

# Trends and variations in length of hospital stay for childbirth in Canada

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## Abstract

**Background:** Early discharge after childbirth is widely reported. In this study the authors examined trends in maternal length of hospital stay in Canada from fiscal year 1984–85 through fiscal year 1994–95. They also examined variations in length of stay in 1994–95 in most of the Canadian provinces and the territories.

**Methods:** Epidemiologic analyses of the temporal and geographic variations in maternal length of hospital stay in Canada from 1984–85 to 1994–95 (even years only), based on hospital discharge data collected by the Canadian Institute for Health Information, with a total of 1 456 800 women for the 6 study years.

**Results:** Mean length of hospital stay decreased during the decade, from 5.3 days in 1984–85 to 3.0 days in 1994–95, with similar trends for both cesarean and vaginal delivery. The decrease resulted from both increasing rates of short stay (less than 2 days) and decreasing rates of long stay (more than 4 days). Substantial temporal and interprovincial variations in several medical and obstetric complications were also observed but did not explain the corresponding variations in length of stay. The reduction in length of hospital stay was not restricted to uncomplicated cases: there was an equivalent decrease in cases with complications. In 1994–95 the average length of hospital stay in Alberta was 2.6 days, 0.3 to 1.7 days shorter than in the other provinces and the territories.

**Interpretation:** Length of hospital stay for childbirth has decreased substantially in Canada in recent years, but there remain important interprovincial variations. These trends and variations are not likely due to changes or differences in patient-specific factors.

## Résumé

**Contexte :** Les congés rapides après l'accouchement font l'objet de nombreux comptes rendus. Dans cette étude, les auteurs ont examiné les tendances de la durée d'hospitalisation de la mère au Canada, de l'exercice 1984–1985 jusqu'à l'exercice 1994–1995. Ils ont aussi examiné les variations de la durée du séjour en 1994–1995 dans la plupart des provinces et les territoires du Canada.

**Méthodes :** Analyses épidémiologiques des variations temporelles et géographiques de la durée d'hospitalisation de la mère au Canada de 1984–1985 à 1994–1995 (années paires seulement), fondées sur les données relatives aux congés d'hôpital recueillies par l'Institut canadien d'information sur la santé : les 6 années étudiées regroupaient au total 1 456 800 femmes.

**Résultats :** La durée moyenne du séjour à l'hôpital a diminué au cours de la décennie pour passer de 5,3 jours en 1984–1985 à 3,0 jours en 1994–1995 et les tendances étaient semblables pour les accouchements par césarienne et par voie vaginale. La réduction a découlé à la fois de la hausse des taux de séjour de courte durée (moins de 2 jours) et de la baisse des taux de séjour de plus longue durée (plus de 4 jours). On a aussi observé d'importantes variations temporelles et interprovinciales dans le cas de plusieurs complications médicales et obstétriques, mais ces variations n'expliquaient toutefois pas les variations correspondantes de la durée du séjour. La réduction de la durée d'hospitalisation n'était pas limitée aux cas sans complications : il y a eu une réduction équivalente chez les cas avec complications. En 1994–1995, la durée moyenne du séjour à



## Evidence

## Études

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l'hôpital était de 2,6 jours en Alberta, soit de 0,3 à 1,7 jours de moins que dans les autres provinces et dans les territoires.

**Interprétation :** La durée d'hospitalisation pour un accouchement a diminué considérablement au Canada depuis quelques années, mais il persiste d'importantes variations interprovinciales. Il est peu probable que ces tendances et variations soient attribuables à des changements ou à des différences au niveau de facteurs particuliers aux patientes.

**H**ow long women should stay in hospital for childbirth remains controversial.<sup>1-8</sup> One incentive for shortening the length of in-hospital stay is to reduce health care costs. However, increasing concern has been expressed that the hospital stay for childbirth will become, or already is, inappropriately short.<sup>1-3</sup> Moreover, although the focus of the debate on early discharge is for uncomplicated vaginal deliveries,<sup>1,2</sup> it is unclear whether and to what extent hospital stay for complicated deliveries has also been shortened in routine practice.

