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Expansion of “green zones” may provide a chance for the global eradication of COVID-19

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With effective vaccines for COVID-19 comes the potential for disease eradication (elimination at the global level). Here we consider the advantages and the challenges, but ultimately suggest consideration of progressive expansion of “green zones” towards a target of COVID-19 eradication. Even if eradication is not achieved, establishing and maintaining “green zones” with no local spread will have many medium term benefits by liberalising travel between “green zone” countries (eg, between NZ and Australia).

The COVID-19 pandemic response led to two unexpected major advances. Perhaps most surprisingly, was that traditional public health and social measures (PHSMs) could stop the spread of a respiratory virus despite about half of spread being from those without symptoms. The virus has been eliminated by these PHSMs in large parts of the globe, including countries with large land borders such as China and Vietnam [1]. Secondly,

effective vaccines were deployed more rapidly than any other vaccine in the past. Together, these two advances suggest that elimination of the pandemic virus (SARS-CoV-2) could occur stepwise, from countries to regions, making global elimination (technically, eradication but with the caveat of potential re-emergence) theoretically possible. But how feasible is eradication, especially given our failures to complete polio eradication and regional measles elimination. We consider this question briefly in this blog and then consider the potential role for Aotearoa/NZ.

The rationale for trying for COVID-19 eradication

Vaccination eradicated smallpox [2], rinderpest [3], and two of the three serotypes of poliovirus [4]. PHSMs were used to eradicate SARS [5] without vaccination. With safe and highly effective vaccines for COVID-19 to build on successes of PHSMs, eradiation has become a reasonable consideration. PHSMs alone have allowed around 20% of the world to be in COVID-free jurisdictions (when counting just China, Taiwan, Vietnam, Australia, and NZ).

Progressive elimination and eradication offers huge public health benefits [6]. Firstly, prevention of disease (including sequelae such as “long COVID”), hospitalisations, and deaths (with substantial savings in years-of-life [7]). Eradication would prevent the worsening of health equity within countries and globally. Also progressive elimination would reduce the risks of more dangerous variants emerging in humans or from animal reservoirs.

The costs of COVID-19 eradication are likely to be affordable. For example, one estimate for the incremental cost of delivering COVID-19 vaccines in 92 low and middle-income countries is of US$1.66 per dose supplied and US$3.70 per person vaccinated with two doses, for a total of US$2.018 billion [8]. Such costs could be easily eclipsed by the large economic benefits of eradication, as suggested from analysis of the follow-up benefits of smallpox eradication [9].

There is now a window of opportunity with the currently huge political and public interest in COVID-19 to support eradication. In our view this interest appears to go far beyond the momentum for existing eradication programmes (ie, for polio and guinea worm [10]) and for regional measles elimination, for which all WHO regions of the world currently have elimination goals [11].

Three threats to succeeding with eradication

One major potential threat to achieving COVID-19 eradication is if the pandemic virus became endemic in non-human animal populations. Fortunately, however, domestic and wild animal infections with SARS-CoV-2 are rare to date [12]. Also, COVID-19 vaccines for domestic animals could be developed and oral vaccine in bait has successfully eliminated other wild animal infections eg, the elimination of rabies from wild foxes in Belgium [13]. Furthermore, the problem of guinea worm infection in domestic dogs has not stopped the global eradication efforts for that disease from continuing [10], since various non-vaccination control measures can be successfully used in dogs [14].

Achieving adequate vaccination coverage may prove too challenging. There are the issues of weak infrastructure to deliver health services in many countries, the lack of trust in governments, and even frank Covid-denialism by some governments [15] and groups.

There is also no vaccine yet licensed for children, though trials are underway that are expected to confirm the safety and efficacy of vaccines in these age groups [16]. Nevertheless, there are the advantages of some single dose vaccines on the market, some prospect of intranasal spray vaccines [17] [18], and even self-application of microneedle patches [19] might become a possibility. Intranasal spray vaccines would mean no injections and therefore could facilitate increased public acceptability of vaccination. Such public acceptability may also grow over time once there is more familiarity with the benefits for individual protection and community protection. Also, inadequate vaccination coverage to achieve country-level elimination could be supplemented by PHSMs – particularly mass mask wearing in public settings. Requirements for vaccine passports by governments and airlines could also push up vaccination rates – and lower the risks of re-introductions to COVID-free countries.

