Deep Dive into Cesarean Section Rates

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What can the numbers tell us?

Overview

- Why we are interested in rising cesarean section rates
- Traditional ways of assessing C/S rates
- Rationale for Robson Classification
    - What is it and how does it work?
    - Barriers and facilitators
- Looking at data using Robson classification (NS)
- What is being reported in NB
- The way forward: Drilling down!

Background

- Cesarean section rates rising internationally
- Uncertainty about the “ideal” rate
- Minimal evidence to suggest that women and neonates benefit from the procedure if it is not necessary
- Short and long term risks of the procedure are difficult to assess and quantify
- Assessment has been hampered over the years by the lack of an internationally accepted classification system

Background

- Traditionally Cesarean sections have been analyzed according to indication (suspected fetal compromise, malpresentation, lack of progress in labour, previous cesarean section)

- Subgroups of women have been studied (according to age, parity, BMI etc)

- Primary vs secondary Cesarean Sections

- Difficult to make comparisons between facilities, regions, countries because each will have a different “case mix”

History of Robson Classification

- Dr. Michael Robson recognized the lack of a comprehensive cesarean section classification system

- First published his classification system in 2001

- Stated that the cesarean section rate could be reduced “but only when it can be justified, accepted by women and safely implemented”

But why bother?

- As clinicians we cannot just accept that the higher the cesarean section rate the better the outcomes
- A closer look allows us to examine women's birth choices and what influences them
- Need to be able to explore further what influence maternal characteristics and labour interventions (induction) have on CS rates
- Allows us to examine variations by site/hospital/region and understand more fully what drives these

What do we hope to achieve?

- Identify and analyze the groups of women who contribute most and least to overall CS rates
- Compare practice in these groups with other units who have more desirable results and consider changes in practice
- Assess the effectiveness of strategies or interventions to optimize CS rates
- Assess the quality of care by analyzing outcomes by groups of women
- Raise staff awareness about the importance of this data, interpretation and use

WHO Robson Classification: Implementation Guide

Robson outlined 5 basic principles of data collection

Information needs to be…..

- Relevant
- Carefully defined
- Accurately collected
- Timely
- Available

Principles of a Classification System (Robson)

- Robust: not needing to be changed frequently
- Groups prospectively identifiable such that outcomes can be improved in those same patients
- Mutually exclusive
- Totally inclusive
- Clinically relevant
- Simple to understand
- Easy to implement

Robson Classification

- Classifies **all** women admitted for delivery into one of 10 groups (not just those that have a cesarean section)
- Based on six basic obstetric variables

1. Parity
2. Previous CS
3. Onset of labour
4. Number of fetuses
5. Gestational age
6. Fetal lie and presentation

WHO statement on Robson Classification

"WHO proposes the Robson Classification system as a global standard for assessing, monitoring and comparing caesarean section rates within healthcare facilities over time, and between facilities".

Robson Classification with subdivisions

Group	Obstetric population
1	Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour
2	Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation who had labour induced or were delivered by CS before labour
2a	Labour induced
2b	Pre-labour CS
3	Multiparous women without a previous CS, with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour
4	Multiparous women without a previous CS, with a single cephalic pregnancy, ≥37 weeks gestation who had labour induced or were delivered by CS before labour
4a	Labour induced
4b	Pre-labour CS

Robson Classification with subdivisions

Group	Obstetric population
5	All multiparous women with at least one previous CS, with a single cephalic pregnancy, ≥37 weeks gestation
5.1	With one previous CS
5.2	With two or more previous CSs
6	All nulliparous women with a single breech pregnancy
7	All multiparous women with a single breech pregnancy including women with previous CS(s)
8	All women with multiple pregnancies including women with previous CS(s)
9	All women with a single pregnancy with a transverse or oblique lie, including women with previous CS(s)
10	All women with a single cephalic pregnancy < 37 weeks gestation, including women with previous CS(s)

Obstetric Variables for Robson Classification

Obstetric variables	
Parity	• Nullipara • Multipara
Previous CS	• Yes (one or more) • No
Onset of labour	• Spontaneous • Induced • No labour (pre-labour CS)
Number of fetuses	• Singleton • Multiple
Gestational age	• Preterm (less than 37 weeks) • Term (37 weeks or more)
Fetal lie and presentation	• Cephalic presentation • Breech presentation • Transverse lie

Definition of core variables used in Robson Classification

Variable	Definition	Observation
Parity*	Number of previous deliveries upon admission for delivery.	Birth of infant weighing ≥ 500 g or ≥ 22 weeks**, alive or dead, with or without malformations, by any route. The number of previous abortions/ miscarriages does not count.
Nullipara	No previous delivery.	This is not necessarily equivalent to Primigravida. For example, a woman in her 4th pregnancy with 3 prior miscarriages (G4 P0 A3) will be a nulliparous woman and belongs in this group.
Multipara	At least one previous delivery.	Delivery of infant weighing ≥ 500 g or ≥ 22 weeks**, alive or dead, with or without malformations, by any route.
Previous CS *	Number of previous CS upon admission for delivery.	Other types of uterine scars (e.g. myomectomy) should not be considered and not included as a prior CS when classifying women.
None	All previous deliveries were vaginal.	
One or more	At least one previous delivery by CS but may have one or more vaginal deliveries in addition.	

