PREGNANCY and COVID-19 in ONTARIO

Final Surveillance Report

Covering the period of March 2020 to March 2023

The end of March 2023 was a milestone at the Better Outcomes Registry & Network (BORN) as it concluded our 3-year odyssey with COVID-19. While the pandemic continues, our COVID-19 data collection and analysis activities are winding down.

Care providers for pregnant individuals and their newborns and health system planners/funders worked collaboratively with BORN to provide critical data to help us learn about the effects of COVID-19 on pregnancy, labour and birth, and the early newborn period as well as the system outcomes. We also worked with researchers to explore the effects of COVID-19 vaccination once it became available. The information and findings were shared provincially, nationally, and internationally to add to scientific knowledge and conclusions drawn. Throughout the process we gained new knowledge that contributed to BORN's mandate to facilitate and improve care in Ontario.

This report summarizes BORN's ***Top 5 learnings*** about the effects of COVID-19 on pregnant individuals and their newborns and the activities that led to these conclusions. We also conclude with recommendations for future infectious disease outbreaks or pandemics.

Top 5 learnings:

1) Pregnant individuals had higher rates of illness, hospitalization and ICU admission associated with COVID-19 infection than non-pregnant individuals in the same age range.

2) Newborns of pregnant individuals with COVID -19 were more likely born preterm (<37 weeks' gestation) compared to the general population of pregnant individuals.

3) Vaccination against COVID-19 administered during pregnancy has ***NOT*** been associated with an increased risk of adverse pregnancy or birth outcomes. Nevertheless, COVID-19 vaccine coverage in the pregnant population remained lower than in the general female population of reproductive age.

4) During public health emergencies, accurate and timely data are urgently needed to inform clinical care and public health policy. To facilitate accurate and timely information, enhancing the BORN Information System (BIS) to facilitate ongoing record linkage with

existing and new provincial data holdings including vaccination records and infectious disease reporting is needed in anticipation of/readiness for future infectious disease events/pandemics.

5) Data collection and knowledge transfer must be collaborative and integrated for maximum benefit.

Learnings:

1) **Pregnant individuals had higher rates of illness, hospitalization and ICU admission associated with COVID-19 infection than non-pregnant individuals in the same age range.** From March 1, 2020 – December 31, 2022, there were 20,682 pregnant individuals in Ontario who tested positive for SARS-CoV-2 during pregnancy. Most cases were diagnosed within the first 27 weeks of pregnancy (Table 1).

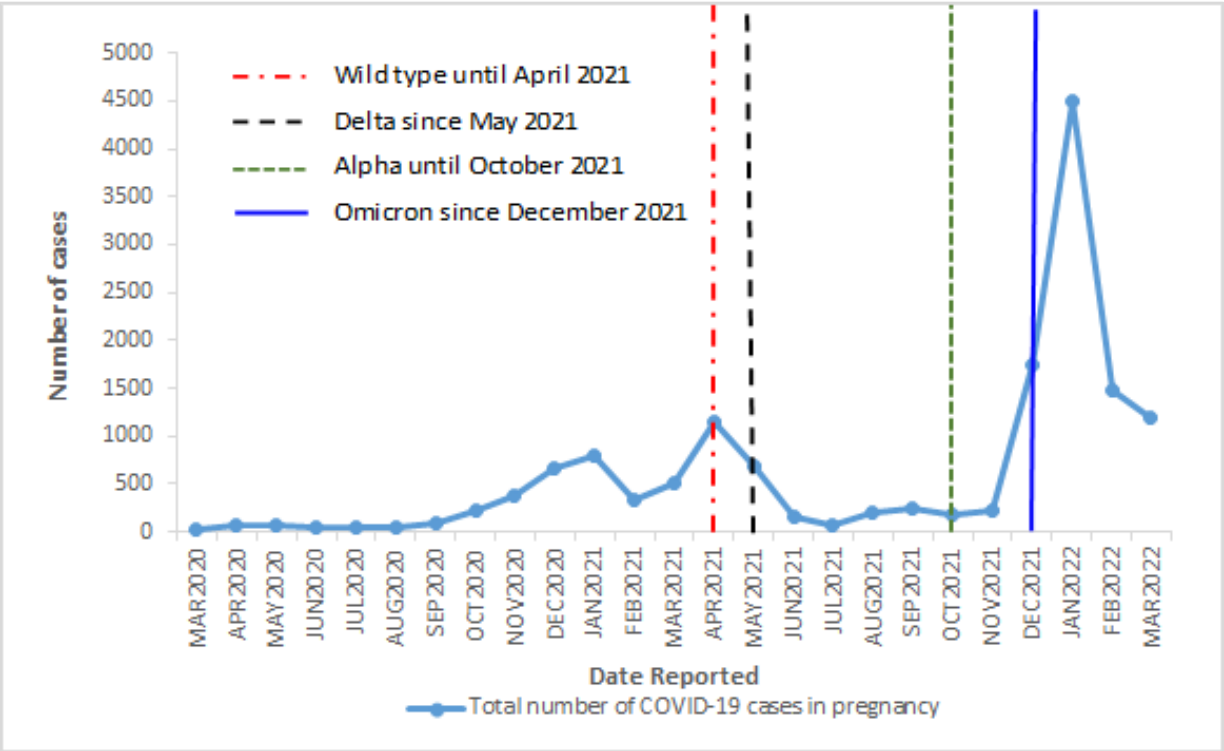
   This total number is likely underreported due to a brief period when PCR testing was significantly reduced and when rapid antigen testing largely replaced PCR due to the vast numbers of cases in the general population (Omicron wave – Figure 1).

