

# **Obstetric Procedures**

**1988/89–1997/98**

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# Executive Summary

This report provides statistics on obstetric procedures performed as part of publicly funded maternity care in New Zealand's hospitals over the last ten years (1 July 1988 – 30 June 1998). The procedures are Caesarean section, instrumental vaginal delivery, inductions, epidural analgesia and episiotomy. The report also provides further analysis of obstetric procedures in the latest two years where more detailed information is available (1 July 96 to 30 June 98).

Data for the latest two years show a steady increase in the rate that women have Caesarean sections as they get older. Some 9% of deliveries are by Caesarean at age 17 while the figure is 28% at age 40. The increase is more marked for elective than for emergency Caesareans. This correlation has previously been noted in New Zealand and many other countries, and it appears to exist regardless of the overall rate of Caesarean sections. While some of the increase is due to women having repeat Caesarean sections and some may be due to non-clinical factors such as women's expectations and preference, it has also been suggested that part of the increase may be due to physiological changes in women as they age.

The latest two years' data also point to relationships between rates of all procedures and the mother's ethnicity and the socioeconomic deprivation of the area where she lives. For example, epidural analgesia was performed in about 14% of Māori women compared to 25% of non-Māori, and 17% for women from most deprived areas compared to 31% in those from least deprived areas. While such correlations have also been documented in some overseas studies, they are less constant findings than is age. Since many of the conditions that could lead to an increased clinical need for intervention (eg, factors such as smoking, poor nutrition, and lack of antenatal care) are commoner in Māori, Pacific women and women from more deprived areas, one might expect higher rates of interventions. However, the data point to an inverse relation, with rates being lower for those expected to have highest clinical need. It may be that factors to do with preferences and expectations are playing a more significant part than clinical need.

The data for the last ten years clearly show rises in national rates of Caesarean sections (11.7% in 1988/89 to 18.2% in 1997/98) and induced deliveries (7.0% and 22.1%). Over the same time instrumental vaginal deliveries have dropped a little. This may be a substitution effect with Caesarean sections taking the place of some forceps deliveries. Interestingly, vacuum extraction (Ventouse) has replaced forceps in many places over the last four years. Rates for epidural analgesia have risen rapidly (to 23.4% in 1997/98) while there has been a fall in episiotomies (to 6.4%). Comparisons show considerable variations between providers in rates of different procedures (Caesarean section rates, for example, range from 12.4% to 24.2% in our public hospitals). These differences persist even when adjusted for the effect of age on Caesarean section rates.

The report raises a number of questions for discussion and further analysis. Clinicians and hospitals need to look carefully at the rates of all these procedures to ensure that women are fully informed about consequences and that decisions to intervene are appropriate. Since these procedures use public health funds they also raise issues about the best use of limited resources.

# 1. INTRODUCTION

This report provides statistics on obstetric procedures performed as part of publicly funded maternity care in New Zealand's hospitals over the last ten years. Over that period more than 95% of all births in New Zealand occurred in hospital. Very few of the procedures analysed here are ever performed in the home setting.

The report analyses the National Minimum Dataset (NMDs) data for each of the years 1988/89 through to 1997/98. The NMDs, held by the New Zealand Health Information Service (NZHIS) of the Ministry of Health, contains both diagnostic and socio-demographic information about all women who were delivered in hospitals. This information is collected and reported by the hospitals themselves (including St Georges private hospital). In general, data are entered by hospital coders rather than directly by clinicians.

The report covers five procedures associated with deliveries, namely:

- Caesarean sections
- instrumental deliveries; (forceps and Ventouse vacuum extractions)
- induced deliveries; (medical inductions and artificial rupture of membranes to induce labour)
- episiotomies (cutting the woman's perineum at the time of delivery)
- epidural analgesia.

The specific codes used to define these procedures are given in the Appendix.

National data about procedures are analysed against age, socioeconomic need group, and ethnicity over the most recent two years. Data for the 10-year period are presented for each region and provider (both Health and Hospital Services (HHSs – formerly known as Crown Health Enterprises or CHEs) and publicly funded private providers). The discussion section of the report offers some observations about the data.

This report supplements other information published by the Ministry of Health, including Birth Statistics and Health Expenditure Trends.

## 2. NATIONAL RESULTS

The information presented in Figure 2.1 contains national information on women who were delivered through public funding in hospitals during 1997/98. Information is supplied on:

- delivery rates by five year age groups and ethnic groups
- length of stay information
- delivery rates by the level of socioeconomic deprivation of the area where the women live<sup>1</sup>.

Figure 2.2 presents the national rates per 100 deliveries for each of the procedures from 1988/89 to 1997/98. The changes that are shown in that figure are further analysed.

Figure 2.3 presents the national rates per 100 deliveries for both forceps deliveries and vacuum extractions, as well as total instrumental vaginal deliveries, from 1988/89 to 1997/98.

Figures 2.4 to Figure 2.9 present data on obstetric procedures from July 96 – June 98:

- Figure 2.4 shows procedure rates by mother's age. Figure 2.5 compares the rates of elective and emergency Caesarean section for 1997/98, broken down by whether the woman has had a previous Caesarean or not. Figure 2.6 shows procedure rates by ethnic groups. Figure 2.7 shows the rates after the data are adjusted for the age of the mother.
- Figure 2.8 shows procedure rates by socioeconomic need group<sup>1</sup>. Figure 2.9 shows the rates after the data are adjusted for the age of the mother.

See Section 4 for further discussion of these figures.

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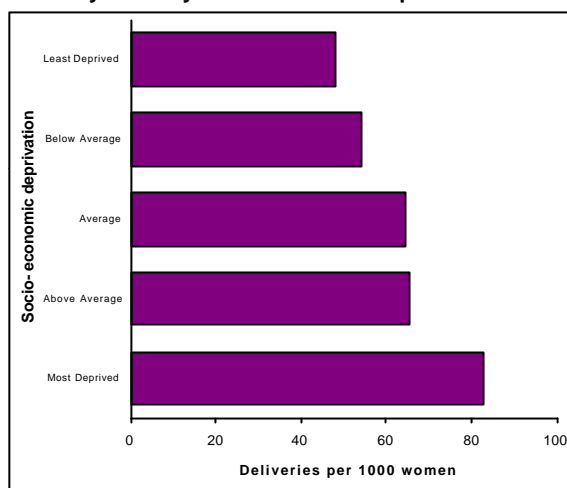
<sup>1</sup> These data uses the NZDep96 score to allocate women to one of five socioeconomic need groups. The scores are calculated from 1996 census data. The score provides a measure of the socioeconomic deprivation for a particular census area unit. Women are allocated to a particular score according to their address.

**Figure 2.1: National obstetric statistics, 1997/98**

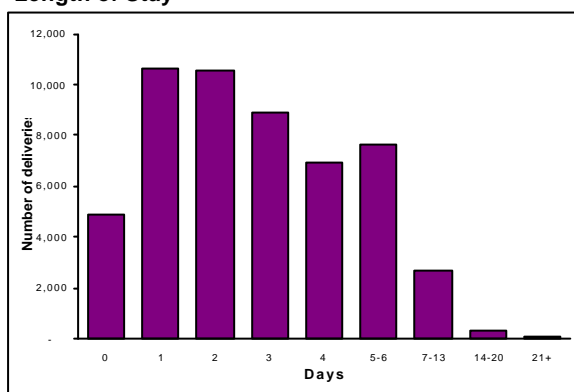
**Number of deliveries per 1000 women**

Age (yr)	Pacific people			Total
	Māori	people	Other	
<20	61.5	45.0	20.4	30.7
20-24	120.2	129.9	56.4	73.4
25-29	104.1	168.7	101.2	105.7
30-34	67.7	144.2	102.5	99.7
35-39	34.6	78.1	44.1	44.3
40+	9.5	22.5	7.6	8.4
<b>Total</b>	<b>70.6</b>	<b>103.8</b>	<b>56.2</b>	<b>61.2</b>

**Delivery rates by socioeconomic deprivation**



**Length of Stay**



**Length of Stay**

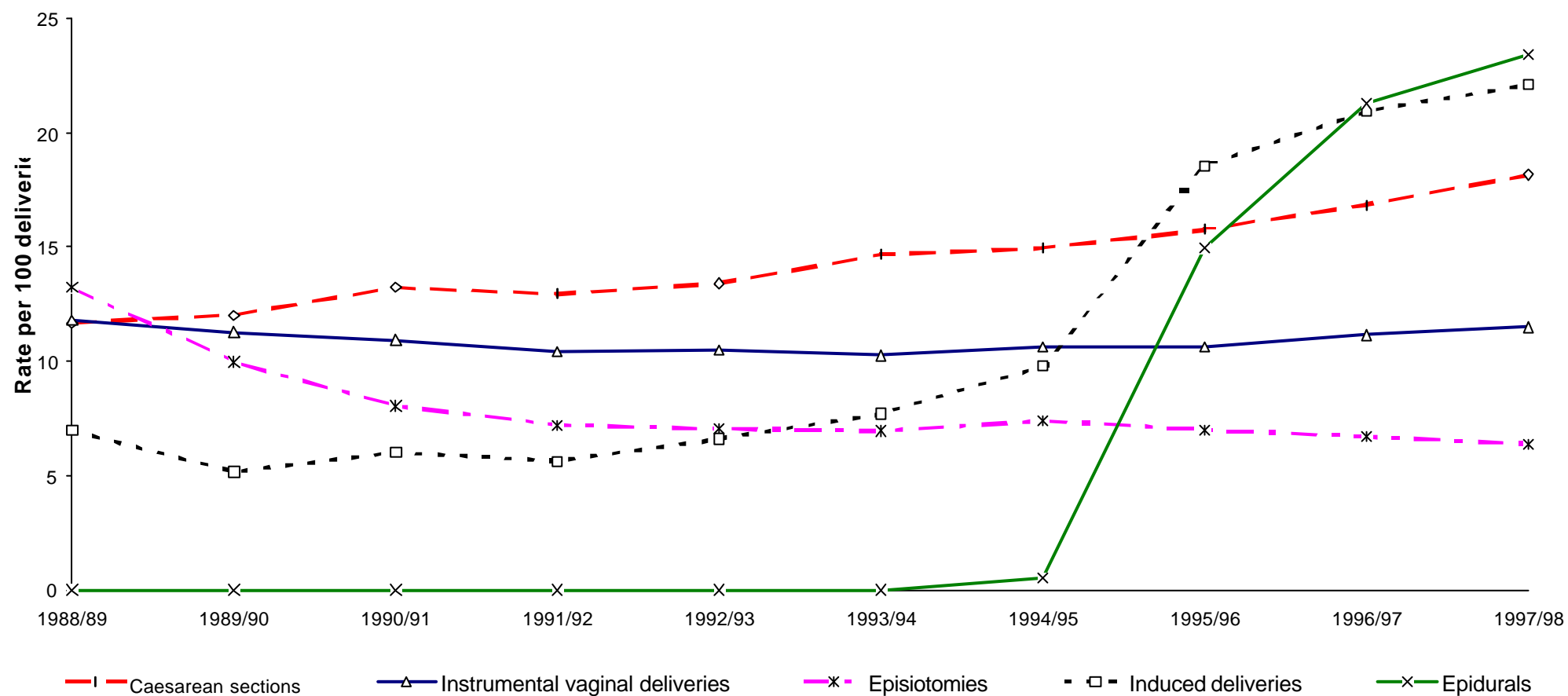
	Days
Average	3.0
Average - day cases excluded	3.3
Minimum	0
Maximum	60
Percentage day case	9.2

**Notes**

- 1 Source: Policy Branch, Ministry of Health.
- 2 Average length of stay is the average number of nights spent in hospital by a women who had a delivery.
- 3 Average length of stay is when all cases with a length of stay (LOS) greater than the 97th percentile for the AN-DRG have their LOS reduced to the 97th percentile for that AN-DRG.
- 4 A day case is a person admitted and discharged on the same day. Day patients do not include patients who died in hospital or transferred to another hospital.

