

WHO/UNICEF Joint Annual Measles Report 2009

Strengthening Immunization Services through Measles Control



Table of Contents

Abbreviations and Acronyms	1
Executive Summary	2
1. Introduction.....	4
2. Progress towards measles mortality reduction.....	4
2.1 Progress towards mortality reduction in the African Region.....	7
2.2 Progress in the Eastern Mediterranean	8
2.3 Progress towards measles elimination, WHO European Region	8
2.4 Progress on measles in the WHO South-East Asia Region	9
2.5 Progress towards measles elimination, WHO Western Pacific Region...	10
2.6 Strategies to support the introduction of a second routine dose: 2009 SAGE recommendations.....	11
2.7 The next global goal.....	11
3. Summary of 2009 measles activities	12
3.1 Reaching high coverage with social mobilization by volunteers	14
3.2 Strengthening health systems	15
3.3 Integration with other child survival interventions.....	16
3.4 Strengthening routine immunization.....	17
3.5 Building stronger surveillance systems & a global laboratory network	18
3.6 Promoting injection safety and AEFI surveillance	20
4. Looking forward: Risk of measles resurgence requires renewed commitment to close funding gap	21
Annex 1: Measles and Measles-Rubella Bundled Vaccine Supplies Procured through UNICEF Supply Division.....	23
Annex 2: Key Measles Statistics 2000-2009.....	24
Annex 3: Core Partners and Contributing Organizations.....	25
Annex 4: The Feasibility of Measles Eradication.....	26

Abbreviations and Acronyms

AFR	African Region
AMR	Region of the Americas
ARC	American Red Cross
Catch-up	One-time vaccination campaign generally targeting children 9 M to 15 Y
CDC	US Centers for Disease Control and Prevention
EMR	Eastern Mediterranean Region
EPI	Expanded Programme on Immunization
EUR	European Region
Follow-up	Periodic vaccination campaign generally targeting children 9 M to 3-5 Y
GAVI	Global Alliance for Vaccines and Immunisation
GIVS	Global Immunization Vision and Strategy
IFRC	International Federation of Red Cross and Red Crescent Societies
IgM	Measles-specific immunoglobulin M
IVB	Department of Immunization, Vaccines and Biologicals, WHO
MCV	Measles containing vaccine
MDG	Millennium Development Goal
OPV	Oral polio vaccine
SEAR	South-East Asian Region
SIA	Supplemental immunization activity
UNICEF	United Nations Children's Fund
UNF	United Nations Foundation
VPD	Vaccine-preventable disease
WHO	World Health Organization
WPR	Western Pacific Region

Executive Summary

"So much has been achieved [in measles control] in the past several years thanks to the hard work and commitment of national governments and donors. But . . . there are signs of stalling momentum. This is a highly contagious disease that can quickly take advantage of any lapse in effort."

-Dr Margaret Chan, WHO Director-General.

At the height of global achievements in measles control to date, a sharp decline in commitments to fully implement measles mortality reduction strategies threatens to set back gains in measles control, and potentially prevent the achievement of the fourth Millennium Development Goal to reduce child deaths by two-thirds by 2015 compared with the level in 1990. The primary obstacles against continued progress include: 1) India, where 2/3 of global measles deaths occur, has not implemented the measles mortality reduction strategy, and 2) a lack of funds and low political commitment has delayed measles vaccination campaigns in Africa. The combined effect of these two factors may lead to a resurgence of measles deaths.

Without a doubt, great progress has been achieved. Measles supplemental immunization activities (SIAs) conducted in 2009 reached more than 73 million children across the world in 2009, with 95% of children (69 million) in countries that have received support from the Measles Initiative. While data is not yet available on routine immunization for 2009, over 107 million children received their first routine measles dose in 2008, which brought global routine coverage to a record level of 83%.

As a result of immunization activities, approximately 12.7 million measles deaths were averted during 2000-2008, which includes: 8.4 million deaths prevented by maintaining routine immunization coverage at the 2000 level and 4.3 million deaths prevented by accelerating immunization activities through increasing routine coverage and implementing measles vaccination campaigns. Most of the gains in reducing global measles deaths occurred between 2000 and 2006, as reflected by the quick rise in global measles vaccination coverage from 72% in 2000 to 81% in 2006. Coverage only improved 2% between 2006 and 2008. Reductions in incidence and mortality have, consequently, begun to level off.

The WHO/UNICEF Global Immunization Vision and Strategy established a global goal of reducing measles mortality by 90% by 2010 compared to levels in 2000. All regions, with the exception of South-East Asia, have achieved the measles mortality reduction goal two years ahead of target. Delayed implementation of large-scale vaccination campaigns in India, the country with the majority of measles deaths, is largely accountable for this lack of progress in South-East Asia, where regional measles mortality declined only 46% between 2000 and 2008.

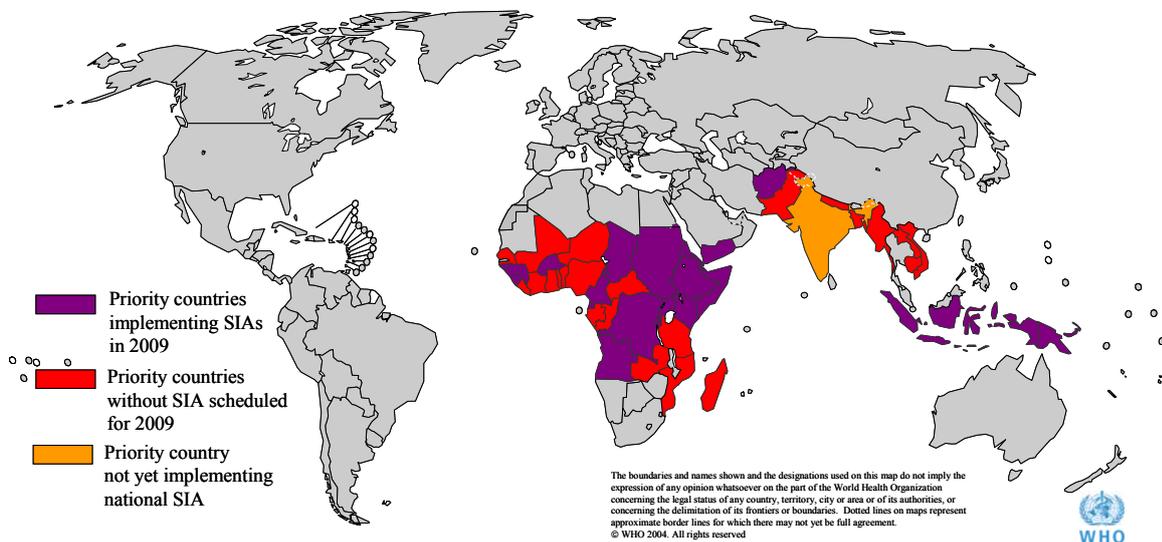
Global measles mortality has decreased by 78% from an estimated 733,000 deaths in 2000 to an estimated 164,000 deaths in 2008. Even the current reduced rate of 450 deaths a day, 300 of which occur in India, is still hundreds too many, however, for a disease that can easily be prevented.