Table 1 - Gestational age at time of SARS CoV-2 positive test
March 1, 2020, to December 31, 2022

Gestational age at diagnosis	(n=20,682)[a]
Less than 14 weeks	7052
14-27 weeks	5759
28-37 weeks	2578
38-42 weeks	4886
Missing	407

[a] Total number of individuals with a positive SARS CoV-2 positive test during pregnancy.

Figure 1 –COVID-19 variants in Ontario
March 1, 2020, to March 31, 2022

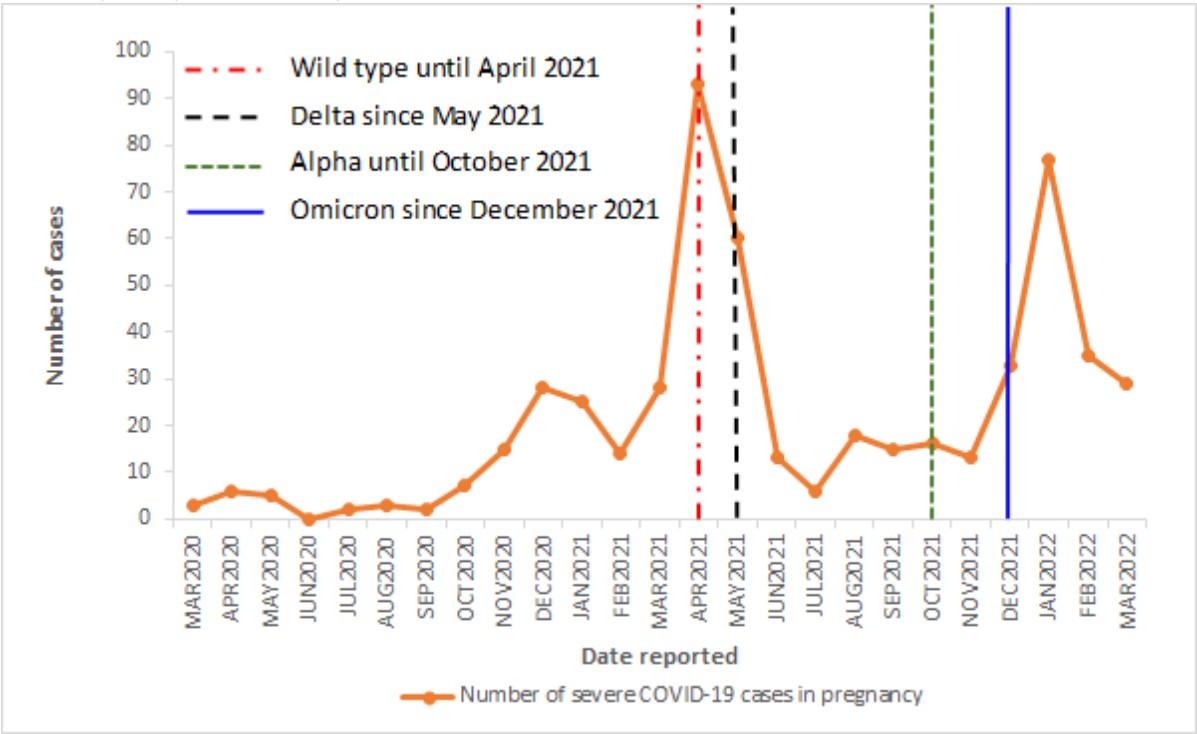


Note: Time periods for variants of concern in Ontario were retrieved from Science Table COVID-19 Advisory for Ontario: Ontario Dashboard.[1] [a] There were 182 additional COVID-19 cases in pregnancy, but the date of infection was not reported. These cases have been excluded from the line graph.

