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Report of the National Influenza Surveillance Scheme, 2020–2021

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Abstract

This report describes influenza surveillance activities in Australia in 2020 to 2021 and the impact which coronavirus disease 2019 (COVID-19) related public health and social measures (PHSMs) had on influenza notifications. Data were extracted from several sources constituting the National Influenza Surveillance Scheme.

In 2020 and 2021, a range of PHSMs were instituted across Australia to reduce the spread of COVID-19. These measures had a substantial impact on influenza circulation during this time. Laboratory-confirmed influenza notifications in these years were the lowest reported to the National Notifiable Diseases Surveillance System (NNDSS) since influenza became nationally notifiable in 2001. Laboratory-confirmed influenza notification rates varied greatly between states and territories in the two-year reporting period, likely influenced by differences in the PHSMs instituted across the country. Higher influenza notification rates were observed in the 0–4 and 5–9 year age groups in 2020, while the notification rates in 2021 were very low across all age groups. In 2020, eighty-seven percent of laboratory-confirmed influenza notifications were influenza A (91.1% influenza A(unsubtyped); 7.7% A(H1N1)pdm09; 1.2% A(H3N2)) and 12.6% were influenza B. In 2021, seventy-two percent of laboratory-confirmed influenza notifications were influenza A (91.1% influenza A(unsubtyped); 8.3% A(H3N2); 1.3% A(H1N1)pdm09) and 17.3% were influenza B.

Very low influenza activity was also observed in community sentinel surveillance systems. However, slight increases in influenza-like illness, still at very low rates compared to previous years, were reported by sentinel general practices, with rises observed in mid-June in both 2020 and 2021. Very few laboratory-confirmed influenza sentinel hospital admissions and deaths were reported in 2020 and 2021.

Keywords: influenza; surveillance; influenza-like illness; sentinel surveillance

Introduction

Influenza is a common, infectious respiratory viral disease. Influenza viruses spread from person to person by aerosolised droplets, commonly produced when an infected person coughs or sneezes.[1,2] Typical symptoms usually begin about two days after being infected and include a sudden onset of fever, cough, headache, myalgia, fatigue, sore throat and a runny nose. Most people recover within a few days without needing medical care; influenza can cause severe illness, hospitalisations for pneumonia and other complications, or death, particularly in high-risk groups.[1] Individuals most at risk of severe influenza include children; pregnant women; the elderly (65 years and older); people with chronic illnesses; and people who are immunocompromised. Vaccination is the best way to prevent influenza and its complications.[1,2]

Influenza types A, B, and C are known to cause respiratory illness in humans. Influenza A and B viruses cause seasonal epidemics, while influenza C is detected less frequently and is usually associated with mild infections.[2] There are two forms of influenza reported globally: epidemic (seasonal or interpandemic) caused by types A and B, and sporadic pandemics caused by type A viruses.[2] Influenza A viruses are further classified into subtypes based on the combinations of the haemagglutinin (HA) and neuraminidase (NA) viral surface proteins. Influenza B viruses are further classified into lineages rather than subtypes.[2]

In temperate climates, seasonal influenza epidemics occur mainly during winter, while in tropical and sub-tropical regions, influenza may occur throughout the year resulting in multiple peaks in a season or extended periods of activity.[1] In temperate regions of Australia, the influenza season usually occurs from April or May to the end of October, with notifications historically peaking in August. Influenza activity varies from year to year. Australia experienced moderate influenza seasons from 2011 to 2016; however, the 2018 season was mild, whilst high activity was observed in 2017 and in 2019.[3,4] In years prior to 2020 (with the exception of 2008 and 2015), influenza A has been the predominant type circulating in Australia. The prevalence of influenza subtypes A(H1N1)pdm09 and A(H3N2) has alternated over time, with each becoming the most frequently identified subtype at different periods.[3,4]

Coronavirus disease 2019 (COVID-19) pandemic impact on influenza

In late 2019, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in Wuhan, China and spread quickly across the world, leading the World Health Organization (WHO) to declare a pandemic on 11 March 2020.[5] In response, Australia halted international travel and cruise ship arrivals, with all returned travellers required to self-isolate for 14 days in hotel quarantine from 28 March 2020. Australia also imposed domestic border closures and large-scale stay-at-home orders including restrictions on population movement and social mixing; mandated mask wearing and social distancing; and emphasised good hygiene practices.[6,7] Many non-essential customer-facing businesses (such as hospitality and hairdressing and beauty services) were forced to close during state and territory lockdowns; there was lower attendance at early childhood centres and schools; and many office-based jobs transitioned to work from home arrangements.[8] In addition, respiratory testing clinics for SARS-CoV-2 were set up and there was wide-scale adoption and funding of telehealth services,[8] changing Australian's testing and primary health care seeking behaviours for respiratory illnesses across 2020 and 2021. These public health and social measures (PHSMs), instituted to contain the spread of COVID-19, were also effective in limiting the spread of influenza in Australia.[7]

Quantifying the impact of COVID-19-related PHSMs on influenza in Australia is inherently difficult due to a range of confounding factors. These include changes in testing priorities in laboratories; diversion of resources to the COVID-19 response; changes in health-seeking behaviours; greater utilisation of telehealth practices; and financial impacts such as income loss and ability to afford healthcare. For this reason, the 2020 and 2021 influenza seasons are not comparable to previous influenza seasons and limited comparisons are made within this report.

Influenza surveillance

Laboratory-confirmed influenza has been a nationally notifiable disease in all Australian states and territories since 2001. Data are reported from each state or territory health department to the National Notifiable Diseases Surveillance System (NNDSS). In Australia, the epidemiology of influenza is further informed by a number of complementary systems based in the community, primary care, hospitals and laboratories, as well as by data from the Australian Bureau of Statistics which includes officially reported deaths.

This report presents an overview of the national influenza surveillance data from 1 January 2020 to 31 December 2021 and describes the impact of COVID-19-related PHSMs on influenza notifications in Australia. Some surveillance systems experienced changes in their surveillance practices during this time due to the COVID-19 pandemic, therefore surveillance data in this report may not be comparable to previous seasons' data.

Surveillance methods

Data for this report were extracted from the following influenza surveillance sources:

- notifications of laboratory-confirmed influenza required by legislation in all states and territories, and notified to the NNDSS;
- subtype and lineage data of circulating influenza viruses, provided by the World Health Organization Collaborating Centre for Reference and Research on Influenza (WHO CCRRI);
- consultation rates for influenza-like illness (ILI) and respiratory virus detection in sentinel general practices, provided by the Australian Sentinel Practices Research Network (ASPREN);
- weekly percentages of participants reporting fever and cough and absence from work or normal duties, from the online community survey FluTracking;
- hospitalised cases of influenza from 17 sentinel hospitals across Australia, through the Influenza Complications Alert Network (FluCAN); and
- mortality data from the Australian Bureau of Statistics (ABS).

Healthdirect Australia data on ILI trends are not presented in this report due to the establishment and operation of the National Coronavirus Helpline during 2020 and 2021. The National Coronavirus Helpline provided COVID-19 health advice, and as a result diverted people with ILI away from Healthdirect telephone and online services.

Data sources

NNDSS

In 2020–2021, laboratory-confirmed influenza was a notifiable disease under state and territory legislation in all jurisdictions. Notifications were sent to the NNDSS for national collation, analyses and reporting. In this report, data were analysed by the date of diagnosis, whichever is the earliest of the dates of symptom onset, specimen collection, or case notification. Age, sex, Indigenous status, virus subtype, the jurisdiction of residence, death, and other outcomes, are included in NNDSS notifications where data are available.

WHO CCRRI

The WHO CCRRI are located in Melbourne (Australia), Beijing (China), Tokyo (Japan), London (the United Kingdom), and Atlanta (the United States of America), and are part of the WHO Global Influenza Surveillance and Response System (GISRS). The WHO CCRRI are responsible for analysing influenza viruses collected through an international surveillance network involving 142 national influenza centres across 115 countries.[9] The Melbourne centre analyses viruses received from Australia and laboratories in the Asia-Pacific Region. Virus isolates are analysed antigenically, and then a geographically and temporally representative number of viruses, together with any strains demonstrating uncharacteristic reactions during antigenic characterisation, are further analysed by genetic sequencing of the viral HA and NA genes.

Virological, serological and epidemiological data form the basis from which the WHO makes recommendations in February (for the Northern Hemisphere) and in September (for the Southern Hemisphere) on which strains should be included in the influenza vaccine for the following influenza season. The WHO vaccine recommendations are made in the context of strains that are antigenically 'like' laboratory reference strains that are named according to a standard nomenclature for influenza viruses. National and regional committees (such as the Australian Influenza Vaccine Committee) then translate the WHO recommendations into actual virus strains acceptable to regulatory authorities and vaccine manufacturers.

Sentinel general practice surveillance

Sentinel general practice surveillance schemes for influenza monitor clinical consultations for ILI, defined as any presentation with fever, cough and fatigue, and collect swabs from patients with ILI to inform virological surveillance of influenza. In Australia, there are two sentinel GP programs: ASPREN, a network of sentinel general practices, which collects deidentified ILI data from over 200 providers across all states and territories, and the Victorian Infectious Diseases Reference Laboratory (VIDRL)-operated Victorian Sentinel Practice Influenza Network (VicSPIN), which operates solely in Victoria. ASPREN reports ILI rates throughout the year, while VicSPIN reports from early May to late October.

