CANCOVID-Preg: Canadian Surveillance of COVID-19 in Pregnancy

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COVID-19 IMMUNITY TASK FORCE | GROUPE DE TRAVAIL SUR L'IMMUNITÉ FACE À LA COVID-19

Synergistic projects to inform public health, clinical care and vaccination policies

CANCOVID-Preg

- National surveillance of SARS-CoV-2 infections in pregnancy – ongoing since March 2020 (CIHR and PHAC)

COVERED

- National survey of pregnant persons on COVID-19 vaccines in pregnancy and lactation (CIHR and PHAC)

Antenatal Serostudies

- National retrospective serostudies to understand seroprevalence at different stages in the pandemic (PHAC)

COVID-19 in pregnancy

- At pandemic outset we needed robust evidence in specific populations in order to guide clinical care and public health policy
- The maternal-newborn population requires unique consideration because:
  - Increased vulnerability to respiratory infections
  - Increased vulnerability to certain medical interventions used to treat infection
  - Unique infection prevention and control needs during labour, delivery, and postpartum
- An extensive collaboration of researchers and clinicians across Canada rapidly initiated CANCOVID-Preg to collect comprehensive information on outcomes for infected pregnant individuals and their newborns
- Need for rapid sharing of recommendations for management of COVID-19 in pregnancy in the absence of data

Committee Opinion No. 400: COVID-19 and Pregnancy

ELWOOD, C; RAESIDE, A; WATSON, H; BOUCOIRAN, I; MONEY, D; YUDIN, M; VAN SCHALKWYK, J; CASTILLO, E; POLIQUIN, V, on behalf of the Infectious Disease Committee of the Society of Obstetricians and Gynaecologists of Canada.

Original: March 13, 2020
Reaffirmed: February 15, 2021

CANCOVID-Preg outline

- CANCOVID-Preg is a prospective, observational, surveillance program for SARS-CoV-2 affected pregnancies in Canada
- Surveillance has been underway since March 1, 2020 and continuing through the pandemic
- Cases in each province/territory are identified through public health reporting or clinical case identification, with regionally adapted data collection according to a common standardized protocol
- Data collection includes: Vaccination status, timing of potential exposure, maternal and infant test results, symptoms, treatment, outcome of COVID-19 disease, pregnancy outcomes, and infant outcomes

Program Objectives

Aim: To provide Canadian data on COVID-19 in pregnancy to support optimal care and public policy.

Objectives

1. To determine the **burden of COVID-19 in pregnancy** in Canada
2. To capture and report **maternal outcomes**, including degree of illness and requirement for hospitalization and/or ventilation
3. To determine **fetal and infant outcomes** including evidence of transmission of COVID-19 infection from mother to infant
4. To provide data to facilitate **planning and support** for COVID-19 affected pregnancies in the Canadian context
5. To contribute data to **international collaborations**, allowing for optimized international understanding of COVID-19 in pregnancy

CANCOVID-Preg informs public health policy

Report #1 December 2, 2020	Society of Obstetricians and Gynecologists of Canada (SOGC) **recommends vaccination** for all pregnant individuals due to risk of COVID-19 in pregnancy
Report #2 January 15, 2021	COVID-19 in pregnancy guideline for clinical care – February 15, 2021
Report #3 February 25, 2021	SOGC calls for a Canada-wide policy change to **prioritize pregnant individuals** for vaccination **Vaccination policies updated** in: ON, BC, NL, NB, SK, MB
Report #4 June 3, 2021	Pregnant persons at risk of COVID complications similar to age 55-59 year olds

June 2021, all provinces recommend pregnant individuals be vaccinated.