Definition of core variables used in Robson Classification

Obstetric Variable	Definition	Observation
Onset of labour	How labour and delivery started in the current pregnancy, regardless of how delivery was planned originally.	This should be based on the history, physical examination and decision by health professional upon admission to the labour/delivery ward.
Spontaneous	Prior to delivery, the woman was in spontaneous labour .	Nulliparous or multiparous women with a scheduled (prelabour) CS who arrive in spontaneous labour belong to this group. This group also includes women who entered labour spontaneously and then received oxytocin or had an amniotomy performed for augmentation (acceleration) of labour.
Induced	Upon admission to the labour ward, the woman was not in labour and was then induced.	Any method of induction is valid including amniotomy, misoprostol, oxytocin, intracervical Foley balloon, laminaria or other. Women who enter labour spontaneously and then receive oxytocin or have an amniotomy to correct dystocias or augment (accelerate) labour do not belong in this group but should be classified as "Spontaneous" onset of labour.
Pre-labour CS	Woman not in labour when admitted for delivery and a decision was taken to deliver by CS.	Cases of induction or spontaneous labour who ultimately were delivered by CS do not belong here .
Number of fetuses	Number of fetuses upon admission for delivery.	Including fetal deaths diagnosed after 22 weeks or 500 g**.
Singleton	One fetus.	Twin pregnancies with fetal demise prior to 22 weeks or 500 g should be counted as a singleton pregnancy
Multiple	More than one fetus.	Including cases of multiples where one or more fetuses died after 22 weeks or 500 g**.

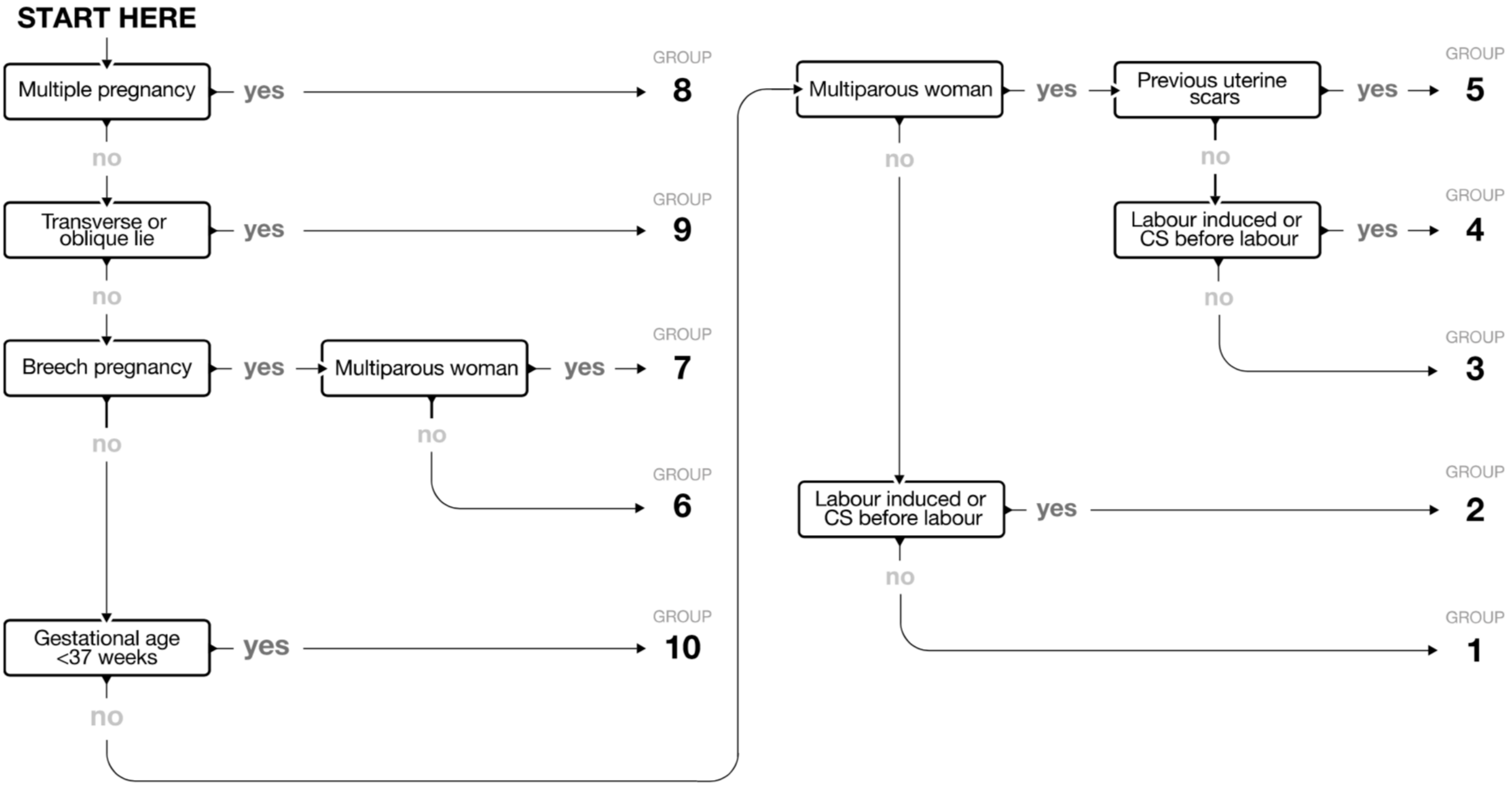
Definition of core variables used in Robson Classificatio

