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Australia's Quarantine Systems Failures: Lessons for NZ

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Aotearoa NZ and Australian states have successfully eliminated community transmission of COVID-19, albeit with occasional outbreaks from imported cases. Both countries have primarily used hotel-based quarantine for returning travellers, but still do not have optimal border control. In this blog we consider potential lessons from Australia's 17 quarantine systems failures for NZ.

Overall, NZ and Australia have done very well with their COVID-19 pandemic responses and they are ranked 2nd and 9th in the world, respectively, by the Lowy Institute in Australia.[1] The rollout of vaccination programmes, starting with border workers, has been a favourable

development in recent months. NZ and Australia have both primarily used hotel-based quarantine for citizens returning to their countries during the pandemic period, with 14 days of quarantine combined with PCR testing and mask use in any shared spaces (eg, common exercise areas are used in NZ, but not in most Australian states). The collated data for quarantine system failures in Australia up to 11 May 2021 is shown in the appendicised table below, with specific details of each event. We identified 17 quarantine system failures, one causing over 800 deaths (Victoria's second wave), and 9 out of the 17 resulted in lockdowns.

This estimate is probably an underestimate of all actual quarantine failures, as not all of those infected will transmit the virus and start a detectable chain of transmission. Therefore, counts of border failures are sensitive to how they are identified and defined. We defined a quarantine system failure as where a border/health worker or person in the community with a link to the quarantine/isolation system became infected with SARS-CoV-2. This definition included people infected in hospital from cases who had been transferred from a quarantine facility (as such cases were still in the 14-day quarantine process). However, this definition did not include pandemic virus transmission solely between returnees within the quarantine facilities (as some other commentators have included in lists of failures in the Australian context[2]).

Looking forward, the quarantine system failure risks in NZ and Australia may increase, given that the proportion of travellers returning to these countries who are infected is increasing due to global intensification of the pandemic and the increasing infectivity of new SARS-CoV-2 variants.[3] Indeed, there have been a number of clearly documented cases of spread *within* quarantine hotels (eg, two instances in Sydney in April 2021), highlighting the increased risk and evolving situation with more highly infectious variants arriving from overseas. However, offsetting this trend will be measures such as the vaccination of quarantine workers. In NZ, the vaccination of border workers began in February 2021 with the Pfizer/BioNTech vaccine. However, vaccination does not fully protect against SARS-CoV-2 transmission, although a moderate degree of protection is likely. For example, infection rates were halved for the AstraZeneca vaccine,[4 5] and perhaps reduced by 70% for the Moderna mRNA vaccine.[6] Furthermore, the level of testing of quarantine workers has been increasing (eg,[7]; which will find some failures before they have a chance to establish as an outbreak in the community). There have been other improvements in the quarantine systems over time (eg, improved security, introduction of mask wearing within quarantine settings, reduction in shared spaces, improved PPE used by workers, and other procedures as detailed in both countries[8 9]).

The start of quarantine-free travel between Australia and NZ (also known as a "green zone" or "Trans-Tasman bubble") provides an opportunity to benchmark COVID-19 border control policies and practices, identify potential improvements in both countries, and harmonise best practices across the region. The green zone further intertwines the biosecurity status of both nations and it is therefore even more important to lower the risk of border failures that could disrupt such travel.

To substantially reduce the risk of SARS-CoV-2 spreading out of the quarantine system (until such time as enough of the population is vaccinated), the most obvious action is to reduce arrivals, or even suspend arrivals, from high infection locations (as NZ temporarily did for travel from India and other high risk countries in April 2021[10]). However, there are several other key lessons from Australia's quarantine system failures for NZ, which are detailed below.

Ensure adequate ventilation or use discrete quarantine units

At least four of the quarantine failures in Australia are thought to be due to inadequate ventilation in hotels used as quarantine facilities (ie, the Holiday Inn cluster in Melbourne, the Parafield outbreak in South Australia, the Four Points by Sheraton failure in Western Australia, and the Mercure Hotel cluster in Western Australia), as described in the appendicised table below. These failures highlight the role of airborne transmission of SARS-CoV-2, and potential measures to address this risk include improving ventilation (eg, letting in more outdoor air through windows or adding air cleaners with HEPA filters to rooms), providing better masks to returnees (eg, N95), and moving away from use of hotels to discrete accommodation units (eg, the cabins used at the Howard Springs facility outside of Darwin). The use of discrete accommodation units allows for natural ventilation and reduces or eliminates shared indoor spaces. To date, there have been no failures at the Howard Springs facility (a converted workers' camp[11]) and this approach should be seriously evaluated for NZ, otherwise NZ could negotiate with Australia to pay for part-use of Howard Springs (eg, for red zone country returnees). The use of better or purpose-built facilities in rural locations will also have less risk from close contacts in central business district hotels.