Another challenge is the emergence of vaccine escape variants with reduced or even lost vaccine protection [20]. Fortunately however, it may not take long for new mRNA vaccines to be designed and produced against new variants. There is considerable global experience with reformulating other vaccines, notably for influenza, to keep ahead of viral evolution.

NZ and the WHO and getting the Australia-NZ “green zone” working

NZ could ask the World Health Organization (WHO) to immediately convene an expert review on the case for progressive elimination and attempting eradication of COVID-19 using vaccines and PHSMs. Even if the feasibility and desirability of eradication is currently uncertain, progressive elimination would still provide a highly defensible interim approach to protect health and economies while scientific information is being collected and assessed to identify optimal long-term scenarios. Then if WHO recommends attempting global eradication, NZ should, as a high-income country, commit to providing further funds to low-income countries for building primary care services and running COVID-19 vaccination campaigns (to its credit NZ has already helped fund COVAX). As we have previously noted, there are multiple ways that WHO could recognise and support COVID-19 elimination efforts [1].

Secondly, NZ should continue to work to build quarantine-free travel “green zones” with other COVID-free countries such as Australia. This approach could highlight to the rest of the world how elimination countries can achieve the benefits of international travel – while still retaining their elimination status. If political agreements are difficult to achieve between NZ and Australia, then unilateral steps could still be taken by the NZ Government (eg, simply allowing travellers from Australia into NZ without the need for quarantine, but obviously with education regarding use of the NZ’s COVID Tracer app etc).

Image by Luke Pilkinton-Ching, University of Otago Wellington.

To successfully sustain a successful travel “green zone” with Australia, it is critical that NZ does more to reduce the risk of border control failures arising in NZ from traveller arrivals from “red zone” countries. There have now been 12 border failures in NZ since August 2020 as per 9 hotel quarantine failures [21]; a sea port-related failure [22]; an infected air crew worker being in the community (March 2021) [23]; and a likely border failure (yet to be explained) that caused the Auckland “Valentine’s Day” outbreak in February/March 2021. Of note is that Australia has had a lower failure rate with its hotel quarantine system than NZ has had [21].

Reducing the risk of such failures could mean:

- **Turning down the tap by restricting the number of places in MIQ facilities for travellers from “red zone” countries** [24], and requiring pre-travel quarantine from these countries. As various NZ legal scholars have pointed out (see Appendix 1), these type of measures are consistent with NZ law. It is well-established that our law provides that people coming from overseas return on the basis of checks under customs, biosecurity and health law. Additionally specific health requirements apply under COVID-19 at present, involving quarantine and, where appropriate, isolation. Such existing provisions would be strengthened but not fundamentally changed with reducing MIQ places and requirements for pre-travel quarantine, measures which could delay return but not prevent it. Furthermore, pre-travel COVID-19 vaccination could potentially allow NZ citizens to fast track their return to NZ and avoid the need for quarantine (with this vaccination potentially being made available at several NZ embassies/consulates around the world eg, in the UK, the US, and Singapore). Similarly, NZ citizens leaving NZ for short-medium term travel with the intention of

returning could be prioritised for vaccination [25].
- **Doing infection control at MIQ facilities extra well and outside of cities.** The vaccination of border workers in NZ is a major step forward, but it will still not reduce the risk of infection spreading between travellers in these facilities. Reducing this risk would require adopting the Australian approach of travellers staying in their rooms with no time in shared spaces (exercise areas and smoking areas). It would also mean only using facilities with appropriate ventilation – ideally with each room having opening windows. Ideally NZ would invest in construction of dedicated quarantine facilities that are outside of cities (see Appendix 2).

Successful "green zones" will also need to address the fact that there are likely to be occasional outbreaks due to the risk of border failures. Agreed approaches between participating countries could help maximise the speed of outbreak control and limit disruptions to discrete outbreak areas. There is also scope for sharing resources (eg, NZ and Australia could share resources for call centres and contact tracing personnel to ensure adequate surge capacity for outbreak control).

