

# Mumps and rubella surveillance in Victoria, 1993 to 2000

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## Abstract

Despite improving childhood coverage of the measles-mumps-rubella vaccine (MMR) in Victoria during the 1990s, mumps and rubella notifications in age groups eligible for vaccination persisted. This study reviewed the mumps and rubella surveillance data from 1993 to 2000 with a specific focus on method of diagnosis. There were 474 notifications of mumps over the seven-year period (annual median 61, range 40 to 77) and 3,544 notifications of rubella (annual median 297, range 66 to 1,165). The highest notifications rates for mumps were consistently among the 1–4 and 5–9 year age groups, whereas there was a marked change in the age distribution of rubella notifications during this interval. A large rubella outbreak occurred in 1995 with 1,165 notifications; the highest notification rates were males aged 15–24 years, infants under one year of age (males and females), and those aged 5–14 years (males and females), respectively. The susceptibility of 5–24 year olds reflects historical changes to the Australian Standard Vaccination Schedule. Rubella notifications returned to baseline levels in 1998 with the highest notification rates in infants aged under one year, and children aged 1–4 years. For both mumps and rubella, the majority of notifications for all age groups were clinically diagnosed, and were most common in children. *Commun Dis Intell* 2003;27:94–99.

*Keywords:* mumps, rubella, surveillance, immunisation

## Introduction

Measles, mumps and rubella were common viral infections in childhood during the pre-vaccine era. Mumps causes aseptic meningitis in up to 10 per cent of cases and was the leading cause of viral encephalitis prior to the implementation of vaccination programs.<sup>1</sup> Whilst acute rubella infection is usually mild, antenatal infection can result in miscarriage, foetal death, and congenital rubella syndrome.<sup>2</sup>

In Australia, monovalent vaccines for measles and rubella were first available 30 years ago, with a monovalent mumps vaccine available for at least 20 years (Table 1).<sup>3</sup> In 1989 a trivalent measles, mumps and rubella vaccine became available and a two-dose schedule has been recommended in the Australian Standard Vaccination Schedule for both males and females since 1993.<sup>3</sup>

Despite improving MMR vaccination coverage in Victorian children aged 2 years (from 78% in 1994–95<sup>4</sup> to 92% in 2000<sup>5</sup>), a review of measles epidemiology between 1992 and 1996 demonstrated continuing high rates of notification in children, with the majority of these based on clinical diagnosis alone.<sup>6</sup> Enhanced measles surveillance in Victoria since 1997 has shown

that a clinical diagnosis of measles has a low positive predictive value, overestimating disease incidence, particularly in young children eligible for vaccination.<sup>7</sup>

Surveillance of mumps and rubella during the 1990s showed persisting levels of notifications from age groups who should have been protected by high and improving vaccination coverage rates. To gain a better understanding of the epidemiology of mumps and rubella, surveillance data from 1993 to 2000 were reviewed, with a specific focus on the methods of diagnosis employed.

## Methods

### Data source

The Victorian 1990 Health (Infectious Disease) Regulations require medical officers and laboratories to notify cases of mumps and rubella to the Department of Human Services within 7 days of diagnosis. The notification form included notifier details, the notified disease, onset date and demographic data of the cases. Notification data were electronically stored in a computer database. Notifications received from laboratories were classified as being laboratory confirmed.

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## Case definitions

The National Health and Medical Research Council surveillance case definitions for mumps and rubella during the period under review are shown in the Box.<sup>8</sup> Notifications were not routinely checked to ascertain whether cases met the clinical criteria of the National Health and Medical Research Council definition.

## Data analysis

All notifications of mumps and rubella received by the Department of Human Services between 1 January 1993 and 31 December 2000 were collated and analysed using MS Excel and Epi Info version 6.04d.

