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EVIDENCE BRIEF

COVID-19 Variant of Concern Omicron (B.1.1.529): Risk Assessment, January 26, 2022

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Key Messages

- Current reporting of confirmed SARS-CoV-2 cases in some jurisdictions, including Ontario, is an underestimate of the true epidemiology of infections due to changes to testing strategies. Predicting the trajectory of current Omicron waves is further complicated by reports of increasing prevalence of the BA.2 Omicron sub lineage in some jurisdictions.

- Evidence continues to demonstrate that three doses of a COVID-19 vaccine provides greater protection from severe outcomes of Omicron variant infection compared to two doses. The duration of protection from a third dose or recent infection remains unclear, but early reports suggest third dose effectiveness against symptomatic infection shows waning at 10 to 16 weeks.

- The bulk of the evidence continues to demonstrate that infection with the Omicron variant causes less severe disease compared to infections with the Delta variant. Nonetheless, due to increased transmissibility of Omicron, the absolute number of severe cases poses a significant threat to health system capacity and critical infrastructure in many jurisdictions. At this time, there is insufficient data to comment on hospitalization outcomes, mortality, or long-term COVID outcomes.

- The current risk of Omicron transmission in Ontario is high, with a low degree of uncertainty. The risk of reinfection and breakthrough infection (after two doses of Pfizer, Moderna, AstraZeneca, or a heterologous combination) in Ontario is high with a low degree of uncertainty. The risk of severe disease, particularly amongst unvaccinated individuals, is moderate with a moderate degree of uncertainty. The overall risk assessment may change as new evidence emerges.

- Based on what is known about Omicron and its high transmissibility and high absolute number of severe cases in Ontario, increased or maintained community-based public health measures and accelerated vaccination efforts targeting those most at-risk of severe outcomes and onward transmission (e.g., those in congregate living settings and schools/daycares) can help protect Ontarians, ensure health system capacity to safely and optimally care for Ontarians, and limit disruption of critical infrastructure and in-person learning.

Issue and Research Question

Since its identification on November 8, 2021 in South Africa,[1] Omicron has become the dominant severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) variant in many countries. Since the last report on January 19, 20222 more evidence has emerged of Omicron's transmissibility, potential immune evasion, and disease severity. This brief updates the evidence since the previous Public Health Ontario (PHO) risk assessments,[3-9] and summarizes available evidence on the Omicron variant of concern (VOC) relevant to the risk of transmission in Ontario up to January 24, 2022, and reported epidemiology up to January 26, 2022.

Methods

PHO Library Services conducted daily searches of primary and preprint literature using the MEDLINE database (search strategies available upon request). In addition, PHO performed grey literature searches daily using various news feeds and custom search engines. English-language peer-reviewed and non-peer-reviewed (preprint) records that described Coronavirus Disease 2019 (COVID-19) variants were included.

Main Findings

Genomics

Since the last PHO Risk Assessment, additional studies have explored the origin of the SARS-CoV-2 Omicron lineage.[10,11] It remains unclear how Omicron evolved, but reports consistently conclude it did not originate from other VOCs.

The Omicron variant includes Pango lineages B.1.1.529, BA.1, BA.2 and BA.3. As of January 25, 2022, the BA.1 sub-lineage accounted for 98.8% of sequences submitted to GISAID, but some countries are reporting recent increases in the proportion of BA.2 sequences.[12] The Omicron sub lineage BA.2 does not contain the Spike (S) deletion at position 69-70 and is S-gene positive (SGTP).[13] Therefore, S-Gene Target Failure (SGTF) may no longer be considered sufficient to monitor Omicron and comparative analyses which use S-gene target results as the determinant of Omicron and Delta should be interpreted with caution if BA.2 is circulating at the time.

On January 21, 2022, the United Kingdom Health Security Agency (UKHSA) designated the BA.2 sub-lineage a variant under investigation (VUI). The number of BA.2 cases remains low in the United Kingdom (UK), but it was designated a VUI due to increasing case numbers both domestically and internationally.[14]

BA.2 replaced BA.1 as the dominant Omicron sub lineage in Denmark in mid-January. Preliminary calculations by Denmark's Statens Serum Institut estimate BA.2 to be 1.5 times more transmissible than BA.1., but the details of their analysis were not found on any publicly available, English language website at the time of writing.

