Australian Government
Department of Health and Aged Care

Australian Centre for Disease Control

2024 • Volume 48 • Electronic publication date: 21/11/2024

Communicable Diseases Intelligence

Editorial

Never waste a measles outbreak

David N Durrheim

Measles outbreaks can be extremely disruptive, may undermine confidence in the immunisation programme, have severe individual impacts on the health of those infected, result in considerable personal costs to families affected, and may spread to other countries if transmission is not rapidly interrupted.[1] Effective public health outbreak responses are resource intensive.[2] Thus, given the enormous cost of measles outbreaks it is essential that every outbreak is considered an opportunity to glean valuable learnings.

Careful analysis of the distribution of outbreak sizes and their duration (or the number of generations of infection resulting from each imported case) provides an accurate estimate of the robustness of elimination. Well-established methods exist for estimating the effective reproduction number (R_e) from outbreak data. In elimination settings, where the proportion of susceptibles is sufficiently low so that sustained transmission is not possible, almost all outbreaks are small in size (single digit number of secondary cases) and there are on average few generations of spread, with R_e sustained well below the epidemic threshold of 1.[3]

The frequency of outbreaks is also a measure of progress towards measles elimination or the effectiveness of public health measures to increase population immunity against measles. Due to large regular outbreaks across Pacific Island Countries (PICs), a coordinated measles vaccination campaign was conducted in 1997/1998, targeting all children up to 14 years of age. Measles outbreaks decreased in the PICs from an average 11.7 outbreaks per annum between 1980 and 1998 to 1.9 outbreaks per annum between 1999 and 2023.[4] This was accompanied by a huge reduction in the size of outbreaks, with 5.68 large disruptive outbreaks (≥ 20/million incidence) per annum before the campaign compared to 0.67 per annum after the campaign.

https://doi.org/10.33321/cdi.2024.48.62
http://health.gov.au/cdi

Related article: Measles secondary vaccine failure in a childcare setting: an outbreak report (https://doi.org/10.33321/cdi.2024.48.61)

It is important to emphasise that it is always better to prevent outbreaks than to respond and learn from them. Only two methods have proven effective in preventing measles outbreaks: ceasing international travel – the COVID-19 pandemic demonstrated just how effective this was at suppressing and eliminating measles outbreaks;[5] and ensuring 95% coverage of every birth cohort with two timely doses of measles-containing vaccine and closing immunity gaps where they exist.

The unique infectiousness of the measles virus, rash-fever symptomatology that reveals cases, and remarkable effectiveness of measles-containing vaccine, mean that measles outbreaks can reveal, with great precision, immunity gaps in a particular community. Where a pattern in case demographics is shared across multiple outbreaks, it can shine a light on systemic immunity gaps across a broader population that require targeted vaccination efforts.

Countries in the Western Pacific Region that have eliminated endemic measles transmission have used the learnings from outbreak interrogation very effectively to target policy or messaging. Examples include the Republic of Korea, which implemented a programme to confirm hospital staff measles immunity and administer vaccination where indicated after a nosocomial outbreak.[6] Hong Kong SAR experienced an impactful measles outbreak among airport workers and this led to recommendations for immunity screening and boosters where indicated for airport staff.[7]

During 2022, six of the seven measles cases reported in Australia occurred in Victoria.[8] All were Australian residents and all infections were acquired overseas. Of note, the index case in the only cluster (n = 3) was between 6 and 12 months of age before travelling overseas and thus eligible for an earlier 'zero' measles dose, which they did not receive. This cluster prompted reminders to immunisers, and the general public, of the importance of checking measles vaccination status before international travel; offering measles vaccination when indicated; and, particularly, offering a 'zero' vaccine dose to children between 6 and 12 months of age before travelling to measles endemic countries.

The Sunshine Coast measles outbreak report in this edition of CDI provides further evidence of the value of outbreak investigation.[9] The finding of no secondary cases in a child-care setting, where many children were either too young to be immunised or had only received a single age-appropriate dose of measles vaccine, contributes to growing international evidence that breakthrough measles infection is generally less transmissible – however, not impossible. With measles, time is of the essence, and as the authors argue, where resources are strained, a focus on cases without two documented vaccine doses is reasonable, while not discounting the potential for secondary transmission from fully vaccinated cases.

Although less likely in Australia, primary vaccine failure (e.g. vaccine was compromised at the time of vaccination due to a cold chain failure) cannot definitively be ruled out by an administrative record. To prove secondary vaccine failure, it is necessary to perform measles-specific immunoglobulin G (IgG) avidity testing: low IgG avidity indicates no prior exposure to measles, while high IgG avidity indicates breakthrough infection after prior exposure to measles antigen through vaccination or natural infection. This additional tool is invaluable when investigating outbreaks in elimination settings and should be more widely used.