JAMA | Original Investigation

Association of SARS-CoV-2 Infection During Pregnancy With Maternal and Perinatal Outcomes

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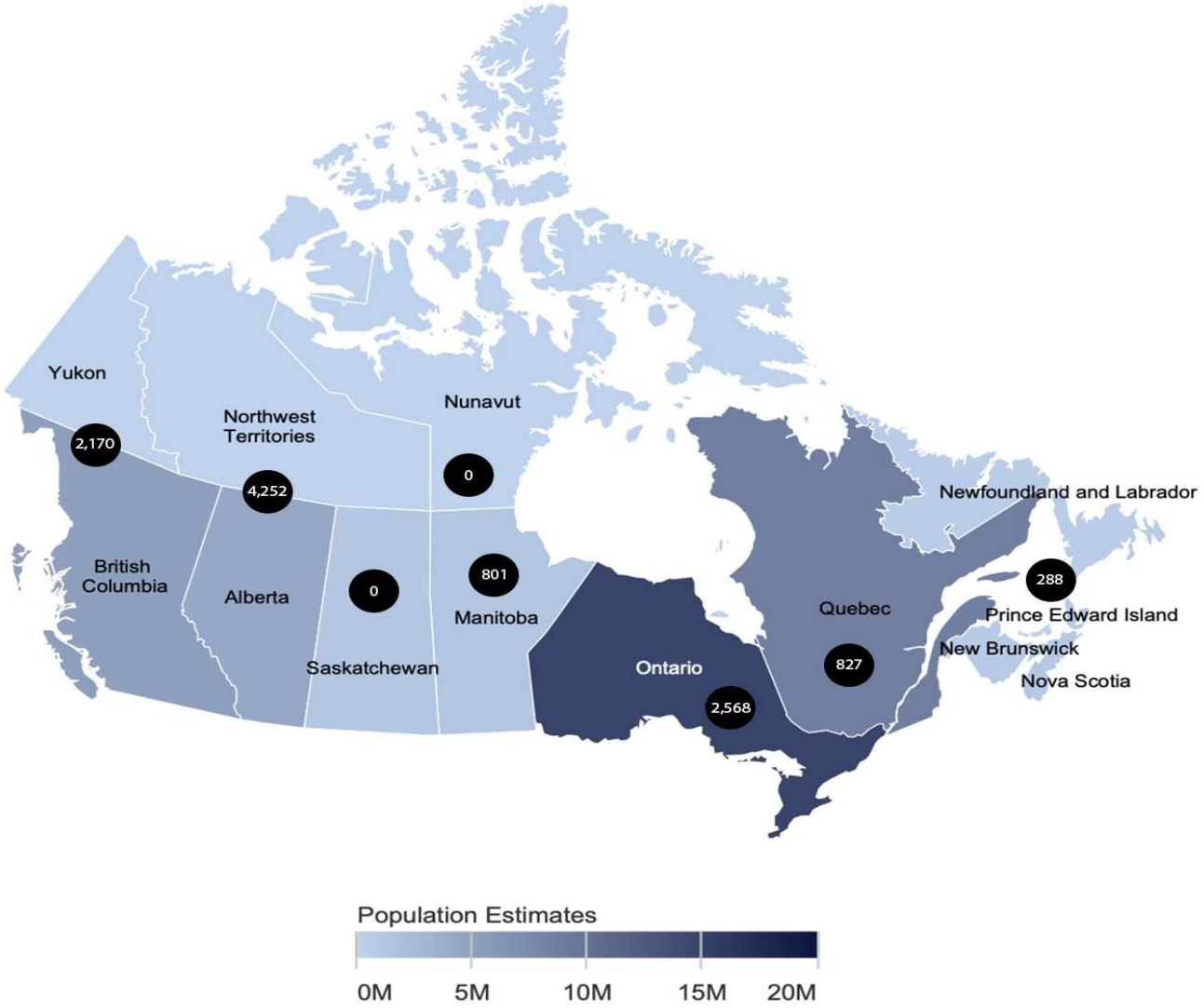
JAMA 2022; 327(20): 1983-1991.