Epidemiology

In Ontario, Canada:

- As of January 26, 2022, whole genome sequencing (WGS) from surveillance testing across Canada reported that of SARS-CoV-2 samples collected the week of January 2, 2022, 93.0% were Omicron, but data were still accumulating.[15] On January 26, 2022, Canada reported 14,165 new cases, 180 new deaths, 261,099 active cases, and the daily percent positivity (over the previous 7 days) was 19.4%. The Public Health Agency of Canada (PHAC) notes that due to changes in COVID-19 testing policies in many jurisdictions starting in late December 2021, case counts will under estimate the total burden of disease.

- In Ontario, on December 28, 2021, 80.4% of samples tested at the PHO laboratory exhibited SGTF, indicating that Omicron is the dominant circulating variant.[16] The PHO laboratory discontinued SGTF testing on December 30, 2021.

- Due to changes in the eligibility criteria for PCR testing in Ontario effective December 31, 2021, reported confirmed case counts are an underestimate of the true number of individuals with SARS-CoV-2 infection.

    - The Ontario 7-day confirmed case average increased from 838 on December 1, 2021 to 4,592 on December 23, 2021, 14,162 on January 6, 2022, 11,338 on January 11, 2022, and was 9,184 on January 18, 2022.[17]

    - On December 31, 2021 (i.e., the day on which changes to the eligibility criteria for PCR testing took effect), the percent positivity was 34.3%.[18] On January 8, 2022 (i.e., just over a week since the testing eligibility update), the percent positivity was 27.7%, and on January 25, 2022 the percent positivity was 14.1%.

    - As of January 25, 2022 there were 385 ongoing outbreaks in long-term care homes, 286 in retirement homes, 456 in congregate living settings, 219 in hospitals, and 28 workplace outbreaks.[19]

Notable epidemiological trends from select countries are:

- During the week of January 17 to January 23, 2022, the World Health Organization (WHO) reported over 21 million new COVID-19 cases across the WHO Regions.[12] Only three out of six regions reported an increase in the number of new weekly cases (Eastern Mediterranean Region [39%], South-East Asia Region [36%] and the European Region [13%]), as compared to five out of six regions in the previous week. New weekly deaths increased in the South-East Asia Region (44%), the Eastern Mediterranean Region (15%), and the region of the Americas (7%), but declined in all the other regions.

- According to modelling projections, the United States (US) Centers for Disease Control and Prevention (CDC) estimated that for the week ending January 22, 2022, 99.9% (95% Confidence Interval [CI]: 99.8-99.9)[20] of SARS-CoV-2 cases were Omicron.

    - As of January 19, 2022, the current 7-day moving average of daily new cases (744,616) decreased -5.0% compared with the previous 7-day moving average (783,922).[21]

    - The 7-day daily average hospitalizations for the week ending January 18, 2022, was 20,990, which is a 1.1% increase from the prior 7-day average (20,757) for the week ending January 11, 2022.[21]

- In the UK, >90% of a representative sample of specimens were Omicron based on SGTF in the last week of December 2021.[22] The United Kingdom Health Security Agency (UKHSA) reported that most surveillance indicators showed decreased COVID-19 activity in week 2 of 2022 (January 10 to 16), while other indicators remained stable.[23]

    - The COVID-19 hospitalization rate was at 17.62 per 100,000 in week 2 compared to 19.92 per 100,000 in the previous week.[23] The highest hospitalization rate for confirmed COVID-19 was in individuals aged 85 years and over. The intensive care unit (ICU) or high dependency unit (HDU) rate for COVID-19 was 0.56 per 100,000 in week 2, compared to 0.70 per 100,000 in the previous week. The highest ICU or HDU admission for COVID-19 were observed in the 65 to 74-year old range. Deaths with COVID-19 remained stable in the most recent week.

    - Between January 20 and January 26, 2022, 646,796 people had a confirmed positive test result, which is a decrease of -0.9% compared to the previous 7 days.[24] Between January 13 to January 19, 2022, 652,469 people had a confirmed positive test, which was a decrease of -37.2% compared to the previous 7 days. In the UK, 102,292 new cases were reported on January 26, 2022.[24]

    - Between January 16 and January 22, 2022, 12,721 individuals were COVID-19 positive upon hospital admission, which is a decrease of -15.2% compared to the previous 7 days.[24] Between January 9 to January 15, 2022, 14,927 admitted to hospital had a positive COVID-19 result, which was a decrease of -4.9% compared to the previous 7 days.