Age- and sex-specific annual notification rates were calculated using Victorian mid-year population data from the Australian Bureau of Statistics. Rates were calculated for total notifications and laboratory-confirmed notifications for both diseases. Rates were calculated using the date of notification as the date of onset was not available for all notifications. For rubella sex- and age-specific laboratory-confirmed rates in an outbreak year (1995) were compared with a non-outbreak period when the number of notifications was at an all time low (1998 to 2000). Age groups used for analysing each disease were decided on by identifying changes in local epidemiology and vaccination policy (Table 1).

For notifications in the year 2000 for children aged 1–4 years the MMR immunisation status was retrieved from the Australian Childhood Immunisation Register (ACIR).

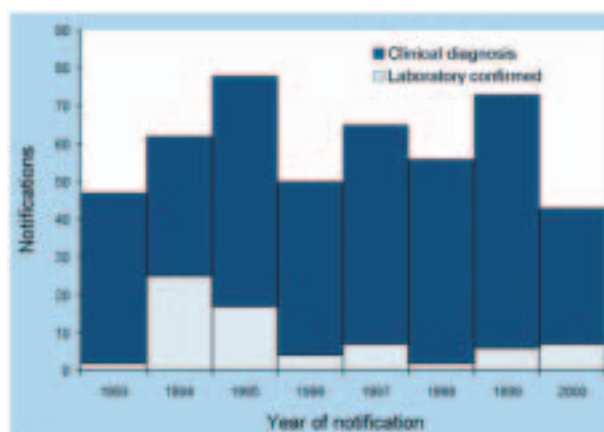
## Results

### Mumps

There were 474 mumps notifications received by the Victorian Department of Human Services between 1 January 1993 and 31 December 2000. The median number of annual notifications was 61 (range 40 to 77). There was no seasonal variation. Only 15 per cent of these notifications were laboratory confirmed (Figure 1).

The highest notification rates were seen in the 1–4 years age group (average annual rate 5.7 per 100,000 population, range 4.3 to 7.7 per 100,000 population) and those aged 5–9 years (average annual rate 5.6 per 100,000 population, range 2.5 to 8.6 per 100,000 population) (Table 2, Figure 2).

**Figure 1. Annual notifications of mumps, Victoria, 1993 to 2000, by notification type**



### Box. National Health and Medical Research Council case definitions for mumps and rubella, 1994

#### Mumps

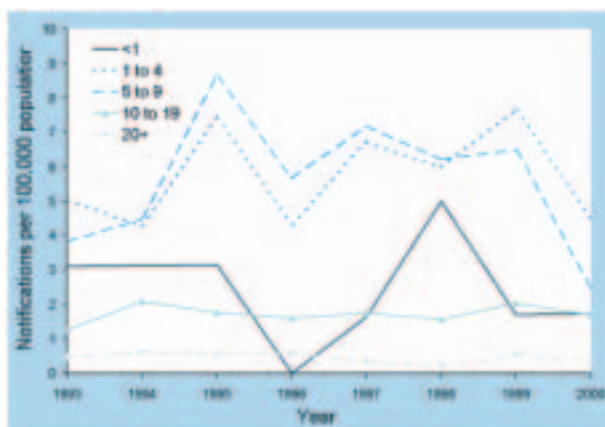
- The mumps virus isolated from a clinical specimen; OR
- a significant rise in mumps antibody level by any standard serological assay, except following immunisation; OR
- a clinically compatible illness (unilateral or bilateral swelling of the parotid or other salivary glands lasting two days or more without other apparent cause).

#### Rubella

A generalised maculopapular rash and a fever, plus:

- one or more of arthralgia/arthritis, lymphadenopathy and conjunctivitis, plus
- an epidemiological link to a confirmed case; OR
- a demonstrated rubella-specific IgM antibody, except following immunisation; OR
- a fourfold or greater change in rubella antibody titre between acute and convalescent phase sera obtained at least two weeks apart; OR
- rubella virus isolated from a clinical specimen.

**Figure 2. Mumps notification rates per 100,000 population, Victoria, 1993 to 2000, by age group**



Between 1993 and 2000 there were no laboratory-confirmed notifications in infants aged under one year. The proportion of laboratory-confirmed notifications increased with age, reaching a maximum of 37 per cent for those aged 20 years and above (Table 2).

