**Cassy O'Connor MP**

Tasmanian Greens Leader
Member for Clark

Tuesday, 5 July 2022

Ruth Forrest MLC
Chair
Public Accounts Committee
Parliament House
Hobart TAS 7000

Dear Ms Forrest,

We write to you in your capacity as Chair of the Public Accounts Committee in order to submit documents for the Committee's consideration.

We understand the Committee is examining a range of matters relating to the Tasmanian Government's response to COVID-19. The Tasmanian Greens have been closely engaged with this crucial public health issue.

As an epidemiologist, Dr Woodruff has direct expertise in disease control, and as such we have been well-placed to support, scrutinise, and contribute to the government's pandemic response.

In addition to our advocacy for the adoption of life-saving measures such as border closures, lockdowns, and quarantine rules as the pandemic took hold, the Greens have also constructively worked with Government to improve Tasmania's response in a range of important ways – including the introduction of a residential rent freeze and evictions moratorium, wage supplements for hotel quarantine measures, and changes to public health measures on public transport.

While the government started the pandemic closely following the scientific evidence and best-practice public health principles, we have been highly concerned by their divergence from this approach since late last year.

As you will see from the submitted documents, we have raised these concerns consistently with government through correspondence, the provision of research, Parliamentary action, and public statements. Our concerns - and those of a range of independent experts and advocates - have been largely ignored. That is, the truth is being ignored while the seriousness of this pathogen is being consistently downplayed by government ministers and public health officials.

Instead of adopting a precautionary approach to Omicron, the government has forged ahead with a reckless, 'let it rip' approach which has led to over 194 000 Tasmanians contracting the virus to date, 83 lives lost to Covid since 15 December last year, a current daily reported case tally over 1000 for almost a fortnight, one of the highest transmission rates in the world, few

public health protections in place, and a BA.4 and BA.5 wave of disease looming. Given what research is already telling us about Long Covid risk, we are extremely worried about the number of Tasmanians who have been, and will be, harmed by this flawed strategy.

In summary, it is our view that this government has in recent months consistently ignored the best available advice and evidence with regard to the management of COVID-19, leading to a range of negative consequences for Tasmanians. We believe the attached documents are important for the Committee to consider in that context.

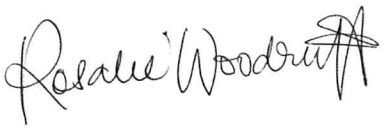
We also respectfully point the Committee towards worrying contemporary research which confirms there is no 'herd immunity' with this SARS virus, and indeed, the risk of reinfection after infection is

Additionally, given the important role the Greens have played in supporting, scrutinising, and contributing to Tasmania's COVID-19 response, we also request we are given the opportunity to appear before the Committee to speak in more detail to these matters.

We look forward to your response.

Kind regards,

**Cassy O'Connor MP**
Greens Leader
Member for Clark



**Dr Rosalie Woodruff MP**
Member for Franklin

# Media release: OzSAGE advises against removing all preventive measures against COVID-19

21 February 2022

In December 2021 we saw a surge in Omicron which resulted in preventable illness, death and severe societal impacts. There have been more deaths from Omicron in January and February 2022 than the whole of 2020 and 2021 combined. The Australian Bureau of Statistics confirms that deaths were due to COVID-19, and not incidental to COVID-19.
Reducing preventive measures including masks, testing and tracing in December 2021 resulted in many businesses experiencing mass cancellations and losses, as well as large numbers of workers being unable to work due to illness. At the peak, supply chains were disrupted, affecting availability of groceries. This could have been mitigated by continued use of masks and investment in testing and tracing. OzSAGE has said repeatedly that a vaccine-only strategy is not enough – we need a ventilation and vaccines-plus strategy as the best way forward.

The health systems in NSW and Victoria have been operating in crisis mode, with large numbers of staff infected and furloughed and even deaths among health workers. Nurses and paramedics went on strike last week in NSW over the appalling conditions they are expected to work in.

**Vaccination rates not optimal, and vaccine not the whole answer**
Australia has not yet achieved high 3rd dose vaccination, the standard now required to be described as 'fully vaccinated', nor are children 5-11 years completely vaccinated. Some groups like residential aged care and disability and Aboriginal and Torres Strait Islander people have lower vaccination rates than the rest of the population. Waning of protection against hospitalisation also occurs after a 3rd dose, so vaccines do not provide durable protection. We would expect to see the effect of this waning by April. For the 50% of the population who have not had a 3rd dose, protection against symptomatic Omicron is minimal. The belief that mass infection will create herd immunity has been proven wrong repeatedly, with four waves of SARS-CoV-2 throughout the pandemic, and reinfection being common. Reinfection has surged during the Omicron wave.

**Not a binary of dead or alive**
The WHO warns that the pandemic is not over and that stopping all COVID-19 prevention measures is premature. SARS-COV-2 is here to stay, and remains a serious infection, even in vaccinated people. It is not like influenza, and has not mutated into the common cold.
The outcomes of COVID are much more than death or survival. Research shows 37% of people get long COVID symptoms. Further, it may cause serious long-term complications, with twice the risk of heart attacks, stroke, heart failure and blood clots a year after infection. A study from the US National Institutes of Health showed virus persists in the brain, heart, lungs and other organs after initial illness. This may result in brain with changes that resemble Alzheimer's disease. It also causes long term lung damage and other serious long-term complications in survivors. Failing to control spread of SARS-COV-2 will result in a chronic burden of serious illness that we have not yet begun to appreciate. The use of masks may prevent a long-term burden of chronic illness from COVID-19. A large study showed that viral load (which is high if exposure dose is high) predicts long COVID. Wearing a mask reduces the viral load we are exposed to.

**Prevent new variants**
Another reason to prevent COVID-19 is that high levels of infection increase the likelihood that new variants will emerge. This is not the time to weaken our testing, tracing and surveillance system. The WHO has called on countries to strengthen both testing and tracing, but NSW and Victoria have done the opposite while removing measures to prevent the spread of SARS-COV-2.

**Retain workers compensation**

The NSW Parliament lower house has voted to remove access to workers compensation for people who become infected at work, unless the worker can prove it was contracted at work, and this now rests with the upper house. This will mean teachers and health workers have to go to work with no recourse if they get seriously ill or disabled from COVID-19 caught at work, while simultaneously facing high levels of infection because of removal of preventive measures to reduce SARS-COV-2 transmission . Making access to workers compensation more difficult is unjust and removes any onus on employers to provide safe working conditions and safe indoor air.

**Leave no-one behind**

Over half the population has a chronic disease of some kind, and one in five people in NSW has a disability. NSW has the largest Aboriginal population in Australia. For these communities and groups, removal of COVID-19 prevention measures and high levels of transmission is more likely to be fatal or cause severe complications. It must be remembered that Aboriginal people are under vaccinated compared to others. We urge that no person or community be left behind, and all are seen as equally important.

We all wish the pandemic were over, but starting and stopping COVID-19 prevention will result in a repeated cycle of epidemics. We believe we can achieve an equilibrium and prevent acute and chronic burden of illness if we retain evidence-based public health measures to prevent COVID-19.

**We recommend:**

1. Retain indoor mask mandates and recommend high quality respirators.
   Initiate widespread education on wearing better quality masks and respirators properly and improving fit
2. Provide free RATs as some other countries are doing.
   Invest in expanded PCR Testing capacity, followed by Trace, Isolate, and Quarantine (TTIQ) and expand surveillance for emerging variants
3. Retain QR codes so that mass tracing can occur when case numbers are high.
   Maintain accurate reporting of cases, hospitalisations, ICU admissions and death, following OzSAGE advice on reporting deaths.
4. Maintain existing access to workers compensation for people infected at work.
   Educate Australians why the pandemic is not over, why public health measures, especially masks, remain important and what they can do to continue to help to protect themselves, their loved ones, our society and economy. Convey that public health measures will continue to be required at higher or lower levels depending on how transmissible & virulent future variants are.
5. Mandate and regulate safe indoor air in workplaces and public indoor spaces, especially in schools and childcare centres – see our detailed guidance on this.
6. Develop and release planning for the management of further VOC
7. Urgently increase 3rd dose vaccination rates and plan now for the logistics required to vaccinate 6 months to 5 year old children.

# COVID-19 has become a leading cause of death in Australia – Urgent Call for Action

https://ozsage.org/media_releases/covid-19-has-become-a-leading-cause-of-death-in-australia-urgent-call-for-action/

OzSAGE, a multi-disciplinary network of Australian experts, is today sounding the alarm on the number of daily deaths due to COVID-19 in Australia. With COVID cases still increasing and winter rapidly approaching, Australia must take protective action to prevent deaths and disability. Hospitalisations remain high, with over 3,000 people admitted nationwide. This has resulted in overcrowded emergency departments and contributed to ambulance ramping and unacceptable ambulance response times, adversely affecting the provision of care for other health conditions. Higher COVID case numbers are leading to increased hospitalisation, suffering and death.

This is the first time an infectious disease has been a leading cause of death in modern history.

## Deaths

Over 70% of the more than 7,926 reported deaths from COVID in Australia to date have occurred in 2022 – and it's still only May. The Australian Bureau of Statistics found that, of the deaths that occurred up to 30 April 2022, COVID-19 was the underlying cause of death 89.8% of the time – that is, the overwhelming majority of deaths were *from* COVID, not *with* COVID.

It is important to note that these deaths were not limited to elderly Australians but include 896 people aged 20 to 50 years, and 13 deaths in children and adolescents. During Australia's first wave, the Australian Institute of Health and Welfare calculated that an average of 8-9 years of life were lost per person dying of COVID.

Deaths per day have been climbing, and currently sit at over 50 deaths per day. We are on track to reach approximately 15,000 to 18,000 deaths from COVID in 2022 – up to sixteen times the annual road toll (which was 1,127 in 2021) and six times the deaths from the worst recent flu season (3,024 deaths in 2017).

As of 8 May, there have been at least 145 deaths due to COVID amongst Aboriginal and Torres Strait Islander people, with 38 recorded just in Queensland. Almost all these deaths occurred this year. While this is less than 2% of deaths nationally, when we look at age-specific rates, Aboriginal and Torres Strait Islander people are 2-3 times more likely to end up in ICU or to die from COVID than non- Aboriginal Australians of the same age.

Our previous OzSAGE document – released February 2022 (Statement on Deaths in Australia from Covid-19) – called for care and respect for all deaths due to COVID-19, for transparent disclosure of data on mortality, and for the causes of death to be discussed with scientific authenticity and integrity.

There is a significant misconception in the general community that once a person has had COVID, they are 'immune'. But this is not the case. The prospect of re-infection looms large for all Australians. A significant drop in life expectancy has been noted in other countries since the beginning of the pandemic. OzSAGE's recommendations are aimed at reducing the impact of COVID in Australia, which currently has one of the highest case rates in the world.

# OzSAGE recommends all governments immediately respond by:

## PUBLIC HEALTH EDUCATION

- Launching a concerted public health campaign to educate the community on what individuals can do to help protect themselves from infection, with a focus on the airborne nature of COVID-19. (Similar to the campaigns for skin cancer, road deaths, and

smoking.) • Communicating the need for mask-wearing in all settings where transmission is likely to occur, such as indoor venues with poor ventilation.
- Making P2/N95 respirators (high-quality masks) freely available to the community with a public campaign on their use.

## IMPROVING VACCINE ACCESS

- Renewing efforts to increase third and fourth dose rates, and broadening eligibility for fourth doses.

## SAFE INDOOR AIR: VENTILATION/FILTRATION

- Championing and legislating standards for safe indoor air through ventilation and filtration.
- Educating and providing toolkits for ventilation assessments (e.g. CO2 monitoring).
- Offering grants to improve ventilation infrastructure, similar to the Victorian Government's Small Business Ventilation Program (Ventilation Rebate).
- Developing detailed plans to guarantee healthy air quality, especially in high-risk places such as aged and residential care facilities.

## TESTING/TRACING/REPORTING

- Providing free and easily accessible PCR testing and free rapid antigen test kits to households.
- Transparently reporting cases, hospitalisations and deaths from COVID.

## IMPROVING ACCESS TO HEALTHCARE

- Developing and improving healthcare protocols and pathways, access and provision, and educating the public and doctors about effective treatments such as antivirals and budesonide.
- Improving access to primary care for treatment, and advertising clear alternate pathways to treatment, for those living in areas of GP shortage or with limited financial means.

## PREVENTING FURTHER OUTBREAKS

- Creating teams including an Occupational Physician, Occupational Nurse, and Occupational Hygienist in each state/territory to review residential care facilities' controls/protections alongside Public Health and advise on practical adjustments to prevent future outbreaks. Similar work should be done for schools and other organisations.
- Supporting the efforts of the National Aboriginal Community Controlled Health Organisation (NACCHO) and other community-controlled organisations to mitigate the effects of COVID in all communities.

# Quotes

Both State and Federal Governments have no time to lose. On average some 50 people a day are dying from COVID. That's one person every 30 minutes. We will see tens of thousands more suffering from long COVID. Our health systems, schools and businesses are already struggling and the situation will get a lot worse if we do not act.

PROFESSOR NANCY BAXTER

It is disappointing that GPs have not been provided guidelines on rapid treatments for COVID in the community. Simple, proven, available measures like the asthma preventer inhaler budesonide may prevent severe complications, but there are no guidelines for community treatment. There are two effective antivirals which can reduce hospitalisation rates and one is widely prescribed in other countries, but access is severely restricted here. Living with COVID also brings with it a responsibility to provide access to effective treatments. We will regret not doing so, with a massive burden of chronic illness that will follow, much of which, along with deaths, could be averted by early use of antivirals and other treatments.

PROFESSOR RAINA MACINTYRE

The theft of precious years of life by COVID-19 for residents in residential care facilities is an overriding worry and concern for them, families, friends and staff. Simple practical protections including third and fourth dose vaccination, safe indoor air and high-quality masks (called P2/N95 respirators) cut the number and extent of outbreaks, preserving the lives of residents and preventing staff attrition.

**DR KARINA POWERS, OCCUPATIONAL AND ENVIRONMENTAL PHYSICIAN**

High quality masks work. We have seen the impact of their removal both internationally and in Australia. Quality masks work regardless of the variant – these are physical barriers to the virus that offer significant protection when used properly.

**MS KATE COLE, OAM, OCCUPATIONAL HYGIENIST**

It is urgent for the Commonwealth Government to introduce regulations and provide funding to ensure that aged care facilities have clean, safe air.

Many of these deaths are avoidable, but not if we continue to allow the virus to spread unchecked through our community.

**PROFESSOR MARC TENNANT**

Australia's experiment of living with COVID-19 has failed. The virus has shown us it's nothing like the flu. We need to change direction and aim for a low COVID future with a vaccines-plus-ventilation strategy.

**DR ZOË HYDE**

The approach to under-served communities and the ongoing crisis in remote First Nations communities is a national disgrace. It's time for everyone to recognize this crisis for what it is – and to realise that disparate health care becomes more so in this crisis.

