

A secondary analysis of rural maternity care outcomes in 3 provinces in Canada

STEFAN GRZYBOWSKI, MD, CCFP, FCFP, MCISc
And the Secondary Analysis Team
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Secondary Analysis Project Objectives

1. Compare selected population-based maternal and newborn outcomes by residence stratified across service levels in each of three provinces using a parallel research strategy;
2. Amalgamate results from the three provinces into a structured composite analysis; and
3. Compare results across hospital service levels.

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Secondary Analysis Team

Jurisdiction	Team Members, Organization
British Columbia	Stefan Grzybowski (PI), Jude Kornelsen and Kathrin Stoll Centre for Rural Health Research Cathe Johnson, Perinatal Services BC
Alberta	Nancy Aelicks, Sharon Zhang, and Brenda Leung, Alberta Perinatal Health Program
Nova Scotia	John Fahey and Rebecca Attenborough, Reproductive Care Program of Nova Scotia



Methods & Approach

- Establish rural population catchment areas by distance to maternity services and linked to postal codes in 3 Canadian provinces (exclude urban populations).
- Define hospital service levels for all rural hospitals providing maternity care in the 3 provinces.
- Link population catchments to local rural hospitals (with intrapartum services) and stratify hospital catchments by level of service. If no local service within one hour stratify catchments by distance to nearest Cesarean Section service, and
- Analyze newborn outcomes and selected maternal outcomes and compare results across service levels adjusting for aboriginal ethnicity and socioeconomic status at catchment level.

Rural Population Catchments

Service Level	Obstetric Service Level	Definition of Service Level
1	No local services	Greater than 240 minutes (4 Hours) from maternity services
2	No local services	121-240 minutes (2-4 Hours) from maternity services
3	No local services	61-120 minutes (1-2 Hours) from maternity services
4	Primary care services without Cesarean Section	Intrapartum care provided by Family Physicians and Midwives (No local specialist access)
5	Primary care services Cesarean Section (GP with Enhanced Surgical Skills)	Intrapartum care provided by Family Physicians and Midwives (No local specialist access)
6	Mixed Model	C-section provided by GP surgeon or Specialist
7	General Surgeon	C-section provided by General Surgeon
8	OB/GYN and General Surgery	C-section provided by Obstetricians

Secondary Analysis Results

2003 - 2008

Table 1. Number of Mothers in Each Service Level*

Service Level	Alberta (n = 70,037)	British Columbia (n = 61,991)	Nova Scotia (n = 18,769)	Total (n = 150,797)
1 (240+ Minutes from Service)	322	601	n/a	955
2 (120-240 Minutes from Service)	1339	623	99	2070
3 (60-120 Minutes from Service)	3082	1892	1772	7024
4 (Primary Care w/o CS)	7126	2976	n/a	14947
5 (GP Surgery)	22666	6814	993	33000
6 (Mixed Model)	4463	7206	n/a	17022
7 (General Surgeon)	302	2778	440	3543
8 (OB/GYN)	30737	39101	15,465	85548

*Dataset excludes multiple, congenital anomalies, home births and out of hospital births

Results: Perinatal Mortality

Table 2. Perinatal Mortality
(includes still births + neonatal deaths up to 7 days)

Service Level	Alberta		British Columbia		Nova Scotia	
	Adjusted OR ¹ (95% CI) (n = 70,037)	N (adjusted)	Adjusted OR ¹ (95% CI) (n = 63,277)	N (adjusted)	Adjusted OR ¹ (95% CI) (n = 18,769)	N (adjusted)
1 (240+ Minutes from Service)	1.40 (0.44, 4.39)	322	2.84 (1.58, 5.10)*	601		
2 (120-240 Minutes from Service)	1.35 (0.77, 2.38)	1339	1.33 (0.59, 3.01)	623	> 999.999 (<0.001 - >999.99)	99
3 (60-120 Minutes from Service)	1.50 (1.03, 2.18)*	3082	0.79 (0.43, 1.45)	1892	0.66 (0.38, 1.14)	1772
4 (Primary Care w/o CS)	1.23 (0.92, 1.64)	7126	1.12 (0.73, 1.70)	2976		
5 (GP Surgery)	1.12 (0.91, 1.36)	22666	1.07 (0.79, 1.44)	6814	0.82 (0.38, 1.78)	993
6 (Mixed Model)	0.88 (0.58, 1.32)	4463	1.07 (0.80, 1.42)	7206		
7 (General Surgeon)	1.53 (0.49, 4.83)	302	0.96 (0.61, 1.51)	2778	0.60 (0.23, 1.65)	440
8 (OB/GYN)	1.0	30737	1.0	39101	1.0	15645