    - As of January 21, 2022, the reproduction number (R) for England ranged from 0.8 to 1.1, with a growth rate range of -6% to +1% per day.[25] Due to changes in behaviour during the December and January holiday period, and the lag in data, it is challenging to interpret trends in the current data. For the week ending January 22, 2022, the percentage of people testing positive for COVID-19 in England continued to decrease.[26] It is estimated that around 1 in 20 people have COVID-19 in England. The percentage of people testing positive for COVID-19 continued to increase for those aged two years to school Year six, and began to increase for school Year seven to school Year 11; however, the percentage of people testing positive decreased for all other age groups in the most recent week.

- In Denmark, the Omicron variant represented >90% of the confirmed SARS-CoV-2 cases based on analysis of data extracted January 7, 2022.[27]

- In Denmark, the 7-day rolling average of new cases per million people increased from 722 on November 30, 2021 to 7,158 on January 25, 2022.[28] On January 19, 2022, Denmark reported 46,747 new COVID-19 cases in the previous 24 hours.[29] On January 26, 2022, South Africa reported 4,514 new COVID-19 cases and a 10.6% positivity rate, which was similar to the previous week.[30,31]

Transmissibility

Modelling, in vitro and in-silico analyses support current epidemiological findings of Omicron having higher transmissibility and suggest potential mechanisms. It remains unclear to what extent the increased transmission of Omicron is due to inherent characteristics of the virus (i.e., enhanced ability to infect cells, tissue tropism) or due to immune evasion.[32]

Epidemiological Evidence

- A contact tracing study in Israel estimated the transmission rate of Omicron based on 51 contacts, 45 (88%) of whom were triple-vaccinated with the Pfizer vaccine and 47 (92%) of whom were masked; the index case was triple-vaccinated and pre-symptomatic at the time of exposure.[33] Only one contact (1/51, 2%), who was triple-vaccinated, became infected. This is a much lower attack rate than previous reports for Omicron. The authors suggest the lower rate may be due to reduced viral shedding in the pre-symptomatic phase due to the index case being triple vaccinated. In addition, most of the exposed contacts were triple-vaccinated, and wore facemasks during most exposures.

- A contact tracing study in Spain estimated the "global" secondary attack rate (SAR), which is the average secondary cases among all the relationships, to be 39% (36.5 - 42.2%) for Omicron cases. In contrast, the SAR for Delta was found to be 26% (25.3 - 27.4%) , which is a 13% decrease (9.9 - 16.1%; $p < 0.000$) relative to Omicron.[34] The SAR was also greater for Omicron compared to Delta in social (30.5% vs 16.2%) and occupational (31% vs 10.5%) settings, but was similar for household contacts (49.4% vs 48%). Unlike Delta cases, for Omicron, no differences were found between the SAR of vaccinated and unvaccinated cases.

- An analysis of 220 SGTF (presumed Omicron) and 869 non-SGTF (presumed Delta) serial intervals in the same week in the Netherlands revealed a mean serial interval of 3.4 days for Omicron and 3.9 days for Delta cases, within households.[35] The mean serial interval of 3.4 days (n=150) for Omicron within-household pairs was significantly shorter than the mean serial interval of 3.9 days (n=728) for Delta within-household pairs; however, there was no significant difference between the 3.1 days mean serial interval for the 70 Omicron between-household pairs and the 3.5 days mean serial interval for the 141 Delta between-household pairs (one-sided Welch's test, df = 165, $p = 0.15$). Using exposure information, the median incubation period was estimated to be 3.4 days for Omicron cases and 4.0 days for Delta cases, but the 95% posterior distribution of the difference included 0. The authors note that the contact tracing guidelines were different for Omicron and Delta cases during the study period, which could have impacted the observed serial intervals but would not account for the differences in within-household serial interval and the shorter Omicron incubation period. The authors conclude that the data suggests that the growth advantage of Omicron is partly due to a shorter serial interval.