In summary, we have briefly presented the case for actively exploring the goal of global eradication of COVID-19. Even if the feasibility and desirability of this goal is currently uncertain, the interim goal of progressive elimination appears highly defensible as a way of protecting public health and economic recovery. Part of this process could be the expansion of groupings of countries that have succeeded with elimination. For NZ this would mean establishing a successful quarantine-free travel "green zone" with Australia, while doing much more to lower the risk of border failures from high risk "red zone" countries.

Appendix 1: The legality of turning down the tap from "red zone" countries

NZ-based legal experts have considered the NZ Bill of Rights Act 1990, the Immigration Act 2009, and the International Covenant on Civil and Political Rights (which NZ has signed). These experts have clarified that the NZ Government can legally set conditions on returning NZ citizens (see here: [26] [27]), as indeed is already being done with the requirement for quarantine. Such requirements can logically include a wide range of measures from pre-flight quarantine and further limiting MIQ bookings (including temporarily suspending travel from some countries) to make border control safer and more manageable in NZ. Such conditions before entry into NZ may delay re-entry but do not render citizens "stateless".

Given the potential for more severe global pandemics in the future, it is important that NZ establishes the principle that the government has a duty to suspend travel from some or all overseas source countries under certain circumstances and criteria. The bar for such actions needs to be high. It will always be about balancing a range of human rights. New Zealanders, particularly those who are the most vulnerable, need to be protected from emerging and pandemic diseases, a right that is enshrined in the Te Tiriti o Waitangi principle of active protection ("which requires the Crown to act, to the fullest extent practicable, to achieve equitable health outcomes for Māori") [28]. The right to health is also recognised in Article 12 of the International Covenant on Economic, Social and Cultural Rights, ratified by New Zealand in 1978. Article 12(2) (c) specifically states that the steps to be taken in the full realisation of the right to the enjoyment of the highest attainable standard of physical and mental health includes those necessary to the 'prevention, treatment and control of epidemics'. There is also the right of New Zealanders to return home: "Every New Zealand citizen has the right to enter New Zealand" (section 18, NZ Bill

of Rights Act 1990). It is important that NZ has clear rules for the circumstances under which entry conditions of varying degrees would be implemented so that such decisions can be rapidly implemented if required.

Lead image by x3 from Pixabay

Appendix 2: The benefits of purpose-built quarantine facilities outside of cities

To reduce the health risks of outbreaks and also to reduce the risk of lockdowns of cities, NZ should begin planning for and constructing purpose-build quarantine facilities outside of cities. These will assist the country getting through the current COVID-19 pandemic and as a legacy investment for managing future pandemic threats that could be much more severe. Ideally dedicated quarantine facilities could be assembled on military bases or isolated resorts (using mobile homes and caravans initially) while construction proceeded on the type of single storied buildings used at the Howard Springs quarantine facility in Australia. Indeed, the Howard Springs facility is being expanded up to 2000 beds [29], and the State Governments of Queensland [30] and Victoria [31] are also exploring having purpose-built quarantine facilities.

Purpose-build quarantine facilities should ideally be designed so they are sufficiently versatile so that they have other uses in inter-pandemic periods. For example, if such buildings were built at Ōhakea air base, they could then be used in the inter-pandemic period for rental accommodation for Massey University students (around 20 minutes away by car in Palmerston North). In this example, proximity to Palmerston North is also why access to an adequate workforce of MIQ facility workers is also not a valid argument against such an approach. Daily saliva-based PCR testing of both border workers and travellers in MIQ facilities should also be considered. Offering vaccination on Day 1 to all those arriving in MIQ facilities may also be worthwhile (while giving only partial benefit – any such benefit is likely to be highly cost-effective given the very high costs of outbreaks from border failures).

While military bases have some special benefits (eg, the long air strip at the Ōhakea air base; the established security and other infrastructure), other potential options for locations include: (i) isolated resorts where accommodation is needed for tourists or conference attendees; and (ii) horticultural areas where accommodation is routinely needed for fruit picking etc. Even using accommodation facilities in tourist towns such as Queenstown would pose very much lower risks of economic damage from lockdowns that the current MIQ arrangements in big cities.

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