Attempted Forceps and Attempted Vacuum Delivery: Maternal and Neonatal Trauma Rates by Province/Territories, Tier of Service and Hospital, Canada, April 2013 to March 2019

Team for Improving Perinatal Health Care Regionalization in Canada (funded by the Canadian Institutes of Health Research PER-150902)

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CIHR Team members listed on page 257.

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Executive summary

Background: The goal of the CIHR Team for Improving Perinatal Health Care Regionalization in Canada is to evaluate the effectiveness and safety of perinatal care regionalization in Canada. This evaluation is stratified by mode of delivery and 3 separate reports address the frequency and safety of primary cesarean delivery (report finalized), attempted forceps and attempted vacuum delivery (this document) and delivery to women after a previous cesarean delivery (report in preparation).

Attempted forceps and attempted vacuum delivery can facilitate childbirth, avoid a cesarean delivery and reduce serious morbidity and death for both mother and baby. On the other hand, attempted forceps and attempted vacuum delivery may be associated with significant maternal and/or neonatal trauma. The frequency of such adverse outcomes is lower when cases for attempted forceps or attempted vacuum delivery are chosen appropriately and when the obstetrician carrying out the procedure is well-trained and skilled.

This Report quantifies the frequency and safety of attempted forceps and attempted vacuum delivery by province/territory, tier of obstetric service and hospital in Canada.

Methods: The analysis was based on all singleton, term, deliveries in Canadian hospitals (excluding Quebec) for the period April 2013 to March 2019 (excluding deliveries to women with a previous cesarean delivery). Data on these deliveries were obtained from the Discharge Abstract Database of the Canadian Institute for Health Information.

Rates of attempted forceps and failed forceps delivery, and rates of attempted vacuum and failed vacuum delivery were quantified by province/territories, tier of obstetric service and hospital (with the tiers of service frameworks obtained from each province/territories). Failed forceps included attempted forceps delivery followed by cesarean delivery, while failed vacuum included attempted vacuum followed by forceps delivery, attempted vacuum followed by cesarean delivery and sequentially failed use of vacuum and forceps followed by cesarean delivery. Since cesarean delivery cases that followed failed forceps and failed vacuum delivery were counted as cases of attempted forceps and attempted vacuum delivery, rates of attempted forceps and attempted vacuum were expressed per 100 deliveries (and not per 100 vaginal deliveries). Attempted forceps- and attempted vacuum-associated rates of maternal trauma were calculated for each province/territories, tier of obstetric service and hospital.

Maternal trauma was defined as a composite outcome that included third- and fourth-degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and injury to the urethra or bladder requiring repair. Neonatal trauma was defined as a composite outcome that included intracranial laceration and hemorrhage due to birth injury, fracture of the skull, epicranial subaponeurotic hemorrhage, other birth injury to the central or peripheral nervous system, birth injury to the long bones, liver or spleen, seizures and neonatal death. Neonatal trauma rates were calculated among infants without congenital anomalies.

Outlier provinces/territories, tiers of service (within each province/territories) and hospitals (within a province/territories-specific tier of service) with significantly higher rates of trauma were identified. Exact binomial 95% confidence intervals (CI) were calculated on rates, and Fishers exact tests were used to determine the statistical significance of differences in rates. Clinical details of the composite outcome were listed for outlier hospitals. Outlier hospitals with neonatal deaths following attempted forceps or attempted vacuum delivery are highlighted with an orange font.

Analyses were also carried out using multi-level models for stabilizing and adjusting trauma rates within hospitals so as to permit comparisons between each hospital and the reference rates of maternal trauma and neonatal trauma (i.e., the maternal/neonatal trauma rate in Canada excluding Quebec). Potential confounders controlled in the regression model included maternal characteristics, namely, maternal age, parity, pre-existing diabetes, hypertensive disorders of pregnancy, gestational diabetes and province/territories-specific tiers of obstetric service. 95% confidence intervals (CI) for the stabilized and adjusted rates were obtained using bootstrap methods and hospitals with stabilized and adjusted trauma rates that were 10% higher and significantly different from the reference rate for Canada (excluding Quebec) were identified as outliers.

Small numbers (<5) were suppressed to protect confidentiality and data from the 3 territories were combined and presented as data from the 'Combined Territories' (CT).

Results: The study population included 1,325,191 singleton deliveries at term gestation in hospitals in Canada (excluding Quebec) between April 2013 and March 2019; of these 38,500 (2.9%) were attempted forceps deliveries, 110,987 (8.4%) were attempted vacuum deliveries and 1,176,704 were non-instrumental deliveries (88.7%). There were 1,606 cases of failed forceps delivery (4.2% of attempted forceps deliveries) and 8,791 cases of failed vacuum delivery (7.9% of attempted vacuum deliveries).

Third-degree perineal lacerations were the predominant component of maternal trauma, followed in frequency by fourth-degree perineal lacerations and high vaginal lacerations. The commonest component of neonatal trauma was injury to the peripheral nervous system and the other common components of neonatal trauma included seizures, injury to the central nervous system, and subaponeurotic hemorrhage. The frequency of the trauma types was dependent on whether forceps delivery or vacuum delivery was attempted.

There were 36,097 (3.1%) cases of maternal trauma among non-instrumental deliveries, and 2,305 (2.1 per 1,000) cases of neonatal trauma among infants without congenital malformations born without attempted forceps or attempted vacuum application. Maternal trauma and neonatal trauma were more common following attempted forceps delivery; 9,728 women (25.3%) sustained maternal trauma, while 341 (9.6 per 1,000) infants suffered neonatal trauma following attempted forceps birth. Maternal trauma was also relatively more common following attempted vacuum delivery, although not as common as trauma following attempted forceps delivery; maternal trauma occurred among 14,614 (13.2%) women following attempted vacuum delivery. The neonatal trauma rate following attempted vacuum birth was similar to the rate after

attempted forceps birth and occurred among 987 (9.6 per 1,000) infants without congenital anomalies.

Maternal trauma rates following failed forceps delivery (i.e., attempted forceps followed by cesarean delivery) were substantially lower (7.2%) than maternal trauma rates following successful forceps delivery (26.1%). However, rates of neonatal trauma were higher following failed forceps birth (15.1 per 1,000) compared with successful forceps birth (9.3 per 1,000). Unlike failed forceps, failed vacuum deliveries were associated with substantially higher rates of maternal trauma (22.5%) compared with successful vacuum deliveries (12.4%). Failed vacuum births were also associated with higher rates of neonatal trauma (23.7 per 1,000) compared with successful vacuum births (8.4 per 1,000). Trauma rates following failed vacuum differed depending on whether the vacuum application was followed by forceps delivery, cesarean delivery, or failed forceps and cesarean delivery. The highest rates of maternal trauma occurred following failed vacuum delivery followed by forceps delivery (29.4%), while failed vacuum application followed by cesarean delivery, and failed vacuum and failed forceps application followed by cesarean delivery were associated with lower rates of maternal trauma (6.1% and 6.1%, respectively). Rates of neonatal trauma rates were high after failed vacuum followed by forceps birth (20.9 per 1,000), failed vacuum followed by cesarean birth (29.5 per 1,000) and failed vacuum followed by failed forceps and cesarean birth (33.7 per 1,000).

Comparisons by province/territories

Table A shows rates of attempted and failed forceps delivery by province/territories. The attempted forceps delivery rate was 2.9% in Canada (excluding Quebec) and such delivery rates

Table A. Rates of attempted forceps and attempted vacuum deliveries (per 100 term, singleton deliveries) and rates of failed forceps and failed vacuum deliveries (per 100 attempted forceps and 100 attempted vacuum deliveries, respectively), by province/territories, Canada, April 2013 to March 2019.

Province /territories	Term singleton deliveries	Attempted forceps deliveries		Failed forceps deliveries		Attempted vacuum deliveries		Failed vacuum deliveries	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate
BC	193,798	7,979	4.1	432	5.4	13,867	7.2	886	6.4
AB	239,684	8,926	3.7	456	5.1	22,999	9.6	1,791	7.8
SK	71,626	1,745	2.4	81	4.6	8,919	12.5	1,001	11.2
MB	78,947	1,194	1.5	54	4.5	5,231	6.6	498	9.5
ON	638,308	16,235	2.5	450	2.8	51,467	8.1	3,746	7.3
NB	31,143	705	2.3	35	5.0	2,908	9.3	255	8.8
NS	38,725	1,145	3.0	59	5.2	2,783	7.2	353	12.7
PE	6,197	95	1.5	15	15.8	392	6.3	45	11.5
NL	20,193	444	2.2	2[redacted]	4.[redacted]	1,983	9.8	179	9.0
CT	7,570	32	0.4	[redacted]	[redacted]	438	5.8	37	8.4
CA	1,326,191	38,500	2.9	1,606	4.2	110,987	8.4	8,791	7.9

Small cells (<5) suppressed (some cells suppressed to prevent back calculation).
Yellow highlight indicates provinces/territories with a rate of attempted/failed forceps or attempted/failed vacuum delivery that was significantly higher than the same rate in the rest of Canada excluding Quebec.

were significantly higher in British Columbia (4.1%) and Alberta (3.7%) compared with the rest of Canada (excluding Quebec). The rate of failed forceps delivery in Canada (excluding Quebec) was 4.2% (of attempted forceps deliveries). Rates of failed forceps delivery were significantly higher in British Columbia (5.4%), Alberta (5.1%) and Prince Edward Island (15.8%) compared with failed forceps delivery rates in the rest of Canada excluding Quebec (Table A).

Table A also shows rates of attempted and failed vacuum delivery by province/territories. The attempted vacuum delivery rate was 8.4% in Canada (excluding Quebec) and rates were significantly higher in Alberta (9.6%), Saskatchewan (12.5%), New Brunswick (9.3%) and Newfoundland and Labrador (9.8%) than in the rest of Canada (excluding Quebec). The rate of failed vacuum delivery in Canada (excluding Quebec) was 7.9% (of attempted vacuum deliveries). Failed vacuum application rates were significantly higher in Saskatchewan (11.2%), Manitoba (9.5%), Nova Scotia (12.7%) and Prince Edward Island (11.5%) compared with the rest of Canada excluding Quebec (Table A).

Table B shows rates of each type of failed vacuum delivery by province/territories: rates of failed vacuum application followed by forceps delivery (5.6% in Canada excluding Quebec) were significantly higher in Saskatchewan (8.5%), Manitoba (6.7%), Nova Scotia (10.1%) and Prince Edward Island (9.2%); rates of failed vacuum application followed by cesarean delivery (1.8% in Canada excluding Quebec) were significantly higher in British Columbia (2.2%), Manitoba (2.4%), and New Brunswick (2.5%); and the use of sequential instruments followed by cesarean

Table B. Rates of attempted vacuum deliveries (per 100 term, singleton deliveries) and failed vacuum deliveries (per 100 attempted vacuum deliveries), by province/territories, Canada excluding Quebec, April 2013 to March 2019.

Province /territories	Singleton deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery		Vacuum followed by cesarean delivery		Sequential instruments followed by cesarean	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate
BC	193,798	13,867	7.2	521	3.8	312	2.2	53	0.4
AB	239,684	22,999	9.6	1,231	5.4	437	1.9	123	0.5
SK	71,626	8,919	12.5	762	8.5	178	2.0	61	0.7
MB	78,947	5,231	6.6	353	6.7	123	2.4	22	0.4
ON	638,308	51,467	8.1	2,710	5.3	809	1.6	227	0.4
NB	31,143	2,908	9.3	176	6.1	73	2.5	6	0.2
NS	38,725	2,783	7.2	280	10.1	44	1.6	29	1.0
PE	6,197	392	6.3	36	9.2	6	1.5	[redacted]	[redacted]
NL	20,193	1,983	9.8	127	6.4	38	1.9	14	0.7
CT	7,570	438	5.8	25	5.7	11	2.5	[redacted]	[redacted]
CA	1,326,191	110,987	8.4	6,221	5.6	2,031	1.8	539	0.5

Small cells (<5) suppressed.
Yellow highlight indicates provinces/territories with a rate of attempted/failed vacuum delivery that was significantly higher than the same rate in the rest of Canada excluding Quebec.

delivery (0.5% in Canada excluding Quebec) was significantly higher in Saskatchewan (0.7%), and Nova Scotia (1.0%) compared with the rest of Canada excluding Quebec.

Rates of maternal trauma following attempted forceps delivery were significantly higher in Alberta (27.3%), Saskatchewan (40.7%), Manitoba (32.2%), Nova Scotia (33.8%) and Prince Edward Island (38.9%) compared with rates in the rest of Canada excluding Quebec (rate in Canada excluding Quebec 25.3%). Maternal trauma rates following attempted vacuum delivery were significantly higher in Saskatchewan (19.4%), Manitoba (15.2%) and Nova Scotia (15.0%) compared with the rest of Canada excluding Quebec (rate in Canada excluding Quebec 13.2%). Rates of neonatal trauma following attempted forceps birth (rate in Canada excluding Quebec 9.6 per 1,000) varied from a low of 0.0 per 1,000 in Prince Edward Island to 14.8 per 1,000 in New Brunswick, although no region had a rate that was significantly higher than rates in the rest of Canada excluding Quebec. However, rates of neonatal trauma following attempted vacuum birth were significantly higher in Alberta (11.8 per 1,000) and Prince Edward Island (26.6 per 1,000) compared with the rate in the rest of Canada excluding Quebec (rate in Canada excluding Quebec 9.6 per 1,000).

Figures A and B below show rates of maternal and neonatal trauma following attempted forceps and attempted vacuum delivery by province/territories, Canada, April 2013 to March 2019.

Comparisons by tiers of obstetric service

Analyses by tier of obstetric service did not show any consistent pattern in rates of maternal trauma and neonatal trauma (except for the higher tiers of service being overrepresented among the outliers). Table C below shows rates of maternal trauma and neonatal trauma following attempted forceps birth by tier of obstetric service in Manitoba and Table D below shows rates of maternal trauma and neonatal trauma following attempted vacuum delivery by tier of obstetric service in Saskatchewan (for illustration; the Report presents analysis by tier of obstetric service for all provinces/territories).

Tiers of obstetric service with significantly higher rates of maternal trauma following attempted forceps delivery included tier 2b in British Columbia, tier 4 in Saskatchewan, tier 3 in Manitoba, tier 3 in Ontario, and tier 4 in Newfoundland and Labrador. Tiers of obstetric service with significantly higher rates of neonatal trauma following attempted forceps birth included tier 4 in British Columbia, tier 2b and tier 3 in Ontario, and tier 3 in Nova Scotia.

Outlier tiers of obstetric service which had significantly higher rates of maternal trauma following attempted vacuum delivery included tier 2 in Alberta, tier 4 in Saskatchewan, tier 3 in Manitoba, tier 3 in Ontario, tier 2b in New Brunswick, tier 3 in Nova Scotia, and tier 4 in Newfoundland and Labrador. Outlier tiers of obstetric service which had significantly higher rates of neonatal trauma following attempted vacuum birth included tier 4 in Alberta, tier 2 in Saskatchewan, and tier 2b in Ontario.

Hospital-specific comparisons of trauma rates

284 obstetric hospitals, and 102 non-obstetric hospitals that conducted at least one delivery, were included in this analysis.

Within-tier comparison of hospitals following attempted forceps delivery: 36 hospitals in Canada

Figure A. Rates (95% confidence intervals) of maternal trauma following attempted forceps delivery, attempted vacuum delivery and non-instrumental delivery among singleton term deliveries in the provinces/territories, Canada (excluding Quebec), April 2013 to March 2019.

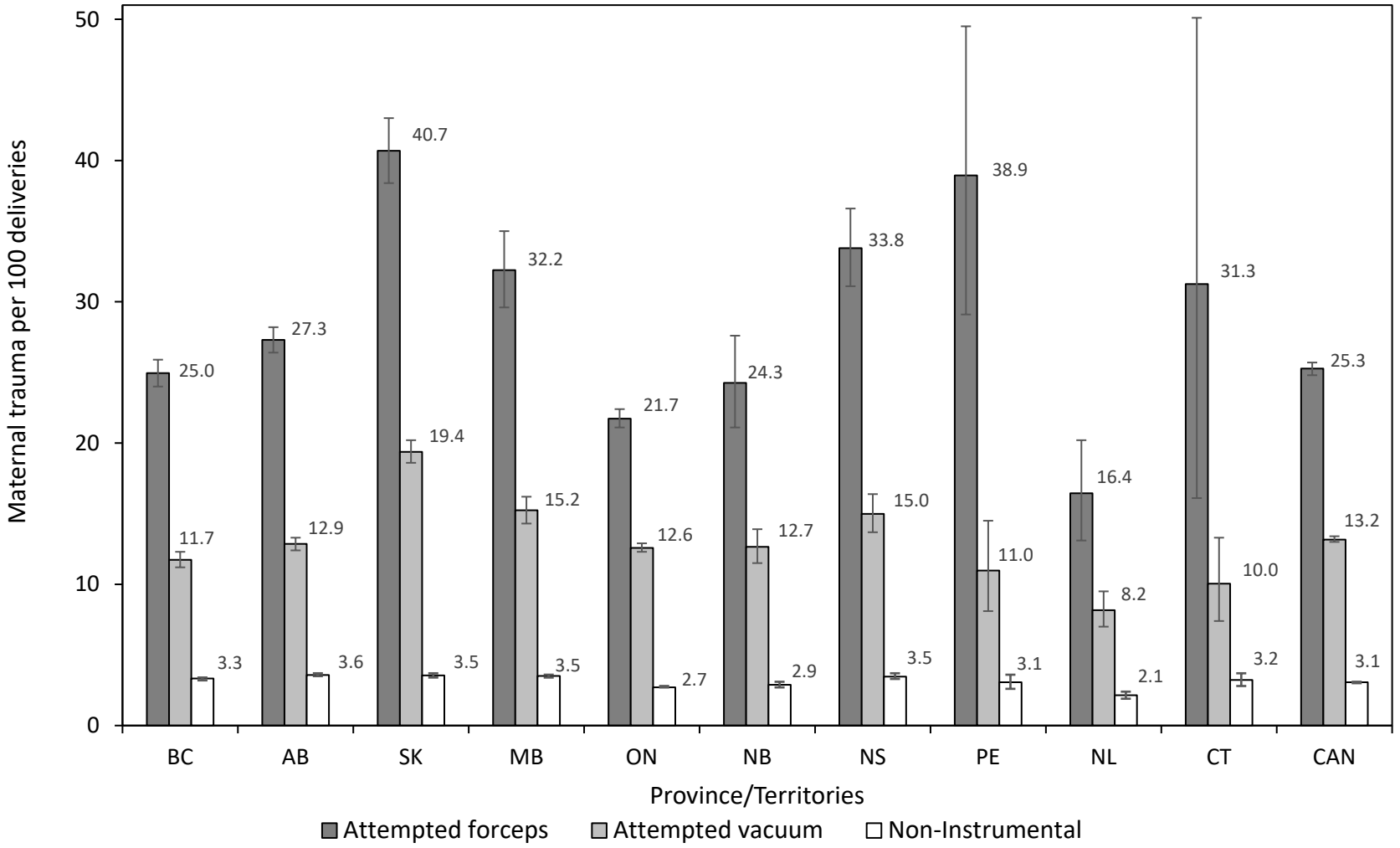


Figure B. Rates (95% confidence intervals) of neonatal trauma following attempted forceps birth, attempted vacuum birth and non-instrumental birth among singleton term births in the provinces and territories, Canada (excluding Quebec) April 2013 to March 2019 (infants with congenital anomalies excluded).

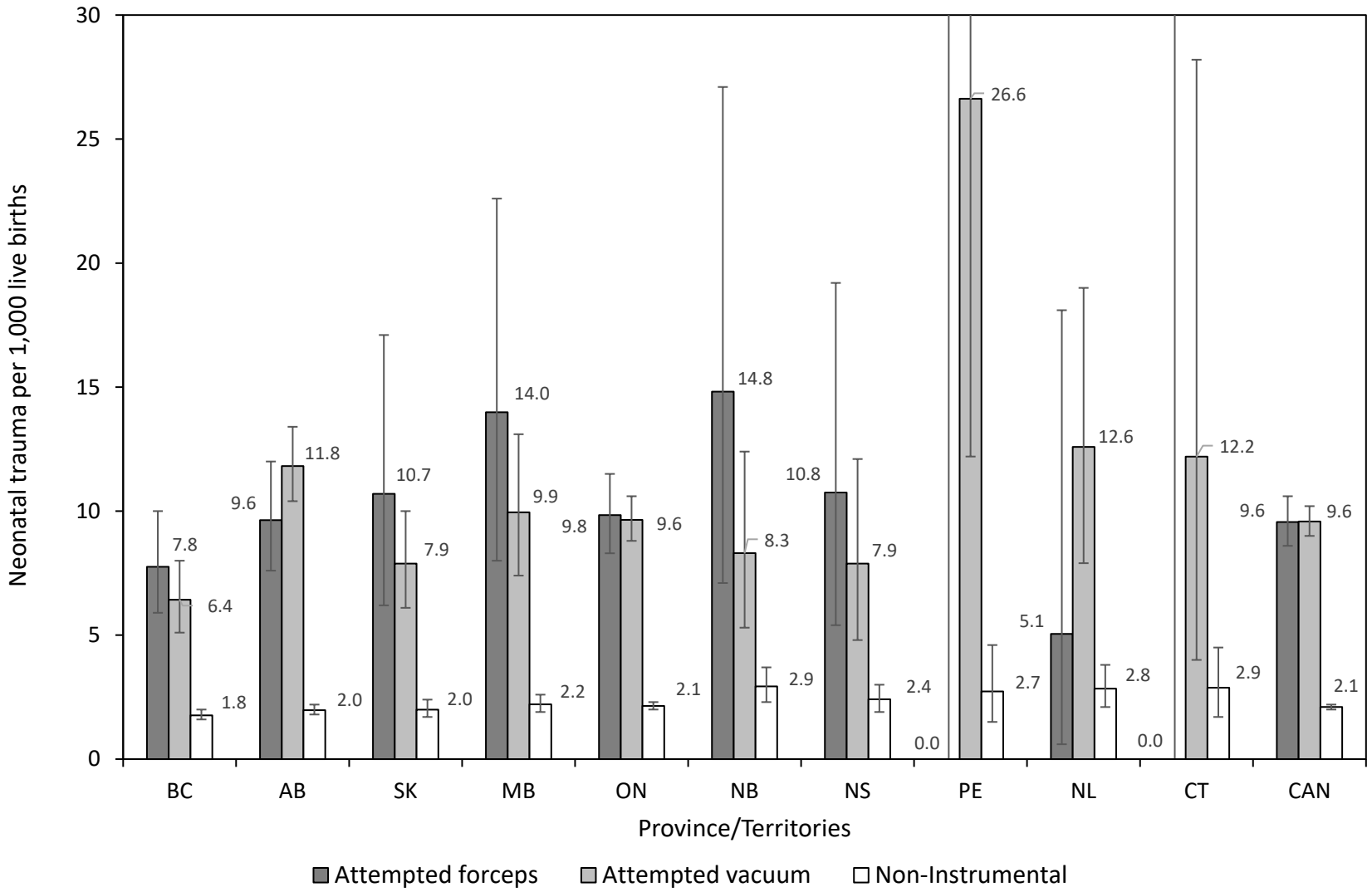


Table C. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Manitoba, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate /100	No.	Rate /100		No.	Rate /100	No.	Rate /1,000
0	179	[redacted]	[redacted]	0	0.0	169	[redacted]	[redacted]	[redacted]	[redacted]
1	92	[redacted]	[redacted]	0	0.0	90	[redacted]	[redacted]	[redacted]	[redacted]
2	26,611	146	0.5	35	24.0	24,392	127	0.5	[redacted]	[redacted]
3	52,065	1,046	2.0	350	33.5	50,258	1,015	2.0	13	12.8
Total	78,947	1,194	1.5	385	32.2	74,909	1,144	1.5	16	14.0

* Infants with congenital anomalies excluded. Small cells (<5) suppressed.
Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.
Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

Table D. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Saskatchewan, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate /100	No.	Rate /100		No.	Rate /100	No.	Rate /1,000
0	173	16	9.2	[redacted]	[redacted]	169	15	8.9	[redacted]	[redacted]
1	3,276	426	13.0	[redacted]	[redacted]	3,121	405	13.0	[redacted]	[redacted]
2	23,652	2,441	10.3	323	13.2	22,560	2,325	10.3	28	12.0
4	44,525	6,036	13.6	1,366	22.6	40,546	5,501	13.6	34	6.2
Total	71,626	8,919	12.5	1,728	19.4	66,396	8,246	12.4	65	7.9

* Infants with congenital anomalies excluded. Small cells (<5) suppressed.
Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.
Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

(excluding Quebec) had rates of maternal trauma following attempted forceps delivery that were significantly higher than the rates in other hospitals in the same tier of service (in the same province/territories). Similarly, 7 hospitals had significantly elevated rates of neonatal trauma following attempted forceps birth. Table E below shows within-tier comparisons of tier 3 hospitals in Ontario with regard to trauma rates following attempted forceps delivery (for illustration; the Report presents the within-tier analysis of all hospitals for each province /territories).

Hospital-specific trauma rates following attempted forceps vs the reference rate: Contrasts of each hospital's stabilized and adjusted rates of maternal trauma following attempted forceps delivery versus the reference rate for Canada (excluding Quebec) showed that 55 hospitals had rates that were 10% or more higher and significantly different from the reference rate. Similarly, comparisons between each hospital's stabilized neonatal trauma rate following attempted forceps birth vs the reference rate showed that 48 hospitals had rates that were 10% or more higher and significantly different from the reference rate (Note: stabilized rates of neonatal trauma were used for this analysis as the relatively small number of cases of neonatal trauma following attempted forceps birth precluded stabilization and adjustment). Figure C below shows stabilized and adjusted rates of maternal trauma following attempted forceps delivery in tier 2, 2b, 3 and 4 hospitals in British Columbia and identifies hospitals with rates that were 10% higher and significantly different from the reference rate for Canada excluding Quebec (for illustration; the Report presents the within-tier analysis for all hospitals for each province/territories).

Within-tier comparison of hospitals following attempted vacuum delivery: 45 hospitals in Canada (excluding Quebec) had maternal trauma rates following attempted vacuum delivery that were significantly higher than the same rates in the other hospitals in the same tier of service (in the same province/territories). Similarly, within-tier comparisons identified a total of 15 hospitals as outliers with regard to neonatal trauma following attempted vacuum birth. Table F below shows within-tier comparisons of tier 2a hospitals in Nova Scotia with regard to trauma rates following attempted vacuum delivery (for illustration; the Report presents the within-tier analysis for all hospitals in each province/territories).

Hospital-specific trauma rates following attempted vacuum vs the reference rate: Contrasts of each hospital's stabilized and adjusted rates of maternal trauma following an attempted vacuum delivery versus the reference rate of maternal trauma following attempted vacuum delivery for Canada (excluding Quebec) showed that 72 hospitals had rates that were 10% or more higher and significantly different from the reference rate. Similarly, comparisons between each hospital's stabilized and adjusted neonatal trauma rate following attempted vacuum delivery vs the reference rate showed that 61 hospitals had rates that were 10% or more higher and significantly different from the reference rate. Figure D below shows stabilized and adjusted rates of neonatal trauma following attempted vacuum birth in New Brunswick hospitals and identifies hospitals with rates that were 10% higher and significantly different from the reference rate for Canada excluding Quebec (for illustration; the Report presents the analysis for all hospitals in each province/territories). Tables G and H below list all hospitals in Canada (excluding Quebec) identified as outliers with significantly high rates of maternal and/or neonatal trauma following attempted forceps and attempted vacuum delivery.

Correspondence between within-tier comparisons and comparisons with the reference rate:
There was good correspondence between the hospitals identified as outliers through the within-tier analysis and the analysis comparing stabilized and adjusted hospital rates against the reference rate for Canada excluding Quebec. Although the latter analyses identified more hospitals as outliers, most

hospitals identified as outliers by the within-tier analysis were also identified as outliers by the analysis comparing rates with the reference rate for Canada excluding Quebec (85% for maternal trauma and 100% for neonatal trauma following attempted forceps delivery; 95% for maternal trauma and 100% for neonatal trauma following attempted vacuum delivery).

Interpretation: This report quantifies rates of attempted forceps and attempted vacuum delivery, and associated rates of maternal trauma and neonatal trauma among singleton, term deliveries to women without a previous cesarean delivery in Canada (excluding Quebec). The frequency of attempted forceps delivery was 2.9%, while the rate of attempted vacuum delivery was 8.4% for the period April 2013 to March 2019. Of the attempted forceps deliveries, 4.2% resulted in failed forceps applications, while 7.9% of attempted vacuum deliveries were failed vacuum deliveries. Maternal trauma rates were very high following attempted forceps delivery (25.3%) and also relatively high after attempted vacuum delivery (13.2%), while rates of neonatal trauma were similar after both attempted forceps and attempted vacuum birth (9.6 per 1,000).

Reports published by the Organization for Economic Cooperation and Development show that Canada has the highest rates of maternal trauma following instrumental deliveries among high-income countries. Recent Canadian studies have also documented high rates of maternal and neonatal trauma following attempted forceps and attempted vacuum delivery. Some of the differences in between-country rates of maternal trauma are likely due to differences in reporting, while differences in the selection of cases for instrumental delivery, type of instrument used, and skill of the maternity care provider are other potential causes for the high Canadian rates.

Although high rates of maternal and neonatal trauma following attempted forceps and attempted vacuum delivery in Canada have been documented in several studies, these elevated rates of trauma are not mentioned in the guidelines of the Society of Obstetricians and Gynaecologists of Canada. Instead, the guidelines highlight an idealized scenario by stating that "….*in carefully selected circumstances, both vacuum and forceps are associated with relatively low rates of serious morbidity and mortality in both mother and baby*" [1]. The low rates of serious morbidity and mortality mentioned above, which apply to 'carefully selected circumstances', do not appear to apply to routine obstetric practice in Canada, where attempted vacuum and attempted forceps (and failed vacuum and failed forceps) are associated with exceptionally high rates of maternal and neonatal trauma.

Significance of maternal and neonatal trauma rates: Severe perineal lacerations (predominantly third-degree perineal lacerations) accounted for the vast majority of maternal trauma. Such lacerations can result in chronic maternal complications including urinary and fecal incontinence, dyspareunia, perineal pain and other pelvic floor disorders. Studies have shown that anal incontinence rates following the primary repair of anal sphincter injuries range from 15% and 61%. The rates of neonatal trauma, though substantially lower than rates of maternal trauma, are also concerning insofar as such trauma represents serious injury with potential long-term consequences. Some of the most serious traumatic outcomes including intracranial hemorrhage, skull fracture, and other injuries to central nervous system (although uncommon) were 10 times more frequent following attempted forceps and attempted vacuum birth than following non-instrumental birth.

Data validity: Studies have shown that hospitalization data in the Discharge Abstract Database are accurate, especially for major and more serious diagnoses. Chart reviews also show that data on maternal trauma such as third- and fourth-degree perineal lacerations are accurate.

Limitations: Comparisons of trauma rates by tier of obstetric service could not be carried out nationally because of the varied tiers-of-service frameworks prevalent in the different provinces /territories of Canada. Other limitations include some potential for data errors and also a small loss of subjects due to incomplete linkage between maternal and infant medical records. Finally, there is potential for residual confounding in the comparisons between provinces/territories, tiers of obstetric service and hospitals.

Final considerations

The following points could help guide the interpretation of this Report's findings:

1. 284 obstetric hospitals, and 102 non-obstetric hospitals that conducted at least one delivery, were included in this analysis.
2. The within-tier comparison of maternal trauma rates following attempted forceps delivery identified 36 hospitals in Canada (excluding Quebec) which had rates of maternal trauma that were significantly higher than the same rates in the other hospitals in the same tier of service (in the same province/territories). Similarly, within-tier comparisons identified a total of 7 hospitals as outliers with regard to neonatal trauma following attempted forceps birth.
3. 45 hospitals in Canada (excluding Quebec) had maternal trauma rates following attempted vacuum delivery that were significantly higher than the same rates in the other hospitals in the same tier of service (in the same province/territories). Within-tier comparisons identified a total of 15 hospitals as outliers with regard to neonatal trauma following attempted vacuum birth.
4. The results of the above-mentioned within-tier analyses are important because they respect the perinatal care regionalization framework and compare hospitals with approximately similar maternal characteristics (i.e., population risk) and organizational factors (i.e., available expertise and infrastructure). This feature of the analysis also represents a limitation: the use of a variable (tier- and province/territories-specific) reference means that hospitals with high trauma which were in tiers of service (or provinces/territories) with high rates of trauma may not have been identified as outliers.
5. The comparison of stabilized and adjusted maternal and neonatal trauma rates between each hospital and the reference rate for Canada (excluding Quebec) yielded a near-national perspective and complemented the results of the within-tier analysis. This analysis method also minimized the false identification of small hospitals as outliers (although the findings were mostly concordant with the within-tier analysis with regard to small hospitals being identified as outliers). The limitations of this analysis include the method of adjustment which precludes comparisons of stabilized and adjusted trauma rates between hospitals (i.e., the adjusted rates are 'internally standardized but not mutually comparable').
6. All provinces/territories, tiers of obstetric service and hospitals (irrespective of outlier or non-outlier status) should evaluate their absolute and relative rates of maternal and neonatal trauma (and rates of failed forceps and failed vacuum delivery) and consider strategies to reduce these complications as part of a continuous quality improvement process.
7. Hospitals identified as outliers (by either the within-tier analysis or the analysis comparing hospital rates vs the reference rate for Canada excluding Quebec) should review their attempted forceps delivery- and attempted vacuum delivery-related practices. Such hospitals may need to consider additional training for obstetricians in instrument use, or a re-evaluation of management options given an indication for expedited delivery (e.g., attempted

vacuum delivery instead of attempted forceps delivery, discouraging sequential instrument use, and considering cesarean delivery earlier in labour).

8. Judgements regarding potentially elevated rates of maternal and neonatal trauma in a hospital, tier of service or province/territories are best made by health authorities and local experts who are familiar with the setting and context. The identification of any remediation measures to be instituted are to be made considering the local context pertinent to the province/territories, tier of service and hospital including patient characteristics, geographical issues, availability of skilled health personnel, infrastructure and other resources.
9. It is not immediately evident which tier(s) of obstetric service hospitals are ideal for providing training in attempted forceps and attempted vacuum delivery to Resident obstetricians and others as rates of trauma appear to be high in many secondary and tertiary hospitals. It may be necessary to identify practitioners with demonstrated skill in attempted forceps delivery and attempted vacuum delivery (i.e., those with low rates of maternal and neonatal trauma following attempted forceps and attempted vacuum delivery on chart review) and designate them as tutors.
10. The results of this Report may be useful for providing pertinent information to women regarding the risks of attempted forceps delivery and attempted vacuum delivery in their particular province/territory and hospital.
11. The province/territories-specific definitions of tiers of obstetric service precluded a more appropriate, pan-Canadian, within-tier comparison of hospitals. It would be ideal to work towards obtaining a Canadian consensus with regard to a tiers-of-obstetric-service framework and national perinatal regionalization.

The purpose of this report is to provide a documentation of contemporary rates of maternal trauma and neonatal trauma following attempted forceps and attempted vacuum delivery that informs health care providers and women. The information could serve to guide initiatives that aim to improve the safety of attempted forceps and attempted vacuum delivery. The CIHR Team for Improving Perinatal Health Care Regionalization in Canada plans to update this report at a future date so that provinces/territories, tiers of obstetric service and hospitals can ascertain the effect of initiatives undertaken to improve the safety of attempted forceps and attempted vacuum delivery in response to this Report.

Table E. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Hamilton HS McMaster Univ MC	12,409	103	0.8	45	43.7	11,063	96	0.9	[redacted]	[redacted]
Kingston General Hospital	8,606	156	1.8	52	33.3	8,252	149	1.8	[redacted]	[redacted]
London Health Sciences Centre	25,700	1,161	4.5	210	18.1	24,072	1,100	4.6	13	11.8
Sinai HS Mount Sinai Hospital	29,607	1,066	3.6	340	31.9	26,933	968	3.6	13	13.4
St. Michael's Hospital	13,120	160	1.2	52	32.5	12,713	155	1.2	[redacted]	[redacted]
Sunnybrook HSC Sunnybrook C	16,965	497	2.9	140	28.2	16,357	485	3	[redacted]	[redacted]
The Ottawa Hospital Gen C	12,265	434	3.5	115	26.5	11,125	399	3.6	5	12.5
The Ottawa Hospital Civic C	14,166	84	0.6	30	35.7	12,912	75	0.6	[redacted]	[redacted]
Total	132,838	3,661	2.8	984	26.9	123,427	3,427	2.8	44	12.8

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

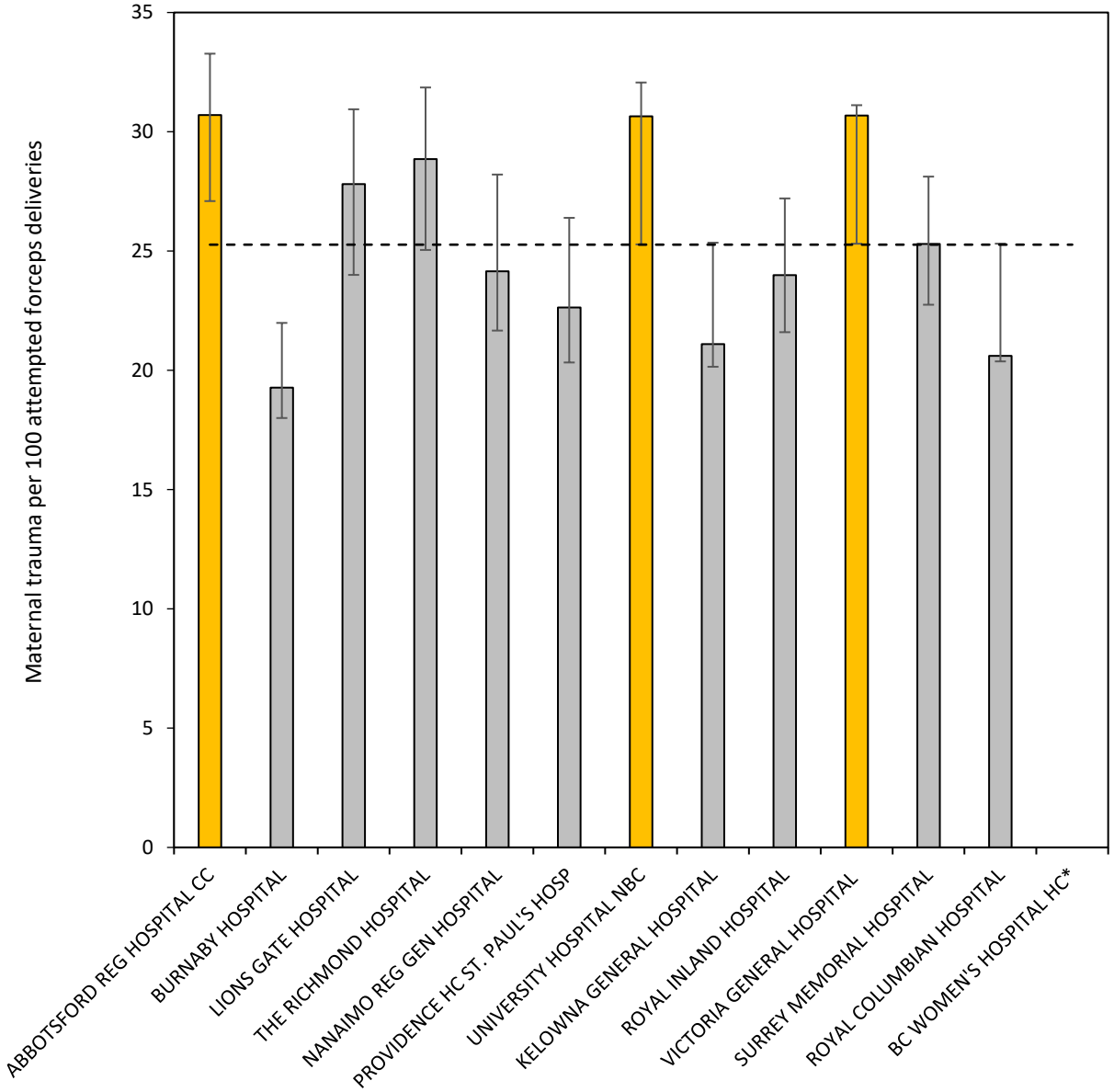
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

HAMILTON HS MCMASTER U MED CENTRE: 3rd or 4th degree perineal tears 40; Cervical/high vaginal laceration [redacted]; other pelvic trauma [redacted].

KINGSTON HSC KINGSTON GEN HOSPITAL: 3rd or 4th degree perineal lacerations 47; Cervical or high vaginal laceration 4; other pelvic trauma [redacted].

SINAI HLTH SYS MOUNT SINAI HOSPITAL: 3rd or 4th degree perineal lacerations 282; Cervical or high vaginal laceration 79; other pelvic trauma 8; repair of the urethra or bladder [redacted].

Figure C. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2, 2b, 3 and 4 hospitals, British Columbia, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.

Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Table F. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2a hospitals, Nova Scotia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Aberdeen Hospital	1,430	91	6.4	[redacted]	[redacted]	1,358	86	6.3	0	0.0
Colchester East Hants HC	2,256	106	4.7	[redacted]	[redacted]	2,156	99	4.6	[redacted]	[redacted]
Cumberland Regional HCC	1,063	118	11.1	15	12.7	991	111	11.2	0	0.0
South Shore Regional Hospital	1,683	134	8.0	32	23.9	1,548	125	8.1	[redacted]	[redacted]
Yarmouth Regional Hospital	1,607	187	11.6	9	4.8	1,524	180	11.8	[redacted]	[redacted]
Total	8,039	636	7.9	62	9.7	7,577	601	7.9	5	8.3

*Infants with congenital anomalies excluded.

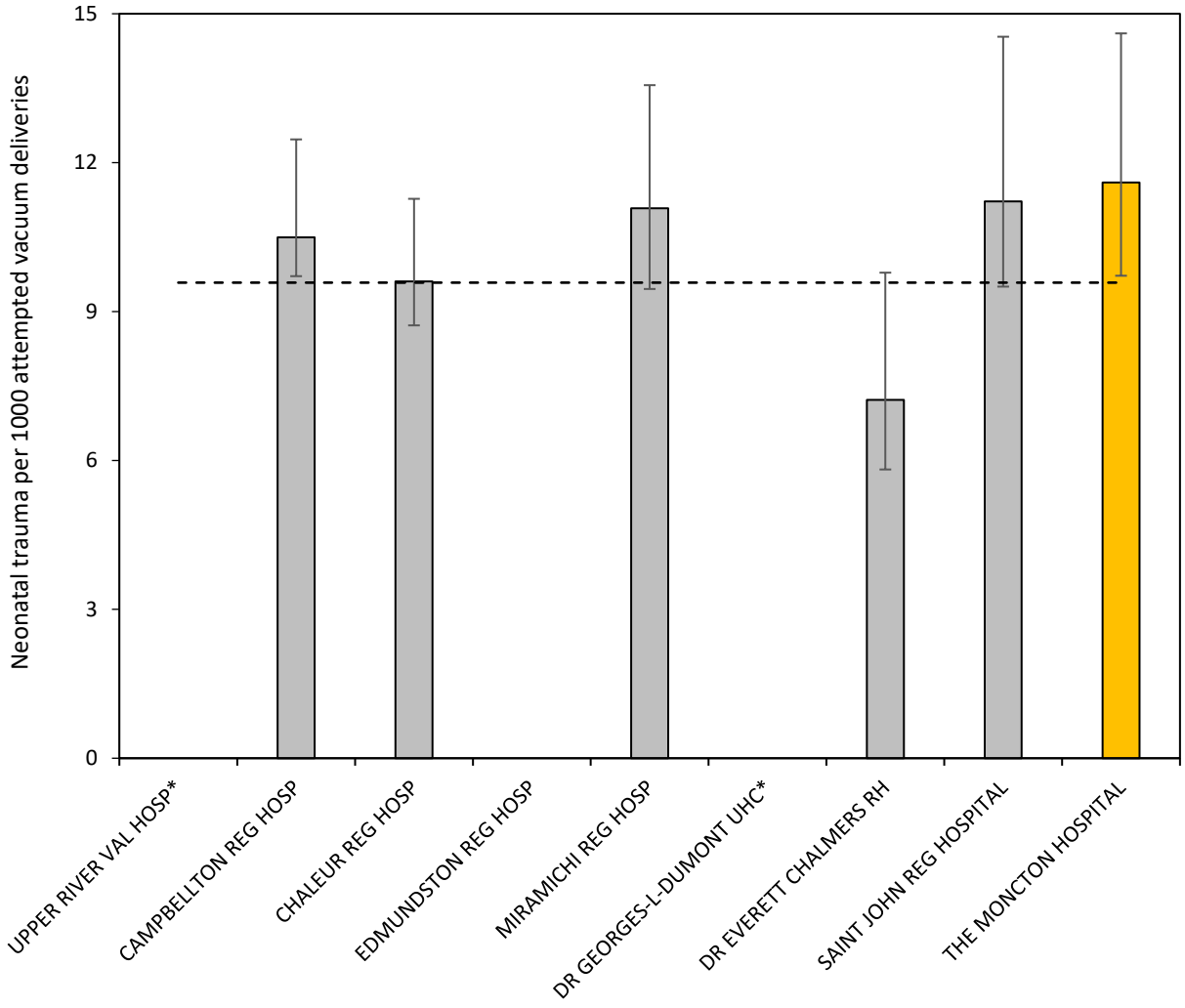
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

SOUTH SHORE REGIONAL HOSPITAL: 3rd or 4th degree perineal lacerations 29; Cervical or high vaginal laceration 6.

SOUTH SHORE REGIONAL HOSPITAL: Seizures [redacted].

Figure D. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum delivery in tier of obstetric service 1, 2a, 2b and 3 hospitals, New Brunswick, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.
Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Table G. Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted forceps delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (25.3/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized rate (95% CI)/1,000
BC	Shuswap Lake Gen Hospital	83.3	24.3	40.0 (32.7-57.4)	0.0	6.4	
	Cowichan District Hospital	52.9	24.3	39.4 (33.0-50.7)	0.0	6.4	
	Cariboo Memorial Hospital	30.0	24.3	30.1 (26.2-36.1)	[redacted]	6.4	12.4 (10.3-20.9)
	Kootenay Lake Hospital	38.2	24.3	37.7 (31.1-45.2)	[redacted]	6.4	10.9 (10.0-13.8)
	Penticton Reg Hospital	27.4	24.3		[redacted]	6.4	14.2 (10.9-23.4)
	West Coast General Hospital	29.8	24.3	32.4 (26.9-39.4)	[redacted]	6.4	
	Langley Memorial Hospital	40.5	24.3	38.6 (31.6-46.5)	[redacted]	6.4	
	Abbotsford Reg Hospital CC	34.2	26.4	30.7 (27.1-33.3)	0.0	4.1	
	Lions Gate Hospital	30.1	26.4		[redacted]	4.1	12.4 (10.4-15.9)
	The Richmond Hospital	31.2	26.4	28.9 (25.0-31.9)	0.0	4.1	
	University Hospital NBC	45.8	33.3	30.6 (25.3-32.1)	[redacted]	13.5	14.5 (11.0-24.7)
	Kelowna Gen Hospital	28.8	33.3		[redacted]	13.5	11.0 (10.0-13.4)
	Victoria General Hospital	27.9	21.0	30.7 (25.3-31.1)	[redacted]	6.7	
	BC Women's Hospital + HC	26.1	25.0	*	10.8	7.8	12.0 (10.5-14.4)
AB	Barrhead Health CC	100.0	25.9	28.4 (26.7-34.8)	0.0	[redacted]	
	Wetaskiwin Hospital CC	0.0	25.9		[redacted]	[redacted]	13.8 (10.7-55.2)
	Drumheller HC	100.0	25.9	41.2 (32.6-58.9)	0.0	[redacted]	
	Provost Health Centre	42.0	25.9	31.6 (26.4-41.2)	0.0	[redacted]	
	High River G Hospital	52.8	25.9	38.6 (30.4-52.1)	[redacted]	[redacted]	12.2 (10.2-19.6)
	Coven't H St. Mary's H Camrose	25.0	25.9		[redacted]	[redacted]	11.6 (10.2-16.5)
	Queen Elizabeth II Hosp	41.2	27.7	34.1 (29.6-39.6)	0.0	7.0	
	Sturgeon Com Hospital	38.4	27.7	35.0 (28.8-39.9)	17.1	7.0	14.8 (11.4-19.5)
	South Health Campus	32.6	27.0	28.7 (27.2-29.2)	12.9	11.5	12.5 (10.7-15.2)
	Peter Lougheed Centre	27.7	27.0		19.4	11.5	18.4 (13.8-23.4)
	Foothills Medical Centre	27.5	27.0		14.3	11.5	14.6 (12.2-18.0)

Table G (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted forceps delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (25.3/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized rate (95% CI)/1,000
AB	Rockyview General Hospital	26.2	27.0		12.8	11.5	13.5 (11.5-16.4)
SK	Meadow Lake Hosp NW HF	[redacted]	23.1	29.1 (26.8-37.1)	0.0	[redacted]	
	Cypress Regional Hospital	45.8	23.1	36.7 (26.7-49.8)	[redacted]		12.6 (10.5-22.8)
	Victoria Hospital RMHC	46.8	23.1	40.1 (26.9-54.0)	0.0		
	Royal University Hospital	41.7	46.4		11.9	12.5	12.2 (10.5-14.6)
	Regina General Hospital	49.7	46.4	27.4 (25.3-27.4)	12.9	12.5	13.3 (11.0-16.0)
MB	Dauphin Reg Health Centre	[redacted]	24.0	28.7 (26.3-34.6)	0.0	[redacted]	
	The Pas Health Complex	53.8	24.0	35.7 (29.0-44.5)	[redacted]		13.0 (10.5-28.9)
	Brandon General Hospital	19.8	24.0				14.7 (10.9-26.1)
	St. Boniface General Hospital	32.8	33.5			12.8	14.7 (12.3-18.0)
ON	Muskoka Algonquin HC HV	[redacted]	18.7	30.4 (27.9-43.4)	0.0	4.1	
	Norfolk General Hospital		18.7	29.5 (27.6-39.0)	0.0	4.1	
	Cornwall CH McConnell Ave		18.7	30.8 (28.1-38.3)	0.0	4.1	
	Winchester Dist M Hospital		18.7	31.9 (29.0-39.4)	0.0	4.1	
	Hopital G De Hawkesbury DGH		18.7	30.7 (28.1-37.3)	0.0	4.1	
	Brockville GH Charles St Site	30.4	18.7	34.1 (30.1-40.3)	0.0	4.1	
	Erie Shores H Leamington DMH	[redacted]	18.7		[redacted]	4.1	12.4 (10.4-20.9)
	Headwaters HC Centre	14.3	18.7		[redacted]	4.1	14.2 (10.9-23.6)
	Pembroke Reg Hospital Inc.	24.4	18.7	33.1 (28.6-38.3)	0.0	4.1	
	Almonte General Hospital	23.9	18.7	31.7 (27.3-36.8)	0.0	4.1	
	Hamilton HS West Lincoln MH	23.6	18.7	32.0 (27.0-37.2)	[redacted]	4.1	
	Timmins District Hospital	15.2	20.9		[redacted]	9.6	25.3 (13.4-51.0)
	Halton HCS Milton D Hospital	31.3	20.9	42.6 (33.3-52.1)		9.6	
	Guelph General Hospital	23.8	20.9	34.0 (26.4-43.5)		9.6	
	Huron Perth HCA Stratford GH	10.0	20.9			9.6	14.3 (11.3-19.1)

Table G (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted forceps delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (25.3/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized rate (95% CI)/1,000
ON	St. Thomas Elgin GH	6.9	20.9		19.2	9.6	16.0 (12.0-21.7)
	Hopital Montfort	32.6	20.9	44.7 (34.5-54.8)		9.6	
	Grey Bruce HS Owen Sound H	38.5	20.2	33.2 (29.5-38.6)	0.0	12.8	
	Halton HCS Oak-Trafalgar MH	41.3	20.2	37.5 (32.5-43.2)		12.8	11.8 (10.2-16.8)
	Scarborough HNW Birchmount	47.5	20.2	44.1 (37.9-50.2)		12.8	10.1 (12.1-35.7)
	Peterborough Reg Health Centre	29.1	20.2	29.2 (25.2-33.5)		12.8	
	St. Joseph's HC Hamilt Charlton	29.3	20.2	29.5 (25.7-33.9)	0.0	12.8	
	Niagara HS St. Catharines Site	12.2	20.2			12.8	13.9 (10.9-19.2)
	William Osler HS Bram Civic H	29.3	20.2	31.0 (26.6-35.8)	0.0	12.8	
	William Osler HS Etobicoke GH	29.4	20.2	29.7 (25.5-34.4)		12.8	13.3 (10.9-16.9)
	Unity Health St. Joseph's HC To	25.4	20.2	25.5 (21.9-29.7)	11.8	12.8	11.9 (10.4-14.4)
	Humber River H Wilson S KC FS	16.9	20.2		25.6	12.8	20.3 (14.2-26.3)
	Grand River Hosp K-W HC	12.7	20.2		16.0	12.8	16.5 (13.5-20.4)
	Royal Victoria Regional HC	30.6	20.4	34.4 (30.6-38.5)	0.0	6.9	
	Michael Garron Hospital	35.4	20.4	39.1 (34.6-44.1)		6.9	10.8 (9.9-13.3)
	Sault Area Hospital	23.5	20.4	30.0 (26.5-33.4)		6.9	
	Health S N Horizon Sante-Nord	26.1	20.4	31.5 (27.8-35.4)		6.9	
	Lakeridge Health Oshawa Site	28.5	20.4	34.4 (30.1-39.0)		6.9	
	Southlake Reg Health Centre	15.4	20.4			6.9	11.2 (10.1-13.5)
	Orillia Soldiers' Memorial H	24.2	20.4	30.0 (26.3-33.9)		6.9	
	Scarborough HNW General	27.2	20.4	33.4 (29.0-37.4)		6.9	
	Windsor RH Metropolitan Camp	22.9	20.4	30.4 (26.4-34.6)	6.1	6.9	
	The Ottawa Hosp Civic Campus	35.7	26.9	28.3 (25.4-31.2)		12.8	14.2 (11.0-23.0)
	Hamilton HS McMaster UM Ctre	43.7	26.9	34.4 (30.3-36.8)		12.8	13.4 (10.7-19.5)
	Kingston HSC Kingston GH	33.3	26.9	27.2 (24.1-30.3)		12.8	18.0 (12.3-27.0)

Table G (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted forceps delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (25.3/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized rate (95% CI)/1,000
ON	The Ottawa Hospital Gen CA	26.5	26.9		12.5	12.8	12.4 (10.6-15.1)
	Sinai HS Mount Sinai Hosp	31.9	26.9	26.3 (23.0-29.5)	13.4	12.8	14.0 (11.8-17.2)
	London HSC Victoria Hosp	18.1	26.9		11.8	12.8	12.7 (10.9-15.3)
NB	Edmundston Reg Hospital	[redacted]	30.6		[redacted]	[redacted]	13.3 (10.6-35.6)
	Miramichi Regional Hospital	34.7	30.6	31.6 (25.4-36.3)	0.0		
	Dr. Georges-L. Dumont UHC	32.7	24.3	*	[redacted]	14.8	16.2 (11.3-31.7)
	Saint John Reg Hospital	27.1	22.4			13.0	11.8 (10.1-16.4)
	The Moncton Hospital	27.9	22.4			13.0	11.0 (9.9-13.9)
	Dr. Everett Chalmers RH	21.0	22.4		11.7	13.0	11.8 (10.3-14.1)
NS	South Shore Reg Hospital	50.0	16.9	41.1 (30.1-56.5)	[redacted]	[redacted]	18.7 (11.5-86.0)
	Valley Regional Hospital	31.4	24.4	31.1 (25.4-36.7)	0.0		
	Cape Breton HC Complex	[redacted]	24.4		[redacted]		12.0 (10.2-18.5)
	IWK Health Centre	38.2	33.8	*	10.4	10.8	11.2 (10.0-13.4)
NL	Capt William Jackman M Hosp	[redacted]	11.7	29.9 (27.4-39.3)	[redacted]	[redacted]	
	Central Newfoundland R H Ctre	17.2	11.7				
	Labrador West Health Centre	[redacted]	11.7	29.4 (27.2-37.3)	0.0		
	Dr. G. B. Cross M Hospital		11.7	30.2 (26.0-37.7)	0.0		
	Health Sciences Centre-St. John's	23.0	16.4	*	[redacted]		

Yellow highlights indicate hospitals with maternal and/or neonatal trauma rates significantly higher than the same rate in all other hospitals within the same tier of obstetric service (in the same province/territories) and orange highlights indicate hospitals with stabilized and adjusted maternal trauma rates or stabilized neonatal trauma rates that were 10% higher and significantly different from the reference maternal or neonatal trauma rates for Canada (excluding Quebec) i.e., 25.3 per 100 deliveries and 9.6 per 1000 births, respectively.

* Sole hospital in their tier of service hence a stabilized and adjusted maternal trauma rate could not be estimated because of absent within-tier variability.

Table H. Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/ 1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
BC	Kitimat Hospital HC	[redacted]	12.3	14.8 (14.1-17.2)	0.0	6.9	
	St. John Hospital	23.3	12.3	18.4 (16.6-22.5)	0.0	6.9	
	Powell River Gen Hospital	27.8	12.3	20.6 (18.3-24.6)	0.0	6.9	
	Shuswap Lake Gen Hospital	15.0	12.3	15.2 (14.1-17.2)	0.0	6.9	
	Queen Victoria Hospital	23.0	12.3	18.8 (17.0-21.8)	[redacted]	6.9	10.8 (10.1-13.2)
	Mills Memorial Hospital	15.7	12.3	16.0 (14.6-18.2)	[redacted]	6.9	15.4 (12.0-27.5)
	East Kootenay Reg Hospital	9.0	12.3		[redacted]	6.9	14.5 (11.9-23.7)
	West Coast Gen Hospital	12.4	12.3	15.7 (14.3-17.7)	0.0	6.9	
	Campbell River DGH N Isl H	14.5	12.3	14.8 (13.4-16.8)	[redacted]	6.9	14.9 (12.1-25.4)
	St Joseph's Gen Hosp Comox	21.5	12.3	17.3 (15.7-19.8)	0.0	6.9	
	Vernon Jubilee Hospital	15.1	12.3	14.9 (13.4-16.7)	0.0	6.9	
	Squamish General Hospital	11.3	12.3		[redacted]	6.9	11.9 (10.6-15.7)
	Cowichan District Hospital	27.5	12.3	25.7 (22.7-29.2)	[redacted]	6.9	11.9 (10.6-15.6)
	Dawson Creek Dist Hosp	9.9	12.3		[redacted]	6.9	11.3 (10.1-14.3)
	Fort St. John Hosp HC	5.1	12.3		[redacted]	6.9	12.1 (10.5-16.0)
	Langley Memorial Hospital	17.6	12.3	17.7 (15.7-19.9)	[redacted]	6.9	
	Lions Gate Hospital	14.3	12.5	14.7 (13.2-15.8)	[redacted]	6.9	
	Abbotsford Reg Hospital CC	13.6	12.5	15.9 (14.1-16.9)	15.4	6.9	21.4 (12.3-31.7)
	Royal Inland Hospital	11.6	12.3		[redacted]	4.9	12.3 (9.7-15.8)
	University Hospital of NBC	15.6	12.3	15.9 (13.2-16.5)	0.0	4.9	
	Victoria General Hospital	12.8	10.5	15.7 (13.2-16.3)	11.1	8.1	12.2 (9.7-13.7)
AB	Slave Lake HC Centre	40.0	20.0	18.7 (15.2-22.6)	0.0	0.0	
	Lacombe Hospital CC	[redacted]	14.2		[redacted]	6.8	11.3 (10.3-15.0)
	Provost Health Centre	15.9	14.2		[redacted]	6.8	11.2 (10.3-14.8)

Table H (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
AB	Westlock Health Care Centre	27.8	14.2	18.6 (16.5-22.2)	0.0	6.8	
	Wetaskiwin Hosp Care Centre	3.2	14.2		22.4	6.8	16.9 (13.0-25.7)
	Ponoka Hospital CC	18.8	14.2	15.4 (14.0-17.4)	0.0	6.8	
	Pincher Creek H Centre	15.5	14.2		[redacted]	6.8	11.0 (10.1-14.2)
	Rocky Mountain House HC	17.9	14.2	15.7 (14.1-17.7)		6.8	10.9 (10.1-13.4)
	Taber Health Centre	13.9	14.2			6.8	13.2 (11.1-20.5)
	Coven't H St. Mary's H Camrose	21.6	14.2	18.0 (15.9-20.3)		6.8	10.6 (9.9=12.5)
	Drumheller Health Centre	23.6	14.2	18.7 (16.5-21.7)	0.0	6.8	
	Brooks Health Centre	12.3	14.2		[redacted]	6.8	14.2 (11.6-22.0)
	High River General Hospital	25.5	14.2	18.7 (16.4-21.1)		6.8	11.9 (10.5-16.6)
	Wainwright Health Centre	40.4	14.2	35.1 (30.5-39.7)		6.8	
	Whitecourt Healthcare Centre	12.9	14.2			6.8	11.1 (9.9-13.9)
	Cold Lake Healthcare Centre	20.1	14.2	18.1 (15.7-20.6)		6.8	
	Northern Lights Reg H Centre	7.5	14.2		29.9	11.5	21.1 (15.6-27.2)
	Queen Elizabeth II Hospital	14.0	14.2		19.6	11.5	14.6 (11.2-19.2)
	Covenant Grey Nuns C Hospital	13.1	13.2	15.2 (13.2-17.0)	[redacted]	11.5	
	Covenant Misericordia Hospital	16.8	13.2	17.5 (15.2-18.6)		11.5	
	Rockyview General Hospital	13.5	12.3	13.3 (12.6-13.8)	11.8	13.7	
	Royal Alexandra Hospital	13.1	12.3	14.5 (13.8-14.7)	8.9	13.7	
	Foothills Medical Centre	13.1	12.3		19.3	13.7	14.3 (10.9-16.8)
SK	La Ronge Health Centre	[redacted]	8.9	17.0 (15.0-24.2)	0.0	[redacted]	
	Southeast Integ CC Moosomin		8.9	19.1 (14.4-27.3)	0.0		
	Melfort Hospital	12.2	8.9		[redacted]		11.1 (9.9-12.9)
	Cypress Regional Hospital	12.9	13.2			12.0	13.3 (11.2-17.2)

Table H (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/ 100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
SK	Meadow Lake H Northwst HF	21.9	13.2	22.9 (15.6-28.5)	28.2	12.0	12.6 (10.5-15.6)
	Victoria Hospital	24.3	13.2	24.3 (16.3-30.5)	[redacted]	12.0	
	Royal University Hospital	23.2	22.6		7.2	6.2	11.7 (9.6-12.3)
MB	Portage Dist Gen Hospital	[redacted]	13.1		[redacted]	8.8	11.0 (10.1-14.1)
	Bethesda Hospital	15.7	13.1		[redacted]	8.8	10.7 (9.9-13.1)
	Selkirk Dis Gen Hospital	9.4	13.1		[redacted]	8.8	11.5 (9.8-15.4)
	Dauphin Reg Health Centre	15.9	13.1	16.9 (13.7-20.7)	[redacted]	8.8	15.5 (11.8-24.3)
	Boundary Trails H Centre	21.5	13.1	20.7 (16.4-25.8)	[redacted]	8.8	
	The Pas Health Complex	19.3	13.1	23.6 (18.8-29.9)	0.0	8.8	
ON	Manitoulin HC Little Current S	0.0	9.1		[redacted]	[redacted]	12.0 (10.6-18.4)
	Strathroy Middlesex GH	20.0	9.1	18.7 (16.5-22.7)	0.0	[redacted]	
	Alexandra Marine GH	12.7	9.1	17.0 (15.0-19.7)	0.0	[redacted]	
	Hopital Notre-Dame Hospital	[redacted]	8.3	15.4 (14.5-17.8)	0.0	11.0	
	Lakeridge Health Port Perry	[redacted]	8.3		[redacted]	11.0	10.7 (10.0-13.0)
	Almonte General Hospital	22.4	8.3	25.8 (22.5-30.9)	[redacted]	11.0	
	Woodstock General Hospital	11.1	8.3	16.8 (15.1-19.3)	[redacted]	11.0	
	Brockville GH Charles Street	12.8	8.3	18.8 (16.6-21.8)	[redacted]	11.0	11.9 (10.5-15.8)
	South Bruce Grey HC Walkerton	9.8	8.3	15.8 (14.3-18.1)	[redacted]	11.0	
	Norfolk General Hospital	15.9	8.3	23.7 (20.5-27.9)	[redacted]	11.0	
	Temiskaming Hospital	5.2	8.3		[redacted]	11.0	11.3 (10.2-14.0)
	Stevenson Memorial Hospital	14.5	8.3	20.1 (17.7-23.6)	0.0	11.0	
	Hopital G De Hawkesbury DGH	8.1	8.3		[redacted]	11.0	15.1 (11.9-23.0)
	Perth Smiths Falls DH SF site	13.8	8.3	20.8 (18.2-24.0)	0.0	11.0	

Table H (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/ 100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
ON	Cornwall CH McConnell Avenue	10.1	8.3	17.9 (15.9-20.5)	[redacted]	11.0	
	Groves M Community Hospital	14.0	8.3	21.1 (18.6-24.3)	[redacted]	11.0	
	Pembroke Reg Hospital Inc.	5.9	8.3		14.4	11.0	12.2 (10.4-16.0)
	Winchester DM Hospital	8.5	8.3		27.5	11.0	21.0 (15.3-30.7)
	Headwaters HC Centre	7.3	8.3		12.0	11.0	11.5 (9.7-15.3)
	Quinte HC Belleville GH	8.0	8.3		18.9	11.0	16.5 (13.0-21.7)
	Timmins and District Hospital	14.7	11.2	19.0 (15.8-22.0)	[redacted]	8.3	11.9 (10.1-15.1)
	Huron Perth HCA Stratford GH	8.3	11.2		[redacted]	8.3	13.0 (10.8-16.9)
	Guelph General Hospital	18.8	11.2	21.5 (17.6-24.7)	[redacted]	8.3	
	Hopital Montfort	13.6	11.2	15.9 (13.0-19.2)	19.0	8.3	15.6 (12.2-19.9)
	Grey Bruce HS Owen Sound H	9.4	13.1		[redacted]	10.9	10.6 (10.0-12.0)
	Peterborough RHC	15.8	13.1	16.2 (14.4-18.3)	10.0	10.9	
	Brant Com HCS Brantford Gen H	16.3	13.1	17.6 (15.7-20.0)	17.5	10.9	13.7 (12.1-15.8)
	Niagara HS St. Catharines Site	6.7	13.1		30.0	10.9	21.1 (17.8-24.3)
	William Osler HS Etobicoke GH	19.5	13.1	20.6 (18.3-23.2)	6.8	10.9	
	Halton H Oakville-Trafalgar MH	18.5	13.1	17.9 (15.9-20.1)	11.2	10.9	
	Scarborough HNW Birchmount	17.1	13.1	17.6 (15.6-20.2)	8.8	10.9	
	St. Joseph's HC Hamilton Charltn	18.6	13.1	19.5 (17.0-22.0	9.0	10.9	
	Humber River H Wilson K-C F St	8.9	13.1		26.7	10.9	13.2 (11.6-15.2)
	Sault Area Hospital	14.8	12.3	15.6 (14.0-17.4)	0.0	9.0	
	Orillia Soldiers Mem Hospital	17.4	12.3	17.2 (15.2-19.2)	[redacted]	9.0	
	North Bay Reg Health Centre	16.2	12.3	19.1 (16.6-21.3)	16.2	9.0	13.7 (11.9-15.9)
	Southlake Reg Health Centre	18.6	12.3	19.1 (16.7-21.4)	12.4	9.0	12.2 (11.0-14.2)

Table H (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/ 100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/ 1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
ON	Scarborough HNW General	15.2	12.3	16.2 (14.2-18.8)	10.1	9.0	10.6 (9.6-12.1)
	Markham Stouffville H Mark S	13.4	12.3		11.2	9.0	11.5 (10.3-13.5)
	Michael Garron Hospital	19.3	12.3	20.0 (17.3-22.5)	7.9	9.0	
	Hamilton HS McMaster U Med C	17.4	15.4	16.1 (13.6-18.6)	21.0	8.5	17.1 (12.3-22.1)
	UH To St. Michael's Hospital	20.0	15.4	16.9 (14.4-19.4)	10.2	8.5	
	The Ottawa Hospital Gen Camp	10.8	15.4		18.4	8.5	15.1 (11.1-19.8)
	The Ottawa Hospital Civic Camp	20.6	15.4	17.9 (15.2-20.1)	9.1	8.5	
NB	Edmundston Reg Hospital	17.6	12.9	16.8 (13.2-17.6)	0.0	6.2	
	Dr. Georges-L.-Dumont Uni HC	25.7	12.7	*	0.0	8.3	*
	Saint John Regional Hospital	16.8	11.7	18.3 (13.2-20.4)	11.9	9.5	
	The Moncton Hospital	9.0	11.7		[redacted]	9.5	11.6 (9.7-14.6)
NS	South Shore Reg Hospital	23.9	9.7	27.5 (16.1-36.8)	[redacted]	8.3	11.6 (10.2-14.3)
	Valley Regional Hospital	16.4	14.1	14.5 (13.2-14.7)	[redacted]	[redacted]	11.1 (9.7-12.7)
	IWK Health Centre	18.3	15.0	*	10.2	7.9	*
NL	Capt William Jackman H	25.0	7.6	18.6 (16.4-25.2)	[redacted]	11.3	
	Central Newfoundland RHC	17.1	7.6	18.9 (15.4-23.9)	[redacted]	11.3	10.7 (9.7-13.5)
	James Paton Mem RHC	15.6	7.6	18.0 (14.7-23.1)	[redacted]	11.3	10.7 (9.7-13.3)
	Burin Peninsula HCC	[redacted]	7.6		[redacted]	11.3	13.7 (11.0-20.0)
	Health Sciences Centre-St. John's	9.3	8.2	*	13.9	12.6	*
CT	Qikiqtani General Hospital	18.8	10.0	17.9 (13.3-21.7)	0.0	12.2	

Yellow highlights indicate hospitals with maternal or neonatal trauma rates significantly higher than the same rate in all other hospitals within the same tier of obstetric service (in the same province/territories) and orange highlights indicate hospitals with stabilized and adjusted maternal trauma rates or stabilized and adjusted neonatal trauma rates that were 10% higher and significantly different from the reference maternal or neonatal trauma rates for Canada (excluding Quebec) i.e., 13.2 per 100 deliveries and 9.6 per 1000 births, respectively.

* Sole hospital in their tier of service and hence stabilized and adjusted maternal and neonatal trauma rates could not be estimated because of absent within-tier variability.

Attempted forceps and attempted vacuum delivery: Maternal and neonatal trauma rates by province/territories, tier of service and hospital, Canada, April 2013 to March 2019

1. Introduction

Note: In this report, the terms 'attempted forceps delivery' and 'attempted vacuum delivery' are used in preference to 'assisted vaginal delivery' and 'operative vaginal delivery'. The latter terms are misnomers insofar as such 'vaginal deliveries' sometimes result in a failed forceps or failed vacuum application with delivery occurring by the cesarean route. Besides the semantic and clinical difference, this distinction has epidemiologic connotations involving the choice of the denominators for the calculation of the frequency of such interventions (see Methods section).

Attempted forceps and attempted vacuum delivery can facilitate childbirth, avoid a cesarean delivery and reduce serious morbidity for both mother and baby [1]. On the other hand, attempted forceps and attempted vacuum delivery may be associated with maternal and/or neonatal trauma [2-7]. The frequency of such adverse outcomes is lower when cases for attempted forceps and attempted vacuum delivery are chosen appropriately and when the obstetrician carrying out the procedure is well trained and skilled. The choice of instrument (which depends on the indication for the intervention and the clinical situation), and use of episiotomy are other important considerations [1-7]. Finally, the clinical context, including the availability of trained personnel and resources, can also have a bearing on the choice between attempted forceps, attempted vacuum delivery and cesarean delivery. The guidelines on assisted vaginal delivery published by the Society of Obstetricians and Gynaecologists of Canada [1] state that such deliveries

"*…. should be undertaken when there is a reasonable chance of success, a high level of safety, and a suitable contingency plan in place. Adequate patient counselling and involvement in decision making are also important aspects in the provision of AVB [assisted vaginal birth]*."

The guidelines also state that

"*Overall, in carefully selected circumstances, both vacuum and forceps are associated with relatively low rates of serious morbidity and mortality in both mother and baby*".

This report examines the safety of attempted forceps and attempted vacuum delivery in Canada by province/territory, tier of obstetric service and hospital. Besides clarifying the situation with regard to the maternal and neonatal trauma associated with attempted forceps and attempted vacuum delivery, such information can inform provinces/territories and individual hospitals about their rates of trauma relative to other comparable regions/hospitals. The information could be used to inform patients so as to help then in their decision making, and also serve to identify hospitals with the best safety records as centres for training future generations of obstetricians.

2. Methods

The study included all hospital deliveries in Canada (excluding Quebec) for the period April 1, 2013 to March 31, 2019. Data were obtained from the Discharge Abstract Database of the Canadian Institute for Health Information (which does not include information on hospitalizations in Quebec). Information in the database was routinely abstracted from medical charts by trained personnel using standardised definitions and processes. Details in the database included maternal and infant characteristics, labour and delivery events, and diagnoses and procedures: diagnoses were coded using the International Classification of Diseases and Related

Health Problems, version 10, Canadian Edition (ICD-10CA [8]), and procedures were coded using the Canadian Classification of Health Interventions (CCI [9]). The validity of the information in the Discharge Abstract Database related to maternal and newborn records has been shown to accurately reflect the information in medical charts [10-12].

For the assessment of maternal trauma rates, the study population was restricted to singleton deliveries at term gestation (≥37 weeks) to women without a previous cesarean delivery. Maternal records were linked to infant records (using identification numbers common to both records) for the assessment of neonatal trauma rates (among live births), The study population for these latter analyses excluded infants with congenital anomaly diagnoses ('Q' codes in ICD-10CA). Analyses were stratified by province/territories, tier of obstetric service and hospital. The tiers of obstetric service designations were obtained from the reproductive care programs of the provinces/territories. Analysis by tiers of service was province/territories specific as these frameworks varied across jurisdictions (see https://phsr.obgyn.ubc.ca/tiers-of-service/). Numeric (e.g., Tier 1, Tier 2, Tier 2.5) or alphanumeric (Tier 1, Tier 2a, Tier 2b) labels were used to identify tiers of obstetric service, and such labels were used interchangeably (e.g., Tier 2 and 2a; Tier 2.5 and Tier 2b; and Tier 2.7 and Tier 2c). Hospitals not providing routine obstetric services were labeled with a tier 0 obstetric service designation.

