

Cumulative Vaccination Coverage of the Second Dose of Measles-Rubella Vaccine in Preschool Children: Results of the 2008 Nationwide Survey in Japan

JMAJ 53(2): 101–105, 2010

Naohide TAKAYAMA,*¹ Hiroshi SAKIYAMA,*² Tatsuo KATO,*³ Satoshi UMEMOTO*⁴

Abstract

It has been demonstrated that decreasing the number of susceptible persons through proper vaccination of the measles vaccine can prevent measles epidemics. In Japan, a 2-dose schedule of measles-rubella (MR) combination vaccine was introduced in 2006, in which the first dose is to be given at age 1 (Stage I) and the second dose to be given for preschool children at age 5–6 (Stage II). In 2007, a nationwide survey on 5,000 randomly selected children at age 6 from various parts of Japan revealed that the cumulative vaccination coverage (CVC) for the second dose of MR vaccine was only 80.3% at the end of Fiscal Year 2006. The 2008 Survey showed that the cumulative vaccination rate increased gradually from early April to late October in 2007, surpassing the corresponding rate during the same period in 2006 by 20–30%. The cumulative vaccination coverage increased at a slower pace from early November 2007 to early January 2008, whereas in mid-January it began to increase at a pace similar to that observed before October 2007. It then showed a steep increase in March 2008, reaching the final CVC of 90.6%. In order to reach the cumulative vaccination rate of 95% or higher for Stage II children at the end of each fiscal year, it is desirable to continue encouraging parents to have their children vaccinated with the second dose of MR vaccine before the influenza vaccination period starts.

Key words Cumulative vaccination coverage, Measles-rubella vaccine, Nationwide survey, Random sampling, Second dose

Introduction

Measles is an acute febrile viral disease that can be complicated by otitis media, pneumonia, or encephalitis. It is known to have high transmission potential and had been regarded as a common childhood disease before the measles vaccine was introduced. In Japan, even after measles vaccination was included in the regular vaccination schedule since 1978, the measles vaccination coverage remained too low to prevent outbreaks, resulting in occasional localized out-

breaks in various areas of Japan.¹

In order to improve this situation, a nationwide campaign to promote early measles vaccination was waged, and the number of measles patients gradually decreased as cumulative vaccination coverage (CVC) increased. Consequently, the number of patients reported from about 3,000 pediatric facilities designated as sentinel sites for monitoring throughout the nation dropped from 8,286 in 2003² to 545 in 2005.³ In 2007, there was another epidemic of measles in Japan. However, unlike previous epidemics, it mostly affected late

*1 Department of Pediatrics, Tokyo Metropolitan Komagome Hospital, Tokyo, Japan (ntakayam@gmail.com).

*2 Sakiyama Pediatric Clinic, Tokyo, Japan.

*3 National Center for Child Health and Development, Tokyo, Japan.

*4 Healthcare Marketing Intelligence Inc., Tokyo, Japan.

This article is a revised English version of a paper originally published in the Journal of the Japan Medical Association (Vol.137, No.12, 2009, pages 2489–2492).