Reduce the risk of community transmission from cases infected *within* quarantine

While our definition of a quarantine system failure did not include virus transmission *solely* between returnees within the quarantine facilities, several of quarantine system failures also involved spread within quarantine facilities prior to infected people being released into the community (see Appendix). Introducing a post-MIQ home quarantine requirement for 5-7 days would help to reduce the risk that cases infected during their MIQ stay will infect others in the community. Other countries pursuing COVID-19 elimination have also focussed on this period. For example, Hong Kong recently extended the length of border quarantine from 14 to 21 days.[12] Testing of people after leaving quarantine on day 16 is now common in Australia (eg,[13]) and should be considered in NZ.

Protect and test border workers

Most of the quarantine system failures in Australia involved the infection of quarantine workers (see Appendix). The vaccination of all quarantine workers against COVID-19 (and the redeployment of all unvaccinated workers to positions outside of the quarantine system) will be particularly valuable when it becomes clearer that vaccines can substantially prevent transmission, in addition to protecting recipients from illness. However, consideration should also be given to improving conditions for quarantine workers to minimise the risk of overwork (eg, in February 2021 there were still concerns by NZ health workers about staffing inadequacies in these facilities), which may increase the risk of PPE failures, or of workers taking on other part-time jobs in other settings. In Western Australia, quarantine hotel staff, including cleaners, security guards and catering staff, are no longer allowed to hold second jobs due to the risk of community transmission, but have received a pay increase of about 40 per cent as compensation.[14] Victorian quarantine workers are also not allowed to have a second job, whereas South Australia staff are allowed second jobs in low risk settings.[15]

While the level of testing of quarantine workers has been increasing (eg,[7]; which will find some failures before they have a chance to establish as an outbreak in the community), NZ should consider mandating daily PCR-based testing of saliva for MIQ workers (arguably a

less invasive method than the current PCR nasopharyngeal swab). This option could also be explored for travellers in MIQ in addition to the current testing regimen to allow for comparative assessments. This testing is being used in parts of Australia,[16] and in other countries. Furthermore, in view of the increased transmissibility of new variants, consideration should be given to testing of all workers in border-associated occupations (eg, providing airline meals and laundry services) at least twice per week. Documented negative tests at an appropriate frequency should be an occupational requirement for all border workers, instead of the self-report systems currently used in NZ (which are susceptible to deception).

In summary, we find that Australia appears to have had 17 COVID-19 identified failures arising from its quarantine systems up to 11 May 2021. These failures provide potential lessons for NZ including ensuring adequate ventilation or using discrete quarantine units, reducing the risk of community transmission from cases infected within quarantine, and protecting and testing border workers. Ongoing improvements or alternatives to hotel-based quarantine are required because quarantine system failures can be very costly in terms of lives and economic impacts such as lockdowns.

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APPENDIX

Table 1: List of the 17 COVID-19 quarantine system failures in Australia from July 2020 up to 11 May 2021

Failure event	Extent of known spread outside of quarantine	Details	Event preventable with full vaccination of frontline border workers (assuming 100% effectiveness)?
Rydges Hotel – Victoria “second wave” outbreak (late May to late October 2020)	Over 19,800 cases,[17] [18] and over 800 deaths[19]	Genomic testing indicated that 99% of Victoria’s second wave of community COVID-19 cases were linked to transmission events related to returned travellers infecting workers at the Rydges Hotel in Carlton and the Stamford Plaza Hotel (see row below) in Melbourne’s central business district (CBD), which were used as facilities for quarantine.[20] Specifically, around 90% of cases can be traced back to a single family of four that returned to Australia in mid-May and were quarantined at the Rydges Hotel.[21] The virus then spread from the infected workers to the community, with high rates of local transmission.[20] The outbreak led to a stringent lockdown for 112 days in the state, with particularly strict measures in the major city of Melbourne.[22] At least nine people employed in Melbourne’s hotel quarantine programme tested positive between late July and early October 2020, although the cases may have been a reflection of substantial community transmission in Melbourne at the time rather than additional hotel quarantine failures.[23] Two of those cases worked while infectious.[23]	Likely
Stamford Plaza Hotel – Victoria “second wave” outbreak (late May to late October 2020)	See row above	Almost 10% of cases in Victoria’s “second wave” outbreak were attributable to an outbreak at the Stamford Hotel in mid-June.[20] The outbreak was traced back to international travellers who returned to Australia in early June,[20] and then was spread by security guards who worked at the facility.[24]	Likely

