



information

CIRCULAR

CAESAREAN SECTION DELIVERIES IN QUEENSLAND

Trisha Johnston, Michael Coory, Epidemiology Services Unit, Health Information Branch.

Summary

This information circular provides a summary of trends for caesarean section and other methods of delivery in Queensland. The information was obtained from the population-based Queensland Perinatal Data Collection, which collects data on all births in the state. It is the first population-based report of trends in method of delivery in Queensland. Also included is benchmarking against interstate and overseas data. The main findings are:

- Australia has the fifth highest proportion of babies delivered by caesarean section of any OECD country.
- The proportion of babies delivered by caesarean section in Australia has increased over the past ten years, from 19.0% in 1993 to 27.0% in 2002. This increase is occurring in many developed countries [1].
- The overall proportion of caesarean deliveries in Queensland (29.5%) is slightly higher than that observed in the other Australian states. Queensland has the highest caesarean rate of all the states in the private sector and the fourth highest rate in the public sector.
- The proportion of deliveries by caesarean section is higher in the private sector than in the public sector (45.2% vs 25.2% respectively, in Queensland in 2004) and is also higher for older women.
- The proportion has also increased over the past two decades among women with no specific risk factors (annual percent increase of 4.52% in the private sector and 2.18% in the public sector).
- The most frequently cited reason for performing caesarean section deliveries in 2004 in the public and private sector was scar from previous uterine surgery/ caesarean section. Among women having their first caesarean, the most commonly recorded reasons were failure to progress, breech presentation and fetal distress.
- There is research evidence that caesarean section is beneficial for high risk conditions such as placenta praevia and transverse lie and that caesarean section carries less risk to the mother and baby than planned vaginal delivery for term breech babies.
- There is a lack of good quality evidence on the risks and benefits of caesarean section versus vaginal delivery for other, lower risk, births.

The results described in this information circular provide a summary of the status of caesarean section in Queensland. However, the information that would be required to explain the observed differences and trends

is largely absent. Thus, there are no clear answers to key questions such as why the caesarean rate is increasing in Queensland and Australia, why there are higher rates observed in Australia compared to other OECD countries, why there are higher rates observed in the private sector and why caesareans among 'no indicated risk' deliveries are increasing.

Introduction

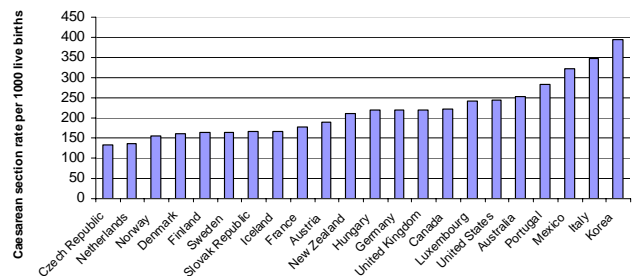
The purpose of this information circular is to provide basic descriptive information on population-based trends in rates of caesarean section in Queensland. Comparisons are also made with other states and internationally. The Queensland information presented is based on the Queensland Perinatal Data Collection, which collects information on all births in Queensland. The Queensland Maternal and Perinatal Quality Council have noted this report.

Results

International comparisons:

The caesarean section rate among Organisation for Economic Cooperation and Development (OECD) countries varies widely from 132.5 per 1000 live births (13.25%) in the Czech Republic to 395.7 per 1000 live births (39.57%) in Korea. As can be seen in Figure 1, in comparison with other OECD countries, the rate of caesarean section births in Australia (253.0 per 1000 live births) is relatively high [2].

