

# Coronavirus disease (COVID-19)



## Priority strategies to optimize testing and screening for primary and secondary schools



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# Executive summary

In November 2020, the Minister of Health established the COVID-19 Testing and Screening Expert Advisory Panel. The Panel provides evidence-informed advice to the federal government on science and policy related to existing and innovative approaches to testing and screening.

The Panel issued its first report [Priority Strategies to Optimize Testing and Screening for COVID-19 in Canada](#) in January 2021. It issued its second report [Priority Strategies to Optimize Testing and Screening for COVID-19 in Long-Term Care](#) in February 2021.

This third report provides recommendations for testing and screening strategies in primary and secondary schools. The report aims to support ongoing operation of in-person learning while continuing to minimize community transmission of COVID-19. These recommendations are supported by case studies.

While a robust body of evidence is not currently available, the case studies serve as an example of how a screening test strategy could be implemented for schools where warranted. The Panel urges a awareness of evaluations as well as the academic literature about screening to ensure that the strongest available evidence guides decision-making.

The Panel's recommendations are focused primarily on communities with high prevalence of COVID-19 (as defined by each jurisdiction). For this reason, they should not be interpreted as being prescriptive, nor as a one-size-fits-all approach. In low-prevalence communities, school closures are less likely. In these communities, screening test strategies could have negative consequences, such as interrupting learning or diverting COVID resources from other priority areas.

Testing and screening are only one part of any jurisdiction's response to the COVID-19 pandemic.

For this report, the Panel considered advice from medical experts. We also looked to the [Pan-Canadian COVID-19 Testing and Screening Guidance](#), which creates a framework around diagnostic tests, screening tests and surveillance. Our recommendations also build on:

- existing guidance (for example, from the [Public Health Agency of Canada](#)) for public health authorities on the potential risks and mitigation strategies for schools
- [procedures](#) from provinces, territories and local public health authorities

Regional and temporary closures of primary and secondary schools and classes may have wide-reaching effects on child development. This makes the resumption of in-person education a high priority.

Efforts to undertake screening strategies in schools are multi-layered. Medical officers of health and public health officials across Canada make decisions daily on how to prioritize diagnostic and screening test resources. Strategies for allocating testing resources for schools must be driven by the following considerations:

- local context
- community diagnostic testing capacity
- community prevalence
- vaccination status of teachers and staff
- consideration for prioritizing testing where there is the greatest benefit

Allocation decisions should ensure that public health personnel or resources remain available for symptomatic testing.

While the cost-benefit relationship is not yet fully understood, in-person learning is critical for children's social development. Testing and screening strategies should reduce the impacts on families and build additional confidence about safety for many parents, students and staff. Breaking the chains of transmission through increased early case detection will reduce the impact on students.

However, the implementation of test-based screening strategies cannot replace other prevention and mitigation measures that have often reduced transmission in schools, homes and the community. A screening strategy for COVID-19 in any setting should be considered if it can prevent the introduction of SARS-CoV-2 or reduce its transmission.

However, it may be appropriate (for example, where community prevalence is low) for schools to prioritize in-person learning without implementing a screening test strategy.

This report's scope includes all jurisdictions, whether they have been able to avoid widespread disease and health system overload, or those regions that have been impacted severely by the pandemic. In this context, the Panel's recommendations respect unique provincial, territorial and local responses to COVID-19, given the differing epidemiological and sociocultural contexts. The Panel's recommendations focus on 5 priority areas for action:

1. Ensure the design of testing and screening strategies for schools addresses equity
2. Make diagnostic tests for symptomatic students and staff a priority
3. Let community prevalence guide screening test strategies and testing frequency
4. Establish innovative partnerships to address staffing requirements for screening
5. Undertake further research to evaluate and inform testing and screening strategies
  - improving sample collection for children
  - pooling samples to increase the number of specimens tested when appropriate
  - evaluating screening test strategies

The Panel recognizes that it may be appropriate for jurisdictions to adopt some of the recommendations in this report and not others based on their unique circumstances.

