goal of 87% self-sufficiency.

### 6.2.1 Bed Requirements Assuming Existing Referral Patterns

Significant increases in the number of obstetrical beds are required over the next 20 years, with IHA and FH requiring the highest increases. *Increases* over existing numbers of obstetrical beds are shown on the next table.

**Table 25: Calculated Need for Incremental Obstetrical Beds, Existing Referral Patterns: Current, 2010 & 2020**

	Shortfall, 2010 vs Current; ( ) = shortfall					Shortfall, 2020 vs 2010; ( ) = shortfall					Shortfall, 2020 vs Current
	Triage	L/D	Single Rm	AP/PP	Total	Triage	L/D	Single Rm	AP/PP	Total	
IHA	(0)	(3)	(2)	(6)	(11)	(0)	(1)	(1)	(2)	(4)	(15)
FH	(0)	(1)	(1)	(2)	(4)	(2)	(3)	(6)	(11)	(22)	(26)
VCH/PHSA	0	0	0	1	2	(1)	(2)	(1)	(7)	(11)	(9)
VIHA	(0)	(0)	(0)	(1)	(2)	(0)	(1)	(0)	(3)	(4)	(6)
NHA	(0)	(0)	(0)	(1)	(1)	(0)	(1)	(0)	(1)	(2)	(3)
<b>TOTAL</b>	<b>(1)</b>	<b>(4)</b>	<b>(3)</b>	<b>(8)</b>	<b>(16)</b>	<b>(3)</b>	<b>(7)</b>	<b>(8)</b>	<b>(24)</b>	<b>(43)</b>	<b>(59)</b>

### 6.2.2 Impact of Changes in Referral Patterns (Repatriation) on Bed Requirements

While some opportunities exist to increase the self-sufficiency of HAs in managing obstetrical cases (e.g., fetal fibronectin testing), the impact on bed requirements for IHA, VIHA and NHA is not anticipated to be substantive.

Substantive opportunity does exist, however, for increasing self-sufficiency rates for FH. The issue of sizable numbers of FH women being cared for in VCH/PHSA hospitals is complex and the reasons are likely many. Further work needs to be done to identify and quantify specific factors. Shifting the flow of FH women from VCH/PHSA to FH hospitals will require considerable effort by FH and VCH/PHSA, a cooperative plan, shared targets and a joint commitment to implement the plan. With a projected increase of 3,500 or 22% of total births to FH women to occur between 2003 and 2020, existing as well as future service demands need to be considered.

FH has established 87% as its target self-sufficiency rate for all programs (current rate is 82% for births and 76% for patient days). If this target were to be achieved, an additional 24 beds would be required over the next 15 years over and above the 26 bed shortfall required to meet growth under the existing referral scenario (total: 50 beds). A

comparison of bed requirements under both scenarios is shown on the table below (with a corresponding decrease in need for PHSA/VCH beds).

**Table 26: Comparison of Calculated Incremental FH Obstetrical Bed Need, Existing Referral Patterns & 87% Self-Sufficiency Rate: Current, 2010 & 2020**

FH	Shortfall, 2010 vs Current; ( ) = shortfall					Shortfall, 2020 vs 2010; ( ) = shortfall					Shortfall, 2020 vs Current
	Triage	L/D	Single Rm	AP/PP	Total	Triage	L/D	Single Rm	AP/PP	Total	
Existing Referral Patterns	0	(1)	(1)	(2)	(4)	(2)	(3)	(6)	(11)	(22)	(26)
87% Self-Sufficiency	(3)	(4)	(7)	(12)	(25)	(3)	(4)	(7)	(12)	(25)	(50)
Difference in Shortfall	(3)	(3)	(6)	(10)	(21)	(1)	(0)	(1)	(1)	(3)	(24)

### 6.2.3 Range of Bed Requirements, Existing Referral Patterns through to Aggressive Repatriation in FH

The bed requirements for IHA, VIHA and NHA are unlikely to be impacted significantly by referral patterns (already fairly self-sufficient) and no additional modeling was done for these HAs. Bed requirements for FH, however, have significant potential to be impacted by referral patterns (i.e., repatriation) and an 87% self-sufficiency scenario was projected (with the corresponding reduction in VCH/PHSA beds). The range of obstetrical bed requirements for both scenarios (all HAs) is summarized on the table below.

**Table 27: Comparison of Calculated Incremental Bed Need, Existing Referral Patterns vs 87% FH Self-Sufficiency Rate: Current, 2010 and 2020**

	Current Referral Patterns			FH 87% Self Sufficiency		
	( ) = shortfall; + = surplus			( ) = shortfall; + = surplus		
	2010 vs Current	2020 vs 2010	2020 vs Current	2010 vs Current	2020 vs 2010	2020 vs Current
IHA	(10)	(5)	(15)	(10)	(5)	(15)
FHA	(5)	(21)	(26)	(25)	(25)	(50)
VCH/PHSA	1	(12)	(11)	21	(8)	13
VIHA	(1)	(4)	(5)	(1)	(4)	(5)
NHA	(1)	(1)	(2)	(1)	(1)	(2)
<b>TOTAL, ALL</b>	<b>(16)</b>	<b>(43)</b>	<b>(59)</b>	<b>(16)</b>	<b>(43)</b>	<b>(59)</b>

## 7.0 Recommendations

1. Operate the specialized perinatal system of care as a provincial program to assure provincial consistency, standardization, and accountability, in collaboration with effective and efficient regional systems.
2. Establish regional perinatal coordinating structures within each HA to support perinatal planning, development of effective and efficient regional systems and implementation of provincial initiatives.

