

# Measles immunisation status of healthcare workers in smaller Victorian hospitals: can we do better?

Noleen Bennett,<sup>1,2</sup> Brett Sutton,<sup>3</sup> Janet Strachan,<sup>3</sup> Alex Hoskins,<sup>1</sup> Michael J. Malloy,<sup>1,4</sup> Leon J. Worth<sup>1,5</sup>

**M**easles is a highly contagious viral infection transmitted via respiratory secretions. Those at risk of more severe or complicated infection include immunocompromised persons, malnourished children, children younger than five years, adults older than 20 years and pregnant women.<sup>1</sup> Vaccination is highly effective, with two doses of MMR (measles-mumps-rubella) vaccine providing 99.7% protection from measles infection.<sup>2</sup>

In 2014, the World Health Organization verified Australia had no local circulating strain of measles.<sup>3</sup> During 2015 to 2018, 74, 99, 81 and 103 measles cases were annually reported, respectively. In 2019, 286 measles cases were reported, a significant increase from previous years.<sup>4</sup>

Non-immune health care workers (HCWs), are especially at risk for occupational acquisition of measles and may transmit infection to colleagues and vulnerable patients. A 2014 systematic review reported the worldwide proportion of HCWs without measles IgG antibodies ranged from 0% to 46%.<sup>5</sup> The risk of these susceptible HCWs acquiring measles is estimated to be 13 to 19 times higher than the general population.<sup>6</sup> In Australia, about 8.0% of HCWs have previously been found to have no evidence of measles immunity.<sup>7,8</sup> There are numerous published reports of Australian HCW occupational acquisition of measles.<sup>9,10</sup>

Comprehensive HCW immunisation programs support cost-effective public health responses to measles cases and prevention

## Abstract

**Objective:** To determine the proportion of healthcare workers (HCWs) in smaller Victorian public healthcare facilities with documented evidence of measles immunity.

**Methods:** A cross-sectional survey, developed by the Victorian Healthcare Associated Surveillance System Coordinating Centre, was completed by all eligible facilities. HCWs were reported as having evidence or no evidence of measles immunity. Those without evidence of immunity were sub-classified as incomplete, declined or unknown status.

**Results:** Seventy-five facilities reported measles immunity status of 17,522 employed HCWs. Of these, 11,751 (67.1%) had documented evidence of immunity. The proportion with evidence of immunity was lowest (45.6%) in facilities with ≤50 HCWs. The majority of HCWs without evidence of immunity (88.2%) had 'unknown' status. Declination or incomplete status comprised very low overall proportions (0.3% and 3.6%, respectively).

**Conclusions:** Reported evidence of HCW measles immunity was moderate in surveyed facilities, with a large proportion having unknown status. HCW immunisation programs in some facilities require refinement to appropriately support public health responses to measles cases and prevention of occupational acquisition of measles.

**Implications for public health:** Non-immune HCWs are at increased risk for acquiring and transmitting measles. Timely access to accurate HCW immunisation records is required to ensure that public health responses are effective.

**Key words:** healthcare worker, measles, immunisation

of occupational acquisition of measles. Such programs include an immunisation policy, consistent with national immunisation recommendations for all vaccine-preventable diseases including measles, current HCW immunisation records and education about relevant vaccine-preventable diseases.<sup>11</sup> For each HCW, details about vaccinations consented/refused and date and results of serology should be recorded.<sup>12</sup> Timely access to these details enables immediate targeted provision of post-exposure prophylaxis (Normal Human Immunoglobulin or MMR)

and monitoring or voluntary exclusion of non-immune HCWs outside the window for post-exposure prophylaxis.

In 2017–2018, smaller Victorian public healthcare facilities were required as part of routine surveillance programs to collect and submit HCW measles immunity data to the Victorian Healthcare Associated Surveillance System (VICNISS) Coordinating Centre. The VICNISS Coordinating Centre collates and analyses process and outcome data on potentially preventable infections that can be acquired by HCWs and patients

1. Victorian Healthcare Associated Infection Surveillance System (VICNISS) Coordinating Centre, Doherty Institute for Infection and Immunity, Victoria

2. Department of Nursing, Melbourne School of Health Sciences, The University of Melbourne, Victoria

3. Department of Health and Human Services, Victorian State Government

4. Centre for Epidemiology and Biostatistics, Melbourne School of Population and Global Health, The University of Melbourne, Victoria

5. Department of Medicine, The University of Melbourne, Victoria

**Correspondence to:** Associate Professor Noleen Bennett, Victorian Healthcare Associated Infection Surveillance System (VICNISS) Coordinating Centre, The Peter Doherty Institute for Infection and Immunity, 792 Elizabeth St, Melbourne, VIC 3000; e-mail: Noleen.Bennett@mh.org.au

Submitted: November 2019; Revision requested: February 2020; Accepted: March 2020

The authors have stated they have no conflict of interest.

