

# Rubella in Australia: can we explain two recent cases of congenital rubella syndrome?

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## Introduction

Vaccination has led to a considerable reduction in rubella and congenital rubella syndrome (CRS) in Australia. In 2002, national notification rates for rubella were the lowest on record and there were no notified cases of CRS between 1997 and 2002—in stark contrast to the pre-vaccination era when there were an average of 120 cases of CRS reported annually. It is a concern therefore that two cases of CRS have been reported from Queensland in 2003.<sup>1</sup> To investigate possible reasons why these two cases occurred, we reviewed recent surveillance data about rubella incidence, immunity and vaccination coverage.

## Methods

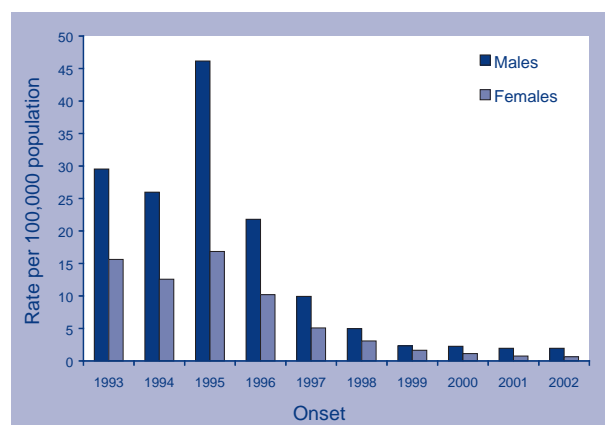
We reviewed notifications of rubella available from the National Notifiable Diseases Surveillance System and the Queensland Notifiable Conditions System as of 24 September 2003. Coverage with the first and second dose of the measles-mumps-rubella (MMR) vaccine due at one and four years of age was reviewed using data from the Australian Childhood Immunisation Register (ACIR). We used the first national serosurvey results to estimate levels of immunity to rubella for persons aged 1–59 years, women of child-bearing age (aged 15–45 years in 2003) and the corresponding cohort of males.<sup>2</sup> To obtain the most recent estimates of immunity we used sera collected in 1999 for 1–18 year olds and sera collected in 1996–1998 for 19–59 year olds. For each of the analyses we identified recent trends and sought any significant differences between Queensland and the rest of Australia.

## Results

### Rubella notifications

Nationally, the rubella notification rate for both males and females has been declining since 1995 (Figure 1) with preliminary data for 2003 indicating that this trend is continuing. All jurisdictions have shown dramatic rate reductions following outbreaks in the early part of the 1990s, and this downward trend has continued in all states and territories except Queensland in 2000–2002 (Figure 2).

**Figure 1. Rubella notification rates, Australia, 1993 to 2002, by sex and year of onset**

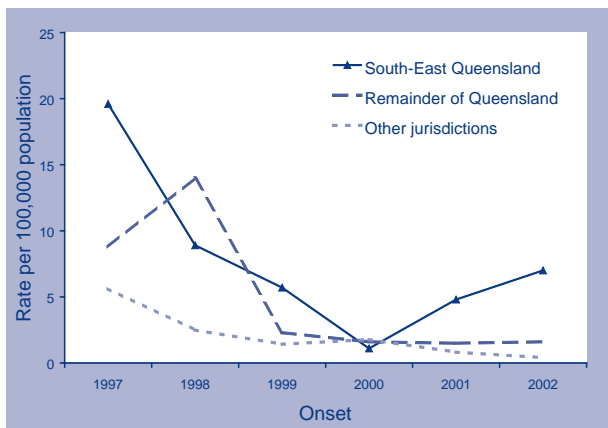


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In 2000, Queensland had their lowest notification rates for rubella on record and even had lower rates than other jurisdictions (Figure 2). This is in contrast to most years prior to 2000, when Queensland had the highest notification rates of any jurisdiction. Following the record low rates in 2000, a sustained increase in rubella notifications occurred in Queensland from mid-2001 to late 2002, such that in 2002 (when the two mothers of the CRS cases would have been infected) 75 per cent of Australia's notifications were from Queensland. Most of the increase was in the Moreton and Brisbane Statistical Divisions, which form the south-east corner of Queensland (Figure 2). These two divisions combined accounted for 89 per cent (170/190) of Queensland's rubella notifications in 2002. Since 2002 however, notifications in Queensland have declined, with only 27 cases notified to the end of June 2003.

**Figure 2. Rubella notification rates, Australia, 1997 to 2002, by jurisdiction and year of onset**

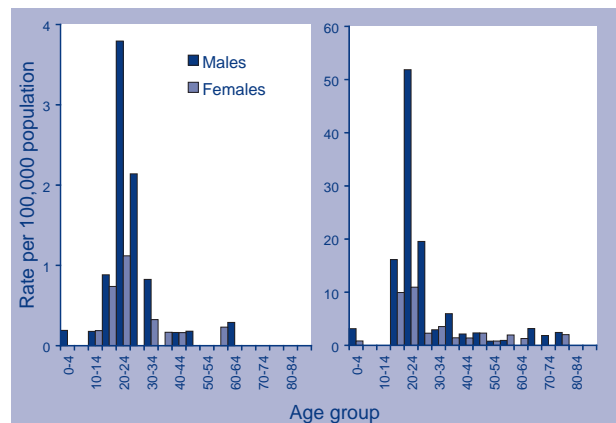


Although Queensland accounted for most of the notified cases of rubella in 2002, the age/sex distribution was the same as elsewhere in Australia (Figure 3). Rates were highest in males aged 15–29 years and females aged 15–24 years. Children aged under 15 years had low rates. Since the Measles Control Campaign (MCC),<sup>3</sup> the proportion of reported rubella cases in young adults has increased across Australia, resulting in an increase in the median age of notified rubella infections for both males and females (Figure 4).