In an initial assessment of the potential uses of existing data for perinatal surveillance, we found that hospital admission and separation records collected by the Canadian Institute for Health Information (CIHI) contain some of the information pertinent for perinatal surveillance, including maternal length of hospital stay.<sup>9</sup> Analysis of the temporal trends and geographic variations in maternal length of hospital stay and of the reasons for these variations may generate results useful in the planning of perinatal care. The goal of our study was to analyse temporal trends and interprovincial variation in the length of hospital stay for women giving birth in Canadian hospitals as recorded by the CIHI for the period Apr. 1, 1984, to Mar. 31, 1995.

## Methods

We used CIHI data for fiscal year 1984-85 to fiscal year 1994-95; data presented here are for even years only. Data for women admitted to hospital for childbirth were abstracted by appropriate codes on case-mix group (CMG). The CIHI uses both surgical and medical partitionings to define major clinical categories. The case-mix group codes generated by the CIHI allowed us to identify deliveries unequivocally. Complications were defined by the diagnosis that was most responsible or other significant diagnosis, including eclampsia or preeclampsia, diabetes mellitus, placenta previa, and significant heart, liver and renal disorders.

We coded maternal age and length of hospital stay using the CIHI manual. Diagnoses were coded according to the ninth revision of the *International Classification of Diseases*.<sup>10</sup> Procedures were coded according to the *Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures*.<sup>11</sup> Because pre- and postpartum length of stay cannot

be distinguished in the CIHI records, we used the entire maternal length of hospital stay instead of postpartum length of stay for the current analysis. Both means and frequencies of short (less than 2 days) and long (more than 4 days) stays were analysed. To limit the influence of the data for a few women with excessively long hospital stays on the calculation of the mean, all women with a hospital stay longer than 20 days were assigned a value of 20 days; this group accounted for less than 0.1% of all cases.

We analysed temporal trends for all women first and then interprovincial variation for the most recent year (1994-95). Because women with medical or obstetric complications may require long hospital stays,<sup>12,13</sup> we also examined temporal trends and interprovincial variation in rates of major medical and obstetric complications, to assess whether variations in the occurrence of these complications were responsible for the temporal or geographic variation in length of hospital stay. We then used stepwise multiple linear regression and logistic regression analyses to assess the independent effects of birthing year and province of residence on length of hospital stay. Because maternal length of hospital stay is directly affected by mode of delivery and clinical complexity, we further stratified interprovincial variation in length of hospital stay in 1994-95 by 5 case-mix groups, taking mode of delivery and clinical complexity into consideration simultaneously: cesarean section with complications (CMG 601, 602), cesarean section without complications (CMG 603, 604), vaginal delivery with minor procedures (CMG 606, 607), vaginal delivery with complications (CMG 608, 609) and vaginal delivery without complications (CMG 610, 611). Finally, to assess whether the observed variations could be explained by differences in rates of in-hospital death or transfer to other institutions, we performed a sensitivity analysis, excluding women who died while in hospital or were transferred to another institution. All analyses were performed with SAS software (SAS Institute, Cary, NC).

## Results

For the 6 fiscal years studied, information for 1 456 800 women who gave birth in Canadian hospitals (63.8% of all those who gave birth in Canadian hospitals during the period<sup>14</sup>) was recorded by the CIHI. Substantial temporal and geographic variation in CIHI participation was noted.



For example, the proportion of women giving birth in Canada for whom data was recorded by the CIHI ranged from 51.0% in 1984–85 to 74.5% in 1994–95, and the province-specific proportion in 1994–95 ranged from 14.6% in Nova Scotia to 100% in Ontario.

Maternal length of hospital stay decreased over the decade, from an average of 5.3 days in 1984–85 to 3.0 days in 1994–95 (Table 1). The decrease was due to both increasing rates of short stay and decreasing rates of long stay (Table 1). Similar trends were observed for cesarean and vaginal delivery. Substantial temporal variations in the rates of several medical and obstetric complications were also observed but did not explain corresponding variations in length of hospital stay (data not shown). Birthing year remained a significant explanatory factor for length of hospital stay after adjustment for province of residence and major medical or obstetric complications (Table 2).

Length of hospital stay in 1994–95 varied substantially across provinces and was shortest in Alberta. This variation resulted from differences in the rates of both short

and long stay (Table 3). Substantial interprovincial variations in several medical and obstetric complications were also observed but did not explain corresponding variations in length of hospital stay (data not shown). Province of residence remained a significant explanatory factor for length of hospital stay after adjustment for major medical and obstetric complications (Table 4). Interprovincial variation in length of hospital stay was present across grades of clinical complexity (Table 5). For example, the difference in mean length of stay for women from Alberta compared with those from Newfoundland — the province with the longest length of stay — was –2.8 days for cesarean delivery with complications and –2.7 days for vaginal delivery with complications. The corresponding figures for cases without complications were –1.4 days and –1.5 days (Table 5).