3. Regional perinatal coordinating structures to work within the provincial perinatal structure to clearly designate centres and beds available for L1, L2A, L2B and L3 level care within their HA, utilizing the data and directions within this report.
4. Develop processes to monitor the census, capacity to accept new patients and reasons for being unable to accept new patients on a daily basis at all MOHS designated and non-designated sites identified on the PHSA survey. Summarize the results in a monthly report to the PSPS Committee and augment with information on patterns of patient transfer within and across HAs.

*Neonatal Beds*

5. Provincially, increase the number of neonatal beds as follows (figures are above and beyond the existing 141 MOHS designated and 38 non-designated beds):
  - a. Between now and 2010: 34 beds (27 required immediately and 7 to accommodate future growth)
  - b. Between 2010 and 2020: 21 beds
6. Continue to centralize L3 neonatal beds within 3 health authorities (VIHA, PHSA and FH), with quaternary level services being provided at BCWs/BC Children's.
7. Continue to offer L2 neonatal services within each health authority, with a goal to increase the level of self-sufficiency within individual HAs; where desirable and feasible, develop a target rate, phased-in implementation plan and timeline.

Two extremes for distributing L2/L3 beds are shown on the table below; one assumes current referral patterns and one assumes aggressive repatriation.

**Table 28: Comparison of Calculated (Existing Referral Patterns & Aggressive Repatriation) & Available Neonatal Beds: Current, 2010 and 2020**

HA of Tx	Calculated Need for Beds (using the Planning Model)						Available Beds (current)		
	Existing Referral Patterns			Aggressive Repatriation			MOHS Desig	Non- Desig Beds	Total Beds
	Current	2010	2020	Current	2010	2020			
IHA	17	20	21	20	24	25	7	6	13
FHA	62	64	74	79	81	95	48	8	56
VCHA/PHSA	91	93	99	66	67	69	57	19	76
VIHA	26	26	29	28	28	31	19	5	24
NHA	10	10	11	13	13	14	10	0	10
<b>Total</b>	<b>206</b>	<b>213</b>	<b>234</b>	<b>206</b>	<b>213</b>	<b>234</b>	<b>141</b>	<b>38</b>	<b>179</b>

**Table 29: Difference in the Calculated (Existing Referral Patterns & Aggressive Repatriation) & Available Neonatal Beds: Current, 2010 and 2020**

HA of Tx	Dif, Calculated vs Available Beds; + = surplus; ( ) = shortfall					
	Existing Referral Patterns			Aggressive Repatriation		
	Current	2010	2020	Current	2010	2020
IHA	(4)	(7)	(8)	(7)	(11)	(12)
FHA	(6)	(8)	(18)	(23)	(25)	(39)
VCHA/PHSA	(15)	(17)	(23)	10	9	7
VIHA	(2)	(2)	(5)	(4)	(4)	(7)
NHA	0	0	(1)	(3)	(3)	(4)
<b>Total</b>	<b>(27)</b>	<b>(34)</b>	<b>(55)</b>	<b>(27)</b>	<b>(34)</b>	<b>(55)</b>

8. Review the staffing levels (and related funding) of MOHS designated L2/L3 neonatal beds to ensure sufficient baseline staffing to accommodate occupancy levels of 80% and above.
9. Examine the circumstances surrounding the relatively high proportion of L1 babies occupying L2/L3 beds and determine whether other options for care might exist that would benefit mothers and babies and might result in more appropriate utilization of L2/L3 beds.
10. Work with community based programs to further develop strategies to support the care of special need babies in the community (e.g., programs for home oxygen and intensive feeding support).

#### *Obstetrical Beds*

11. Provincially, increase the number of obstetrical beds as follows:
  - a. Between now and 2010: 16 L1/L2/L3 obstetrical beds.
  - b. Between 2010 and 2020: 43 L1/L2/L3 obstetrical beds.
12. Continue to centralize complex obstetrical cases in tertiary centres which align with the specialized neonatal beds (VIHA, PHSA and FH).
13. PHSA/VCH to work with FH to identify mechanisms to increase self-sufficiency rates in FH for obstetrical services; where desirable and feasible, develop a target rate, phased-in implementation plan and timeline.

Two extremes for distributing new obstetrical beds are shown on the table below; one assumes current referral patterns and one assumes aggressive FH repatriation (to achieve FHs stated goal of 87% self-sufficiency).

**Table 30: Comparison of Calculated Incremental Bed Need, Existing Referral Patterns & 87% FH Self-Sufficiency Rate: Current, 2010 and 2020**

	Current Referral Patterns			FH 87% Self Sufficiency		
	( ) = shortfall; + = surplus			( ) = shortfall; + = surplus		
	2010 vs Current	2020 vs 2010	2020 vs Current	2010 vs Current	2020 vs 2010	2020 vs Current
IHA	(10)	(5)	(15)	(10)	(5)	(15)
FHA	(5)	(21)	(26)	(25)	(25)	(50)
VCH/PHSA	1	(12)	(11)	21	(8)	13
VIHA	(1)	(4)	(5)	(1)	(4)	(5)
NHA	(1)	(1)	(2)	(1)	(1)	(2)
<b>TOTAL, ALL</b>	<b>(16)</b>	<b>(43)</b>	<b>(59)</b>	<b>(16)</b>	<b>(43)</b>	<b>(59)</b>

14. Pursue mechanisms that enable perinatal women to remain in their home HA to the extent possible (e.g., fetal fibronectin testing).

