



PINNACLECARE



Medical Intelligence Report

Date: February 1, 2022

KeyBank, NA, or its affiliates ("Key") is providing these materials for informational purposes. Key has not reviewed the materials for accuracy or completeness, and the studies and research referenced may change as more information becomes available. The material is not intended as medical advice. Please consult your personal health provider if you have any questions or concerns about any symptoms you or a member of your family are experiencing and before starting any treatments discussed in the materials. Pinnacle is not an affiliate of Key. This material should in no way be considered to be a solicitation by Key for business on behalf of Pinnacle, or an endorsement of Pinnacle. Key makes no representations regarding the suitability or otherwise of the products or services provided by the Pinnacle. Any opinions, projections, or recommendations contained herein are subject to change without notice and are not intended as individual investment advice. This material is presented for informational purposes only and should not be construed as individual tax or financial advice. KeyBank does not give legal advice.

Investment products are:

NOT FDIC INSURED • NOT BANK GUARANTEED • MAY LOSE VALUE • NOT A DEPOSIT • NOT INSURED BY ANY FEDERAL OR STATE GOVERNMENT AGENCY



Topic: COVID-19 Research Update



COVID-19 Testing

Starting January 15, 2022, private insurance companies are required to reimburse or pay for up to eight tests per month for each person on a health insurance plan (Soucheray, 2022). Additionally, 500,000,000 COVID-19 antigen tests will be available through the federal government and shipped by the United States Post Office.

Public discussions on the role of antigen testing during the Omicron surge have led to confusion on the utility of the tests for detecting people with COVID-19. The recent scarcity of tests and/or the long wait-times for results from PCR-based tests made testing after exposure to COVID-19 irrelevant again, much like during other periods with high levels of transmission. Frustratingly, the recommendations by experts do not often involve a discussion about what steps to take when the testing process breaks down due to a surging number of cases.

Even though there have been reports about the ability of antigen tests to provide a timely notification of infection with Omicron, the ability of the tests to detect pieces of the virus has not changed.

None of the mutations present in any of the variants have changed the ability of antigen tests to detect the presence of infection.

However, the timing and amount of virus produced by different variants has changed. This type of scenario can affect when a test is most useful, and is illustrated in Figure 1.

The timing of when a test can accurately detect an infection may lead to changes in how the test is used. The Delta variant was found to produce a large amount of virus that was detectable early in the course of infection. The amount of virus that was detectable by antigen tests was found to roughly correlate with infectiousness, making it possible to effectively use antigen testing right before an event to prevent exposure to infectious individuals.

The Omicron virus has changed so that a positive antigen test is no longer associated with a level of virus that leads to an infection.

Individuals have found that they were infectious before antigen tests were able to detect the virus, which led to documented outbreaks around the world (Shepherd, 2022). Antigen tests can

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.

still be used to accurately detect cases of COVID-19 from the Omicron variant, but reliance on other public health measures, such as quarantining after exposure and isolation when symptoms are present, may be necessary if the individual is indeed shown to be infectious before the virus can be detected by antigen tests. The continued utility of antigen testing to gauge the safety of attending a gathering may also need to be reevaluated when the current surge in transmission has subsided.

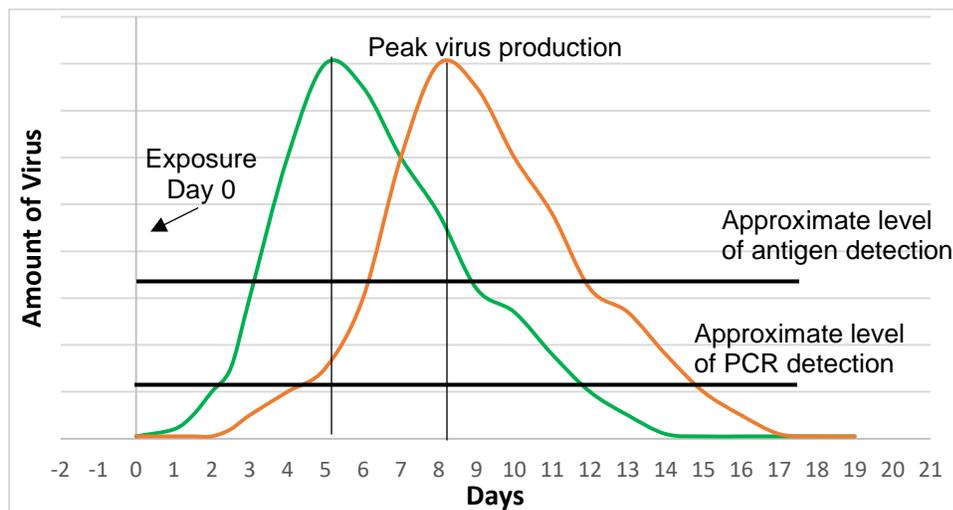


Figure 1. Graphical representation of two hypothetical coronavirus variants that differ based on when the highest level of virus is produced. The virus illustrated with the green line reaches the peak production of viral particles around five days after exposure. The second virus, depicted in orange, grows more slowly. The amount of the green virus is large enough to be detected by PCR and antigen testing earlier than the virus shown in orange.

Tests performed at the peak of virus production are the most likely to correctly identify individuals with COVID-19.

Currently, it is recommended that both PCR-based and antigen tests be performed approximately five days after the start of an infection. This timing is based on experiments that show the highest level of virus production occurs five days after infection with the Alpha and Delta variant. If the date of infection is not known, but symptoms are present, experiments have shown that virus levels are usually high enough to be detected once symptoms begin. However, preliminary reports about the Omicron variant suggest that these recommendations may need to be changed (Reardon, 2022).

Measurement of viral production by a new variant takes time to complete, and only preliminary information about the Omicron variant is currently available. In the current situation, preliminary results are based on small groups of people and studies where the data may not have been collected using ideal protocols in order to speed the process. As more information is gathered, the preliminary results may be corroborated or found to be incorrect.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.
No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



To date, experiments with the Omicron variant suggest that symptoms start sooner after exposure when compared to the Delta variant.