Accessibility Link – Long Description Figure 1

[1] Science Table COVID-19 Advisory for Ontario: Ontario Dashboard available at https://covid19-sciencetable.ca/ontario-dashboard/?msclkid=96c174f8d07611ecbd1a002f317661d6 Accessed May 30, 2022

Figure 2 – Severity of COVID-19 in pregnancy
March 1, 2020, to March 31,2022



Note: Time periods for variants of concern in Ontario were retrieved from Science Table COVID-19 Advisory for Ontario: Ontario Dashboard.[1]

[a] Severe COVID-19 cases include anyone with any of the following: hospitalization, ICU admission, death, pneumonia, sepsis, respiratory failure, acute respiratory distress syndrome, heart failure, septic shock, coagulopathy, disseminated intravascular coagulopathy, renal failure, liver dysfunction, or ventilatory support.
[b] There were 12 additional severe cases in pregnancy, but the date of infection was not reported. These cases have been excluded from the line graph.

Accessibility Link – Long Description Figure 2

From March 1, 2020, to December 31, 2022, 97% of pregnant individuals with COVID-19 experienced mild to moderate disease and 3% experienced severe disease (Table 2 and Figure 2). More severe illness in pregnancy was associated with the Wild/Delta waves and the Omicron waves.

Table 2 - Frequency of maternal comorbidities according to COVID-19 severity
March 1, 2020, to December 31, 2022

Maternal Comorbidities	General Pregnant Population (n=286,419)	Mild and Moderate COVID-19 (n=20,003)	Severe COVID-19 (n=679)	Total COVID-19 (n=20,682)
Diabetes	29,823 (10.4%)	1988 (9.9%)	98 (14.4%)	2086 (10.1%)
Hypertension	20,098 (7.0%)	1319 (6.6%)	67 (9.9%)	1386 (6.7%)

[a] Includes pre-existing diabetes and hypertension, as well as diabetes and hypertension during pregnancy.
[b] Less than 1% of individuals overall had pre-existing cardiovascular disease or asthma, thus stratification by COVID-19 disease severity was not possible due to small cell counts.

A larger proportion of pregnant individuals with severe COVID-19 had comorbidities compared to those with mild to moderate disease, as well as the general pregnant population during the same period (Table 2).

Of the 20,682 pregnancies with COVID-19, 616 (3.0%) pregnant individuals were hospitalized due to COVID-19 with the majority (528 individuals) having a general admission and 88 individuals being admitted to an intensive care unit. A total of 6 individuals (0.03%) died (Table 3). These proportions are higher than those of the general female population in Ontario aged 20-39 who were hospitalized due to COVID-19 illness or complications (hospitalization rate = 0.1%)[2]. Overall, respiratory complications were the most prevalent SARS-CoV-2 complications with pneumonia being the most common (Table 4). Length of hospital stay, in days, due to COVID-19 illness and/or complications varied considerably (mean=5.2, median=2, std=11.6) (Table 5). Three-quarters of hospitalized individuals were admitted for 5 days or less (data not shown), and a small number of pregnant individuals were admitted to hospital for 30 days or more due to COVID-19. There was far less variability for pregnant individuals without COVID-19 who were admitted to hospital for birth during the same period; they were primarily admitted to hospital for two days or less (mean=1.9, median=1.7, std=0.9).

[2] Ontario COVID-19 Data Tool available at https://www.publichealthontario.ca/en/data-and-analysis/infectious-disease/covid-19-data-surveillance/covid-19-data-tool?tab=maps%20 Accessed June 2, 2022.

Table 3 - Outcomes for all pregnant individuals with COVID-19
March 1, 2020, to December 31, 2022

Outcome	(n=20,682)[a]
No hospitalization	20,066 (97.0%)
Hospitalization[b]	616 (3.0%)
General admission	528 (2.6%)
ICU admission	88 (0.4%)
Death	6 (0.03%)

[a] Total number of individuals with a COVID-19 during pregnancy.
[b] Hospitalizations due to COVID-19.

