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Paraag Bhatt, Janet Strachan, Marion Easton, Lucinda Franklin, George Drewett

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## Short report

# Effect of COVID-19 restrictions and border closures on vaccine preventable diseases in Victoria, Australia, 2020–2021

Paraag Bhatt, Janet Strachan, Marion Easton, Lucinda Franklin, George Drewett

## Abstract

### Background

In 2020, Victoria introduced multiple interventions aimed at containing the spread of coronavirus disease 2019 (COVID-19). We examine the effect of these restrictions on other vaccine preventable diseases (VPDs).

### Methods

We analysed the mandatory reporting data, notified to the Victorian Department of Health, for VPDs from January 2015 to December 2021.

### Results

Reductions in notifications were seen for most notifiable VPDs. A precipitous decline in influenza and measles notifications was recorded in April 2020, which was sustained for both diseases throughout 2020–2021. Notifications for chickenpox, invasive meningococcal disease, invasive pneumococcal disease, and pertussis were reduced by greater than 50% from the 2015–2019 average. No notified cases of diphtheria, poliomyelitis, or rubella were reported in 2020–2021.

### Conclusion

Restrictions placed to mitigate the effects of the COVID-19 pandemic were associated with significant reductions in other VPDs, which were sustained into 2021. Nevertheless, it is important that high levels of population vaccine coverage continue, to prevent a rebound increase in VPDs as restrictions are eased, and to maximise protection against VPDs for all Australians.

Keywords: Coronavirus; VPD; lockdown; influenza; vaccination; Sars-CoV-2

## Introduction

In Victoria, the Coronavirus Disease 2019 (COVID-19) pandemic and the subsequent application of multiple public health interventions—including restrictions on international travel, state border closures and the introduction of preventive measures such as mandatory

mask-wearing, physical distancing, and restrictions on gatherings—have resulted in significant behavioural change. Schools and childcare centres were closed for prolonged periods, and people were asked to work from home wherever possible. Preventative measures implemented against COVID-19 are likely to confer protection against other communicable diseases.<sup>1</sup>

However, COVID-19 lockdowns have led to considerable disruption to delivery of healthcare interventions such as vaccination programs globally.<sup>2</sup> Fortunately, this does not appear to have been the case in Australia.<sup>3</sup>

As Australia now implements its COVID-19 vaccination program, which commenced in early 2021, we investigate the rates of vaccine preventable diseases (VPD) reported in Victoria since the beginning of the COVID-19 pandemic and the subsequent restrictions on movement and gathering that were enforced.

## Methods

We analysed the mandatory reporting data notified to the Victorian Department of Health for vaccine preventable diseases from January 2015 to December 2021. Notifiable VPDs in Victoria comprise the following conditions for which there is a vaccine on the national immunisation program: diphtheria, *Haemophilus influenzae* type b (Hib), hepatitis B, influenza, invasive meningococcal disease, invasive pneumococcal disease, measles, mumps, pertussis, poliomyelitis, rubella, rotavirus, tetanus, and varicella-zoster virus infection (chickenpox and shingles). Hepatitis B was not included in this analysis.

Basic descriptive statistics were reported, with means reported for parametric data, and medians reported for non-parametric data.

All data in this study were obtained and reported under the legislative authority of the *Public Health and Wellbeing Act 2008* and separate ethics approval was not required.

## Results

Summary epidemiological data for notifiable VPDs in Victoria from 2015-2021 are presented in Table 1. Incidence graphs from 2015-2021 for the nine notifiable conditions with five or more notifications per year are presented in Figure 1.

A precipitous decline in influenza notifications occurred in April 2020. Historically, the months

of July to October are associated with a seasonal increase in influenza. In 2020, there were very few influenza notifications for these months (0.3% of 2019 notifications, and 0.6% of the 2015–2017 five-yearly average notifications for this period). The low numbers continued throughout 2021, with a small increase occurring in December 2021.

No notified cases of Hib, diphtheria, poliomyelitis, or rubella were reported in 2020, but there were three non-linked Hib cases notified in 2021. Single cases of tetanus occurred in both 2020 and 2021. Five cases of measles were reported for the 2020 calendar year, with none reported after March 2020. The number of notified mumps cases in 2020 was similar to the 2015–2019 mean, but there was only a single case notified in 2021.