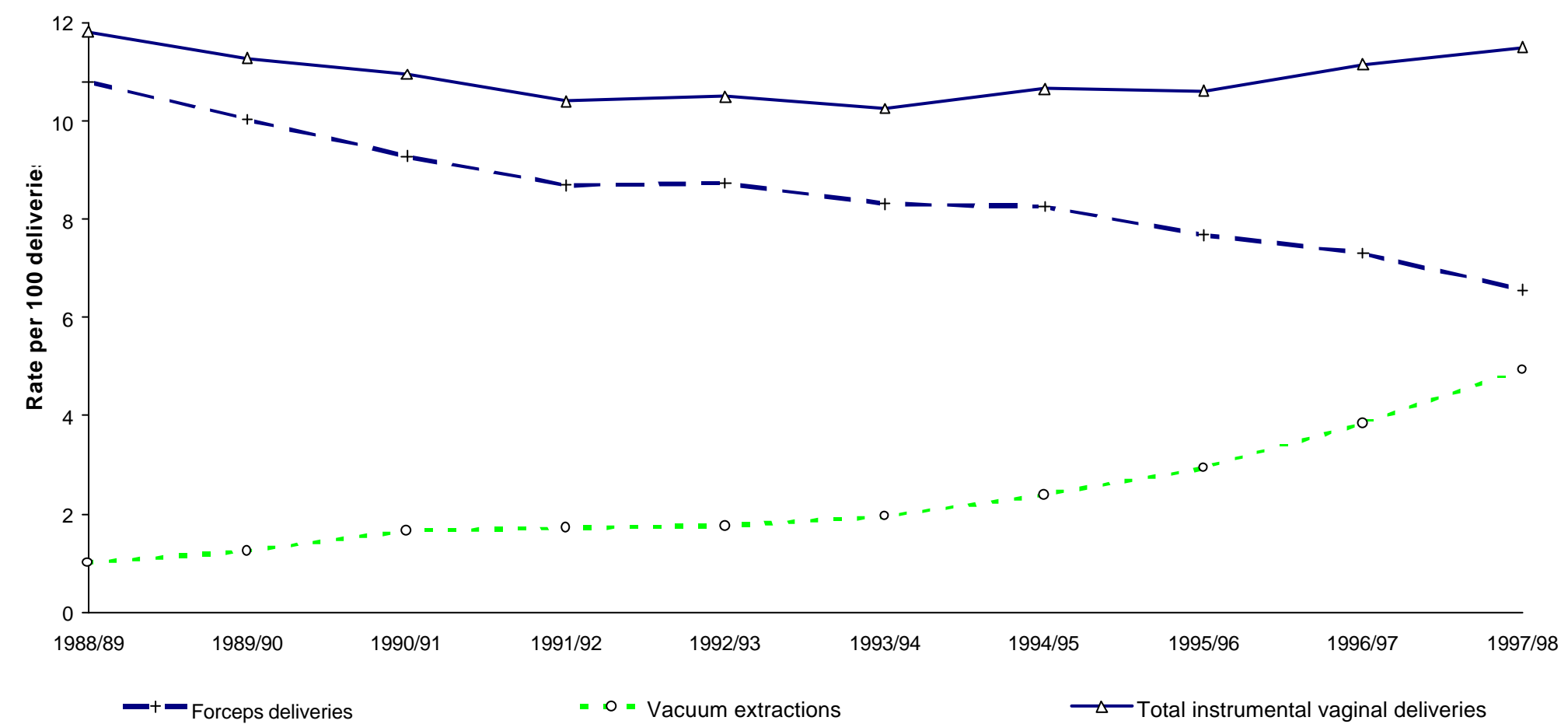


**Figure 2.2 National rates per 100 deliveries for five obstetric procedures, 1988/89 – 1997/98**

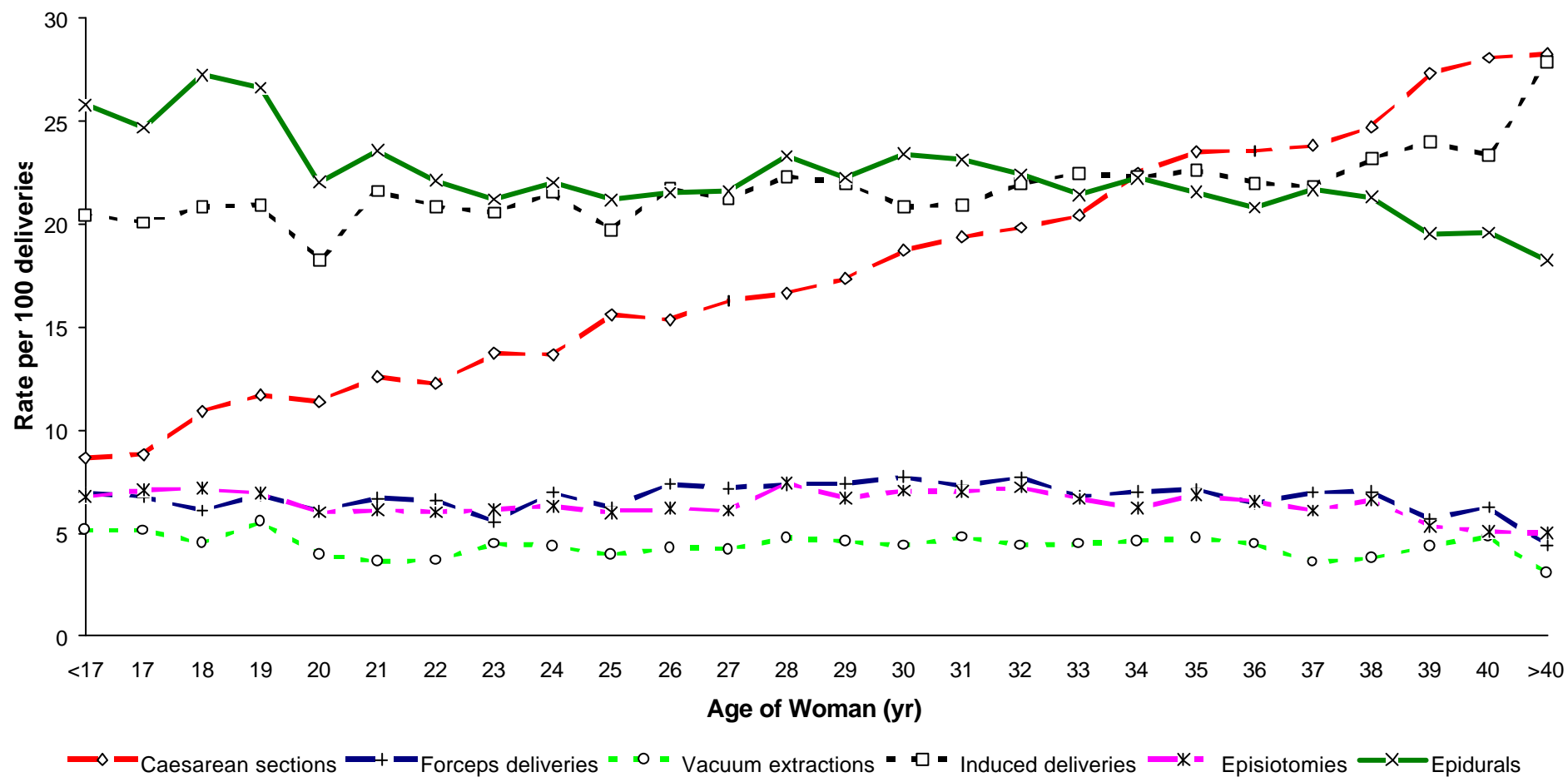


Note: The steep increase in induced deliveries between 1994/95 and 1995/96 is thought to be partly due to coding changes (see Section 3.3, and Section 4).

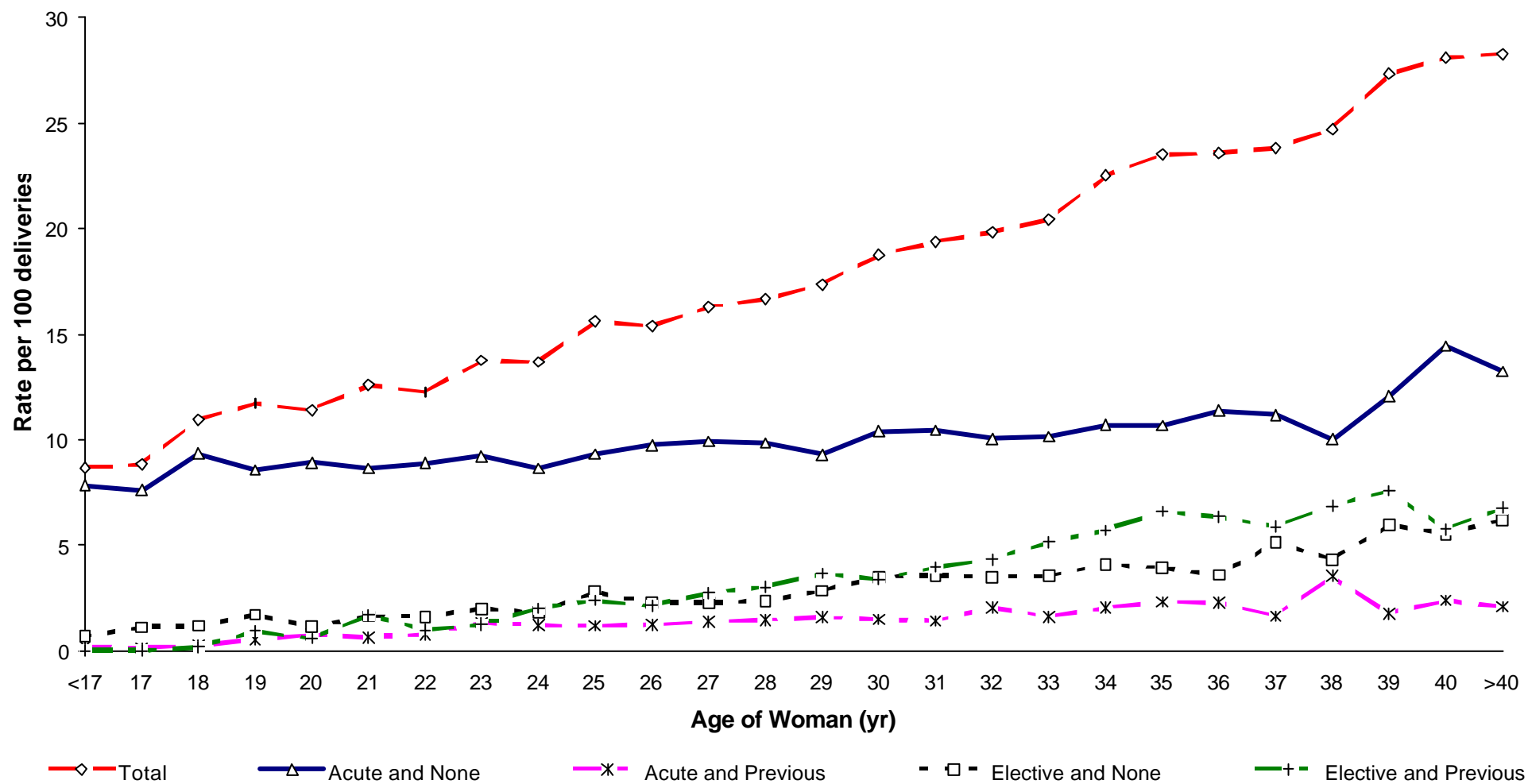
Figure 2.3 National rates per 100 deliveries for instrumental vaginal delivery procedures, 1988/89 – 1997/98



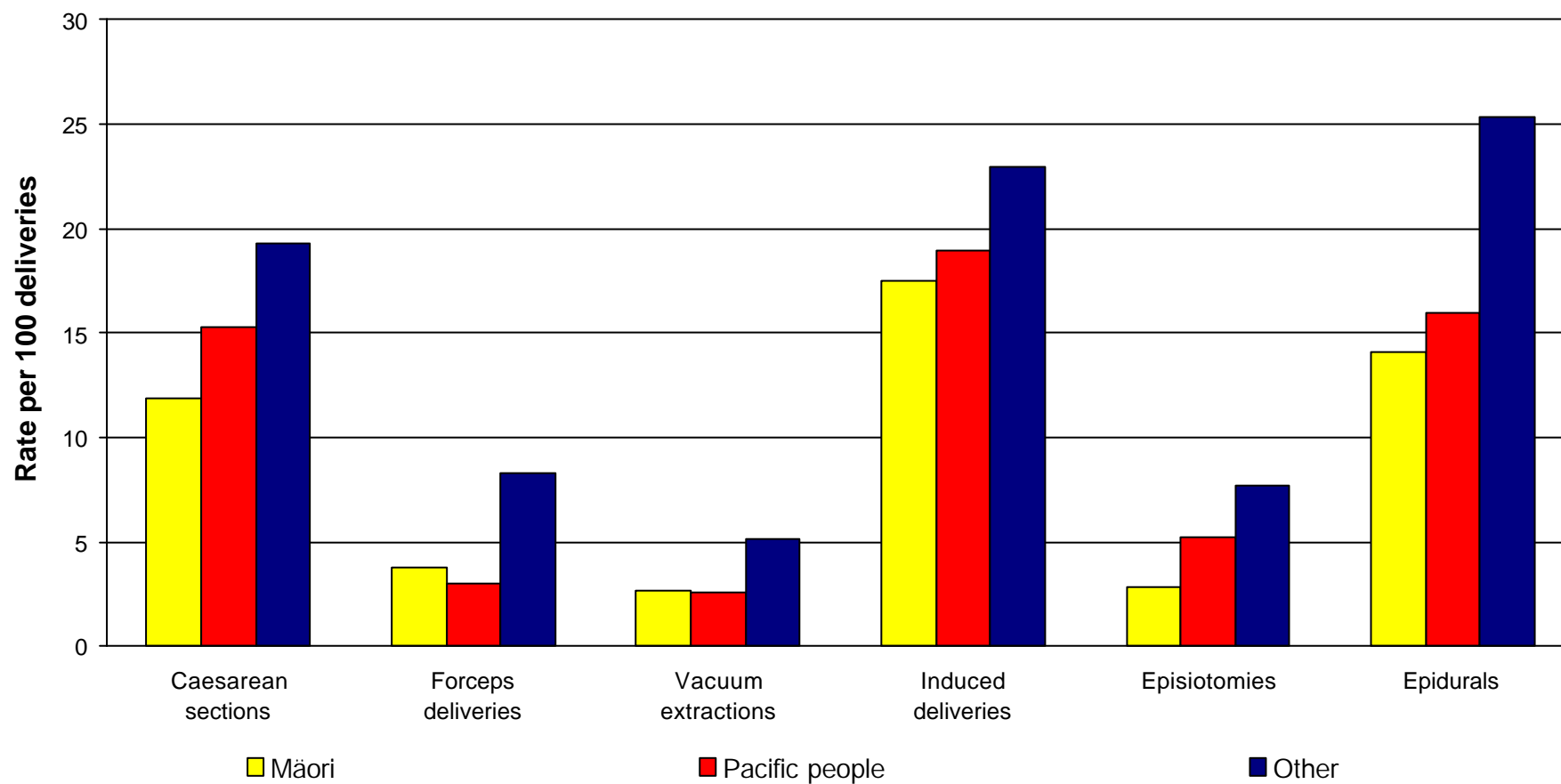
**Figure 2.4 National rates per 100 deliveries for five obstetric procedures by woman's age, 1 July 1996 – 30 June 1998**