## 8.0 Summary

This report identifies and quantifies the need for additional neonatal and obstetrical beds to support a projected increase in births between now and 2020. It includes a summary of historical birth trends and the current status of specialized obstetrical and neonatal beds in BC. Through the development of a planning model, current and future need for obstetrical and neonatal beds have been estimated and compared to existing numbers and distribution of beds. The analysis builds on work completed by Dr. Shoo Lee et al in April 2002 and summarized in a report entitled *Report on Tertiary Neonatal Care in BC*. While the methodologies and timelines for data analysis that were used by Dr. Shoo Lee (benchmark comparisons of numbers of beds per capita) and the one used to define bed needs in this paper (use of BC specific CIHI data) differ, the conclusion is the same – additional neonatal beds are required to enable effective functioning of the provincial system of neonatal (and obstetrical) care. Additional obstetrical beds are also identified as required to meet projected increases in births.

The next step in this process will be for individual HAs to review these recommendations and their respective bed requirements, identify a preferred configuration for L2/L3 neonatal and obstetrical beds within each HA and develop an implementation plan, timeline and budget to meet their bed requirements. With the establishment of the HA structure and the Provincial Specialized Perinatal Service Committee (PSPS), BC is well positioned to ensure timely implementation of these recommendations.

## **Appendix 1: Highlights of Relevant Reports**

### **Report on Tertiary Neonatal Care in BC, Centre for Healthcare Innovation and Improvement, Shoo Lee et al, April 2002**

At the request of the BC Ministry of Health, a comprehensive review was undertaken by the Centre for Health Innovation and Improvement in 2002 on the current state of tertiary neonatal services and outcomes in BC and to compare these with the rest of Canada. The review included a review of 96/97 data from the Canadian Neonatal Intensive Care Unit database, which was updated through a cross-Canada telephone survey of 17 sites.

The review drew several conclusions, most notably the following:

- ⌘ Live births in BC have steadily declined over the past 5 years and are projected to stabilize until 2010, after which time they will increase.
- ⌘ BC has one of the lowest numbers of combined L3/L2 neonatal beds amongst the Canadian provinces (3.6 and 3.4 per thousand births respectively).
- ⌘ Current regionalization system is effective and efficient.
- ⌘ BC fares favorably to the national average for incidences of major adverse outcomes amongst babies admitted to the NICU. Transport outcomes in BC were comparable to the rest of Canada.
- ⌘ Level 3 neonatal beds:
  - ⌘ The use of Level 3 beds is very efficient in BC compared to the rest of Canada, partly because of a centralized system for patient referral and transfer.
  - ⌘ The current supply of Level neonatal beds is adequate to meet the provincial needs until 2010, although a reallocation of a small number of beds from BCW's to each of RCH (2 beds) and VGH (1 bed) is recommended. Beyond 2010, the needs are expected to rise.
- ⌘ Level 2 neonatal beds:
  - ⌘ Currently 10 sites provided L2 care, although only 7 are funded by the MOHS to provide this level of care.
  - ⌘ The current supply of Level 2 neonatal beds is inadequate and below the national average. An additional 24 to 44 beds are required to meet demand until 2010 (-1 bed for Victoria, +7 beds for PHSA/VCH, +12 beds for FH, +8 beds for IHA and +2 beds for NHA). Beyond 2010, the needs are expected to rise.
  - ⌘ The impact of a Level 2 neonatal bed shortage is a heavy reliance on Level I nurseries to care for Level 2 babies in BC.

### **Perinatal Services Plan, BearingPoint, Oct 2002**

- ⌘ In December 2001, the PHSA mandated C&W to coordinate the development of a provincial tertiary perinatal services plan and to chair a plan advisory Task Group (representatives from the MOH and each of the 6 Health Authorities). Group was co-chaired by the MOH & C&W.
- ⌘ Report recommends the establishment of a provincial tertiary perinatal services program and identifies 14 steps to complete to move forward with the implementation (steps and current status are outlined earlier in this report).

- ⌘ Recommendation was submitted and approved by the provincial Leadership Council (CEO's & MOHS).
- ⌘ Factors identified as contributing to the need for such a program are as follows:
  - Ongoing threats of service withdrawal;
  - Human resource limitations and competition between facilities for human resources;
  - Lack of a coordinating structure for integrated planning and service management;
  - Lack of a current provincial strategy for delivering services;
  - Limitations in province-wide accountability provisions, monitored clinical standards and quality assurance mechanisms in place for tertiary perinatal services.
  - Health Authorities are completing independent services plans, with potential implications for tertiary perinatal services.
- ⌘ Discussion about the current definitions of tertiary neonatal and perinatal care. Definitions were developed to distinguish levels of funding, rather than defining care needs; determining factor is the tertiary requirement of the fetus or baby, not the mother.
- ⌘ Describes current provincial tertiary capacity - 3 sites providing maternal ICU's, 7 funded L2 and/or L3 nurseries (147 beds) and 5 unfunded L2 and/or L3 nurseries (28 beds).
- ⌘ No recommendation provided re future citing of L2 or L3 services other than an overall direction that services should be available at more than one site.
- ⌘ Issues identified for further discussion/resolution: (1) response times by BCW/BCCH physicians to provide consultation; (2) lack of transparency in the criteria for triage decisions by BCW/BCCH physicians; (3) timeliness of reverse transports (may have resolved with new BCAS goal to respond to reverse transfer requests within 24 hours).
- ⌘ Similar issues re nursery overcrowding are discussed as per those in the report by Shoo Lee et al (see above).
- ⌘ Planning objectives, principles and requirements (service and program) were identified and confirmed by the Advisory Group.
- ⌘ Proposes a structure for the provincial tertiary perinatal services program:
  - Program to fall within the mandate of the PHSA, Women & Family Health Programs and represented by the PHSA in the Provincial Leadership Council forum.
  - A medical and program director will be appointed.
  - A permanent Program Advisory Committee with representation from each of the 6 HAs will inform program activity and policy development.
  - Decision support resources (Centre for Healthcare Innovation and Improvement; BCRCP).
- ⌘ Proposes a role for the provincial tertiary perinatal services program is provided.

