



Parental Separation Following Preterm Delivery in Canada: A Population-Based Cohort Study

Deepak Louis MD, DM¹, Ava Nykiforuk BSc², Aaron Chiu MD, FRCPC¹, Sapna Oberoi MD, DM³, Chelsea Ruth MD FRCPC^{1,4}, Lisa Flaten MSc⁴, James M. Bolton MD, FRCPC^{4,5}, Kristene Cheung PhD⁶, Lisa M. Lix PhD^{4,7}, Allan Garland MD, MA^{4,8}

¹Section of Neonatology, ²Rady Faculty of Medicine, ³Pediatric Hematology Oncology, ⁴Centre for Health Policy, ⁵Department of Psychiatry, ⁶Department of Clinical Health Psychology, ⁷Department of Community Health Sciences, ⁸Department of Medicine

Introduction

- Preterm delivery and subsequent care of children born preterm can be a stressful experience for some parents, adversely impacting their marital relationship.
- Mothers and fathers of children born preterm perceive and cope with parenting stress differently, potentially creating conflicts between them. There are few studies exploring the effects of preterm birth on parental separation.
- Parental separation is regarded as a major adverse childhood experience, with negative effects on children's behaviours, emotions, cognition, psychological development, and school performance, all of which could be magnified for children born preterm.

Objective and Hypothesis

- To examine the relationship between preterm delivery and parental separation and to identify the associated risk factors

Hypothesis: Parents of children born preterm have a higher rate of separation/divorce compared to parents of term children.

Methods

Design: Population-based retrospective cohort study.

Participants:

Inclusion criteria:

- Both parents continuously registered with Manitoba Health from two years prior to five years after the preterm delivery.
- Their relationship status was available in the Manitoba Health insurance registry during this period.
- They were married/common-law at the time of the index birth.
- Their children were alive and continuously registered with Manitoba Health for five years after the index birth event.

Exclusion criteria:

- Parents whose children died during the five-year follow-up period.
- Parents who had other children born preterm during the five-year-follow-up period.

Exposure: Preterm birth (categorized as <28 weeks, 28-33 weeks, 34-36 weeks gestational age).

Main Outcome Measures:

- **Primary:**
 - Parental separation within five years of childbirth
- **Secondary:**
 - Time to separation from the index delivery.

- A multivariable Poisson regression model was created to estimate the 5-year incidence rate ratios (IRR) of the primary outcome. The model was also used to establish socio-demographic and medical risk factors for parental separation.