ASPREN and VicSPIN reporters swab test a subset of ILI patients for a panel of respiratory pathogens which include SARS-CoV-2, influenza and respiratory syncytial virus (RSV). These data are used to provide annual vaccine effectiveness estimates to the Global Influenza Vaccine Effectiveness (GIVE) collaboration and data to the WHO CCRRI. Over the report period, there was a reduction in the number of sentinel general practice reporters in 2020 (n = 271) and 2021 (n = 249) compared to previous years (317 general practice reporters in both 2019 and 2018). Most general practices suspended respiratory swab testing surveillance practices due to the COVID-19 pandemic, as patients with respiratory symptoms were diverted to, or could access, Commonwealth- and state-funded respiratory clinics.[10] Sentinel general practices that continued consultations with patients with respiratory symptoms primarily conducted these via telehealth, resulting in maintained syndromic surveillance but limited virological surveillance.

FluTracking

FluTracking is a community-based surveillance system led by the Hunter New England Local Health District, in collaboration with the University of Newcastle and the Hunter Medical Research Institute. FluTracking monitors the transmission, impact and severity of ILI in the community. It involves volunteer participants from across Australia completing an online weekly survey, which collects data on ILI symptoms, absence from work or normal duties, healthcare presentation, self-reported testing, and annual influenza vaccination.

Prior to 2020, FluTracking surveys were administered from April to mid-October each year. In 2020, to assist with COVID-19 surveillance, FluTracking began survey collection earlier (commencing in mid-February) and expanded surveillance to year-round with surveys continuing beyond mid-October 2020. Surveys were also modified to include COVID-19-specific questions, including collection of COVID-19 vaccination status.

FluCAN

FluCAN is a national hospital-based sentinel surveillance system reporting data from 17 surveillance hospitals and five paediatric system sites (22 sentinel hospital sites in total). FluCAN collects detailed clinical and laboratory information from all patients hospitalised at participating sites with a laboratory-confirmed diagnosis of influenza, to determine the burden of disease requiring hospitalisation associated with influenza, and to estimate the effectiveness of the influenza vaccine against hospitalisation with influenza. In addition, FluCAN also provides annual vaccine effectiveness estimates to the GIVE collaboration and data to the WHO CCRRI.

Mortality

Deaths data was compiled by the ABS from information provided by the state and territory Registrars of Births, Deaths and Marriages. The 10th revision of the *International Classification of Diseases and Related Health Problems* (ICD-10) was used to code and estimate influenza deaths. In this report, deaths for 2020 and 2021 with an underlying cause of influenza and pneumonia (ICD-10 J09–J18) are presented. ICD-10 code J09 was introduced in July 2009. The expanded range of codes, J09–J18, correlates with previous versions of ICD-10 codes J10–J11.

Results

In 2020 and 2021, very low numbers of laboratory-confirmed influenza notifications were reported to the NNDSS compared to previous years, with no seasonal peak observed in either year (Figure 1a). From March 2020, laboratory-confirmed influenza notifications decreased dramatically from typical interseasonal levels to less than 300 notifications per month between April 2020 and December 2021, aligning with the enactment of COVID-19 related PHSMs (Figure 1b). Laboratory-confirmed influenza notification rates varied greatly between states and territories (Table 1). Higher laboratory-confirmed influenza notification rates were observed in the 0–4 and 5–9 year age groups in 2020, whereas in 2021, rates were very low across all age groups. Low influenza activity was also observed in community surveillance systems. However, slight increases in ILI, still at very low rates compared to previous years, were reported by sentinel general practices, with peaks observed in mid-June in 2020 and 2021. Very few laboratory-confirmed influenza sentinel hospital admissions and deaths were reported in 2020 and 2021.

National notifications of laboratory-confirmed influenza

In 2020 and 2021, there were respectively 21,353 and 750 laboratory-confirmed influenza cases notified to the NNDSS (compared to 313,470 cases in 2019 and 58,869 cases in 2018). Notifications in 2020 and 2021 represent the lowest number of laboratory-confirmed influenza cases notified to the NNDSS since influenza became nationally notifiable in 2001. Laboratory-confirmed influenza cases were elevated between January and March 2020 (about 6,600 cases per month), consistent with the trends observed in the 2018–2019 interseasonal period but higher than prior interseasonal levels (Figure 1a). There was a substantial decline in laboratory-confirmed influenza notifications from April 2020; this aligned with the introduction of international travel restrictions and quarantine requirements, and other PHSMs, in response to the COVID-19 pandemic (Figure 1b). From April to December 2020, laboratory-confirmed influenza notifications continued to follow an overall decreasing trend, from 308 notifications in April to 66 notifications in December 2020 (Figure 1b).

In 2021, laboratory-confirmed influenza notifications remained very low, with fewer than 75 notifications per month until December 2021 when 97 notifications were reported to the NNDSS. This slight increase, in the number of laboratory-confirmed influenza notifications observed in December 2021, aligned with the gradual re-opening of domestic state and territory borders and with the opening of Australia’s international borders to some COVID-19 vaccinated international travellers (Figure 1b). There was no seasonal peak (usually observed in August) in either 2020 or 2021 (Figure 1b).

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Figure 1a: Laboratory-confirmed influenza notifications by year and month of diagnosis overlaid with public health and social measures introduced in response to the coronavirus disease 2019 (COVID-19) pandemic, Australia, 2017–2021

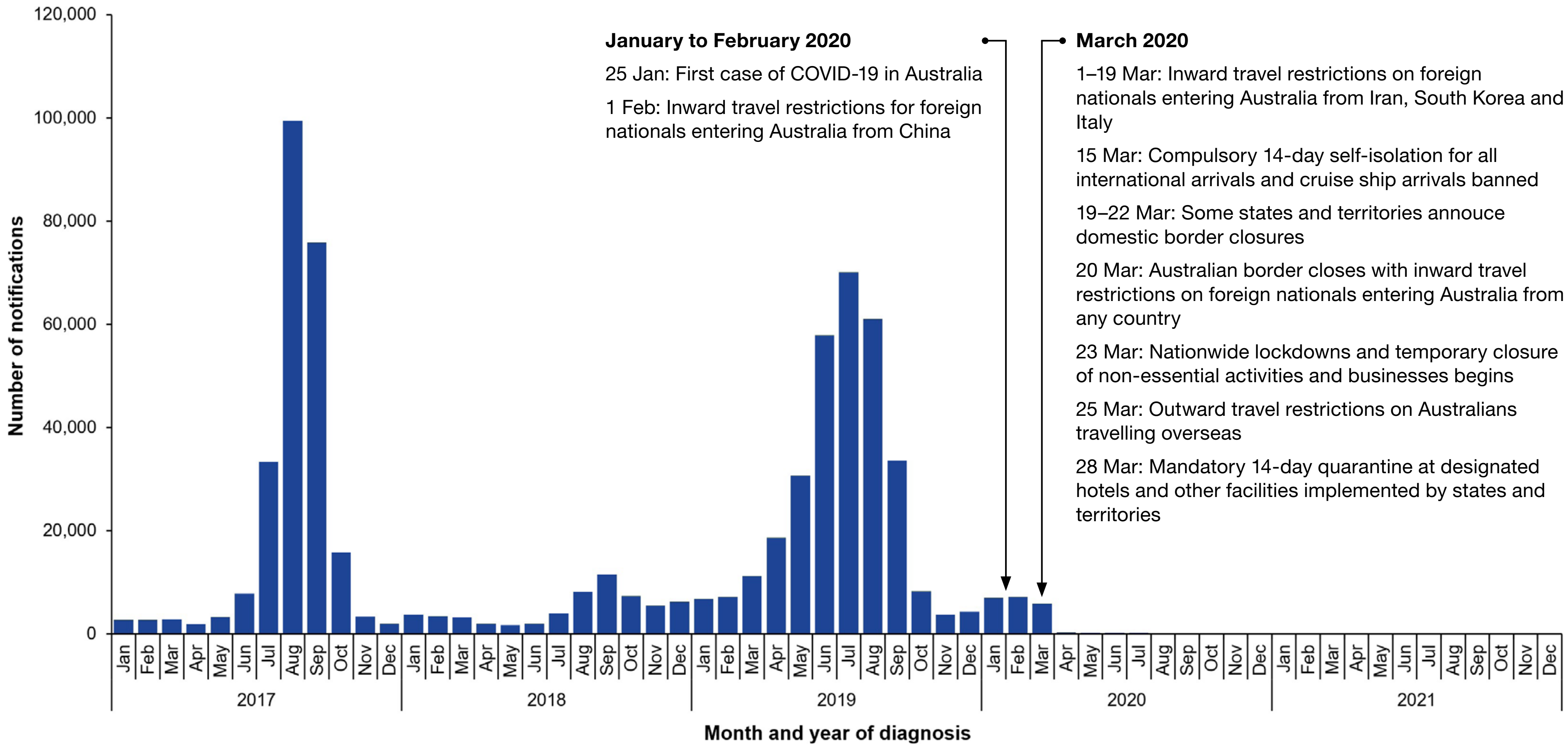


Figure 1b: Laboratory-confirmed influenza notifications by year and month of diagnosis overlaid with public health and social measures introduced in response to the coronavirus disease 2019 (COVID-19) pandemic, Australia, April 2020 – December 2021