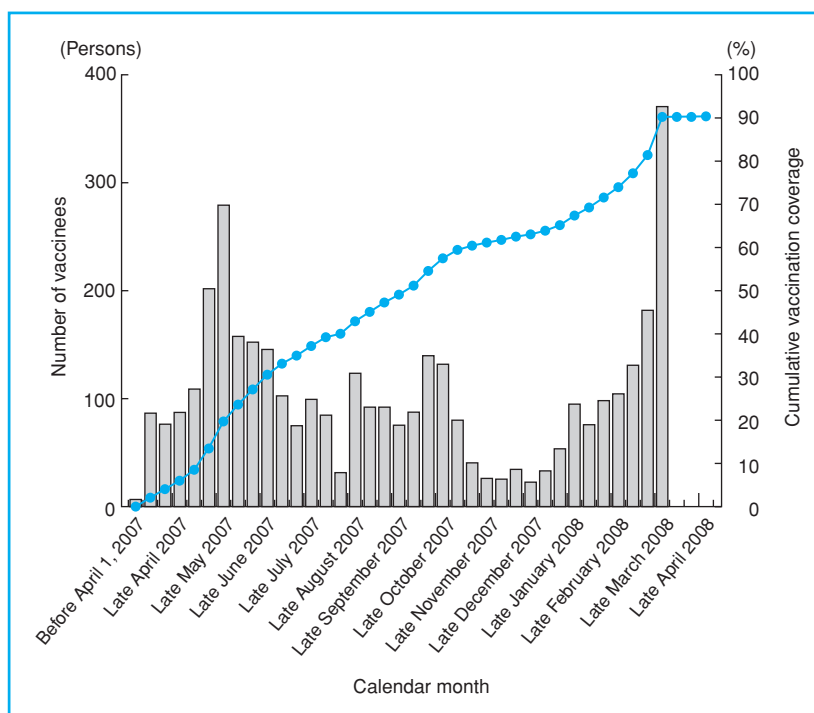


Fig. 1 The number of vaccinees and the cumulative vaccination coverage for the second dose of measles-rubella vaccine among children within one year of entering elementary school: the 2008 Survey results

teens and early twenties with no significant outbreaks among one-year-old infants.⁴

Among the three stages of measles elimination advocated by the World Health Organization,^{1,3} Japan is considered to have stepped up from the first stage (control) to the second stage (outbreak prevention). Before proceeding to the third stage (elimination), it is necessary to prevent accumulation of the measles-susceptible individuals who are the source of measles epidemics. In the USA, the 2-dose vaccination of measles-mumps-rubella (MMR) vaccine for age 1 and preschool children started in 1989, and the number of measles patients has been less than 100 since 1999.⁵ The 2-dose vaccination schedule of measles-rubella (MR) vaccine for age 1 (Stage I) and preschool children at ages 5–6 (Stage II) was also introduced in Japan in 2006. However, preventing measles outbreaks require sufficiently high vaccination rates at both Stage I and Stage II. In the 2007 Survey conducted by the Ministry of Health, Labour and Welfare of Japan, although the measles vaccination coverage of the first dose

had already reached 95% in children up to 36 months of age,⁶ the coverage of the second dose was only 80.3%.⁷ A similar survey was carried out in 2008 to investigate the changes in vaccination coverage of the second dose.

Subjects and Methods

The 2008 Survey followed the same procedure used for a nationwide MR vaccination coverage survey for preschool children (Stage II).⁶ Specifically, 5,000 children who had reached age 6 by April 1, 2007, were randomly sampled nationwide. To the 1,208 local authorities where the sampled children resided, the letter of request, survey sheets, and the procedure manual were sent in June 2008. Persons in charge of preventive vaccination program in those local authorities were asked to inquire the date on which the sampled children received MR vaccination. Based on the completed survey sheets, the number of children who completed MR vaccination was obtained for each early, mid, and late part of each