In 2000, there were 11 notifications in the 1–4 years age group and all were clinically diagnosed. According to the ACIR, 10 cases had received their first MMR vaccination due at 12 months.

**Table 1. Significant events in measles, mumps and rubella immunisation practice in Australia**

| Year | Intervention   |
|------|--|
| 1968 | Live, attenuated measles vaccine approved  |
| 1970 | Rubella vaccine approved, measles vaccine widely available   |
| 1971 | Measles vaccine initially recommended for 15-month-old infants<br>School girl rubella program for 10–14 year old girls and non-immune women of child-bearing age |
| 1975 | First national immunisation schedule: measles vaccination for infants at 12 months of age  |
| 1980 | Mumps vaccine approved for infants aged 12–15 months   |
| 1982 | Combined measles-mumps vaccine (MM) available  |
| 1989 | Measles-mumps-rubella vaccine (MMR) available  |
| 1993 | Childhood immunisation schedule included 2nd dose of MMR for children aged 10–16 years (MMR replaced the school girl rubella vaccination program)                |
| 1998 | Measles Control Campaign with shift in timing of 2nd dose to children aged 4–5 years   |
| 2000 | Recommended age for 2nd MMR dose changed to 4 years  |

Adapted from historical table available at <http://www.ncirs.usyd.edu.au/publ/publ-79-histtab3.html>

**Table 2. Laboratory and clinical notifications of mumps, Victoria, 1993 to 2000, by age group**

| Age group    | Clinical only |             | Laboratory confirmed |             | Total<br>n | Average annual<br>rate (per 100,000<br>population) |
|--------------|---------------|-------------|----------------------|-------------|------------|--|
|              | n             | %           | n                    | %           |            |  |
| <1           | 11            | (100)       | 0                    | (0)         | 11         | 2.3  |
| 1–4          | 112           | (97)        | 4                    | (3)         | 116        | 5.7  |
| 5–9          | 136           | (94)        | 8                    | (6)         | 144        | 5.6  |
| 10–19        | 72            | (83)        | 15                   | (17)        | 87         | 1.7  |
| 20+          | 73            | (63)        | 43                   | (37)        | 116        | 0.4  |
| <b>Total</b> | <b>404</b>    | <b>(83)</b> | <b>70</b>            | <b>(17)</b> | <b>474</b> | <b>1.3</b>   |

## Rubella

There were 3,544 rubella notifications received by the Victorian Department of Human Services between 1 January 1993 and 31 December 2000 (Figure 3), with 2 outbreaks of rubella identified. Figure 3 includes the tail end of an outbreak that commenced in 1992 and concluded in 1993. The second outbreak began in mid-1995, peaked quickly (1,165 notifications received in 1995), with notifications declining, but remaining above pre-1995 baseline levels until 1998. Notifications declined from 189 in 1998, to 123 in 1999 and to 66 in 2000, which was the lowest annual figure on record (Figure 3).

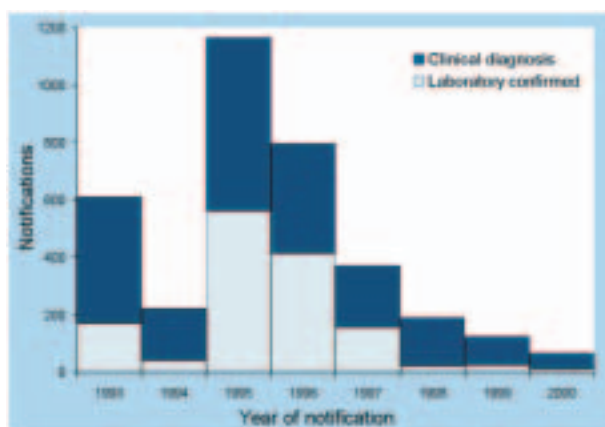
Laboratory-confirmed notifications, as a proportion of all notifications, were highest during the 1995 outbreak reaching 52 per cent in males and 38 per cent in females (Figure 3, Table 3). This proportion decreased to 16 per cent in males and 14 per cent in females for the period between 1998 and 2000. For both 1995 and the period between 1998 and 2000, the proportion of notifications that were laboratory-