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*Aust NZ J Public Health.* 2020; 44:346-8; doi: 10.1111/1753-6405.12989

as a direct or indirect result of healthcare. The objective of this study was to determine the currently unknown statewide proportion of HCWs employed in smaller Victorian public healthcare facilities with documented evidence of measles immunity, in order to determine if refinement of HCW immunisation programs is required.

## Methods

### Eligible healthcare facilities and staff

All Victorian public healthcare facilities with fewer than 100 acute beds were required during 2017/18 to complete a cross-sectional survey recording HCW measles immune status. These facilities are mostly located in rural Victoria and usually provide general medical services only.

Participating facilities were permitted to submit data at acute care hospital or health-service level. A health-service can encompass acute, sub-acute and aged-care services with common governance. All staff<sup>12</sup> employed permanently, temporarily or casually by the facility on their nominated survey day, regardless of their occupation, were included. Unpaid staff (e.g. students, volunteers) and those employed by external organisations (e.g. agency nurses) were excluded.

### Data collection

Using the standardised survey accessible on the VICNISS website, data were collected by Infection Prevention and Control professionals employed by the surveyed facilities. These data included number of HCWs employed, number of HCWs with evidence of measles immunity and number of HCWs with no evidence of measles immunity. It was optional to similarly collect data about occupational groups medical, nursing and other staff. Education regarding survey methodology and standardised definitions

was provided by the VICNISS Coordinating Centre, and all data were submitted via a secure online portal.

Consistent with NHMRC-defined Quality Assurance activities, no HCW-identifying data were collected, and pooled data were captured for purposes of quality improvement within participating healthcare facilities. Ethical approval was therefore not required.<sup>13</sup>

### Definitions

In accordance with national immunisation recommendations,<sup>11</sup> HCWs were classified as having *evidence of measles immunity*, if documented as having received two doses of measles vaccine given at least four weeks apart and with both doses given at  $\geq 12$  months of age; confirmed serological evidence of immunity (measles IgG positive); or date of birth was prior to 1966. Adults born prior to 1966 were considered to be immune due to measles circulating widely in the community during this period.

HCWs classified as potentially susceptible to measles or having no evidence of measles immunity were sub-categorised as:

- *Incomplete*, if commenced and planned to complete the recommended MMR vaccination course or serology results were pending.
- *Declined*, if offered and declined to commence or complete the recommended MMR vaccination course or to undertake serologic testing.
- *Unknown*, if measles immunity status was not listed on a register set up and maintained by the facility and/or unable to be contacted or able to be contacted but could not provide sufficient documentation regarding immunity status.

### Analysis

All statistical analyses were performed in Stata/SE 14.1 for Windows (StataCorp LP, College Station, TX, USA). The proportion of HCWs with or without evidence of measles immunity and the distribution of proportions (median and range) reported by participating facilities were determined. To enable comparison between similarly sized facilities, facility-level data were grouped according to the number of HCWs employed:  $\leq 50$ , 51–100, 101–200, 201–500 or  $> 500$ .<sup>14</sup>

## Results

All eligible facilities (62 hospitals and 13 health-services) collected and submitted HCW measles immunity status data for 17,522 employed HCWs. Of the surveyed HCWs, 11,751 (67.1%) had documented evidence of immunity.

The proportion of HCWs with evidence of immunity was lowest (45.6%) in facilities with  $\leq 50$  HCWs and highest (73.6%) in those with  $> 500$  HCWs. At the facility-level, the median proportion of HCW with evidence of measles immunity was 66.7% (range 0.0% to 99.4%), see Table 1. In the 24 facilities where occupational group data were collected, 251/445 (56.4%) of medical staff and 2327/3066 (75.9%) of nursing staff had evidence of measles immunity.