***Provincial Specialized Perinatal Services Program, BearingPoint, June 2003***

- ⌘ Follow up to Oct 2002 Perinatal Services Plan.
- ⌘ Report discusses the rationale for changes for the Provincial Specialized Perinatal Services Program (fragmented care delivery, indicators for tertiary care are based on services provided rather than need, human resource planning).
- ⌘ Summarizes the current resources of the tertiary sites (beds & physicians/midwives) - PHSA (C&W), FH (RCH) & VIHA (Victoria General).
- ⌘ Proposes:
  - Principles & elements of a provincial integrated clinical & academic perinatal health care program – similar to those identified in the Oct 2002 report but simplified.
  - Roles and responsibilities of a provincial program (roles of the local delivery site, health authority, PHSA and provincial specialized perinatal network). Some HA specific roles identified.
  - Establishment of an Operations Planning Committee for the Provincial Specialized Perinatal Services (PSPS) program.

*BC Perinatal Services Costing Project: Report on Costs in the Neonatal Intensive Care Unit, Centre for Healthcare Innovation and Improvement, Shoo Lee & Lauren Anderson, Jan 2004.*

- ⌘ Discusses the costs associated with neonatal care as part of the BC Perinatal Services Costing project.
- ⌘ Goal is to develop a classification system for neonatal beds based on resource use and a funding formula based on the proposed classification and actual resource use.
- ⌘ Retrospective analysis of the costs associated with care in the NICU at BCWs. Utilized 2001/02 patient data and 2002/03 costs; costs include all costs, both direct (e.g., direct nursing, pharmacy and surgical supplies) and allocated (indirect costs, diagnostics, procedures, consultations, allied health worker costs, depreciation and indirect nursing costs). Physician costs and physical plant costs are not included.
- ⌘ Cost for NICU: \$32.2M (\$19.7M cost of care + \$12.5 attributable costs). 65% of costs were direct costs, 25% indirect costs and 10% depreciation costs.
- ⌘ Analysis of the level 3 criteria in the current classification system does not have a strong effect on bed cost/day. Proposes a new classification system where all assisted ventilation days are classified as level 3 days and all remaining days are L2.
- ⌘ Using the proposed classification system, the mean daily cost of level 3 care was \$1,702/day. Assuming a 77% occupancy, \$1,315/day should be allocated to each level 3 bed/day. Due to the extra costs associated with high acuity care, an additional cost of \$10,020 should be added for each PPHN patient and an additional \$2,880 for each surgical patient.
- ⌘ The mean daily cost of L2 care was \$1,180. Assuming a 77% occupancy, \$909/day should be allocated to each L2 bed/day.

*BC Perinatal Services Costing Project: Report on Costs of Perinatal Care, Centre for Healthcare Innovation and Improvement, Shoo Lee & Lauren Anderson, May 2004.*

- ⌘ Discusses the costs associated with perinatal care as part of the BC Perinatal Services Costing project.

- €# Goal is to develop a funding formula for perinatal care in BC.
- €# Retrospective analysis of the costs associated with care at BC Women's. Utilized 2001/02 patient data and 2002/03 costs; costs include all costs, both direct (e.g., direct nursing, pharmacy and surgical supplies) and allocated (indirect costs, diagnostics, procedures, consultations, allied health worker costs, depreciation and indirect nursing costs). Physician costs and physical plant costs are not included.
- €# Cost for perinatal care: \$47.7M (24.3M cost of care + \$23.4M attributable costs); 72% of costs were direct costs, 27.5% indirect costs and .5% depreciation costs.
- €# Of the costs of care, triage/assessment comprises 3.6%, antepartum 11.8%, labour & delivery 51.5% and postpartum 33%.
- €# Funding formula recommended is \$905/patient for triage, \$348/AP bed/day @ 82% occupancy rate; \$1,859 per delivery for SRMC care and \$2,656 per LDR patient and \$524/PP bed/day. A surgical care supplement of \$1,735 should be added for patients requiring surgical care.

## Appendix 2: Birth Trends, 1995 & 2003

Indicator	1995		2003		Dif, 2003 vs 1995		Change in Past 10 Years <sup>16</sup>	Implications on Service Utilization	
	#	%	#	%	#	%			
Fertility (per women 15-44 yrs old)		1.59		1.39		(0.20)	Slow reduction		
Live births (per 1,000 population)	46,762	12.40	40,285	9.72	(6,477)	(2.68)	Slow decrease		
Stillbirths (per 1,000 live births)	347	7.40	289	7.12	(58)	(0.28)	No significant change		
Seasonal births	Not statistically significant in either year, although Nov - Feb had lowest #'s & May/June highest								
Age of mother having children	<20	2,618	5.6%	1,475	3.7%	(1,143)	(1.9%)	Slow decrease	# preterm or LBW babies is reduced with reduced teenage pregnancies
	20-29	23,339	49.9%	17,309	43.0%	(6,030)	(6.9%)	Slow decrease	
	30-39	19,890	42.5%	20,094	49.9%	204	7.3%	Slight increase	
	40+	915	2.0%	1,407	3.5%	492	1.5%	Significant increase	Increased rate of AP & labour and delivery complications; increased risk of preterm birth, multiple birth, LBW & adm to NICU with advanced maternal age
	<b>Total</b>	<b>46,762</b>	<b>100.0%</b>	<b>40,285</b>	<b>100.0%</b>	<b>(6,477)</b>	<b>0.0%</b>		
Births to primipara mothers	21,725	46.5%	18,108	44.9%	(3,617)	(1.5%)	Decrease		
Multiple births	982	2.1%	1,177	2.9%	195	0.8%	Increase, esp age 35+		
Caesarean sections	9,288	19.9%	11,367	28.2%	2,079	8.3%	Increase, all ages, especially 35+ & 20-34	Longer lengths of stays	
Mode of delivery	Spontaneous vertex	32,000	68.4%	24,556	61.0%	(7,444)	(7.5%)	Decrease	
	Spontaneous breech	390	0.8%	128	0.3%	(262)	(0.5%)		
	Forceps/vacuum	4,514	9.7%	4,234	10.5%	(280)	0.9%	More vacuum; less forceps	
	First c/s	5,889	12.6%	7,280	18.1%	1,391	5.5%	Increase	

<sup>16</sup> Note: Level of significance has not been assessed.

