CANADIAN SURVEILLANCE OF COVID-19 IN PREGNANCY: EPIDEMIOLOGY, MATERNAL AND INFANT OUTCOMES

Report #3: Released February 25, 2021

Early Release: Maternal and Infant Outcomes (March 1, 2020 to December 31, 2020) from Five Canadian Provinces

Principal Investigator: Dr. Deborah Money, Professor, Obstetrics & Gynecology, Faculty of Medicine and School of Population & Public Health, University of British Colombia

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BACKGROUND

Two interim reports have been released by the Canadian Surveillance of COVID-19 in Pregnancy: Epidemiology, Maternal and Infant Outcomes (CANCOVID-Preg) team. With only a subset of Canadian data, both of the aforementioned reports highlighted increased rates of hospitalizations and ICU admissions among pregnant women diagnosed with COVID-19. With a sample size of 1880, this third report will focus on COVID-19 pregnant positive cases from March 1st until December 31st, 2020. As of December 31st, 2020, there have been more than 500,000 cases of COVID-19 and more than 15,000 deaths in Canada.[1] Globally, COVID has infected more than 79 million people and caused more than 1.5 million deaths.[2]

Given that pregnant women exhibit greater susceptibility to severe illness from respiratory infections including Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), and influenza, the global spread of COVID-19 raises unique questions and significant concerns for the health of this priority population.[3,4] Until recently, there was a global dearth of data regarding the burden of COVID-19 on pregnant populations. A number of early reports concluded there was no increased risk of severe illness related to COVID-19 in pregnant compared to non-pregnant populations.[5] However, more recent reports internationally have started to present evidence to the contrary. For example, US surveillance reports indicate that compared to non-pregnant populations, pregnant populations appear to be at increased risk of admission to the intensive care unit (ICU) [10.5 versus 3.9 per 1,000 cases; adjusted risk ratio (aRR = 3.0; 95% CI = 2.6–3.4)].[6,7] They are also more likely to require ventilation (2.9 versus 1.1 per 1,000 cases; aRR = 2.9; 95% CI = 2.2–3.8) and extracorporeal membrane oxygenation (0.7 versus 0.3 per 1,000 cases; aRR = 2.4; 95% CI = 1.5–4.0).[6,7] The last two CANCOVID-Preg reports also described increased risk of hospitalization (Report #1: (RR = 6.57, 95% CI: 4.82 to 8.95, Report # 2: RR = 4.18, 95% CI: 3.34 to 5.09) and ICU admission (Report #1: RR=8.49, 95% CI: 4.13 to 17.46, Report #2: RR=4.07, 95% CI: 2.13 to 6.43) in Canada.[8,9]

Current data also suggests that COVID-19 has been associated with adverse pregnancy outcomes.[6,10,11] According to the US Centers for Disease Control and Prevention (US CDC), among 3912 live births with reported gestational age, 12.9% were born preterm (<37 weeks' gestation) compared to 10.2% in

the general US population.[10] Of those COVID-19 related preterm births, 3.8% were delivered at <34 weeks' gestation.[10] Increased frequency of preterm birth has also been documented by a living systematic review of COVID-19 in pregnancy.[6] Further to this, among term infants in the US surveillance report, 9.3% were admitted to the neonatal ICU (NICU).[10] Similarly CANCOVID-Preg found increased preterm birth rates (Report #1: 15.0%, Report #2: 12.2%) and NICU admission (Report #1: 15.4%, Report #2: 14.0%).[8,9]

Analogous to the first and second CANCOVID-Preg reports, Report #3 continues to add to the growing body of evidence that suggests that pregnant women are at increased risk of severe illness related to COVID-19. This report highlights preliminary findings from five provinces [British Columbia (BC), Alberta (AB), and Ontario (ON), Quebec (QC), and Manitoba (MB)], participating in CANCOVID-Preg. On behalf of public health officials, with support from the Public Health Agency of Canada, the Canadian Institutes for Health Research, the Better Outcomes Registry & Network (BORN) Ontario, and the BC Women's Health Foundation, this national, prospective, surveillance project was initiated in order to monitor pregnant women during the pandemic and assess both maternal and infant outcomes related to COVID-19. This national surveillance initiative is supported by central coordination at the University of British Columbia, based at the Women's Health Research Institute in Vancouver, BC.