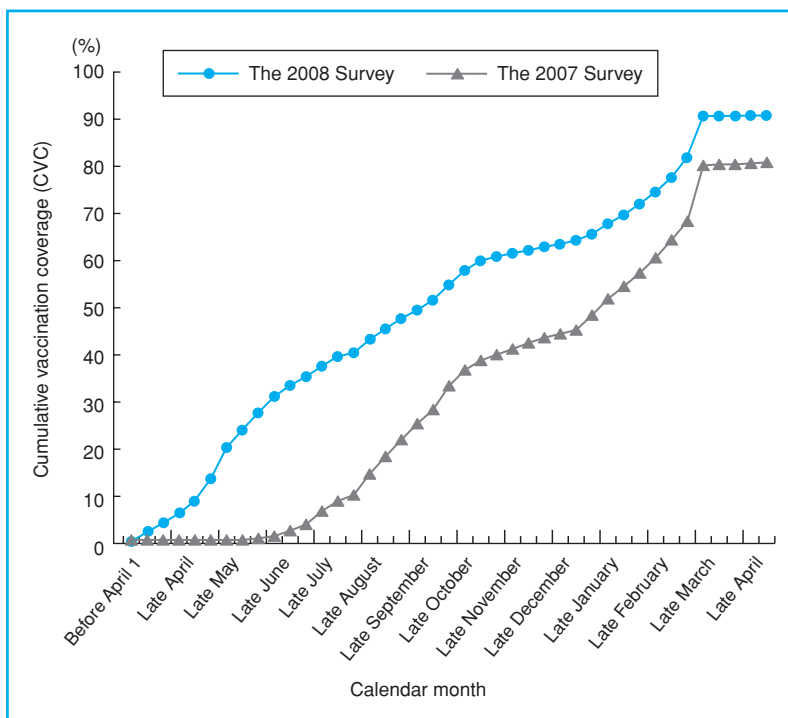


Fig. 2 Comparison of the measles-rubella cumulative vaccination coverage curves between the 2007 and 2008 Surveys

The 2007 Survey, carried out in June 2007, was to determine the Fiscal Year (FY) 2006 cumulative vaccination coverage (CVC) in children who reached the age 6 before April 1, 2007. The 2008 Survey, carried out in June 2008, was to determine the FY 2007 CVC in children who reached age 6 before April 1, 2008.

month to determine the CVC for Fiscal Year (FY) 2007.

Results

Survey sheet recovery rate

In June 2008, a letter requesting cooperation for the survey was sent to the 1,208 local authorities where the randomly sampled 5,000 children at age 6 were living. Of those, responses were obtained from the 1,061 local authorities, meaning a recovery rate of 87.8% in terms of the number of local authorities. The recovery rate in terms of the number of samples was 87.4%, since records on 4,368 children were recovered from the sampled 5,000 children. Of those 4,368 recovered records, there were 3,848 cases that completed second dose of MR vaccination, 384 cases with no MR vaccination, 23 cases with no description regarding vaccines (no data entry), and 113 cases of completed vaccination but

on uncertain date (uncertain cases). There were 9 cases of second dose vaccination with mono-antigen measles vaccine; these 9 were regarded as no MR vaccination.

Excluding the 136 cases with no data and uncertain cases, a total of 4,232 cases, meaning the 3,848 cases that completed second dose plus the 384 cases of not vaccinated with MR vaccine (including those 9 with mono-antigen measles vaccine), were considered in the data analysis. There was no local authority that declined cooperation to protect personal information or for other reasons.

Number of children who underwent MR vaccination in one-third month intervals

In the 2008 Survey (for FY 2007), there were 6 cases that completed the MR vaccination before April 1, 2007. The number of vaccinees increased considerably to 87 in early April, and it reached 280 in late May. However, the number decreased

to 140–150 in June and thereafter, dropping to only 32 in mid-August. The number of vaccinees rose again in late August and after but varied in the range of 70–140 until mid-November. From late November to early January, it remained at low levels of 26–48. The number of vaccinees was 54 in mid-January and increased to 77–106 from late January to late February. The number increased to 132 in early March and 183 in mid-March, and then it increased sharply to 372 in late March (**Fig. 1**). The number of vaccinees in April 2008 was 4.

National cumulative MR vaccination coverage

The CVC for MR vaccine in FY 2007 shows a gradual and steady increase from early April of 2007 until early November, and then it leveled off from mid-November to mid-January of 2008. The rate began to increase in late January, showing a similar slope to that before October. Although it increased sharply in late March, there was hardly any increase in April of 2008 (**Fig. 1**). The CVC was 30.9% [95% confidence interval (CI): 29.5–32.3%] in late June, 43.1% (95%CI: 41.6–44.6%) in late August, 57.8% (95%CI: 56.3–59.3%) in late October, 63.4% (95%CI: 61.9–64.8%) in late December, and 81.8% (95%CI: 80.6–83.0%) in mid-March. By the end of March in 2008, the total number of children who underwent MR vaccination was 3,848, with the CVC being 90.6% (95%CI: 89.7–91.5%).