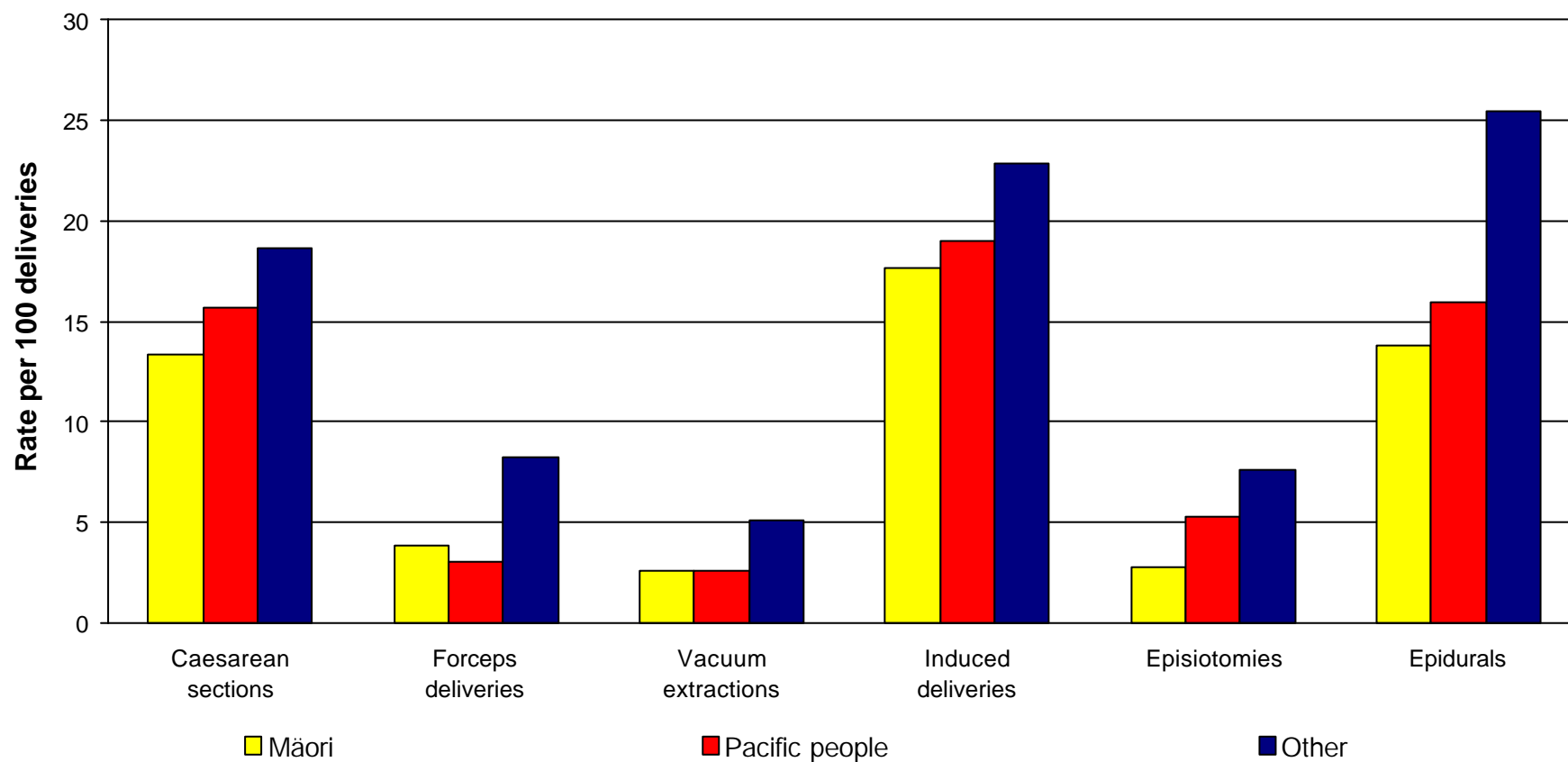
**Figure 2.5 Acute and elective Caesarean section rates by age and whether woman had a previous Caesarean, 1 July 1997 – 30 June 1998**



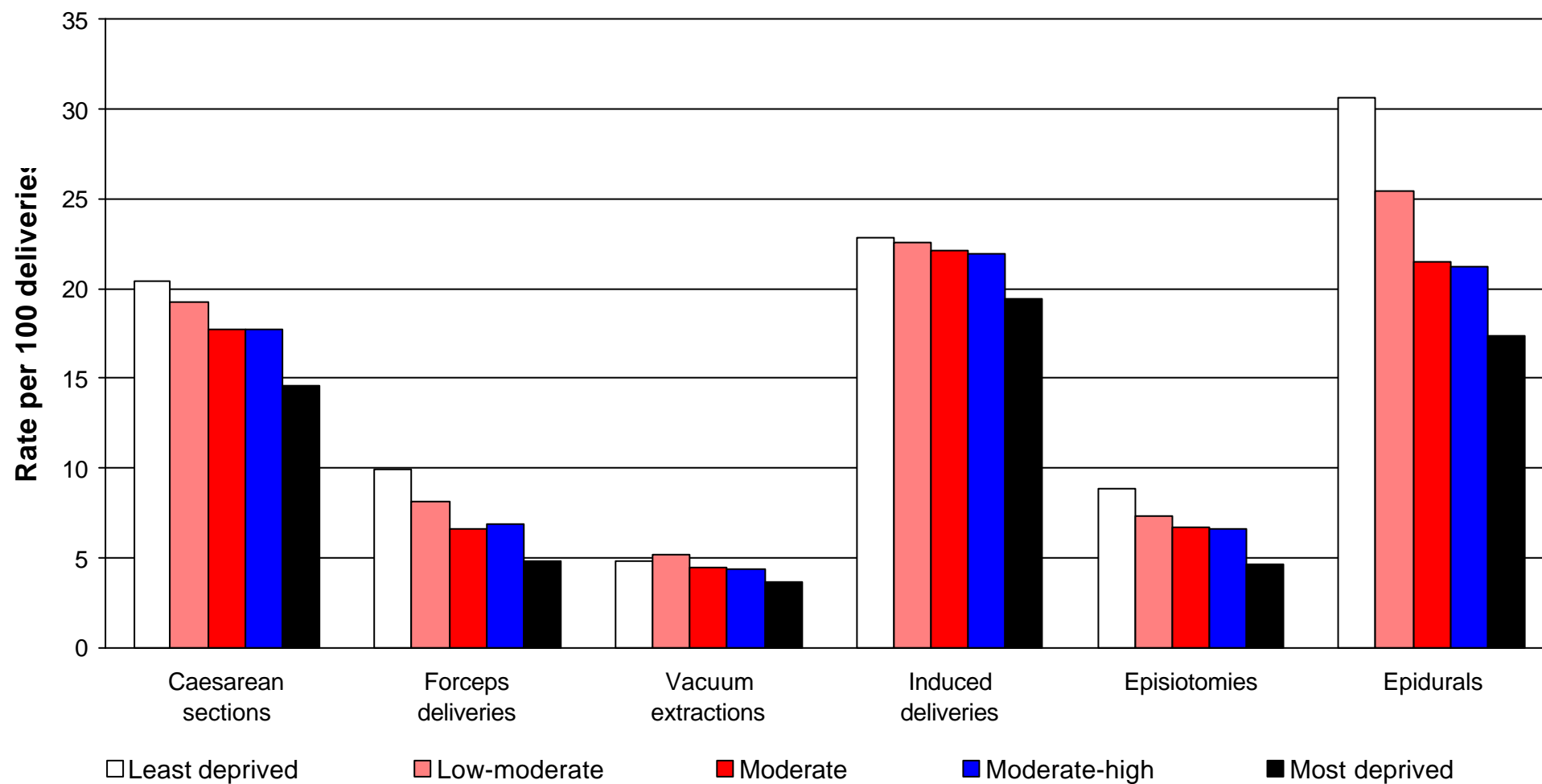
**Figure 2.6 National procedure rates by ethnic group, 1 July 1996 – 30 June 98**



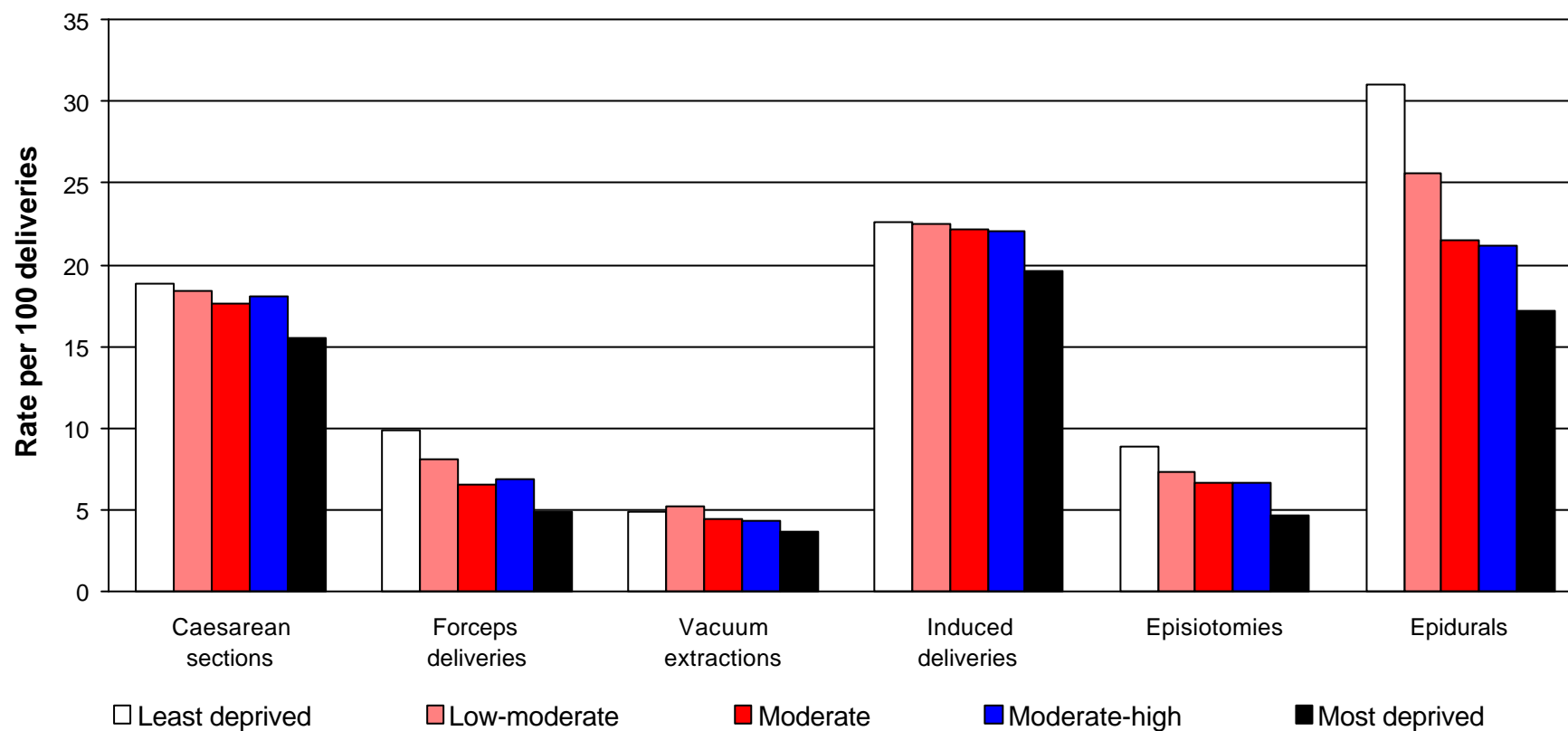
**Figure 2.7 Age-standardised national procedure rates by ethnic group, 1 July 1996 – 30 June 98**



**Figure 2.8 National procedure rates by socioeconomic need group, 1 July 1996 – 30 June 98**



**Figure 2.9 Age-standardised national procedure rates by socioeconomic need group, 1 July 1996 – 30 June 98**





### 3. RESULTS BY PROVIDER

#### 3.1. CAESAREAN SECTIONS

This section presents results for Caesarean sections, with comparisons both over time and specifically for 1997/98.