**PROFESSOR LISA JACKSON-PULVER**

There are so many co-benefits to improving and paying attention to indoor air quality including increases in productivity and cognitive function/decision making ability and a reduction in absenteeism. Pre-pandemic the cost of poor indoor air was estimated for Australia at $12B per year – I think we are only now appreciating that this is a significant underestimate when our indoor spaces are challenged with a pandemic.

**ASSOCIATE PROFESSOR ROBYN SCHOFIELD, UNIVERSITY OF MELBOURNE, ASSOCIATE DEAN ENVIRONMENT AND SUSTAINABILITY**

OZSAGE

# Australia must plan now for a significant burden of disease and disability due to Long COVID


## Summary

- COVID-19 is multisystem disease with between 5 and 30% of the population experiencing disability due to long-term health effects manifesting as fatigue, difficulty in breathing and cognitive dysfunction. Long COVID is a heterogeneous condition, but many organ systems may be affected.
- Australia must plan for the increased demands that Long COVID-19 will have on our health and disability services and for reductions in the work capacity of many Australians.
- These demands occur at a time when the health system is strained and there are concerns about the rising costs of Australian's National Disability Insurance Scheme (NDIS) and people not eligible for the NDIS are being left behind without sufficient support.
- Australia has relied on a vaccine-only strategy to date. Vaccination alone does not adequately prevent transmission of SARS-CoV-2, and the impact on health and disability services of repeated infections is yet unknown.
- The burden of long COVID can be prevented or reduced. There is a need for all levels of government and society to recognise the likely impacts of long COVID-19 and prevent or mitigate it with additional strategies such as ventilation, masks, safe indoor air, testing and tracing to reduce transmission.
- OzSAGE provides context on long COVID-19, how it will affect society, the economy, the workforce and demand for health and disability services in the future, and makes recommendations for governments on how to prevent long COVID and how best to plan for the future impacts of long COVID on health.


## Background

SARS-COV-2 has many long-term and chronic complications. The WHO defines long COVID as the persistence of symptoms more than three months after initial infection and lasting at least two months. Estimates of long COVID vary from 4.5 to 30% or more. A meta-analysis showed that post-COVID-19 symptoms are present in more than 60% of patients infected by SARS-CoV-2. One study found a 4.5% rate of long COVID following Omicron compared to 11% for Delta. However, the vastly higher case numbers for Omicron will translate to a greater burden of long COVID, as it has for deaths and acute disease. The varied estimates of long COVID depend on the definition used and how it is measured. A range of symptoms, including fatigue, breathlessness, persistent cough, depression, headaches, mood swings, memory loss, other neurocognitive deficits, musculoskeletal inflammation, pain, muscle weakness, gastrointestinal upset, and skin rashes have been described. Fatigue and shortness of breath are the most common post-COVID-19 symptoms. Long-term symptoms may occur after relatively mild acute illness.

## Heterogeneous aetiology and multisystem disease

The SARS-CoV-2 virus can persist in almost any organ of body after the initial infection, and can cause a range of complications in the lungs, heart, blood vessels, brain and immune system. It can impair the immune system after infection. In addition, for at least a year after the initial infection, there is a doubled risk of heart attacks, strokes, cardiac arrest and blood clots. Other complications include metabolic, rheumatological, Intestinal, dermatological and endocrine disorders, including an increased risk of diabetes. Damage to organ systems has been found even in people with mild infection. Six months after infection, people with break through infection have a 1.75 times higher risk of death and a 1.5 times higher risk of post-acute sequelae. Vaccination may reduce long term complications by 15%.

**Australia's vaccine-only strategy will lead to mass infection, reinfection and a chronic disease burden**

Available vaccines prevent hospitalization and death, but do not protect well against infection. Omicron infection confers low protection against reinfection, so reinfection is expected. The national strategy to date has assumed mass infection is inevitable and aimed only for prevention of death and severe disease. OzSAGE believes this is a mistake and recommend reduction of infection to prevent future mass chronic disease and disability. Australia has relied on a vaccine-only strategy, yet rates of vaccination are sub-optimal for the third dose and in children. A vaccine-plus strategy that includes investment in testing, tracing, masks and ventilation can reduce the mass infection we currently face. By February 2022 alone, over 17% of Australians were infected, far higher than officially reported cases. Mass infection and unchecked spread of SAR-CoV-2 could lead to mass disablement among Australians. If we assume the best-case scenario for Australia (that 4.5% of people will develop long COVID) and if almost everyone becomes infected in the next year or two, we could be looking at over 1 million people suffering long COVID. This could be double or more at higher prevalence of long COVID. The impacts of long COVID will likely fall disproportionately on those at higher risk and with less access to health care – older Australians, regional rural and remote Australians, First Nations' people, people with disabilities and those from lower socioeconomic groups. While older people are more likely to experience post-acute complications, children are also vulnerable. The Covid-19 Schools infection Survey England: Long Covid and Mental Health reported in March 2022 that 2%**Error! Hyperlink reference not valid.** of primary school pupils and 5% secondary school pupils had experienced long COVID. The long term generational impacts may be significant.

**Workforce and economic implications**

Australian Bureau of Statistic data shows an increase in the number of people working fewer hours due to continued disruption from the Omicron variant and influenza between April and May 2022. The number of people working fewer hours due to their own illness in May 2022 (780,500 people) was the highest level recorded during the pandemic. In addition to acute illness disrupting the workforce, longer term effects are already being seen due to long COVID.

Data from overseas provides evidence of mass disablement occurring when Covid-19 infection spreads unchecked. The Census Bureau in USA, surveys 60,000-household on behalf of the Bureau of Labor Statistics shows 13% increased cognitive disability (having trouble concentrating, remembering or making decisions) in April/May 2022 average compared with January/February 2020 average. A large US study found one in five COVID-19 survivors aged 18–64 years and one in four survivors aged ≥65 years experienced at least one post-acute condition attributable to previous COVID-19. Around 2.0 million people in the UK (3.1% of the population) were experiencing self-reported long COVID as of 1 May 2022,

and around 398,000 (20%) reported that their ability for day-to-day activities had been "limited a lot". In the UK, levels of disablement following infection are affecting the workforce – a quarter of employers report that long COVID is a major cause of workplace absence.

Furthermore, problems with cognition, sudden cardiac or neurologic events have implications for safety critical and business process-critical tasking. For example, in roles such as commercial vehicle drivers, surgeon, police or key critical organizational management, catastrophic outcomes can occur due to direct and indirect Covid-19 illness.

We do not know yet the longer-term impacts of COVID-19 on economic participation because of people being unable to work or having reduced capacity to work. However, given the international evidence and the ongoing impacts of the pandemic, it is likely that future claims for income support through the disability support pension and unemployment benefits will rise.

The significant proportion of individuals experiencing symptoms for the foreseeable future as a consequence of their contracting Covid-19, will impact resourcing for Workers' Compensation Claims. Insurers affected include those funded privately, but large numbers of staff, particularly those working for government, are covered under insurance funded by public treasuries. There are therefore serious considerations for state Treasuries in their insurer exposures.

**Implications for the health system, the NDIS and disability supports**

Without a Vaccine-Plus strategy including safe indoor air, masks, testing and tracing, and widespread access to anti-virals, Australia is likely to see large increase in the prevalence of chronic illness and disability related to COVID-19. This will place considerable pressure on our already stretched health, rehabilitation and disability services and supports.

These pressures occur at a time when the health system is chronically over-burdened by COVID-19, and there are concerns about the costs of the NDIS due to higher demand than the original modelling by the Productivity Commission suggested. To be eligible for the NDIS someone needs to be less than 65 years at entry to the Scheme and have a permanent disability that substantially reduces their functional capacity or ability to undertake activities in one of the following areas: communication, self-care, learning, mobilising, and self-management. It is clear that long COVID can affect functioning across all of these areas. People with disability who do not meet these criteria are meant to receive services and supports through other systems (referred to as Tier 2) across all levels of government however there is widespread acknowledgement that these services have not been available as States and Territories and the Commonwealth have directed funding to the NDIS. This means that people with fluctuating disabilities, including psychosocial disability, have often missed out on supports sometimes resulting in a deterioration in their functional capacity potentially seeing them require NDIS funding down the track.

Long COVID may put additional upward pressure on the NDIS in two ways: a deterioration in functioning of people who are already on the NDIS and new entrants to the scheme who develop significant, permanent disability due to long COVID and require individual packages for equipment, therapy, personal care and other supports. Many people with long COVID will not be eligible for NDIS, at least initially. However, these people will still require support from rehabilitation, health and non-NDIS funded disability services. A substantial burden of chronic disease will likely impact the health system in the coming years. Prevention of COVID and investment in these services will be critical to improve or prevent deterioriation in functioning to prevent future reliance on the NDIS.

# Recommendations

- **Prevention** of SARS-CoV-2 infection through all means possible is essential to reduce the long-term burden of disease and disability from COVID-19. This includes renewed efforts to raise the rates of 3rd and 4th dose boosters, and to increase vaccination rates in children. A Vaccine-Plus strategy includes safe indoor air, masks, testing and tracing, which will all reduce transmission. The combined effects of these can substantially reduce disease burden of COVID-19 and long COVID. See specific OzSAGE advice for these.
- **Treatment** – broader, affordable and equitable access to antivirals to decrease viral load and hasten recovery may reduce long term complications.
- **We recommend the government urgently conduct modelling** to assess the likely impact of long COVID on the job capacity of Australian workers, the health system, the NDIS and other disability services, and the likely demands on income support due to disability caused by long COVID. This should test best and worst-case estimates of long-term disease and disability to inform planning for the future.
- **Raising awareness** and acknowledgment of Long COVID and the spectrum of post-acute complications for patients and health care providers. Employers should also be made aware of the potential for increasing numbers of employees dealing with long COVID and plan for workforce issues.
- **Clinical pathways** and clinical decision support tools for GPs should be established for assessment, investigations and specialist referral. This includes protocols on specific diagnostics for abnormalities not detected by routine tests (pulmonary, microclots, myocarditis).
- **Education for employers and organizations on pathways for medical fitness for work review and extended sick leave** for staff. Occupational physicians and general practitioners with occupational interest (involving occupational therapists and neuropsychologists if needed) can clarify if an individual who complains of symptoms or is making significant errors, is capable of safe work or identify what supports are needed to maintain their role safely. The doctors can also help clarify treatment plan and the prognosis and support for return from extended sick leave if needed.
- **Infrastructure to manage burden of chronic illness** (specialised long COVID clinics, and health system planning for the increased burden of chronic cardiac, respiratory and other complications). Ensure specialised clinics are accessible to disadvantaged groups. This could be achieved by strategies such as outreach programs through existing health networks, upskilling regional health practitioners and ongoing support for telehealth MBS item numbers.
- **Commonwealth and State and Territory governments need to plan for the potential increased demand for disability services including the NDIS in coming years** . Investments should then be directed to supporting people who are disabled by long COVID to receive the necessary services and support through the health system, rehabilitation, tier 2 disability supports, and the NDIS if they experience significant and permanent disablement.
- **Support for people who are unable to work or have reduced work capacity due to long COVID.** Consideration of expansion of Job Access Disability support with workplace accommodations including promoting flexible working conditions, rehabilitation services, incentives for employers to accommodate workers disabled by COVID-19 (such as subsidisation of work from home equipment, supernumerary work placement) and income support for people reduced work capacity due to long COVID.

**Long COVID working group**

Dr Karina Powers

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Prof Nancy Baxter

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# Minister Silent on Healthcare Staff COVID Absences

Dr Rosalie Woodruff MP - Tuesday, 9 November 2021

**Tags:** Health, Health Crisis, COVID-19

Rosalie Woodruff MP | Greens Health spokesperson

With Tasmania's borders opening in five weeks, the Government must urgently consider the potential health system impacts of absences from healthcare workers who become infected with coronavirus.

It is extremely concerning Health Minister Jeremy Rockliff would not respond to our question on this issue in Parliament today. Given his failure to answer, I have written to him on behalf of the Greens seeking an immediate response.

Full vaccination provides critical protection against the worst effects of COVID-19, but does not prevent all vaccinated people from becoming infected with the virus.

Recent research in The Lancet medical journal shows the overall effectiveness against infection for fully-vaccinated people in a large US study was 73%.*

There is already chronic understaffing in Tasmania's health system. It's crucial the Government has modelled, and is planning replacements for, the potential impact of coronavirus-positive healthcare workers unable to attend work.

In an already overstretched system, every healthcare professional who cannot attend a shift adds to the work burden on staff, and potentially impacts upon the optimum patient care.

Tasmanians have reasonable anxieties about the potential impact of COVID-19 once the border opens, and questions from our crucial health professionals cannot be ignored.

*https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)02183-8/fulltext#:~:text=In%20a%20pivotal%20randomised%20controlled,to%20SARS%2DCoV%2D2.

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# Student Safeguards Must be in Place by New School Year

Cassy O'Connor MP - Wednesday, 10 November 2021

**Tags:** Child Safety, Children and Young People, Commission of Inquiry

**Cassy O'Connor MP | Greens Leader and Education spokesperson**

Tasmanian parents need greater reassurance that their children are safe in the state's public school system.

The lack of transparency demonstrated by the Gutwein Government over the Inquiry in to the Department of Education's responses to child sexual abuse has done nothing to foster trust.

Professors Stephen Smallbone and Tim McCormack's full report of the inquiry in to sexual abuse in the State's public school system was received by government in June - nearly five months ago. It was released through Right to Information, on the same day the Education Minister tabled a summary document.

The report details a culture of cover up within education in Tasmania. The Government does little to reassure Tasmanians that cultural change is underway by attempting to hide details of the report.

When scrutinised by opposition parties in Parliament this morning, Minister Courtney claimed the government has been transparent. That would be more believable had they not sat on the report for five months before suddenly tabling a summary document in Parliament earlier on the same day that the full report was released through the statutory Right to Information process.

The report revealed "some record of concern" about more than 40 current employees, including at least three principals, with half potentially requiring further investigation. Perhaps of even greater concern, the Department has no way of knowing whether or not relief teachers have red flags against their name.

This would have been distressing news to wake up to for any parent sending their kids off to school this morning.

In the government's response to the report's recommendations, we are told many will take more than a year to implement. Those recommendations were made by Professors Smallbone and McCormack to fix serious issues identified with the safety of children and young people in schools. Their implementation is urgent to keep children safe.

Minister Courtney was unable to explain why their implementing safeguards will take so long.

Tasmanian parents need to know students are as safe as possible in public schools. Minister Courtney must explain to them why all the systems and safeguards for students won't be in place by the start of the 2022 school year.

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# Premier Backtracking on Public Health Commitments

Dr Rosalie Woodruff MP - Friday, 19 November 2021

**Tags:** COVID-19, Health

**Dr Rosalie Woodruff MP | Greens Health spokesperson**

Premier Peter Gutwein has said on numerous occasions he will not be pressured to open the borders, but as 15th December approaches he is abandoning some of his previous public health commitments. With approximately one quarter of all Tasmanians not expected to be fully vaccinated by then, there is concern and confusion in the community about the government's mixed messages and safeguards.

The Premier has previously assured Tasmanians all 12 to 15 year olds would be fully vaccinated by the time borders open. But with four weeks to go, vaccine data indicate we'll only be able to double-dose vaccinate 67% of these vulnerable young people. New plans to boost vaccination rates for teenagers now are coming far too late to change that situation.