Of the 5,771 (32.9%) HCWs with no evidence of immunity, 5253 (91%) were employed in the three facility categories with  $\geq 101$  HCWs. The majority of HCWs with no evidence of immunity had unknown status (88.2%), with the overall proportion of HCWs categorised as unknown being 29.1%. One facility reported unknown status for all surveyed HCWs ( $n=132$ ). The overall proportions of HCWs who either declined vaccination or had incomplete status were low (0.3% and 3.6%, respectively), see Table 1.

Table 1: Healthcare worker measles immunity status.

Facility size (No. of HCWs employed)	No. of surveyed facilities	Total no. of surveyed HCWs	With evidence of measles immunity					HCWs without evidence of measles immunity							
			HCWs		Participating facilities			Incomplete		Declined		Unknown		Total	
			No.	%	Median %	Min %	Max %	No.	%	No.	%	No.	%	No.	%
$\leq 50$	5	195	89	45.6	66.7	8.5	87.9	4	2.1	0	0.0	102	52.3	106	54.4
51-100	17	1,199	787	65.6	64.6	8.3	95.9	43	3.6	5	0.4	364	30.4	412	34.4
101-200	28	4,108	2,595	63.2	60.5	0.0	97.2	283	6.9	8	0.2	1,222	29.7	1,513	36.8
201-500	17	5,470	3,457	63.2	72.5	4.7	99.4	71	1.3	23	0.4	1,919	35.1	2,013	36.8
$> 500$	8	6,550	4,823	73.6	84.4	42.6	91.5	235	3.6	8	0.1	1,484	22.7	1,727	26.4
Total	75	17,522	11,751	67.1	66.7	0.0	99.4	636	3.6	44	0.3	5,091	29.1	5,771	32.9

Note:

HCW, healthcare worker

## Discussion

This survey is the first of this scale to evaluate measles immunity status in Australian HCWs. When compared to smaller studies,<sup>5</sup> we identified a relatively high number (32.9%) of the 17,522 surveyed HCWs employed across 75 Victorian public healthcare facilities who do not have the recommended evidence of measles immunity.

The status for the majority of HCWs without evidence of measles immunity was reported as unknown, rather than incomplete or declined. We acknowledge that many of these HCWs may, in fact, be immune to measles. In 2011, a small sample of HCWs (n=95) with unknown or incomplete status at a Victorian hospital were all tested for immunity to a range of vaccine-preventable diseases. Only 8% were found to be non-immune to measles.<sup>7</sup> The low proportion of HCWs declining vaccination or serology is consistent with published reports suggesting that vaccine hesitancy or refusal among HCWs is infrequently related to MMR vaccination.<sup>15</sup>

As a consequence of the survey results and in the context of the recent significant increase in the number of measles cases both nationally and internationally,<sup>4,16</sup> many facilities have been encouraged to review and improve their HCW immunisation programs. Although reasons are not clear why the proportion of HCWs with evidence of measles immunity was not comparable across all or similarly sized facilities, some facilities may especially benefit from the implementation of a mandatory policy directive. The New South Wales Occupational Assessment, Screening and Vaccination Against Specified Infectious Diseases policy mandates that at-risk HCWs provide evidence of immunity to certain vaccine-preventable diseases. HCWs who choose not to comply may under Chief Executive discretionary power be reassigned to a low-risk work area or have their employment terminated.<sup>17</sup> This approach has not yet been applied or tested in Victoria.

One limitation of our study is the representativeness of the surveyed population. In 2017–2018, the VICNISS HCW measles immunity surveillance survey was available only to smaller Victorian public healthcare facilities. Looking ahead, this survey will be made available to all Victorian rural and metropolitan healthcare facilities, including public and private sectors and facilities with >100 beds. Broader representation could assist in

further identifying state-wide trends and opportunities for synergistic immunisation program development. Also planned are two future studies: i) as for other VICNISS surveys,<sup>18</sup> evaluation of the quality of data captured as part of the HCW measles immunity survey; and ii) exploration of the differences (barriers and enablers) between HCW immunisation programs (policies and practices) that lead to low and high proportions of HCW with evidence of immunity to vaccine-preventable diseases, including measles.

In conclusion, we report the current state-wide proportion of HCWs with evidence of measles immunity in smaller public healthcare facilities. While 66.7% of surveyed staff reported evidence of measles immunity, a large proportion (29.1%) had unknown status. Findings suggest that HCW immunisation programs in some of the surveyed facilities require refinement to appropriately support public health responses to measles cases and prevention of occupational acquisition of measles.

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