Table 4 - COVID-19 complications and use of ventilator support among pregnant individuals
March 1, 2020, to December 31, 2022

Complications	(n= 20,682)[a]
Pneumonia	112 (0.54%)
Sepsis	12 (0.06%)
Respiratory failure	25 (0.12%)
Acute respiratory distress syndrome	29 (0.14%)
Liver dysfunction	10 (0.05%)
Coagulopathy	12 (0.06%)
Other complications[b]	24 (0.12%)
Ventilatory support[c]	45 (0.22%)
Severe COVID-19 during pregnancy[d]	679 (3.28%)

[a] Total number of pregnant individuals with COVID-19 during pregnancy, regardless of disease severity.
[b] Some complications have been grouped together due to small cell counts. Other complications include heart failure, renal failure, septic shock, and disseminated intravascular coagulopathy.
[c] Ventilatory support has been grouped together due to small cell counts. It includes extracorporeal membrane oxygenation (ECMO), non-invasive ventilation and invasive ventilation.
[d] Includes anyone with any of the following: hospitalization, ICU admission, death, pneumonia, sepsis, respiratory failure, acute respiratory distress syndrome, heart failure, septic shock, coagulopathy, disseminated intravascular coagulopathy, renal failure, liver dysfunction, or ventilatory support. These are not mutually exclusive conditions.

Table 5 - Length of stay (LOS) in hospital due to COVID-19 versus average postpartum LOS in days

March 1, 2020, to December 31, 2022[a]

Length of Stay	Mean	Median	Standard deviation	Minimum	Maximum
Average postpartum LOS for all pregnancies	1.9	1.7	0.9	< 1	8
COVID-19	5.2	2	11.6	< 1	181

[a] Includes vaginal and cesarean deliveries during the same period.

2) Newborns of pregnant individuals with COVID -19 were more likely born preterm (<37 weeks' gestation) compared to the general population of pregnant individuals.

Of the 19,242 infants born to an individual with a COVID-19 diagnosis during pregnancy and where a birth has occurred as of December 31, 2022, 74 (0.4%) were stillbirths (Table 6), and the majority (66.4%) were born vaginally (Table 7). In comparison, the stillbirth rate for the 5-year period pre-pandemic in Ontario was 0.47%[3]. Of the livebirths, 8.4% were born preterm (before 37 completed weeks) (Table 8). The typical preterm birth rate in Ontario is 7.7% and varies by region from 5.6% - 12.1%[4]. Moreover, 7.0% of infants born to mothers with COVID-19 during pregnancy had a birth weight of less than 2500 grams (Table 9). Neonatal intensive care unit (NICU) admission occurred for 2507 (13.1%) newborns which is similar to the average rate of 13.2% found in a study during the early part of the pandemic[5].

Due to limited SARS-CoV-2 testing performed on newborns at birth in Ontario, SARS-CoV-2 infection in newborns is not reported. However, a study conducted in Ontario[6] reported that vertical transmission (from pregnant individual to infant) was unlikely.

[3] Stillbirths in Ontario 2021. Ottawa, Ontario, 2021 available at https://www.bornontario.ca/en/news/stillbirths-in-ontario-2021.aspx

[4] One in a Million. BORN Ontario Biennial Report 2016-2018. Ottawa, Ontario, 2018. Ontario COVID-19 Data Tool available at https://www.bornontario.ca/en/publications/resources/Documents/BORN-Biennial-Report-Feb-2019.pdf

[5] Roberts NF, Sprague AE, Taljaard M, Fell DB, Ray JG, Tunde-Byass M, et al. Maternal-Newborn Health System Changes and Outcomes in Ontario, Canada, During Wave 1 of the COVID-19 Pandemic-A Retrospective Study. J Obstet Gynaecol Can. 2022 Jun;44(6):664-674. doi: 10.1016/j.jogc.2021.12.006. Epub 2021 Dec 29. PMID: 34973435; PMCID: PMC8716144. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8716144/?report=reader

[6] Fitzpatrick T, Wilton AS, Chung H, Guttmann A. SARS-CoV-2 Infection Among Maternal-Infant Dyads in Ontario, Canada. JAMA Netw Open. 2021;4(8):e2120150. Published 2021 Aug 2. doi:10.1001/jamanetworkopen.2021.20150. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8353536/?report=reader

Table 6 – Birth outcomes associated with COVID-19 during pregnancy
March 1, 2020, to December 31, 2022[c]

Birth Outcome	(n=19,242)[a]
Live birth	19,168 (99.6%)
Stillbirth at ≥20wks or ≥500gms[b]	74 (0.4%)

[a] Total number of infants delivered (including live births and stillbirths).