We obtained essentially the same results when we excluded from the analyses the data for women who died while in hospital or were transferred to another institution (data not shown).

**Table 1: Temporal trends in length of hospital stay for women giving birth in Canadian hospitals, 1984–85 to 1994–95\***

Variable	Fiscal year					
	1984–85	1986–87	1988–89	1990–91	1992–93	1994–95
Mean length of stay (and SD), d						
Vaginal delivery	4.7 (2.1)	4.5 (2.1)	4.2 (2.1)	3.7 (1.9)	3.2 (1.7)	2.6 (1.6)
Cesarean section	7.6 (3.0)	7.4 (3.0)	7.0 (2.9)	6.4 (2.8)	5.8 (2.7)	5.0 (2.6)
All deliveries	5.3 (2.6)	5.1 (2.6)	4.8 (2.6)	4.3 (2.3)	3.7 (2.2)	3.0 (2.0)
% of women with length of stay < 2 d	1.6	1.9	2.3	2.9	4.9	13.5
% of women with length of stay > 4 d	57.5	51.6	44.5	33.9	23.7	14.2

Note: SD = standard deviation. Source: Canadian Institute for Health Information (CIHI).

\*The rates of several medical complications, including gestational diabetes mellitus, oligohydramnios, infection of amniotic cavity, and poor or excessive fetal growth, varied substantially over time. The variation in these complications did not explain the variation in length of hospital stay.

**Table 2: Results of stepwise multiple linear regression and multiple logistic regression analyses for temporal trends in length of hospital stay, 1984–85 to 1994–95\*†**

Year	Mean difference in length of stay (and 95% CI), d	Odds ratio (and 95% CI)	
		For short stay	For long stay
1984–85	0	1	1
1986–87	–0.26 (–0.25 to –0.27)	1.22 (1.16 to 1.28)	0.73 (0.72 to 0.74)
1988–89	–0.57 (–0.56 to –0.58)	1.55 (1.48 to 1.62)	0.51 (0.50 to 0.52)
1990–91	–1.08 (–1.07 to –1.09)	1.91 (1.84 to 2.00)	0.29 (0.29 to 0.30)
1992–93	–1.65 (–1.64 to –1.66)	3.25 (3.12 to 3.38)	0.15 (0.14 to 0.15)
1994–95	–2.26 (–2.25 to –2.27)	10.01 (9.64 to 10.39)	0.06 (0.05 to 0.06)

Note: CI = confidence interval, short stay = less than 2 days, long stay = more than 4 days.

\*Potential confounding variables included in the initial models: region of residence (eastern, Ontario and western), maternal age, fetal death, multiple pregnancy, cesarean delivery, previous cesarean delivery, breech presentation, other malposition or malpresentation, dystocia, fetal distress, preeclampsia or eclampsia, gestational diabetes mellitus, placenta previa, abruptio placenta, polyhydramnios, oligohydramnios, infection of amniotic cavity, poor fetal growth and excessive fetal growth. Year of birth was represented with indicator variables, with 1984 as the reference. The significance level was set at 0.05.

†Compared with 1984, the mean length of stay was 0.26 days shorter in 1986, the odds ratio for a length of stay less than 2 days was 1.22 in 1986, and the odds ratio for a length of stay greater than 4 days was 0.73 in 1986, and so on for the other years.



## Interpretation

We found a dramatic reduction in the mean length of hospital stay for women giving birth in Canadian hospitals in recent years, from 5.3 days in 1984–85 to 3.0 days in 1994–95. We also found substantial interprovincial variation in length of hospital stay. For example, in

1994–95 the average length of stay in Alberta was 2.6 days, 0.3 to 1.7 days shorter than the average for the other provinces and the territories. These findings are in general consistent with results from previous studies conducted in Canada<sup>15,16</sup> and the United States,<sup>17,18</sup> although the substantial interprovincial variation in length of hospital stay in recent years has not been reported previously.