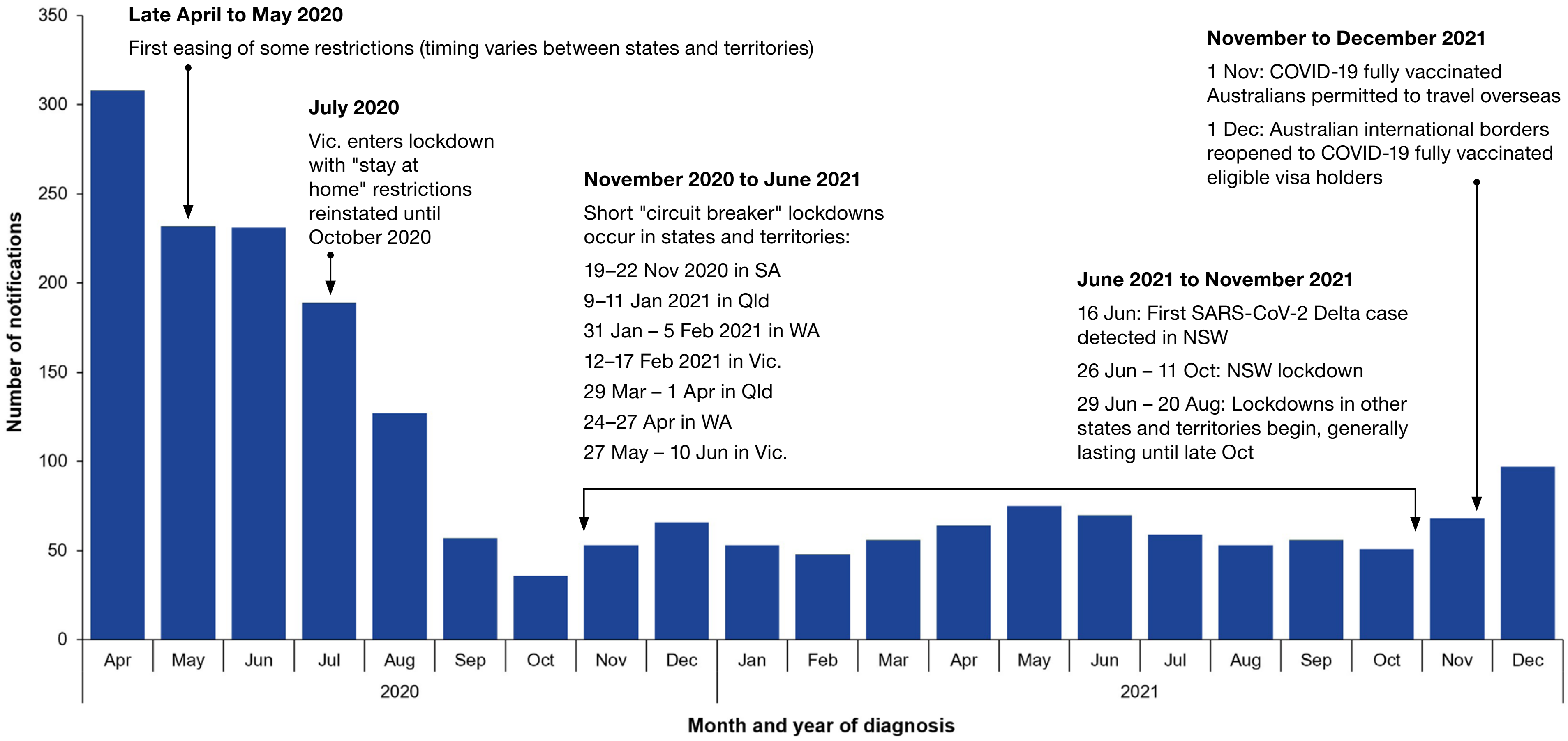


Table 1: Notifications and notification rates of laboratory-confirmed influenza by state or territory,[a,b] Australia, 2020–2021

	2020			2021		
Jurisdiction	Notifications	%	Rate	Notifications	%	Rate
ACT	200	0.9	45	8	1.1	2
NSW	7,242	33.9	89	135	18.0	2
NT	282	1.3	114	84	11.2	34
Qld	6,049	28.3	117	300	40.0	6
SA	1,536	7.2	86	38	5.1	2
Tas.	168	0.8	30	39	5.2	7
Vic.	4,664	21.8	71	111	14.8	2
WA	1,212	5.7	45	35	4.7	1
Australia	**21,353**	**100**	**83**	**750**	**100**	**3**

a Notification rate per 100,000 population per year. Population data are based on the Australian Bureau of Statistics (ABS) Estimated Resident Population (ERP) for 2020 and 2021, respectively.

b ACT: Australian Capital Territory; NSW: New South Wales; NT: Northern Territory; Qld: Queensland; SA: South Australia; Tas.: Tasmania; Vic.: Victoria; WA: Western Australia.

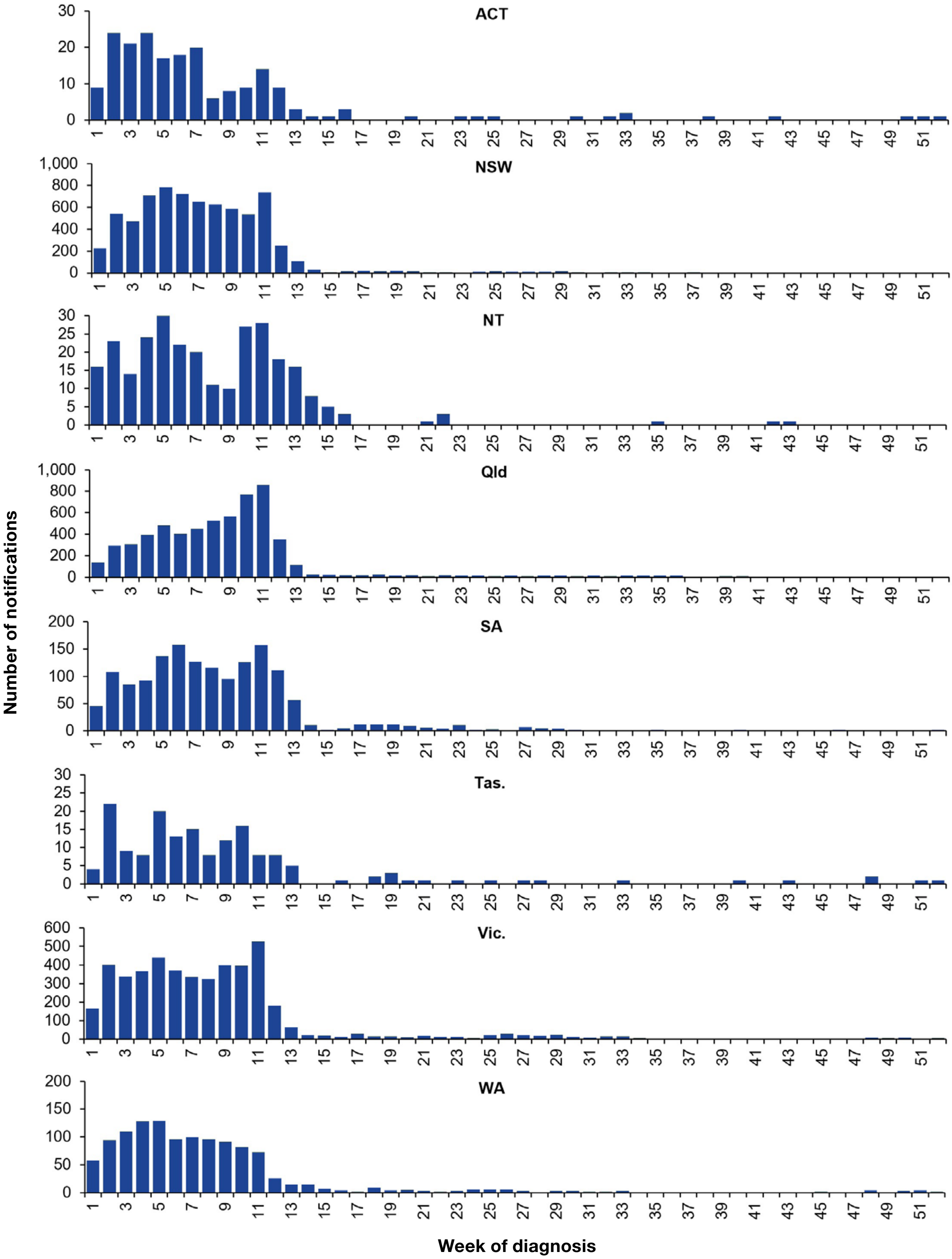
Geographic spread

Laboratory-confirmed influenza notifications in 2020 and 2021 were dominated by Australia's most populous states, which typically report higher case numbers (Table 1). The largest proportions of laboratory-confirmed influenza notifications were reported in 2020 by New South Wales (33.9%), Queensland (28.3%) and Victoria (21.8%), and in 2021 by Queensland (40%), New South Wales (18%) and Victoria (14.8%) (Table 1). However, when adjusted for population size, the highest laboratory-confirmed influenza notification rates in 2020 were reported by Queensland (117 cases per 100,000 population) and the Northern Territory (114 cases per 100,000 population); and in 2021 were highest again in the Northern Territory (34 cases per 100,000 population) (Table 1). The national notification rate was 83 cases per 100,000 population and three cases per 100,000 population in 2020 and 2021, respectively.

In 2020, all states and territories observed elevated laboratory-confirmed influenza notifications between January and March, followed by a substantial decline in April. Some jurisdictions (the Australian Capital Territory, South Australia, Tasmania, Victoria and Western Australia) observed slight increases in laboratory-confirmed influenza notifications during the typical influenza season (during the months April or May to October), though no distinct or usual peak was observed (Figure 2).