2.1. Attempted forceps and attempted vacuum deliveries: Women who delivered by attempted forceps or attempted vacuum were identified using the appropriate CCI intervention codes (5MD53 for forceps delivery; 5MD54 for vacuum delivery and 5MD55 for combined vacuum and forceps delivery). Women who delivered by forceps following a failed vacuum delivery were included in the attempted vacuum delivery group. Cases of failed forceps (i.e., cesarean delivery following failed forceps application) were included in the attempted forceps group. Such cases were identified using an ICD-10 code (O665) for failed instrument use in conjunction with intervention codes indicating use of forceps and delivery by cesarean (CCI codes 5MD60RC, 5MD60JZ, 5MD60KC, 5MD60RA, 5MD60RE, 5MD60JW, and 5MD60RG). Similarly, cases of failed vacuum followed by cesarean delivery were included in the attempted vacuum delivery group and identified using the failed instrument ICD-10 code (O665) in conjunction with codes indicating a failed vacuum followed by a cesarean delivery (CCI codes 5MD60RD, 5MD60KA, 5MD60KD, 5MD60RB, 5MD60RF, 5MD60JX, and 5MD60RH). Lastly, cases of sequential instrument use followed by cesarean delivery (i.e., vacuum application, followed by forceps application, followed by cesarean delivery) were identified using the failed instrument ICD-10 code (O665) in conjunction with codes indicating use of both vacuum and forceps followed by cesarean delivery (5MD60C). Such cases of failed vacuum delivery were also classified in the attempted vacuum delivery group. Thus, attempted forceps delivery included both successful and failed cases of forceps application and attempted vacuum delivery included both successful and failed cases of vacuum application. It is recognized that the failed instrumental deliveries and especially sequential use of instruments is associated with higher rates of trauma (although such deliveries may be more appropriate than a second stage cesarean delivery in some situations) [5,13,14].

In the preliminary analyses, the total number of vaginal deliveries was used as the denominator for calculating rates of attempted forceps and attempted vacuum delivery (per convention [15,16]). However, such calculations yielded a ratio measure since they included cesarean deliveries in the numerator (e.g., cases of failed forceps delivery) which were not included in the denominator (the latter consisted exclusively of vaginal deliveries per the traditional formulation

[15,16]). We, therefore, considered it preferable to quantify the frequency of attempted forceps and attempted vacuum delivery using all deliveries (among women without a previous cesarean delivery) as the denominator. Thus, attempted forceps and attempted vacuum delivery rates in this Report (which were restricted to singletons at term gestation) included all singleton, term vaginal and cesarean deliveries in the denominator (among women without a previous cesarean delivery). These rates cannot be directly compared with operative vaginal delivery rates calculated using the traditional vaginal deliveries denominator [15,16].

2.2. Maternal trauma: Maternal trauma was defined as a composite outcome that included third-degree perineal lacerations (O702), fourth-degree perineal lacerations (O703), repair of third- or fourth-degree perineal lacerations (5PC80JQ), cervical tears (O713, 5PC80JJ), high vaginal lacerations (O714), other pelvic trauma, and repair of the urethra or bladder (5PC80JR). Other pelvic trauma included other obstetric injury to pelvic organs such as the urethra or bladder (O715), obstetric damage to pelvic joints and ligaments (O716), obstetric hematoma of the pelvis (O717), other specified maternal trauma (O718) and other unspecified maternal trauma (O719).

2.3. Neonatal trauma: Neonatal trauma was defined as a composite outcome that included intracranial laceration and hemorrhage due to birth injury (P10), fracture of the skull due to birth injury (P130), epicranial subaponeurotic hemorrhage due to birth injury (P122), other birth injury to the central or peripheral nervous system, birth injury to the femur (P132) or other long bones (P133), birth injury to the liver or spleen (P150, P151), seizures (P90) and neonatal death. Other birth injury to the central nervous system included cerebral edema due to birth injury (P110), other specified brain damage due to birth injury (P111), unspecified brain damage due to birth injury (P112), birth injury to other cranial nerves (P114), and birth injury to the spine and spinal cord (P115), while other birth injury to the peripheral nervous system included Erb's paralysis due to birth injury (P140), Klumpke's paralysis due to birth injury (P141) and other brachial plexus injuries (P143).

2.4. Non-instrumental deliveries: Rates of maternal and neonatal trauma among spontaneous vaginal deliveries and cesarean deliveries (that did not involve an attempted forceps or attempted vacuum delivery) were quantified to document the frequency with which maternal and neonatal trauma occurred in childbirth not assisted by instruments. This also enabled the quantification of the proportion of trauma associated with instrumental vs non-instrumental delivery. The provision of these comparative figures was not intended to imply that spontaneous vaginal delivery or cesarean delivery is an available or appropriate option when an attempted forceps or attempted vacuum delivery is indicated.

2.5. Analysis: Rates of attempted forceps and attempted vacuum deliveries and associated rates of maternal and neonatal trauma were quantified by province/territories, tier of obstetric service and hospital. Comparisons were made between trauma rates in the provinces/territories vs the rest of Canada (excluding Quebec); between tiers of service within the same province/territories; and between each hospital and other hospitals within the same tier of obstetric service in a given province/territories. The trauma rate in a hospital that was the sole institution in its tier of service was compared with the trauma rate in the rest of the province. Exact binomial 95% confidence intervals (CI) were calculated on rates and 2-sided Fisher's exact tests were used to determine the statistical significance of differences in rates. Inference was guided by the P value for the difference in rates, with a 2-sided P value <0.05 indicating a statistically significant difference. In cases where hospitals were identified as having a trauma rate that was significantly higher than the same rate in other hospitals in the same tier of service (or in all other hospitals in the

province), the components of the composite trauma outcome were listed in order to provide more clinical insight. Hospitals with outlier rates of neonatal trauma, which included neonatal deaths following attempted forceps/vacuum delivery, were highlighted in orange font. Note that the sum of trauma components could exceed the total number of trauma cases as some women/babies may have had more than one type of trauma.

Analyses were also carried out using multi-level logistic models for stabilizing and adjusting rates of maternal trauma and neonatal trauma following attempted forceps delivery and attempted vacuum delivery in each hospital. These analyses permitted a comparison of each hospital's rates of trauma against the reference rate for Canada excluding Quebec. The analysis replicated the methods used in recent MBRRACE-UK reports for comparing institution-specific rates of perinatal death with the perinatal mortality rate in the United Kingdom (done by calculating standardized mortality ratios contrasting each institution's rate of death with the national reference rate [17,18]). The stabilized and adjusted maternal trauma rate following attempted forceps delivery (or attempted vacuum delivery) for each hospital in Canada (excluding Quebec) was calculated by multiplying the (reference) maternal trauma rate following attempted forceps delivery (or attempted vacuum delivery) in Canada (excluding Quebec) by a hospital-specific standardized maternal trauma ratio. The latter ratio was calculated for each hospital by dividing the stabilized risk-adjusted, hospital-specific estimate of maternal trauma following attempted forceps delivery (or attempted vacuum delivery) for the hospital by the expected rate of such maternal trauma obtained using the average such estimate for all hospitals [17-20]. Stabilization of hospital rates served to minimize small hospitals from being identified as outliers due to chance, and adjustment addressed potential confounding. Confounders controlled in the regression model included maternal characteristics, namely, age (15-19, 20-24, 25-29, 30-34, 35-39 and ≥40 years), multiparity (yes/no/unknown), hypertensive disorders of pregnancy including chronic hypertension, gestational hypertension and pre-eclampsia (yes/no), pre-existing diabetes (yes/no) and gestational diabetes (yes/no). Hospital-specific organizational factors were also adjusted by including province/territories-specific tiers of obstetric service in the regression model. The same analyses were repeated to estimate stabilized and adjusted rates of neonatal trauma following attempted forceps birth (or attempted vacuum birth).

Attempts to obtain stabilized and adjusted rates of neonatal trauma following attempted forceps birth were unsuccessful because of the relatively small number of neonatal trauma cases following attempted forceps birth. Therefore, the comparison of each hospital's rate of neonatal trauma following attempted forceps birth with the reference rate for Canada excluding Quebec was based on stabilized rates (not on stabilized and adjusted rates). However, comparisons between each hospital's rate vs the reference rate for maternal trauma following attempted forceps delivery and attempted vacuum delivery and comparisons between each hospital's rate vs the reference rate for neonatal trauma following attempted vacuum delivery was based on stabilized and adjusted rates.

95% confidence intervals for the stabilized and adjusted rates were obtained using bootstrap methods. For this, the study population was recreated by sampling all hospitals in Canada (excluding Quebec) which carried out the deliveries of interest (i.e., attempted forceps deliveries or attempted vacuum delivery) with replacement [17-20]. The recreated dataset was then used to estimate a stabilized and adjusted rate of maternal trauma (or neonatal trauma) for all the hospitals in the sample. This process was repeated 1500 times in order to obtain approximately 1,000 stabilized and adjusted maternal trauma (or neonatal trauma) rates for each hospital. Centiles 50, 2.5 and 97.5 of this distribution of stabilized and adjusted rates were then used to

obtain the point estimate and the bootstrapped 95% confidence intervals for each hospital. Hospitals with stabilized and adjusted maternal trauma or neonatal trauma rates following attempted forceps delivery or attempted vacuum delivery that were 10% higher and significantly different from the reference rate for Canada excluding Quebec were identified as outliers.

2.6. Ethics approval: Ethics approval for the study was obtained from the ethics review board of the University of British Columbia (H17-00587). Small numbers (<5) were suppressed in order to prevent potential identification and breach of confidentiality (cells were sometimes suppressed to prevent back calculation). Data from the 3 territories were combined and presented as data from the 'Combined Territories' (CT).

3. Results

The study population included 1,326,191 singleton deliveries at term gestation in hospitals in Canada (excluding Quebec) between April 2013 and March 2019 (excluding women with a previous cesarean delivery). There were 60,439 cases of maternal trauma in the study population (4.6%). Severe perineal lacerations were comprised 79% (47,497 of 60,439) of maternal trauma cases among all singleton term deliveries (Table 1) and third-degree perineal lacerations constituted 90% of all severe perineal lacerations. Other pelvic trauma (12%) and high vaginal lacerations (7%) were the other more common types of maternal trauma.

The rate of neonatal trauma in the study population was 2.9 per 1,000 live births (3,633 cases). The most common type of neonatal trauma was injury to the peripheral nervous system (39%; 1,409 of 3,633 cases), with Erb's paralysis constituting 39% of all injuries to the peripheral nervous system (Table 1). Seizures were the second most common component of neonatal trauma (32%), followed by other injury to the central nervous system (12%), subaponeurotic hemorrhage (11%) and injury to the long bones (11%).

3.1. Canada (excluding Quebec): Attempted forceps and attempted vacuum delivery

3.1.1. Frequency of attempted forceps and attempted vacuum delivery: Of the 1,326,191 singleton deliveries, 38,500 (2.9%) were attempted forceps deliveries and 110,987 (8.4%) were attempted vacuum deliveries (Table 1 and Figure 1). The remaining 1,176,704 non-instrumental deliveries included singleton, term, spontaneous vaginal deliveries and cesarean deliveries (to women without a previous cesarean delivery).

3.1.2. Frequency of failed forceps and failed vacuum deliveries: Of the 38,500 attempted forceps deliveries, 1,606 (4.2%) were failed forceps deliveries (i.e., forceps application followed by a cesarean delivery), while 8,791 (7.9%) of the 110,987 attempted vacuum deliveries were failed vacuum deliveries (Table 2 and Figure 1). The latter included 6,221 (70.8%) vacuum applications followed by a forceps delivery, 2,031 (23.1%) vacuum applications followed by a cesarean delivery and 539 (6.1%) cases of sequential instrument use (failed vacuum and failed forceps application) followed by a cesarean delivery.

3.1.3. Trauma following attempted forceps delivery

Maternal trauma was common following forceps delivery (9,728 cases; 25.3%). Third-degree lacerations, high vaginal lacerations and fourth-degree lacerations were the 3 most common types of maternal trauma (19.1%, 3.1% and 2.2%, respectively; Table 1). Neonatal trauma occurred among 341 infants delivered by attempted forceps (9.6 cases per 1,000) with injuries to the peripheral nervous system, and seizures being the two most common types of neonatal

Table 1. Frequency of the components of maternal trauma and neonatal trauma among women following attempted forceps delivery, attempted vacuum delivery and non-instrumental deliveries, Canada (excluding Quebec), 2013-2018.

Outcome	Attempted forceps		Attempted vacuum		Non-instrumental deliveries*	
	Number	Rate†	Number	Rate†	Number	Rate†
All deliveries	38,500	2.9	110,987	8.4	1,176,704	88.7
Deliveries with maternal trauma#	9,728	25.3	14,614	13.2	36,097	3.07
Severe perineal tear	8,285	21.5	12,948	11.7	26,264	2.23
3rd degree perineal tear	7,346	19.1	11,457	10.3	24,030	2.04
4th degree perineal tear	848	2.20	1,354	1.22	2,074	0.18
Unspecified	91	0.24	137	0.36	160	0.42
Cervical tear	208	0.54	388	0.35	2,216	0.19
High vaginal laceration	1,193	3.10	1,036	0.93	2,020	0.17
Other pelvic trauma	454	1.18	615	0.55	6,193	0.53
Repair of urethra/bladder	20	0.05	45	0.04	468	0.04
All births‡	35,663	2.9	103,000	8.3	1,097,374	88.8
Neonatal trauma#	341	9.6	987	9.6	2,305	2.10
Intracranial hemorrhage	25	0.7	85	0.8	53	0.05
Skull fracture	24	0.7	27	0.3	35	0.03
Subaponeurotic hemorrhage	33	0.9	254	2.5	102	0.09
Injury to the central nervous system	41	1.1	276	2.7	123	0.11
Injury to the peripheral nervous system injury	173	4.9	351	3.4	885	0.81
Erb's paralysis	71	2.0	120	1.2	344	0.31
Injury to the long bones	22	0.6	108	1.0	264	0.24
Seizures	73	2.0	170	1.7	916	0.83
Neonatal deaths	11	0.3	31	0.3	106	0.10

* Non-instrumental deliveries included vaginal deliveries and cesarean deliveries not assisted by either forceps or vacuum.

† Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

‡ Infants with congenital anomalies excluded.

Sum of cases with specific trauma exceeds the total because some cases had more than one trauma type.

trauma (4.9 and 2.0 per 1,000, respectively). Compared with non-instrumental deliveries, neonatal death rates (among infants without congenital anomalies) were about 3 times more frequent following attempted forceps birth (Table 1).

Of the total cases of maternal trauma among singleton, term deliveries in the study population, 16.1% (9,728 of 60,439 cases) occurred following attempted forceps delivery, and 9.4% (341 of 3,633) of all neonatal trauma occurred after attempted forceps delivery.

3.1.4. Trauma following attempted vacuum delivery: Maternal trauma following attempted vacuum delivery (14,614 cases; 13.2%, Table 1) was less frequent than the maternal trauma following attempted forceps delivery. Third-degree lacerations, fourth-degree lacerations and high vaginal lacerations were the most common types of maternal trauma following attempted vacuum delivery (10.3%, 1.2% and 0.93%, respectively; Table 1). Neonatal trauma occurred among 987 infants delivered by attempted vacuum (9.6 cases per 1,000). with injuries to the peripheral nervous system (3.4 per 1,000), other injuries to the central nervous system (2.7 per 1,000), subaponeurotic hemorrhage (2.5 per 1,000) and seizures (1.7 per 1,000) being the most common types of neonatal trauma. Compared with non-instrumental deliveries, neonatal death rates (among infants without congenital anomalies) were about 3 times more frequent following attempted vacuum birth (Table 1).

Of the total cases of maternal trauma among singleton, term deliveries in the study population, 24.2% (14,614 of 60,439 cases) occurred following attempted vacuum delivery, and 27.2% (987 of 3,633) of all neonatal trauma occurred after attempted vacuum birth.

Figure 1. Frequency of attempted forceps and attempted vacuum delivery (per 100 singleton, term deliveries) and rates of failed forceps (per 100 attempted forceps deliveries) and failed vacuum delivery (per 100 attempted vacuum deliveries), Canada (excluding Quebec), April 2013 to March 2019.

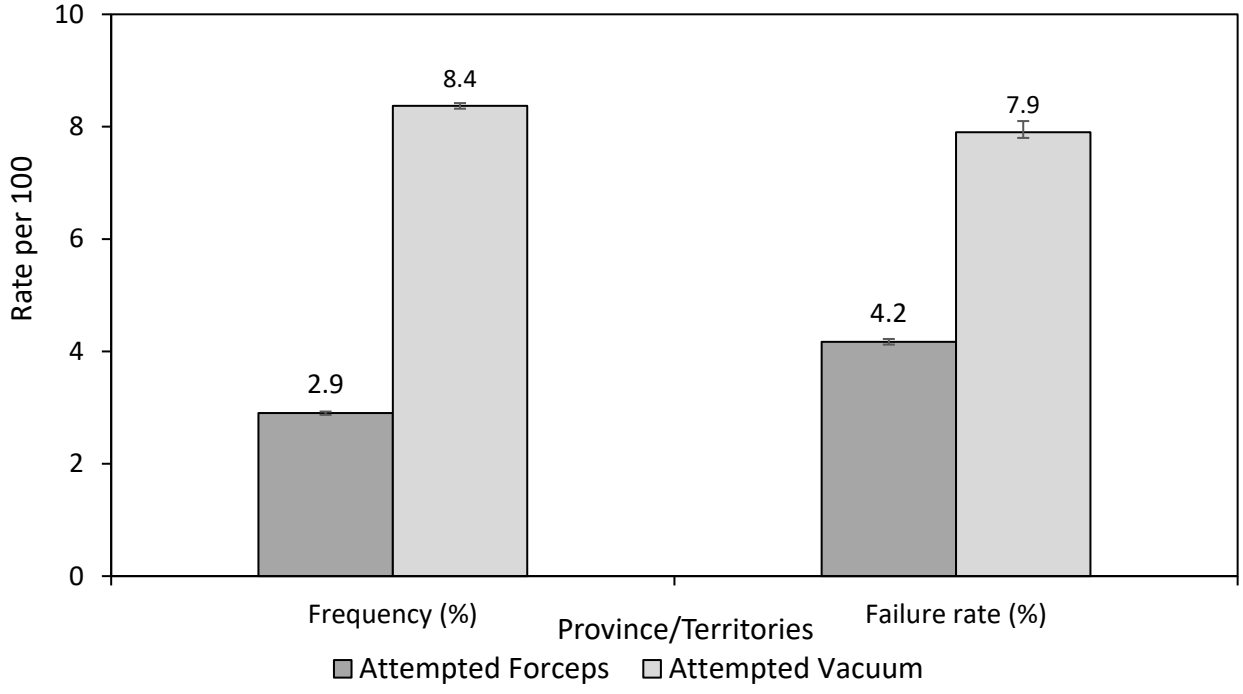


Table 2. Numbers and rates of attempted and failed forceps deliveries, numbers and rates of attempted and failed vacuum deliveries and associated rates of maternal trauma and neonatal trauma, Canada (excluding Quebec), April 2013 to March 2019.

Type of delivery	Deliveries		Maternal trauma		Births*	Neonatal trauma	
	Number	Rate per 100†	Number	Rate per 100		Number	Rate per 1,000
Attempted forceps	38,500	2.9	9,728	25.3	35,663	341	9.6
Successful	36,894	95.8	9,613	26.1	34,202	319	9.3
Failed (forceps followed by cesarean delivery)	1,606	4.2	115	7.2	1,461	22	15.1
Attempted vacuum	110,987	8.4	14,614	13.2	103,000	987	9.6
Successful	102,196	92.1	12,632	12.4	94,894	795	8.4
Failed	8,791	7.9	1,982	22.5	8,106	192	23.7
Vacuum followed by forceps delivery	6,221	70.8	1,826	29.4	5,736	120	20.9
Vacuum followed by cesarean delivery	2,031	23.1	123	6.1	1,866	55	29.5
Vacuum followed by forceps and cesarean delivery	539	6.1	33	6.1	504	17	33.7
Non-instrumental deliveries‡	1,176,704	88.7	36,097	3.1	1,097,374	2,305	2.10
Total	1,326,191	100.0	60,439	4.6	1,236,037	3,633	2.9

* Births with congenital anomalies excluded.

† Attempted forceps/vacuum expressed per 100 deliveries; successful/failed forceps and successful/failed vacuum deliveries expressed per 100 attempted forceps/vacuum deliveries. Subcategories of failed vacuum deliveries expressed per 100 failed vacuum deliveries.

‡ Non-instrumental deliveries included vaginal deliveries and cesarean deliveries not assisted by either forceps or vacuum.

3.1.5. Non-instrumental deliveries: Non-instrumental deliveries, including both spontaneous vaginal and cesarean deliveries, constituted the majority of all deliveries (88.7%; Table 1). Maternal trauma occurred among 3.1% of non-instrumental deliveries (compared with 25.3% and 13.2% following attempted forceps and attempted vacuum delivery, respectively). Neonatal trauma rates were 2.1 per 1,000 live births following non-instrumental delivery (compared with 9.6 per 1,000 following attempted forceps and 9.6 per 1,000 following attempted vacuum birth). A majority of maternal and neonatal trauma cases occurred following non-instrumental delivery (59.7% of maternal trauma and 63.4% of neonatal trauma).

3.1.6. Trauma following failed forceps deliveries: Failed forceps deliveries (i.e., forceps followed by cesarean delivery) were associated with a 73% (95% CI 67-77) lower rate of maternal trauma (7.2%, 95% CI 6.0-8.5) compared with successful forceps deliveries (26.1%, 95% CI 25.6-26.5). However, live births following failed forceps were associated with a 61% (95% CI 5-147) higher rate of neonatal trauma (15.1 per 1,000, 95% CI 9.5-22.7) compared with live births following successful forceps delivery (9.3 per 1,000, 95% CI 8.3-10.4; Table 2).

3.1.7. Trauma following failed vacuum deliveries: Failed vacuum deliveries had an 82% (95% CI 75-90) higher rate of maternal trauma (22.5%, 95% CI 21.7-23.4) compared with successful vacuum deliveries (12.4%, 95% CI 12.2-12.6) and a 183% (95% CI 142-230) higher rate of neonatal trauma (23.7 per 1,000, 95% CI 20.5-27.2) compared with successful vacuum births (8.4 per 1,000, 95% CI 7.8-9.0; Table 2). Trauma rates following failed vacuum delivery depended on the type of failed vacuum delivery: failed vacuum delivery followed by forceps delivery was associated with the highest rate of maternal trauma (29.4%), while all types of failed vacuum deliveries were associated with high rates of neonatal trauma (vacuum followed by forceps birth 20.9 per 1,000; vacuum followed by cesarean birth 29.5%; and vacuum followed by forceps followed by cesarean birth 33.7%; Table 2).

3.2. Province/territories: Attempted forceps and attempted vacuum delivery

3.2.1. Frequency of attempted and failed forceps delivery (by province/territories)

Table 3 below shows rates of attempted and failed forceps delivery by provinces/territories of Canada (excluding Quebec). Attempted forceps rates were significantly higher in British Columbia and Alberta compared with the rest of Canada (excluding Quebec). The rate of failed forceps deliveries in Canada (excluding Quebec) was 4.2% (of attempted forceps deliveries). Rates of failed forceps delivery were significantly higher in British Columbia, Alberta and Prince Edward Island compared with failed forceps delivery rates in the rest of Canada excluding Quebec (Table 3 and Figure 2).

3.2.2. Frequency of attempted and failed vacuum delivery (by province/territories)

Table 3 shows rates of attempted and failed vacuum delivery by provinces/territories of Canada (excluding Quebec). Attempted vacuum delivery rates were significantly higher in Alberta, Saskatchewan, New Brunswick and Newfoundland and Labrador than in the rest of Canada (excluding Quebec). The rate of failed vacuum delivery in Canada (excluding Quebec) was 7.9% (of attempted vacuum deliveries). Failed vacuum application rates were significantly higher in Saskatchewan, Manitoba, Nova Scotia and Prince Edward Island compared with the rest of Canada excluding Quebec (Table 3 and Figure 2).

Table 3. Rates of attempted forceps and attempted vacuum deliveries (per 100 term, singleton deliveries) and rates of failed forceps and failed vacuum deliveries (per 100 attempted forceps and 100 attempted vacuum deliveries), by province/territories, Canada excluding Quebec, April 2013 to March 2019.

Province /territories	Term singleton deliveries	Attempted forceps deliveries		Failed forceps delivery		Attempted vacuum deliveries		Failed vacuum deliveries	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate
BC	193,798	7,979	4.1	432	5.4	13,867	7.2	886	6.4
AB	239,684	8,926	3.7	456	5.1	22,999	9.6	1,791	7.8
SK	71,626	1,745	2.4	81	4.6	8,919	12.5	1,001	11.2
MB	78,947	1,194	1.5	54	4.5	5,231	6.6	498	9.5
ON	638,308	16,235	2.5	450	2.8	51,467	8.1	3,746	7.3
NB	31,143	705	2.3	35	5.0	2,908	9.3	255	8.8
NS	38,725	1,145	3.0	59	5.2	2,783	7.2	353	12.7
PE	6,197	95	1.5	15	15.8	392	6.3	45	11.5
NL	20,193	444	2.2	2[redacted]	4.[redacted]	1,983	9.8	179	9.0
CT	7,570	32	0.4	[redacted]	[redacted]	438	5.8	37	8.4
CA	1,326,191	38,500	2.9	1,606	4.2	110,987	8.4	8,791	7.9

Small cells (<5) suppressed.

Yellow highlight indicates provinces/territories with a rate of attempted/failed forceps or attempted/failed vacuum delivery that was significantly higher than the same rate in the rest of Canada excluding Quebec.

Figure 2. Failed forceps and failed vacuum delivery rates (95% confidence intervals) per 100 attempted forceps and 100 attempted vacuum deliveries, Canada excluding Quebec, April 2013 to March 2019.

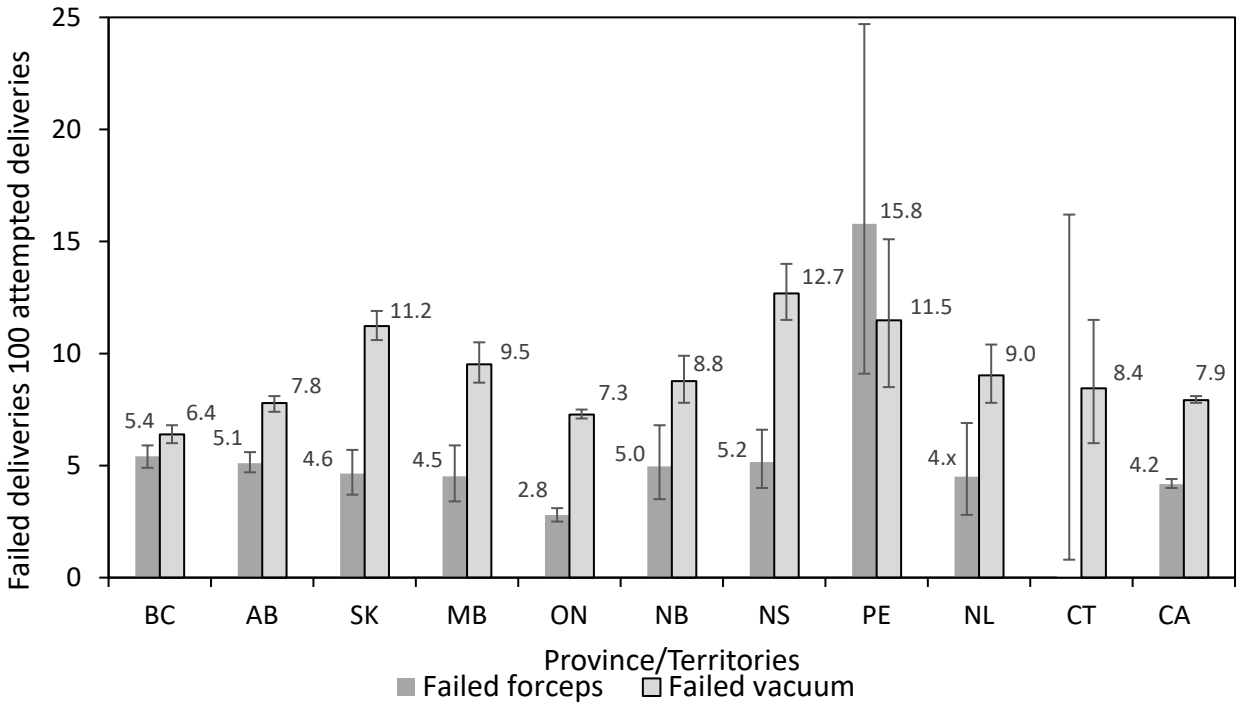


Table 4 and Figure 3 show types of failed vacuum delivery by province/territories. The rate of failed vacuum application followed by forceps delivery were significantly higher in Saskatchewan, Manitoba, Nova Scotia and Prince Edward Island compared with rates in the rest of Canada excluding Quebec. Rates of failed vacuum application followed by cesarean delivery were significantly higher in British Columbia, Manitoba, and New Brunswick than in the rest of Canada excluding Quebec (Table 4). The sequential application of vacuum and forceps, followed by cesarean delivery, was significantly higher in Saskatchewan and Nova Scotia.

Table 4. Rates of attempted vacuum deliveries (per 100 term, singleton deliveries) and failed vacuum deliveries (per 100 attempted vacuum deliveries), by province/territories, Canada excluding Quebec, April 2013 to March 2019.

Province /territories	Singleton deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery		Vacuum followed by cesarean delivery		Sequential instruments followed by cesarean	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate
BC	193,798	13,867	7.2	521	3.8	312	2.2	53	0.4
AB	239,684	22,999	9.6	1,231	5.4	437	1.9	123	0.5
SK	71,626	8,919	12.5	762	8.5	178	2.0	61	0.7
MB	78,947	5,231	6.6	353	6.7	123	2.4	22	0.4
ON	638,308	51,467	8.1	2,710	5.3	809	1.6	227	0.4
NB	31,143	2,908	9.3	176	6.1	73	2.5	6	0.2
NS	38,725	2,783	7.2	280	10.1	44	1.6	29	1.0
PE	6,197	392	6.3	36	9.2	6	1.5	[redacted]	[redacted]
NL	20,193	1,983	9.8	127	6.4	38	1.9	14	0.7
CT	7,570	438	5.8	25	5.7	11	2.5	[redacted]	[redacted]
CA	1,326,191	110,987	8.4	6,221	5.6	2,031	1.8	539	0.5

Small cells (<5) suppressed.
Yellow highlight indicates provinces/territories with a rate of attempted/failed vacuum delivery that was significantly higher than the same rate in the rest of Canada excluding Quebec.

3.2.3. Trauma following attempted forceps, attempted vacuum and non-instrumental delivery

Tables 5 and 6 below show maternal trauma and neonatal trauma rates following attempted forceps delivery and attempted vacuum delivery, while Figures 4 and 5 show the same rates and rates of trauma following non-instrumental delivery by provinces/territories. Rates of maternal trauma following attempted forceps delivery were significantly higher in Alberta (27.3%), Saskatchewan (40.7%), Manitoba (32.2%), Nova Scotia (33.8%) and Prince Edward Island (38.9%) than in the rest of Canada excluding Quebec (Canada excluding Quebec 25.3%; Table 5). Rates of maternal trauma following attempted vacuum delivery were significantly higher in Saskatchewan (19.4%), Manitoba (15.2%) and Nova Scotia (15.0%) compared with the rest of Canada excluding Quebec (Canada excluding Quebec 13.2%; Table 6).

Rates of neonatal trauma following attempted forceps birth ranged from a low of 0.0 per 1,000 live births in Prince Edward Island to 14.8 per 1,000 live births in New Brunswick, although no province/territories had a rate that was significantly higher than that in the rest of Canada excluding Quebec (rate in Canada excluding Quebec 9.6 per 1,000; Table 5). Rates of neonatal trauma following attempted vacuum birth were significantly higher in Alberta (11.8 per 1,000 live births) and Prince

Edward Island (26.6 per 1,000 live births) than in the rest of Canada excluding Quebec (Canada excluding Quebec 9.6 per 1,000 live births; Table 6). Figures 4 and 5 show that rates of maternal trauma were 3.1 per 100 non-instrumental deliveries, while rates of neonatal trauma were 2.1 per 1,000 non-instrumental births.

Figure 3. Failed vacuum delivery types (95% confidence intervals) per 100 attempted vacuum deliveries, Canada excluding Quebec, April 2013 to March 2019.

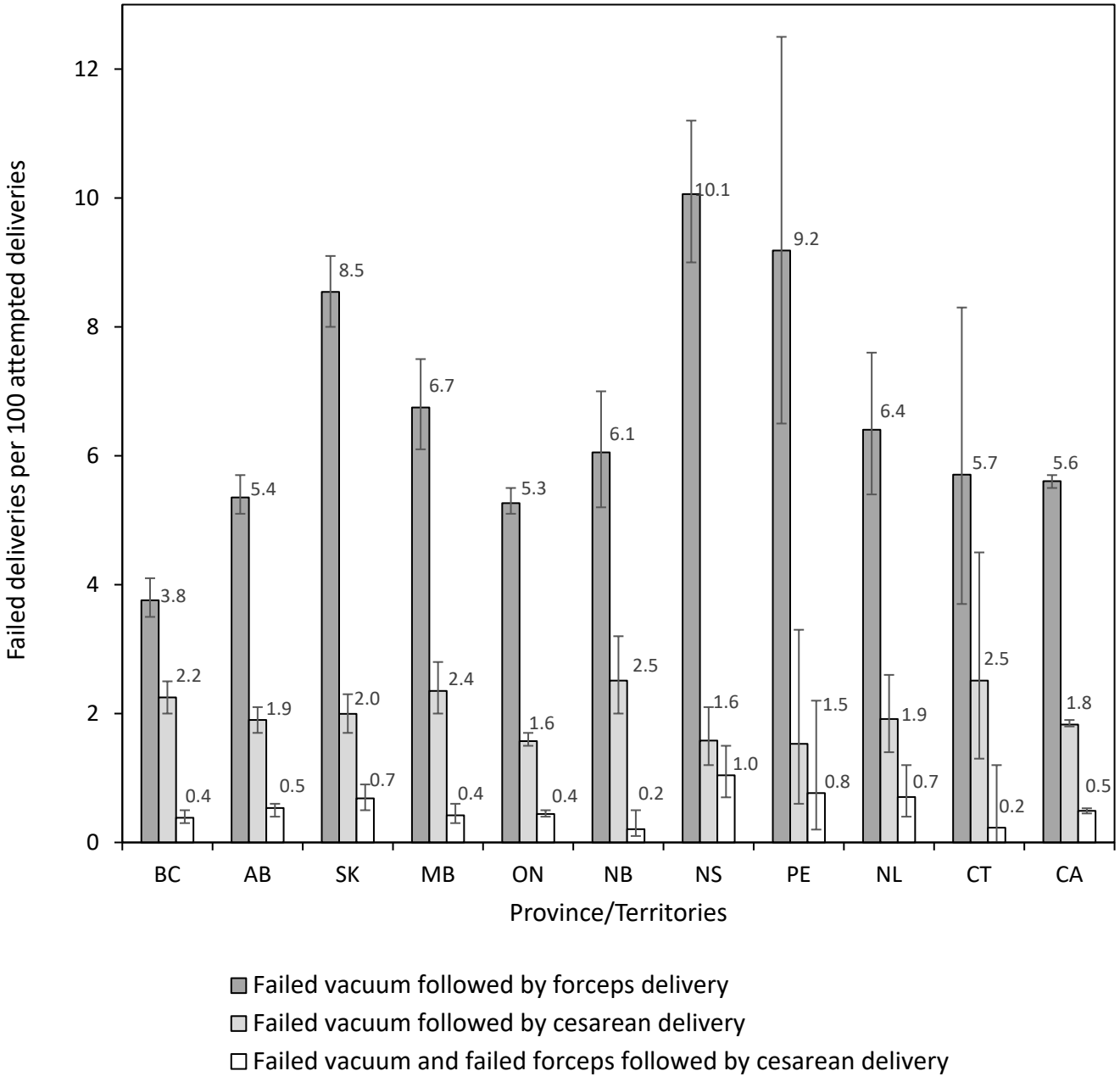


Table 5. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma by province/territories, Canada excluding Quebec, April 2013 to March 2019.

Province/ Territories	Singleton deliveries (no previous cesarean)	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/ 100	No.	Rate/ 100		No.	Rate/ 100	No.	Rate/ 1,000
BC	193,798	7,979	4.1	1,991	25.0	182,495	7,478	4.1	58	7.8
AB	239,684	8,926	3.7	2,437	27.3	217,536	8,097	3.7	78	9.6
SK	71,626	1,745	2.4	710	40.7	66,396	1,589	2.4	17	10.7
MB	78,947	1,194	1.5	385	32.2	74,909	1,144	1.5	16	14.0
ON	638,308	16,235	2.5	3,527	21.7	598,957	15,146	2.5	149	9.8
NB	31,143	705	2.3	171	24.3	29,690	675	2.3	10	14.8
NS	38,725	1,145	3.0	387	33.8	35,476	1,023	2.9	11	10.8
PE	6,197	95	1.5	37	38.9	5,553	84	1.5	0	0.0
NL	20,193	444	2.2	73	16.4	17,989	396	2.2	[redacted]	[redacted]
CT	7,570	32	0.4	10	31.3	7,036	31	0.4	[redacted]	[redacted]
CA	1,326,191	38,500	2.9	9,728	25.3	1,236,037	35,663	2.9	341	9.6

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates provinces/territories with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in the rest of Canada excluding Quebec.

Table 6. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma by province/territories, Canada, April 2013 to March 2019.

Province/ Territories	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/ 100	No.	Rate/ 100		No.	Rate/ 100	No.	Rate/ 1,000
BC	193,798	13,867	7.2	1,627	11.7	182,495	13,067	7.2	84	6.4
AB	239,684	22,999	9.6	2,957	12.9	217,536	20,649	9.5	244	11.8
SK	71,626	8,919	12.5	1,728	19.4	66,396	8,246	12.4	65	7.9
MB	78,947	5,231	6.6	797	15.2	74,909	4,925	6.6	49	9.9
ON	638,308	51,467	8.1	6,471	12.6	598,957	48,312	8.1	466	9.6
NB	31,143	2,908	9.3	368	12.7	29,690	2,768	9.3	23	8.3
NS	38,725	2,783	7.2	417	15.0	35,476	2,537	7.2	20	7.9
PE	6,197	392	6.3	43	11.0	5,553	338	6.1	9	26.6
NL	20,193	1,983	9.8	162	8.2	17,989	1,748	9.7	22	12.6
CT	7,570	438	5.8	44	10.0	7,036	410	5.8	5	12.2
CA	1,326,191	110,987	8.4	14,614	13.2	1,236,037	103,000	8.3	987	9.6

* Infants with congenital anomalies excluded.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates provinces/territories with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in the rest of Canada excluding Quebec.

Figure 4. Rates (95% confidence intervals) of maternal trauma following attempted forceps delivery, attempted vacuum delivery and non-instrumental delivery among singleton term deliveries in the provinces/territories, Canada (excluding Quebec), April 2013 to March 2019.

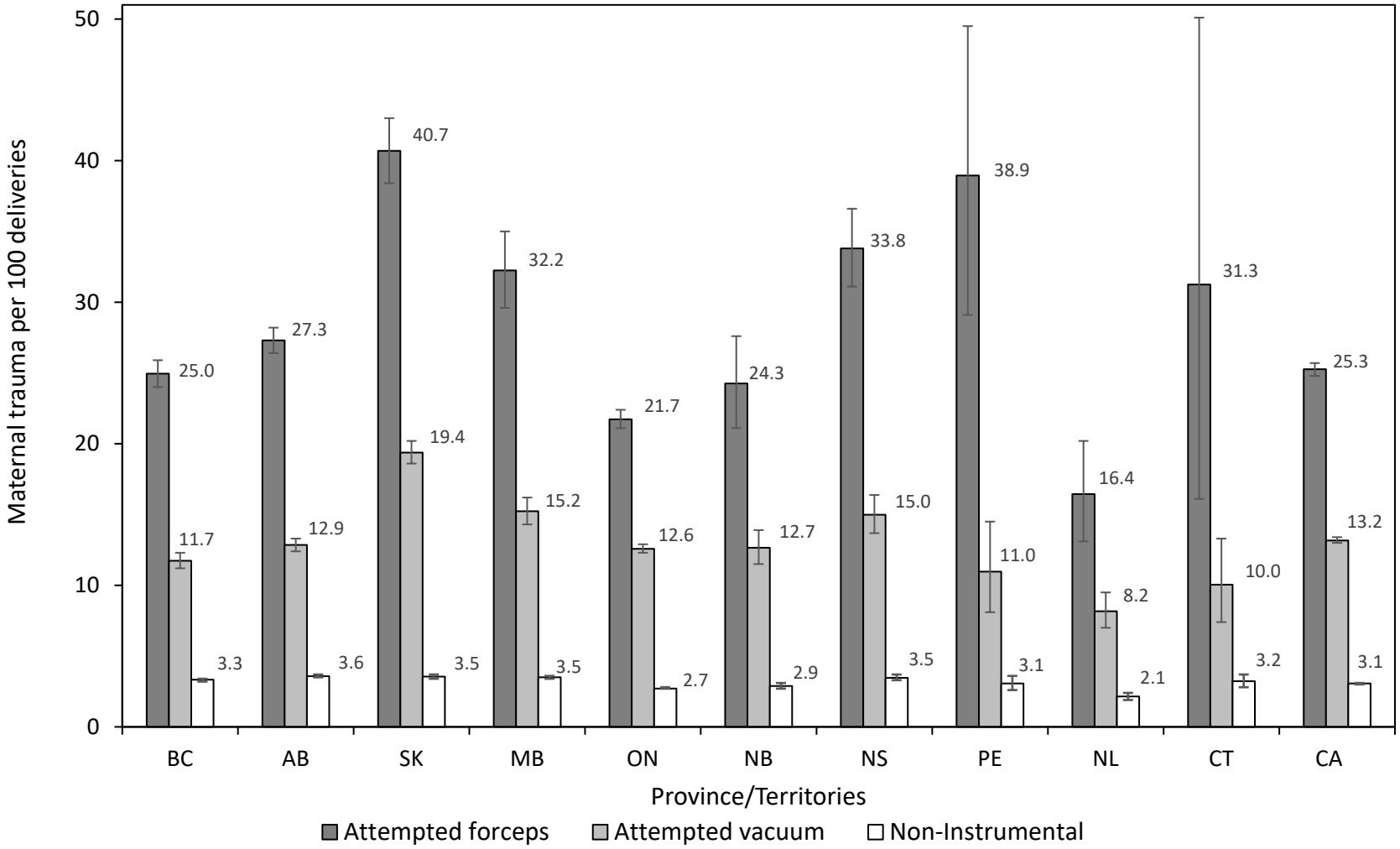
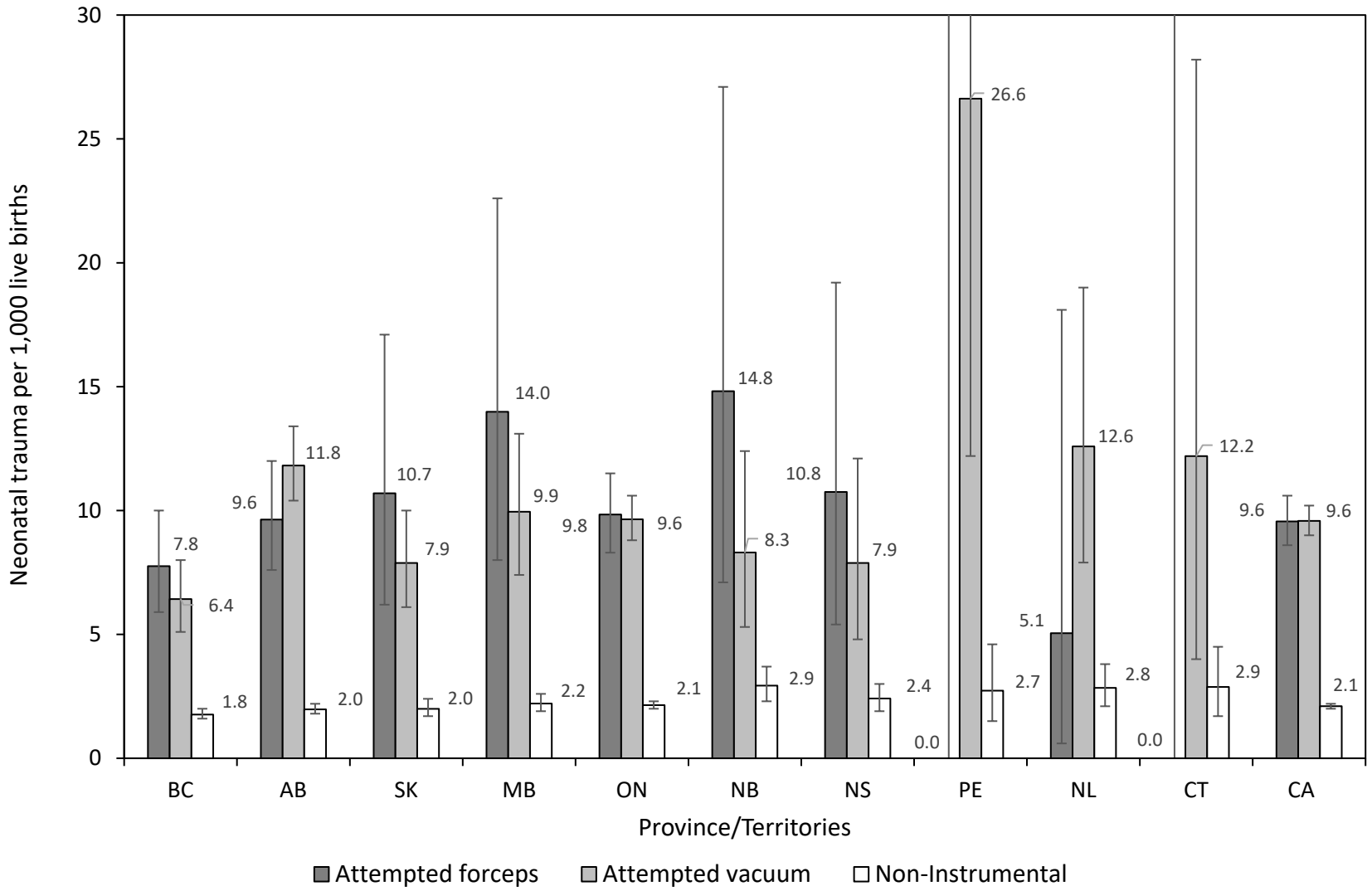


Figure 5. Rates (95% confidence intervals) of neonatal trauma following attempted forceps births, attempted vacuum births and non-instrumental births among singleton term births in the provinces/territories, Canada (excluding Quebec) April 2013 to March 2019 (infants with congenital anomalies excluded).



3.3. Tiers of obstetric service (TOS): Trauma rates following attempted forceps and attempted vacuum delivery

Tier of service analyses were carried out after stratifying by province/territories (given variations in provincial/territorial tiers of service; see https://phsr.obgyn.ubc.ca/tiers-of-service/). Tiers of obstetric service with significantly higher rates of maternal or neonatal trauma compared with the same rates in all other tiers combined are highlighted.

3.3.1. British Columbia TOS: Attempted forceps deliveries by tiers of obstetric service

Rates of maternal trauma were significantly higher in tier 2b hospitals, while rates of neonatal trauma were significantly higher in tier 4 hospitals compared with other tiers of obstetric service (Tables 7).

Table 7. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tiers of obstetric service (TOS), British Columbia, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate/100		No.	Rate	No.	Rate/1,000
0	72	0	0.0	0	0.0	72	0	0.0	0	0.0
1	294	0	0.0	0	0.0	288	0	0.0	0	0.0
1.5	53,648	1,174	2.2	285	24.3	50,967	1,100	2.2	7	6.4
2	46,585	1,753	3.8	462	26.4	44,608	1,687	3.8	7	4.1
2.5	17,468	477	2.7	159	33.3	16,504	446	2.7	6	13.5
3	44,728	2,134	4.8	449	21.0	41,020	1,935	4.7	13	6.7
4	31,003	2,441	7.9	636	26.1	29,036	2,310	8.0	25	10.8
Total	193,798	7,979	4.1	1,991	25.0	182,495	7,478	4.1	58	7.8

* Infants with congenital anomalies excluded.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.2. British Columbia TOS: Attempted vacuum deliveries by tiers of obstetric service

Rates of maternal trauma and neonatal trauma were not significantly different in any tier of service relative to other tiers of service.

Table 8. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), British Columbia, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	72	0	0.0	0	0.0	72	0	0	0	0
1	294	7	2.4	0	0.0	288	7	2.4	0	0.0
1.5	53,648	3,984	7.4	489	12.3	50,967	3,787	7.4	26	6.9
2	46,585	3,815	8.2	477	12.5	44,608	3,646	8.2	25	6.9
2.5	17,468	1,080	6.2	133	12.3	16,504	1,021	6.2	5	4.9
3	44,728	2,972	6.6	311	10.5	41,020	2,705	6.6	22	8.1
4	31,003	2,009	6.5	217	10.8	29,036	1,901	6.5	6	3.2
Total	193,798	13,867	7.2	1627	11.7	182,495	13,067	7.2	84	6.4

* Infants with congenital anomalies excluded.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

3.3.3. Alberta (TOS): Attempted forceps deliveries by tier of obstetric service

Rates of maternal trauma and neonatal trauma were not significantly different in any tier of service relative to other tiers of service. Note that Alberta had a significantly higher rate of maternal trauma following attempted forceps delivery compared with the rest of Canada excluding Quebec (Table 5).

Table 9. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tiers of obstetric service (TOS), Alberta, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	151	[redacted]	[redacted]	[redacted]	[redacted]	143	[redacted]	[redacted]	[redacted]	[redacted]
1	1,198	[redacted]	[redacted]	[redacted]	[redacted]	1,130	[redacted]	[redacted]	[redacted]	[redacted]
2	30,797	239	0.8	62	25.9	28,740	222	0.8	[redacted]	[redacted]
3	97,062	3,684	3.8	1,022	27.7	89,929	3,446	3.8	24	7.0
4	110,476	5,000	4.5	1,352	27.0	97,594	4,427	4.5	51	11.5
TOTAL	239,684	8,926	3.7	2,437	27.3	217,536	8,097	3.7	78	9.6

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

3.3.4. Alberta TOS: Attempted vacuum deliveries by tier of obstetric service

Rates of maternal trauma in Alberta were significantly higher in tier 2 hospitals and rates of neonatal trauma were significantly higher in tier 4 hospitals relative to trauma rates in other tiers of service hospitals. Note that rates of neonatal trauma following attempted vacuum delivery were significantly higher in Alberta compared with the same rates in Canada excluding Quebec (Table 6).

Table 10. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Alberta, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	151	5	3.3	0	0.0	143	[redacted]	[redacted]	0	0.0
1	1,198	65	5.4	13	20.0	1,130	[redacted]	[redacted]	0	0.0
2	30,797	4,129	13.4	588	14.2	28,740	3,830	13.3	26	6.8
3	97,062	5,490	5.7	722	13.2	89,929	5,034	5.6	58	11.5
4	110,476	13,310	12.0	1634	12.3	97,594	11,718	12.0	160	13.7
Total	239,684	22,999	9.6	2,957	12.9	217,536	20,649	9.5	244	11.8

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.5. Saskatchewan TOS: Attempted forceps deliveries by tier of obstetric service

Rates of maternal trauma were significantly higher in tier 4 hospitals compared maternal trauma rates in all other tiers of service hospitals, while neonatal trauma rates were not significantly different in any tier of service relative to other tiers of service. Note that Saskatchewan had a significantly higher rate of maternal trauma following attempted forceps delivery compared with the rest of Canada excluding Quebec (Table 5).

Table 11. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service, Saskatchewan, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	173	[redacted]	[redacted]	[redacted]	[redacted]	169	[redacted]	[redacted]	[redacted]	[redacted]
1	3,276	[redacted]	[redacted]	[redacted]	[redacted]	3,121	[redacted]	[redacted]	[redacted]	[redacted]
2	23,652	373	1.6	86	23.1	22,560	359	1.6	[redacted]	[redacted]
4	44,525	1,341	3.0	622	46.4	40,546	1,201	3.0	15	12.5
Total	71,626	1,745	2.4	710	40.7	66,396	1,589	2.4	17	10.7

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.6. Saskatchewan TOS: Attempted vacuum deliveries by tier of obstetric service

Rates of maternal trauma in Saskatchewan were significantly higher in tier 4 hospitals compared with maternal trauma rates in other tiers of service hospitals, while rates of neonatal trauma were significantly higher in tier 2 hospitals relative to neonatal trauma rates in other tiers of service hospitals. Note that rates of maternal trauma following attempted vacuum delivery were significantly higher in Saskatchewan compared with the same rates in Canada excluding Quebec (Table 6).

Table 12. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Saskatchewan, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	173	16	9.2	[redacted]	[redacted]	169	15	8.9	[redacted]	[redacted]
1	3,276	426	13.0	[redacted]	[redacted]	3,121	405	13.0	[redacted]	[redacted]
2	23,652	2,441	10.3	323	13.2	22,560	2,325	10.3	28	12.0
4	44,525	6,036	13.6	1,366	22.6	40,546	5,501	13.6	34	6.2
Total	71,626	8,919	12.5	1,728	19.4	66,396	8,246	12.4	65	7.9

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.7. Manitoba TOS: Attempted forceps deliveries by tier of obstetric service

Rates of maternal trauma following attempted forceps delivery were significantly higher in tier 3 hospitals compared maternal trauma rates in all other tiers of service hospitals in Manitoba. Neonatal trauma rates were not significantly different in any tier of service relative to other tiers of service. Note that maternal trauma rates following attempted forceps delivery in Manitoba were significantly higher than rates in the rest of Canada excluding Quebec (Table 5).

Table 13. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Manitoba, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	179	[redacted]	[redacted]	0	0.0	169	[redacted]	[redacted]	[redacted]	[redacted]
1	92	[redacted]	[redacted]	0	0.0	90	[redacted]	[redacted]	[redacted]	[redacted]
2	26,611	146	0.5	35	24.0	24,392	127	0.5	[redacted]	[redacted]
3	52,065	1,046	2.0	350	33.5	50,258	1,015	2.0	13	12.8
Total	78,947	1,194	1.5	385	32.2	74,909	1,144	1.5	16	14.0

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.8. Manitoba TOS: Attempted vacuum deliveries by tier of obstetric service

Rates of maternal trauma following attempted vacuum delivery were significantly higher in tier 3 hospitals compared with maternal trauma rates in other tiers of service hospitals. Rates of neonatal trauma were not significantly higher in any tier of service relative to neonatal trauma rates in other tiers of service. Note that rates of maternal trauma following attempted vacuum delivery were significantly higher in Manitoba compared with the same rates in Canada excluding Quebec (Table 6).

Table 14. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Manitoba, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	179	[redacted]	[redacted]	0	0.0	169	[redacted]	[redacted]	0	0.0
1	92	[redacted]	[redacted]	0	0.0	90	[redacted]	[redacted]	0	0.0
2	26,611	1,757	6.6	230	13.1	24,392	1,586	6.5	14	8.8
3	52,065	3,471	6.7	567	16.3	50,258	3,336	6.6	35	10.5
Total	78,947	5,231	6.6	797	15.2	74,909	4,925	6.6	49	9.9

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.9. Ontario TOS: Attempted forceps deliveries by tier of obstetric service

Rates of maternal trauma following attempted forceps delivery were significantly higher in tier 3 hospitals compared with maternal trauma rates in all other tiers of service hospitals in Ontario. Neonatal trauma rates following attempted forceps delivery were significantly higher in tier 2b and tier 3 hospitals compared with neonatal trauma rates in other tiers of service.

Table 15. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Ontario, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	76	0	0.0	0	0.0	68	0	0.0	0	0.0
1	5,158	21	0.4	5	23.8	4065	19	0.5	0	0.0
1.5	61,898	1,313	2.1	246	18.7	57,389	1,209	2.1	5	4.1
2	62,262	2,147	3.4	448	20.9	57,079	1,969	3.4	19	9.6
2.3	186,045	3,965	2.1	799	20.2	177,405	3,764	2.1	48	12.8
2.7	190,031	5,128	2.7	1,045	20.4	179,524	4,758	2.7	33	6.9
3	132,838	3,661	2.8	984	26.9	123,427	3,427	2.8	44	12.8
Total	638,308	16,235	2.5	3,527	21.7	598,957	15,146	2.5	149	9.8

* Infants with congenital anomalies excluded.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.10. Ontario TOS: Attempted vacuum deliveries by tier of obstetric service

Rates of maternal trauma following attempted vacuum delivery were significantly higher in tier 3 hospitals compared with maternal trauma rates in other tiers of service hospitals, while rates of neonatal trauma following attempted vacuum delivery were significantly higher in tier 2b hospitals relative to neonatal trauma rates in other tiers of service hospitals.

Table 16. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Ontario, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1000
0	76	[redacted]	[redacted]	[redacted]	[redacted]	68	[redacted]	[redacted]	0	0.0
1	5,158	28[redacted]	5.[redacted]	2[redacted]	9.[redacted]	4,065	22[redacted]	5.6	[redacted]	[redacted]
1.5	61,898	5,615	9.1	465	8.3	57,389	5,174	9.0	57	11.0
2	62,262	4,463	7.2	498	11.2	57,079	4,112	7.2	34	8.3
2.3	186,045	16,176	8.7	2,122	13.1	177,405	15,439	8.7	169	10.9
2.7	190,031	15,101	7.9	1,850	12.3	179,524	14,276	8.0	128	9.0
3	132,838	9,825	7.4	1,509	15.4	123,427	9,082	7.4	77	8.5
TOTAL	638,308	51,467	8.1	6,471	12.6	598,957	48,312	8.1	466	9.6

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.11. New Brunswick TOS: Attempted forceps deliveries by tier of obstetric service

Rates of maternal trauma and rates of neonatal trauma following attempted forceps delivery in New Brunswick were not significantly different in any tier of service compared with the same rates in other tiers of service.

Table 17. Numbers and rates of attempted forceps deliveries, and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), New Brunswick, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
1	1,324	0	0.0	0	0.0	1,293	0	0.0	0	0.0
2	6,474	98	1.5	30	30.6	6,136	91	1.5	[redacted]	[redacted]
2.5	3,316	49	1.5	16	32.7	3,076	47	1.5	[redacted]	[redacted]
3	20,029	558	2.8	125	22.4	19,185	537	2.8	7	13.0
TOTAL	31,143	705	2.3	171	24.3	29,690	675	2.3	10	14.8

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

3.3.12. New Brunswick TOS: Attempted vacuum deliveries by tier of obstetric service

Rates of maternal trauma following attempted vacuum delivery were significantly higher in tier 2b hospitals compared with maternal trauma rates in other tiers of service hospitals, while rates of neonatal trauma following attempted vacuum delivery were not significantly different in any tier of service compared with other tiers of service.

Table 18. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service, New Brunswick, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
1	1,324	45	3.4	[redacted]	[redacted]	1,293	41	3.2	[redacted]	[redacted]
2	6,474	848	13.1	10[redacted]	12.[redacted]	6,136	809	13.2	[redacted]	[redacted]
2.5	3,316	144	4.3	37	25.7	3,076	135	4.4	0	0.0
3	20,029	1,871	9.3	219	11.7	19,185	1,783	9.3	17	9.5
TOTAL	31,143	2,908	9.3	368	12.7	29,690	2,768	9.3	23	8.3

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.13. Nova Scotia TOS: Attempted forceps deliveries by tier of obstetric service

Maternal trauma rates following attempted forceps delivery were significantly higher in tier of service 3 hospitals in Nova Scotia compared with the same rates in the other tiers of service. Rates of neonatal trauma following attempted forceps birth were not significantly higher in any tier of service compared with the same rates in other tiers of service. Note that maternal trauma rates following attempted forceps delivery in Nova Scotia were significantly higher than rates in the rest of Canada excluding Quebec (Table 5).

Table 19. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tiers of obstetric service (TOS), Nova Scotia, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	12	0	0.0	0	0.0	12	0	0.0	0	0.0
2	8,039	183	2.3	31	16.9	7,577	174	2.3	[redacted]	[redacted]
2.5	9,637	86	0.9	21	24.4	9,103	82	0.9	[redacted]	[redacted]
3	21,037	876	4.2	335	38.2	18,784	767	4.1	8	10.4
TOTAL	38,725	1,145	3.0	387	33.8	35,476	1,023	2.9	11	10.8

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.14. Nova Scotia TOS: Attempted vacuum deliveries by tier of obstetric service

Rates of maternal trauma following attempted vacuum delivery were significantly higher in tier 3 hospital(s) compared with other tiers of service hospitals. Rates of neonatal trauma following attempted vacuum delivery and were not significantly different in any tier of service compared with the same rates in other tiers of service. Note that rates of maternal trauma following attempted vacuum delivery were significantly higher in Nova Scotia compared with the same rates in Canada excluding Quebec (Table 6).

Table 20. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Nova Scotia, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
0	12	0	0.0	0	0.0	12	[redacted]	[redacted]	[redacted]	[redacted]
2	8,039	636	7.9	62	9.7	7,577	601	7.9	5	8.3
2.5	9,637	906	9.4	128	14.1	9,103	855	9.4	[redacted]	[redacted]
3	21,037	1,241	5.9	227	18.3	18,784	1,081	5.8	11	10.2
TOTAL	38,725	2,783	7.2	417	15.0	35,476	2,537	7.2	20	7.9

* Infants with congenital anomalies excluded.

Small numbers (<5) supressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of obstetric trauma or severe birth trauma that was significantly higher than the rate in all other tiers of service combined.

3.3.15. Prince Edward Island TOS: Attempted forceps deliveries by tier of obstetric service

Rates of maternal trauma following attempted forceps delivery in Prince Edward Island were not different in any tier of service relative to other tiers of service. There were no cases of neonatal trauma following attempted forceps birth in Prince Edward Island. Note that maternal trauma rates following attempted forceps delivery in Prince Edward Island were significantly higher than rates in the rest of Canada excluding Quebec (Table 5).

Table 21. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Prince Edward Island, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
2	2,332	14	0.6	8	57.1	2,019	14	0.7	0	0.0
2.5	3,865	81	2.1	29	35.8	3,534	70	2.0	0	0.0
TOTAL	6,197	95	1.5	37	38.9	5,553	84	1.5	0	0.0

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

3.3.16. Prince Edward Island TOS: Attempted vacuum deliveries by tier of obstetric service

Rates of maternal trauma and neonatal trauma following attempted vacuum delivery were not different in any tier of service relative to other tiers of service. Note that rates of neonatal trauma following attempted vacuum delivery were significantly higher in Prince Edward Island compared with the same rates in Canada excluding Quebec (Table 6).

Table 22. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Prince Edward Island, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1000
2	2,332	255	10.9	24	9.4	2,019	213	10.5	[redacted]	[redacted]
2.5	3,865	137	3.5	19	13.9	3,534	125	3.5	[redacted]	[redacted]
TOTAL	6,197	392	6.3	43	11.0	5,553	338	6.1	9	26.6

* Infants with congenital anomalies excluded.

Small numbers (<5) supressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

3.3.17. Newfoundland and Labrador TOS: Attempted forceps deliveries by tier of obstetric service

Rates of maternal trauma following attempted forceps delivery in Newfoundland and Labrador were significantly higher in the tiers of service 4 hospital(s) relative to other tiers of service hospitals. Rates of neonatal trauma following attempted forceps birth were not significantly different in any tiers of service relative to other tiers of service.

Table 23. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Newfoundland and Labrador, April 2013 to March 2019.

TOS	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
1	33	0	0.0	0	0.0	33	0	0.0	0	0.0
2	6,453	257	4.0	30	11.7	6,139	238	3.9	[redacted]	[redacted]
3	2,648	26	1.0	6	23.1	2,546	25	1.0	0	0.0
4	11,059	161	1.5	37	23.0	9,271	133	1.4	[redacted]	[redacted]
Total	20,193	444	2.2	73	16.4	17,989	396	2.2	[redacted]	[redacted]

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

Tiers of Obstetric Service in Newfoundland and Labrador were assigned based on hospital volume.

3.3.18. Newfoundland and Labrador TOS: Attempted vacuum deliveries by tier of obstetric service

Rates of maternal trauma following attempted vacuum delivery were significantly higher in the tier of service 4 hospital(s) relative to other tiers of service hospitals. However, the rate of neonatal trauma following attempted vacuum delivery was not significantly different in any tier of service relative to other tiers of service.

Table 24. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Newfoundland and Labrador, April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
1	33	0	0.0	0	0.0	33	0	0.0	0	0.0
2	6,453	550	8.5	42	7.6	6,139	529	8.6	[redacted]	[redacted]
3	2,648	301	11.4	15	5.0	2,546	282	11.1	[redacted]	[redacted]
4	11,059	1,132	10.2	105	9.3	9,271	937	10.1	13	13.9
Total	20,193	1,983	9.8	162	8.2	17,989	1,748	9.7	22	12.6

* Infants with congenital anomalies excluded.

Small cells (<5) supressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Yellow highlight indicates tiers of obstetric service with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other tiers of service combined.

Tiers of Obstetric Service in Newfoundland and Labrador were assigned based on hospital volume.

3.3.19. Northwest Territories, Nunavut, and Yukon TOS: Attempted forceps deliveries by tier of obstetric service

Attempted forceps deliveries were only performed in tier of service 2 hospitals in the Combined Territories.

Table 25. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Northwest Territories, Nunavut, and Yukon (Combined Territories), April 2013 to March 2019.

TOSO	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
1	108	0	0.0	0	0.0	96	0	0.0	0	0.0
2	7,462	32	0.4	10	31.3	6,940	31	0.4	[redacted]	[redacted]
TOTAL	7,570	32	0.4	10	31.3	7,036	31	0.4	[redacted]	[redacted]

* Infants with congenital anomalies excluded.

Small cells (<5) suppressed.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

3.3.20. Northwest Territories, Nunavut, and Yukon TOS: Attempted vacuum deliveries by tier of obstetric service

Attempted vacuum delivery in the Combined Territories were only performed in tier 2 hospitals.

Table 26. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma by tier of obstetric service (TOS), Northwest Territories, Nunavut, and Yukon (Combined Territories), April 2013 to March 2019.

TOS	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate/100	No.	Rate/100		No.	Rate/100	No.	Rate/1,000
1	108	0	0.0	0	0.0	96	0	0.0	0	0.0
2	7,462	438	5.9	44	10.0	6,940	410	5.9	5	12.2
TOTAL	7,570	438	5.8	44	10.0	7,036	410	5.8	5	12.2

* Infants with congenital anomalies excluded.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

3.4. Hospitals: Maternal and neonatal trauma rates following attempted forceps, and attempted vacuum delivery, and rates of failed forceps and failed vacuum delivery

The Tables below show hospital-specific rates of

a) maternal and neonatal trauma following attempted forceps delivery and a within-tier comparison of hospitals in each province/territories
b) maternal and neonatal trauma following attempted forceps delivery and a comparison between each hospital's rate vs the reference rate of trauma
c) failed forceps delivery.
d) maternal and neonatal trauma following attempted vacuum delivery and a within-tier comparison of hospitals in each province/territories
e) maternal and neonatal trauma following attempted vacuum delivery and a comparison between each hospital's rate vs the reference rate of trauma
f) failed vacuum delivery.

As mentioned in the Methods section, the comparison of maternal trauma and neonatal trauma rates following attempted forceps delivery and attempted vacuum delivery involved

i) Within-tier comparisons: Each hospital's maternal trauma and neonatal trauma rate was compared with the same rate in all other hospitals within the same tier of service (in the same province/territories). Outlier hospitals i.e., those with significantly higher rates of maternal or neonatal trauma, are identified with yellow highlight. The frequency of each component of composite maternal trauma and composite neonatal trauma in outlier hospitals is provided in the footnotes, and outlier hospitals whose neonatal trauma outcome included neonatal deaths are identified with orange font.
ii) Hospital vs reference: Comparisons were made between each hospital's stabilized and adjusted maternal trauma and neonatal trauma rate vs the reference rates for Canada excluding Quebec (viz., 25.3 per 100 deliveries for maternal trauma and 9.6 per 1,000 live births for neonatal trauma following attempted forceps delivery, and 13.2 per 100 deliveries for maternal trauma and 9.6 per 1,000 live births for neonatal trauma following attempted vacuum delivery). Outlier hospitals i.e., those whose stabilized and adjusted rate exceeded the reference rate for Canada excluding Quebec by 10% and whose 95% confidence bounds did not include the reference rate, are identified with orange highlight.

Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder. Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

284 obstetric hospitals, and 102 non-obstetric hospitals that conducted at least one delivery, were included in this analysis.

3.4.1. British Columbia hospitals: Trauma rates following attempted forceps delivery

Tables 27 to 33 below list the numbers and rates of attempted forceps delivery and associated rates of maternal trauma and neonatal trauma in hospitals by tier of obstetric service in British Columbia.

3.4.1.1. British Columbia hospitals: Within-tier hospital-specific trauma rates following attempted forceps delivery

Table 27. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 0 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Boundary Hospital	7	0	0.0	0	0.0	7	0	0.0	0	0.0
Chetwynd Hospital Health Centre	5	0	0.0	0	0.0	5	0	0.0	0	0.0
Delta Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Dr. Helmcken Mem Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Eagle Ridge Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Fraser Canyon Hospital	7	0	0.0	0	0.0	7	0	0.0	0	0.0
Lakes District Hospital and HC	9	0	0.0	0	0.0	9	0	0.0	0	0.0
Mackenzie District Hospital HC	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
McBride and District Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Mission Memorial Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Nicola Valley Health Centre	10	0	0.0	0	0.0	10	0	0.0	0	0.0
Northern Haida Gwaii Hosp HC	6	0	0.0	0	0.0	6	0	0.0	0	0.0
Port Hardy Hospital	9	0	0.0	0	0.0	9	0	0.0	0	0.0
Royal Jubilee Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Saanich Peninsula Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
South Okanagan Gen Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Tofino General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
TOTAL	72	0	0.0	0	0.0	72	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 28. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Haida Gwaii Hospital Hlth Centre	67	0	0.0	0	0.0	64	0	0.0	0	0.0
Invermere And District Hospital	128	0	0.0	0	0.0	126	0	0.0	0	0.0
Lady Minto Gulf Islands Hospital	99	0	0.0	0	0.0	98	0	0.0	0	0.0
Total	294	0	0.0	0	0.0	288	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 29. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1.5 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
100 Mile District Gen Hospital	79	0	0.0	0	0.0	78	0	0.0	0	0.0
Bulkley Valley District Hospital	1135	0	0.0	0	0.0	1101	0	0.0	0	0.0
Campbell River and District GH	907	37	4.1	7	18.9	817	35	4.3	0	0.0
Cariboo Memorial Hospital	1420	30	2.1	9	30.0	1333	29	2.2	[redacted]	[redacted]
Chilliwack General Hospital	3557	28	0.8	6	21.4	3333	27	0.8	0	0.0
Cowichan District Hospital	2327	17	0.7	9	52.9	2208	14	0.6	0	0.0
Creston Valley Hospital	277	0	0.0	0	0.0	270	0	0.0	0	0.0
Dawson Creek District Hospital	1745	0	0.0	0	0.0	1679	0	0.0	0	0.0
East Kootenay Regional Hospital	1934	5	0.3	[redacted]	[redacted]	1872	5	0.3	0	0.0
Elk Valley Hospital	548	0	0.0	0	0.0	527	0	0.0	0	0.0
Fort Nelson General Hospital	12	0	0.0	0	0.0	12	0	0.0	0	0.0
Fort St. John Hospital H Centre	2992	67	2.2	[redacted]	[redacted]	2922	65	2.2	0	0.0
G. R. Baker Memorial Hospital	807	[redacted]	[redacted]	0	0.0	775	[redacted]	[redacted]	0	0.0
Golden And District Gen Hospital	263	0	0.0	0	0.0	247	0	0.0	0	0.0
Kitimat Hospital Health Centre	295	0	0.0	0	0.0	293	0	0.0	0	0.0
Kootenay Boundary Reg Hospital	1002	7	0.7	[redacted]	[redacted]	950	7	0.7	0	0.0
Kootenay Lake Hospital	1387	76	5.5	29	38.2	1316	69	5.2	[redacted]	[redacted]
Langley Memorial Hospital	6917	121	1.7	49	40.5	6484	118	1.8	[redacted]	[redacted]
Lillooet Hospital Health Centre	66	0	0.0	0	0.0	66	0	0.0	0	0.0
Mills Memorial Hospital	1437	5	0.3	0	0.0	1406	5	0.4	0	0.0
Peace Arch Hospital	4841	243	5.0	41	16.9	4615	233	5.0	[redacted]	[redacted]
Penticton Regional Hospital	2456	84	3.4	23	27.4	2286	75	3.3	[redacted]	[redacted]
Port McNeill District Hospital	19	0	0.0	0	0.0	19	0	0.0	0	0.0
Powell River General Hospital	524	20	3.8	5	25.0	490	17	3.5	0	0.0

Table 29 (cont). Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1.5 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Prince Rupert Regional Hospital	849	[redacted]	[redacted]	0	0.0	827	[redacted]	[redacted]	0	0.0
Queen Victoria Hospital	401	[redacted]	[redacted]	0	0.0	381	[redacted]	[redacted]	0	0.0
Ridge Meadows Hospital HCC	3556	79	2.2	17	21.5	3410	73	2.1	0	0.0
Shuswap Lake General Hospital	908	6	0.7	5	83.3	881	6	0.7	0	0.0
Squamish General Hospital	1388	40	2.9	8	20.0	1313	38	2.9	0	0.0
St Joseph's Gen Hospital [Comox]	1210	7	0.6	[redacted]	[redacted]	1138	7	0.6	0	0.0
St. John Hospital	704	0	0.0	0	0.0	678	0	0.0	0	0.0
St. Mary's Hospital [Sechelt]	786	[redacted]	[redacted]	0	0.0	706	[redacted]	[redacted]	0	0.0
Stuart Lake Hospital	24	0	0.0	0	0.0	24	0	0.0	0	0.0
The North Isl H Campbell River DC	900	63	7.0	10	15.9	806	53	6.6	0	0.0
The North Island H Comox Valle C	1145	5	0.4	[redacted]	[redacted]	1115	5	0.4	0	0.0
Vernon Jubilee Hospital	3697	124	3.4	30	24.2	3508	114	3.2	[redacted]	[redacted]
West Coast General Hospital	1050	104	9.9	31	29.8	999	100	10.0	0	0.0
Wrinch Memorial Hospital	83	0	0.0	0	0.0	82	0	0.0	0	0.0
Total	53648	1174	2.2	285	24.3	50967	1100	2.2	7	6.4

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals within the same tier of service (in each province/territories).

