

# China has the momentum to eliminate measles

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The biological and technical feasibility of achieving measles eradication is well-recognised. There are irrefutable ethical, economic and epidemiological arguments for accelerating progress towards elimination in every country and World Health Organization Region.<sup>1</sup> However, suboptimal immunisation programme performance and insufficient political commitment in many countries resulted in a huge global increase in measles cases and preventable deaths in 2018 and 2019, with re-established transmission in countries that have previously eliminated endemic virus transmission.<sup>2</sup> Natural immunity following these wide-spread outbreaks, combined with non-pharmaceutical measures to curb COVID-19, extinguished this measles resurgence. However, the deleterious impact of the COVID-19 pandemic on routine immunisation coverage as a result of re-allocation of resources towards COVID-19 and disruption of health service delivery saw coverage with the first dose of measles-containing vaccine (MCV) decrease from a global average of 86% between 2015 and 2019 to 81% in 2021—the lowest level since 2008.<sup>3</sup>

In contrast, China has continued to make consistent progress towards elimination of measles and rubella during this recent period. Its national immunisation programme has progressively strengthened over past decades. The profound impact of increased routine immunisation coverage is clearly demonstrated by the 99.9% decrease in measles incidence between 1980 and 2021 (Figs. 1 and 2).<sup>4</sup>

Following a highly successful nationwide Supplementary Immunisation Activity (SIA) in 2010, during which 103 million children received MCV regardless of previous vaccination history, China has focused on achieving very high MCV coverage of every birth cohort (exceeding 99% reported coverage in recent years).<sup>5</sup> This routine activity has been supplemented with provincial annual risk assessments to target any necessary follow-up SIAs. Of great importance was

the strengthening of case-based measles surveillance supported by expanded laboratory diagnosis and genotyping which allowed in-depth epidemiologic and virologic analysis to optimize immunisation strategies. The further reduced measles incidence resulting from COVID-19 border control and other stringent public health and social measures, as well as rapid catch-up vaccination offered to children who missed out on routine immunisation during the first year of the pandemic, provide China with a unique opportunity to benefit from the lowest recorded measles incidence in their history and accelerate measles elimination.<sup>6</sup>

China's extensive quality laboratory network provides further evidence of progress towards measles elimination. The H1 genotype that circulated endemically in China for more than 25 years was last detected in Yunnan Province in September 2019.<sup>7</sup> In 1990 there were 19 circulating measles genotypes, while in 2018 this was reduced to four (B3, D4, D8 and H1).<sup>8</sup> If H1 extinction is confirmed, then this is huge step forward towards global measles virus eradication. Furthermore, since April 2020, no imported genotypes have been detected, while ongoing vaccine-associated genotype A detections provide evidence of surveillance quality.

To maintain this momentum towards measles elimination, it is essential that China continues to ensure timely access to two doses of MCV for all children, and to maintain the checking of vaccination status in all schools, with catch-up vaccination where indicated as a safety net.<sup>9</sup> Modelling has indicated the need for a catch-up campaign with rubella-containing vaccine among susceptible adolescent schoolchildren to close existing rubella immunity gaps. If a high-quality catch-up campaign is conducted with measles-and-rubella containing vaccine, it will further accelerate measles elimination.<sup>10</sup>

The epidemiological and programmatic value of high quality surveillance cannot be overemphasised. The source of each confirmed measles case, should be fully investigated particularly as international travel increases. A high source attribution rate confirms the quality of the public health response to measles cases, and an in-depth understanding of the epidemiology of measles cases will

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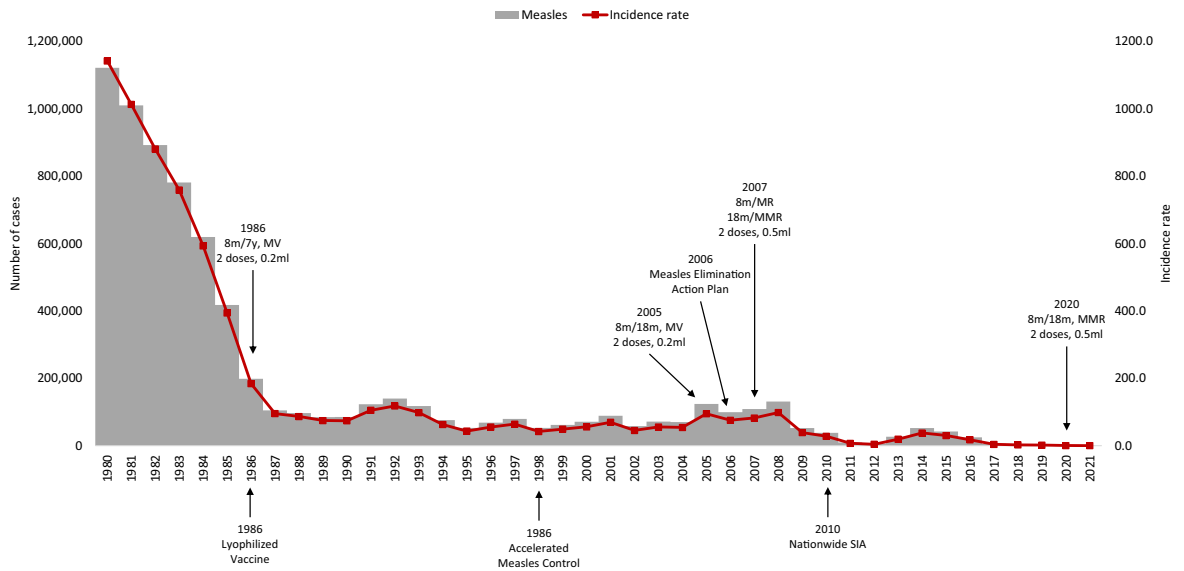


Fig. 1: Number of measles cases, incidence and immunization program history, China, 1980–2012.

highlight any chinks in population immunity armour that may require targeted immunisation activity. Genotyping a high proportion of cases will not only assist in confirming the source of imported cases but further confirm the elimination of H1 genotype circulation.