Because symptoms usually include coughing and other processes that expel fluid from the respiratory tract, transmission is possible earlier with the Omicron variant. The earlier onset of symptoms may be caused by a change in optimum growth conditions for the Omicron variant. Preliminary studies suggest that the Omicron variant may be more likely to be located in the throat while Delta and other variants were more likely to be present in the nasal cavities. It is reasonable to hypothesize that growth of the virus in the throat would lead to coughing more readily than virus located in the nose. This scenario may be the reason people have been found to have earlier symptoms even though the amount of virus is still too low to be detected by antigen testing.

Current Recommendations for Testing

A positive test at any time is indicative of an infection as the rate for false positive results is very low for both PCR-based tests and antigen tests.

A positive test means that person should isolate for at least five days after the onset of symptoms, or a positive test if no symptoms are present, to prevent the spread of COVID-19. The start of this five day timeframe for isolation is not when the infection occurred.

For example, if you found out you were exposed to COVID on Sunday, Sunday is considered day zero for quarantine purposes.

- Individuals who are vaccinated and do not have symptoms do not need to quarantine, but should wear a mask around others for ten days and get tested.
- Individuals who are not vaccinated should quarantine for five days regardless of symptoms, should wear a mask for ten days when around others, and should get tested.
- Testing should occur three to five days after exposure, corresponding to Wednesday, Thursday, or Friday.
- Testing before three days, even with PCR-based testing, is less likely to provide an accurate negative test.
- If the test is positive and you are having symptoms, the start of the isolation period, or day zero, is the day symptoms started, which is usually two to three days after exposure. If symptoms started Tuesday, the isolation period would extend at least to the following Sunday.
- If the test is positive, and you are not having symptoms, the start of the isolation period, or day zero, begins on the day you took the test. If you took your test on Wednesday, the isolation period would extend at least to the following Monday.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



A negative test after exposure to someone with COVID-19 can be more complicated to interpret. If the test was taken less than five days from the time of exposure, a negative result could be due to low levels of virus early in the infection. An additional test would therefore be necessary at a later date.

Screening is a form of testing that is used to detect possible cases when they are not having symptoms and are not known to have had an exposure. If a group of people take a test before attending a family dinner, they are screening for COVID-19. This type of testing only allows for a determination of whether you have a detectable amount of virus in the nasal cavity at the time of the test. If you have been infected recently, and still have low levels of virus, the test may give a false negative. This type of situation is where antigen tests seem to have a diminished ability to detect the Omicron variant when compared to the Delta variant. Further information is needed to determine if antigen tests will be useful in screening a population for COVID-19.

Antigen Testing in Children

A review of 17 studies compared the use of rapid, antigen tests to PCR-based tests in children (Fujita-Rohwerder et al, 2022). Eight antigen tests from six different brands were evaluated. The results are of interest as these types of tests are often used at schools and childcare facilities to identify those who have COVID-19 in order to prevent transmission.

The **sensitivity**, or ability to correctly identify those who are sick, can also be described as a **false-negative rate**, or how many people are identified incorrectly as not being sick. **Specificity**, the ability to identify those who are not sick, can likewise be described as the **false-positive rate**, or how many people are identified incorrectly as being ill.

Overall, the sensitivity of the tests was 64.2%, which means that 64.2% of those who were actually sick had a positive test while the remaining 35.8% of sick individuals had a negative test. The tests had a much higher specificity of 99.1%, which means that only 0.9% of healthy individuals received an erroneous positive result.

The tests were therefore more likely to give a false negative than a false positive.

If the children were symptomatic at the time of testing, the sensitivity was increased to 71.8%. If the children were asymptomatic, the sensitivity was lower at 56.2%. The specificity was not changed based on whether the participants had symptoms or not.

The combined testing performance was lower than that recommended by the WHO and FDA, which is 80% or higher sensitivity and 97% or higher specificity.

Based on the results of the evaluation, the authors conclude that the low diagnostic sensitivity may impact the intended purpose of antigen tests. Also, most of the studies involved testing by professionals. It is unknown how real-life performance of tests would be affected by the fact that most tests are often performed by the children themselves and may be less-than-perfect test samples.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



Antigen Testing Performance

A similar evaluation of the performance of antigen testing regardless of age included 214 clinical accuracy datasets with 112,323 samples (Brümmer et al, 2021). The analysis was updated on a weekly basis between April, 2021 and August, 2021 to track any changes that may be occurring. In the initial evaluation on April 30, 2021, the pooled sensitivity was 71.2% with a specificity with 98.9%. The sensitivity increased to 76.3% when only the tests that accurately followed the manufacturer's instructions were included in the analysis.

The values determined by the researchers in these evaluations suggest that the sensitivity of antigen tests leads to approximately 30% of sick individuals getting an erroneous negative result, which is similar to the results reported in the pediatric testing.

In response to the study by Fujita-Rohwerder and colleagues, one expert interviewed by CIDRAP News reiterated that "positive results are generally meaningful, but negative results have to be taken with a grain of salt," and another stated that interpreting negative test results is "a huge challenge" (Van Beuskom, 2022).

Kelly Wroblewski, director of infectious diseases at the Association of Public Health Laboratories, recommends that in the case of a symptomatic child with a negative result from an antigen test, a PCR-based test should be used for verification. Children without symptoms that have been exposed to COVID-19 and receive negative results from an antigen should have repeated tests over a few days. She went on to say,

"If your kid has the sniffles but no severe symptoms, no fever, you can probably send them to school with a mask [if they test negative]. But if they've had an exposure and have a sniffle, maybe just keep them home. Even if it's not COVID, they could have something else that's infectious."

Use of N95 Masks

Increased production has alleviated the shortage of N95 and KN95 in the United States (Stobbe, 2022). With the expanded access, health officials, including those at the CDC, are encouraging the use of the better filtering masks.

The updated guidance states that properly fitted N95 and KN95 masks offer the most protection from SARS-CoV-2 infection.