*p < 0.05; ¹ Adjusted for: maternal age (< 18, > 35), parity, diabetes (existing & gestational), hypertension (existing & gestational), past neonatal death, past still birth)

Results: Prematurity

**Table 3. Prematurity: Less than 34 Weeks GA
(Excluding Stillbirths)**

Service Level	Alberta		British Columbia		Nova Scotia	
	Adjusted OR ¹ (95% CI) (n = 70,037)	N (adjusted)	Adj OR ¹ (95% CI) (n =61,608)	N (adjusted)	Adjusted OR ¹ (95% CI) (n = 18,769)	N (adjusted)
1 (240+ Minutes from Service)	1.32 (0.57, 2.98)	308	0.74 (0.33, 1.66)	601		
2 (120-240 Minutes from Service)	1.09 (0.70, 1.68)	1286	0.81 (0.38, 1.72)	623	0.78 (0.19, 3.21)	99
3 (60-120 Minutes from Service)	1.02 (0.75, 1.38)	3,359	1.29 (0.91, 1.85)	1892	0.96 (0.66, 1.41)	1772
4 (Primary Care w/o CS)	1.08 (0.88, 1.33)	7,263	0.90 (0.64, 1.26)	2976		
5 (GP Surgery)	1.02 (0.89, 1.18)	23,274	0.97 (0.77, 1.22)	6814	0.82 (0.52, 1.28)	993
6 (Mixed Model)	0.94 (0.72, 1.23)	8,819	0.91 (0.72, 1.14)	7206		
7 (General Surgeon)	2.00 (0.98, 4.07)	262	0.82 (0.57, 1.17)	2778	1.11 (0.52, 2.37)	440
8 (OB/GYN)	1.0	29,528	1.0	39101	1.0	15645

*p < 0.05; ¹ Adjusted for: maternal age (< 18, > 35), parity, diabetes (existing & gestational), hypertension (existing & gestational), past neonatal death, past still birth)

Results: Cesarean Section

Table 4. Cesarean Section

Service Level	Alberta		British Columbia		Nova Scotia	
	Adjusted OR ¹ (95% CI) (n = 70,037)	N (adjusted)	Adj OR ¹ (95% CI) (n =61,608)	N (adjusted)	Adjusted OR ¹ (95% CI) (n = 18,769)	N (adjusted)
1 (240+ Minutes from Service)	0.64 (0.48, 0.87)*	310	0.70 (0.57, 0.85)*	601		
2 (120-240 Minutes from Service)	0.67 (0.58, 0.77)*	1,298	0.74 (0.61, 0.90)*	623	0.67 (0.40, 1.10)	99
3 (60-120 Minutes from Service)	0.86 (0.78, 0.94)*	3,394	0.92 (0.83, 1.03)	1892	0.87 (0.77, 0.98)*	1772
4 (Primary Care w/o CS)	0.81 (0.76, 0.86)*	7,320	0.84 (0.78, 0.92)*	2976		
5 (GP Surgery)	1.07 (1.03, 1.12)*	23,460	0.91 (0.86, 0.96)*	6814	1.08 (0.93, 1.24)	993
6 (Mixed Model)	0.91 (0.84, 0.99)*	8,918	0.95 (0.89, 1.00)	7206		
7 (General Surgeon)	1.29 (0.99, 1.69)	264	1.19 (1.09, 1.29)*	2778	0.91 (0.73, 1.14)	440
8 (OB/GYN)	1.0	29,711	1.0	39101	1.0	15645

*p < 0.05; ¹ Adjusted for: maternal age (< 18, > 35), parity, diabetes (existing & gestational), hypertension (existing & gestational), past neonatal death, past still birth)

Conventional Meta-analysis: Summarizing Results from 3 Provinces

- **Steps To Take**

1. extract data from individual studies & calculate result for that study (the 'point estimate' or 'summary statistic'), with an estimate of the chance variation (confidence interval).
2. decide if it would be appropriate to calculate a pooled average result across studies and, if so, calculate and present such a result