COWICHAN DISTRICT HOSPITAL: 3rd or 4th degree perineal lacerations 7; Cervical tears or high vaginal lacerations [redacted]; Other pelvic trauma [redacted].

KOOTENAY LAKE HOSPITAL: 3rd or 4th degree perineal lacerations 20; Cervical tears or high vaginal lacerations 10.

LANGLEY MEMORIAL HOSPITAL: 3rd or 4th degree perineal lacerations 42; Cervical tears or high vaginal lacerations 9; Other pelvic trauma [redacted].

SHUSWAP LAKE GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations [redacted]; Cervical tears or high vaginal lacerations [redacted]; Other pelvic trauma [redacted]; repair of the urethra or bladder [redacted].

Table 30. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Abbotsford Regional Hospital	11140	73	0.7	25	34.2	10387	68	0.7	0	0.0
Burnaby Hospital	6655	135	2.0	26	19.3	6434	130	2.0	0	0.0
Lions Gate Hospital	6253	226	3.6	68	30.1	5998	212	3.5	[redacted]	[redacted]
Nanaimo Reg Gen Hospital	5614	381	6.8	94	24.7	5320	362	6.8	[redacted]	[redacted]
St. Paul's Mt Saint Joseph Hosp	7063	595	8.4	142	23.8	6861	579	11.9	[redacted]	[redacted]
The Richmond Hospital	9860	343	3.5	107	31.2	9608	336	3.5	0	0.0
Total	46585	1753	3.8	462	26.4	44608	1687	3.8	7	4.1

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals within the same tier of service (in each province/territories).

THE RICHMOND HOSPITAL: 3rd or 4th degree perineal lacerations 85; Cervical or high vaginal laceration 21; Other pelvic trauma [redacted]; repair of the urethra or bladder [redacted].

LIONS GATE HOSPITAL: Injury to the central or peripheral nervous system [redacted]; Injury to the long bones [redacted].

Table 31. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2.5 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Kelowna General Hospital	7157	177	2.5	51	28.8	6815	168	2.5	[redacted]	[redacted]
Royal Inland Hospital	5357	228	4.3	75	32.9	5003	209	4.2	[redacted]	[redacted]
University Hospital of NBC	4954	72	1.5	33	45.8	4686	69	1.5	[redacted]	[redacted]
Total	17468	477	2.7	159	33.3	16504	446	2.7	6	13.5

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals within the same tier of service (in each province/territories).

UNIVERSITY HOSPITAL OF NORTHERN BRITISH COLUMBIA: 3rd or 4th degree perineal lacerations 31; Cervical or high vaginal laceration [redacted]; Other pelvic trauma [redacted].

Table 32. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Royal Columbian Hospital	12548	1005	8.0	182	18.1	11767	912	7.8	7	7.7
Surrey Memorial Hospital	18551	903	4.9	204	22.6	16735	812	4.9	[redacted]	[redacted]
Victoria General Hospital	13629	226	1.7	63	27.9	12518	211	2.0	[redacted]	[redacted]
Total	44728	2134	4.8	449	21.0	41020	1935	4.7	13	6.7

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals within the same tier of service (in each province/territories).
VICTORIA GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations 33; Cervical or high vaginal laceration 25; Other pelvic trauma 13.

Table 33. Numbers and rates of attempted forceps deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 4 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
BC Women's Hospital + HC	31003	2441	7.9	636	26.1	29036	2310	8.0	25	10.8
Total	31003	2441	7.9	636	26.1	29036	2310	8.0	25	10.8

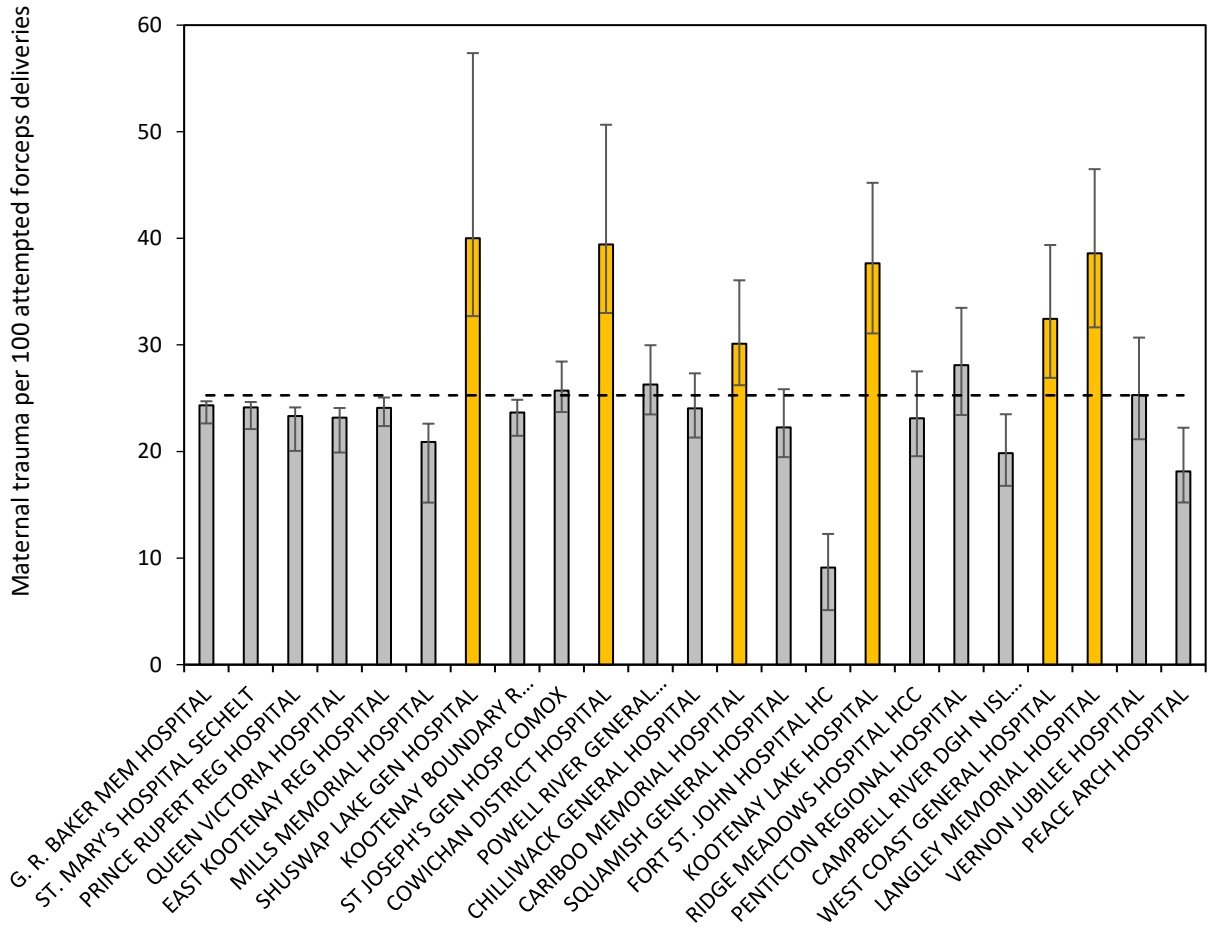
*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the province.
BC WOMEN'S HOSPITAL + HC: Injury to the central nervous system [redacted]; Injury to the peripheral nervous system 17; Seizures 5; Neonatal deaths [redacted].

3.4.1.2. British Columbia hospital rates vs the reference rate: Trauma rates following attempted forceps delivery

Figures 6 and 7 below show stabilized and adjusted rates of maternal trauma following attempted forceps delivery in each hospital in British Columbia (compared with the reference rate in Canada excluding Quebec of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

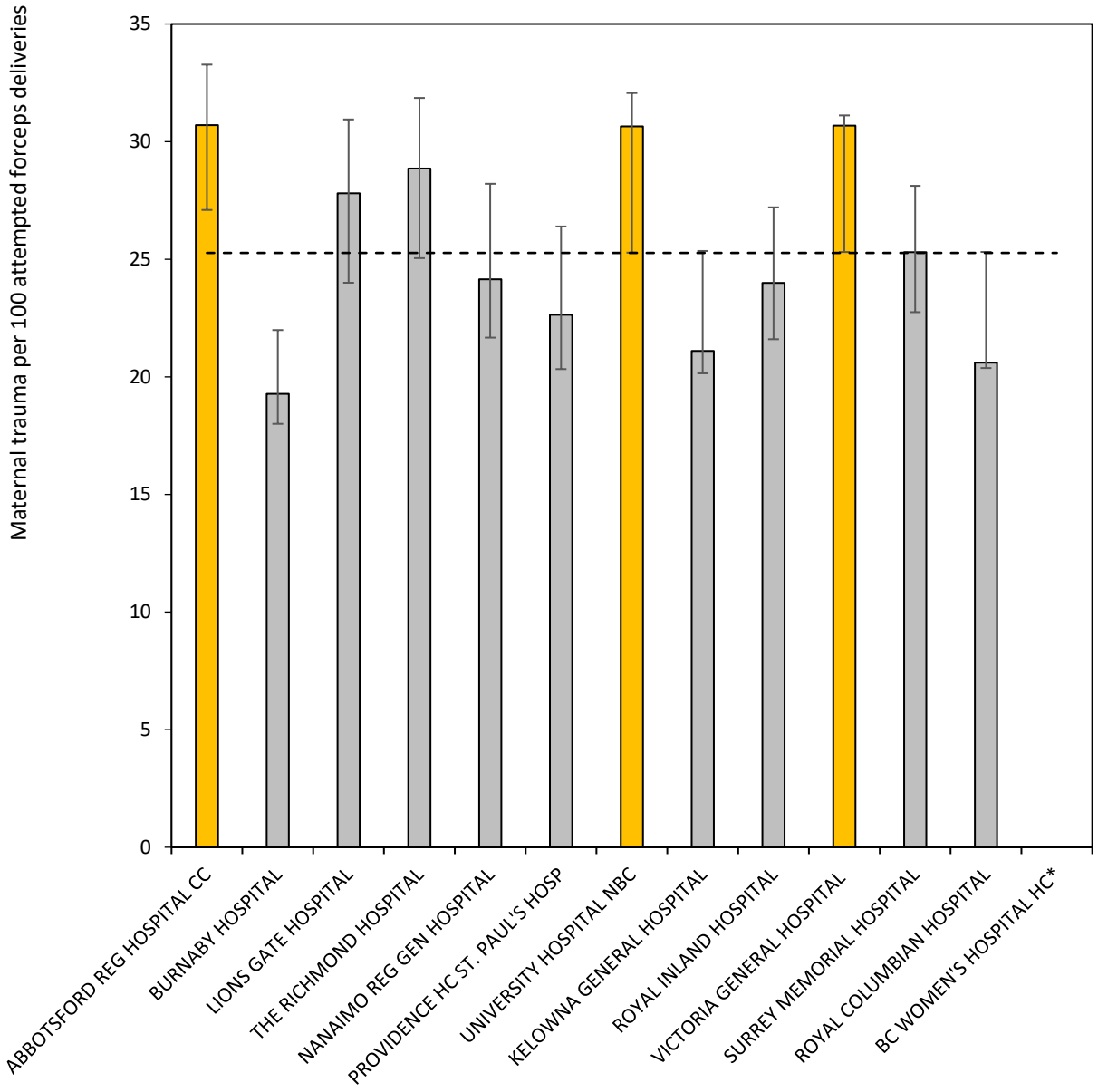
Figures 8 and 9 below show stabilized rates of neonatal trauma following attempted forceps birth in each hospital in British Columbia (compared with the reference rate Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 6. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 1.5 hospitals, British Columbia, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

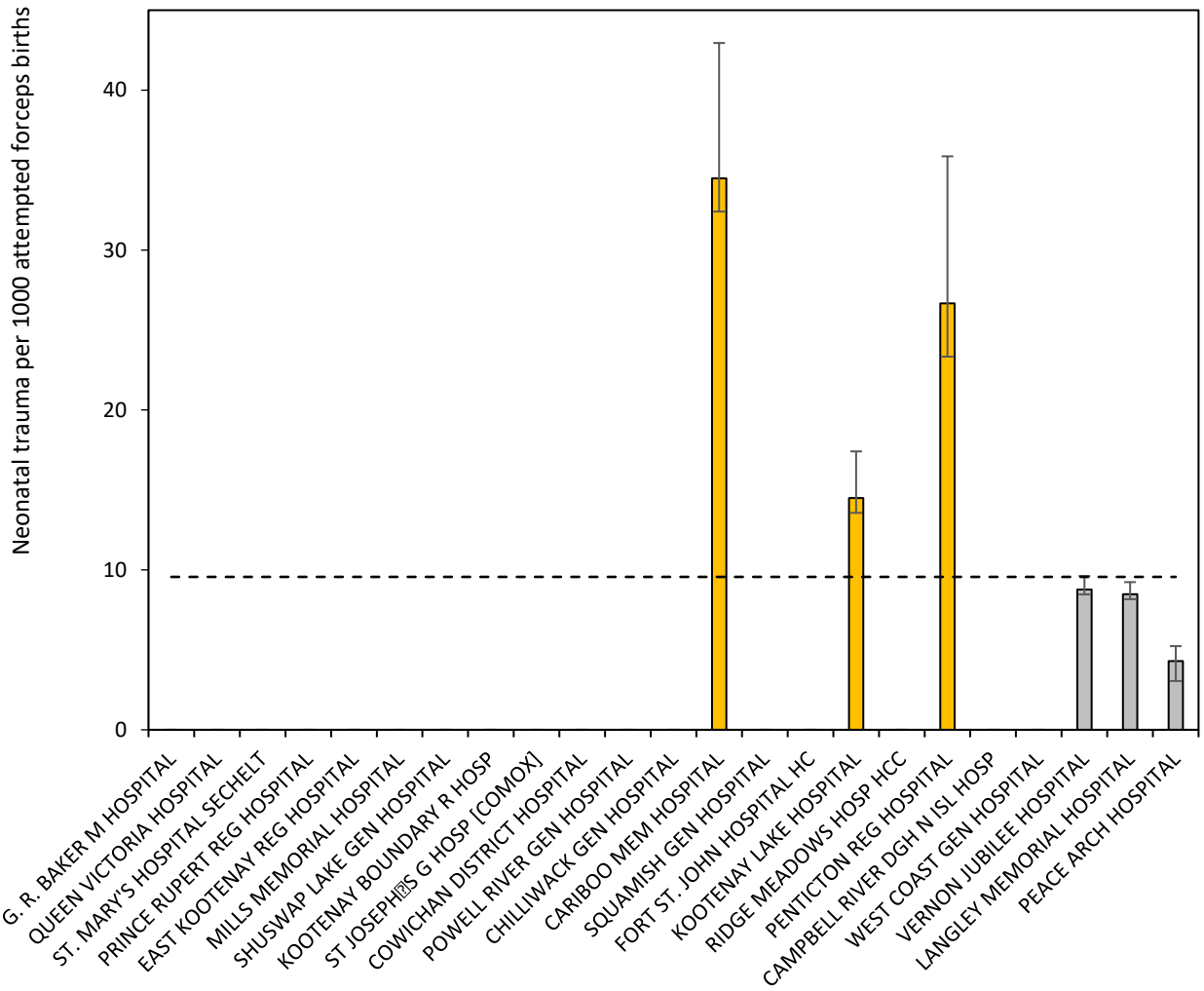
Figure 7. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2, 2b, 3 and 4 hospitals, British Columbia, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.

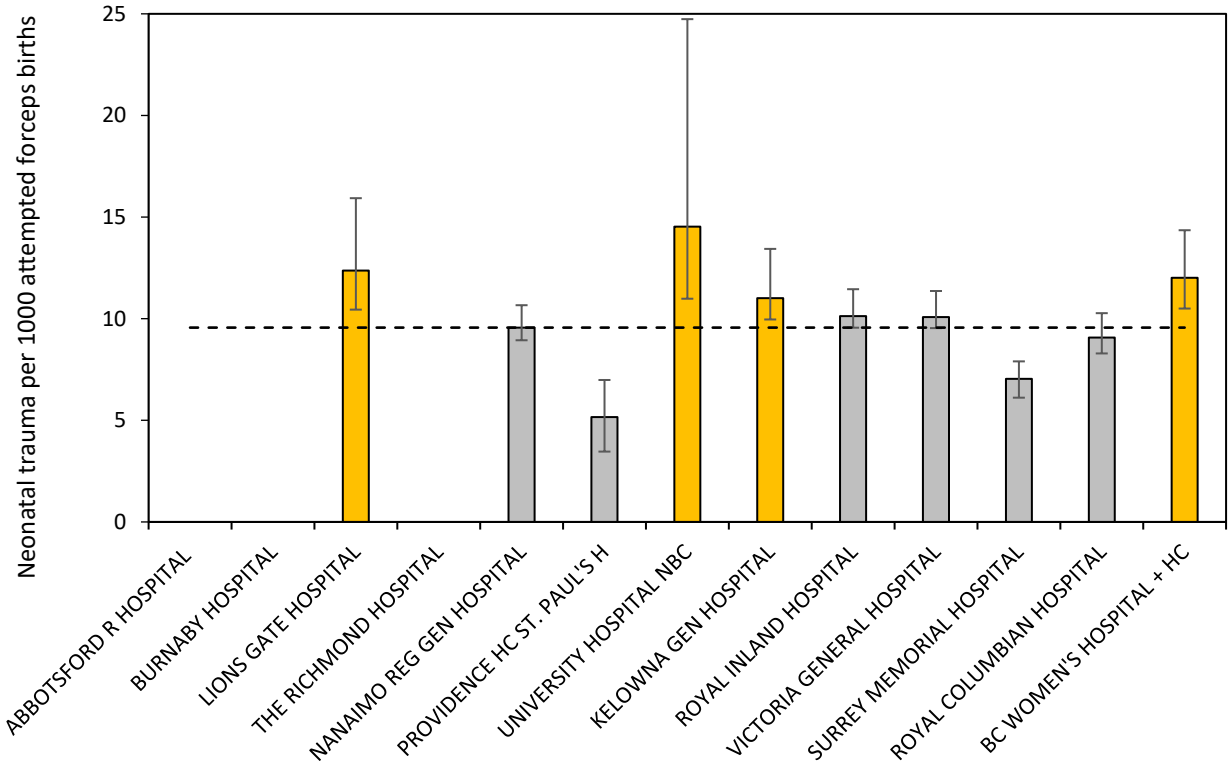
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 8. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 1.5 hospitals, British Columbia, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 9. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 2, 2b, 3 and 4 hospitals, British Columbia, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.1.3. British Columbia hospitals: Failed forceps deliveries

Table 34 lists the rates of attempted and failed forceps delivery (forceps application followed by cesarean delivery) by hospital in British Columbia.

Table 34. Attempted forceps deliveries (per 100 term, singleton deliveries) and failed forceps followed by cesarean delivery (per 100 attempted forceps deliveries), British Columbia, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Singleton deliveries	Attempted forceps deliveries		Forceps followed by cesarean*	
			No.	Rate	No.	Rate
1.5	Kootenay Lake Hospital	1,387	76	5.5	7	9.2
1.5	Peace Arch Hospital	4,841	243	5.0	23	9.5
1.5	Penticton Regional Hospital	2,456	84	3.4	14	16.7
1.5	Ridge Meadows Hospital HCC	3,556	79	2.2	13	16.5
1.5	Vernon Jubilee Hospital	3,697	124	3.4	11	8.9
1.5	Total	41,659	953	2.3	87	9.1
2	Abbotsford Reg Hosp Can Ctre	11,140	73	0.7	10	13.7
2	Burnaby Hospital	6,655	135	2.0	5	3.7
2	Lions Gate Hospital	6,253	226	3.6	11	4.9
2	Nanaimo Reg General Hospital	5,614	381	6.8	11	2.9
2	St. Paul's Mount St Joseph Hosp	7,063	595	8.4	11	1.8
2	The Richmond Hospital	9,860	343	3.5	13	3.8
2	Total	46,585	1,753	3.8	61	3.5
2.5	Kelowna General Hospital	7,157	177	2.5	8	4.5
2.5	Royal Inland Hospital	5,357	228	4.3	19	8.3
2.5	Total	17,468	477	2.7	31	6.5
3	Royal Columbian Hospital	12,548	1,005	8.0	53	5.3
3	Surrey Memorial Hospital	18,551	903	4.9	67	7.4
3	Victoria General Hospital	13,629	226	1.7	22	9.7
3	Total	44,728	2,134	4.8	142	6.7
4	Women's Hospital + HC BC	31,003	2,441	7.9	102	4.2
4	Total	31,003	2,441	7.9	102	4.2
All tiers/hospitals, BC		193,798	7,979	4.1	432	5.4

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries.

3.4.1.4. British Columbia hospitals: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 35 to 41 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in British Columbia.

Table 35. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 0 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Boundary Hospital	7	0	0.0	0	0.0	7	0	0.0	0	0.0
Chetwynd Hospital Health Centre	5	0	0.0	0	0.0	5	0	0.0	0	0.0
Delta Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Dr. Helmcken Memorial Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Eagle Ridge Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Fraser Canyon Hospital	7	0	0.0	0	0.0	7	0	0.0	0	0.0
Lakes District Hospital and HC	9	0	0.0	0	0.0	9	0	0.0	0	0.0
Mackenzie District Hospital HC	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Mcbride and District Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Mission Memorial Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Nicola Valley Health Centre	10	0	0.0	0	0.0	10	0	0.0	0	0.0
Northern Haida Gwaii Hosp HC	6	0	0.0	0	0.0	6	0	0.0	0	0.0
Port Hardy Hospital	9	0	0.0	0	0.0	9	0	0.0	0	0.0
Royal Jubilee Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Saanich Peninsula Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
South Okanagan Gen Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Tofino General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Total	72	0	0.0	0	0.0	72	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 36. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 1 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Haida Gwaii Hospital Hlth Centre	67	[redacted]	[redacted]	0	0.0	64	[redacted]	[redacted]	0	0.0
Invermere And District Hospital	128	[redacted]	[redacted]	0	0.0	126	[redacted]	[redacted]	0	0.0
Lady Minto Gulf Islands Hospital	99	[redacted]	[redacted]	0	0.0	98	[redacted]	[redacted]	0	0.0
Total	294	7	2.4	0	0.0	288	7	2.4	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 37. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 1.5 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
100 Mile District Gen Hospital	79	7	8.9	0	0.0	78	7	9.0	0	0.0
Bulkley Valley District Hospital	1,135	118	10.4	14	11.9	1,101	114	10.4	0	0.0
Campbell River and District GH	907	83	9.2	12	14.5	817	74	9.1	[redacted]	[redacted]
Cariboo Memorial Hospital	1,420	131	9.2	14	10.7	1,333	125	9.4	[redacted]	[redacted]
Chilliwack General Hospital	3,557	126	3.5	13	10.3	3,333	121	3.6	0	0.0
Cowichan District Hospital	2,327	149	6.4	41	27.5	2,208	140	6.3	[redacted]	[redacted]
Creston Valley Hospital	277	20	7.2	[redacted]	[redacted]	270	19	7.0	0	0.0
Dawson Creek District Hospital	1,745	152	8.7	15	9.9	1,679	148	8.8	[redacted]	[redacted]
East Kootenay Regional Hospital	1,934	100	5.2	9	9.0	1,872	97	5.2	[redacted]	[redacted]
Elk Valley Hospital	548	53	9.7	7	13.2	527	51	9.7	0	0.0
Fort Nelson General Hospital	12	0	0.0	0	0.0	12	0	0.0	0	0.0
Fort St. John Hospital H Centre	2,992	235	7.9	12	5.1	2,922	227	7.8	[redacted]	[redacted]
G. R. Baker Memorial Hospital	807	81	10.0	9	11.1	775	77	9.9	0	0.0
Golden and District Gen Hospital	263	26	9.9	[redacted]	[redacted]	247	25	10.1	0	0.0
Kitimat Hospital Health Centre	295	10	3.4	[redacted]	[redacted]	293	10	3.4	0	0.0
Kootenay Boundary Reg Hospital	1,002	34	3.4	[redacted]	[redacted]	950	32	3.4	0	0.0
Kootenay Lake Hospital	1,387	69	5.0	7	10.1	1,316	67	5.1	0	0.0
Langley Memorial Hospital	6,917	584	8.4	103	17.6	6,484	554	8.5	[redacted]	[redacted]
Lillooet Hospital Health Centre	66	[redacted]	[redacted]	0	0.0	66	[redacted]	[redacted]	0	0.0
Mills Memorial Hospital	1,437	83	5.8	13	15.7	1,406	81	5.8	[redacted]	[redacted]
Peace Arch Hospital	4,841	351	7.3	26	7.4	4,615	336	7.3	0	0.0
Penticton Regional Hospital	2,456	300	12.2	31	10.3	2,286	280	12.2	[redacted]	[redacted]
Port McNeill District Hospital	19	0	0.0	0	0.0	19	0	0.0	0	0.0
Powell River General Hospital	524	36	6.9	10	27.8	490	32	6.5	0	0.0
Prince Rupert Regional Hospital	849	66	7.8	[redacted]	[redacted]	827	63	7.6	0	0.0
Queen Victoria Hospital	401	61	15.2	14	23.0	381	60	15.7	[redacted]	[redacted]

Table 37 (cont). Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 1.5 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Ridge Meadows Hospital And Hcc	3,556	349	9.8	18	5.2	3,410	339	9.9	[redacted]	[redacted]
Shuswap Lake General Hospital	908	40	4.4	6	15.0	881	36	4.1	0	0.0
Squamish General Hospital	1,388	150	10.8	17	11.3	1,313	137	10.4	[redacted]	[redacted]
St Joseph's General Hosp [Comox]	1,210	65	5.4	14	21.5	1,138	63	5.5	0	0.0
St. John Hospital	704	30	4.3	7	23.3	678	30	4.4	0	0.0
St. Mary's Hospital [Sechelt]	786	118	15.0	14	11.9	706	104	14.7	[redacted]	[redacted]
Stuart Lake Hospital	24	0	0.0	0	0.0	24	0	0.0	0	0.0
The North Isl H Campbell River	900	36	4.0	[redacted]	[redacted]	806	30	3.7	[redacted]	[redacted]
The North Isl H Comox Valley C	1,145	63	5.5	10	15.9	1,115	62	5.6	0	0.0
Vernon Jubilee Hospital	3,697	139	3.8	21	15.1	3,508	134	3.8	0	0.0
West Coast General Hospital	1,050	113	10.8	14	12.4	999	106	10.6	0	0.0
Wrinch Memorial Hospital	83	5	6.0	0	0.0	82	5	6.1	0	0.0
TOTAL	53,648	3,984	7.4	489	12.3	50,967	3,787	7.4	26	6.9

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants. Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

COWICHAN DISTRICT HOSPITAL: 3rd or 4th degree perineal lacerations 27; Cervical tears or high vaginal lacerations 11; Other pelvic trauma [redacted].

LANGLEY MEMORIAL HOSPITAL: 3rd or 4th degree perineal lacerations 93; Cervical tears or high vaginal lacerations 10; Other pelvic trauma [redacted].

POWELL RIVER GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations [redacted]; Cervical tears/high vaginal lacerations [redacted]; Other pelvic trauma [redacted].

QUEEN VICTORIA HOSPITAL: 3rd or 4th degree perineal lacerations 11; Cervical tears or high vaginal lacerations [redacted]; Other pelvic trauma [redacted].

ST JOSEPH'S GENERAL HOSP [COMOX]: 3rd or 4th degree perineal lacerations 14.

EAST KOOTENAY REGIONAL HOSPITAL: Injury to the long bones [redacted]; Seizures [redacted].

MILLS MEMORIAL HOSPITAL: Injury to the central or peripheral nervous system [redacted]; Seizures [redacted].

Table 38. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 2 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Abbotsford Regional Hospital	11,140	1,323	11.9	180	13.6	10,387	1236	11.9	19	15.4
Burnaby Hospital	6,655	534	8.0	52	9.7	6,434	514	8.0	[redacted]	[redacted]
Lions Gate Hospital	6,253	405	6.5	58	14.3	5,998	383	6.4	[redacted]	[redacted]
Nanaimo Reg Gen Hospital	5,614	270	4.8	33	12.2	5,320	259	4.9	[redacted]	[redacted]
St. Paul's Mount St Joseph Hosp	7,063	344	4.9	39	11.3	6,861	336	4.9	[redacted]	[redacted]
The Richmond Hospital	9,860	939	9.5	115	12.2	9,608	918	9.6	0	0.0
Total	46,585	3,815	8.2	477	12.5	44,608	3,646	8.2	25	6.9

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants. Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

ABBOTSFORD REGIONAL HOSPITAL: 3rd or 4th degree perineal lacerations 157; Cervical tears or high vaginal lacerations 18; Other pelvic trauma 8.

ABBOTSFORD REGIONAL HOSPITAL: Injury to the central nervous system 13; Injury to the peripheral nervous system [redacted]; Injury to long bones [redacted]; Seizures [redacted].

Table 39. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 2.5 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Kelowna General Hospital	7,157	513	7.2	57	11.1	6,815	489	7.2	[redacted]	[redacted]
Royal Inland Hospital	5,357	310	5.8	36	11.6	5,003	284	5.7	[redacted]	10.6
University Hospital of NBC	4,954	257	5.2	40	15.6	4,686	248	5.3	0	0.0
Total	17,468	1,080	6.2	133	12.3	16,504	1021	6.2	5	4.9

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 40. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 3 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Royal Columbian Hospital	12,548	748	6.0	57	7.6	11767	697	5.9	[redacted]	[redacted]
Surrey Memorial Hospital	18,551	1228	6.6	127	10.3	16735	1106	6.6		
Victoria General Hospital	13,629	996	7.3	127	12.8	12518	902	7.2	10	11.1
Total	44,728	2972	6.6	311	10.5	41020	2705	6.6	22	8.1

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

VICTORIA GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations 98; Cervical tears/high vaginal lacerations 14; Other pelvic trauma 17.

Table 41. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 4 hospitals, British Columbia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
BC Women's Hospital + HC	31,003	2,009	6.5	217	10.8	29,036	1,901	6.5	6	3.2
Total	31,003	2,009	6.5	217	10.8	29,036	1,901	6.5	6	3.2

* Infants with congenital anomalies excluded.

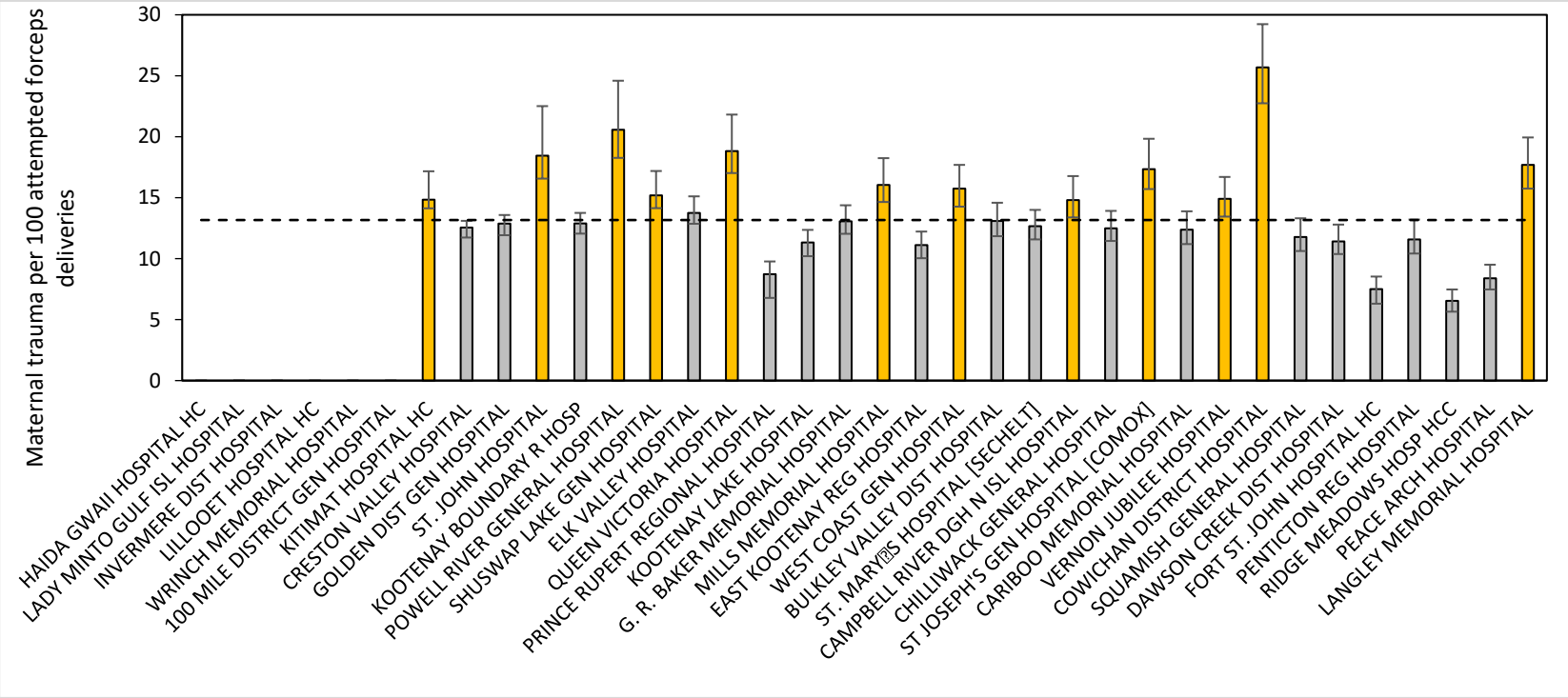
Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

3.4.1.5. British Columbia hospitals rates vs the reference rate: Trauma rates following attempted vacuum delivery

Figures 10 and 11 below show stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in British Columbia (compared with the reference rate of 13.2 per 100 deliveries in Canada excluding Quebec). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

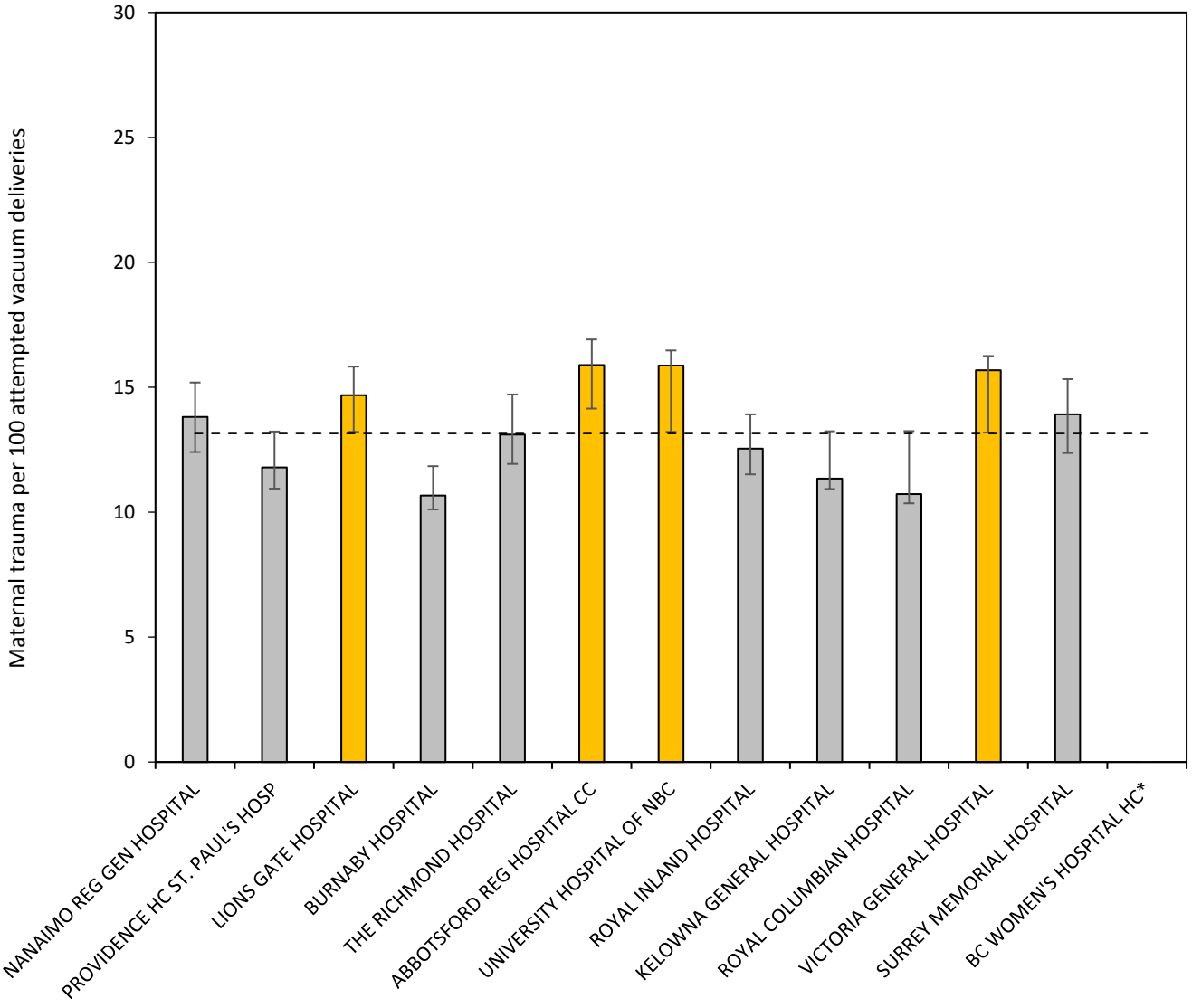
Figures 12 and 13 below show stabilized and adjusted rates of neonatal trauma following attempted vacuum delivery in each hospital in British Columbia (compared with the reference rate of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 10. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 1.5 hospitals, British Columbia, April 2013 to March 2019.



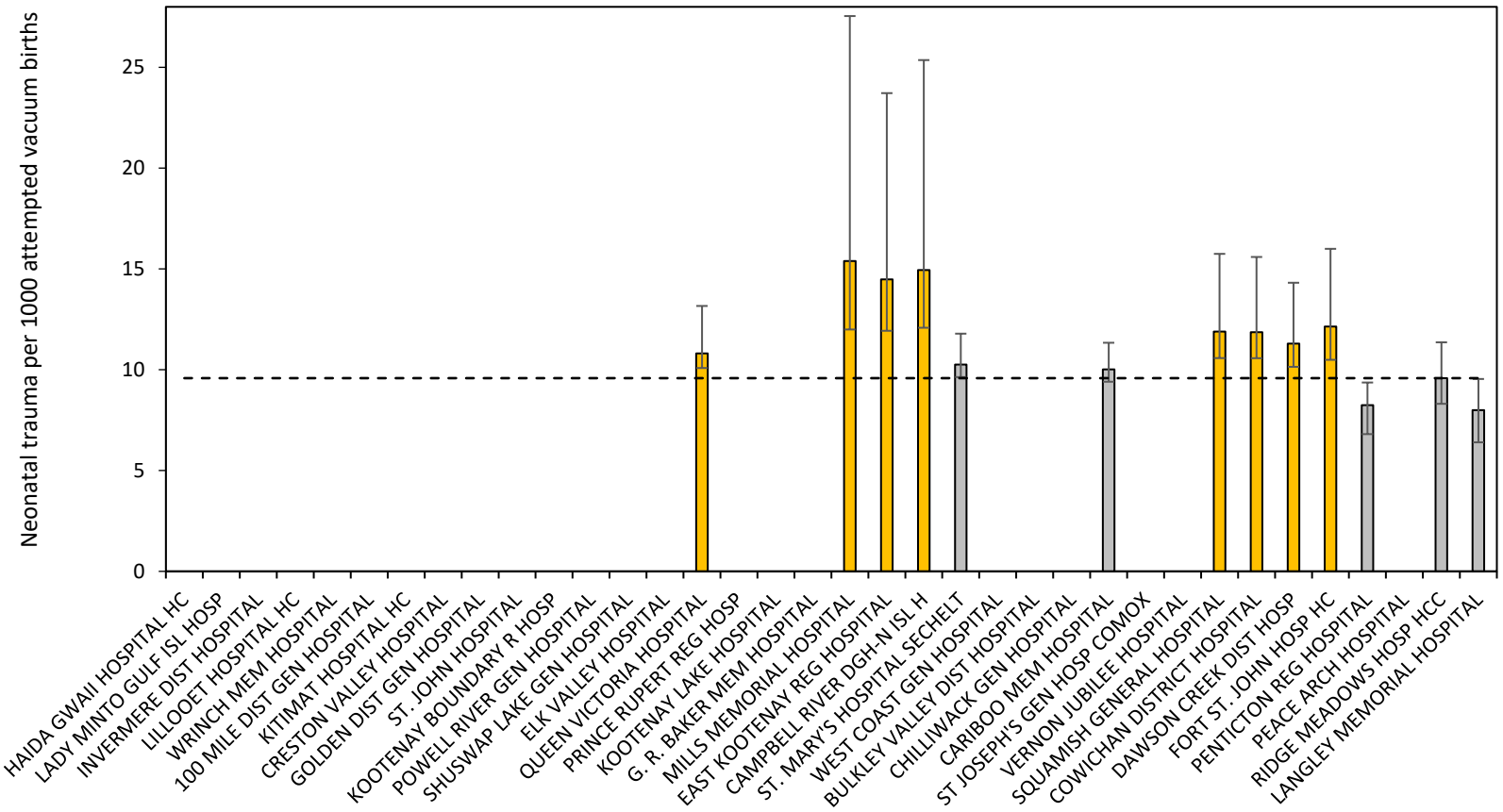
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 11. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 2a, 2b, 3 and 4 hospitals, British Columbia, April 2013 to March 2019.



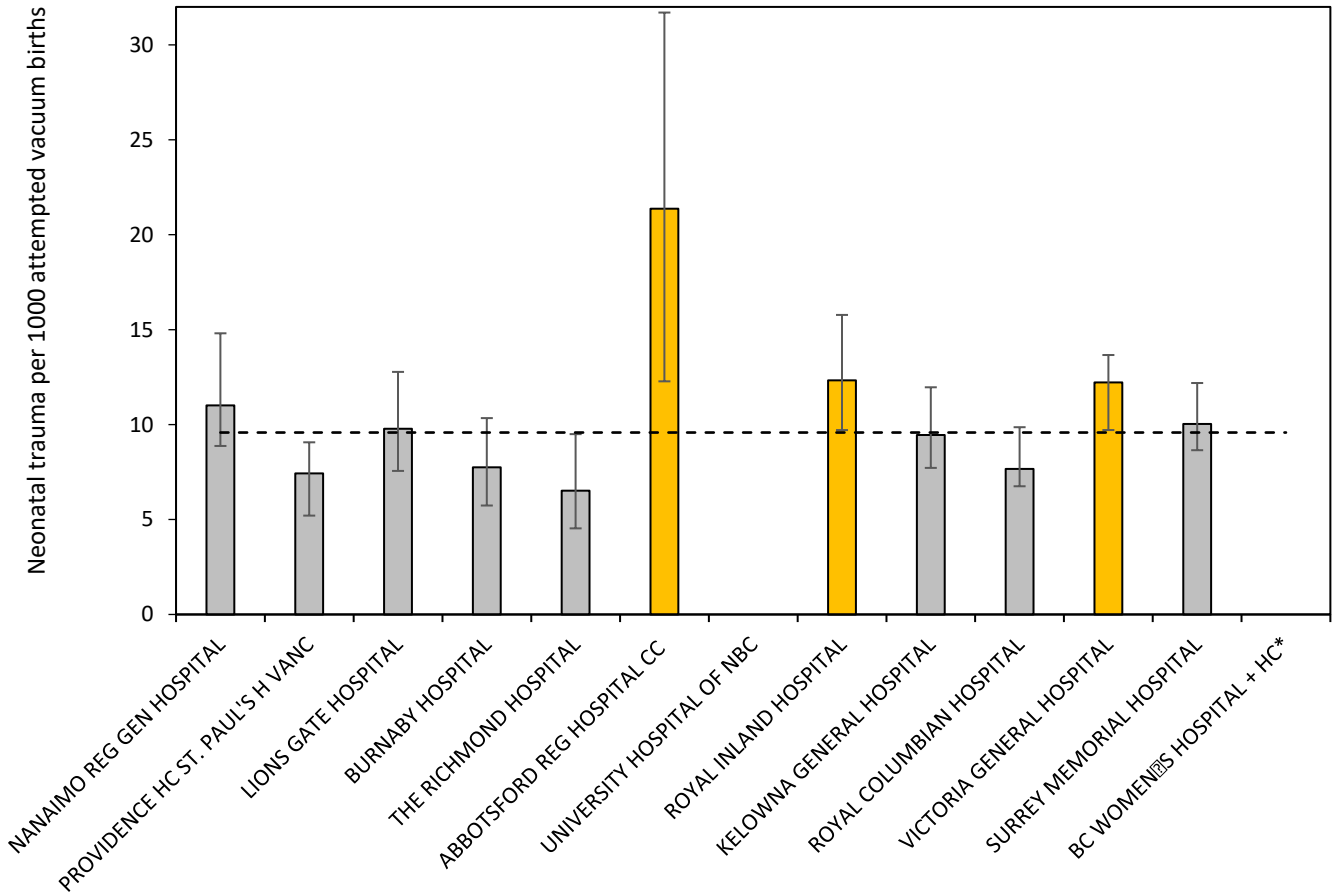
* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 12. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 1.5 hospitals, British Columbia, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 13. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 2a, 2b, 3 and 4 hospitals, British Columbia, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.1.6. British Columbia hospitals: Failed vacuum deliveries by hospital

Hospital-specific rates of attempted vacuum and the 3 types of failed vacuum delivery in British Columbia are listed below.

Table 42. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries (per 100 attempted vacuum deliveries), British Columbia, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; total includes all hospitals).

Tier	Hospital Name	Singleton deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery		Vacuum followed by cesarean delivery		Sequential instruments followed by cesarean	
			No.	Rate*	No.	Rate*	No.	Rate*	No.	Rate*
1.5	Bulkley Valley District Hospital	1,135	118	10.4	0	0.0	16	13.6	0	0.0
1.5	Campbell River Dist Gen Hosp	907	83	9.2	0	0.0	8	9.6		
1.5	Cariboo Memorial Hospital	1,420	131	9.2			7	5.3		
1.5	Cowichan District Hospital	2,327	149	6.4	9	6.0	8	5.4	0	0.0
1.5	Dawson Creek District Hospital	1,745	152	8.7			7	4.6	0	0.0
1.5	East Kootenay Regional	1,934	100	5.2			7	7.0		
1.5	Elk Valley Hospital	548	53	9.7			7	13.2	0	0.0
1.5	Fort St. John Hospital Hlth Ctre	2,992	235	7.9	27	11.5				
1.5	Kootenay Lake Hospital	1,387	69	5.0	11	15.9				
1.5	Langley Memorial Hospital	6,917	584	8.4	26	4.5	8	1.4		
1.5	Peace Arch Hospital	4,841	351	7.3	7	2.0	21	6.0		
1.5	Penticton Regional Hospital	2,456	300	12.2	15	5.0	8	2.7		
1.5	Powell River General Hospital	524	36	6.9	10	27.8			0	0.0
1.5	Prince Rupert Regional Hospital	849	66	7.8			6	9.1	0	0.0
1.5	Queen Victoria Hospital	401	61	15.2			10	16.4	0	0.0
1.5	Ridge Meadows Hospital HCC	3,556	349	9.8	16	4.6	23	6.6		
1.5	Squamish General Hospital	1,388	150	10.8	8	5.3	5	3.3	0	0.0
1.5	St. John Hospital	704	30	4.3	0	0.0	6	20.0	0	0.0
1.5	St. Mary’s Hospital [Sechelt]	786	118	15.0	11	9.3			0	0.0
1.5	The North Isl Hosp Comox VC	1,145	63	5.5			9	14.3		

Table 42 (cont.). Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries (per 100 attempted vacuum deliveries), British Columbia, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital Name	Singleton deliveries	Attempted vacuum delivery		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
1.5	Vernon Jubilee Hospital	3,697	139	3.8	22	15.8				
1.5	Total	41,659	3,337	8.0	177	5.3	164	4.9	20	0.6
2	Abbotsford Reg Hosp Can Ctre	11,140	1,323	11.9	18	1.4	26	2.0		
2	Burnaby Hospital	6,655	534	8.0	24	4.5	5	0.9		
2	Lions Gate Hospital	6,253	405	6.5	36	8.9	5	1.2		
2	Nanaimo Reg General Hospital	5,614	270	4.8	20	7.4			0	0.0
2	St. Paul's Mount St Joseph	7,063	344	4.9	29	8.4				
2	The Richmond Hospital	9,860	939	9.5	7	0.7	11	1.2	0	0.0
2	Total	46,585	3,815	8.2	134	3.5	51	1.3	5	0.1
2.5	Kelowna General Hospital	7,157	513	7.2	20	3.9				
2.5	Royal Inland Hospital	5,357	310	5.8	18	5.8			0	0.0
2.5	University Hospital NBC	4,954	257	5.2	6	2.3	6	2.3	0	0.0
2.5	Total	17,468	1,080	6.2	44	4.1	12	1.1		
3	Royal Columbian Hospital	12,548	748	6	32	4.3				
3	Surrey Memorial Hospital	18,551	1,228	6.6	21	1.7	30	2.4	6	0.5
3	Victoria General Hospital	13,629	996	7.3	43	4.3	23	2.3	14	1.4
3	Total	44,728	2,972	6.6	96	3.2	56	1.9	22	0.7
4	Women's Hospital + HC BC	31,003	2,009	6.5	56	2.8	11	0.5		
4	Total	31,003	2,009	6.5	56	2.8	11	0.5		
All Tiers/Hospitals, BC		193,798	13,867	7.2	521	3.8	312	2.2	53	0.4

Small cells (<5) suppressed.

*Rates of failed vacuum (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.

3.4.2.1. Alberta hospitals: Within-tier hospital-specific trauma rates following attempted forceps delivery

Tables 43 to 47 below list the numbers and rates of attempted forceps delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Alberta.

Table 43. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 0 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Bow Island Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Cardston Health Centre	57	0	0.0	0	0.0	51	0	0.0	0	0.0
Central Peace Health Complex	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Devon General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Didsbury District Health Services	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Fairview Health Complex	8	0	0.0	0	0.0	8	0	0.0	0	0.0
Grande Cache Comm H Complex	10	0	0.0	0	0.0	10	0	0.0	0	0.0
High Prairie Health Complex	23	0	0.0	0	0.0	22	0	0.0	0	0.0
Leduc Community Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Manning Community Hlth Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Redwater Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Sacred Heart Comm H Centre	6	0	0.0	0	0.0	6	0	0.0	0	0.0
Seton (Jasper) Healthcare Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Smoky Lake Healthcare Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Strathmore District H Services	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Swan Hills Healthcare Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
University of Alberta Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Wabasca/Desmarais Hcare Centre	30	0	0.0	0	0.0	29	0	0.0	0	0.0
Westview Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Total	151	[redacted]	[redacted]	[redacted]	[redacted]	143	[redacted]	[redacted]	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 44. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 1 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Athabasca Healthcare Centre	5	0	0.0	0	0.0	5	0	0.0	0	0.0
Crowsnest Pass Health Centre	123	0	0.0	0	0.0	115	0	0.0	0	0.0
Drayton Valley Hospital C Centre	38	0	0.0	0	0.0	36	0	0.0	0	0.0
Raymond Health Centre	47	0	0.0	0	0.0	46	0	0.0	0	0.0
Rimbey Hospital and Care Centre	222	0	0.0	0	0.0	219	0	0.0	0	0.0
Slave Lake Healthcare Centre	317	[redacted]	[redacted]	0	0.0	305	[redacted]	[redacted]	0	0.0
St. Theresa General Hospital	14	0	0.0	0	0.0	14	0	0.0	0	0.0
Sundre Hospital and Care Centre	133	0	0.0	0	0.0	122	0	0.0	0	0.0
Three Hills Health Centre	241	[redacted]	[redacted]	[redacted]	[redacted]	216	0	0.0	0	0.0
Valleyview Health Centre	58	0	0.0	0	0.0	52	0	0.0	0	0.0
Total	1,198	[redacted]	[redacted]	[redacted]	[redacted]	1,130	[redacted]	[redacted]	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 45. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 2 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Barrhead Healthcare Centre	844	[redacted]	[redacted]	[redacted]	[redacted]	781	[redacted]	[redacted]	0	0.0
Brooks Health Centre	1,390	[redacted]	[redacted]	0	0.0	1,308	[redacted]	[redacted]	0	0.0
Canmore General Hospital	1,654	12	0.7	[redacted]	16.7	1,523	10	0.7	0	0.0
Cold Lake Healthcare Centre	1,318	9	0.7	[redacted]	33.3	1,191	9	0.8	0	0.0
Covenant H Bonnyville HC Centre	1,390	0	0.0	0	0.0	1,269	0	0.0	0	0.0
Covenant H St. Mary's H Camrose	1,583	48	3.0	12	25.0	1,526	46	3.0	[redacted]	[redacted]
Daysland Health Centre	10	0	0.0	0	0.0	9	0	0.0	0	0.0
Drumheller Health Centre	1,013	6	0.6	6	100.0	978	[redacted]	[redacted]	0	0.0
Edson Healthcare Centre	708	0	0.0	0	0.0	694	0	0.0	0	0.0
Fort Saskatchewan Comm Hosp	906	52	5.7	[redacted]	3.8	864	49	5.7	0	0.0
High River General Hospital	2,042	36	1.8	19	52.8	1,796	32	1.8	[redacted]	[redacted]
Hinton Healthcare Centre	1,135	[redacted]	[redacted]	[redacted]	50.0	1,097	[redacted]	[redacted]	0	0.0
Lacombe Hospital Care Centre	547	0	0.0	0	0.0	525	0	0.0	0	0.0
Northwest Health Centre	2,818	0	0.0	0	0.0	2,506	0	0.0	0	0.0
Olds Hospital and Care Centre	1,331	[redacted]	[redacted]	0	0.0	1,220	[redacted]	[redacted]	0	0.0
Peace River Comm Health Centre	2,253	[redacted]	[redacted]	0	0.0	2,021	[redacted]	[redacted]	0	0.0
Pincher Creek Health Centre	498	0	0.0	0	0.0	459	0	0.0	0	0.0
Ponoka Hospital And Care Centre	594	0	0.0	0	0.0	580	0	0.0	0	0.0
Provost Health Centre	443	14	3.2	6	42.9	425	12	2.8	0	0.0
Rocky Mountain House H Centre	748	[redacted]	[redacted]	0	0.0	716	[redacted]	[redacted]	0	0.0
St. Therese-St. Paul HC Centre	967	[redacted]	[redacted]	0	0.0	943	[redacted]	[redacted]	0	0.0
Stettler Hospital Care Centre	879	[redacted]	[redacted]	[redacted]	25.0	865	[redacted]	[redacted]	0	0.0
Taber Health Centre	658	[redacted]	[redacted]	0	0.0	607	[redacted]	[redacted]	0	0.0
Vermilion Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Viking Health Centre	567	0	0.0	0	0.0	550	0	0.0	0	0.0

Table 45 (cont). Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 2 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma (forceps)		Births* (No CA)	Attempted forceps births		Neonatal trauma (forceps)	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Wainwright Health Centre	786	16	2.0	6	37.5	723	14	1.9	0	0.0
Westlock Healthcare Centre	490	24	4.9	[redacted]	[redacted]	467	24	5.1	0	0.0
Wetaskiwin Hospital Care Centre	1,872	[redacted]	[redacted]	0	0.0	1,772	[redacted]	[redacted]	[redacted]	[redacted]
Whitecourt Healthcare Centre	684	[redacted]	[redacted]	[redacted]	[redacted]	661	[redacted]	[redacted]	0	0.0
William J. Cadzow L La B HCC	666	0	0.0	0	0.0	661	0	0.0	0	0.0
Total	30,797	239	0.8	62	25.9	28,740	222	0.8	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

DRUMHELLER HEALTH CENTRE: 3rd or 4th degree perineal lacerations 5; Cervical or high vaginal laceration [redacted].

HIGH RIVER GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations 17; Cervical or high vaginal laceration [redacted].

WETASKIWIN HOSPITAL CARE CENTRE: Injury to the peripheral nervous system [redacted].

Table 46. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 3 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Chinook Regional Hospital	10,595	180	1.7	41	22.8	9,848	167	1.7	0	0.0
Covenant H Grey Nuns C Hosp	28,442	2,373	8.3	654	27.6	26,884	2.241	8.3	16	7.1
Covenant H Misericordia C Hosp	12,654	438	3.5	132	30.1	11,945	413	3.5	[redacted]	[redacted]
Medicine Hat Regional Hospital	5,097	21	0.4	5	23.8	4,568	18	0.4	0	0.0
Northern Lights Regional HC	6,012	78	1.3	12	15.4	5,551	73	1.3	0	0.0
Queen Elizabeth II Hospital	9,138	34	0.4	14	41.2	8,031	27	0.3	0	0.0
Red Deer Reg Hospital Centre	11,048	240	2.2	41	17.1	10,084	215	2.1	0	0.0
Sturgeon Community Hospital	14,076	320	2.3	123	38.4	13,018	292	2.2	5	17.1
Total	97,062	3,684	3.8	1,022	27.7	89,929	3.446	3.8	24	7.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

STURGEON COMMUNITY HOSPITAL: 3rd or 4th degree perineal lacerations 119; Cervical or high vaginal laceration 7.

STURGEON COMMUNITY HOSPITAL: Intracranial hemorrhage [redacted]; Injury to the peripheral nervous system [redacted]; Seizures [redacted].

Table 47. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 4 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Foothills Medical Centre	24,470	937	3.8	258	27.5	20,394	767	3.8	11	14.3
Peter Lougheed Centre	24,364	600	2.5	166	27.7	21,307	515	2.4	10	19.4
Rockyview General Hospital	21,866	1,139	5.2	298	26.2	19,496	1,017	5.2	13	12.8
Royal Alexandra Hospital	28,175	1,867	6.6	481	25.8	26,283	1,739	6.6	12	6.9
South Health Campus	11,601	457	3.9	149	32.6	10,114	389	3.8	5	12.9
Total	110,476	5,000	4.5	1,352	27.0	97,594	4,427	4.5	51	11.5

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tiers of service.

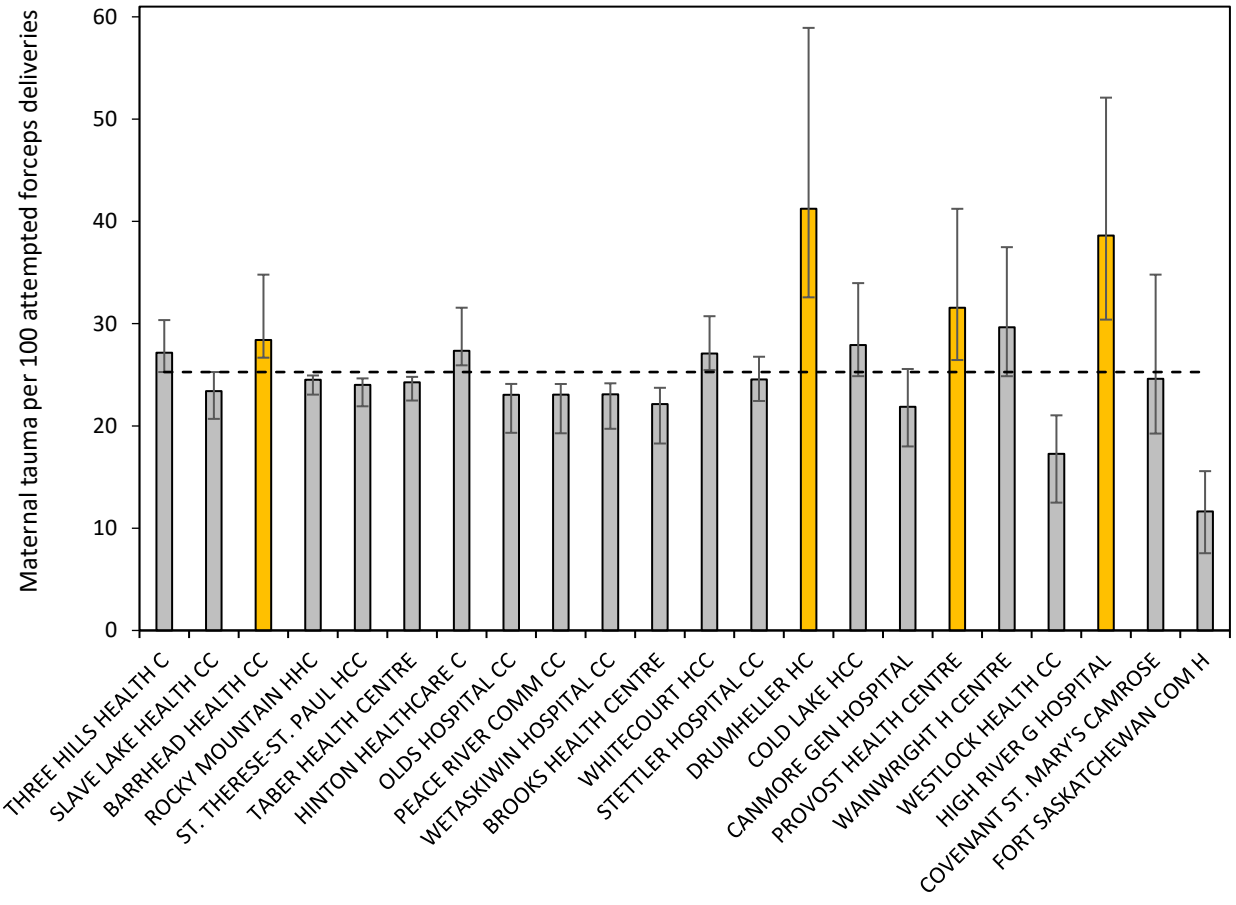
SOUTH HEALTH CAMPUS: 3rd or 4th degree perineal lacerations 94; Cervical or high vaginal laceration 66; other pelvic trauma [redacted]; repair of the urethra or bladder [redacted].

3.4.2.2. Alberta hospital rates vs the reference rate: Trauma rates following attempted forceps delivery

Figures 14 and 15 below show stabilized and adjusted rates of maternal trauma following attempted forceps delivery in each hospital in Alberta (compared with the reference rate for Canada excluding Quebec of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

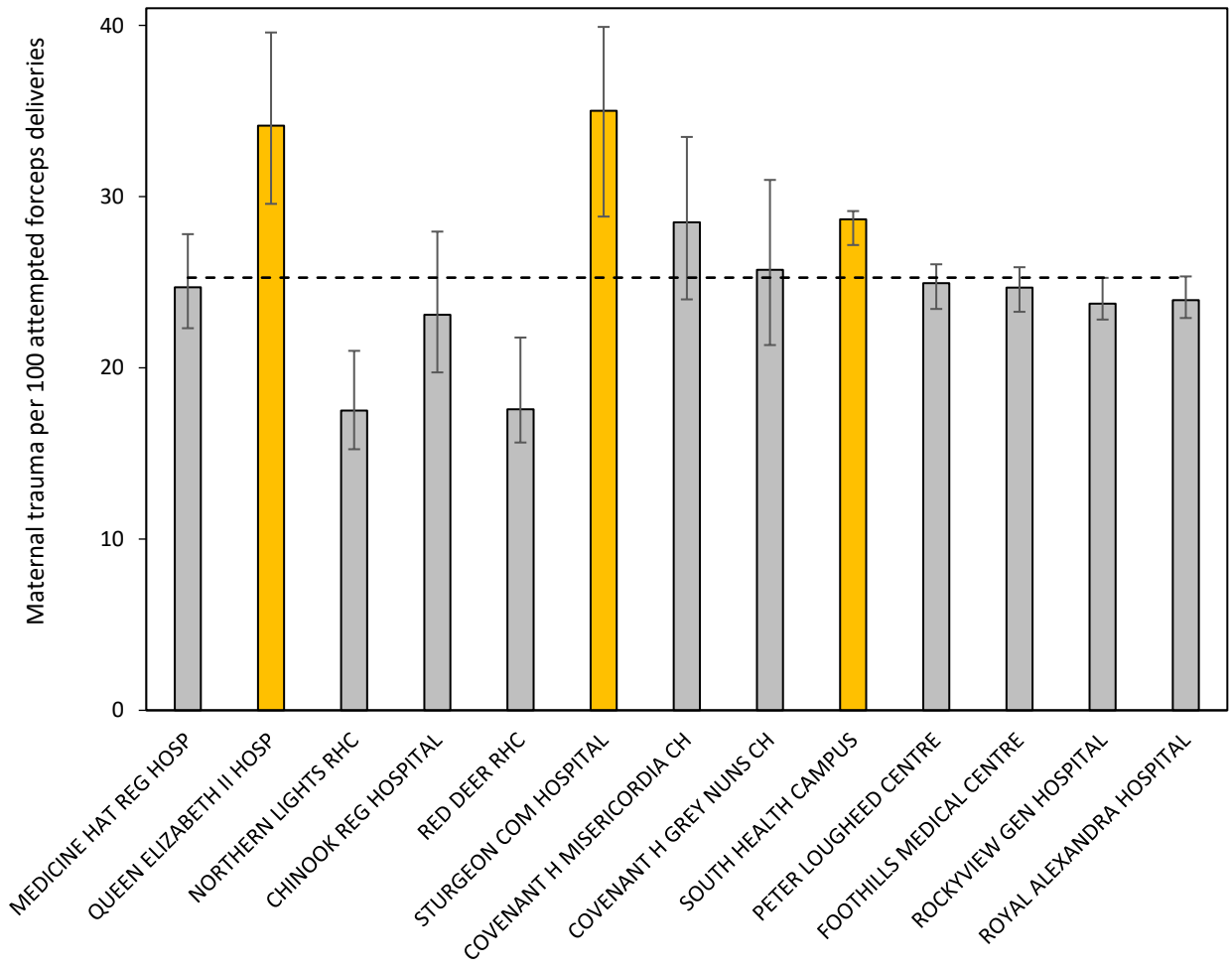
Figures 16 and 17 below show stabilized rates of neonatal trauma following attempted forceps birth in each hospital in Alberta (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 14. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 1 and 2 hospitals, Alberta, April 2013 to March 2019.



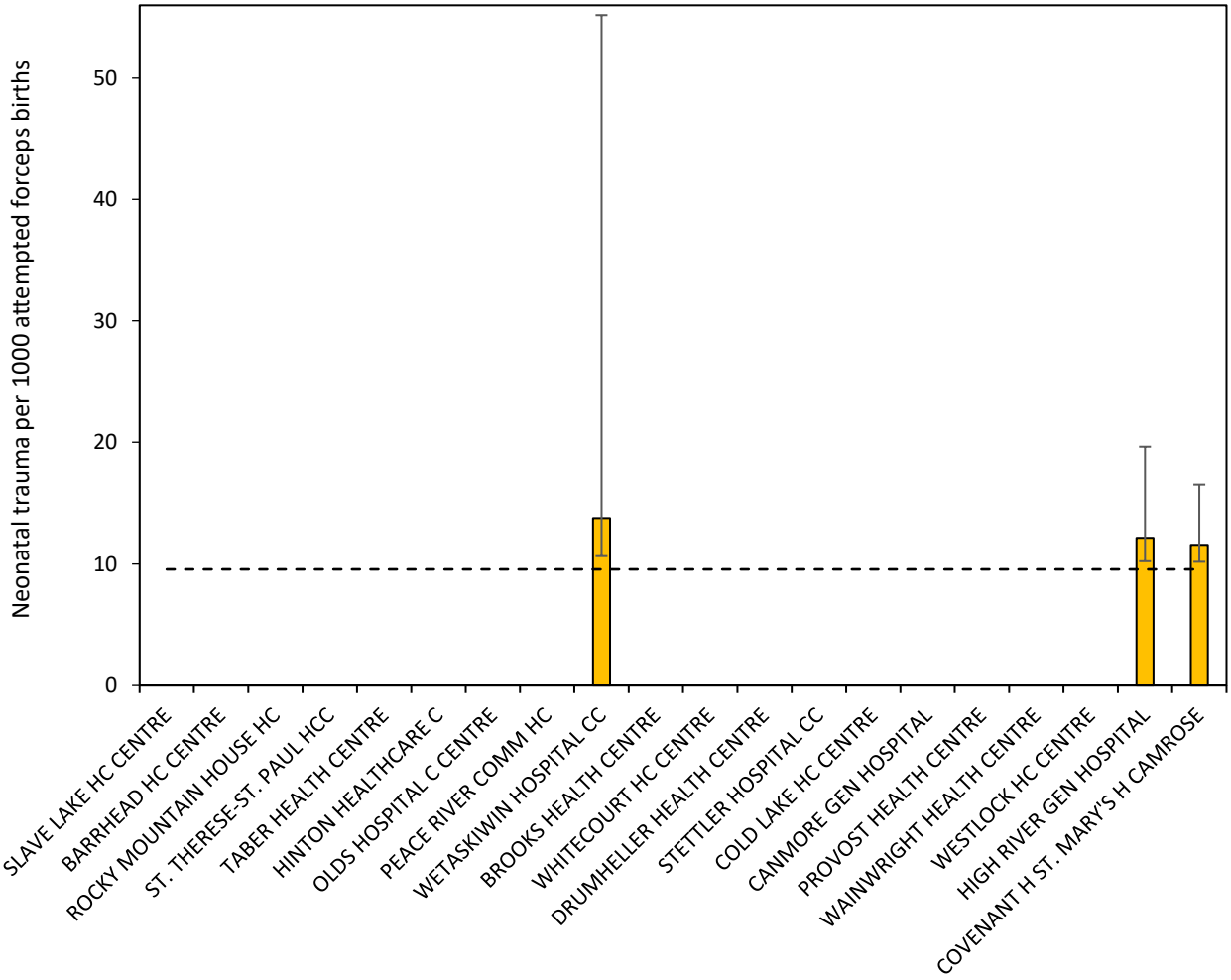
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 15. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 3 and 4 hospitals, Alberta, April 2013 to March 2019.



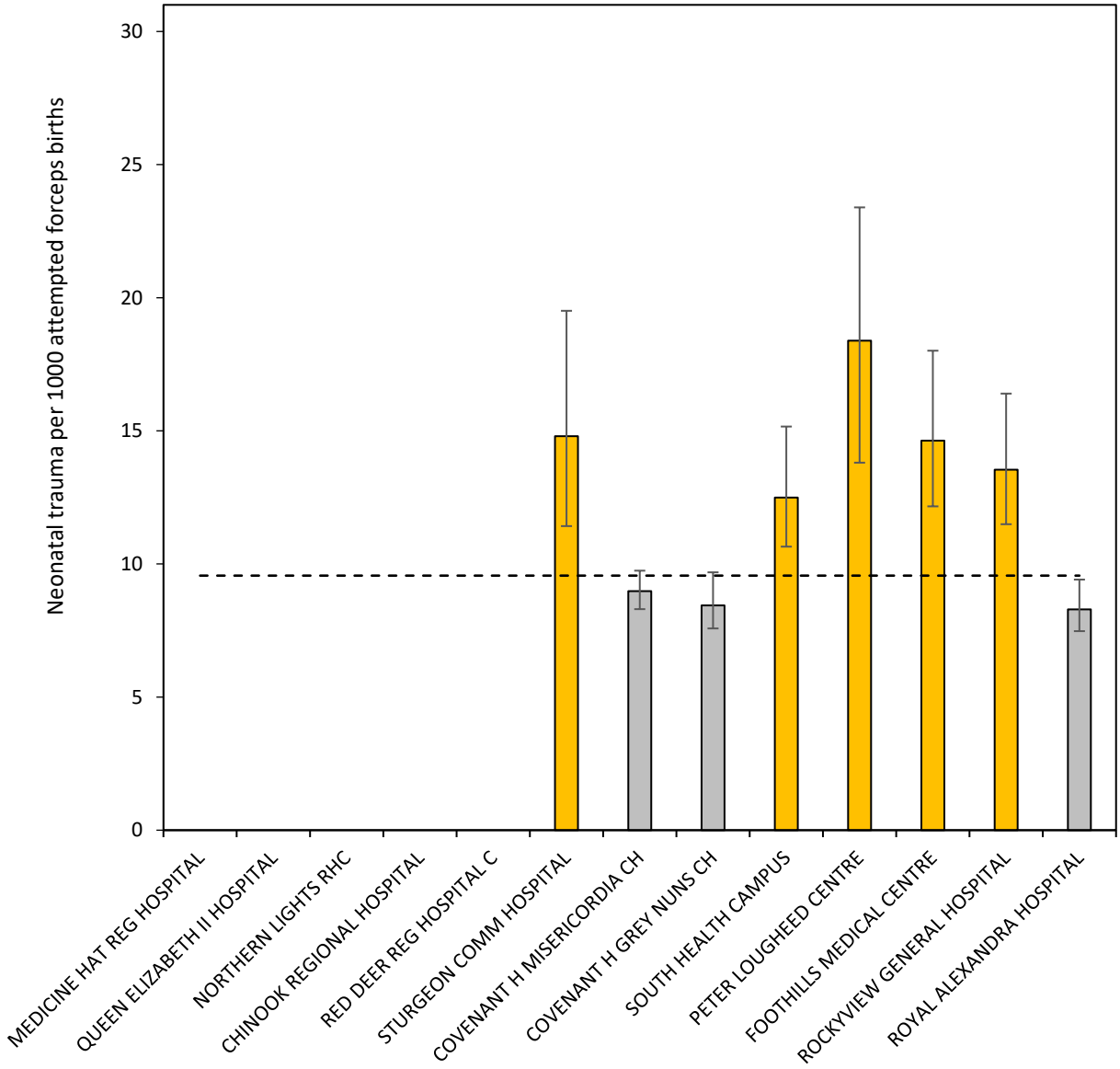
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 16. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps births in tier of obstetric service 1 and 2 hospitals, Alberta, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 17. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps births in tier of obstetric service 3 and 4 hospitals, Alberta, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.2.3. Alberta hospitals: Failed forceps deliveries

Table 48 lists the rates of attempted and failed forceps delivery (forceps application followed by cesarean delivery) by hospital in Alberta.