In 2009, 27 of 32 (84%) SIAs in countries supported by the Measles Initiative combined measles vaccination with at least one other intervention used to improve child survival, such as vaccination against polio (OPV) or rubella, vitamin A, de-worming or long-lasting insecticide-treated nets (LLINs). The Measles Initiative, with other partners, supported the distribution of more than 3.9 million LLINs for malaria prevention, 13.3 million doses of deworming medicine, and more than 26.9 million doses of vitamin A. Additionally, more than 32 million children received OPV alongside their measles vaccinations during SIAs in 2009.

The WHO measles and rubella global laboratory network continued to provide standardized quality-controlled measles and rubella testing in 2009 to identify outbreaks and disease transmission patterns. The lab network supported testing for 183 Member States (95%) in 2008, compared with 71 (37%) in 2000. By 2008, 173 countries (90%) had also implemented case-based surveillance, compared with 120 (62%) countries in 2004. Case-based surveillance is more effective than the alternative aggregated surveillance method and is essential to understand how vaccination activities, or lapses in vaccination activities, affect measles transmission and mortality.

Three issues need to be addressed to achieve the 2010 goal:

1. **Funding:** With a funding gap of over \$106 million USD for activities planned in 2010-2011, less than 50% of funding has been secured to implement measles activities in priority countries in 2010. Despite innovative mechanisms among ministries of health to secure resources for immunization, some countries will have to delay measles SIAs unless donor support increases. This puts these countries at risk of outbreaks and increases the risk of importation for all countries.
2. **India:** The only country still relying on a single dose strategy at nine months of age plans to introduce a second dose of measles vaccination in most of the country in 2010-2011. Political commitment is critical to ensure timely and successful implementation.
3. **Strengthening routine immunization:** 60 countries have not yet introduced a second routine dose of measles vaccine. Six priority countries are currently eligible for, and expected to, introduce a second routine dose in 2011 and eight more are expected to become eligible by 2015.



Source: WHO/IVB database, January 2010

Figure 1: Of the priority countries supported by the Measles Initiative, 22 implemented SIAs in 2009, 24 did not have an SIA planned for 2009, and 1 had not yet implemented a national SIA

1. Introduction

Measles is one of the most contagious human diseases. In 1980, before the use of measles vaccine was widespread, there were an estimated 2.6 million deaths from measles worldwide. Because measles vaccination can avert such a large proportion of child deaths and routine vaccination coverage is considered a marker of access to health services, measles vaccination coverage was selected as an indicator of progress towards Millennium Development Goal 4 to reduce deaths among children overall by two thirds by 2015 compared with the level in 1990.¹

A partnership committed to reducing global measles deaths, the Measles Initiative, was launched in 2001. Formed by the American Red Cross, UNICEF, the United Nations Foundation, the U.S. Centers for Disease Control and Prevention, and the World Health Organization, the Measles Initiative provides technical and financial support to governments and communities for measles vaccination campaigns and disease surveillance. At the Sixty-first World Health Assembly in 2008, all Member States reaffirmed their commitment to achieving a 90% reduction in measles mortality by 2010 compared with 2000.²

Although there have been dramatic reductions in measles mortality between 2000 and 2008, the reduction in mortality began to level off after 2006. Increasing political and financial support is critical to reach global disease control goals.

The resources provided by the Measles Initiative partners have been pivotal in priority countries that had the highest burden of measles in 2000. The Initiative secures the financial resources required to implement activities through joint resource mobilization efforts. In 2009, the Initiative provided more than US\$ 20 million for measles campaigns and surveillance in 32 countries. Since its inception, over US\$ 693 million has been devoted to measles control through the Initiative.

The 2009 Annual Report outlines the activities that have been implemented during the period January to December 2009 with the support of the Measles Initiative in the context of overall progress towards the GIVS measles mortality reduction goal (See Annex 1 for measles mortality reduction goals and WHO/UNICEF measles mortality reduction strategy).

2. Progress towards measles mortality reduction

The WHO–UNICEF accelerated strategy for reducing measles mortality focuses on countries where the burden of measles is highest. The strategy aims to (i) achieve and maintain high coverage ($\geq 90\%$ nationally and $\geq 80\%$ in each district) of 2 doses of measles-containing vaccine (MCV) delivered through routine services and SIAs, (ii) implement effective laboratory-supported disease surveillance, and (iii) provide appropriate clinical management for measles cases.

Cumulatively, approximately 12.7 million measles deaths were averted during 2000–2008 as a result of immunization activities; maintaining routine immunization coverage at the 2000 level averted an estimated 8.4 million (66%) of these deaths and accelerating immunization activities by increasing routine coverage and implementing measles SIAs averted an additional 4.3 million (33%) estimated deaths.

While five regions have achieved the 90% mortality reduction target two years ahead of schedule, improvement in measles vaccination in the South-East Asia region is urgent, as 77% of the total estimated global measles deaths in 2008 occurred in this region, largely in one country - India. South-

¹ *The Millennium Development Goals report 2009*. New York, United Nations, 2009 (http://mdgs.un.org/unsd/mdg/Resources/Static/Products/Progress2009/MDG_Report_2009_En.pdf, accessed 18 November 2009)

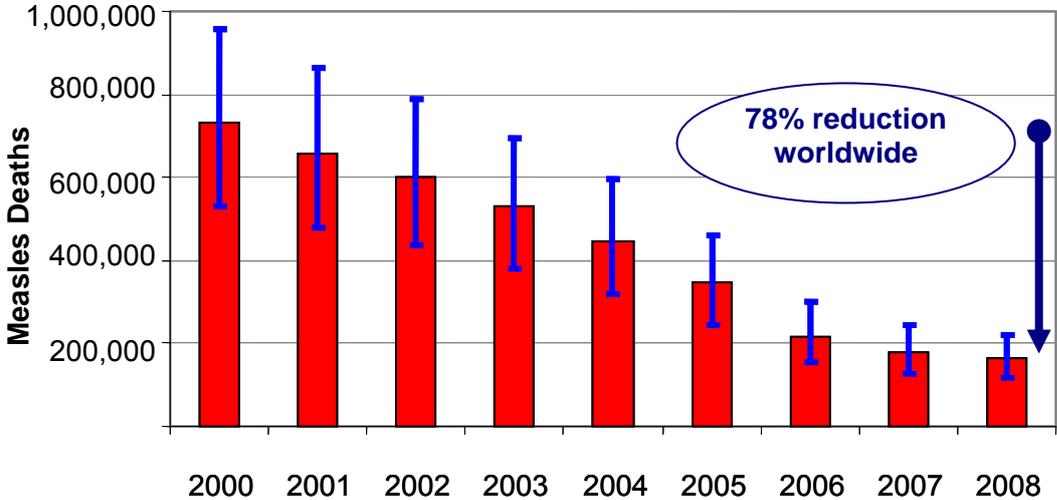
² *GIVS: Global Immunization Vision and Strategy 2006–2015*. Geneva, World Health Organization and UNICEF, 2005. (Available at http://www.who.int/vaccines-documents/docspdf05/givs_final_en.pdf.)