[b] Spontaneous stillbirth may have occurred during the antepartum or intrapartum period.

[c]Due to normal delays in reporting of birth outcomes in the registry, there are 905 missing birth records.

Table 7 - Mode of delivery associated with COVID-19 during pregnancy
March 1, 2020, to December 31, 2022

Mode of Delivery	Number of births with COVID-19 diagnosis during pregnancy (n=19,242)[a]	Number of births without COVID-19 diagnosis during pregnancy (n=267,177)
Spontaneous vaginal	11,304 (58.8%)	162,629 (60.9%)
Assisted vaginal (forceps or vacuum)	1465 (7.6%)	22,389 (8.4%)
Induced or spontaneous labour ending in cesarean section	3073 (16.0%)	39,156 (14.7%)
No labour - cesarean section	3394 (17.6%)	43,009 (16.1%)
Mode of delivery missing	6 (0.03%)	0 (0.0%)

[a] Total number of infants delivered (including live births and stillbirths).

Table 8 - Gestational age at birth for liveborn infants to pregnant individuals with COVID-19 during pregnancy

March 1, 2020, to December 31, 2022

Gestational Age	(n=19,168)
< 28 weeks	85 (0.4%)
28 - 31 weeks	128 (0.7%)
32-33 weeks	202 (1.1%)
34-36 weeks	1202 (6.3%)
≥ 37 weeks (term)	17,551(91.6%)

Table 9 - Birth weight of liveborn infants to pregnant individuals with COVID-19 during pregnancy

March 1, 2020, to December 31, 2022

Birth Weight	(n=19,168)
< 2500g	1334 (7.0%)
2500 - 3999g	15,790 (82.4%)
≥ 4000g	1708 (8.9%)
Missing	336 (1.8%)

3) Vaccination against COVID-19 administered during pregnancy has *NOT* been associated with an increased risk of adverse pregnancy or birth outcomes. Nevertheless, COVID-19 vaccine coverage in the pregnant population remained lower than in the general female population of reproductive age.

BORN partnered with Dr. Deshayne Fell (Epidemiologist - University of Ottawa) and a group of international experts to study the effects of COVID-19 vaccination on pregnant individuals and newborns. The scientific papers are excerpted here:

- Receiving a primary COVID-19 vaccine series (dose 1 and 2) during pregnancy was ***not associated*** with any increased risk of adverse pregnancy or birth outcomes (e.g., postpartum hemorrhage, chorioamnionitis, cesarean delivery, NICU admission, 5-minute Apgar score <7, preterm birth (<37 weeks), small-for-gestational-age at birth or

stillbirth)[7,8]. The results did not differ according to the number of COVID-19 doses (dose 1 and/or 2) received during pregnancy, trimester when vaccination occurred, and type of mRNA vaccine product.

- Receipt of a third dose (first booster dose) of COVID-19 vaccine during pregnancy was ***not associated*** with any increased risk of adverse maternal, fetal, and neonatal outcomes (e.g., placental abruption, chorioamnionitis, postpartum hemorrhage, cesarean delivery, stillbirth, preterm birth (<37 weeks), NICU admission, 5-minute Apgar score <7, or small-for-gestational-age at birth). There was no difference in subgroup analyses by mRNA vaccine product and trimester when dose 3 was received. (The study is currently in press with BMJ Medicine).

- **COVID-19 vaccine coverage** with at least 1 dose was **lower among pregnant individuals** than in the general female population of reproductive age in Ontario[9]. Similarly, among pregnant individuals who were not yet vaccinated at the time of giving birth, COVID-19 vaccination **after pregnancy also remained lower** than vaccine coverage in the general female population in ON[10].

- The results suggested that there is a **subgroup of pregnant individuals** (e.g., those in younger age groups, those reporting smoking and substance use during pregnancy, and those living in a rural area or a neighbourhood with lower income and higher material deprivation) who were **less likely to get vaccinated** against COVID-19 during pregnancy[9] and even after giving birth[10].