METHODS

Data on laboratory-confirmed (SARS-CoV-2 PCR positive) COVID-19 affected pregnancies were electronically reported to the CANCOVID-Preg team in each province by provincial public health agencies. For BC, AB, QC, and MB, clinical information was abstracted from medical records for affected pregnancies and entered directly into a Research Electronic Data Capture (REDCap) database, which utilizes a robust data confidentiality and security protocol. In ON, data were entered at the point of care into a data collection tool and securely transferred to the BORN Information System (where it was linked with the corresponding pregnancy or birth record). Public health laboratory notifications were also submitted to BORN Ontario for linkage to the BORN Information System. Like our previous reports, only high-level summary data were amalgamated (i.e., individual, record-level data are not yet available for combined analysis). Given the rapidly evolving nature of the pandemic, and the implications that these data have for pregnant populations in Canada, the CANCOVID-Preg Investigative Team resolved to release a series of early interim reports. Of note, the data for this report were censored at December 31st, 2020.

Available subset data (BC, AB, ON, QC, and MB) for 1880 pregnant positive cases (67% of the total number of cases reported to CANCOVID-Preg), from March 1st 2020 until December 31st, 2020 were amalgamated for this report. Certain data elements were missing or incomplete for some cases leading to varying denominators in the tables below, reflecting those cases for which the information in question was available. After combining provincial data, cells with less than 6 observations were reported as <6, as per privacy requirements.

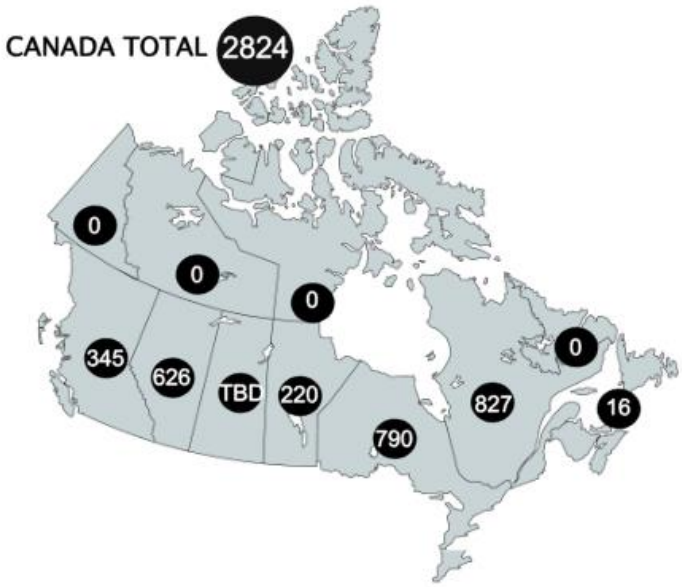


FIGURE 1. Number of confirmed pregnant positive cases in Canada (as of Dec 31st, 2020) reported to CANCOVID-Preg. Saskatchewan has not been included in the total calculation as this site has been unable to provide case numbers to date. The Atlantic provinces have been combined (n=16) due to small samples sizes.

RESULTS

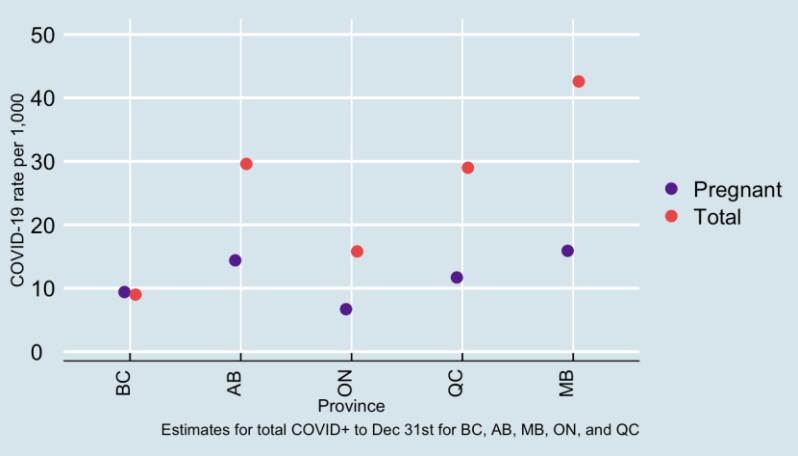
As of December 31st, 2020, there were 2824 cumulative, pregnant, COVID-19 positive cases in Canada reported to CANCOVID-Preg (Figure 1).

Table 1 provides crude COVID-19 incidence rates per 1000 pregnancies by province, compared to the general population of all females aged 20-49 in each province (shown visually in Figure 2).[12-18] Although we cannot determine risk of COVID-19 acquisition among pregnant women from these data, compared to the general population, infection rates appear to be lower among pregnant women in every province noted below with the exception of BC.