# Table of contents

<b>Executive summary.....</b>	<b>i</b>
<b>Table of contents.....</b>	<b>iii</b>
<b>The Expert Advisory Panel and reports .....</b>	<b>1</b>
Mandate of the Panel .....	1
Plan for reports.....	1
Consultation .....	1
Guiding principles.....	1
Terms .....	2
Acknowledgements.....	2
<b>Preamble.....</b>	<b>3</b>
<b>Ensure the design of testing and screening strategies for schools addresses equity.....</b>	<b>5</b>
<b>Make diagnostic tests for symptomatic students and staff a priority .....</b>	<b>7</b>
<b>Let community prevalence guide screening test strategies and testing frequency.....</b>	<b>9</b>
<b>Establish innovative partnerships to address staffing requirements for screening strategies .....</b>	<b>11</b>
<b>Undertake further research to evaluate and inform testing and screening strategies.....</b>	<b>13</b>
Improving sample collection for children.....	13
Pooling samples to increase the number of specimens tested .....	14
Evaluating screening test strategies .....	14
<b>Conclusion.....</b>	<b>15</b>
<b>Annex 1: Key terms.....</b>	<b>17</b>



# The Expert Advisory Panel and reports

## Mandate of the Panel

The COVID-19 Testing and Screening Expert Advisory Panel aims to provide timely and relevant guidance to the Minister of Health on COVID-19 testing and screening.

The Panel's mandate is to complement, not replace, evolving regulatory and clinical guidance regarding testing and screening. Our reports are responsive to federal, provincial and territorial needs, as all governments seek opportunities to integrate new technologies and approaches into their COVID-19 response plans. The Panel recognizes that it may be appropriate for jurisdictions to adopt some testing and screening strategies and not others based on evidence, local epidemiology and a jurisdiction's policy context.

## Plan for reports

The focus of the first Panel report included 4 immediate actions to optimize testing and screening including:

1. optimize diagnostic capacity with lab-based PCR testing
2. accelerate the use of rapid tests, primarily for screening
3. address equity considerations for testing and screening programs
4. improve communications strategies to enhance testing and screening uptake

The second report focused on testing and screening strategies in the long-term care sector. This third report provides a perspective on how the recommendations from the first report can be applied to schools.

## Consultation

The Panel consulted with more than 40 health experts, public policy experts, education experts and other stakeholders who are contributing to the COVID-19 response. We will continue to consult with a variety of stakeholders as we prepare further reports.

## Guiding principles

Public health initiatives benefit from incorporating principles to prevent unintended harm, promote equity and increase accountability. Panel discussions and engagement with stakeholders highlighted a number of key principles to consider in its guidance. These principles align with the framework outlined in the Canadian National Advisory Committee on Immunization guidance and are based on ethics, equity, feasibility and acceptability. The Panel applied these principles in framing its guidance.

This report contains the Panel's independent advice and recommendations, which were based on information presented and made available to it.

## Terms

Some of the terms used in the report may not be familiar to all readers. A glossary of terms is included in an annex for reference. For the purpose of this report, the Panel describes key terms as follows:

- **diagnostic test/testing:** used to identify current infection in an individual and is performed when a person:
  - [has symptoms consistent with COVID-19](#) or
  - has no symptoms but has had high-risk exposure to SARS-CoV-2, as defined by public health guidance (for example, is an asymptomatic close contact)
- **primary school student:** children aged 4 to 14 years in kindergarten to grade 8
- **screening test/screening:** used to identify infected individuals who have no symptoms and no known or suspected exposure to SARS-CoV-2
- **secondary/high school student:** students aged 14 to 19 in grades 9 to 12

## Acknowledgements

The Panel expresses its appreciation to the ex officio members of the Panel and to officials at Health Canada who have been working tirelessly to support the Panel. The Panel also acknowledges the contributions of the "shadow panel" on testing and screening a group of students and young scientists who provided expert research and analytical assistance. Shadow panel members include Michael Liu, Matthew Downer, Tingting Yan, Sara Rotenberg, Netra Unni Rajesh, Jane Cooper and Rahul Arora.

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# Preamble

Maximizing the time that schools are open during the COVID-19 pandemic is crucial for students, teachers, families and communities across the country. There is some evidence demonstrating the [substantial and direct effects of school closures on many students](#). As a result of the pandemic, students have suffered [learning loss](#), [food insecurity](#), [loss of support and therapy programs](#), and [social isolation](#). These impacts are especially [serious](#) for students with pre-existing mental health conditions, insecure home situations and/or disabilities.

School closures also impact parents and teachers, particularly women. Challenges include balancing child supervision with work, childcare constraints (particularly for essential workers) and increased stress from shifting to virtual learning. This has led to an unprecedented drop in labour force participation [among women](#). [Existing inequities](#) exacerbate these factors for low-income, single-parent and racialized families, families with children with disabilities and families without English or French as a first language.

