

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

Report #2: Released January 15, 2021

Early Release: Maternal and Infant Outcomes (March 1, 2020 to November 30, 2020) from Four Canadian Provinces

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BACKGROUND

On December 2nd, 2020 a preliminary report (Report #1) with analyses from three provinces participating in the Canadian Surveillance of COVID-19 in Pregnancy: Epidemiology, Maternal and Infant Outcomes (CANCOVID-Preg) project was released. With only a subset of Canadian data, the aforementioned report cautiously highlighted increased rates of hospitalizations and ICU admissions among pregnant women diagnosed with COVID-19. This next report has been promptly released in order to provide additional support and stabilization of trends that were described in Report #1. This report will focus on pregnant positive cases from March 1st until November 30th, 2020. Globally as of November 30th, 2020, COVID-19 has infected more than 60,000,000 people, with close to 1,500,000 deaths.¹ In Canada as of November 30th, 2020, there have been over 300,000 cases and more than 12,000 deaths.²

Given that pregnant women exhibit greater susceptibility to severe illness from some other 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}

Current data also suggest that COVID-19 has been associated with adverse pregnancy outcomes.^{6,8,9} 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.⁸ Of those COVID-19 related preterm births, 3.8% were delivered at <34

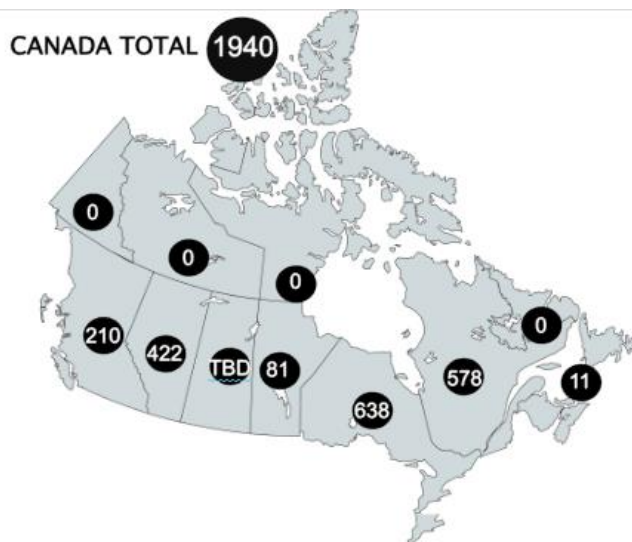
weeks' gestation.⁸ Increased frequency of preterm birth has also been documented by a living systematic review of COVID-19 in pregnancy.⁶ Further to this, among term infants in the US surveillance report, 9.3% were admitted to the neonatal ICU (NICU).⁸

Analogous to our first report, Report #2 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 three provinces [Ontario (ON), Alberta (AB), and British Columbia (BC)], and one hospital in Quebec (QC) 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 AB, BC, and QC, 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. As in Report #1, only high-level summary data were amalgamated for the purposes of this report (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 November 30th and future interim analyses will be conducted on a monthly or bimonthly basis.

Available subset data (ON, AB, BC, QC) for 1271 pregnant positive cases (66%) of the total number of cases, from March 1st 2020 until November 30th, 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.



Last updated
 BC: Nov 27, 2020
 Alberta: Nov 30, 2020
 Ontario: Nov 30, 2020
 Quebec: Nov 11, 2020
 NWT: Nov 11, 2020
 Prince Edward Island: Nov 11, 2020
 Saskatchewan: TBD
 Manitoba: Nov 13, 2020
 Nova Scotia: Oct 20, 2020
 New Brunswick: Oct 21, 2020
 Newfoundland: Oct 20, 2020
 Yukon: Oct 20, 2020
 Nunavut: N/A

FIGURE 1. Number of confirmed pregnant positive cases in Canada (as of Nov 30th, 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.

RESULTS

As of November 30th, 2020, there were 1940 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).¹⁷ 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.