East Asia contributed to 19% of the global reduction in measles deaths since 2000, which is a substantial achievement due to the large population of this region. However, given the high levels of measles mortality in 2000, this progress is still inadequate and equivalent to only a 46% regional drop in measles mortality. All other regions have achieved close to double this mortality reduction and experience within South-East Asia indicates that the measles mortality reduction goal can be achieved with the WHO-UNICEF recommended strategy (i-iii above) and sustained if the strategy is fully implemented.

Global mortality attributed to measles declined by 78% over the past 9 years, from an estimated 733,000 deaths in 2000 to 164,000 in 2008, but the reduction in measles incidence and mortality began to level off after 2006 (Table 1, Fig. 2). A considerable decline in funding for measles-control activities has delayed SIAs that are needed in 2010 in a number of countries. Experts have predicted that the continuation of this downward trend in funding would result in a resurgence in deaths from measles, which could slow global progress towards achieving Millennium Development Goal 4. Widespread measles outbreaks across southern Africa at the beginning of 2010 corroborate the gravity of these concerns.

To overcome stagnating vaccination coverage achieved through routine services and SIAs and the consequent levelling off of measles mortality reduction, three key factors must be addressed: (i) political and financial commitments to measles control in many of the countries with the highest burden has been declining, (ii) the strategy for accelerating the reduction of measles mortality has not been implemented in India, and (iii) routine immunization systems have not been reinforced by introducing a second routine dose of measles vaccine among 60 countries. Six priority countries are currently eligible for and expected to introduce a second routine dose in 2011 and eight more are expected to become eligible by 2015.

Figure 2: Estimated number of measles deaths --- worldwide, by year, 2000-2008¹



Source: WHO/IVB, data as of September 2009

Table 1 Coverage of the first-dose of measles-containing vaccine administered through routine immunization services among children aged 1 year,^a and estimated number of deaths from measles, by WHO region, 2000 and 2008

WHO region	2000		2008		Decrease in measles deaths 2000–2008	% of estimated global decrease in measles deaths attributable to region or priority countries
	% coverage with first- dose of measles- containing vaccine	Estimated number of measles deaths (uncertainty bounds) ^b	% coverage with first- dose of measles- containing vaccine	Estimated number of measles deaths (uncertainty bounds) ^b	Number (%)	
African	56	371 000 (270 000–483 000)	73	28 000 (19 000–40 000)	343 000 (92)	60
Americas ^d	92	< 1000 ^c	93	<1000 ^c	–	–
Eastern Mediterranean	72	101 000 (75 000–131 000)	83	7 000 (5 000–10 000)	94 000 (93)	17
European ^d	91	<1000 ^c	94	<1000 ^c	–	–
South-East Asia	61	234 000 (169 000–309 000)	75	126 000 (90 000–168 000)	108 000 (46)	19
Western Pacific	85	25 000 (17 000–35 000)	93	2 000 (1 000–4 000)	23 000 (92)	4
Total	72	733 000 (530 000–959 000)	83	164 000 (115 000–222 000)	569 000 (78)	–
47 priority countries	58	709 000 (517 000–925 000)	74	160 000 (112 000–215 000)	549 000 (81)	96

^a WHO–UNICEF estimates are available at http://www.who.int/immunization_monitoring/routine/immunization_coverage/en/index4.html.

^b Uncertainty bounds are based on Monte Carlo simulations that account for uncertainty in key input variables (that is, vaccination coverage and case-fatality rates).

^c The static natural history model is not sufficiently precise at low incidence levels.

2.1 Progress towards mortality reduction in the African Region¹

In 2000, >50% of the estimated global burden from measles mortality occurred in WHO's African Region. By the end of 2008, the estimated number of measles deaths in the region had decreased by 92% compared with 2000, following implementation of the WHO/UNICEF measles mortality reduction strategy. All except 6 countries in the region have established case-based surveillance for measles and 24 of these 40 countries met at least one of the primary performance indicator targets for adequate measles case reporting rates and high surveillance sensitivity in 2008.

SIAs continue to be conducted throughout the region and routine MCV1 coverage has improved by 17% from 56% in 2000 to 73% in 2008. Following the achievement of the 90% measles mortality reduction goal at the regional level, deaths from measles continue to occur and greater progress in measles control is both needed and feasible in the region. The African Regional Measles Technical Advisory Group has recommended several pre-elimination targets. These include reducing measles deaths by 98% by 2012 when compared with 2000 estimates, achieving >95% SIA coverage in all districts, and attaining the targets for the 2 main indicators of measles surveillance performance. The advisory group also recommended that countries in the region consider introducing a second routine dose of measles vaccine if MCV1 coverage has reached >80% for at least 3 consecutive years and 1 of the 2 measles surveillance indicator targets have been achieved for ≥ 2 years.

To achieve the regional pre-elimination targets, further efforts are needed to (i) increase MCV1 coverage in all countries and in each district, (ii) continue periodic SIAs that achieve high coverage in all districts, (iii) routinely monitor and validate reported routine and SIA coverage, (iv) strengthen case-based surveillance for measles in all districts, and (v) increase political and financial support of national governments. Much work remains to both sustain the gains made in controlling measles in many areas and to extend this level of success to all segments of the population in each country.

Zimbabwe: measles reappearing?

From 2006 to mid 2009, Zimbabwe prevented large measles outbreaks by giving children one dose of measles vaccine through routine services and one through SIAs. Routine services have suffered, however, from on-going political and economic troubles. Poor government remunerations have forced many health workers to seek alternative sources of employment and contributed to a lack of training for the new health workers and medical officers saddled with managing district health teams. While no outbreaks were reported between SIAs, the effects of diminishing MCV1 coverage in recent years and variable district-level campaign coverage have been difficult to assess. A weakened surveillance system makes underreporting likely and Zimbabwe was classified in 2008 as a country at risk for outbreaks, with a large unvaccinated population that included close to 155,000 children.

The integrated measles SIA implemented in June 2009 was the first opportunity for children under five in many villages to receive immunization services. Some mothers reported that their infants could not receive any immunizations before the SIA because health centres were out of stock of vaccines or health workers were absent. During the campaign, health workers also provided polio vaccine, vitamin A, and overdue routine vaccine doses for children that had missed other scheduled antigens.

Logistical constraints were the primary challenge of the 2009 SIA. Fuel shortages delayed supply delivery and postponed outreach sessions. The combined efforts of Zimbabwe's Ministry of Health, UNICEF, and WHO were, however, eventually able to reach 1.4 million children after a campaign extension. About 1,782 vaccination teams, comprised of 9,626 health workers and 5,918 volunteers, reached a reported 92% of eligible children. Tragically, this SIA was unable to reach some religious groups opposed to vaccination, which, combined with the country's growing history of suboptimal routine vaccination coverage across all groups, permitted an outbreak to take hold by December 2009 when 81 cases were confirmed. By March 2010, 110 child deaths due to measles had been reported.