Obstetric Variable	Definition	Observation
Gestational age	Gestational age upon admission for current delivery.	Based on best estimate (menstrual or earliest ultrasound) or neonatal exam or definitions used in your setting.
Term	37 weeks or more.	
Preterm	Less than 37 weeks.	
Fetal lie and presentation	The final fetal lie/presentation before a decision for delivery or before a diagnosis of labour is made.	Women admitted with a breech fetus who undergo external version and then deliver a cephalic fetus should be considered as cephalic. Women with a dead fetus in transverse lie who undergo internal version before delivery should be considered breech.
Cephalic	Fetal head is the presenting part.	Vertex, face or brow, or compound head presentations (hand prolapse) should go here.
Breech	Fetal buttocks or one foot or two feet are the presenting part.	All types of breech (frank, complete and footling).
Transverse or Oblique lie	Fetal long axis is perpendicular or oblique in relation to the mother´s long axis.	The fetal shoulder or arm are presenting or there is no presenting part.

ummary of specifications for variable in each Robson grou

Group	Parity	Previous CS	Number of fetuses	Fetal presentation or lie	Gestational age (weeks)	Onset of labour
1	0	No	1	Cephalic	≥ 37	Spontaneous
2	0	No	1	Cephalic	≥ 37	Induced or CS before labour
3	≥ 1	No	1	Cephalic	≥ 37	Spontaneous
4	≥ 1	No	1	Cephalic	≥ 37	Induced or CS before labour
5	≥ 1	Yes	1	Cephalic	≥ 37	Any
6	0	No	1	Breech	Any	Any
7	≥ 1	Any	1	Breech	Any	Any
8	Any	Any	≥ 2	Any	Any	Any
9	Any	Any	1	Transverse or Oblique	Any	Any
10	Any	Any	1	Cephalic	< 37	Any

Flow chart for classification with Robson classification



Source: Adapted from Nassar LF, Sancho HD. Instrucción de Robson . v.0.1-1. 2015/06/08. Caja Costarricense de Seguro Social)

Barriers to implementation

- Data quality may be suboptimal with missing or incomplete variables, misclassifications
- Definitions may vary by region/country (ie definitions of a birth may be >20 weeks or >22 weeks)
- Many feel subdivisions for 1,2 and 5 are necessary
- It takes time, commitment and understanding, need a designated person
- **If process is undertaken need to commit to action plan**

Interpretation of Robson: Three main domains

- **Data quality**: Need to improve?
- **Type of population**: Reflects the characteristics of the patient population
- **Cesarean section rates**: Understand and compare CS rates in each group and determine which group contributes the most to the overall CS rate

Differences in size of groups or events may be due to….

- Poor data quality (missing or incorrect information)…need to assess data quality
- Differences in epidemiological characteristics..need to assess the type of obstetric population
- Differences in clinical practice…need to assess CS rates

Nova Scotia Data……

Introduction to the Data Table!

- Column 1: Group (1-10)
- Column 2: Number of CS in that group
- Column 3: Number of women in that group
- Column 4: Number of women in the group/total # of women
- Column 5: Number of CS in the group/total # women in the group (Group CS rate)
- Column 6: Absolute contribution to the overall CS rate (CS/ total number of women delivered)
- Column 7: Relative contribution to the overall CS rate (CS/total CS)

Robson Classification Data Table

Setting name: *Hospital ABC*				**period:** *January 2016 to December 2016*		
Column 1	**Column 2**	**Column 3**	**Column 4**	**Column 5**	**Column 6**	**Column 7**
Group	Number of CS in group	Number of women in group	Group Size[1] (%)	Group CS rate[2] (%)	Absolute group contribution to overall CS rate[3] (%)	Relative contribution of group to overall CS rate[4] (%)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Total*	**Total number CS**	**Total number women delivered**	**100%**	**Overall CS rate**	**Overall CS rate**	**100%**

Unclassifiable: Number of cases and % [Number unclassifiable cases / (Total Number women delivered classified + unclassified) X 100]

* These totals and percentages come from the data in the table.
1. Group size (%) = n of women in the group / total N women delivered in the hospital x 100
2. Group CS rate (%) = n of CS in the group / total N of women in the group x 100
3. Absolute contribution (%) = n of CS in the group / total N of women delivered in the hospital x 100
4. Relative contribution (%) = n of CS in the group / total N of CS in the hospital x 100