These factors underlie the need to maintain in-person school operations to the extent possible. Despite the many benefits to in-person learning, the possibility of introducing SARS-CoV-2 into homes can be a source of stress for parents, teachers, staff and students.

The Panel recommends that existing preventative practices continue in schools. This is consistent with the [Public Health Agency of Canada](#) and provincial, territorial and local public health guidance on such things as:

- symptom screening
- hand washing
- wearing masks
- physical distancing
- use of cohorts
- adequate ventilation

Children and youth under the age of 19 account for approximately [17%](#) of the COVID-19 cases across Canada in March 2020. However, compared with adults, children make up a much [lower proportion](#) of Canadians who experienced hospitalization, severe disease outcomes and death. Children are likely to [be asymptomatic](#) or exhibit [milder disease symptoms](#). In other words, they may have SARS-CoV-2 infection but not COVID-19. Therefore, prevalence and infectiousness in children may be [underestimated](#) since testing programs have generally and appropriately focused on symptomatic people.

As a result, there is [limited consensus](#) on the transmission of SARS-CoV-2 from children and youth in different settings, including through household [transmission to adults](#). There is also limited evidence of transmission among children in [school settings](#).

There is significant evidence on SARS-CoV-2 variants of concern as well as changing degrees of ongoing community spread. For example, while COVID-19 prevention measures differ between countries, there is evidence in England of within-school transmission, with [31%](#) of school settings reporting COVID-19 cases. Since children are less likely to become severely ill from COVID-19, but may still spread SARS-CoV-2, screening test strategies in schools also include preventing the introduction of SARS-CoV-2 into homes and the community.

Screening test strategies may not be warranted for all schools, especially those that have no cases or have very low community prevalence. In these situations, screening strategies may create negative consequences. For example, in low-prevalence settings, positive results from rapid tests may be false-positives, leading to unnecessary loss of

work and missed classes due to [isolation requirements](#). Implementation of a screening strategy should be specific to the community. It should also consider the benefits, feasibility and broader community context.

For schools in First Nations, Inuit and Métis communities, the Panel emphasizes the need for Indigenous-led approaches to ensure that the strategy identifies and meets the community's needs.

# Ensure the design of testing and screening strategies for schools addresses equity

In our [first report](#), the Panel recommended considering equity in testing and screening measures. Strategies should consider the local context and be designed to improve access to testing and screening in under-served and higher-risk communities.

COVID-19 has highlighted and amplified existing health inequities in Canada. Testing and screening strategies for schools must address equity issues, with specific thought given to students:

- from families of lower socio-economic status
- living in multi-generational households
- living in rural, remote and Indigenous communities
- with disabilities

It is also important to consider the disproportionate impact of COVID-19 [and school closures on racialized](#) communities and disadvantaged neighbourhoods.

Access to testing can influence testing uptake, including access to testing facilities due to their hours, location, physical barriers and inaccessible environments. Limited access to screening programs and testing centres may be attributed to several factors, such as:

- operating hours
- inaccessible environments
- centralized locations
- communication strategies
- the method by which appointments are allocated

The Panel recommends that screening strategies for schools address reach, accessibility issues and cultural safety, particularly in economically disadvantaged communities with high prevalence of COVID-19. Screening strategies should consider screening tests within the school setting or at a location that is accessible and within walking distance. This location should be safe and inclusive (for example, a community centre).

As identified in our first report, understanding and addressing reasons for avoiding testing is critical to increasing youth and parental willingness to seek testing.

Mobile screening units are an innovative approach to addressing accessibility issues. They bring testing or [sample collection](#) to the community or school, where resources are available to do so. For example, [Nova Scotia](#) deployed 2 mobile testing vans, staffed by nurses and public health staff, to help test children and facilitate contact tracing. The mobile testing vans are currently being sent to schools with a confirmed case or a high community prevalence of COVID-19.

Finally, many families include members whose first language is not French or English. The Panel recommends that screening programs for schools consider language, knowledge and accessibility barriers in all communications to family members of school-aged children. Messaging needs to be simple, clear and understandable for all literacy levels. As well, it should be available in multilingual and alternative formats, to better communicate information on testing and screening programs for schools.



## Make diagnostic tests for symptomatic students and staff a priority

Most schools already require parents and students to screen for symptoms first thing in the morning. For example, students and staff in British Columbia must monitor for symptoms using the [daily health check application](#). The application uses a series of questions to help determine whether children should go to school.

[Public health guidance](#) advises symptomatic students to stay away from school. Students who develop symptoms during school should be isolated and go home. Public health authorities will provide guidance for siblings and household members as required.