They also noted that these types of masks are more difficult for some people to tolerate for long periods of time. Therefore, people are urged to use well-fitting masks that they are able to wear correctly and consistently. The use of any mask is still considered better than no mask. Use of even cloth masks allows for source control, or a reduction in the infectious particles released by someone infected with SARS-CoV-2.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.
No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



COVID-19 and Pregnancy

A recent study performed in Scotland investigated the level of COVID-19 vaccination in pregnant women between December 8, 2020 and October 31, 2021 (Stock et al., 2022). Vaccine coverage was lower in pregnant women (32.3%) when compared to the general female population (77.4%). The study also reported the mortality rate in infants who were born within 28 days of the onset of a maternal infection with SARS-CoV-2, and the number of still-births and deaths within the first month of being born was 22.6 per 1,000 births. When same figure was determined for women who had had a SARS-CoV-2 infection at any time during the pregnancy, the number of still-births and deaths within the first month was 8.0 per 1,000 births. This is compared to a background rate of 5.6 deaths per 1,000 births overall in Scotland during the pandemic. Additionally, 77.4% of SARS-CoV-2 related infections, 90.0% of SARS-CoV-2 associated hospital admission, 98% of SARS-CoV-2 associated critical care admission, and all baby deaths occurred in women who were not vaccinated.

Overall, the study indicates that infection with SARS-CoV-2 at any time during pregnancy increased the risk of infant death, and most of the negative outcomes occurred in women who were unvaccinated.

There are a number of studies now available that indicate that vaccination against COVID-19 is safe during pregnancy, providing protection for both the mother and infant (Hall, 2022). The available COVID-19 vaccines do not increase the risk of preterm delivery, stillbirth, or any other abnormal pregnancy outcome (Wadman, 2022). Additionally, vaccination of the mother leads to transfer of antibodies through both the placenta and breastmilk. In a preprint, researchers found that 60% of infants whose mothers were vaccinated during pregnancy continued to have antibodies at six months of age.

Another small study of the neurodevelopment of infants born during the pandemic indicates a possible small delay regardless of whether their mother had COVID-19 (Wadman, 2022 and Van Beuskom, 2022). The study was performed at two hospitals in New York City and followed infants born during 2020. It was found that the babies in the study scored slightly lower on tests for motor and social skills than babies born before the pandemic, but there was no difference in the scores on tests for communication skills and problem-solving skills.

The authors stressed that it is not known if the differences would continue as babies can quickly get back on neurodevelopmental track because of the malleability of the brain in the first year of life.

The magnitude of the difference was also not large, but they added that the trend should continue to be monitored to make sure that the differences do not persist or that certain groups are not more affected due to disadvantaged status in regard to pandemic conditions. Two other studies have reported similar results, but the studies include small groups of babies, and the correlation may not be observed as more data is collected. Additionally, assessment of the level of development of infants at six months is difficult to quantitate, and the information in the most recent study was based on questionnaires completed by parents, which could lead to bias from parental perceptions.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



State of the Pandemic

Worldwide, the number of COVID-19 cases continued to increase rapidly with a 55% increase in new cases from the previous week (Schnirring, 2022). The level of deaths worldwide has not increased with the rate of new cases as was observed in previous surges. The level of deaths was high to begin with, however, with around 50,000 deaths a week since October.

Excess mortality figures from around the world have been analyzed. Worldwide, the deaths related to COVID-19 are acknowledged to be undercounted, and the estimates range from 1.6 to four-times higher than the 5.5 million reported worldwide deaths (Adam, 2022). The number of deaths in India, for example, is estimated to be ten-times higher than the official totals. The proportion of deaths worldwide attributed to COVID-19 is 16% with much larger figures in some countries, such as Mexico where 33% of deaths have been due to COVID-19.

In the United States, the number of new cases is no longer rising nationwide as areas first affected by the Omicron variant begin to see a decrease, but there are other areas of the country that are observing increases in the number of new cases (New York Times, 2022).

Unlike the global statistics, the number of hospitalizations and deaths have increased in the United States for the last two weeks with a 25% increase in deaths and a 13% increase in the number of individuals hospitalized.

The CDC released a report describing the current understanding of the severity of disease caused by the Omicron variant in the United States (Iuliano et al., 2022). Overall, this variant of SARS-CoV-2 has been found to be more transmissible and less virulent than previously circulating variants. The researchers compared the level of cases, emergency department visits, hospital admissions, proportion of hospital beds in use, and the number of deaths during the time period the Omicron variant was predominant with the same indicators in the first winter of the pandemic (2020 to 2021) with the original variant of SARS-CoV-2 and after the Delta variant became predominant in July, 2021. The results of the comparison are listed in Table 1.

Table 1. Comparison of pandemic indicators between the Omicron variant and the Delta

Variant	Highest Daily 7-Day Average Of Cases	Emergency Department Visits	Hospital Admissions	Inpatient Beds in Use for COVID-19 Patients	ICU Beds in Use for COVID-19 Patients	Highest Daily 7-Day Average of Deaths
Omicron	798,976	48,238	21,586	20.6%	30.4%	1,854
Delta	164,249	25,873	12,285	13.4%	29.2%	1,924
Original Variant	250,335	20,372	16,497	17.2%	30.9%	3,422

The number of staffed inpatient beds in use was higher during the period for the Omicron variant compared to the same time period for the Delta variant and the original variant.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



However, the number of intensive care unit beds in use and the number of deaths when the Omicron variant became dominant did not increase at the same rate as during other periods.

When the information is analyzed in relation to the overall number of cases, the differences in the severity of COVID-19 from the different variants is more obvious. The values per 1,000 cases during the three time periods are listed in Table 2.

Table 2. Ratio of events to the number cases of COVID-19.

Variant	Emergency Department Visits	Hospital Admissions	Deaths
Omicron	87 per 1,000	27 per 1,000	9 per 1,000
Delta	167 per 1,000	78 per 1,000	13 per 1,000
Original Variant	92 per 1,000	68 per 1,000	16 per 1,000

Other indicators collected from 199 United States hospitals, including the mean length of stay, percentages who were admitted to an ICU, percentage who received invasive mechanical ventilation, and percentage who died while in the hospital, were also lower during the Omicron period than during previous periods. The lowered severity of COVID-19 from Omicron is attributed to higher vaccination coverage and infection-acquired immunity, which reduces disease severity, as well as a lower virulence of the Omicron variant.

The authors stress that “Although disease severity appears lower with the Omicron variant, the high volume of ED [emergency department] visits and hospitalizations can strain local health care systems in the United States, and the average daily number of deaths remains substantial.”