TABLE 1. Infection rates in pregnant population and total female population by province (as of Nov 30th, 2020)

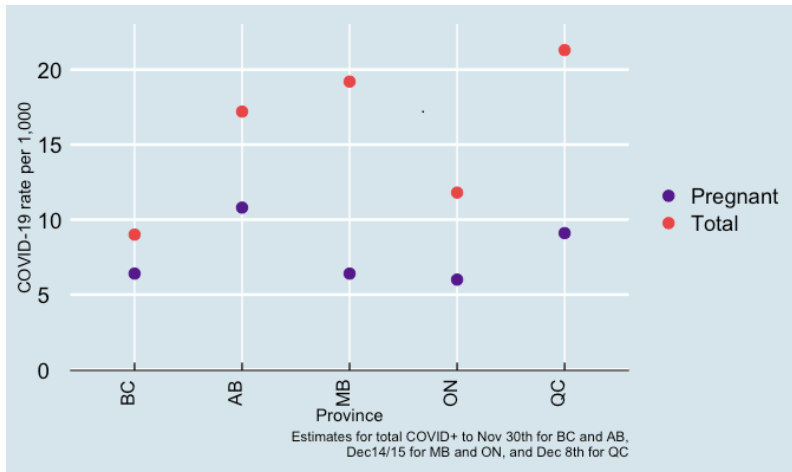
Province	Pregnant population						Total population of females 20-49 years				
	Births in 2019 ¹	Corrected births to Nov 30	Pregnant COVID-19 cases ²	COVID-19/1000 pregnant	Lower CI	Upper CI	Total pop females 20-49 years ³	Total COVID-19 cases among females 20-49 years ⁴	COVID-19/1000 total	Lower CI	Upper CI
BC	43878	33059	210	6.4	5.5	7.3	1019652	9178	9.0	8.8	9.2
AB	51690	38945	422	10.8	9.8	11.9	933041	16006	17.2	16.9	17.4
MB	16737	12610	81	6.4	5.1	8.0	271461	5200	19.2	18.6	19.7
ON	140541	105887	638	6.0	5.6	6.5	3029347	35721	11.8	11.7	11.9
QC	84172	63417	578	9.1	8.4	9.9	1596800	33965	21.3	21.0	21.5

¹ Data Source: Reference 17

² Data Source: CANCOVID-Preg (Figure 1 above).

³ Data Source: Reference 18

⁴ Data Source: References 10 through 14.



Province	Lower CI	Upper CI
BC	8.8	9.2
AB	16.9	17.4
MB	18.6	19.7
ON	11.7	11.9
QC	21.0	21.5

FIGURE 2. Infection rates in pregnant population and total female population by province (as of November 30th 2020).

We have included 1271 cases, or 66% of the total number of pregnant positive cases (1940 as of Nov 30th), in this report for which we have completed at least some data collection. Of these, 176 resided in BC, 422 in AB, 35 in QC, and 638 in ON. Among pregnant positive cases, 44.9% were between 30 and 35 years of age. Most cases were diagnosed between 14 and 27 weeks’ gestation (37.1%), with infection most often acquired via the community-at-large (56.6%). Obesity was the most common underlying condition (12.5%) (Table 2).

TABLE 2. Maternal characteristics from March 1, 2020 until November 30, 2020 in ON, BC, QC, and AB

	n	Denominator	Percent
Maternal age (years)			
<30	382	1050	36.4
30-35	456	1050	43.4
36+	212	1050	20.2
Maternal underlying conditions			
Cardiovascular disease	11	729	1.5
Chronic hypertension	13	729	1.8
Chronic lung disease	0	729	0.0
Diabetes mellitus	33	729	4.5
Immunosuppression	<6	729	NA
Obesity (BMI ≥30kg/m2)	91	729	12.5
Other	34	729	4.7
Mode of COVID-19 acquisition			
Community	226	399	56.6
Healthcare worker	48	399	12.0
Other	28	399	7.0
Travel	17	399	4.3
Unknown	90	399	22.6
Gestational age at diagnosis (weeks)			
<14	125	695	18.0
14-27	273	695	39.3
28-37	218	695	31.4
38-42	79	695	11.4

The most common symptoms associated with a positive COVID-19 diagnosis during pregnancy were cough (48.3%), fever (31.3%), headache (28.5%) and rhinitis (26.8%) (Figure 3).