The Panel recommends diagnostic testing with lab-based PCR at test centres for all students, teachers and staff with symptoms, as well as known contacts as [defined by public health](#). The Panel recommends making the turnaround of results for symptomatic testing a priority in order to allow public health to initiate case management as soon as possible. This is important particularly in the presence of [variants of concern](#) that are more transmissible. Local public health authorities retain discretion to initiate school or class closures as needed to manage outbreaks.

### Case Study

[Manitoba](#) is piloting a Fast Pass testing program for school staff who:

- have COVID-19 symptoms
- have been in close contact with someone at school who's been exposed or
- have a household member with symptoms

This rapid testing program uses the Songbird Hyris bCUBE PCR rapid test, which uses nasal swab samples. Staff receive the results within hours. Positive test results allow for faster case management, quarantine and contact tracing. Negative test results require confirmation at Manitoba's provincial laboratory.



# Let community prevalence guide screening test strategies and testing frequency

Test-based screening is the process of testing people with a low probability of having COVID-19. This means they [are asymptomatic and have](#) not been in close contact with someone with COVID-19.

Screening tests are typically used to identify asymptomatic individuals. People who don't show symptoms may be infectious for [up to 3 days](#) before symptoms appear or may remain asymptomatic yet [transmit the virus](#) to others. For a screening strategy to be most effective, [community prevalence](#) is an important measure for guiding the strategy and test [frequency](#). Further, these strategies must ensure [rapid turnaround times](#) on [test results](#).

Where PCR tests are available, they can be used as screening tests for greater accuracy. Alternatively, lower-sensitivity tests like rapid antigen tests (RATs) can be used to complement this capacity.

As we describe in our first report, point-of-care (PoC) rapid tests, such as RATs and PoC PCR tests, allow for rapid turnaround times (within 15 minutes to 1 hour). Most PoC tests are not as sensitive as laboratory-based PCR tests. However, when properly used, they may be [useful tools](#) to identify people who are asymptomatic. Thus, they can help to reduce transmission.

The Panel recognizes that 30% to 50% of children with SARS-CoV-2 [infection are asymptomatic](#). We encourage screening test strategies where community prevalence suggests it would be beneficial. We also recommend the use of rapid tests to screen for COVID-19 cases as a complement to lab-based PCR test capacity. When a student, teacher or staff tests positive with a rapid test, we recommend a follow-up diagnostic test (lab-based PCR) to verify the result. These individuals should also be isolated according to public health guidance.

## Case Studies

The [Kingston, Frontenac, Lennox and Addington Public Health Unit](#) is conducting screening tests at COVID-19 assessment centres for asymptomatic individuals, including students and teachers, who:

- have travelled outside the region or
- have had visitors from outside the region in the last 14 days

In [Montreal](#), 2 high schools were randomly testing 25% of staff and students every week using RATs. The project examined the impact of bringing students and teachers back to school after 7 days of isolation versus 14 days. RATs were used to monitor those who return from isolation early. The project found that deploying rapid tests randomly is not worth the time, energy and [investment required](#).

[Ontario](#): Ontario recently directed larger school boards to offer targeted testing and screening of its student population. This approach targets resources in high-transmission or high-prevalence areas, maximizing the impact of school, school board and public health capacity. For example, [Ottawa Public Health](#) collaborated with school boards and the Children's Hospital of Eastern Ontario to run school-based rapid testing clinics in high-prevalence areas of the city. The goal was to prevent spread of the SARS-CoV-2 at home, in schools and in the community. Over 3 weekends, 2,336 individuals from 47 different schools were tested. Twenty participants tested positive, 9 of whom were students.

Over the past months, Canada has seen numerous cases of SARS-CoV-2 variants of concern. These include B.1.1.7, which was first identified in the UK, and B.1.351, first identified in South Africa. [Variant B.1.1.7](#) is more contagious, and the UK has reported that children have been [vectors of this variant](#).

While preventative measures in schools differ between the UK and Canada, the presence of variants of concern should be considered when designing school screening strategies.

When at least one positive case in the school is linked to a variant of concern, the Panel recommends both diagnostic testing of contacts and broad-based screening testing to break the chains of transmission. Where diagnostic test capacity is constrained, screening tests can be used for lower-risk contacts.

Public health guidance should determine the strategy for implementation, the individuals targeted and the testing frequency. Lab-based PCR tests are used to confirm diagnosis of COVID-19 after a positive rapid test.