Further strain on the health system in the United States can be expected based on a report from the Netherlands that indicates 74.3% of people who recovered after treatment in the intensive care unit for COVID-19 had lingering physical symptoms, 26% had mental symptoms, and 16% had cognitive symptoms a year after being released from the hospital (Van Beuskom, 2022). The study included 246 individuals 16 years or older who were admitted to the intensive care unit between March 1, 2020 and July 1, 2020. The average stay in the intensive care unit was 18.5 days.

The most commonly reported new physical problems after their illness were weakness (38.9%), joint stiffness (26.3%), joint pain (25.5%), muscle weakness (24.8%), muscle pain (21.3%), and shortness of breath (20.8%). The mental symptoms included anxiety (17.9%), depression, (18.3%), and PTSD (9.8%). On tests to evaluate cognitive ability, 39 participants had scores that indicate cognitive symptoms. Many of the participants also had symptoms in two or more categories (i.e. physical, mental, and cognitive) with 30.6% reporting symptoms in two categories and 10.5% reporting symptoms in all three categories. There was also a high rate of work related problems, and 57.8% of participants who were employed before their illness had to work fewer hours, remain on sick leave, or quit their job.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



COVID-19 in Children

A worldwide study of the outcome of pediatric COVID-19 cases treated in the emergency department was recently published in *JAMA* (Funk et al., 2022). The study investigated 3,222 children 18 years of age or younger who tested positive for COVID-19 during treatment between March, 2020 and June, 2021, in one of 41 emergency departments in Argentina, Australia, Canada, Costa Rica, Italy, New Zealand, Paraguay, Singapore, Spain, and the United States. When assessed 14 days after the emergency room visit, 22.8% were hospitalized, 3.3% were found to have severe outcomes, and 0.12% had died.

The characteristics associated with a severe outcome included

- **Increased age.** Children aged five to ten years had a 1.6-fold increase in risk of severe outcome while children aged ten to 18 had a 2.39-fold increase in risk.
- **Chronic illness.** Those reporting a chronic illness had 2.34-times the risk of severe outcome.
- **Having had a prior episode of pneumonia.** Children who had had pneumonia previously had an 3.15-times increase in risk
- **Length of symptoms.** The risk of severe outcome increased by 2.22 if symptoms had started four to seven days before when compared to the risk after zero to three days of symptoms.

When compared to youths without SARS-CoV-2 who were hospitalized, there was a 3.9% increase in the risk of severe outcomes in children with COVID-19.

Importantly, asthma was not related to poor outcomes of children with COVID-19 who were treated at emergency departments (Wappes, 2022).

COVID-19 Vaccine Updates

A study was recently published that found no effect on fertility from COVID-19 vaccination (Wesselink et al., 2022). The study included 2,126 women participating in a preconception study who were residing in the United States or Canada between December, 2020 and November, 2021. During the study, participants completed questionnaires every eight weeks on sociodemographics, lifestyle, medical factors, and partner information.

Evaluation of the data showed that COVID-19 vaccination for either partner was not associated with the probability of becoming pregnant within one menstrual cycle.

Infection with SARS-CoV-2 did not affect the probability of a woman becoming pregnant, but men who had COVID-19 had a transient reduction in fertility.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



Several studies were also published that show the durability of protection against hospitalization and death from vaccination. One of the studies investigated the magnitude of the effect of a booster dose (third dose) of mRNA vaccine on symptomatic COVID-19 resulting from either the **Delta** or **Omicron** variant. Information about individuals who received PCR-based testing for COVID-19 at 4,666 pharmacy-based testing sites in 49 states in the United States was evaluated between December 10, 2021, and January 1, 2022 (Accorsi et al., 2022). There were 23,391 positive tests and 46,764 negative tests included in the evaluation. The proportion of individuals with each test result based on their vaccination status is shown in Table 3.

Table 3. The proportion of positive tests based on vaccination status.

Vaccination Status	Three Doses of vaccine	Two Doses of Vaccine	Unvaccinated
Proportion of Positive Omicron Tests	18.6%	55.3%	26%
Proportion of Positive Delta Tests	6.6%	44.4%	49%
Proportion of Negative Tests	39.7%	41.6%	18.6%

Based on the results, the authors conclude that among individuals seeking testing for a COVID-19 like illness in December, 2021, those who had three doses of an mRNA vaccine were the least likely to test positive for either variant.

Individuals with three doses of vaccine were 67% less likely to get infected with the Omicron variant and 94% less likely to be infected with the Delta variant when compared to unvaccinated individuals.

Individuals with three doses of vaccine were 66% less likely to be infected with the Omicron variant and 84% less likely to be infected with the Delta variant when compared to individuals with two doses of vaccine.

The amount of virus in positive samples was also lower for people who had had three doses of vaccine. The level of protection provided by three doses was also evaluated based on which variant caused the infection, and vaccination with three doses was less protective against the Omicron variant than the Delta variant.

A second published report described the duration of protection observed in the United States for people vaccinated with the Pfizer-BioNTech vaccine, the Moderna vaccine, or the Johnson & Johnson vaccine (Lin et al., 2022). The vaccine effectiveness against infection with SARS-CoV-2 was measured over eight months for all three vaccines.

The peak level of protection for the mRNA vaccines was found at two months after full vaccination (two doses), and the peak level of protection for the Johnson & Johnson vaccine was at one month after full vaccination (one dose).

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



The values of the peak level of protection and the final measurements at seven months for the mRNA vaccines and five months for the Johnson & Johnson vaccine are listed in Table 4.

Table 4. Vaccine effectiveness against COVID-19 infection, hospitalization, and death soon after vaccination and later.

Vaccine	Early vs. Late Effectiveness against Infection	Early vs. Late Effectiveness against Hospitalization	Early vs. Late Effectiveness against Death
Pfizer-BioNTech	94.5% vs. 66.6%	96.4% vs. 88.7%	98% vs. 90.5%
Moderna	95.9% vs. 80.3%	97.2% vs. 94.1%	98.6% vs. 95.5%
Johnson & Johnson	74.8% vs. 59.4%	85.8% vs. 80%	85.9% vs. 70%

The rate of waning of protection was found to be similar for all age groups, but individuals 65 years or older had a lower level of protection overall. Because individuals over the age of 65 started with a lower level of vaccine effectiveness, they also had the lowest level at the end of the study. In other words, the lower levels were not due to a faster rate of loss of effectiveness.