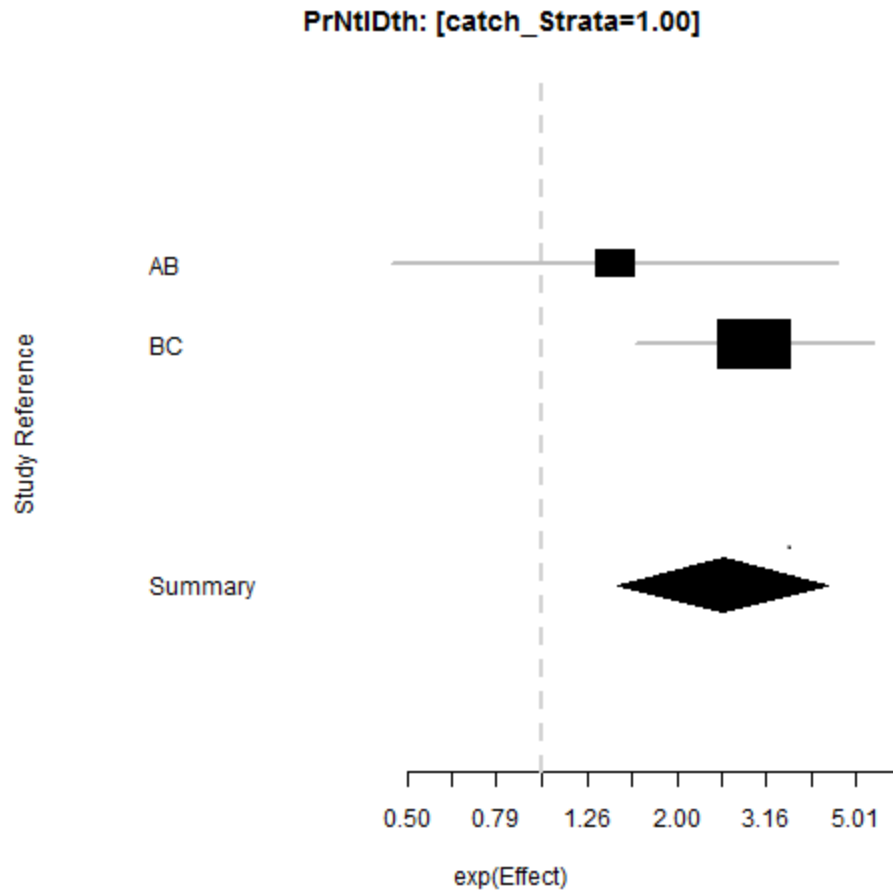
The Cochrane Collaboration

Working together to provide the best evidence for health care

The Challenge & Our Approach

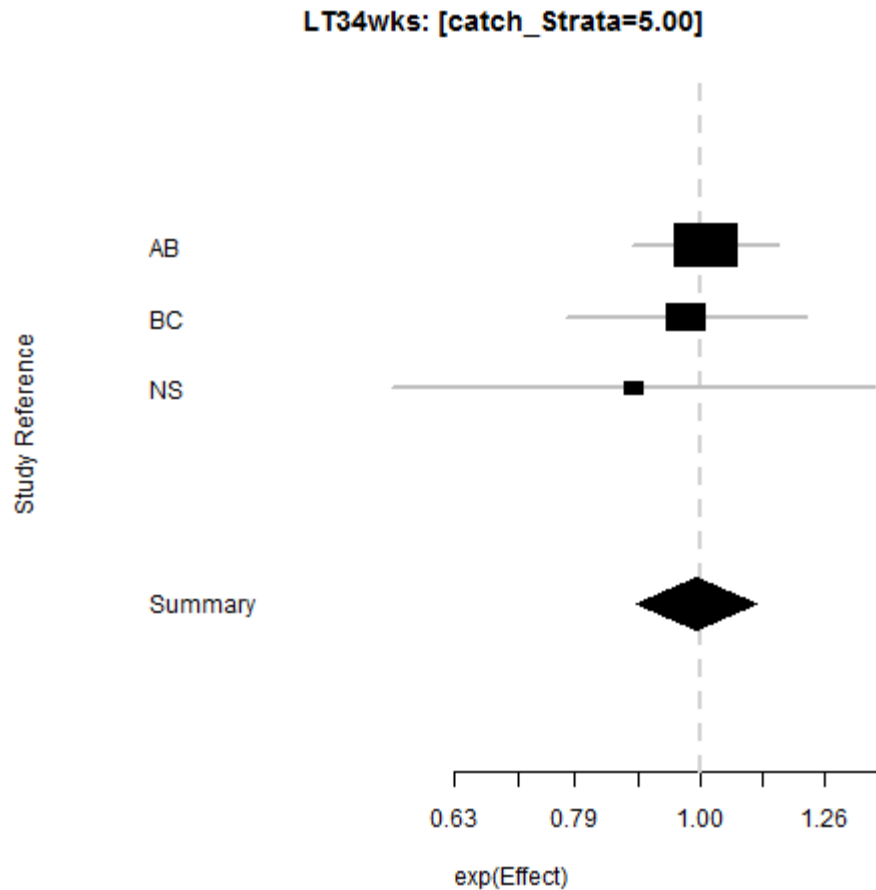
- **The Challenge**
 - Perinatal data in the provincial databases is bound by restrictive covenants on the release of data beyond an individual provincial jurisdiction.
- **Our Approach**
 - Harmonize data definitions in all 3 provincial databases and conduct parallel analyses.
 - Amalgamate results using covariate matrices an intermediate analytic step.