Nova Scotia Data: 2017

Group	# of CS in each group	Total number in goup	Group size (# of women in group/ total # of women in group)	Group CS rate (# CS /total# of women in group)	Absolute group contribution to overall CS rate (# of CS in the group/total #of women delivered)	Relative group contribution to overall CS rate (# of CS in the group/total CS)
Group 1	113	943	20.2	12.0	2.4	9.0
Group 2	265	805	17.3	32.9	5.7	21.2
Group 3	12	1011	21.7	1.2	0.3	1.0
Group 4	45	591	12.7	7.6	1.0	3.6
Group 5	353	471	10.1	74.5	7.6	28.3
Group 6	128	133	2.9	96.2	2.7	10.2
Group 7	58	64	1.4	90.6	1.2	4.6
Group 8	136	229	4.9	59.3	2.9	10.9
Group 9	3	3	0.1	100	0.1	0.2
Group 10	88	332	7.1	26.5	1.9	7.0
Not enough information	48	80	1.7		1.0	3.8
Total	1249	4662	100		26.8	100

Data Quality Assessment

Step 1: add up totals.Is there missing data?

Data Quality

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Step 2: Look at Group 9 (singleton, transverse or oblique lie)

Should be less than 1%

Greater than 1% suggests misclassifcation

Data Quality

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Step 3: Look at the CS rate in Group 9
Should be 100%

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Type of Population Assessment

: Look at groups 1 and 2 (nulliparous, >=37 weeks, singleton, ce

Usually 35-42%

Type of population

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ze of groups 3 and 4 (multiparous >= 37 weeks, cephalic, singlet

Usually ~30%

Type of population

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Look at Group 5 (multiparous, >= 37 weeks singleton, cephalic, p

Should be roughly half the overall CS rate

Low overall CS rates Group 5 will be <10%

Type of population

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Look at Groups 6 and 7 (breeches, nulliparous and multiparous

Should be 3-4%

If over 4, high rates of preterm births

Type of population

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Step 5: look at Group 8 (multiples)
Should be 1.5-2%

Type of population

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Step 6: Look at Group 10 (preterm cephalic singletons)
Should be less than 5% in normal risk settings

Type of population

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Step 7: Look at the ratio of Groups 1:2
Should be 2:1 or higher
If lower, may be due to high induction rate

Type of population

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Step 8: Look at the ratio of Groups 3:4
Should be higher than 2:1

Type of population

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Look at the ratio of Groups 6:7 (nulliparous breech: multiparous
Should be 2:1

Assess the CS rate

- Step 1: CS rate for Group 1….12 % (10% should be possible)
- Step 2: CS rate for Group 2….32.9% (usually 20-35%)
- Step 3: CS rate for Group 3….1.2% (usually no higher than 3.0%)
- Step 4: CS rate for Group 4….7.6% (rarely higher than 15%)

Steps to Assess CS rate

- Step 5: CS rate for Group 5….74.5% (usually ~50-60%)
- Step 6: CS rate Group 8 (multiples)…59.3% (usually ~60% and dependent on type of twins)
- Step 7: CS rate Group 10 (preterm)….26.5% (usually ~30%)

Steps to Assess CS rate

- Step 8: look at the relative contributions of 1,2 and 5 to overall CS rate…..58.5% (usually contributes 66% or 2/3 to all CS
- Step 9: look at the relative contribution of Group 5 to the overall rate …28.3%

Robson Classification: Regional Hospitals NS 2017

Group Description	# C/S	Group #	Size of this Group	C-Section Rate in Group	Contribution to C/S Rate
#1: Nulliparous, singleton, cephalic, >= 37 weeks, in spontaneous labour	99	608	21.58%	16.28%	3.51%
#2: Nulliparous, singleton, cephalic, >= 37 weeks, induced or C/S before labour	157	400	14.20%	39.25%	5.57%
#3: Multiparous, singleton, cephalic, >= 37 weeks, in spontaneous labour (excluding previous C/S)	19	771	27.37%	2.46%	0.67%
#4: Multiparous, singleton, cephalic, >= 37 weeks, induced or C/S before labour (excluding previous C/S)	48	326	11.57%	14.72%	1.70%
#5: Previous C/S, singleton, cephalic, >= 37 weeks	256	321	11.40%	79.75%	9.09%
#6: Nulliparous, singleton, breech	68	69	2.45%	98.55%	2.41%
#7: Multiparous, singleton, breech (including previous C/S)	47	49	1.74%	95.92%	1.67%
#8: All multiple pregnancies (including previous C/S)	18	46	1.63%	39.13%	0.64%
#10: All singleton cephalic < 37 weeks (including previous C/S)	42	130	4.61%	32.31%	1.49%
Not enough information	44	97	3.44%	45.36%	1.56%