Table 3.1 shows Caesarean section rates per 100 deliveries from 1988/89 to 1997/98 for each provider (Hospital and Health Service – not individual maternity units).

**Table 3.1 Caesarean sections per 100 deliveries by year and provider, 1988/89 – 1997/98**

Provider	Year									
	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Northland Health	12.9	11.0	12.7	13.1	12.2	14.1	12.9	13.1	14.0	12.4
Waitemata Health	0.6	2.0	8.1	8.1	11.1	11.8	13.4	14.3	15.1	19.6
Auckland Healthcare	15.9	17.2	18.3	17.4	17.7	18.9	20.1	20.9	21.4	23.6
South Auckland Health	9.1	8.0	8.1	7.3	7.3	8.4	8.8	11.1	10.5	12.5
Health Waikato	10.3	11.1	12.2	10.7	11.5	11.3	10.0	13.5	14.4	17.4
Eastbay Health	13.2	12.5	14.1	12.7	14.9	15.4	15.5	13.7	10.9	11.9
Lakeland Health	10.2	8.1	9.4	11.2	12.7	12.2	12.3	8.7	12.6	12.4
Western Bay Health	17.2	18.4	21.3	19.6	16.7	19.3	16.3	18.4	19.1	17.9
Tairāwhiti Healthcare	11.9	10.0	12.8	14.0	14.8	14.6	14.5	12.1	14.5	12.8
Taranaki Healthcare	12.1	11.5	11.8	11.4	9.7	12.2	12.0	14.7	13.8	13.5
Healthcare Hawkes Bay	10.2	11.0	11.2	11.4	11.8	11.7	10.9	12.2	13.9	14.5
MidCentral Health	18.1	16.3	16.8	14.0	14.0	16.5	16.7	14.2	19.9	19.6
Good Health Wanganui	12.6	10.8	13.3	11.1	10.8	14.0	13.9	14.9	16.3	18.5
Capital Coast Health	12.4	13.9	15.0	16.9	18.0	18.2	18.6	19.4	22.2	21.2
Hutt Valley Health	10.3	10.6	11.7	12.2	14.8	15.9	15.9	15.7	15.4	19.6
Wairarapa Health	12.9	12.6	10.3	10.9	12.6	13.0	13.4	13.8	12.4	14.6
Nelson-Marlborough Health	8.8	10.1	11.6	9.1	11.5	14.1	12.7	13.2	15.9	15.7
Coast Health Care	12.0	13.2	12.5	8.6	11.4	11.9	13.1	11.9	16.7	12.2
Canterbury Health	1.0	1.4	1.3	2.0	1.2	2.3	1.9	1.0	1.3	1.8
Healthlink South	15.3	18.6	19.5	20.3	17.7	21.1	19.8	18.9	22.5	24.2
St Georges	–	–	–	–	–	#	35.0	35.3	28.7	35.6
Canterbury Combined <sup>3</sup>	11.3	13.8	14.5	15.3	13.8	18.0	18.3	19.1	21.2	23.9
Health South Canterbury	11.0	12.2	11.8	11.4	13.1	15.3	13.7	12.7	17.1	18.4
Healthcare Otago	13.8	15.3	16.3	15.9	15.6	15.6	16.8	16.2	18.2	20.0
Southern Health	9.1	8.8	10.0	11.0	11.7	10.0	11.7	13.8	15.3	18.6
<b>New Zealand</b>	<b>11.7</b>	<b>12.0</b>	<b>13.2</b>	<b>13.0</b>	<b>13.4</b>	<b>14.7</b>	<b>14.9</b>	<b>15.8</b>	<b>16.9</b>	<b>18.2</b>

#### Notes

1 Data source: NMDS public hospital data, maintained by the NZ Health Information Service (NZHIS).

2 Time period covered - 12 months to 30 June of each year.

3 Canterbury Health, Healthlink South, and St Georges combined.

4 "–" indicates that there were no Caesarean sections carried out.

5 "#" indicates that there were less than five deliveries.

Figure 2.4 shows that Caesarean section rates are closely correlated with maternal age. This is a finding that appears to be consistent over time and across a number of countries (see discussion, Section 4) and may be partially independent of clinical practice factors. Therefore, part of the difference between providers shown in Table 3.1 may be due to different age structures of the catchment populations. Table 3.2 shows the Caesarean section rate standardised to allow for age differences. Adjustments have not been made for ethnicity and socioeconomic differences since, as discussed later, these factors may be more closely related to clinical factors rather than factors in the population.

**Table 3.2 Caesarean section age-standardised rate by year and provider, 1988/89–1997/98**

Provider	Year									
	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Northland Health	13.5	11.6	13.3	13.7	12.6	14.5	13.3	13.5	14.4	12.3
Waitemata Health	0.6	2.0	8.0	8.0	10.8	11.5	12.8	13.5	14.1	18.5
Auckland Healthcare	15.5	16.8	17.8	16.9	16.9	18.0	18.8	19.7	19.7	21.5
South Auckland Health	9.8	8.6	8.6	7.7	7.6	8.6	9.0	11.3	10.6	12.6
Health Waikato	10.9	11.7	12.7	11.1	11.8	11.6	10.3	13.7	14.5	17.3
Eastbay Health	14.4	13.5	15.3	13.7	16.0	16.4	16.6	14.5	11.7	12.3
Lakeland Health	11.0	8.6	9.9	11.9	13.2	12.6	12.8	9.0	13.1	12.8
Western Bay Health	17.9	19.0	21.9	19.8	16.8	19.5	16.2	18.4	18.8	17.5
Tairāwhiti Healthcare	12.6	10.7	13.6	14.7	15.5	15.3	15.1	12.4	14.6	12.8
Taranaki Healthcare	12.8	12.1	12.3	11.7	10.0	12.4	12.0	15.0	13.9	13.3
Healthcare Hawkes Bay	11.0	11.7	11.7	12.1	12.2	12.1	11.3	12.5	14.3	14.6
MidCentral Health	18.9	16.9	17.3	14.3	14.2	16.6	16.7	14.3	19.8	19.5
Good Health Wanganui	13.5	11.5	14.0	11.8	11.3	14.5	14.7	15.5	16.9	19.2
Capital Coast Health	12.4	13.7	14.5	16.3	17.2	17.3	17.4	18.1	20.6	19.3
Hutt Valley Health	10.5	10.9	11.9	12.2	14.8	15.8	15.8	15.4	15.0	19.2
Wairarapa Health	13.7	13.3	11.0	11.3	13.0	13.4	13.4	14.0	12.4	14.4
Nelson-Marlborough Health	9.0	10.4	11.7	9.2	11.5	14.0	12.5	12.8	15.4	14.9
Coast Health Care	12.8	13.8	12.9	9.0	11.8	12.2	13.2	11.8	16.4	12.3
Canterbury Health	1.0	1.5	1.2	2.0	1.2	2.3	1.9	1.0	1.3	1.8
Healthlink South	15.8	19.2	20.0	20.4	17.6	20.4	19.3	18.1	21.4	22.7
St Georges	–	–	–	–	–	#	31.1	31.3	26.3	32.7
Canterbury Combined <sup>3</sup>	11.6	14.2	14.7	15.3	13.7	17.5	17.8	18.2	20.1	22.4
Health South Canterbury	11.5	12.5	12.1	11.4	13.4	15.2	13.6	12.5	16.7	18.0
Healthcare Otago	14.0	15.7	16.4	15.9	15.5	15.3	16.3	15.7	17.4	19.2
Southern Health	9.6	9.3	10.4	11.3	12.0	10.2	11.9	13.6	15.4	18.4
<b>New Zealand</b>	<b>12.1</b>	<b>12.4</b>	<b>13.5</b>	<b>13.1</b>	<b>13.4</b>	<b>14.6</b>	<b>14.8</b>	<b>15.5</b>	<b>16.5</b>	<b>17.7</b>

**Notes**

1 Data source: NMDS public hospital data, maintained by the NZ Health Information Service (NZHIS).

2 Time period covered - 12 months to 30 June of each year.

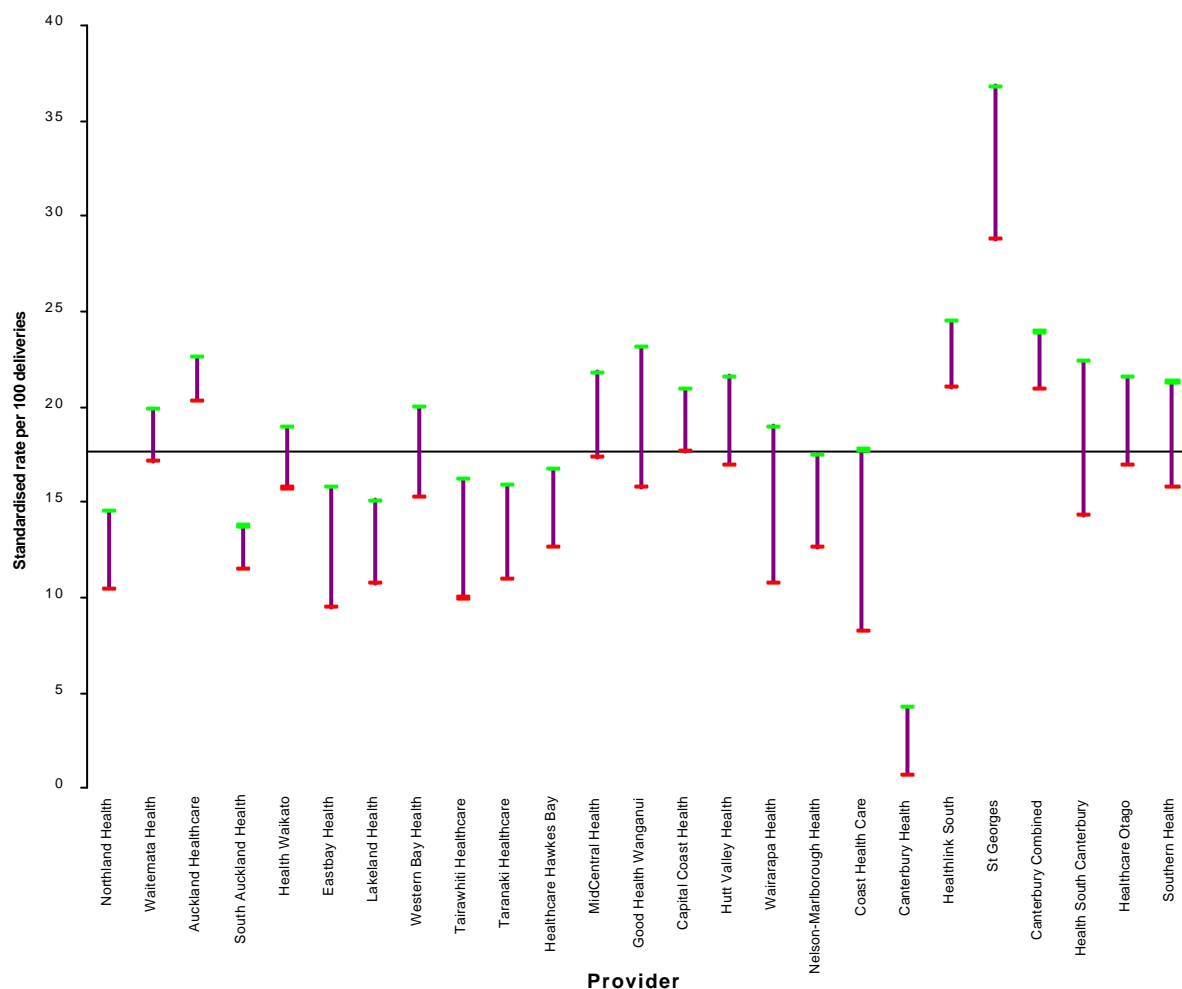
3 Canterbury Health, Healthlink South, and St Georges combined.

4 "–" indicates that there were no Caesarean sections carried out.

5 "#" indicates that there were less than five deliveries.

Figure 3.1 shows age-standardised rates by provider for 1997/98, together with the 99% confidence limits around each rate. Providers who are completely above or below the line (national average) had Caesarean section rates significantly different from the national average after adjusting for age.