By our calculations, in mid-December nearly a quarter of all Tasmanians will not

be fully vaccinated. That group includes all children under 12, and represents a significant potential for the coronavirus delta variant to circulate in the community.

The Government has not given any indication it is prioritising the vaccination of school-aged children when the expected announcement to green-light vaccines for 5-11 year olds is given by the Commonwealth in January.

The Premier has today walked back from yesterday's statement about only requiring "spot checks" of travellers' vaccination status upon arrival from 15th December, but numerous questions remain about his government's commitment and ability to properly resource Biosecurity to keep pace with the torrent of incoming visitors.

Waning immunity, and the potential for infection and transmission of the virus among fully vaccinated people, are other important considerations not addressed. Nor has how the hospital system will cope in the event of a large outbreak – despite constant questions being raised by healthcare workers, the Greens, and others.

To this point in the pandemic, the Premier has been guided by the public health advice in making decisions to keep Tasmanians safe. Despite assurances otherwise, it seems the federal push to open borders for Christmas is overriding some of his previously stated public health commitments, and Tasmanians are rightly asking why.

The Premier has a duty to outline his plans for protecting children and vulnerable people, to resource the public health safety measures needed to prevent an epidemic of COVID-19 occurring in Tasmania, and to increase investment in health system staffing prior to 15 December.

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# Vaccine Mandates for High Risk Professions

Dr Rosalie Woodruff MP - Wednesday, 24 November 2021

**Tags:** Health, COVID-19

**Rosalie Woodruff MP** | Greens Health spokesperson

With borders opening in just three weeks, Premier Peter Gutwein still refuses to provide certainty around the mandatory vaccination of teachers, police, other highly exposed public sector employees, and childcare workers.

Every other state and territory in Australia, except Queensland, has mandated vaccinations for teachers and childcare workers. Most have also required vaccination for police.

In Tasmania, education and support staff who work with children with disabilities are required to be vaccinated, but teachers and childcare workers are not.

Nor are police, who have close contact with vulnerable people, including children.

In early November, the Premier said a process was underway to assess the risk for each public sector agency, and identify which employees will be subject to vaccine mandates. Three weeks later, we've heard nothing more.

In Parliament today the Minister for Education accepted there will be COVID circulating in schools early next year. When asked by the Greens, the Premier could only say his government was continuing to look at the issue of vaccination mandates for teachers.

With the date for reopening our borders fast approaching, the community needs reassurance from the Premier that he is taking every step possible to safeguard children and Tasmanian public sector employees from the risk of delta infection.

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# The Reopening of Tasmania's Borders

Cassy O'Connor MP - Wednesday, 15 December 2021

**Tags:** COVID-19, Health

**Cassy O'Connor MP | Greens Leader**

fter nearly two years of relative safety from COVID, Tasmania opened its borders to all mainland states today.

It's estimated around 14 000 people each day will arrive here over Summer, and many of them will be from NSW and Victoria where both Delta and Omicron are on the loose.

In the past 24 hours, NSW and Victoria have each recorded more than 1000 new cases. Modelling released today suggests NSW could be facing 25 000 new cases a day by the end of January. These factors, in a fast-changing situation, substantially elevate the risk of COVID entering Tasmania.

Having made the premature decision to open the border today in the middle of a global pandemic and before young children are vaccinated, Premier Peter Gutwein has an enormous responsibility on his shoulders.

He helped to keep Tasmanians safe for more than 18 months. With the virus seemingly out of control in NSW and Victoria, and the NSW Premier lifting all restrictions today, we trust Peter Gutwein will have the flexibility and courage to pull up the drawbridge if necessary to protect the health and lives of Tasmanians.

**Rosalie Woodruff MP | Greens Health spokesperson**

he Omicron variant brings many unknowns, but what is clear from the rapidly increasing numbers overseas is it's highly contagious.

Tasmanian children won't be vaccinated until the new year, and most people have not yet had their necessary third dose.

There will likely be hundreds of thousands of visitors to Tasmania over summer, visiting family, friends and tourist attractions.

Tasmania's small population means we don't have spare resources to fill roles when people are exposed or infected with COVID and need to isolate. This is especially the case with Biosecurity Tasmania and healthcare workers.

The last 21 months have taken their toll on Tasmanians, and these experiences should not be in vain. The missed family gatherings, the weddings and funerals, should not be sacrifices made for nothing.

The Director of Public Health must be involved in all decision-making over summer. The Premier must put the health and safety of Tasmanians first, and have open communications through media conference.

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# Mask Mandate Essential

Dr Rosalie Woodruff MP - Sunday, 19 December 2021

**Tags:** COVID-19

Rosalie Woodruff MP | Greens Health spokesperson

The Greens welcome the introduction of an indoor mask mandate, but question why this important measure has not been in place since the state's borders opened last week.

The expert epidemiological modelling commissioned by the Government was oxygen-clear - when our borders opened to states with high levels of COVID, the virus would inevitably enter Tasmania.

Given this, and the rapid rise of the highly contagious Omicron strain, a mask mandate should have been in place in Tasmania from day one.

There are now seven confirmed cases in less than a week of borders opening. After almost two COVID-free years, many Tasmanians are understandably worried.

Masks are a crucial defence against the spread of COVID-19, particularly in indoor and crowded settings. It's vital to mandate mask wearing for these

settings.

Public health principles do not rely on individuals to take action - that is a recipe for pandemics to spread.

Other countries that have taken public health measures too late, like the UK and European countries, are now forced to step in with more extreme responses to control spiralling hospital cases.

The only way to control pandemics is at a population level by creating the regulations and systems to protect our community. Mask mandates for likely super spreader environments, especially indoor areas, is an obvious preventive measures.

In addition to mask mandates, the Government should re-establish communication around new cases and exposure sites. Since COVID entered Tasmania the first day borders were open, new cases have emerged daily but many Tasmanians are missing out on this crucial information in real time.

We've already recorded seven cases in less than a week, despite the border measures in place.

What Tasmanians want to hear is that the Gutwein Government will do everything in its capacity to keep them safe, and not let the virus rip as they are seeing in some mainland states.

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# Gutwein Abandons Tasmanians to Omicron

Cassy O'Connor MP - Thursday, 30 December 2021

**Tags:** COVID-19, Health, Political Leadership

**Cassy O'Connor MP | Greens Leader**

The Gutwein Government has abandoned the strong public health principles and messaging that kept Tasmanians safe from a deadly, disabling virus for nearly two years.

With his let-it-rip strategy, Peter Gutwein has gone from hero to public health enemy number one within a fortnight.

While Omicron continues to infect Tasmanians and threaten unvaccinated children because Peter Gutwein opened the border too early, locals have effectively been left to fend for themselves and vulnerable people they love.

The State has hundreds of cases of COVID-19, including three hospitalisations. At a time when Tasmanians most need to hear from the Premier, there's radio silence for days.

Where, for example, is the warning to Tasmanians about avoiding New Year's Eve super-spreader events?

Where is the advice for immunocompromised Tasmanians, like cancer patients, the elderly, Tasmanians living with disability, their families and friends?

Where is the guidance on upgrading to better quality masks to protect against the super-transmissible Omicron?

When will the Gutwein Government subsidise urgently needed rapid antigen tests?

Why is Peter Gutwein continuing to allow plane loads full of Covid in to infect under-protected Tasmanians?

Does his government regard vulnerable Tasmanians, including children under 12, as acceptable collateral damage for a short-term economic sugar hit?

Why so little up to date, readily accessible information on risky locations and Covid outbreaks, so Tasmanians can try to shield themselves from catching a deadly, disabling disease?

Is the strategy just to let it rip, claiming lives, overwhelming our hospitals and consigning a generation of Tasmanians to debilitating long Covid, and potential brain damage?

These questions remain unanswered by Peter Gutwein. Tasmanians are desperate for information – they're anxious and, rightly, angry about the Liberals' betrayal of their trust.

We urge all Tasmanians to stay safe this New Years Eve – stay in where you can, and mask up with a high quality mask, or double mask, if you're in a public space. Enjoy the summer by safely socialising outdoors.

Don't accept that catching Covid is an inevitability. We're only here because of the dark choices made by the a Morrison, Perrottet and Gutwein Governments.

The health of friends, family and our fellow Tasmanians are what matters most as Australia lurches in to 2022.

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# Gutwein Signs on to Morrison's Dangerous Covid Path

Dr Rosalie Woodruff MP - Friday, 31 December 2021

**Tags:** Health, Tasmanian Health Service, COVID-19, Political Leadership

**Rosalie Woodruff MP | Greens Health spokesperson**

The Prime Minister's reset of close contacts, and anti-testing rhetoric is dangerous and will put lives at risk – but it was accepted without question by Tasmania's Premier, Peter Gutwein.

While both Western Australian and South Australian Premiers had the spine to stand up to Morrison's dangerous re-definition of 'close contacts', Peter Gutwein did not. The only reason for changing the exposure period for 'close contact' from 15 minutes to 4 hours is to reduce the soaring numbers of covid being reported.

Regrettably, it's no surprise Scott Morrison is ignoring science, and putting politics above the public good. After his 22 months of listening to public health advice and consequently keeping Tasmanians safe, Peter Gutwein's capitulation to the Prime Minister says everything we need to know about his changed priorities.

Yet another example of Premier Gutwein's changed course is his decision to cancel the requirement for negative PCR tests for visitors to Tasmania. This will simply mean more mainland COVID-19 cases make it to our vulnerable island state.

Tasmania has a much more vulnerable population, and a health system that will not cope with the increased burden COVID will put on it. That was clear from the Kirby modelling the Government commissioned ahead of our borders opening, based on the Delta strain – it will only be worse with Omicron.

Peter Gutwein should be straight with Tasmanians about the impact his changes to testing requirements and Omicron's obvious community transmission will have. He should release the up-to- date modelling on which he made his dangerous decision to not only open the borders, but back in the Prime Minister at National Cabinet yesterday.

Governments must not give up trying to control COVID-19. The Premier needs a strategy to maximise vaccines, ventilation, HEPA air cleaners, better masks (KF94, P2/FFP2, N95), rapid antigen test availability, increase contact tracing, continue quarantine, and financial support for struggling businesses and casual workers – and he should close the borders to high risk states.

It's distressingly clear the Liberals' focus is no longer to keep Tasmanians safe, it's simply to do the bidding of the Federal Liberal Party, along with the THA and TICT.

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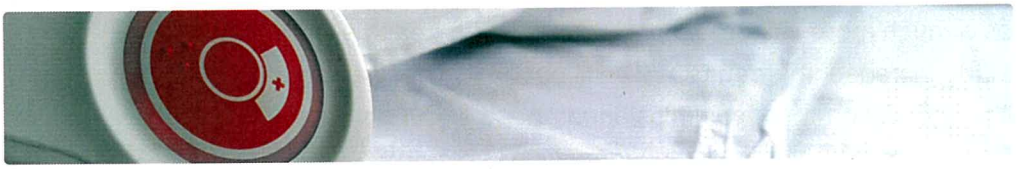



# Gutwein Must Reverse Let It Rip Strategy

Dr Rosalie Woodruff MP - Tuesday, 4 January 2022

**Tags:** Health, COVID-19, Hospitals, Aged Care, Economy, Small Business

**Rosalie Woodruff MP | Greens Health spokesperson**

The predicted and rapidly unfolding COVID crisis is hurting Tasmania. Hundreds of people a day are being infected, testing is a mess and businesses are closing their doors.

In the three weeks since Peter Gutwein opened the State's borders and welcomed COVID to our island, we've gone from a confident and healthy island to a bunkered-down, infected community, with many living in anxiety.

Over 700 Tasmanians tested positive in the last 24 hours, and Omicron is now in aged care homes, hospitals and childcare centres. There is obvious community transmission, close contacts and symptomatic people are being turned away from testing clinics, and businesses are closing their doors.

Peter Gutwein's call for calm is nothing more than failed leadership. The Premier bulldozed to open the borders - despite knowing almost nothing about Omicron, but in the full knowledge of unvaccinated under 12s and a fast spreading new

wave in NSW and Victoria.

Tasmania is now in the grip of a serious health crisis and public confidence in the government's management of COVID has collapsed, largely because Peter Gutwein has stopped leading with care.

After 22 months of putting public health first, and telling people how serious and debilitating COVID could be, the Premier has opened the border and walked away.

The Premier must stop trying to normalise Omicron and put the health and safety of Tasmanians and local businesses first. We need to slow the rapid spread of COVID in the community, and we implore Peter Gutwein to put the needs of vulnerable people first.

Slowing the virus is a multi-pronged strategy starting with closing the borders to high risk states, and using a short lockdown to allow the beleaguered public health response to catch up with the massive caseload. We urgently need to fast-track vaccines, more rapid antigen tests and staff for contact tracing, to continue quarantine, better masks (KF94, P2/FFP2, N95), and to improve indoor air quality.

If the Premier continues this heartless 'let it rip' strategy, he is responsible for every Tasmanian who tests positive, every person turned away from a testing clinic, and every business that closes its doors.

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# Jury Trial Suspension is on Peter Gutwein

Cassy O'Connor MP - Thursday, 6 January 2022

**Tags:** Justice, Supreme Court, Prisons, COVID-19, Health

**Cassy O'Connor MP | Greens Leader**

The Supreme Court's decision to suspend jury trials, while right for the safety of those called to do jury duty, will mean justice is delayed for many. There is already a backlog of cases to be heard, and this will only add to the wait.

In Peter Gutwein's Covid-infected Tasmania, justice is now on hold.

People will be remanded in custody for months before their matters can be heard. That's not a functioning justice system, it's unjust imprisonment and it's due to a political decision made by the Premier to open the floodgates to Omicron.

While we know the Liberals are largely ambivalent about the rights of prisoners, this is not about the guilty. This decision impacts those who have yet to receive a verdict – and who may, ultimately, be acquitted.

Thousands of Tasmanians are becoming infected, businesses are closing, workers are losing income, the health system is cracking, now it's the justice

system. What will it take for the Premier to reset to slow the spread of this dangerous virus?

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# As Covid Surges, Serious Questions Remain Over School Return

Cassy O'Connor MP - Monday, 10 January 2022

**Tags:** COVID-19, Education, Schools, Children and Young People

**Cassy O'Connor MP | Greens Leader and Education spokesperson**

As Covid rips through the Tasmanian community, many parents are highly stressed about sending their unvaccinated children into classrooms when the school year begins on 9 February.

Education Minister Courtney needs to explain in detail how children can be kept safe from the highly infectious Omicron variant, or Delta, during this escalating Covid outbreak.

A month from now case numbers will still be soaring, and Public Health guesstimates this current surge will peak in March.

Telling parents their children 'may' need to wear masks provides no reassurance this Minister and this government are 'on top of Covid' as they promised Tasmanians they would be.

Parents can't make an informed decision about whether it's safe to send their children back in to crowded classrooms.

Teachers also need strong reassurance, particularly those who are immuno-compromised or with a chronic condition.

If Covid got loose in our primary schools it would be devastating.