Figure 1: Caesarean section rate per 1000 live births in OECD countries, 2001



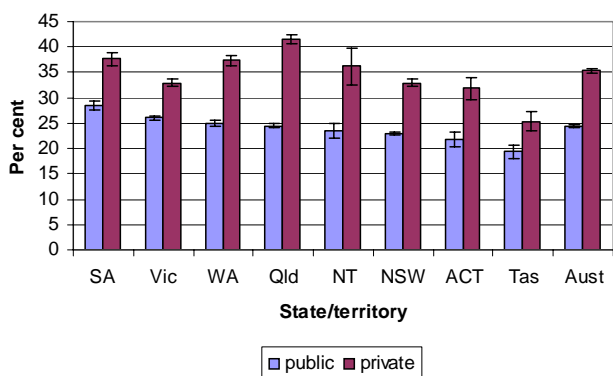
Source: OECD Health Data, 2004

Interstate comparisons:

The proportion of babies delivered by caesarean section has increased by 42% in Australia over the past ten years from 19.0% in 1993 to 27.0% in 2002 [3]. In Australia in 2002 the proportion of babies delivered by caesarean section varied from 21.4% in Tasmania to over 29% in

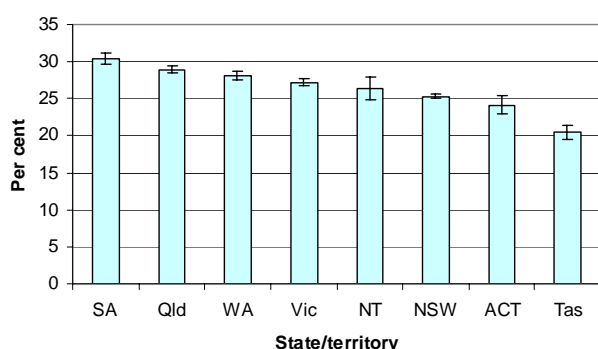
Queensland, Western Australia and South Australia. The proportion of deliveries by caesarean section in Queensland (29.5%) is slightly higher than that observed for the whole of Australia. Figure 2 shows interstate variation in caesarean section rates by public-private sector. Queensland has the fourth highest proportion of caesarean deliveries in the public sector (public hospitals), after South Australia, Victoria and Western Australia and the highest proportion out of all the states and territories in the private sector (private hospitals). When interstate comparison data is adjusted for sector to allow calculation of the proportion of caesarean section deliveries in each state or territory if they had the same proportion of public and private deliveries as occur in the whole of Australia, Queensland has the second highest caesarean section rate in Australia, after South Australia (see Figure 3).

Figure 2: Proportion of deliveries by caesarean section by state/territory and sector, 2002



Source: AIHW National Perinatal Statistics Unit, 2004
Vertical bars indicate 95% confidence intervals

Figure 3: Proportion of deliveries by caesarean section by state/territory adjusted for sector, 2002



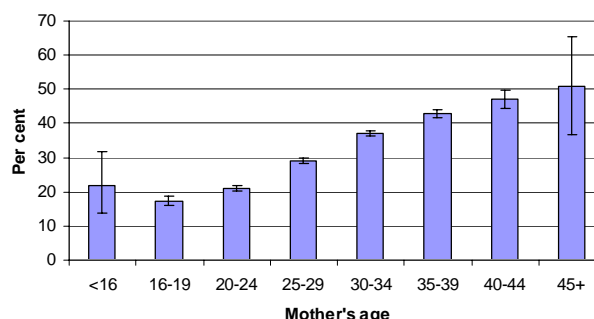
Source: AIHW National Perinatal Statistics Unit, 2004
Vertical bars indicate 95% confidence intervals

Variation by sector:

As can be seen in Figure 2, the proportion of deliveries by caesarean section in the private sector is higher than in the public sector throughout Australia. In Queensland in 2004, births in the private sector (private facilities and private beds in public facilities) were 79% more likely to be delivered by caesarean section than births in the