In-vivo, In-vitro and Modelling Evidence

The human ACE2 (hACE2) receptor is used by SARS-CoV-2 to enter host cells; therefore, mutations that alter binding affinity or stability or tissue tropism (e.g., faster replication in human bronchi as opposed to lungs) could impact infectivity and transmission. Since the last PHO Risk Assessment,[2] more in vitro studies have reported evidence of Omicron exhibiting different tissue tropism,[36] and new in silico and electron micrograph studies have analyzed Omicron binding to the hACE2 receptor, with varied findings regarding binding affinity and proteolytic cleavage.[37-43] A few additional studies are highlighted below.

- An analysis of the IFN-α/β response to Omicron, Delta, and wildtype SARS-CoV-2 revealed that Omicron has an elevated ability to suppress IFN-β induction upon infection, and can better tolerate the antiviral activity of exogenous IFN-α.45 Of note, levels of viral RNA were comparable for all SARS-CoV-2 strains, which excludes the possibility that the Omicron response was due to less IFN-inducing RNA. In terms of sensitivity to exogenous IFNs, 50 units IFN/ml suppressed titers of wildtype SARS-CoV-2 and Delta by 10-fold or more, but Omicron titers remained within the same order of magnitude. 500 units IFN/ml were needed to suppress Omicron to a similar extent as 50 IFN/ml suppressed wildtype and 100 units IFN/ml suppressed Delta. The dose response slope of Omicron looked different than that of wildtype and Delta. The authors conclude that Omicron has gained an increased resistance to human type I IFNs.

- An analysis of differences in viral environmental stability between the SARS-CoV-2 wildtype and VOCs revealed that Omicron has the highest environmental stability at 25 degrees Celsius with 45% - 55% relative humidity, compared to Alpha, Beta, Gamma, Delta, and wildtype.46 In terms of survival time on plastic surfaces, the study reported (95% CI): wildtype: 56.0 hours (39.0 – 76.7), Alpha: 191.3 hours (152.5 – 232.1), Beta: 156.6 hours (122.7 – 192.9), Gamma: 59.3 hours (43.9 – 77.7), Delta: 114.0 hours (91.3 – 139.1), and Omicron: 193.5 hours (153.1 – 236.2). In terms of survival time (95% CI) on human skin surfaces: wildtype: 8.6 hours (6.5 – 10.9), Alpha: 19.6 hours (14.8 – 25.3), Beta: 19.1 hours (13.9 – 25.3), Gamma: 11.0 (8.1 – 14.7), Delta: 16.8 hours (13.1 – 21.1), and Omicron: 21.1 hours (15.8 – 27.6). The authors note that Omicron was completely inactivated (4 log reduction) by 40% ethanol alcohol within 15 seconds, and on constructed skin models, all VOCs were completely inactivated (4 log reduction) by 15 second exposure to 35% ethanol alcohol.

Diagnostics

Although most current molecular tests for SARS-CoV-2 are expected to be able to detect Omicron,[8] there is increasing evidence of reduced sensitivity, optimal detection windows and specimen site for rapid antigen tests, as previously described.[9] Recently, Nova Scotia Health compared the results of a common rapid take-home test using three sample sites: nasal swab; throat swab and a combined nasal/throat swab.[47] Compared to PCR test results, nasal or throat samples each detected 64.5% of cases; however, combining the nose and throat swabs increased sensitivity to 88.7%.

Clinical Presentation

Information continues to emerge regarding the signs and symptoms of Omicron and how they may differ from infection with other SARS-CoV-2 variants. The UK Covid-19 Infection Survey recently reported that individuals with Omicron-compatible infections were substantially less likely to report loss of taste or loss of smell compared to people with Delta-compatible infections, which has been reported elsewhere.[2,8,9,26,48] In December 2021, which was an Omicron-dominant period, 58% (95% CI: 57% to 59%) of people testing positive for COVID-19 reported specific symptoms, which was a decrease from November 2021 (pre-Omicron), when 65% (95% CI: 63% to 67%) of people testing positive reported symptoms. Omicron infections were associated with fewer lower respiratory tract symptoms and more upper respiratory tract symptoms, and increases in sore throat (thought this was also common in symptomatic PCR-negative participants). The authors note that the analysis is averaged over a period of transition from one variant-dominant period to another, and advise caution when interpreting this analysis.