Methods

- Data on completed SARS-CoV-2 affected pregnancies between March 1, 2020 and October 31, 2021 from six Canadian provinces
  - British Columbia, Alberta, Ontario, Quebec, Manitoba, and Nova Scotia
- Laboratory-confirmed SARS-CoV-2 affected pregnancies (identified by a positive SARS-CoV-2 PCR test at any point in pregnancy)
- Comparison groups:
  - Statistics Canada (StatCan): All female positive SARS-CoV-2 cases aged 20-49 used for comparison to our pregnant cohort.
  - Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD): COVID-19 unaffected pregnancies during the same time frame used to compare perinatal outcomes.

Results

8786 pregnancies affected by SARS-CoV-2: March 2020-October 2021



Results

Table 1. Demographic and Clinical Summaries for Pregnant Persons Diagnosed as Having SARS-CoV-2 Infection in Canada

Characteristics	Estimate
Age, y	
No. (%)	n = 5993
<30	2419 (40.4)
30-35	2381 (39.7)
≥36	1193 (19.9)
Median (IQR)[a]	31 (28-35) [n = 1418]
Gestational age at diagnosis, No. (%), wk	n = 5967
≤14	1080 (18.1)
15-27	2084 (34.9)
28-37	2148 (35.7)
≥38	666 (11.1)
Days between diagnosis and delivery, median (IQR)[b]	73 (20-140) [n = 3367]
Preexisting hypertension, No. (%)[d]	140 (3.4) [n = 4130]
Type 1 or 2 diabetes, No. (%)[d]	108 (2.6) [n = 4130]
Asthma, No. (%)[d]	147 (3.6) [n = 4130]
Body mass index, No. (%)[b]	n = 2711
<25	1285 (47.5)
25-29	764 (28.3)
≥30	656 (24.3)
Vaccination, No. (%)[b]	n = 3361
0 Doses	3318 (98.7)
1 Dose	28 (0.8)
≥2 Doses	15 (0.5)

Results

Ethnicity of SARS-CoV-2 affected pregnancies in Canada compared to ethnicity of all females aged 15-49 in Canada

	CANCOVID-Preg	All females aged 15-45 in Canada (StatCan)
White	231 (30.01%)	80.0%
South Asian	183 (23.83%)	3.4%
Other	178 (23.18%)	9.3%
Black	127 (16.54%)	2.2%
East or SE Asian	49 (6.38%)	4.8%

Results

Maternal SARS-CoV-2 hospitalizations and ICU admissions compared to SARS-CoV-2-positive females (pregnant and non-pregnant) aged 20-49 in Canada

	Pregnant positive SARS-CoV-2 cases in BC, AB, MB, ON, NS, and QC 1 March 2020 to 31 October 2021 (n=6 012)	Positive SARS-CoV-2 cases in females aged 20-49 in Canada 1 March 2020 to 31 October 2021 (n=313 982)	Relative Risk	95% CI
Number and percent hospitalized	466 (7.75%)	9196 (2.93%)	**2.65**	2.41-2.88
Number and percent admitted to ICU	121 (2.01%)	1157 (0.37%)	**5.46**	4.50-6.53

100% of hospitalized were unvaccinated or incompletely vaccinated (2 doses considered ‘complete’