TABLE 1. Infection rates in pregnant population and total female population by province (as of December 31st, 2020)

Province	Births in 2019[1]	Corrected births to Dec 31	Pregnant cases[2]	COVID+/ 1000 pregnant	Lower CI	Upper CI	Total pop female 20-49[3]	Total cases[4]	COVID +/1000 total	Lower CI	Upper CI
BC	43 878	36 785	345	9.4	8.4	10.4	1 019 652	9 178	9.0	8.8	9.2
AB	51 690	43 335	626	14.4	13.4	15.6	933 041	27 611	29.6	29.3	29.9
ON	140 541	117 823	790	6.7	6.3	7.2	2 944 223	46 641	15.8	15.7	16.0
QC	84 172	70 566	827	11.7	10.9	12.5	1 596 800	46 342	29.0	28.8	29.3
MB	16 500	13 833	220	15.9	13.9	18.2	271 461	11 552	42.6	41.8	43.3

[1] Data Source: Reference 12
[2] Data Source: CANCOVID-Preg (Figure 1 above).
[3] Data Source: Reference 13
[4] Data Source: References 14 through 18



Confidence Intervals				
	Pregnant Population		General Female Population	
BC	8.4	10.4	8.8	9.2
AB	13.4	15.6	29.3	29.9
ON	6.3	7.2	15.7	16.0
QC	10.9	12.5	28.8	29.3
MB	13.9	18.2	41.8	43.3

FIGURE 2. Infection rates in pregnant population and total female population by province (as of December 31st, 2020).

We have included 1880 cases, or 67% of the total number of pregnant positive cases reported to CANCOVID-Preg, in this report for which we have at least some outcome data. Of these, 333 resided in BC, 626 in AB, 764 in ON, 123 in QC, and 34 in MB. Among pregnant positive cases, 44.6% were between 30 and 35 years of age. Most cases were diagnosed between 14 and 27 weeks' gestation (38.7%), with infection most often acquired via the community-at-large (50.6%). Obesity was the most common underlying condition (11.9%) (Table 2).

TABLE 2. Maternal characteristics from March 1st, 2020 until December 31st, 2020 in BC, AB, ON, QC, and MB

	n	Denominator	Percent
Gestational age at diagnosis (weeks)			
<14	295	1453	20.3
14-27	563	1453	38.7
28-37	453	1453	31.2
>=38	142	1453	9.8
Maternal age (years)			
<30	632	1742	36.3
30-35	777	1742	44.6
36-45	328	1742	18.8
46+	<6	1742	NA
Maternal underlying conditions[1]			
Cardiovascular disease	23	1107	2.1
Chronic hypertension	24	1107	2.2
Chronic lung disease	0	1107	0.0
Diabetes mellitus	76	1107	6.9
Immunosuppression	12	1107	1.1
Obesity (BMI ≥30kg/m2)	132	1107	11.9
Other	48	1107	4.3
Mode of COVID-19 acquisition[1]			
Community	438	866	50.6
Healthcare worker	97	866	11.2
Other	60	866	6.9
Travel	25	866	2.9
Unknown	127	866	14.7

[1] Categories are not mutually exclusive

The most common symptoms associated with a positive COVID-19 diagnosis during pregnancy were cough (47.0%), headache (31.0%), fever (29.8%) and rhinitis (25.6%) (Figure 3).

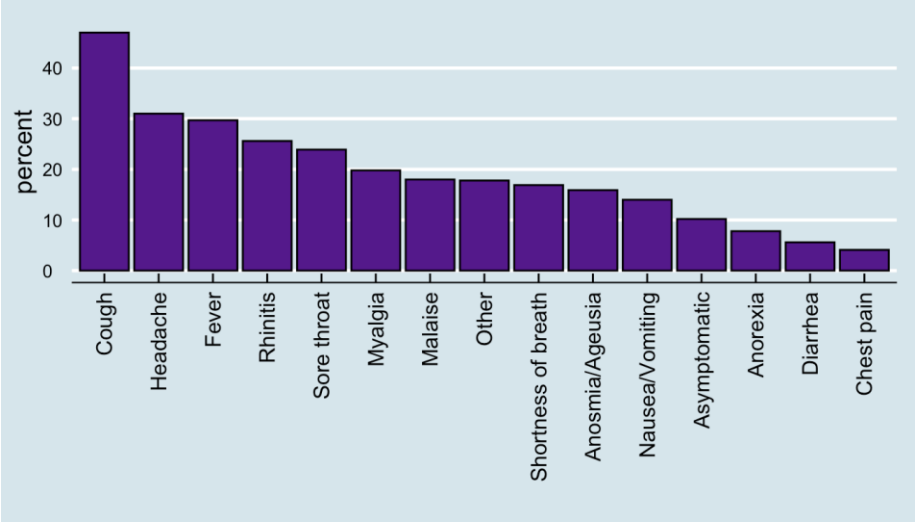


FIGURE 3. Maternal COVID-19 symptomatology among n=1291 pregnant positive cases from March 1st, 2020 until December 31st, 2020 in BC, AB, ON, QC, and MB