Table 48. Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), Alberta, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Singleton deliveries	Attempted forceps deliveries		Forceps followed by cesarean delivery*	
			No.	Rate	No.	Rate
2	Covenant H St. Mary's H	1,583	48	3.0	8	16.7
2	Total	30,797	239	0.8	20	8.4
3	Chinook Regional Hospital	10,595	180	1.7	11	6.1
3	Covenant H Grey Nuns Comm H	28,442	2,373	8.3	140	5.9
3	Covenant H Misericordia Comm H	12,654	438	3.5	16	3.7
3	Red Deer Regional Hospital	11,048	240	2.2	6	2.5
3	Sturgeon Community Hospital	14,076	320	2.3	14	4.4
3	Total	97,062	3,684	3.8	193	5.2
4	Foothills Medical Centre	24,470	937	3.8	42	4.5
4	Peter Lougheed Centre	24,364	600	2.5	43	7.2
4	Rockyview General Hospital	21,866	1,139	5.2	85	7.5
4	Royal Alexandra Hospital	28,175	1,867	6.6	56	3
4	South Health Campus	11,601	457	3.9	17	3.7
4	Total	110,476	5,000	4.5	243	4.9
All Tiers/Hospitals, Alberta		239,684	8,926	3.7	456	5.1

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries.

3.4.2.4. Alberta hospitals: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 49 to 53 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Alberta.

Table 49. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 0 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Bow Island Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Cardston Health Centre	57	5	8.8	0	0.0	51	[redacted]	[redacted]	0	0.0
Central Peace Health Complex	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Devon General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Didsbury District Health Services	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Fairview Health Complex	8	0	0.0	0	0.0	8	0	0.0	0	0.0
Grande Cache Comm Hlth C	10	0	0.0	0	0.0	10	0	0.0	0	0.0
High Prairie Health Complex	23	0	0.0	0	0.0	22	0	0.0	0	0.0
Leduc Community Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Manning Community H Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Redwater Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Sacred Heart Comm Hlth Centre	6	0	0.0	0	0.0	6	0	0.0	0	0.0
Seton (Jasper) Healthcare Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Smoky Lake Healthcare Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Strathmore District H Services	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Swan Hills Healthcare Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
University Of Alberta Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Wabasca/Desmarais Hcare Centre	30	0	0.0	0	0.0	29	0	0.0	0	0.0
Westview Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Total	151	5	3.3	0	0.0	143	[redacted]	[redacted]	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 50. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 1 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Athabasca Healthcare Centre	5	0	0.0	0	0.0	5	0	0.0	0	0.0
Crowsnest Pass Health Centre	123	8	6.5	[redacted]	[redacted]	115	8	7.0	0	0.0
Drayton Valley Hospital C Centre	38	[redacted]	[redacted]	0	0.0	36	[redacted]	[redacted]	0	0.0
Raymond Health Centre	47	6	12.8	0	0.0	46	5	10.9	0	0.0
Rimbey Hospital and Care Centre	222	18	8.1	[redacted]	[redacted]	219	18	8.2	0	0.0
Slave Lake Healthcare Centre	317	15	4.7	6	40.0	305	15	4.9	0	0.0
St. Theresa General Hospital	14	[redacted]	[redacted]	0	0.0	14	[redacted]	[redacted]	0	0.0
Sundre Hospital and Care Centre	133	12	9.0	[redacted]	[redacted]	122	12	9.8	0	0.0
Three Hills Health Centre	241	[redacted]	[redacted]	[redacted]	[redacted]	216	[redacted]	[redacted]	0	0.0
Valleyview Health Centre	58	0	0.0	0	0.0	52	0	0.0	0	0.0
Total	1,198	65	5.4	13	20.0	1,130	63	5.6	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 51. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 2 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Barrhead Healthcare Centre	844	103	12.2	7	6.8	781	97	12.4	[redacted]	[redacted]
Brooks Health Centre	1390	138	9.9	17	12.3	1308	133	10.2	[redacted]	[redacted]
Canmore General Hospital	1654	257	15.5	39	15.2	1523	237	15.6	0	0.0
Cold Lake Healthcare Centre	1318	219	16.6	44	20.1	1191	195	16.4	[redacted]	[redacted]
Covenant H Bonnyville HC Centre	1390	202	14.5	29	14.4	1269	185	14.6	0	0.0
Covenant H St. Mary's H Camrose	1583	97	6.1	21	21.6	1526	90	5.9	[redacted]	[redacted]
Daysland Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Drumheller Health Centre	1013	106	10.5	25	23.6	978	104	10.6	0	0.0
Edson Healthcare Centre	708	128	18.1	7	5.5	694	123	17.7	0	0.0
Fort Saskatchewan Comm Hosp	906	105	11.6	5	4.8	864	97	11.2	0	0.0
High River General Hospital	2042	161	7.9	41	25.5	1796	142	7.9	[redacted]	[redacted]
Hinton Healthcare Centre	1135	51	4.5	6	11.8	1097	46	4.2	0	0.0
Lacombe Hospital Care Centre	547	42	7.7	[redacted]	[redacted]	525	40	7.6	[redacted]	[redacted]
Northwest Health Centre	2818	470	16.7	54	11.5	2506	409	16.3	0	0.0
Olds Hospital and Care Centre	1331	200	15.0	26	13.0	1220	183	15.0	[redacted]	[redacted]
Peace River Comm Health Centre	2253	403	17.9	33	8.2	2021	358	17.7	[redacted]	[redacted]
Pincher Creek Health Centre	498	58	11.6	9	15.5	459	51	11.1	[redacted]	[redacted]
Ponoka Hospital and Care Centre	594	48	8.1	9	18.8	580	46	7.9	0	0.0
Provost Health Centre	443	44	9.9	7	15.9	425	42	9.9	[redacted]	[redacted]
Rocky Mountain H Health Centre	748	67	9.0	12	17.9	716	64	8.9	[redacted]	[redacted]
St. Therese-St. Paul HCare Centre	967	195	20.2	28	14.4	943	192	20.4	[redacted]	[redacted]

Table 51 (cont). Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 2 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Stettler Hospital Care Centre	879	190	21.6	27	14.2	865	186	21.5	0	0.0
Taber Health Centre	658	79	12.0	11	13.9	607	77	12.7	[redacted]	[redacted]
Vermilion Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Viking Health Centre	567	74	13.1	10	13.5	550	72	13.1	0	0.0
Wainwright Health Centre	786	178	22.6	72	40.4	723	167	23.1	[redacted]	[redacted]
Westlock Healthcare Centre	490	36	7.3	10	27.8	467	34	7.3	0	0.0
Wetaskiwin Hosp Care Centre	1,872	282	15.1	9	3.2	1,772	268	15.1	6	22.4
Whitecourt Healthcare Centre	684	170	24.9	22	12.9	661	167	25.3	[redacted]	[redacted]
William J. Cadzow L La B HCC	666	26	3.9	[redacted]	[redacted]	661	25	3.8	0	0.0
Total	30,797	4,129	13.4	588	14.2	28,740	3,830	13.3	26	6.8

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.
COLD LAKE HEALTHCARE CENTRE: 3rd or 4th degree perineal lacerations 39; Cervical tears or high vaginal lacerations 10; Other pelvic trauma [redacted].
COVENANT H ST. MARY'S H CAMROSE: 3rd/ 4th degree perineal lacerations 17; Other pelvic trauma [redacted].
DRUMHELLER HEALTH CENTRE: 3rd or 4th degree perineal lacerations 21; Cervical tears or high vaginal lacerations [redacted]; Other pelvic trauma [redacted].
HIGH RIVER GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations 32; Cervical tears or high vaginal lacerations 5; Other pelvic trauma [redacted]; Repair of the urethra or bladder [redacted].
WAINWRIGHT HEALTH CENTRE: 3rd or 4th degree perineal lacerations 71; Cervical tears or high vaginal lacerations [redacted]; Other pelvic trauma [redacted].
WESTLOCK HEALTHCARE CENTRE: 3rd or 4th degree perineal lacerations 5; Cervical tears or high vaginal lacerations [redacted]; Other pelvic trauma [redacted].
WETASKIWIN HOSP CARE CENTRE: Injury to the central nervous system [redacted]; Injury to the peripheral nervous system [redacted]; Injury to the long bones [redacted]; Seizures [redacted]; Neonatal deaths [redacted].

Table 52. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 3 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Chinook Regional Hospital	10,595	646	6.1	81	12.5	9,848	594	6.0	[redacted]	[redacted]
Covenant H Grey Nuns C Hosp	28,442	718	2.5	94	13.1	26,884	663	2.5	[redacted]	[redacted]
Covenant H Misericordia C Hosp	12,654	749	5.9	126	16.8	11,945	700	5.9	[redacted]	[redacted]
Medicine Hat Regional Hospital	5,097	438	8.6	59	13.5	4,568	397	8.7	[redacted]	[redacted]
Northern Lights Regional HC	6,012	666	11.1	50	7.5	5,551	603	10.9	18	29.9
Queen Elizabeth II Hospital	9,138	693	7.6	97	14.0	8,031	611	7.6	12	19.6
Red Deer Reg Hospital Centre	11,048	416	3.8	51	12.3	10,084	382	3.8	[redacted]	[redacted]
Sturgeon Community Hospital	14,076	1,164	8.3	164	14.1	13,018	1,084	8.3	12	11.1
Total	97,062	5,490	5.7	722	13.2	89,929	5,034	5.6	58	11.5

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

COVENANT H MISERICORDIA C HOSP: 3rd / 4th degree perineal lacerations 92; Cervical tears or high vaginal lacerations 14; Other pelvic trauma [redacted].

NORTHERN LIGHTS REGIONAL HC: Intracranial hemorrhage [redacted]; Injury to the central nervous system 11; Injury to the peripheral nervous system 6.

Table 53. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma trauma in tiers of obstetric service 4 hospitals, Alberta, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Foothills Medical Centre	24,470	2,533	10.4	331	13.1	20,394	2,126	10.4	41	19.3
Peter Lougheed Centre	24,364	5,537	22.7	604	10.9	21,307	4,871	22.9	73	15.0
Rockyview General Hospital	21,866	2,593	11.9	349	13.5	19,496	2,295	11.8	27	11.8
Royal Alexandra Hospital	28,175	1,416	5.0	186	13.1	26,283	1,349	5.1	12	8.9
South Health Campus	11,601	1,231	10.6	164	13.3	10,114	1,077	10.6	7	6.5
Total	110,476	13,310	12.0	1634	12.3	97,594	11,718	12.0	160	13.7

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

ROCKYVIEW GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations 296; Cervical tears or high vaginal lacerations 31; Other pelvic trauma 16; Repair of the urethra or bladder [redacted].

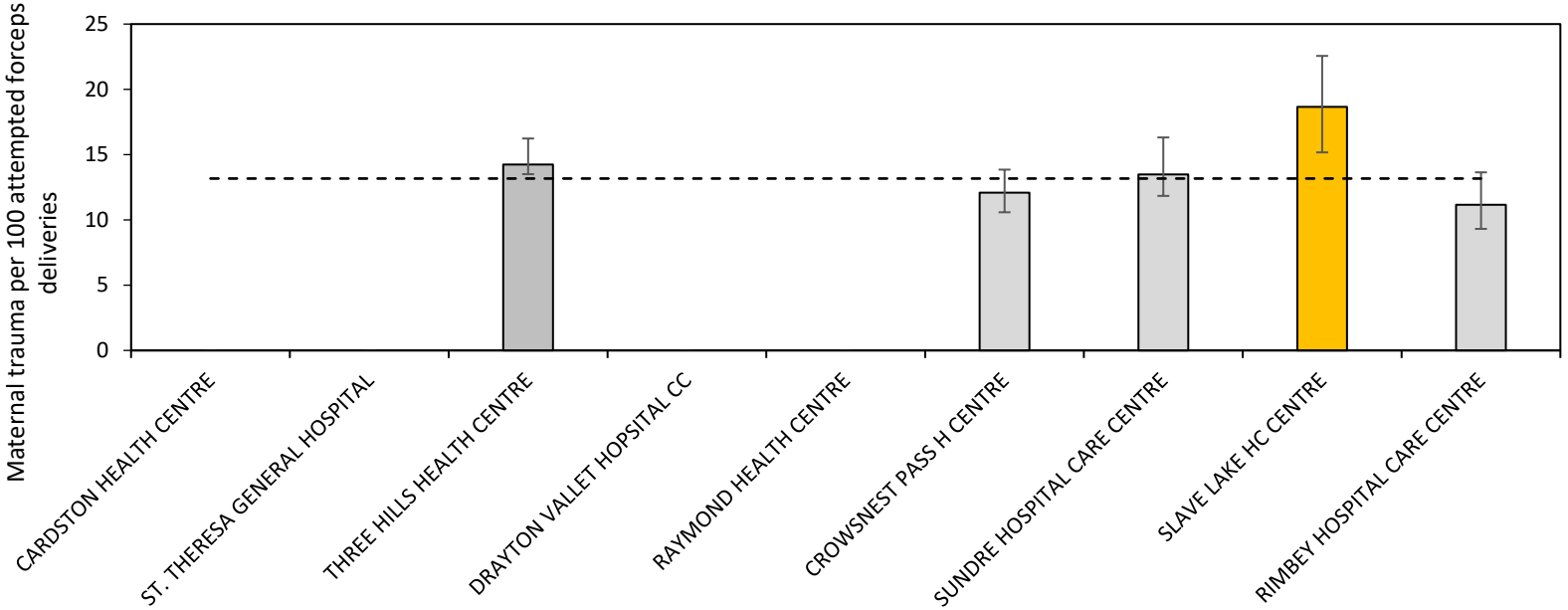
FOOTHILLS MEDICAL CENTRE: Intracranial hemorrhage 6; Skull fracture [redacted]; Injury to the central nervous system 29; Injury to the peripheral nervous system 5; Injury to the long bones [redacted]; Seizures [redacted].

3.4.2.5. Alberta hospital rates vs the reference rate: Trauma rates following attempted vacuum delivery

Figures 18, 19 and 20 below show stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in Alberta (compared with the reference rate for Canada excluding Quebec of 13.2 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

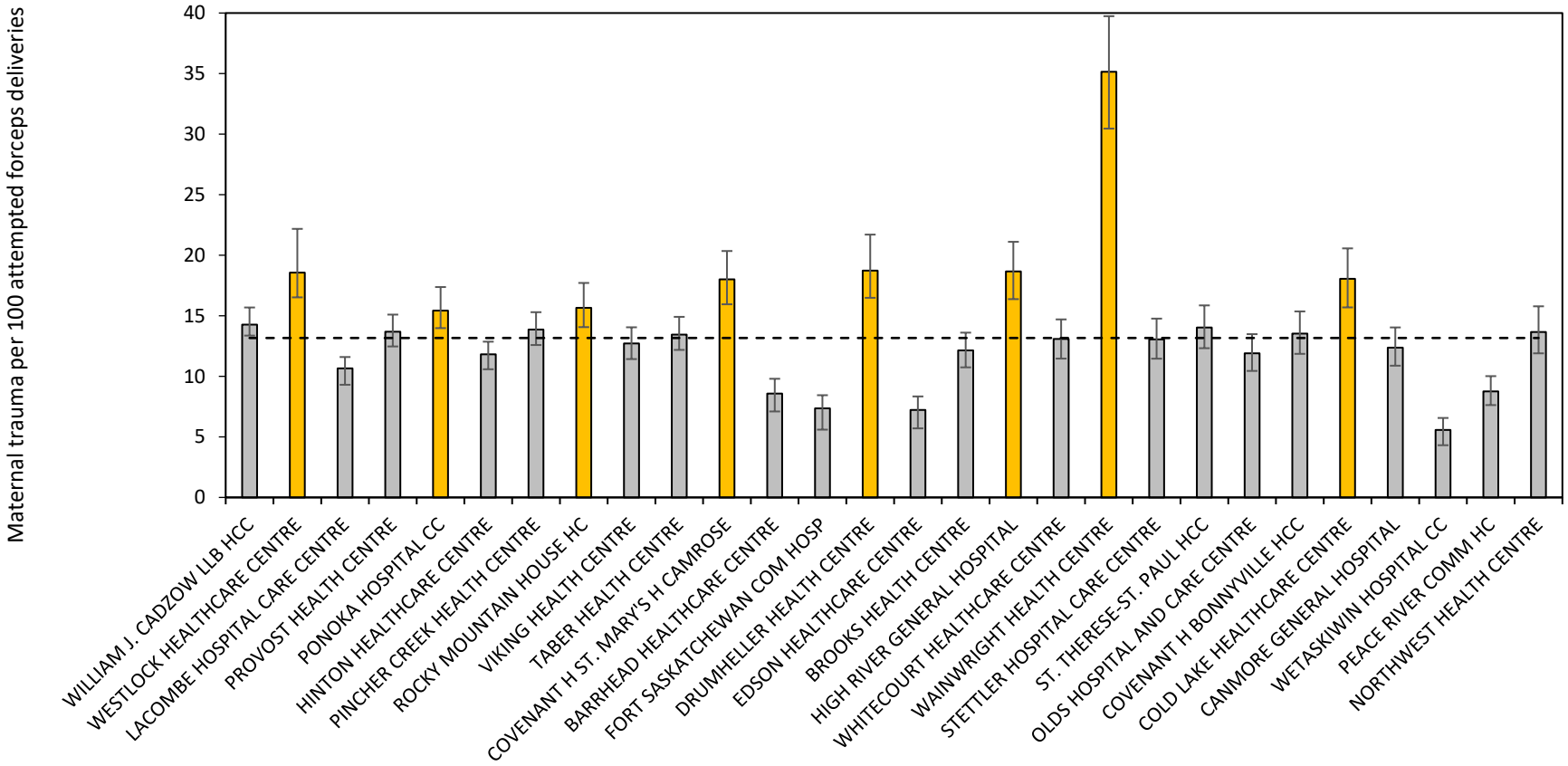
Figures 21 and 22 below show stabilized and adjusted rates of neonatal trauma following attempted vacuum delivery in each hospital in Alberta (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 18. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 1 hospitals, Alberta, April 2013 to March 2019.



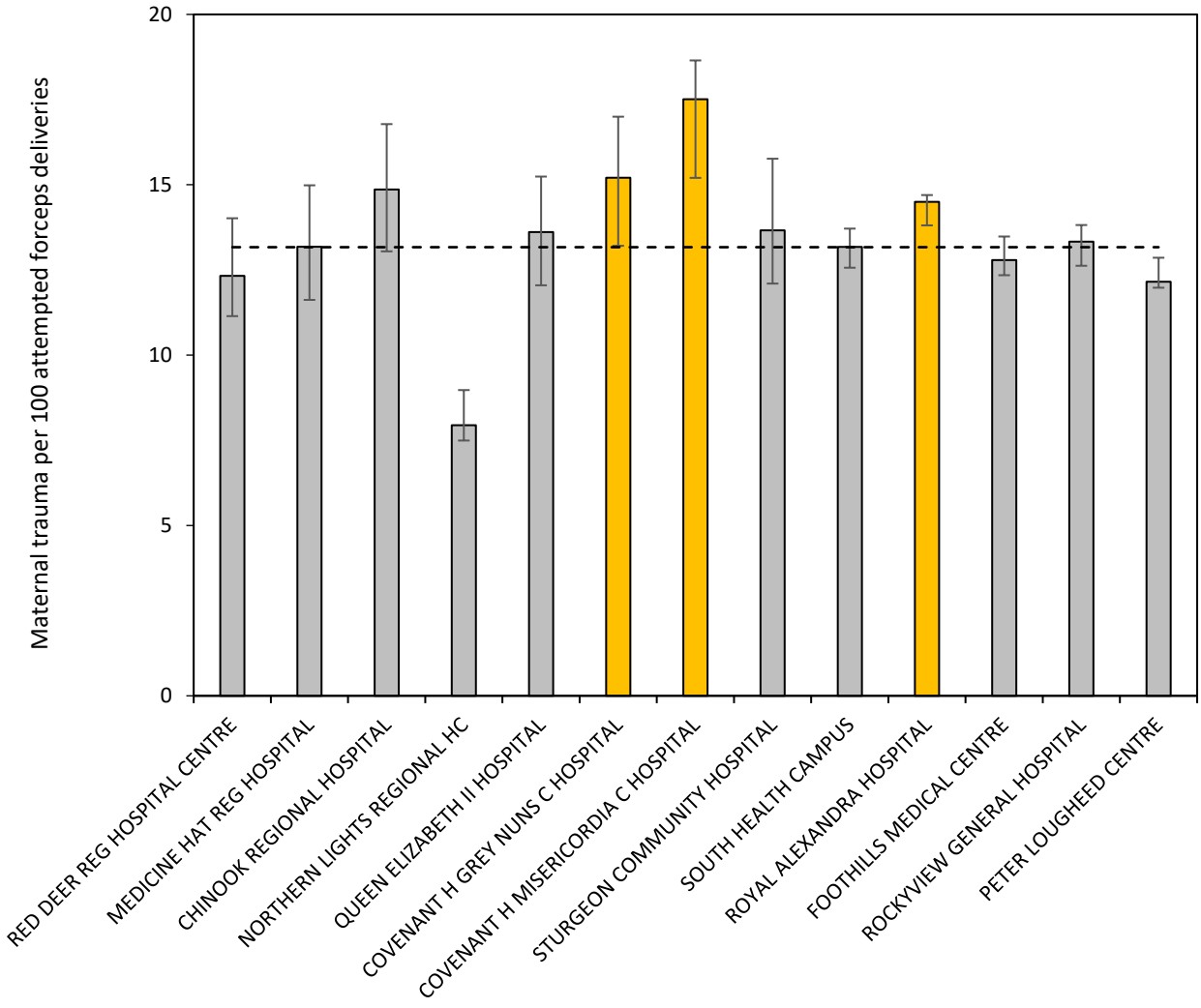
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 19. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 2 hospitals, Alberta, April 2013 to March 2019.



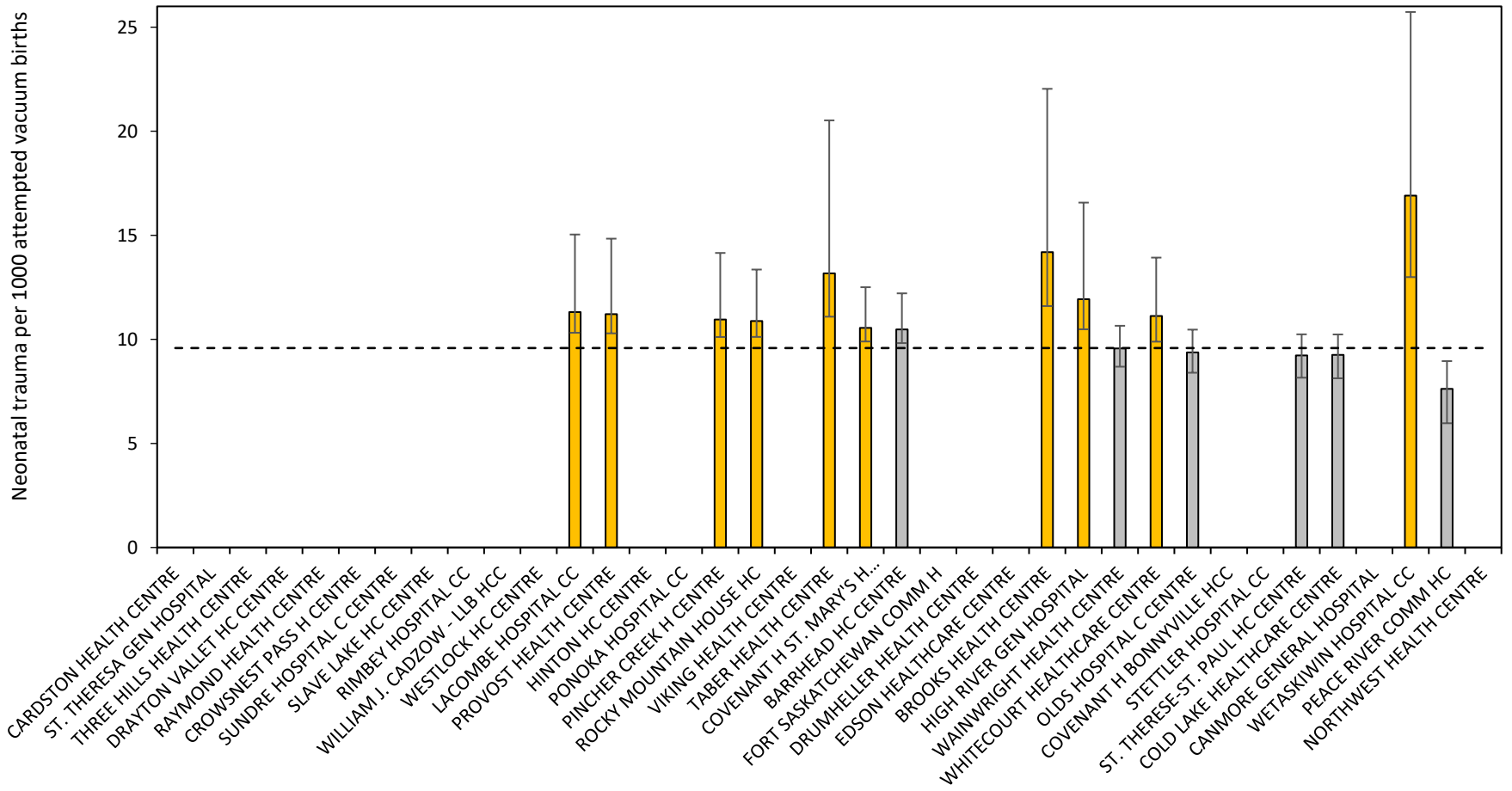
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 20. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 3 and 4 hospitals, Alberta, April 2013 to March 2019.



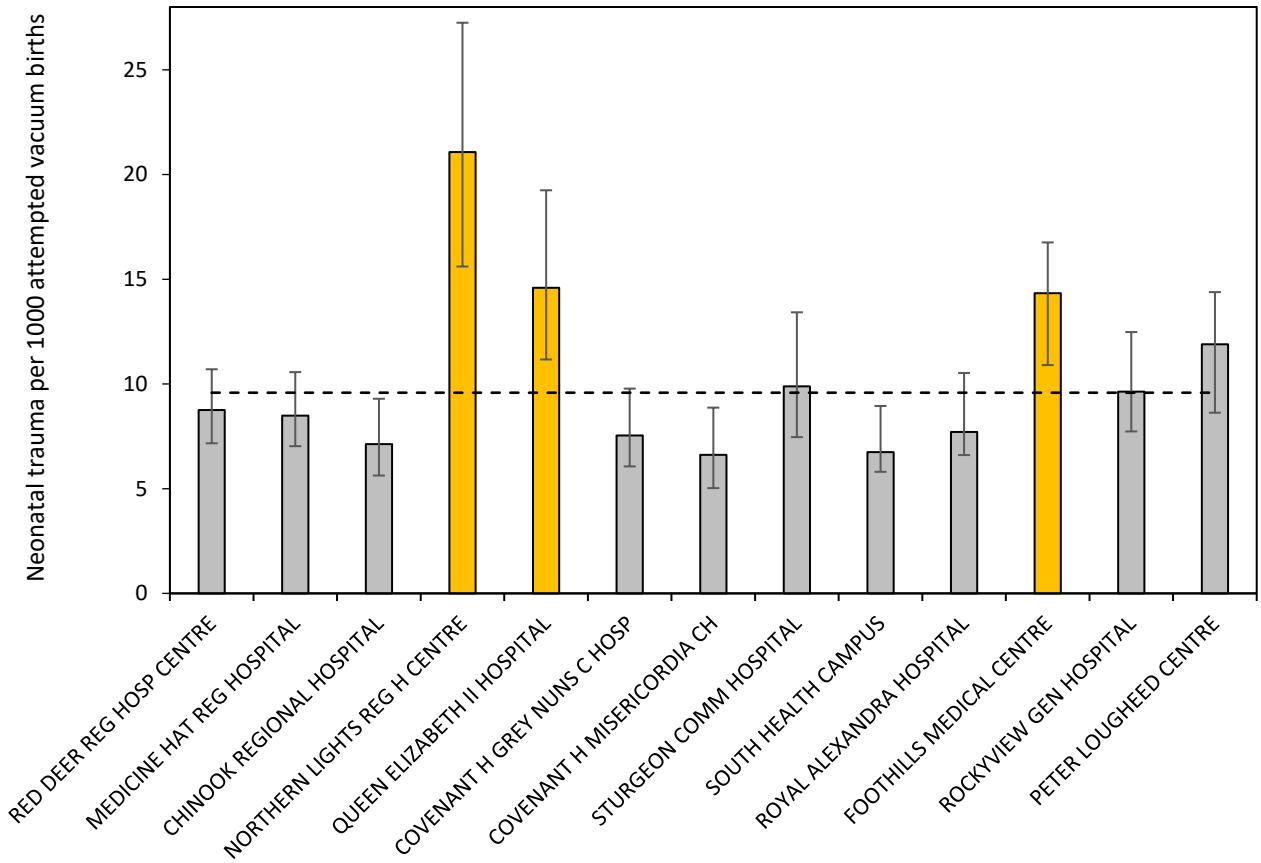
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 21. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum births in tier of obstetric service 1 and 2 hospitals, Alberta, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 22. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum births in tier of obstetric service 3 and 4 hospitals, Alberta, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.2.6. Alberta hospitals: Failed vacuum deliveries

Hospital-specific rates of attempted vacuum and the 3 types of failed vacuum delivery in Alberta are listed below.

Table 54. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Alberta, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital Name	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
2	Barrhead Healthcare Centre	844	103	12.2	6	5.8	[redacted]	[redacted]	0	0.0
2	Brooks Health Centre	1,390	138	9.9	6	4.3	5	3.6	0	0.0
2	Canmore General Hospital	1,654	257	15.5	5	1.9	15	5.8	11	4.3
2	Cold Lake Healthcare Centre	1,318	219	16.6	11	5.0	[redacted]	[redacted]	[redacted]	[redacted]
2	Covenant H Bonnyville HCC	1,390	202	14.5	5	2.5	[redacted]	[redacted]	[redacted]	[redacted]
2	Edson Healthcare Centre	708	128	18.1	[redacted]	[redacted]	6	4.7	0	0.0
2	Fort Saskatchewan Comm Hosp	906	105	11.6	19	18.1	0	0.0	0	0.0
2	High River General Hospital	2,042	161	7.9	16	9.9	[redacted]	[redacted]	0	0.0
2	Northwest Health Centre	2,818	470	16.7	0	0.0	32	6.8	0	0.0
2	Olds Hospital and Care Centre	1,331	200	15.0	[redacted]	[redacted]	10	5.0	[redacted]	[redacted]
2	Peace River Community H Centre	2,253	403	17.9	[redacted]	[redacted]	16	4.0	[redacted]	[redacted]
2	Provost Health Centre	443	44	9.9	7	15.9	0	0.0	0	0.0
2	Stettler Hospital Care Centre	879	190	21.6	26	13.7	0	0.0	0	0.0
2	Wainwright Health Centre	786	178	22.6	26	14.6	[redacted]	[redacted]	0	0.0
2	Wetaskiwin Hospital Care Centre	1,872	282	15.1	[redacted]	[redacted]	10	3.5	0	0.0
2	Whitecourt Healthcare Centre	684	170	24.9	16	9.4	0	0.0	0	0.0
2	Total	30,797	4,129	13.4	168	4.1	121	2.9	18	0.4
3	Chinook Regional Hospital	10,595	646	6.1	24	3.7	28	4.3	[redacted]	[redacted]

Table 54 (cont). Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Alberta, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital Name	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
3	Covenant H Grey Nuns Comm H	28,442	718	2.5	65	9.1	11	1.5	7	1.0
3	Covenant H Misericordia Com H	12,654	749	5.9	87	11.6	5	0.7	[redacted]	[redacted]
3	Medicine Hat Regional Hospital	5,097	438	8.6	12	2.7	28	6.4	[redacted]	[redacted]
3	Northern Lights Reg H Centre	6,012	666	11.1	14	2.1	24	3.6	0	0.0
3	Queen Elizabeth Ii Hospital	9,138	693	7.6	23	3.3	17	2.5	[redacted]	[redacted]
3	Red Deer Regional Hosp Centre	11,048	416	3.8	14	3.4	7	1.7	[redacted]	[redacted]
3	Sturgeon Community Hospital	14,076	1,164	8.3	72	6.2	6	0.5	5	0.4
3	Total	97,062	5,490	5.7	311	5.7	126	2.3	24	0.4
4	Foothills Medical Centre	24,470	2,533	10.4	121	4.8	32	1.3	10	0.4
4	Peter Lougheed Centre	24,364	5,537	22.7	364	6.6	55	1.0	43	0.8
4	Rockyview General Hospital	21,866	2,593	11.9	97	3.7	70	2.7	9	0.3
4	Royal Alexandra Hospital	28,175	1,416	5.0	107	7.6	18	1.3	10	0.7
4	South Health Campus	11,601	1,231	10.6	61	5.0	14	1.1	9	0.7
4	Total	110,476	13,310	12.0	750	5.6	189	1.4	81	0.6
All Tiers/Hospitals, Alberta		239,684	22,999	9.6	1231	5.4	437	1.9	123	0.5

Small cells (<5) suppressed.

*Rates of failed vacuum (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.

3.4.3.1. Saskatchewan hospitals: Within-tier hospital-specific trauma rates following attempted forceps delivery

Tables 55 to 58 below list the numbers and rates of attempted forceps delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Saskatchewan.

Table 55. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 0 hospitals, Saskatchewan, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Broadview Union Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Hudson Bay Health Care Facility	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Kamsack Hospital Nursing Home	5	0	0.0	0	0.0	5	0	0.0	0	0.0
Kelvington Hospital	6	0	0.0	0	0.0	6	0	0.0	0	0.0
Kindersley District Health Centre	34	0	0.0	0	0.0	32	0	0.0	0	0.0
La Loche Health Centre	57	0	0.0	0	0.0	56	0	0.0	0	0.0
Maidstone Health Complex	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Porcupine Carragana Hospital	32	0	0.0	0	0.0	31	0	0.0	0	0.0
Rosthern Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
St. Joseph's Health Centre	13	0	0.0	0	0.0	13	0	0.0	0	0.0
Unity and District Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Weyburn General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Wolseley Memorial Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Wynyard Integrated Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Yutthe Dene Nakohodi H Centre	8	0	0.0	0	0.0	8	0	0.0	0	0.0
Total	173	0	0.0	0	0.0	169	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 56. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 1 hospitals, Saskatchewan, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
All Nations' Healing Hospital	103	0	0.0	0	0.0	101	0	0.0	0	0.0
E Hosp St. Joseph's H Estevan	1,333	28	2.1	[redacted]	[redacted]	1,232	26	2.1	0	0.0
Humboldt District Hospital	222	0	0.0	0	0.0	220	0	0.0	0	0.0
La Ronge Health Centre	326	0	0.0	0	0.0	312	0	0.0	0	0.0
Melfort Hospital	869	[redacted]	[redacted]	0	0.0	849	[redacted]	[redacted]	0	0.0
Nipawin Hospital	149	[redacted]	[redacted]	0	0.0	147	[redacted]	[redacted]	0	0.0
Rosetown Health Centre	55	0	0.0	0	0.0	53	0	0.0	0	0.0
Southeast Integ C Ctre Moosomin	172	0	0.0	0	0.0	160	0	0.0	0	0.0
Tisdale Hospital	47	0	0.0	0	0.0	47	0	0.0	0	0.0
Total	3,276	31	0.9	[redacted]	[redacted]	3,121	29	0.9	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 57. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 2 hospitals, Saskatchewan, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Battlefords Union Hospital	2,577	15	0.6	[redacted]	[redacted]	2,512	15	0.6	0	0.0
Cypress Regional Hospital	2,067	24	1.2	11	45.8	1,967	21	1.1	[redacted]	[redacted]
Dr. F.H. Wigmore R Hospital	2,529	28	1.1	7	25	2,356	26	1.1	0	0.0
Lloydminster Hospital	4,391	218	5	42	19.3	4,257	214	5.0	[redacted]	[redacted]
Meadow Lake Hospital NWHF	1,343	[redacted]	[redacted]	[redacted]	[redacted]	1,258	[redacted]	[redacted]	0	0.0
Victoria Hospital RMHC	7,488	47	0.6	22	46.8	7,203	47	0.7	0	0.0
Yorkton Regional Health Centre	3,257	40	1.2	[redacted]	[redacted]	3,007	35	1.2	0	0.0
Total	23,652	373	1.6	86	23.1	22,560	359	1.6	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

CYPRESS REGIONAL HOSPITAL: 3rd or 4th degree perineal lacerations 11.

VICTORIA HOSPITAL: 3rd or 4th degree perineal lacerations 20; Cervical or high vaginal laceration [redacted]; other pelvic trauma [redacted]

Table 58. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 4 hospitals, Saskatchewan, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Regina General Hospital	19,440	789	4.1	392	49.7	17303	698	4.0	9	12.9
Royal University Hospital	25,085	552	2.2	230	41.7	23243	503	2.2	6	11.9
Total	44,525	1341	3.0	622	46.4	40546	1201	3.0	15	12.5

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

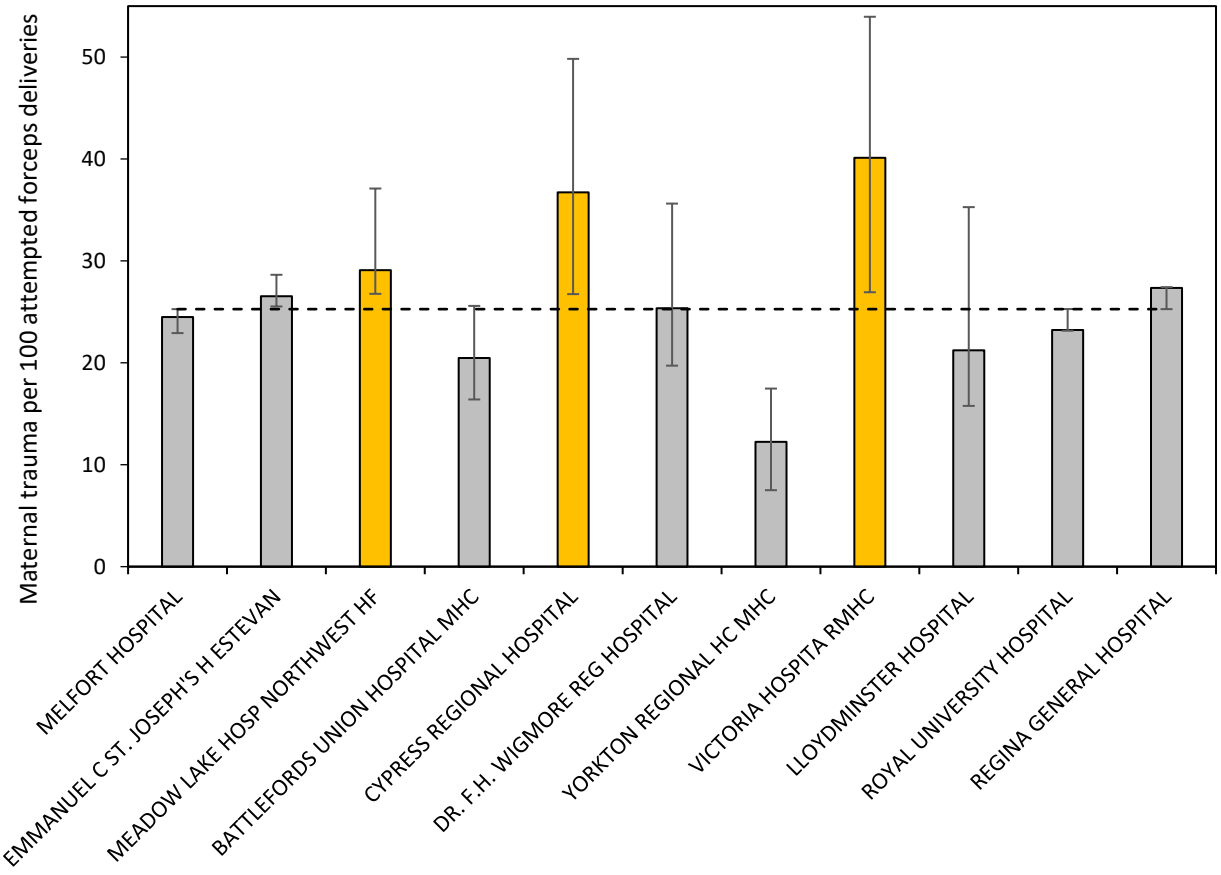
REGINA GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations 348; Cervical or high vaginal laceration 68; other pelvic trauma 14; Repair of the urethra or bladder [redacted].

3.4.3.2. Saskatchewan hospital rates vs the reference rate: Trauma rates following attempted forceps delivery

Figure 23 below shows stabilized and adjusted rates of maternal trauma following attempted forceps delivery in each hospital in Saskatchewan (compared with the reference for Canada excluding Quebec of rate of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

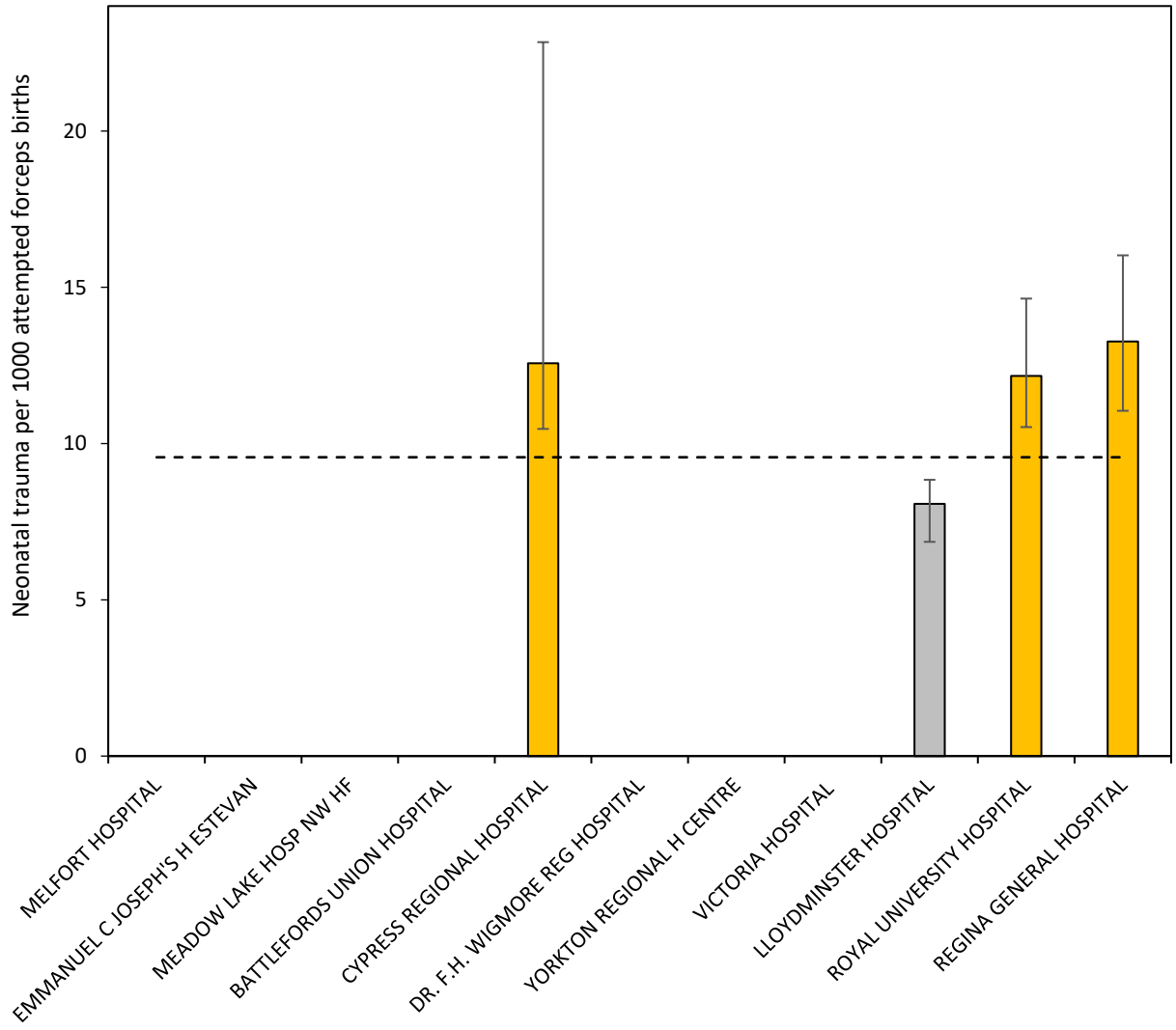
Figures 24 below shows stabilized rates of neonatal trauma following attempted forceps birth in each hospital in Saskatchewan (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 23. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 1, 2 and 4 hospitals, Saskatchewan, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 24. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 1, 2 and 4 hospitals, Saskatchewan, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.3.3. Saskatchewan hospitals: Failed forceps deliveries

Hospital-specific rates of attempted forceps delivery and failed forceps delivery in Saskatchewan are provided below.

Table 59. Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), Saskatchewan, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Deliveries	Attempted forceps deliveries		Forceps followed by cesarean delivery*	
			No.	Rate	No.	Rate
2	Lloydminster Hospital	4,391	218	5.0	10	4.6
2	Total	23,652	373	1.6	17	4.6
4	Regina General Hospital	19,440	789	4.1	32	4.1
4	Royal University Hospital	25,085	552	2.2	30	5.4
4	Total	44,525	1,341	3.0	62	4.6
All Tiers/Hospitals, SK		71,626	1,745	2.4	81	4.6

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries.

3.4.3.4. Saskatchewan hospitals: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 60 to 63 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Saskatchewan.

Table 60. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 0 hospitals, Saskatchewan, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Broadview Union Hospital	[redacted]	0	0.0	0	0.0	[redacted]	[redacted]	0.0	0	0.0
Hudson Bay Health Care Facility	[redacted]	0	0.0	0	0.0	[redacted]	[redacted]	0.0	0	0.0
Kamsack Hospital Nursing Home	5	0	0.0	0	0.0	5	0	0.0	0	0.0
Kelvington Hospital	6	0	0.0	0	0.0	6	0	0.0	0	0.0
Kindersley District Hlth Centre	34	[redacted]	[redacted]	0	0.0	32	[redacted]	[redacted]	0	0.0
La Loche Health Centre	57	0	0.0	0	0.0	56	0	0.0	0	0.0
Maidstone Health Complex	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Porcupine Carragana Hospital	32	14	43.8	[redacted]	[redacted]	31	13	41.9	0	0.0
Rosthern Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
St. Joseph's Health Centre	13	0	0.0	0	0.0	13	0	0.0	0	0.0
Unity and District Health Centre	[redacted]	[redacted]	[redacted]	0	0.0	[redacted]	[redacted]	[redacted]	0	0.0
Weyburn General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Wolseley Memorial Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Wynyard Integrated Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Yutthe Dene Nakohodi Health C	8	0	0.0	0	0.0	8	0	0.0	0	0.0
Total	173	16	9.2	[redacted]	[redacted]	169	15	8.9	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 61. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1 hospitals, Saskatchewan, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
All Nations' Healing Hospital	103	0	0.0	0	0.0	101	0	0.0	0	0.0
Emmanuel H St. Joseph's H [Estevan]	1,333	231	17.3	13	5.6	1232	214	17.4	[redacted]	[redacted]
Humboldt District Hospital	222	11	5.0	0	0.0	220	11	5.0	0	0.0
La Ronge Health Centre	326	5	1.5	[redacted]	[redacted]	312	5	1.6	0	0.0
Melfort Hospital	869	156	18	19	12.2	849	153	18	[redacted]	[redacted]
Nipawin Hospital	149	[redacted]	[redacted]	[redacted]	[redacted]	147	[redacted]	[redacted]	0	0.0
Rosetown Health Centre	55	5	9.1	0	0.0	53	5	9.4	0	0.0
Southeast Integ CC Moosomin	172	14	8.1	[redacted]	[redacted]	160	13	8.1	0	0.0
Tisdale Hospital	47	[redacted]	[redacted]	0	0.0	47	[redacted]	[redacted]	0	0.0
Total	3,276	426	13.0	38	8.9	3,121	405	13.0	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

SOUTHEAST INTEG C CENTRE MOOSOMIN: 3rd or 4th degree perineal lacerations [redacted]; Other pelvic trauma [redacted].

Table 62. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2 hospitals, Saskatchewan, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Battlefords Union Hospital	2,577	379	14.7	28	7.4	2,512	373	14.8	[redacted]	[redacted]
Cypress Regional Hospital	2,067	139	6.7	18	12.9	1,967	137	7.0	[redacted]	[redacted]
Dr. F.H. Wigmore Reg Hospital	2,529	421	16.6	53	12.6	2,356	389	16.5	[redacted]	[redacted]
Lloydminster Hospital	4,391	437	10.0	26	5.9	4,257	427	10.0	5	11.7
Meadow Lake Hospital NWHF	1,343	191	14.2	39	21.9	1,258	177	14.1	5	28.2
Victoria Hospital	7,488	552	7.4	134	24.3	7,203	524	7.3	[redacted]	[redacted]
Yorkton Regional Health Centre	3,257	322	9.9	25	7.8	3,007	298	9.9	[redacted]	[redacted]
Total	23,652	2,441	10.3	323	13.2	22,560	2325	10.3	28	12.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

MEADOW LAKE HOSPITAL: 3rd or 4th degree perineal lacerations 34; Cervical tears or high vaginal lacerations [redacted]; Other pelvic trauma [redacted].

VICTORIA HOSPITAL: 3rd or 4th degree perineal lacerations 120; Cervical tears or high vaginal lacerations 13; Other pelvic trauma 8.

Table 63. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 4 hospitals, Saskatchewan, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Regina General Hospital	19,440	2,110	10.9	455	21.6	17,303	1,887	10.9	8	4.2
Royal University Hospital	25,085	3,926	15.7	911	23.2	23,243	3,614	15.5	26	7.2
Total	44,525	6,036	13.6	1,366	22.6	40,546	5,501	13.6	34	6.2

*Infants with congenital anomalies excluded.

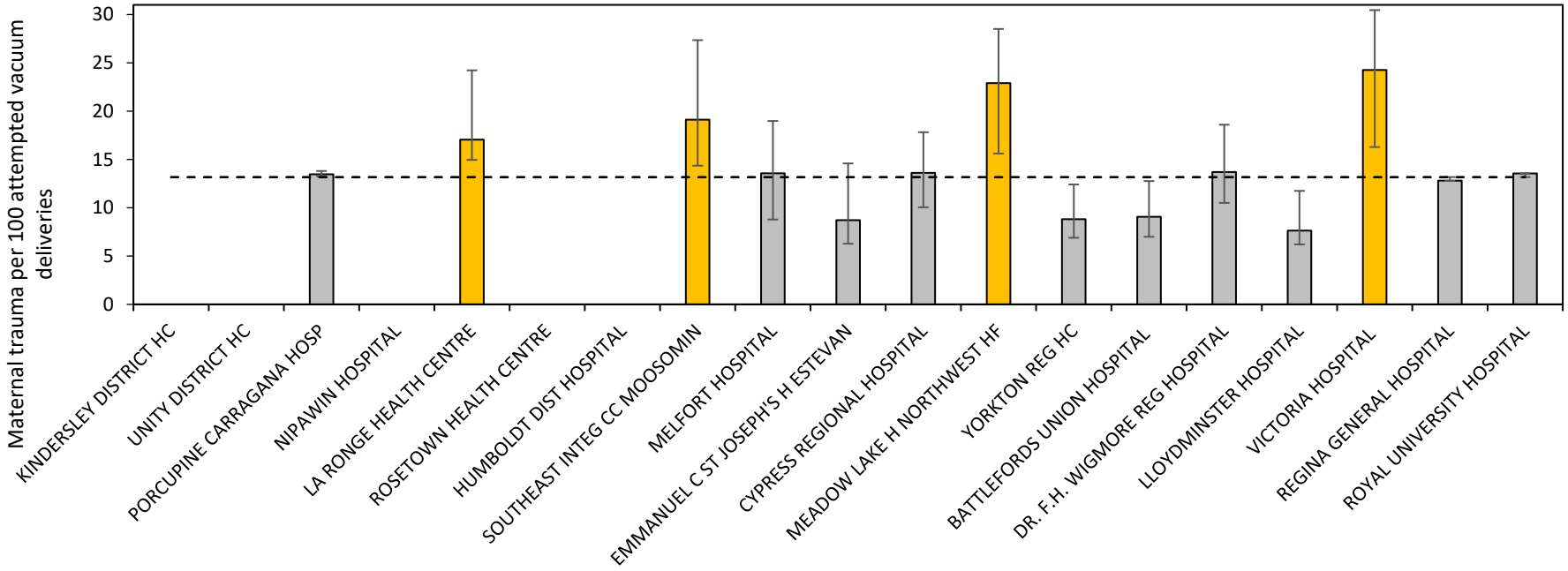
Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

3.4.3.5. Saskatchewan hospital rates vs the reference rate: Trauma rates following attempted vacuum delivery

Figure 25 below shows stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in Saskatchewan (compared with the reference rate for Canada excluding Quebec of 13.2 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

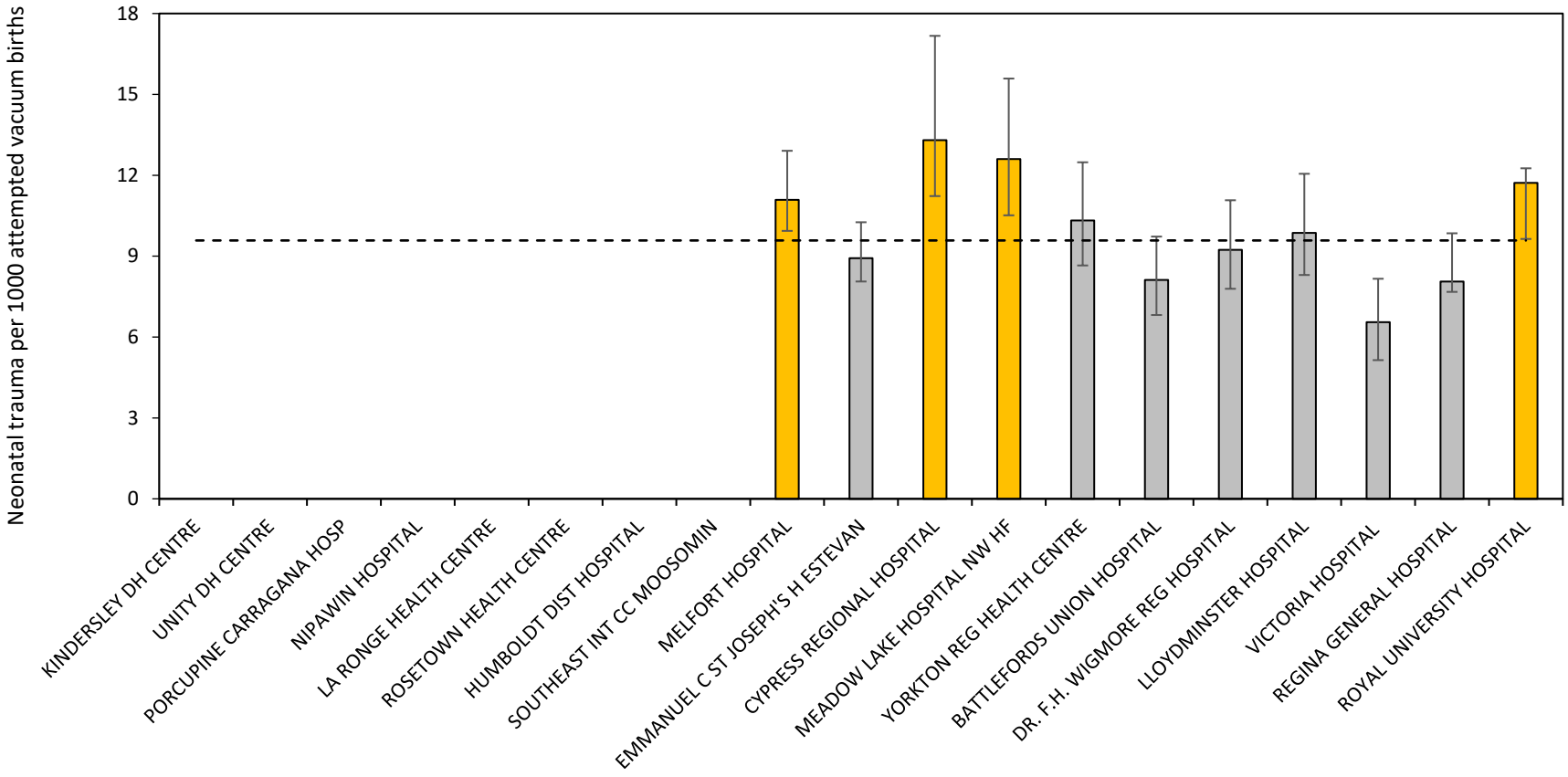
Figure 26 below shows stabilized and adjusted rates of neonatal trauma following attempted vacuum delivery in each hospital in Saskatchewan (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 25. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 1, 2 and 4 hospitals, Saskatchewan, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 26. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 1, 2 and 4 hospitals, Saskatchewan, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.3.6. Saskatchewan hospitals: Failed vacuum deliveries

Hospital-specific rates of attempted vacuum and the 3 types of failed vacuum delivery in Saskatchewan are listed below.

Table 64. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Saskatchewan, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital Name	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rat
1	Emmanuel H St. Joseph's Hosp Estevan	1,333	231	17.3	40	17.3	[redacted]	[redacted]	0	0.0
1	Total	3,276	426	13.0	42	9.9	[redacted]	[redacted]	0	0.0
2	Battlefords Union Hospital and MHC	2,577	379	14.7	35	9.2	6	1.6	[redacted]	[redacted]
2	Dr. F.H. Wigmore Regional Hospital	2,529	421	16.6	9	2.1	[redacted]	[redacted]	0	0.0
2	Lloydminster Hospital	4,391	437	10.0	52	11.9	8	1.8	[redacted]	[redacted]
2	Meadow Lake Hospital	761	118	15.5	[redacted]	[redacted]	16	13.6	0	0.0
2	Victoria Hospital and Reg MHC	7,488	552	7.4	36	6.5	11	2.0	[redacted]	[redacted]
2	Yorkton Regional Mental H Centre	3,257	322	9.9	31	9.6	6	1.9	[redacted]	[redacted]
2	Total	23,652	2,441	10.3	171	7.0	53	2.2	10	0.4
4	Regina General Hospital	19,440	2,110	10.9	181	8.6	34	1.6	10	0.5
4	Royal University Hospital	25,085	3,926	15.7	364	9.3	88	2.2	41	1.0
4	Total	44,525	6,036	13.6	545	9.0	122	2.0	51	0.8
All Tiers/Hospitals, Saskatchewan		71,626	8,919	12.5	762	8.5	178	2.0	61	0.7

Small cells (<5) suppressed.

*Rates of failed vacuum (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.

3.4.4.1. Manitoba hospitals: Within-tier hospital-specific trauma rates following attempted forceps delivery

Tables 65 to 68 below list the numbers and rates of attempted forceps delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Manitoba.

Table 65. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 0 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Altona Community Memorial	11	0	0.0	0	0.0	11	0	0.0	0	0.0
Arborg Districts Health Centre	6	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Beausejour District Hospital	[redacted]	0	0.0	0	0.0	0	0	0.0	0	0.0
Churchill Health Centre	[redacted]	0	0.0	0	0.0	0	0	0.0	0	0.0
Concordia Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Deloraine Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
E. M. Crowe Memorial Hospital	5	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Gimli Community Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Grace Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Hamiota District Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Lakeshore Health Centre	8	0	0.0	0	0.0	6	0	0.0	0	0.0
Lynn Lake Hospital	7	[redacted]	[redacted]	0	0.0	7	[redacted]	[redacted]	[redacted]	[redacted]
Melita Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Minnedosa District Hospital	6	0	0.0	0	0.0	6	0	0.0	0	0.0
Norway House Hospital	42	0	0.0	0	0.0	41	0	0.0	0	0.0
Percy E. Moore Hospital	24	0	0.0	0	0.0	23	0	0.0	0	0.0
Pinawa Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Pine Falls Health Complex	13	0	0.0	0	0.0	13	0	0.0	0	0.0
Russell Health Centre	5	0	0.0	0	0.0	5	0	0.0	0	0.0
Souris Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0

Table 65 (cont). Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 0 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma (forceps)		Births* (No CA)	Attempted forceps births		Neonatal trauma (forceps)	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Ste. Rose General Hospital	11	0	0.0	0	0.0	10	0	0.0	0	0.0
Stonewall District Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Swan River Valley Hospital	19	[redacted]	[redacted]	0	0.0	19	[redacted]	[redacted]	[redacted]	[redacted]
Teulon/Hunter Mem Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Victoria General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Virden District Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Total	179	[redacted]	[redacted]	0	0.0	169	[redacted]	[redacted]	[redacted]	[redacted]

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 66. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 1 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Notre Dame Hospital	92	[redacted]	[redacted]	0	0.0	90	[redacted]	[redacted]	[redacted]	[redacted]
Total	92	[redacted]	[redacted]	0	0.0	90	[redacted]	[redacted]	[redacted]	[redacted]

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 67. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 2 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Bethesda Hospital	2,391	16	0.7	[redacted]	[redacted]	2,275	14	0.6	0	0.0
Boundary Trails Health Centre	4,596	5	0.1	[redacted]	[redacted]	4,385	5	0.1	0	0.0
Brandon General Hospital	7,376	81	1.1	16	19.8	6,139	67	1.1	[redacted]	[redacted]
Dauphin Regional Health Centre	1,546	[redacted]	[redacted]	[redacted]	[redacted]	1,439	[redacted]	[redacted]	0	0.0
Flin Flon General Hospital	594	[redacted]	[redacted]	[redacted]	[redacted]	566	[redacted]	[redacted]	0	0.0
Neepawa Health Centre	514	0	0.0	0	0.0	491	0	0.0	0	0.0
Portage Dist General Hospital	1,282	0	0.0	0	0.0	1,273	0	0.0	0	0.0
Selkirk Regional Health Centre	1,544	0	0.0	0	0.0	1,442	0	0.0	0	0.0
Ste. Anne Hospital	703	15	2.1	[redacted]	[redacted]	688	14	2.0	0	0.0
The Pas Health Complex	1,874	13	0.7	7	53.8	1,810	13	0.7	[redacted]	[redacted]
Thompson General Hospital	4,191	9	0.2	0	0.0	3,884	7	0.2	0	0.0
Total	26,611	146	0.5	35	24.0	24,392	127	0.5	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

THE PAS HEALTH COMPLEX: 3rd or 4th degree perineal laceration 7.

Table 68. Numbers and rates of attempted forceps deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 3 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Health Sciences Centre Winnipeg	25,145	176	0.7	65	36.9	24,286	171	0.7	[redacted]	[redacted]
St. Boniface General Hospital	26,920	870	3.2	285	32.8	25,972	844	3.2	[redacted]	[redacted]
Total	52,065	1,046	2.0	350	33.5	50,258	1,015	2.0	13	12.8

*Infants with congenital anomalies excluded.

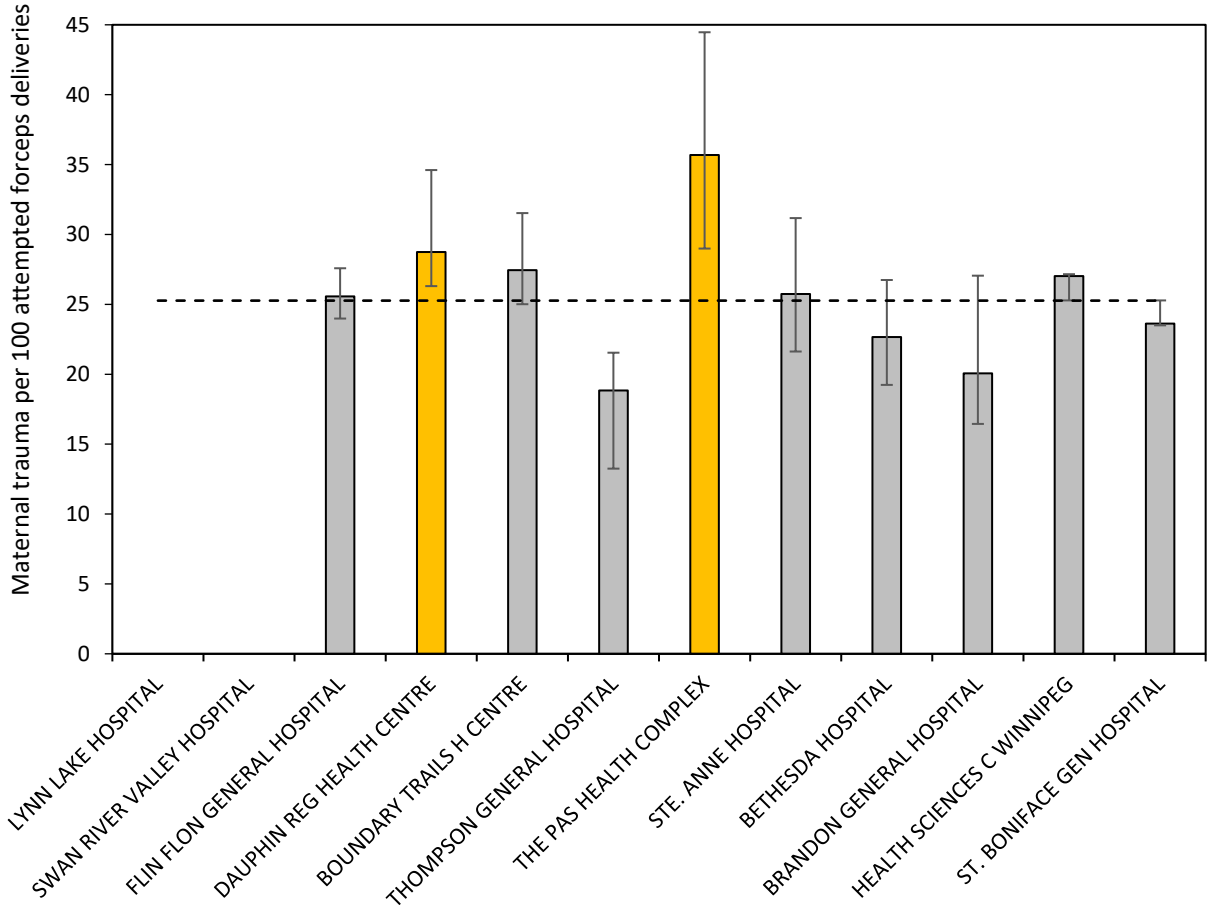
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

3.4.4.2. Manitoba hospital rates vs the reference rate: Trauma rates following attempted forceps delivery

Figures 25 shows stabilized and adjusted rates of maternal trauma following attempted forceps delivery in each hospital in Manitoba (compared with the reference rate for Canada excluding Quebec of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

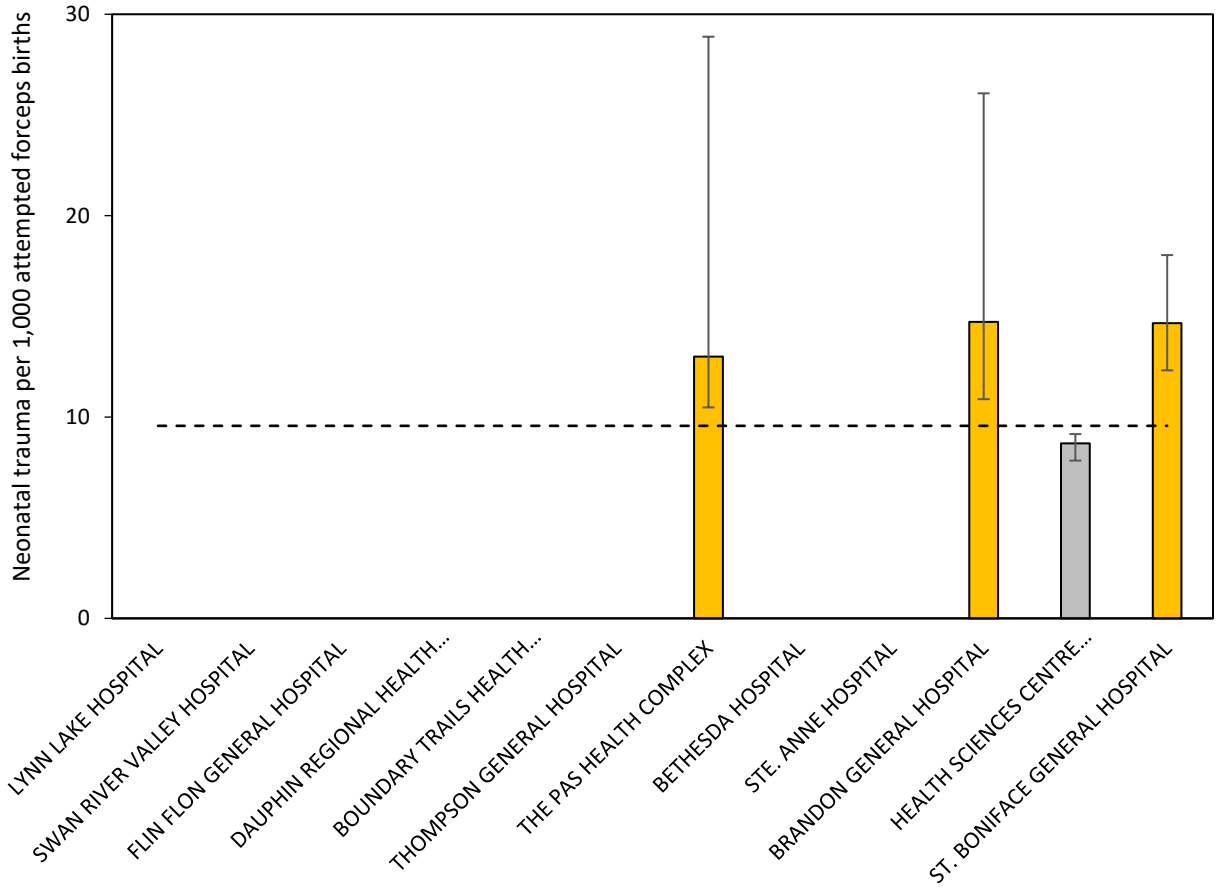
Figures 26 below shows stabilized rates of neonatal trauma following attempted forceps birth in each hospital in Manitoba (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 25. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 0, 2 and 3 hospitals, Manitoba, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 26. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 0, 2 and 3 hospitals, Manitoba, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.4.3. Manitoba hospitals: Failed forceps deliveries

Table 69 lists the rates of attempted and failed forceps delivery (forceps application followed by cesarean delivery) by hospital in Manitoba.

Table 69. Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), Manitoba, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted forceps deliveries		Forceps followed by cesarean delivery*	
			No.	Rate	No.	Rate
2	Brandon General Hospital	7,376	81	1.1	5	6.2
2	Total	26,611	146	0.5	8	5.5
3	Health Sciences Centre	25,145	176	0.7	15	8.5
3	St. Boniface General Hospital	26,920	870	3.2	31	3.6
3	Total	52,065	1,046	2.0	46	4.4
All Tiers/Hospitals, Manitoba		78,947	1,194	1.5	54	4.5

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries.

3.4.4.4. Manitoba hospitals: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 70 to 73 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Manitoba.

Table 70. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 0 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Altona Community Memorial	11	[redacted]	[redacted]	0	0.0	11	[redacted]	[redacted]	0	0.0
Arborg Districts Health Centre	6	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Beausejour District Hospital	[redacted]	0	0.0	0	0.0	0	0	0.0	0	0.0
Churchill Health Centre	[redacted]	0	0.0	0	0.0	0	0	0.0	0	0.0
Concordia Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Deloraine Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
E. M. Crowe Memorial Hospital	5	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Gimli Community Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Grace Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Hamiota District Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Lakeshore Health Centre	8	0	0.0	0	0.0	6	0	0.0	0	0.0
Lynn Lake Hospital	7	0	0.0	0	0.0	7	0	0.0	0	0.0
Melita Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Minnedosa District Hospital	6	0	0.0	0	0.0	6	0	0.0	0	0.0
Norway House Hospital	42	0	0.0	0	0.0	41	0	0.0	0	0.0
Percy E. Moore Hospital	24	0	0.0	0	0.0	23	0	0.0	0	0.0
Pinawa Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Pine Falls Health Complex	13	0	0.0	0	0.0	13	0	0.0	0	0.0
Russell Health Centre	5	0	0.0	0	0.0	5	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 70 (cont). Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal birth trauma in tiers of obstetric service 0 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Souris Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Ste. Rose General Hospital	11	0	0.0	0	0.0	10	0	0.0	0	0.0
Stonewall District Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Swan River Valley Hospital	19	0	0.0	0	0.0	19	0	0.0	0	0.0
Teulon/Hunter Mem Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Victoria General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Virden District Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Total	179	[redacted]	[redacted]	0	0.0	169	[redacted]	[redacted]	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 71. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 1 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Notre Dame Hospital	92	[redacted]	[redacted]	0	0.0	90	[redacted]	[redacted]	0	0.0
Total	92	[redacted]	[redacted]	0	0.0	90	[redacted]	[redacted]	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 72. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 2 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Bethesda Hospital	2,391	51	2.1	8	15.7	2,275	48	2.1	[redacted]	[redacted]
Boundary Trails Health Centre	4,596	144	3.1	31	21.5	4,385	138	3.1	[redacted]	[redacted]
Brandon General Hospital	7,376	676	9.2	102	15.1	6,139	572	9.3	[redacted]	[redacted]
Dauphin Regional Health Centre	1,546	126	8.2	20	15.9	1,439	115	8	[redacted]	[redacted]
Flin Flon General Hospital	594	66	11.1	[redacted]	[redacted]	566	65	11.5	[redacted]	[redacted]
Neepawa Health Centre	514	41	8	[redacted]	[redacted]	491	39	7.9	0	0.0
Portage District Ge Hospital	1,282	37	2.9	[redacted]	[redacted]	1,273	36	2.8	[redacted]	[redacted]
Selkirk Regional Health Centre	1,544	117	7.6	11	9.4	1,442	107	7.4	[redacted]	[redacted]
Ste. Anne Hospital	703	9	1.3	[redacted]	[redacted]	688	9	1.3	0	0.0
The Pas Health Complex	1,874	202	10.8	39	19.3	1,810	196	10.8	0	0.0
Thompson General Hospital	4,191	288	6.9	10	3.5	3,884	261	6.7	[redacted]	[redacted]
Total	26,611	1,757	6.6	230	13.1	24,392	1,586	6.5	14	8.8

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

BOUNDARY TRAILS HEALTH CENTRE: 3rd or 4th degree perineal lacerations 25; Cervical tears or high vaginal lacerations 7; Other pelvic trauma [redacted].