The researchers also found that the reduction in vaccine effectiveness was similar for people who were vaccinated at different times during the study period.

This finding indicates that it was not the introduction of the Delta variant that had the most effect on the reduction of vaccine effectiveness during the summer and fall of 2021, but rather declining immunity over time.

There was also a minor contribution from the mutations in the Delta variant that allowed for immune evasion by the virus.

The results from this study indicate that there was a reduction in the vaccine effectiveness against infection with SARS-CoV-2, but the size of the reduction in vaccine effectiveness for hospitalization or death was not as large as originally reported. The initial reports were based on small studies in Israel. Additionally, the researchers were able to determine that all three vaccines maintained better effectiveness in preventing hospitalization and death than in preventing infection over time. The two mRNA vaccines provided higher levels of protection than the Johnson & Johnson vaccine.

One other study was performed in England, and evaluated the Oxford-AstraZeneca vaccine and the Pfizer-BioNTech vaccine (Andrews et al., 2022). The timing of the study allowed for a comparison of the effect of vaccination against the **Delta** variant over time. The vaccine effectiveness against the **Delta** variant was highest a few weeks after the second dose and decreased over 20 weeks to a 44% effectiveness against symptomatic COVID-19 for the Oxford-AstraZeneca vaccine and 66.3% for the Pfizer-BioNTech vaccine.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



The size of the decrease in vaccine effectiveness against hospitalization and death was smaller. Twenty weeks after receipt of the second dose, the vaccine effectiveness against hospitalization for the Oxford-AstraZeneca vaccine was 80% and 91.7% for the Pfizer-BioNTech vaccine, and the vaccine effectiveness against death was 84% for the Oxford-AstraZeneca vaccine and 91.9% for the Pfizer-BioNTech vaccine.

The waning of protection against symptomatic infection was more pronounced in individuals over the age of 65 when compared to individuals between 40 and 64. The reduction in protection against hospitalization was largest for people 65 or older who were considered to be extremely vulnerable based on health status and for people 40 to 64 with underlying medical conditions.

Vaccine Effectiveness in Adolescents

The vaccine effectiveness of the Pfizer-BioNTech vaccine against hospitalization, admission to an intensive care unit, the use of life-supporting interventions (mechanical ventilation, vasopressors, and extracorporeal membrane oxygenation), or death in children aged twelve and 18 years of age was reported in a recent publication (Olson et al., 2022). The study included 1,222 participants who were admitted to 31 hospitals in 23 states between July 1, 2021 and October 25, 2021. The time frame of the study means that the **Delta** variant was the predominant variant in the United States at the time. There were 445 hospitalized individuals who tested positive for COVID-19 and 777 who tested negative and were used as a comparison group. The vaccination rate of the participants with COVID-19 was 4% while the vaccination rate for the comparison group without COVID-19 was 40%.

The researchers reported that 40% of the participants with COVID-19 were admitted to the intensive care unit, and 29% required life support. Only two of the 180 individuals who required treatment in the intensive care unit were vaccinated.

Based on this information, it was determined that the vaccine effectiveness of the Pfizer-BioNTech vaccine against hospitalization was 94%, 98% effective against intensive care admission, and 98% effective against requiring the use of life support.

There were seven deaths during the study period, and all occurred in children who were unvaccinated.

The Pfizer-BioNTech vaccine has also been found to be 91% effective against the coronavirus-related multisystem inflammatory syndrome in children (MIS-C) (Zambrano et al., 2022). The study investigating the vaccine included information on 102 hospitalized children aged twelve to 18 years who were being treated at 24 pediatric hospitals in 20 states between July 1, 2021 and December 9, 2021. During this time period, the predominant variant in the United States was the **Delta** variant. The data was compared to 181 hospitalized children who had tested negative for COVID-19.

Of the 102 children with MIS-C, 5% were fully vaccinated with two doses 28 days or more before hospitalization, and the remaining were unvaccinated. During treatment for MIS-C, 61%

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



of the 102 children were admitted to the intensive care unit, and 37% received life support, which included invasive mechanical ventilation, use of medications to stabilize blood pressure, or extracorporeal membrane oxygenation (ECMO).

All of 38 children requiring life support as part of treatment for MIS-C were unvaccinated.

This corresponds to 39% of the unvaccinated individuals while none of the vaccinated children required respiratory or cardiovascular life support. There were no deaths reported, and the median length of hospital stay was five days.

The previously determined vaccine effectiveness against hospitalization due to COVID-19 in children aged twelve to 18 was 93%.

When combined, the previous and current findings indicate that vaccination of children aged twelve to 18 is very effective in preventing severe COVID-19-related complications, including MIS-C.

At the time of the study, vaccination had not yet been authorized for children under the age of twelve, and therefore younger children were not included in the study. The median age of the participants with COVID-19 was 14.2 years, and 39.2% of those with MIS-C had at least one underlying condition. The most common underlying condition for individuals with MIS-C was asthma, and 14.7% of the children with MIS-C had asthma.

Underlying conditions included:

- Obesity
- Asthma
- Diabetes
- Atopic or allergic condition
- Cardiovascular system disorder
- Neurologic or neuromuscular disorder
- Cancer
- Immunosuppressive disorders
- Endocrine disorders
- Rheumatologic/autoimmune disorder
- Hematologic disorder
- Renal or urological dysfunction
- Gastrointestinal or liver disorder
- Metabolic or confirmed or suspected genetic disorder

Effect of Booster Doses of the Pfizer-BioNTech Vaccine

Researchers at a large medical center in Tel Aviv published results on the effects of a booster (third) dose of the Pfizer-BioNTech vaccine in healthcare workers (Spitzer et al., 2022).

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



Because the participants worked at the hospital, they were screened for SARS-CoV-2 infection every 14 days, allowing for a determination of the prevention of asymptomatic infection as well as symptomatic illness. There were a total of 1,928 participants who had all previously received two doses of the Pfizer-BioNTech vaccine, and 1,650 also received a booster dose at the start of the study. Participants were observed for 39 days after the booster dose, and there were 44 cases of COVID-19 identified during this period. The **Delta** variant was the most prevalent variant at the time of the study.