Australia must continue to prevent measles outbreaks by ensuring very high coverage of every birth cohort, closing the gap on timely measles immunisation protection for Aboriginal and Torres Strait Island children, and being liberal with boosters and zero dose vaccination when people travel internationally, particularly to countries where measles is endemic or large outbreaks are occurring. When outbreaks do occur, they should be used as a 'canary in the coalmine' to reveal population immunity gaps.[3]

Author details

David N Durrheim

Hunter New England Population Health, Hunter New England Local Health District, NSW, Australia; School of Medicine and Public Health, University of Newcastle, Callaghan, NSW, Australia

Email: David.Durrheim@health.nsw.gov.au

References

1. Crowcroft NS, Minta AA, Bolotin S, Cernuschi T, Ariyarajah A, Antoni S et al. The problem with delaying measles elimination. *Vaccines (Basel)*. 2024;12(7):813. doi: https://doi.org/10.3390/vaccines12070813.

2. Gastañaduy PA, Banerjee E, DeBolt C, Bravo-Alcántara P, Samad SA, Pastor D et al. Public health responses during measles outbreaks in elimination settings: strategies and challenges. *Hum Vaccin Immunother*. 2018;14(9):2222–38. doi: https://doi.org/10.1080/21645515.2018.1474310.

3. Durrheim DN, Crowcroft NS, Strebel PM. Measles – the epidemiology of elimination. *Vaccine*. 2014;32:6880–3. doi: https://doi.org/10.1016/j.vaccine.2014.10.061.

4. Durrheim DN, Tuibeqa IV, Aho GS, Grangeon JP, Ogaoga D, Wattiaux A et al. Pacific Island Countries demonstrate the sustained success of a coordinated measles mass vaccination campaign. *Lancet Reg Health West Pac*. 2024;42:100998. doi: https://doi.org/10.1016/j.lanwpc.2023.100998.

5. Durrheim DN, Baker MG, Capeding MR, Goh KT, Lee D, Papania M et al. Accelerating measles elimination in the Western Pacific Region during the calm between the storms. *Lancet Reg Health West Pac*. 2022;23:100495. doi: https://doi.org/10.1016/j.lanwpc.2022.100495.

6. Choi S, Chung JW, Chang YJ, Lim EJ, Moon SH, Do HH et al. A lesson from a measles outbreak among healthcare workers in a single hospital in South Korea: the importance of knowing the prevalence of susceptibility. *Vaccines (Basel)*. 2023;11(9):1505. doi: https://doi.org/10.3390/vaccines11091505.

7. Hon KL, Leung AKC, Leung K, Chan GCF. Measles outbreak at an international airport: a Hong Kong perspective. *Hong Kong Med J*. 2019;25(4):331–3. doi: https://doi.org/10.12809/hkmj197962.

8. Marsland MJ, Strachan J, Gang RF, O'Hara M, Hughes NM, Glynn-Robinson A. Lessons from the re-emergence of imported measles cases following the COVID-19 pandemic in Victoria, Australia. *Commun Dis Intell (2018)*. 2023;47. doi: https://doi.org/10.33321/cdi.2023.47.54.

9. Smoll NR, Barnekow D, Neucom D, Tout W, Williams DL, Thomas M et al. Measles secondary vaccine failure in a childcare setting: an outbreak report. *Commun Dis Intell (2018)*. 2024;48. doi: https://doi.org/10.33321/cdi.2024.48.61.

10. Hagan JE, Crooke SN, Gunregjav N, Sowers SB, Mercader S, Hickman CJ et al. Breakthrough measles among vaccinated adults born during the post-Soviet transition period in Mongolia. *Vaccines (Basel)*. 2024;12(6):695. doi: https://doi.org/10.3390/vaccines12060695.

Communicable Diseases Intelligence

Communicable Diseases Intelligence (CDI) is a peer-reviewed scientific journal published by the Health Security & Emergency Management Division, Department of Health and Aged Care.

The journal aims to disseminate information on the epidemiology, surveillance, prevention and control of communicable diseases of relevance to Australia.

ISSN: 2209-6051 Online

This journal is indexed by Index Medicus and Medline.

Contacts

CDI is produced by:

Health Security & Emergency Management Division
Australian Government Department of Health and Aged Care
GPO Box 9848, (MDP 6)
CANBERRA ACT 2601

www.health.gov.au/cdi

cdi.editor@health.gov.au

Submit an Article

You are invited to submit your next communicable disease related article to *Communicable Diseases Intelligence* (CDI) for consideration. More information regarding CDI can be found at: www.health.gov.au/cdi.

Further enquiries should be directed to: cdi.editor@health.gov.au.