In summary, COVID-19 illness during pregnancy has been associated with an increased risk of hospital and intensive care unit admission, pregnancy complications, and adverse birth outcomes (e.g., preterm birth). It has also been shown that COVID-19 vaccination during

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[7] Fell DB, Dhinsa T, Alton GD, Török E, Dimanlig-Cruz S, Regan AK, et al. Association of COVID-19 Vaccination in Pregnancy With Adverse Peripartum Outcomes. JAMA. 2022 Apr 19;327(15):1478-1487. doi: 10.1001/jama.2022.4255. PMID: 35323842; PMCID: PMC8949767. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8949767/?report=reader

[8] Fell DB, Dimanlig-Cruz S, Regan AK, Håberg SE, Gravel CA, Oakley L, et al. Risk of preterm birth, small for gestational age at birth, and stillbirth after covid-19 vaccination during pregnancy: population based retrospective cohort study. BMJ. 2022 Aug 17;378:e071416. doi: 10.1136/bmj-2022-071416. PMID: 35977737; PMCID: PMC9382031. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9382031/?report=reader

[9] Fell DB, Török E, Sprague AE, Regan AK, Dhinsa T, Alton GD, et al. Temporal trends and determinants of COVID-19 vaccine coverage and series initiation during pregnancy in Ontario, Canada, December 2020 to December 2021: A population-based retrospective cohort study. Vaccine. 2023 Mar 3;41(10):1716-1725. doi: 10.1016/j.vaccine.2023.01.073. Epub 2023 Feb 3. PMID: 36759282; PMCID: PMC9894778. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9894778/?report=reader

[10] Török E, Dhinsa T, Dimanlig-Cruz S, Alton GD, Sprague AE, Dunn SI, et al. Temporal trends and determinants of COVID-19 vaccine series initiation after recent pregnancy. Hum Vaccin Immunother. 2023 May 30:2215150. doi: 10.1080/21645515.2023.2215150. Available at: https://pubmed.ncbi.nlm.nih.gov/37249316/

pregnancy effectively reduces the risk of COVID-19 infection in pregnant individuals and their newborn infants. BORN's contribution to this work adds to the growing body of evidence that COVID-19 vaccination during pregnancy is not associated with a higher risk of adverse maternal and birth outcomes. These findings can help inform public health strategies to increase COVID-19 vaccine acceptance and coverage in the pregnant population, especially among certain subgroups.

There is a report series with additional details on all the vaccination studies available on the BORN Ontario website[11].

4) **During public health emergencies, accurate and timely data are urgently needed to inform clinical care and public health policy. To facilitate accurate and timely information, enhancing the BORN Information System (BIS) to facilitate ongoing record linkage with existing and new provincial data holdings including vaccination records and infectious disease reporting is needed in anticipation of/readiness for future infectious disease events/pandemics.**

Pregnant individuals and newborns are vulnerable populations – being able to easily create and enable data collection screens that link to pregnancy and birth outcomes would be valuable and would facilitate data sharing across jurisdictions to help strengthen conclusions. While COVID-19 is the longest pandemic we have faced so far, there have been other instances in the last 20 years of important infectious diseases that impacted pregnant individuals and newborns (i.e., 2009 A/H1N1 influenza pandemic, severe acute respiratory syndrome [SARS], Zika virus, and Middle East respiratory syndrome). In each case, BORN was consulted and where possible mounted a data collection strategy, but with considerable time and resource efforts. In the case of COVID-19, the development and launch of BORN's data collection strategy took weeks, and sites (birthing hospitals and midwifery practice groups) had to be recruited and educated on how to complete and securely submit the fillable PDF forms to the BIS, causing further delays in obtaining crucial data on COVID-19 infection at a time when little was known about its effect on pregnant individuals and their unborn child. Additionally, we had to do complex linkages between multiple datasets (laboratory data, vaccination data, census data) and outcome data in the BIS.