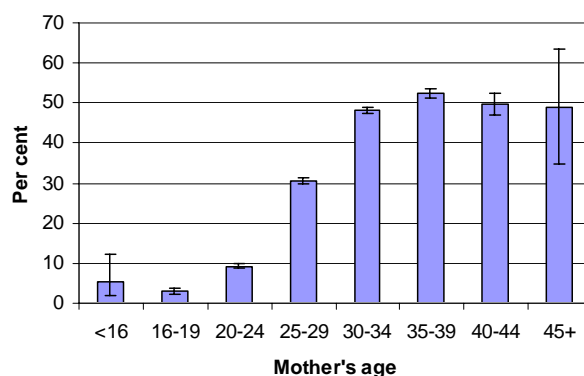
public sector (public beds in public facilities) (RR=1.79; 95%CI 1.75-1.84). It has been suggested that the higher proportion of caesarean deliveries in the private sector may be related to age rather than sector per se [4]. That is, there is a higher proportion of caesarean delivery among older women (see Figure 4), arguably due to an increased rate of complications (discussed below), and older women are also more likely to be treated in the private sector (see Figure 5). However, while age may explain part of the excess in private facilities, the difference between the rate in the public and private sector remains after adjusting for age (adjusted RR=1.57; 1.52-1.62) so is not the only reason for the observed excess. The increase in caesarean section delivery over the past 18 years in Queensland is evident regardless of age or sector (see Figures 6 and 7). Annual per cent change in caesarean rates by age group and sector are shown in Table 1. The largest increase in caesarean section rates has occurred among women aged 20-34 years and 35 years and over in the private sector where the caesarean section rate has increased by 4.08% per year (3.96-4.20) and 3.46% per year (3.24-3.68), respectively. The smallest increase has occurred among women less than 20 years in the public sector (annual % change=1.80; 1.36-2.23).

Figure 4: Proportion of deliveries by caesarean section by mother's age, Queensland 2004



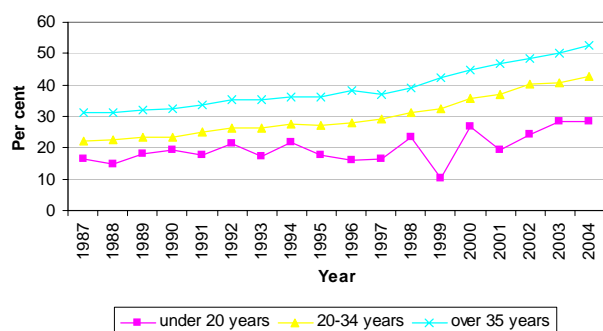
Source: Queensland Perinatal Data Collection
Vertical bars indicate 95% confidence intervals

Figure 5: Proportion of women in each age group delivering in the private sector, Queensland 2004



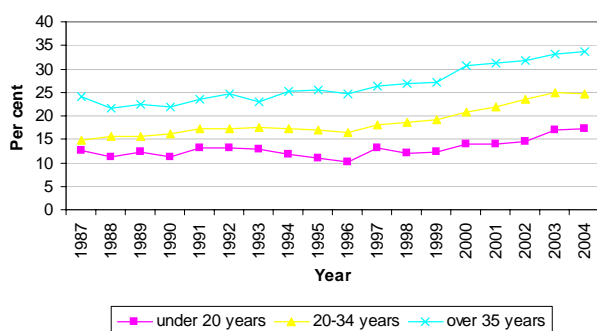
Source: Queensland Perinatal Data Collection
Vertical bars indicate 95% confidence intervals

Figure 6: Proportion of deliveries by caesarean section for the first pregnancy in the private sector, by age, Queensland 1987 to 2004



Source: Queensland Perinatal Data Collection

Figure 7: Proportion of deliveries by caesarean section for the first pregnancy in the public sector, by age, Queensland 1987 to 2004



Source: Queensland Perinatal Data Collection

Table 1: Annual per cent change in caesarean section rates by age group and sector, Queensland 1987-2004

Sector	Age group	Annual % change*	95% confidence interval
Private	Less than 20 years	2.51	1.04 - 4.01
	20-34 years	4.08	3.96 - 4.20
	35+ years	3.46	3.24 - 3.68
Public	Less than 20 years	1.80	1.36 - 2.23
	20-34 years	3.07	2.94 - 3.20
	35+ years	2.92	2.60 - 3.25

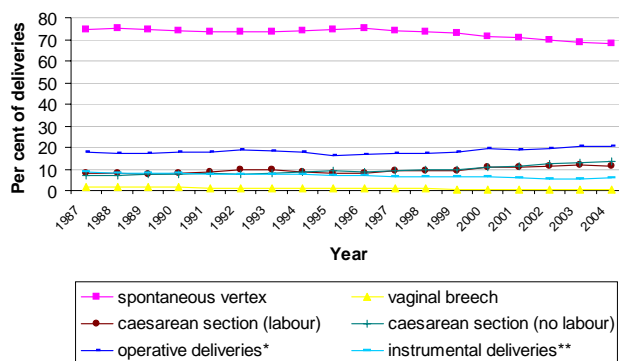
Source: Queensland Perinatal Data Collection
 * Calculated using generalised linear models with a binomial error term and log link. Year was fitted as a linear term.

