1 | INTRODUCTION

The emergence of COVID-19, the coronavirus disease caused by the severe acute respiratory syndrome (SARS) coronavirus 2 (SARS-CoV-2), in January 2020, and its rapid development into a global pandemic has been chronicled in the global media. At the time of writing, it is still raging on several continents. COVID-19 is not a “Black Swan” event as the emergence of a novel coronavirus was predicted by public health professionals following the outbreaks of SARS in 2004 and Middle East respiratory syndrome (MERS) in 2012. Its rapid spread and intensity, coupled with its truly global reach, has made COVID-19 a major cross-sectorial disruptor with its social and economic impact projected to last a decade. But even when COVID-19 is eventually controlled akin to the common influenza, epidemiologists predict that it will not be the last of the pandemics. Other zoonotic coronaviruses akin to SARS-CoV and...
MERS-CoV are currently in existence in various host species.\(^4\) As human infringement and continued pressure on the last residual vestiges of natural environments continues, cross-species transmission of these coronaviruses is inevitable, and some of these are almost certain to emerge as a yet another major threat to humans.\(^5\)

The take-home message is clear: living with the stochastic occurrence of coronavirus epidemics, some of which may develop into pandemics, is the new reality, and we will have to adapt to it in terms of work habits,\(^6\) urban transport,\(^7\) and urban open space planning\(^8\) but also urban soundscapes\(^9\) as well as office design\(^10\) and residential housing design.\(^11\) In addition, public health strategies need to adapt at a national and local level, informed by the experiences made of suppressing COVID-19 during 2020. Once an outbreak is detected a rapid suppression of the event is critical which requires rapid contact-tracing coupled with effective containment measures. One of these measures is to establish temporary boundaries to restrict the movement out of affected areas ("ring-fencing"). Recent experiences in Victoria have shown that where such ring-fencing is delayed, community spread increases with concomitant social and economic harm caused by extended periods of lockdown. A major concern in ring-fencing, however, is that "leakage" occurs, with people breaching the restrictions, either intentionally or unintentionally.

Critically, one of the lessons of COVID-19 and its public health management, has to be that a future pandemic environment (which will be inevitable) will require the acceptance by the public that the emergence of small, localised clusters and thus the need for localised ring-fencing will become the 'new normal'. In order to minimise social and economic harm experienced by the response to COVID-19, however, a firm 'buy-in' by the general public will be required to appreciate the validity the necessary public health measures and support their implementation. Geographically broad-scale and temporally extended periods of lockdown, especially when occurring repeatedly, have shown to cause fatigue and disobedience. Indeed, concurrence with public health measures and compliance with any imposed restrictions, however, tends to weaken where the public perceives the (personally quantifiable) impact of these measures on their lives and livelihoods as disproportionate to the (personally less well quantifiable) community gains. This holds particularly true where measures are either voluntary or are mandatory but not decisively enforced. Personal responses to observations of increased disobedience range from resignation to fatalism, fuelling further disobedience. Thus there is a need to engage the public in accepting, adhering to and also socially enforcing necessary public health measures. While health promotion activities play a major role, it is critical to also empower the public to understand which areas are within a ringfenced zone, and to readily notice people that are "out-of-bounds."

Using the example of the COVID-19 induced border closures between NSW and Victoria as an example, this paper argues to implement a ubiquitous observation and enforcement tool (local government area based car registration plates), to moderate community behaviour and ensure increased compliance with the directives of health authorities.

2 | Public health control measures

Public health strategies discussed and exercised during the COVID-19 pandemic have been eradication (New Zealand),\(^12\) containment and herd immunity (Sweden).\(^13\) Of these, containment strategies have been the most common.\(^14,15\) At each national level, government reactions to curb or slow the progress of COVID-19 have involved, to various degrees and duration, the reduction of international arrivals to repatriation flights, limitations to domestic travel, the temporary shut-down of non-essential businesses, and the restriction of human movement during periods of "lockdown."

When Australia was formed in 1901 as a voluntary Federation of former British colonies, the newly created states (ex colonies) retained their rights to exercise public health measures as they deemed fit. The Federal government can control some public health measures, such as restricting international travel, and can attempt to coordinate, but it cannot control the actions of the states. Consequently, lockdown provisions were enacted on a state by state basis, usually relying on powers derived from the individual state Health Acts.