¹ See <http://www.who.int/wer> for a complete summary.

2.2 Progress in the Eastern Mediterranean

In 1997, the 22 countries of the WHO Eastern Mediterranean Region (EMR) resolved to eliminate measles from the region by 2010. The global goal 90% reduction in measles mortality by 2010 has been achieved at the regional level, with 84% routine measles vaccination coverage in 2008, and some countries are close to elimination. Six countries have reported less than 1 case per million in the presence a high-performing surveillance system, including Bahrain, Jordan, Iran, Oman, Palestine and Tunisia. At the same time, the region saw a resurgence in measles cases in some countries in 2009 due to outbreaks in Iraq, Afghanistan, Somalia, South Sudan and Pakistan. The number of reported measles cases increased at the regional level from 11,600 cases in 2008 to approximately 16,800 cases in 2009.

SIAs were conducted in Egypt, Iraq, Yemen and Somalia in 2009 to reduce the build-up of susceptible children and 19 countries are now providing two routine doses of measles vaccine. All countries report measles and rubella data to the WHO EMR office on a monthly basis and case-based measles surveillance has been established in 19 countries. The regional laboratory network has made considerable progress by expanding and completing establishment of a national measles/rubella laboratory (NML) with full serology capacity in all 22 countries in the Region in 2009. Continued support to strengthen surveillance systems is needed, however, now that all countries have completed their catch-up campaigns and awareness of the disease could falter.

Measles outbreaks are still occurring in the Region and some of these necessitate outbreak response immunization and SIAs targeting high-risk and difficult-to-reach groups. These localized SIAs are needed to reach refugees from Afghanistan in Iran, Roma migrants in Jordan, nomads and refugees from Chad in Libya, and refugees in Syria, among other populations.

2.3 Progress towards measles elimination, WHO European Region¹

In 2007 and 2008, measles incidence declined to a historical low of <10 cases/1,000,000 population in the European Region. Routine first dose immunization coverage reached a high of 93–94% in 2005–2008, up from 90–91% in the 2000–2004 period. Variation in progress across the region, however, illustrates that a number of challenges to achieving elimination remain. The European Region's target of >95% coverage with MCV1 was reached by only 32 countries (60%). The three principal barriers that must be overcome to sustain and increase immunization coverage and eventually achieve elimination are: (i) pockets of suboptimal immunization coverage due to culture and belief systems regarding vaccination or vulnerable populations, which has led to continued outbreaks and the resurgence of indigenous measles in some western European countries; (ii) setbacks in the implementation of SIAs in Eastern Europe; and, (iii) lack of access to health care services due to health systems reform, geographic location, and inadequate support from paediatricians.

Measles elimination in the European Region is achievable, as has been demonstrated by countries which have been free of indigenous measles for years by maintaining high routine coverage (e.g. Finland).

Measles-Rubella Vaccine Introduced in Tajikistan, 97% Coverage Achieved

Tajikistan introduced measles-rubella vaccine in 2009 through a campaign that reached 2,267,724 children at over 5,000 immunization posts staffed by 1,835 fixed site vaccination teams and 88 mobile vaccination teams. Over 97% of targeted children were reached for the first time with rubella-containing vaccine. As recommended for the introduction of new routine vaccinations, routine MR was introduced in the National Plan of Immunization following the campaign in November and is scheduled for 1 and 6 year-old children, corresponding with Tajikistan's population immunity profile. Tajikistan will also offer MR vaccination to women in child bearing age from 2010 onwards.

Adapted from: SIA Technical report, Dr. M. Balasanyan, WHO, Tajikistan

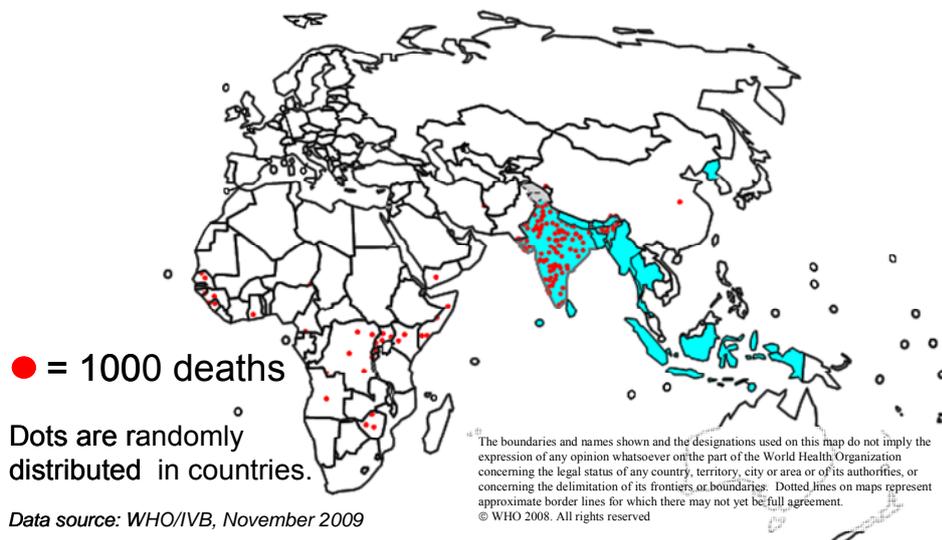
¹ See <http://www.who.int/wer> for a complete summary of progress in the European region.

2.4 Progress on measles in the WHO South-East Asia Region

The South-East Asia Region (SEAR) has a goal of 90% reduction in measles mortality by 2010 in comparison to 2000 estimates, which was estimated to have been achieved by all countries in the region except India by 2008. Including India, overall regional mortality reduction only reached 46%, with routine measles coverage up to 75% by 2008 from 61% in 2000. Bhutan, DPR Korea, Maldives, Thailand and Sri Lanka currently provide a second dose through routine immunization services in all districts and nine countries (82%) conduct case-based surveillance for measles supported by the regional measles/rubella laboratory network, which has 18 accredited laboratories. Despite this significant region-wide achievement in measles control, the 90% mortality reduction goal will not be achieved by 2010 unless India fully implements the WHO/UNICEF recommended strategies for measles control (more details below.)

At a regional measles consultation in New Delhi in August 2009, all participating Member States agreed that regional measles elimination was technically, biologically and programmatically feasible and 10 of 11 countries in the region agreed that elimination could be achieved by 2020. The 62nd session of the Regional Committee reviewed the status of regional measles control and placed the proposed goal to eliminate measles by 2020 on the agenda for its 63rd session in September 2010.