**Figure 3.1 Caesarean section age-standardised rate by provider, 1997/98.**



## 3.2. INSTRUMENTAL VAGINAL DELIVERIES

This section presents results for instrumental vaginal deliveries. Analysis is presented separately for forceps deliveries and for deliveries by vacuum extraction (Ventouse).

Table 3.3 shows forceps delivery rates per 100 deliveries from 1988/89 to 1997/98 for each provider (Hospital and Health Service – not individual maternity units). Table 3.4 shows the corresponding results for vacuum extractions.

Figure 3.2 and Figure 3.3 shows rates by provider for 1997/98, together with the 99% confidence limits around each rate. Providers who are completely above or below the line (national average) had Vacuum extraction rates significantly different from the national average.

Figure 3.3 show forceps and vacuum extraction rates by provider for the 1997/98 year.

**Table 3.3 Forceps deliveries per 100 deliveries by year and provider, 1988/89 – 1997/98**

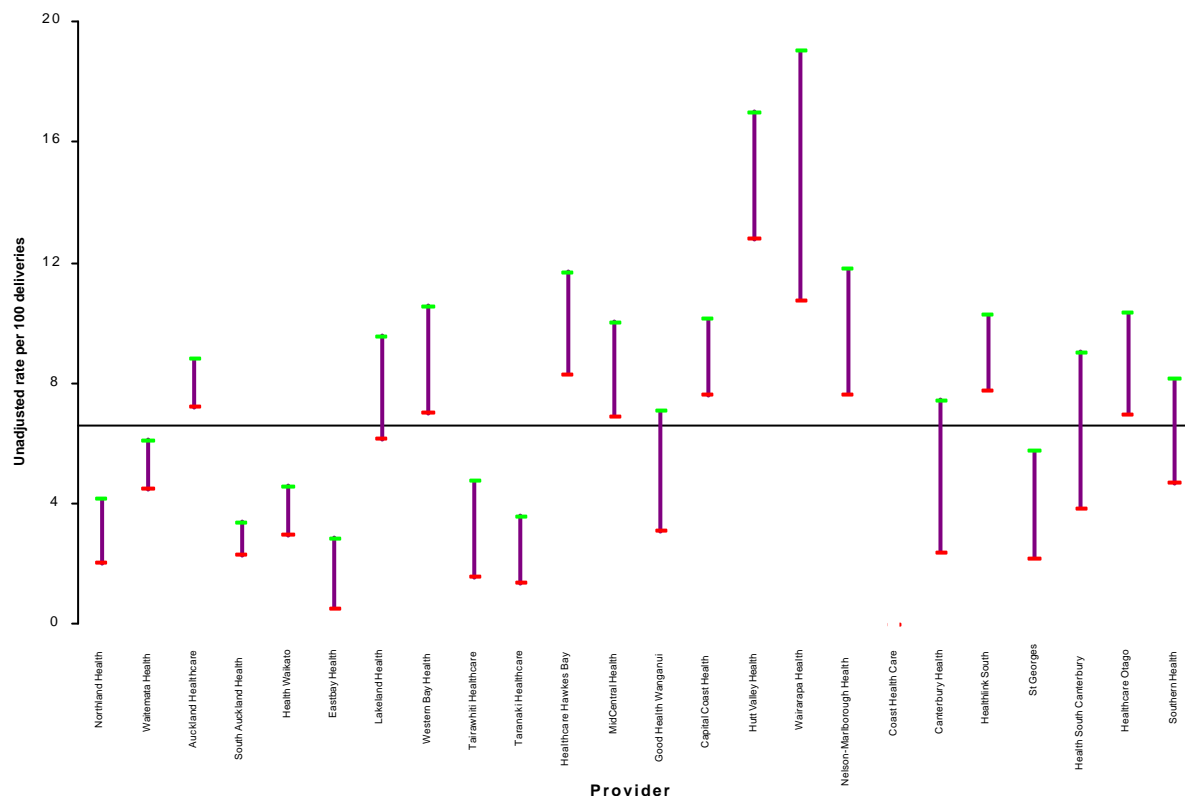
Provider	Year									
	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Northland Health	3.3	3.1	2.4	2.4	2.2	3.0	3.0	2.3	2.9	2.9
Waitemata Health	6.7	6.5	8.7	9.2	10.1	9.0	9.4	7.3	5.9	5.2
Auckland Healthcare	13.2	11.2	11.1	11.2	10.8	10.3	10.1	9.3	8.6	8.0
South Auckland Health	4.6	5.6	5.1	3.5	3.7	3.0	2.6	3.0	4.0	2.8
Health Waikato	8.6	8.3	7.1	5.9	4.4	3.1	2.9	3.4	3.6	3.7
Eastbay Health	3.7	3.3	2.7	2.5	2.1	2.9	2.4	2.4	1.3	1.3
Lakeland Health	13.7	14.4	11.1	9.5	9.5	7.8	8.3	5.0	7.8	7.7
Western Bay Health	15.8	12.9	11.3	11.2	13.4	11.5	12.2	12.5	9.5	8.6
Tairāwhiti Healthcare	5.4	4.9	3.6	2.5	3.0	2.3	1.9	2.3	4.2	2.8
Taranaki Healthcare	10.4	9.2	9.0	5.9	5.6	5.0	3.5	1.7	2.9	2.2
Healthcare Hawkes Bay	19.8	16.7	15.0	13.3	14.0	15.9	14.1	11.7	10.6	9.9
MidCentral Health	10.8	9.3	8.0	9.0	8.8	11.0	11.0	8.8	8.0	8.3
Good Health Wanganui	13.6	8.3	8.4	7.6	9.0	7.3	8.4	9.1	5.0	4.7
Capital Coast Health	14.2	13.5	11.9	10.2	11.2	10.4	9.6	8.3	10.2	8.8
Hutt Valley Health	18.1	18.4	16.6	17.9	17.1	16.2	15.9	16.3	17.4	14.8
Wairarapa Health	15.9	21.4	13.3	20.0	19.9	18.4	19.5	20.8	19.0	14.4
Nelson-Marlborough Health	7.7	9.0	11.5	11.2	10.3	12.5	10.5	11.1	8.2	9.5
Coast Health Care	3.2	3.1	2.9	3.8	1.2	3.2	2.9	2.1	0.3	0.6
Canterbury Health	4.3	2.6	3.5	2.9	3.9	4.0	4.9	3.8	3.7	4.3
Healthlink South	11.6	12.1	10.8	7.7	8.9	8.2	10.8	11.0	9.5	8.9
St Georges	—	—	—	—	—	—	2.8	2.9	4.0	3.6
Health South Canterbury	13.0	8.1	9.1	8.8	5.9	5.9	5.9	4.6	5.0	6.0
Healthcare Otago	14.4	10.7	9.2	9.7	8.5	6.8	5.5	7.2	7.0	8.5
Southern Health	9.8	12.1	11.6	11.1	12.4	9.0	11.7	9.7	8.2	6.2
<b>New Zealand</b>	<b>10.8</b>	<b>10.0</b>	<b>9.3</b>	<b>8.7</b>	<b>8.7</b>	<b>8.3</b>	<b>8.3</b>	<b>7.7</b>	<b>7.3</b>	<b>6.6</b>

### Notes

- 1 Data source: NMDS public hospital data, maintained by the NZ Health Information Service (NZHIS).
- 2 Time period covered - 12 months to 30 June of each year.
- 3 "—" indicates that there were no forceps deliveries carried out.
- 4 "#" indicates that there were less than five deliveries.

Figure 3.2 shows rates by provider for 1997/98, together with the 99% confidence limits around each rate. Providers who are completely above or below the line (national average) had forceps delivery rates significantly different from the national average.

**Figure 3.2 Forceps per 100 deliveries by provider, 1997/98**



**Table 3.4 Vacuum extractions per 100 deliveries by year and provider, 1988/89 – 1997/98**

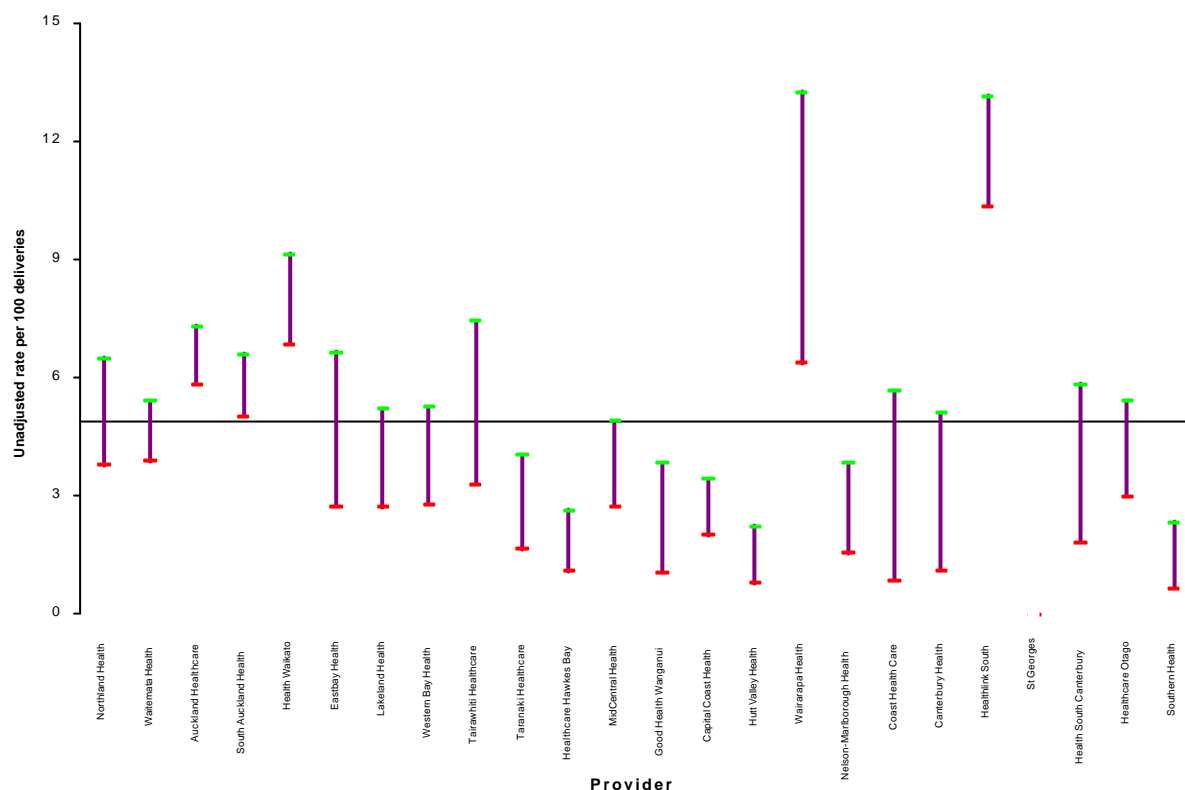
Provider	Year									
	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Northland Health	3.2	3.4	3.9	3.7	2.4	3.9	3.8	5.6	5.2	5.0
Waitemata Health	0.0	0.2	0.4	0.4	0.2	0.4	0.8	2.0	4.2	4.6
Auckland Healthcare	0.2	1.1	2.4	2.1	2.2	2.1	3.2	3.8	5.6	6.6
South Auckland Health	0.7	1.1	1.3	0.9	1.1	1.9	2.0	1.8	3.7	5.8
Health Waikato	2.1	1.7	2.6	2.2	1.6	2.6	3.0	4.8	6.4	7.9
Eastbay Health	–	–	–	0.5	0.7	0.5	0.6	0.5	1.7	4.3
Lakeland Health	0.7	1.4	0.9	0.4	0.9	0.1	0.6	0.1	1.3	3.8
Western Bay Health	–	–	–	0.1	0.3	–	0.1	0.3	3.2	3.8
Tairarwhiti Healthcare	6.1	6.1	7.0	9.8	6.2	6.0	5.2	4.4	4.7	5.0
Taranaki Healthcare	0.4	0.7	0.3	0.2	0.4	–	1.4	1.6	2.1	2.6
Healthcare Hawkes Bay	0.1	0.1	0.0	0.2	0.1	0.2	0.7	1.2	0.5	1.7
MidCentral Health	0.2	0.7	0.8	1.3	0.5	0.9	0.9	2.5	3.0	3.7
Good Health Wanganui	0.7	2.3	0.6	0.9	1.3	0.8	1.1	0.9	0.8	2.1
Capital Coast Health	0.3	0.4	0.2	0.5	0.6	0.7	1.3	2.0	1.8	2.6
Hutt Valley Health	–	–	–	–	–	–	–	0.0	–	1.4
Wairarapa Health	2.9	2.5	6.0	3.1	9.1	6.3	7.2	11.0	8.0	9.3
Nelson-Marlborough Health	–	–	–	–	0.3	0.5	0.5	0.3	1.3	2.5
Coast Health Care	0.6	–	–	1.2	1.2	1.2	1.9	2.6	3.1	2.3
Canterbury Health	–	0.3	0.1	0.3	0.9	0.5	0.6	2.4	1.8	2.4
Healthlink South	4.3	4.8	6.8	8.2	7.5	7.3	7.7	8.5	9.4	11.7
St Georges	–	–	–	–	–	–	0.3	0.3	–	0.4
Health South Canterbury	–	0.1	–	–	3.9	1.9	3.0	0.6	2.3	3.3
Healthcare Otago	0.6	0.7	1.0	1.0	2.3	3.1	4.1	3.8	2.3	4.0
Southern Health	0.4	0.3	0.7	0.1	0.3	0.5	0.3	0.1	0.4	1.3
<b>New Zealand</b>	<b>1.0</b>	<b>1.2</b>	<b>1.7</b>	<b>1.7</b>	<b>1.8</b>	<b>2.0</b>	<b>2.4</b>	<b>2.9</b>	<b>3.8</b>	<b>4.9</b>

**Notes**

- 1 Data source: NMDS public hospital data, maintained by the NZ Health Information Service (NZHIS).
- 2 Time period covered - 12 months to 30 June of each year.
- 3 "–" indicates that there were no vacuum extractions carried out.
- 4 "#" indicates that there were less than five deliveries.