While the initial lockdown was more or less nationwide from 31 March to 15 May,\(^16,17\) the differences in lockdown provisions in the various states did not come to the fore. Cross-border issues did not emerge, nor when the universal lockdown ended in mid-May 2020, with gradual easing of restrictions on dining and public venues. Once Victoria started to register a resurgence of community infections in late June, the State government instituted ring-fencing by declaring stage 3 lockdown restrictions for selected suburbs\(^18\) with an increasing ring-fencing perimeter as spread continued.\(^19\) In response to the increasing numbers of cases in Melbourne, the NSW state government unilaterally declared that the state border between NSW and Victoria be closed on 8 July 2020.\(^20\) This could be more or less readily policed as, with exception of a section in the Australian Alps and along the Pacific Coast, the border between the two states was formed by the Murray River with a limited number of well-established bridge crossings. While theoretically a clean solution at fencing off an entire state, the border control order caused major problems for several cross-border communities, especially Albury-Wodonga.\(^21-23\) For that community in particular, concerted efforts have been made since the 1970s to forge a community identity with shared facilities and economy\(^24\) with large numbers of people living and working on different sides of the border. Over the past decade, the health systems in particular have become closely integrated, with all obstetrics, for example, in Wodonga and all oncology in Albury.\(^25\)

2.1 | Impact of these control measures on cross-border traffic

Not surprisingly, the practicalities of the enforcement of the original Border Control Order\(^20\) and the implications of that enforcement on the communities, however, brought about a flurry of modifications to primarily in the form of limited exemptions and adjustments.\(^26-31\)
To allow cross-border communities to function, a generic, not mapped-out border zone was established at the start of the border closure period, with cross-border traffic permitted on a demonstrable needs basis. Given the rising number of cases in Melbourne and seeding of SARS-CoV2 into regional Victoria, NSW reacted and created a very narrow border corridor on 20 July 2020 (Figures 1 and 2A), which resulted in severe cross-border restrictions. These rapidly changing conditions brought about confusion among the border communities, coupled with growing sense of frustration and resentment at the seemingly arbitrary boundaries. The boundaries were adjusted on 28 July to add communities adjacent to Wodonga, which had a high number of residents working in Albury (Figure 2B). Following the failure of ring-fencing Melbourne and environs, as well as a display of selfishness by some residents blatantly flaunting the movement restrictions, Victoria moved on 2 August to declare a state-wide stage 3 locked down and stage 4 with curfew for Melbourne. The border boundaries did not change at that stage, but New South Wales restricted cross-border access.

The wider zone took into account the need for movement of agricultural workers and contractors (Figure 3). The enforcement of the cross-border movement restrictions relied on permits (Figures S1 and S2), that needed to be verified individually at roadblocks (Figures S3 and S4), with reports of persons trying to be smuggled though the control points.

2.2 Practical limitations of the enforcement of ring-fencing

While ring-fencing is a valid, logical and inherently adaptable concept for controlling the spread of communicable diseases, it is reliant on community adherence, which can be voluntary or can be enforceable through legislated fines and other forms of punishment. Not surprisingly, the media were full of stories where police fined citizens for breaching social distancing rules and for breaching restrictions on legitimate travel within Victoria. A particularly blatant example was that of a man driving over 300kms from Melbourne claiming to buy a burger at a McDonalds in Wodonga, or a man driving over 40km from Thornbury to Werribee claiming to get a haircut from his favourite barber. These violations only came to light during randomly created temporary checkpoints akin to random breath and drug tests. The actual number of ring-fencing violations

FIGURE 1 COVID border buffer zone between New South Wales and Victoria, 28 July 2020
can never be ascertained. On the NSW side, travel from and to the border zone was strongly discouraged, but not formally prohibited. Since all adherence relied solely on personal ethics, numerous violations occurred (pers. obs.).

While driving licences, or, for people without such identification, personal identification documents and proof of age cards provided the required locational residential details, any violations are not discernible, unless caught in random roadside checks. Essentially, if acting irresponsibly, individual mobility with each state remained largely unimpeded, allowing seeding of SARS-CoV2 into regional areas.

Technological control measures include licence plate recognition and facial recognition. At present, in Australia, automated licence plate recognition is installed in most police vehicles, stationary toll gates, red-light cameras, as well as in point-to-point average speed barriers on motorways. The current system is flawed as it only detects a small number of vehicles and because many motorists maintain vehicle registrations at locations other than their primary place of residence (for reason of registration or insurance costs). Furthermore, a police-state style surveillance of people’s movements through facial recognition, akin to the processes rolled out in China, is not desirable from a civil liberty perspective. Other European countries previously had sub-state level car registration, such as France, which abandoned its departmental car registration in 2009 and Italy, which abandoned the provincial coding in 1994.

Traditionally, the major reasons for sub-state level car registration as exercised in several countries has economic benefits to the local government areas (LGA), as it ensures that the distribution of road tax (or fuel excise) benefits is related to the number of vehicles registered in that LGA. From a public health perspective such sub-state level car registration attached to the primary place of residence will allow for ring-fencing based on LGAs, with all “out of bounds” vehicle traffic readily detectable. This system also allows to flexibly and adaptively add ring-fences to emerging hotspots. Residents tend to be aware in which LGA they reside, which allows health warnings and movement limitations (e.g., ring-fencing boundaries) to be readily disseminated and promoted. While this does not negate the actions of bad faith actors, that is, wilfully deceitful passengers, such a system will inhibit most of the inappropriate movement. Infractions are immediately obvious and observable by both law enforcement and the general public, and thus more readily preventable.