A growing body of research points to significant long term health impacts, including a higher risk of developing diabetes, in children who have contracted Covid.

The Gutwein Government has let Covid rip through the Tasmanian community but it must take every necessary step not to let it rip through Tasmania's schools.

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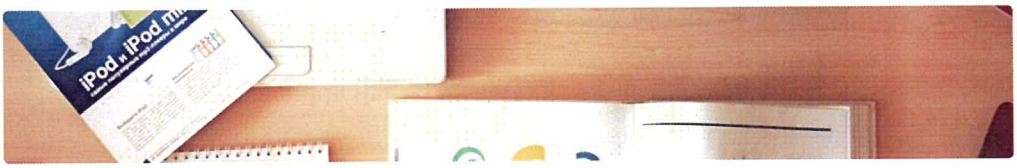



# Gutwein Government Has No Apparent Plan for Preventing Covid in Students with Disability

Cassy O'Connor MP - Friday, 14 January 2022

**Tags:** Education, Schools, COVID-19

**Cassy O'Connor MP | Greens Leader**

Tasmanian children remain highly vulnerable to the Gutwein Government's current let-Covid-rip strategy, children with disabilities likely even more so.

It's imperative the government release its plan for how it proposes to keep students with disability safe when school returns - if it has one.

Since the Premier announced the lifting of border restrictions in October last year, parents, carers and teachers of students with disability have been ringing the alarm bells with government. They want answers on the steps that will be taken to keep their children safe, remembering no Tasmanian child under 12 will be double-vaccinated before the start of the school year.

With less than a month until school returns, the radio silence from government is not good enough.

COVID-19 is a profound risk to people with disability, particularly those who depend on others to provide support. The Gutwein Government's "let it rip" and 'personal responsibility' strategy has only increased that risk to every Tasmanian with a disability.

The Premier should put himself in the shoes of parents, carers and teachers of children with disability. How would he feel knowing a child of his was facing a infection with a deadly virus? How would he feel seeing this risk being met with platitudes and inaction, just three weeks before school is set to go back.

Peter Gutwein is pretending everything is on track for the reopening of schools on 9th February, when the current Covid infection wave will have yet to peak according to Public Health. Without proper plans to protect students with disability, thousands of Tasmanian students would be entering an environment that would put their health in real peril.

The Gutwein Government needs to engage with parents, carers, teachers and advocates immediately and explain how this public health crisis of government's making will be mitigated to protect students with disability.

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# School Start Plan Unsafe

Dr Rosalie Woodruff MP - Friday, 21 January 2022

**Tags:** Education, Schools, COVID-19

Dr Rosalie Woodruff MP | Greens Health spokesperson

The plan Premier Gutwein has announced for Tasmania's education system is a plan to keep schools open, not a plan to keep schools safe.

Despite parents, teachers, the AEU and the Greens consistently voicing concerns about vaccination rates, COVID case management, mask wearing, ventilation, and workforce availability, the Government's last minute plan does not safely address any of these issues.

There is no explanation – or public health rationale – for allowing classroom positive case numbers to grow to five before action would be taken to increase the safety of students.

Why do primary school children – who will all be unvaccinated when school returns – not have to wear masks, when expert evidence shows this is a key factor in reducing school infection rates?

The Government's plan to exempt teachers who are 'close contacts', but have no apparent symptoms, from isolation means they can return to the classroom and potentially infect children.

This plan denies the science of Omicron transmission, and sows seeds of confusion for parents who are looking to make sure their children are safe. Knowing COVID will be allowed to circulate in schools in these ways will be a clear red flag for many parents – particularly those whose children have additional risk factors.

It's also not clear the government's plan to create a pool of teachers to respond to the expected unavailability staff is at all feasible. Relief teachers have already reported being run off their feet before borders opened, and it remains to be seen how many retired teachers will want to take the risk of potentially exposing themselves to COVID, or who want to deal with such challenging circumstances.

Premier Gutwein has declared schools will return on 9th February no matter what. But if ventilation improvement is not complete, the back up workforce is not available, mask wearing is not mandated, and COVID case management is not fixed, he should delay the start date until they are.

Minister Courtney is putting her high-paid attention into relaxing on holiday while her staff scramble to respond to what is probably the biggest school public health crisis since the polio epidemic.

The Gutwein Government has formulated a plan they think will keep schools open, but it's already apparent this plan doesn't reassure parents and teachers it does everything possible to keep schools safe. The Premier should call his Minister to return, take on board feedback from the AEU in the days ahead, and be prepared to delay the return to school if necessary.

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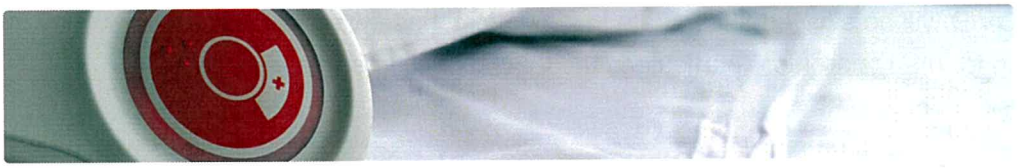



# Greens Release Plan to Flatten the Curve and Save Lives

Cassy O'Connor MP - Tuesday, 1 February 2022

**Tags:** Health, COVID-19, Schools, Hospitals, Small Business, Education

**Cassy O'Connor MP | Greens Leader**

Last December, the Premier abandoned his longstanding commitment to putting health and safety first, and adopted a "let it rip" Covid response. This radical reversal of Covid management was not discussed with Tasmanians. It is based on the false hope we are towards the end of the Covid pandemic. There is no credible evidence to support this belief.

Since Peter Gutwein opened the State's borders and welcomed COVID to our island, we've gone from a confident and healthy island to a bunkered-down, infected community, with many living in anxiety.

Since opening the borders, there have been five deaths, 29,071 cases, and currently there are 16 hospitalisations, 1 ICU admission and 14 Tasmanians are in community case management facilities.

Lutruwita/Tasmania needs to flatten the curve to save lives and livelihoods.

The Greens' plan puts the health and safety of Tasmanians and local businesses first. Instead of trying to normalise infection as the Gutwein Government is doing, we want to see Tasmanians kept safe from Covid and the risk of long Covid.

**Dr Rosalie Woodruff MP | Greens Health spokesperson**

Our key goal must be to reduce transmission of the virus to save lives and prevent debilitating long Covid. It's also critical to preventing Ambulance Tasmania and the State's public hospitals from being overrun, and for the safe function of society.

We urgently need to fast-track vaccines for 5-11 year olds, mandate third dose vaccination for all front-facing government employees and school staff, and invest in ventilation infrastructure. We need P2, N95 and similar masks to be mandatory and provided free for teachers, and staff in aged, disability and child care.

The decision to dilute or drop evidence-based public health measures to restrict the movement of coronavirus through our population was a grave mistake. Our plan reinstates a timely testing process for people to determine if they are Covid-positive, and makes Rapid Antigen Tests free and accessible, including for close contacts with and without symptoms.

Further delay in implementing these evidence-based public health measures will see infections continue to increase, along with hospitalisations and deaths, and ensure more cases of debilitating long Covid in the community.

Tasmanians deserve better than 'let it rip' as the Covid management strategy for Omicron, and likely future Covid variants They know a new plan for Covid is desperately needed. The Greens' plan is backed by public health evidence and a commitment to public safety.

**The Greens' plan includes:**

- Accelerated vaccination for high risk groups, including children under 12, and third doses for the double vaccinated.
- A delay in returning under 12s to face-to-face learning, except for children of essential workers, until all children are able to be double vaccinated
- Masks for primary school children when they return to classrooms
- Upgraded mask advice and mandates to prevent Omicron spread
- Increase resourcing for COVID @ Home

- Pay front-line healthcare workers a Covid allowance
- Investment in a substantial statewide Covid-safe ventilation upgrade for all government buildings, including schools
- Grants for community organisations and private businesses to upgrade ventilation
- Reinstate tenancy protections and cost of living relief measures
- Formally recognise, and act to prevent, the risk of debilitating long Covid

***You can read our full plan here***

***- https://tasmps.greens.org.au/policy/greens-covid19-emergency-response-plan***

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# Gutwein Reckless Considering End to Mask Mandate

Dr Rosalie Woodruff MP - Friday, 18 February 2022

**Tags:** Health, COVID-19, Schools, Education

**Dr Rosalie Woodruff MP | Greens Health spokesperson**

We are unsurprised at the Liberals' plan to ditch mandatory check-ins from 6pm tonight, but the Premier's indication he will consider dropping mask mandates is alarming.

The Check-In Tas app became largely redundant as soon as the Gutwein Government abandoned resourcing for contact tracing. It has become as useless at curbing Covid spread as Peter Gutwein's cavalier adoption of individual responsibility as a core public health measure.

The numbers of Tasmanians checking in declined when they realised the information was simply going into a black hole.

After Peter Gutwein blithely detailed the increasing school outbreaks, he went on to tell Tasmanians he is considering removing the State's mask mandate – one of

the only remaining public health protections.

There are hundreds of new Covid cases every day, and more than half Tasmania's schools have cases. Today the State Health Commander confirmed 18,000 school children are yet to even receive a single vaccine dose.

This is the environment in which Peter Gutwein thinks ditching masks is a good idea.

Effective masks provide a level of protection for uninfected wearers, as well as reducing Covid spread from those who are infected. They are a critical public health measure while Covid remains spreading in the community.

It is reckless to consider abandoning masks, and it sends a dangerous message to the community. It seems each day brings a new low for the once-public health focussed Premier.

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# Gutwein Government's Failed Covid Guidelines Put Aged Care Residents at Risk

Dr Rosalie Woodruff MP - Wednesday, 2 March 2022

**Tags:** Health, Aged Care, COVID-19

**Dr Rosalie Woodruff MP | Greens Health spokesperson**

Tasmania's guidelines for residential aged care facilities ignores critical infection management directions needed to successfully prevent exposure by residents or staff to the airborne Covid-19 virus.

The World Health Organisation declared Covid to be an airborne virus in May 2021, and the Victorian Department of Health also confirmed the same in February this year. The independent OzSAGE group of epidemiologists warn against incorrectly referring to Covid as principally being transmitted via contact and droplets.

When we asked Health Minister Jeremy Rockliff about his government's failure to adequately address the reality of Covid transmission, he refused to answer the question.

Covid-19 is an airborne virus, and the fine aerosols produced by an infected person talking or breathing can be potentially deadly or disabling. The Gutwein Government's aged care guidelines contain no general prescription for aged-care staff to wear masks to protect themselves and the vulnerable people they work with.

Minister Rockliff refused to commit to updating the aged care guidelines to conform to OzSAGE advice and World Health Organisation best practice. Tasmanians living in aged care are some of the most at-risk people in our community, but the Liberals are refusing to listen to the science about how best to protect them.

We are concerned an underlying reason for these poor quality guidelines and the subsequent failure to ensure N95 or P2 masks are worn, and to properly upgrade ventilation systems, is a desire to cut costs in aged care.

Minister Rockliff's silence in Parliament indicates it is unlikely he will be updating the advice for aged care facilities to require the minimum protections needed to care for Tasmanians at risk.

Peter Gutwein's Liberals have now seemingly abandoned aged care residents in the same way their federal counterparts have.

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# Gutwein's Reckless Removal of Masks

Dr Rosalie Woodruff MP - Friday, 4 March 2022

**Tags:** Health, COVID-19, Schools

**Dr Rosalie Woodruff MP | Greens Health spokesperson**

The Gutwein Government's decision to remove universal mask wearing requirements for retail settings, and in hospitality and markets in a week, is a preposterous move.

The decision follows a week of sustained high Covid case numbers, including in primary schools, and denies the reality that many Tasmanians are not fully vaccinated, with three doses.

A substantial proportion of Tasmanians are not yet fully vaccinated, including no child under 12 years old. On Wednesday the Minister for Education, in response to our question in Parliament, admitted there are 1710 young people with active Covid, nearly 1300 of whom are in primary school.

Mask wearing reduces the risk of hospitalisation from Covid, as well as the risk of developing long Covid and its potentially serious and disabling consequences.

With the high amount of virus circulating among unprotected Tasmanians, the Premier's removal of an indoor mask wearing requirement at this point is reckless, and careless about the chronic disease burden risk.

People can be infected with Covid and show no symptoms, or take days before symptoms appear. Universal mask wearing reduces the viral load in an indoor air space, and substantially reduces an individual's risk and the level of infection across the community.

The Premier's actions are inexplicable when children and about a third of adults are not yet fully vaccinated. He should return to putting the health and safety of vulnerable Tasmanians, including all children, beyond his "open for business" focus.

In the current Covid climate, the Premier's decision is reckless and it flies in the face of epidemiological science. In this context, we urge all Tasmanians to continue wearing masks.

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# Liberals Refuse to Release Mask Advice

Dr Rosalie Woodruff MP - Wednesday, 9 March 2022

**Tags:** Health, COVID-19

**Dr Rosalie Woodruff MP | Greens Health spokesperson**

In their refusal to provide Public Health advice on removal of mask protections, the Gutwein Government is treating Tasmanians with contempt.

It's patronising to all Tasmanians, who are being kept in the dark. The community deserves better than a government too arrogant to be straight with them.

While the Health Minister spoke for 20 minutes about the government's apparently terrific response to Covid - which has infected more than 50,000 Tasmanians - he didn't provide any reason not to be straight with the community.

What's so wrong with the advice that Mr Rockliff doesn't want people to see it?

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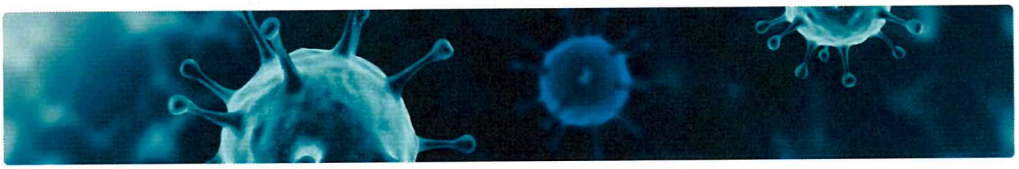



# Covid Cases Jump as Masks Come Off

Dr Rosalie Woodruff MP - Tuesday, 15 March 2022

**Tags:** COVID-19, Health

**Dr Rosalie Woodruff MP | Greens Health spokesperson**

Today's 400+ case jump follows the Gutwein Government's decision to remove mask wearing protections in most indoor settings. This increase in cases was predicted – and avoidable.

The independent OzSAGE experts have recommended governments maintain mask protections to reduce the spread of Covid.

Masks reduce the risk of being hospitalised from Covid, and of developing long Covid – which can have potentially serious and disabling consequences.

This is simple, clear public health policy. The Premier himself was forced by Public Health to acknowledge that mask wearing indoors is still recommended.

Covid cases are on the rise in Tasmania and a new variant is establishing itself. Today's spike in cases looks like an entirely avoidable result of the Premier's irresponsible decision.

We urge all Tasmanians to wear a mask in indoor settings – for your own health, and the health of those around you.