Figure 3.3 shows rates by provider for 1997/98, together with the 99% confidence limits around each rate. Providers who are completely above or below the line (national average) had Vacuum extraction rates significantly different from the national average.

**Figure 3.3 Vacuum extractions per 100 deliveries by provider, 1997/98**



### 3.3. INDUCTIONS

This section presents results for induced deliveries. Table 3.5 shows induction rates per 100 deliveries from 1988/89 to 1997/98 for each provider (Hospital and Health Service – not individual maternity units).

**Table 3.5 Inductions per 100 deliveries by year and provider, 1988/89 – 1997/98**

Provider	Year									
	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Northland Health	0.5	3.6	1.9	1.8	5.8	4.4	6.8	17.4	15.6	13.6
Waitemata Health	2.6	1.7	2.0	3.5	3.5	4.3	8.9	13.8	17.7	21.5
Auckland Healthcare	5.2	1.5	7.1	3.8	5.3	5.6	11.0	24.2	23.3	25.7
South Auckland Health	0.1	0.4	5.2	6.6	8.8	11.9	9.9	14.2	20.4	19.6
Health Waikato	29.3	14.1	6.3	4.3	2.1	4.7	6.6	19.6	20.5	21.3
Eastbay Health	3.6	3.5	–	–	–	–	3.4	10.7	12.1	12.5
Lakeland Health	8.6	4.2	8.8	16.9	15.1	17.7	18.4	20.6	20.1	17.3
Western Bay Health	0.1	1.3	2.7	4.5	2.8	0.3	4.7	23.6	28.6	27.5
Tairāwhiti Healthcare	11.9	8.9	15.7	5.6	7.5	10.7	12.3	13.8	14.6	17.4
Taranaki Healthcare	15.5	17.8	15.7	11.4	12.7	10.8	13.7	22.6	23.7	23.8
Healthcare Hawkes Bay	4.7	9.2	11.0	7.3	6.8	7.2	11.9	18.7	22.5	27.8
MidCentral Health	11.8	10.9	11.7	13.8	12.5	13.6	13.2	12.8	15.5	15.9
Good Health Wanganui	7.0	6.2	11.7	11.3	14.8	14.2	15.2	21.1	22.5	18.6
Capital Coast Health	4.6	4.2	5.0	3.6	4.8	7.4	10.7	18.9	20.3	23.6
Hutt Valley Health	1.1	0.0	0.0	–	–	–	–	16.9	20.7	22.6
Wairarapa Health	0.9	–	0.2	0.2	–	–	–	19.2	27.5	24.7
Nelson-Marlborough Health	5.2	5.2	5.6	6.4	13.6	21.1	16.8	20.4	25.2	25.8
Coast Health Care	0.6	0.4	–	0.2	7.2	8.2	6.4	19.6	17.6	14.8
Canterbury Health	0.4	0.6	0.3	0.9	4.7	4.7	5.2	11.6	12.2	12.4
Healthlink South	1.7	1.2	1.4	3.7	8.0	10.5	11.1	14.7	22.7	26.4
St Georges	–	–	–	–	–	–	11.0	11.1	13.7	13.6
Health South Canterbury	–	5.1	11.3	16.1	17.2	24.8	21.5	25.9	24.6	25.5
Healthcare Otago	7.4	6.9	7.1	9.6	9.3	6.8	9.0	20.9	24.7	26.9
Southern Health	6.6	9.2	11.5	9.4	4.4	2.8	4.8	19.5	26.1	26.4
<b>New Zealand</b>	<b>7.0</b>	<b>5.2</b>	<b>6.0</b>	<b>5.6</b>	<b>6.6</b>	<b>7.7</b>	<b>9.8</b>	<b>18.6</b>	<b>21.0</b>	<b>22.1</b>

#### Notes

1 Data source: NMDS public hospital data, maintained by the NZ Health Information Service (NZHIS).

2 Time period covered - 12 months to 30 June of each year.

3 "–" indicates that there were no induced deliveries carried out.

4 "#" indicates that there were less than five deliveries.



Figure 3.4 shows rates by provider for 1997/98, together with the 99% confidence limits around each rate. Providers who are completely above or below the line (national average) had induction rates significantly different from the national average.

**Figure 3.4 Inductions per 100 deliveries by provider, 1997/98**

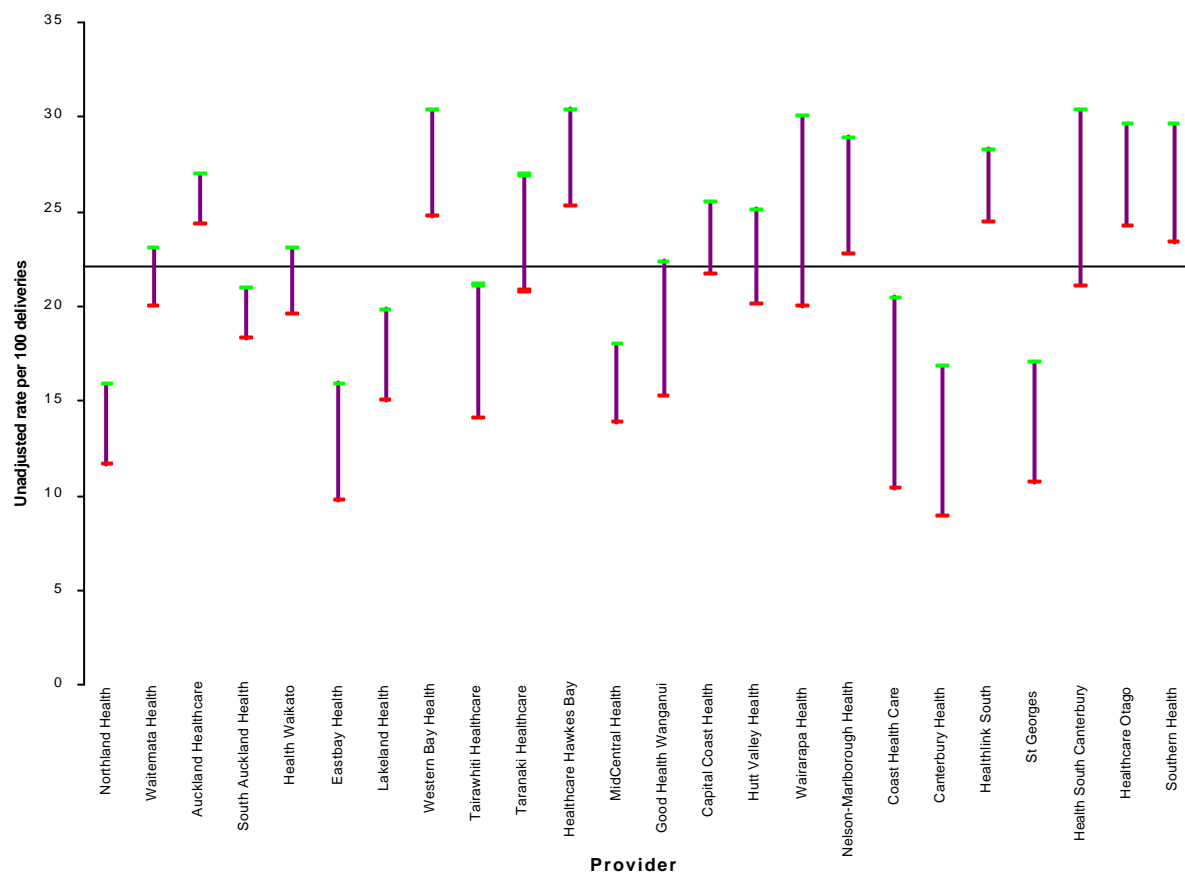


Table 3.5 and Figure 2.2 reveal what appears to be a discontinuity in the rate of induced deliveries between 1994/95 and 1995/96. Such a sudden change is often an artefact of the data collection method.

In 1995/96, the number of codes available for coding procedures was increased from three to 15, and some more analysis is presented to examine the likely impact of this change.

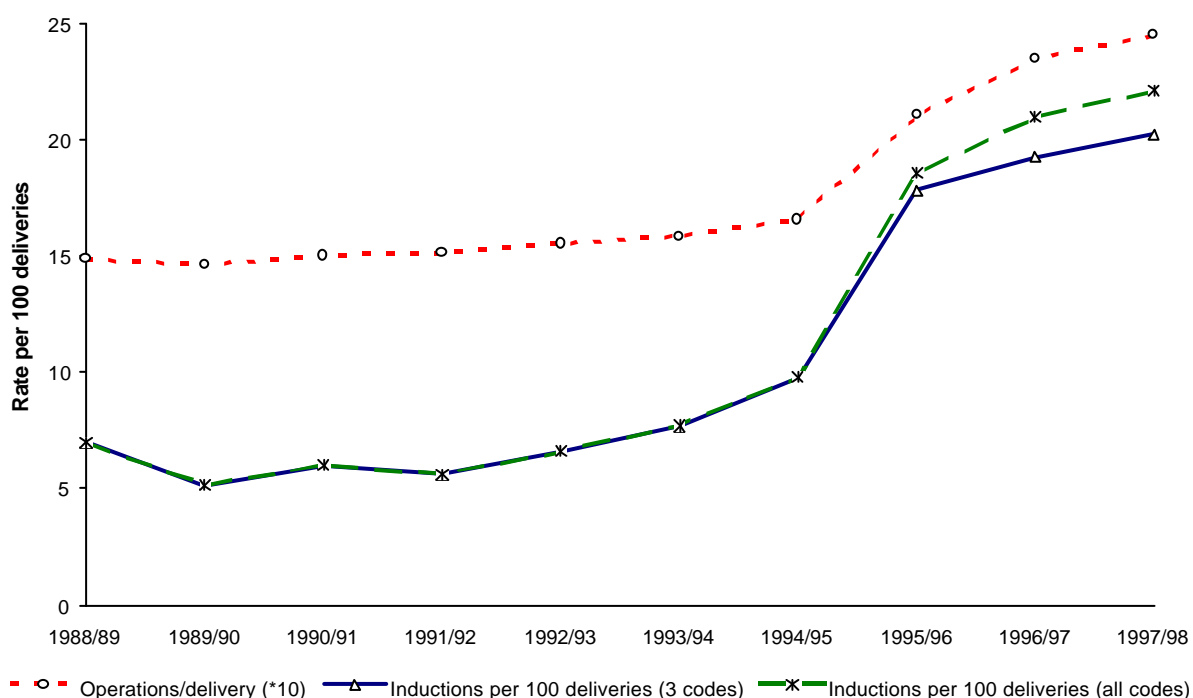
Figure 3.5 presents the average number of procedures coded per delivery from 1988/89 to 1997/98. There was a marked increase in the number of codes used in 1995/96 and a continuing increase in the subsequent two years. This increase is likely to be due to the change to the new ICD-9-CMA coding system in 1995/96 along with the increase to 15 available codes, and the accompanying coder training.

The figure also presents the induction rates per 100 deliveries (from 1995/96 onwards) using either only the first three codes, or all 15 codes. The jump in 1995/96 appears to have been present even when only the first three codes are considered. In the later two years focusing on only the first three codes reduces the rate – presumably because some inductions are not included in codes one to three.

Because the increase so closely matches the increased use of codes it is likely that coding changes explain much, though not all, of the increase in the national level of induced deliveries. This indicates that, prior to 1995/96, induced deliveries were not being routinely coded by many providers, or were seen as lower priority than other procedures performed on a woman being delivered.

However, a proportion of the increase remains unexplained. Some appears likely to reflect a genuine upwards trend which seems to have continued in the last three years.