Figure 1. Bivariable Log-Binomial Models of Relative Risks for Hospitalization

Variables	No. (%) of patients: Not hospitalized	No. (%) of patients: Hospitalized	Absolute risk difference, % (95% CI)	Relative risk (95% CI)
Age, y				
<30	2262 (93.51)	157 (6.49)	[Reference]	1 [Reference]
30-35	2185 (91.77)	196 (8.23)	1.7 (0.3 to 3.2)	1.25 (1.02-1.53)
≥36	1082 (90.70)	111 (9.30)	2.8 (0.9 to 4.7)	1.42 (1.13-1.8)
Body mass index				
<25	1209 (94.23)	74 (5.77)	[Reference]	1 [Reference]
25-29	708 (92.67)	56 (7.33)	1.6 (-0.7 to 3.8)	1.26 (0.9-1.77)
≥30	585 (89.18)	71 (10.82)	5.1 (2.4 to 7.8)	1.89 (1.38-2.58)
Preexisting hypertension				
No	5343 (92.60)	427 (7.40)	[Reference]	1 [Reference]
Yes	197 (84.19)	37 (15.81)	8.4 (3.7 to 13.1)	2.36 (1.54-3.4)
Type 1 or 2 diabetes				
No	5309 (92.52)	429 (7.48)	[Reference]	1 [Reference]
Yes	231 (86.84)	35 (13.16)	5.7 (1.6 to 9.8)	2.12 (1.27-3.25)
Asthma				
No	3697 (92.82)	286 (7.18)	[Reference]	1 [Reference]
Yes	127 (86.39)	20 (13.61)	6.4 (0.8 to 12)	1.86 (1.17-2.76)
Gestational age at diagnosis, wk				
<14	1064 (98.52)	16 (1.48)	-3.5 (-4.7 to -2.3)	0.3 (0.17-0.48)
14-27	1980 (95.01)	104 (4.99)	[Reference]	1 [Reference]
≥28	2462 (87.83)	341 (12.17)	7.2 (5.6 to 8.7)	2.44 (1.98-3.03)
Race and ethnicity				
African, Black, or Caribbean	216 (88.16)	29 (11.84)	7 (2.7 to 11.3)	2.45 (1.52-3.89)
East Asian or Southeast Asian	149 (88.17)	20 (11.83)	7 (1.9 to 12.1)	2.45 (1.43-4.07)
Hispanic or Latinx	81 (89.01)	10 (10.99)	6.2 (-0.4 to 12.8)	2.28 (1.1-4.24)
Middle Eastern	128 (88.28)	17 (11.72)	6.9 (1.4 to 12.4)	1.55 (0.88-2.64)
Other (including Indigenous)	222 (92.50)	18 (7.50)	2.7 (-1 to 6.3)	2.43 (1.37-4.12)
South Asian	356 (95.19)	18 (4.81)	0 (-2.7 to 2.6)	1 (0.56-1.7)
White	730 (95.18)	37 (4.82)	[Reference]	1 [Reference]

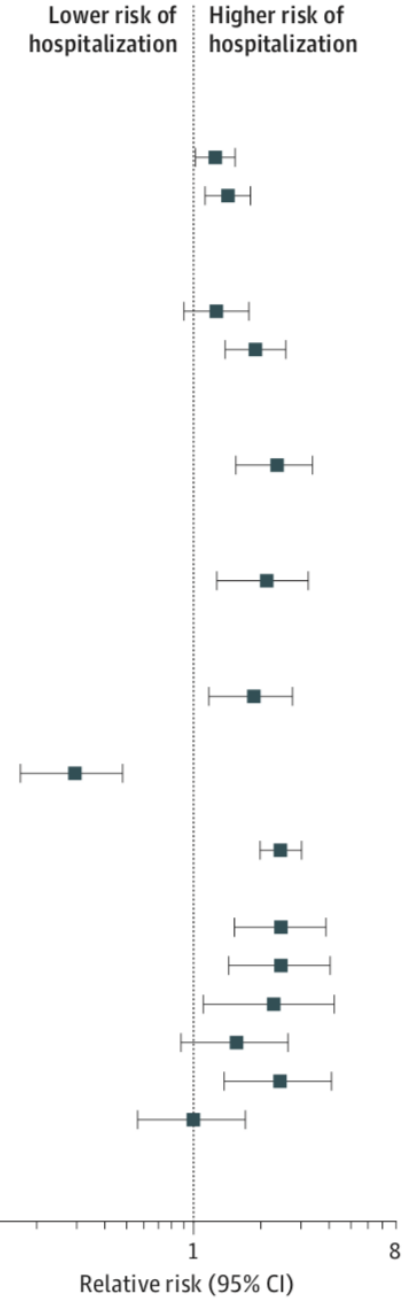
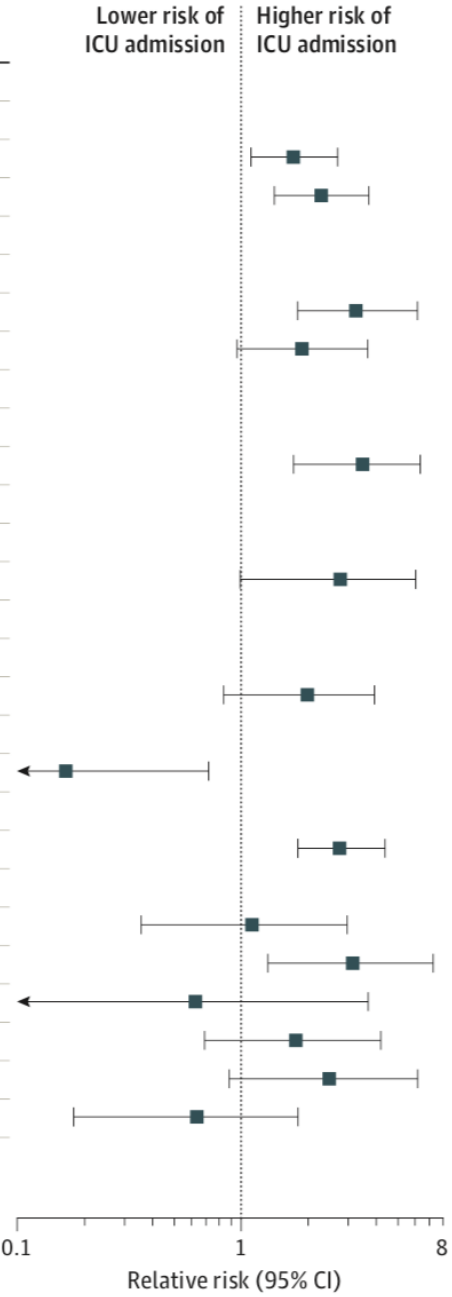