**Table 3: Interprovincial variation in length of hospital stay, 1994–95\*†**

Variable	Newfoundland n = 5 860	PEI n = 1 593	NS n = 1 611	NB n = 8 931	Ontario n = 149 069	Manitoba n = 11 644	Saskatchewan n = 13 182	Alberta n = 39 316	BC n = 46 458	Yukon and Northwest Territories n = 1 645
Mean length of stay (and SD), d	4.3 (2.8)	4.3 (2.2)	3.7 (2.7)	3.9 (2.2)	2.9 (1.9)	3.1 (2.1)	3.6 (2.1)	2.6 (1.9)	3.3 (2.1)	3.1 (1.9)
% of women with length of stay < 2 d	2.9	2.1	7.3	2.6	14.0	8.7	6.9	24.6	9.5	15.4
% of women with length of stay > 4 d	31.4	32.9	21.9	25.7	12.5	14.6	21.9	8.6	16.9	15.3

\*Source: CIHI. Quebec did not participate in data collection by the CIHI in 1994–95, and Nova Scotia provided only a small proportion of its data.  
†The rates of several medical complications, including gestational diabetes mellitus, polyhydramnios, infection of amniotic cavity, poor fetal growth and dystocia, varied substantially across provinces. The interprovincial variation in these complications did not explain the variation in length of hospital stay.

**Table 4: Results of stepwise multiple linear regression and multiple logistic regression analyses for interprovincial variations in length of hospital stay, 1994–95\*†**

Province or territory	Mean difference in length of stay (and 95% CI), d	Odds ratio (and 95% CI)	
		For short stay	For long stay
Alberta	0	1	1
Newfoundland	+1.67 (+1.62 to +1.72)	0.08 (0.07 to 0.10)	4.51 (4.20 to 4.84)
PEI	+1.68 (+1.59 to +1.77)	0.06 (0.04 to 0.09)	5.01 (4.45 to 5.65)
NS	+0.95 (+0.86 to +1.04)	0.27 (0.23 to 0.33)	2.37 (2.07 to 2.71)
NB	+1.33 (+1.29 to +1.37)	0.07 (0.07 to 0.09)	3.10 (2.91 to 3.31)
Ontario	+0.35 (+0.33 to +0.37)	0.47 (0.46 to 0.49)	1.71 (1.65 to 1.78)
Manitoba	+0.60 (+0.56 to +0.64)	0.26 (0.25 to 0.28)	1.76 (1.65 to 1.88)
Saskatchewan	+0.99 (+0.96 to +1.02)	0.22 (0.21 to 0.24)	2.13 (2.01 to 2.27)
BC	+0.58 (+0.56 to +0.60)	0.33 (0.32 to 0.34)	1.56 (1.49 to 1.63)
Yukon and Northwest Territories	+0.68 (+0.60 to +0.76)	0.46 (0.40 to 0.53)	2.12 (1.83 to 2.45)

\*Potential confounding variables included in the initial models: maternal age, fetal death, multiple pregnancy, cesarean delivery, previous cesarean delivery, breech presentation, other malposition or malpresentation, dystocia, fetal distress, preeclampsia or eclampsia, gestational diabetes mellitus, placenta previa, abruptio placenta, polyhydramnios, oligohydramnios, infection of amniotic cavity, poor fetal growth and excessive fetal growth. Alberta was the reference. The significance level was set at 0.05.

†Compared with Alberta, the mean length of stay was 1.67 days longer in Newfoundland, the odds ratio for a length of stay less than 2 days was 0.08 in Newfoundland, and the odds ratio for a length of stay greater than 4 days was 4.51 in Newfoundland, and so on for the other provinces and territories.