THE PAS HEALTH COMPLEX: 3rd or 4th degree perineal lacerations 33; Cervical tears or high vaginal lacerations [redacted]; Other pelvic trauma [redacted]; Repair of the urethra or bladder [redacted].

DAUPHIN REGIONAL HEALTH CENTRE: Injury to the long bones [redacted]; Neonatal deaths [redacted].

Table 73. Numbers and rates of attempted vacuum deliveries and rates of maternal and neonatal trauma in tiers of obstetric service 3 hospitals, Manitoba, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Health Sciences Centre Winnipeg	25,145	2,680	10.7	438	16.3	24,286	2,572	10.6	28	10.9
St. Boniface General Hospital	26,920	791	2.9	129	16.3	25,972	764	2.9	7	9.2
Total	52,065	3,471	6.7	567	16.3	50,258	3,336	6.6	35	10.5

*Infants with congenital anomalies excluded.

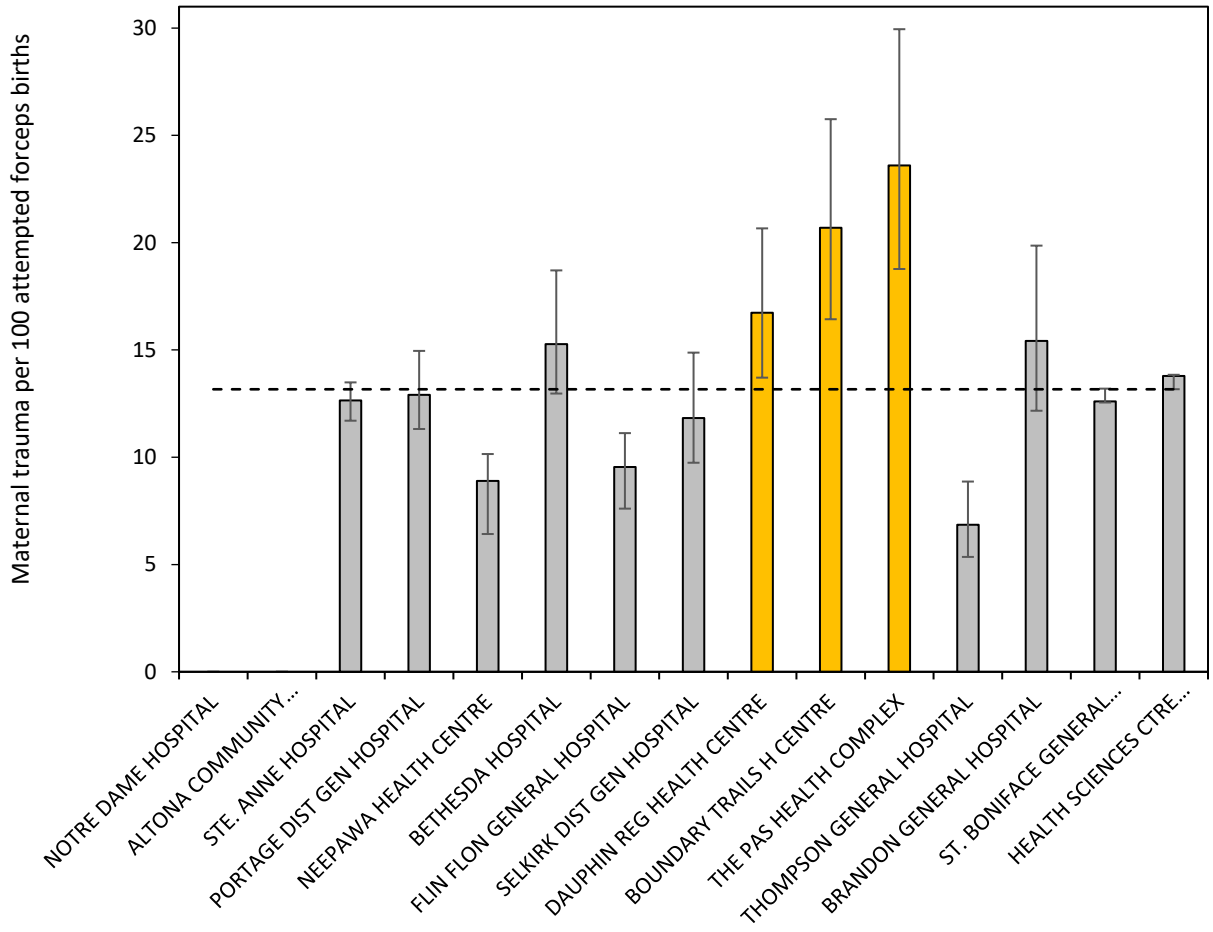
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

3.4.4.5. Manitoba hospital rates vs the reference: Trauma rates following attempted vacuum delivery

Figure 27 below shows stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in Manitoba (compared with the reference rate for Canada excluding Quebec of 13.2 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

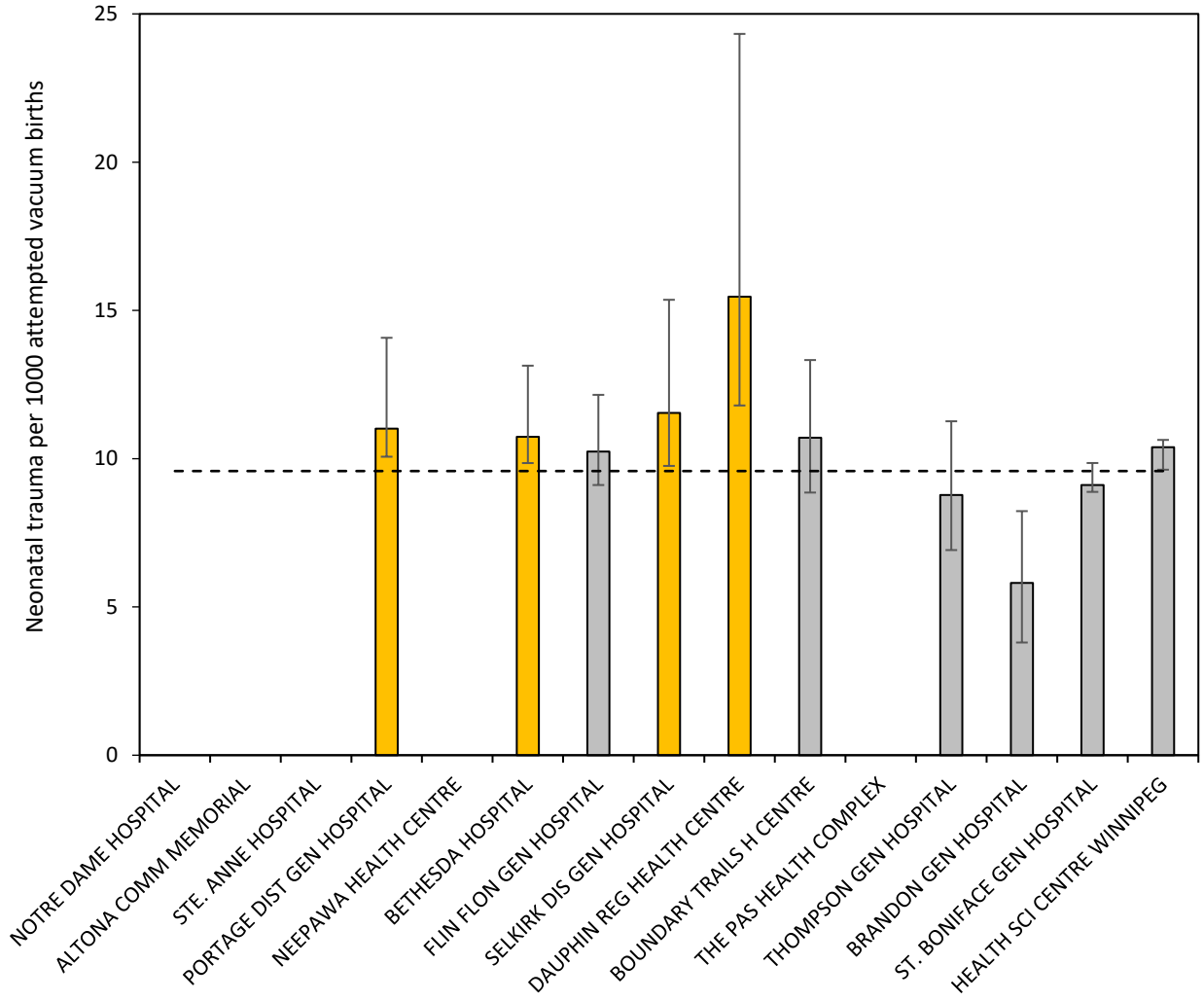
Figure 28 below shows stabilized and adjusted rates of neonatal trauma following attempted vacuum birth in each hospital in Manitoba (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 27. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum births in tier of obstetric service 0, 1, 2 and 3 hospitals, Manitoba, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 28. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 0, 1, 2 and 3 hospitals, Manitoba, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.4.6. Manitoba hospitals: Failed vacuum deliveries

Hospital-specific rates of attempted vacuum delivery and the 3 types of failed vacuum delivery in Manitoba are listed below.

Table 74. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Manitoba, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
2	Bethesda Hospital	2,391	51	2.1	[redacted]	[redacted]	6	11.8	0	0.0
2	Boundary Trails Health Centre	4,596	144	3.1	[redacted]	[redacted]	11	7.6	0	0.0
2	Brandon General Hospital	7,376	676	9.2	71	10.5	5	0.7	[redacted]	[redacted]
2	Selkirk Regional Health Centre	1,544	117	7.6	[redacted]	[redacted]	5	4.3	0	0.0
2	The Pas Health Complex	1,874	202	10.8	5	2.5	[redacted]	[redacted]	[redacted]	[redacted]
2	Thompson General Hospital	4,191	288	6.9	6	2.1	[redacted]	[redacted]	0	0.0
2	Total	26,611	1,757	6.6	92	5.2	39	2.2	[redacted]	0.2
3	Health Sciences Centre	25,145	2,680	10.7	189	7.1	68	2.5	15	0.6
3	St. Boniface General Hospital	26,920	791	2.9	71	9.0	16	2.0	[redacted]	[redacted]
3	Total	52,065	3,471	6.7	260	7.5	84	2.4	1[redacted]	0.5
All Tiers/Hospitals, Manitoba		78,947	5,231	6.6	353	6.7	123	2.4	22	0.4

Small cells (<5) suppressed.

*Rates of failed vacuum (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.

3.4.5.1. Ontario hospitals: Within-tier hospital-specific trauma rates following attempted forceps delivery

Tables 75 to 81 below list the numbers and rates of attempted forceps delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Ontario.

Table 75. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 0 hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Atikokan General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Geraldton District Hospital	5	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Hornepayne Community Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Huron Perth HCA Seaforth C H	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Kirkland And District Hospital	7	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Manitoulin HC Mindemoya H site	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
North of Sup HCG Wilson MGH	42	0	0.0	0	0.0	42	0	0.0	0	0.0
North Shore HNW Blind R DHC	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Quinte HC North Hastings Dist H	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Quinte HC Prince Edward C Mem	6	0	0.0	0	0.0	5	0	0.0	0	0.0
University Health Network	[redacted]	0	0.0	0	0.0	0	0	0.0	0	0.0
Weeneebayko AHA Attawapiskat	7	0	0.0	0	0.0	6	0	0.0	0	0.0
Wingham and District Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Total	76	0	0.0	0	0.0	68	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 76. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1a hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Alexandra Marine Gen Hospital	564	0	0.0	0	0.0	332	0	0.0	0	0.0
Dryden Regional Health Centre	555	0	0.0	0	0.0	506	0	0.0	0	0.0
Hanover and District Hospital	634	[redacted]	0.6	[redacted]	[redacted]	587	[redacted]	[redacted]	0	0.0
Huron Perth HCA Clinton Pub H	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Lady Dunn Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Listowel Memorial Hospital	853	0	0.0	0	0.0	360	0	0.0	0	0.0
Manitoulin HC Little Curr Site	201	0	0.0	0	0.0	192	0	0.0	0	0.0
Mics Group HS Lady Minto Hosp	20	0	0.0	0	0.0	19	0	0.0	0	0.0
North Sup HC Grp McCausland H	12	0	0.0	0	0.0	12	0	0.0	0	0.0
North Sup HC Grp Wilson MGH	36	0	0.0	0	0.0	33	0	0.0	0	0.0
North Wel HCC Louise Marsh H	192	0	0.0	0	0.0	189	0	0.0	0	0.0
North Wel HCC Palmerston DH	367	0	0.0	0	0.0	361	0	0.0	0	0.0
Red Lake Margaret C M H	84	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Renfrew Victoria Hospital	78	0	0.0	0	0.0	74	0	0.0	0	0.0
Sensenbrenner Hospital	415	0	0.0	0	0.0	401	0	0.0	0	0.0
St. Joseph's GH Elliot Lake	346	[redacted]	[redacted]	0	0.0	336	[redacted]	[redacted]	0	0.0
Strathroy Middlesex Gen Hosp	567	14	2.5	[redacted]	[redacted]	526	12	2.3	0	0.0
Weeneebayko AHA Moose F S	221	0	0.0	0	0.0	123	0	0.0	0	0.0
Total	5158	21	0.4	5	23.8	4065	19	0.5	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

HANOVER AND DISTRICT HOSPITAL: 3rd or 4th degree perineal lacerations [redacted]; Cervical or high vaginal laceration [redacted]; Other pelvic trauma [redacted].

Table 77. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1b hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Almonte General Hospital	1,927	92	4.8	22	23.9	1,820	81	4.5	0	0.0
Brockville G Charles St Site	1,671	23	1.4	7	30.4	1,525	20	1.3	0	0.0
Collingwood Gen Marine Hosp	2,615	64	2.4	12	18.8	2,574	63	2.4	0	0.0
Cornwall CH McConnell Ave S	2,557	7	0.3	[redacted]	[redacted]	2,432	6	0.2	0	0.0
Erie Shores H Leamington DMH	1,492	33	2.2	[redacted]	[redacted]	1,358	28	2.1	[redacted]	[redacted]
Georgian Bay GH Midland Site	733	9	1.2	[redacted]	[redacted]	718	9	1.3	0	0.0
Groves Mem Community Hospital	2,109	0	0.0	0	0.0	1,944	0	0.0	0	0.0
Halton HCS Georgetown Hosp	826	32	3.9	[redacted]	12.5	791	32	4.0	0	0.0
Hamilton HS West Lincoln M H	3,431	263	7.7	62	23.6	3,320	254	7.7	[redacted]	[redacted]
Headwaters Health Care Centre	3,748	77	2.1	11	14.3	3,593	73	2.0	[redacted]	[redacted]
Hôpital Gén De Hawkesbury DGH	2,119	9	0.4	[redacted]	[redacted]	2,029	9	0.4	0	0.0
Hôpital Notre-Dame Hospital	276	0	0.0	0	0.0	270	0	0.0	0	0.0
Lake of the Woods Dist Hosp	1,005	0	0.0	0	0.0	943	0	0.0	0	0.0
Lakeridge Health Port Perry S	1,169	0	0.0	0	0.0	1,008	0	0.0	0	0.0
Muskoka Algonq HC Huntsv DMH	821	[redacted]	[redacted]	[redacted]	100.0	772	[redacted]	[redacted]	0	0.0
Muskoka Algonq HC S Muskoka	538	0	0.0	0	0.0	523	0	0.0	0	0.0
Norfolk General Hospital	1,561	[redacted]	[redacted]	[redacted]	100.0	1,481	[redacted]	[redacted]	0	0.0
Northumberland Hills Hospital	2,525	65	2.6	7	10.8	2,419	60	2.5	0	0.0
Pembroke Regional Hospital Inc.	3,468	86	2.5	21	24.4	2,948	73	2.5	0	0.0
Perth Smiths Falls DH Smiths F S	1,482	[redacted]	[redacted]	0	0.0	1,432	[redacted]	[redacted]	0	0.0
Quinte HC Belleville Gen Hosp	6,793	128	1.9	15	11.7	5,476	98	1.8	0	0.0
Riverside HCFI La Verendrye H	828	0	0.0	0	0.0	783	0	0.0	0	0.0
Ross Memorial Hospital	1,606	13	0.8	0	0.0	1,545	13	0.8	0	0.0
Sioux Lookout Meno Ya Win HC	1,980	0	0.0	0	0.0	1,850	0	0.0	0	0.0

Table 77 (cont.). Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1b hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
South Bruce Grey HC Walkerton	2155	0	0.0	0	0.0	2009	0	0.0	0	0.0
Stevenson Memorial Hospital	1901	41	2.2	[redacted]	[redacted]	1816	38	2.1	0	0.0
Temiskaming Hospital	1363	0	0.0	0	0.0	1288	0	0.0	0	0.0
West Lincoln Memorial Hospital	694	33	4.8	6	18.2	680	31	4.6	0	0.0
West Parry Sound Health Centre	465	[redacted]	[redacted]	0	0.0	436	[redacted]	[redacted]	0	0.0
Winchester District Mem Hosp	3,687	8	0.2	[redacted]	[redacted]	3,463	8	0.2	0	0.0
Woodstock General Hospital	4,353	324	7.4	61	18.8	4,143	307	7.4	[redacted]	[redacted]
Total	61,898	1,313	2.1	246	18.7	57,389	1,209	2.1	5	4.1

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

HAMILTON HSCI WEST LINCOLN MH: 3rd or 4th degree perineal lacerations 60; Cervical or high vaginal laceration [redacted]; Other pelvic trauma [redacted].

HEADWATERS HEALTH CARE CENTRE: Skull fracture [redacted]; Injury to the central nervous system or peripheral nervous system [redacted].

Table 78. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2a hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Bluewater Health Sarnia GHS	2,540	87	3.4	10	11.5	2,411	85	3.5	0	0.0
Bluewater Health Mitton Site	2,487	116	4.7	10	8.6	2,410	111	4.6	0	0.0
Cambridge Memorial Hospital	6,687	66	1.0	9	13.6	5,967	60	1.0	0	0.0
Guelph General Hospital	7,674	240	3.1	57	23.8	6,997	216	3.1	[redacted]	[redacted]
Halton HC Services Milton DH	4,671	163	3.5	51	31.3	4,488	153	3.4	[redacted]	[redacted]
Huron Perth HCA Stratford GH	5,190	249	4.8	25	10.0	4,859	236	4.9	[redacted]	[redacted]
Hôpital Montfort	15,390	623	4.0	203	32.6	13,505	537	4.0	[redacted]	[redacted]
Queensway Carleton Hospital	11,242	250	2.2	52	20.8	10,462	235	2.2	[redacted]	[redacted]
St. Thomas Elgin Gen Hospital	3,198	274	8.6	19	6.9	3,032	261	8.6	5	19.2
Timmins and District Hospital	3,183	79	2.5	12	15.2	2,948	75	2.5	[redacted]	[redacted]
Total	62,262	2,147	3.4	448	20.9	57,079	1,969	3.4	19	9.6

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

HALTON HCS MILTON DIST HOSPITAL: 3rd or 4th degree perineal lacerations 46; Cervical/high vaginal laceration 6; other pelvic trauma [redacted].

HÔPITAL MONTFORT: 3rd or 4th degree perineal lacerations 191; Cervical or high vaginal laceration 14; other pelvic trauma [redacted].

TIMMINS AND DISTRICT HOSPITAL: Intracranial hemorrhage [redacted]; Skull fracture [redacted]; Injury to the central nervous system or peripheral nervous system [redacted]; Seizures [redacted]; Neonatal deaths [redacted].

Table 79. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2b hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Brant Community HCS BGH	6,349	23	0.4	6	26.1	6,186	21	0.3	0	0.0
Chatham-Kent HA Chatham C	1,902	33	1.7	8	24.2	1,772	30	1.7	0	0.0
Chatham-Kent HA Public GH	2,105	107	5.1	19	17.8	2,010	104	5.2	[redacted]	[redacted]
Grand River Hosp K-W H Centre	19,765	1,059	5.4	135	12.7	18,860	1,002	5.3	16	16.0
Grey Bruce HS Owen Sound H	3,258	26	0.8	10	38.5	3,099	24	0.8	0	0.0
Halton HCS Oakville-Trafalgar	11,116	46	0.4	19	41.3	10,520	45	0.4	[redacted]	[redacted]
Humber River H Church St Site	2,165	39	1.8	6	15.4	2,122	39	1.8	0	0.0
Humber River Hosp Finch St Site	3,437	104	3.0	13	12.5	3,321	101	3.0	[redacted]	[redacted]
Humber River Hosp Wilson Site	9,524	326	3.4	55	16.9	9,139	313	3.4	8	25.6
Joseph Brant Hospital	6,759	583	8.6	98	16.8	6,506	564	8.7	[redacted]	[redacted]
Lakeridge Hlth Ajax Pickering S	3,446	11	0.3	0	0.0	3,293	11	0.3	0	0.0
Niagara HS St. Catharines Site	13,676	180	1.3	22	12.2	12,573	165	1.3	[redacted]	[redacted]
Peterborough Reg Health Centre	7,400	189	2.6	55	29.1	6,890	175	2.5	[redacted]	[redacted]
Rouge Valley HS Ajax Pickering	3,554	8	0.2	[redacted]	[redacted]	3,406	6	0.2	0	0.0
St. Joseph's Healthcare Hamilton	15,728	116	0.7	34	29.3	14,865	104	0.7	0	0.0
The Scarborough H Birchmount C	8,235	80	1.0	38	47.5	7,915	75	0.9	[redacted]	[redacted]
Trillium HP Mississauga Hosp	16,863	120	0.7	25	20.8	16,331	116	0.7	0	0.0
Unity H TO St. Joseph's HC TO	15,539	448	2.9	114	25.4	14,719	423	2.9	5	11.8
Will Osler HS Brampton Civic H	23,146	188	0.8	56	29.8	22,281	180	0.8	0	0.0
Will Osler HS Etobicoke Gen H	12,078	279	2.3	82	29.4	11,597	266	2.3	[redacted]	[redacted]
Total	186,045	3,965	2.1	799	20.2	177,405	3,764	2.1	48	12.8

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

GREY BRUCE HS OWEN SOUND HOSPITAL: 3rd or 4th degree perineal lacerations 9; Cervical or high vaginal laceration [redacted].
HALTON HCS OAKVILLE-TRAFALGAR HOSPITAL: 3rd or 4th degree perineal lacerations 19.
PETERBOROUGH REG HEALTH CENTRE: 3rd or 4th degree perineal lacerations 51; Cervical or high vaginal laceration 6.
ST. JOSEPH'S HEALTHCARE HAMILTON: 3rd or 4th degree perineal lacerations 31; Cervical or high vaginal laceration [redacted]; other pelvic trauma [redacted]; repair of the urethra or bladder [redacted].
SCARBOROUGH HNW BIRCHMOUNT: 3rd or 4th degree perineal lacerations 35; Cervical or high vaginal laceration [redacted].
UNITY HTH TORONTO ST. JOSEPH'S H CENTRE: 3rd or 4th degree perineal lacerations 110; Cervical or high vaginal laceration [redacted]. other pelvic trauma [redacted].
WILLIAM OSLER HS BRAMTON CIVIC HOSPITAL: 3rd or 4th degree perineal lacerations 52; Cervical or high vaginal laceration 5; other pelvic trauma [redacted].
WILLIAM OSLER HS ETOBICOKE GEN HOSPITAL: 3rd or 4th degree perineal lacerations 82; other pelvic trauma [redacted].

Table 80. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2c hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Health Sci N/Horizon Santé-Nord	8,488	138	1.6	36	26.1	8207	133	1.6	[redacted]	[redacted]
Lakeridge Health Oshawa Site	12,195	214	1.8	61	28.5	11,486	199	1.7	[redacted]	[redacted]
Mackenzie H M Richmond Hill H	11,788	312	2.6	27	8.7	11,234	299	2.7	[redacted]	[redacted]
Markham Stouffville Hosp MS	15,271	269	1.8	43	16.0	14,587	251	1.7	[redacted]	[redacted]
Michael Garron Hospital	13,419	79	0.6	28	35.4	12,774	73	0.6	[redacted]	[redacted]
North Bay Reg Health Centre	3,973	71	1.8	8	11.3	3,793	66	1.7	0	0.0
North York Gen H Gen Site	26,456	1,202	4.5	230	19.1	24,016	1,077	4.5	9	8.4
Orillia Soldiers' Mem Hospital	4,258	330	7.8	80	24.2	3,896	304	7.8	[redacted]	[redacted]
Rouge Valley HS RY Centenary	4,859	67	1.4	12	17.9	4,513	64	1.4	0	0.0
Royal Victoria Reg Health Centre	9,442	62	0.7	19	30.6	9,002	58	0.6	0	0.0
Sault Area Hospital	4,132	115	2.8	27	23.5	4,002	111	2.8	[redacted]	[redacted]
Scarborough HNW Centenary	4,655	59	1.3	9	15.3	4,504	55	1.2	0	0.0
Southlake Reg Health Centre	12,566	280	2.2	43	15.4	11,979	262	2.2	[redacted]	[redacted]
The Scarborough H Gen Campus	12,008	331	2.8	90	27.2	11,575	321	2.8	[redacted]	[redacted]
Thunder Bay Reg HS Centre	6,882	92	1.3	15	16.3	6,528	86	1.3	0	0.0
Trillium HP Credit Valley Hosp	23,146	439	1.9	72	16.4	22,199	418	1.9	[redacted]	[redacted]
Windsor Reg H Metro Campus	16,493	1,068	6.5	245	22.9	15,229	981	6.4	6	6.1
Total	190,031	5,128	2.7	1045	20.4	179,524	4,758	2.7	33	6.9

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.
LAKERIDGE HEALTH OSHAWA SITE: 3rd or 4th degree perineal lacerations 55; Cervical or high vaginal laceration 6.
MICHAEL GARRON HOSPITAL: 3rd or 4th degree perineal lacerations 24; Cervical or high vaginal laceration 6; other pelvic trauma [redacted].
ROYAL VICTORIA REG HEALTH CENTRE: 3rd or 4th degree perineal lacerations 19.
SCARBOROUGH HNW GENERAL: 3rd or 4th degree perineal lacerations 85; Cervical or high vaginal laceration 5; other pelvic trauma [redacted].

Table 81. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Hamilton HS McMaster Univ MC	12,409	103	0.8	45	43.7	11,063	96	0.9	[redacted]	[redacted]
Kingston General Hospital	8,606	156	1.8	52	33.3	8,252	149	1.8	[redacted]	[redacted]
London Health Sciences Centre	25,700	1,161	4.5	210	18.1	24,072	1,100	4.6	13	11.8
Sinai HS Mount Sinai Hospital	29,607	1,066	3.6	340	31.9	26,933	968	3.6	13	13.4
St. Michael's Hospital	13,120	160	1.2	52	32.5	12,713	155	1.2	[redacted]	[redacted]
Sunnybrook HSC Sunnybrook C	16,965	497	2.9	140	28.2	16,357	485	3	[redacted]	[redacted]
The Ottawa Hospital Gen C	12,265	434	3.5	115	26.5	11,125	399	3.6	5	12.5
The Ottawa Hospital Civic C	14,166	84	0.6	30	35.7	12,912	75	0.6	[redacted]	[redacted]
Total	132,838	3,661	2.8	984	26.9	123,427	3,427	2.8	44	12.8

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

HAMILTON HS MCMASTER U MED CENTRE: 3rd or 4th degree perineal tears 40; Cervical/high vaginal laceration [redacted]; other pelvic trauma [redacted].

KINGSTON HSC KINGSTON GEN HOSPITAL: 3rd or 4th degree perineal lacerations 47; Cervical or high vaginal laceration 4; other pelvic trauma [redacted].

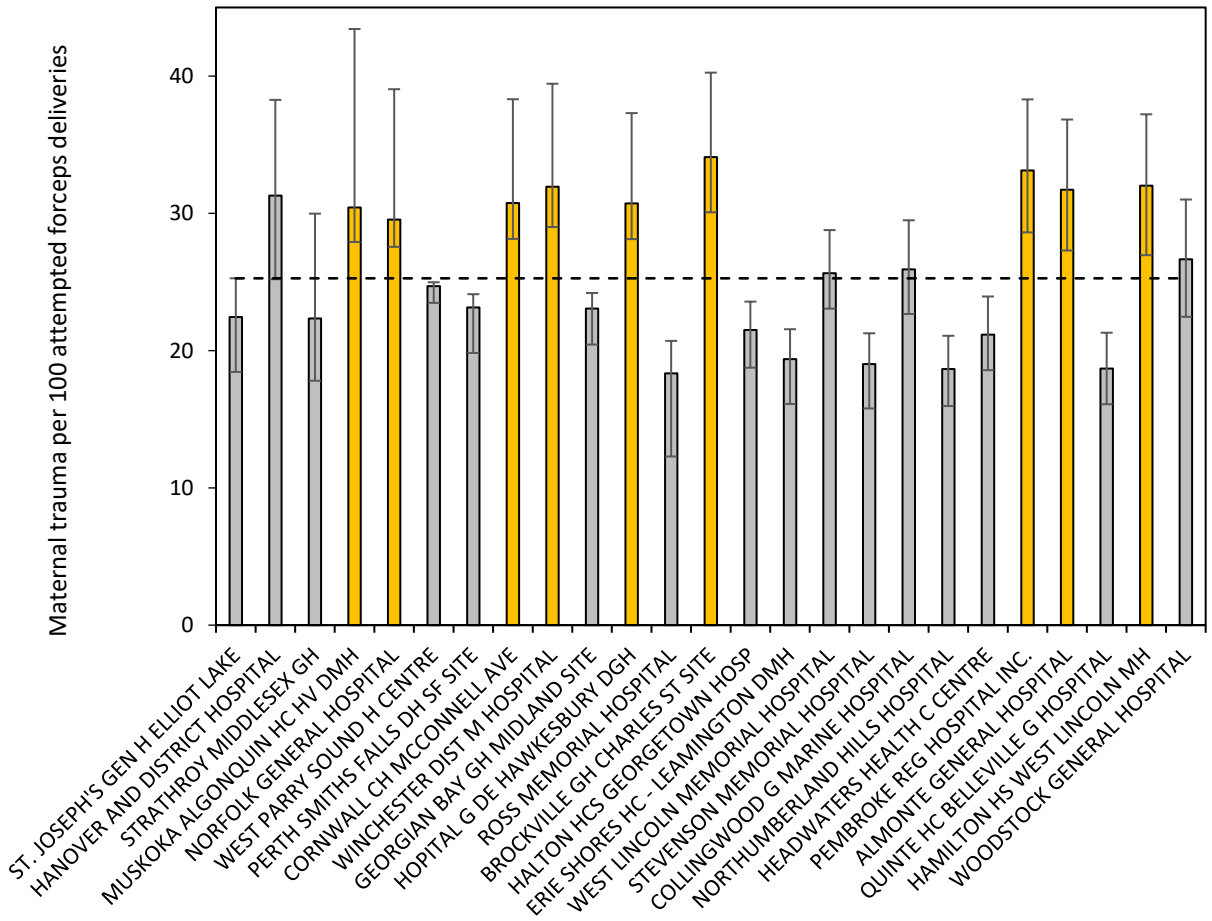
SINAI HLTH SYS MOUNT SINAI HOSPITAL: 3rd or 4th degree perineal lacerations 282; Cervical or high vaginal laceration 79; other pelvic trauma 8; repair of the urethra or bladder [redacted].

3.4.5.2. Ontario hospital rates vs the reference rate: Trauma rates following attempted forceps delivery

Figures 29 to 33 below shows stabilized and adjusted rates of maternal trauma following attempted forceps delivery in each hospital in Ontario (compared with the reference rate for Canada excluding Quebec of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

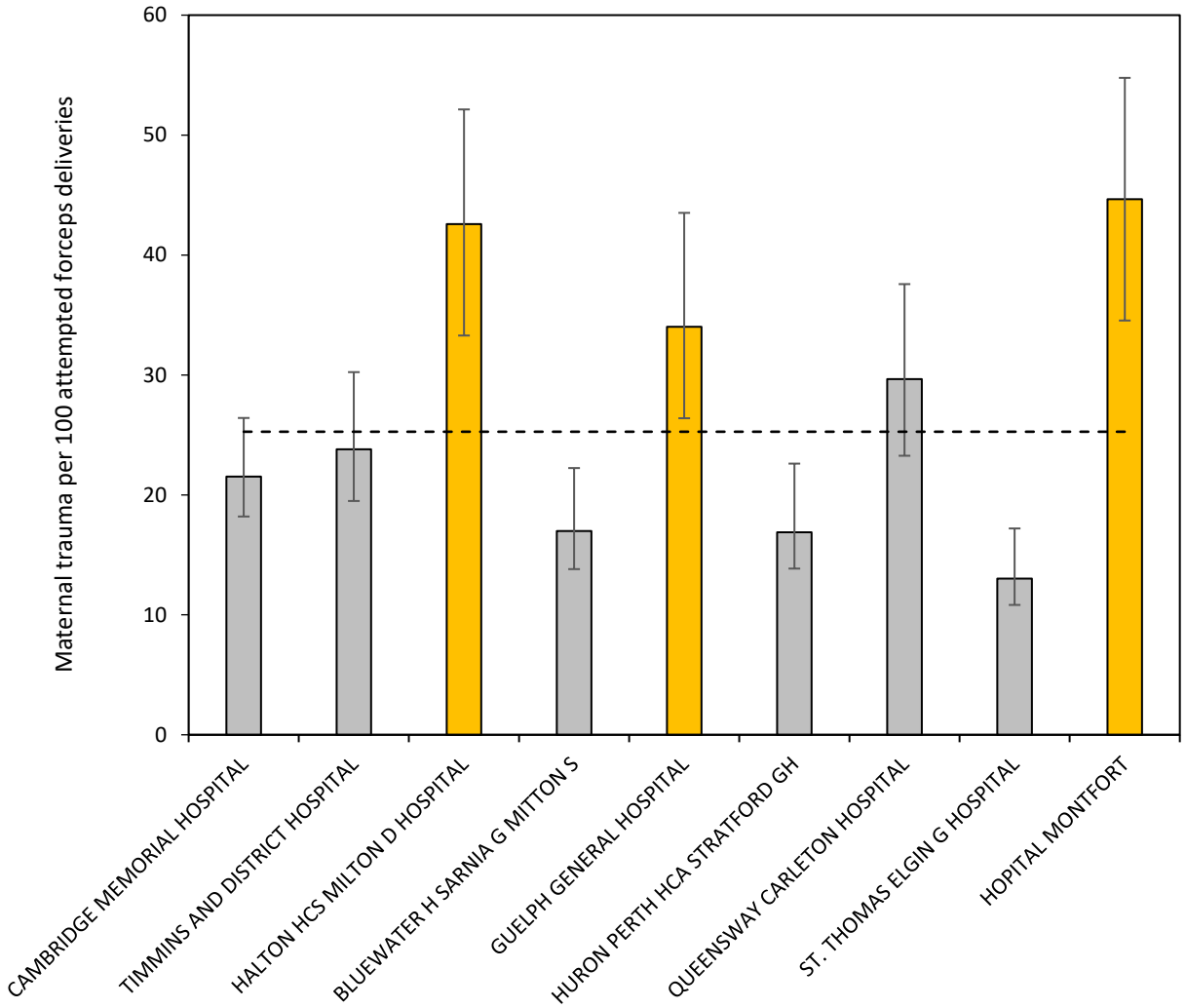
Figures 34 to 37 below shows stabilized rates of neonatal trauma following attempted forceps births in each hospital in Ontario (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 29. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 1a and 1b hospitals, Ontario, April 2013 to March 2019.



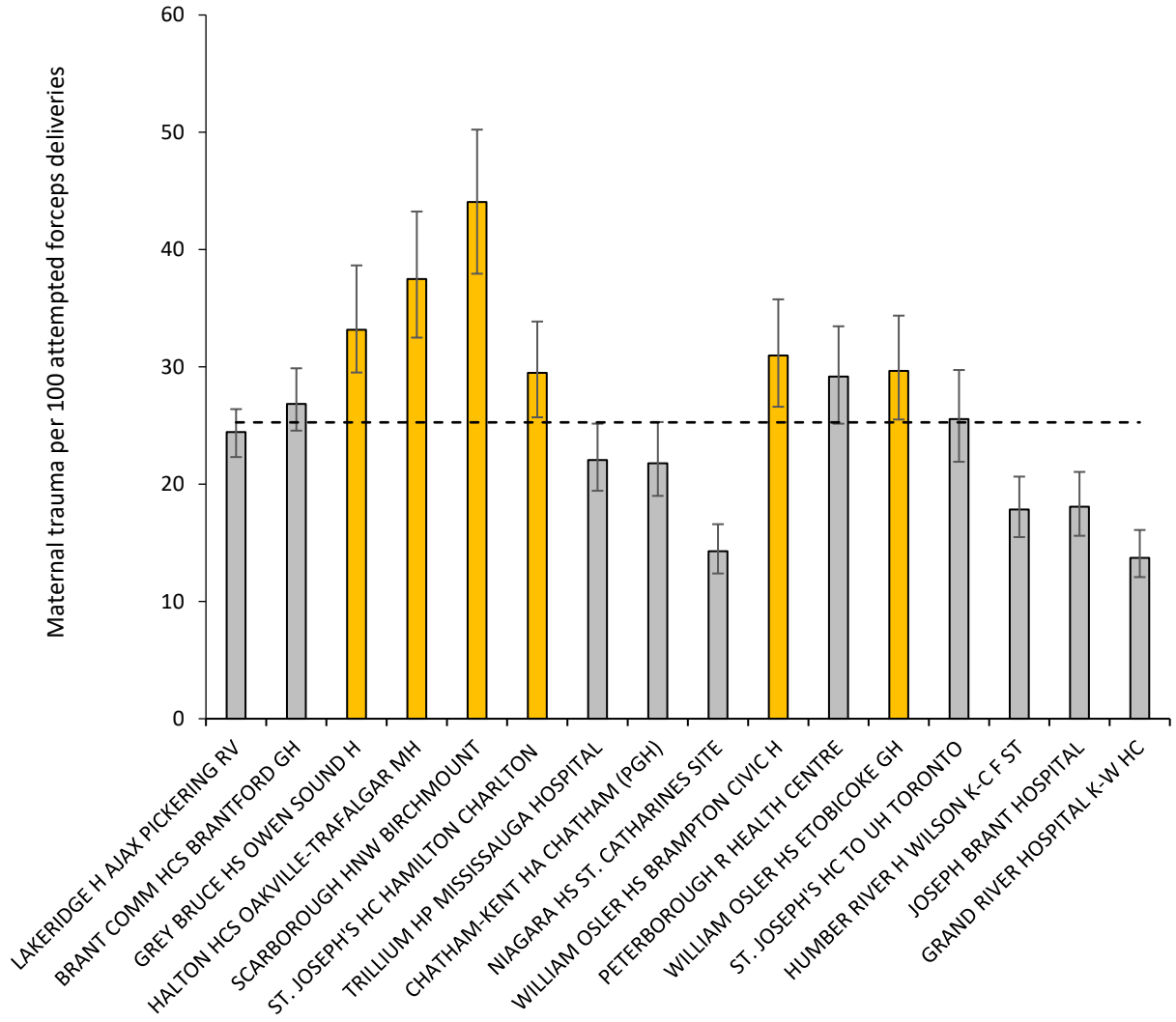
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 30. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2a hospitals, Ontario, April 2013 to March 2019.



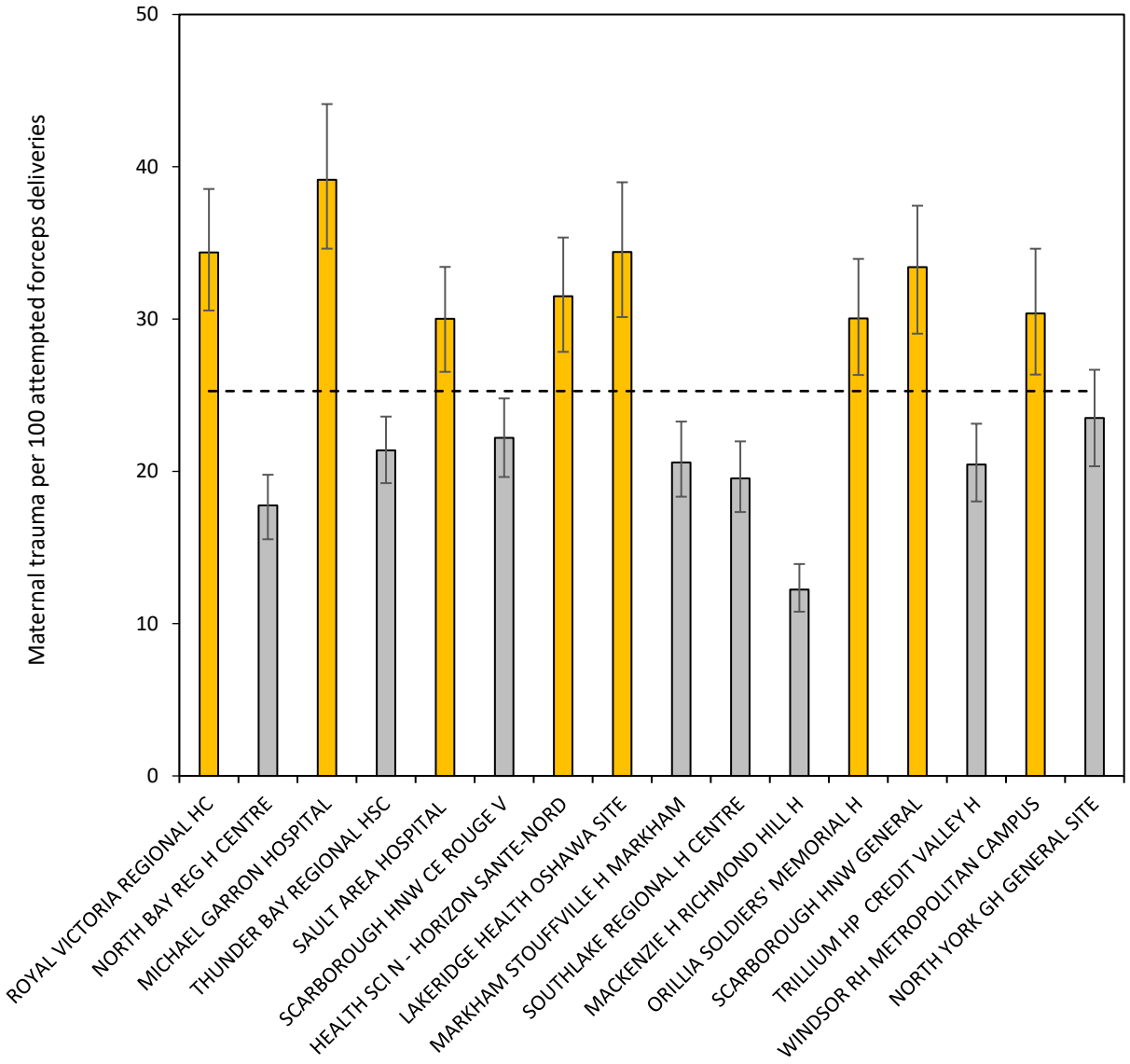
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 31. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2b hospitals, Ontario, April 2013 to March 2019.



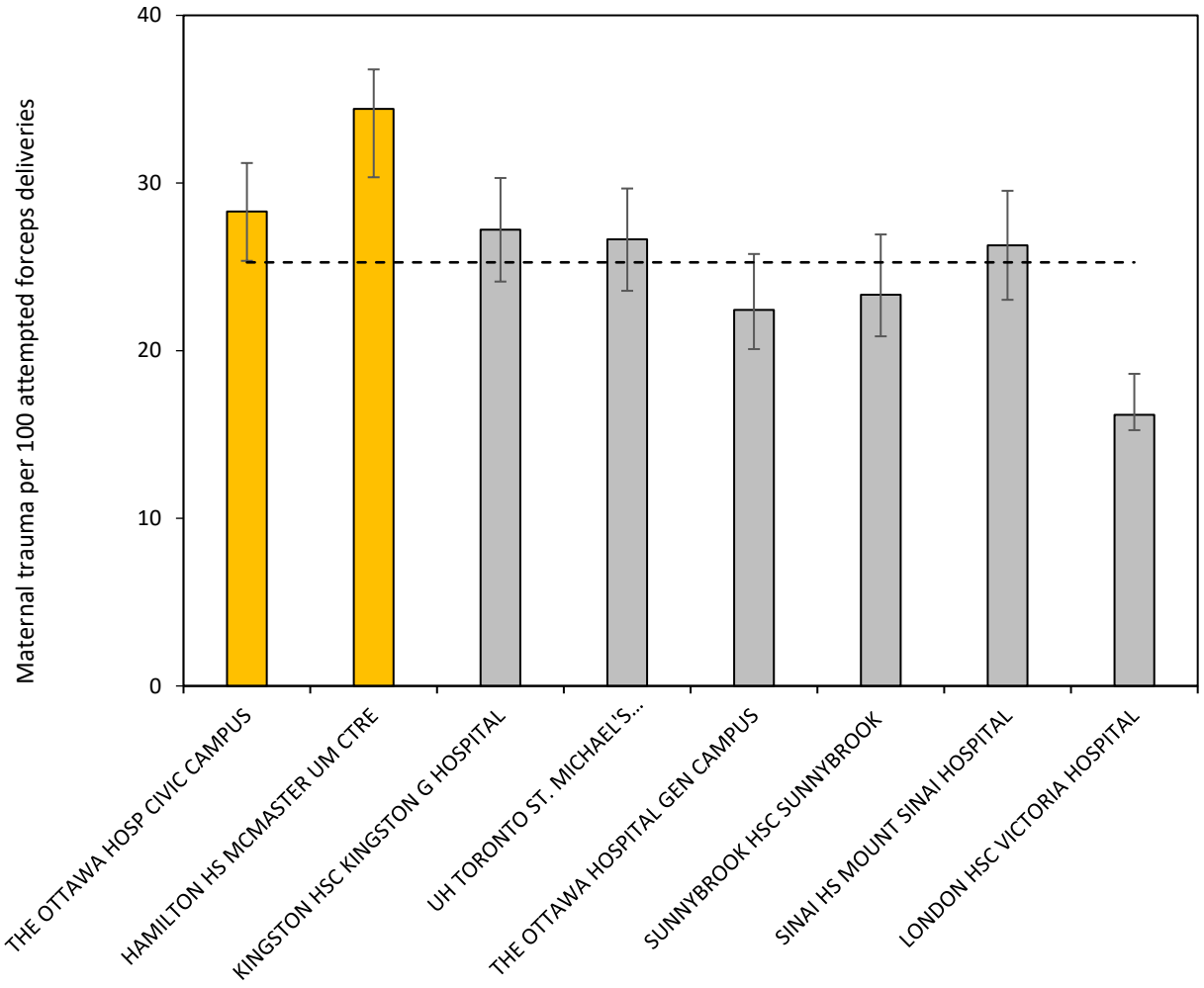
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 32. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2c hospitals, Ontario, April 2013 to March 2019.



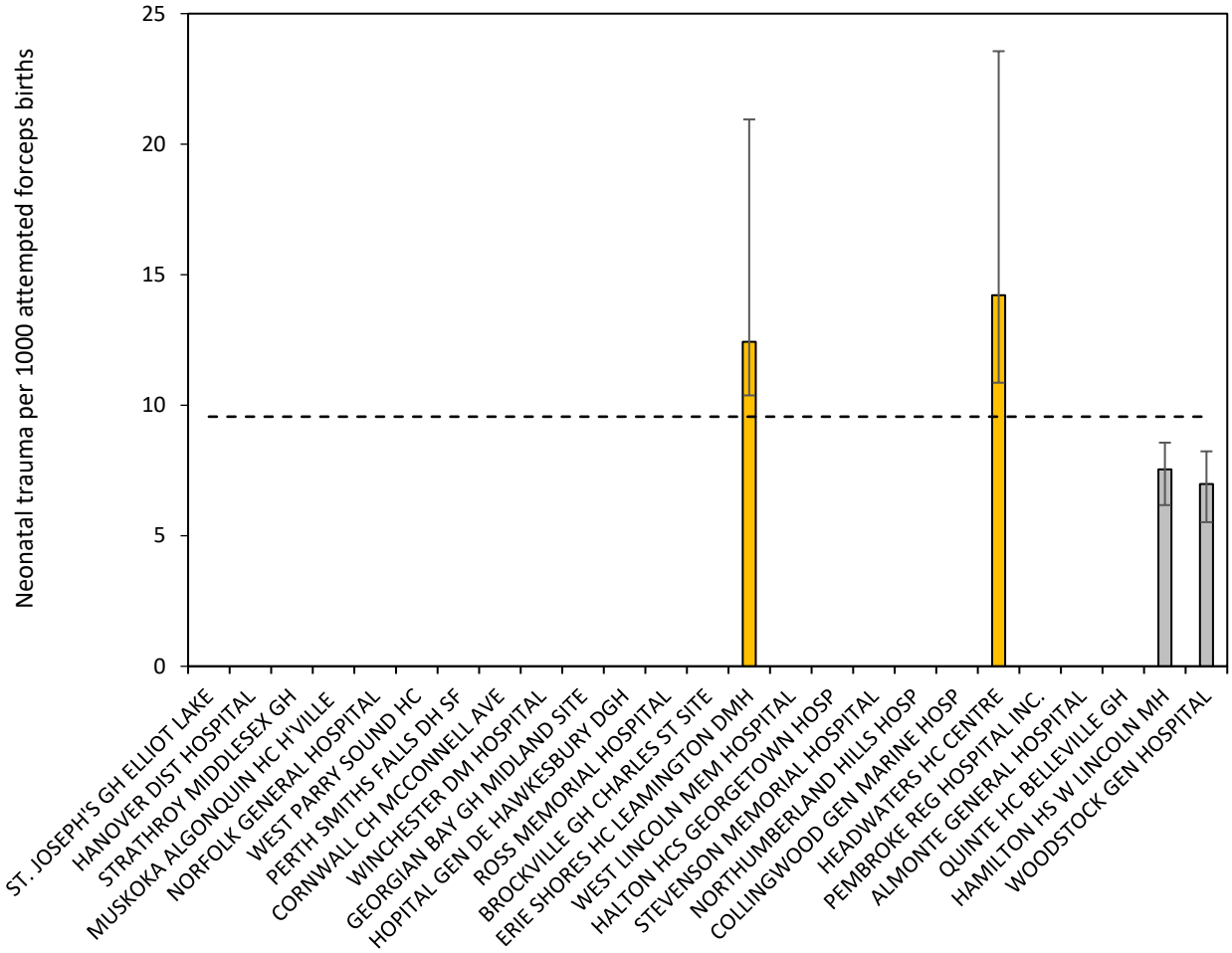
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 33. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 3 hospitals, Ontario, April 2013 to March 2019.



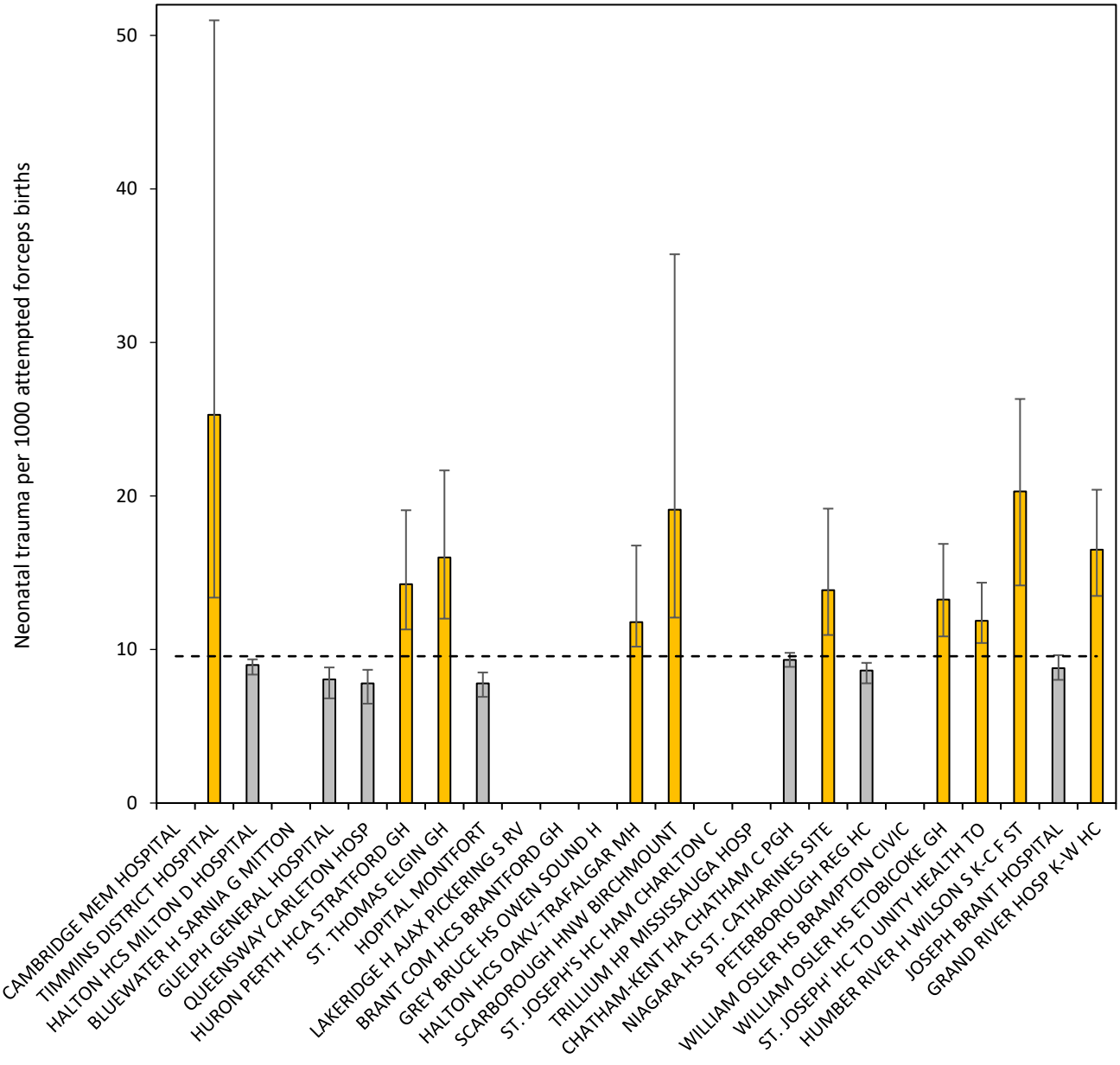
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 34. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps births in tier of obstetric service 1 and 1.5 hospitals, Ontario, April 2013 to March 2019.



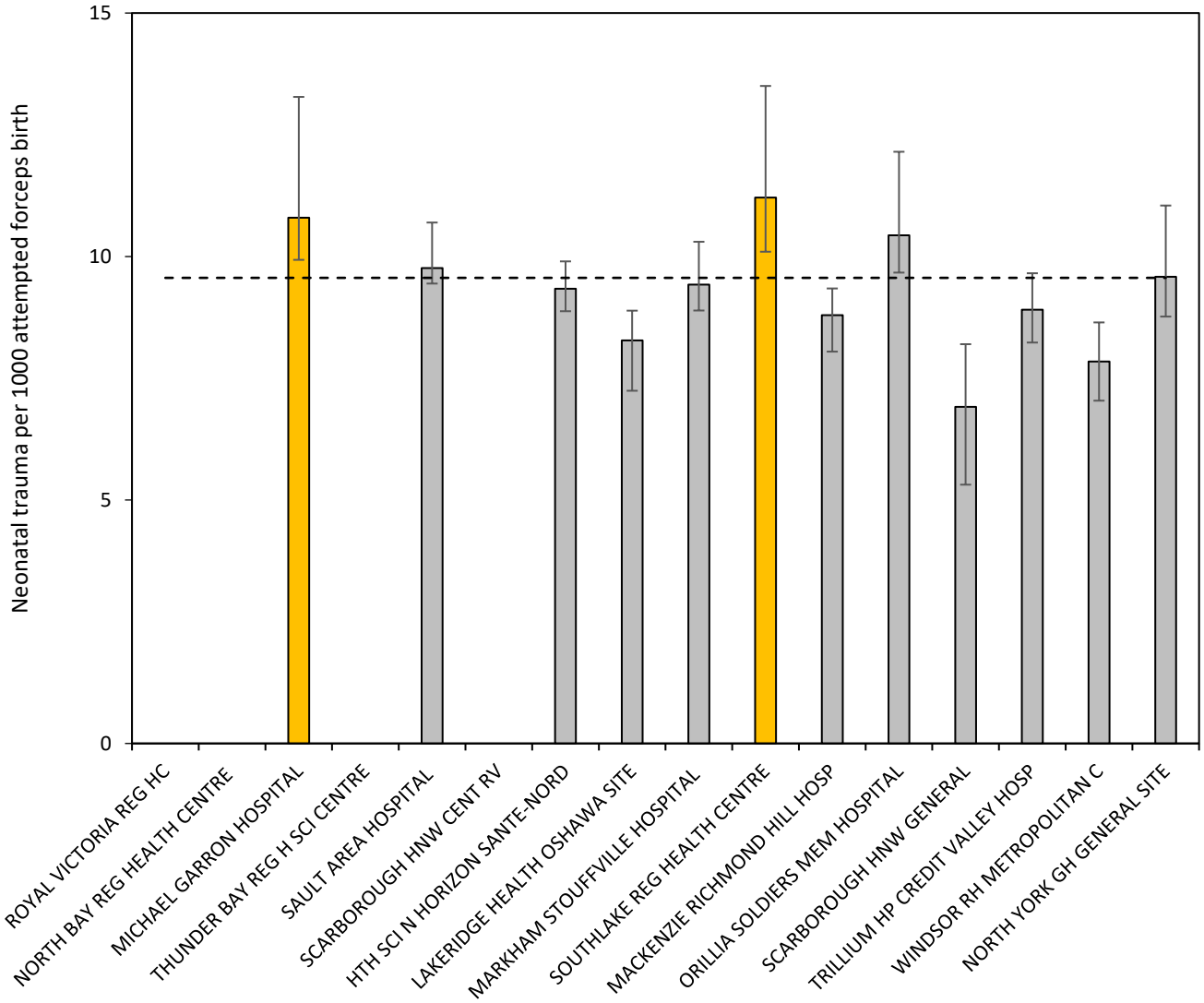
Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 35. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 2a and 2b hospitals, Ontario, April 2013 to March 2019.



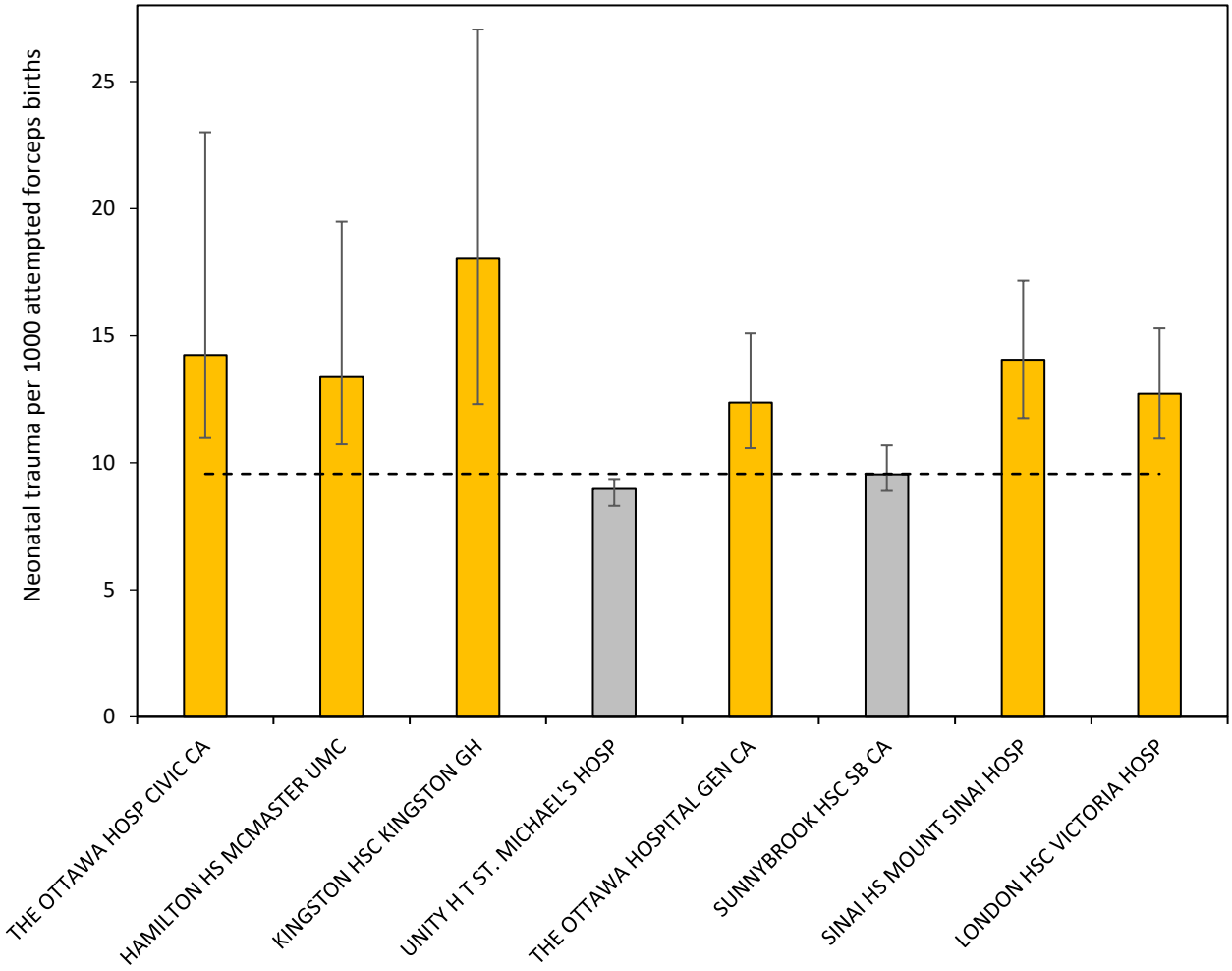
Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 36. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 2c hospitals, Ontario, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 37. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 3 hospitals, Ontario, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.5.3. Ontario hospitals: Failed forceps deliveries

Table 82 lists the rates of attempted and failed forceps delivery (forceps application followed by cesarean delivery) by hospital in Ontario.

Table 82. Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), Ontario, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Singleton deliveries	Attempted forceps deliveries		Forceps followed by cesarean	
			No.	Rate	No.	Rate
1.5	Almonte General Hospital	1,927	92	4.8	7	7.6
1.5	Georgian Bay Gen Hosp— Midland Site	733	9	1.2	7	77.8
1.5	Hamilton HS— West Lincoln Memorial	3,431	263	7.7	10	3.8
1.5	Headwaters Health Care Centre	3,748	77	2.1	5	6.5
1.5	Northumberland Hills Hospital	2,525	65	2.6	9	13.8
1.5	Quinte HC— Belleville Gen Hosp	6,793	128	1.9	9	7.0
1.5	Total	48,258	1,266	2.6	59	4.7
2.0	Cambridge Memorial Hospital	6,687	66	1.0	5	7.6
2.0	Guelph General Hospital	7,674	240	3.1	6	2.5
2.0	Halton HC Services—Milton Dist	4,671	163	3.5	12	7.4
2.0	Huron Perth HCA—Stratford	5,190	249	4.8	9	3.6
2.0	Hôpital Montfort	15,390	623	4.0	19	3.0
2.0	Queensway Carleton Hospital	11,242	250	2.2	8	3.2
2.0	St. Thomas Elgin General Hospital	3,198	274	8.6	7	2.6
2.0	Timmins And District Hospital	3,183	79	2.5	9	11.4
2.0	Total	59,775	2,031	3.4	76	3.7
2.3	Chatham-Kent H Alliance—Public G	2,105	107	5.1	7	6.5
2.3	Grand River Hosp—K-W H Centre	19,765	1,059	5.4	24	2.3
2.3	Halton HCS— Oakville- Trafalgar Mem	11,116	46	0.4	0	0.0
2.3	Humber River Hosp—Wilson Site	9,524	326	3.4	8	2.5
2.3	Peterborough Regional Health Centre	7,400	189	2.6	17	9.0
2.3	St. Joseph's Healthcare Hamilton	15,728	116	0.7	15	12.9
2.3	Unity H Toronto — St. Joseph's Health	15,539	448	2.9	8	1.8
2.3	William Osler HS—Brampton Civic	23,146	188	0.8	8	4.3
2.3	William Osler HS—Etobicoke Gen Hosp	12,078	279	2.3	11	3.9
2.3	Total	182,787	3,939	2.2	116	2.9

Table 82 (cont). Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), Ontario, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Singleton deliveries	Attempted forceps deliveries		Forceps followed by cesarean*	
			No.	Rate	No.	Rate
2.7	Lakeridge Health Oshawa Site	12,195	214	1.8	10	4.7
2.7	Mackenzie H Mackenzie Richmond Hill	11,788	312	2.6	8	2.6
2.7	North York General Hospital Gen Site	26,456	1,202	4.5	18	1.5
2.7	Orillia Soldiers' Memorial Hospital	4,258	330	7.8	6	1.8
2.7	Southlake Regional Health Centre	12,566	280	2.2	13	4.6
2.7	Thunder Bay Regional Health Sciences	6,882	92	1.3	8	8.7
2.7	Trillium Health Partners Credit Valley Hosp	23,146	439	1.9	11	2.5
2.7	Windsor Reg Hosp Metropolitan Campus	16,493	1,068	6.5	16	1.5
2.7	Total	190,031	5,128	2.7	103	2.0
3.0	Hamilton HS McMaster Univ Medical	12,409	103	0.8	6	5.8
3.0	Kingston General Hospital	8,606	156	1.8	10	6.4
3.0	London Health Sciences Centre	25,700	1,161	4.5	35	3.0
3.0	Sinai Health System Mount Sinai Hospital	29,607	1,066	3.6	16	1.5
3.0	The Ottawa Hospital General Campus	12,265	434	3.5	24	5.5
3.0	Total	132,838	3,661	2.8	95	2.6
All Tiers/Hospitals, Ontario		638,308	16,235	2.5	450	2.8

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries.

3.4.5.4. Ontario hospitals: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 83 to 89 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Ontario.

Table 83. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 0 hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Atikokan General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Geraldton District Hospital	5	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Hornepayne Community Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Huron Perth HCA Seaforth CH	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Kirkland and District Hospital	7	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Manitoulin HC Mindemoya HS	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
North of Sup HCG Wilson MGH	42	[redacted]	[redacted]	[redacted]	[redacted]	42	[redacted]	[redacted]	0	0.0
North Shore HNW Blind Riv DHC	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Quinte HC North Hastings DH	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Quinte HC Prince Edward CMH	6	0	0.0	0	0.0	5	0	0.0	0	0.0
University Health Network	[redacted]	0	0.0	0	0.0	0	0	0.0	0	0.0
Weeneebayko AHA Attawapiskat	7	0	0.0	0	0.0	6	0	0.0	0	0.0
Wingham and District Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Total	76	[redacted]	[redacted]	[redacted]	[redacted]	68	[redacted]	[redacted]	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 84. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1a hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Alexandra Marine Gen Hospital	564	55	9.8	7	12.7	332	33	9.9	0	0.0
Dryden Regional Health Centre	555	61	11.0	[redacted]	6.6	506	55	10.9	0	0.0
Hanover And District Hospital	634	31	4.9	[redacted]	9.7	587	29	4.9	0	0.0
Huron Perth HCA— Clinton PH	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Lady Dunn Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Listowel Memorial Hospital	853	23	2.7	[redacted]	8.7	360	5	1.4	0	0.0
Manitoulin HC Little Curr Site	201	5	2.5	0	0.0	192	[redacted]	[redacted]	[redacted]	[redacted]
Mics Group HS Lady Minto H	20	[redacted]	[redacted]	0	0.0	19	[redacted]	[redacted]	0	0.0
North Sup HCG McCausland H	12	[redacted]	[redacted]	0	0.0	12	[redacted]	[redacted]	0	0.0
North Sup HCG Wilson Mem G H	36	0	0.0	0	0.0	33	0	0.0	0	0.0
North We HCC Louise Marshal H	192	9	4.7	0	0.0	189	9	4.8	0	0.0
North We HCC Palmerston D H	367	20	5.4	[redacted]	5.0	361	19	5.3	0	0.0
Red Lake Marg Cochenour M H	84	[redacted]	[redacted]	0	0.0	[redacted]	0	0.0	0	0.0
Renfrew Victoria Hospital	78	7	9.0	0	0.0	74	7	9.5	0	0.0
Sensenbrenner Hospital	415	31	7.5	[redacted]	9.7	401	29	7.2	0	0.0
St. Joseph's GH Elliot Lake	346	6	1.7	0	0.0	336	6	1.8	0	0.0
Strathroy Middlesex Gen H	567	30	5.3	6	20.0	526	27	5.1	0	0.0
Weeneebayko AHA—Moose F S	221	[redacted]	[redacted]	0	0.0	123	[redacted]	[redacted]	0	0.0
Total	5,158	286	5.5	26	9.1	4,065	228	5.6	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

STRATHROY MIDDLESEX GEN HOSP: 3rd or 4th degree perineal lacerations 6.

MANITOULIN HC LITTLE CURRENT SITE: Seizures [redacted].

Table 85. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1b hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births * (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Almonte General Hospital	1,927	85	4.4	19	22.4	1820	82	4.5	[redacted]	[redacted]
Brockville GH Charles St Site	1,671	117	7.0	15	12.8	1525	105	6.9	[redacted]	[redacted]
Collingwood Gen Marine Hosp	2,615	206	7.9	14	6.8	2574	204	7.9	[redacted]	[redacted]
Cornwall CH McConnell Ave S	2,557	248	9.7	25	10.1	2432	239	9.8	[redacted]	[redacted]
Erie Shores H Leamington DMH	1,492	94	6.3	[redacted]	[redacted]	1358	84	6.2	0	0.0
Georgian Bay GH Midland Site	733	177	24.1	7	4.0	718	172	24.0	0	0.0
Groves Mem Community Hospital	2,109	285	13.5	40	14.0	1944	268	13.8	[redacted]	[redacted]
Halton HCS Georgetown Hosp	826	97	11.7	6	6.2	791	93	11.8	0	0.0
Hamilton HS West Lincoln M H	3,431	103	3.0	6	5.8	3320	101	3.0	0	0.0
Headwaters Health Care Centre	3,748	695	18.5	51	7.3	3593	669	18.6	8	12.0
Hôpital Gén De Hawkesbury DGH	2,119	160	7.6	13	8.1	2029	155	7.6	[redacted]	[redacted]
Hôpital Notre-Dame Hospital	276	24	8.7	[redacted]	[redacted]	270	24	8.9	0	0.0
Lake of the Woods Dist Hosp	1,005	75	7.5	7	9.3	943	72	7.6	0	0.0
Lakeridge H Port Perry Site	1,169	67	5.7	[redacted]	[redacted]	1008	58	5.8	[redacted]	[redacted]
Muskoka Algonquin Huntsville H	821	29	3.5	0	0.0	772	26	3.4	0	0.0
Muskoka Algonquin S Muskoka H	538	21	3.9	[redacted]	[redacted]	523	21	4.0	0	0.0
Norfolk General Hospital	1,561	126	8.1	20	15.9	1481	121	8.2	[redacted]	[redacted]
Northumberland Hills Hospital	2,525	303	12.0	8	2.6	2419	284	11.7	[redacted]	[redacted]
Pembroke Regional Hospital Inc.	3,468	392	11.3	23	5.9	2948	347	11.8	5	14.4
Perth Smiths Falls DH Smiths F	1,482	189	12.8	26	13.8	1432	182	12.7	0	0.0
Quinte HC Belleville Gen Hosp	6,793	979	14.4	78	8.0	5476	793	14.5	15	18.9
Riverside HCFI La Verendrye H	828	25	3.0	[redacted]	[redacted]	783	21	2.7	0	0.0
Stevenson Memorial Hospital	1901	138	7.3	20	14.5	1816	129	7.1	0	0.0

Table 85 (cont). Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1b hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Ross Memorial Hospital	1,606	134	8.3	7	5.2	1545	129	8.3	0	0.0
Sioux Lookout Meno Ya Win HC	1,980	38	1.9	0	0.0	1850	37	2.0	0	0.0
South Bruce Grey HC Walkerton S	2155	122	5.7	12	9.8	2009	113	5.6	[redacted]	[redacted]
Temiskaming Hospital	1,363	134	9.8	7	5.2	1,288	124	9.6	[redacted]	[redacted]
West Lincoln Memorial Hospital	694	37	5.3	[redacted]	[redacted]	680	35	5.1	0	0.0
West Parry Sound Health Centre	465	17	3.7	[redacted]	[redacted]	436	17	3.9	0	0.0
Winchester D Memorial Hospital	3,687	390	10.6	33	8.5	3,463	364	10.5	10	27.5
Woodstock General Hospital	4,353	108	2.5	12	11.1	4,143	105	2.5	[redacted]	[redacted]
Total	61,898	5,615	9.1	465	8.3	57,389	5174	9.0	57	11.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

ALMONTE GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations 15; Cervical or high vaginal laceration [redacted]; Other pelvic trauma [redacted].

GROVES MEM COMMUNITY HOSPITAL: 3rd or 4th degree perineal lacerations 26; Cervical or high vaginal laceration 9; Oher pelvic trauma 5.

NORFOLK GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations 18; Cervical or high vaginal laceration [redacted].

PERTH SMITHS FALLS DH SF SITE: 3rd or 4th degree perineal lacerations 19; Cervical or high vaginal laceration 7; Repair of the urethra or bladder [redacted].

STEVENSON MEMORIAL HOSPITAL: 3rd or 4th degree perineal lacerations 19; Cervical or high vaginal laceration [redacted]; Other pelvic trauma [redacted].

QUINTE HC BELLEVILLE GEN HOSPITAL: Intracranial hemorrhage [redacted]; Injury to the central nervous system or peripheral nervous system 11; Injury to the long bones [redacted]; seizures [redacted].

WINCHESTER DIST MEM HOSPITAL: Injury to the CNS or peripheral nervous system 8; Injury to the long bones [redacted]; Seizures [redacted].