Figure 3: Measles mortality in South-East Asia accounted for ¾ of all measles deaths in 2008



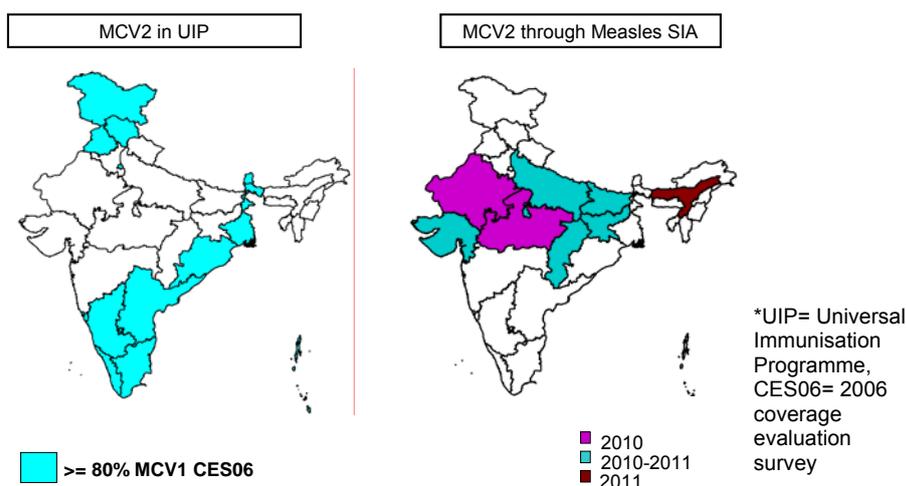
Progress on measles in India

Of the 47 measles priority countries identified in 2000 by WHO and UNICEF, 46 countries had conducted a nation-wide catch-up campaign by the end of 2009, the exception being India. Based on MCV1 coverage, which is currently only 70% nationally and varies widely among states (47% in Uttar Pradesh and 99% in Goa), there were between 60,000 and 120,000 estimated measles deaths in India in 2008 that could have been prevented by vaccination. India's National Technical Advisory Group on Immunization met in August 2009 to review plans to improve measles control and reinforced earlier recommendations to introduce a second dose of measles vaccine in India, through SIAs or routine services depending on state-level first routine measles dose coverage (see map below.) The Government of India also held a consultation meeting with immunization program managers from 18 states in September 2009 to discuss MR vaccine introduction.

Efforts have been scaled up to alleviate fears among the Indian public health community that measles SIAs would disrupt routine services and increase the number of AEFI cases. The journal *Indian Pediatrics* released a special edition with a focus on measles and advocacy has included:

- WHO held a Regional Consultation on measles in South-East Asia (SEAR) in 2009, prompting the Government of India to present its measles mortality reduction plan.
- The Public Health Foundation of India held a round table expert consultation on measles.

Plans to Introduce Measles Second opportunity



"Three out of four children who died from measles in 2008 were in India. India's plan to scale up its measles vaccination campaign in many parts of the country is very encouraging."

-Ann M. Veneman, UNICEF Executive Director.

2.5 Progress towards measles elimination, WHO Western Pacific Region¹

Of the 37 countries and areas in the Western Pacific Region, 24 have achieved or nearly achieved elimination, including the Republic of Korea, Australia, and all Pacific Island countries. Excluding China, reported confirmed measles cases in the region decreased 86%, from 106,172 in 2000 to 14,724 in 2008. In 35 of the 37 countries, MCV1 coverage has increased from 81% during 1990-1995 to 92% during 2003-2008 and as of 2008, 30 countries had introduced a second routine dose.

All countries in the region conduct case-based measles surveillance, supported by the measles and rubella laboratory network. The sensitivity of reporting suspected measles cases, however, needs improvement in some countries that track surveillance performance and others need to begin monitoring national surveillance performance.

Key countries with weak surveillance and routine coverage inadequate to meet the region's 2012 elimination goal include Cambodia, the Lao People's Democratic Republic and Papua New Guinea. Challenges also exist in China and Japan, which contain 82% of the region's population. During 2008, over 140,000 measles cases were confirmed in just these two countries. However, both have made new commitments to achieving the 2012 regional elimination goal. China will conduct its first nation-wide SIA in 2010 and has already produced over 100 million doses of measles vaccine for what is expected to be the world's largest vaccination campaign ever conducted. Japan has begun implementing a National Measles Elimination Plan that includes a five-year rolling SIA for 13 and 18 year-olds.

Key WHO strategies for achieving measles elimination:

- (i) Maintaining a high rate of vaccination coverage (95%) with 2 doses of measles-containing vaccine through routine immunization or SIAs, or both,
- (ii) Maintaining sensitive and timely case-based measles surveillance, and
- (iii) Providing access to an accredited measles laboratory network for testing suspected measles cases and identifying measles virus genotypes.

¹ See <http://www.who.int/wer> for a complete summary of progress in the Western Pacific.

2.6 Strategies to support the introduction of a second routine dose: 2009 SAGE recommendations

In April 2009, the Strategic Advisory Group of Experts (SAGE), the principal advisory group to WHO for vaccines and immunization, reviewed key findings of the Working Group on Measles on strategies for providing two doses of measles vaccine to every child. Adding a second routine dose to immunization schedules, while continuing SIAs, can improve disease control for one or more of the following reasons: 1) to slow the accumulation of susceptible children and thereby allow lengthening of the inter-campaign interval; 2) to gradually decrease reliance on SIAs and eventually stop SIAs once high population immunity (>95%) can be maintained with a routine two dose schedule alone; and 3) to establish a well-child visit in the 2nd year of life.

The key conclusions to support implementation of two-dose schedules were published in the 2009 WHO position paper on measles vaccines and included:

- **Criteria for starting routine MCV2:** MCV2 may be added to the routine immunization schedule in countries that have achieved > 80% national MCV1 coverage for three years. Countries that do not meet this criterion should instead prioritize improving MCV1 coverage and conducting high quality follow-up SIAs.
- **Optimal timing of routine MCV2:** Where MCV1 is given at 9 months of age, routine MCV2 should be administered at 15-18 months of age. In countries with very low measles transmission and MCV1 administered at 12 months, the optimal age, between 15-18 months and school entry, for routine MCV2 depends on programmatic considerations.
- **Criteria for stopping follow-up campaigns:** In countries with moderate to weak health systems, regular measles immunization campaigns can protect children who do not have access to routine health services. Cessation of SIAs should only be considered when greater than 90-95% routine vaccination coverage has been achieved at the national level for both the first and second doses for a period of 3 consecutive years. Before stopping SIAs, a review should be conducted by a national committee to examine vaccination and surveillance programme performance, population immunity, and a variety of epidemiologic factors (for more information, see <http://www.who.int/wer/2009/wer8435.pdf>.)

After these SAGE recommendations were established in April 2009, applications for funding support to introduce MCV2 were submitted by Zambia and Ghana to the Global Alliance for Vaccines and Immunization (GAVI). While both received conditional approval, suspension of GAVI funding until June 2010 has unfortunately delayed these important activities.

2.7 The next global goal

Because five regions have already reached the 90% measles mortality reduction goal by 2009, efforts to establish the next measles control target are under-way. A range of options, including 95% measles mortality reduction by 2015 compared to 2000 levels, are being evaluated. The long-term feasibility of measles eradication is being assessed in detail with support from the Bill and Melinda Gates Foundation (see Annex 4 for details on this body of work.) While the benefits of eradication for child survival are well accepted, the substantial financial and political investment that would be required needs careful examination. Progress on the assessment of the long-term feasibility of measles eradication and the next measles mortality reduction goal were reviewed by the Executive Board in January 2010 and will be discussed at the World Health Assembly in the May 2010.