In 2021, all jurisdictions continued to observe low laboratory-confirmed influenza notifications. In the Australian Capital Territory and Tasmania, slight increases in laboratory-confirmed notifications were observed in mid-2021, and in the Northern Territory, slight increases in activity were observed from March to May and August to November, similar to the timing of influenza trends observed in previous years in the Northern Territory (Figure 2).[3,4] An increase in influenza activity was also observed from November to December 2021 in New South Wales, South Australia, Victoria and Western Australia, aligning with the relaxing of PHSMs across the country, state and territory borders permanently re-opening, and Australian international borders re-opening to some COVID-19 fully-vaccinated eligible visa holders.

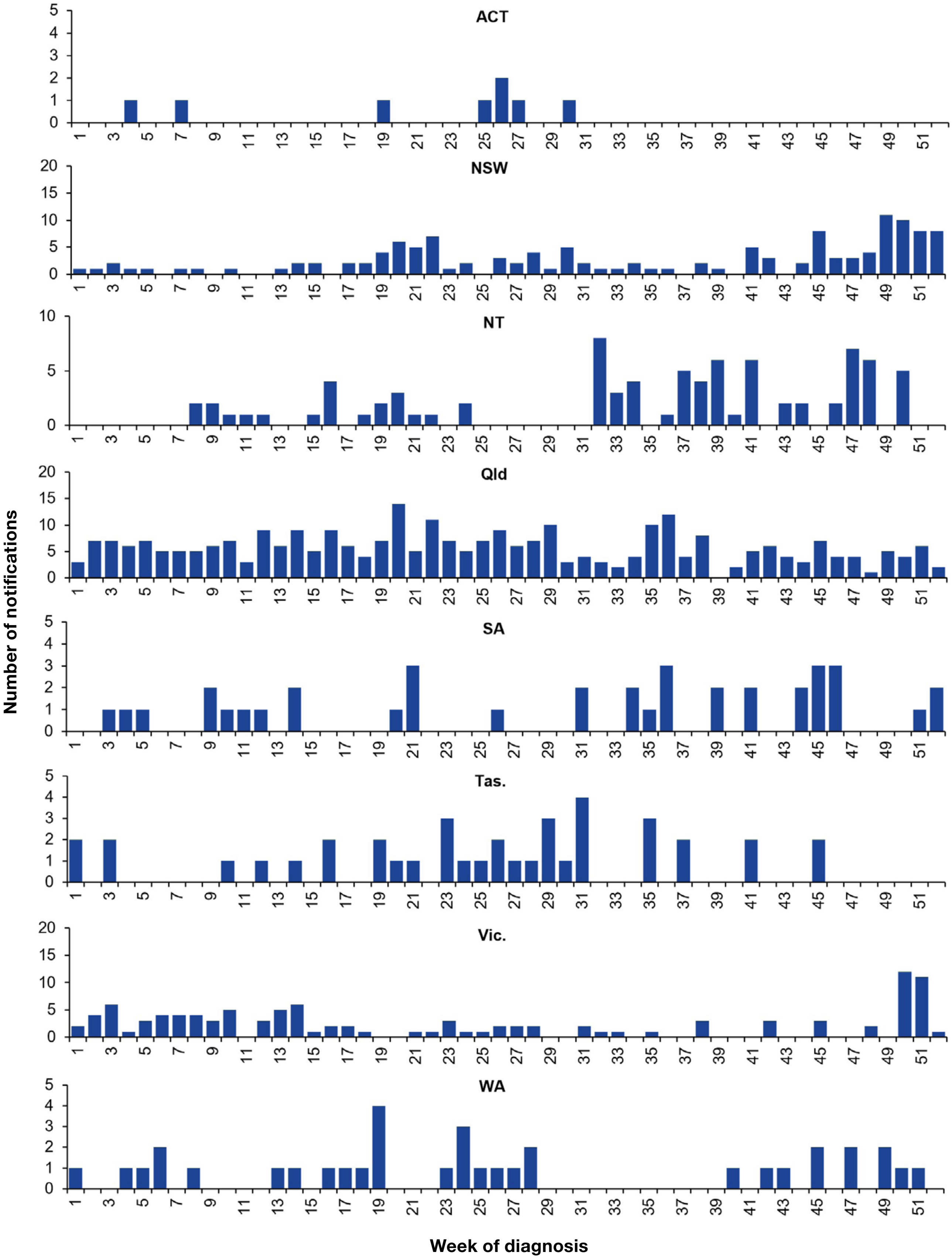
Figure 2a: Laboratory-confirmed influenza notifications by state or territory and week of diagnosis,[a,b] Australia, 2020



a y-axis varies between jurisdictions.

b ACT: Australian Capital Territory; NSW: New South Wales; NT: Northern Territory; Qld: Queensland; SA: South Australia; Tas.: Tasmania; Vic.: Victoria; WA: Western Australia.

Figure 2b: Laboratory-confirmed influenza notifications by state or territory and week of diagnosis,[a,b] Australia, 2021



a y-axis varies between jurisdictions.

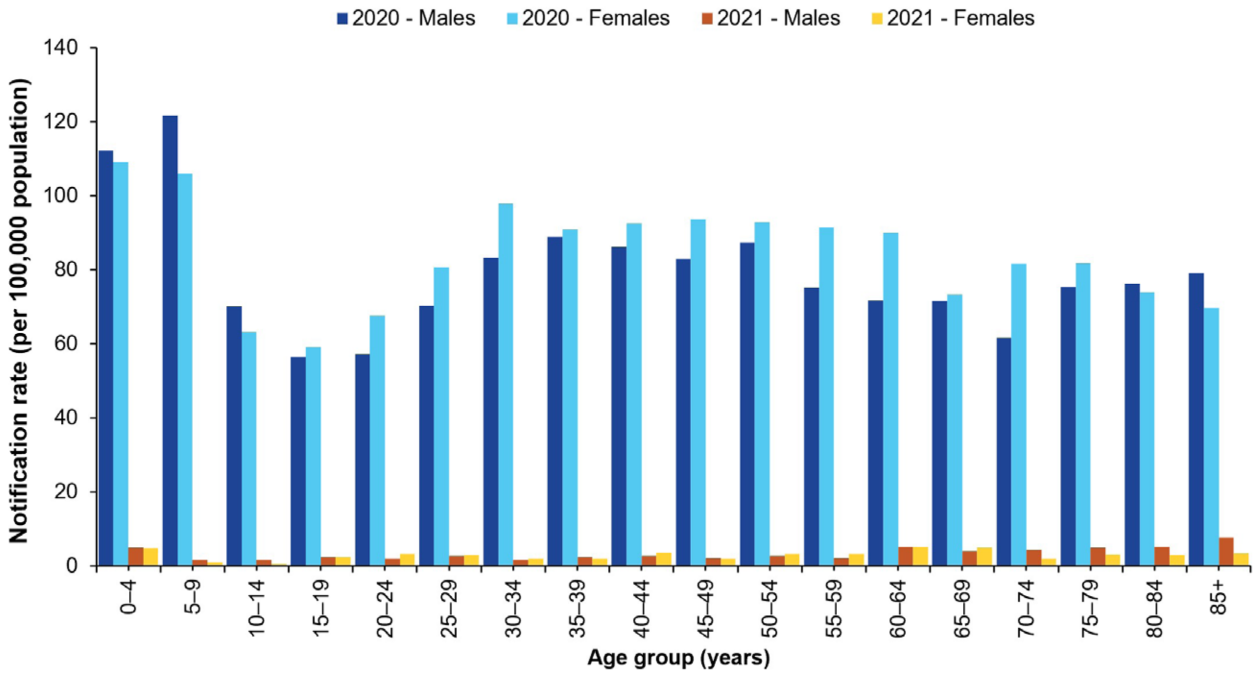
b ACT: Australian Capital Territory; NSW: New South Wales; NT: Northern Territory; Qld: Queensland; SA: South Australia; Tas.: Tasmania; Vic.: Victoria; WA: Western Australia.

Age and sex profile

Age-specific notification rates for laboratory-confirmed influenza reported to the NNDSS in 2020–2021 are shown in Figure 3. In 2020, the highest notification rates were observed in children aged 5–9 years (114 cases per 100,000 population), which were around 1.4 times higher than the overall notification rate (83 cases per 100,000 population). Notification rates were lowest among those aged 10–24 years, whilst notification rates amongst those aged 25 years and over were relatively similar (Figure 3). In 2021, laboratory-confirmed influenza notification rates were very low across all age groups, with age-specific notification rates not exceeding 8 cases per 100,000 population across any age group (Figure 3).

Overall, notifications by sex were approximately equal for males (48%; n = 11,067) and females (52%; n = 10,208) in 2020 and in 2021 (males 50.5%; n = 377; females 49.5%; n = 370).

Figure 3: Age-specific notification rates[a] of laboratory-confirmed influenza by five-year age group and sex,[b] Australia, 2020–2021



a Notification rate per 100,000 population. Population data are based on the Australian Bureau of Statistics Estimated Resident Population (ABS ERP) for 2020 and 2021, respectively.

b Excludes six notifications with unknown age and 75 notifications with unknown sex from 2020 and 2021.

Aboriginal and Torres Strait Islander status

The completeness and reliability of Indigenous status data is low across most Australian jurisdictions, affecting the accuracy and representativeness of these estimates. In 2020, Indigenous status was recorded for 51.2% (n = 10,932) of the total laboratory-confirmed influenza notifications; in 2021, only 39.3% (n = 295), of the total laboratory-confirmed influenza notifications had Indigenous status recorded.