Table 86. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2a hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Bluewater H Sarnia Gen H Site	2,540	83	3.3	2	2.4	2,411	82	3.4	0	0.0
Bluewater Health Mitton Site	2,487	85	3.4	4	4.7	2,410	83	3.4	0	0.0
Cambridge Memorial Hospital	6,687	796	11.9	67	8.4	5,967	715	12.0	[redacted]	[redacted]
Guelph General Hospital	7,674	512	6.7	96	18.8	6,997	465	6.6	[redacted]	[redacted]
Halton HCS Milton Dist Hospital	4,671	402	8.6	39	9.7	4,488	390	8.7	[redacted]	[redacted]
Huron Perth HCA Stratford G H	5,190	240	4.6	20	8.3	4,859	222	4.6	[redacted]	[redacted]
Hôpital Montfort	15,390	601	3.9	82	13.6	13,505	525	3.9	10	19.0
Queensway Carleton Hospital	11,242	1,431	12.7	148	10.3	10,462	1,335	12.8	8	6.0
St. Thomas Elgin General Hosp	3,198	95	3	8	8.4	3,032	91	3.0	[redacted]	[redacted]
Timmins and District Hospital	3,183	218	6.8	32	14.7	2,948	204	6.9	[redacted]	[redacted]
Total	62,262	4,463	7.2	498	11.2	57,079	4,112	7.2	34	8.3

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

GUELPH GENERAL HOSPITAL: 3rd or 4th degree perineal lacerations 90; Cervical or high vaginal laceration 5; Other pelvic trauma [redacted].

HÔPITAL MONTFORT: 3rd or 4th degree perineal lacerations 76; Cervical or high vaginal laceration [redacted]; Other pelvic trauma 5.

HÔPITAL MONTFORT: Skull fracture [redacted]; Injury to the central nervous system or peripheral nervous system 6; Seizures [redacted].

Table 87. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2b hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Brant C HCS Brantford Gen H	6,349	705	11.1	115	16.3	6,186	687	11.1	12	17.5
Chatham-Kent HA Chatham C	1,902	111	5.8	[redacted]	[redacted]	1,772	106	6.0	[redacted]	[redacted]
Chatham-Kent HA Public Gen H	2,105	62	2.9	[redacted]	[redacted]	2,010	58	2.9	[redacted]	[redacted]
Grand River Hosp K-W H Centre	19,765	260	1.3	23	8.8	18,860	246	1.3	[redacted]	[redacted]
Grey Bruce HA Owen Sound H	3,258	233	7.2	22	9.4	3,099	223	7.2	[redacted]	[redacted]
Halton HCS Oakville-Trafalgar	11,116	1,123	10.1	208	18.5	10,520	1,068	10.2	12	11.2
Humber River Hosp Church St S	2,165	367	17	28	7.6	2,122	361	17.0	[redacted]	[redacted]
Humber River Hosp Finch St Site	3,437	381	11.1	54	14.2	3,321	367	11.1	[redacted]	[redacted]
Humber River Hosp Wilson Site	9,524	775	8.1	69	8.9	9,139	749	8.2	20	26.7
Joseph Brant Hospital	6,759	523	7.7	55	10.5	6,506	498	7.7	[redacted]	[redacted]
Lakeridge H Ajax Pickering Site	3,446	590	17.1	75	12.7	3,293	563	17.1	5	8.9
Niagara HS St. Catharines Site	13,676	905	6.6	61	6.7	12,573	832	6.6	25	30.0
Peterborough Reg Health Centre	7,400	640	8.6	101	15.8	6,890	600	8.7	6	10.0
Rouge Valley HS Ajax Pickering	3,554	718	20.2	81	11.3	3,406	703	20.6	5	7.1
St. Joseph's Healthcare Hamilton	15,728	1,543	9.8	287	18.6	14,865	1,448	9.7	13	9.0
The Scarborough H Birchmount	8,235	1,185	14.4	203	17.1	7,915	1,139	14.4	10	8.8
Trillium H Part Mississauga H	16,863	1,439	8.5	118	8.2	16,331	1,378	8.4	11	8.0
Unity Hlth T St. Joseph's HC TO	15,539	1,790	11.5	169	9.4	14,719	1,703	11.6	15	8.8
Will Osler HS Brampton Civic H	23,146	1,758	7.6	232	13.2	22,281	1,687	7.6	14	8.3
Will Osler HS Etobicoke Gen H	12,078	1,068	8.8	208	19.5	11,597	1,023	8.8	7	6.8
Total	186,045	16,176	8.7	2,122	13.1	177,405	15,439	8.7	169	10.9

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

BRANT COM HCS BRANTFORD GEN H: 3rd or 4th degree perineal tears 113; Cervical/high vaginal laceration [redacted]; Other pelvic trauma [redacted].

HALTON HCS OAKVILLETRAFALGAR H: 3rd or 4th degree perineal tears 198; Cervical/high vaginal laceration 9; Other pelvic trauma [redacted].
PETERBOROUGH REG HEALTH CENTRE: 3rd or 4th degree perineal tears 95; Cervical or high vaginal laceration 7.
ST. JOSEPH'S HEALTHCARE HAMILTON: 3rd or 4th degree perineal tears 273; Cervical or high vaginal laceration 13; Other pelvic trauma [redacted].
THE SCARBOROUGH HOSPITAL–BIRCHMOUNT CAMPUS: 3rd or 4th degree perineal tears 191; Cervical/high vaginal laceration 21; Other pelvic trauma [redacted].
WILLIAM OSLER HS ETOBICOKE GH: 3rd or 4th degree perineal tears 204; Cervical or high vaginal laceration [redacted]; Other pelvic trauma [redacted].
HUMBER RIVER HOSP WILSON SITE: Intracranial hemorrhage [redacted]; Skull fracture [redacted]; Injury to the CNS peripheral nervous system 16.
NIAGARA HEALTH SYS ST. CATHARINES: Intracranial hemorrhage [redacted]; Injury to the central nervous system or peripheral nervous system 14; Injury to the long bones [redacted]; Seizures 10.

Table 88. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2c hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
H S North / Horizon Santé-Nord	8,488	356	4.2	39	11.0	8,207	337	4.1	[redacted]	[redacted]
Lakeridge Health Oshawa Site	12,195	797	6.5	100	12.5	11,486	747	6.5	11	14.7
MH Mackenzie Richmond Hill H	11,788	1,410	12	69	4.9	11,234	1336	11.9	12	9.0
Markham Stouffville Markham	15,271	1,682	11	226	13.4	14,587	1612	11.1	18	11.2
Michael Garron Hospital	13,419	1,746	13	337	19.3	12,774	1650	12.9	13	7.9
North Bay Reg Health Centre	3,973	648	16.3	105	16.2	3,793	616	16.2	10	16.2
North York Gen Hospital Gen S	26,456	1,358	5.1	160	11.8	24,016	1234	5.1	8	6.5
Orillia Soldiers' Mem Hospital	4,258	132	3.1	23	17.4	3,896	116	3.0	[redacted]	[redacted]
Rouge Valley HS RV Centenary	4,859	531	10.9	36	6.8	4,513	495	11.0	[redacted]	[redacted]
Royal Victoria Reg Health Centre	9,442	712	7.5	85	11.9	9,002	686	7.6	6	8.7
Sault Area Hospital	4,132	115	2.8	17	14.8	4,002	107	2.7	0	0.0
Scarborough HN Centenary	4,655	494	10.6	39	7.9	4,504	477	10.6	[redacted]	[redacted]
Southlake Reg Health Centre	12,566	688	5.5	128	18.6	11,979	647	5.4	8	12.4
The Scarborough H Gen Campus	12,008	928	7.7	142	15.3	11,575	892	7.7	9	10.1
Thunder Bay Reg HS Centre	6,882	421	6.1	57	13.5	6,528	399	6.1	[redacted]	[redacted]
Trillium HP Credit Valley Hosp	23,146	2,469	10.7	236	9.6	22,199	2361	10.6	19	8.0
Windsor RH Metropolitan Camp	16,493	614	3.7	51	8.3	15,229	564	3.7	[redacted]	[redacted]
Total	190,031	15,101	7.9	1850	12.3	179,524	14276	8.0	128	9.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

MICHAEL GARRON HOSPITAL: 3rd or 4th degree perineal lacerations 314; Cervical or high vaginal laceration 23; Other pelvic trauma 20; Repair of the urethra or bladder [redacted].

NORTH BAY REG HEALTH CENTRE: 3rd or 4th degree perineal lacerations 74; Cervical or high vaginal laceration 30; Other pelvic trauma 5; Repair of the urethra or bladder [redacted].

SOUTHLAKE REG HEALTH CENTRE: 3rd or 4th degree perineal lacerations 115; Cervical/high vaginal laceration 11; Other pelvic trauma [redacted].

THE SCARBOROUGH HOS GENERAL C: 3rd or 4th degree perineal lacerations 135; Cervical or high vaginal laceration 6; Other pelvic trauma [redacted]; Repair of the urethra or bladder [redacted].

Table 89. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, Ontario, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Obstetric trauma		Births (No CA)	Attempted vacuum births		Severe birth trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Hamilton HS McMaster U Med C	12,409	760	6.1	133	17.5	1,1063	668	6.0	14	21.0
Kingston General Hospital	8,606	509	5.9	78	15.3	8,252	490	5.9	7	14.3
London Health Sciences Centre	25,700	505	2.0	33	6.5	24,072	472	2.0	[redacted]	[redacted]
Sinai HS Mount Sinai Hospital	29,607	3,376	11.4	488	14.5	26,933	3,077	11.4	11	3.6
St. Michael's Hospital	13,120	1,106	8.4	221	20.0	12,713	1,077	8.5	11	10.2
Sunnybrook HSC—Sunnybrook C	16,965	1,327	7.8	171	12.9	16,357	1,281	7.8	[redacted]	[redacted]
The Ottawa Hospital—Gen C	12,265	779	6.4	84	10.8	11,125	705	6.3	13	18.4
The Ottawa Hospital—Civic C	14,166	1,463	10.3	301	20.6	12,912	1,312	10.2	12	9.1
Total	132,838	9,825	7.4	1509	15.4	123,427	9,082	7.4	77	8.5

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

THE OTTAWA HOSPITAL CIVIC CAMPUS: 3rd or 4th degree perineal tears 280; Cervical or high vaginal laceration 21; other pelvic trauma 6.

UNITY HLTH TO ST. MICHAEL'S HOSPITAL: 3rd or 4th degree perineal tears 213; Cervical/high vaginal laceration 7; other pelvic trauma [redacted].

HAMILTON HS MCMASTER U MED CENTRE: Injury to the central nervous system or peripheral nervous system 7; Injury to the long bones [redacted]; seizures 5; Neonatal deaths [redacted].

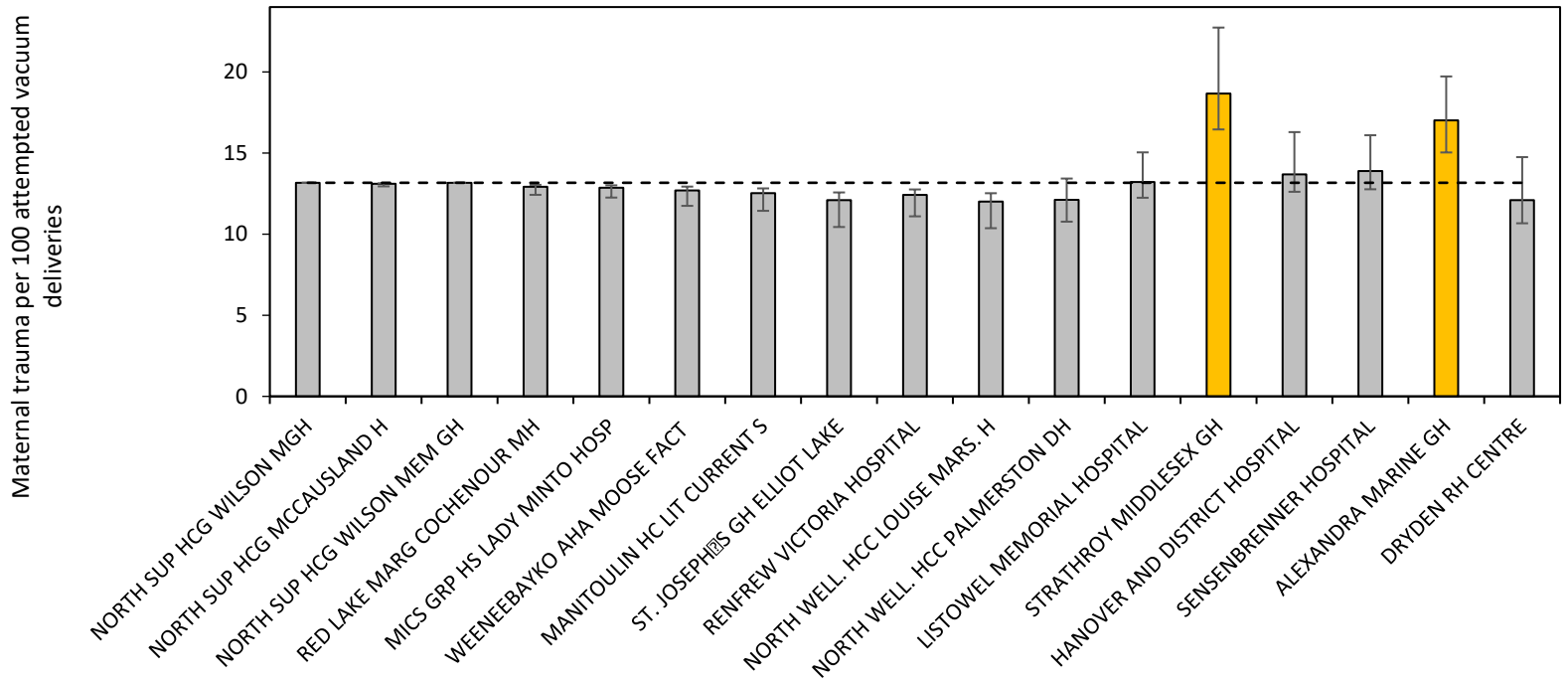
THE OTTAWA HOSPITAL GENERAL CENTRE: Intracranial hemorrhage [redacted]; Injury to the central nervous system or peripheral nervous system 7; Injury to the long bones [redacted]; Seizures [redacted].

3.4.4.5. Ontario hospital rates vs the reference rate: Trauma rates following attempted vacuum delivery

Figures 38 to 42 below shows stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in Ontario (compared with the reference rate for Canada excluding Quebec of 13.2 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

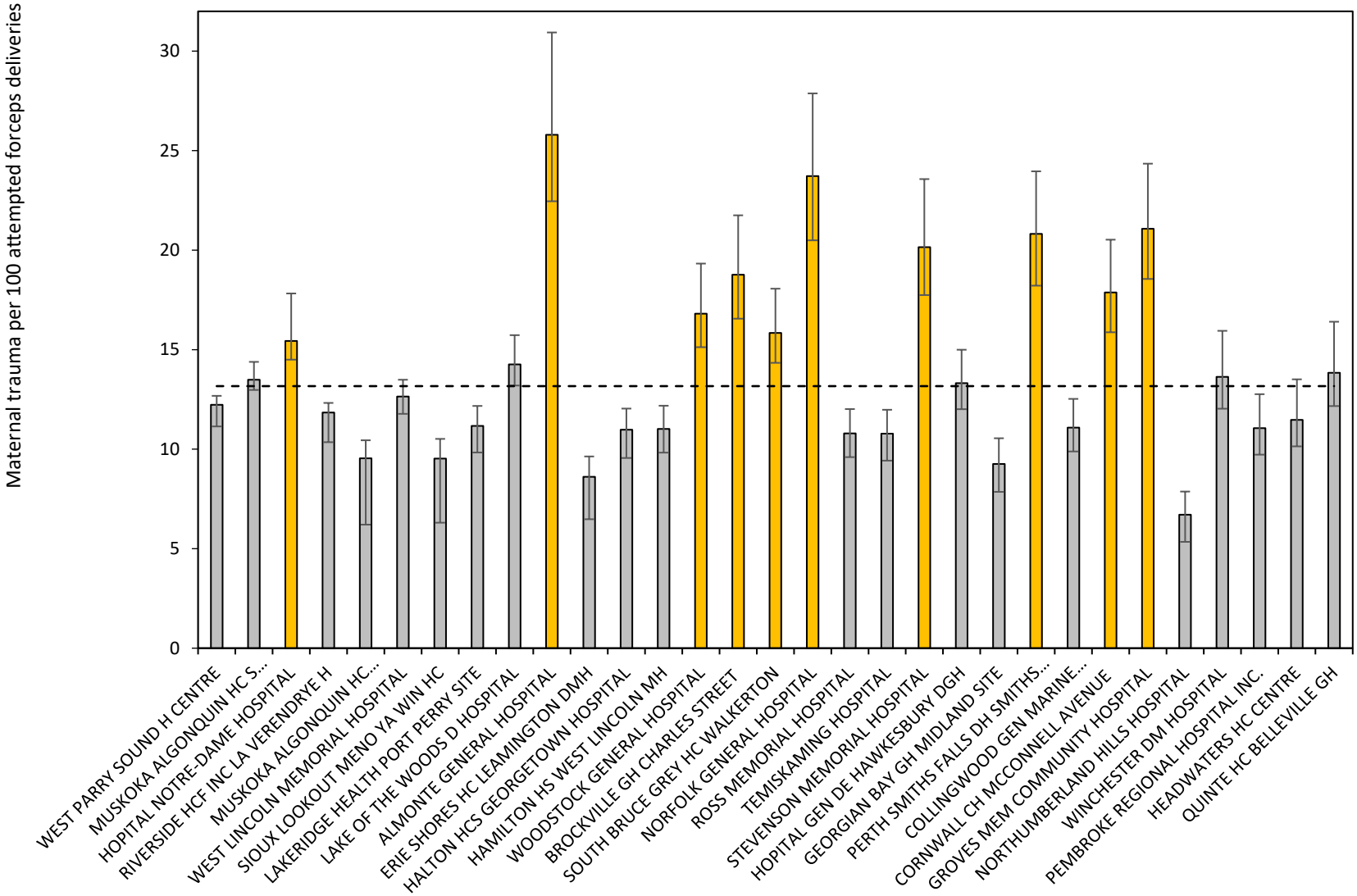
Figure 43 to 47 below shows stabilized and adjusted rates of neonatal trauma following attempted vacuum births in each hospital in Ontario (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 38. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 1a hospitals, Ontario, April 2013 to March 2019.



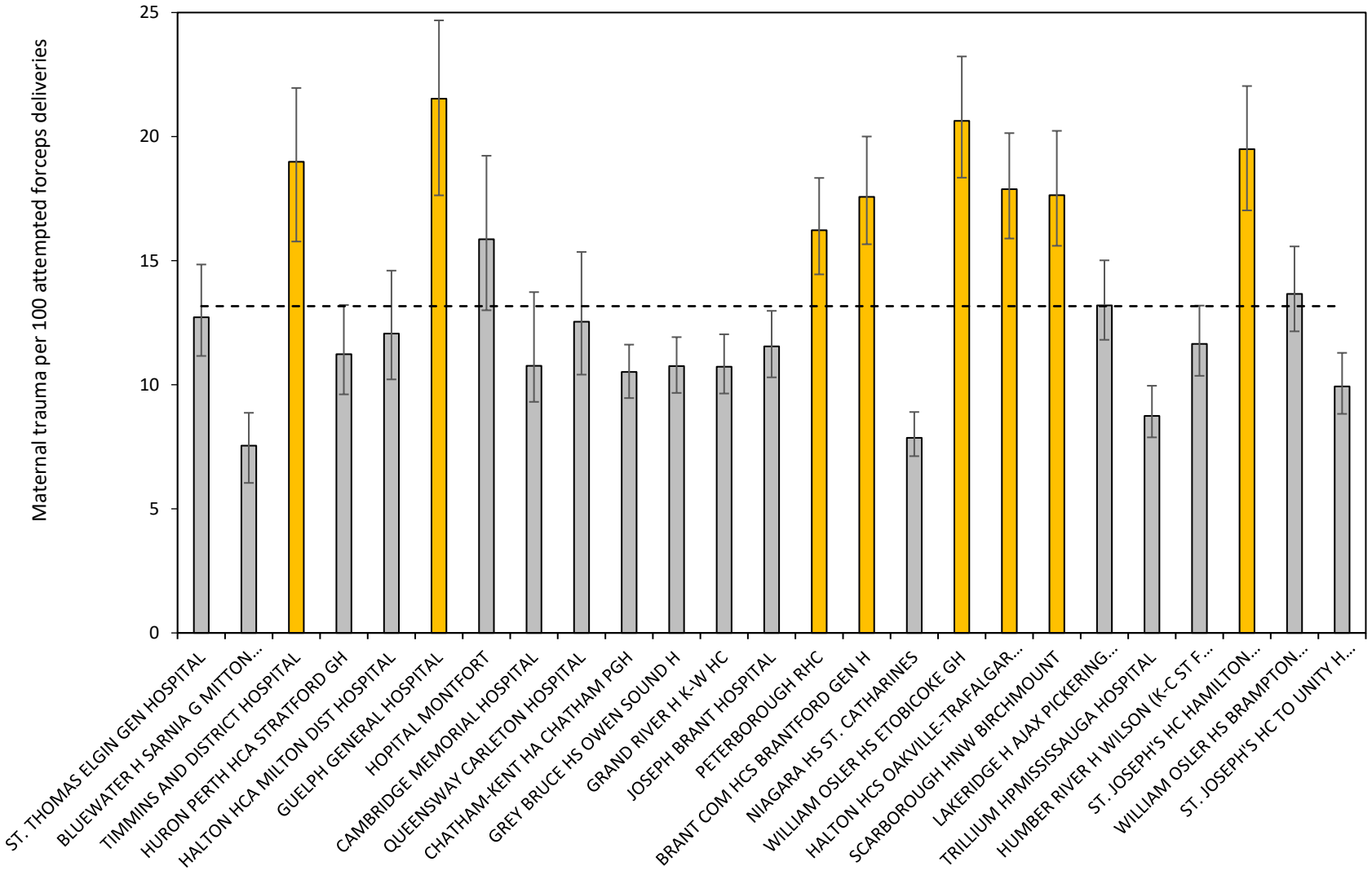
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 39. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 1b hospitals, Ontario, April 2013 to March 2019.



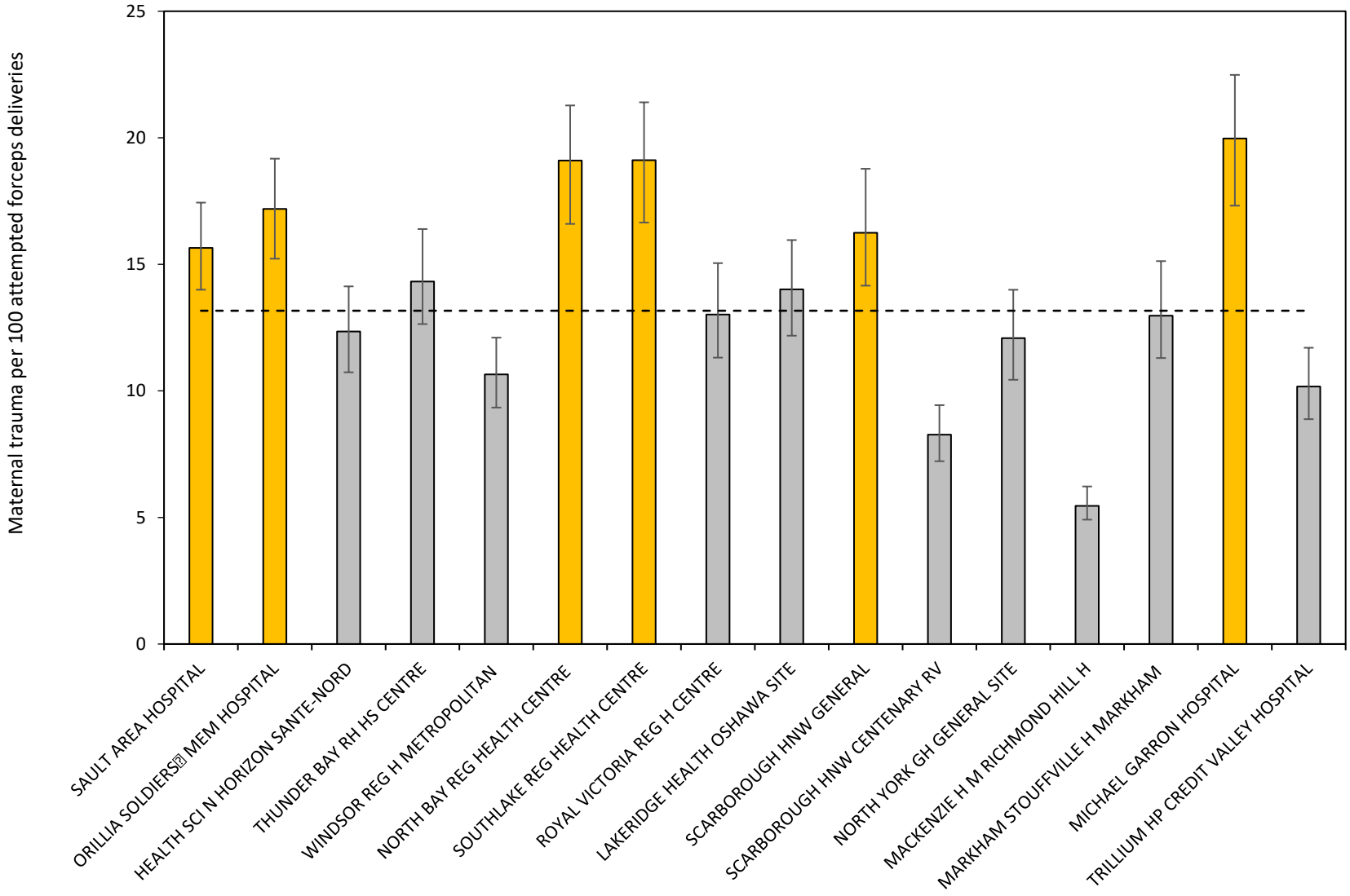
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 40. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 2a and 2b hospitals, Ontario, April 2013 to March 2019.



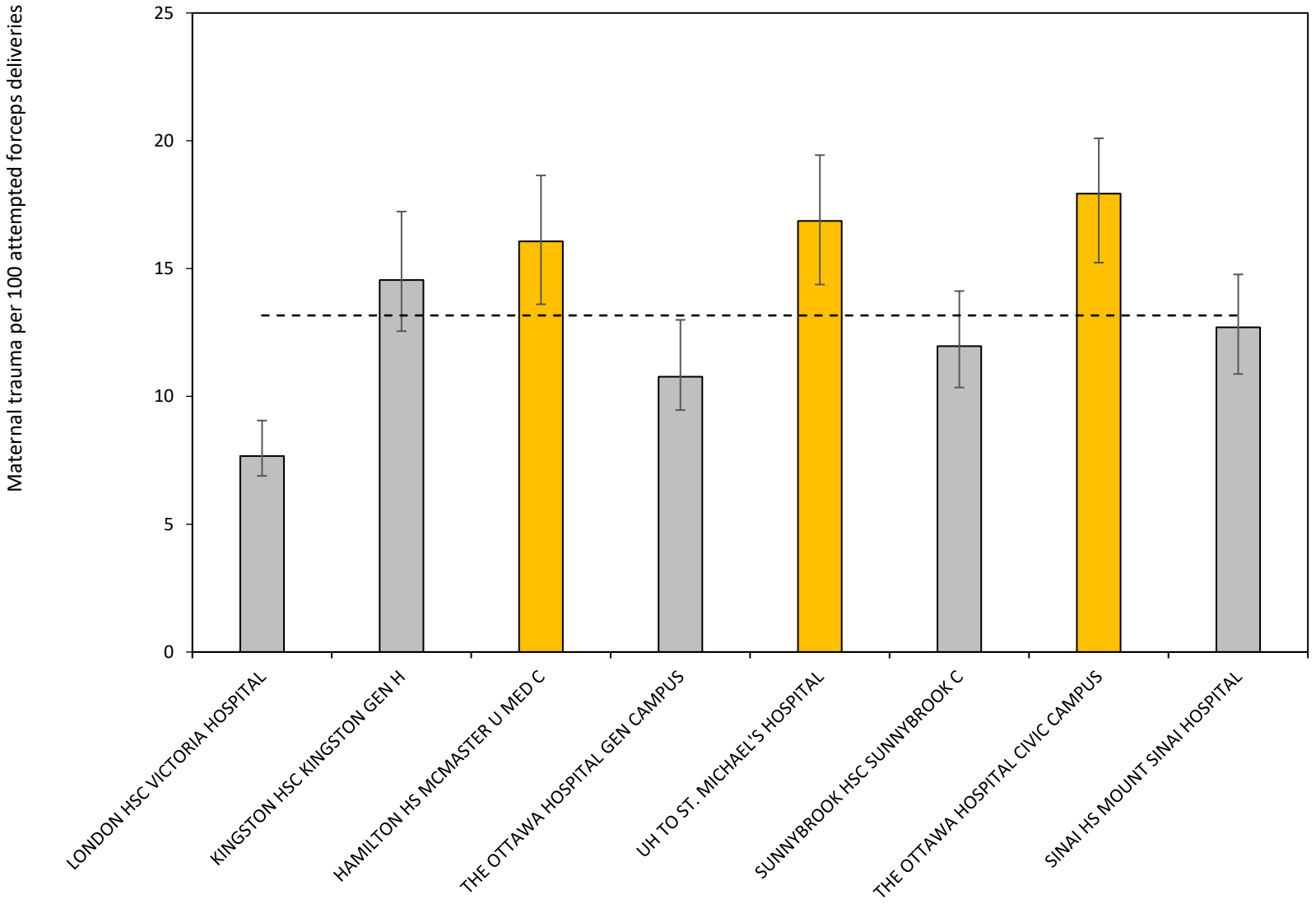
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 41 Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 2c hospitals, Ontario, April 2013 to March 2019.



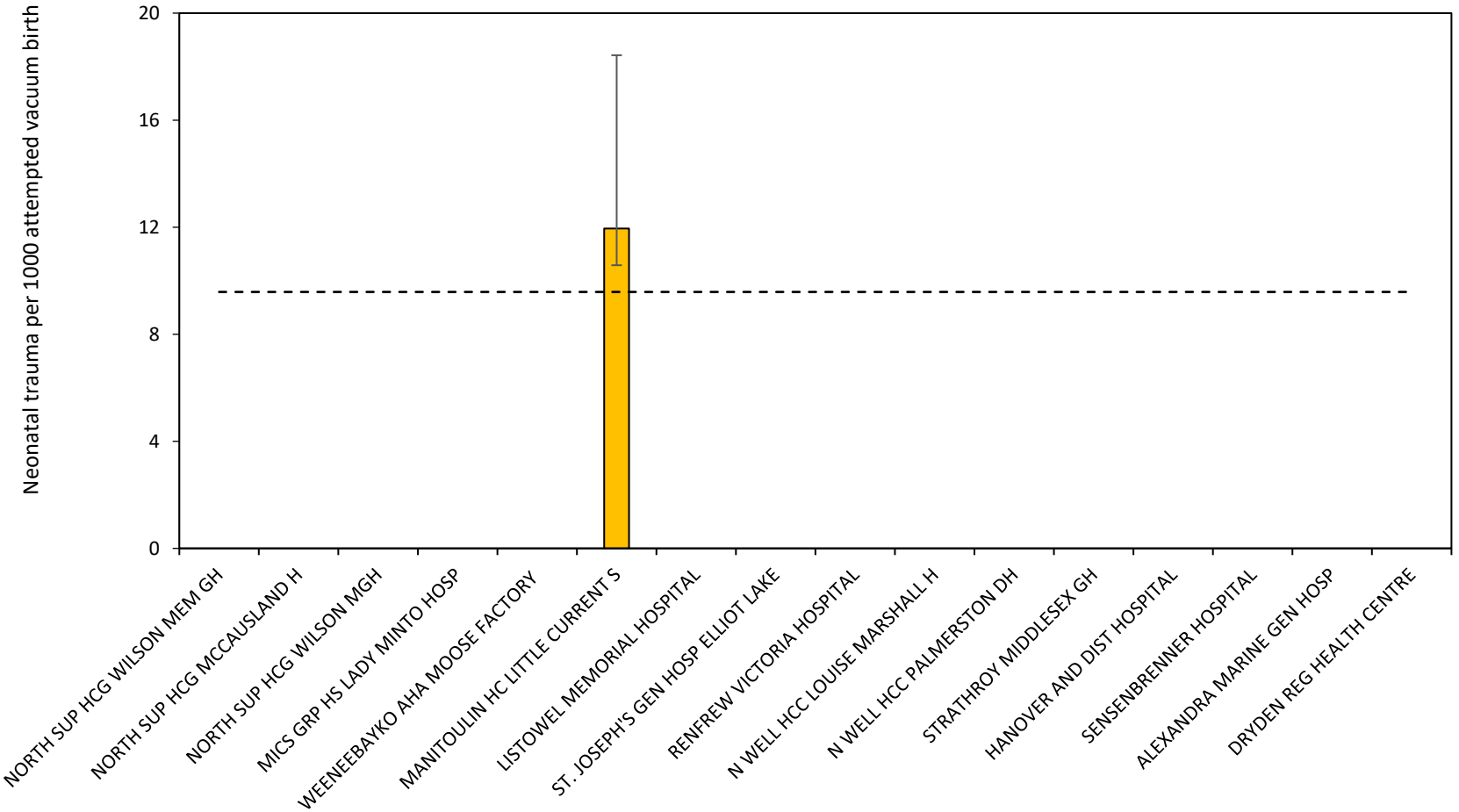
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 42. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 3 hospitals, Ontario, April 2013 to March 2019.



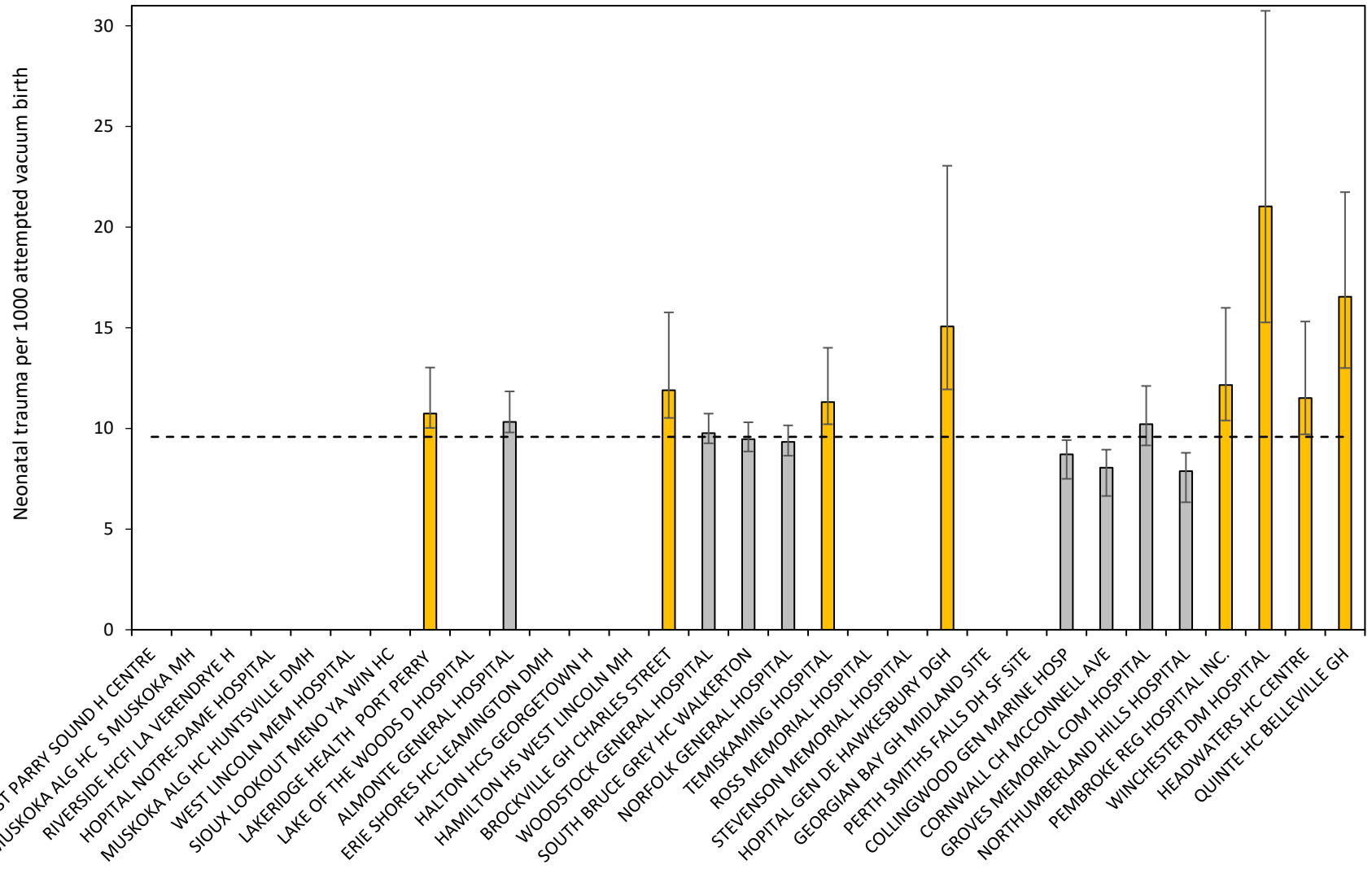
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 43. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 1a hospitals, Ontario, April 2013 to March 2019.



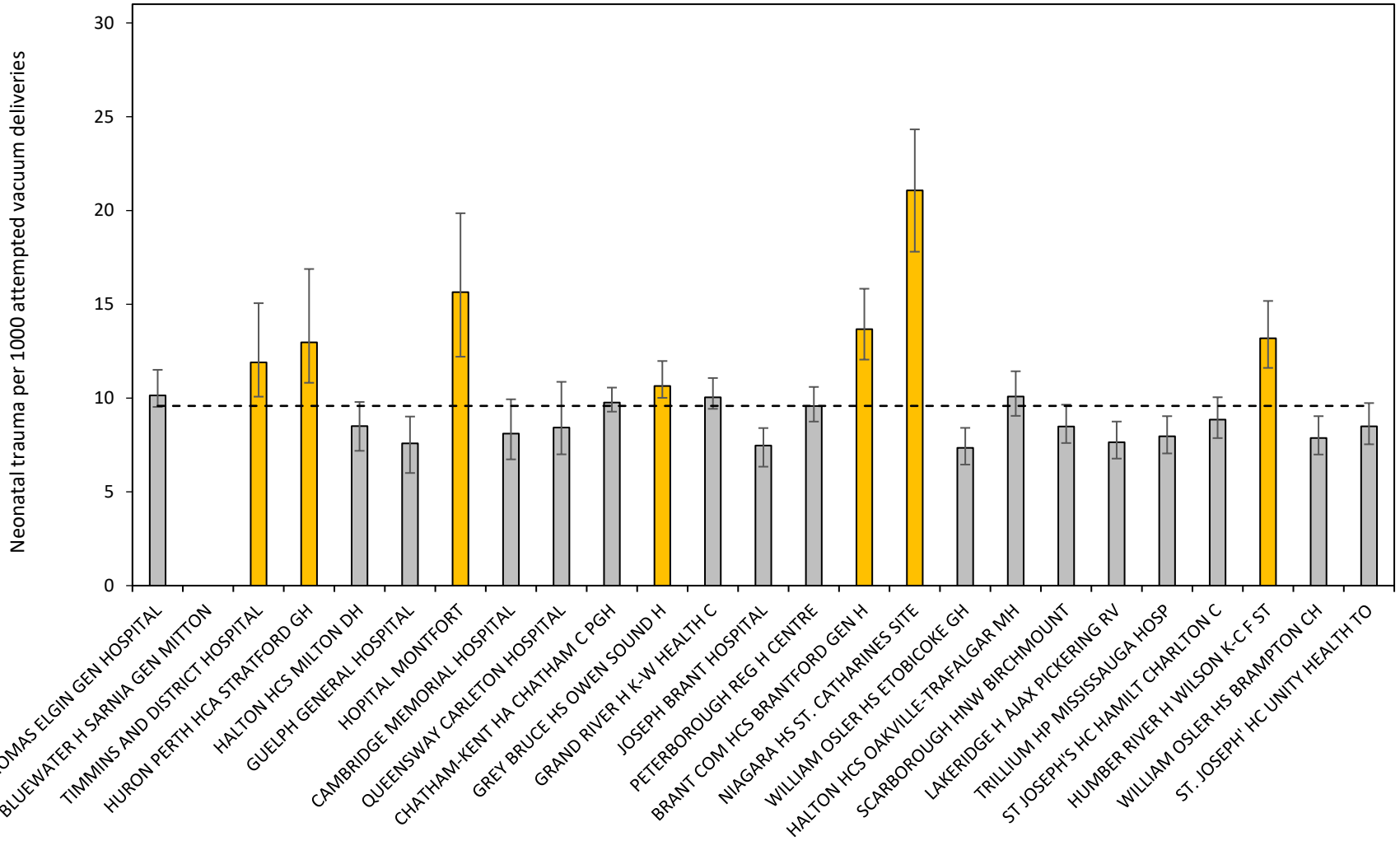
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 44. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 1b hospitals, Ontario, April 2013 to March 2019.



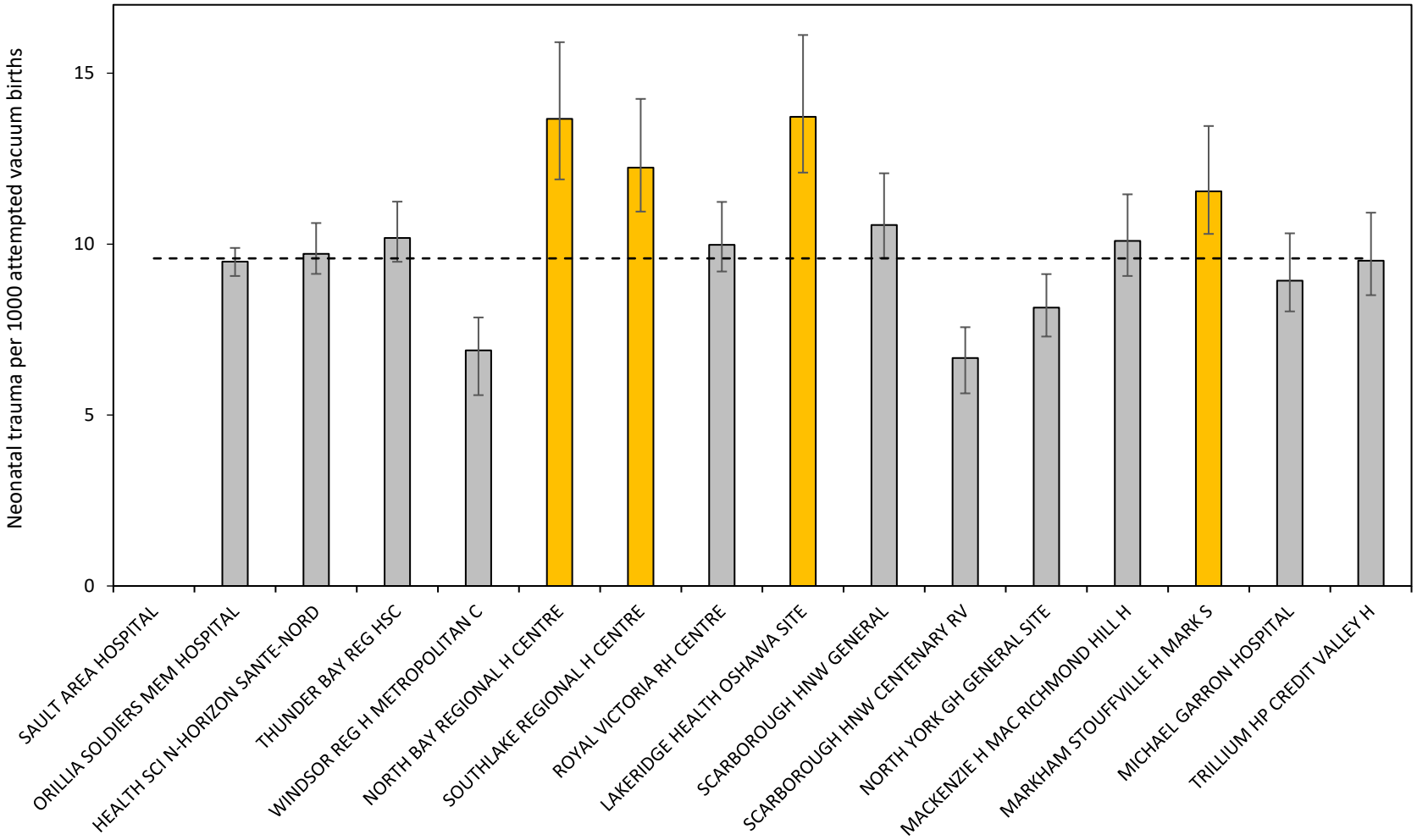
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 45. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 2a and 2b hospitals, Ontario, April 2013 to March 2019.



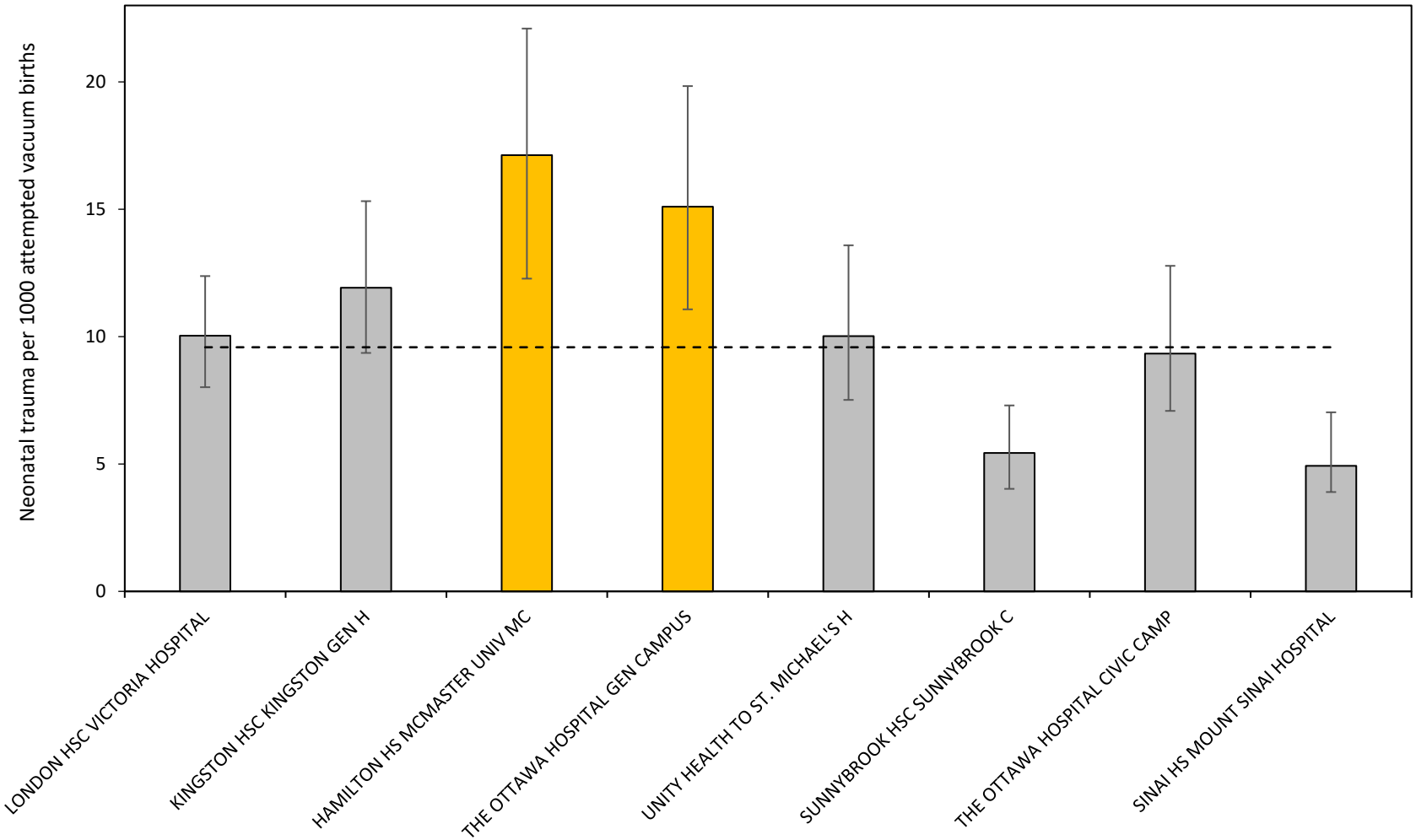
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 46. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 2c hospitals, Ontario, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 47. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 3 hospitals, Ontario, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.5.6. Ontario hospitals: Failed vacuum deliveries by hospital

Hospital-specific rates of attempted vacuum and the 3 types of failed vacuum delivery in Ontario are listed below.

Table 90. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Ontario, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
1.5	Brockville G Hosp Charles St Site	1,671	117	7.0	5	4.3	20	17.1	[redacted]	[redacted]
1.5	Collingwood G Marine Hospital	2,615	206	7.9	5	2.4	[redacted]	[redacted]	[redacted]	[redacted]
1.5	Cornwall CH McConnell Ave Site	2,557	248	9.7	12	4.8	[redacted]	[redacted]	[redacted]	[redacted]
1.5	Erie Shores Healthcare	707	85	12.0	7	8.2	[redacted]	[redacted]	[redacted]	[redacted]
1.5	Georgian Bay GH Midland Site	733	177	24.1	13	7.3	5	2.8	[redacted]	[redacted]
1.5	Groves Memorial Comm Hospital	2,109	285	13.5	0	0.0	49	17.2	0	0.0
1.5	Halton HCS Georgetown Hospital	826	97	11.7	8	8.2	[redacted]	[redacted]	0	0.0
1.5	Hamilton HS West Lincoln Mem H	3,431	103	3.0	7	6.8	[redacted]	[redacted]	[redacted]	[redacted]
1.5	Headwaters Health Care Centre	3,748	695	18.5	35	5.0	29	4.2	[redacted]	[redacted]
1.5	Hôpital Gén De Hawkesbury DGH	2,119	160	7.6	[redacted]	[redacted]	7	4.4	0	0.0
1.5	Northumberland Hills Hospital	2,525	303	12.0	11	3.6	5	1.7	[redacted]	[redacted]
1.5	Pembroke Regional Hospital Inc.	3,468	392	11.3	54	13.8	[redacted]	[redacted]	0	0.0
1.5	Perth Smiths Falls Dist H SF Site	1,482	189	12.8	18	9.5	[redacted]	[redacted]	0	0.0
1.5	Quinte HC— Belleville Gen Hosp	6,793	979	14.4	56	5.7	30	3.1	10	1.0
1.5	Ross Memorial Hospital	1,606	134	8.3	[redacted]	[redacted]	5	3.7	0	0.0
1.5	Stevenson Memorial Hospital	1,901	138	7.3	7	5.1	[redacted]	[redacted]	[redacted]	[redacted]
1.5	Winchester District Mem Hospital	3,687	390	10.6	16	4.1	18	4.6	0	0.0
1.5	Woodstock General Hospital	4,353	108	2.5	7	6.5	[redacted]	[redacted]	[redacted]	[redacted]
1.5	Total	48,258	4,891	10.1	269	5.5	188	3.8	27	0.6
2.0	Bluewater H Sarnia G Hospital Site	2,540	83	3.3	11	13.3	0	0.0	0	0.0
2.0	Cambridge Memorial Hospital	6,687	796	11.9	59	7.4	19	2.4	5	0.6

Table 90 (cont). Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Ontario, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
2.0	Guelph General Hospital	7,674	512	6.7	67	13.1	10	2.0	5	1.0
2.0	Halton HC Services Milton D H	4,671	402	8.6	35	,8.7	[redacted]	[redacted]	[redacted]	[redacted]
2.0	Huron Perth HCA—Stratford	5,190	240	4.6	29	12.1	[redacted]	[redacted]	5	2.1
2.0	Hôpital Montfort	15,390	601	3.9	44	7.3	6	1.0	6	1.0
2.0	Queensway Carleton Hospital	11,242	1,431	12.7	65	4.5	25	1.7	15	1.0
2.0	St. Thomas Elgin General Hospital	3,198	95	3.0	6	6.3	[redacted]	[redacted]	[redacted]	[redacted]
2.0	Timmins And District Hospital	3,183	218	6.8	43	19.7	[redacted]	[redacted]	[redacted]	[redacted]
2.0	Total	59,775	4,378	7.3	359	8.2	70	1.6	44	1.0
2.3	Brant Comm HCS Brantford G H	6,349	705	11.1	36	5.1	8	1.1	8	1.1
2.3	Chatham-Kent HA Chatham C	1,902	111	5.8	5	4.5	12	10.8	0	0.0
2.3	Grand River Hosp K-W H Centre	19,765	260	1.3	15	5.8	[redacted]	[redacted]	0	0.0
2.3	Halton HCS Oakville- Trafalgar H	11,116	1,123	10.1	24	2.1	18	1.6	[redacted]	[redacted]
2.3	Humber River Hospital Church St	2,165	367	17.0	7	1.9	[redacted]	[redacted]	0	0.0
2.3	Humber River Hospital Finch St S	3,437	381	11.1	45	11.8	[redacted]	[redacted]	[redacted]	[redacted]
2.3	Humber River Hosp Wilson Site	9,524	775	8.1	43	5.5	8	1.0	[redacted]	[redacted]
2.3	Joseph Brant Hospital	6,759	523	7.7	41	7.8	[redacted]	[redacted]	0	0.0
2.3	Lakeridge Health Ajax Pickering	3,446	590	17.1	17	2.9	6	1.0	[redacted]	[redacted]
2.3	Niagara HS St. Catharines Site	13,676	905	6.6	42	4.6	14	1.5	[redacted]	[redacted]
2.3	Peterborough Reg Health Centre	7,400	640	8.6	39	6.1	6	0.9	[redacted]	[redacted]
2.3	Rouge Val HS RV Ajax Pickering	3,554	718	20.2	76	10.6	11	1.5	[redacted]	[redacted]
2.3	St. Joseph's Healthcare Hamilton	15,728	1,543	9.8	56	3.6	44	2.9	8	0.5
2.3	The Scarborough H Birchmount C	8,235	1,185	14.4	36	3.0	8	0.7	[redacted]	[redacted]

Table 90 (cont). Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Ontario, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
2.3	Trillium HP—Mississauga Hosp	16,863	1,439	8.5	20	1.4	30	2.1	[redacted]	[redacted]
2.3	Unity H TO—St. Joseph's HC TO	15,539	1,790	11.5	91	5.1	26	1.5	5	0.3
2.3	William Osl HS Brampton Civic H	23,146	1,758	7.6	130	7.4	16	0.9	17	1.0
2.3	William Osl HS Etobicoke G Hosp	12,078	1,068	8.8	99	9.3	7	0.7	9	0.8
2.3	Total	182,787	15,943	8.7	823	5.2	226	1.4	69	0.4
2.7	HS North / Horizon Santé-Nord	8,488	356	4.2	21	5.9	[redacted]	[redacted]	0	.
2.7	Lakeridge Health — Oshawa Site	12,195	797	6.5	50	6.3	22	2.8	[redacted]	[redacted]
2.7	MH Mackenzie Richmond Hill H	11,788	1,410	12.0	48	3.4	5	0.4	0	.
2.7	Markham Stouffville H Markham S	15,271	1,682	11.0	30	1.8	19	1.1	[redacted]	[redacted]
2.7	Michael Garron Hospital	13,419	1,746	13.0	99	5.7	18	1.0	11	0.6
2.7	North Bay Regional Health Centre	3,973	648	16.3	30	4.6	16	2.5	[redacted]	[redacted]
2.7	North York General Hospital Gen S	26,456	1,358	5.1	130	9.6	[redacted]	[redacted]	[redacted]	[redacted]
2.7	Orillia Soldiers' Memorial Hospital	4,258	132	3.1	15	11.4	[redacted]	[redacted]	[redacted]	[redacted]
2.7	Rouge Valley HS RV Centenary	4,859	531	10.9	17	3.2	[redacted]	[redacted]	[redacted]	[redacted]
2.7	Royal Victoria Reg Health Centre	9,442	712	7.5	19	2.7	17	2.4	[redacted]	[redacted]
2.7	Sault Area Hospital	4,132	115	2.8	7	6.1	[redacted]	[redacted]	0	0.0
2.7	Scarborough HNW Centenary	4,655	494	10.6	23	4.7	0	0.0	0	0.0
2.7	Southlake Regional Health Centre	12,566	688	5.5	47	6.8	12	1.7	6	0.9
2.7	The Scarborough Hosp Gen Camp	12.008	928	7.7	44	4.7	3	0.3	3	0.3
2.7	Thunder Bay R Health Sciences C	6,882	421	6.1	17	4.0	24	5.7	[redacted]	[redacted]
2.7	Trillium HP Credit Valley Hosp	23,146	2,469	10.7	103	4.2	20	0.8	8	0.3
2.7	Windsor RH Metropolitan Campus	16,493	614	3.7	19	3.1	0	0.0	[redacted]	[redacted]
2.7	Total	190,031	15,101	7.9	719	4.8	169	1.1	50	0.3

Table 90 (cont). Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Ontario, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
3.0	Hamilton HS McMaster Univ MC	12,409	760	6.1	24	3.2	23	3.0	[redacted]	[redacted]
3.0	Kingston General Hospital	8,606	509	5.9	31	6.1	11	2.2	6	1.2
3.0	London Health Sciences C	25,700	505	2.0	24	4.8	[redacted]	[redacted]	[redacted]	[redacted]
3.0	Sinai HS Mount Sinai Hospital	29,607	3,376	11.4	280	8.3	15	0.4	7	0.2
3.0	St. Michael's Hospital	13,120	1,106	8.4	33	3.0	5	0.5	[redacted]	[redacted]
3.0	Sunnybrook HSC Sunnybrook	16,965	1,327	7.8	45	3.4	5	0.4	[redacted]	[redacted]
3.0	The Ottawa Hospital General C	12,265	779	6.4	46	5.9	20	2.6	10	1.3
3.0	The Ottawa Hospital Civic Campus	14,166	1,463	10.3	35	2.4	40	2.7	[redacted]	[redacted]
3.0	Total	132,838	9,825	7.4	518	5.3	123	1.3	34	0.3
All Tiers/Hospitals, Ontario		638,308	51,467	8.1	2,710	5.3	809	1.6	227	0.4

*Rates of failed vacuum (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.

3.4.6.1. New Brunswick hospitals: Within-tier hospital-specific trauma rates following attempted forceps delivery

Tables 91 to 94 below list the numbers and rates of attempted forceps delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in New Brunswick.

Table 91. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1 hospitals, New Brunswick, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Upper River Valley Hospital	1324	0	0.0	0	0.0	1293	0	0.0	0	0.0
Total	1324	0	0.0	0	0.0	1293	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 92. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2a hospitals, New Brunswick, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Campbellton Regional Hospital	993	6	0.6	[redacted]	[redacted]	944	5	0.5	0	0.0
Chaleur Regional Hospital	2026	9	0.4	[redacted]	[redacted]	1867	8	0.4	0	0.0
Edmundston Regional Hospital	1597	8	0.5	[redacted]	[redacted]	1529	8	0.5	[redacted]	[redacted]
Miramichi Regional Hospital	1858	75	4.0	26	34.7	1796	70	3.9	0	0.0
Total	6474	98	1.5	30	30.6	6136	91	1.5	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 93. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2b hospitals, New Brunswick, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Dr. Georges-L.-Dumont Uni HC	3316	49	1.5	16	32.7	3076	47	1.5	[redacted]	[redacted]
Total	3316	49	1.5	16	32.7	3076	47	1.5	[redacted]	[redacted]

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 94. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, New Brunswick, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Dr. Everett Chalmers R Hospital	6802	442	.5	93	21.0	6519	429	6.6	5	11.7
Saint John Regional Hospital	7438	48	0.6	13	27.1	7137	44	0.6	[redacted]	[redacted]
The Moncton Hospital	5789	68	1.2	19	27.9	5529	64	1.2	[redacted]	[redacted]
Total	20029	558	2.8	125	22.4	19185	537	2.8	7	13.0

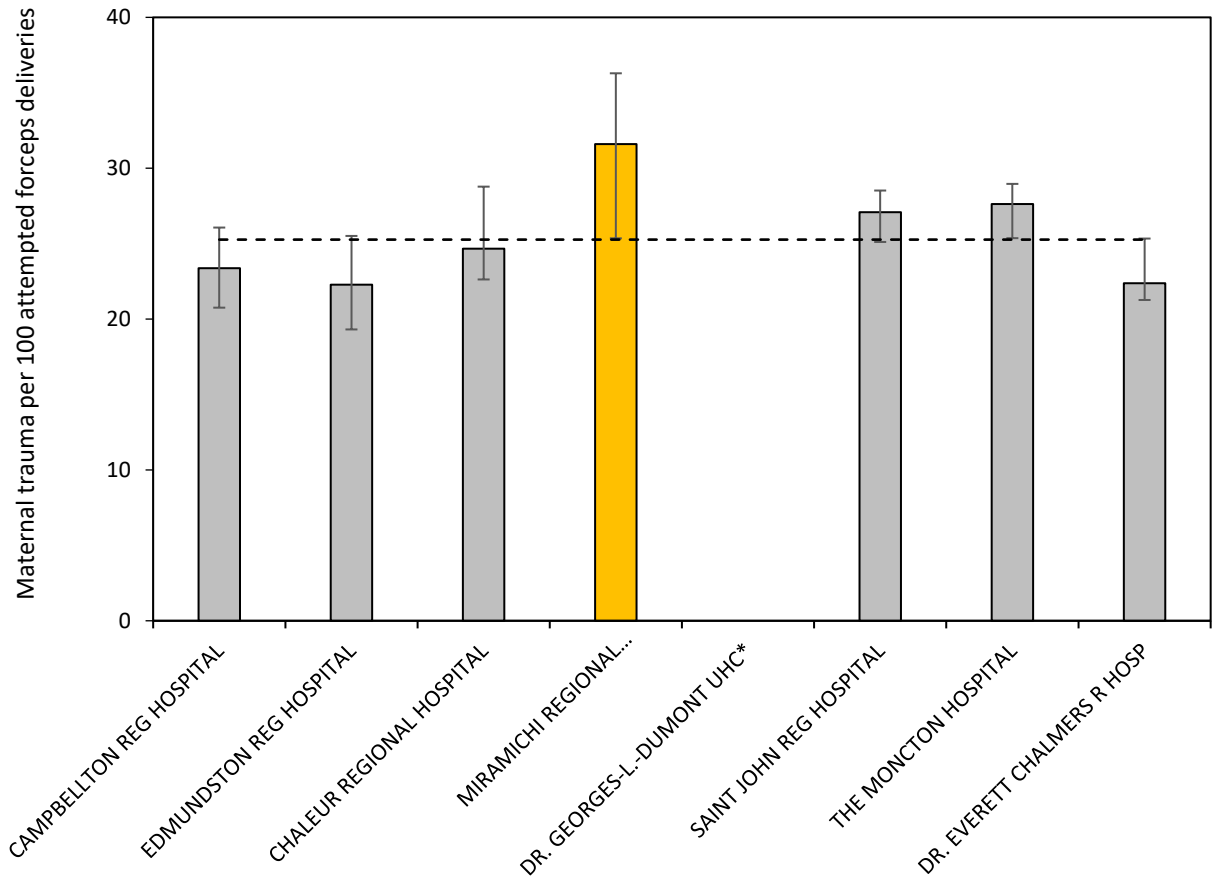
*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

3.4.6.2. New Brunswick hospital rates vs the reference rate: Trauma rates following attempted forceps delivery

Figures 48 shows stabilized and adjusted rates of maternal trauma following attempted forceps delivery in each hospital in New Brunswick (compared with the reference rate for Canada excluding Quebec of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

Figures 49 below shows stabilized rates of neonatal trauma following attempted forceps birth in each hospital in New Brunswick (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

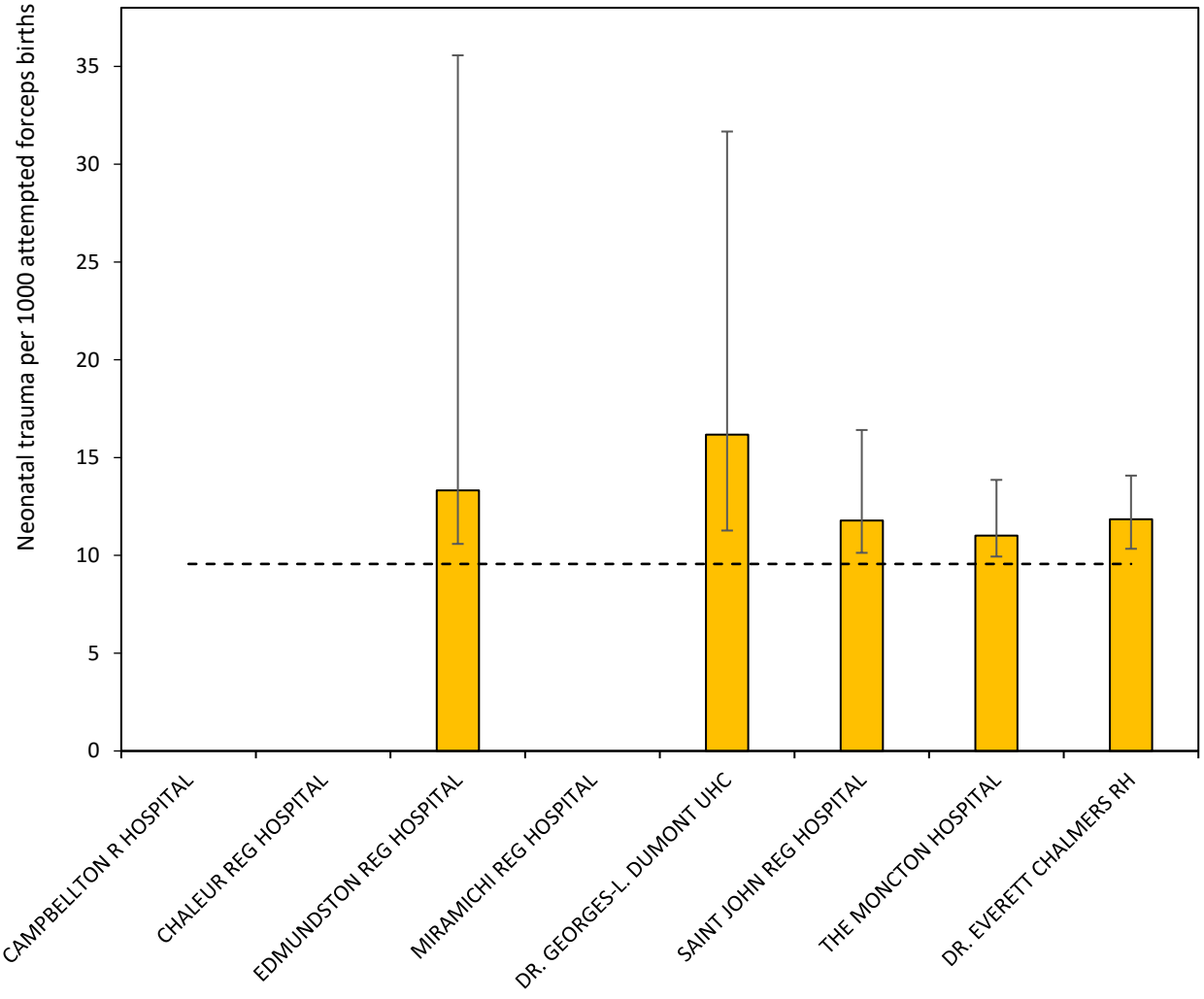
Figure 48. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2a, 2b and 3 hospitals, New Brunswick, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.

Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 49. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 2a, 2b and 3 hospitals, New Brunswick, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.6.3. New Brunswick hospitals: Failed forceps deliveries

Table 95 lists the rates of attempted and failed forceps delivery (forceps application followed by cesarean delivery) by hospital in New Brunswick.

Table 95. Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), New Brunswick, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Deliveries	Attempted forceps deliveries		Forceps followed by cesarean delivery*	
			No.	Rate	No.	Rate
3	Dr. Everett Chalmers	6,802	442	6.5	23	5.2
3	Saint John Regional	7,438	48	0.6	5	10.4
3	Total	23,345	607	2.6	32	5.3
All Tiers/Hospitals NB		31,143	705	2.3	35	5.0

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries.

3.4.6.4. New Brunswick hospitals: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 96 to 98 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in New Brunswick.

Table 96. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1 hospitals, New Brunswick, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Upper River Valley Hospital	1,324	45	3.4	3	6.7	1,293	41	3.2	[redacted]	[redacted]
Total	1,324	45	3.4	3	6.7	1,293	41	3.2	[redacted]	[redacted]

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 97. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2a hospitals, New Brunswick, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Campbellton Regional Hospital	993	91	9.2	11	12.1	944	85	9.0	[redacted]	[redacted]
Chaleur Regional Hospital	2,026	199	9.8	20	10.1	1,867	185	9.9	[redacted]	[redacted]
Edmundston Regional Hospital	1,597	210	13.1	37	17.6	1,529	197	12.9	0	0.0
Miramichi Regional Hospital	1,858	348	18.7	41	11.8	1,796	342	19.0	[redacted]	[redacted]
Total	6,474	848	13.1	109	12.9	6,136	809	13.2	5	6.2

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.
EDMUNDSTON REGIONAL HOSPITAL: 3rd or 4th degree perineal lacerations 37; Cervical or high vaginal laceration [redacted].

Table 97. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2b hospitals, New Brunswick, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Dr. Georges-L.-Dumont Uni HC	3,316	144	4.3	37	25.7	3,076	135	4.4	0	0.0
Total	3,316	144	4.3	37	25.7	3,076	135	4.4	0	0.0

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.
DR. GEORGES-L.-DUMONT UNI H CENTRE: 3rd or 4th degree perineal lacerations 37.

Table 98. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, New Brunswick, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Dr. Everett Chalmers R Hospital	6802	415	6.1	33	8.0	6519	401	6.2	[redacted]	[redacted]
Saint John Regional Hospital	7438	709	9.5	119	16.8	7137	672	9.4	8	11.9
The Moncton Hospital	5789	747	12.9	67	9.0	5529	710	12.8	[redacted]	[redacted]
Total	20029	1871	9.3	219	11.7	19185	1783	9.3	17	9.5

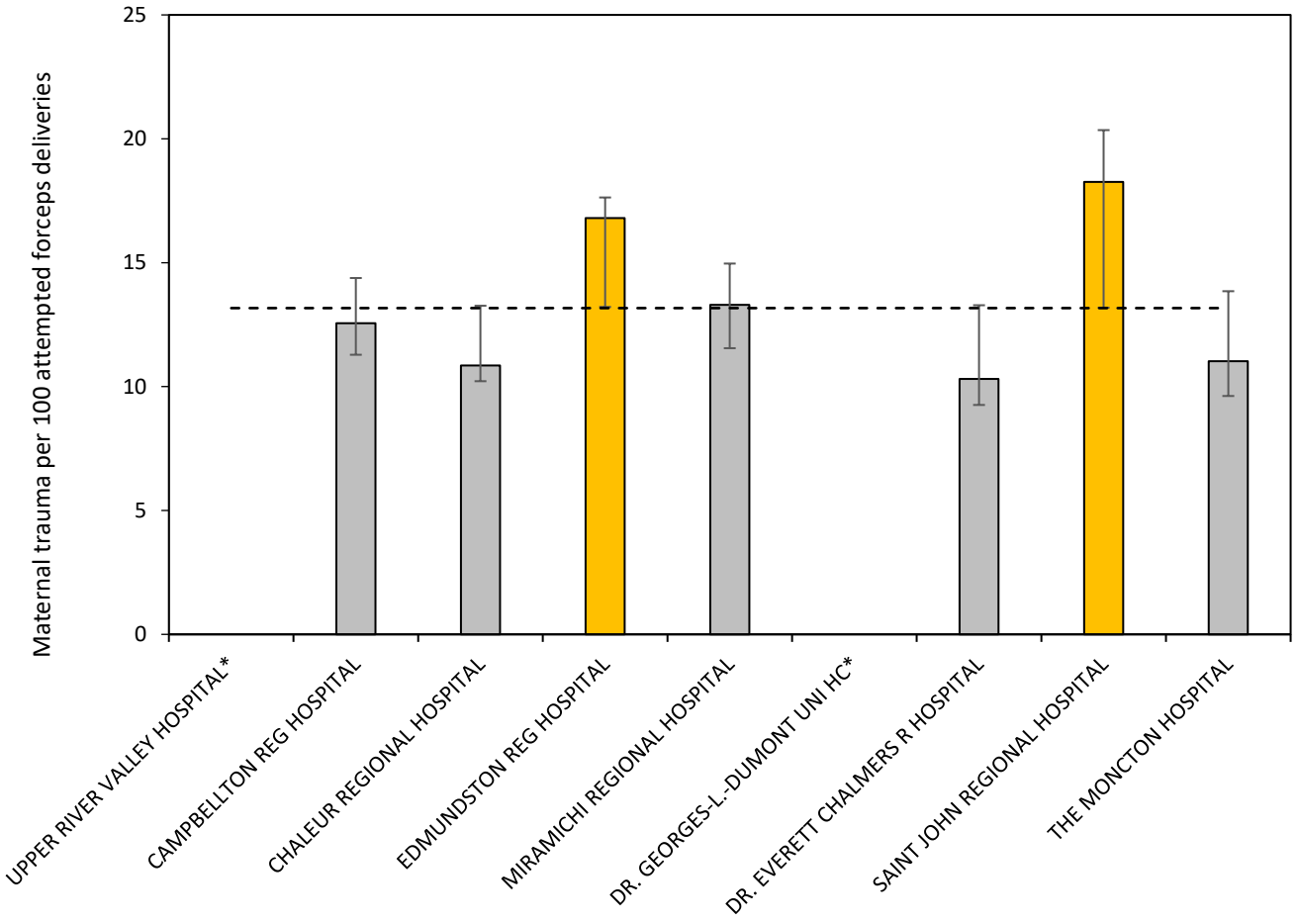
*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.
SAINT JOHN REGIONAL HOSPITAL: 3rd or 4th degree perineal lacerations 110; Cervical or high vaginal laceration 7; Other pelvic trauma [redacted].

