

Measles has Killed but What Next in the 21st Century?

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The name *Rubeola* derives its name from Arabic, meaning thereby *Red spots* [1]. The name Morbilli was derived from Italian word Morbillo [2]. Home established measles as an infectious disease in 18th century. Another worker Withering in 1792 reasserted that the difference of measles with small pox existed. Recognition of the *measles* as a separate entity from *German measles* dates back to early 19th century. Panum was the first worker who did classical studies on the epidemiology of measles in Faroe Island in 1847. Measles virus was isolated from eleven years old boy named David Edmonston in USA in 1954 (Enders et al: 1954). The Kopliks spots which are absolutely pathognomonic of the invasion of the measles were described by Koplik in 1896 [3].

Before active immunization was available, epidemics of measles used to occur in the cyclical trend of two to three years during spring months and before the age of fifteen years 95% of the population used to suffer from the disease. Typically, a disease of children, it may occur at any age in the remotest isolated communities if the disease is introduced for the first time. These epidemics in the virgin population are accompanied by high mortality rate. Outbreaks in Faroe Islands in 1846 and in Fizi Island in 1875 are examples of this type of transmission. There are a number of other examples of such type of virgin epidemics and the highest mortality rate, as Greenland had its first exposure in 1951 and the epidemics affected as high as 99.9% of the indigenous population (Christensen et. al; 1952). According to WHO report, in the absence of

immunization, 90% of the persons can be expected to develop clinical measles sometimes in their life time as noted in Greenland in 1951 epidemic [4].

Measles was the captain of childhood deaths and diseases globally hardly 30 years ago. More than 1 million measles-related deaths per year was almost certainly an underestimate. Pediatric wards in the developing world were flooded with patients with measles and its complications, and measles continued to be a major cause of blindness globally. In 1980, routine immunizations, including a single dose of measles vaccine, to the poorest countries of the world produced remarkable results, culminating in the achievement of the global Universal Childhood Immunization goals in 1990 and thereafter, introduction of the second dose of measles revolutionized in containing the morbidity and mortality related to measles in low, middle and high income countries. Obviously, there was a visible shift of the cases in higher age group [5]. Regardless of what the true mortality rate was in 2000, there is no doubt that by 2008 global measles-related deaths had declined markedly, to an estimated 164,000. Measles-control activities had been outstandingly successful. It appeared to be only a matter of time before the world could feasibly take on the task of measles elimination to eradication [6].

In most countries, the incidence of disease is highest among children in the first year of life, whereas the proportion of cases occurring in children older than 5 years of age and in adults varies from country to country. Infants under 9 months of age

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are traditionally regarded as too young to be vaccinated. Increasingly, however, babies are being born to mothers with minimal measles immunity, often owing to minimal natural boosting after childhood immunization. Such mothers pass less-protective immunity to their infants, who are therefore protected for a shorter period, and it has been proposed that these infants be vaccinated at a younger age. A recent trial of measles immunization at 4 months of age in Guinea-Bissau showed adequate protective efficacy. If these results can be replicated elsewhere, it would be appropriate to revisit the recommended age of first measles vaccination in order to close the current window of susceptibility.

The measles vaccine used now in India is a live attenuated strain of measles virus, the immunity of which is lifelong [7]. However, these vaccines are not 100% effective. In countries where immunization is undertaken at 12-15 months of age, measles vaccine efficacy ranges between 90% and 95%. In India, where the first dose is given at 9-12 months of age, the vaccine efficacy is approximately 85%. Although measles immunization is an effective strategy to prevent the cases, outbreaks can continue to occur especially in densely populated areas such as urban slums, even with the good coverage. The effective vaccination has reduced the incidence in children and the adolescent groups are affected.