Trends in method of delivery

Increases in caesarean section have been accompanied by changes in other methods of delivery. In both public and private sectors, the proportions of spontaneous vertex deliveries, vaginal breech deliveries and instrumental vaginal deliveries (forceps and ventouse vacuum) have

decreased since 1987 (Figures 8 and 9). Annual percent change for each method by sector is shown in Table 2.

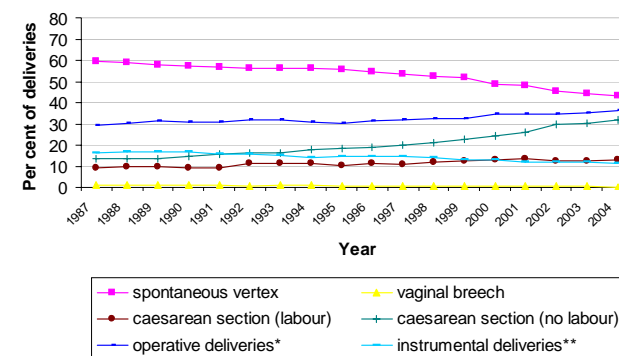
Figure 8: Proportion of births by various methods of delivery in the public sector, Queensland 1987 to 2004



Source: Queensland Perinatal Data Collection
 * Per cent of deliveries by caesarean section, forceps or vacuum among women who started labour
 ** Per cent of deliveries by forceps or ventouse vacuum

In Queensland, as elsewhere in Australia [5], the overall rate of operative deliveries (caesarean section, forceps and vacuum) among women who started labour has not increased substantially since 1987 in comparison with the changes seen in the individual methods over this time (see Figures 8 and 9 and Table 2). One interpretation of this result has been that the increase in caesarean section among women who experience labour represents a change in preference for procedure that seems to be medically motivated [5]. This suggests that the main area of increase in caesarean deliveries is among women who did not start labour. This subgroup of births is sometimes misnamed 'elective' caesarean sections. This is problematic as it is not necessarily true that women who do not start labour had a planned (or booked) caesarean. The increase among women who do not start labour can be attributed to many factors including improved screening procedures allowing potentially

Figure 9: Proportion of births by various methods of delivery in the private sector, Queensland 1987 to 2004



Source: Queensland Perinatal Data Collection
 * Per cent of deliveries by caesarean section, forceps or vacuum among women who started labour
 ** Per cent of deliveries by forceps or ventouse vacuum

Table 2: Annual per cent change in delivery methods by sector, Queensland 1987-2004

Delivery method	Annual % change ^a public	95% confidence interval	Annual % change ^a private	95% confidence interval
Spontaneous vertex	-0.48	-0.51 - -0.44	-1.67	-1.73 - -1.61
Vaginal breech	-6.51	-7.01 - -6.00	-6.12	-6.87 - -5.35
Instrumental delivery ^b	-2.30	-2.48 - -2.11	-2.17	-2.34 - -2.01
Caesarean - labour	2.46	2.29 - 2.63	2.23	2.03 - 2.42
Caesarean - non labour	4.18	4.01 - 4.36	5.66	5.52 - 5.81
Operative deliveries ^c	0.81	0.69 - 0.93	1.05	0.94 - 1.16

Source: Queensland Perinatal Data Collection

a. Calculated using generalised linear models with binomial error term and a log link. Year was fitted as a linear term.