3.4.6.5. New Brunswick hospital rates vs the reference rate: Trauma rates following attempted vacuum delivery

Figure 50 below shows stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in New Brunswick (compared with the reference rate for Canada excluding Quebec of 13.2 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

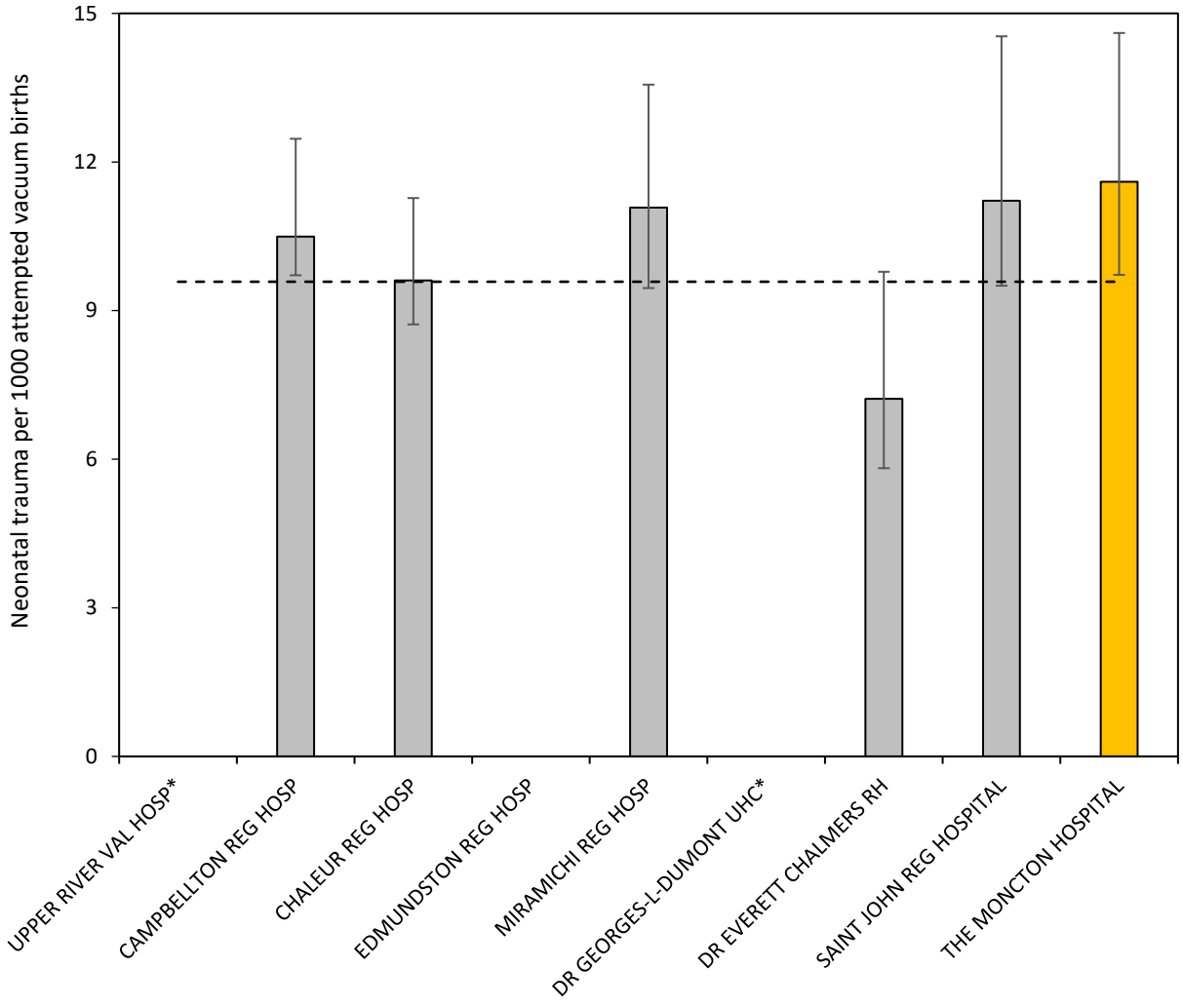
Figure 51 below shows stabilized and adjusted rates of neonatal trauma following attempted vacuum birth in each hospital in New Brunswick (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 50. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 1, 2a, 2b and 3 hospitals, New Brunswick, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier. Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 51. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 1, 2a, 2b and 3 hospitals, New Brunswick, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.
Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.6.6. New Brunswick: Failed vacuum deliveries

Hospital-specific rates of attempted vacuum and the 3 types of failed vacuum delivery in New Brunswick are listed below.

Table 99. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, New Brunswick, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
2	Campbellton Regional Hospital	993	91	9.2	[redacted]	[redacted]	10	11.0	0	0.0
2	Chaleur Regional Hospital	2,026	199	9.8	9	4.5	18	9.0	0	0.0
2	Edmundston Regional Hospital	1,597	210	13.1	[redacted]	[redacted]	9	4.3	[redacted]	[redacted]
2	Miramichi Regional Hospital	1,858	348	18.7	55	15.8	9	2.6	[redacted]	[redacted]
2	Total	6,474	848	13.1	74	8.7	46	5.4	[redacted]	[redacted]
3	Dr. Georges-L.- Dumont Univ HC	3,316	144	4.3	11	7.6	[redacted]	[redacted]	[redacted]	[redacted]
3	Dr. Everett Chalmers R Hospital	6,802	415	6.1	27	6.5	[redacted]	[redacted]	[redacted]	[redacted]
3	Saint John Regional Hospital	7,438	709	9.5	21	3.0	12	1.7	[redacted]	[redacted]
3	The Moncton Hospital	5,789	747	12.9	42	5.6	11	1.5	[redacted]	[redacted]
3	Total	20,029	1,871	9.3	90	4.8	25	1.3	[redacted]	[redacted]
All Tiers/Hospitals New Brunswick		31,143	2,908	9.3	176	6.1	73	2.5	6	0.2

*Rates of failed vacuum (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.

3.4.7.1. Nova Scotia hospitals: Within-tier hospital-specific trauma rates following attempted forceps delivery

Tables 100 to 103 below list the numbers and rates of attempted forceps delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Nova Scotia.

Table 100. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 0 hospitals, Nova Scotia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Buchanan Memorial Comm HC	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Digby General Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Inverness Consolidated Mem H	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Queen Elizabeth Ii Health S C	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Roseway Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Soldiers Memorial Hospital	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Total	12	0	0.0	0	0.0	12	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 101. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2a hospitals, Nova Scotia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Aberdeen Hospital	1430	48	3.4	[redacted]	[redacted]	1358	47	3.5	0	0.0
Colchester East Hants Health C	2256	65	2.9	15	23.1	2156	62	2.9	0	0.0
Cumberland Regional Health CC	1063	30	2.8	6	20.0	991	28	2.8	0	0.0
South Shore Regional Hospital	1683	14	0.8	7	50.0	1548	12	0.8	[redacted]	[redacted]
Yarmouth Regional Hospital	1607	26	1.6	[redacted]	[redacted]	1524	25	1.6	0	0.0
Total	8039	183	2.3	31	16.9	7577	174	2.3	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

SOUTH SHORE REGIONAL HOSPITAL: 3rd or 4th degree perineal lacerations 7,

SOUTH SHORE REGIONAL HOSPITAL: Injury to the long bones [redacted]; Seizures [redacted].

Table 102. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2b hospitals, Nova Scotia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Cape Breton Healthcare Complex	4210	37	0.9	[redacted]	[redacted]	3981	35	0.9	[redacted]	[redacted]
St. Martha's Regional Hospital	1826	14	0.8	[redacted]	[redacted]	1720	14	0.8	0	0.0
Valley Regional Hospital	3601	35	1.0	11	31.4	3402	33	1.0	0	0.0
Total	9637	86	0.9	21	24.4	9103	82	0.9	[redacted]	[redacted]

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 103. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, Nova Scotia, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
IWK Health Centre	21037	876	4.2	335	38.2	18784	767	4.1	8	10.4
Total	21037	876	4.2	335	38.2	18784	767	4.1	8	10.4

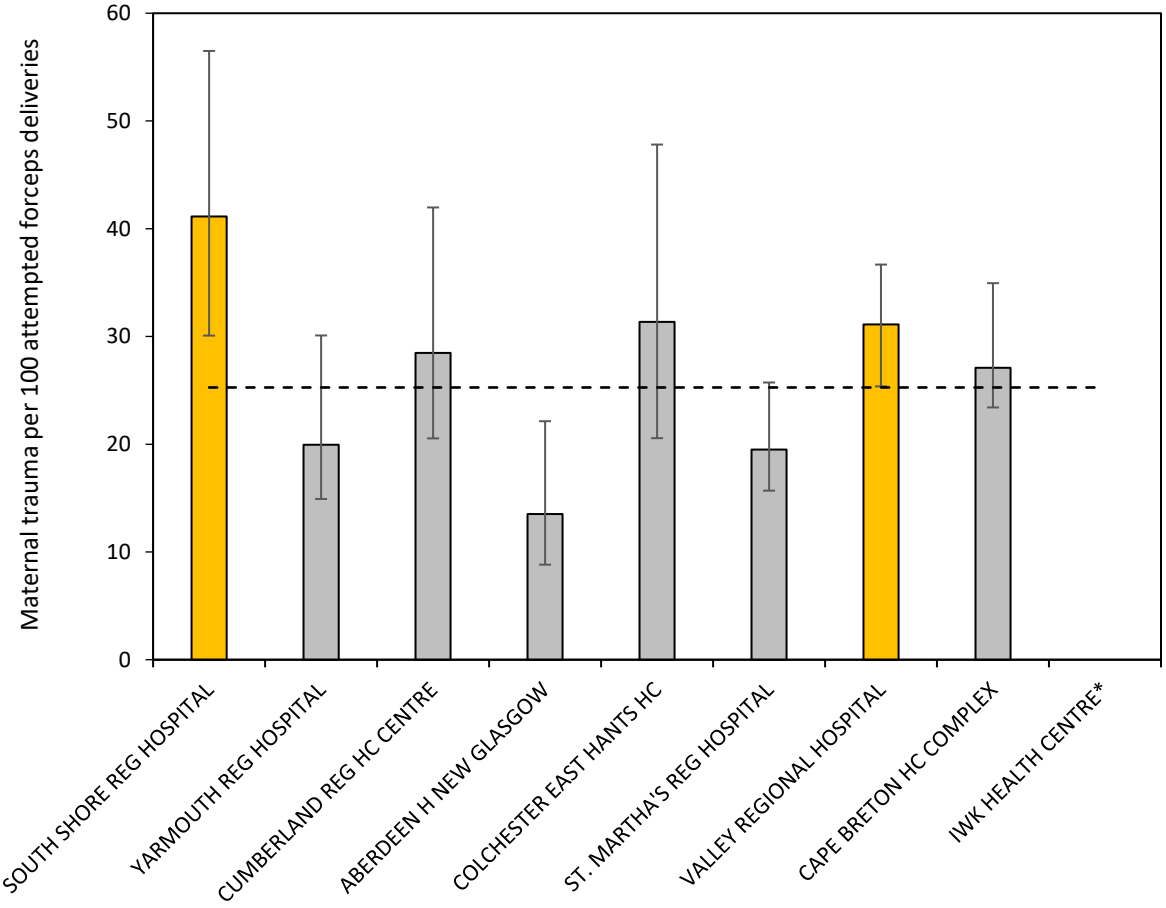
*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the province.
IWK HEALTH CENTRE: 3rd or 4th degree perineal lacerations 266; Cervical or high vaginal lacerations 79; Other pelvic trauma 15; repair of the urethra or bladder [redacted].

3.4.7.2. Nova Scotia hospital rates vs the reference rate: Trauma rates following attempted forceps delivery

Figure 52 shows stabilized and adjusted rates of maternal trauma following attempted forceps delivery in each hospital in Nova Scotia (compared with the reference rate for Canada excluding Quebec of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

Figure 53 below shows stabilized rates of neonatal trauma following attempted forceps birth in each hospital in Nova Scotia (compared with the reference rate of for Canada excluding Quebec 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

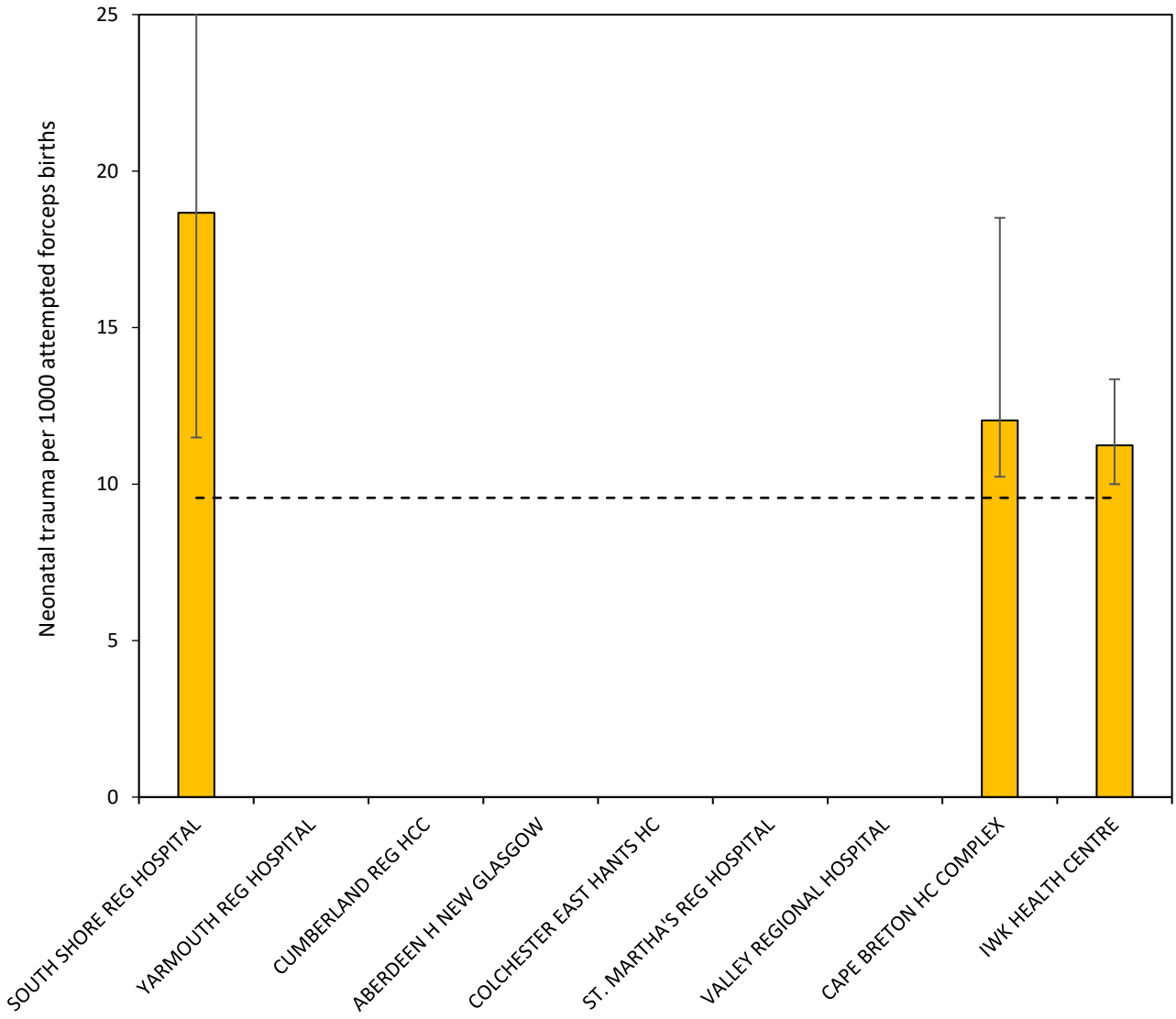
Figure 52. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2a, 2b and 3 hospitals, Nova Scotia, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.

Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 53. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 2a, 2b and 3 hospitals, Nova Scotia, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.7.3. Nova Scotia hospitals: Failed forceps deliveries

Table 104 lists the rates of attempted and failed forceps delivery (forceps application followed by cesarean delivery) by hospital in Nova Scotia.

Table 104. Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), Nova Scotia, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Deliveries	Attempted forceps deliveries		Forceps followed by cesarean delivery*	
			No.	Rate	No.	Rate
3	IWK Health Centre	21,037	876	4.2	50	5.7
3	Total	21,037	876	4.2	50	5.7
All Tiers/Hospitals Nova Scotia		38,725	1,145	3.0	59	5.2

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries.

3.4.7.4. Nova Scotia hospitals: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 105 to 108 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Nova Scotia.

Table 105. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 0 hospitals, Nova Scotia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Buchanan Memorial Comm HC		0	0.0	0	0.0		0	0.0	0	0.0
Digby General Hospital		0	0.0	0	0.0		0	0.0	0	0.0
Inverness Consolidated M H		0	0.0	0	0.0		0	0.0	0	0.0
Queen Elizabeth II Health SC		0	0.0	0	0.0		0	0.0	0	0.0
Roseway Hospital		0	0.0	0	0.0					
Soldiers Memorial Hospital		0	0.0	0	0.0					
Total	12	0	0.0	0	0.0	12				

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 106. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2a hospitals, Nova Scotia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Aberdeen Hospital	1,430	91	6.4	[redacted]	[redacted]	1,358	86	6.3	0	0.0
Colchester East Hants HC	2,256	106	4.7	[redacted]	[redacted]	2,156	99	4.6	[redacted]	[redacted]
Cumberland Regional HCC	1,063	118	11.1	15	12.7	991	111	11.2	0	0.0
South Shore Regional Hospital	1,683	134	8.0	32	23.9	1,548	125	8.1	[redacted]	[redacted]
Yarmouth Regional Hospital	1,607	187	11.6	9	4.8	1,524	180	11.8	[redacted]	[redacted]
Total	8,039	636	7.9	62	9.7	7,577	601	7.9	5	8.3

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of service.

SOUTH SHORE REGIONAL HOSPITAL: 3rd or 4th degree perineal lacerations 29; Cervical or high vaginal laceration 6.

SOUTH SHORE REGIONAL HOSPITAL: Seizures [redacted].

Table 107. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2b hospitals, Nova Scotia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Cape Breton Healthcare Complex	4,210	502	11.9	65	12.9	3,981	479	12	[redacted]	[redacted]
St. Martha's Regional Hospital	1,826	136	7.4	19	14	1,720	126	7.3	0	0.0
Valley Regional Hospital	3,601	268	7.4	44	16.4	3,402	250	7.3	[redacted]	[redacted]
Total	9,637	906	9.4	128	14.1	9,103	855	9.4	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 108. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, Nova Scotia, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
IWK Health Centre	21,037	1,241	5.9	227	18.3	18,784	1,081	5.8	11	10.2
Total	21,037	1,241	5.9	227	18.3	18,784	1,081	5.8	11	10.2

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the province.

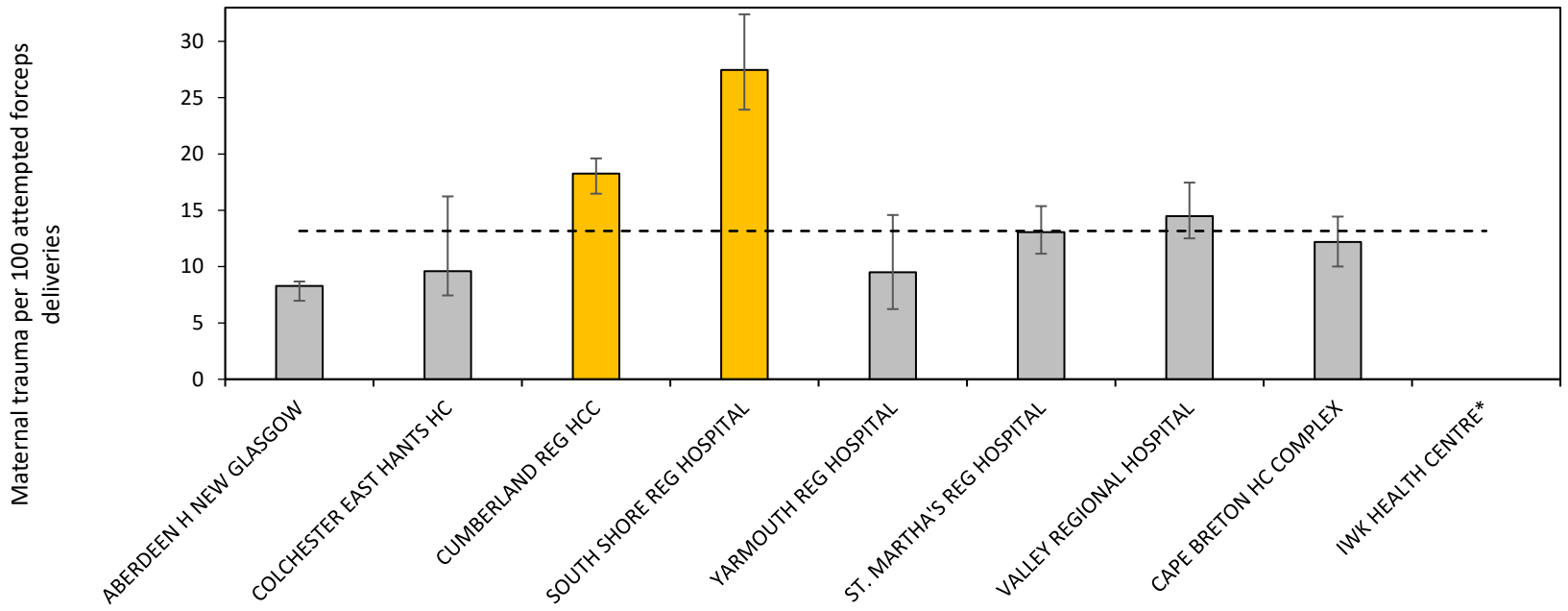
IWK HEALTH CENTRE: 3rd or 4th degree perineal lacerations 197; Cervical or high vaginal laceration 39; Other pelvic trauma 9.

3.4.7.5. Nova Scotia hospital rates vs the reference rate: Trauma rates following attempted vacuum delivery

Figure 54 below shows stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in Nova Scotia (compared with the reference rate for Canada excluding Quebec of 13.2 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

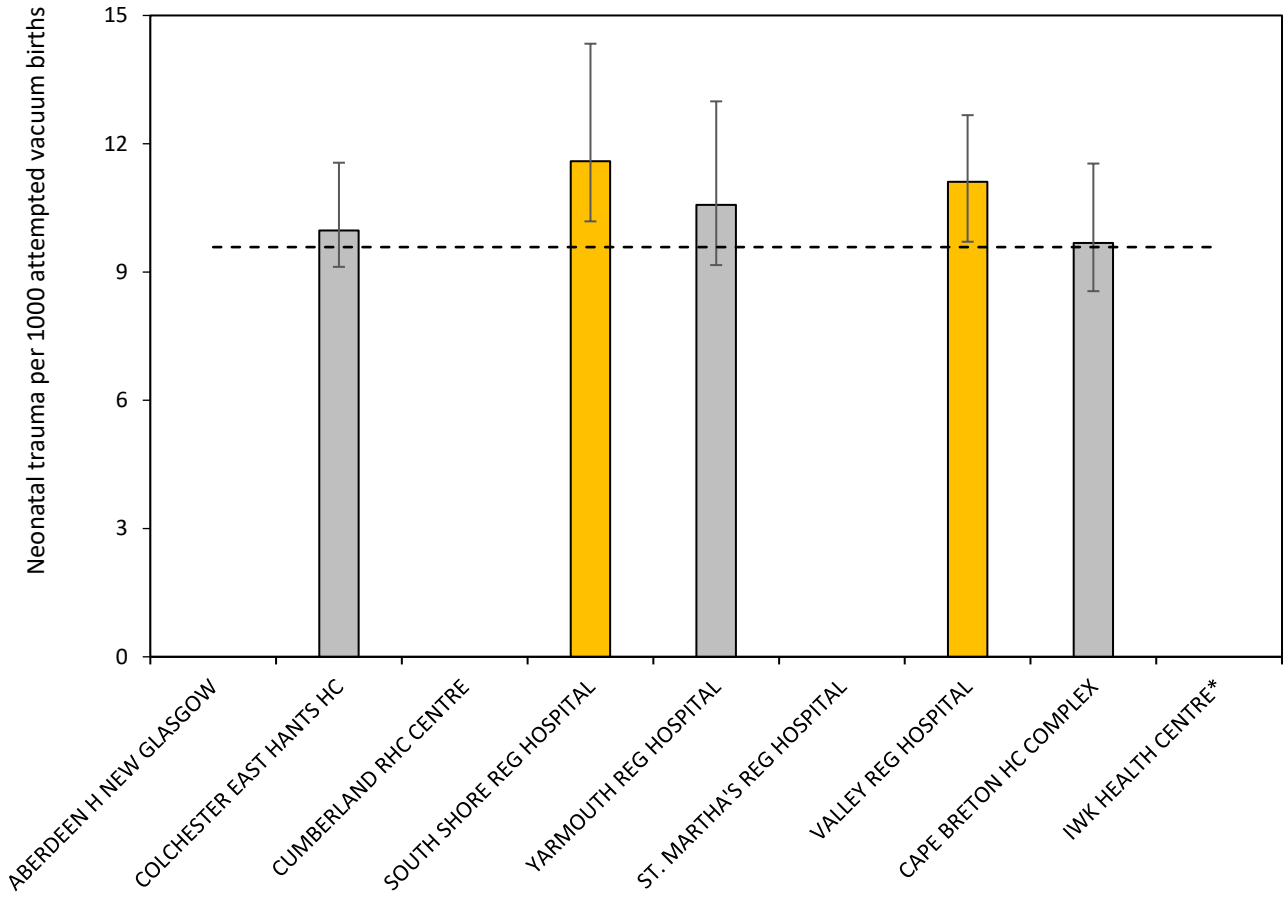
Figure 55 below shows stabilized and adjusted rates of neonatal trauma following attempted vacuum delivery in each hospital in Nova Scotia (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 54. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 2a, 2b and 3 hospitals, Nova Scotia, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 55. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 2a, 2b and 3 hospitals, Nova Scotia, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.7.6. Nova Scotia: Failed vacuum deliveries

Hospital-specific rates of attempted vacuum and the 3 types of failed vacuum delivery in Nova Scotia are listed below.

Table 109. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Nova Scotia, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
2.0	Aberdeen Hospital	688	61	8.9	6	9.8	[redacted]	[redacted]	0	0.0
2.0	Colchester East Hants HC	2,256	106	4.7	6	5.7	[redacted]	[redacted]	0	0.0
2.0	Cumberland Regional HCC	1,063	118	11.1	15	12.7	0	0.0	0	0.0
2.0	South Shore Regional Hospital	1,683	134	8.0	7	5.2	[redacted]	[redacted]	[redacted]	[redacted]
2.0	Total	5,690	419	7.4	34	8.1	8	1.9	[redacted]	[redacted]
2.5	Cape Breton HC Complex	4,210	502	11.9	53	10.6	18	3.6	7	1.4
2.5	St. Martha's Regional Hospital	1,826	136	7.4	17	12.5	[redacted]	[redacted]	[redacted]	[redacted]
2.5	Valley Regional Hospital	3,601	268	7.4	31	11.6	[redacted]	[redacted]	[redacted]	[redacted]
2.5	Total	9,637	906	9.4	101	11.1	28	3.1	9	1.0
3.0	IWK Health Centre	21,037	1,241	5.9	143	11.5	6	0.5	16	1.3
3.0	Total	21,037	1,241	5.9	143	11.5	6	0.5	16	1.3
All Tiers/Hospitals Nova Scotia		38,725	2,783	7.2	280	10.1	44	1.6	29	1.0

*Rates of failed vacuum (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.

3.4.8.1. Prince Edward Island hospitals: Within-tier hospital-specific trauma rates following attempted forceps delivery

Tables 110 and 111 below list the numbers and rates of attempted forceps delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Prince Edward Island.

Table 110. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2a hospitals, Prince Edward Island, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Prince County Hospital	2,332	14	0.6	8	57.1	2,019	14	0.7	0	0.0
Total	2,332	14	0.6	8	57.1	2,019	14	0.7	0	0.0

*Infants with congenital anomalies excluded.

Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 111. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2b hospitals, Prince Edward Island, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Queen Elizabeth Hospital	3,865	81	2.1	29	35.8	3,534	70	2.0	0	0.0
Total	3,865	81	2.1	29	35.8	3,534	70	2.0	0	0.0

*Infants with congenital anomalies excluded.

Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

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3.4.8.2. Prince Edward Island hospital rates vs the reference rate: Trauma rates following attempted forceps delivery

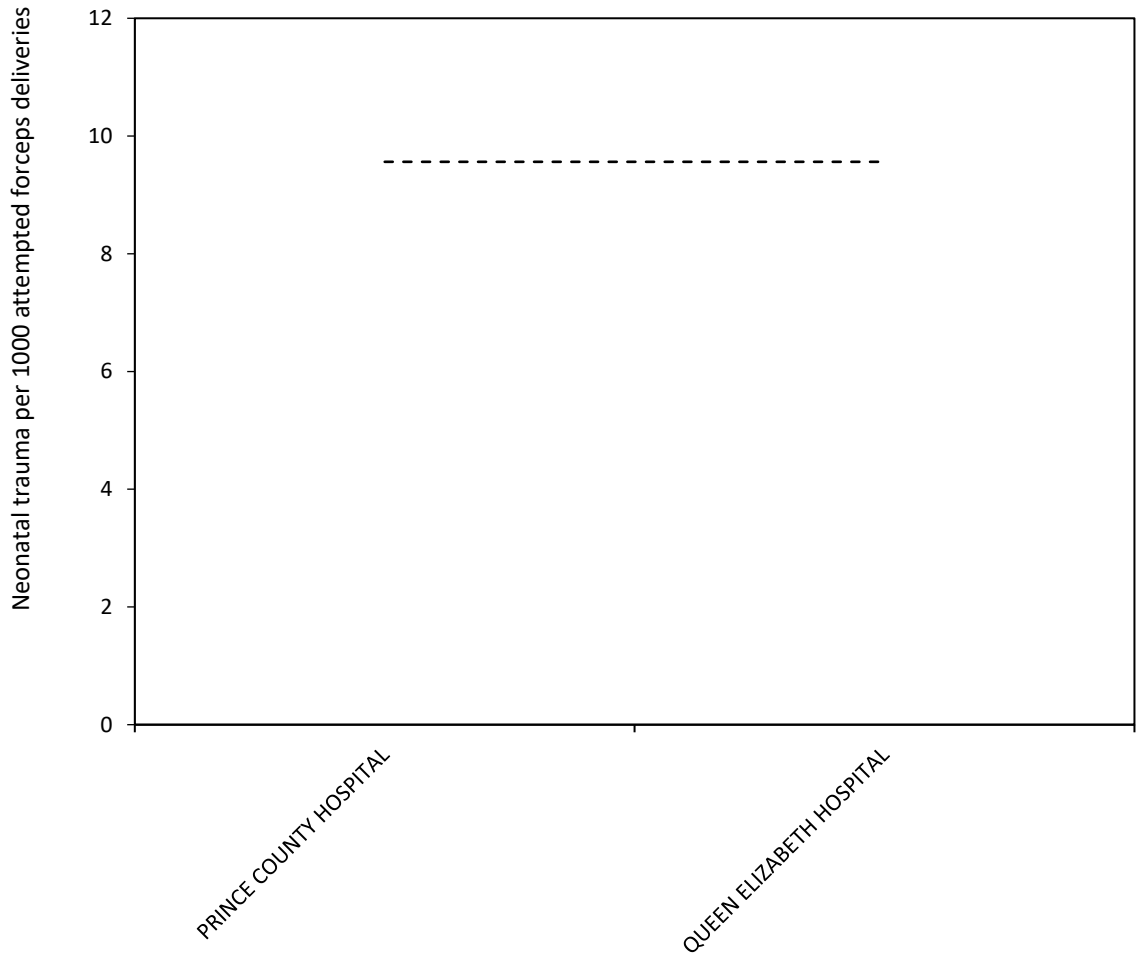
Stabilized and adjusted rates of maternal trauma following attempted forceps delivery in each hospital in Prince Edward Island (compared with the reference rate of 25.3 per 100 deliveries) could not be estimated because of a lack of variability for the hospital(s) in this tier.
(Figure 56). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

Figures 57 below shows stabilized rates of neonatal trauma following attempted forceps birth in each hospital in Prince Edward Island (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 56. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2a and 2b hospitals, Prince Edward Island, April 2013 to March 2019.

* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in these tiers.

Figure 57. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 2a and 2b hospitals, Prince Edward Island, April 2013 to March 2019.



There were no cases of neonatal trauma following attempted forceps birth in tier of obstetric service 2a and 2b hospitals in Prince Edward Island.

3.4.8.3. Prince Edward Island hospitals: Failed forceps deliveries

Table 112 lists the rates of attempted and failed forceps delivery (forceps application followed by cesarean delivery) by hospital in Prince Edward Island.

Table 112. Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), Prince Edward Island, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Singleton deliveries	Attempted forceps deliveries		Forceps followed by cesarean delivery*	
			No.	Rate	No.	Rate
2.0	Prince County Hospital	2,332	14	0.6	[redacted]	[redacted]
2.0	Total	2,332	14	0.6	[redacted]	[redacted]
2.5	Queen Elizabeth Hospital	3,865	81	2.1	[redacted]	[redacted]
2.5	Total	3,865	81	2.1	[redacted]	[redacted]
All Tiers/Hospitals PE		6,197	95	1.5	15	15.8

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries.

Small cells (<5) suppressed.

3.4.8.4. Prince Edward Island: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 113 and 114 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Prince Edward Island.

Table 113. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2a hospitals, Prince Edward Island, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Prince County Hospital	2,332	255	10.9	24	9.4	2,019	213	10.5	[redacted]	18.8
Total	2,332	255	10.9	24	9.4	2,019	213	10.5	[redacted]	18.8

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 114. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2b hospitals, Prince Edward Island, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Queen Elizabeth Hospital	3,865	137	3.5	19	13.9	3,534	125	3.5	5	40.0
Total	3,865	137	3.5	19	13.9	3,534	125	3.5	5	40.0

*Infants with congenital anomalies excluded.

Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

3.4.8.5. Prince Edward Island hospital rates vs the reference rate: Trauma rates following attempted vacuum delivery

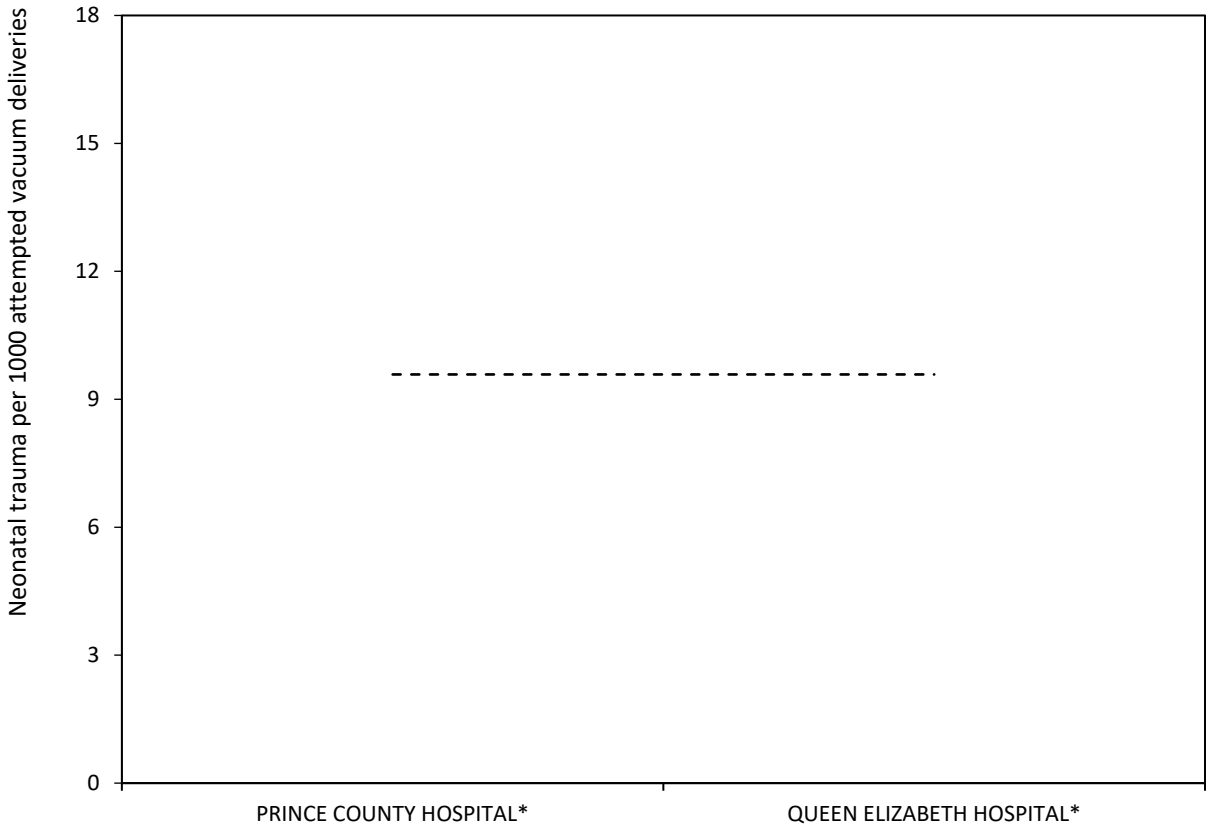
Stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in Prince Edward Island (compared with the reference rate for Canada excluding Quebec of 13.2 per 100 deliveries) could not be estimated because of a lack of variability for the hospital(s) in this tier. (Figure 58). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

Stabilized and adjusted rates of neonatal trauma following attempted vacuum birth in each hospital in Prince Edward Island (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births) could not be estimated because f a lack of variability for the hospital(s) in this tier (Figure 59). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 58. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 2a and 2b hospitals, Prince Edward Island, April 2013 to March 2019.

* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.

Figure 59. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum delivery in tier of obstetric service 2a and 2b hospitals, Prince Edward Island, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.

3.4.8.6. Prince Edward Island: Failed vacuum deliveries

Hospital-specific rates of attempted vacuum and the 3 types of failed vacuum delivery in Nova Scotia are listed below.

Table 113. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Prince Edward Island, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
2.0	Prince County Hospital	2,332	255	10.9	22	8.6	[redacted]	[redacted]	[redacted]	[redacted]
2.0	Total	2,332	255	10.9	22	8.6	[redacted]	[redacted]	[redacted]	[redacted]
2.5	Queen Elizabeth Hospital	3,865	137	3.5	14	10.2	[redacted]	[redacted]	[redacted]	[redacted]
2.5	Total	3,865	137	3.5	14	10.2	[redacted]	[redacted]	[redacted]	[redacted]
All Tiers/Hospitals PT		6,197	392	6.3	36	9.2	6	1.5	[redacted]	[redacted]

*Rates of failed vacuum delivery (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.
Small cells (<5) suppressed.

3.4.9.1. Newfoundland and Labrador: Within-tier hospital-specific trauma rates following attempted forceps delivery

Tables 114 to 118 below list the numbers and rates of attempted forceps delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Newfoundland and Labrador.

Table 114. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1 hospitals, Newfoundland and Labrador, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Connaigre Peninsula Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Dr. Charles L. Legrow Health	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Dr. Y.K. Jeon Kittiwake Health	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Green Bay Health Centre	10	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Placentia Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Rufus Guinchard Health Care	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Sir Thomas Roddick Hospital	14	0	0.0	0	0.0	14	0	0.0	0	0.0
Total	33	0	0.0	0	0.0	33	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 115. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2 hospitals, Newfoundland and Labrador, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Burin Peninsula Health C Centre	520	[redacted]	[redacted]	0	0.0	475	[redacted]	[redacted]	0	0.0
Captain William Jackman Mem H	149	[redacted]	[redacted]	[redacted]	[redacted]	136	[redacted]	[redacted]	0	0.0
Carbonear General Hospital	858	87	10.1	5	5.7	810	79	9.8	0	0.0
Central Newfoundland R H Ctre	1,769	99	5.6	17	17.2	1,710	92	5.4	[redacted]	[redacted]
Charles S. Curtis M Hospital	296	6	2.0	0	0.0	286	5	1.7	0	0.0
Dr. G. B. Cross Memorial Hospital	747	9	1.2	[redacted]	[redacted]	702	9	1.3	0	0.0
James Paton M R Health Centre	797	47	5.9	[redacted]	[redacted]	774	46	5.9	[redacted]	[redacted]
Labrador Health Centre	1,034	[redacted]	[redacted]	0	0.0	982	[redacted]	[redacted]	0	0.0
Labrador West Health Centre	283	[redacted]	[redacted]	[redacted]	[redacted]	264	[redacted]	[redacted]	0	0.0
Total	6,453	257	4.0	30	11.7	6,139	238	3.9	[redacted]	[redacted]

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the same tier of obstetric service.

CENTRAL NEWFOUNDLAND REGIONAL HEALTH CENTRE: 3rd or 4th degree perineal laceration 11; Cervical or high vaginal laceration [redacted]; Other pelvic trauma [redacted].

Table 116. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, Newfoundland and Labrador, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Western Memorial R Hospital	2,648	26	1.0	6	23.1	2,546	25	1.0	0	0.0
Total	2,648	26	1.0	6	23.1	2,546	25	1.0	0	0.0

*Infants with congenital anomalies excluded.
Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 118. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 4 hospitals, Newfoundland and Labrador, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Health Sciences Centre-St. John's	11,059	161	1.5	37	23.0	9,271	133	1.4	[redacted]	[redacted]
Total	11,059	161	1.5	37	23.0	9,271	133	1.4	[redacted]	[redacted]

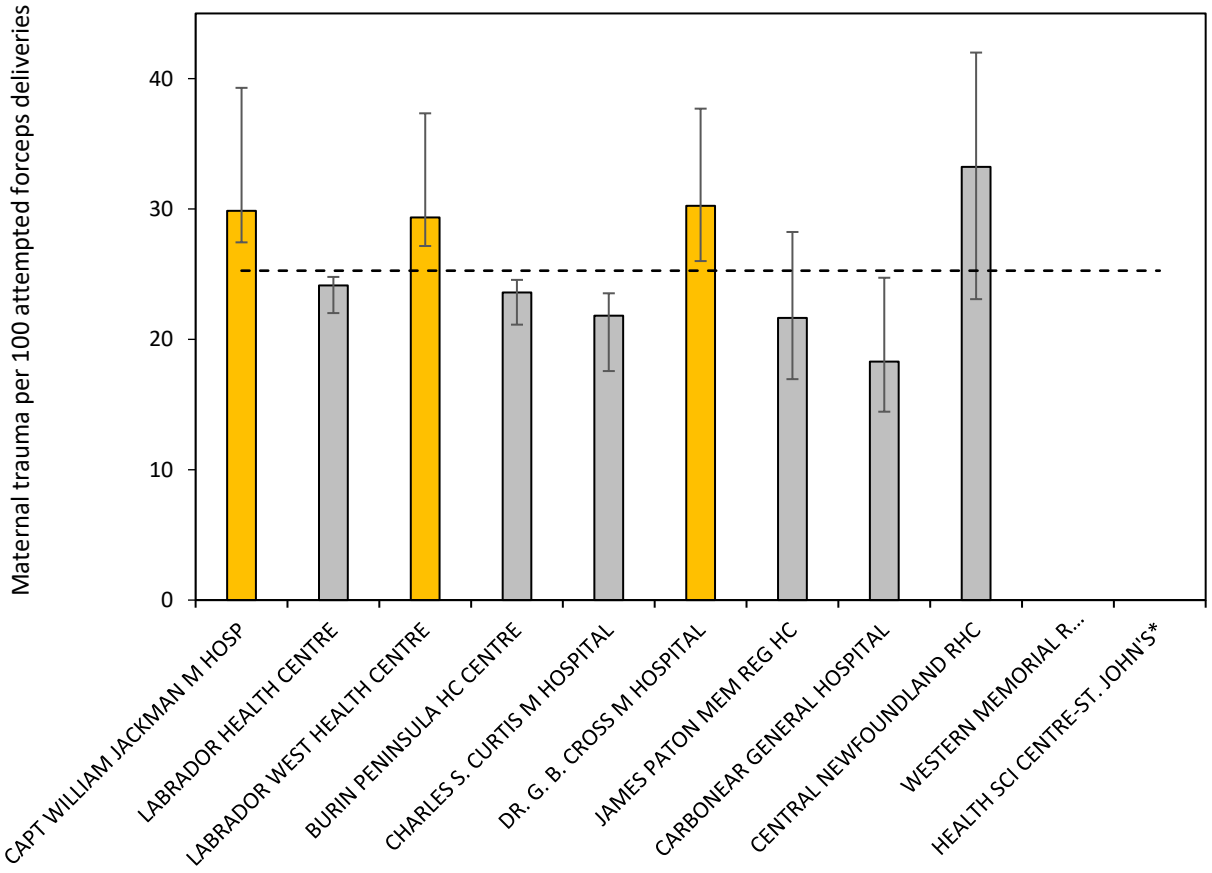
*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the province combined.
HEALTH SCIENCES CENTRE-ST. JOHN'S: 3rd or 4th degree perineal lacerations 26; Cervical/high vaginal laceration 11; Other pelvic trauma [redacted].

3.4.9.2. Newfoundland and Labrador hospital rates vs the reference rate: Trauma rates following attempted forceps delivery

Figure 60 shows stabilized and adjusted rates of maternal trauma following attempted forceps delivery in each hospital in Newfoundland and Labrador (compared with the reference rate for Canada excluding Quebec of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

Figures 61 below shows stabilized rates of neonatal trauma following attempted forceps birth in each hospital in Newfoundland and Labrador (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

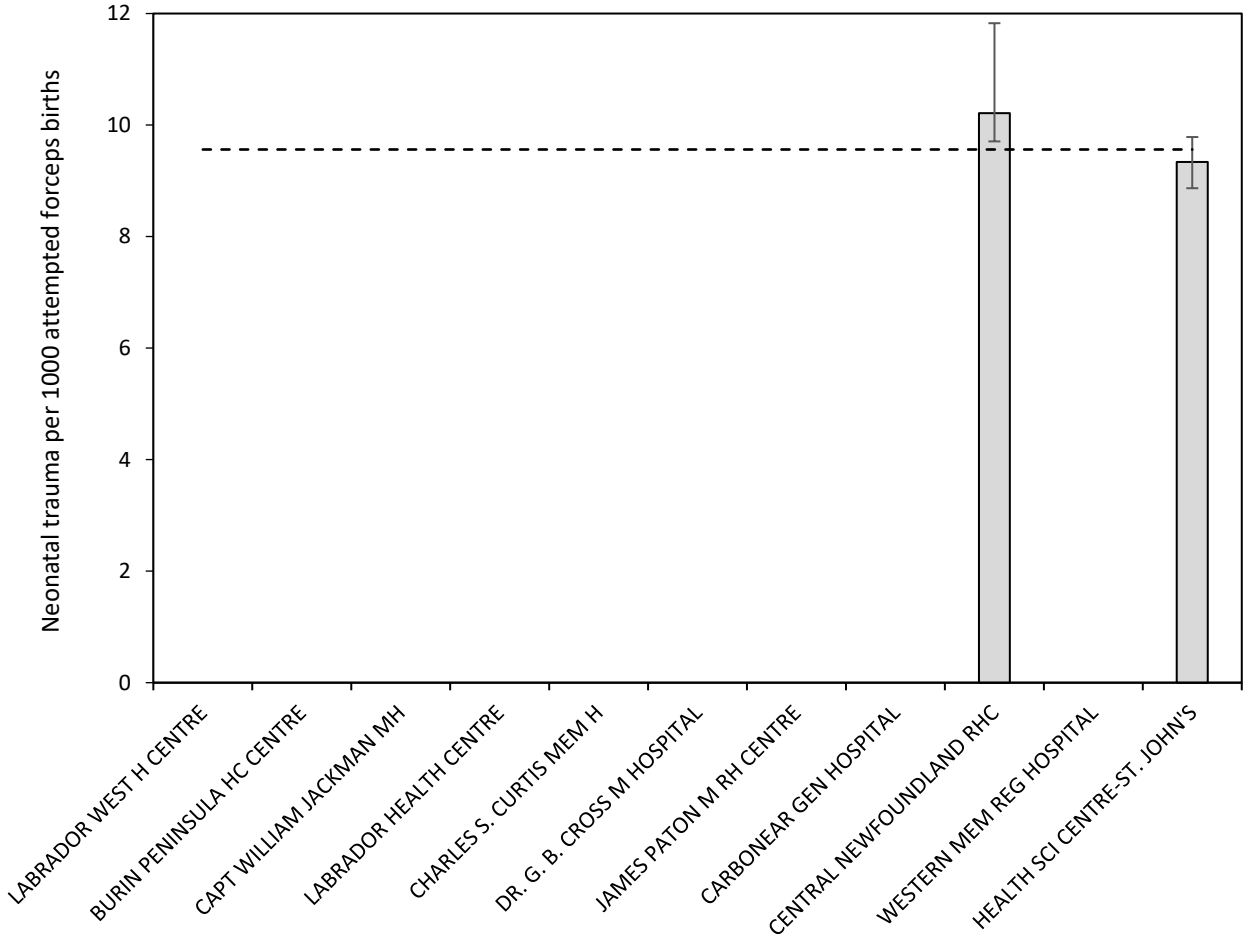
Figure 60. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2, 3 and 4 hospitals, Newfoundland and Labrador, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.

Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 61. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 2, 3 and 4 hospitals, Newfoundland and Labrador, April 2013 to March 2019.



Grey bars indicate hospitals which had a stabilized trauma rate that was not 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and/or whose 95% confidence bounds did not exceed the reference trauma rate.

3.4.9.3. Newfoundland and Labrador hospitals: Failed forceps deliveries

Table 119 lists the rates of attempted and failed forceps delivery (forceps application followed by cesarean delivery) by hospital in Newfoundland and Labrador.

Table 119. Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), Newfoundland and Labrador, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Deliveries	Attempted forceps deliveries		Forceps followed by cesarean delivery*	
			No.	Rate	No.	Rate
4	Health Sci Centre-St. John's	11,059	161	1.5	13	8.1
4	Total	11,059	161	1.5	13	8.1
All Tiers/Hospitals NL		20,193	444	2.2	2[redacted]	4.[redacted]

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries. Some cells suppressed to prevent back calculation.

3.4.9.4. Newfoundland and Labrador hospitals: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 120 to 123 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Prince Edward Island.

Table 120. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1 hospitals, Newfoundland and Labrador, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Connaigre Peninsula Health Ctr	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Dr. Charles L. Legrow Health Ctr	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Dr. Y.K. Jeon Kittiwake Health Ctr	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Green Bay Health Centre	10	0	0.0	0	0.0	10	0	0.0	0	0.0
Placentia Health Centre	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Rufus Guinchard Health Care Ctr	[redacted]	0	0.0	0	0.0	[redacted]	0	0.0	0	0.0
Sir Thomas Roddick Hospital	14	0	0.0	0	0.0	14	0	0.0	0	0.0
Total	33	0	0.0	0	0.0	33	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 121. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2 hospitals, Newfoundland and Labrador, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Burin Peninsula Health CC	520	92	17.7	4	[redacted]	475	87	18.3	[redacted]	[redacted]
Captain William Jackman M H	149	16	10.7	[redacted]	[redacted]	136	14	10.3	0	0.0
Carbonear General Hospital	858	96	11.2	6	6.3	810	93	11.5	[redacted]	[redacted]
Central Newfoundland R H Ctr	1,769	41	2.3	7	17.1	1710	41	2.4	[redacted]	[redacted]
Charles S. Curtis Memorial Hosp	296	5	1.7	0	0.0	286	5	1.7	0	0.0
Dr. G. B. Cross Memorial Hospital	747	115	15.4	9	7.8	702	109	15.5	0	0.0
James Paton Memorial R Health C	797	45	5.6	7	15.6	774	45	5.8	[redacted]	[redacted]
Labrador Health Centre	1,034	113	10.9	4	[redacted]	982	109	11.1	0	0.0
Labrador West Health Centre	283	27	9.5	1	[redacted]	264	26	9.8	0	0.0
Total	6,453	550	8.5	42	7.6	6139	529	8.6	6	11.3

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the province combined.

CAPT WILLIAM JACKMAN MEMORIAL HOSPITAL: 3rd or 4th degree perineal lacerations [redacted]; other pelvic trauma [redacted].

CENTRAL NEWFOUNDLAND REGIONAL HEALTH CENTRE: 3rd or 4th degree perineal lacerations [redacted]; cervical or high vaginal lacerations [redacted]; other pelvic trauma [redacted].

Table 122. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 3 hospitals, Newfoundland and Labrador, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Western Memorial R Hospital	2,648	301	11.4	15	5.0	2,546	282	11.1	[redacted]	[redacted]
Total	2,648	301	11.4	15	5.0	2,546	282	11.1	[redacted]	[redacted]

*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 123. Numbers and rates of attempted vacuum delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 4 hospitals, Newfoundland and Labrador, April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Health Sciences Centre-St. John's	11,059	1,132	10.2	105	9.3	9,271	937	10.1	13	13.9
Total	11,059	1,132	10.2	105	9.3	9,271	937	10.1	13	13.9

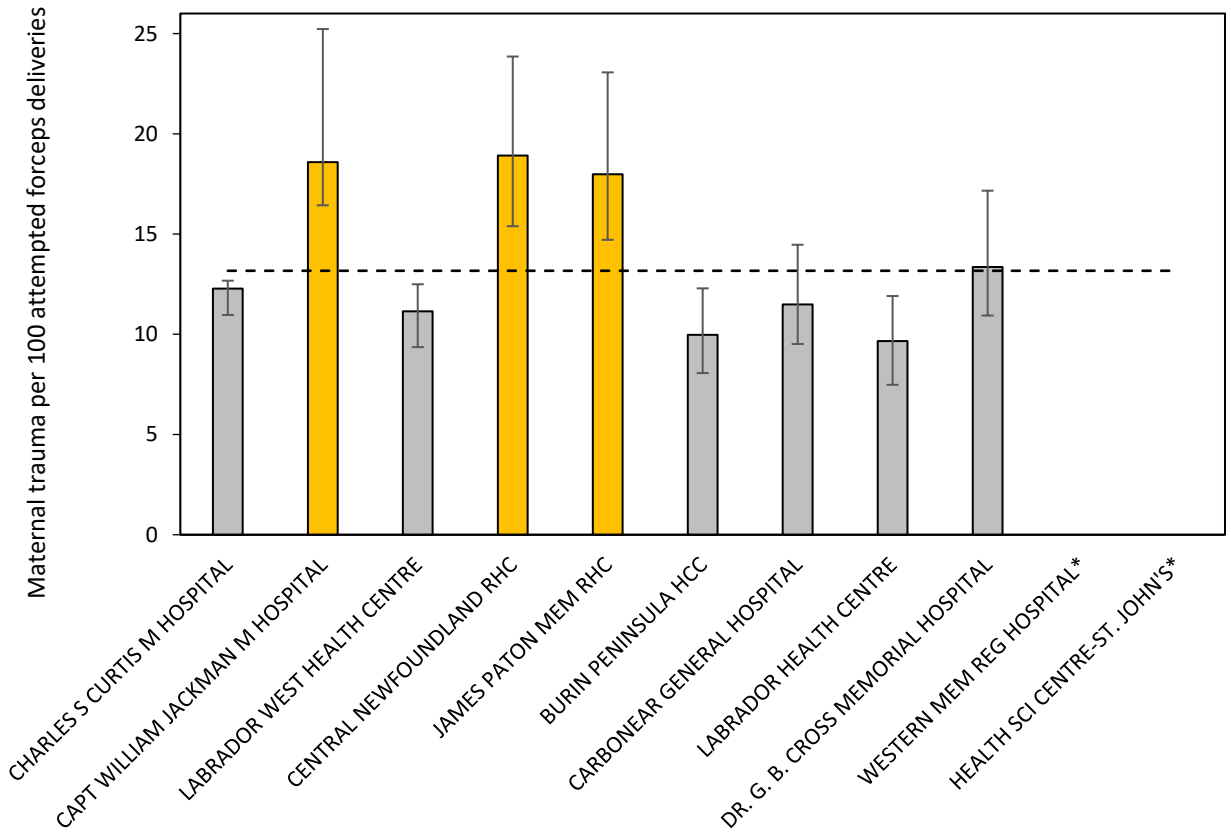
*Infants with congenital anomalies excluded.
Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.
Yellow highlight indicates hospitals with a rate of maternal trauma or neonatal trauma that was significantly higher than the rate in all other hospitals in the province combined.
HEALTH SCIENCES CENTRE-ST. JOHN'S: 3rd or 4th degree perineal lacerations 79; Cervical or high vaginal laceration 24; Other pelvic trauma 7; Repair of the urethra or bladder [redacted].

3.4.9.5. Newfoundland and Labrador hospital rates vs the reference rate: Trauma rates following attempted vacuum delivery

Figure 62 shows stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in Newfoundland and Labrador (compared with the reference rate for Canada excluding Quebec of 13.2 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

Figures 63 below shows stabilized and adjusted rates of neonatal trauma following attempted vacuum birth in each hospital in Newfoundland and Labrador (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

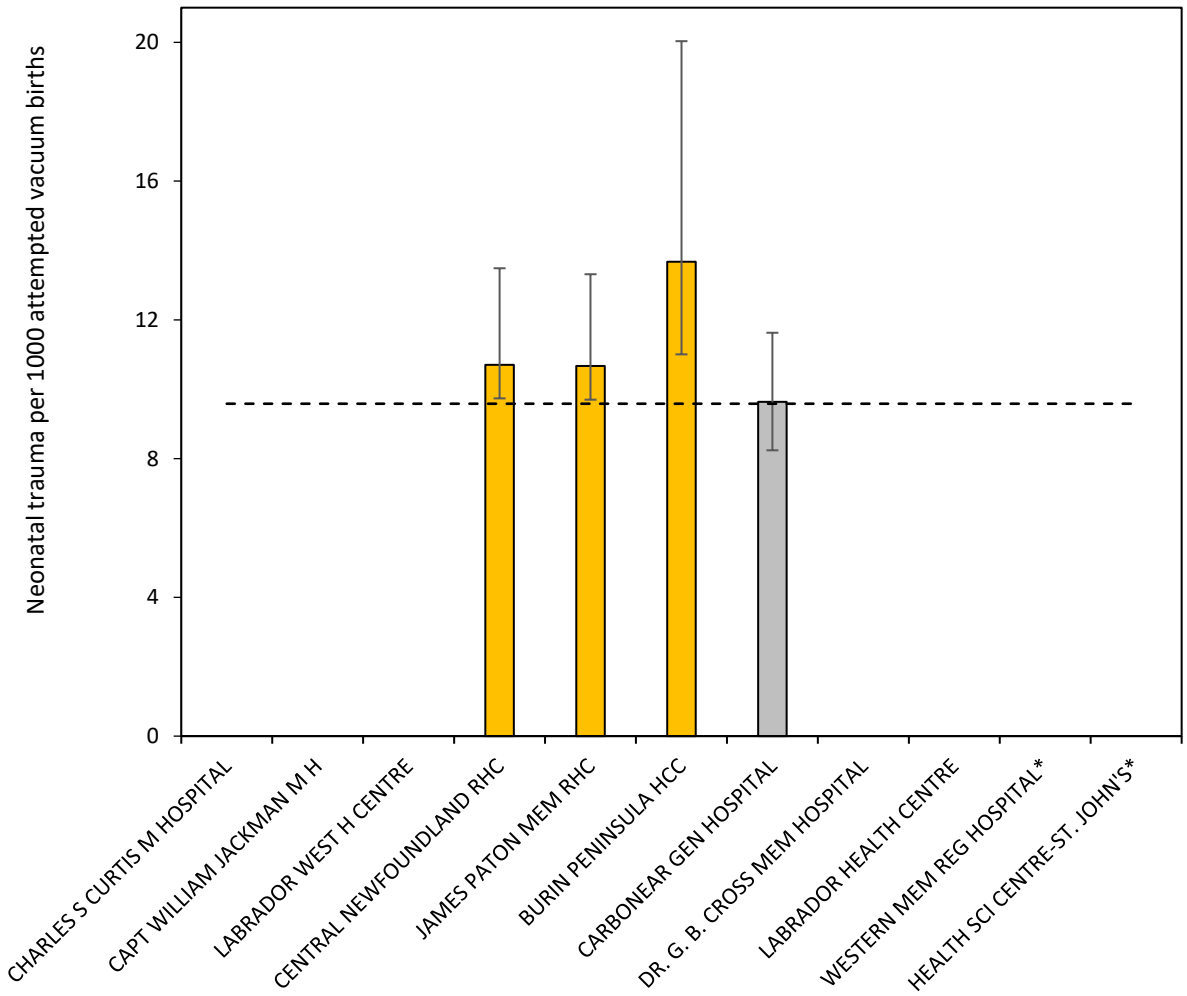
Figure 62. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 2, 3 and 4 hospitals, Newfoundland and Labrador, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.

Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 63. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 2, 3 and 4 hospitals, Newfoundland and Labrador, April 2013 to March 2019.



* A stabilized and adjusted rate could not be estimated because of a lack of variability for the hospital(s) in this tier.
Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.9.6. Newfoundland and Labrador hospitals: Failed vacuum deliveries

Hospital-specific rates of attempted vacuum and the 3 types of failed vacuum delivery in Newfoundland and Labrador.

Table 124. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Newfoundland and Labrador, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
2	Carbonear General Hospital	858	96	11.2	15	15.6	[redacted]	[redacted]	[redacted]	[redacted]
2	Central Newfoundland R H C	1,769	41	2.3	5	12.2	[redacted]	[redacted]	[redacted]	[redacted]
2	Dr. G. B. Cross Memorial Hospital	747	115	15.4	11	9.6	[redacted]	[redacted]	[redacted]	[redacted]
2	Total	3,374	252	7.5	31	12.3	[redacted]	[redacted]	[redacted]	[redacted]
3	Western Memorial R Hospital	2,648	301	11.4	13	4.3	6	2.0	5	1.7
3	Total	2,648	301	11.4	13	4.3	6	2.0	5	1.7
4	Health Sciences Centre-St. John's	11,059	1,132	10.2	73	6.4	27	2.4	8	0.7
4	Total	11,059	1,132	10.2	73	6.4	27	2.4	8	0.7
All Tiers/Hospitals NL		20,193	1,983	9.8	127	6.4	38	1.9	14	0.7

*Rates of failed vacuum (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.
Small cells (<5) suppressed.

3.4.10.1. Hospitals in the Combined Territories: Within-tier hospital-specific trauma rates following attempted forceps delivery

Table 125. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1 hospitals, Northwest Territories, Nunavut, and Yukon, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Fort Smith Health Centre	64	0	0.0	0	0.0	60	0	0.0	0	0.0
Hay River Regional H Centre	44	0	0.0	0	0.0	36	0	0.0	0	0.0
Total	108	0	0.0	0	0.0	96	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Table 126. Numbers and rates of attempted forceps delivery and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2 hospitals, Northwest Territories, Nunavut, and Yukon, April 2013 to March 2019.

Hospital	Deliveries	Attempted forceps deliveries		Maternal trauma		Births* (No CA)	Attempted forceps births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Inuvik Regional Hospital	566	0	0.0	0	0.0	529	0	0.0	0	0.0
Qikiqtani General Hospital	1,825	[redacted]	[redacted]	[redacted]	[redacted]	1,683	[redacted]	[redacted]	0	0.0
Stanton Territorial Hospital	3,056	[redacted]	[redacted]	[redacted]	[redacted]	2,869	[redacted]	[redacted]	0	0.0
Whitehorse General Hospital	2,015	25	1.2	7	28.0	1,859	24	1.3	0	0.0
Total	7,462	32	0.4	10	31.3	6,940	31	0.4	0	0.0

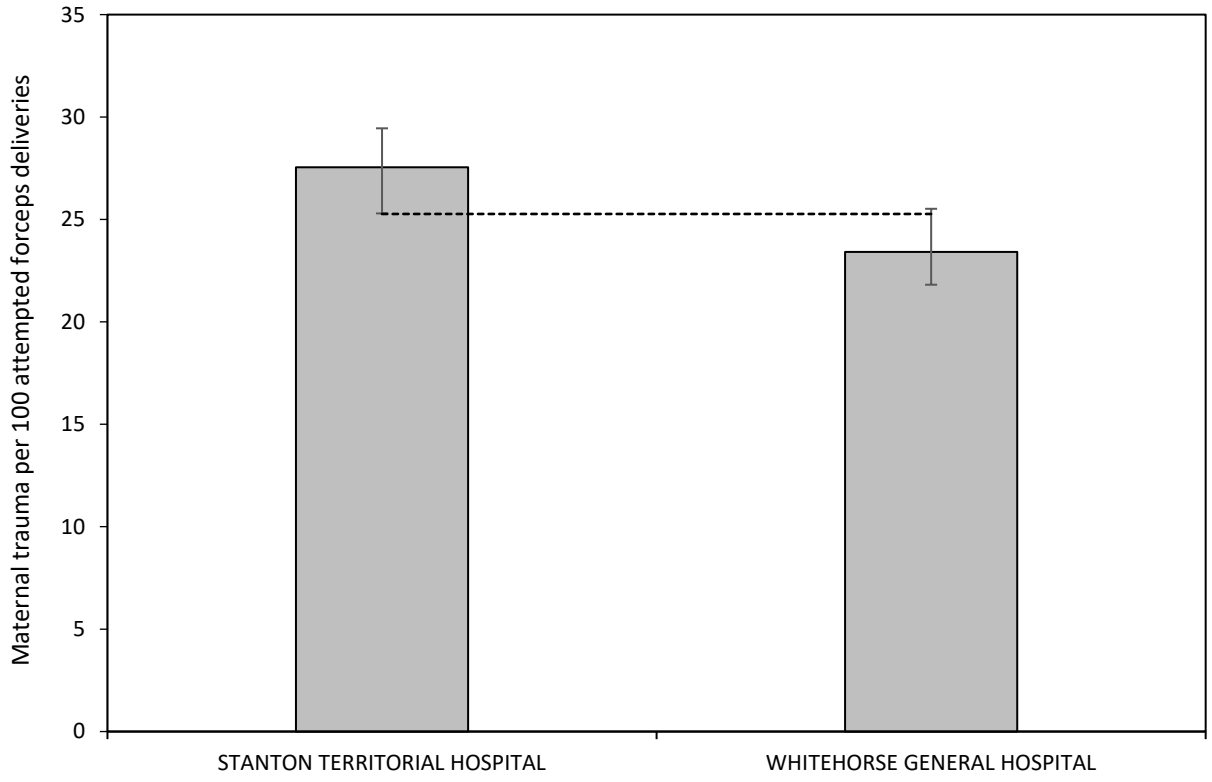
*Infants with congenital anomalies excluded.
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

3.4.10.2. Hospital rates in the Combined Territories vs the reference rate: Trauma rates following attempted forceps delivery

Figure 64 shows stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in the Northwest Territories, Nunavut, and Yukon (compared with the reference rate for Canada excluding Quebec of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

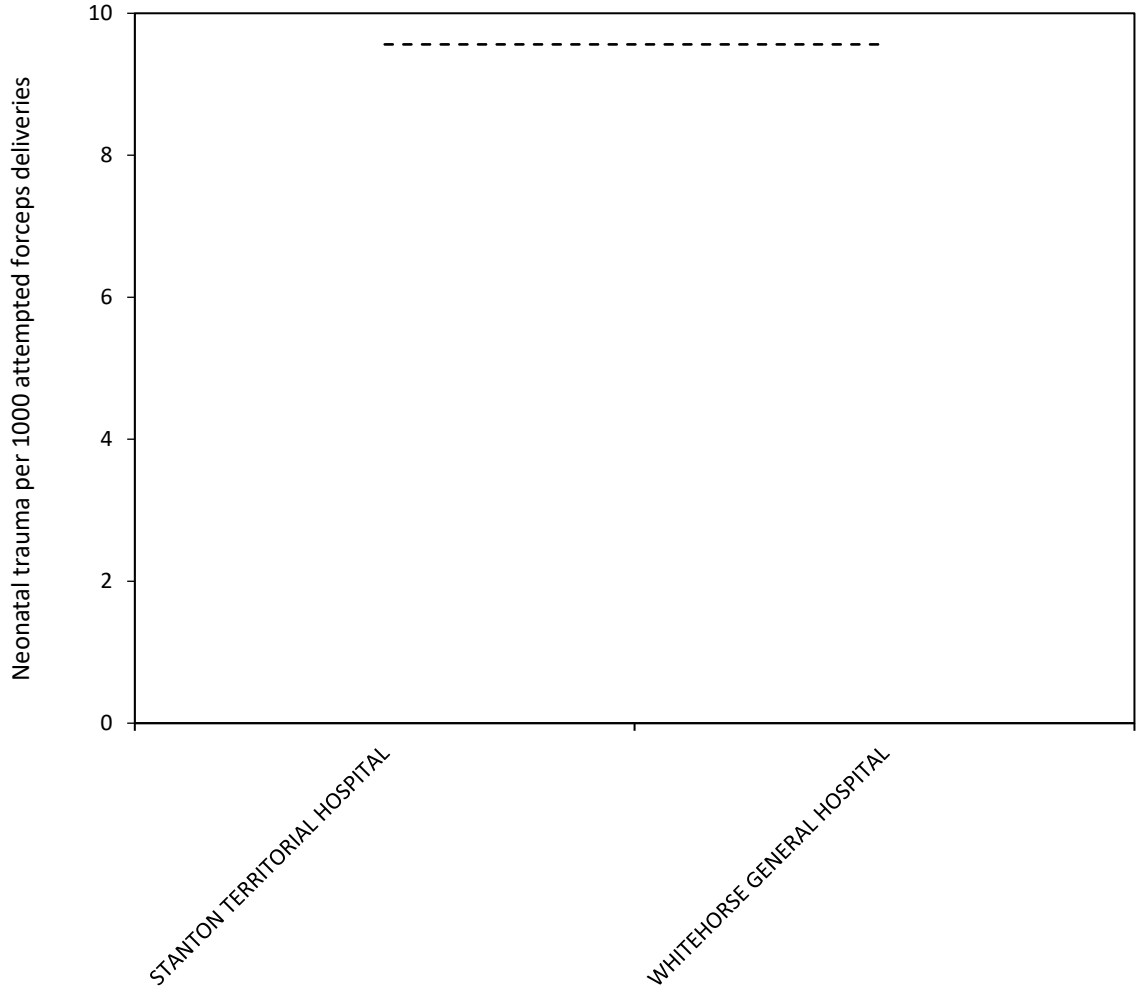
Figures 65 below shows stabilized rates of neonatal trauma following attempted vacuum birth in each hospital in the Northwest Territories, Nunavut, and Yukon (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 64. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted forceps delivery in tier of obstetric service 2 hospitals, in the Combined Territories (Northwest Territories, Nunavut, and Yukon), April 2013 to March 2019.



Grey bars indicate hospitals which had a stabilized and adjusted trauma rate that was not 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and/or whose 95% confidence bounds did not exceed the reference trauma rate.

Figure 65. Stabilized rates (95% confidence intervals) of neonatal trauma following attempted forceps birth in tier of obstetric service 2 hospitals, in the Combined Territories (Northwest Territories, Nunavut, and Yukon), April 2013 to March 2019.



There were no cases of neonatal trauma following attempted forceps birth in tier of obstetric service 2 hospitals in the Combined Territories.

3.4.10.3. Hospitals in the Combined Territories: Failed forceps deliveries by hospital

Hospital-specific rates of attempted forceps delivery and failed forceps delivery in Northwest Territories, Nunavut, and Yukon are provided below.

Table 127. Attempted forceps deliveries (per 100 singleton deliveries) and failed forceps deliveries followed by cesarean delivery (per 100 attempted forceps deliveries), Northwest Territories, Nunavut, and Yukon, April 2013 to March 2019 (only hospitals with ≥5 cases of failed forceps listed; totals include all hospitals).

Tier	Hospital Name	Deliveries	Attempted forceps deliveries		Forceps followed by cesarean delivery*	
			No.	Rate	No.	Rate
2	Stanton Territorial Hospital	3,056	[redacted]	[redacted]	[redacted]	[redacted]
2	Whitehorse General	2,015	25	1.2	[redacted]	[redacted]
2	Total	5,071	32	0.6	[redacted]	[redacted]
All Tiers/Hospitals NT, NU, YK		7,570	32	0.4	[redacted]	[redacted]

* Rate of attempted forceps followed by cesarean delivery expressed per 100 attempted forceps deliveries.

3.4.10.4. Hospitals in the Combined Territories: Within-tier hospital-specific trauma rates following attempted vacuum delivery

Tables 128 and 129 below list the numbers and rates of attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma in hospitals within each tier of obstetric service in Prince Edward Island.

Table 128. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 1 hospitals, Northwest Territories, Nunavut, and Yukon (combined), April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Fort Smith Health Centre	64	0	0.0	0	0.0	60	0	0.0	0	0.0
Hay River Regional Health Centre	44	0	0.0	0	0.0	36	0	0.0	0	0.0
Total	108	0	0.0	0	0.0	96	0	0.0	0	0.0

*Infants with congenital anomalies excluded.

Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

Table 129. Numbers and rates of attempted vacuum deliveries and rates of maternal trauma and neonatal trauma in tiers of obstetric service 2 hospitals, Northwest Territories, Nunavut, and Yukon (combined), April 2013 to March 2019.

Hospital	Deliveries	Attempted vacuum deliveries		Maternal trauma		Births* (No CA)	Attempted vacuum births		Neonatal trauma	
		No.	Rate	No.	Rate		No.	Rate	No.	Rate
Inuvik Regional Hospital	566	23	4.1	0	0.0	529	22	4.2	0	0.0
Qikiqtani General Hospital	1,825	32	1.8	6	18.8	1,683	29	1.7	0	0.0
Stanton Territorial Hospital	3,056	234	7.7	26	11.1	2,869	224	7.8	[redacted]	[redacted]
Whitehorse General Hospital	2,015	149	7.4	12	8.1	1,859	135	7.3		
Total	7,462	438	5.9	44	10.0	6,940	410	5.9	5	12.2

*Infants with congenital anomalies excluded.