Additional public health promotion benefits are that vehicle owners can automatically be notified by telephone and/or e-mail of the creation of, or modifications to ring-fenced areas, including

FIGURE 2  Boundary adjustments of the COVID border buffer zone between New South Wales and Victoria in the Albury-Wodonga area, July 2020. (Source sections of Figures 1 and 2. (A) 20 July 202032. (B) 28 July 202034

3 | DISCUSSION

Since the majority of breaches related to ring-fencing will occur via motorised transport, however, positive vehicle identification as to point of origin will reduce policing effort and thus target outcomes, without infringing unduly on personal and privacy considerations.

One of the inhibitors to a ready policing of inappropriate and illegal travel behaviour in Australia is the fact that car registration is state-based (Figure S5) rather than based on prefectures as in Greece (Figure S6A), on Cantons as in Switzerland (Figure S6B), on districts as in Austria (Figure S6C), or on local government authorities (“Kreis”) as in Germany (Figure S6D). Other European countries previously had sub-state level car registration, such as France, which abandoned its departmental car registration in 2009 and Italy, which abandoned the provincial coding in 1994. Traditionally, the major reasons for sub-state level car registration as exercised in several countries has economic benefits to the local government areas (LGA), as it ensures that the distribution of road tax (or fuel excise) benefits is related to the number of vehicles registered in that LGA. From a public health perspective such sub-state level car registration attached to the primary place of residence will allow for ring-fencing based on LGAs, with all “out of bounds” vehicle traffic readily detectable. This system also allows to flexibly and adaptively add ring-fences to emerging hotspots. Residents tend to be aware in which LGA they reside, which allows health warnings and movement limitations (e.g., ring-fencing boundaries) to be readily disseminated and promoted. While this does not negate the actions of bad faith actors, that is, wilfully deceitful passengers, such a system will inhibit most of the inappropriate movement. Infractions are immediately obvious and observable by both law enforcement and the general public, and thus more readily preventable.

Additional public health promotion benefits are that vehicle owners can automatically be notified by telephone and/or e-mail of the creation of, or modifications to ring-fenced areas, including
the provision of detailed boundary mapping, thereby ensuring wider knowledge than mere disseminations through the media. Those community members that rely on public transport (bus, train) for the medium- to long-distance travel can be communicated with, and if need be intercepted, at the time of seat booking.

Importantly, sub-state level car registration empowers the community to recognise compliance as well as non-compliance, and thus reinforces a sense of personal agency. Public health promotion, coupled with an observation and enforcement tool, is likely to moderate community behaviour and ensure increased compliance with the directives of health authorities.

Given that other zoonotic coronaviruses are currently in existence in various host species and some of these are almost certain to emerge as a future major threat to humans, it is prudent to be ready for another pandemic in the short to medium-term future. The public health response to pandemics, which often require state-imposed measures that curtail individual freedom of movement and assembly, can result in a sense of personal disempowerment which leads to disengagement with the process. Where compliance with public health measures is readily discernible (e.g., through compulsory wearing of face masks), people experience the sense that their personal burden is shared by the community as a whole. Where compliance is not readily observable, and thus compliance is not personally verifiable by each member of the public, some community members may (covertly) question the commitment of others, which in turn may stimulate personal non-compliance. This is compounded, as noted in the introduction, in situations where the public perceives the personally quantifiable impact of public health measures on their lives and livelihoods as disproportionate to the personally less well quantifiable community gains.

4 | CONCLUSIONS

While ring-fencing is an inherently spatially adaptable and flexible concept for controlling the spread of communicable diseases, it entails the curtailment an individual's freedom of movement and assembly which impacts, sometimes severely, on their professional social and recreational lives. At present, compliance with ring-fencing is inherently unobservable by the general public. As the majority of medium- to long-distance travel in Australia is undertaken by car, sub-state level car registration makes "out of bounds" traffic immediately obvious and thus engenders personal empowerment by the general public.
It may be time to consider sub-state level car registration in the Australian setting as part of the suite of public health measures to deal with a future pandemic, coronavirus or otherwise, which unfortunately appears to be inevitable.

**ETHICAL CLEARANCE**

There is no ethical clearance required.

**CONFLICT OF INTEREST**

There is no conflict of interest to report.

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SUPPORTING INFORMATION
Additional Supporting Information may be found online in the Supporting Information section.

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