b. Deliveries by forceps or vacuum

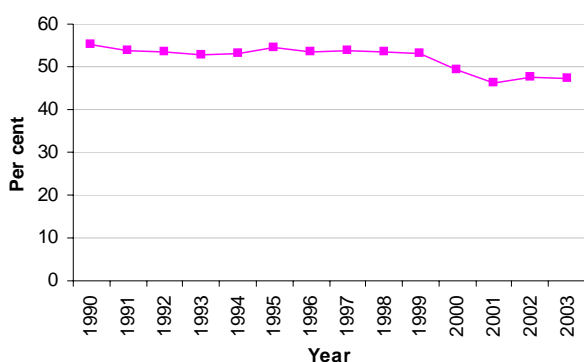
c. Deliveries by caesarean section, forceps or vacuum among women who started labour

at risk babies to be identified and delivered by caesarean section, a cyclic effect of previous caesarean section leading to subsequent caesarean section delivery and patient and doctor preference.

No indicated risk caesarean section:

In an attempt to obtain a clearer picture of trends in caesarean sections in women at low risk, researchers in the USA have developed a definition of ‘no indicated risk’ and have investigated trends in caesarean delivery among this subgroup of women [6]. In the US study, patients were defined (retrospectively) as being at ‘no indicated risk’ if they had a singleton, full term (>=37 weeks gestation), vertex presentation birth with no reported medical risk factors or complications of labour or delivery (list of applicable conditions and complications available from original article). They found that the proportion of women having their first (primary) caesarean section birth had increased among this group of women over the past 10 years. This methodology was applied to Queensland perinatal data to determine whether there has been an increase in caesarean deliveries among low risk women. Low risk births were defined as in the US study, except that women who had had previous large or preterm babies were included as

Figure 10: Proportion of women at “no indicated risk”^{} among women giving birth in Queensland 1990-2003**



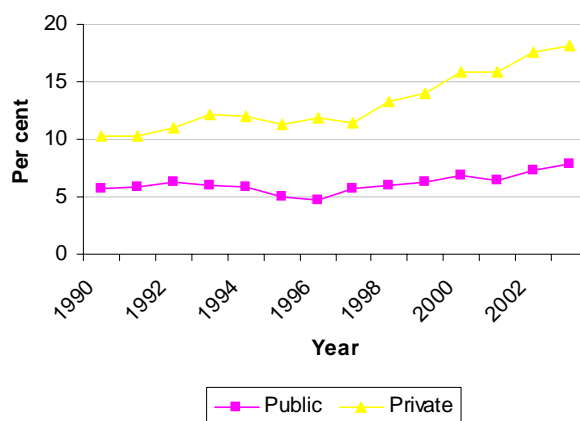
Source: Queensland Perinatal Data Collection

* ‘No indicated risk’ defined as singleton, term (37-41 weeks gestation), vertex presentation, no previous caesarean section, no reported medical risk factor or complication of labour or delivery (from a list of conditions specified in [6])

“at risk” in the US study but were not able to be identified in Queensland data. In addition, women who had had a previous caesarean delivery and those who had not delivered prior to 41 weeks gestation were classified as “at risk” in the Queensland sample but not in the US study. Overall, the proportion of women at “no indicated risk” has

decreased in Queensland since 1990 (annual % change=-1.11; -1.17- -1.05) (see Figure 10). A decrease was also observed in the US study. This decrease is consistent with the trend towards having babies at older ages. It was found that the proportion of primary caesarean section deliveries among low risk women increased from 1990 to 2003 (see Figure 11). This increase was most dramatic in the private sector, with an annual increase of 4.52% (4.15-4.90) but also occurred in the public sector (annual % change=2.18%; 1.76-2.60).

