

# A World Without Measles

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Measles is one of the most highly transmissible contagious human diseases. In the prevaccine era, >90% of children had measles by their 15th birthday. In 1980, before the use of measles vaccine was widespread, an estimated 2.6 million deaths due to measles occurred worldwide. The aim of Millennium Development Goal 4 (MDG4) is to reduce the overall number of deaths among children by two-thirds by 2015, compared with the level in 1990.[1] Recognizing the potential of measles vaccination to reduce mortality among children and that measles vaccination coverage may be considered a marker of access to children's health services, routine measles vaccination coverage was selected as an indicator of progress towards this goal. At the 63rd World Health Assembly (WHA) in 2010,

Member States endorsed the following accelerated measles control targets to be achieved by 2015 [2]: exceed 90% coverage with the first dose of measles-containing vaccine nationally and exceed 80% vaccination coverage in every district; reduce annual measles incidence to <5 cases per million and maintain that level; and reduce measles mortality by  $\geq 95\%$ , compared with 2000 estimates. These ambitious targets are aligned with MDG4 and represent milestones towards the global eradication of measles.

Global mortality attributed to measles has decreased by an impressive 78% from an estimated 733,000 deaths in 2000 to 164,000 in 2008 [3]. The decrease in measles mortality has accounted for  $\sim 23\%$  of the overall decrease in childhood mortality since 1990 and for 24% since 2000.[4] All countries, with the exception of India, achieved the 2010 global goal of reducing measles mortality by 90% two years ahead of the target date [3]. This progress has been made possible through accelerated measles control activities implemented by high-burden countries with the financial and technical support of the Measles Initiative. (Launched in 2001, the Measles Initiative is an international partnership committed to reducing measles deaths worldwide, founded and led by the American Red Cross, the Centers for Disease Control and Prevention, UNICEF, United Nations Foundation, and the World Health Organization (WHO) and joined subsequently by a number of other

organizations. Additional information available at <http://www.measlesinitiative.org>). Moreover, measles elimination has been sustained in the WHO Region of the Americas since 2002, and important steps are being taken to achieve the goal of measles elimination in 3 other WHO regions (Europe, Eastern Mediterranean, and Western Pacific) by 2015 or before. In 2009, the African Region adopted the goal of eliminating measles by 2020, and the South East Asian Region passed a resolution urging countries to mobilize resources to support elimination of measles with discussions continuing about establishing a target date.

In May 2008, encouraged by the progress being made in reducing measles deaths worldwide, Member States requested that the WHO evaluate the feasibility of the global eradication of measles [5]. A comprehensive program of work was performed that explored the biological, programmatic, economic, social, and political aspects of the feasibility of measles eradication. In July 2010, at a Global Consultation on the Feasibility of Measles Eradication, the results of these studies were presented to an ad hoc advisory panel [6]. The panel concluded that measles can and should be eradicated and that global eradication by 2020 is feasible given evidence of measurable progress towards the 2015 targets (see the advisory group report in this issue). Furthermore, the ad hoc advisory panel stressed that measles eradication activities should be carried out in the context of strengthening

Potential conflicts of interest: none reported.

Supplement sponsorship: This article is part of a supplement entitled "Global Progress Toward Measles Eradication and Prevention of Rubella and Congenital Rubella Syndrome", which was sponsored by the Centers for Disease Control and Prevention.

Two of the authors are staff members of the World Health Organization. The authors alone are responsible for the views expressed in this publication, and they do not necessarily represent the decisions, policy, or views of the World Health Organization.

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**The Journal of Infectious Diseases** 2011;204:S1–S3

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0022-1899 (print)/1537-6613 (online)/2011/204S1-0001\$14.00  
DOI: 10.1093/infdis/jir111

routine immunization services and should be used to accelerate rubella control and the prevention of congenital rubella syndrome. In November 2010, the report from this meeting was reviewed by the WHO Strategic Advisory Group of Experts (SAGE), who agreed with the main finding that measles can and should be eradicated [7]. The SAGE did not recommend a target date for measles eradication; rather, it proposed that demonstration of sufficient progress toward the 2015 control targets and regional measles elimination goals be made as a basis for establishing a target date for measles eradication. In January 2011, this approach was supported by the Executive Board of the WHA.

This steady march toward a measles-free world is now facing a setback. Starting in mid-2009, there has been a widespread resurgence of measles affecting 28 countries in sub-Saharan Africa that has resulted in >200,000 reported measles cases and > 1400 reported measles-associated deaths. Because of underreporting, the true number of measles cases and deaths is estimated to be 10–20-fold higher. The underlying cause of these outbreaks is insufficient vaccination, due to both low first-dose coverage (because of weak routine immunization systems) and reduced quality or delayed measles