**Table 5: Interprovincial variation in length of hospital stay by mode of delivery and clinical complexity, 1994–95\***

Type of delivery	Province or territory; mean length of stay (and SD), d									
	Newfoundland n = 5 860	PEI n = 1 593	NB n = 8 931	Ontario n = 149 069	Manitoba n = 11 644	Saskatchewan n = 13 182	Alberta n = 39 316	BC n = 46 458	Yukon and Northwest Territories n = 1 645	
Cesarean delivery with complications	7.9 (4.3)	8.1 (3.6)	7.0 (4.1)	6.1 (3.6)	6.9 (3.9)	6.3 (3.4)	5.1 (3.3)	5.8 (3.5)	6.1 (3.1)	
Cesarean delivery without complications	5.3 (2.1)	5.4 (1.4)	5.2 (1.7)	4.4 (1.3)	4.6 (1.5)	4.8 (1.7)	3.9 (1.3)	4.4 (1.3)	5.2 (2.0)	
Vaginal delivery with minor procedure	4.5 (2.3)	3.9 (1.3)	3.8 (1.3)	3.4 (1.9)	3.2 (1.8)	3.9 (2.2)	3.1 (1.8)	3.6 (2.0)	3.6 (2.6)	
Vaginal delivery with complications	5.4 (3.9)	4.9 (3.3)	4.7 (3.1)	3.3 (2.4)	3.6 (2.4)	3.9 (2.3)	2.7 (2.1)	3.6 (2.5)	3.3 (2.0)	
Vaginal delivery without complications	3.5 (2.1)	3.5 (1.3)	3.2 (1.3)	2.2 (1.0)	2.4 (1.1)	2.9 (1.3)	2.0 (1.0)	2.5 (1.1)	2.6 (1.4)	

\*Source: CIHI. Quebec did not participate in data collection by the CIHI in 1994–95, and Nova Scotia provided only a small proportion of its data. Because of the small sample sizes in the 5 subgroups and because there may have been selection bias in subgroups of patients with complications, the Nova Scotia data were excluded from this table.



Policy-related factors may be responsible for the shortened length of hospital stay in recent years and in certain provinces in Canada. First, the variations in patient-specific factors did not explain the variations in length of stay. Second, birthing year and province of residence remained significant explanatory factors for length of stay after adjustment for many patient-specific factors by regression models. Third, stratified analysis indicated that the interprovincial differences in length of hospital stay were not affected by mode of delivery or clinical complexity. This last finding highlights the need for closer examination of the potential health consequences of the shortened maternal length of hospital stay for both women and their infants. Previous studies have suggested that early discharge (within 2 days of admission) may be safe for women at "low risk."<sup>21-3</sup> However, in Alberta in 1994-95, for example, 20% of women who gave birth vaginally with complications and 1.3% of those who underwent cesarean section with complications were discharged within 2 days of admission, and more than 90% and 50% respectively were discharged within 4 days.

Studies drawing on administrative data may suffer from coding errors.<sup>19,20</sup> A particular concern in our study is that errors in coding the diagnosis may have compromised the ability to adjust for medical or obstetric complications by regression models. Fortunately, all provinces except Quebec and Nova Scotia participated fully in data collection by the CIHI in 1994-95, the year for which we analysed interprovincial variation in length of hospital stay. The argument that our findings are biased would thus have to assume that there were dramatic interprovincial variations in population profile in 1994-95, the healthiest women residing in Alberta. Although difficult to disprove with available information, such an extreme scenario is highly unlikely. Our study is also limited by the incomplete participation in CIHI data collection by some provinces and the temporal variation in participation. In particular, if the participating provinces or hospitals in earlier years were those with systematically longer hospital stays, the observed trend of a reduction in length of stay in recent years could be an artifact. However, this is not the case (data available from us on request). Our study is further limited by the inability to separate prepartum from postpartum hospital stay and to separate "acute days" from "nonacute days." The latter are days on which the patient is not receiving necessary hospital services and is not severely ill.<sup>21-24</sup> Separation of acute from nonacute days may be helpful in assessing the efficiency of use of hospital resources.

A recent Statistics Canada report has indicated that between 1986-87 and 1994-95, the number of staffed beds in Canadian hospitals was reduced by 30.0%.<sup>25</sup> The reduction in Alberta was 53.5%, the largest among the

provinces. There is no doubt that the reduction in staffed beds in Canadian hospitals may have put pressure on hospitals to discharge patients earlier. Given the recent dramatic reduction in length of hospital stay for childbirth in certain provinces, systematic follow-up studies to examine the potential risks of shortened hospital stay in these provinces are warranted, particularly because the reduction has probably resulted from administrative pressure and has not been restricted to uncomplicated cases. Large multicentre clinical trials of early versus traditional discharge may be not feasible. For several practical reasons, it is difficult to randomly assign women to early-discharge versus late-discharge groups, and the compliance rate in this type of study tends to be low. Large observational studies measuring several outcomes (including breastfeeding, satisfaction, postpartum blues and depression, and maternal and neonatal illness) would be more appropriate. As a first step toward a comprehensive assessment of the potential consequences of early discharge, we are carrying out a CIHI data linkage study to assess the potential risks of maternal readmission after childbirth in certain Canadian provinces.

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