Notifications for invasive pneumococcal disease and pertussis reduced by more than 50% in 2020 compared to the 2015–2019 mean (Invasive pneumococcal disease: 58% decrease; pertussis: 57% decrease). A decline of 70% from the 2015–2019 average ( $n = 63$ ) in invasive meningococcal disease was also observed in 2020 ( $n = 19$ ), with the number of notifications almost halved again in 2021 ( $n = 10$ ), accompanied by a decrease in median age from 39 years for 2015–2019 to 15 years in 2021. There was a change in predominating serotype, with serogroup B accounting for 63% and 60% of infections in 2020 and 2021 respectively, but 35% in 2015–2019.

Regarding varicella zoster virus, shingles notifications were slightly decreased in 2020 (7% reduction on the 2015–2019 mean), whereas a greater decrease in chickenpox notifications was observed (58% reduction compared to 2015-2019 average). This reduction was more marked in metropolitan Melbourne than in the rural areas (61% vs 48%). Rotavirus notifications were also reduced in 2020 (262 vs 493 in 2019), and the summer seasonal increase in rotavirus notifications seen in 2019 did not occur in either 2020 or 2021.

Table 1: Cases of notifiable vaccine-preventable disease, Victoria, Australia, 2015–2021<sup>a,b</sup>

Condition	2021	2020	2015–2019 mean yearly total	2015–2019 median yearly total	2015–2019 maximum yearly total range	Percentage change from 2015–2019 mean to 2020 <sup>c</sup>	2021 Rate per 100,000 population	2020 Rate per 100,000 population	2015–2019 Rate per 100,000 population per annum
Diphtheria	0	0	—	0	0–3	N/A	0	0	0
<i>Haemophilus influenzae</i> type b	3	0	—	2	0–4	N/A	0	0	0
Influenza	109	4,793	31,926	—	11,622–69,599	-85%	1.6	72.0	500.2
Invasive meningococcal disease	10	19	63	—	36–89	-70%	0.1	0.3	1.0
Invasive pneumococcal disease	245	192	453	—	351–511	-58%	3.7	2.9	7.1
Measles	0	5	35	—	22–57	-86%	0	0.1	0.6
Mumps	1	24	26	—	16–45	-6%	0	0.4	0.4
Pertussis	317	1,158	2,712	—	1,699–4,742	-57%	4.7	17.4	42.5
Rotavirus	114	262	N/A <sup>c</sup>	—	493 (2019) <sup>d</sup>	N/A	1.7	3.9	2.5
Rubella	0	0	—	2	0–6	N/A	0	0	0
Tetanus	1	1	—	1	0–2	N/A	0	0	0
Varicella zoster – chickenpox	542	546	1,304	—	963–1,605	-58%	8.1	8.2	20.4
Varicella zoster – shingles	2,355	2,304	2,479	—	1,714–2,964	-7%	35.4	34.6	38.8