Indicator		1995		2003		Dif, 2003 vs 1995		Change in Past 10 Years <sup>16</sup>	Implications on Service Utilization
		#	%	#	%	#	%	%	
	Repeat c/s	3,399	7.3%	4,087	10.1%	688	2.9%	Increase	
	None stated	570	1.2%	0	0.0%	(570)	(1.2%)		
	<b>Total</b>	<b>46,762</b>	<b>100.0%</b>	<b>40,285</b>	<b>100.0%</b>	<b>(6,477)</b>	<b>0.0%</b>		
Live births with maternal complications		21,695	46.4%	20725	51.4%	(970)	5.1%		
Live births with perinatal complications		16,226	34.7%	13538	33.6%	(2,688)	(1.1%)		
Infant mortality	Infant death < 1 yr of age	276	0.6%	163	0.4%	(113)	(0.2%)	Decrease, all ages	
Low birth weight babies	<1,500	123	0.3%	356	0.9%	233	0.6%	Significant increase	82% of newborns weighing 1,500 - 2,499 g were admitted to NICU (01/02); median LOS 23 days
	1,500-2,499	2,058	4.4%	1,773	4.4%	(285)	0.0%		62% of newborns weighing 1,500 - 2,499 g were admitted to NICU (01/02); median LOS 7 days
	<b>Total &lt;2,500</b>	<b>2,181</b>	<b>4.7%</b>	<b>2,129</b>	<b>5.3%</b>	<b>(52)</b>	<b>0.6%</b>	No significant change	
Pre-term/term/post-term	<27 wks	191	0.4%	174	0.4%	(17)	0.0%	Slight increase	Significantly higher rates of morbidity and mortality
	28-36 wks	2,852	6.1%	2,715	6.7%	(137)	0.6%	Increase	
	37-41	42,157	90.2%	37,031	91.9%	(5,126)	1.8%		
	42-45	1,402	3.0%	326	0.8%	(1,076)	(2.2%)	Decrease	
	None stated	160	0.3%	39	0.1%	(121)	(0.2%)		
	<b>Total</b>	<b>46,762</b>	<b>100.0%</b>	<b>40,285</b>	<b>100.0%</b>	<b>(6,477)</b>	<b>0.0%</b>	Increase	

Source:

1. *Vital Statistics 1995 & 2003 Annual Reports*
2. *Implications on Service Utilization: Giving Birth in Canada: A Regional Profile (CIHI, 2004) & the Canadian Perinatal Health Report (Health Canada, 2003)*

Notes:

1. Includes events that occurred in BC for BC residents only (excludes events to non-residents and events to BC residents that occurred outside BC)
2. 1995: Utilizes ICD-9 coding; 2003: Utilizes ICD-10 coding