Disease Severity

- There remain limitations with the Omicron severity literature (e.g., lag time to observe hospitalizations); however, the bulk of early evidence suggests Omicron causes less severe disease than Delta, and this is supported by several new studies that have emerged since the last PHO Risk Assessment;[49] however, there remains a moderate degree of uncertainty regarding disease severity. There remains insufficient data to comment on hospitalization outcomes, including progression of severity of illness, complications, and mortality. Select studies are highlighted below.

- A South African study comparing SGTF, non-SGTF, and Delta cases reported that after controlling for factors associated with hospitalization, SGTF cases had significantly lower odds of admission than non-SGTF cases (256/10,547 [2.4%] vs 121/948 [12.8%]; adjusted odds ratio [aOR] 0.2, 95% CI 0.1–0.3).[50] After controlling for disease severity factors, the odds of severe disease were comparable between hospitalized SGTF versus non-SGTF infections (42/204 [21%] vs 45/113 [40%]; aOR 0.7, 95% CI 0.3–1.4). After controlling for factors associated with disease severity, SGTF-infected individuals had significantly lower odds of severe disease (496/793 [62.5%] vs 57/244 [23.4%]; aOR 0.3, 95% CI 0.2–0.5), as compared to individuals with earlier Delta variant infections. Overall, the authors report that individuals with SGTF infections had an 80% lower odds of being admitted to hospital compared to non-SGTF infections, but the authors could not make any firm conclusions regarding the risk of severe disease among hospitalized individuals, potentially because of the low numbers of individuals in the analysis. Of note, data from South Africa may not be generalizable to the Ontario context due to differences in history of previous SARS-CoV-2 infection and vaccination status, as well as age distribution of the population.

- A single-centre retrospective cohort study in France characterized their first 1,119 cases of Omicron.[51] From the 825 patients with a known vaccination status, 383 (46.4%) were vaccinated, of whom 91.9% had received at least two doses of vaccine. Most (63.55%) of the patients were symptomatic, but the hospitalization rate was low (1.9%), and the median age of hospitalized patients was 49 years. One patient required intensive care. In contrast to Omicron cases, Delta cases during the same time period were significantly older, more likely to be symptomatic (77.6%), and the hospitalization rate was 6.2 times higher, transfer to ICU was 31 times more frequent, and lethality rate was 13 times higher.

- A cohort study in Portugal compared the risk of severe disease among patients infected with Omicron (BA.1) or Delta, in the same time period.[52] Cases were considered hospitalized if they were admitted within 14 days following a positiveSARS-CoV-2 PCR result. All models were adjusted for sex, age, previous infection, and vaccination status. Based on 15,978 participants, 9,397 were infected by Delta and 6,581 were infected with Omicron. In the Delta group, 148 (1.6%) were hospitalized, and in the Omicron group, 16 (0.2%) were hospitalized. From the 26 total deaths, all were in the Delta group. Adjusted HR for hospitalization for the Omicron group compared with Delta was 0.25 (95%CI 0.15 to 0.43). The length of hospital stay for Omicron patients was significantly shorter than for Delta (confounding-adjusted difference -4.0 days (95%CI -7.2 to -0.8). The odds of death were 0.14 (95% CI 0.0011 to 1.12), which is a reduction in the risk of death of 86% for the Omicron group, compared with Delta. The authors concluded that Omicron was associated with a 75% risk reduction of hospitalization compared with Delta and reduced length of hospital stay.

- A cohort study of long-term care facility (LTCF) residents in England compared the risk of hospital admission or death in residents who tested positive for SARS-CoV-2 in the period shortly before Omicron emerged (Delta dominant) and the Omicron-dominant period, with adjustments for age, sex, vaccine type, and booster vaccination.[53] The risk of hospital admission was substantially higher in 398 residents infected in the Delta-dominant period (10.8% hospitalized, 95% CI: 8.13-14.29) compared to 1,241 residents infected in the Omicron-period (4.01% hospitalized, 95% CI: 2.87-5.59, adjusted Hazard Ratio 0.50, 95% CI: 0.29-0.87, p=0.014). No residents with previous infection were hospitalized in either period. Overall, mortality was lower in the Omicron versus the pre-Omicron period, (p<0.0001).