Of laboratory-confirmed influenza notifications with Indigenous status recorded, 5.5% (n = 597) in 2020 and 7.5% (n = 22) in 2021 identified as an Aboriginal and Torres Strait Islander person. Notification rates were 1.7 and 2 times higher among those who identified as Aboriginal and Torres Strait Islander people compared to non-Indigenous Australians, in 2020 and 2021 respectively.

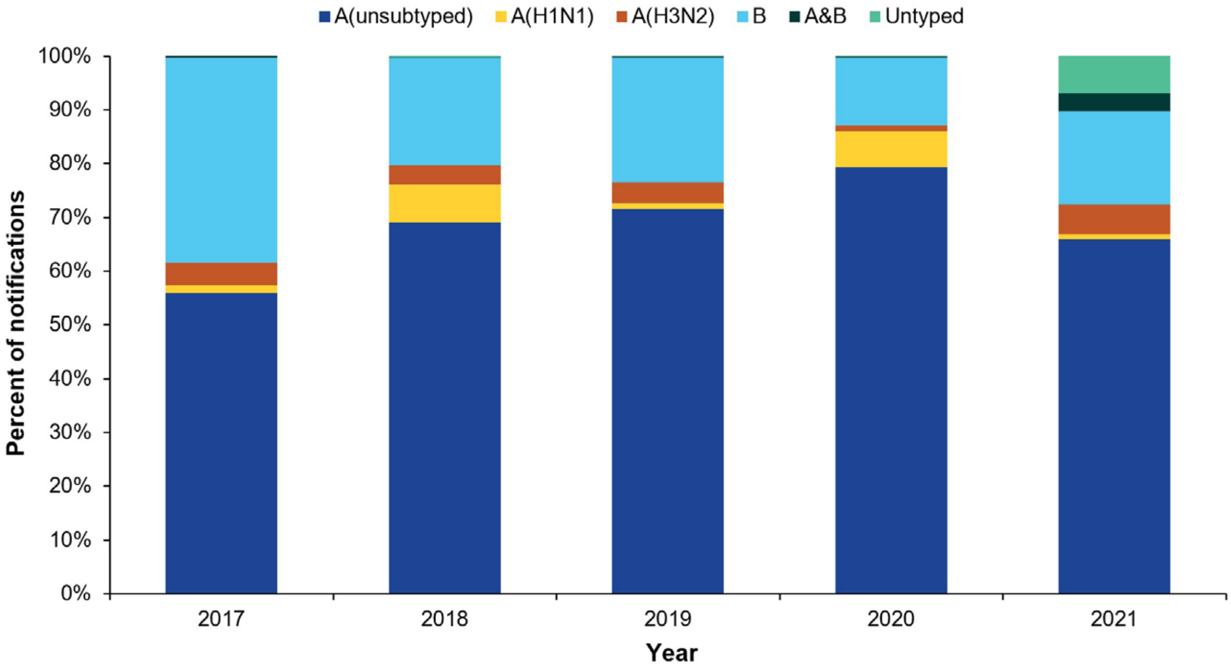
Virus type and subtype

In 2020, influenza A accounted for 87% of laboratory-confirmed influenza notifications; 12.6% were influenza B. Of those that were influenza A, 91.1% were unsubtyped, 7.7% were A(H1N1)pdm09 and 1.2% were A(H3N2) (Figure 4, Table 2). In 2020, mixed influenza type A and B infections accounted for fewer than 1% of notifications (n = 36), and typing data were not available for 22 notified cases.

In 2021, of laboratory-confirmed influenza notifications, 72% were influenza A and 17.3% were influenza B. Of those that were influenza A, 91.1% were unsubtyped, 7.6% were A(H3N2), and 1.3% were A(H1N1) pdm09 (Figure 4, Table 2). In 2021, mixed influenza type A and B infections accounted for 3.3% (n = 25) of notifications, and typing data were not available for 7.4% (n = 52) of influenza notifications. Infection with influenza C was rare, with no notifications in 2020 and only three notifications reported in 2021.

As only a small proportion of influenza samples were subtyped this may influence the apparent distribution of influenza subtypes presented in this report.

Figure 4: Proportion of laboratory-confirmed influenza notifications by type and subtype,[a] Australia, 2017–2021



a Excludes four notifications of influenza C.

Table 2: Laboratory-confirmed influenza notifications and notification rates[a] by type/subtype, year and age group,[b] Australia, 2020–2021

Year	Age group (years)	Influenza type/subtype					Notification rate influenza A	Notification rate influenza B	Notification rate (Total)
		A(H1N1)pdm09	A(H3N2)	A(unsubtyped)	B	A and B			
2020	0–4	132	21	1,367	188		99	12	111
	5–9	113	10	1,417	309	1	95	19	114
	10–19	85	15	1,410	421	1	49	14	63
	20–64	826	116	10,214	1,561	21	73	10	84
	≥ 65	282	53	2,525	223	13	68	5	74
2021	0–4	3	8	43	18	1	4	1	5
	5–9	0	2	16	5	0	1	0	1
	10–19	0	3	35	8	1	1	0	2
	20–64	4	25	265	76	18	2	1	3
	≥ 65	0	3	133	23	5	3	1	4

a Notification rate per 100,000 population per year.

b Excludes 71 untyped notifications, three influenza C notifications and eight notifications where age was not reported.

Virology

Samples received and tested

The WHO CCRRI received a total of 777 Australian influenza virus samples collected between 1 January 2020 and 31 December 2021 (Table 3). This represents 3.5% of the 22,103 laboratory-confirmed notifications reported to the NNDSS in the same period. The numbers of influenza virus samples received by the WHO CCRRI in 2020 and 2021 were substantially lower than the number of samples received in previous years; however, the number of samples were proportionate to the reduced number of influenza laboratory-confirmed notifications.

In 2020, influenza A(H1N1)pdm09 made up the majority of viruses typed (69.1%; n = 448) by the WHO CCRRI, followed by influenza A(H3N2) (10.3%; n = 67). A small proportion of influenza B viruses were detected in 2020, with B/Victoria comprising 7.3% (n = 47), and B/unknown lineage 6.6% (n = 43) of all influenza samples. There were two B/Yamagata lineage viruses detected in 2020 (Table 3).

In 2021, the predominant virus received by the WHO CCRRI was influenza A(H3N2) (60.8%; n = 79), followed by influenza A(unsubtyped) (10.8%; n = 14). As in 2020, a smaller proportion of influenza B viruses were detected in 2021 with 11.5% (n = 15) B/unknown lineage and 10.8% (n = 14) B/Victoria detected among influenza samples (Table 3). There were no influenza B/Yamagata viruses detected in Australian samples in 2021. There was also a lack of influenza B/Yamagata viruses detected by other countries in 2021.[11] The virological surveillance trends observed in 2020 and 2021 are consistent with those observed in the notification data during the same time.

Table 3: All Australian samples received by the World Health Organization Collaborating Centre for Reference and Research on Influenza, Melbourne (WHO CCRRI), by subtype/lineage,[a,b] Australia, 2020–2021

	2020		2021	
Influenza type/subtype	n	%	n	%
A(H1N1)pdm09	448	69.1	6	4.6
A(H3N2)	67	10.3	79	60.8
A(unsubtyped)	38	5.9	14	10.8
A(mixed subtype)	1	0.2	1	0.8
A(H3N2)v	0	0	1	0.8
B/Victoria	47	7.3	14	10.8
B/Yamagata	2	0.3	0	0
B/unknown lineage	43	6.6	15	11.5
Mixed type (A&B)	2	0.3	0	0

a Samples collected during 1 January 2020 – 31 December 2021.

b Excludes five false positive results.

The 2020 quadrivalent southern hemisphere seasonal influenza vaccine included an A/Brisbane/02/2018 (H1N1)pdm09-like virus, an A/South Australia/34/2019 (H3N2)-like virus; a B/Washington/02/2019-like virus, and a B/Phuket/3073/2013-like virus; the trivalent southern hemisphere seasonal influenza vaccine did not include a B/Phuket/3073/2013-like virus. The 2021 quadrivalent southern hemisphere seasonal egg-based influenza vaccine included an A/Victoria/2570/2019 (H1N1)pdm09-like virus; an A/Hong Kong/2671/2019 (H3N2)-like virus; a B/Washington/02/2019-like virus; and a B/Phuket/3073/2013-like virus; the trivalent egg-based southern hemisphere seasonal influenza vaccine did not include a B/Phuket/3073/2013-like virus. A cell-based quadrivalent influenza vaccine was available in the private market for the first time in Australia for the 2021 influenza season. The cell-based influenza vaccine included an A/Wisconsin/588/2019 (H1N1)pdm09-like virus; an A/Hong Kong/45/2019 (H3N2)-like virus; a B/Washington/02/2019-like virus; and a B/Phuket/3073/2013-like virus. For more information on the seasonal influenza vaccines that were available for the 2020 and 2021 season in Australia, refer to the 2020 and 2021 statements on the administration of seasonal influenza vaccines released by the Australian Technical Advisory Group on Immunisation (ATAGI).[12–15]

The WHO CCRRI conducted antigenic characterisation by haemagglutination inhibition (HI) assays on 402 influenza virus isolates during the two-year period (347 in 2020 and 55 in 2021). For 2020, of the influenza virus isolates, 44.3% (120/271) of influenza A(H1N1)pdm09 isolates, 58.7% (27/46) of influenza A(H3N2) isolates, 100% (29/29) of influenza B/Victoria isolates and 100% (1/1) of influenza B/Yamagata were antigenically similar to the corresponding vaccine components. Of the influenza virus isolates from 2021, all (100%; 4/4) influenza A(H1N1)pdm09 isolates, 2.2% (1/46) of influenza A(H3N2) isolates and 100% (5/5) of influenza B/Victoria isolates were antigenically similar to the corresponding vaccine components.