Results

Figure 1: Flow of study participants

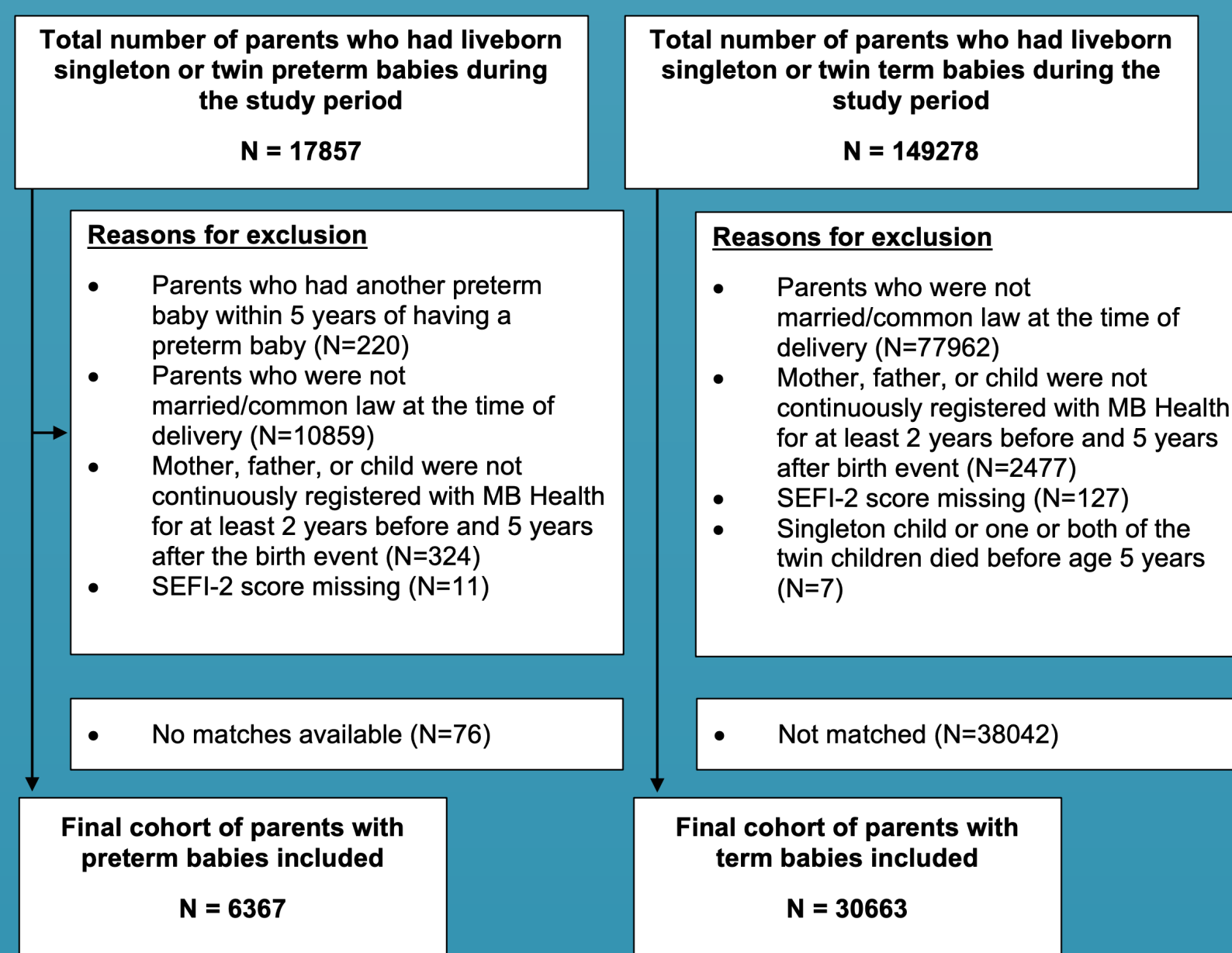


Table 1: Baseline characteristics of study cohorts

| | < 28 weeks N=164 | 28-33 weeks N=1196 | 34-36 weeks N=5007 | Term Controls N=30663 |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Maternal Characteristics | | | | |
| Maternal age at delivery, median [IQR] mean±SD | 30 [27, 34] 30.26±4.78 | 30 [27, 34] 30.39±4.96 | 30 [27, 34] 30.16±4.99 | 30 [27, 33] 29.91±4.72 |
| Parity >1, N (%) | 103 (62.8%) | 760 (63.6%) | 3296 (65.8%) | 19812 (64.6%) |
| Maternal diabetes, N (%) | 14 (8.5%) | 61 (5.1%) | 329 (6.6%) | 567 (1.9%) |
| Maternal hypertension, N (%) | 28 (17.1%) | 284 (23.8%) | 871 (17.4%) | 2472 (8.1%) |
| Smoking, N (%) | s | 48 (4.0%) | 175 (3.5%) | 825 (2.7%) |
| Caesarean section, N (%) | 82 (50.0%) | 607 (50.8%) | 1571 (31.4%) | 6153 (20.1%) |
| Twin birth, N (%) | 20 (12.2%) | 199 (16.6%) | 547 (10.9%) | 312 (1.0%) |
| Year of delivery, median [IQR] mean±SD | 1998 [1994, 2005] 1999.89±7.51 | 1999 [1993, 2007] 2000.21±7.56 | 2000 [1995, 2007] 2001.03±7.50 | 1999 [1994, 2007] 2000.55±7.69 |
| Rural Residence, N (%) | 64 (39.0%) | 484 (40.5%) | 2145 (42.8%) | 12707 (41.4%) |
| SEFI-2 Score, median [IQR] mean±SD | -0.12 [-0.76, 0.35] -0.12±0.89 | -0.13 [-0.67, 0.34] -0.10±0.93 | -0.13 [-0.69, 0.37] -0.08±0.95 | -0.15 [-0.69, 0.32] -0.13±0.88 |
| Income assistance at time of delivery, N (%) | s | 22 (1.8%) | 82 (1.6%) | 307 (1.0%) |
| Mental disorders (mood disorder or substance use) 2 years prior to birth, N (%) | 10 (6.1%) | 71 (5.9%) | 365 (7.3%) | 1670 (5.5%) |
| Paternal Characteristics | | | | |
| Paternal age at delivery, median [IQR] mean±SD | 32 [28, 35] 32.37±5.76 | 32 [29, 36] 32.69±5.74 | 32 [28, 36] 32.43±5.65 | 32 [28, 36] 32.21±5.35 |
| Rural Residence, N (%) | 63 (38.4%) | 480 (40.1%) | 2117 (42.3%) | 12589 (41.1%) |