Type of patient population	IWK	Other regional hospitals
Step 1: Groups 1 and 2	37.3%	35.8%
Step 2: Groups 3 and 4	34.4%	39%
Step 3: Group 5	10.1%	11.4%
Step 4:Groups 6 and 7	4.3%	4.2%
Step 5: Group 8	4.9%	1.6%
Step 6: Group 10	7.1%	4.6%
Step 7: Ratio of 1:2	1.2:1	1.5:1
Step 8: Ratio of 3:4	1.7:1	2.4:1
Step 9: Ratio of 6:7	2.1:1	1,4:1
Not enough information	1.7%	1.56%

C/S rates	IWK	Other regional hospitals
Step 1: Group 1	12%	16.3%
Step 2: Group 2	32.9%	39.3%
Step 3: Group 3	1.2%	2.5%
Step 4: Group 4	7.6%	14.7%
Step 5: Group 5	74.5%	79.8%
Step 6: Group 8	59.3%	39.1%
Step 7: Group 10	26.5%	32.3%
Step 8: Groups 1,2 and 5	58.5%	64%
Step 9: contribution of group 5	7.6%	9.1%
Overall C/S rate	26,8%	28.3%

New Brunswick Data….

PérinatalNB

NB Perinatal Health Program
Report of Indicators| 2011–2016

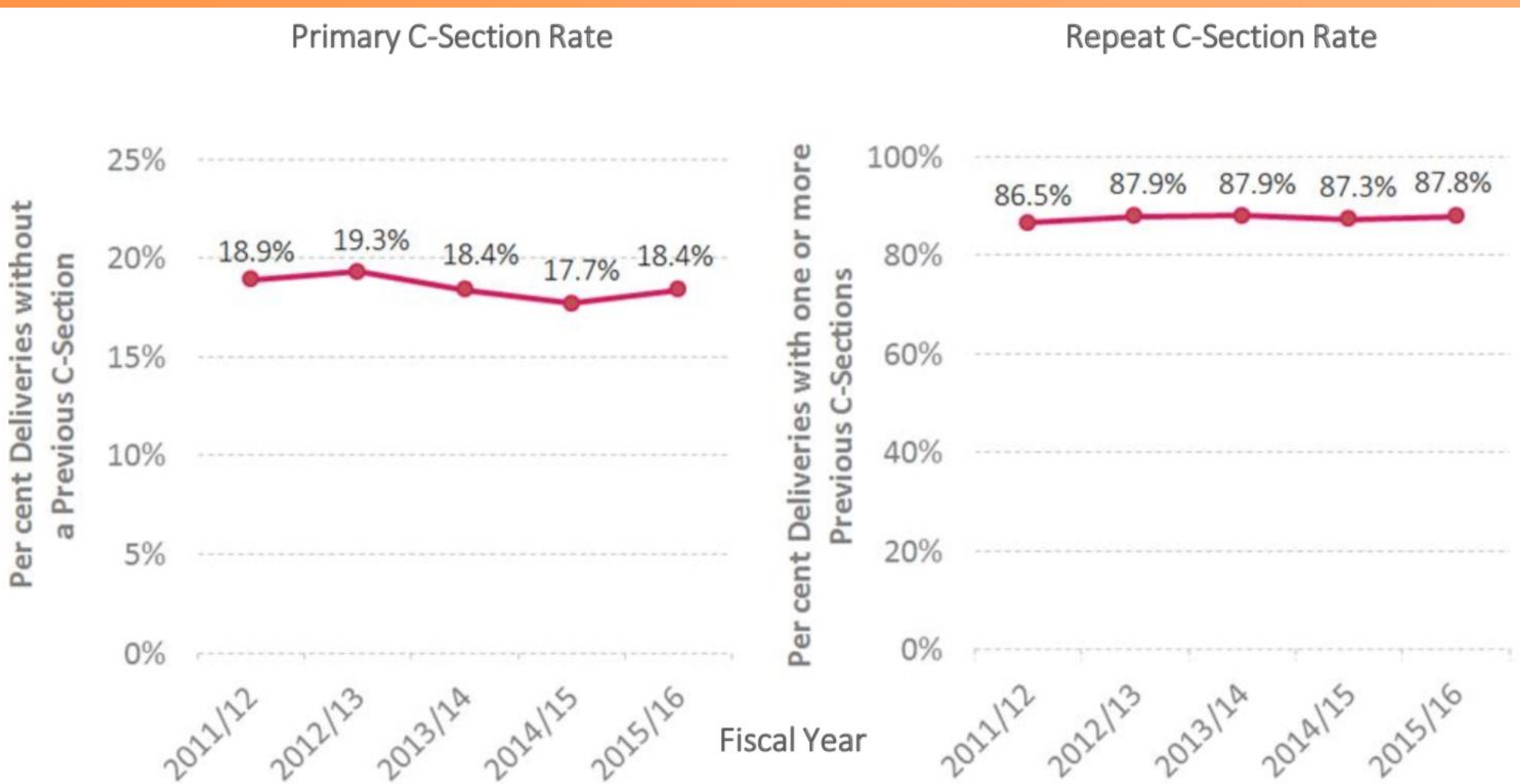

Figure 2.2: Primary C-section Rate and Repeat C-section Rate, New Brunswick, 2011/12-2015/16