Among the 1839 women with complete information about any COVID-19 related hospitalization or ICU admission, 8.1% were hospitalized and 1.6% were admitted to the ICU (Table 3). Non-COVID-19 related hospitalizations have not been included. Notably, compared to their non-pregnant counterparts (COVID-19 positive females aged 18-45), pregnant women were at increased risk of being hospitalized (RR = 5.33, 95% CI: 4.51 to 6.20) and admitted to the ICU (RR=5.88, 95% CI: 3.80 to 8.22) (Table 4). Although not reported in Table 4 below due to small numbers in some provinces, individual provincial rates are consistent with amalgamated data.

TABLE 3. Maternal COVID-19 hospitalizations/interventions from March 1st, 2020 until December 31st, 2020 in BC, AB, ON, and QC

	n	Denominator	Percent
Fever	156	1248	12.5
Hospitalized	148	1839	8.1
Abnormal X-ray or pneumonia	39	1248	3.1
ICU admission	29	1839	1.6
Oxygen	20	1248	1.6
Mechanical ventilation	7	1248	0.6
Coagulopathy	<6	1248	NA
Other (sepsis)	<6	1248	NA

[1] MB data was not available for this outcome

TABLE 4. COVID-19-related hospitalizations and ICU admissions among pregnant COVID-19 positive females (18-45 years) in BC (333), AB (626), ON (764), and QC (116) compared to non-pregnant COVID-19 positive females (18-45 years)[3] in BC, AB, ON and QC[4]

	Pregnant positive cases (n=1839) in BC, AB, QC, and ON[1,2]			Non-pregnant positive cases in BC, AB, QC, and ON (n=136,062)[3,4]			RR	95%CI
	Number total	Per 1000	Percent	Number total	Per 1000	Percent		
Number and percent hospitalized	148	80.49	8.05%	2056	15.11	1.51%	5.33	4.51 to 6.20
Number and percent admitted to ICU	29	15.77	1.58%	365	2.68	0.27%	5.88	3.80 to 8.22

[1] MB data was not available for this outcome
[2] Hospital and ICU admission data for ON came from iPHIS integrated Public Health Information System (ON)
[3] AB data were for non-pregnant females 15-55
[4] Data Sources include: the BC Centre for Disease Control (BC), Communicable Disease & Outbreak Management (CDOM) (AB), iPHIS integrated Public Health Information System (ON), Government of Quebec (QC) [14-17]

Of the reported pregnancy outcomes, 96.3% were live births and 1.2% were stillbirths. Among the 738 cases with delivery and gestational age data, 82.0% occurred at term and 12.3% at preterm gestation (Table 5). Preterm birth etiology showed 40.2% were medically indicated and 45.1% were spontaneous (Table 6).

TABLE 5. Pregnancy outcomes from March 1st, 2020 until December 31st, 2020 in ON, BC, QC, and AB[1]

	n	Denominator	Percent
Gravidity			
1	203	686	29.6
≥2	483	686	70.4
Parity			
0	271	694	39.0
1	240	694	34.6
≥2	183	694	26.4
Multiple pregnancy			
Multiple	14	726	1.9
Singleton	712	726	98.1
Pregnancy outcome (n=all infants)			
TA	<6	757	NA
SA	18	757	2.4
Stillbirth (≥20 weeks GA)	9	757	1.2
Live birth	729	757	96.3
Mode of delivery			
Cesearean section	224	641	34.9
Vaginal	417	641	65.1
Labour			
Spontaneous	285	578	49.3
Induced	197	578	34.1
No labour	96	578	16.6
GA at delivery (n=live births + stillbirths)			
Term	605	738	82.0
Preterm (<37 weeks)	91	738	12.3
Missing	42	738	5.7

[1] MB data was not available for this outcome

TABLE 6. Preterm birth etiology in ON, BC, QC, and AB, and MB[1]

	n	Percent
Medically indicated	41	40.2
Spontaneous	46	45.1
Missing	15	14.7

[1] MB had 11 preterm births that were included in table 6 but not in table 5 above resulting in a discrepancy in denominators between these two tables (i.e., 91 preterm births in table 5 versus 102 in table 6).