| SEFI-2 Score, median [IQR] mean±SD | -0.14 [-0.78, 0.35] -0.13±0.90 | -0.11 [-0.67, 0.35] -0.09±0.94 | -0.12 [-0.67, 0.38] -0.07±0.94 | -0.14 [-0.67, 0.33] -0.12±0.88 |
| Mental disorders (mood disorder or substance use) 2 years prior to birth, N (%) | s | 54 (4.5%) | 235 (4.7%) | 1205 (3.9%) |
| Neonatal Characteristics | | | | |
| Birth weight (grams), median [IQR] mean±SD | 861 [750, 1012.5] 1005.49±610.13 | 1751 [1425, 2091] 1781.52±505.46 | 2682 [2381, 3003] 2715.38±513.11 | 3520 [3207, 3843] 3533.27±484.86 |
| SGA, N (%) | 14 (8.5%) | 117 (9.8%) | 444 (8.9%) | 2355 (7.7%) |
| Male, N (%) | 80 (48.8%) | 666 (55.7%) | 2811 (56.1%) | 15763 (51.4%) |
| Twin birth, N (%) | 20 (12.2%) | 199 (16.6%) | 547 (10.9%) | 312 (1.0%) |
| Birth order, median [IQR] mean±SD | 2 [1, 3] 2.00±1.39 | 2 [1, 3] 2.06±1.40 | 2 [1, 3] 2.16±1.38 | 2 [1, 3] 2.07±1.21 |
| 5 min APGAR score, median [IQR] mean±SD | 7 [6, 8] 6.99±1.78 | 8 [8, 9] 8.11±1.21 | 9 [8, 9] 8.60±0.83 | 9 [9, 9] 8.90±0.63 |

IQR= interquartile range; SD= standard deviation; SEFI-2= Socioeconomic Index Factor-Version 2; SGA= Small for gestational age; s= small numbers (<6) in the row.

Results

Table 2: Description of the primary and secondary outcomes

| | < 28 weeks N=164 | 28-33 weeks N=1196 | 34-36 weeks N=5007 | Preterm parents N=6367 | Term parents N=30663 |
|--|-------------------------|-----------------------------|-------------------------|---------------------------|-------------------------|
| Parental separation within 5 years of the index birth, N (%) | 9 (5.5%) | 64 (5.4%) | 277 (5.5%) | 350 (5.5%) | 1285 (4.2%) |
| Time of parental separation after the index birth (months), median [IQR] mean±SD | 40 [23, 45] 34.78±18.89 | 33.5 [16.5, 46] 31.72±17.52 | 34 [16, 46] 32.05±17.67 | 34 [16, 46] 32.06±17.63 | 34 [19, 48] 32.47±17.55 |

Table 3: Incidence rate ratios (IRRs) of Poisson regression model for parental separation