Summarizing Results: Forest Plots



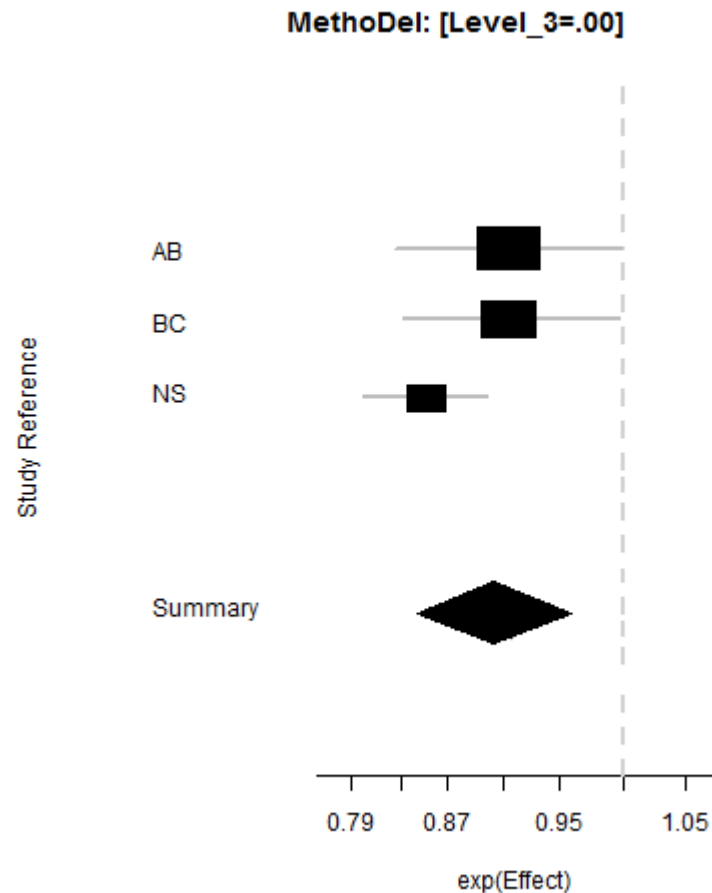
*example of summary result using Forest Plot: **Perinatal Mortality for Service Level 1**

Summarizing Results: Forest Plots



*example of summary result using Forest Plot: **Prematurity for Service Level 5**

Summarizing Results: Forest Plots



*example of summary result using Forest Plot: **Cesarean Section for Service Level 3**

Discussion

- Secondary Analysis of multi-jurisdictional data through amalgamation of the intermediate analytic data is a mechanism for overcoming some of the challenges of cross jurisdictional research when case level data cannot be shared.
- Ecological analysis of variables at catchment level provides a solution to data restrictions.

Limitations

- Missing data and variability in definition of specific data fields between jurisdictions.
- Adjusting for socio-economic status and Aboriginal ethnicity at the catchment level.
- Inability to send case level data between provinces necessitating a special case of meta-analysis.

Conclusion

- Multi-jurisdictional rural results support earlier work on the outcomes associated with access to rural maternity care services.
- Intervention rates, such as caesarean section, are lower in most small rural service levels.
- Stratification of rural population catchments and systemic monitoring of outcomes provides evidence demonstrating the effectiveness of different models of maternity care.