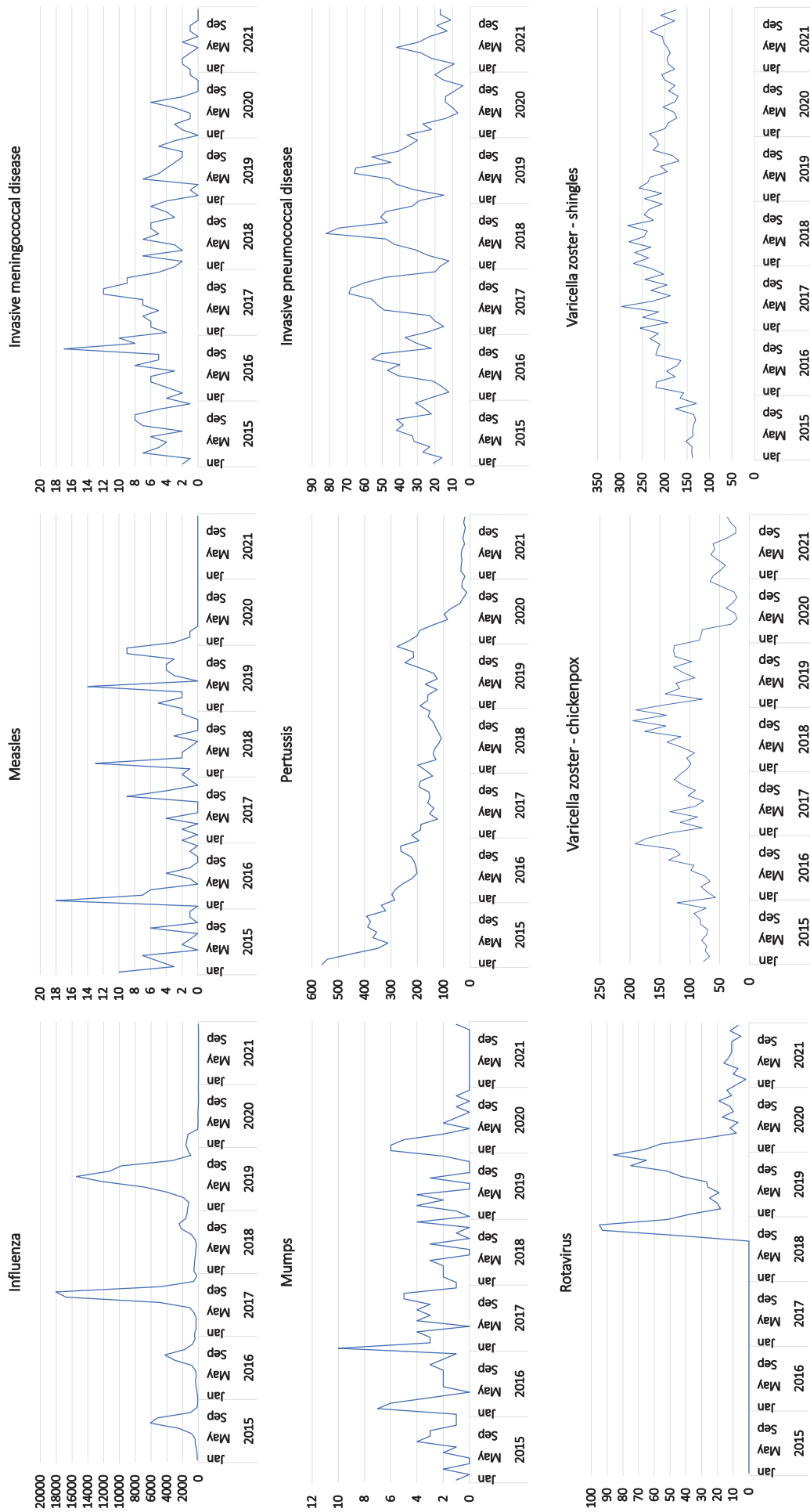
a Means are reported for parametric data, while medians are reported for non-parametric data. Notification rates are based on the Australian Bureau of Statistics resource: 31010do001\_202106 National, state and territory population, Jun 2021 [Database]; available from: [https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/jun-2021/31010do001\\_202106.xlsx](https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/jun-2021/31010do001_202106.xlsx).

b No cases of polio were reported throughout 2015–2021 (not shown).

c N/A: not applicable.

d Reporting for rotavirus commenced in September 2018, therefore only 2019–2021 data are included here.

Figure 1: Notifications of vaccine preventable diseases in Victoria with more than five notifications per year, by calendar month, 2015–2021



## Discussion

Globally, the COVID-19 pandemic has led to significant behavioural change and reduced movement of people since early 2020.<sup>4</sup> Since SARS-CoV-2 was first detected in Australia in January 2020, Victoria has experienced the longest period of time under restrictions nationally, and arguably some of the strictest measures globally.<sup>5</sup> Prior to the emergence of the SARS-CoV-2 'Omicron' variant, Victoria demonstrated the effectiveness of lockdowns and border closures on driving down COVID-19 case numbers.<sup>6</sup> Our data further demonstrates the effectiveness of these measures on several VPDs.

A dramatic reduction in notifications following COVID-19 control measures was seen with influenza, with a greater than 99% reduction in notifications by 2021. This may partly be due to reduced testing for influenza in preference for COVID-19 testing during 2020–2021; however, this likely only accounts for a fraction of the reduction. The decline in influenza cases was mirrored globally<sup>7</sup> and commenced immediately after the implementation of international restrictions in late March 2020. There were no rubella cases notified throughout 2020–2021, and no measles cases beyond March 2020.