**Figure 3.5 Average number of procedures per delivery and induction rates per 100 deliveries by year, 1988/89 – 1997/98, using only first three procedure codes**



Source: Policy Branch, Ministry of Health

### 3.4. EPISIOTOMIES

This section presents results for episiotomies. Table 3.6 shows episiotomy rates per 100 deliveries from 1988/89 to 1997/98 for each provider (Hospital and Health Service – not individual maternity units).

**Table 3.6 Episiotomies per 100 deliveries by year and provider, 1988/89 – 1997/98**

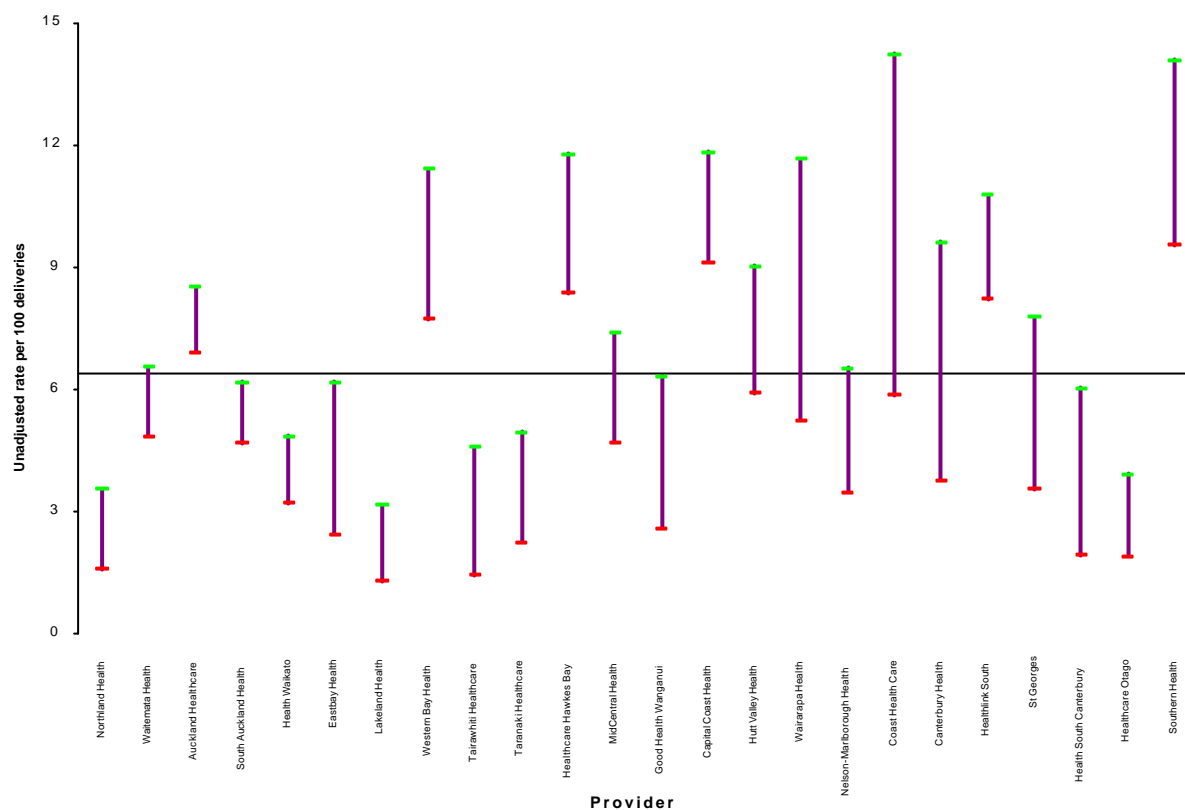
Provider	Year									
	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Northland Health	3.8	2.7	2.2	1.6	3.3	2.6	2.9	2.1	2.0	2.4
Waitemata Health	13.4	1.9	0.0	–	–	1.7	5.5	6.6	6.0	5.7
Auckland Healthcare	10.6	0.0	0.1	0.8	0.8	4.4	7.7	7.8	7.6	7.7
South Auckland Health	10.1	8.2	7.2	5.3	5.9	7.7	7.7	5.9	6.8	5.4
Health Waikato	11.8	9.3	9.6	7.8	6.7	5.0	4.3	4.2	3.3	4.0
Eastbay Health	7.4	8.5	8.5	9.5	6.0	4.6	5.2	3.6	2.6	3.9
Lakeland Health	10.3	6.4	8.7	8.3	7.0	4.7	5.8	2.9	3.3	2.0
Western Bay Health	14.1	10.3	8.0	8.7	7.8	7.1	5.0	5.7	8.6	9.4
Tairāwhiti Healthcare	16.2	15.8	10.4	11.9	11.5	9.5	5.6	4.3	3.8	2.6
Taranaki Healthcare	14.5	14.5	12.4	10.9	9.4	7.6	6.1	5.2	3.4	3.4
Healthcare Hawkes Bay	13.2	11.4	7.5	4.2	13.8	15.2	7.7	10.0	9.7	10.0
MidCentral Health	16.2	14.8	12.5	10.8	10.2	8.3	9.6	8.1	7.0	5.9
Good Health Wanganui	13.8	11.4	9.7	9.1	6.5	5.3	6.3	4.0	4.7	4.1
Capital Coast Health	14.5	12.3	11.9	9.4	8.9	10.2	11.0	11.3	10.2	10.4
Hutt Valley Health	19.7	16.8	15.7	14.4	12.0	9.9	9.9	7.4	7.2	7.3
Wairarapa Health	29.6	33.1	27.4	30.9	30.3	26.0	12.3	9.2	7.6	7.9
Nelson-Marlborough Health	8.4	8.5	6.6	12.6	12.8	8.2	11.7	8.6	8.1	4.8
Coast Health Care	13.1	10.0	8.2	6.3	7.5	9.5	7.2	8.8	9.1	9.3
Canterbury Health	18.4	15.6	12.6	11.4	10.4	8.9	7.2	12.3	9.8	6.1
Healthlink South	14.2	14.5	12.7	11.6	9.6	7.6	9.8	9.6	10.0	9.4
St Georges	–	–	–	–	–	–	7.1	6.6	6.5	5.3
Health South Canterbury	19.4	20.1	12.7	12.2	9.4	5.9	6.4	4.4	2.8	3.5
Healthcare Otago	8.7	5.8	4.7	3.8	3.7	3.4	3.1	4.6	2.8	2.8
Southern Health	31.8	27.6	23.2	20.3	18.0	16.0	12.2	9.8	10.5	11.7
<b>New Zealand</b>	<b>13.2</b>	<b>10.0</b>	<b>8.0</b>	<b>7.2</b>	<b>7.0</b>	<b>7.0</b>	<b>7.4</b>	<b>7.0</b>	<b>6.7</b>	<b>6.4</b>

#### Notes

- 1 Data source: NMDS public hospital data, maintained by the NZ Health Information Service (NZHIS).
- 2 Time period covered - 12 months to 30 June of each year.
- 3 "–" indicates that there were no episiotomies carried out.
- 4 "#" indicates that there were less than five deliveries.

Figure 3.6 shows rates by provider for 1997/98, together with the 99% confidence limits around each rate. Providers who are completely above or below the line (national average) had episiotomy rates significantly different from the national average.

**Figure 3.6 Episiotomies per 100 deliveries by provider, 1997/98**



### 3.5. EPIDURALS

This section presents results for epidurals. Table 3.7 shows epidural rates per 100 deliveries from 1988/89 to 1997/98 for each provider (Hospital and Health Service – not individual maternity units). The lack of data for most of the early years in Table 3.7 is due to the procedure not being coded in those years.

**Table 3.7 Epidurals per 100 deliveries by year and provider, 1988/89 – 1997/98**

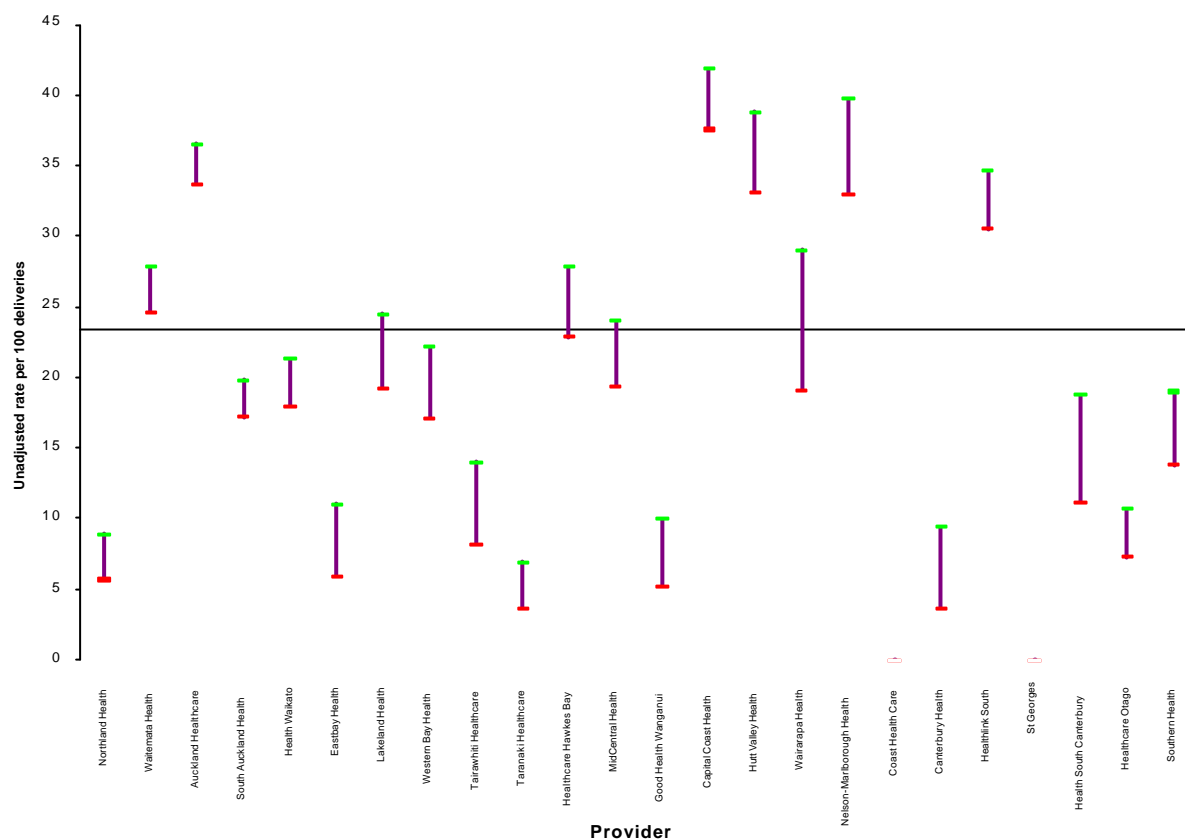
Provider	Year									
	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Northland Health	–	–	–	–	–	–	0.7	4.2	4.9	7.1
Waitemata Health	–	–	–	–	–	–	–	4.6	20.1	26.2
Auckland Healthcare	–	–	–	–	–	–	0.2	25.4	29.8	35.1
South Auckland Health	–	–	–	–	0.0	0.0	0.8	11.0	18.1	18.5
Health Waikato	–	–	–	–	–	–	0.1	13.8	18.0	19.6
Eastbay Health	–	–	–	–	–	–	2.1	5.9	4.3	8.1
Lakeland Health	–	–	–	–	–	–	–	15.6	23.0	21.8
Western Bay Health	–	–	–	–	–	–	–	9.9	21.5	19.5
Tairāwhiti Healthcare	–	–	–	–	–	–	0.1	8.4	8.3	10.8
Taranaki Healthcare	–	–	–	–	–	–	0.6	1.3	4.0	5.1
Healthcare Hawkes Bay	–	–	–	–	–	–	1.7	17.7	19.7	25.3
MidCentral Health	–	–	–	–	–	–	0.5	13.9	15.2	21.6
Good Health Wanganui	–	–	–	–	–	–	–	2.9	11.3	7.2
Capital Coast Health	–	–	–	–	–	–	–	13.8	32.8	39.7
Hutt Valley Health	–	–	–	–	–	–	–	21.5	34.2	35.9
Wairarapa Health	–	–	–	–	–	–	–	11.2	23.1	23.7
Nelson-Marlborough Health	–	–	–	–	0.1	–	7.0	34.1	37.0	36.3
Coast Health Care	–	–	–	–	–	–	0.3	–	–	0.3
Canterbury Health	–	–	–	–	–	–	0.6	1.9	2.9	5.9
Healthlink South	–	–	–	–	–	–	0.2	25.0	30.5	32.5
St Georges	–	–	–	–	–	–	–	–	–	–
Health South Canterbury	–	–	–	–	–	–	–	4.4	8.8	14.6
Healthcare Otago	–	–	–	–	–	–	0.3	18.8	20.5	8.8
Southern Health	–	–	–	–	–	–	–	3.8	8.2	16.2
<b>New Zealand</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.5</b>	<b>15.0</b>	<b>21.3</b>	<b>23.4</b>

#### Notes

- 1 Data source: NMDS public hospital data, maintained by the NZ Health Information Service (NZHIS).
- 2 Time period covered - 12 months to 30 June of each year.
- 3 "–" indicates that there were no epidurals carried out.
- 4 "#" indicates that there were less than five deliveries.

