

Global eradication of measles

Report by the Secretariat

1. In May 2009, the Executive Board at its 125th session reviewed an initial assessment of the feasibility of the global elimination of measles and requested a more comprehensive report in 2010.¹ This report summarizes the progress made in achieving current targets and goals and presents information on the feasibility of achieving a further goal of measles eradication. It provides an assessment of programmatic challenges to achieving measles elimination in each WHO region, and proposes milestones and intermediate targets to be attained.

2. The Strategic Advisory Group of Experts on immunization advised, in April 2009, that the term “eradication” should be used to describe worldwide interruption of measles transmission (i.e. simultaneous elimination of measles in all regions).²

PROGRESS TOWARDS THE CURRENT GLOBAL GOAL

3. The current global goal, established in the Global Immunization Vision and Strategy, is that, by 2010 or earlier, mortality due to measles will have been reduced by 90% compared to the estimated 2000 levels. Global mortality due to measles has been reduced by 78%, from an estimated 733 000 deaths in 2000 to an estimated 164 000 deaths in 2008. All WHO regions have already achieved this goal, with the exception of the South-East Asia Region, but within that Region it has been achieved by all countries except India. In 2008, global routine coverage with the first dose of measles-containing vaccine reached 83%, an increase from 72% in 2000. In 2008, more than 110 million children received measles-containing vaccine through supplementary immunization activities³ in the 47 priority countries⁴ identified as having a high measles mortality burden in 2000.

¹ See documents EB125/4 and EB125/2009/REC/1, summary record of the first meeting, section 5.

² *Weekly epidemiological record*, 2009, **84**(23):220–236.

³ Nationwide *catch-up* supplementary immunization activities target all children in a particular age group (most frequently children aged from nine months to 14 years) and have the goal of eliminating susceptibility to measles in the general population. Periodic *follow-up* activities target all children born since the last supplementary immunization activity. *Follow-up* activities are generally conducted nationwide every two to four years and target children aged from 9 to 59 months, with the goal of eliminating any measles susceptibility that has developed in recent birth cohorts as well as protecting children who did not respond to their first measles vaccination.

⁴ Afghanistan, Angola, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Guinea-Bissau, India, Indonesia, Kenya, Lao People's Democratic Republic, Liberia, Madagascar, Mali, Mozambique, Myanmar, Nepal, Niger, Nigeria, Pakistan, Papua New Guinea, Rwanda, Senegal, Sierra Leone, Somalia, Sudan, Timor-Leste, Togo, Uganda, United Republic of Tanzania, Viet Nam, Yemen and Zambia.

REQUIREMENTS FOR MEASLES ERADICATION

4. Before setting a goal for measles eradication, the following requirements should be met: (a) it is biologically feasible; (b) it is programmatically and operationally feasible; (c) there is a sufficient supply of high-quality vaccines; (d) it is cost effective, and the scale of resources required is recognized; (e) eradication activities are designed to contribute to strengthening health systems and are synergistic with other child health programmes; and (f) there is sufficient political and financial commitment by Member States supported by a broad-based partnership of major public health agencies and donors.

5. **Biological feasibility.** In June 2009, the International Task Force for Disease Eradication concluded that measles eradication is biologically possible, using tools that are currently available. It noted that this aspect had already been evidenced in the Region of the Americas, and that implementation challenges remained in each of the remaining five WHO regions. The Task Force highlighted the crucial role of effective routine immunization services and the need for operational research to guide programme strategies.¹

6. **Programmatic and operational feasibility.** The Region of the Americas has demonstrated the feasibility of the regional elimination of measles, sustaining the interruption of transmission since 2002. The five remaining WHO regions have assessed progress and challenges towards regional measles elimination. All regions have established a target date for elimination except the South-East Asia Region, but this will be discussed by the latter's Regional Committee at its Sixty-third session in 2010.

7. **Vaccine supply.** Independent consultants have made a detailed analysis of the demand, and of the potential risks to supply, for the measles-containing vaccines that would be needed for measles eradication by 2020. In aggregate, projected manufacturing capacity for measles-containing vaccine would be more than sufficient to meet the increase in demand associated with achieving eradication.