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# Archer Must Act on Risdon Prison Covid Outbreak

Dr Rosalie Woodruff MP - Tuesday, 12 April 2022

**Tags:** Risdon Prison, COVID-19, Health, Corrections

**Dr Rosalie Woodruff MP | Greens Health and Justice spokesperson**

Risdon Prison is overcrowded and understaffed, and now they are battling mass outbreaks of Coronavirus and staff absences. This is a combustible, inhumane situation and Corrections Minister Archer needs to release low risk inmates to relieve the pressure in the prison.

Inmates have long been the silent victims of the pandemic, with visitations from loved ones cut back and now ceased all together as the prison struggles to contain a surge in cases among staff and inmates.

The Greens are calling for the release of vulnerable, low risk prisoners on compassionate grounds.

There is a strong epidemiological case for this to happen immediately, to curb the spread of the virus and to relieve pressure on staff.

With 16 staff testing positive in recent days this will become a full blown crisis by week's end. Corrections Minister Elise Archer needs to act decisively and with

compassion. She must, today, seek health advice and work with unions collaboratively.

This pandemic is not over, despite the casual 'let it rip' approach of the Liberal Government.

The Greens will support any and all measures that see vulnerable Tasmanians protected. We call on the new Premier and Health Minister Jeremy Rockliff to mobilise his department and spur his Ministers into action.

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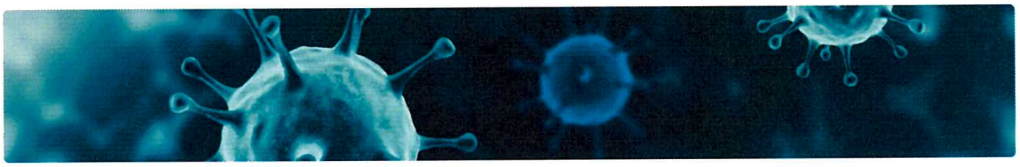



# Removing Covid Protections is Irresponsible

Dr Rosalie Woodruff MP - Wednesday, 27 April 2022

**Tags:** COVID-19, Health

**Dr Rosalie Woodruff MP | Greens Health spokesperson**

Today's announcement that Covid close contact restrictions will be dropped is irresponsible and potentially harmful. Case numbers are still extremely high – and most critically, Tasmanians are still dying and developing long Covid.

Winter is coming, the Covid daily case rate remains high, and the effectiveness of the third vaccine dose is waning for many Tasmanians. Now is the time for the Liberals to tighten and reinforce the importance of public health protections, not to weaken them.

Instead of abandoning critical protections, the Rockliff Government should be stepping up mask wearing education campaigns and funding ventilation upgrades.

Removing close contact isolation requirements won't solve workplace shortages. It will just mean more people get Covid, and more people risk getting long Covid post-viral syndrome and other serious long-term complications.

Epidemiologists across Australia and the world are unified in saying the Covid pandemic is far from over. Just because Premier Rockliff and the Tasmanian Liberals want it to be over, doesn't make it so.

In the midst of a crisis, we need to take care of each other.

To get through winter safely, Premier Rockliff's job is to enforce the public health measures that will protect vulnerable people in the community. That means indoor mask wearing and maintaining safe distances, as well as ensuring close contacts remaining quarantined to prevent unnecessary transmission of a highly infectious virus. Encouraging anything else is irresponsible

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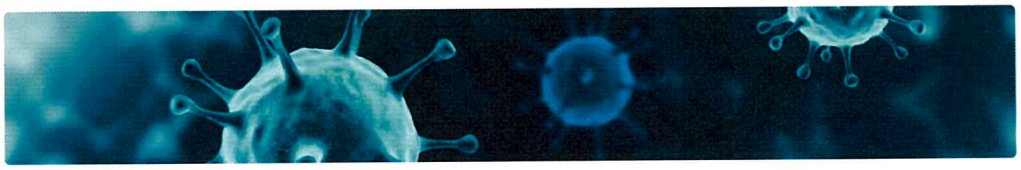



# Liberals Cut Protections while Covid Cases Double

Dr Rosalie Woodruff MP - Tuesday, 21 June 2022

**Tags:** COVID-19, Health

**Dr Rosalie Woodruff MP | Greens Health spokesperson**

In the last two days, Tasmania's Covid case number has more than doubled to 1000 cases, and hospitalisations have increased by a third. While the evidence of rising Covid cases is unarguable, the Premier and Health Minister Jeremy Rockliff is pushing ahead to remove the very protections Tasmanians need against infection.

With the Covid virus circulating extensively in the community, and without universal mask wearing in indoor spaces, even fully vaccinated people are very susceptible to infection.

From Saturday, Premier Rockliff is removing the requirement to wear face masks in tightly packed indoor places, like public transport, schools or childcare centres. Mask requirements to protect the sick, elderly and immune-compromised in hospitals, aged care and disability settings will also disappear on 30 June.

Full vaccine coverage does not protect people from being exposed to a huge viral dose and then infection. The research is clear now that Covid infection can cause serious, sometimes life-shortening, health complications or post-viral illness in many people.

People who are immunosuppressed, like cancer patients, those who have existing chronic illnesses, such as respiratory disease, diabetes, hypertension, and older people are more likely to get long COVID or a post-COVID condition. Even people without those conditions, or who get few or no Covid symptoms when infected, are at risk.

Universal mask-wearing substantially reduces the amount of virus in small spaces – like buses or hospital waiting rooms. The best way to protect from Covid is layered protection.

It is beyond reason or basic public health management to be removing the requirement to wear masks with Covid infection and daily hospital cases remaining high. The Minister for Health should extend the requirement in existing settings, and expand it to include other public indoor spaces.

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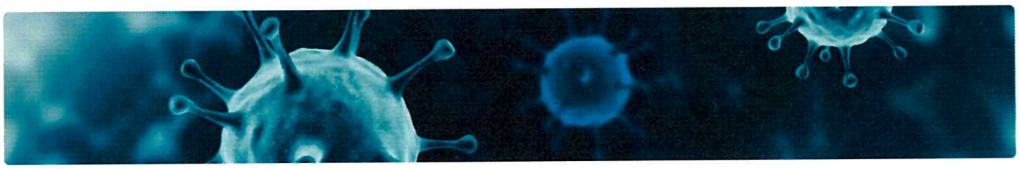



# Rockliff Government Leaving Tasmanians at Risk as Covid Hospitalisations Rise

Cassy O'Connor MP - Monday, 4 July 2022

**Tags:** COVID-19, Health

**Cassy O'Connor MP | Greens Leader**

The soaring hospitalisations rate reported in the latest Covid-19 data is yet more evidence that the Government's reckless approach to this deadly virus is putting Tasmanians at risk.

We now have 72 people in hospital with Covid-19, up from 53 just yesterday – a jump of 35%. The number of active cases has also continued to significantly increase.

As indicated by international and interstate evidence, Tasmania is very likely entering a new wave of infection with new mutations of the virus. But rather than take steps to mitigate and control the spread of COVID-19, the government has appallingly decided to give up entirely.

81 Tasmanians have already died since the politically-driven decision to open the state's borders on 15 December.

With the Government's current 'let it rip' approach, it is tragically inevitable that this number will continue to grow all too quickly.

There are a range of simple, common-sense strategies like masks and ventilation that we should be using to slow the spread of coronavirus. Instead, Premier Rockliff is leaving Tasmanians – especially those who are immunocompromised or with disability – high and dry, and putting them at a hugely increased risk.

How many more lives need to be lost before the Premier admits his Government has got this wrong, and finally starts listening to the international evidence and independent experts on Covid-19?

Rosalie Woodruff MP
Greens Member for Franklin

9 November 2021

The Hon. Jeremy Rockliff MP
Minister for Health,
Level 10, 15 Murray Street
HOBART TASMANIA 7000

**Re: Healthcare staff absences from COVID infection**

Dear Minister,

I write regarding the critical issue of health system preparedness for the border reopening.

This morning in Parliament I asked whether your department had modelled how many healthcare workers may become infected with coronavirus under outbreak scenarios, and what plans are in place to manage projected potential absences.

I was troubled you did not address this question.

The requirement for double dose vaccination of all healthcare workers is an essential component for protecting individuals, and our health system's capability, against COVID-19. Full vaccination against coronavirus does not, however, prevent all individuals from becoming infected.

A recent study in The Lancet (attached) of a large US population reports the Pfizer vaccine prevented infection at an overall rate of 73% among participants. We cannot ignore the reality that coronavirus circulating in the Tasmanian population will infect some proportion of healthcare workers.

Infection control measures used in health settings dramatically reduce risk of transmission, but are never completely effective. Further, healthcare workers are just as likely as any other vaccinated individual to contract coronavirus in non-work settings. In either case, any healthcare staff who become infected would not be able to work for at least a fortnight.

On behalf of Tasmanians concerned our health system is already under extreme pressure, we would like to know whether you have modelled the potential rate of coronavirus infections on absences in the health workforce following December 15, and what are your government's plans for replacement staff during absences.

Parliament House, Hobart TAS 7000 | Phone: (03) 6212 2260 | rosalie.woodruff@parliament.tas.gov.au

I hope you can provide an early response to these important questions.

Sincerely,

**Dr Rosalie Woodruff MP**
Greens Health Spokesperson

# Effectiveness of mRNA BNT162b2 COVID-19 vaccine up to 6 months in a large integrated health system in the USA: a retrospective cohort study

*Sara Y Tartof, Jeff M Slezak, Heidi Fischer, Vennis Hong, Bradley K Ackerson, Omesh N Ranasinghe, Timothy B Frankland, Oluwaseye A Ogun, Joann M Zamparo, Sharon Gray, Srinivas R Valluri, Kaije Pan, Frederick J Angulo, Luis Jodar, John M McLaughlin*

## Summary

**Background** Vaccine effectiveness studies have not differentiated the effect of the delta (B.1.617.2) variant and potential waning immunity in observed reductions in effectiveness against SARS-CoV-2 infections. We aimed to evaluate overall and variant-specific effectiveness of BNT162b2 (tozinameran, Pfizer–BioNTech) against SARS-CoV-2 infections and COVID-19-related hospital admissions by time since vaccination among members of a large US health-care system.

**Methods** In this retrospective cohort study, we analysed electronic health records of individuals (≥12 years) who were members of the health-care organisation Kaiser Permanente Southern California (CA, USA), to assess BNT162b2 vaccine effectiveness against SARS-CoV-2 infections and COVID-19-related hospital admissions for up to 6 months. Participants were required to have 1 year or more previous membership of the organisation. Outcomes comprised SARS-CoV-2 PCR-positive tests and COVID-19-related hospital admissions. Effectiveness calculations were based on hazard ratios from adjusted Cox models. This study was registered with ClinicalTrials.gov, NCT04848584.

**Findings** Between Dec 14, 2020, and Aug 8, 2021, of 4 920 549 individuals assessed for eligibility, we included 3 436 957 (median age 45 years [IQR 29–61]; 1 799 395 [52·4%] female and 1 637 394 [47·6%] male). For fully vaccinated individuals, effectiveness against SARS-CoV-2 infections was 73% (95% CI 72–74) and against COVID-19-related hospital admissions was 90% (89–92). Effectiveness against infections declined from 88% (95% CI 86–89) during the first month after full vaccination to 47% (43–51) after 5 months. Among sequenced infections, vaccine effectiveness against infections of the delta variant was high during the first month after full vaccination (93% [95% CI 85–97]) but declined to 53% [39–65] after 4 months. Effectiveness against other (non-delta) variants the first month after full vaccination was also high at 97% (95% CI 95–99), but waned to 67% (45–80) at 4–5 months. Vaccine effectiveness against hospital admissions for infections with the delta variant for all ages was high overall (93% [95% CI 84–96]) up to 6 months.

**Interpretation** Our results provide support for high effectiveness of BNT162b2 against hospital admissions up until around 6 months after being fully vaccinated, even in the face of widespread dissemination of the delta variant. Reduction in vaccine effectiveness against SARS-CoV-2 infections over time is probably primarily due to waning immunity with time rather than the delta variant escaping vaccine protection.

**Funding** Pfizer.



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See Comment page 1382

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## Introduction

In a pivotal randomised controlled trial, the BNT162b2 mRNA vaccine (tozinameran, Pfizer–BioNTech) showed 95% or greater efficacy against symptomatic and severe COVID-19 disease due to SARS-CoV-2.[1] In the early months after its introduction, BNT162b2 has been shown to be highly effective in the real-world setting and to have had a large public health effect on reducing infections, hospital admissions, and deaths at a time when the alpha (B.1.1.7) variant was the predominant strain in Israel,[2–4] the USA,[5–8] Canada,[9] the UK,[10–16] and Qatar.[17,18]

The continual emergence of SARS-CoV-2 variants has raised concern that COVID-19 vaccines could have reduced effectiveness against new viral strains; however, BNT162b2 has shown robust amounts of neutralising antibodies against all variants of concern evaluated to date.[19–21] Moreover, confirmatory, real-world studies have shown high effectiveness of two doses of BNT162b2 against COVID-19, especially severe disease, caused by variants of concern alpha,[3,17] beta (B.1.351),[17,22] and delta[9,14–16,23,24] in various settings.

After global transmission of the delta variant in June and July, 2021, reports describing reduced effectiveness of BNT162b2 (and other COVID-19 vaccines) against SARS-CoV-2 infections caused by the delta variant began to surface from Israel,[25] Qatar,[23] and the USA.[26,27]

The emergence of the delta variant, however, might not be the primary driver of reported declines in effectiveness

## Research in context

### Evidence before this study

After global transmission of the delta (B.1.617.2) variant in June and July, 2021, reports describing reduced effectiveness of BNT162b2 (and other COVID-19 vaccines) against SARS-CoV-2 infections caused by the delta variant began to surface from Israel, Qatar, and the USA. Vaccine effectiveness studies in the setting of widespread prevalence of the delta variant, however, have not adequately differentiated the effect of the variant from potential waning immunity on observed reductions in effectiveness against SARS-CoV-2 infections. To help answer this urgent public health question, we evaluated overall and variant-specific real-world effectiveness of BNT162b2 against SARS-CoV-2 infections and COVID-19-related hospital admissions by time since vaccination among members of a large integrated health-care system in the USA up until 6 months after full vaccination.

### Added value of this study

Our variant-specific analysis suggests that reductions in BNT162b2 effectiveness over time are likely to be primarily due to waning vaccine effectiveness rather than the delta variant escaping vaccine protection given that effectiveness against delta variant infections was more than 90% within 1 month of full vaccination, reductions in effectiveness in infections by time since being fully vaccinated were observed irrespective of SARS-CoV-2 variant, and effectiveness against hospital admissions due to the delta variant was very high over the entire study period.

### Implications of all the available evidence

Related to other findings from Israel, the USA, and other countries, our findings underscore the importance of monitoring vaccine effectiveness over time and suggest that booster doses are likely to be needed to restore the initial high amounts of protection observed early in the vaccination programme.

against SARS-CoV-2 infections and increasing rates of breakthrough infections among individuals who are fully vaccinated.[23] In Israel, Qatar, and the USA, for example, widespread dissemination of the delta variant also coincided with the time period during which many individuals at high risk who were fully vaccinated first (eg, health-care workers, individuals who were immunocompromised, and older people) were approaching 6 months since the receipt of their second dose. Thus, waning of vaccine-induced immunity, which was observed in the pivotal randomised controlled trial before the emergence of the delta variant,[28] is an important factor to consider in the context of reported declines in effectiveness.