Five of the cases of COVID-19 were in people with three doses of the vaccine, and 39 were in participants who had not received a booster.

This corresponds to an incidence rate of 12.8 per 100,000 people in those who had three doses compared to 116 per 100,000 in those who had two doses.

Level of Protection from Infection and Hospitalization due to the Delta Variant

A new report from the CDC indicates that vaccination and previous infection with SARS-CoV-2 both offered strong protection against infection and severe outcomes during the wave of new cases from the Delta variant (León et al., 2022). The study evaluated the effect of vaccination and previous infection on the number of new cases and hospitalization rates for adults 18 years or older in New York state and California. The population of these two states accounts for 18% of the population of the United States.

Data collected between May, 2021 and November, 2021 from both states showed that COVID-19 incidence was highest among individuals who were not vaccinated and had not had a previous infection with SARS-CoV-2.

However, the relative amount of protection from vaccination versus previous infection changed as the Delta variant became the prominent variant in the United States. The magnitude of the protection was measured during the week of May 30, 2021, when the first cases of the Delta variant were identified in the United States, but the Alpha variant was still the predominant form, and is shown in Table 5.

Table 5. Magnitude of the decrease in case rates among different groups compared to unvaccinated individuals without a previous infection in the week of May 30, 2021.

Population	State	Case rates	Hospitalization Rates
Vaccinated, no previous infection	CA	19.9-times lower	27.7-times lower
	NY	18.4-times lower	NR
Unvaccinated persons with a previous COVID-19 diagnosis	CA	7.2-times lower	6-times lower
	NY	9.9-times lower	NR
Vaccinated persons with a previous COVID-19 diagnosis	CA	9.6-times lower	7.1-times lower
	NY	8.5-times lower	NR

NR=Not reported

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



The magnitude of the protection measured during the week of October 3, 2021, when Delta was predominant, is shown in Table 6.

Table 6. Magnitude of the decrease in case rates among different groups compared to unvaccinated individuals without a previous infection in the week of October 3, 2021.

Population	State	Case Rates	Hospitalization Rates
Vaccinated, no previous infection	CA	6.2-times lower	19.8-times lower
	NY	4.5-times lower	NR
Unvaccinated persons with a previous COVID-19 diagnosis	CA	29-times lower	55.3-times lower
	NY	14.7-times lower	NR
Vaccinated persons with a previous COVID-19 diagnosis	CA	32.5-times lower	57.5-times
	NY	19.8-times lower	NR

NR=Not Reported

The results show that protection from a previous infection was higher than the protection from vaccination after the Delta variant became predominant.

During this time, vaccine-induced immunity declined because of mutations in the virus that allowed for immune evasion as well as a waning of the level of neutralizing antibodies from vaccination. The highest levels of COVID-19 incidence in vaccinated individuals were observed in people who had received the Johnson & Johnson vaccine followed by the Pfizer-BioNTech vaccine. People who had received the Moderna vaccine had the lowest incidence. There was no apparent pattern of incidence based on the product used for vaccination in people who were vaccinated after a previous diagnosis with COVID-19.

Overall case and hospitalization rates were lower for people who had recovered from COVID-19 than for those who were vaccinated. This analysis only includes information from before the booster shots were available and does not include the effects observed for the Omicron variant. Current evidence suggests that a previous infection seems to provide less protection from the Omicron variant compared to vaccination that includes a booster dose.

While immunity from previous infection was more advantageous than vaccination at one point during the pandemic, obtaining immunity from vaccination remains much safer with fewer potential side effects than infection with SARS-CoV-2.

Hybrid Immunity against SARS-CoV-2

Hybrid immunity refers to individuals who have had an infection with SARS-CoV-2 and also received a vaccine. Early studies suggested that individuals with this type of immunity had a very high level of protection from another infection (Kozlov, 2021). Researchers in Israel have analyzed SARS-CoV-2 infections between August, 2021 and September, 2021 and looked to see if there was a correlation with people who had immunity from vaccination or an infection.

Over the study period, the infection rate for all groups of people increased.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



This included those who had been infected and were unvaccinated, those who had been infected and were vaccinated (hybrid immunity), and those with two to three doses of vaccine who had not ever been infected.

The studies suggest that all of the types of immunity to SARS-CoV-2 will wane over time, and that individuals who have had COVID-19 will still benefit from vaccination. The benefit of vaccination after infection seems to be especially important against Omicron as this variant readily infects individuals who have had a previous infection.

Use of a Fourth Dose of the Pfizer-BioNTech Vaccine

The Israeli Health Ministry released preliminary results of their study of an additional, fourth dose of the Pfizer-BioNTech vaccine for people over the age of 60 and healthcare workers at high risk of infection (Kershner, 2022).

Researchers found that there was a five-fold increase in the level of antibodies after the fourth shot, but there was not a large improvement in the protection from infection with the Omicron variant.

In the hospital workers who received the fourth shot, the number of participants infected was only slightly lower than the number of participants who had not received a fourth shot. There was no evidence of negative effects associated with the additional dose, and the lead researcher from the study supported the additional dose in vulnerable groups who could get some increase in protection. For healthy individuals, however, the researchers stated that it might be preferable to wait for new vaccines that are specifically targeted to the more transmissible variants such as Delta and Omicron.

Inactivated-Virus Vaccines

Vaccines based on inactivated virus have been found to provide little to no protection against infection from the Omicron variant (Dolgin, 2022). Two of the widely distributed vaccines made by China (Sinovac and Sinopharm) are inactivated-virus vaccines. Even with two doses of the vaccine, which is considered the full vaccine dose, very few antibodies are produced that are effective against transmission of the Omicron variant. In individuals who have had a booster, or third dose, of the inactivated vaccines, the level of neutralizing antibodies against the Omicron variant remains low.

It is thought that levels of other, non-neutralizing antibodies and interactions with T cells remain high enough to provide protection from severe symptoms even if there is little protection from infection.