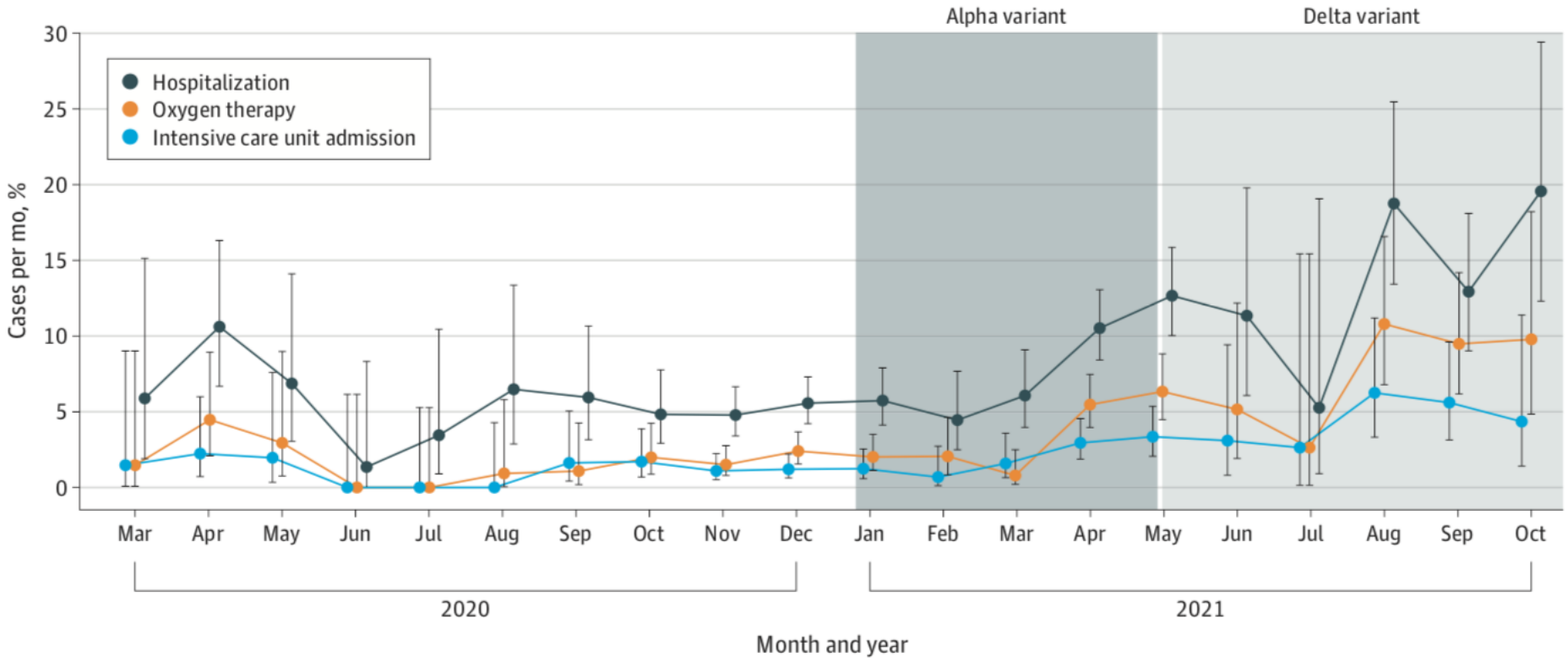
Figure 2. Bivariable Log-Binomial Models of Relative Risks for Intensive Care Unit (ICU) Admission