To be effective, screening test strategies for schools should:

- consider community diagnostic testing capacity
- be convenient and accessible for students, staff and families
- be appropriately planned, implemented, evaluated and adapted
- allow for flexibility based on the local context (for example, fewer COVID-19 outbreaks have been identified in [primary schools compared to secondary schools](#))

Results should also be available quickly to facilitate rapid isolation, contact tracing and quarantine.

Decisions on when and how frequently to screen should be developed in conjunction with public health's assessment of the local context and resource capacity, including:

- community prevalence
  - if community prevalence is higher, then screening tests could be more frequent
  - if community prevalence is lower, then screening tests could be less frequent or unnecessary
- outbreak status (as defined by the jurisdiction)
  - if there is no outbreak at the school, then screening tests could be less frequent or unnecessary
  - if there is an outbreak at the school, then screening strategies could be more frequent
- presence of variants of concern
  - if a variant of concern is in the community, then it may be appropriate to implement more screening tests if community prevalence suggests this would be beneficial

Consideration must be given to the potential costs and benefits of undertaking screening tests for schools as compared to other public health measures (for example, potential unintended impacts on capacity for vaccination). It is also important to note that screening strategies for schools will require dedicated resources that are appropriate to the frequency and intensity of the strategy. The Panel recognizes that public health authorities across Canada have limited resources. We understand that priority decisions are often based on limited evidence and short timelines.



## Establish innovative partnerships to address staffing requirements for screening strategies

As recommended in our first report, shifting the screening and testing process to other trained professionals presents an opportunity to reduce the strain on health care workers. The following are human resource and task-shifting recommendations for schools:

- use a wide variety of professionals (for example, pharmacists, paramedics) to collect samples
- train parents to collect samples from primary school students using techniques and kits at home
- train secondary students to collect their own samples using techniques and kits without the need for health care professional supervision
- consider the use of third-party professionals to undertake systematic testing and screening
- establish innovative partnerships and collaborations to address staffing requirements to implement screening programs

### Case Study

England: The Ministry of Defence deployed 2,700 service personnel to run 218 mobile testing units to support COVID-19 testing around the country. In July 2020, the armed forces announced that they would be training civilian contractors to continue testing.



# Undertake further research to evaluate and inform testing and screening strategies

## Improving sample collection for children

Repeated nasopharyngeal swabs can impact the success of school-based screening test programs. They can be [uncomfortable and cause anxiety for some children](#).

Swish-and-gargle, spit or nasal sample collection are 3 examples of more accessible approaches.

In swish-and-gargle, the person swishes and gargles salt water before spitting the sample into a tube. However, young children may find it hard to gargle or may dislike the taste of the salt-water solution. There may also be additional considerations for remote or isolated communities.

Spit sample collection (called “neat saliva” collection) involves spitting [into a funnel](#) or [straw](#).

Unlike nasopharyngeal swabs, nasal swabs do not require a swab to be inserted as far into the nose. This option may be more effective for collecting samples from children.

### Case Study

[British Columbia](#) was the first province in Canada to introduce swish-and-gargle tests for school-aged children. Since then, [New Brunswick](#), [Yukon](#) and [Ontario](#) have also introduced or recommended this option for children between the ages of 4 and 12.

There is more and more evidence on the use of less invasive sampling methods and alternative rapid testing technologies using saliva. Alternative sampling methods will require further discussions between federal and provincial/territorial governments to ensure an adequate supply of tests and sample collection devices. For example, swish-and-gargle and spit sample collection methods could impact laboratory capacity. Both methods are more suited for analysis by lab-based PCR, not for rapid tests with lower sensitivity. However, pooling the samples could reduce the load on public health laboratories and accelerate processing.

The Panel also recognizes the utility of self-administered screening tests for older students, teachers and school staff, as well as parents of younger school-aged children. Studies have found that older students can [successfully collect](#) their own test samples using nasal swabs for RATs or point-of-care PCR tests. Home tests may become available in Canada within the next few months and could be considered by schools in future screening test strategies.

### Case Studies

Quebec: The [Laval region](#) began a project in primary and secondary schools that tests saliva samples for SARS-CoV-2 using PCR. Students are able to take the test at home and return it to a screening clinic without having to wait or book an appointment.

[Austria](#) is sending self-collected nasal test kits home with students, teachers and staff for testing [twice a week](#). Students who test positive are re-tested with a PCR test.