The majority of infants (82.1%) were in the normal range for birth weight (i.e., 2500-4000 grams) and were not admitted to the NICU (83.3%) (Table 7). To date, of the 239 infants for which testing data was available, 165 were tested for SARS-CoV-2, and <6 nasopharyngeal swabs indicated a positive result (Table 8).

TABLE 7. Infant outcomes from March 1, 2020 until December 31, 2020 in BC, AB, ON, and QC[1]

	n	Denominator	Percent
Apgar (5 minutes)			
<7	11	471	2.3
≥7	460	471	97.7
Birth weight (g)			
Low (<2500 g)	59	560	10.5
Normal (2500-4000 g)	460	560	82.1

High (>4000 g)	41	560	7.3
Small for Gestational Age (SGA)			
No	483	532	90.8
Yes	49	532	9.2
Care until discharge			
Asymptomatic and isolated from mother	9	174	5.2
Asymptomatic and kept with well mother	141	174	81.0
Symptomatic and isolated from mother	<6	174	NA
Transferred due to clinical needs	16	174	9.2
Other	6	174	3.4
Infant feeding[2]			
Breastfed	198	306	64.7
Donor milk	14	306	4.6
Expressed breast milk	49	306	16.0
IV and/or TPN	8	306	2.6
Substitute/formula	94	306	30.7
NICU admission			
No	410	492	83.3
Yes	82	492	16.7
GA at delivery			
Term	601	729	82.4
Preterm (<37 weeks)	88	729	12.1
Missing	40	729	5.5

[1] MB data was not available for this outcome
[2] Categories are not mutually exclusive

TABLE 8. Infant SARS-CoV-2 PCR testing March 1, 2020 until December 31st, 2020 for BC, AB, ON, and QC[1].

	n	Denominator	Percent
Positive	<6	239	NA
Negative	159	239	66.5
Result pending	<6	239	NA
Not performed	74	239	31.0

[1] MB data was not available for this outcome

DISCUSSION

The CANCOVID-Preg team has compiled this third report in order to present an ongoing picture of the burden of COVID-19 on pregnancy in Canada. This report included amalgamated outcome data from five provinces (BC, AB, ON, QC, and MB) up to December 31st, 2020.

Findings were consistent with Reports #1 and #2 with the exception of infection rates, which appear to be lower among pregnant women in every province except BC (Figure 2). [8,9] Under reporting of pregnant cases in AB, ON, QC, and MB may explain the discrepancy. Also, rates in the general population were lower in BC compared to the other provinces, indicating that, overall, the infection rate in BC is lower compared to other provinces. More research is required in order to further comment on this finding.

Notably, although the absolute risk is low, compared to their non-pregnant counterparts, COVID-19 infected pregnant women remain at increased risk of being hospitalized (RR = 5.33, 95% CI: 4.51 to 6.20) and admitted to the ICU (RR=5.88, 95% CI: 3.80 to 8.22). As previously stated, increased risk may be related to physiological and immunological changes that occur during pregnancy, resulting in a greater predisposition and susceptibility to more severe consequences of infection.[4] However, increased

risk of hospitalization may also be related to care provider anxiety and heightened vigilance/caution regarding the clinical care of pregnant women during a pandemic.

Similar to findings reported by the US CDC and the living systematic review of COVID-19 in pregnancy, we found 12.3% of our sample were born preterm.[6,10] The rates of NICU admission in our data were in keeping with rates of prematurity. Infant SARS-CoV-2 testing was infrequent in the four Canadian provinces that provided outcome data; however, among infants known to be tested, positive cases were rare. This finding supports the growing body of evidence that perinatal infection is uncommon. Importantly, stillbirths were not statistically higher in our sample (1.2%) compared to the national estimate (0.8%), ($x^2 = 0.99$, $p = 0.31$, 95% CI = 0.01-0.02).[19]

Limitations

These preliminary analyses are subject to a number of limitations. First, only five provinces were able to participate in this subset. Results are therefore not representative of the entire Canadian context. Also, only 34 cases were included in this report for MB. That said, BC, AB, ON, and QC represent approximately 85% of pregnancies in Canada, making the subset used in this report still highly representative of the majority of pregnancies in the country.[20] Subsequent analyses will be conducted using individual line-level data and additional provincial/territorial representation for a more comprehensive understanding of the national burden of COVID-19 in pregnancy. Moreover, ON hospitalization/intervention data (Table 3) are derived exclusively from BORN and may therefore comprise a more seriously ill group of pregnant women. Next, for a number of outcomes, cell sizes were too small to draw meaningful conclusions. Finally, protocols for infant SARS-CoV-2 testing following delivery have not yet been standardized in Canada, resulting in a deficit of data related to this outcome.