Fig. 1: Immunization coverage status of Polio, DPT, BCG and Measles in India from 1980 to 2002

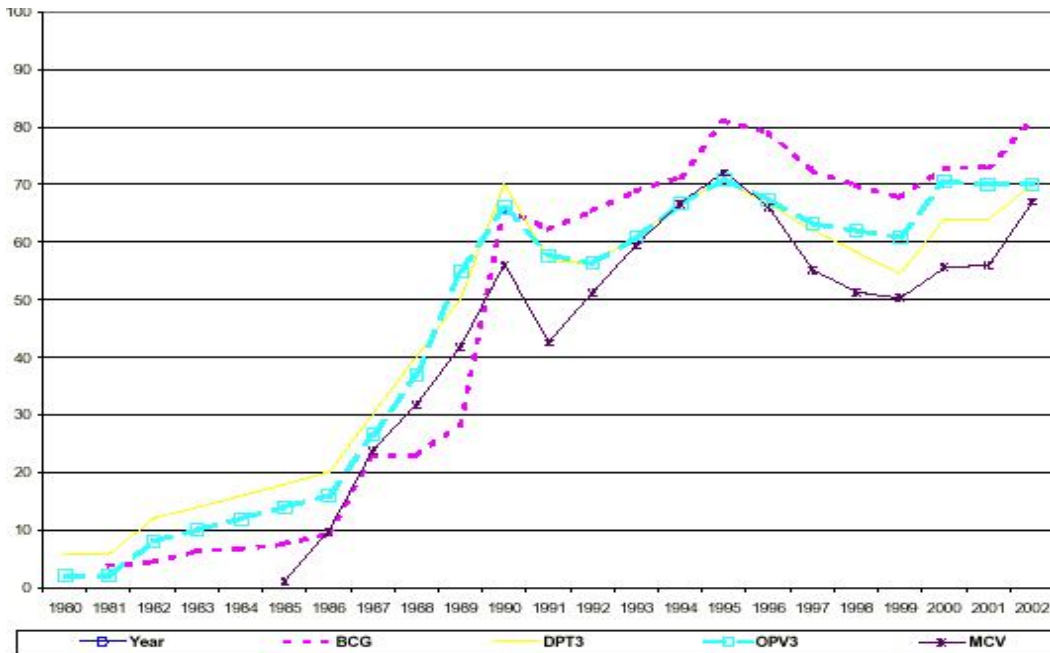
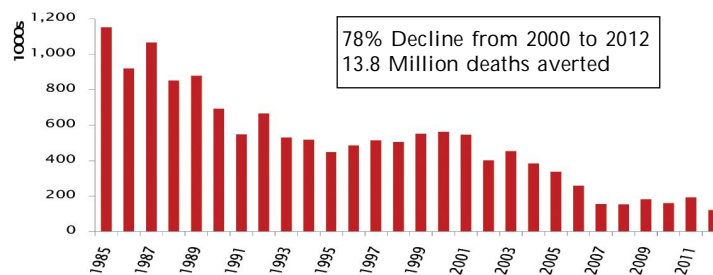


Fig. 2: 90% reduction in estimated measles deaths, 1985 - 2012



Source: WHO/IVB estimates, February 2014

Though major age group involved is 1 to 14 years, infant measles is also reported [8, 9, 10]. Measles mortality is the highest in the malnourished populations [11]. Although global immunization coverage increased from less than 20% in 1983 to

80% in 1990 and the number of reported cases of measles declined from over 4 million per year to 0.7 million in 1997, but still the case fatality ratio ranges (from 0.1 to 30 % in outbreaks among high-risk population in various countries [12]. The lack of

reliable surveillance data and understanding of local measles epidemiology makes it difficult to fully appreciate the public health burden in India and to organize targeted measles morbidity and mortality reduction strategy.

The largest percentage reduction in estimated measles mortality during 1999-2005 was in the Western Pacific region (81%), followed by Africa (75%) and the eastern Mediterranean region (62%). Africa achieved the largest total reduction, contributing 72% of the global reduction in measles mortality [13]. However, by 2015 reduction of target is 95%. So we are still substantially short of this to go to the target date.

The graph reflects the estimated number of measles deaths worldwide for the time period from 1985 through to 2012. While there is an impressive 90% decline looking over the whole time period, there was a 78% reduction during the period 2000 to 2012. During this period alone it is estimated that 13.8 million deaths were averted through measles vaccination.