Comparison of the results between the 2007 and 2008 Surveys

Because the amendment of the Preventive Vaccination Law was enforced in April of 2006, the routine MR vaccination in FY 2006 did not start until June. Thus, in the 2007 Survey (for FY 2006), the CVC began to rise in early June. In contrast, in the 2008 Survey (for FY 2007), it began to increase in early April and varied at levels about 20–30% higher than those in the previous year from early June to mid-December. Although the

rate of increase slowed since November, the cumulative rate eventually reached 90.6% in the 2008 Survey, which was about 10% higher than that of the 2007 Survey (**Fig. 2**).

Discussion

The second dose of MR vaccination started on June 2, 2006, by the amended Preventive Vaccination Law.⁸ Thus, the FY 2006 covered by the 2007 Survey was the very first year that the vaccination began. Repeated amendment within a short period of time caused confusion in the field and lack of preparedness among those who are involved in administering the vaccination. These factors lead to the final cumulative MR vaccination coverage of only 80.3% for the targeted children (those within one year before entering elementary school) in FY 2006.⁷

Since the 2008 Survey covered FY 2007, the second year after enforcement of the amendment law, the cumulative MR vaccination coverage began to rise in early April and eventually reached 90.6%. However, in both the 2007 and 2008 Surveys,⁷ the rate of increase dropped between November to January of the following year. This slow period is consistent with the period of influenza vaccination from November to January. Eventually, the CVC in FY 2007 reached above 90% because the so-called “rushing vaccinees” increased just prior to the deadline for routine vaccination. However, in order to achieve the CVC of 95% or above without depending on the “rushing vaccinees,” it is necessary to continue encouraging parents of the targeted children to complete their routine MR vaccination before the influenza vaccination period starts.

Acknowledgements

This study was supported by a grant from the Japanese Ministry of Health, Labour and Welfare Research Project for Emerging and Reemerging Infectious Diseases.

References

1. Nakajima N, Kato T. The reason we need further measures against measles now. *Pediatrics of Japan*. 2007;48:257–262. (in Japanese)
2. Infectious Disease Surveillance Center, National Institute of Infectious Diseases. Measles 2001–2003. *Infectious Agents Surveillance Report*. 2004;25:60–61. (in Japanese)
3. Infectious Disease Surveillance Center, National Institute of Infectious Diseases. Measles and rubella, as of March 2006. *Infectious Agents Surveillance Report*. 2006;27:85–86. (in Japanese)
4. Infectious Disease Surveillance Center, National Institute of

- Infectious Diseases. Measles 2006–2007. Infectious Agents Surveillance Report. 2007;28:239–240. (in Japanese)
5. CDC. Measles—United States, 1999. MMWR Morb Mortal Wkly Rep. 2000;49:557–560.
 6. Takayama N, Sakiyama H, Miyamura T, et al. Cumulative vaccination coverage of measles and oral polio vaccine obtained by the nationwide survey. Journal of the Japanese Association for Infectious Diseases. 2005;79:7–12. (in Japanese)
 7. Takayama N, Sakiyama H, Kato T, et al. Nationwide survey results on cumulative vaccination coverage of the second dose of measles-rubella bivalent vaccine. Japanese Journal of Pediatrics. 2008;61:773–776. (in Japanese)
 8. Kimura M, Hirayama M, Sakai H. Preventive Vaccination Guide, 11th ed. Tokyo: Kindai Shuppan Co., Ltd.; 2006:12, 173. (in Japanese)