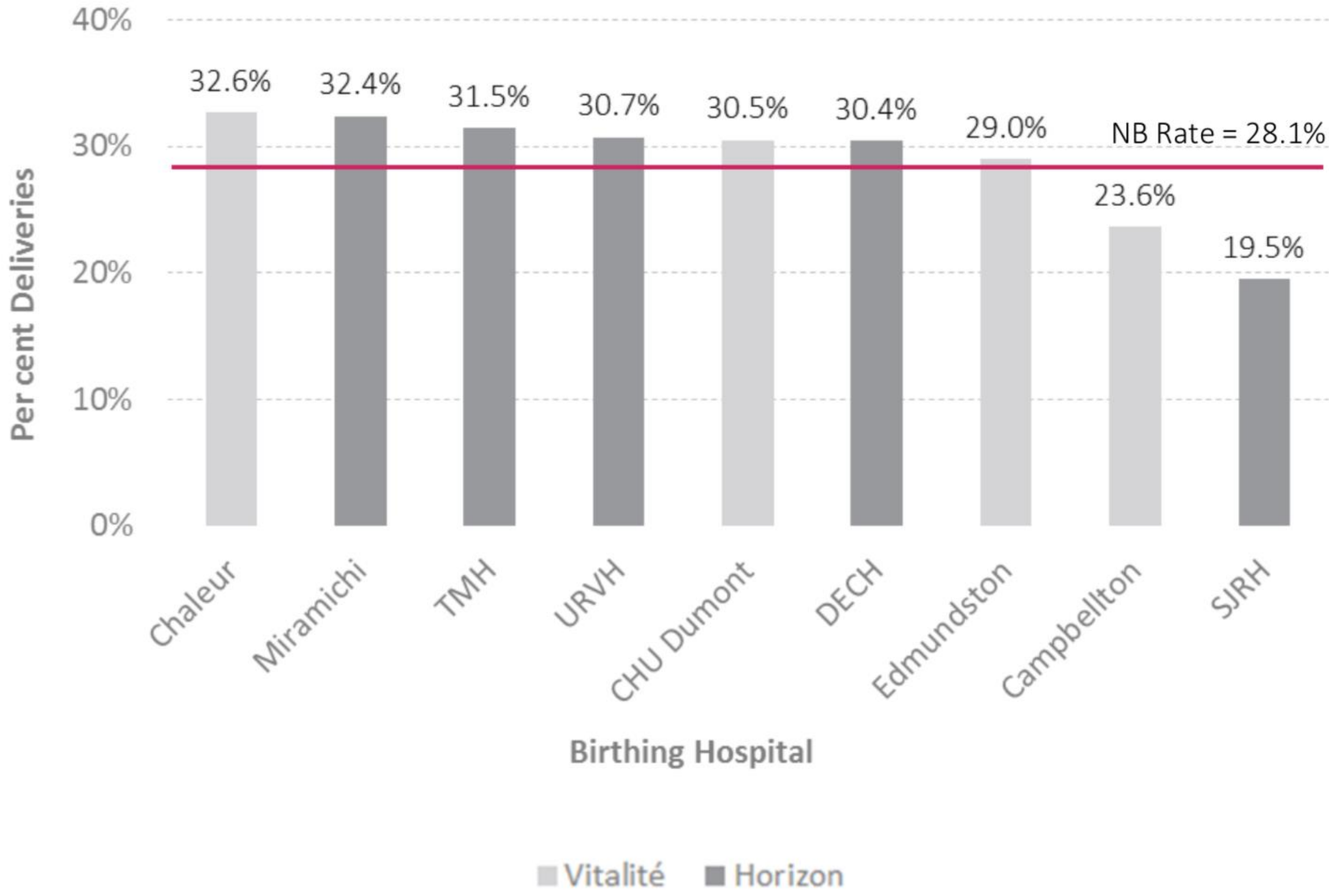

Figure 2.1: C-section Rate, by birthing hospital, New Brunswick, 2015/16

Table 2.1: C-section Rate, by birthing hospital and year, New Brunswick, 2011/12-2015/16

Birthing Facility	C-Section Rate				
	2011/12	2012/13	2013/14	2014/15	2015/16
Campbellton Regional Hospital	40.2%	32.8% ▼	31.9% ▼	30.6% ▼	23.6% ▼
Chaleur Regional Hospital	26.8%	28.8% ▲	37.7% ▲	33.3% ▼	32.6% ▼
Dr. Everett Chalmers Regional Hospital	30.1%	30.6% ▲	30.9% ▲	30.0% ▼	30.4% ▲
Dr. Georges-L.-Dumont University Hospital Centre	25.3%	29.3% ▲	25.9% ▼	30.1% ▲	30.5% ▲
Edmundston Regional Hospital	29.8%	31.1% ▲	27.3% ▼	24.0% ▼	29.0% ▲
Miramichi Regional Hospital	38.4%	40.0% ▲	35.6% ▼	34.3% ▼	32.4% ▼
The Moncton Hospital	29.7%	28.8% ▼	26.0% ▼	27.8% ▲	31.5% ▲
Saint John Regional Hospital	20.3%	20.3%	21.3% ▲	21.2% ▼	19.5% ▼
Upper River Valley Hospital	24.7%	26.1% ▲	27.6% ▲	23.1% ▼	30.7% ▲