| Variables | Adjusted IRR (95% CI) | P-value |
|---|-----------------------|---------|
| >37 weeks (reference) | 1.00 | - |
| 34-36 weeks | 1.26 (1.09, 1.45) | 0.0017 |
| 28-33 weeks | 1.20 (0.93, 1.55) | 0.16 |
| <28 weeks | 1.27 (0.66, 2.45) | 0.48 |
| Maternal age (in years) | 0.94 (0.92, 0.96) | <0.0001 |
| Paternal age (in years) | 1.01 (0.99, 1.03) | 0.21 |
| Parity 1 (reference) | 1.00 | - |
| >1 | 1.36 (1.22, 1.53) | <0.0001 |
| Maternal diabetes | 1.03 (0.77, 1.38) | 0.83 |
| Maternal hypertension | 1.01 (0.85, 1.19) | 0.93 |
| Maternal smoking | 2.04 (1.65, 2.53) | <0.0001 |
| Caesarean section | 1.06 (0.94, 1.19) | 0.38 |
| Twin birth | 0.80 (0.60, 1.07) | 0.14 |
| Year of delivery | 0.97 (0.96, 0.97) | <0.0001 |
| Maternal rural residence | 0.62 (0.55, 0.69) | <0.0001 |
| Maternal SEFI-2 score | 1.25 (1.18, 1.32) | <0.0001 |
| Maternal income assistance at time of delivery | 3.37 (2.73, 4.15) | <0.0001 |
| Mental disorders among mothers (mood or substance use) 2 years prior to index birth event | 1.84 (1.58, 2.15) | <0.0001 |
| Mental disorders among fathers (mood or substance use) 2 years prior to index birth event | 2.06 (1.72, 2.45) | <0.0001 |

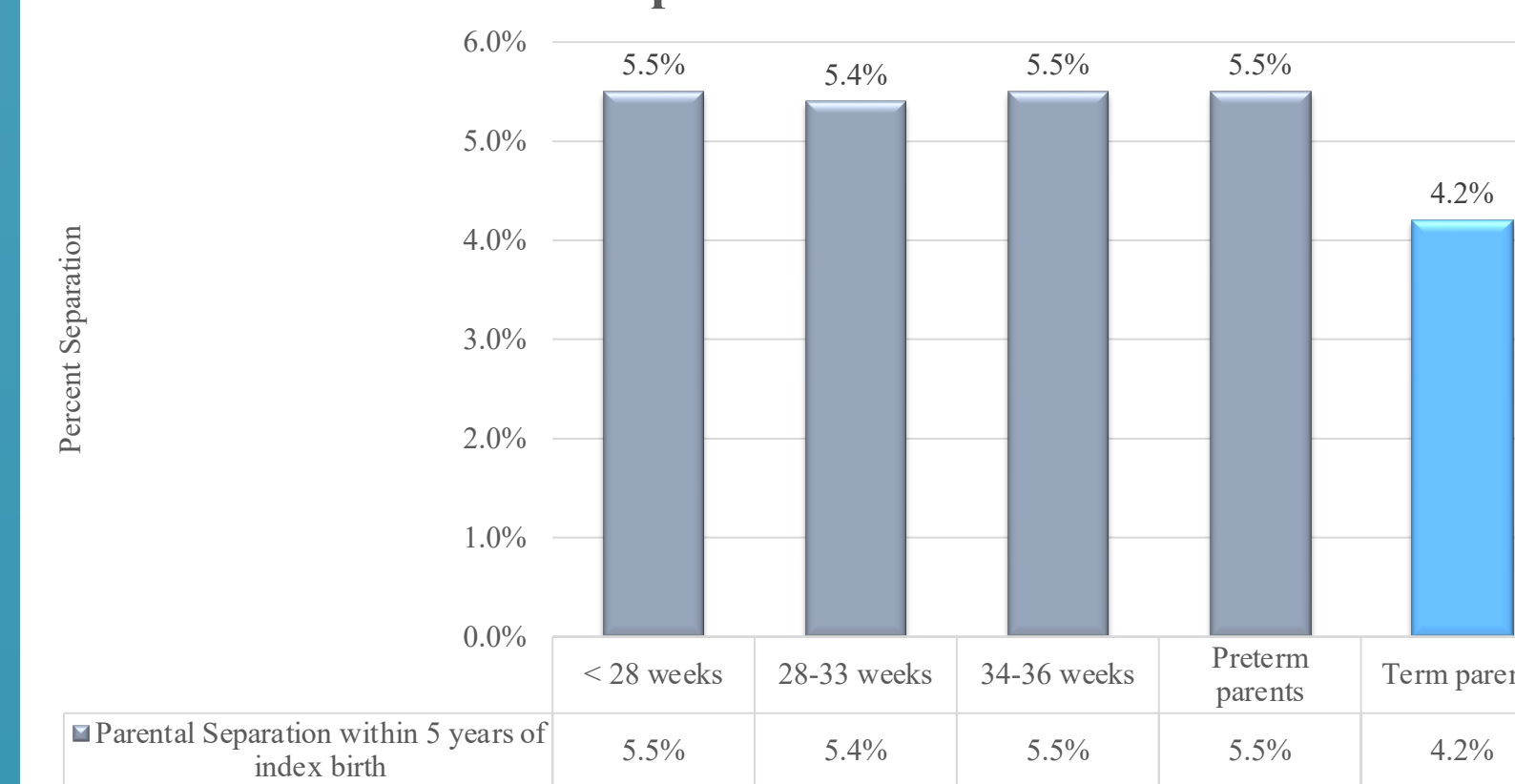
eTable 3: Incidence rate ratios (IRRs) of post hoc Poisson regression model for parental separation (preterm as a single category)