In a recent publication on COVID-19 by the Ministry of Health, Dr. Kieran Moore (the Chief Medical Officer of Health) stated that *Ontario needs timely, accurate, and detailed surveillance information as well as ready access to scientific expertise to enhance its capacity to detect and monitor disease threats; and guide decisions about public health*

[11] BORN COVID-19 Vaccination During Pregnancy in Ontario. https://www.bornontario.ca/en/whats-happening/covid-19-vaccination-during-pregnancy-in-ontario.aspx Accessed June 2, 2022.

measures when a threat reaches a certain magnitude[12]*.* While BORN participated in this type of surveillance and scientific work, much of the effort would have been reduced with linked data available in the BIS. BORN needs a flexible, modular, and ready-to-go data collection system for times when special data collection is warranted (recognizing that any new data collection would have to go through the approval process at BORN). Additionally, to enhance future surveillance efforts, it would be helpful to have an ongoing feed of data from the provincial repositories (e.g., illness, vaccines, public health reportable diseases) so that we could identify signals that these exposures might be causing issues in the pregnant or breastfeeding or newborn populations. We have learned through SARS and now COVID-19 that pregnant and breastfeeding individuals have different outcomes from the general population and population-specific data are required for evidence-informed decisions about care.

In the United Kingdom (UK), the UK Obstetric Surveillance System (UKOSS) is an excellent example of a 'just-in-time' solution[13]. This system, created years ago, enabled the UK to rapidly respond with data collection on COVID-19 in pregnancy as soon as the pandemic was declared to help guide care providers[14]. Many of the first studies on COVID-19 in pregnancy came from the UK. In the event of a future 'emerging health issue' (which is not a question of 'if', but more 'when'), BORN Ontario wants to be better prepared to collect data by having a ready-made generic and nimble encounter in the BIS that could be 'activated' when required to help to facilitate care in a more expeditious manner. It would ensure timely data collection to inform policymakers, healthcare providers and the pregnant population.

5) Data collection and knowledge transfer must be collaborative and integrated for maximum benefit.

BORN would not have been able to do the COVID-19 surveillance including the research activities on COVID-19 vaccination in pregnancy without the tremendous collaboration of government and public health, hospitals, midwifery practice groups, clinical care providers, provincial laboratory and vaccination databases, perinatal and professional practice networks, national research groups, and research funders. We are incredibly grateful for the willingness of people who had a 'get it done' attitude despite the growing health care

[12] UK Obstetric Surveillance System (UKOSS) available at https://www.npeu.ox.ac.uk/ukoss Accessed June 2, 2022.
[13] Knight M, Brocklehurst P, O'Brien P, Quigley MA, Kurinczuk JJ. Planning for a cohort study to investigate the impact and management of influenza in pregnancy in a future pandemic. Southampton (UK): NIHR Journals Library; 2015 Mar. PMID: 25834863. Available at https://pubmed.ncbi.nlm.nih.gov/25834863/
[14] Lawrence LM, Bishop A, Curran J. Integrated Knowledge Translation with Public Health Policy Makers: A Scoping Review. Healthc Policy. 2019 Feb;14(3):55-77. doi: 10.12927/hcpol.2019.25792. PMID: 31017866; PMCID: PMC7008688. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7008688/?report=reader

system challenges as the pandemic progressed.

Integrated knowledge transfer (IKT) was a crucial component of the work we did and was critical to helping advise policy makers on care practices. Lawrence and colleagues[15] define IKT as the engagement of knowledge users (e.g., policy makers, clinicians, patients) as active participants in the research process. We held regular meetings with our clinical, public health, and research colleagues across the province to plan our surveillance and research activities. We involved the regional perinatal networks and the Provincial Council of Maternal Child Health who assisted in reaching out to care providers, and we worked collaboratively with data contributors from clinical, public health, and laboratory sites to keep them engaged with the process and outcomes. Lastly, we shared results widely, both in scientific forms and in summaries and graphics developed for the general public.

In a global pandemic, both national and international collaborations are crucial. To have comparable results, we worked with the CAN-COVID Preg network (see website: https://ridprogram.med.ubc.ca/cancovid-preg/)[15] to standardize data fields we collected, and we also collaborated with experts in maternal immunization from different countries.

Summary:

BORN's primary mandate as a Registry is to facilitate and improve care. During the pandemic we certainly met this mandate by providing valuable information about the effect of COVID-19 on pregnant individuals and newborns. This information helped care providers and regional networks draft recommendations for clinical care, helped policy makers enact standards, helped public health with population-specific information, and helped Ontario families understand their options. Furthermore, once COVID-19 vaccines became available, our work contributed to guide all these groups make evidence-informed decisions regarding vaccination.