Primary and Repeat C-Section Rate

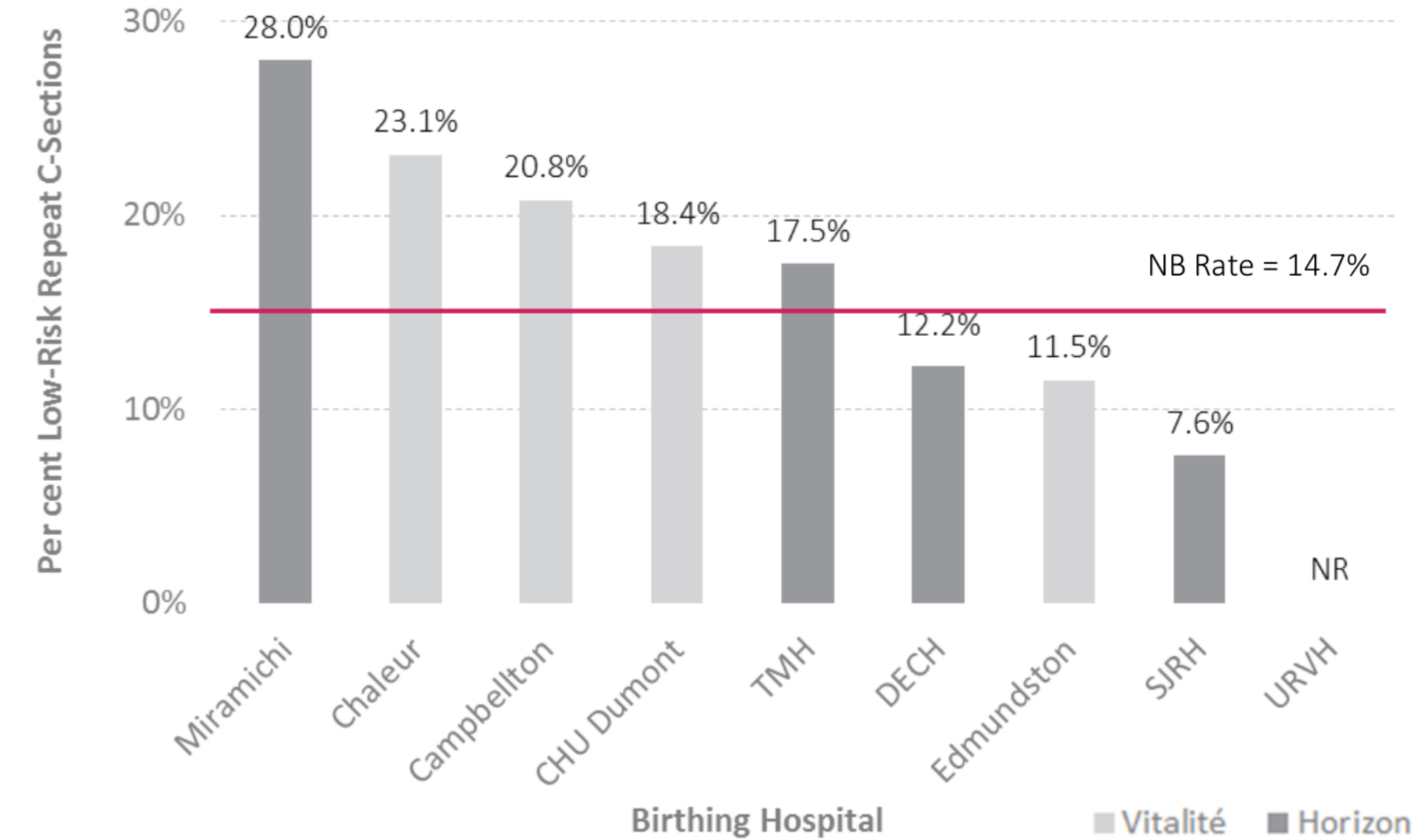

Figure 2.4: Per cent of term low-risk repeat C-sections delivered between 37 and 39 weeks gestation, by birthing hospital, New Brunswick, 2015/16

Table 2.2: Crude VBAC Rate, VBAC Attempt Rate and VBAC Success Rate, New Brunswick, 2011/12-2015/16

Location	VBAC Deliveries				
	2011/12	2012/13	2013/14	2014/15	2015/16
Crude VBAC Rate	13.5%	12.1% ▼	12.1%	12.7% ▲	12.2% ▼
VBAC Attempt Rate	17.0%	15.4% ▼	16.1% ▲	16.9% ▲	17.9% ▲
VBAC Success Rate	79.3%	78.8% ▼	75.2% ▼	75.3% ▲	68.1% ▼

