

OREGON PUBLIC HEALTH DIVISION • DEPARTMENT OF HUMAN SERVICES

MEASLES: A TALE OF TWO COUNTRIES

It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair.

The Dickens quote captures the discongruity of measles control between the eastern and western hemispheres.

In the United States in the pre-vaccine era, about 500,000 cases of measles were reported each year, but, in reality, a number approximating the entire birth cohort was infected annually. Associated with these cases were an estimated 500 deaths and 4,000 cases of encephalitis.¹

Forty-five years after introduction of the vaccine, measles virus no longer circulates in the U.S. However, the battle is far from over. This issue of the *CD Summary* compares immunization strategies and disease trends between two developed countries.

THE BEST OF TIMES

The United States' effort to eliminate measles has involved three campaigns (Fig. 1):

- The first, in 1966, involved single-dose vaccination at 12 months of age.

Following the licensure of the vaccine in 1963, the incidence of measles decreased by more than 98%, and the peaks in case counts that had been seen every 2–3 years vanished like the top of Mt. St. Helens.*

- The second, announced in 1978, had three components: 1) high-level population immunity through vaccination with a single dose of measles vaccine (measles vaccination has been required for school children in Oregon since 1973); 2) disease surveillance; and 3) prompt containment of measles outbreaks. The occurrence of such outbreaks among vaccinated school-aged children and unvaccinated preschool children prompted the Advisory Committee on Immunization Practices and the American Academy of Pediatrics to recommend in 1989 that all children receive two doses of measles-containing vaccine, preferably as MMR.
- In 1991, the third elimination initiative was launched to increase preschool immunization levels to more than 90% and to vaccinate all children with a second dose. This recommendation was made in the wake of a 3-year epidemic of measles that began in 1989 and resulted in >55,000 cases and 123 deaths. The

greatest increase in measles incidence occurred in children <5 years of age due to low vaccination levels in this group. The initiative emphasized vaccination of preschool children as close to the recommended age as possible.¹ (In Oregon, a second dose of measles vaccine was required for kindergarten in 1998.)

In December 1993, the Centers for Disease Control and Prevention (CDC) announced that no cases of measles were reported in the U.S. during a 3-week stretch, and that all cases during the previous 9 weeks had been traced to importation — suggesting that measles transmission within the U.S. had at last been interrupted.

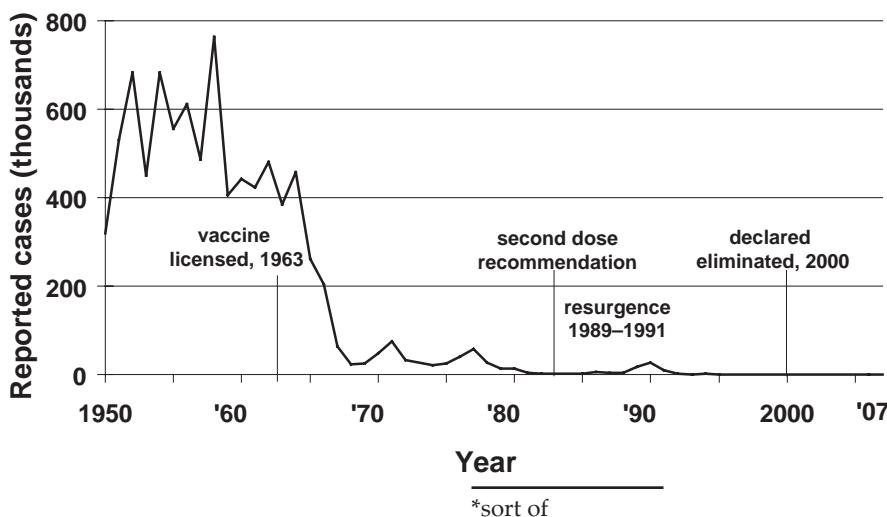
Since 1995, more than 90% of 19- to 35-month-old children and more than 97% of children entering school have received at least one dose of MMR. Since 1997, the annual incidence has been less than 1 case per million, and most have been imported or linked to imported cases. In 2000, leaders in the field concluded, "Measles is no longer endemic in the US."^{2,3} What's more, measles has nearly vanished from the entire Western Hemisphere. Since 2000, only four of the 231 importations of measles into the U.S. were from other countries in the Americas (Table, *verso*).

THE WORST OF TIMES

Japan, on the other hand, has demonstrated what happens when a country allows its immunization rate to sag. The MMR vaccine used in Japan was withdrawn in 1993 after unexpectedly high rates of aseptic meningitis were associated with the mumps Urabe strain; and in 1994, Japan dropped its requirement for mandatory childhood immunizations entirely.⁴

Measles has been on a spree in Japan ever since. The disease has not been nationally reportable in Japan, so the measles picture there is painted by estimates and reporting sentinels. An estimated 200,000 cases and 88 deaths (mainly in children) in 2000

Figure 1. Reported Measles Incidence, United States, 1992–2007 (2007 provisional data)





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and 286,000 cases occurred in 2001.^{4,5} After a brief respite during 2003–2006, measles is again epidemic in Japan. Although measles was not officially reportable there, between January and September 2007, a total of 2,525 cases were reported from about 3,000 pediatric sentinels, and 805 cases in persons ≥ 15 years of age were reported from about 450 hospital sentinels. The outbreak was reflected in the closure of 263 schools during April–June 2007. Measles cases stemming from this outbreak in Japan have been reported in Canada, Taiwan, and the United States — including 6 cases traced to a player on the Japanese team at the 2007 Little League World Series.^{†6-8}

In April 2006, Japan opted for routine two-dose vaccination against measles and rubella. Vaccine coverage for the second shot differs widely among municipalities, with the national average being 80%.⁹ Japanese officials have now set a target date of 2012 for measles elimination, and beginning this month the strategy includes 1) a catch-up immunization campaign starting with teens; 2) introduction of case-based surveillance instead of reliance on reports from sentinel clinics and hospitals; 3) rapid response to measles outbreaks; and 4) a system for quickly evaluating immunization practice to maintain 2-dose vaccination coverage of at least 95%.⁶

On January 1, 2008, measles finally became reportable in Japan, and 2,638 cases were reported during January and February.¹⁰ The problem of measles in Japan is far from over.

† It was Warner Robins over Japan 3-2 in extra innings in the title game.

CONCLUSION

International comparisons of measles incidence refute the notion that the declines we've seen in vaccine-preventable diseases can simply be attributed to economic development and accompanying improvements in hygiene. Measles has essentially been eliminated in the Western Hemisphere — in both developed and developing countries — while its transmission continues unabated in countries — even developed ones — with lower vaccination rates.

The global epidemiology of measles highlights the need to maintain very high vaccine coverage — probably >95% (or sufficient to maintain population immunity at 92% or better¹¹) —

Table : Sources of Measles Importations into the U.S., 2000–2007

Country or region	Importations
Japan	40
China	34
Other East & SE Asia	39
Western Europe	31
India	27
Other Asia	20
Eastern Europe	15
Africa	14
Other South Pacific	7
Mexico	3
Caribbean	1
Central America	0
South America	0
Canada	0

until measles has been eliminated from the globe.

And if we can achieve that, we will have done a far, far better thing than....well, than a lot of other things we might've done.

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