3. Summary of 2009 measles activities

Measles campaigns were conducted in 32 priority countries in 2009. Over 73 million children and adolescents were reached across the world and most children, 69 million of which were in countries that have been supported by the Measles Initiative. In 27 of 32 countries, children were also offered vaccinations against polio or rubella or other interventions such as vitamin A, deworming medication, and long-lasting insecticide-treated nets (LLINs) when they received measles vaccine. The measles and rubella laboratory network continued to support optimal measles control and increased capacity in 2009 through regional and country-level training workshops, technical support in five regions, and expansion of the number of laboratories participating in the network.

Key Events in 2009

April - The regions of the Americas and Europe united to vaccinate millions of children, adults and seniors in 80 countries and territories. Vaccination campaigns against measles, influenza, rotavirus, rubella and yellow fever were combined with advocacy and social outreach activities to boost awareness of the importance of immunization.

May - At the 125th session of the WHO Executive Board, Member States supported goals to eliminate measles, encouraged by the regional progress in measles mortality reduction, the success in the Americas and the cost-effectiveness of vaccination. Cognizant of the challenges ahead, Member States mentioned the importance of maintaining high routine vaccination coverage, funding gaps, and the need to do more in the South-East Asia Region.

August - WHO issued a position paper on measles vaccines in routine immunization programmes, setting the standard that all children should be vaccinated with two doses of measles vaccine, administered through routine services or periodic campaigns.

A regional consultation on measles in South-East Asia took place in New Delhi in August to establish consensus on a measles elimination goal in the South-East Asia Region of WHO. During the consultation, 10 of 11 countries in the region agreed that elimination could be achieved by 2020.

December - The Measles Initiative announced that measles deaths worldwide fell 78% since 2000, from an estimated 733,000 in 2000 to 164,000 in 2008. Global immunization experts warned that resurgence in measles deaths is likely if vaccination efforts are not sustained.

Evidence so far suggests that measles activities in 2009 were able to maintain the level of control seen in 2008. The underlying risk of outbreaks has risen, however, and the virus will quickly spread if the obstacles identified during activities in 2009 are not carefully managed. Recent reports from countries suggest that many problems could be avoided if support is strengthening by increasing:

1. Political commitment and leadership
2. Country financial support
3. Demand for vaccination among parents

Table 2: 2009 measles SIAs and integrated interventions among countries supported by the Measles Initiative*

Country	Routine measles coverage estimate for 2008	Target age group	Extent	Reached	Coverage	OPV	Vitamin A	LLINs	Deworming	TT/dT	Rubella	Other*
WHO African Region												
1. Angola	79%	9-59 M	National	3,469,806	101%	√	√		√	√		
2. Botswana	94%	9-59 M	National	195,841	115%		√					
3. Burkina Faso*	75%	1-14 Y	Outbreak response	3,813,867	104%							
4. Burundi	84%	6-59 M	National	1,321,915	95%		√	√*	√			
5. Cameroun	80%	12-59 M	National	3,315,076	96%	√	√		√			
6. Cape Verde	96%	12-59 M	National	41,703	87%	√						
7. Chad	23%	6-59 M	National	1,782,689	93%	√						
8. DRC	67%	6-59 M	Sub-national	2,412,168	93%	√	√		√			
9. Equatorial Guinea	51%	12-59 M	National	70,500	80%	√	√		√	√		
10. Eritrea	95%	9-47 M	National	285,285	82%	√	√					√
11. Ethiopia	74%	6-59 M	Sub-national	266,621	65%	√						
12. Guinea	64%	9-59 M	National	1,977,225	101%		√	√	√			
13. Guinea-Bissau	64%	9-59 M	National	243,099	101%		√		√			
14. Kenya	90%	9-59 M	National	5,525,400	82%	√	√					
15. Namibia	73%	9-59 M	National	298,025	102%	√	√					
16. Rwanda	92%	9-59 M	National	1,350,125	101%	√	√		√			
17. Sierra Leone	60%	9-59 M	National	829,842	101%	√	√		√			
18. Swaziland	95%	9-47 M	National	87,592	96%		√		√			
19. Uganda	68%	9-47 M	National	4,894,484	104%	√		√				
20. Zimbabwe	66%	9-59 M	National	1,408,584	92%	√	√					
Regional sub-total			33,589,847									
WHO Eastern Mediterranean Region												
21. Afghanistan	75%	9-36 M	National	3,000,777	106%	√				√		
22. Egypt	92%	2-11 Y	National (2 nd phase)	17,843,811	99%							
23. Somalia	24%	9-59 M	National (2 phases)	1,186,684	83%	√	√		√			√
24. S. Sudan	43%	6-59 M	Sub-national	291,369	65%		√	√	√	√		
25. Yemen	62%	9-59 M	National	3,246,804	96%	√	√					
Regional sub-total			25,569,445									
WHO European Region												
26. Tajikistan	86%	1-14 Y	Sub-national	2,334,301	97%							√
Regional sub-total			2,334,301									
<p>Source: Country SIA technical reports as of 15/3/2010. ALL DATA SUBJECT TO CHANGE. Other includes mid-upper arm circumference (MUAC), iron folate, ORS, aquatab, or routine antigens. *Notes: Burkina Faso: 31/63 districts implemented outbreak response vaccination, <i>not funded by the Measles Initiative</i>. Burundi: LLINs distributed in 7 out of 17 provinces</p>												

Table 2 (contin): 2009 measles SIAs among countries supported by the Measles Initiative*

Country	Routine measles coverage estimate for 2008	Target age group	Extent	Reached	Coverage	OPV	Vitamin A	LLINs	Deworming	TT/dT	Rubella	Other*
WHO Southeast Asia Region												
27. Indonesia	83%	9-59 M	Sub-national*	1,774,352	90%	√	√			√		√
28. Timor Leste	73%	9-59 M	National	126,823	76%		√			√*		√
Regional sub-total			1,901,175									
WHO Western Pacific Region												
29. China	94%	8 M-14 Y	Sub-national	5,008,565	98%							
30. Papua New Guinea	54%	6 M-6 Y	National	945,582	86%							
31. Solomon Is.	60%	12-59 M	National	59,790	90%		√		√			
32. Kiribati	72%	12-59 M	National	9,865	98%							
Regional sub-total			6,023,802									
GLOBAL TOTAL			69,418,570									
<p>Source: Country SIA technical reports as of 15/3/2010. ALL DATA SUBJECT TO CHANGE. Other includes mid-upper arm circumference (MUAC), iron folate, ORS, aquatab, or routine antigens. *Notes: SIA in Indonesia implemented in Aceh, North Sumatra and North Maluku and TT given in 2 districts.</p>												



Immunization card screening, Zimbabwe (Photo credit: E. Simons, WHO)



Volunteers help out at a SIA in Sierra Leone, 2009 (Photo credit: M. Gacic, WHO)

3.1 Reaching high coverage with social mobilization by volunteers

Social mobilization is often cited by program managers as the most important factor in achieving high coverage. At the community level, this requires large numbers of people. Most vaccination programs rely heavily on volunteers to raise awareness of the campaign through house-to-house visits, communicate the importance of vaccination at schools and gatherings, and identify vulnerable and hard-to-reach populations in their areas. In 2009, volunteers made up over 40% of the work force for measles vaccination campaigns among the 13 countries reporting data (Table 3.)