Vaccine effectiveness studies in the setting of high prevalence of the delta variant have not adequately differentiated the effect of the delta variant from potential waning immunity on observed reductions in effectiveness against SARS-CoV-2 infections. This distinction is essential to inform the need for booster doses and to establish what the antigenic composition of future vaccines should be. To help answer this urgent public-health question, we aimed to evaluate overall and variant-specific real-world effectiveness of BNT162b2 against SARS-CoV-2 infections and COVID-19-related hospital admissions by time since vaccination among members of a large integrated health-care system in the USA.

## Methods

### Study design and participants

In this retrospective cohort study, we analysed electronic health records from the Kaiser Permanente Southern California (KPSC) health-care system (CA, USA) to assess the effectiveness of the BNT162b2 vaccine against SARS-CoV-2 infections and COVID-19-related hospital admissions. The study population consisted of all KPSC members aged 12 years and older. The start of the study period corresponded to the date the first doses of BNT162b2 were administered to KPSC members. The test-negative design described in the study protocol will be performed in future work.

KPSC is an integrated health-care organisation with more than 4·7 million members, representative of the socioeconomic and racial and ethnic diversity of the area's population.[29] KPSC electronic health records integrate clinical data including diagnostic, pharmacy, laboratory, and vaccination history information across all settings of care. Care delivered to members outside of the KPSC system is also captured, as outside providers must submit detailed claims to KPSC for reimbursement by the health plan.

Participants were required to have 1 year or more of membership (allowing a 31-day gap during previous membership to allow for potential delays in renewal) to determine comorbidities and medical history. Patients with documentation requesting removal from all research studies were excluded. The study protocol was reviewed and approved by the KPSC institutional review board, which waived requirement for informed consent (number 12816).

### Procedures

COVID-19 vaccines were provided to KPSC members at no cost following emergency use authorisation. Any COVID-19 vaccines administered to members outside of the KPSC system during the study period were captured using batch queries to the California Immunization Registry. California providers are required by law to report all COVID-19 vaccine administrations to the registry every 24 h. KPSC followed the state of California guidance in rolling out COVID-19 vaccines, first making vaccines available to health-care workers in December, 2020.

Vaccines were then progressively made available to older people, individuals with underlying health conditions, and essential workers. By April, 2021, anyone aged 16 years or older was eligible to receive the vaccine. Those aged 12–15 years became eligible in May, 2021.

The primary exposure was full vaccination with BNT162b2, defined as receiving two doses of BNT162b2 with 7 days or more after the second dose. Individuals were considered partially vaccinated if they received only one dose with 14 days or more after the first dose or if they received two doses with less than 7 days after the second dose. Individuals were considered unvaccinated until receipt of their first dose of BNT162b2, or until censoring at disenrolment, death, or receipt of another COVID-19 vaccine.

### Outcomes

Outcomes comprised SARS-CoV-2 infection defined as testing positive for SARS-CoV-2 via a PCR test from any sample (ie, bronchial lavage, nasopharyngeal or nasal swab, oropharyngeal swab, throat swab, saliva, sputum, or tracheal aspirate) in any clinical setting regardless of the presence of symptoms (see appendix p 1), and COVID-19-related hospital admission defined as a hospital admission with a positive SARS-CoV-2 PCR test that was conducted between 14 days before and 3 days after the date of hospital admission.

All PCR-positive SARS-CoV-2 laboratory specimens collected between March 4 and July 21, 2021, were processed for whole genome sequencing and viral lineage designation (appendix p 1). A small number of archived specimens (n=148) collected before March 4, 2021, were also included. For those with multiple positive samples, the first successfully sequenced sample was included in analyses.

### Statistical analysis

Using descriptive statistics, we described the distribution of demographic and clinical characteristics of the study cohort by BNT162b2 vaccination status and history of SARS-CoV-2 infection. Among those who tested positive for SARS-CoV-2, we described study population characteristics by infecting strain (ie, delta, other variant, failed sequencing). Analyses of specimens that failed sequencing were not specified in the protocol but were added due to sufficient sample size and to better understand potential bias in the sequenced sub-sample. Median time since full vaccination was also described. Hazard ratios (HRs) with 95% CIs from an unadjusted Cox model with time-varying covariates were estimated comparing rates of SARS-CoV-2 infection and COVID-19-related hospital admissions among fully vaccinated and partially vaccinated individuals to those who were unvaccinated. BNT162b2 vaccination status was categorised as time-varying, with all participants entering the cohort as unvaccinated. Follow-up time was censored at the time of disenrolment from KPSC, death, receipt of any other newly licensed or investigational COVID-19 vaccine or prophylactic agent other than BNT162b2, or receipt of more than two doses of BNT162b2. Unexposed person-time consisted of follow-up time of those never vaccinated against COVID-19, as well as time contributed by participants before being vaccinated or censored. To assess durability, vaccine effectiveness was estimated at monthly intervals after participants were fully vaccinated with BNT162b2. Sufficient sample size allowed for monthly estimates rather than the 3-month intervals specified in the protocol. Calendar time was included in all models (crude and adjusted) as the underlying time scale to allow the baseline hazard to vary flexibly as vaccine eligibility, testing practices, non-pharmaceutical interventions, lockdown requirements, disease activity, and COVID-19 treatment changed over time. The estimated hazard for a model with time-varying covariates does not have the direct relationship with cumulative incidence that the standard Cox model does, as cumulative incidence depends on the entire history of the time-varying covariate for all patients. Thus, the vaccine effectiveness estimates from these models will not match a crude rate ratio calculated using events or person-time (appendix pp 7–8). With calendar time as the timescale, both unadjusted and adjusted models compare those who are unvaccinated on each calendar date to those who are vaccinated on that same date. The adjusted Cox model extends this, effectively comparing each vaccinated person on a given date to a person with the same covariates who is unvaccinated as of that date.

See Online for appendix

Adjusted HRs and 95% CIs were estimated by including all measured covariates in the Cox models with time-varying vaccination status. Variables included in the multivariable models were age, sex, race and ethnicity, previous PCR-positive SARS-CoV-2, previous health-care utilisation (inpatient, outpatient, emergency department, or virtual), body-mass index, acute myocardial infarction, congestive heart failure, cerebrovascular disease, peripheral vascular disease, organ transplant, diabetes, malignancy, renal disease, chronic obstructive pulmonary disease, hypertension, Charlson comorbidity index, influenza vaccination in the year before index date, pneumococcal vaccination in the 5 years before index date, and neighbourhood deprivation index[30] to capture differences in neighbourhood level socioeconomic status. The inclusion of all pre-specified covariates, as requested by the US Food and Drug Administration, differs from the backward selection method outlined in the protocol. Robust variance was computed to account for clustering introduced by including neighbourhood deprivation index in the model. For all models, vaccine effectiveness was calculated as: (1–HR) multiplied by 100%. Due to limitations in sample size, variant-specific vaccine effectiveness analyses were not stratified by age, were estimated only up to 4 months for SARS-CoV-2 infections, and were not stratified by month for COVID-19-related hospital admissions. Statistical

| | BNT162b2 vaccination status | | | | SARS-CoV-2 outcomes | | | |
|---|---|---|---|---|---|---|---|---|
| | Unvaccinated* (n=2 290 189) | One dose plus <14 days (n=27 274) | One dose plus ≥14 days or two doses plus <7 days (n=76 205) | Two doses plus ≥7 days (n=1 043 289) | Uninfected (n=3 252 916) | SARS-CoV-2 infection (n=184 041) | COVID-19 hospital admission (n=12 130) | Total (N=3 436 957) |
| **Age, years** | | | | | | | | |
| 12–15 | 104 918 (4·6%) | 7164 (26·3%) | 10 697 (14·0%) | 78 843 (7·6%) | 192 999 (5·9%) | 8623 (4·7%) | 45 (0·4%) | 201 622 (5·9%) |
| 16–44 | 1 038 609 (45·4%) | 12 943 (47·5%) | 35 876 (47·1%) | 420 393 (40·3%) | 1 417 518 (43·6%) | 90 303 (49·1%) | 2366 (19·5%) | 1 507 821 (43·9%) |
| 45–64 | 709 815 (31·0%) | 5808 (21·3%) | 20 709 (27·2%) | 314 911 (30·2%) | 990 866 (30·5%) | 60 377 (32·8%) | 4302 (35·5%) | 1 051 243 (30·6%) |
| ≥65 | 436 847 (19·1%) | 1359 (5·0%) | 8923 (11·7%) | 229 142 (22·0%) | 651 533 (20·0%) | 24 738 (13·4%) | 5417 (44·7%) | 676 271 (19·7%) |
| Median | 45 (29–61) | 29 (15–45) | 37 (21–54) | 46 (29–62) | 45 (29–61) | 42 (29–57) | 62 (49–74) | 45 (29–61) |
| **Sex** | | | | | | | | |
| Male | 1 115 148 (48·7%) | 12 694 (46·5%) | 36 843 (48·3%) | 472 709 (45·3%) | 1 552 606 (47·7%) | 84 788 (46·1%) | 6608 (54·5%) | 1 637 394 (47·6%) |
| Female | 1 174 921 (51·3%) | 14 579 (53·5%) | 39 355 (51·6%) | 570 540 (54·7%) | 1 700 146 (52·3%) | 99 249 (53·9%) | 5522 (45·5%) | 1 799 395 (52·4%) |
| Other or unknown | 120 (<0·1%) | 1 (<0·1%) | 7 (<0·1%) | 40 (<0·1%) | 164 (<0·1%) | 4 (<0·1%) | 0 | 168 (<0·1%) |
| **Race and ethnicity** | | | | | | | | |
| Hispanic | 924 696 (40·4%) | 14 683 (53·8%) | 35 991 (47·2%) | 415 217 (39·8%) | 1 284 467 (39·5%) | 106 120 (57·7%) | 6691 (55·2%) | 1 390 587 (40·5%) |
| Black | 197 993 (8·6%) | 3465 (12·7%) | 6350 (8·3%) | 68 391 (6·6%) | 262 682 (8·1%) | 13 517 (7·3%) | 1201 (9·9%) | 276 199 (8·0%) |
| White | 759 438 (33·2%) | 5563 (20·4%) | 19 422 (25·5%) | 324 033 (31·1%) | 1 066 792 (32·8%) | 41 664 (22·6%) | 2752 (22·7%) | 1 108 456 (32·3%) |
| Asian or Pacific Islander | 226 149 (9·9%) | 1734 (6·4%) | 8355 (11·0%) | 162 948 (15·6%) | 385 995 (11·9%) | 13 191 (7·2%) | 1268 (10·5%) | 399 186 (11·6%) |
| Other | 52 505 (2·3%) | 602 (2·2%) | 1906 (2·5%) | 25 431 (2·4%) | 76 892 (2·4%) | 3552 (1·9%) | 117 (1·0%) | 80 444 (2·3%) |
| Unknown | 129 408 (5·7%) | 1227 (4·5%) | 4181 (5·5%) | 47 269 (4·5%) | 176 088 (5·4%) | 5997 (3·3%) | 101 (0·8%) | 182 085 (5·3%) |
| **Body-mass index, kg/m²** | | | | | | | | |
| <18·5 | 62 618 (2·7%) | 2127 (7·8%) | 3953 (5·2%) | 38 136 (3·7%) | 103 360 (3·2%) | 3474 (1·9%) | 132 (1·1%) | 106 834 (3·1%) |
| 18·5–24·9 | 607 399 (26·5%) | 8366 (30·7%) | 22 675 (29·8%) | 307 811 (29·5%) | 907 630 (27·9%) | 38 621 (21%) | 1750 (14·4%) | 946 251 (27·5%) |
| 25·0–29·9 | 687 057 (30·0%) | 7167 (26·3%) | 21 499 (28·2%) | 318 164 (30·5%) | 978 156 (30·1%) | 55 731 (30·3%) | 3436 (28·3%) | 1 033 887 (30·1%) |
| 30·0–34·9 | 439 367 (19·2%) | 4634 (17·0%) | 13 359 (17·5%) | 191 486 (18·4%) | 605 962 (18·6%) | 42 884 (23·3%) | 3101 (25·6%) | 648 846 (18·9%) |
| 35·0–39·9 | 203 208 (8·9%) | 2272 (8·3%) | 6232 (8·2%) | 86 551 (8·3%) | 276 414 (8·5%) | 21 849 (11·9%) | 1803 (14·9%) | 298 263 (8·7%) |
| ≥40·0 | 137 456 (6·0%) | 1497 (5·5%) | 3854 (5·1%) | 54 839 (5·3%) | 181 492 (5·6%) | 16 154 (8·8%) | 1691 (13·9%) | 197 646 (5·8%) |
| Unknown | 153 084 (6·7%) | 1211 (4·4%) | 4633 (6·1%) | 46 302 (4·4%) | 199 902 (6·1%) | 5328 (2·9%) | 217 (1·8%) | 205 230 (6·0%) |
| **Comorbidities** | | | | | | | | |
| Congestive heart failure | 43 875 (1·9%) | 218 (0·8%) | 995 (1·3%) | 20 120 (1·9%) | 61 451 (1·9%) | 3757 (2·0%) | 1357 (11·2%) | 65 208 (1·9%) |
| Coronary artery disease | 26 661 (1·2%) | 120 (0·4%) | 568 (0·7%) | 12 379 (1·2%) | 37 662 (1·2%) | 2066 (1·1%) | 613 (5·1%) | 39 728 (1·2%) |
| Peripheral vascular disease | 179 305 (7·8%) | 539 (2·0%) | 3538 (4·6%) | 96 772 (9·3%) | 268 007 (8·2%) | 12 147 (6·6%) | 3316 (27·3%) | 280 154 (8·2%) |
| Cerebrovascular disease | 34 513 (1·5%) | 147 (0·5%) | 846 (1·1%) | 16 661 (1·6%) | 49 626 (1·5%) | 2541 (1·4%) | 730 (6·0%) | 52 167 (1·5%) |
| Organ transplant | 3111 (0·1%) | 18 (0·1%) | 63 (0·1%) | 1638 (0·2%) | 4408 (0·1%) | 422 (0·2%) | 160 (1·3%) | 4830 (0·1%) |
| Diabetes with unknown glycated haemoglobin | 25 942 (1·1%) | 195 (0·7%) | 725 (1·0%) | 9648 (0·9%) | 34 427 (1·1%) | 2083 (1·1%) | 329 (2·7%) | 36 510 (1·1%) |
| Diabetes with glycated haemoglobin <7·5% | 157 336 (6·9%) | 814 (3·0%) | 3693 (4·8%) | 81 669 (7·8%) | 229 185 (7·0%) | 14 327 (7·8%) | 2566 (21·2%) | 243 512 (7·1%) |
| Diabetes with glycated haemoglobin ≥7·5% | 86 318 (3·8%) | 644 (2·4%) | 2254 (3·0%) | 38 732 (3·7%) | 117 845 (3·6%) | 10 103 (5·5%) | 1966 (16·2%) | 127 948 (3·7%) |
| Chronic obstructive pulmonary disease | 204 050 (8·9%) | 2338 (8·6%) | 6298 (8·3%) | 101 486 (9·7%) | 295 394 (9·1%) | 18 778 (10·2%) | 2209 (18·2%) | 314 172 (9·1%) |
| Renal disease | 106 351 (4·6%) | 420 (1·5%) | 2137 (2·8%) | 53 200 (5·1%) | 154 006 (4·7%) | 8102 (4·4%) | 2579 (21·3%) | 162 108 (4·7%) |
| Malignancy | 52 934 (2·3%) | 288 (1·1%) | 1194 (1·6%) | 27 092 (2·6%) | 77 528 (2·4%) | 3980 (2·2%) | 792 (6·5%) | 81 508 (2·4%) |
| Hypertension | 465 109 (20·3%) | 2637 (9·7%) | 10 930 (14·3%) | 231 754 (22·2%) | 673 564 (20·7%) | 36 866 (20·0%) | 6227 (51·3%) | 710 430 (20·7%) |
| **Charlson comorbidity index** | | | | | | | | |
| 0 | 1 685 257 (73·6%) | 22 609 (82·9%) | 60 171 (79%) | 743 248 (71·2%) | 2 379 993 (73·2%) | 131 292 (71·3%) | 4460 (36·8%) | 2 511 285 (73·1%) |
| 1 | 303 977 (13·3%) | 3213 (11·8%) | 9266 (12·2%) | 149 201 (14·3%) | 437 558 (13·5%) | 28 099 (15·3%) | 2171 (17·9%) | 465 657 (13·5%) |
| 2 | 126 645 (5·5%) | 713 (2·6%) | 3047 (4·0%) | 62 764 (6·0%) | 182 559 (5·6%) | 10 610 (5·8%) | 1499 (12·4%) | 193 169 (5·6%) |
| 3 | 57 517 (2·5%) | 254 (0·9%) | 1240 (1·6%) | 30 419 (2·9%) | 85 034 (2·6%) | 4396 (2·4%) | 885 (7·3%) | 89 430 (2·6%) |
| ≥4 | 116 793 (5·1%) | 485 (1·8%) | 2481 (3·3%) | 57 657 (5·5%) | 167 772 (5·2%) | 9644 (5·2%) | 3115 (25·7%) | 177 416 (5·2%) |