8. **Cost-effectiveness.** The Secretariat has commissioned an independent analysis of the cost and cost-effectiveness of measles eradication, as compared to the current mortality reduction goal, and to an intermediate goal of further mortality reduction (e.g. 95% mortality reduction). This work is ongoing, with results expected in June 2010.

9. **System strengthening.** Positive benefits of measles control activities on health systems include integration of vaccination with other public health interventions such as provision of insecticide-treated bednets, vitamin A supplements and antihelminthic treatments. Related benefits also include the development of a surveillance platform supported by high-quality laboratory diagnostic capability for other vaccine-preventable diseases such as yellow fever and Japanese encephalitis. The Secretariat has commissioned an independent analysis of the impact of eradication activities on health systems. The outcome of this work (expected June 2010) will be proposed strategies to reinforce routine immunization systems for a sustainable impact.

10. **Platform of support.** The Strategic Advisory Group of Experts on immunization expressed grave concern about the considerable decline in funding for measles control since 2008 (April 2009). The Group concluded that, if adequate resources are not guaranteed for programme activities planned for 2009 and beyond, resulting programme weaknesses would allow a resurgence of measles to occur. The associated increase in deaths among young children would jeopardize the achievement of the

¹ *Weekly epidemiological record*, 2009, **84**(44):459–466.

under-five mortality rate target of Millennium Development Goal 4. Increased advocacy and broader consultation is needed among technical experts, representatives from countries, public health partner agencies and key donors to review the evidence and gain financial and political support.

REGIONAL MEASLES ELIMINATION

11. In 1994 the **Region of the Americas** established the goal of measles elimination by 2000. At that time the reported annual incidence of measles was 31 reported cases per million population, regional coverage with the first dose of measles-containing vaccine was 84% (see Figure) and several countries that had implemented pioneering strategies had interrupted or nearly interrupted measles transmission.

12. In November 2002, eight years later, the Region reported having successfully interrupted transmission of the last endemic strain of measles virus. Elimination was achieved through the commitment of an entire region to reach a common goal and the full implementation of the regional measles elimination strategy. The elimination strategy included a well-defined vaccination activities and sensitive disease surveillance, with enhanced laboratory diagnostic capabilities. The vaccination activities combine sustained high routine coverage (more than 90%) and the implementation of high-quality supplementary immunization activities. The incremental cost of the vaccination strategy used to achieve measles elimination in Latin American and Caribbean countries was US\$ 244 million from 1994 to 2002.

13. In 2003, adoption of the goal to eliminate rubella and congenital rubella syndrome from the Region by 2010 helped to maintain measles elimination through mass vaccination of adolescents and adults with measles-rubella vaccine.

14. This Region's experience demonstrates several factors that contributed to the achievement of the regional goal. These include full compliance with vaccination strategies; house-to-house monitoring of measles vaccination coverage at the lowest geographical level; the political commitment of Presidents, First Ladies, and high-level politicians; consensus building among various stakeholders; fostering alliances with scientific associations and the private sector; the provision of an uninterrupted supply of high-quality vaccines at affordable prices through PAHO's Revolving Fund for Vaccine Procurement; and the determination and effectiveness of the health workers of the Region.

15. The **African Region** attained the goal of 90% measles mortality reduction as compared to 2000 estimates by the end of 2006 – three years earlier than its regional target year of 2009. This success was accomplished through the collective efforts of Member States and the Measles Initiative¹ to implement the strategies that had proved successful in the Region of the Americas. Coverage with the first dose of measles vaccine² improved from 56% in 2000 to 73% in 2008 (see Figure). In 2008, however, a total of 7.7 million infants (27% of the birth cohort) did not receive their first dose. It is estimated that 17 countries are at risk of not attaining 90% national coverage levels with the first dose of measles-containing vaccine unless major changes are made to strengthen routine immunization systems.