In addition to engaging and involving the community in measles vaccination and pre-registering children for the campaigns, volunteers are essential on vaccination days to manage crowds, screen vaccination cards, record immunizations and other interventions, and hand out non-vaccine materials like LLINs. Volunteers sometimes also conduct rapid coverage assessments to identify un- or under-immunized groups that can then be targeted with mop-up vaccination activities.

Without these efforts to bring all eligible children to vaccination posts, SIAs could not achieve the high levels of coverage, particularly among marginalized communities, and, consequently, the equitable distribution of resources that mark the success of this vaccination strategy. Volunteers may be teachers, routine community health program volunteers, or members of the numerous organizations that support vaccination campaigns, such as national Red Cross and Red Crescent societies, the Church of Jesus Christ of Latter-day Saints (LDS), Save the Children, the Peace Corps, and World Vision, and other NGOs (see box below for examples of other organizations).

In addition, funds for the volunteers' social mobilization activities come from their respective organizations and represent a cost savings to the government. For example, the Kenya Red Cross Society was responsible for social mobilization in 51 of 78 districts in Kenya. They also lent 51 vehicles during the campaign to deliver vaccine and vaccinators to immunization posts. The cost of this effort was supported directly by the American Red Cross.

Table 3: Number of volunteers and health workers implementing measles SIAs in 2009*

Country	Volunteers	Health workers
Afghanistan (phase 1)	>3,000	>3,000
Afghanistan (phase 2)	7,626	11,439
Cameroon	10,093	16,293
Chad	3,080	2,944
Eritrea	1,156	1,734
Ethiopia	2,008	NA
Rwanda	10,545	4,218
Solomon Islands	132	362
Somalia (phase 3)	3,177	1,898
Swaziland	4,896	1,133
Tajikistan	248	5,000
Timor Leste	1,665	1,033
Yemen	300	17,194
Zimbabwe	5,918	9,626
Total	50,844	72,874

**Note: This data only represents a small sample of volunteer participation. Sources include country SIA technical reports, LDS, and ARC.*

Table 4: Examples of affiliation of SIA volunteers in priority countries, where data is available*

Country	Number of volunteers by affiliation
Angola	560 Red Cross
Botswana	179 LDS
Burundi	2,614 Red Cross
Cape Verde	600 LDS
Kenya	670 LDS 5,825 Red Cross
Namibia	200 LDS 150 Red Cross
Rwanda	1,172 Red Cross 6,327 community health volunteers
Sierra Leone	585 LDS 350 Red Cross
Solomon Islands	24 Red Cross 81 Save the Children 27 World Vision
Swaziland	153 LDS 240 Red Cross 4,743 Other
Tajikistan	800 Red Cross
Timor Leste	135 Red Cross 1,545 Family Health volunteers
Uganda	520 LDS 4,000 Red Cross

Examples of organizations partnering to enhance measles vaccination activities in 2009 (not exhaustive)

- | | |
|---|--|
| The Access Project (Rwanda) | Rotary International |
| Afar People Development Association (Ethiopia) | Save the Children |
| AUSAID | Timor-Leste Integrated Health Assistance |
| The Church of Jesus Christ of Latter-day Saints | UNICEF |
| Eritrean Women's Association | USAID |
| Eritrean Youth & Students Associations | Vision Eritrea |
| Helen Keller International | WHO |
| MSF | World Vision |
| IntraHealth International (Rwanda) | Yemen Ministry of Widows |
| Red Cross and Red Crescent Societies | Yemeni Youth Association |

3.2 Strengthening health systems

Measles campaigns support health systems through micro-planning, training of health workers, supplementing and maintaining cold chain equipment, improving waste management systems, reinforcing injection-safety standards, strengthening disease surveillance systems and promoting the use of surveillance

data for programme management. The same health workers involved in providing routine immunization and health services are the health workers that implement campaigns, usually in the catchment areas of their health facilities.

Micro-planning determines population access to immunization, develops strategies on how to provide services to hard-to-reach populations, enhances health worker understanding of access to health facilities in their catchment area, and often serves as the basis for micro-planning for routine services. The micro-planning process enhances access to health services through health worker mapping of the community locations, identification of underserved and hard-to-reach groups, and estimation of the number of children within the age ranges targeted for vaccination. A work schedule is developed for every team so that the entire target population can be reached within the campaign days or weeks and the maximum immunization coverage can be achieved. In addition to this training on logistics, the health workers are provided with training on injection safety and vaccine supply management during the SIA planning period.

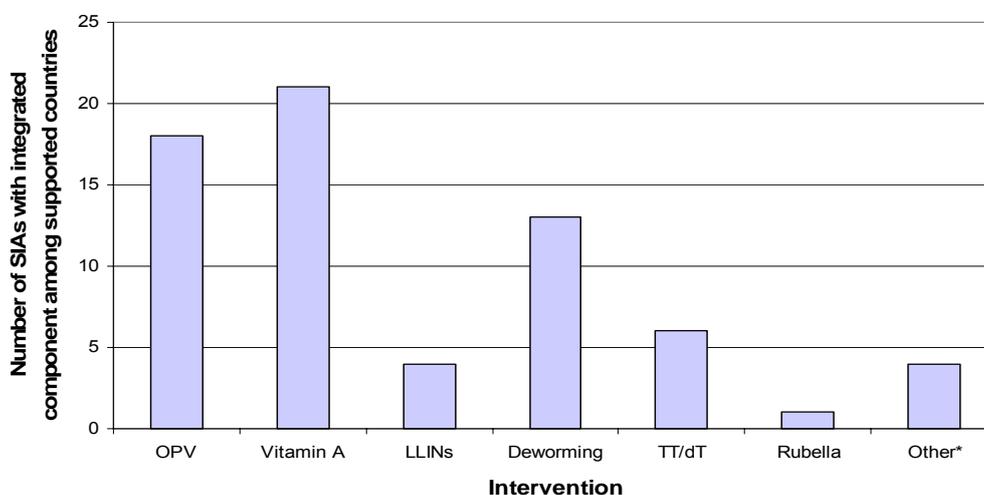
Poorly functioning cold-chain systems (e.g. cold rooms and refrigerators for vaccine storage, cold boxes and vaccine carriers) are a major constraint in many countries. Measles campaigns provide the opportunity to expand, replace, and repair cold-chain equipment. Furthermore, the waste management system is reviewed during preparations for the campaign and incinerators are built to expand waste management capacity when resources allow.