(Table continues on next page)

| | BNT162b2 vaccination status | | | | SARS-CoV-2 outcomes | | | |
|---|---|---|---|---|---|---|---|---|
| | Unvaccinated* (n=2 290 189) | One dose plus <14 days (n=27 274) | One dose plus ≥14 days or two doses plus <7 days (n=76 205) | Two doses plus ≥7 days (n=1 043 289) | Uninfected (n=3 252 916) | SARS-CoV-2 infection (n=184 041) | COVID-19 hospital admission (n=12 130) | Total (N=3 436 957) |
| (Continued from previous page) | | | | | | | | |
| **Previous positive SARS-CoV-2 PCR test** | | | | | | | | |
| 1 | 47 993 (2·1%) | 668 (2·4%) | 1681 (2·2%) | 18 356 (1·8%) | 68 258 (2·1%) | 440 (0·2%) | 71 (0·6%) | 68 698 (2·0%) |
| ≥2 | 3827 (0·2%) | 53 (0·2%) | 116 (0·2%) | 1590 (0·2%) | 5537 (0·2%) | 49 (<0·1%) | 6 (<0·1%) | 5586 (0·2%) |
| **Previous positive SARS-CoV-2 serology** | | | | | | | | |
| 1 | 2466 (0·1%) | 41 (0·2%) | 56 (0·1%) | 1231 (0·1%) | 3764 (0·1%) | 30 (<0·1%) | 4 (<0·1%) | 3794 (0·1%) |
| ≥2 | 69 (<0·1%) | 0 | 0 | 45 (<0·1%) | 113 | 1 (<0·1%) | 0 | 114 (<0·1%) |

Data are n (%) or median (IQR). Characteristics of Kaiser Permanente Southern California members (n=3 436 957), by BNT162b2 vaccination status (as of Aug 8, 2021), and by SARS-CoV-2 outcomes (Dec 14, 2020, to Aug 8, 2021). *Unvaccinated group includes those not vaccinated with BNT162b2 as of Aug 8, 2021, and those vaccinated with other COVID-19 vaccines. Those vaccinated with COVID-19 vaccines other than BNT162b2 are censored in the vaccine effectiveness modelling at vaccination date.

*Table:* **Baseline characteristics**

comparisons of vaccine effectiveness by time since vaccination were made using Wald $\chi^2$ tests for contrasts within Cox models. Vaccine effectiveness for delta and other variants could not be directly compared in the same regression model. The difference between delta variant vaccine effectiveness versus other variant vaccine effectiveness was compared using independent Z tests on the log HRs, which are conservative as the vaccine effectiveness for COVID-19 variants is positively correlated in the same population. All analyses were performed using SAS Enterprise Guide statistical software, version 7.1. This study was registered with ClinicalTrials.gov, NCT04848584.

### Role of the funding source

The funder of the study approved the study design, and participated in data interpretation and writing of the report.

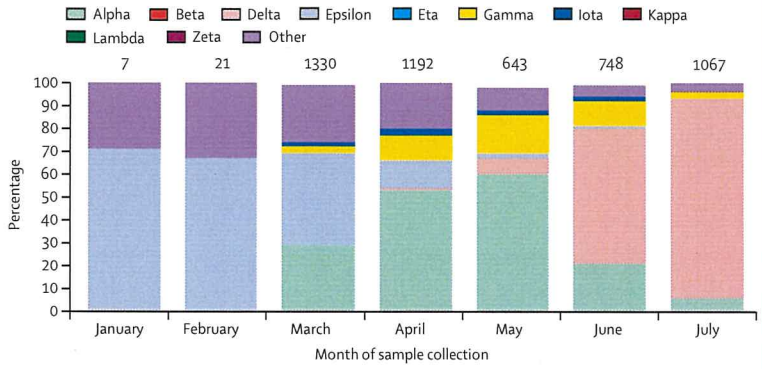
## Results

The study period ran from Dec 14, 2020, to Aug 8, 2021. As of Dec 14, 2020, of 4 920 549 individuals assessed for eligibility there were 3 436 957 members of KPSC who fulfilled the inclusion criteria of age 12 years or older with membership of 1 year or longer who were included in the study cohort. Median age was 45 years (IQR 29–61), 1 799 395 [52·4%] participants were female and 1 637 394 [47·6%] were male. 1 390 587 (40·5%) participants were Hispanic, 1 108 456 (32·3%) were white, 399 186 (11·6%) were Asian or a Pacific Islander, and 276 199 (8·0%) were Black. In the year before the study start date, 74 284 (2·2%) of 3 436 957 participants had one or more positive SARS-CoV-2 PCR tests, and 543 628 (15·8%) had one or more negative PCR tests (table).

During the study period, 184 041 (5·4%) of 3 436 957 participants were infected with SARS-CoV-2, among whom 12 130 (6·6%) were admitted to hospital. A higher proportion of the individuals infected with SARS-CoV-2 were younger (median age 42 years *vs* 45 years), Hispanic (57·7% *vs* 39·5%), and obese (>30 kg/m²; 43·9% *vs* 32·7%) than those who were not infected. Among those infected with SARS-CoV-2, a higher proportion of those who were admitted to hospital for COVID-19 were older, male, had comorbidities, and had greater previous health-care utilisation than those not admitted to hospital (table, appendix p 2).

Of 9147 specimens sent for whole genome sequencing, 236 were excluded from analyses (42 were the second sequenced samples from the same individual; 194 were the second failed samples from the same individual). Therefore, 8911 specimens were included for analyses and 5008 (56·2%) of 8911 had a sequence determined (appendix pp 3–4). We systematically submitted all PCR-positive specimens for sequencing starting March 4, 2021; however, the overall count of submitted specimens (n=8911) was 4·8% of all positive SARS-CoV-2 cases in the study (n=184 041). Specimens for which a sequence could not be determined were more likely to have high cycle threshold (Ct) values (appendix p 5). The median Ct values of sequenced N, ORF1ab, and S genes were 23·0 cycles for N, 23·3 cycles for ORF1ab, and 23·4 cycles for S; the median Ct values for specimens for which a sequence could not be determined were 30·7 cycles for N, 32·4 cycles for ORF1ab, and 28·8 cycles for S. Over the study period, 1422 (28·4%) of 5008 specimens for which a sequence could be determined were the delta variant. The proportion of sequenced specimens that were delta increased from 0·6% (seven of 1192) in April, 2021, to 86·5% (923 of 1067) in July, 2021 (figure 1). The distribution of comorbidities and previous health-care utilisation was generally consistent between the variant groups in our cohort (appendix pp 3–4).

By Aug 8, 2021, 1 146 768 (33·4%) of 3 436 957 cohort members had received one or more doses of BNT162b2 (1 010 516 received ≥1 dose of mRNA-1273 [Moderna],




| | January | February | March | April | May | June | July |
|---|---|---|---|---|---|---|---|
| Alpha | 0 | 0 | 383 (28·8%) | 632 (53·0%) | 389 (60·5%) | 158 (21·1%) | 60 (5·6%) |
| Beta | 0 | 0 | 2 (0·2%) | 5 (0·4%) | 2 (0·3%) | 1 (0·1%) | 1 (0·1%) |
| Delta | 0 | 0 | 0 | 7 (0·6%) | 47 (7·3%) | 445 (59·5%) | 923 (86·5%) |
| Epsilon | 5 (71·4%) | 14 (66·7%) | 532 (40·0%) | 139 (11·7%) | 11 (1·7%) | 4 (0·5%) | 0 |
| Eta | 0 | 0 | 2 (0·2%) | 2 (0·2%) | 1 (0·2%) | 1 (0·1%) | 0 |
| Gamma | 0 | 0 | 40 (3·0%) | 131 (11·0%) | 107 (16·6%) | 82 (11·0%) | 33 (3·1%) |
| Iota | 0 | 0 | 25 (1·9%) | 33 (2·8%) | 16 (2·5%) | 17 (2·3%) | 1 (0·1%) |
| Kappa | 0 | 0 | 1 (0·1%) | 1 (0·1%) | 0 | 0 | 0 |
| Lambda | 0 | 0 | 1 (0·1%) | 4 (0·3%) | 3 (0·5%) | 0 | 1 (0·1%) |
| Zeta | 0 | 0 | 6 (0·5%) | 0 | 0 | 0 | 0 |
| Other | 2 (28·6%) | 7 (33·3%) | 338 (25·4%) | 238 (20·0%) | 67 (10·4%) | 40 (5·3%) | 48 (4·5%) |
| All | 7 (100%) | 21 (100%) | 1330 (100%) | 1192 (100%) | 643 (100%) | 748 (100%) | 1067 (100%) |
| Failed sequence | 9/16 (56·3%) | 13/34 (38·2%) | 993/2323 (42·7%) | 882/2074 (42·5%) | 648/1291 (50·2%) | 720/1468 (49·0%) | 638/1705 (37·4%) |

*Figure 1:* **Distribution of variants from January to July, 2021**
n=5008. Failed sequence counts are not included.

109 911 Ad26.COV2.S [Janssen], 2972 other COVID-19 vaccines or mixed regimens, and 1166 790 remained unvaccinated). Of these, 1 043 289 (91·0%) of 1 146 768 patients were fully vaccinated, and 76 205 (6·6%) of 1 146 768 were partially vaccinated with BNT162b2 (table). Mean time since being fully vaccinated (7 days after second dose) was 3·4 months (SD 1·8); 752 562 (72·1%) of 1 043 289 of the fully vaccinated individuals were fully vaccinated at least 3 months before.

Over the entire study period, fully vaccinated individuals had an adjusted vaccine effectiveness of 73% (95% CI 72–74) against SARS-CoV-2 infections and 90% (89–92) against COVID-19-related hospital admissions (appendix pp 6–7). Stratified by age group, the vaccine effectiveness against infection of those who were fully vaccinated was 91% (95% CI 88–93) for those aged 12–15 years and 61% (57–65) for those aged 65 years and older (appendix p 6). The age stratified vaccine effectiveness against hospital admissions was 92% (95% CI 88–95) for those aged 16–44 years, and 86% (82–88) for those aged 65 years and older (appendix p 6).

Vaccine effectiveness against infection for the fully vaccinated decreased with increasing time since vaccination, declining from 88% (95% CI 86–89) during the first month after full vaccination to 47% (43–51) after 5 months (≥157 days after second dose, p<0·0001; figure 2A; appendix p 9). Individuals aged 65 years and older had a vaccine effectiveness of 80% (95% CI 73–85) within 1 month after being fully vaccinated, decreasing to 43% (30–54; p<0·0001) at 5 months after full vaccination (figure 2A; appendix p 9). Among fully vaccinated individuals of all ages, overall adjusted vaccine effectiveness estimates for COVID-19 hospital admissions were 87% (95% CI 82–91) within 1 month after being fully vaccinated, and 88% (82–92) at 5 months after full vaccination, showing no significant waning (p=0·80; figure 2B; appendix pp 9–10).

Overall vaccine effectiveness against infection with the delta variant for the fully vaccinated was 75% (95% CI 71–78), while overall vaccine effectiveness for other variants was 91% (88–92; appendix pp 9–10). Estimates against both delta and other variants were high within 1 month after full vaccination (vaccine effectiveness against delta 93% [95% CI 85–97] *vs* other variants 97% [95–99]; p=0·29). At 4 months after full vaccination, vaccine effectiveness against delta infections declined to 53% (95% CI 39–65) and vaccine effectiveness against other variants declined to 67% (45–80; p=0·25). The difference in rate of decline in vaccine effectiveness between delta and other variants was not significant (p=0·30). For specimens in which a sequence could not be determined, adjusted vaccine effectiveness after full vaccination declined from 84% [95% CI 78–88]) at less than 1 month to 47% (30–59) after 4 months (figure 3; appendix pp 10–11). Among the fully vaccinated, vaccine effectiveness against hospital admissions was 93% (95% CI 84–96) for delta and 95% (90–98) for other variants. Effectiveness against hospital admissions was lower among specimens that failed sequencing (vaccine effectiveness 77% [95% CI 67–85]; appendix pp 10–11).