Viruses received by the WHO CCRRI were also tested for their sensitivity to the neuraminidase inhibitors oseltamivir and zanamivir. In 2020, of the 275 influenza A(H1N1)pdm09 samples tested, 0.7% (n = 2) demonstrated highly reduced inhibition to oseltamivir (defined by a ≥ 100-fold shift in the half-maximal inhibitory concentration (IC_{50}) in a neuraminidase inhibition (NI) assay), while none demonstrated highly reduced inhibition to zanamivir (≥ 100-fold shift in IC_{50} in a NI assay). In 2021, no samples demonstrated highly reduced inhibition to either oseltamivir or zanamivir.

Influenza-like illness – national online community survey (FluTracking)

Participants

In 2020, at least one FluTracking survey was completed by 109,400 participants, twice the number of participants who completed at least one survey (or had at least one survey completed on their behalf) in 2019 (52,801 participants). This represented a participation rate of 426 respondents per 100,000 population. The rapid growth in participation was largely attributed to a national address made by the Deputy Chief Medical Officer for Australia in April 2020, encouraging all Australians to join FluTracking, as the survey had expanded to include questions on symptoms consistent with COVID-19-like illness to assist with COVID-19 surveillance.[16]

In 2021, an 18% decrease in participation was observed, with 90,089 participants (351 respondents per 100,000 population) completing at least one survey. The highest proportions of FluTracking participants in 2020 and 2021 were in the 40–64 years and the 65 years and over age groups. During the reporting period, more participants were female (average 58.5% in 2020–2021). The proportion of participants who identified as an Aboriginal and Torres Strait Islander person was 1.7% (n = 1,779) in 2020 and 1.4% (n = 1,212) in 2021, compared to 3.3% of the Australian population who identify as an Aboriginal and Torres Strait Islander person.

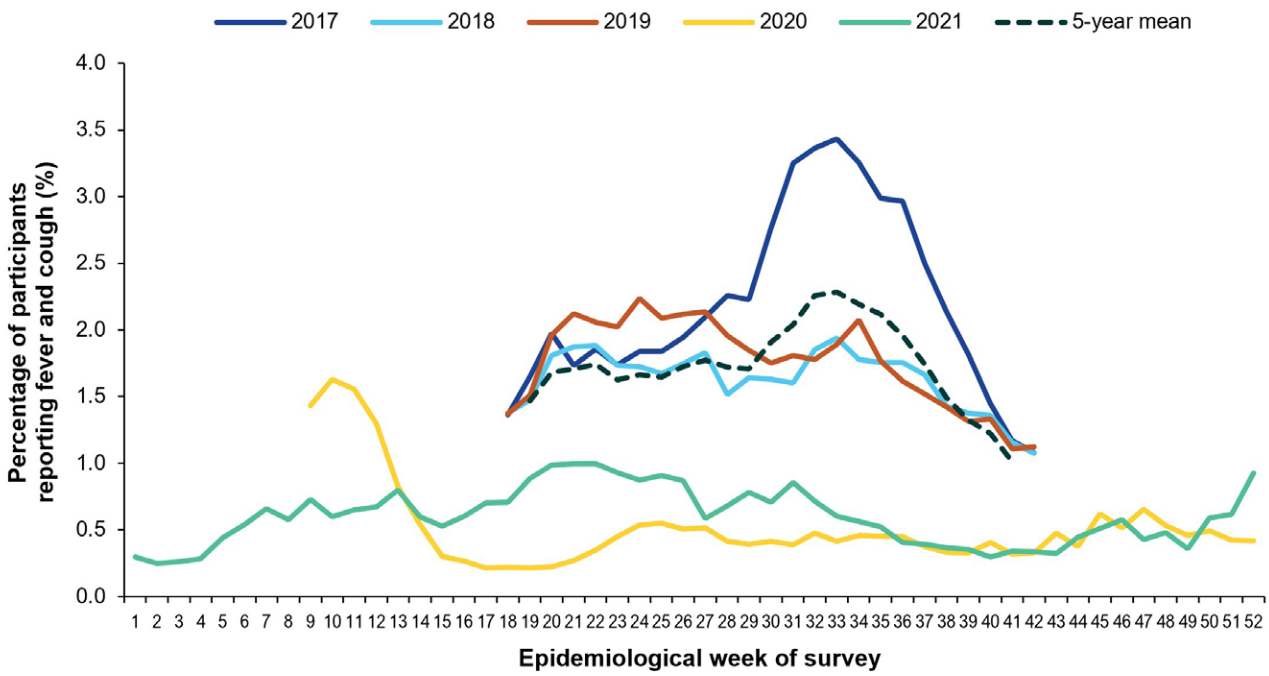
Percentage of participants with ILI symptoms (fever and cough)

In 2020, the FluTracking survey commenced eight weeks earlier than usual, from the week beginning 17 February, with the percentage of FluTracking participants reporting new fever and cough analysed and presented from the following week commencing 24 February. The highest percentage of FluTracking survey participants reporting fever and cough (1.6%) occurred during the first two weeks of March 2020 (Figure 5). From mid-March 2020, the percentage of survey participants reporting fever and cough decreased rapidly in line with the introduction of stringent PHSMs in response to the COVID-19 pandemic. From early April to December 2020, the percentage of survey participants reporting fever and cough each week remained below 0.5%, except for a few weeks in June, August and November (Figure 5).

Fever and cough activity remained low across 2021, with a slight increase in activity and a peak observed across mid-May to late June at 1% of participants (Figure 5). Fever and cough activity then declined gradually from early June to late October 2021, aligning with the staged re introduction of PHSMs from June 2021 in response to large-scale community transmission of SARS-CoV-2 B.1.617.2 (Delta variant) in Australia's eastern states and territories.[8] From December 2021, the percentage of survey participants reporting fever and cough increased rapidly, aligning with an increase in influenza notifications following international and domestic border re-openings and the emergence of the SARS-CoV-2 B.1.1.529 (Omicron) variant in Australia.

Fever and cough activity remained considerably lower in May to October of 2020 and 2021, when stringent PHSMs were in place across Australia, than in the corresponding time during pre-pandemic years (Figure 5).

Figure 5: Age-standardised percentage of FluTracking participants reporting new fever and cough symptoms compared with the five-year mean by week of survey,[a] Australia, 1 May 2017 to 31 December 2021

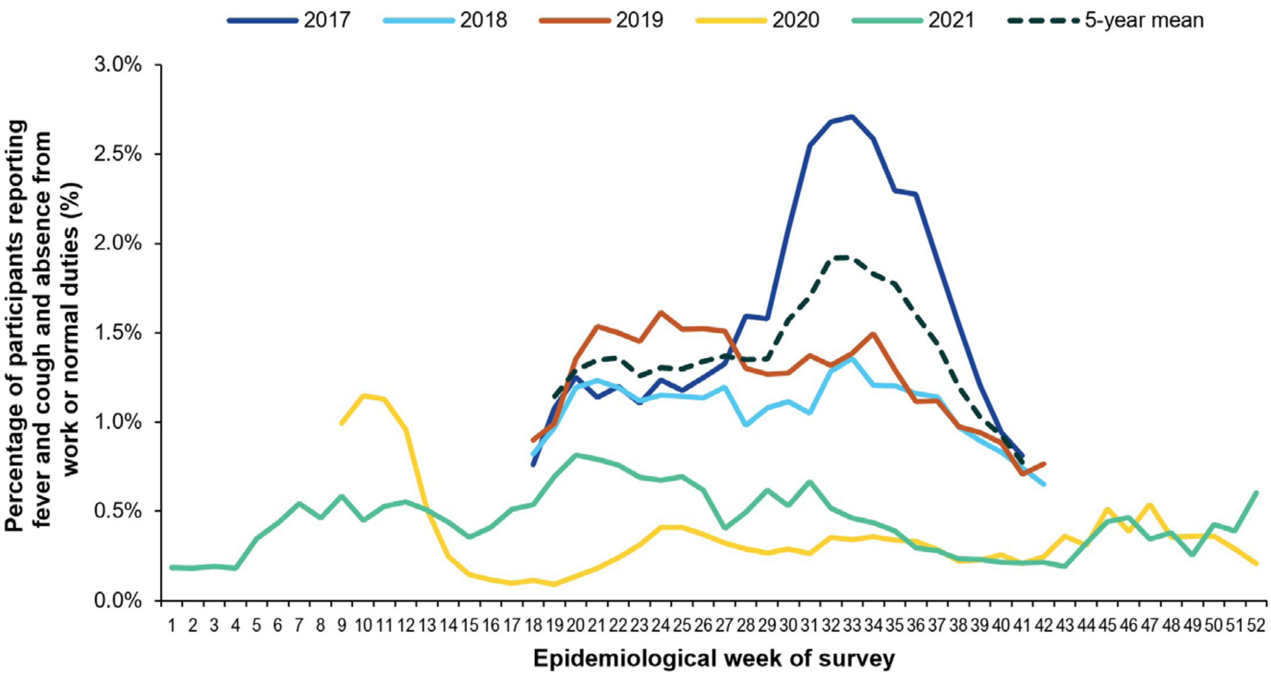


a The five-year mean includes May to October 2015–2019. In years prior to 2020, FluTracking was activated only during the main influenza season from May to October. A historical mean outside of these months is not available.