## Pooling samples to increase the number of specimens tested

When a jurisdiction has limited lab-based PCR test capacity, sample pooling can be used to increase the number of specimens for testing at one time. Pooling involves mixing several samples in a batch, then testing this pooled batch for SARS-CoV-2. This approach increases testing capacity and preserves material needed to assess samples. Any pools with positive tests are re-tested individually, which does add to the time to process and receive test results. The Canadian Public Health Laboratory Network has prepared [guidelines](#) on sample pooling for SARS-CoV-2 tests.

Pooling works best in areas of low community prevalence. However, pooling may not be possible in jurisdictions where there are capacity constraints.

The Panel recommends that pooling be used with tests that can detect very small concentrations of SARS-CoV-2, such as lab-based PCR. Further evaluation would be helpful to determine how best to introduce this approach for school-based settings.

## Evaluating screening test strategies

The Panel acknowledges the lack of quality evidence to support the implementation of specific test-based screening strategies for schools. The pandemic has required jurisdictions to react quickly to control the spread of SARS-CoV-2, including by implementing asymptomatic screening test strategies in schools or other sectors. Given the urgency to deploy measures to address the pandemic, these strategies may not have been designed with evaluation in mind.

It is too early to report on the effectiveness of many of the case studies featured in this report. Wherever possible, the success of these strategies at reducing SARS-CoV-2 transmission and the efficient use of resources should be [evaluated](#). Clear details on program objectives and evaluation methods will pave the way for other jurisdictions to implement or discontinue similar programs.

Finally, [sharing metrics](#) from implemented strategies could help to increase confidence in the safety of the learning environment for parents, staff and students. Provinces and territories have limited resources. They could benefit from the lessons that different jurisdictions have learned about their school-based screening experiences.

## Conclusion

The ongoing operation of in-person learning in schools is essential to the social and intellectual development and mental health of students and families.

The foundation of an effective public health response is the “find, test, trace, isolate and support” strategy. In this report, the Panel presents considerations to support testing and screening approaches for schools where warranted, with the aim of ongoing in-person learning. Jurisdictions will need to continually evaluate and adapt testing and screening strategies based on the evolving epidemiological conditions in communities, resource capacity, new technologies, and the lessons learned.

The Panel’s recommendations focus on 5 priority areas for action:

- Ensure the design of testing and screening strategies for schools addresses equity
- Make diagnostic tests for symptomatic students and staff a priority
- Let community prevalence guide screening test strategies and testing frequency
- Establish innovative partnerships to address staffing requirements for screening
- Undertake further research to evaluate and inform testing and screening strategies



## Annex 1: Key terms

**Antigen test:** A test that detects the presence of a specific protein that is part of the SARS-CoV-2 virus rather than the genetic material from the virus

**Asymptomatic person:** An individual without COVID-19 symptoms

**B.1.1.7:** SARS-CoV-2 variant of concern first detected in the United Kingdom

**B.1.351:** SARS-CoV-2 variant of concern first detected in South Africa

**COVID-19:** Coronavirus disease caused by SARS-CoV-2

**Genome:** Complete set of genetic material

**Genome sequencing:** A process that determines the order of nucleotides in a genome

**Isolation:** Keeping someone who is sick or has tested positive for COVID-19 away from others

**Outbreak:** One or more positive cases of COVID-19 in a long-term care home

**PCR:** Polymerase chain reaction

**PoC:** Point-of-care

**Point of care:** Completed outside the clinical laboratory at or near where a patient is receiving care

**Prevalence:** The proportion of a population with COVID-19 at a given time

**Quarantine:** Keeping someone who was in close contact with someone who has COVID-19 away from others

**RAT:** Rapid antigen test

**SARS-CoV-2:** Severe acute respiratory syndrome coronavirus 2, the coronavirus that causes COVID-19

**Screening:** Intended to identify infected persons who are asymptomatic and without known or suspected exposure to COVID-19

Usually performed to identify persons who may spread the virus so that measures can be taken to prevent further transmission

**Sensitivity:** The ability of a test to correctly identify those who have COVID-19 at the time the specimen was collected for laboratory analysis

**Surveillance:** Population-wide approaches undertaken to inform public health actions, such as wastewater monitoring

**Task shifting:** Re-distribution of tasks among different types of health workers (for example, nurses, pharmacists) to improve the use of resources and the provision of services

**Testing:** Intended to identify current infection in an individual and is performed when a person signs or symptoms consistent with COVID-19 or had recent known or suspected exposure to COVID-19

**Turnaround time:** The time it takes from the time a sample is collected from an individual until the test results are available

**Variant of concern:** SARS-CoV-2 that have mutated to be more transmissible and/or cause more severe illness