The greater reduction in notifications of chickenpox (varicella) in metropolitan areas compared to rural areas is likely connected to increased closure of schools and childcare centres in metropolitan Melbourne during lockdown, which did not occur rurally to the same extent. Little change was seen in the rate of notifications for shingles (herpes zoster) in 2020–2021, with both years showing a slight decrease on the 2015–2019 mean. The lower rate may be partly explained by a hypothesised reduction in health-seeking behaviour during this time.

The decline in meningococcal infections in 2020–2021 compared to 2015–2019 could be due, in part, to social distancing measures including school closures. An increase in

serogroups W and Y, occurring predominantly in persons aged over 50 years, dominated the period 2015–2019.<sup>8</sup> The change in serogroups to predominantly serogroup B, and lowered median age for notifications in 2020 and 2021, suggests the effectiveness of state and national immunisation programs from mid-2017 which targeted meningococcal serogroups A, C, W and Y.<sup>9</sup>

Indirect negative effects of the COVID-19 pandemic include disruption of routine vaccination services, particularly in low-resource countries.<sup>2</sup> In India, it is estimated that up to 5 million children may have missed their routine vaccinations in a single month as resources were redirected to the fight against COVID-19. Similarly, in Nepal, routine vaccinations were suspended for close to two months as a result of national lockdown, with multiple outbreaks of measles reported since that time.<sup>2</sup> Fortunately, Australia's vaccination rates for VPDs do not appear to have been significantly affected, with 95.2% of all one-year-olds, 93.1% of all two-year-olds, and 96.1 % of all five-year-olds fully immunised against VPD, in keeping with previous years.<sup>3</sup> However, although vaccination coverage in young children has not declined in Australia, adolescent programs in Victoria have been impacted, and lower levels of shingles vaccination have been seen in older Victorians.<sup>10</sup> Local councils sought to administer additional vaccines in 2021 to make up for vaccines missed the previous year. Overall, the lack of disruption from COVID-19 lock-downs is reassuring, as a significant drop in VPD vaccine coverage could pose risks as international borders are re-opened.

While published data regarding the effect of COVID-19 restrictions on VPDs nationally is sparse, data from Central Queensland also suggests a reduction in notifications of VPDs following the implementation of COVID-19 public health measures.<sup>11</sup> With the easing of restrictions, particularly those limiting international travel, it is expected that notifications of several VPDs in Victoria will rise. Nevertheless, as a result of the COVID-19 pandemic, public

awareness surrounding the value of basic preventive measures including physical distancing, hand sanitisation, mask-wearing, staying home when symptomatic and testing for disease, in addition to high vaccination coverage, may result in a sustained reduction in notifications.<sup>4</sup>

## Limitations

As a passive surveillance system, the Victorian VPD notification system is intrinsically prone to inaccuracies of data reporting and under-reporting. Furthermore, individual case follow-up of notifications for all VPDs is not required as part of the reporting system, which may lead to some data inaccuracies. Additionally, as an observational study, a causal relationship between the COVID-19 pandemic and associated restrictions and the demonstrated reductions in VPD in Victoria cannot be proven, although the strong temporal relationship provides some evidence for this.

## Conclusion

Our data demonstrate a clear temporal relationship between the reduction of VPD notifications in Victoria and the introduction of border closures, COVID-19 safety measures, and restrictions in response to the COVID-19 outbreak, suggesting a significant effect of these measures in reducing VPDs in Victoria. Many of these reductions were sustained in 2021. However, as Australia's international border is reopened and our attention and resources are directed to the rollout of the COVID-19 vaccination program across the state, it is important that high levels of population vaccine coverage continue, in order to prevent a rebound increase in VPDs as restrictions are eased, and to maximise protection against VPDs for all Australians.

## Author details

Paraag Bhatt<sup>1</sup>  
Janet Strachan<sup>2</sup>  
Marion Easton<sup>2</sup>  
Lucinda Franklin<sup>2</sup>  
George Drewett<sup>2,3,4</sup>

1. School of Medicine, Monash University, Clayton, Victoria, Australia.

2. Department of Health, Victoria, Australia.

3. Department of Infectious Diseases, Austin Health, Heidelberg, Australia

4. Burnet Institute, Victoria, Australia.

## Corresponding author

George Drewett

Infectious Diseases Registrar, Austin Health, Heidelberg 3084, Victoria, Australia

Phone: +61394966676

Email: [george.drewett@burnet.edu.au](mailto:george.drewett@burnet.edu.au)



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