### Appendix 3: Newborn Discharges and Days at MOHS Designated Level 2 & 3 Centres, 1995/96 to 2003/04

Hospital	Indicator	1995/1996	1996/1997	1997/1998	1998/1999	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	2003/04 vs 1995/96	
											#	%
BCW's/BCCH	D/C'es with L2/L3 Days	1,439	1,422	1,444	1,400	1,338	1,251	1,191	1,223	1,274	(165)	(11%)
	Total L2 Days	6,809	6,159	6,107	6,691	6,040	6,967	7,116	6,686	7,708	899	13.2%
	Total L3 Days	12,736	11,829	10,575	10,971	10,373	8,726	8,866	9,620	10,659	(2,077)	(16%)
	Total L2 & L3 Days	19,545	17,988	16,682	17,662	16,413	15,693	15,982	16,306	18,367	(1,178)	(6%)
Royal Columbian Hospital	D/C'es with L2/L3 Days	527	619	618	528	555	578	493	561	508	(19)	(4%)
	Total L2 Days	7,068	5,985	6,082	6,246	5,506	5,657	5,111	5,839	5,517	(1,551)	(22%)
	Total L3 Days	1,812	1,984	1,866	2,255	2,495	2,672	2,740	3,438	2,543	731	40.3%
	Total L2 & L3 Days	8,880	7,969	7,948	8,501	8,001	8,329	7,851	9,277	8,060	(820)	(9%)
Surrey Memorial	D/C'es with L2/L3 Days	255	493	521	477	458	446	539	451	436	181	71.0%
	Total L2 Days	1,436	2,447	2,567	2,922	2,794	3,185	4,361	4,329	4,273	2,837	197.6%
	Total L3 Days	0	0	0	10	43	25	30	13	38	38	n/a
	Total L2 & L3 Days	1,436	2,447	2,567	2,932	2,837	3,210	4,391	4,342	4,311	2,875	200.2%
Victoria General	D/C'es with L2/L3 Days	383	474	509	487	454	487	517	533	530	147	38.4%
	Total L2 Days	2,638	3,360	4,715	4,190	4,136	4,229	4,202	4,225	3,977	1,339	50.8%
	Total L3 Days	1,317	2,167	885	788	894	1,348	1,242	1,466	1,311	(6)	(0%)
	Total L2 & L3 Days	3,955	5,527	5,600	4,978	5,030	5,577	5,444	5,691	5,288	1,333	33.7%
Royal Inland	D/C'es with L2/L3 Days	217	232	226	194	168	193	165	181	195	(22)	(10%)
	Total L2 Days	1,390	1,430	1,566	1,569	1,367	1,430	1,485	1,831	2,071	681	49.0%
	Total L3 Days	0	0	0	0	0	0	0	0	0	0	0.0%
	Total L2 & L3 Days	1,390	1,430	1,566	1,569	1,367	1,430	1,485	1,831	2,071	681	49.0%
MSA Hospital	D/C'es with L2/L3 Days	278	278	278	278	278	283	257	284	268	(10)	(4%)
	Total L2 Days	1,527	1,527	1,527	1,527	1,527	1,487	1,501	1,828	1,466	(61)	(4%)
	Total L3 Days	0	0	0	0	0	0	0	0	0	0	0.0%
	Total L2 & L3 Days	1,527	1,527	1,527	1,527	1,527	1,487	1,501	1,828	1,466	(61)	(4%)
Prince George	D/C'es with L2/L3 Days	396	482	568	450	403	337	289	219	216	(180)	(45%)
	Total L2 Days	2,910	3,203	3,626	2,340	3,089	2,591	1,953	2,420	2,217	(693)	(24%)
	Total L3 Days	18	0	3	0	0	0	0	0	0	(18)	(100%)
	Total L2 & L3 Days	2,928	3,203	3,629	2,340	3,089	2,591	1,953	2,420	2,217	(711)	(24%)
Total	D/C'es with L2/L3 Days	3,495	4,000	4,164	3,814	3,654	3,575	3,451	3,452	3,427	(68)	(2%)
	Total L2 Days	23,778	24,111	26,190	25,485	24,459	25,546	25,729	27,158	27,229	3,451	14.5%
	Total L3 Days	15,883	15,980	13,329	14,024	13,805	12,771	12,878	14,537	14,551	(1,332)	(8%)
	Total L2 & L3 Days	39,661	40,091	39,519	39,509	38,264	38,317	38,607	41,695	41,780	2,119	5.3%

Source: MOHS DAD dataset, BCWs/BCCH internal dataset, Royal Inland internal dataset (1995/96 & 1996/97)

Notes:

1. Includes all acute discharges with some NICU L2 and/or NICU L3 days, regardless of patient service.
2. SCN cases reported under BCCH from 1994/95 - 1999/2000 have been merged with BCW cases in these years in an attempt to provide comparable data.
3. 1995/96 - 98/99 data was not available for MSA Hospital; 1909/00 data was assumed for these years (to allow annual comparisons at a provincial level).

## **Appendix 4: Summary of Assumptions Used in the Planning Model**

### **Demand Projections**

#### **Numbers & age distribution of mothers**

- €# # of births will be as per PEOPLE 29 projections.
- €# The percentage of high-risk (ages 35 – 50) to low-risk women will decline until 2015 (approximately) and will then begin to increase.
- €# The birth rate in women between the ages of 35 and 50 will continue to increase.
- €# The distribution (%) of births to high and low-risk women will remain relatively constant between now and 2020 (20/080).

#### **Type & Acuity of Cases**

- €# % of L2 & L3 deliveries and babies will remain as per 2003/04, using CIHI/HAY Group classification of acuity (i.e., # of L2 & L3 births will increase at the same rate as the number of total births). This includes:
  - €# % of assisted and c/s deliveries, including the % with and without complications.
  - €# % of women admitting with various antepartum diagnoses, with and without complications.
  - €# % of L2 & L3 babies, including the % in each birth weight classification (<750 gms, 750-999 gms, 1,000-1,499 gm) and the % with and without complications.

#### **Length of Stay**

- €# LOS for women and babies will remain as per 2003/04 (i.e., length of stay for a c/s will remain as per 2003/04, same with vaginal deliveries).

### **Bed/Supply Requirements**

- €# Desired obstetrical occupancy is 80% and L2/L3 neonatal occupancy is 75%.
- €# Obstetrical supply includes the total requirement for triage, labour/delivery, single room and ante/post partum beds.

### **Distribution of Beds/Services**

- €# The % of births and L2/L3 neonatal days within and outside each HA will remain as per 2003/04, with the exception of FH.
- €# Two scenarios are discussed for FH, one where existing referral patterns continue and one where FH achieves 87% self-sufficiency.
- €# Optimum unit size is 12 for an L2 nursery and 20+ for a combined L2/L3 nursery.

## ***Appendix 5: Estimate of Proportions of L1, L2 & L3 Babies in MOHS Designated & Non-Designated Beds***

The most significant challenge of this planning exercise was to estimate the actual number of L2/L3 babies cared for in BC hospitals. While a significant amount of BC data is available through the CIHI Discharge Abstract Data (DAD) system, classification of the data using this system (Case Mixed Groups) does not align with the classification levels used in BC. In the absence of such an alignment, a methodology that was developed for use in Ontario (CIHI/HAY Consulting Group methodology) was utilized to establish the “size of the pie” and the L2/L3 proportions for this planning exercise.

While useful for this planning exercise, the definitions used in the CIHI/HAY methodology were considered by many to be “generous” and represent the outer limits of use/need for L2/L3 beds in BC. A proportion of babies that would be classified as L1B in BC were classified as L2 when the CIHI/HAY methodology was applied; similarly a proportion of babies that would be classified as L2 in BC were classified as L3 when the CIHI/HAY methodology was applied. As accurate census data was available on the use of L3 beds in BC, an adjustment factor could be applied to correct the L2/L3 anomaly. Accurate census data was not available on the use of L1B/L2 beds so L1/L2 bed requirements were consolidated and identified as L2. The latter is consistent with the purpose of this planning exercise which was to capture the needs of babies requiring a more intensive level of care than that which could be provided on a maternity unit.