Conclusion

Despite limitations, this preliminary report can help inform public policy and urgently needed evidence-based guidelines for clinical care during this rapidly evolving global pandemic. The Canadian maternity care system is a global leader and informs maternity care in many countries internationally. With an assembled pan-Canadian team, we are poised to provide critical Canadian data to guide healthcare for pregnant women and their infants.

List of Co-investigators/Collaborators/Partners:

Global Research in Pregnancy and the Newborn Collaboration

Public Health Agency of Canada

Canadian Perinatal Surveillance System

British Columbia:

Chelsea Elwood, B.M.ScH, M.Sc, MD, FRCSC
Clinical Assistant Professor, Department of Obstetrics and Gynecology, University of British Columbia

Joseph Ting, MPH, MBBS, MRCPCH, FRCPC, DRCOG
Clinical Associate Professor, Department of Pediatrics, University of British Columbia

Ashley Roberts, MD, FRCPC
Clinical Assistant Professor, Department of Pediatrics, University of British Columbia

Arianne Albert, PhD
Senior Biostatistician, Women's Health Research Institute

Elisabeth McClymont, PhD
Postdoctoral Fellow, Department of Obstetrics & Gynecology, University of British Columbia

KS Joseph, MD, PhD
Professor, Department of Obstetrics & Gynecology, University of British Columbia

Julie van Schalkwyk, MD, FRCSC
Site Head, Obstetrics & Gynecology, BC Women's Hospital & Health Centre, Clinical Associate Professor, Department of Obstetrics & Gynecology, University of British Columbia

Eda Karacabeyli, MD, MHA
Maternal Fetal Medicine, Fellow
Department of Obstectics & Gynecology, University of British Columbia

Kirsten Grabowska, MD
Clinical Assistant Professor, Division of Maternal Fetal Medicine, Surrey Memorial Hospital

Alberta:
Eliana Castillo, MD, FRCSC
Clinical Associate Professor, Obstetrics & Gynecology, University of Calgary

Verena Kuret, MD, FRCSC
Clinical Assistant Professor, Obstetrics & Gynecology, University of Calgary

Ariela Rozenek, MD
Resident, Obstetrics & Gynecology, University of Calgary

Saskatchewan:
Jocelyne Martel, MD, FRCSC
Clinical Professor, Obstetrics & Gynecology, University of Saskatchewan

Dr. George Carson, MD, FRCSC
Maternal Fetal Medicine, Regina General Hospital, Saskatchewan Health Authority

Dr. Jessica Minion, MD
Provincial Clinical Lead Public Health – Laboratory Medicine, Roy Romanow Provincial Laboratory Regina, Saskatchewan Health Authority

Manitoba:
Vanessa Poliquin, MD, FRCSC
Assistant Professor, Obstetrics, Gynecology & Reproductive Sciences, Director of Research, Max Rady College of Medicine, University of Manitoba

Carla Loeppky, PhD
Director of Epidemiology and Surveillance & Lead Epidemiologist, Manitoba Health Seniors and Active Living, Assistant Professor, Community Health Sciences, University of Manitoba

Kerry Dust, PhD
Scientist, Cadham Provincial Laboratory

Heather Watson-Burgess, MD
Resident, Max Rady College of Medicine, University of Manitoba

Quebec:
Isabelle Boucoiran, MD, FRCSC
Professeure adjointe de clinique, Obstétrique-Gynécology, Université de Montréal

Haim Abenhaim, MD, FRCSC
Associate Professor, Obstetrics & Gynecology, McGill University

Fatima Kakkar, MD, FRCSC
Professeure adjointe de clinique, Département de pédiatrie, Université de Montréal

Arnaud Gagneur, MD, PhD
Professeur, Faculté de médecine et des sciences de la santé, Université de Sherbrooke

Andrea Spence, PhD
Research Associate, Centre for Clinical Epidemiology | Centre d'épidémiologie Clinique Hôpital general juif - Sir Mortimer B. Davis - Jewish General Hospital