Failure event	Extent of known spread outside of quarantine	Details	Event preventable with full vaccination of frontline border workers (assuming 100% effectiveness)?
Marriot Hotel at Circular Quay in Sydney, New South Wales [NSW] (August 2020)	2 security guards	A security guard at the Marriot Hotel at Circular Quay in Sydney tested positive for COVID-19 on 15 August.[25] Genomic sequencing linked the infection to a returned overseas traveller at the facility.[25] A second security guard subsequently tested positive.[26]	Likely
Parafield outbreak in South Australia (December 2020)	33 cases[19]	Genomic testing indicated that Adelaide's Parafield cluster was linked to transmission events related to a returned traveller in a quarantine hotel infecting workers in the facility, possibly due to poor ventilation at the facility.[20] The virus spread from the workers to the community, resulting in a strict lockdown.[20]	Likely
Quarantine hotel facility cleaner infected in Sydney, NSW (December 2020)	A single worker	A quarantine hotel worker (a cleaner) who completed shifts at two quarantine hotels, the Ibis Hotel and the Novotel in Darling Harbour in Sydney, tested positive in early December.[27] There was also spread in this facility with 5 returned travellers being infected.	Likely
Avalon outbreak in NSW (January 2021)	151 cases (as of 11 January 2021)[28]	It has been reported that genomic sequencing suggests that the strain is of US origin and entered Australia via an infectious returned traveller who entered hotel quarantine upon arrival.[27] It is currently unknown how the virus spread to the community and source investigations were still underway (as per January 2021). Case numbers include those from the linked Croydon and Wollongong clusters, but not the linked Black Rock cluster in Victoria (27 cases as of 5 January 2021) due to separate reporting by states.	Unclear

Failure event	Extent of known spread outside of quarantine	Details	Event preventable with full vaccination of frontline border workers (assuming 100% effectiveness)?
Berala outbreak in NSW (January 2021)	26 cases (as of 11 January 2021)[28]	It has been reported that genomic sequencing linked the outbreak back to infectious international travellers.[29] A patient transport worker transferred infectious travellers from Sydney Airport to a hospital.[28 29] Another patient transport worker who was a close contact of the first then also tested positive.[28 29] The virus then spread from the second infected worker into the community, seeding the Berala outbreak.[29]	Likely
Hotel Grand Chancellor outbreak in Brisbane, Queensland (January 2021)	6 cases (as of 13 January 2021)[30]	A hotel quarantine worker in Brisbane tested positive in early January 2021 for the UK variant of COVID-19 (ie, B.1.1.7).[31] This case led to a three-day lockdown in the greater Brisbane area, while contact tracers worked to ensure there was no community transmission of the strain.[32] It was later revealed that there were six genomically linked cases within the quarantine facility, including the hotel quarantine worker and five returned travellers.[30]	Likely

Failure event	Extent of known spread outside of quarantine	Details	Event preventable with full vaccination of frontline border workers (assuming 100% effectiveness)?
Four Points by Sheraton hotel, Western Australia (January 2021)	A single worker	A Perth quarantine hotel security guard, who worked a second job as a ride share driver, tested positive to the UK strain of SARS-CoV-2, sparking a five-day lockdown for 80 per cent of the state's population, in an attempt to stop any further transmission.[14] It's believed he was exposed to the virus on the 26 January when he worked at Four Points by Sheraton, on the same floor where a quarantined returned traveller with a confirmed case of the UK variant was staying. After feeling sick on 28 January, the case visited a GP, and tested positive on 30 January. The exact cause is unknown, but it's believed poor ventilation could be a factor.[33] This comes a week after Western Australia committed to daily testing of the hotel quarantine staff, instead of weekly.[34] Quarantine hotel staff, including cleaners, security guards and catering staff, are no longer allowed to have second jobs but will receive a pay increase of about 40 per cent as compensation.[14] It has been announced an inquiry will be held.[33]	Likely
Grand Hyatt Hotel, Victoria (February 2021)	A single worker	One 26-year-old staff member at the Grand Hyatt Hotel (an isolation facility) tested positive for the highly transmissible UK variant of COVID-19 (ie, the B.1.1.7 variant) in February 2021, leading to heightened restrictions.[35] The close contacts of the case all tested negative, and the outbreak did not spread into the wider community.[35]	Likely