While not used in the estimates or projections, a site survey and brief review of selected data was undertaken in order to better understand and estimate the level of care of babies in MOHS designated and non-designated beds. All hospitals identified as having MOHS designated and non-designated beds in nurseries were contacted and asked to estimate the proportion of L1, L2A, L2B and L3 babies in their respective nurseries on any given day. These proportions were compared with other data sources and significant inconsistencies were discussed with contacts at the respective sites. Data sources used to “validate” the estimated proportions of babies by care level included:

- ≠ Bed utilization sheets - these sheets are completed daily by the Clinical Nurse Leaders in the BC Women’s Special Care Nursery and contains bed availability information that is provided by L2 and L2/L3 nurseries (usually by telephone).
- ≠ Numbers of oxygen, TPN and ventilator days for 2003/04 (obtained from the BCRCPC database).
- ≠ Percentage of L2 and L3 babies identified in the BC CIHI data in MOHS designated nurseries (similar information is not available for non-designated nurseries).
- ≠ Application of the CIHI/HAY methodology to actual Case Mix Groups (CMGs) for babies in MOHS designated nurseries (CMGs for MOHS non-designated nurseries are not available).

Provincially, the analysis suggests that 45% of L2/L3 beds are used to care for L1 babies, 15% for L2A babies, 13% for L2B babies and 27% for L3 babies. Further study is recommended to identify the circumstances surrounding the relatively high proportion of L1 babies in L2/L3 nurseries and determine whether other options for care might exist that would benefit mothers and babies and might result in more appropriate utilization of L2/L3 beds.

Levels of care are significantly higher in MOHS designated nurseries than non-designated nurseries as is shown on the next table. These differences are consistent with differences in staffing levels in these two types of nurseries.

**Table 31: Estimated Use of MOHS Designated and Non-Designated L2/L3 Nursery Beds, by Care Level**

Hospital	Total Beds	Avg Census	Bed Use per Day (#)						Bed Use per Day, excl Vacant Beds (%)				
			L1	L2A	L2B	L3	Vacant	Total	L1	L2A	L2B	L3	Total
MOHS Desig	141	119	44	14	20	41	22	141	37%	12%	17%	34%	100%
Non-Desig	38	33	24	9	0	0	5	38	73%	27%	0%	0%	100%
<b>Total, All Beds</b>	<b>179</b>	<b>152</b>	<b>68</b>	<b>23</b>	<b>20</b>	<b>41</b>	<b>27</b>	<b>141</b>	<b>45%</b>	<b>15%</b>	<b>13%</b>	<b>27%</b>	<b>100%</b>

*Note: The average census is estimated at 119 babies per day rather than 114 because 2004/05 census data was used for Royal Columbian and Victoria General (reflects current reality).*

*Source: PHSA site survey with “validation” from other data sources.*

Specifics of the estimated use of MOHS designated nursery beds by care level are shown on the next table.

**Table 32: Estimated Use of MOHS Designated L2/L3 Nursery Beds, by Care Level**

Hospital	MOHS Desig'n	Total Beds	Avg Census	Bed Use per Day (#)						Bed Use per Day, excl Vacant Beds (%)				
				L1	L2A	L2B	L3	Vacant	Total	L1	L2A	L2B	L3	Total
Royal Inland	L2	7	6	4	2	1	0	1	7	63%	28%	9%	0%	100%
MSA	L2	5	4	3	2	0	0	1	5	63%	38%	0%	0%	100%
RCH	L2	16	15	6	3	6	0	1	16	42%	17%	42%	0%	100%
	L3	12	10	0	0	0	9	3	12	0%	0%	0%	100%	100%
	Total	28	25	6	3	6	9	3	28	26%	10%	26%	38%	100%
SMH	L2	15	12	8	2	2	0	3	15	63%	19%	19%	0%	100%
Vic Gen	L2	16	14	10	1	3	0	2	16	74%	7%	19%	0%	100%
	L3	3	2	0	0	0	2	1	3	0%	0%	0%	100%	100%
	Total	19	16	10	1	3	2	3	19	64%	6%	17%	14%	100%
PG	L2	10	6	4	1	0	0	4	10	70%	23%	7%	0%	100%
BC Women's	L2	24	21	9	4	8	0	3	24	43%	19%	38%	0%	100%
	L3	33	29	0	0	0	29	4	33	0%	0%	0%	100%	100%
	Total	57	50	9	4	8	29	7	57	18%	8%	16%	58%	100%
<b>Total MOHS Designated</b>	<b>L2</b>	<b>93</b>	<b>78</b>	<b>44</b>	<b>14</b>	<b>20</b>	<b>0</b>	<b>15</b>	<b>93</b>	<b>56%</b>	<b>18%</b>	<b>26%</b>	<b>0%</b>	<b>100%</b>
	<b>L3</b>	<b>48</b>	<b>41</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>41</b>	<b>7</b>	<b>48</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>100%</b>	<b>100%</b>
	<b>Total</b>	<b>141</b>	<b>119</b>	<b>44</b>	<b>14</b>	<b>20</b>	<b>41</b>	<b>22</b>	<b>141</b>	<b>37%</b>	<b>12%</b>	<b>17%</b>	<b>34%</b>	<b>100%</b>

*Note: The average census is estimated at 119 babies per day rather than 114 because 2004/05 census data was used for Royal Columbian and Victoria General (reflects current reality).*

*Source: PHSA site survey with “validation” from other data sources.*

Specifics of the estimated use of non-designated nursery beds by care level are shown on the next table.