Figure 11: Trend in primary caesarean section deliveries among women at “no indicated risk”^{} by sector, Queensland 1990-2003**



Source: Queensland Perinatal Data Collection

* ‘No indicated risk’ defined as singleton, term (37-41 weeks gestation), vertex presentation, no previous caesarean section, no reported medical risk factor or complication of labour or delivery (from a list of conditions specified in [6])

Reason for caesarean section

The most common reason for performing a caesarean delivery in both public and private sectors was scar from previous caesarean section (‘uterine surgery’) which was cited as the reason for 35% and 31% of caesarean section deliveries in the private and public sectors, respectively in 2004. To explore the reasons for performing the initial caesarean delivery, reasons for caesarean were examined

when this was the woman's first caesarean delivery (primary caesarean deliveries). The most frequently occurring 'reasons for caesarean' for primary caesarean births in Queensland in 2004 are shown by sector in Table 3. The most frequently reported reason for primary caesarean was failure to progress in the public sector and 'no classifiable (medical, labour or delivery-related) condition' in the private sector. The next most frequent reason in the private sector was failure to progress, followed by breech presentation and fetal distress. The second most common reason recorded in the public sector was fetal distress, followed by breech presentation and other malpresentation. 'No classifiable condition' was less commonly recorded as a reason for caesarean delivery in the public sector than in the private sector (see Table 3).

Table 3: Reason for primary caesarean section* recorded in the medical chart, by sector, Queensland 2004

Reason (ICD10.4 AM code)	Private		Public	
	n	% of total	N	% of total
no classifiable (medical, labour or delivery-related) condition (o82)	771	16.92	217	4.36
failure to progress (o61 - o63)	764	16.77	1275	25.59
breech presentation (o32.1, o64.1)	546	11.98	790	15.86
fetal distress (o68)	536	11.76	1062	21.32
multiple births (o30, o31)	305	6.69	138	2.77
other malpresentation (o32.0, o32.2 - o32.9, o64.0, o64.2 - o64.9)	267	5.86	419	8.41
pregnancy associated hypertension (o10, o11, o13 - o16)	227	4.98	152	3.05
disproportion/dystocia (o33)	209	4.59	52	1.04
placenta praevia (o44)	133	2.92	150	3.01
poor reproductive/obstetric history (Z35.2)	131	2.88	129	2.59
poor fetal growth (o36.5)	80	1.76	54	1.08
obstructed labour (o65 - o66)	77	1.69	80	1.61
excessive fetal growth (o36.6)	70	1.54	72	1.45
abrupto Placenta (o45)	23	0.50	45	0.90
other haemorrhage (o43, o46, o67)	21	0.46	34	0.68
preterm delivery (o60)	16	0.35	13	0.26
cord complication (o69)	13	0.29	43	0.86

* previous caesarean section defined as pregnancy complication = 034.2

Caesarean section among Indigenous and rural women:

Indigenous and urban-rural differences in caesarean delivery rate were examined for births in the public sector only since relatively few Indigenous women (2.69%) or women in rural areas (27.55% compared with approximately 35% in other areas) accessed the private sector. In 2000-2004 Aboriginal and Torres Strait Islander women had the same rate of caesarean section delivery as non-Indigenous women after adjusting for age. Women living in urban centres outside of the South East corner of Queensland had the same rate of caesarean

section delivery as women living in the South East corner. Women living in rural or remote areas were slightly less likely to have a caesarean delivery than women living in the South East corner of Queensland (RR=0.95, 0.93-0.98), (adjusting for age). This difference was not found when women at 'higher risk' were considered separately.

Discussion

The results described above provide a summary of the status of caesarean section in Queensland. However, the information that would be required to explain the observed differences and trends is largely absent. Thus, there are no clear answers to key questions such as why the caesarean rate is increasing in Queensland and Australia, why there are higher rates observed in Australia compared to other OECD countries, why there are higher rates observed in the private sector, and why caesareans among 'no indicated risk' deliveries are increasing.

There is a lack of robust research evidence about the risks and benefits of different methods of delivery. Thus, while we know that the rate of caesarean section deliveries in Australia and other developed countries is rising, there is no consensus on what this means in terms of risk and benefit. Also, there is no consensus about what is an acceptable rate of caesarean section delivery in a developed country. Recommendations from the World Health Organisation in 1985 [7], based on consideration of information available at that time, were that there

is no justification for countries with low rates of perinatal mortality to have a rate of caesarean section higher than 10-15%. However, rates in many countries exceed this recommendation and it is not clear from the evidence-base regarding caesarean deliveries what the implications of this excess are.