¹ The Measles Initiative comprises the American Red Cross, the US Centers for Disease Control and Prevention, the United Nations Foundation, UNICEF, and WHO.

² WHO/UNICEF estimates.

16. The Regional Committee for Africa adopted a regional measles elimination goal for 2020 at its Fifty-ninth session in 2009. Key factors for translating this into reality are sustained political commitment and country ownership, as well as financial support through strong global and local partnerships. Member States will need to invest in strengthening immunization and health systems, since routine immunization plays a central role in elimination efforts. The African Region is ready to embark on a regional measles elimination effort with immediate focus on reaching the 2012 pre-elimination targets,¹ with major emphasis on improving measles routine immunization coverage.

17. In 1997, the Member States of the **Eastern Mediterranean Region** resolved to eliminate measles by 2010. Regional coverage with the first dose of measles-containing vaccine had reached 83% in 2008, compared to 69% in 1997 (see Figure). During 1997–2008, more than 243 million children in the Region were vaccinated through supplementary immunization activities. In 2007, the Region achieved a 90% reduction in measles mortality compared to 2000 estimates, thereby reaching the global goal for 2010.

18. Of the 21 countries and areas in the Region, it is estimated that seven countries and one area (together containing 37% of the regional population)² could achieve elimination by the regional target of 2010. A further 10 countries (containing 45% of the regional population)³ could achieve elimination by 2015 and another four countries (containing 18% of the regional population)⁴ could achieve it before 2020. The forecast is positive, but there are obstacles to overcome. Funding sources have not been identified for measles follow-up supplementary immunization activities in 2010 and beyond for 12 countries. Shortages of human resources have hindered the institution of adequate measles case-based surveillance. Poliomyelitis remains the top vaccine-preventable disease priority in three countries of the Region. In four countries, vaccination coverage rates have stagnated owing to weak health systems. Conflict and lack of security undermine development of effective health services. The Region is committed to addressing these challenges and in particular will capitalize on periods of tranquillity to stop measles transmission in all countries of the Region before 2020.

19. In 1998, the **European Region** set the goal of eliminating measles and rubella and preventing congenital rubella infection by 2010. Since then, measles incidence in the Region declined from 90 reported cases per million population to historically low levels of 10 cases or less per million in 2007 (see Figure). However, in 2008, there has been a resurgence of measles cases in western European countries. The majority of outbreaks have been in unimmunized populations in countries where national immunization programmes are challenged by a combination of public and political complacency regarding the value of immunization and the rising influence of anti-vaccination groups.

20. Thirty of the Region's 53 Member States are not likely to achieve measles elimination by 2010. Reversing this expectation will take a combination of high-level political and societal commitment to sustain high coverage levels of two doses of measles-containing vaccine; additional supplementary immunization activities to reduce measles susceptibility among defined age cohorts; restoration of the

¹ Reducing measles deaths by 98% by 2012 as compared to 2000 estimates; reducing measles incidence to less than 5 cases per million population per year at national level in all countries; raising to more than 90% the routine coverage at national level in all countries and to more than 80% in all districts; achieving more than 95% coverage of supplementary immunization activities in all districts; and attaining the targets for the two main measles surveillance performance indicators.

² Bahrain, Islamic Republic of Iran, Jordan, Libyan Arab Jamahiriya, Oman, Syrian Arab Republic, Tunisia, West Bank and Gaza Strip.

³ Djibouti, Egypt, Kuwait, Lebanon, Morocco, Qatar, Saudi Arabia, Sudan, United Arab Emirates, Yemen.

⁴ Afghanistan, Iraq, Pakistan, Somalia.

public's trust in immunization and continued education of health professionals; and close monitoring of performance indicators. The Region accords the elimination goal high priority. With appropriate action and commitment, the Region expects to be able to eliminate measles before 2015.