This work was truly a collaborative effort. BORN could not have done this without constant and targeted collaboration and communication. We also needed and received rapid help from government partners who provided access to laboratory and vaccination data.

We thank everyone for their efforts (full list on next page). While no one wants to endure another pandemic like this, it is reassuring that for the maternal-child population in Ontario we have an effective model of collaboration that allows us to produce data and information needed to respond. We intend to build on this and take the lessons learned to become even more effective in the future.

[15] Money DM, CANCOVID-Preg Network. *Canadian Surveillance of COVID-19 in Pregnancy: Epidemiology, Maternal and Infant Outcomes Report #3*. Published 2021. Accessed March 9, 2021. Available at: http://med-fom-ridprogram.sites.olt.ubc.ca/files/2021/02/CANCOVID_Preg-report-3-ON-BC-AB-QC-MB-_25Feb2021_Final.pdf

BORN Ontario thanks the following people and organizations for their assistance with designing our data collection, data contributions and helping to share the information from the data analysis.

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**We also acknowledge several other co-authors who were not members of the Steering Committee but contributed to individual studies.

Data Contributors:

Ontario Hospitals with Maternal-Newborn Units and their data entry personnel
Midwifery Practice Groups in Ontario
Ministry of Health (Provided access to the PCR Laboratory test results)
Ministry of Health COVAX-ON (Provided regular cuts of data from the vaccine registry)

Knowledge Translation Partners:

Association of Ontario Midwives
Canadian Fertility and Andrology Society
CAN-COVID Pregnancy Network
COVID-19 Immunity Task Force
Ontario Public Health Association and Public Health Units
Prenatal Screening Ontario
The Provincial Council for Maternal Child Health (PCMCH) and the Regional Perinatal Networks of Ontario
Society of Obstetricians and Gynaecologists of Canada

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We may have inadvertently missed people who provided advice or direction to our project. We apologize, but please know your contribution was valued.

Accessibility Link – Long Description for Figure 1

Figure 1 is a line graph with the y-axis representing the SARS-CoV-2 positive cases in pregnancy by month on the x-axis from March 1, 2020 to March 31, 2022. There are 4 vertical lines representing the time periods of the prominent SARS-CoV-2 variants that were circulating in Ontario. The wild type variants were circulating from the start of the pandemic until April 2021, the delta variant was present starting in May 2021, the alpha variant was present until 2021 and omicron has been circulating since December 2021.

Table 1: Number of reported SARS-CoV-2 positive cases during pregnancy by month from March 1, 2020 – March 31, 2022.

Date reported	Total number of COVID-19 cases in pregnancy
MAR2020	29
APR2020	77
MAY2020	72
JUN2020	40
JUL2020	42
AUG2020	39
SEP2020	89
OCT2020	226
NOV2020	367
DEC2020	672
JAN2021	786
FEB2021	327
MAR2021	516
APR2021	1142
MAY2021	692
JUN2021	156
JUL2021	69
AUG2021	190
SEP2021	245
OCT2021	177
NOV2021	224
DEC2021	1748
JAN2022	4505
FEB2022	1473

MAR2022	1197

Return to Figure 1 on page 3.

Accessibility Link – Long Description for Figure 2

Figure 2 is a line graph with the y-axis representing the number of reported severe COVID-19 cases in pregnancy by month on the x-axis from March 1, 2020 to March 31, 2022. There are 4 vertical lines representing the time periods of the prominent SARS-CoV-2 variants that were circulating in Ontario. The wild type variants were circulating from the start of the pandemic until April 2021, the delta variant was present starting in May 2021, the alpha variant was present until 2021 and omicron has been circulating since December 2021.
Table 1: Number of reported severe COVID-19 cases during pregnancy by month from March 1, 2020 – March 31, 2022.

Date reported	Number of severe COVID-19 cases in pregnancy
MAR2020	< 6
APR2020	6
MAY2020	< 6
JUN2020	0
JUL2020	< 6
AUG2020	< 6
SEP2020	< 6
OCT2020	7
NOV2020	15
DEC2020	28
JAN2021	25
FEB2021	14
MAR2021	28
APR2021	93
MAY2021	60
JUN2021	13
JUL2021	6
AUG2021	18
SEP2021	15
OCT2021	16
NOV2021	13
DEC2021	33

JAN2022	77
FEB2022	35
MAR2022	29

Return to Figure 2 on page 4.