There have been few randomised trials conducted to evaluate the benefits and risks of caesarean section delivery [8]. Conclusions from studies that have been conducted are outlined below.

- For high risk conditions such as placenta praevia and transverse lie there is convincing evidence that caesarean section reduces the risk of adverse outcomes [9].
- For intermediate risk births there is less robust evidence. A Cochrane review summarised three randomised trials comparing outcomes for singleton term breech deliveries allocated to caesarean section delivery to those allocated to vaginal delivery [10]. It was concluded that planned caesarean section compared with planned vaginal birth reduced perinatal and neonatal death and serious neonatal morbidity in the population considered (term, breech, singleton births). Planned caesarean section was associated with modestly increased short-term maternal morbidity. Three months after delivery, women who delivered via planned caesarean section reported less urinary incontinence, more abdominal pain and less perineal pain than women who delivered vaginally. Long-term morbidity and implications for subsequent reproductive function were not assessed [10].
- There have been no trials conducted to determine the benefits and risks of caesarean delivery compared with vaginal delivery in births to women who have previously delivered via caesarean section. Non-randomised cohort studies have examined this issue, but results are difficult to interpret due to the potential for bias with this study design since there is no way to distinguish between the effects of factors that influence the choice of delivery method and the actual method of delivery on the outcomes of interest. A Cochrane review identified five meta-analyses of cohort studies on this topic [11]. The success rate for vaginal birth after a previous caesarean delivery ranged from 67% to 85% depending on the population considered, the reason for the original caesarean section, and the definition of eligibility for vaginal birth after a previous caesarean delivery used in studies included in meta-analyses. Risks and benefits were identified for both planned elective repeat caesarean section and planned vaginal birth after a previous caesarean delivery (see Figure 12), but in general there was no clear preference in terms of benefits and risks for either method of delivery. It was concluded that the reliability of results concerning this topic is questionable since almost all studies conducted so far have been retrospective and groups included in meta-analyses were not necessarily comparable due to inconsistency in the definition of women eligible for inclusion [11].
- For low risk births there is very little evidence regarding benefits and risks. There have been no clinical trials in low risk births (i.e., singleton, vertex presentation, full-term births with no evidence of medical conditions or complications that may infer a need for caesarean delivery). Results from

retrospective cohort studies are difficult to interpret due to problems obtaining a clear definition of the risk status of the birth. A Cochrane review is planned to provide a summary of all studies relating to caesarean section for non-medical reasons [12], but like the summary of studies investigating repeat caesarean section versus vaginal birth after a previous caesarean, it is not likely that this summary will provide any clear answers. Figure 12 provides a summary of the evidence regarding risks for caesarean and vaginal delivery methods, some of which may apply to caesarean delivery in low-risk births. However, it is not possible to make a statement regarding whether elective caesarean for low risk births is more or less safe than vaginal births with the available evidence.

Birth is a profound human experience and the freedom to choose the delivery method (and the accompanying risks) is an issue that provokes powerful, emotional responses. The idea of a randomised trial of elective caesarean section in low risk women has provoked heated debate among both clinicians and consumers. Thus, it is not envisaged that a study will be conducted to resolve this issue in the near future.

The preference of the woman who is having the baby is another factor that impacts on the rate of caesarean section that must be considered when trying to determine an 'optimum' rate. If a woman is informed of the current evidence regarding advantages and disadvantages of each delivery option and there are no medical indications to rule out vaginal or caesarean delivery, then it is difficult to justify enforcing a delivery method on her, particularly given the current lack of evidence regarding the benefits and risks of each method in a low risk group.