In a world on the precipice of a colossal measles resurgence,<sup>11</sup> having China achieve measles elimination will encourage, and catalyse, other countries with large populations that this public health goal is indeed attainable.

#### Declaration of interests

David Durrheim, Aiqiang Xu, Michael Baker and Li Yang Hsu are members of the independent Western Pacific Measles and Rubella Elimination Regional Verification Commission and declare no conflict of interest.

#### References

- 1 Durrheim DN. Measles eradication – retreating is not an option. *Lancet Infect Dis.* 2020;20:e138–e141.
- 2 Durrheim DN, Baker MG, Capeding MR, et al. Accelerating measles elimination in the Western Pacific Region during the calm between the storms. *Lancet Reg Health West Pac.* 2022;23:100495.

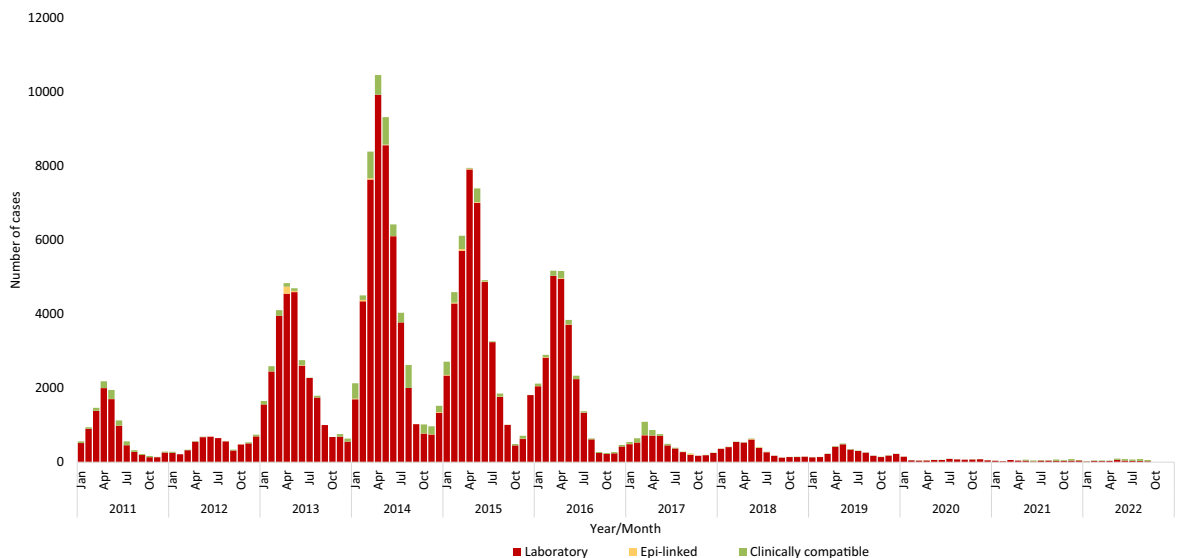


Fig. 2: Measles cases by month of rash onset, China, 2011–2022.

- 3 Rachlin A, Danovaro-Holliday MC, Murphy P, Sodha SV, Wallace AS. Routine vaccination coverage – worldwide, 2021. *MMWR Morb Mortal Wkly Rep.* 2022;71:1396–1400.
- 4 Chen S, Yao L, Wang W, Tang S. Developing an effective and sustainable national immunisation programme in China: issues and challenges. *Lancet Public Health.* 2022. [https://doi.org/10.1016/S2468-2667\(22\)00171-2](https://doi.org/10.1016/S2468-2667(22)00171-2).
- 5 Ma C, Rodewald L, Hao L, et al. Progress toward measles elimination— China, January 2013-June 2019. *China CDC Weekly.* 2019;1:21–25.
- 6 Song S, Wang P, Li J, et al. The indirect impact of control measures in COVID-19 pandemic on the incidence of other infectious diseases in China. *Public Health Pract (Oxf).* 2022;4:100278. <https://doi.org/10.1016/j.puhip.2022.100278>.
- 7 Wang H, Zhu Z, Duan X, et al. Transmission pattern of measles virus circulating in China during 1993–2021: genotyping evidence supports that China is approaching measles elimination. *Clin Infect Dis.* 2022. <https://doi.org/10.1093/cid/ciac674>.
- 8 Brown KE, Rota PA, Goodson JL, et al. Genetic characterization of measles and rubella viruses detected through global measles and rubella elimination surveillance, 2016-2018. *MMWR Morb Mortal Wkly Rep.* 2019;68:587–591.
- 9 Sadigh K, Fox G, Khetsuriani N, et al. Policy and practice of checking vaccination status at school in 2018, a global overview. *Vaccine.* 2022;40:2432–2441.
- 10 Hao L, Glasser JW, Su Q, et al. Evaluating vaccination policies to accelerate measles elimination in China: a meta-population modelling study. *Int J Epidemiol.* 2019;48:1240–1251.
- 11 Durrheim DN, Andrus JK, Tabassum S, Bashour H, Githanga D, Pfaff G. A dangerous measles future looms beyond the COVID-19 pandemic. *Nat Med.* 2021;27:360–361.