## Discussion

This retrospective cohort study conducted in a large integrated health-care system showed that individuals who were fully vaccinated with BNT162b2 had 73% (95% CI 72–74) overall effectiveness against SARS-CoV-2 infections and 90% (89–92) effectiveness against COVID-19-related hospital admissions after a mean time since being fully vaccinated of 3·4 months. Effectiveness against SARS-CoV-2 infections waned during the 6 months of this study. Effectiveness against hospital admissions in all age groups did not wane over the duration of the study. These findings are consistent with preliminary reports from the Israel Ministry of Health and US Centers for Disease Control and Prevention showing reductions in effectiveness of BNT162b2 against infections 5 months or longer after being fully vaccinated, but consistently high estimates against COVID-19-related hospital admissions and severe disease up until July, 2021.[24–27] The most recent report from August, 2021, from Israel, however, suggests that some reduction in effectiveness against hospital admissions has been

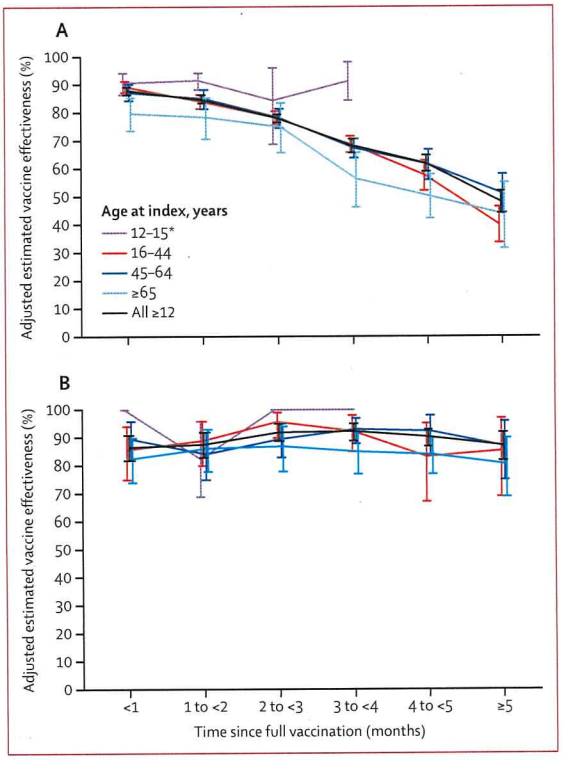



*Figure 2:* **Adjusted estimated vaccine effectiveness against SARS-CoV-2 infection and hospital admissions**
Vaccine effectiveness (95% CI) against SARS-CoV-2 infection (A) and COVID-19 hospital admission (B) by age group and number of months since being fully vaccinated with BNT162b2. *BNT162b2 authorised for those aged 12–15 years in May, 2021, limiting follow-up time for this age group.

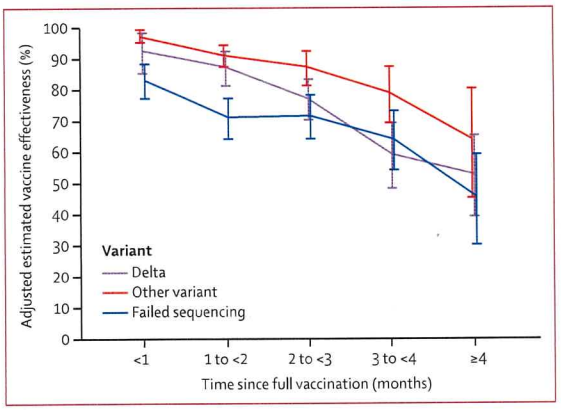



*Figure 3:* **Adjusted estimated vaccine effectiveness against SARS-CoV-2 infection by variant**
Data are shown for number of months since being fully vaccinated with BNT162b2 with 95% CIs.

observed among older people (≥65 years) roughly 6 months after receiving the second dose of BNT162b2.[31] Thus, long-term effectiveness data against severe outcomes should be continuously monitored in our study population and globally.

Effectiveness of BNT162b2 against infections caused by the delta variant, which became the predominant strain in KPSC by July, 2021, was 75% (95% CI 71–78) over the study period. Effectiveness against delta infections at 1 month after being fully vaccinated was high at 93% (85–97) but fell to 53% (39–65) up to 5 months after being fully vaccinated. Effectiveness against other (non-delta) variants within 1 month of being fully vaccinated was also high at 97% (95–99) and also waned, to 67% (45–80) up to 5 months after being fully vaccinated. Effectiveness against delta-related hospital admissions over the entire study period was high, at 93% (84–96) and was similar to effectiveness against hospital admissions for other (non-delta) variants. These findings are consistent with reports from the USA[24,26,27] and Qatar.[23] Our variant-specific analyses suggest that reductions in vaccine effectiveness over time are likely to be primarily due to waning vaccine effectiveness rather than the delta variant escaping vaccine protection given that vaccine effectiveness against delta infections was more than 90% soon after vaccination, vaccine effectiveness against delta and other variants for hospital admissions was very high over the entire study period, and reductions in vaccine effectiveness against infection by time since being fully vaccinated were observed irrespective of the variant. We did not observe a difference in waning between variant types; however, the number of events at 3–4 months was low for analyses by variant. As such, analyses with longer follow-up to measure the rate of waning for the delta versus other variants are warranted. Related to our findings, studies from Canada[9] and the UK[14,15] have shown high effectiveness of BNT162b2 against symptomatic COVID-19 caused by the delta variant in a vaccine schedule that separates the first and second doses by 2–3 months instead of 3 weeks. This longer interval between doses could lead to higher immunological responses;[32,33] however, duration of follow-up in these studies (<3 months)[9,14,15] was insufficient to establish the effects of waning. Moreover, given the lower effectiveness after only one dose observed in our study and in other reports of one-dose effectiveness against variants of concern like beta or delta,[14,17,23] delaying the second dose is not without risk.

Our results reiterate in a real-world US setting that vaccination with BNT162b2 remains an essential tool for preventing COVID-19, especially COVID-19-associated hospital admissions, caused by all current variants of concern. Along with other emerging evidence,[9,14–16,23] our results suggest that despite early effectiveness of BNT162b2 against delta and other variants of concern, effectiveness against infection erodes steadily in the months after receipt of the second dose. Waning effectiveness and an increased number of infections 6–12 months after the second dose—along with the potential need for booster doses—was expected given that lower neutralising antibody titres during this time period have been observed in immunogenicity studies.[34–36]

Waning has been observed for both mRNA-based (Pfizer–BioNTech and Moderna) COVID-19 vaccines,[26,27] and is consistent with studies of other coronaviruses.[37] Reassuringly, early phase 1 data show that a third booster dose of the current BNT162b2 vaccine given 6 months after the second dose elicited neutralising antibody titres against the original SARS-CoV-2 wild-type strain, beta, and delta, which were several times higher than after two primary doses.[34,35] Modelling studies have predicted that these increases in neutralising antibody titres will restore high amounts of vaccine effectiveness.[36] Moreover, early unpublished data from an Israeli health maintenance organisation (Maccabi Health Services) suggest that a third booster dose is highly effective in a setting in which the delta variant accounts for nearly all cases.[38,39] These findings suggest that boosting with the current BNT162b2 vaccine rather than a delta-specific construct might be effective. Considerations of booster doses should also account for COVID-19 supply, as priority populations in some countries or subnational settings have not yet received a primary vaccination series.[40]

Our study has potential limitations. We were unable to establish causal relationships between vaccination and COVID-19 outcomes in this observational study. Further, it is difficult to achieve a perfect balance of testing patterns and other characteristics between vaccinated and unvaccinated patients in this real-world observational study design. We attempt to address this issue by adjusting for proxies for general health-care seeking behaviour (visits across health-care settings before baseline), prior vaccination behaviour, demographics, comorbidities, and neighbourhood-level socioeconomic status. However, we did not have data for adherence to masking guidelines, social interactions, and occupation, which are likely to also affect likelihood of testing for SARS-CoV-2 either when experiencing symptoms or routinely as a preventive measure. KPSC maintained several drive-through testing clinics, did not have resource limitations on COVID-19 testing, and provided free testing to all members during the study period. We compared vaccinated and unvaccinated individuals at the same point in time, which balances the availability of testing, infection rates, and other secular inputs that might affect testing behaviours between vaccinated and unvaccinated patients to the extent possible in observational research. Effectiveness was lowest for PCR-positive specimens for which a sequence could not be determined. These specimens had higher Ct values than other PCR-positive specimens, which probably corresponded to milder or asymptomatic infections. Thus, our vaccine effectiveness estimates against SARS-CoV-2 infections and hospital admissions could be muted by mild or asymptomatic infections and are not directly comparable to estimates of effectiveness against symptomatic disease. Sequencing was more likely to fail in samples from vaccinated individuals due to lower viral loads, which could lead to an overestimate of variant-specific effectiveness. Finally, although the KPSC electronic health records might miss some vaccinations administered outside of the health system, our data capture through the California Immunization Registry minimised this effect.

Our results show high effectiveness of BNT162b2 against hospital admissions up until 6 months after being fully vaccinated in a large, diverse cohort under real-world vaccination conditions, even in the face of widespread dissemination of the delta variant. These findings underscore the importance of continuing to prioritise improving COVID-19 vaccination rates, including in hard-to-reach communities. Effectiveness against infections was high soon after full vaccination, both for delta and other variants of concern, but waned over the study period. Although waning effectiveness against hospital admissions was not observed in our study population to date, this possibility should be carefully monitored.[31] Our findings underscore the importance of monitoring vaccine effectiveness over time and suggest that booster doses might eventually be needed to restore the high levels of protection observed early in the vaccination programme. These factors are especially important to help control heightened transmission of the delta variant as we enter the upcoming autumn and winter viral respiratory season.

#### Contributors

SYT, FJA, LJ, and JMM conceived this study. JMS, HF, VH, and ONR conducted the analysis. SYT, FJA, JMS, HF, and JMM wrote the first draft of the protocol. SYT and JMM wrote the first draft of the manuscript. All authors contributed to the study design, drafting the protocol, and edited the manuscript for important intellectual content. All authors gave final approval of the version to be published. All authors had full access to all the data and had final responsibility for the decision to submit for publication.

#### Declaration of interests

JMZ, SG, KP, FJA, LJ, SRV, and JMM are employees of and hold stock and stock options in Pfizer. TBF holds shares of Pfizer stock. SYT, JMS, HF, VH, BKA, ONR, TBF, and OAO received research support from Pfizer during the conduct of this study that was paid directly to KPSC. For work unrelated to this project, SYT received research funding from Gilead, GlaxoSmithKline, and Genentech; BKA received research funding from GlaxoSmithKline, Novavax, Dynavax, Genentech, Novartis, Seqirus, and Moderna; JMS received research funding from Novavax, Dynavax, and ALK; and HF received research funding from Genentech. All other authors declare no competing interests.

#### Data sharing

Individual-level testing and clinical outcomes data reported in this study are not publicly shared. Individuals wishing to access disaggregated data, including data reported in this study, should submit requests for access to the corresponding author (sara.y.tartof@kp.org). De-identified data (including, as applicable, participant data and relevant data dictionaries) will be shared upon approval of analysis proposals with signed data-access agreements in place.

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SARS-CoV-2 and acknowledge Uğur Şahin and Özlem Türeci from BioNTech, the holders of the emergency use authorisation for BNT162b2 in Israel; BNT162b2 is produced using BioNTech proprietary mRNA technology and was developed by BioNTech and Pfizer. The study design was developed by KPSC and approved by KPSC and Pfizer. KPSC collected and analysed the data; Pfizer did not participate in the collection or analysis of data. KPSC and Pfizer participated in the interpretation of data, in the writing of the report, and in the decision to submit the paper for publication.

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| Topic | Type | Date | Link |
|---|---|---|---|
| Various | Budget Estimates 2021 | 6-Sep-21 | https://tasmps.greens.org.au/parliament/health-covid-19-0 |
| Hospital Preparedness | Speech | 12-Oct-21 | https://tasmps.greens.org.au/parliament/hospitals-preparedness-covid-19 |
| Decision to Re-Open Borders | Question to Premier | 26-Oct-21 | https://tasmps.greens.org.au/parliament/covid-19-decision-reopen-tasmania-15 |
| Potential Cases in Health Workers | Question to Minister for Health | 9-Nov-21 | https://tasmps.greens.org.au/parliament/covid-19-potential-cases-health-workers |
| Government Response | Speech | 10-Nov-21 | https://tasmps.greens.org.au/parliament/covid-19-government-response |
| Re-opening and preparedness | Speech | 10-Nov-21 | https://tasmps.greens.org.au/parliament/covid-19-re-opening-preparedness |
| Vaccine mandate for teachers and childcare workers | Question to Premier | 24-Nov-21 | https://tasmps.greens.org.au/parliament/covid-19-vaccine-mandate-teachers |
| Reconnecting Tasmania Plan | Speech | 24-Nov-21 | https://tasmps.greens.org.au/parliament/covid-19-reconnecting-tasmania-plan |
| Outbreaks in Schools | Question to Minister for Education | 2-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-outbreaks-schools |
| Masks in Aged Care Facilities | Question to Minister for Health | 2-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-mask-requirements-aged-care |
| COVID-19 Issues in Schools | Speech | 2-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-issues-schools |
| Preventing Mass Infection | Speech | 3-Mar-22 | https://tasmps.greens.org.au/parliament/preventing-covid-mass-infection |
| Preventing Mass Infection #2 | Speech | 3-Mar-22 | https://tasmps.greens.org.au/parliament/preventing-covid-mass-infection-0 |
| Relaxation of Mask Rules | Question to Premier | 8-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-wearing-masks-relaxation-rules |
| Number of Cases in Schools | Question to Minister for Education | 8-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-numbers-cases-schools |
| COVID-19 Strategies | Question to Premier | 9-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-strategies |
| Removal of Mask Mandate | Speech | 9-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-removal-mandatory-mask-wearing |
| Risk for People with Disability | Question to Minister for Disability Services | 22-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-risk-people-disability |
| Government Actions and Number of Cases | Question to Premier | 23-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-government-actions-numbers |
| Lifting of Mask Mandate and Effect on Case Numbers | Question to Minister for Health | 24-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-lifting-mask-mandate-effect |
| Public Health Advice on Lifting of Mask Mandates | Question to Minister for Health | 24-Mar-22 | https://tasmps.greens.org.au/parliament/covid-19-public-health-advice-lifting |
| COVID-19 Research | Speech | 5-May-22 | https://tasmps.greens.org.au/parliament/covid-19-research |
| COVID-19 Research #2 | Speech | 5-May-22 | https://tasmps.greens.org.au/parliament/covid-19-research-0 |
| Protective Measures | Question to Minister for Health | 26-May-22 | https://tasmps.greens.org.au/parliament/covid-19-protective-measures |
| Infection rates in Educational Settings | Question to Minister for Education | 26-May-22 | https://tasmps.greens.org.au/parliament/covid-19-infection-rates-educational |
| Public Health Response Limitations | Speech | 26-May-22 | https://tasmps.greens.org.au/parliament/covid-19-public-health-response |
| Public Health Response Limitations #2 | Speech | 26-May-22 | https://tasmps.greens.org.au/parliament/covid-19-public-health-response-0 |
| Mask Mandate in Schools | Question | 1-Jun-22 | https://tasmps.greens.org.au/parliament/covid-19-mask-mandate-schools |
| COVID-19 Response | Premier - Budget Estimates 2022 | 6-Jun-22 | https://tasmps.greens.org.au/parliament/premier-covid-19-response |
| COVID-19 Response | Health - Budget Estimates 2022 | 6-Jun-22 | https://tasmps.greens.org.au/parliament/health-covid |
| COVID Safety | Disability Services - Budget Estimates 2022 | 8-Jun-22 | https://tasmps.greens.org.au/parliament/disability-services-covid-safety |