Variables	No. (%) of patients: Not admitted to ICU	No. (%) of patients: Admitted to ICU	Absolute risk difference, % (95% CI)	Relative risk (95% CI)
Age, y				
<30	2389 (98.76)	30 (1.24)	[Reference]	1 [Reference]
30-35	2327 (97.73)	54 (2.27)	1 (0.3 to 1.8)	1.71 (1.11-2.7)
≥36	1158 (97.07)	35 (2.93)	1.7 (0.6 to 2.7)	2.28 (1.41-3.72)
Body mass index				
<25	1267 (98.75)	16 (1.25)	[Reference]	1 [Reference]
25-29	746 (97.64)	18 (2.36)	1.1 (-0.1 to 2.3)	3.26 (1.79-6.15)
≥30	629 (95.88)	27 (4.12)	2.9 (1.2 to 4.5)	1.87 (0.96-3.69)
Preexisting hypertension				
No	5664 (98.16)	106 (1.84)	[Reference]	1 [Reference]
Yes	220 (94.02)	14 (5.98)	4.1 (1.1 to 7.2)	3.5 (1.72-6.34)
Type 1 or 2 diabetes				
No	5630 (98.12)	108 (1.88)	[Reference]	1 [Reference]
Yes	254 (95.49)	12 (4.51)	2.6 (0.1 to 5.1)	2.78 (0.99-6.05)
Asthma				
No	3908 (98.12)	75 (1.88)	[Reference]	1 [Reference]
Yes	140 (95.24)	7 (4.76)	2.9 (-0.6 to 6.3)	1.98 (0.84-3.95)
Gestational age at diagnosis, wk				
<14	1078 (99.81)	2 (0.19)	-1 (-1.5 to -0.4)	0.16 (0.03-0.55)
14-27	2060 (98.85)	24 (1.15)	[Reference]	1 [Reference]
≥28	2709 (96.65)	94 (3.35)	2.2 (1.4 to 3)	2.76 (1.79-4.41)
Race and ethnicity				
African, Black, or Caribbean	240 (97.96)	5 (2.04)	0.3 (-1.6 to 2.3)	1.12 (0.36-2.99)
East Asian or Southeast Asian	160 (94.67)	9 (5.33)	3.6 (0.1 to 7.1)	3.16 (1.32-7.24)
Hispanic or Latinx	90 (98.90)	1 (1.10)	-0.6 (-2.9 to 1.7)	0.62 (0.03-3.08)
Middle Eastern	139 (95.86)	6 (4.14)	2.4 (-0.9 to 5.8)	1.76 (0.69-4.22)
Other (including Indigenous)	232 (96.67)	8 (3.33)	1.6 (-0.8 to 4.1)	2.48 (0.88-6.16)
South Asian	370 (98.93)	4 (1.07)	-0.6 (-2 to 0.8)	0.63 (0.18-1.8)
White	754 (98.31)	13 (1.69)	[Reference]	1 [Reference]