Figure 12. Risks associated with delivery methods:

- Urinary and faecal incontinence, pelvic organ prolapse, dyspareunia, and perineal pain are more common with vaginal delivery than with caesarean section, due to damage to the pelvic floor or anal sphincter. The risk of these outcomes is higher among operative vaginal deliveries than among spontaneous vaginal deliveries [13]. One study suggests that longer term (after 50 years of age), the protective effect of caesarean section for urinary incontinence disappears [14].
- Caesarean section involves a slightly increased risk of a subsequent ectopic pregnancy, placenta praevia, placenta accreta and emergency hysterectomy [13]
- There is some evidence that repeat caesarean section is related to higher risk of infection than vaginal birth after a previous caesarean [11]

- There is some evidence that vaginal birth after a previous caesarean involves a higher risk of uterine rupture and perinatal death than elective caesarean section [11]
- Babies are slightly more likely to suffer from respiratory complications (no difference among babies born post 40 weeks gestation), CNS depression, and feeding difficulties in the period immediately following the birth when delivered via caesarean section than when delivered vaginally. Laceration injuries are also more common among caesarean births [13].
- Caesarean section limits mobility for up to 6 weeks which impacts on ability to care for a new baby [15].
- It has been suggested that women giving birth by caesarean section are more likely to suffer long term psychosocial problems, such as postnatal depression or post-traumatic stress syndrome than women giving birth vaginally. However, there is no strong evidence to support this [13].
- There is conflicting evidence regarding maternal mortality rates. A recent review of the literature concluded that there is no evidence of differential maternal mortality for vaginal and caesarean delivery methods [13].
- Among term breech births, planned caesarean section compared with planned vaginal birth results in reduced perinatal or neonatal death and serious neonatal morbidity. Planned caesarean section in term breech births is associated with modestly increased short-term maternal morbidity. Randomised trials found that three months after delivery, women who delivered via planned caesarean section reported less urinary incontinence, more abdominal pain and less perineal pain than women who delivered vaginally.

References

1. Walker, R., D. Turnbull, and C. Wilkinson, *Strategies to address global caesarean section rates: A review of the evidence*. Birth, 2002. **29**(1): 28-39.
2. OECD, *OECD Health Data*. 2004.
3. Laws, P.J. and E.A. Sullivan, *Australia's mothers and babies 2002*. AIHW Cat. No. PER 28., in *Perinatal Statistics Series No. 15*. 2004, AIHW National Perinatal Statistics Unit: Sydney.
4. Papapetros, I., *Obstetric intervention among private and public patients in Australia: Intervention relates more to age than to having private insurance*. BMJ, 2001. **322**: 430-431.
5. Roberts, C.L., et al., *Operative delivery during labour: trends and predictive factors*. Paediatr Perinat Epidemiol, 2002. **16**: 115-123.
6. Declercq, E., F. Menacker, and M.F. MacDorman, *Rise in "no indicated risk" primary caesareans in the United States, 1991-2001: cross sectional analysis*. BMJ, 2005. **330**: 71-72.
7. World Health Organisation, *Appropriate technology for birth*. Lancet, 1985. **ii**(August 24): 436-437.
8. The Cochrane Collaboration, *The Cochrane Library (available through CKN or at www.thecochranelibrary.com)*. 2005, John Wiley & Sons Ltd.
9. Neilson, J.P., *Interventions for suspected placenta praevia*. Cochrane Database Syst Rev, 2003. **2003**(1): Art. No.:CD001998.
10. Hofmeyr, G.J. and M.E. Hannah, *Planned caesarean section for term breech delivery*. Cochrane Database Syst Rev, 2003. **2003**(2): Art. No.: CD000166.
11. Dodd, J.M., et al., *Planned elective repeat caesarean section versus planned vaginal birth for women with a previous caesarean birth*. Cochrane Database Syst Rev, 2004. **2004**(4): Art. No.:CD004224.pub2.
12. Lavender, T., et al., *Caesarean section for non-medical reasons at term (Protocol)*. Cochrane Database Syst Rev, 2004. **2004**(1): Art. No.:CD004660.
13. Wax, J.R., et al., *Patient choice caesarean: An evidence-based review*. Obstet Gynecol Surv, 2004. **59**(8): 601-616.
14. Rortveit, G., et al., *Urinary incontinence after vaginal delivery or caesarean section*. N Engl J Med, 2003. **348**: 900-907.
15. Senate Community Affairs References Committee Secretariat, *Rocking the cradle: A report into childbirth procedures*. 1999, Commonwealth of Australia: Canberra.