21. The **South-East Asia Region** adopted the Global Immunization Vision and Strategy's global goal for measles mortality reduction. Routine immunization coverage for measles in the Region increased from 61% in 2000 to 75% in 2008 and the reported incidence of measles declined from 50 to 43 cases per million population over the same period (see Figure). The estimated number of deaths from measles in the Region 2000–2008 was reduced by 46%, from 234 000 to 126 000. All Member States, except India, achieved or exceeded the 90% mortality reduction target. However, the Region as a whole will not achieve the global goal until India fully implements the recommended strategies in the 10 states with the highest incidence of measles cases. Achievement of this is expected by 2013.

22. Member States agreed at a regional measles consultation (August, 2009) that measles elimination was technically, biologically and programmatically feasible before 2020. The Regional Committee will consider establishing a goal to eliminate measles by 2020 at its Sixty-third session in September 2010.

23. Key challenges include the need to vaccinate more than 1000 million more children than are currently receiving routine immunization; achieving and sustaining poliomyelitis eradication activities in poliomyelitis-endemic countries; undertaking studies to determine the immunogenicity and effectiveness of measles vaccine in settings with high population density and high birth rates; raising resources to meet the estimated additional costs of US\$ 2000 million, and the need to establish high standards of injection safety.

24. In 2003, the Regional Committee for the **Western Pacific** resolved to eliminate measles. Between 1997 and 2008, 195 million children and adolescents were vaccinated through supplementary immunization activities in 30 of 37 countries and areas in the Region and by 2008, regional coverage with the first dose of measles-containing vaccine had increased to 93% (see Figure).

25. Of the Region's 37 countries and areas, 25 (containing 4% of the regional population) have eliminated or nearly eliminated measles; six (containing 8% of the regional population) are likely to achieve elimination by 2012, and the remaining six¹ (containing the remaining 88% of the regional population) may also achieve elimination by 2012, but are likely to achieve elimination by 2015.

26. Recent commitments from China and Japan, the two countries which, in 2008, accounted for 82% of the Region's population and 97% of its measles cases, will bring the Region closer to achieving its elimination goal. China plans to conduct national supplementary immunization activities in 2010, targeting over 94 million children and adolescents. Japan is increasing routine two-dose measles coverage and conducting a five-year series of supplementary immunization activities. In order to achieve elimination by 2012, it is critical that political commitments at the highest level are attained; that two-dose measles vaccination coverage is sustained at 95% or more through a combination of routine services and supplementary immunization activities; and that high quality case-based measles surveillance is achieved, supported by an accredited laboratory network.

¹ China, Japan, Lao People's Democratic Republic, New Zealand, Papua New Guinea, Philippines.

NEXT STEPS

27. Measles eradication is achievable. One WHO region has sustained measles elimination for the past seven years and four of the five remaining WHO regions have set an elimination goal to be achieved by 2020 or earlier.

28. A major obstacle in many countries is the inadequacy of routine immunization and surveillance systems. These must be strengthened if regional measles elimination is to be achieved and maintained. Periodic follow-up supplementary immunization activities will also be needed to sustain high levels of population immunity.

29. The Secretariat has commissioned analytical work to reinforce the strengthening of immunization systems, and other areas that will support assessment of the economic aspects of measles eradication activities. The aim is to provide information resources that will support the provision of further advice by the Strategic Advisory Group of Experts on immunization, and by the governing bodies of WHO.

30. Global measles targets for 2015 are proposed as milestones towards global eradication of measles. These include achievement of the Global Immunization Vision and Strategy's goal to increase vaccination coverage as well as targets for reduction of incidence and mortality:

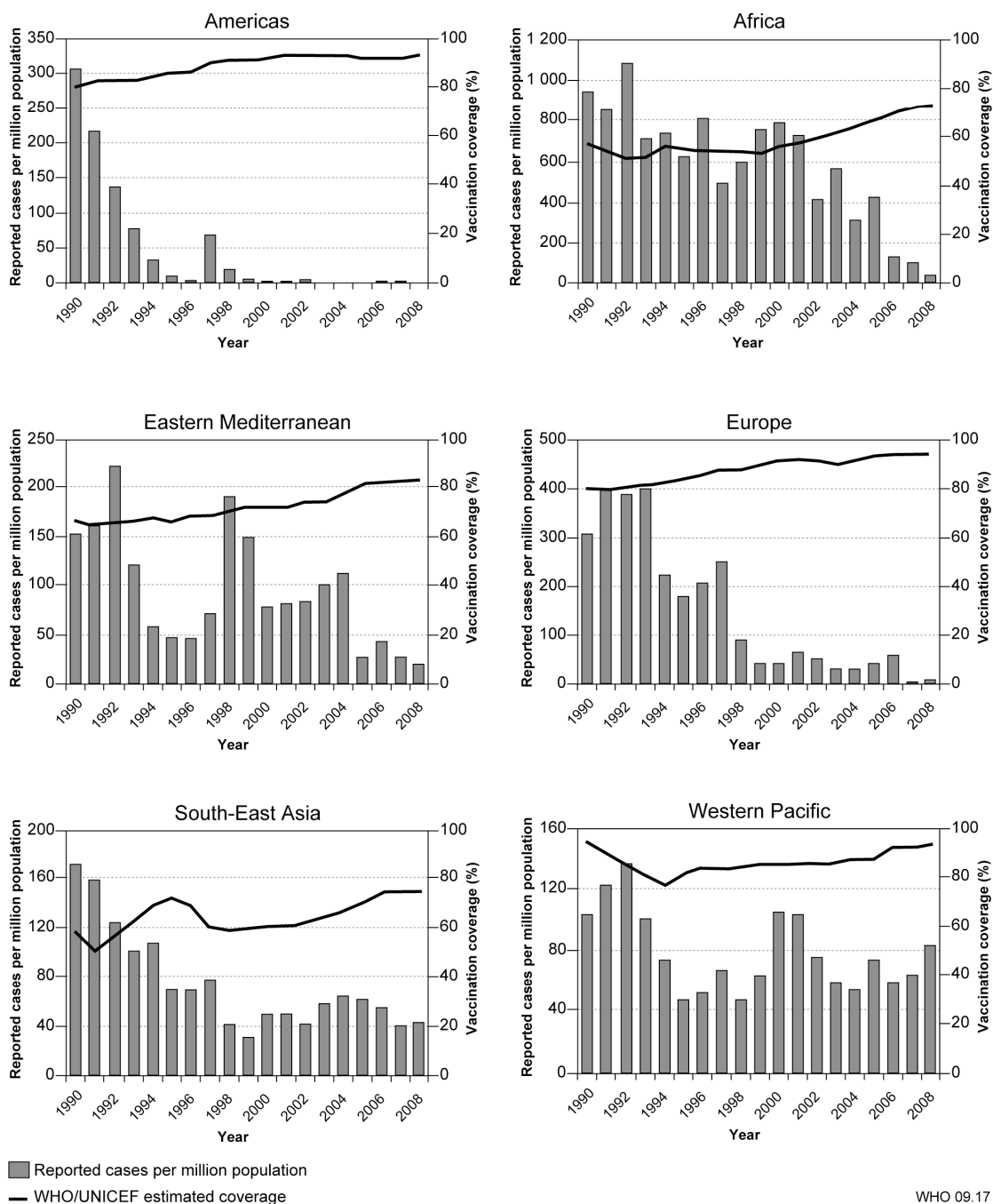
- exceed 90% coverage with the first dose of measles-containing vaccine nationally and exceed 80% vaccination coverage in every district or equivalent administrative unit;
- reduce annual measles incidence to less than five cases per million and maintain that level;
- reduce measles mortality by 95% or more as compared to 2000 estimates.

31. Achievement of these targets would reinforce the Global Immunization Vision and Strategy coverage goal. This is the basis for controlling other vaccine-preventable diseases and would lay the groundwork for a future measles eradication goal.

ACTION BY THE EXECUTIVE BOARD

32. The Board is requested to note the report, and provide comments and strategic direction for the establishment of the next global measles goal.

Figure
Reported measles incidence and first dose measles vaccination
coverage by WHO region, 1990–2008



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