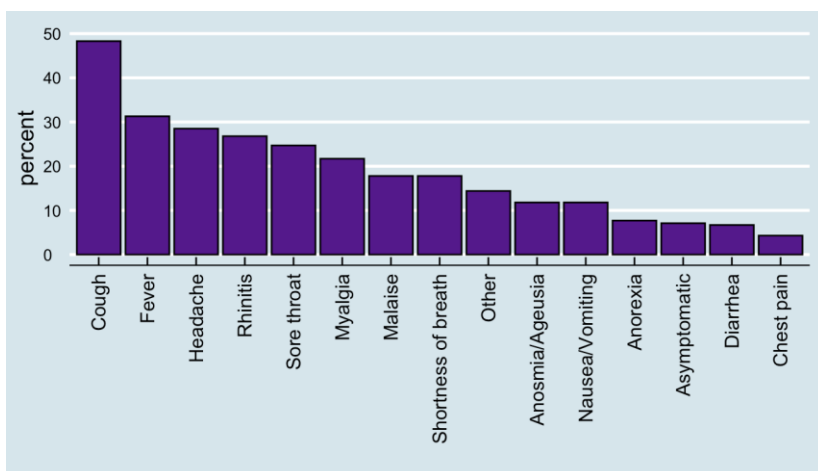


FIGURE 3. Maternal COVID-19 symptomatology among n=466 pregnant positive cases from March 1, 2020 until November 30, 2020 in ON, BC, QC, and AB

Among the 1270 women with complete information about any COVID-19-related hospitalization or ICU admissions, 7.1% were hospitalized and 1.2% 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 = 4.18, 95% CI: 3.34 to 5.09) and admitted to the ICU (RR=4.07, 95% CI: 2.13 to 6.43) (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 1, 2020 until November 30, 2020 in ON, BC, QC and AB

Features/Interventions	n	Denominator	Percent
Fever	103	760	13.6
Hospitalized	90	1270	7.1
Abnormal X-ray or pneumonia	19	760	2.5
ICU admission	15	1270	1.2
Oxygen	12	760	1.6
Mechanical ventilation	6	760	0.8
Coagulopathy	<6	760	NA
Other (sepsis)	<6	760	NA

TABLE 4. COVID-19-related hospitalizations and ICU admissions among pregnant COVID-19 positive females (18-45 years) in BC (175), AB (422), ON (638), and QC (35) compared to non-pregnant COVID-19 positive females (18-45 years) in BC, AB, and ON

	Pregnant COVID-19 positive females in BC, AB, ON ¹ , and QC ² per 1,000 (n=1270)/%			Non-pregnant COVID-19 positive females in BC, AB, and ON per 1,000 (n=48,593)/% ^{3,4}			RR	95%CI
	Number total	Per 1000	Percent	Number total	Per 1000	Percent		
Hospitalized	90	70.9	7.1%	823	16.9	1.7%	4.18	3.34 to 5.09
Admitted to ICU	15	11.8	1.2%	141	2.9	0.3%	4.07	2.13 to 6.43

¹ Hospital and ICU admission data for ON came from iPHIS integrated Public Health Information System (ON)

² QC had data from only 35 cases, and no overall non-pregnant hospitalization data. They are included in the calculations for pregnant hospitalizations and ICU admissions.

³ AB data were for non-pregnant females 15-55

⁴ Data Sources include: the BC Centre for Disease Control (BC), iPHIS integrated Public Health Information System (ON), Communicable Disease & Outbreak Management (CDOM) (AB) ¹⁰⁻¹⁴

Among the 481 reported pregnancy outcomes, 98.8% were live births and 1.2% were stillbirths. Of the 508 cases with delivery and gestational age data, 87.8% occurred at term and 12.2% at preterm gestation (Table 5). Of the 62 preterm infants, 43.5% were medically indicated preterm births and 46.8% were spontaneous (Table 6).

TABLE 5. Pregnancy outcomes from March 1, 2020 until November 30, 2020 in ON, BC, QC, and AB

	n	Denominator	Percent
Gravidity			
1	119	434	27.4
≥2	315	434	72.6
Parity			
0	151	425	35.5
1	154	425	36.2
≥2	120	425	28.2
Multiple pregnancy			
Multiple	8	515	1.6
Singleton	507	515	98.4
Pregnancy outcome (n=all pregnancies)			
Stillbirth (≥20 weeks GA)	6	481	1.2
Live birth	475	481	98.8
Mode of delivery			
Caesarean section	151	438	34.5
Vaginal	287	438	65.5
Labour			
Spontaneous	204	408	50.0
Induced	138	408	33.8
No labour	66	408	16.2
Gestational age at delivery (n=total number of infants including stillbirths)			
Term	446	508	87.8
Preterm (<37 weeks)	62	508	12.2