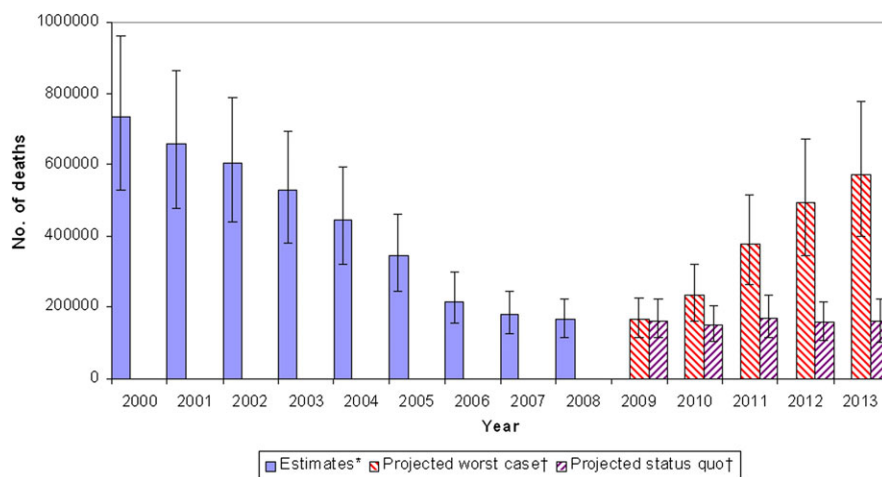
campaigns, which have been exacerbated by major funding gaps. The outbreaks in Africa, together with the continued high numbers of measles deaths occurring in India, threaten the contribution of measles mortality reduction to the achievement of MDG4.

Financial support to the Measles Initiative decreased from US\$150 million in 2007 to US\$50 million in 2009, and US\$35 million in 2010, and many priority countries have not been able to raise the expected 50% of operational costs for measles supplementary immunization activities. This has resulted in postponement of scheduled vaccination campaigns and cutbacks in the number of age-groups targeted for vaccination. The WHO has estimated that reduced financial and political commitment to measles control over the period 2010–2013 could, as a worst case scenario, result in an additional 200,000 measles deaths in 2011 and a total of >500,000 measles-related deaths worldwide in 2013 alone (see Figure 1). The gains in measles mortality reduction made over the past decade will be lost if additional resources are not made available immediately to fully implement planned vaccination activities and laboratory-backed surveillance for measles cases. Thus, the world is now at a crossroads regarding whether it has the will and the means to make the sociopolitical and

financial commitment to reverse the resurgence, achieve the 2015 mortality reduction target, and reap the tremendous long-term humanitarian and economic benefits of a world without measles. The availability of an inexpensive and effective vaccine makes measles immunization one of the most cost-effective public health interventions across a range of development settings [8, 9].

In this supplement, the papers have been organized under 6 topic headings. The first of these, “Public Health Importance of Measles and Rubella,” describes the global burden of disease due to measles and rubella and the tremendous impact on this disease burden during the vaccine era through the application of appropriate vaccination strategies, while noting the remaining unfinished agenda to complete the interruption of transmission of these diseases and their devastating effects. In the case of measles, documentation is provided of the major contribution of measles vaccination since 1990 toward reducing deaths among children aged <5 years worldwide.

The next section, “Feasibility of Measles Eradication,” presents the results of various studies requested in 2008 by the Member States of the WHO to assess the feasibility of measles eradication. These studies include evaluation of the biological,



**Figure 1.** Estimated number of measles-related deaths worldwide, 2000–2008, and projections of a possible resurgence in measles-related deaths worldwide, 2009–2013.

technical, and operational feasibility of measles eradication; a comparative analysis of measles eradication with other previous and current eradication initiatives; issues related to availability of a sufficient global vaccine supply; and assessment of the impact of such an initiative on immunization services and health systems.

The third section, "Economic Studies," provides economic analyses at the country and global levels of the cost-effectiveness and cost-benefit of measles eradication. These studies demonstrate that measles eradication is highly cost-effective regardless of country income level, is cost-saving in those countries that have already eliminated measles, and compares favorably with almost any other investment in health.

The fourth section, "Measles Vaccine Safety and Effectiveness," reviews and highlights studies of the field effectiveness of measles-containing vaccines, persistence of measles antibodies following vaccination, the relative contributions of the first and second routine doses of measles vaccine and measles mass campaign doses to the observed public health impact of measles vaccination, the safety and immunogenicity of measles vaccination in human immunodeficiency virus-infected children, and progress toward improving injection safety in Africa catalyzed by the Measles Initiative.

The fifth section, "Regional and Country Experiences," offers a collection of country and regional reports on the epidemiology of measles and rubella, as well as articles about the progress towards achieving regional measles mortality reduction and elimination

targets. The epidemiology of recent outbreaks of measles is described in detail. Issues regarding the programmatic and operational feasibility are addressed, and the successful experience and lessons learned in the Americas are highlighted.

The final section of the supplement, "Molecular Epidemiology and Laboratory Aspects of Measles and Rubella Surveillance," provides an overview of the expansion of the WHO Global Measles and Rubella Laboratory Network, with emphasis on advances in molecular epidemiology of measles and rubella, new testing procedures, and the challenges associated with laboratory testing in an elimination setting.

The stunning progress toward a world without measles in this century is now threatened and is in need of renewed commitment. The reports in this supplement document the many successes along the journey toward measles eradication and the challenges that lie ahead. A comprehensive, rigorous evaluation of the feasibility of measles eradication has concluded that measles can and should be eradicated, with a target date to be established in the near future based on measurable progress towards 2015 targets. As stated by the WHO's ad hoc advisory panel in July 2010 (in this issue) [6],

Building the required political, social and economic platforms for measles eradication is both a disease control and an important developmental opportunity, requiring a broad multidisciplinary partnership...The success of measles eradication will depend on strong management, accountability, communication,

advocacy, and resource mobilization at all levels (p. S5).

With this kind of support combined with country commitment, we can anticipate the realization of the dream of a world without measles.

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