Failure event	Extent of known spread outside of quarantine	Details	Event preventable with full vaccination of frontline border workers (assuming 100% effectiveness)?
Holiday Inn Hotel cluster, Victoria (February 2021)	22 cases	Twenty-two cases have been linked to the Holiday Inn cluster in Melbourne, where an infected returned traveller used a nebuliser, causing an outbreak and a 5-day lockdown.[36] There were no further cases detected in the community during the lockdown as all confirmed cases had already been informed of their status as close contacts and were in isolation for the duration of their infectious period. Cases included returned travellers, hotel quarantine staff and their families, as well as a Melbourne Airport worker.[36]	Likely
Princess Alexandra Hospital doctor outbreak, Brisbane (March 2021)	6 cases[37]	A doctor and a nurse (see row below) who worked at the Princess Alexandra Hospital while unvaccinated were linked to two separate COVID-19 outbreaks.[37] While both outbreaks were the highly transmissible UK variant of the disease and originated at the same hospital, they were from two different sources.[37] The doctor tested positive on 12 March 2021, with subsequent infections in 5 other persons.[37] These outbreaks resulted in a 3-day lockdown just before the Easter holiday.[37]	Likely (we considered health workers at the Princess Alexandra to be “border workers” given that the hospital patients were still part of the quarantine system)
Princess Alexandra Hospital nurse outbreak, Brisbane (March 2021)	13 cases[38]	A nurse (see row above) who worked on a COVID-19 ward at the Princess Alexandra Hospital while unvaccinated tested positive in late March 2021.[37] Genome sequencing links the case to an overseas traveller from India who was being cared for at the hospital.[39] The nurse’s sister, a number of attendees at a “hen’s party”, and several other contacts were subsequently infected.[37]	Likely (as per the comment in the row above)

Failure event	Extent of known spread outside of quarantine	Details	Event preventable with full vaccination of frontline border workers (assuming 100% effectiveness)?
Sofitel Wentworth in Sydney, NSW (March 2021)	A single security guard	A security guard at the Sofitel Wentworth in Sydney tested positive for COVID-19 on 13 March through routine surveillance testing.[40] Genomic sequencing linked the case to a returned traveller and subsequent testing revealed that another returned traveller was also infected within the facility.[40]	Likely

Failure event	Extent of known spread outside of quarantine	Details	Event preventable with full vaccination of frontline border workers (assuming 100% effectiveness)?
Mercure Hotel cluster in Perth, Western Australia (April 2021)	3 cases	A mother and her four-year-old daughter who had returned from the UK, and a traveller who had returned from China contracted the virus while in hotel quarantine.[41] The mother and child's infections were detected on 16 April and genomically linked to a couple who had returned from India on April 10 and subsequently tested positive for the UK variant.[41] All of the travellers were staying in adjacent rooms on the same hotel floor.[41] The returned traveller from China tested negative on release from hotel quarantine in Perth on 17 April, but later tested positive for COVID-19 in Melbourne.[42] The case then spent up to five days in the community in Perth while infectious, and two linked community cases were identified.[43] The outbreak led to a 3 day lockdown in Perth and the neighbouring Peel region,[42] and a brief suspension in quarantine-free travel between Western Australia and NZ.[43] The ventilation at the Mercure Hotel had previously been identified as the riskiest among Western Australia's 10 quarantine hotels, with an engineer finding that the corridors had no independent airflow with oxygen supply leaking from the adjoining rooms.[41] Chief Health Officer Andy Robertson had recommended that the Mercure Hotel no longer operate as a quarantine facility on 14 April.[41]	No

Failure event	Extent of known spread outside of quarantine	Details	Event preventable with full vaccination of frontline border workers (assuming 100% effectiveness)?
Community cases in NSW (May 2021)	2 cases	On 5 May 2021, a man from Sydney was diagnosed with COVID-19.[44] His wife subsequently tested positive.[44] The cases were genomically linked to a traveller who returned from the US and was moved to a quarantine facility on 28 April.[45] However, an epidemiological link between the traveller and the cases has yet to be established,[44] suggesting that there may be additional cases in the community. Additionally, fragments of coronavirus were detected in wastewater samples in Sydney.[45] The cases have not resulted in a lockdown in NSW, but additional restrictions, including compulsory masking and limits on indoor gatherings were put in place.[44] Additionally, the situation led the NZ Government to temporarily pause their quarantine-free travel arrangement with NSW for 48 hours, and a close contact of one of the cases was placed in an MIQ facility in Christchurch after travelling to NZ.[44]	Unclear (while this is likely to be some type of quarantine facility failure – there is a small chance that infection was transmitted via other means – eg, from the US traveller via an infected air crew member)
Comunity case in Victoria (May 2021)	1 case (as of 11 May 2021)	A traveller who returned from India via the Maldives and Singapore completed the required stay in quarantine in South Australia.[46] After leaving quarantine on 4 May, he then travelled directly to his home in Victoria. He subsequently developed symptoms and tested positive.[46] It is thought that the traveller likely contracted the virus while in quarantine in South Australia; it has been reported that the traveller stayed next door to another person who tested positive for the virus.[46]	Unclear

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