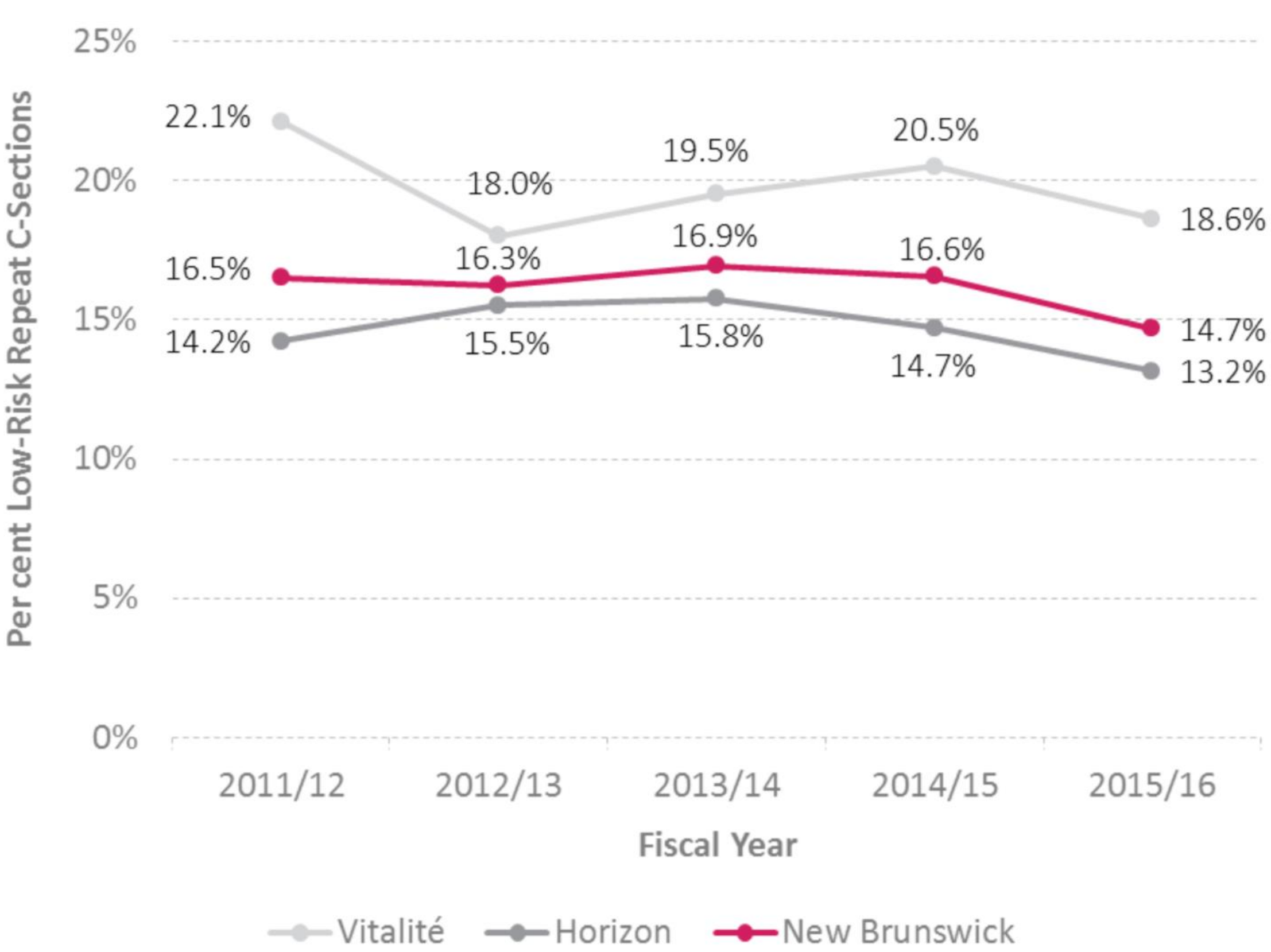

Figure 2.3: Per cent of term low-risk repeat C-sections delivered between 37 and 39 weeks gestation, by Regional Health Authority, New Brunswick, 2011/12-2015/16

Robson Classification in Canada

- Five Canadian Perinatal Programs, combined aggregate data to examine rates of CS using Robson Classification and identify “target” groups in order to focus strategies to optimize cesarean section rates

- 965,499 women delivered in 5 provinces between 2007/8 and 2010/11.

- Largest contributor to CS rate was Group 5 (previous CS) followed by Group 2 (nulliparous, term cephalic induced or no labour

- Third contributor was Group 1

Kelly et al, J Obstet Gynaecol Can 2013;35(3):206–214

Robson Classification in Canada

- Authors concluded that any strategies to address the CS rate in Canada must include Group 5 in conjunction with a reduction in primary caesarean section rates in Groups 1 and 2

- Focused quality improvement strategies have been shown to be effective at safely reducing the CS rate with “plan/do/study/act” cycles to bring about change

Kelly et al, J Obstet Gynaecol Can 2013;35(3):206–214

Next Steps for New Brunswick……