Figure 3.7 shows rates by provider for 1997/98, together with the 99% confidence limits around each rate. Providers who are completely above or below the line (national average) had epidural rates significantly different from the national average.

**Figure 3.7 Epidurals per 100 deliveries by provider, 1997/98**



## 4. DISCUSSION

Data for the latest two years reveal a striking correlation between maternal age and rates of Caesarean section. They also point to a weaker inverse relationship between rates of interventions and the mother's ethnicity and the socioeconomic deprivation of the area where she lives. Analysis of rates for each provider over these two years show considerable differences around the country with a few providers having consistently higher than average rates and some tending to be lower.

The data for the last ten years clearly show rises in national rates of Caesarean sections and induced deliveries. Instrumental vaginal deliveries have dropped somewhat and some of this may be because women who might previously have had a forceps delivery are now having a Caesarean section. Over the last four years, in many places vacuum extraction (Ventouse) rates have increased while forceps deliveries have decreased. Rates for epidural analgesia seem to have risen rapidly while there has been a fall in episiotomies. Comparisons show also considerable variations between providers in rates of different procedures. These persist even when adjusted for the effect of age on Caesarean section rates.

Further discussion of these findings is given below along with some comments on the quality of the information.

### 4.1. EFFECTS OF AGE, ETHNICITY AND SOCIOECONOMIC NEED

The effect of maternal age on obstetric procedures in 1996–98 data was presented in Figure 2.4. It showed that each year's increase in mother's age (from young mothers upwards) was very strongly ( $R^2 = 98.5$ ) associated with rates of Caesarean section (see Section 4.2). There are weaker relationships with epidurals (reducing frequency with increasing age:  $R^2 = 58$ ), and with inductions (frequency increasing with age,  $R^2 = 58$ ). Other procedures are not associated with age.

It is also striking that in Figures 2.6 to 2.9 there appears to be a clear relationship between rates of all procedures and the ethnicity of mothers and their socioeconomic need group. When the data are adjusted for the mother's age this association persists.

A 1995 New Zealand study (Johnson et al 1995) based on data from Middlemore Hospital (South Auckland) showed Caesarean section rates of 6.5%, 9.5% and 11.5% in Māori, Pacific and European women respectively. A few overseas studies have looked at the connection between rates of Caesarean section and ethnic group or race. A South African study (Matshidze et al 1998) based on data from 1990 showed that women classified as 'blacks' had lower rates of Caesarean section than 'whites' or 'coloureds' did. A Californian study (Gould et al 1989) on 1982–83 birth certificate data showed higher rates among non-Hispanic whites, intermediate for Asian Americans and blacks, and lowest for Mexican Americans.

Socioeconomic factors have not previously been analysed in relation to obstetric intervention rates in New Zealand. A South Australian study (Jonas et al 1992) showed that women with low socioeconomic status, and non-Caucasian women had a lower likelihood of an elective Caesarean or induction. If procedures were being carried out purely for clinical reasons it might be expected that women from areas of greatest socioeconomic need would have the highest rates, matching their higher incidence of ill-health. However, in New Zealand as in some other countries, the opposite appears to be the case.

These findings raise questions about what non-clinical factors influence clinicians to intervene more as women age and to intervene more in delivering non-Māori women and women from more deprived areas. There are issues to be considered about whether women have full information before consenting to procedures that are perhaps not clinically necessary. Are there factors to do with women's expectations and perceptions, or is there something to do with the interaction between the woman and the clinician? Given the limited availability of public funding for health there are also important questions about whether funds are being put to the highest priority use.

## **4.2. CAESAREAN SECTIONS**

The rise in Caesarean section rates is a phenomenon that has previously been reported both in New Zealand (Linton et al 1988; Bulger et al 1998) and internationally (Flamm, et al 1998; Joffe, et al 1994). The results presented here indicate a continuing rise in New Zealand rates since Bulger et al published data up to 1994/95.

As already discussed, Figure 2.4 shows that rates of Caesarean section are very strongly associated with increasing maternal age from a young age. Figure 2.5 further analysed the rise in rates of Caesarean section with age for the 1997/98 year. Data about whether the woman is recorded as having a uterine scar from a previous Caesarean section is included. The figure shows rates of emergency and elective Caesarean sections<sup>2</sup> according to whether or not the woman has had a previous Caesarean section.

At younger ages over 87% of Caesarean sections are emergency operations. By age 35, although emergency operations are commoner (risen from 8% to 13%), they now make up only 55% of all Caesareans. Just over half of all elective operations are recorded as having been carried out in women who have had previous Caesarean sections – and naturally this is commoner with increasing age. Although some years ago it was thought to be good clinical practice to routinely deliver by Caesarean after a previous section, there is now considerable evidence that vaginal birth after Caesarean is safe – and a 'trial of labour' is now accepted clinical best practice rather than an elective operation.

However, while some of the increasingly frequent operations with rising age are explained as repeat operations, there are still some 50% that are not explained. This is a phenomenon that has previously been recognised both in New Zealand (Linton et al 1988) and in many other countries (Parazzini et al 1992; Kirsop et al 1992; Abu-Heijja et al 1998; Rosenthal and Paterson-Brown, 1998). Rosenthal and Paterson-Brown suggested that this might be related to physiological factors in the mother (though their analysis was confined to nulliparous women). Certainly the consistency of the finding in countries as diverse as Jordan, Jamaica, Germany, Australia and New Zealand suggests that it is less likely to be solely a matter of clinical practice or social pressures.

Unfortunately, the codes for elective and acute Caesarean sections, and for previous operations, have only been available since the 1995/96 year and, as often happens, coding consistency appears to have taken a year or two to be established in all sites. Hence Figure 2.5 is only based on the most recent year and no trend data is available.

Table 3.1 shows that there is a considerable variation between providers in their rates of Caesarean section. Even after adjusting for age (Table 3.2) there are still considerable differences. Most

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<sup>2</sup> Codes 74.02 and 74.12 – whether or not the operation is pre-labour.



providers show quite consistent trends over the 10-year period. A few hospitals appear to have had a small reduction in rates in the last year reported compared to the previous year.

Further analysis is required to identify the causes for increasing rates of Caesarean section over time and for the variation between different providers. The NMDS contains some data that may help with this, since there are records of associated conditions for every birth. However, as already mentioned, the very rapid increases found in many codes for associated conditions over the last three to four years is most likely an artefact of improved data capture (possibly related to payment according to severity of case-mix).

#### **4.3. INDUCED DELIVERIES**

Compared to Caesarean section rate, induced delivery rates have previously been less widely reported and studied. The data for New Zealand shows a current national rate of 22.1% with a steady rise over the last three years.

Four years ago there was a sudden steep increase in rates recorded (Table 3.5 and Figure 2.2). As mentioned in Section 3.3, it is likely that a large part of the explanation for the steep rise in 1994 is a change in hospital coding rules and practice. Nevertheless, it is likely that, over the ten years studied, the rise in induced delivery rates has been at least as great as the rise in Caesareans.

As with Caesarean sections, the rates for individual providers vary somewhat around the country. On the whole there is little correlation between a provider's results in 1997/98 for induced deliveries and those for Caesarean sections (or other procedures), although a few hospitals were consistently higher or lower than average.

Separate analysis of surgical induction (artificial rupture of membranes ARM) was carried out to see if the rise was restricted to ARMs. However, the increase still persisted when only medical inductions were counted.

#### **4.4. INSTRUMENTAL VAGINAL DELIVERIES**

Figure 2.3 shows that rates of instrumental vaginal deliveries have declined slightly over the 10-year period. This may to some extent be a substitution effect with the increasing Caesarean section rate. It also seems that in the last four years vacuum extraction rates are increasing while forceps are decreasing. An interesting, but unexplained finding in the analysis of the latest two years' data is that, while rates of forceps are about twice as high for women from the least deprived areas compared to those from the most deprived areas, rates are essentially the same for vacuum extractions.

There is very considerable variation between hospitals in their use of instrumental vaginal deliveries – more so than with the other two procedures considered so far. Wairarapa and Hutt Valley HHSs appears to have had consistently much higher rates than other places over the whole ten year period.

#### **4.5. EPISIOTOMIES**

National rates recorded for episiotomies are low and dropping (13.2% dropping to 6.4%). It is surprising that the rates for episiotomy are lower than the recorded forceps rate. Since it is not common to perform a forceps delivery without an episiotomy, and since episiotomies are also on occasions performed without forceps, it would be expected that episiotomy rates would be higher

than forceps rates. The absolute episiotomy rates are therefore called into question. It may be that this procedure is not completely coded.

On the other hand, one would expect that, if anything, coding has become more, rather than less complete over the last 10 years. This appears to be shown by the other procedures recorded. Nevertheless, there has been a drop in national recorded episiotomy rates.

It is likely, then, that, even if there is some under-recording, there has been a genuine change in clinical practice towards fewer episiotomies over the period. This would be consistent with evidence that, in most situations, episiotomies are best avoided.

#### **4.6. EPIDURAL ANALGESIA**

The tables clearly show that epidurals were not recorded before 1995/96 (they were certainly available and performed before that time). Since recording has started it is clear that this is a very frequently performed procedure in many hospitals. Rates of 35% are lower than the levels reported from some data collected in individual hospitals and it seems likely that the national data for this procedure is also incomplete.

Epidural rates are considerably higher in women who are not Māori or Pacific people (about 25% compared to 15%) and in women from areas with the least socioeconomic need (30% for least deprived compared to 17% for most deprived).

There is a considerable difference between providers' in rates of epidurals. To some extent this is likely to reflect the varying availability of anaesthetists to administer the procedure – especially the difficulty in getting epidurals in outlying hospitals.

#### **4.7. DATA QUALITY AND LIMITATIONS**

There have been changes in coding systems and practices during the years covered by this report. The data point to improvements in the comprehensiveness of recording over the period as well as the increase in available codes. This also shows up in a steep increase in recorded prevalence of other associated conditions over the last four years that have not been part of this analysis. Part of this increase is likely to have affected by the training and attention paid to hospital coding practices that occurred at the same time as the increase in available codes in 1994. Contracting arrangements are also likely to have been important, since hospitals have increasingly been contracted according to the complexity of their mix of cases – so they have incentives to record complications and procedures carefully.

The NMDS database contains more data that could usefully be analysed in relation to obstetric procedures. Coding for associated conditions would allow further analysis of the clinical reasons for changing rates of procedures. However, as pointed out above, concerns about data accuracy mean that conclusions would need to be guarded – especially for early years.

The NMDS does not contain data about provider type (eg, GP, midwife or specialist) nor does it cover births out of hospital. Health Benefits Ltd, as part of its claims payment processes, has been collecting considerable extra data over the last year. Moreover, the data are more commonly entered by the clinicians involved in procedures and may therefore be more accurate. The Health Funding Authority's planned perinatal database will combine claims data with NMDS data and allow more accurate analysis in future.



## **5. CONCLUSIONS**

Examining procedure rates does not by itself allow conclusions about the appropriateness of care. This would require a measure of outcomes. However, the present data do show trends over time (notably, the rise in Caesarean sections and induced deliveries) and highlight considerable inter-provider variation, even after controlling for age. The correlation with ethnic and socioeconomic factors raises a number of concerns since they seem to be counter to expected clinical need. Such data raise questions that should be addressed by clinicians in individual units as well as at the national level.

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## 7. APPENDIX

The following are the definitions used for data analysis in this report according NMDS codes

A Caesarean section is defined as a delivery with a procedure code of:

- 74.01 Classical elective Caesarean section
- 74.02 Emergency classical Caesarean section
- 74.11 Elective lower segment Caesarean section
- 74.12 Emergency lower segment Caesarean section
- 74.2 Extrapertoneal Caesarean section
- 74.4 Caesarean section of other specified type
- 74.91 Hysterotomy to terminate pregnancy
- 74.99 Caesarean section of other unspecified type.

An instrumental vaginal delivery is defined as a delivery with a procedure code of:

- 72.0 Low forceps operation
- 72.1 Low forceps operation with episiotomy
- 72.2 Mid forceps operation
- 72.3 High forceps operation
- 72.4 Forceps rotation of foetal head
- 72.6 Forceps application to aftercoming head
- 72.8 Other specified instrumental delivery
- 72.9 Unspecified instrumental delivery
- 73.22 Internal and combined version with extraction.
- 72.7 Delivery by vacuum extraction (Ventouse) – separately analysed.

An induced delivery is defined as a delivery with a procedure code of:

- 73.01 Induction of labour by artificial rupture of membrane
- 73.1 Other surgical induction of labour
- 73.4 Medical induction of labour.

An episiotomy is defined as a delivery with a procedure code of 73.6.

An epidural is defined as a delivery with a procedure code of 03.91 (injection of anaesthetic into spinal canal for analgesia).