By 2008, the WHO and partners were struggling with polio eradication, which they had missed their 2000 global target. On scientific and public health grounds, the feasibility, desirability, and timing of measles eradication should not be dependent on the ongoing polio-eradication effort [14]. In practice, however, the two efforts are inextricably linked. Because the same donors that fund polio-eradication programs will be called on to support measles eradication, the shifting of resources could jeopardize

polio eradication efforts. Some argue that if polio eradication is really feasible, it should be completed before measles-eradication efforts are launched; yet by 2008, continuing polio transmission in Afghanistan, Nigeria, Pakistan, and re-emergence in other countries where the virus was endemic was leading to growing skepticism about the feasibility of eradication.

Although global measles control seems to be struggling, the polio situation is looking somewhat more promising. On January 13, 2012, India reported that it had been 12 months since the last wild-virus poliomyelitis case was confirmed in that country. Now India has officially declared 'Polio Free' by the World Health Organization in 13th January, 2014. It is one of the 11 countries in the South East Asian region which have been certified as wild polio virus free countries. A 2.3 million strong team of polio volunteers and 150,000 supervisors worked day and night to reach every child. However, 2014 saw increased numbers of new polio cases in Pakistan (306-Wild Polio Virus/WPV), Nigeria (6/WPV), and Afghanistan (26/WPV), according to the Global Polio Eradication Initiative. Polio eradication remains an elusive target, although there is growing optimism that it may eventually be achieved.

Global Polio Eradication Initiative (Polio this week as of 15 July 2015)

(<http://www.polioeradication.org/Dataandmonitoring/Poliothisweek.aspx>)

Table 1: Wild polio virus type 1 and circulating vaccine-derived poliovirus cases

| Total cases | Year-to-date 2015 | | Year-to-date 2014 | | Total in 2014 | |
|----------------------------|-------------------|-------|-------------------|-------|---------------|-------|
| | WPV | cVDPV | WPV | cVDPV | WPV | cVDPV |
| Globally | 33 | 9 | 122 | 29 | 359 | 55 |
| - in endemic countries | 33 | 1 | 107 | 29 | 340 | 52 |
| - in non-endemic countries | 0 | 8 | 15 | 0 | 19 | 3 |

Table 2: Case breakdown by country

| Countries | Year-to-date 2015 | | Year-to-date 2014 | | Total in 2014 | | Onset of paralysis of most recent case | |
|----------------------|-------------------|-------|-------------------|-------|---------------|-------|--|-----------|
| | WPV | cVDPV | WPV | cVDPV | WPV | cVDPV | WPV | cVDPV |
| Pakistan | 28 | 0 | 94 | 16 | 306 | 22 | 30-Jun-15 | 13-Dec-14 |
| Afghanistan | 5 | 0 | 8 | 0 | 28 | 0 | 07-Jun-15 | N/A |
| Nigeria | 0 | 1 | 5 | 13 | 6 | 30 | 24-Jul-14 | 16-May-15 |
| Somalia | 0 | 0 | 4 | 0 | 5 | 0 | 11-Aug-14 | N/A |
| Equatorial Guinea | 0 | 0 | 4 | 0 | 5 | 0 | 03-May-14 | N/A |
| Iraq | 0 | 0 | 2 | 0 | 2 | 0 | 07-Apr-14 | N/A |
| Cameroon | 0 | 0 | 3 | 0 | 5 | 0 | 09-Jul-14 | N/A |
| Syrian Arab Republic | 0 | 0 | 1 | 0 | 1 | 0 | 21-Jan-14 | N/A |
| Ethiopia | 0 | 0 | 1 | 0 | 1 | 0 | 05-Jan-14 | N/A |
| South Sudan | 0 | 0 | 0 | 0 | 0 | 2 | N/A | 12-Sep-14 |

If and when that occurs, the overall financial costs plus the opportunity costs will have exceeded the initial estimates many times over — a point that is not likely to be lost on funding agencies. These figures will be essential for calculating realistic costs of measles eradication, which should be analyzed and weighed against the substantial future health and economic benefits such an initiative could bring. In the shorter term, however, until greater measles control is achieved, particularly in Western Europe and Africa, health professionals in the United States and elsewhere those countries which have reached elimination stage, a pool of the susceptible would collect over the period of time and thereby those countries due to imported measles virus can anticipate more small but scattered outbreaks, mind it not the bigger ones among susceptible groups [5].

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