TABLE 6. Preterm birth type

	Etiology	n	Denominator	Percent
1	Medically indicated	27	62	43.5
2	Spontaneous	29	62	46.8

The majority of infants (86.5%) were in the normal range for birth weight (i.e., 2500-4000 grams). Most were not admitted to the NICU (86.0%) (Table 7). Data for infant SARS-CoV-2 testing was available from BC and ON only. To date, of the 143 live births with data in these provinces, 51 infants (35.7%) 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 November 30, 2020 in ON, BC, QC, and AB

	n	Denominator ¹	Percent
Apgar score (5 minutes)			
<7	9	397	2.3
≥7	388	397	97.7
Birth weight (g)			
Low (<2500 g)	41	386	10.6
Normal (2500-4000 g)	334	386	86.5
High (>4000 g)	11	386	2.8
Small for gestational age <10th percentile²			
No	274	284	96.5
Yes	10	284	3.5
Infant care until discharge			
Asymptomatic and isolated from mother	7	116	6.0

Asymptomatic and kept with well mother	93	116	80.2
Symptomatic and isolated from mother	<6	116	NA
Transferred due to clinical needs	10	116	8.6
Other	<6	116	NA
Infant feeding³			
Breastfed	101	154	65.6
Donor milk	8	154	5.2
Expressed breast milk	34	154	22.1
IV and/or TPN	<6	154	NA
Substitute/formula	67	154	43.5
NICU admission			
No	350	407	86.0
Yes	57	407	14.0
GA at delivery			
Term	415	471	88.1
Preterm (<37 weeks)	56	471	11.9

¹ Incomplete data in some provinces has resulted in varying denominators.

² Data was not available for AB or QC

³ Categories are not mutually exclusive

TABLE 8. Infant SARS-CoV-2 testing March 1, 2020 until November 30, 2020 in ON, and BC.

	n	Denominator total live births	Denominator with SARS-CoV-2 testing data	Percent
Positive	<6	143	51	NA
Negative	41	143	51	80.4%
Result pending	<6	143	51	NA
Not performed	6	143	51	11.8%

DISCUSSION

In this second report, data from four provinces were amalgamated to contribute to the stabilization of trends that were described in Report #1. Overall, our current findings in data updated to November 30, 2020 are in keeping with our last report (which included data up to September 30, 2020).

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 and admitted to the ICU. We observed a decrease in the magnitude of the relative risk estimate for hospitalization in this report compared to Report #1 (Report #1: 6.57, Report # 2: 4.18), and in the relative risk estimate for ICU admission (Report # 1: 8.40, Report #2: 4.07). These differences partly reflect a change in data used to compute these estimates in Ontario. As we noted previously, 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 Further to this, 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. Although care provider anxiety may be playing a role in hospitalizations, ICU admission is a more objective marker of disease severity. Care provider anxiety is, therefore, unlikely to contribute to the ICU admissions observed in our sample.

Similar to findings reported by the US CDC and the living systematic review of COVID-19 in pregnancy, we found 12.2% of our sample were born preterm.^{6,8} The rates of NICU admission in our data were in keeping with rates of prematurity. Infant SARS-CoV-2 testing was infrequent in these four Canadian provinces; 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 slightly higher in our sample (1.2%) compared to the national estimate (0.8%).¹⁵ It is unclear if this trend will persist as we accumulate more data, and the etiology of these stillbirths is unknown at present. We will continue to closely monitor this finding and interpret with caution at present.

Limitations

These preliminary analyses are subject to a number of limitations. First, only four provinces were able to participate in this subset. Results are, therefore, not representative of the entire Canadian context. Also, QC data were abstracted from only 1 of the 9 participating hospitals (CHU Sainte-Justine) in the province, resulting in a much smaller sample compared to ON, AB, and BC. As of November 30th, 2020 QC had the highest number of pregnant positive cases in Canada (Figure 1). The 35 cases that were included in this report, therefore, under-represent the burden that COVID-19 has had on pregnancy in QC. Nevertheless, ON, AB, and BC represent approximately 60% of pregnancies in Canada;¹⁶ thus, the subset used in this report is still representative of the majority of pregnancies in the country. Subsequent analyses will be conducted with additional provincial/territorial representation for a more comprehensive understanding of the national burden of COVID-19 in pregnancy. Moreover, for ON data for treatment during hospitalization (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.

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