Vaccine Effectiveness (VE)

Since the last PHO Risk Assessment,[2] more evidence has emerged demonstrating that two doses of COVID-19 vaccines are less effective at preventing Omicron breakthrough infections compared to other VOCs and 'wild-type' SARS-CoV-2, and a third COVID-19 vaccine dose increases short-term protection against symptomatic Omicron infection.[54-65]

- Using a high-throughput live SARS-CoV-2 neutralisation assay, a study analyzed neutralising antibody (NAb) titres (NAbTs) against Omicron and compared these to NAbTs against Alpha and Delta VOCs.61 At 2–6 weeks after two-dose vaccination with Pfizer, most (166 [83%] of 199) had a quantifiable NAbT against Omicron (median 50% inhibitory concentration [IC50] 122 [IQR 46–173]), but it was seven fold lower [95% CI 6.3–7.4] than NAbTs against Alpha (median IC 50 600 [IQR 384–1141]) and three fold [95% CI 2.8–3.3] lower than NAbTs against Delta (median IC 50 301 [IQR 171–572]. At 12–16 weeks after two-dose vaccination with Pfizer, approximately half of participants (69 [51%] of 136) had a quantifiable NAbT against Omicron, whereas almost all had a quantifiable NAbT against Alpha (131 [96%] of 136) and Delta (132 [97%] of 136). The decrease in Omicron NAbT 10 weeks after the second dose was significant ($\chi 2$ p<0.0001). The same analysis but following two-dose vaccination with AZD1222 (Oxford-AstraZeneca COVID-19 vaccine) found that less than half of participants had quantifiable NAbT against Omicron 2–6 weeks after the second dose (25 [37%] of 68), which dropped further (5 [19%] of 26) 12–16 weeks after second dose, but most participants had a quantifiable NAbT against Alpha (59 [87%] of 68) and Delta (52 [76%] of 68) 2–6 weeks after second dose of AZD1222. The authors conclude that a three-dose vaccination might increase population immunity against current VOCs, including Omicron.

In-Vitro and Modelling Evidence of Vaccine Efficacy

Since the previous PHO Risk Assessment,[2] additional studies have reported reduced antibody levels and function against Omicron compared to wild-type SARS-CoV-2 and other VOCs in two-dose vaccinated and/or previously infected individuals.[54-58,61,63-65] There is additional evidence to support previous reports that despite the numerous mutations in Omicron, T cell recognition of Omicron is largely preserved.[11,39,42,60,62,66,67] Select reports are highlighted below.

- A study using sera from the Pfizer-BioNTech clinical trials C4591001 and NCT04368728 investigated antibody neutralization against Omicron (engineered) and wildtype virus titres after 2 and 3 doses of Pfizer vaccine, up to four months.[64] Plaque reduction neutralization results showed that at 2 or 4 weeks after the second dose, the neutralization geometric mean titers (GMTs) were 511 and 20 against the wild-type and Omicron-spike viruses, respectively, indicating two doses of Pfizer were insufficient to elicit robust neutralization against Omicron. One month after the third dose, neutralization GMTs increased to 1342 and 336, respectively, suggesting three doses of vaccine increased the magnitude of neutralization against Omicron. At 4 months after the third dose, neutralization GMTs decreased to 820 and 171, for wildtype and Omicron, respectively, which was a similar decay in neutralization for both.

Breakthrough Infections and Reinfections

As more individuals in a population become vaccinated, a greater proportion of SARS-CoV-2 infections will occur in vaccinated individuals. However, this does not mean that vaccinated individuals are more likely to get infected. Since the last PHO Risk Assessment,[2] more evidence has emerged characterizing breakthrough infections caused by Omicron. Two are highlighted below.

- The January 19, 2022 update of the UK Coronavirus (COVID-19) Infection Survey analyzed 26,528 participants "at risk" of reinfection and identified 917 reinfections between July 2, 2020 and January 9, 2022.26 The risk of reinfection was 16 times higher in the Omicron period compared with the Delta-dominant period.

- A single-centre retrospective cohort study in France characterized the first 1,119 cases of Omicron.[51] From the 825 Omicron cases with a known vaccination status, 383 (46.4%) were vaccinated, of whom 91.9% had at least two doses of vaccine.