Ontario:
Jon Barrett, MBBCH, MD, FRCOG, FRCSC
Professor, Maternal-Fetal Medicine, University of Toronto

John Snelgrove, MD, MSc, FRCSC
Assistant Professor, Maternal-Fetal Medicine, University of Toronto

Mark Yudin, MD, FRCSC
Associate Professor, Obstetrics & Gynecology, St. Michael's Hospital, University of Toronto

Ann Sprague, RN, PhD
Project Advisor, BORN Ontario, Centre for Practice-Changing Research Building

Maha Othman, MD, PhD
Associate Professor, Biomedical and Molecular Sciences, Queen's University

Deshayne Fell, PhD
Associate Professor, School of Epidemiology and Public Health, University of Ottawa and Scientist, Children's Hospital of Eastern Ontario Research Institute

Ann Kinga Malinowski, MD, MSc, FRCSC
Assistant Professor, Maternal-Fetal Medicine, University of Toronto

Wendy Whittle, MD, FRCSC
Assistant Professor, Maternal-Fetal Medicine, University of Toronto

Gillian Alton, PhD
Epidemiologist, BORN Ontario

Greg Ryan, MD, FRCSC
Professor, Obstetrics & Gynecology, University of Toronto

Mark Walker, MD, FRCSC, MSc, MHCM
Scientific Director, BORN Ontario, Professor, Obstetrics & Gynecology, University of Ottawa

Prakeshkumar Shah, MD, MRCP, MSc, FRCPC
Pediatrician-in-Chief, Mount Sinai Hospital,
Senior Clinician Scientist, Lunenfeld-Tanenbaum Research Institute
Professor, Departments of Paediatrics and Institute of HPME, University of Toronto,
Director, Canadian Neonatal Network

Darine El-Chaâr, MD, FRCSC, MSc
Medical Staff - Division of Maternal-Fetal Medicine, Department of Obstetrics, Gynecology and Newborn Care, The Ottawa Hospital

Nova Scotia:

Heather Scott, MD, FRCSC
Associate Professor, Obstetrics & Gynecology, Dalhousie University

New Brunswick:
Lynn Murphy-Kaulbeck, MD, MSc, FRCSC
Medical Director, NB Perinatal Health Program, Associate Professor, Maternal Fetal Medicine, Dalhousie University

Gaetane Leblanc Cormier, BSc, MBA
Director, NB Perinatal Health Program

Newfoundland:
Joan Crane, MD, MSc, FRCSC
Professor, Obstetrics & Gynecology, Memorial University

Tina Delaney, MD, FRCSC
Associate Professor, Obstetrics & Gynecology, Memorial University

Phil A. Murphy, MSc
Clinical Epidemiologist, Children's and Women's Health, Eastern Health, Professional Associate, Obstetrics & Gynecology, Pediatrics, Memorial University

PEI:
Krista Cassell, MD
Obstetrician/Gynecologist, Charlottetown

Yukon:
Sarah Saunders, MD, FRCSC
Obstetrician/Gynecologist, Whitehorse General Hospital

Shannon Ryan
Project Coordinator, Congenital Anomalies Surveillance, Health and Social Services

Additional Territories – low burden of COVID-19 – will be added should there be a shift in the pandemic

Coordinating Centre Staff:

Julie Hanna
Project Manager, Women's Health Research Institute, BC Women's Hospital & Health Centre

Tiffany Reeve, MSc
Research Manager, CANCOVID-Preg, Women's Health Research Institute, BC Women's Hospital & Health Centre

Melissa Watt, CCRP

Research Coordinator, Women's Health Research Institute, BC Women's Hospital & Health Centre

Evelyn Maan, RN
Research Program Manager, Oak Tree Clinic/Women's Health Research Institute, BC Women's Hospital & Health Centre

Zahra Pakzad, MSc
Research Projects Manager, Women's Health Research Institute, BC Women's Hospital & Health Centre

Arezou Azampanah, MSc
Research Assistant, Oak Tree Clinic/Women's Health Research Institute, BC Women's Hospital & Health Centre

Iveoma Udevi, BSc
Research Assistant, Women's Health Research Institute, BC Women's Hospital & Health Centre