The findings are concerning because nearly 5 billion of the 11 billion vaccine doses distributed worldwide were Sinovac or Sinopharm. There are also more than 200 million doses of other types of inactivated vaccines that have been administered. This means that a large number of people have little protection from infection to a variant that has already been found to have a large increase in transmission compared to previous variants. While the subpar vaccination is

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



expected to dampen severe outcomes, as with any large outbreak, health related services will be impacted due to high demand.

References

Accorsi EK, Britton A, Fleming-Dutra KE, Smith ZR, Shang N, Derado G, Miller J, Schrag SJ, Verani JR. Association Between 3 Doses of mRNA COVID-19 Vaccine and Symptomatic Infection Caused by the SARS-CoV-2 Omicron and Delta Variants. *JAMA*. 2022 Jan 21.

Adam D. The pandemic's true death toll: millions more than official counts. *Nature*. 2022 Jan;601(7893):312-315.

Andrews N, Tessier E, Stowe J, Gower C, Kirsebom F, Simmons R, Gallagher E, Thelwall S, Groves N, Dabrera G, Myers R, Campbell CNJ, Amirthalingam G, Edmunds M, Zambon M, Brown K, Hopkins S, Chand M, Ladhani SN, Ramsay M, Lopez Bernal J. Duration of Protection against Mild and Severe Disease by Covid-19 Vaccines. *N Engl J Med*. 2022 Jan 27;386(4):340-350.

Brümmer LE, Katzenschlager S, Gaeddert M, Erdmann C, Schmitz S, Bota M, Grilli M, Larmann J, Weigand MA, Pollock NR, Macé A, Carmona S, Ongarello S, Sacks JA, Denkinger CM. Accuracy of novel antigen rapid diagnostics for SARS-CoV-2: A living systematic review and meta-analysis. *PLoS Med*. 2021 Aug 12;18(8):e1003735.

Dolgin E. Omicron thwarts some of the world's most-used COVID vaccines. *Nature*. 2022 Jan;601(7893):311.

Fujita-Rohwerder N, Beckmann L, Zens Y, Verma A. Diagnostic accuracy of rapid point-of-care tests for diagnosis of current SARS-CoV-2 infections in children: a systematic review and meta-analysis. *BMJ Evid Based Med*. 2022 Jan 18:bmjebm-2021-111828.

Funk AL, Florin TA, Kuppermann N, Tancredi DJ, Xie J, Kim K, Neuman MI, Ambroggio L, Plint AC, Mintegi S, Klassen TP, Salvadori MI, Malley R, Payne DC, Simon NJ, Yock-Corrales A, Nebhrajani JR, Chaudhari PP, Breslin KA, Finkelstein Y, Campos C, Bergmann KR, Bhatt M, Ahmad FA, Gardiner MA, Avva UR, Shah NP, Sartori LF, Sabhaney VJ, Caperell K, Navanandan N, Borland ML, Morris CR, Gangoiti I, Pavlicich V, Kannikeswaran N, Lunoe MM, Rino PB, Kam AJ, Cherry JC, Rogers AJ, Chong SL, Palumbo L, Angelats CM, Morrison AK, Kwok MY, Becker SM, Dixon AC, Poonai N, Eckerle M, Wasseem M, Dalziel SR, Freedman SB; Pediatric Emergency Research Network-COVID-19 Study Team. Outcomes of SARS-CoV-2-Positive Youths Tested in Emergency Departments: The Global PERN-COVID-19 Study. *JAMA Netw Open*. 2022 Jan 4;5(1):e2142322.

Hall S. COVID vaccines safely protect pregnant people: the data are in. *Nature*. 2022 Jan;601(7893):308-309.

Iuliano AD, Brunkard JM, Boehmer TK, et al. Trends in Disease Severity and Health Care Utilization During the Early Omicron Variant Period Compared with Previous SARS-CoV-2 High

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



Transmission Periods — United States, December 2020–January 2022. *MMWR Morb Mortal Wkly Rep* 2022;71:146–152.

Joseph A. New data show those who recovered from Covid-19 were less likely than vaccinated to get infected during Delta wave. *STATNews*. Published January 19, 2022. Accessed January 20, 2022 at <https://www.statnews.com/2022/01/19/those-who-recovered-from-covid-19-were-less-likely-than-vaccinated-to-get-infected-during-delta-wave/>

Kershner I. A fourth shot may not offer much more protection against catching Omicron, an early Israeli study suggests. *The New York Times*. Published January 18, 2022. Accessed January 18, 2022 at <https://www.nytimes.com/live/2022/01/18/world/omicron-covid-vaccine-tests>

Kozlov M. Waning COVID super-immunity raises questions about Omicron. *Nature*. Published December 13, 2021. Accessed January 20, 2022 at <https://www.nature.com/articles/d41586-021-03674-1>

León TM, Dorabawila V, Nelson L, et al. COVID-19 Cases and Hospitalizations by COVID-19 Vaccination Status and Previous COVID-19 Diagnosis — California and New York, May–November 2021. *MMWR Morb Mortal Wkly Rep* 2022;71:125–131.

Lin DY, Gu Y, Wheeler B, Young H, Holloway S, Sunny SK, Moore Z, Zeng D. Effectiveness of Covid-19 Vaccines over a 9-Month Period in North Carolina. *N Engl J Med*. 2022 Jan 12:NEJMoa2117128.

New York Times. Coronavirus in the U.S.: Latest Map and Case Count. Published January 25, 2022. Accessed on January 25, 2022 at <https://www.nytimes.com/interactive/2021/us/covid-cases.html>

Olson SM, Newhams MM, Halasa NB, Price AM, Boom JA, Sahni LC, Pannaraj PS, Irby K, Walker TC, Schwartz SP, Maddux AB, Mack EH, Bradford TT, Schuster JE, Nofziger RA, Cameron MA, Chiotos K, Cullimore ML, Gertz SJ, Levy ER, Kong M, Cvijanovich NZ, Staat MA, Kamidani S, Chatani BM, Bhumbra SS, Blin KE, Gaspers MG, Hobbs CV, Heidemann SM, Maamari M, Flori HR, Hume JR, Zinter MS, Michelson KN, Zambrano LD, Campbell AP, Patel MM, Randolph AG; Overcoming Covid-19 Investigators. Effectiveness of BNT162b2 Vaccine against Critical Covid-19 in Adolescents. *N Engl J Med*. 2022 Jan 12:NEJMoa2117995.