Measures in Response to Omicron

This section was informed by scanning government websites and searches in the Google search engine for literature related to Omicron, public health measures, and vaccination programming; thus, some relevant articles may not be included. The following jurisdictions were searched on January 25, 2022: Denmark, England, Finland, France, Germany, Ireland, Israel, Italy, Netherlands, Norway, Portugal, New York State, and California.

Changes to Public Health Measures

All included jurisdictions implemented public health measures in response to the emergence of Omicron. However, more recently, most jurisdictions are shifting focus to emphasize vaccination and are expressing interest in or have already started removing restrictions. Since the last Risk Assessment,[2] the following changes to public health measures were identified in select jurisdictions:

- Some jurisdictions announced or have already started easing measures including removing mask mandates (e.g., England, France)[68,69] and work-from-home mandates (e.g., England, France, Ireland),[68-70] lifting the use of a health pass system (e.g., England, Ireland),[68,70] reopening venues (e.g., France, Netherlands),[69,71] or removing capacity and/or gathering limits (e.g., France, Ireland).[69,70]

- Some jurisdictions discussed or have already tightened vaccine pass eligibility by removing the third option of showing proof of a negative test result (e.g., France, Finland)[69,72] and validity by shortening the amount of time a pass is valid post infection and vaccination (e.g., Germany).[73] Italy increased use of their health pass system.[74]

- Some jurisdictions extended the measures already in place until February 2022 (e.g., Germany, New York State).[73,75]

- The US announced that 400 million high-grade N95 masks would be given to Americans free of charge (likely through pharmacies and community health centres).[76]

Changes to Vaccination Programming

Since the last Risk Assessment, the following changes to vaccination programming were identified in select jurisdictions:

- Some jurisdictions increased vaccinations either through a fourth dose (e.g., Ireland),[70] a booster dose for adults (e.g., Portugal),[77] or through vaccination campaigns (e.g., New York State).[78]

- California introduced two bills that, if approved, would allow children age 12 years and older to be vaccinated, including the COVID-19 vaccine, without parental knowledge or permission and would add the COVID-19 vaccine to the list of required vaccines for kids attending K-12 schools.[79] There are no details available on when these bills might be passed; however, if passed, both bills will go into effect on January 1, 2023.[80]

Ontario Risk Assessment

- The current risk of Omicron transmission in Ontario is high, with a low degree of uncertainty. The risk of reinfection and breakthrough infection in Ontario is high with a low degree of uncertainty, while the risk of severe disease, particularly amongst unvaccinated individuals, is moderate, with a moderate degree of uncertainty. The volume of cases due to the increased transmission of Omicron presents risks to testing capacity and as a result, risks to surveillance quality. The incidence of severe cases due to increased transmission is a threat to health system capacity.

- The overall risk assessment may change as new evidence emerges (see Table 1).

Table 1. Risk Assessment for Omicron B.1.1.529

Issues	Risk Level	Degree of Uncertainty
Increased Transmissibility	High	Low
Disease Severity	Moderate	Moderate
COVID-19 Re-infection	High	Low
Lowered Vaccine Effectiveness/Breakthrough Infections	High	Low
Impacts on Testing/Surveillance	Moderate	Low

Implications for Practice

The epidemiology of Omicron in Ontario is more challenging to interpret due to the rapid increase in Omicron cases and changes in eligibility for PCR testing, which makes metrics such as the reproduction number and confirmed case rate an underestimate. As a result, it is difficult to identify when an Omicron wave has peaked in Ontario and in some other jurisdictions. The changes to testing also require the identification of new data sources and new models for projections.

The evidence for three vaccine doses providing additional protection against symptomatic infection and good protection from hospitalization is strong, making three dose vaccinations (and four doses, in those eligible) a key public health tool in the current Omicron context. To prevent inequities, all eligible individuals require support to access third doses. In addition, it is essential that efforts continue to have all eligible persons who have not yet received their first and second doses vaccinated, as those who are not fully vaccinated continue to be at risk for more severe outcomes.

Public health measures (e.g., masking, capacity limits), ongoing efforts to vaccinated all eligible individuals and accelerated booster vaccinations are important to mitigate the surge in Omicron cases, reduce population morbidity and mortality, and address impacts to the health system.

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