Results

Figure 3. Adverse Maternal Outcomes Associated With SARS-CoV-2 Diagnosis in Pregnancy From March 1, 2020, to October 31, 2021 (N = 6012)



Total No. of SARS-CoV-2 cases by month	68	179	102	74	87	108	185	352	732	916	645	292	379	713	537	97	38	176	232	92

Results

Table 2. Adverse Pregnancy Outcomes Among Pregnant Persons Diagnosed as Having SARS-CoV-2 During the Pandemic Compared With Pregnant Persons Not Diagnosed as Having SARS-CoV-2 in Canada

Outcomes	No./total (%)		Absolute risk difference (95% CI)	Relative risk (95% CI)	*P* value
	Persons with SARS-CoV-2 diagnosed during pregnancy[a]	Persons without SARS-CoV-2 diagnosed during pregnancy[b]			
Preeclampsia[c]	91/1260 (7.22)	33201/428 813 (7.74)	−0.52 (−1.95 to 0.91)	0.93 (0.75-1.12)	.53
Cesarean delivery	1965/5696 (34.50)	138 918/428 813 (32.40)	2.10 (0.86 to 3.34)	1.06 (1.03-1.10)	.001
Preterm delivery <37 wk[d]	635/5746 (11.05)	28 394/419 937 (6.76)	4.29 (3.48 to 5.10)	1.63 (1.52-1.76)	<.001
Late preterm (34-36 wk)	480 (8.35)	21 638 (5.15)	3.20 (2.48 to 3.92)	1.62 (1.48-1.76)	<.001
Moderate preterm (32-33 wk)	84 (1.46)	2957 (0.70)	0.86 (0.45 to 1.07)	2.08 (1.64-2.53)	<.001
Very preterm (28-31 wk)	41 (0.71)	2269 (0.54)	0.17 (−0.05 to 0.39)	1.32 (0.93-1.74)	.08
Extremely preterm (20-27 wk)	30 (0.52)	1530 (0.36)	0.16 (−0.03 to 0.34)	1.43 (0.95-1.97)	.60
Stillbirth[e]	35/5743 (0.61)	3695/443 184 (0.83)	−0.22 (−0.43 to −0.02)	0.73 (0.50-0.99)	.07

[a] From the Canadian Surveillance of COVID-19 in Pregnancy (CANCOVID-Preg) program.

[b] From the Canadian Institute for Health Information Discharge Abstract Database.

[c] Data not available from Alberta and Ontario.

[d] Not including stillbirth or intrauterine fetal demise among the total number of fetuses in pregnancies continuing for 20 weeks or longer.

[e] Among the total number of fetuses in pregnancies continuing for 20 weeks or longer or weighing at least 500 g. Includes intrauterine and intrapartum fetal demise. Does not include neonatal mortality.

Conclusions based on data analyzed to date

- SARS-CoV-2 infection during pregnancy was significantly associated with increased risk of adverse maternal outcomes and preterm birth
- Some other international studies have found increased rates of pre-eclampsia and stillbirth, which we did not see in the Canadian context
- Compared with the similarly aged Canadian female population, the racial and ethnic distribution of SARS-CoV-2 cases during pregnancy was statistically significantly different
- The rise in the proportion of cases of severe disease in the spring and summer of 2021 may reflect the effect of viral variant emergence on pregnant populations

Next Steps

- Continue to data abstract and enter information for 2021-2022 cases
- Pull data for up to end of 2022 and redo analyses
- Further assess impact of vaccines and Omicron era infections
- Detailed analysis of infant outcomes
- Analysis of placental findings associated with COVID-19 and relevant clinical outcomes
- Assess how to create and sustain a platform to enable future response to significant infections affecting pregnancies in Canada

The CANCOVID-Preg
Investigative Team

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