Burden of illness among participants with ILI symptoms

In 2020 and 2021, the peak weekly percentage of participants taking time off work or normal duties was 1.1% (which occurred in March 2020, prior to the introduction of PHSMs) and 0.8% (which occurred in May 2021; Figure 6), compared to 1.3% and 1.1% in 2019 and 2018, respectively.[3,4] Similar to fever and cough activity, the weekly percentage of participants taking time off work or normal duties decreased rapidly across March 2020 and remained relatively low and stable from April to December 2020, with the percentage of participants taking time off work or normal duties not exceeding 0.5% during this period (Figure 6). The percentage of participants taking time off work or normal duties was relatively consistent across 2021, with a slight increase in activity and a peak observed in mid-May at 0.5%, and a second increase observed over late October to December, aligning with the relaxation of COVID-19 related PHSMs and with the emergence of the SARS-CoV-2 B.1.1.529 (Omicron variant) in Australia.

Figure 6: Age-standardised percentage of FluTracking participants reporting time off work or normal duties due to fever and cough symptoms compared with the five-year mean by week of survey,[a] Australia, 1 May 2017 to 31 December 2021



a The five-year mean includes May to October 2015–2019. In years prior to 2020, FluTracking was activated only during the main influenza season from May to October. A historical mean outside of these months is not available.

As with fever and cough activity, the weekly percentage of participants taking time off work or normal duties remained considerably lower in May to October of 2020 and 2021, than in the corresponding time during pre-pandemic years (Figure 6).

The percentage of participants with ILI that self-reported testing positive for influenza in 2020 was 1% (n = 56) and 0.9% (n = 57) in 2021. Due to changes to survey question wording made between 2019 and 2020, self-reported testing data are not comparable to previous years.

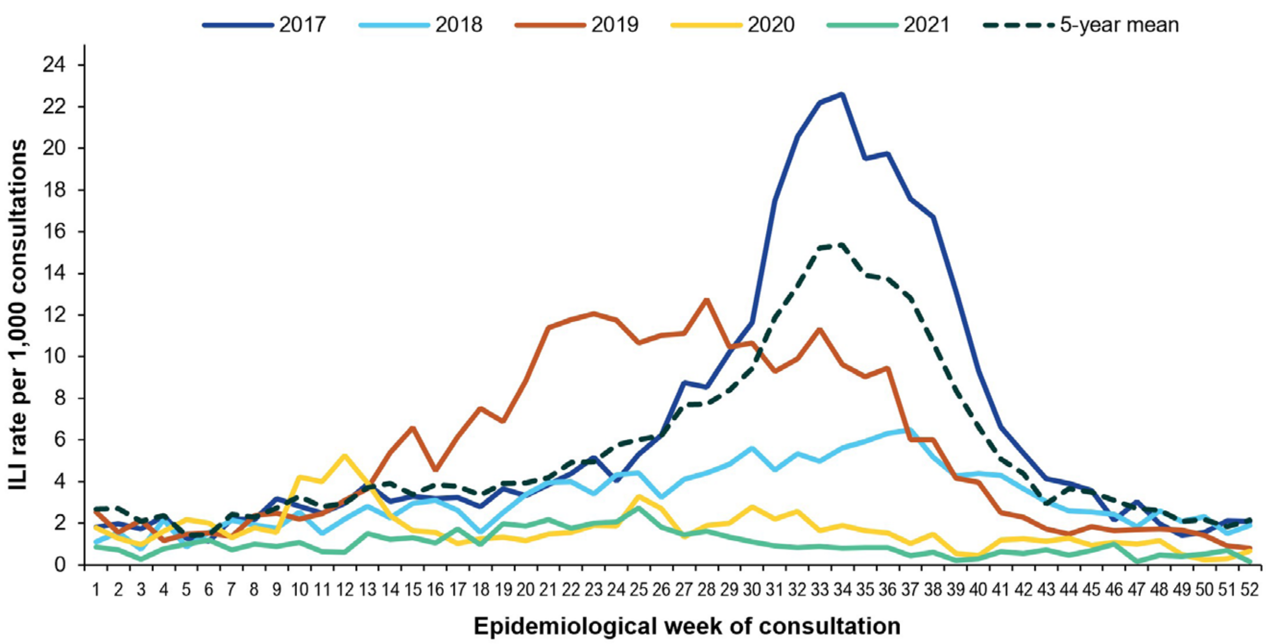
Influenza-like illness consultations from sentinel general practitioner surveillance systems

In 2020, there were 1,937 ILI notifications from sentinel general practices, representing an overall rate of 2 ILI notifications per 1,000 consultations. In 2021, there were 1,058 ILI notifications from sentinel general practices, representing an overall rate of 1 ILI notification per 1,000 consultations. The ILI notification rates from sentinel general practices in 2020 and 2021 were much lower than the 6 ILI notifications per 1,000 consultations reported in 2019 and 4 notifications per 1,000 consultations in 2018.

In 2020, the ILI notification rate increased sharply in late February and subsequently reached the highest point in the week ending mid-March at 5 ILI cases per 1,000 consultations (weeks 9–13, as shown in Figure 7). This sharp increase coincided with health authorities encouraging people with respiratory symptoms to get in contact with their healthcare provider to identify any SARS-CoV-2 transmission in early 2020. From late March, the ILI notification rate decreased rapidly following the set-up of designated respiratory clinics (to increase respiratory testing capacity in response to the COVID-19 pandemic), where patients with respiratory symptoms were diverted.

In 2021, a minor rise in ILI notification rates was also observed in mid-June, at 3 ILI notifications per 1,000 consultations (Figure 7), aligning with the slight increase in influenza laboratory-confirmed notifications observed in mid-2021. A typical seasonal peak of ILI notifications was not observed in either 2020 or 2021 (Figure 7).

Figure 7: Unweighted rate of ILI reported from Australian Sentinel Practices Research Network (ASPREN) sentinel general practice sites compared with the five-year mean by week of consultation,[a] Australia, 2017–2021



a The five-year mean includes the years 2015 to 2019.

There was a large reduction in the number of swab tests conducted by ASPREN sentinel general practice sites in 2020 (n = 844) and 2021 (n = 411) compared to previous years (n = 3,192 in 2019 and n = 1,954 in 2018). The reduction in swab testing in 2020 and 2021 can be attributed to patients with respiratory symptoms often being diverted to respiratory clinics for assessment and testing. Therefore, 2020 and 2021 positivity data is based on a small number of samples and may not be generalisable. Of the 1,937 general practice attendees with ILI in 2020, 844 were swabbed, of whom 2.5% (n = 21) were positive for influenza. Of positive for influenza general practice attendees, 90.5% (n = 19) were influenza A and 9.5% (n = 2) were influenza B (Table 4). Of the 1,058 general practice attendees with ILI in 2021, only one was positive for influenza (Table 4).

Due to very few patients attending sentinel general practice with laboratory-confirmed influenza, no influenza vaccine effectiveness estimates for 2020 and 2021 are available.

Table 4: Summary of virological surveillance activities conducted by Australian Sentinel Practices Research Network (ASPREN) sentinel general practice sites,[a] Australia, 2020–2021

Characteristic	2020	2021
Number of swabs processed	844	411
Number of samples positive for influenza	21	1
Number of samples positive for influenza A	**19**	**1**
Number of samples positive for influenza A(H3N2)	3	0
Number of samples positive for influenza A(H1N1)pdm09	14	0
Number of samples positive and influenza A(unsubtyped)	2	1
Number of samples positive for influenza B	**2**	**0**
Number of samples positive for influenza B/Victoria	1	0
Number of samples positive for influenza B (unknown lineages)	1	0

a Virological surveillance data from VicSPIN general practice sites are not included in Table 4 and therefore virological samples may be less representative for Victoria.

Hospitalisations at sentinel hospitals – FluCAN

In 2020 and 2021, very few patients were admitted with laboratory-confirmed influenza to the 17 sentinel surveillance hospitals. Twenty patients were admitted with laboratory-confirmed influenza at sentinel hospitals between 1 April and 30 November 2020 and six patients were admitted between 29 March and 31 December 2021 (Table 5); these patient numbers are considerably fewer than the numbers of patients admitted during similar time periods in 2019 (n = 4,154) and 2018 (n = 769). In 2020, peak weekly hospital admissions occurred in late March, with five patients admitted with laboratory-confirmed influenza (25% of all laboratory-confirmed influenza patients admitted at sentinel hospitals in 2020). In 2021, there were six patients admitted to hospital with laboratory-confirmed influenza across the year.

In 2020, of the 20 patients admitted with laboratory-confirmed influenza, 25% (n = 5) were aged 65 years and older, 40% (n = 8) were children younger than 16 years of age; and 25% (n = 5) were Aboriginal and Torres Strait Islander peoples. In 2021, of the six patients admitted with confirmed influenza, 67% (n = 4) were children younger than 16 years of age and 50% (n = 3) were Aboriginal and Torres Strait Islander peoples (Table 5).

Most patients were admitted with influenza A in 2020 (70%; n = 14) and 2021 (83.3%; n = 5). In 2020, of the patients admitted with laboratory-confirmed influenza, 55% (n = 11) and 33.3% (n = 2) respectively had chronic comorbidities. A small number of patients with laboratory-confirmed influenza were admitted to an intensive care unit in 2020 (n = 1) and 2021 (n = 1), and sadly there were three deaths reported in 2020 (Table 5).