Reardon S. When Should You Get a COVID Test? *Scientific American*. Published January 26, 2022. Accessed January 28, 2022 at <https://www.scientificamerican.com/article/when-should-you-get-a-covid-test1/>

Schnirring L. Global COVID-19 cases continue to spike, with deaths stable. *CIDRAP News*. Published January 12, 2022. Accessed on January 12, 2022 at <https://www.cidrap.umn.edu/news-perspective/2022/01/global-covid-19-cases-continue-spike-deaths-stable>

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



Shepherd K. They relied on rapid coronavirus tests to gather safely. Some wish they hadn't. *The Washington Post*. Published January 17, 2022. Accessed on January 18, 2022 at <https://www.washingtonpost.com/health/2022/01/17/rapid-coronavirus-tests-accuracy-omicron/>

Soucheray S. COVID-19 testing back in the spotlight as Omicron rages. *CIDRAP News*. Published January 11, 2022. Accessed January 12, 2022 at <https://www.cidrap.umn.edu/news-perspective/2022/01/covid-19-testing-back-spotlight-omicron-rages>

Spitzer A, Angel Y, Marudi O, Zeltser D, Saiag E, Goldshmidt H, Goldiner I, Stark M, Halutz O, Gamzu R, Slobodkin M, Amrami N, Feigin E, Elbaz M, Furman M, Bronstein Y, Chikly A, Eshkol A, Furer V, Mayer T, Meijer S, Melloul A, Mizrahi M, Yakubovsky M, Rosenberg D, Safir A, Spitzer L, Taleb E, Elkayam O, Silberman A, Eviatar T, Elalouf O, Levinson T, Pozyuchenko K, Itzhaki-Alfia A, Sprecher E, Ben-Ami R, Henig O. Association of a Third Dose of BNT162b2 Vaccine With Incidence of SARS-CoV-2 Infection Among Health Care Workers in Israel. *JAMA*. 2022 Jan 25;327(4):341-349.

Stobbe M. CDC encourages more Americans to consider N95 masks. *STATNews*. Published January 14, 2022. Accessed January 18, 2022 at <https://www.statnews.com/2022/01/14/cdc-encourages-more-americans-to-consider-n95-masks/>

Stock SJ, Carruthers J, Calvert C, Denny C, Donaghy J, Goulding A, Hopcroft LEM, Hopkins L, McLaughlin T, Pan J, Shi T, Taylor B, Agrawal U, Auyeung B, Katikireddi SV, McCowan C, Murray J, Simpson CR, Robertson C, Vasileiou E, Sheikh A, Wood R. SARS-CoV-2 infection and COVID-19 vaccination rates in pregnant women in Scotland. *Nat Med*. 2022 Jan 13.

Van Beusekom M. Pandemic birth tied to poor development. *CIDRAP News*. Published January 4, 2022. Accessed January 6, 2022 at <https://www.cidrap.umn.edu/news-perspective/2022/01/pandemic-birth-tied-poor-development>

Van Beusekom M. High false-negative rate limits value of rapid COVID tests for kids. *CIDRAP News*. Published January 21, 2021. Accessed January 24, 2022 at <https://www.cidrap.umn.edu/news-perspective/2022/01/high-false-negative-rate-limits-value-rapid-covid-tests-kids>

Van Beusekom M. 75% of COVID ICU survivors have physical symptoms 1 year on. *CIDRAP News*. Published January 25, 2022. Accessed January 26, 2022 at <https://www.cidrap.umn.edu/news-perspective/2022/01/75-covid-icu-survivors-have-physical-symptoms-1-year>

Wadman M. COVID-19 starkly increases pregnancy complications, including stillbirths, among the unvaccinated, Scottish study shows. *Science*. Published January 14, 2022. Accessed January 18, 2022 at <https://www.science.org/content/article/covid-19-starkly-increases-pregnancy-complications-including-stillbirths-among>

Wadman M. Small study suggests pandemic may slow babies' development. *Science*. Published January 4, 2022. Accessed January 6, 2022 at <https://www.science.org/content/article/small-study-suggests-pandemic-may-slow-babies-development>

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.



Wappes J. Global study notes risk factors for uncommon severe COVID-19 in kids. *CIDRAP News*. Published January 12, 2022. Accessed on July 12, 2022 at <https://www.cidrap.umn.edu/news-perspective/2022/01/global-study-notes-risk-factors-uncommon-severe-covid-19-kids>

Wesselink AK, Hatch EE, Rothman KJ, Wang TR, Willis MD, Yland J, Crowe HM, Geller RJ, Willis SK, Perkins RB, Regan AK, Levinson J, Mikkelsen EM, Wise LA. A prospective cohort study of COVID-19 vaccination, SARS-CoV-2 infection, and fertility. *Am J Epidemiol*. 2022 Jan 20:kwac011.

Zambrano LD, Newhams MM, Olson SM, Halasa NB, Price AM, Boom JA, Sahni LC, Kamidani S, Tarquinio KM, Maddux AB, Heidemann SM, Bhumbra SS, Bline KE, Nofziger RA, Hobbs CV, Bradford TT, Cvijanovich NZ, Irby K, Mack EH, Cullimore ML, Pannaraj PS, Kong M, Walker TC, Gertz SJ, Michelson KN, Cameron MA, Chiotos K, Maamari M, Schuster JE, Orzel AO, Patel MM, Campbell AP, Randolph AG; Overcoming COVID-19 Investigators. Effectiveness of BNT162b2 (Pfizer-BioNTech) mRNA Vaccination Against Multisystem Inflammatory Syndrome in Children Among Persons Aged 12-18 Years - United States, July-December 2021. *MMWR Morb Mortal Wkly Rep*. 2022 Jan 14;71(2):52-58.

The information provided in this report is not intended to represent a complete compilation of all treatment options available nor is it to be interpreted as medical advice. The information is intended to serve solely as a guide to facilitate a discussion between you and your medical provider(s). Medical decisions should be made only after consultation with and at the direction of your treating physician(s).

Copyright © 2022 PinnacleCare International, LLC. All rights reserved.

No part of this material may be reproduced in any form, or by any means, without the prior written consent of PinnacleCare International, LLC.