**Table 33: Estimated Use of Non-Designated L2/L3 Nursery Beds, by Care Level**

Hospital	Total Beds	Avg Census	Bed Use per Day (#)						Bed Use per Day, excl Vacant Beds (%)				
			L1	L2A	L2B	L3	Vacant	Total	L1	L2A	L2B	L3	Total
Burnaby	8	6	4	2	0	0	2	8	62%	38%	0%	0%	100%
Kelowna	6	6	5	1	0	0	0	6	80%	20%	0%	0%	100%
St Paul's	8	6	4	3	0	0	2	8	58%	42%	0%	0%	100%
Lion's Gate	8	7	5	3	0	0	1	8	64%	36%	0%	0%	100%
Richmond	3	2	2	0	0	0	1	3	100%	0%	0%	0%	100%
Nanaimo	5	5	5	0	0	0	0	5	100%	0%	0%	0%	100%
<b>Total, Non Designated</b>	<b>38</b>	<b>33</b>	<b>24</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>38</b>	<b>73%</b>	<b>27%</b>	<b>0%</b>	<b>0%</b>	<b>100%</b>

*Source: PHSA site survey with "validation" from other data sources.*

While far from perfect, this methodology provides a very high level estimate of the level of care of babies currently cared for in both MOHS designated and non-designated nurseries. Improved data collection on levels of care and census would allow for the substitution of actual data for estimated data for future analyses.

## Appendix 6: Maternity Beds in BC

	Obstetrical Beds Open					Obstetrical Beds Closed				
	Triage	L/D	Single Rm	AP/PP	Total Open	Triage	L/D	Single Rm	AP/PP	Total Closed
100 Mile House		2		2	4					0
Boundary		1			1					0
<i>Cariboo (Williams Lake)</i>					0					0
Creston Valley	1	1	3		5	1	1	6	9	17
Dr Helmcken(Clearwater)		1			1					0
East Kootenay (Cranbrook)		4		5	9					0
Fernie		2		1	3					0
Golden		2			2					0
Kelowna	3	5		17	25				7	7
Kootenay Lake		2			2				6	6
Invermere		1	1	1	3					0
Lillooet		1	1	1	3					0
Penticton		4		7	11					0
Royal Inland		5	10	14	29					0
Shuswap		2	3		5			1		1
Trail		3	3		6					0
Queen Victoria		1	1	10	12					0
Vernon		4		10	14					0
<b>Sub-Total IHA</b>	<b>4</b>	<b>41</b>	<b>22</b>	<b>68</b>	<b>135</b>	<b>1</b>	<b>1</b>	<b>7</b>	<b>22</b>	<b>31</b>
Burnaby	2	5		18	25					0
Chilliwack	1		8	4	13					0
Langley			12		12					0
MSA	3	5		16	24					0
Peach Arch	1	3		7	11					0
RCH	4	8		28	40		1		16	17
Ridge Meadows	1	4		9	14					0
Surrey	6		29	4	39			9		9
<b>Sub-Total FH</b>	<b>18</b>	<b>25</b>	<b>49</b>	<b>86</b>	<b>178</b>	<b>0</b>	<b>1</b>	<b>9</b>	<b>16</b>	<b>26</b>
Bella Coola		1	1	1	3					0
Lions Gate	1	7		15	23				6	6
Powell River		2		3	5					0
Richmond	3	4		15	22				3	3
Squamish		2		2	4					0
St. Mary's			3		3					0
St. Paul's	2		16	6	24					0
<b>Sub-Total VCH</b>	<b>6</b>	<b>16</b>	<b>20</b>	<b>42</b>	<b>84</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>9</b>
Campbell River	1	2		12	15					0
Cowichan	2	3		6	11					0
Lady Minto (Salt Spring)		1			1					0
Nanaimo	1	5		16	22					0
Port McNeil		1		1	2					0
St. Joseph's		3		12	15					0
Tofino		1		1	2					0
Victoria General		8		36	44				5	5
West Coast	1		4		5					0

	Obstetrical Beds Open					Obstetrical Beds Closed				
	Triage	L/D	Single Rm	AP/PP	Total Open	Triage	L/D	Single Rm	AP/PP	Total Closed
<b>Sub-Total VIHA</b>	<b>5</b>	<b>24</b>	<b>4</b>	<b>84</b>	<b>117</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>5</b>
Bulkley Valley		2		5	7					0
Burns Lake	2				2					0
Chetwynd			1		1					0
Dawson Creek & District		3		3	6					0
Fort Nelson		1	1	3	5		1		2	3
Fort St. John	2	2		12	16				7	7
GR Baker (Quesnel)		2		2	4					0
Kitimat			3	1	4					0
Mills Memorial		3		6	9					0
Prince George	2	6		15	23					0
Prince Rupert	2	2			4					0
Queen Charlotte		1	1	1	3					0
St John		2	1	4	7					0
Stuart Lake		1			1					0
Wrinch Memorial		1		4	5					0
<b>Sub-Total NHA</b>	<b>8</b>	<b>26</b>	<b>7</b>	<b>56</b>	<b>97</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>9</b>	<b>10</b>
<b>Sub-Total PHSA (BCWs)</b>	<b>6</b>	<b>13</b>	<b>8</b>	<b>69</b>	<b>96</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>20</b>
<b>TOTAL, ALL</b>	<b>47</b>	<b>145</b>	<b>110</b>	<b>405</b>	<b>707</b>	<b>1</b>	<b>3</b>	<b>16</b>	<b>81</b>	<b>101</b>