confirmed was lower in the younger age groups compared with older age groups (Table 3). In 1995 the highest notification rates were in males aged 15–24 years (153 cases per 100,000 population), male and female infants combined aged under one year (98 cases per 100,000 population), and male and females combined aged 5–14 years (38 cases per 100,000 population) (Table 3, Figure 4).

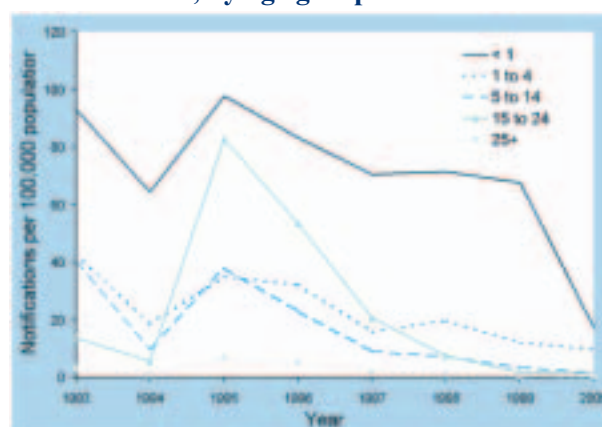
In 1995 the male to female ratio for all notifications in the 15–24 year age range was 14.5:1 but had fallen to 4:1 between 1998 and 2000. In contrast, the male to female ratio for those aged 5–14 years remained relatively unchanged (1.4:1 in 1995 and 1.8:1 between 1998 and 2000). Between 1998 and 2000 (non-outbreak period) the highest notification rate was in infants aged under one year and second highest in the 1–4 year age group (Table 3, Figure 4).

In the year 2000 there were 24 notifications in children aged 1–4 years; 23 were clinically diagnosed (19 had received at least one dose of MMR vaccination according to the ACIR) and one was laboratory diagnosed (no doses of MMR according to the ACIR).

**Figure 3. Annual notifications of rubella, Victoria, 1993 to 2000, by notification type**



**Figure 4. Notification rates for rubella per 100,000 population, Victoria, 1993 to 2000, by age group**



**Table 3. Notification rates for rubella per 100,000 population, Victoria, 1995 (annual rate) and 1998 to 2000 (average annual rate), by age group, sex and proportion that were laboratory-confirmed**

| Age group    | 1995        |           |             |           | 1998 to 2000 |           |            |           |
|--------------|-------------|-----------|-------------|-----------|--------------|-----------|------------|-----------|
|              | Male        |           | Female      |           | Male         |           | Female     |           |
|              | Rate        | LC %      | Rate        | LC %      | Rate         | LC %      | Rate       | LC %      |
| <1           | 110.6       | 19        | 84.3        | 8         | 59.0         | 0         | 45.4       | 0         |
| 1–4          | 38.1        | 0         | 32.1        | 8         | 13.8         | 5         | 12.2       | 2         |
| 5–14         | 42.7        | 42        | 32.3        | 37        | 5.3          | 2         | 3.0        | 15        |
| 15–24        | 153.2       | 56        | 10.9        | 50        | 5.6          | 42        | 1.5        | 25        |
| 25+          | 11.3        | 69        | 2.9         | 73        | 0.7          | 47        | 0.3        | 55        |
| <b>Total</b> | <b>40.5</b> | <b>52</b> | <b>10.7</b> | <b>38</b> | <b>3.5</b>   | <b>16</b> | <b>2.0</b> | <b>14</b> |