**Vaccination coverage**

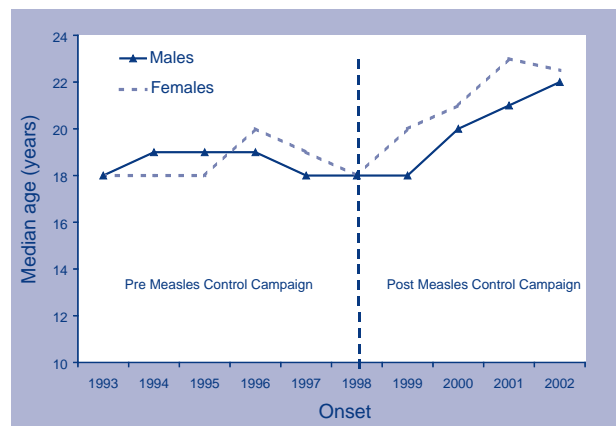
Vaccination coverage data from the ACIR by jurisdiction indicates that levels for Queensland for both the first and second dose of MMR vaccine have always been above or similar to the average for Australia as a whole. According to the ACIR, Queensland achieved 90 per cent coverage with MMR at 24 months in 1998 and coverage rates for this milestone now approach 95 per cent across the State. As with other jurisdictions, coverage for the second dose at 72 months increased steadily after changes to the childhood schedule in 1998 and now approaches 85 per cent. Statistical Divisions with slightly lower than average childhood vaccination coverage do not correspond with those that have had high rubella notification rates.

**Figure 3. Rubella notification rates, Australia, 2002, by jurisdiction (a: jurisdictions other than Queensland; b: Queensland), and age group and sex\***



\* Note differing scales on x axis.

**Figure 4. Median age of notified rubella cases, Australia, 1993 to 2002, by sex and year of onset**



## Immunity in the first serosurvey

Using the most recently available results from the first serosurvey, immunity for 1–59 year olds in Queensland (90.3%) was similar to, but slightly lower than, the national average (91.8%). A similar pattern was seen for women of child bearing age (Queensland 92.8%, Australia 95.4%). However, immunity for these groups at a population level in both Queensland and Australia is above that thought to be required for herd immunity (82–87%).<sup>4</sup> In contrast, men aged 15–45 years were found to have much lower levels of immunity (Queensland 85.2%, Australia 87.2%). Such levels may be insufficient to prevent ongoing transmission in young adult males. Unfortunately the Young Adult MMR Campaign conducted in 2001<sup>5</sup> is unlikely to have significantly improved immunity levels; in Queensland, it is estimated that only about five per cent of the eligible 18 to 30 year old cohort received a dose of MMR vaccine (K Peterson, State Immunisation Coordinator, Queensland Health, personal communication).

## Discussion

The epidemiology of rubella has changed since the MCC was conducted in 1998.<sup>3</sup> Notification rates for children aged less than 15 years have declined dramatically due to firstly, the mass vaccination of primary school aged children as part of the MCC; secondly, lowering of the age for the second dose of MMR from age 10–16 years to age 4–5 years (and later 4 years); and finally, continued improvement in coverage with the first dose of MMR vaccine. This has resulted in the lowest overall notification rate on record for Australia in 2002.

Improved immunity in children and lower rates overall have led to an increase in the median age of rubella infection. This is of concern because it puts susceptible young females of child-bearing age at increased risk of infection. In addition, there remains a cohort of susceptible young adult males who have missed being vaccinated as part of previous young adult or schoolgirl only programs and are too old to have been eligible for vaccination as infants. As the serosurvey results show, this cohort probably has insufficient immunity to prevent ongoing transmission and can therefore act as a reservoir to infect susceptible women of child-bearing age. Both the increased median age of infection and ongoing circulation of rubella in young adult males helps to explain why cases of CRS can still occur despite record low rates overall.

What is more difficult to explain is why increased notification rates of rubella and reported cases of CRS are confined to Queensland, and south-east Queensland in particular. National serosurveillance and childhood vaccination coverage data indicate that Queensland has similar levels of immunity to other jurisdictions. However, the serosurveillance data do indicate there is sub-optimal immunity in young adult males and that a proportion of women of child-bearing age are still susceptible. It would appear that the population of susceptible adults in the densely populated and rapidly expanding areas of south-east Queensland is large enough to sustain transmission of rubella. This may not be the case in less densely populated areas which were found to have similar levels of immunity to South East Queensland.

Another possible explanation is that Queensland, especially South East Queensland, has more complete rubella and CRS surveillance data than other jurisdictions due to increased awareness and reporting of these diseases. Since national surveillance began, Queensland has usually had the highest annual notification rate of all states and territories and has reported proportionally more cases of CRS than any other jurisdiction except New South Wales.<sup>1</sup> In addition, some Public Health Units in south-east Queensland alerted general practitioners and other clinicians in their area to increases in rubella notifications in early 2002. However, better surveillance alone is unlikely to explain such a large difference in notification rates.

Even if we don't fully understand the reasons why rubella notification rates increased in Queensland during 2001 and 2002, the notification of two cases of CRS serves as a warning for the whole of Australia. We need to maintain high coverage with the first dose of MMR vaccine and improve uptake of the second dose. Given rubella transmission is still occurring amongst young adults, maintenance of programs to detect and vaccinate non-immune females of child-bearing age is essential, through screening of females planning pregnancy and through antenatal/postnatal programs. High quality surveillance data are also required to determine whether immunity is sufficient to prevent further cases of rubella and CRS. If rubella continues to circulate in young adults, we may need to consider another adult vaccination program using mass vaccination strategies such as those successfully employed in the Americas.<sup>6</sup>

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