| Variables | Adjusted IRR (95% CI) | P-value |
|---|-----------------------|---------|
| >37 weeks (reference) | 1.00 | - |
| <37 weeks | 1.25 (1.09, 1.42) | 0.0009 |
| Maternal age (in years) | 0.94 (0.92, 0.96) | <0.0001 |
| Paternal age (in years) | 1.01 (0.99, 1.03) | 0.21 |
| Parity 1 (reference) | 1.00 | - |
| >1 | 1.36 (1.22, 1.52) | <0.0001 |
| Maternal diabetes | 1.03 (0.78, 1.38) | 0.82 |
| Maternal hypertension | 1.01 (0.85, 1.19) | 0.94 |
| Maternal Smoking | 2.04 (1.64, 2.52) | <0.0001 |
| Caesarean section | 1.05 (0.93, 1.19) | 0.39 |
| Twin birth | 0.80 (0.59, 1.07) | 0.13 |
| Year of delivery | 0.97 (0.96, 0.97) | <0.0001 |
| Maternal Rural Residence | 0.62 (0.55, 0.69) | <0.0001 |
| Maternal SEFI-2 Score | 1.25 (1.18, 1.32) | <0.0001 |
| Maternal income assistance at time of delivery | 3.37 (2.74, 4.15) | <0.0001 |
| Mental disorders among mothers (mood or substance use) 2 years prior to index birth event | 1.84 (1.58, 2.15) | <0.0001 |
| Mental disorders among fathers (mood or substance use) 2 years prior to index birth event | 2.06 (1.72, 2.45) | <0.0001 |

- In Table 3, the regression model did not show an association between parents of children born 28-33 weeks and born <28 weeks with separation.
 - However, the percentages of separation among them were very similar to that of parents of children born at 34-36 weeks.
 - The IRRs were similar as well, however the confidence intervals were wide.
 - This suggests the low sample sizes in the extremely preterm and moderate-very preterm categories did not have enough power to detect a statistical significance.
 - The *post hoc* analysis with preterm as a single category showed that prematurity was associated with divorce/separation with an IRR similar to the primary analysis.

Results

Population Cohort



- Socio-demographic and medical risk factors associated with parental separation, IRR (95% CI)

- Maternal income assistance at time of delivery, 3.37 (2.73, 4.15)
- Mental disorders among fathers (mood or substance use) 2 years prior to index birth event, 2.06 (1.72, 2.45)
- Maternal smoking, 2.04 (1.65, 2.53)
- Mental disorders among mothers (mood or substance use) 2 years prior to index birth event, 1.84 (1.58, 2.15)
- Parity >1, 1.36 (1.22, 1.53)
- Higher maternal SEFI-2 score, 1.25 (1.18, 1.32)

- Protective factors against parental separation, IRR (95% CI)

- Maternal rural residence, 0.62 (0.55, 0.69)
- Older maternal age, 0.94 (0.92, 0.96)
- Year of index delivery, 0.97 (0.96, 0.97)

Conclusion

- In a population-based cohort, parents of children born at 34-36 weeks gestational age had higher separation rates than parents of children born full-term.
- We determined parental socio-demographic and medical risk factors associated with parental separation among this cohort.
- The maternal and paternal risk factors identified can be used to help identify at-risk parents and offer appropriate supports.