In 2020 and 2021, very few patients admitted to sentinel hospitals with laboratory-confirmed influenza had received a seasonal influenza vaccine. Therefore, there are no influenza vaccine effectiveness estimates for 2020 and 2021, due to low numbers of laboratory-confirmed influenza hospitalisations.

Table 5: Demographic characteristics, influenza type/subtype and outcomes of patients admitted with laboratory-confirmed influenza at Influenza Complications Alert Network (FluCAN) sentinel hospital sites,[a] Australia, 2020–2021

Category	Characteristic	2020		2021	
		n	%	n	%
Total hospitalised	—	20	—	6	—
Influenza type/subtype	A(H1N1)pdm09	5	25	2	33
	A(H3N2)	1	5	2	33
	A(unsubtyped)	8	40	1	17
	B	6	30	1	17
Age group (years)	< 16	8	40	4	67
	16–64	7	35	2	33
	65+	5	25	0	—
Sex	Female	6	30	3	50
	Male	14	70	3	50
Pregnancy status	Pregnant	0	—	0	—
Indigenous status	Aboriginal and Torres Strait Islander	5	25	3	50
	Non-Indigenous	15	75	3	50
Jurisdiction[a]	ACT	0	—	1	17
	NSW	8	40	2	33
	NT	4	20	1	17
	Qld	2	10	2	33
	SA	1	5	0	—
	Tas.	0	—	0	—
	Vic.	4	20	0	—
	WA	1	5	0	—
Outcome	Intensive care admissions	1	5	1	17
	Died in hospital[b]	3	15	0	—

a ACT: Australian Capital Territory; NSW: New South Wales; NT: Northern Territory; Qld: Queensland; SA: South Australia; Tas.: Tasmania; Vic.: Victoria; WA: Western Australia.

b In 2020, of the 20 patients where hospital mortality status was documented, three patients died (15%); of these, all three deaths occurred in those not admitted to the intensive care unit.

Mortality

Mortality from a primary influenza infection is uncommon, and a proportion of deaths attributed to influenza occur from complications including pneumonia, obstructive airways disease and sudden cardiac failure. These occur predominantly in identified risk groups such as those aged 65 years and older, those under six months of age, or those with chronic medical conditions.

Influenza mortality data reported to the NNDSS

The completeness and reliability of deaths data notified to the NNDSS is low, affecting the accuracy of these estimates. For this reason, the number of influenza-associated deaths reported to the NNDSS does not represent the true mortality associated with this disease.

In 2020, of laboratory-confirmed influenza notifications, 36.7% (n = 7,829) had death status recorded. A total of 37 influenza-associated deaths were reported to the NNDSS in 2020, representing a case fatality rate (CFR) of 0.17%. Most deaths occurred in the 75 years and over age group (n = 20).

There were no influenza-associated deaths notified to the NNDSS in 2021, and 40.8% (n = 306) of the laboratory-confirmed influenza notifications had death status recorded.

ABS cause of death data

Influenza (ICD-10 codes J09–J11) was noted as the underlying cause of death for 55 persons in 2020 (0.03% of all deaths),[17] and two persons in 2021 (< 0.01% of all deaths).[18] The number of influenza deaths reported in 2021 is the lowest number of annual influenza deaths on record.[18] In 2021, influenza and pneumonia (ICD-10 codes J09–J18) as a combined group decreased by 12.5% from 2020. This follows a 45.9% decrease in 2020 after a high influenza mortality rate in 2019.[18]

Discussion and conclusion

Across 2020 and 2021, the impact and severity of influenza in Australia was low; this was likely a result of PHSMs implemented in response to the COVID-19 pandemic. Influenza surveillance in Australia is supported by a network of data sources and systems, each varying in their capacity to detect true cases of influenza and accurately reflect the burden of disease. The interpretation of surveillance data from these data sources and systems are subject to limitations, including under-ascertainment, variability in testing practices and differences in healthcare-seeking behaviour across jurisdictions and age groups, many of which were disrupted across 2020 and 2021.

Based on available data, atypically low influenza activity was observed in Australia across 2020 and 2021. Laboratory-confirmed influenza notifications were the lowest numbers of influenza notifications to the NNDSS since influenza became nationally notifiable in 2001, with no seasonal peak (usually observed in August) occurring in either year.

Influenza circulation and temporal trends in laboratory-confirmed influenza cases in 2020 and 2021 were effectively interrupted by COVID-19-related PHSMs.[6,7,19] Seasonal influenza has a smaller serial interval (intervals between cases), a lower reproductive number, and a shorter median duration of infectivity compared to the SARS-CoV-2 lineages detected in 2020 and 2021.[20] International border closures and quarantine mandates based on SARS-CoV-2 incubation periods (which were considerably longer than influenza incubation periods) were likely the main measures that limited influenza introduction and transmission in Australia during 2020 and 2021.[20,21] Like Australia, New Zealand, Singapore, Japan and several Pacific Island countries were able to effectively close their international borders and experienced historically low levels of influenza, indicating that border controls played a key role in in limiting overseas introduction.[21] Restrictions on domestic travel also limited the transmission of influenza viruses, which additionally contribute to seasonal influenza epidemics in major Australian capital cities.[6,19]

Limited interpersonal contact following stay-at-home orders and gathering restrictions, reduced attendance at schools or workplaces, and mandated mask wearing also reduced opportunities for the usual influenza transmission pathways.[8,21,22] In addition, circulating SARS-CoV-2 may have caused viral displacement and interference with influenza, through competition, further limiting influenza circulation in 2020 and 2021.[20,21]

Furthermore, Australians were strongly encouraged to get vaccinated with the seasonal influenza vaccine to reduce any unnecessary burden on the healthcare system in preparation for co-circulating respiratory viruses.[6] Subsequently, influenza vaccination coverage was particularly high in 2020, and coverage in 2021 was comparatively higher than in non-pandemic years.[23] Increased influenza immunity in the population, and reduced susceptibility among high-risk groups, may have contributed modestly to reducing influenza transmission; however, quantifying this specific contribution is challenging, given the simultaneous impacts of mandated quarantine, border closures and other public health measures described above.

There was substantial variation in laboratory-confirmed influenza notification rates between the states and territories in 2020 and 2021. Higher laboratory-confirmed influenza notifications rates were reported in Queensland and the Northern Territory in 2020, and in the Northern Territory in 2021. It is not uncommon for large variations in notification rates to be observed between states and territories due to differences in climatic conditions and therefore timing or length of influenza seasons, and testing availability. However, in 2020 and 2021, there were also fewer PHSMs to contain the spread of COVID-19 in Queensland and the Northern Territory, compared to other states and territories, which may have enabled influenza to circulate more easily in Queensland and the Northern Territory.[8]

In previous years, the highest rates of laboratory-confirmed influenza notifications are typically observed in children (aged 0–4 and 5–9 years) and older adults (those aged 65 years and over).[3,4] However, in 2020, notification rates among adults aged 65 years and over were relatively similar to those aged 25–64 years. Older adults are considered at higher risk of severe COVID-19. There was increased adoption of personal protective measures (such as mask wearing and social distancing) among older age groups, and residential aged care facilities enforced strict personal protective measures and limited visitation to prevent SARS-CoV-2 transmission.[24] These practices may have contributed to the lower rate of laboratory-confirmed influenza notifications among adults aged 65 years and over.

Similar to laboratory confirmed influenza notification trends, very low influenza activity was also observed in community and hospital-based sentinel surveillance systems, providing further evidence of the true decline of circulating influenza in 2020 and 2021.[6,25] Temporal ILI trends were also influenced by the events that occurred throughout the COVID-19 pandemic, such as the sharp increase in ILI consultations at sentinel general practice sites following a public call out for people with respiratory symptoms to get in contact with their healthcare provider.

Of influenza viruses characterised by the WHO CCRRI, antigenic characterisation showed moderate similarity between vaccine components and circulating influenza strains for most virus types in 2020, but notably low similarity for A(H3N2) in 2021. The southern hemisphere influenza vaccine recommendation process was constrained by a significantly lower volume and geographic representation of circulating influenza virus data than was typical before the COVID-19 pandemic. Despite these limitations, new groups of influenza A(H3N2) and B/Victoria-lineage viruses that demonstrated antigenic changes compared to recently recommended vaccine viruses were identified and consequently, the A(H3N2) and B/Victoria-lineage component recommendations were updated.[26]

At their technical meeting in 2021, the WHO recommended that quadrivalent vaccines for use in the 2022 southern hemisphere influenza season contain the following:

Egg-based vaccines

- an A/Victoria/2570/2019 (H1N1)pdm09-like virus;
- an A/Darwin/9/2021 (H3N2)-like virus;
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus; and
- a B/Phuket/3073/2013 (B/Yamagata lineage)-like virus.

Cell- or recombinant-based vaccines

- an A/Wisconsin/588/2019 (H1N1)pdm09-like virus;
- an A/Darwin/6/2021 (H3N2)-like virus;
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus; and
- a B/Phuket/3073/2013 (B/Yamagata lineage)-like virus.[26]

For trivalent influenza vaccines to be used in the 2022 southern hemisphere influenza season, the WHO recommended the use of A(H1N1)pdm09, A(H3N2) and B/Victoria lineage viruses as listed above for use in quadrivalent vaccines.[26]

Overall, all data sources showed very low influenza activity following the introduction of PHSMs to contain the spread of COVID-19 in 2020 and 2021. These measures significantly disrupted normal influenza circulation, resulting in exceptionally low levels of activity. As a result, influenza activity in 2020 and 2021 was atypically low and not representative of normal seasonal patterns, limiting the comparability of these years with other influenza seasons.

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