LC Laboratory-confirmed

## Discussion

This review of Victorian surveillance data between 1993 and 2000 demonstrated little change in mumps epidemiology with notification rates, the proportion of laboratory-confirmed cases, and age groups affected remaining stable. The mumps notification rates were highest in the 1–4 and 5–9 year age groups. The rubella surveillance data, by contrast, demonstrated a changing epidemiology. A large rubella outbreak occurred in 1995 with the highest notification rates in males aged 15–24 years, infants under one year of age (males and females), and those aged 5–14 years (males and females), respectively. By 1998 rubella notifications had returned to pre-1995 baseline levels. The highest rubella notification rates between 1998 and 2000 were seen in infants aged under one year, with the second highest rates in the 1–4 year age group. For both mumps and rubella, laboratory confirmation in these younger age groups was infrequent. A similar picture has been seen for measles where it was demonstrated that the low rate of laboratory confirmation for notifications from the younger age groups represented a true absence of disease.<sup>7</sup> On the basis of this, we hypothesise that low rates of laboratory-confirmed mumps and rubella are indicative of low levels of disease.

Enhanced measles surveillance introduced for Victoria in 1997 has shown that passive surveillance based on the clinical diagnosis of measles was inaccurate due to the poor predictive value of a clinical diagnosis. Of 317 notifications, 258 had serology performed and only 19 (6%) of these were laboratory confirmed with measles.<sup>7</sup> Similarly, in populations with high levels of MMR coverage simple rash illnesses (diagnosed as rubella) and parotitis (a classical feature of mumps) may often be due to other aetiologies.<sup>9,10</sup> In this study, a large proportion of notifications for both mumps and rubella were from children in age groups targeted by vaccination and were based on a clinical diagnosis only, which may have resulted in an overestimation of cases. This has been highlighted by other enhanced surveillance systems in countries with widespread vaccination. Enhanced mumps surveillance in the United Kingdom<sup>11</sup> and Texas<sup>12</sup> showed that despite a large proportion of notified cases being laboratory tested only 3 per cent and 7 per cent, respectively, were laboratory confirmed. Rubella enhanced surveillance during the National England and Wales measles and rubella immunisation strategy campaign in 1994 showed only 29 per cent of notified cases were laboratory confirmed as rubella.<sup>13</sup>

The higher rubella notification rates in the 5–14 and 15–24 year age ranges, reflect susceptibility due to lack of exposure to the virus in childhood and lack of vaccination due to changes in the schedule. Infant

rubella vaccination (as part of MMR) was only available from 1989 and the second dose strategy for teenagers commenced in Victoria in 1994/95.<sup>14</sup> The national serosurvey performed prior to the 1998 Measles Control Campaign showed the 10–12 year age group had the lowest proportion of immune subjects (60%) but this gap in immunity was removed by the Campaign.<sup>14</sup> Rubella vaccination between 1971 and 1993 targeted adolescent schoolgirls only, leaving contemporary males susceptible.<sup>14,15</sup> Prior to the Measles Control Campaign, females had significantly higher rubella seropositivity rates (97%) than males (85%) in the 16–39 year age range.<sup>14</sup>

High vaccine coverage in children should continue to ensure minimal mumps and rubella virus circulation in the younger age groups. Continuing rubella circulation will result in cases in males currently aged in their 20s<sup>15</sup> and for mumps it is likely that true cases will also be in adults. As has been seen with measles epidemiology, gradual introduction of vaccination programs with slowly increasing coverage rates leads to the development of susceptible cohorts, who neither get wild virus infection nor receive vaccination.<sup>16</sup>

This study highlights the difficulties in interpreting notifications rates derived from passive surveillance data as the incidence of vaccine preventable diseases declines. To gain a better understanding of the true epidemiology of mumps and rubella in Victoria the Department of Human Services is undertaking a period of enhanced surveillance for mumps and rubella. The system will be similar to that introduced for measles in 1997,<sup>7</sup> focussing on laboratory confirmation of all cases. Early results from enhanced mumps surveillance have shown that of 16 notifications made in July 2001, only two were laboratory confirmed.<sup>17</sup> These results suggest mumps, at least, is less common than notifications would lead us to believe.

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