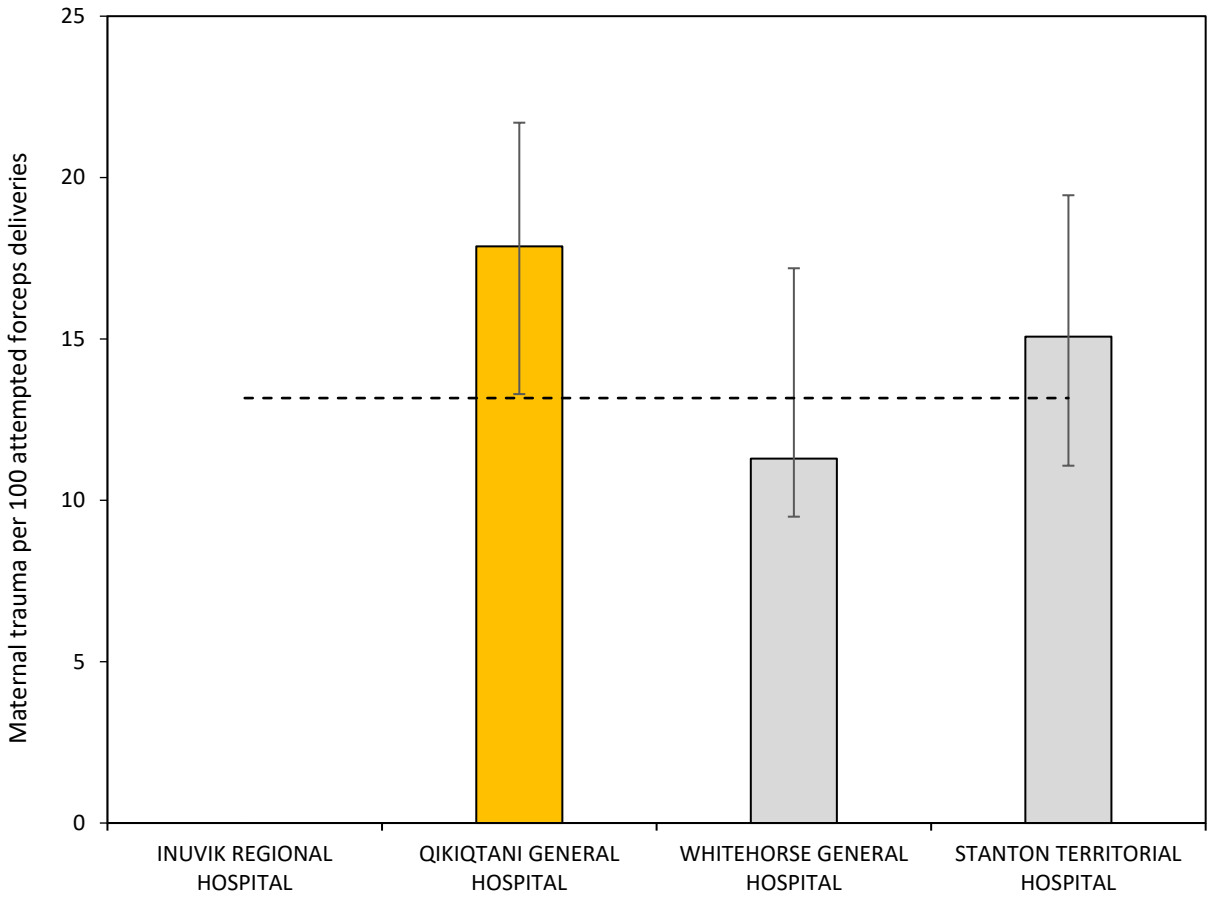
Small cells (<5) suppressed. Rates of maternal trauma expressed per 100 deliveries and rates of neonatal trauma expressed per 1,000 infants.

3.4.10.5. Hospital rates in the Combined Territories vs the reference rate: Trauma rates following attempted vacuum delivery

Figure 66 shows stabilized and adjusted rates of maternal trauma following attempted vacuum delivery in each hospital in the Northwest Territories, Nunavut, and Yukon (compared with the reference rate for Canada excluding Quebec of 25.3 per 100 deliveries). Maternal trauma included 3rd or 4th degree perineal lacerations, cervical tears, high vaginal lacerations, other pelvic trauma, and repair of the urethra or bladder.

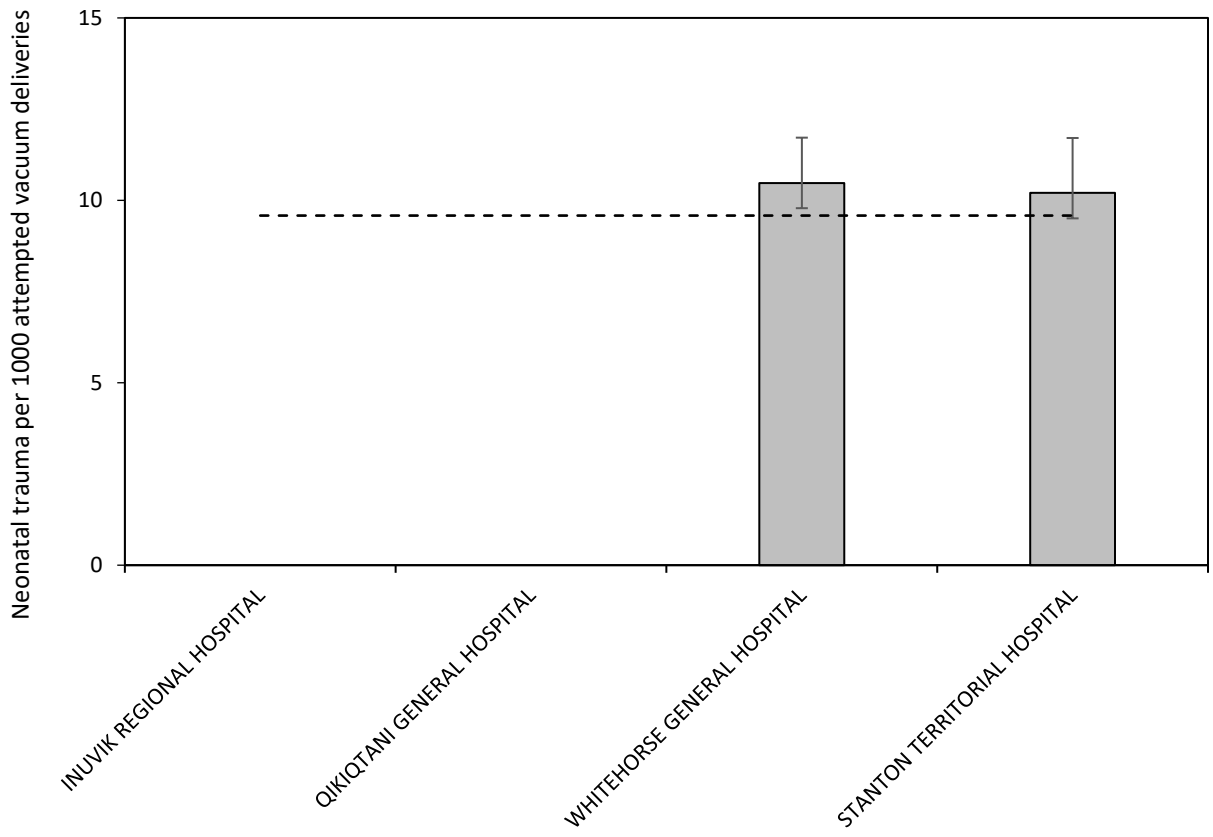
Figures 67 below shows stabilized rates of neonatal trauma following attempted vacuum birth in each hospital in the Northwest Territories, Nunavut, and Yukon (compared with the reference rate for Canada excluding Quebec of 9.6 per 1,000 live births). Neonatal trauma included intracranial hemorrhage, skull fracture, subaponeurotic hemorrhage, injury to the central nervous system or peripheral nervous system, injury to the long bones, injury to the liver or spleen, seizures and neonatal death.

Figure 66. Stabilized and adjusted rates (95% confidence intervals) of maternal trauma following attempted vacuum delivery in tier of obstetric service 1 and 2 hospitals, Northwest Territories, Nunavut, and Yukon, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

Figure 67. Stabilized and adjusted rates (95% confidence intervals) of neonatal trauma following attempted vacuum birth in tier of obstetric service 1 and 2 hospitals, Northwest Territories, Nunavut, and Yukon, April 2013 to March 2019.



Orange bars indicate hospitals which had a stabilized and adjusted trauma rate that was 10% or more higher than the reference trauma rate in Canada (excluding Quebec) and whose 95% confidence bounds exceeded the reference trauma rate.

3.4.10.6. Hospitals in the Combined Territories: Failed vacuum deliveries by hospital

Hospital-specific rates of attempted vacuum and the 3 types of failed vacuum delivery in Northwest Territories, Nunavut, and Yukon are listed below.

Table 128. Rates of attempted vacuum deliveries (per 100 singleton deliveries) and failed vacuum deliveries, Northwest Territories, Nunavut, and Yukon, April 2013 to March 2019 (only hospitals with ≥5 cases in any one of the failed vacuum categories listed; totals include all hospitals).

Tier	Hospital	Deliveries	Attempted vacuum deliveries		Vacuum followed by forceps delivery*		Vacuum followed by cesarean delivery*		Sequential instruments followed by cesarean*	
			No.	Rate	No.	Rate	No.	Rate	No.	Rate
2	Stanton Territorial Hospital	3,056	234	7.7	13	5.6	0	0	[redacted]	[redacted]
2	Whitehorse General Hospital	2,015	149	7.4	12	8.1	11	7.4	[redacted]	[redacted]
2	Total	5,071	383	7.6	25	6.5	11	2.9	[redacted]	[redacted]
All Tiers/Hospitals, NW, NU, YU		7,570	438	5.8	25	5.7	11	2.5	[redacted]	[redacted]

*Rates of failed vacuum (vacuum followed by forceps delivery, vacuum followed by cesarean delivery, and sequential instrument use followed by cesarean delivery) expressed per 100 attempted vacuum deliveries.

4. Discussion

This report quantifies rates of attempted forceps and attempted vacuum delivery and associated rates of maternal trauma and neonatal trauma among singleton, term deliveries to women without a previous cesarean delivery in Canada (excluding Quebec). The frequency of attempted forceps delivery was 2.9%, while the rate of attempted vacuum delivery was 8.4% for the period April 2013 to March 2019. Of the attempted forceps deliveries, 4.2% resulted in failed forceps applications, while 7.9% of attempted vacuum deliveries resulted in failed vacuum applications. Maternal trauma rates were high following attempted forceps delivery (25.3%) and also relatively high after attempted vacuum delivery (13.2%), while rates of neonatal trauma were similar after both attempted forceps and attempted vacuum birth (9.6 per 1,000 live births).

Third-degree and fourth-degree perineal lacerations and high vaginal lacerations were the most common types of maternal trauma following attempted forceps and attempted vacuum delivery, while injuries to the peripheral nervous system and central nervous system, seizures and subaponeurotic hemorrhage were the more common types of neonatal trauma. Composite neonatal trauma was 4-5 times more common and neonatal deaths were about 3 times more frequent among non-anomalous infants following attempted forceps and attempted vacuum birth compared with neonatal deaths among non-anomalous infants following non-instrumental birth.

Failed forceps followed by cesarean delivery was associated with a lower rate of maternal trauma (7.2%) compared with successful forceps delivery (26.1%). However, infants born by failed forceps and cesarean birth sustained a higher rate of neonatal trauma (15.1 per 1,000) compared with infants born following successful forceps delivery (9.3 per 1,000). Failed vacuum delivery was associated with a higher rate of maternal trauma (22.5%) compared with successful vacuum deliveries (12.4%) and also a higher rate of neonatal trauma (23.7 vs 8.4 per 1,000 live births). The maternal trauma rate following failed vacuum delivery was dependent on the type of failed vacuum delivery: failed vacuum delivery followed by forceps delivery was associated with a high rate of maternal trauma (29.4%), while failed vacuum application followed by cesarean delivery, and failed vacuum and failed forceps application followed by cesarean delivery were associated with lower rates of maternal trauma (6.1% and 6.1%, respectively). Rates of neonatal trauma were high among all types of failed vacuum delivery: 20.9 per 1,000 among infants born following failed vacuum and successful forceps delivery, 29.5 per 1,000 among infants born following failed vacuum application followed by cesarean delivery, and 33.7 per 1,000 among infants born following failed applications of vacuum and forceps followed by cesarean delivery.

4.1. Comparisons by province/territories

Attempted forceps rates were significantly higher in British Columbia and Alberta compared with the rest of Canada (excluding Quebec) while rates of failed forceps delivery were significantly higher in British Columbia, Alberta and Prince Edward Island. Attempted vacuum delivery rates were significantly higher in Alberta, Saskatchewan, New Brunswick and Newfoundland and Labrador than in the rest of Canada (excluding Quebec), and rates of failed vacuum application were significantly higher in Saskatchewan, Manitoba, Nova Scotia and Prince Edward Island. The use of sequential instruments (failed vacuum application followed by successful forceps delivery) was significantly higher in Saskatchewan, Manitoba, Nova Scotia and Prince Edward Island then in the rest of Canada excluding Quebec, failed vacuum followed by cesarean delivery was significantly higher in British Columbia, Manitoba and New Brunswick, while use of sequential instruments (i.e., failed vacuum and failed forceps

application) followed by cesarean delivery was significantly more common in Saskatchewan and Nova Scotia.

Rates of maternal trauma following attempted forceps delivery were significantly higher in Alberta, Saskatchewan, Manitoba, Nova Scotia and Prince Edward Island compared with the rest of Canada, and rates of maternal trauma following attempted vacuum delivery were significantly higher in Saskatchewan, Manitoba and Nova Scotia compared with the rest of Canada excluding Quebec. Neonatal trauma rates following attempted forceps birth varied widely, although no province/territories had a rate that was significantly higher than that in the rest of Canada excluding Quebec. Rates of neonatal trauma following attempted vacuum birth were significantly higher in Alberta and Prince Edward Island than in the rest of Canada excluding Quebec.

4.2. Comparisons by tiers of obstetric service

There was no clear pattern in trauma rates by increasing tier of obstetric service within provinces/territories, except for an overrepresentation of the higher tiers of obstetric service among the tiers with significantly higher rates of trauma.

4.3. Hospitals with outlier rates of trauma following attempted forceps delivery

Within-tier comparisons of maternal trauma rates following attempted forceps delivery showed that (of 284 obstetric and 102 non-obstetric hospitals included in this analysis) 36 hospitals in Canada (excluding Quebec) had rates of maternal trauma that were significantly higher than the same rates in the other hospitals in the same tier of service (in the same province/territories). These included 6 hospitals in British Columbia, 4 in Alberta, 3 in Saskatchewan, 1 in Manitoba, 18 in Ontario, 2 in Nova Scotia and 2 in Newfoundland and Labrador. Similarly, within-tier comparisons identified a total of 7 hospitals as outliers with regard to neonatal trauma following attempted forceps birth, and these included 2 hospitals in British Columbia, 2 in Alberta, 2 in Ontario and 1 hospital in Nova Scotia (Table 129 below).

Comparisons between each hospital's stabilized and adjusted rate of maternal trauma following attempted forceps delivery and the reference rate for Canada (excluding Quebec) showed that 55 hospitals had rates that were 10% or more higher and significantly different from the reference rate. These included 9 hospitals in British Columbia, 7 in Alberta, 3 in Saskatchewan, 2 in Manitoba, 28 in Ontario, 1 in New Brunswick, 2 in Nova Scotia, and 3 in Newfoundland and Labrador (Table 129 below). Similarly, comparisons between each hospital's stabilized neonatal trauma rate following attempted forceps birth vs the reference rate for Canada (excluding Quebec) showed that 48 hospitals had rates that were 10% or more higher and significantly different from the reference rate. These included 7 hospitals in British Columbia, 8 in Alberta, 3 in Saskatchewan, 3 in Manitoba, 20 in Ontario, 4 in New Brunswick, and 3 in Nova Scotia.

There was good correspondence between the outlier hospitals identified through the within-tier analysis of hospitals and the analyses comparing stabilized and adjusted (or stabilized) hospital rates against the reference rate for Canada (excluding Quebec). Of 34 hospitals identified as outliers by the within-tier analysis of maternal trauma following attempted forceps delivery, 28 were also identified as outliers by the analysis comparing stabilized and adjusted rates against the reference rate (the latter rates could not be computed for 2 outlier hospitals because of a lack of within-tier variability; Table 129 below). Of the 7 hospitals identified as outliers by the within-

tier analysis of neonatal trauma following attempted forceps birth, all 7 were also identified as outliers by the analysis comparing stabilized rates against the reference rate (Table 129). On the other hand, there were several hospitals identified as outliers in the comparison with the reference (national) rate that were not identified as outliers in the within-tier comparisons.

4.4. Hospitals with outlier rates of trauma following attempted vacuum delivery

45 hospitals in Canada excluding Quebec (among 284 obstetric and 102 non-obstetric hospitals included in this analysis) had maternal trauma rates following attempted vacuum delivery that were significantly higher than the same rates in the other hospitals in the same tier of service (in the same province/territories). These included 6 hospitals in British Columbia, 8 in Alberta, 3 in Saskatchewan, 1 in Manitoba, 19 in Ontario, 3 in New Brunswick, 2 in Nova Scotia and 3 in Newfoundland and Labrador. Similarly, within-tier comparisons identified a total of 15 hospitals as outliers with regard to neonatal trauma following attempted vacuum birth and these included 3 hospitals in British Columbia, 3 in Alberta, 1in Manitoba, 7 in Ontario and 1 hospital in Nova Scotia (Table 130 below).

Comparisons between each hospital's stabilized and adjusted rate of maternal trauma and the reference rate of maternal trauma following attempted vacuum delivery for Canada (excluding Quebec) showed that 72 hospitals had rates that were 10% or more higher and significantly different from the reference rate. These included 16 hospitals in British Columbia, 12 in Alberta, 4 in Saskatchewan, 3 in Manitoba, 29 in Ontario, 2 in New Brunswick, 2 in Nova Scotia, 3 in Newfoundland and Labrador and 1 hospital in the Combined Territories (Table 130 below). Similarly, comparisons between each hospital's stabilized and adjusted neonatal trauma rate following attempted vacuum birth vs the reference rate showed that 61 hospitals had rates that were 10% or more higher and significantly different from the reference rate. These included 11 hospitals in British Columbia, 13 in Alberta, 4 in Saskatchewan, 4 in Manitoba, 23 in Ontario, 1 in New Brunswick, 2 in Nova Scotia and 3 in Newfoundland and Labrador.

Of 45 hospitals identified as outliers by the within-tier analysis of maternal trauma following attempted vacuum delivery, 40 were also identified as outliers by the analysis comparing stabilized and adjusted rates against the reference rate for Canada excluding Quebec (the latter rates could not be estimated for 3 hospitals identified as outliers in the within-tier analysis; Table 130). Of the 15 hospitals identified as outliers by the within-tier analysis of neonatal trauma following attempted vacuum birth, all 15 were also identified as outliers by the analysis comparing stabilized and adjusted rates against the reference rate (Table 130 below).

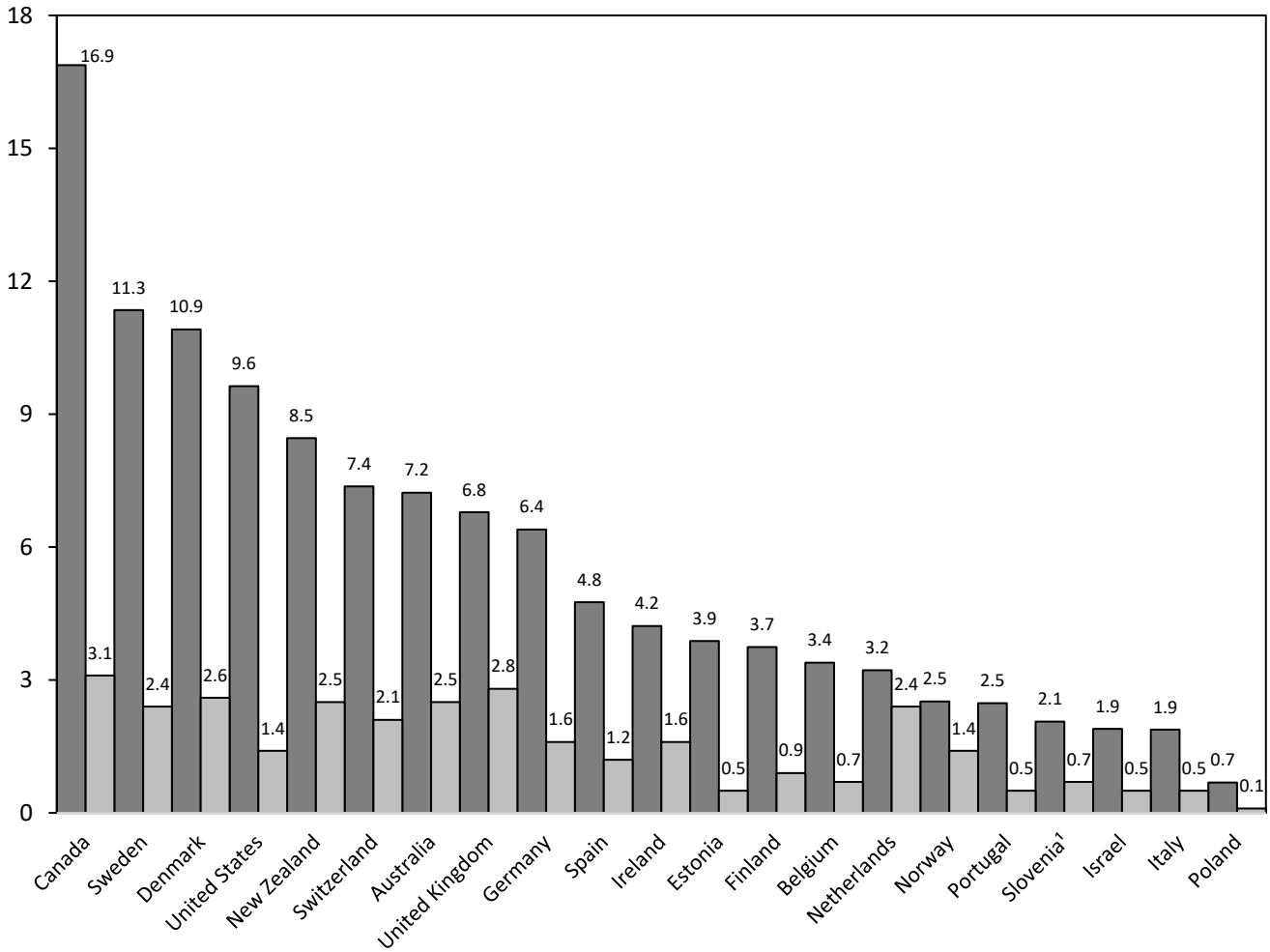
4.5. Trauma rates following attempted forceps and vacuum delivery in the international context

Comparative statistics routinely published by the Organization for Economic Cooperation and Development (OECD) have regularly characterized Canadian rates of maternal (obstetric) trauma as being the highest among member countries (obstetric trauma under the OECD definition is restricted to severe perineal lacerations [21]). The OECD comparisons show that the relatively high rates of obstetric trauma in Canada are observed both among deliveries with instruments and also among deliveries without instruments (Figure 68). Some of these difference in between-country rates of obstetric trauma are likely due to differences in measurement/reporting, while

type of instrument used, skill of the obstetrician, and selection of cases for instrumental delivery are other potential causes.

High rates of maternal and neonatal trauma following attempted forceps and attempted vacuum delivery in Canada have been previously documented in several studies [3-7]. However, these elevated rates of trauma were not mentioned in the guidelines of the Society of Obstetricians and Gynaecologists of Canada, which highlighted an idealized scenario by stating that "….*in carefully selected circumstances, both vacuum and forceps are associated with relatively low rates of serious morbidity and mortality in both mother and baby*" [1]. The low rates of serious morbidity and mortality, which apply to carefully selected circumstances, do not appear to apply to routine obstetric practice in Canada, where attempted vacuum and attempted forceps (and failed vacuum and failed forceps) are associated with exceptionally high rates of maternal and neonatal trauma.

Figure 68. Rates of obstetric trauma (severe perineal lacerations) in member countries of the Organization for Economic Cooperation and Development, 2017 [21]. Light bars refer to obstetric trauma following spontaneous delivery; Dark bars to obstetric trauma following instrumental delivery.



4.6. Within-tier comparison of hospital rates vs comparison of hospital rates with a reference rate

Almost all hospitals identified as outliers with high trauma rates by the within-tier analysis were also identified as outliers in the comparison of hospitals against the reference rate for Canada excluding Quebec. However, several other hospitals were also identified as outliers by the latter method. The reasons for the difference include the variable reference and the smaller size of the comparison groups involved in the within-tier analysis as well as the explicit adjustment for confounders in the regression modeling.

From a conceptual standpoint, a case can be made for comparing a hospital's maternal (or neonatal) trauma rate with the maternal (or neonatal) trauma rate in other hospitals in the same tier. This ensures comparability of both patient factors (in terms of risk) and organizational factors (in terms of available infrastructure and skilled personnel). The counter-argument to this viewpoint is that all hospitals in Canada should be held to the same standard (i.e., women should be able to expect the same high standard of care in any hospital). In fact, it is a principle of regionalization that tier of obstetric service is to be matched to risk so that health outcomes are optimized.

As mentioned, the within-tier comparison of hospitals was predicated on the regionalization framework and this analysis was province/territories specific (since each province/territories had its own tiers of obstetric service framework). This feature of the analysis constitutes a substantial strength: the use of a tier- and province/territories-specific reference meant that the between-hospital comparisons were made between comparable populations and hospitals. Comparing hospitals within the same tier of obstetric service has the advantage of reduced potential for confounding due to between-hospital differences in maternal characteristics and organizational factors. However, the use of a variable tier- and province/ territories-specific reference also constitutes a weakness. Problems with this analysis arise because hospitals with high maternal or neonatal trauma, which are in tiers of service (or in provinces/territories) with high rates of such trauma, are less likely to be identified as outliers since many hospitals in the same tier of service (or in the same province/territories) would have high maternal or neonatal trauma rates.

Stabilization and adjustment of maternal and neonatal trauma rates using a multi-level logistic regression model, and comparisons between hospitals and a Canada (excluding Quebec) benchmark reduced the chance of small hospitals being identified as outliers due to chance (although this analysis identified more small hospitals as outliers than the within-tiers comparison). Adjustment for maternal characteristics in the multi-level models addressed potential confounding by these factors in contrasts between all small and large hospitals in Canada (excluding Quebec). The disadvantages of the stabilization and adjustment analysis include those related to standardized mortality ratios: SMRs are 'internally standardized but not mutually comparable' [22, p. 73] and between-hospital comparisons can be an '"apples/oranges" exercise' [20, pp. 16-17] i.e., it is appropriate to compare the stabilized and adjusted maternal (or neonatal) trauma rate of any hospital with the reference rate for Canada excluding Quebec but not necessarily appropriate to compare one hospital's stabilized and adjusted maternal (or neonatal) trauma rate with another hospital's stabilized and adjusted maternal (or neonatal) trauma rate. Other disadvantages include an inability to adjust for differences in all maternal characteristics and organizational factors. However, confounding by indication for the attempted forceps delivery or the attempted vacuum delivery was not considered to be an issue in these comparisons as such confounding typically biases the effects of therapy/intervention when the outcome under consideration is an intended effect of the treatment/intervention [23,24] (whereas the components of maternal and neonatal trauma were unintended effects of attempted forceps and attempted vacuum delivery). Confounding by indication would have had a more substantial effect on

between-hospital comparisons of attempted forceps delivery and attempted vacuum delivery rates (rather than on the unintended consequences of attempted forceps delivery and attempted vacuum delivery).

4.7. Significance of maternal and neonatal trauma rates

Severe perineal lacerations, especially third-degree perineal lacerations, accounted for the vast majority of maternal outcomes. Such lacerations and other maternal trauma can result in chronic maternal complications including urinary and fecal incontinence, dyspareunia, perineal pain and other pelvic floor disorders [25,26]. Studies have shown that anal incontinence rates following the primary repair of anal sphincter injuries range from 15% and 61% [27,28]. Also, the incidence of anal incontinence following anal sphincter injury increases from approximately 31% at 3-6 months to 54% at 3-8 years following delivery [29]. The rates of neonatal trauma, though substantially lower than rates of maternal trauma, are also concerning insofar as such trauma represents serious injury with potential long-term consequences. Although absolute rates were low, composite neonatal trauma was 4-5 times higher following attempted forceps and attempted vacuum birth compared with non-instrumental birth (i.e., spontaneous vaginal birth and cesarean birth), some of the most serious traumatic outcomes including intracranial hemorrhage, skull fracture, and other injuries to central nervous system were more than 10 times higher, and neonatal death rates were about 3 times more common following attempted forceps and attempted vacuum birth.

The above-mentioned comparisons between trauma rates following attempted forceps delivery and attempted vacuum delivery vs spontaneous vaginal delivery and cesarean delivery are not intended to suggest that these modes of delivery are interchangeable. Similarly, the findings of this Report are not intended to imply that cesarean delivery is a safer option than attempted forceps delivery or attempted vacuum delivery when the latter is indicated. Nevertheless, this Report highlights the high rates of maternal and neonatal trauma following attempted forceps and attempted vacuum delivery in Canada that are far in excess of rates reported from other high-income countries. The Report also identifies extremely high rates of such trauma in specific hospitals. Clearly, the presumption that attempted forceps and attempted vacuum delivery are associated with low rates of morbidity and mortality in both mothers and babies "*in carefully selected circumstances"* [1] does not apply to routine obstetric practice in Canada (excluding Quebec). There is, therefore, an urgent need for obstetricians to recognize and address the high rates of trauma associated with attempted forceps and attempted vacuum delivery in Canada. The appropriate course of action needed to address this issue has to be determined by the obstetric community through carefully considered and scholarly discussion. There is also a need to appropriately inform women regarding the benefits and risks of the different delivery options in routine obstetric practice in Canada.

A related point to note is that several hospitals offering the highest level of obstetric care in Canada and performing large numbers of attempted forceps and attempted vacuum deliveries had very high rates of maternal and/or neonatal trauma. These hospitals are responsible for the training of Resident obstetricians, who may learn to accept the currently high rates of maternal and neonatal trauma following attempted forceps and attempted vacuum delivery as normative (especially given contemporary high and ever-increasing rates of cesarean delivery). Some evidence for this proposition is contained in a study of Irish and Canadian trainees in obstetrics, who showed comparable levels of confidence and comfort in performing attempted forceps and attempted vacuum deliveries despite significant differences in training. The Irish trainee group averaged 45 forceps and 125 vacuum applications, while the Canadian trainees averaged 6 forceps and 20 vacuum applications [30]. Similarly, a recent study exploring the attitudes of obstetrics and gynaecology residents in Canada

towards the SOGC guideline on assisted vaginal delivery showed that a majority (88%) agreed with the guideline on the issues related to the risks associated with such delivery [31]. On the other hand, Health Insurance Reciprocal of Canada, a not-for-profit health care safety advisor that offers insurance products to hospitals and related organizations, notes that common themes related to malpractice claims include (among others) misapplied forceps or vacuum, lack of physician documentation of the number of attempts, and physician privileges for assisted vaginal delivery renewed by hospitals without demonstrated evidence of skill [32].

4.8. Data validity: Studies have shown that hospitalization data in the Discharge Abstract Database is accurate, especially for major and more serious diagnoses [10-12]. One study [10] which used the Nova Scotia Atlee Perinatal Database as the gold standard showed that the data had a 97% sensitivity for 3rd degree perineal lacerations and a 95% sensitivity for 4th degree perineal lacerations. The specificity for 3rd and 4th degree lacerations was 99.9%. The accuracy of the hospitalization data was also high for neonatal diagnoses, with sensitivity for 3rd and 4th degree intraventricular hemorrhage being 89%, while specificity was 100%. A more recent chart re-abstraction study carried out in hospitals across Canada also showed excellent agreement (97%) between Discharge Abstract Database data on obstetric trauma and medical chart information [12].

4.9. Limitations: This report and analyses have a few limitations. Comparisons of trauma rates by tiers of obstetric service could not be carried out nationally because of the varied tiers of service frameworks prevalent in the different provinces/territories of Canada. Thus, the within-tier analysis of hospitals in provinces/territories with high trauma rates may not have identified hospitals with high trauma rates in tiers of service and provinces/territories with high rates. Other limitations include some potential for data error and also a small loss of subjects due to incomplete linkage between maternal and infant medical records. There was also potential for residual confounding in the comparisons between provinces/territories, tiers of obstetric service and hospitals. However, the potential for confounding is likely small: although contrasts of maternal and neonatal trauma rates by province, tier of service and hospital could be potentially confounded by the risk factors for instrument use, our study was focussed on trauma rates given attempted forceps or vacuum use. A final limitation of the analysis relates to the multiple comparisons carried out in the study. This could have resulted in false positive identification of some hospitals as having significantly high rates of trauma.

4.10. Final considerations

The following points could help guide the interpretation of this Report's findings:

1. 284 obstetric hospitals, and 102 non-obstetric hospitals that conducted at least one delivery, were included in this analysis.
2. The within-tier comparison of maternal trauma rates following attempted forceps delivery identified 36 hospitals in Canada (excluding Quebec) which had rates of maternal trauma that were significantly higher than the same rates in the other hospitals in the same tier of service (in the same province/territories). Similarly, within-tier comparisons identified a total of 7 hospitals as outliers with regard to neonatal trauma following attempted forceps birth.
3. 45 hospitals in Canada (excluding Quebec) had maternal trauma rates following attempted vacuum delivery that were significantly higher than the same rates in the other hospitals in the same tier of service (in the same province/territories). Within-tier comparisons identified a total of 15 hospitals as outliers with regard to neonatal trauma following attempted vacuum birth.

4. The results of the above-mentioned within-tier analyses are important because they respect the perinatal care regionalization framework and compare hospitals with approximately similar maternal characteristics (i.e., population risk) and organizational factors (i.e., available expertise and infrastructure). This feature of the analysis also represents a limitation: the use of a variable (tier- and province/territories-specific) reference means that hospitals with high trauma rates which were in tiers of service (or provinces/territories) with high rates of trauma may not have been identified as outliers.
5. The comparison of stabilized and adjusted maternal and neonatal trauma rates between each hospital and the reference rate for Canada (excluding Quebec) yielded a near-national perspective and complemented the results of the within-tier analysis. This analysis method also minimized the false identification of small hospitals as outliers (although the findings were mostly concordant with the within-tier analysis with regard to small hospitals identified as outliers). The limitations of this analysis include the method of adjustment which precludes comparisons of stabilized and adjusted trauma rates between hospitals (i.e., the adjusted rates are 'internally standardized but not mutually comparable').
6. All provinces/territories, tiers of obstetric service and hospitals (irrespective of outlier or non-outlier status) should evaluate their absolute and relative rates of maternal and neonatal trauma (and rates of failed forceps and failed vacuum delivery) and consider strategies to reduce these complications as part of a continuous quality improvement process.
7. Hospitals identified as outliers (by either the within-tier analysis or the analysis comparing hospital rates vs the reference rate for Canada excluding Quebec) should review their attempted forceps delivery- and attempted vacuum delivery-related practices. Such hospitals may need to consider additional training for obstetricians in instrument use, or a re-evaluation of management options given an indication for expedited delivery (e.g., attempted vacuum delivery instead of attempted forceps delivery, discouraging sequential instrument use, and considering cesarean delivery earlier in labour).
8. Judgements regarding potentially elevated rates of maternal and neonatal trauma in a hospital, tier of service or province/territories are best made by health authorities and local experts who are familiar with the setting and context. The identification of any remediation measures to be instituted are to be made considering the local context pertinent to the province/territories, tier of service and hospital including patient characteristics, geographical issues, availability of skilled health personnel, infrastructure and other resources.
9. It is not immediately evident which tier(s) of obstetric service hospitals are ideal for providing training in attempted forceps and attempted vacuum delivery to Resident obstetricians and others as rates of trauma appear to be high in many secondary and tertiary hospitals. It may be necessary to identify practitioners with demonstrated skill in attempted forceps delivery and attempted vacuum delivery (i.e., those with low rates of maternal and neonatal trauma following attempted forceps and attempted vacuum delivery on chart review) and designate them as tutors.
10. The results of this Report may be useful for providing pertinent information to women regarding the risks of attempted forceps delivery and attempted vacuum delivery in their particular province/ territories and hospital.
11. The province/territories-specific definitions of tiers of obstetric service precluded a more appropriate, pan-Canadian, within-tier comparison of hospitals. It would be ideal to work

towards obtaining a Canadian consensus with regard to a tiers-of-obstetric-service framework and national perinatal regionalization.

The purpose of this report is to provide a documentation of contemporary rates of maternal trauma and neonatal trauma following attempted forceps and attempted vacuum delivery that informs health care providers and women. The information could serve to guide initiatives that aim to improve the safety of attempted forceps and attempted vacuum delivery. The CIHR Team for Improving Perinatal Health Care Regionalization in Canada plans to update this report at a future date so that provinces/territories, tiers of obstetric service and hospitals can ascertain the effect of initiatives undertaken to improve the safety of attempted forceps and attempted vacuum delivery in response to this Report.

Table 129. Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted forceps delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (25.3/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized rate (95% CI)/1,000
BC	Shuswap Lake Gen Hospital	83.3	24.3	40.0 (32.7-57.4)	0.0	6.4	
	Cowichan District Hospital	52.9	24.3	39.4 (33.0-50.7)	0.0	6.4	
	Cariboo Memorial Hospital	30.0	24.3	30.1 (26.2-36.1)	[redacted]	6.4	12.4 (10.3-20.9)
	Kootenay Lake Hospital	38.2	24.3	37.7 (31.1-45.2)	[redacted]	6.4	10.9 (10.0-13.8)
	Penticton Reg Hospital	27.4	24.3		[redacted]	6.4	14.2 (10.9-23.4)
	West Coast General Hospital	29.8	24.3	32.4 (26.9-39.4)	[redacted]	6.4	
	Langley Memorial Hospital	40.5	24.3	38.6 (31.6-46.5)	[redacted]	6.4	
	Abbotsford Reg Hospital CC	34.2	26.4	30.7 (27.1-33.3)	0.0	4.1	
	Lions Gate Hospital	30.1	26.4		[redacted]	4.1	12.4 (10.4-15.9)
	The Richmond Hospital	31.2	26.4	28.9 (25.0-31.9)	0.0	4.1	
	University Hospital NBC	45.8	33.3	30.6 (25.3-32.1)	[redacted]	13.5	14.5 (11.0-24.7)
	Kelowna Gen Hospital	28.8	33.3		[redacted]	13.5	11.0 (10.0-13.4)
	Victoria General Hospital	27.9	21.0	30.7 (25.3-31.1)	[redacted]	6.7	
	BC Women's Hospital + HC	26.1	25.0	*	10.8	7.8	12.0 (10.5-14.4)
AB	Barrhead Health CC	100.0	25.9	28.4 (26.7-34.8)	0.0	[redacted]	
	Wetaskiwin Hospital CC	0.0	25.9		[redacted]	[redacted]	13.8 (10.7-55.2)
	Drumheller HC	100.0	25.9	41.2 (32.6-58.9)	0.0	[redacted]	
	Provost Health Centre	42.0	25.9	31.6 (26.4-41.2)	0.0	[redacted]	
	High River G Hospital	52.8	25.9	38.6 (30.4-52.1)	[redacted]	[redacted]	12.2 (10.2-19.6)
	Coven't H St. Mary's H Camrose	25.0	25.9		[redacted]	[redacted]	11.6 (10.2-16.5)
	Queen Elizabeth II Hosp	41.2	27.7	34.1 (29.6-39.6)	0.0	7.0	
	Sturgeon Com Hospital	38.4	27.7	35.0 (28.8-39.9)	17.1	7.0	14.8 (11.4-19.5)
	South Health Campus	32.6	27.0	28.7 (27.2-29.2)	12.9	11.5	12.5 (10.7-15.2)
	Peter Lougheed Centre	27.7	27.0		19.4	11.5	18.4 (13.8-23.4)
	Foothills Medical Centre	27.5	27.0		14.3	11.5	14.6 (12.2-18.0)

Table 129 (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted forceps delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (25.3/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized rate (95% CI)/1,000
AB	Rockyview General Hospital	26.2	27.0		12.8	11.5	13.5 (11.5-16.4)
SK	Meadow Lake Hosp NW HF		23.1	29.1 (26.8-37.1)	0.0		
	Cypress Regional Hospital	45.8	23.1	36.7 (26.7-49.8)			12.6 (10.5-22.8)
	Victoria Hospital RMHC	46.8	23.1	40.1 (26.9-54.0)	0.0		
	Royal University Hospital	41.7	46.4		11.9	12.5	12.2 (10.5-14.6)
	Regina General Hospital	49.7	46.4	27.4 (25.3-27.4)	12.9	12.5	13.3 (11.0-16.0)
MB	Dauphin Reg Health Centre		24.0	28.7 (26.3-34.6)	0.0		
	The Pas Health Complex	53.8	24.0	35.7 (29.0-44.5)			13.0 (10.5-28.9)
	Brandon General Hospital	19.8	24.0				14.7 (10.9-26.1)
	St. Boniface General Hospital	32.8	33.5			12.8	14.7 (12.3-18.0)
ON	Muskoka Algonquin HC HV		18.7	30.4 (27.9-43.4)	0.0	4.1	
	Norfolk General Hospital		18.7	29.5 (27.6-39.0)	0.0	4.1	
	Cornwall CH McConnell Ave		18.7	30.8 (28.1-38.3)	0.0	4.1	
	Winchester Dist M Hospital		18.7	31.9 (29.0-39.4)	0.0	4.1	
	Hopital G De Hawkesbury DGH		18.7	30.7 (28.1-37.3)	0.0	4.1	
	Brockville GH Charles St Site	30.4	18.7	34.1 (30.1-40.3)	0.0	4.1	
	Erie Shores H Leamington DMH		18.7			4.1	12.4 (10.4-20.9)
	Headwaters HC Centre	14.3	18.7			4.1	14.2 (10.9-23.6)
	Pembroke Reg Hospital Inc.	24.4	18.7	33.1 (28.6-38.3)	0.0	4.1	
	Almonte General Hospital	23.9	18.7	31.7 (27.3-36.8)	0.0	4.1	
	Hamilton HS West Lincoln MH	23.6	18.7	32.0 (27.0-37.2)		4.1	
	Timmins District Hospital	15.2	20.9			9.6	25.3 (13.4-51.0)
	Halton HCS Milton D Hospital	31.3	20.9	42.6 (33.3-52.1)		9.6	
	Guelph General Hospital	23.8	20.9	34.0 (26.4-43.5)		9.6	
	Huron Perth HCA Stratford GH	10.0	20.9			9.6	14.3 (11.3-19.1)

Table 129 (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted forceps delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (25.3/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized rate (95% CI)/1,000
ON	St. Thomas Elgin GH	6.9	20.9		19.2	9.6	16.0 (12.0-21.7)
	Hopital Montfort	32.6	20.9	44.7 (34.5-54.8)	[redacted]	9.6	
	Grey Bruce HS Owen Sound H	38.5	20.2	33.2 (29.5-38.6)	0.0	12.8	
	Halton HCS Oak-Trafalgar MH	41.3	20.2	37.5 (32.5-43.2)	[redacted]	12.8	11.8 (10.2-16.8)
	Scarborough HNW Birchmount	47.5	20.2	44.1 (37.9-50.2)	[redacted]	12.8	10.1 (12.1-35.7)
	Peterborough Reg Health Centre	29.1	20.2	29.2 (25.2-33.5)	[redacted]	12.8	
	St. Joseph's HC Hamilt Charlton	29.3	20.2	29.5 (25.7-33.9)	0.0	12.8	
	Niagara HS St. Catharines Site	12.2	20.2		[redacted]	12.8	13.9 (10.9-19.2)
	William Osler HS Bram Civic H	29.3	20.2	31.0 (26.6-35.8)	0.0	12.8	
	William Osler HS Etobicoke GH	29.4	20.2	29.7 (25.5-34.4)	[redacted]	12.8	13.3 (10.9-16.9)
	Unity Health St. Joseph's HC To	25.4	20.2	25.5 (21.9-29.7)	11.8	12.8	11.9 (10.4-14.4)
	Humber River H Wilson S KC FS	16.9	20.2		25.6	12.8	20.3 (14.2-26.3)
	Grand River Hosp K-W HC	12.7	20.2		16.0	12.8	16.5 (13.5-20.4)
	Royal Victoria Regional HC	30.6	20.4	34.4 (30.6-38.5)	0.0	6.9	
	Michael Garron Hospital	35.4	20.4	39.1 (34.6-44.1)	[redacted]	6.9	10.8 (9.9-13.3)
	Sault Area Hospital	23.5	20.4	30.0 (26.5-33.4)	[redacted]	6.9	
	Health S N Horizon Sante-Nord	26.1	20.4	31.5 (27.8-35.4)	[redacted]	6.9	
	Lakeridge Health Oshawa Site	28.5	20.4	34.4 (30.1-39.0)	[redacted]	6.9	
	Southlake Reg Health Centre	15.4	20.4		[redacted]	6.9	11.2 (10.1-13.5)
	Orillia Soldiers' Memorial H	24.2	20.4	30.0 (26.3-33.9)	[redacted]	6.9	
	Scarborough HNW General	27.2	20.4	33.4 (29.0-37.4)	[redacted]	6.9	
	Windsor RH Metropolitan Camp	22.9	20.4	30.4 (26.4-34.6)	6.1	6.9	
	The Ottawa Hosp Civic Campus	35.7	26.9	28.3 (25.4-31.2)	[redacted]	12.8	14.2 (11.0-23.0)
	Hamilton HS McMaster UM Ctre	43.7	26.9	34.4 (30.3-36.8)	[redacted]	12.8	13.4 (10.7-19.5)
	Kingston HSC Kingston GH	33.3	26.9	27.2 (24.1-30.3)	[redacted]	12.8	18.0 (12.3-27.0)

Table 129 (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted forceps delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (25.3/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized rate (95% CI)/1,000
ON	The Ottawa Hospital Gen CA	26.5	26.9		12.5	12.8	12.4 (10.6-15.1)
	Sinai HS Mount Sinai Hosp	31.9	26.9	26.3 (23.0-29.5)	13.4	12.8	14.0 (11.8-17.2)
	London HSC Victoria Hosp	18.1	26.9		11.8	12.8	12.7 (10.9-15.3)
NB	Edmundston Reg Hospital	[redacted]	30.6		[redacted]	[redacted]	13.3 (10.6-35.6)
	Miramichi Regional Hospital	34.7	30.6	31.6 (25.4-36.3)	0.0		
	Dr. Georges-L. Dumont UHC	32.7	24.3	*	[redacted]	14.8	16.2 (11.3-31.7)
	Saint John Reg Hospital	27.1	22.4		[redacted]	13.0	11.8 (10.1-16.4)
	The Moncton Hospital	27.9	22.4		[redacted]	13.0	11.0 (9.9-13.9)
	Dr. Everett Chalmers RH	21.0	22.4		11.7	13.0	11.8 (10.3-14.1)
NS	South Shore Reg Hospital	50.0	16.9	41.1 (30.1-56.5)	[redacted]	[redacted]	18.7 (11.5-86.0)
	Valley Regional Hospital	31.4	24.4	31.1 (25.4-36.7)	0.0		
	Cape Breton HC Complex	[redacted]	24.4		[redacted]	[redacted]	12.0 (10.2-18.5)
	IWK Health Centre	38.2	33.8	*	10.4	10.8	11.2 (10.0-13.4)
NL	Capt William Jackman M Hosp	[redacted]	11.7	29.9 (27.4-39.3)	[redacted]	[redacted]	
	Central Newfoundland R H Ctre	17.2	11.7		[redacted]		
	Labrador West Health Centre	[redacted]	11.7	29.4 (27.2-37.3)	0.0		
	Dr. G. B. Cross M Hospital	[redacted]	11.7	30.2 (26.0-37.7)	0.0		
	Health Sciences Centre-St. John's	23.0	16.4	*	[redacted]	[redacted]	

Yellow highlights indicate hospitals with maternal and/or neonatal trauma rates significantly higher than the same rate in all other hospitals within the same tier of obstetric service (in the same province/territories) and orange highlights indicate hospitals with stabilized and adjusted maternal trauma rates or stabilized neonatal trauma rates that were 10% higher and significantly different from the reference maternal or neonatal trauma rates for Canada (excluding Quebec) i.e., 25.3 per 100 deliveries and 9.6 per 1000 births, respectively.

* Sole hospital in their tier of service hence a stabilized and adjusted maternal trauma rate could not be estimated because of absent within-tier variability.

Table 130. Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/ 1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
BC	Kitimat Hospital HC	[redacted]	12.3	14.8 (14.1-17.2)	0.0	6.9	
	St. John Hospital	23.3	12.3	18.4 (16.6-22.5)	0.0	6.9	
	Powell River Gen Hospital	27.8	12.3	20.6 (18.3-24.6)	0.0	6.9	
	Shuswap Lake Gen Hospital	15.0	12.3	15.2 (14.1-17.2)	0.0	6.9	
	Queen Victoria Hospital	23.0	12.3	18.8 (17.0-21.8)	[redacted]	6.9	10.8 (10.1-13.2)
	Mills Memorial Hospital	15.7	12.3	16.0 (14.6-18.2)	[redacted]	6.9	15.4 (12.0-27.5)
	East Kootenay Reg Hospital	9.0	12.3		[redacted]	6.9	14.5 (11.9-23.7)
	West Coast Gen Hospital	12.4	12.3	15.7 (14.3-17.7)	0.0	6.9	
	Campbell River DGH N Isl H	14.5	12.3	14.8 (13.4-16.8)	[redacted]	6.9	14.9 (12.1-25.4)
	St Joseph's Gen Hosp Comox	21.5	12.3	17.3 (15.7-19.8)	0.0	6.9	
	Vernon Jubilee Hospital	15.1	12.3	14.9 (13.4-16.7)	0.0	6.9	
	Squamish General Hospital	11.3	12.3		[redacted]	6.9	11.9 (10.6-15.7)
	Cowichan District Hospital	27.5	12.3	25.7 (22.7-29.2)	[redacted]	6.9	11.9 (10.6-15.6)
	Dawson Creek Dist Hosp	9.9	12.3		[redacted]	6.9	11.3 (10.1-14.3)
	Fort St. John Hosp HC	5.1	12.3		[redacted]	6.9	12.1 (10.5-16.0)
	Langley Memorial Hospital	17.6	12.3	17.7 (15.7-19.9)	[redacted]	6.9	
	Lions Gate Hospital	14.3	12.5	14.7 (13.2-15.8)	[redacted]	6.9	
	Abbotsford Reg Hospital CC	13.6	12.5	15.9 (14.1-16.9)	15.4	6.9	21.4 (12.3-31.7)
	Royal Inland Hospital	11.6	12.3		[redacted]	4.9	12.3 (9.7-15.8)
	University Hospital of NBC	15.6	12.3	15.9 (13.2-16.5)	0.0	4.9	
	Victoria General Hospital	12.8	10.5	15.7 (13.2-16.3)	11.1	8.1	12.2 (9.7-13.7)
AB	Slave Lake HC Centre	40.0	20.0	18.7 (15.2-22.6)	0.0	0.0	
	Lacombe Hospital CC	[redacted]	14.2		[redacted]	6.8	11.3 (10.3-15.0)
	Provost Health Centre	15.9	14.2		[redacted]	6.8	11.2 (10.3-14.8)

Table 130 (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
AB	Westlock Health Care Centre	27.8	14.2	18.6 (16.5-22.2)	0.0	6.8	
	Wetaskiwin Hosp Care Centre	3.2	14.2		22.4	6.8	16.9 (13.0-25.7)
	Ponoka Hospital CC	18.8	14.2	15.4 (14.0-17.4)	0.0	6.8	
	Pincher Creek H Centre	15.5	14.2		[redacted]	6.8	11.0 (10.1-14.2)
	Rocky Mountain House HC	17.9	14.2	15.7 (14.1-17.7)		6.8	10.9 (10.1-13.4)
	Taber Health Centre	13.9	14.2			6.8	13.2 (11.1-20.5)
	Coven't H St. Mary's H Camrose	21.6	14.2	18.0 (15.9-20.3)		6.8	10.6 (9.9=12.5)
	Drumheller Health Centre	23.6	14.2	18.7 (16.5-21.7)	0.0	6.8	
	Brooks Health Centre	12.3	14.2		[redacted]	6.8	14.2 (11.6-22.0)
	High River General Hospital	25.5	14.2	18.7 (16.4-21.1)		6.8	11.9 (10.5-16.6)
	Wainwright Health Centre	40.4	14.2	35.1 (30.5-39.7)		6.8	
	Whitecourt Healthcare Centre	12.9	14.2			6.8	11.1 (9.9-13.9)
	Cold Lake Healthcare Centre	20.1	14.2	18.1 (15.7-20.6)		6.8	
	Northern Lights Reg H Centre	7.5	14.2		29.9	11.5	21.1 (15.6-27.2)
	Queen Elizabeth II Hospital	14.0	14.2		19.6	11.5	14.6 (11.2-19.2)
	Covenant Grey Nuns C Hospital	13.1	13.2	15.2 (13.2-17.0)	[redacted]	11.5	
	Covenant Misericordia Hospital	16.8	13.2	17.5 (15.2-18.6)		11.5	
	Rockyview General Hospital	13.5	12.3	13.3 (12.6-13.8)	11.8	13.7	
	Royal Alexandra Hospital	13.1	12.3	14.5 (13.8-14.7)	8.9	13.7	
	Foothills Medical Centre	13.1	12.3		19.3	13.7	14.3 (10.9-16.8)
SK	La Ronge Health Centre	[redacted]	8.9	17.0 (15.0-24.2)	0.0	[redacted]	
	Southeast Integ CC Moosomin		8.9	19.1 (14.4-27.3)	0.0		
	Melfort Hospital	12.2	8.9		[redacted]		11.1 (9.9-12.9)
	Cypress Regional Hospital	12.9	13.2			12.0	13.3 (11.2-17.2)

Table 130 (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/ 100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
SK	Meadow Lake H Northwst HF	21.9	13.2	22.9 (15.6-28.5)	28.2	12.0	12.6 (10.5-15.6)
	Victoria Hospital	24.3	13.2	24.3 (16.3-30.5)	[redacted]	12.0	
	Royal University Hospital	23.2	22.6		7.2	6.2	11.7 (9.6-12.3)
MB	Portage Dist Gen Hospital	[redacted]	13.1		[redacted]	8.8	11.0 (10.1-14.1)
	Bethesda Hospital	15.7	13.1		[redacted]	8.8	10.7 (9.9-13.1)
	Selkirk Dis Gen Hospital	9.4	13.1		[redacted]	8.8	11.5 (9.8-15.4)
	Dauphin Reg Health Centre	15.9	13.1	16.9 (13.7-20.7)	[redacted]	8.8	15.5 (11.8-24.3)
	Boundary Trails H Centre	21.5	13.1	20.7 (16.4-25.8)	[redacted]	8.8	
	The Pas Health Complex	19.3	13.1	23.6 (18.8-29.9)	0.0	8.8	
ON	Manitoulin HC Little Current S	0.0	9.1		[redacted]	[redacted]	12.0 (10.6-18.4)
	Strathroy Middlesex GH	20.0	9.1	18.7 (16.5-22.7)	0.0	[redacted]	
	Alexandra Marine GH	12.7	9.1	17.0 (15.0-19.7)	0.0	[redacted]	
	Hopital Notre-Dame Hospital	[redacted]	8.3	15.4 (14.5-17.8)	0.0	11.0	
	Lakeridge Health Port Perry	[redacted]	8.3		[redacted]	11.0	10.7 (10.0-13.0)
	Almonte General Hospital	22.4	8.3	25.8 (22.5-30.9)	[redacted]	11.0	
	Woodstock General Hospital	11.1	8.3	16.8 (15.1-19.3)	[redacted]	11.0	
	Brockville GH Charles Street	12.8	8.3	18.8 (16.6-21.8)	[redacted]	11.0	11.9 (10.5-15.8)
	South Bruce Grey HC Walkerton	9.8	8.3	15.8 (14.3-18.1)	[redacted]	11.0	
	Norfolk General Hospital	15.9	8.3	23.7 (20.5-27.9)	[redacted]	11.0	
	Temiskaming Hospital	5.2	8.3		[redacted]	11.0	11.3 (10.2-14.0)
	Stevenson Memorial Hospital	14.5	8.3	20.1 (17.7-23.6)	0.0	11.0	
	Hopital G De Hawkesbury DGH	8.1	8.3		[redacted]	11.0	15.1 (11.9-23.0)
	Perth Smiths Falls DH SF site	13.8	8.3	20.8 (18.2-24.0)	0.0	11.0	

Table 130 (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/ 100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
ON	Cornwall CH McConnell Avenue	10.1	8.3	17.9 (15.9-20.5)	[redacted]	11.0	
	Groves M Community Hospital	14.0	8.3	21.1 (18.6-24.3)	[redacted]	11.0	
	Pembroke Reg Hospital Inc.	5.9	8.3		14.4	11.0	12.2 (10.4-16.0)
	Winchester DM Hospital	8.5	8.3		27.5	11.0	21.0 (15.3-30.7)
	Headwaters HC Centre	7.3	8.3		12.0	11.0	11.5 (9.7-15.3)
	Quinte HC Belleville GH	8.0	8.3		18.9	11.0	16.5 (13.0-21.7)
	Timmins and District Hospital	14.7	11.2	19.0 (15.8-22.0)	[redacted]	8.3	11.9 (10.1-15.1)
	Huron Perth HCA Stratford GH	8.3	11.2		[redacted]	8.3	13.0 (10.8-16.9)
	Guelph General Hospital	18.8	11.2	21.5 (17.6-24.7)	[redacted]	8.3	
	Hopital Montfort	13.6	11.2	15.9 (13.0-19.2)	19.0	8.3	15.6 (12.2-19.9)
	Grey Bruce HS Owen Sound H	9.4	13.1		[redacted]	10.9	10.6 (10.0-12.0)
	Peterborough RHC	15.8	13.1	16.2 (14.4-18.3)	10.0	10.9	
	Brant Com HCS Brantford Gen H	16.3	13.1	17.6 (15.7-20.0)	17.5	10.9	13.7 (12.1-15.8)
	Niagara HS St. Catharines Site	6.7	13.1		30.0	10.9	21.1 (17.8-24.3)
	William Osler HS Etobicoke GH	19.5	13.1	20.6 (18.3-23.2)	6.8	10.9	
	Halton H Oakville-Trafalgar MH	18.5	13.1	17.9 (15.9-20.1)	11.2	10.9	
	Scarborough HNW Birchmount	17.1	13.1	17.6 (15.6-20.2)	8.8	10.9	
	St. Joseph's HC Hamilton Charltn	18.6	13.1	19.5 (17.0-22.0	9.0	10.9	
	Humber River H Wilson K-C F St	8.9	13.1		26.7	10.9	13.2 (11.6-15.2)
	Sault Area Hospital	14.8	12.3	15.6 (14.0-17.4)	0.0	9.0	
	Orillia Soldiers Mem Hospital	17.4	12.3	17.2 (15.2-19.2)	[redacted]	9.0	
	North Bay Reg Health Centre	16.2	12.3	19.1 (16.6-21.3)	16.2	9.0	13.7 (11.9-15.9)
	Southlake Reg Health Centre	18.6	12.3	19.1 (16.7-21.4)	12.4	9.0	12.2 (11.0-14.2)

Table 130 (cont.). Hospitals identified as outliers with significantly higher rates of maternal and/or neonatal trauma following attempted vacuum delivery, Canada (excluding Quebec), April 2013 to March 2019.

P/T	Hospital	Maternal trauma			Neonatal trauma		
		Within-tier comparison		Comparison with reference (13.2/100)	Within-tier comparison		Comparison with reference (9.6/1,000)
		Hospital rate/100	Tier rate/ 100	Stabilized and adjusted rate (95% CI)/100	Hospital rate/ 1,000	Tier rate/ 1,000	Stabilized and adjusted rate (95% CI)/1,000
ON	Scarborough HNW General	15.2	12.3	16.2 (14.2-18.8)	10.1	9.0	10.6 (9.6-12.1)
	Markham Stouffville H Mark S	13.4	12.3		11.2	9.0	11.5 (10.3-13.5)
	Michael Garron Hospital	19.3	12.3	20.0 (17.3-22.5)	7.9	9.0	
	Hamilton HS McMaster U Med C	17.4	15.4	16.1 (13.6-18.6)	21.0	8.5	17.1 (12.3-22.1)
	UH To St. Michael's Hospital	20.0	15.4	16.9 (14.4-19.4)	10.2	8.5	
	The Ottawa Hospital Gen Camp	10.8	15.4		18.4	8.5	15.1 (11.1-19.8)
	The Ottawa Hospital Civic Camp	20.6	15.4	17.9 (15.2-20.1)	9.1	8.5	
NB	Edmundston Reg Hospital	17.6	12.9	16.8 (13.2-17.6)	0.0	6.2	
	Dr. Georges-L.-Dumont Uni HC	25.7	12.7	*	0.0	8.3	*
	Saint John Regional Hospital	16.8	11.7	18.3 (13.2-20.4)	11.9	9.5	
	The Moncton Hospital	9.0	11.7		[redacted]	9.5	11.6 (9.7-14.6)
NS	South Shore Reg Hospital	23.9	9.7	27.5 (16.1-36.8)	[redacted]	8.3	11.6 (10.2-14.3)
	Valley Regional Hospital	16.4	14.1	14.5 (13.2-14.7)	[redacted]	[redacted]	11.1 (9.7-12.7)
	IWK Health Centre	18.3	15.0	*	10.2	7.9	*
NL	Capt William Jackman H	25.0	7.6	18.6 (16.4-25.2)	[redacted]	11.3	
	Central Newfoundland RHC	17.1	7.6	18.9 (15.4-23.9)	[redacted]	11.3	10.7 (9.7-13.5)
	James Paton Mem RHC	15.6	7.6	18.0 (14.7-23.1)	[redacted]	11.3	10.7 (9.7-13.3)
	Burin Peninsula HCC	[redacted]	7.6		[redacted]	11.3	13.7 (11.0-20.0)
	Health Sciences Centre-St. John's	9.3	8.2	*	13.9	12.6	*
CT	Qikiqtani General Hospital	18.8	10.0	17.9 (13.3-21.7)	0.0	12.2	

Yellow highlights indicate hospitals with maternal or neonatal trauma rates significantly higher than the same rate in all other hospitals within the same tier of obstetric service (in the same province/territories) and orange highlights indicate hospitals with stabilized and adjusted maternal trauma rates or stabilized and adjusted neonatal trauma rates that were 10% higher and significantly different from the reference maternal or neonatal trauma rates for Canada (excluding Quebec) i.e., 13.2 per 100 deliveries and 9.6 per 1000 births, respectively.

* Sole hospital in their tier of service and hence stabilized and adjusted maternal and neonatal trauma rates could not be estimated because of absent within-tier variability.

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6. Team for Improving Perinatal Health Care Regionalization in Canada (funded by the Canadian Institutes of Health Research PER-150902)

List of Team members.

Principal Knowledge Users: Blue highlight
Principal Applicants: White
Collaborators: Green highlight

Stakeholder group abbreviations:
Researcher = R; Clinician = C; Knowledge User = KU; Policy Maker = P

Note: New listed on the original grant application and new members included.

Name	Affiliation	Expertise	Stakeholder group
NEWFOUNDLAND AND LABRADOR			
Lorraine Burrage	Provincial Perinatal Program	Perinatal Health Services	KU, P
Phil Murphy	Provincial Perinatal Program	Perinatal Health Services	KU, P
Brenda Oldford	Division Manager, Eastern Health	Perinatal Health Services	KU, P
PRINCE EDWARD ISLAND			
Diane Boswall	Maternal Child Clinical Specialist, Public Health; Children's Developmental Services, Health PEI	Maternal Child Health; Public Health	C, KU, P
NOVA SCOTIA			
Rebecca Attenborough	Manager, Reproductive Care Program of Nova Scotia	Perinatal Nursing; Health Services	KU, P
John Fahey	Research Analyst, Reproductive Care Program of Nova Scotia	Geospatial analysis; Health Services Research	R, KU, P
Heather Scott	Director, Reproductive Care Program of Nova Scotia; Associate Professor, Dalhousie University and the IWK Health Centre	Perinatal Health Services; Maternal Fetal Medicine	R, C, KU, P
Michiel Van Den Hof	Professor, Dalhousie University and the IWK Health Centre	Maternal Fetal Medicine; Perinatal Health Services	R, C, KU
NEW BRUNSWICK			
Katherine Bocking	Researcher	Perinatal Health Services	R
Lynn Murphy-Kaulbeck	Assistant Professor, Obstetrics and Gynaecology, Dalhousie University Maternal Fetal Medicine, The Moncton Hospital	Maternal Fetal Medicine; Perinatal Health Services	R, C, P
Gaetane LeBlanc Cormier	Program Director	Perinatal Health Services	KU, P

	Perinatal New Brunswick		
QUEBEC			
Nathalie Auger	Institut national de santé publique du Québec (INSPQ) and Université de Montréal	Epidemiology; Perinatal Services	R, P
Amélie Boutin	Assistant Professor, CHU de Québec-Université Laval Research Center	Perinatal epidemiology	R, P
Michael Kramer	Professor, Pediatrics; Professor, Epidemiology, Biostatistics and Occupational Health, McGill Univ /Montreal Children's Hospital	Epidemiology; Pediatrics; Perinatal Population Health	R, C, P
Jérôme Martinez	**Director, Health Surveillance,** INSPQ	Surveillance; Perinatal Population Health	KU, P
Julie Poissant	**Scientific Advisor, Perinatal Programs,** INSPQ	Surveillance; Perinatal Population Health	KU, P
ONTARIO			
Jon Barrett	Professor, Obstetrics & Gynecology, Univ of Toronto; Chief, Obstetrics & Gynecology, York Central Hospital	Maternal Fetal Medicine	R, C, KU
Anne Biringer	Associate Professor, Family and Community Medicine, University of Toronto; Director, Maternity Care, Department of Family Medicine, Mount Sinai Hospital	Maternity Care; Family Medicine	R, C, KU, P
Jennifer Blake	Chief Operating Officer, SOGC Adjunct Professor, Obstetrics and Gynaecology, Univ Ottawa/Toronto	Health Research; Policy Development	C, KU, P
Jocelyn Cook	Scientific Director, SOGC	Health Research; Policy Development	KU, P
Kevin Coughlin	Associate Professor, Western University; SW Ontario Maternal Newborn Child and Youth Network and Canadian Paediatric Society	Neonatology	C, KU, P
Liz Darling	Professor, Laurentian University and Midwife	Midwifery; Epidemiology	R, C, P
Paromita Deb-Rinker	Epidemiologist, Maternal and Infant Health Section, Public Health Agency of Canada (PHAC)	Epidemiology; Health Services; Health Policy	R, P
Sandra Dunn	KT Specialist, BORN Ontario, CHEO Research Institute	Nursing; Knowledge Translation	C, KU, P
Susie Dzakpasu	Senior Epidemiologist, Maternal and Infant Health Section, PHAC	Epidemiology; Health Services; Health Policy	R, P
Sarah Fawzy	Patient Advocate	Advocacy	KU

Deshayne Fell	Assistant Professor, University of Ottawa	Epidemiology; Health Services	R
Kyong- Soon Lee	Associate Professor & Neonatologist, University of Toronto and Acute Care Transport Services Team	Neonatology; Emergency transport	R, C, P
Juan Andres Leon	Chief, Maternal, Child and Youth Health, PHAC	Health Services; Health Policy	R, P
Julian Little	Professor, University of Ottawa	Epidemiology	R, P
Shiliang Liu	Senior Research Scientist, Maternal, Child and Youth Health, PHAC	Epidemiology	R, P
Wei Luo	Manager, Maternal and Infant Health and Congenital Anomaly Surveillance, PHAC	Health Services; Congenital Anomaly Surveillance	R, P
Wendy McAllister	Manager, Best Start Research Centre, Health Nexus, Ontario	Knowledge Translation	KU, P
Sarah McDonald	Associate Professor, Obstetrics & Gynecology, McMaster University	Perinatal Health Services; Maternal Fetal Medicine	R, C, P
Aideen Moore	Associate Professor, Pediatrics, University of Toronto; Neonatologist, The Hospital for Sick Children	Neonatology	R, C, P
Chantal Nelson	Maternal and Infant Health Section, Public Health Agency of Canada, Ottawa	Perinatal Surveillance and Perinatal Health Services	R, P, KU
Renato Natale	Professor, Obstetrics and Gynaecology and Pediatrics, University of Western Ontario	Maternal Fetal Medicine	C, R KU, P
Gwen Peterek	Perinatal Nurse Consultant, Southwestern Ontario Maternal Newborn Child and Youth Network	Perinatal Nursing; Health Services	KU, P
Joel Ray	Professor, Medicine, Obstetrics and Gynaecology, University of Toronto and Institute of Health Policy, Management and Evaluation	Internal medicine; Obstetrics; Epidemiology	R, C, P
Darlene Rose	Regional Director, Champlain Maternal Newborn Regional Program	Perinatal programs, health services	KU, P
PrakeshKumar Shah	Professor, Neonatology, University of Toronto and Institute of Health Policy, Management and Evaluation	Neonatology; Epidemiology	R, C, P
Graeme Smith	Professor and Head, Obstetrics & Gynecology, Kingston General Hospital, Queen's University	Maternal Fetal Medicine; Perinatal Health Services	R, C
Ann Sprague	Scientific Manager, BORN Ontario	Perinatal Nursing; Health Services	KU, P

Marie-Josée Trépanier	Regional Director, Champlain Maternal Newborn Regional Program	Perinatal Nursing; Health Services	KU, P
Mark Walker	Professor, Obstetrics & Gynecology Univ Ottawa; Chief, Obstetrics, Gynecology and Newborn Care, Ottawa Hospital; Scientific Director, BORN Ontario	Maternal Fetal Medicine; Perinatal Health Services	R, C, P
Hilary Whyte	Professor, Paediatrics, Univ Toronto, Neonatologist, The Hospital for Sick Children; Medical Director of Acute Care Transport Services	Neonatology; Emergency Transport	R, C, KU, P
MANITOBA			
Claire Betker	A/Executive Director, Public Health Branch; Director, Population Health and Health Equity, Manitoba Health	Perinatal Nursing; Public Health	KU, P
Jane Evans	Professor, Medical Genetics, University of Manitoba	Congenital Anomalies, Genetics, Surveillance	R, C, P
Maureen Heaman	Professor, College of Nursing, University of Manitoba	Perinatal Nursing and Public Health	R, KU, P
SASKATCHEWAN			
George Carson	Professor, Maternal Fetal Medicine, University of Saskatchewan and President, Society of Obstetricians and Gynaecologists of Canada	Maternal Fetal Medicine; Perinatal Health Services	C, KU, P
Roxanne Laforge	Perinatal Education Program Coordinator, Univ of Saskatchewan	Perinatal Education; Health Services	C, KU, P
Leah Thorp	Coordinator, Perinatal Outreach Education, Regina Qu'Appelle Health Region, Saskatchewan	Perinatal Education; Health Services	C, KU, P
Brandy Winquist	Executive Director, Academics and Learning, Saskatchewan Health Authority	Community and Population Health Sciences	R, KU, P
ALBERTA			
Radha Chari	Chair, Obstetrics and Gynecology, University of Alberta; Co-Chair, Guidelines Committee, SOGC	Maternal Fetal Medicine; Perinatal Health Services	C, KU, P
Susan Crawford	Epidemiologist, Alberta Perinatal Health Program	Perinatal Surveillance and Perinatal Health Services	KU, P, R
Thierry Lacaze	Professor and Chief, Division of Neontaology, Univ of Calgary, Chair, Fetus and Newborn Committee, CPS	Neonatology; Perinatal Health Services	R, C, P
Debbie Leitch	Executive Director-Maternal, Newborn, Child and Youth SCN at Alberta Health Services	Perinatal programs, Policy	P, KU

Stacey Litvinchuk	Executive Director, Surgery Strategic Clinical Network, Alberta Health Services	Rural maternity care and surgical servies	KU, P
Stacey Nyl	Coordinator, Alberta Perinatal Health Program	Perinatal Nursing; Health Services	KU, P
Reg Sauve	Professor, Pediatrics & Community Health Sciences, Univ of Calgary, Neonatologist and Chair, CPSS	Neonatology; Surveillance; Community Health	R, C, P
Barbara Sibbald	Alberta Children's Hospital and the Alberta Congenital Anomalies Surveillance System	Surveillance; Perinatal Health Services	R, P
Doug Wilson	Professor and Head, Department of Obstetrics and Gynecology; Medical Genetics, University of Calgary	Maternal Fetal Medicine	R, C, KU, P
Carmen Young	Assistant Professor, University of Alberta	Maternal Fetal Medicine	R, C, KU, P
BRITISH COLUMBIA			
Laura Arbour	Professor of Medical Genetics, University of British Columbia	Medical Genetics; Pediatrics	R, C, P
Nadine Caron	Associate Professor and General Surgeon, Univ Northern BC	Aboriginal Health; Canadian Health Policy.	C, KU, P
Alyson Hagan-Johnson	Patient Voices Network	Advocacy	KU
Ellen Giesbrecht	Senior Medical Director, BC Women's Hospital	Maternal Fetal Medicine	C, KU, R
Jennifer Hutcheon	Associate Professor, Obstetrics and Gynaecology, UBC; Epidemiologist, Perinatal Services BC	Epidemiology and Health Services Research	R, P
Sid John	Research Assistant	Perinatal Epidemiology	R, P
K.S. Joseph (Nominated PI)	Professor, Obstetrics and Gynaecology and School of Population and Public Health, UBC	Perinatal Epidemiology	R, P
Jude Kornelsen	Co-Director, Centre for Rural Health Research and Assistant Professor, UBC	Rural perinatal health services; family medicine	R, C, P
Lily Lee	Director, Provincial Registry, Surveillance, Performance & Analytics, Perinatal Services BC	Perinatal Nursing; Public Health	KU, P
Sarka Lisonkova	Associate Professor, Obstetrics and Gynaecology, UBC	Perinatal Epidemiology	R, P
Sheona Mitchell	Assistant Professor, Obstetrics & Gynaecology, Northern Medical Program, UBC	Obstetric and Neonatal Care in Rural, Remote, Northern Regions	R, C, KU

Giulia Muraca	Post-doctoral Fellow, University of British Columbia and Karolinska Institute	Perinatal epidemiology	R, P
Ann Pederson	Executive Director, Perinatal Services BC	Population Health Promotion	KU, P
Neda Razaz	Assistant Professor, University of British Columbia and Karolinska Institute	Perinatal epidemiology	R, P
Yasser Sabr	Assistant Professor, College of Medicine, King Saud University, Riyadh, Saudi Arabia.	Maternal Fetal Medicine, Perinatal epidemiology	R, C, P
Joseph Ting	Assistant Professor, Pediatrics, UBC; Director, Emergency Neonatal Transport, BC	Neonatology; Emergency Transport	R, C, P
Kim Williams	Provincial Executive Director, Perinatal Services BC	Perinatal Nursing; Health Services	KU, P
YUKON			
Shannon Ryan	Genetic Counsellor and Project Coordinator, Congenital Anomalies Surveillance Yukon	Surveillance; Congenital Anomalies; Genetics	KU, P
NORTHWEST TERRITORIES			
Sarah Cook	Territorial Medical Officer	Family medicine; obstetric care	C, P, KU
Andrew Kotaska	Stanton Territorial Hospital, Yellowknife	Obstetrician and Gynaecologist	R, C, KU, P