Suraya Bondy, BHSc
Research Assistant, BC Women's Hospital & Health Centre

REFERENCES

1. Public Health Agency of Canada. Statement from the Chief Public Health Officer of Canada on December 31, 2020 (Accessed February 3, 2021). https://www.canada.ca/en/public-health/news/2020/12/statement-from-the-chief-public-health-officer-of-canada-on-december-31-2020.html.
2. World Health Organization. Coronavirus disease (COVID-19): weekly epidemiological update - 29 December 2020 (Accessed February 7, 2021). https://www.who.int/publications/m/item/weekly-epidemiological-update---29-december-2020.
3. Schwartz DA, Graham AL. Potential Maternal and Infant Outcomes from Coronavirus 2019-nCoV (SARS-CoV-2) Infecting Pregnant Women: Lessons from SARS, MERS, and Other Human Coronavirus Infections. *Viruses*, 2020;12:178-194.
4. Rasmussen S, Smulian JC, Lednicky JA, et al. Coronavirus Disease 2019 (SARSCOV-2) and Pregnancy: What obstetricians need to know. *AJOG*, 2020;222(5):415-426. https://doi.org/10.1016/j.ajog.2020.02.017.
5. Qiao J. What are the risks of COVID-19 infection in pregnant women?. *The Lancet*, 2020;395(10226):760-762.
6. Allotey J, Stallings E, Bonet M, et al. Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis. *BMJ*, 2020;370:m3320.
7. Zambrano LD, Ellington S, Strid P, et al. Update: characteristics of symptomatic women of reproductive age with laboratory-confirmed SARS-CoV-2 infection by pregnancy status—United States, January 22–October 3, 2020. *Morbidity and Mortality Weekly Report*, 2020;69(44):1641-1647.
8. Money D. 2020. *Early Release: Maternal and Infant Outcomes (March 1, 2020 to September 30, 2020) from Three Canadian Provinces Report #1: Released December 2nd, 2020*. Canadian Surveillance of COVID-19 in pregnancy: Epidemiology, Maternal and Infant Outcomes. Available from: https://ridprogram.med.ubc.ca/cancovid-preg/
9. Money D. 2020. *Early Release: Maternal and Infant Outcomes (March 1, 2020 to November 30, 2020) from Four Canadian Provinces Report #2: Released January 15th, 2021*. Canadian Surveillance of COVID-19 in pregnancy: Epidemiology, Maternal and Infant Outcomes. Available from: https://ridprogram.med.ubc.ca/cancovid-preg/
10. Woodworth KR, Olsen EO, Neelam V, et al. Birth and infant outcomes following laboratory-confirmed SARS-CoV-2 infection in pregnancy—SET-NET, 16 jurisdictions, March 29–October 14, 2020. *Morbidity and Mortality Weekly Report*, 2020;69(44):1635-1640.
11. Chen H, Guo J, Wang C, Luo F, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *The Lancet*, 2020; 395(10226):809-815.
12. Statistics Canada. No date. *Table 13-10-0415-01 Live births, by month*. Last updated December 22, 2020. https://doi.org/10.25318/1310041501-eng (Accessed February 7, 2021.)
13. Statistics Canada. No date. *Table 17-10-0134-01 Estimates of population (2016 Census and administrative data), by age group and sex for July 1st, Canada, provinces, territories, health regions (2018 boundaries) and peer groups.* https://doi.org/10.25318/1710013401-eng (Accessed February 3, 2021).

14. BC Centre for Disease Control. BC COVID-19 Data (Accessed February 3, 2021). http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data
15. Government of Alberta. COVID-19 Alberta statistics: Interactive aggregate data on COVID-19 cases in Alberta (Accessed February 3, 2021). https://www.alberta.ca/stats/covid-19-alberta-statistics.htm
16. Public Health Ontario. Ontario COVID-19 Data Tool (Accessed February 3, 2021). https://www.publichealthontario.ca/en/data-and-analysis/infectious-disease/covid-19-data-surveillance/covid-19-data-tool
17. Government of Quebec. Data on COVID-19 in Quebec (Accessed February 3, 2021). https://www.quebec.ca/en/health/health-issues/a-z/2019-coronavirus/situation-coronavirus-in-quebec/#c63039
18. Government of Manitoba. COVID-19 Novel Coronavirus: Cases and Risk of COVID-19 in Manitoba (Accessed February 3, 2021). https://www.gov.mb.ca/covid19/updates/cases.html
19. Statistics Canada. No date. *Live births and fetal deaths (stillbirths), by type of birth (single or multiple)* (table). Last updated February 7, 2021. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310042801 (Accessed December 18, 2020).
20. Statistics Canada. 2009. *Births*. Statistics Canada Catalogue no. 84F0210X. https://www150.statcan.gc.ca/n1/en/pub/84f0210x/84f0210x2009000-eng.pdf?st=BUOD2P4m (Accessed February 7, 2021).