3.3 Integration with other child survival interventions

Integration of critical health interventions is one of the four strategic areas of the Global Immunization and Vision Strategy. Though integration of multiple interventions with measles campaigns may in some instances cause additional stress on transportation systems and health workers' time, a variety of studies have concluded that integrated campaign packages save more lives and adequate planning can manage formidable logistical challenges. Integrated activities are now common practice and in several regions, annual or multi-annual intensification of routine immunization is increasingly being utilized to combine the effects of broad social mobilization, like that used for SIAs, with a spectrum of health interventions in order to bolster the reach of the routine health system.

The distribution of long-lasting insecticide-treated nets (LLINs), vitamin A supplementation, and OPV are supported by a number of agencies and new opportunities for integration are evaluated on an on-going basis. In 2009, the Measles Initiative, with other partners, supported the distribution of more than 3.9 million LLINs for malaria prevention, 13.3 million doses of deworming medicine, and more than 26.9 million doses of vitamin A. Additionally, more than 32 million children received OPV alongside their measles vaccinations during SIAs. Though the logistics involved in implementing integrated campaigns are more difficult than those for campaigns focusing simply on measles vaccination, 84% of the measles SIAs in 2009 in countries supported by the Measles Initiative offered at least one additional intervention.

Figure 4: Number of measles SIAs integrated with the delivery of other interventions in 2009, among countries supported by the Measles Initiative (32 total in 2009)



*See Table 2 for details.

Joining Forces

Integrated measles campaigns bring together partners at international, national and sub-national levels. International collaboration provides financial and technical assistance, while local alliances are necessary to ensure that the essential human resources, vehicles, fuel, funding, and other needs are met. At the country level, creating strong partnerships among non-governmental organizations and government agencies that implement disease control programs is fundamental for successful financing, planning, supervision, and monitoring of vaccination activities.

Partnerships and integrated health campaigns: largest-ever measles vaccination campaign in Somalia served as the platform to deliver other interventions

Somalia conducted two rounds of Child Health Days (CHD) in 2009. To respond to immediate needs of vulnerable population and increase coverage and equity of access to basic health interventions, CHDs are one of several health service delivery mechanisms supported by WHO and UNICEF in Somalia. The CHD package included measles vaccine, DPT, OPV, TT, Vitamin A, ORS, Aqua Tabs and de-worming medicine (Albendazol).

Over 1,900,000 children (9-59 months of age) and 800,000 women of child-bearing age across the entire country of Somalia benefited from the package of preventive care, beginning in southern Somalia in March and concluding in northwest Somalia, also known as Somaliland, in September.

The campaign became the largest ever conducted in Somalia by raising awareness of the campaign through messages sent via mosques, cell-phones, radio, TV and loudspeakers. More than 3,600 field teams helped deliver services in urban and rural areas utilizing schools, health centres, mosques and, in remote areas, mobile clinics. The campaign was made possible with the support of the Measles Initiative partners, Denmark, Japan, the Canadian Committee for UNICEF, and USAID.

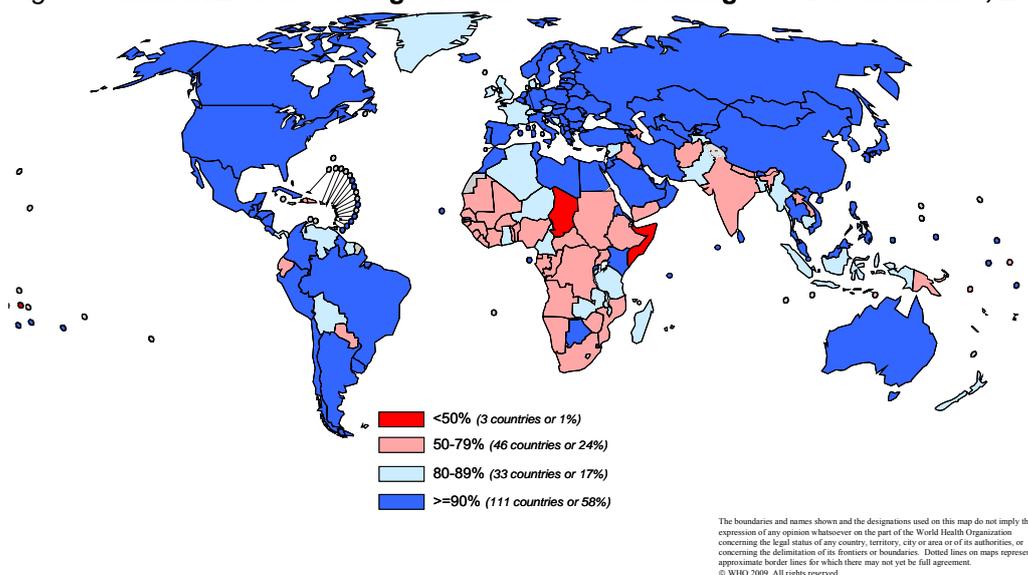
3.4 Strengthening routine immunization

Routine coverage rising slower

Over two-thirds of the measles deaths prevented over the past decade were avoided by maintaining routine immunization coverage at 2000 levels alone. Since 2006, momentum in improving routine vaccination coverage has stalled in all regions and there continues to be substantial variation in coverage between regions (*Table 1.*) Global routine first dose coverage of measles vaccine (MCV1) increased to 83% in 2008, up only 1% from 2007. Of the 22.7 million infants and young children in 2008 who missed receiving MCV1 through routine immunization services, 58% reside in 6 large countries: India (7.6 million children missed), Nigeria (2.0 million missed), China (1.1 million missed), Democratic Republic of the Congo (0.8 million missed), Pakistan (0.8 million missed) and Ethiopia (0.7 million missed).

Because sustainable measles mortality reduction depends on strong routine immunization programmes, reaching high coverage with routine services in every district has been a central strategy for effective measles control. Moreover, measles is the most critical vaccine-preventable disease for understanding immunization system performance because measles outbreaks quickly identify where routine services needs to be strengthened. For instance, one phenomenon that has repeatedly been identified by measles outbreaks is a deficit of routine immunization in peri-urban areas and routine strengthening in these locations areas has become a priority. Resources are leveraged with GAVI, USAID and other donors at country level that invest in routine immunization whenever possible and the Measles Initiative partners advocate for the inclusion of routine immunization in broad initiatives such as Sector-Wide Approaches.

Figure 5: Immunization coverage with measles containing vaccines in infants, 2008



Source: WHO / UNICEF coverage estimates, 1980-2008 as of August 2009

3.5 Building stronger surveillance systems & a global laboratory network

Measles Surveillance Systems and Laboratory Network

Effective surveillance for measles entails establishing case-based surveillance that includes investigation and laboratory testing of samples from all suspected case, with the exception that during large outbreaks testing is only recommended for the first 10 cases. By 2008, 173 (90%) of 193 member states had implemented case-based surveillance compared with 120 countries in 2004, when data collection on global case-based surveillance began.

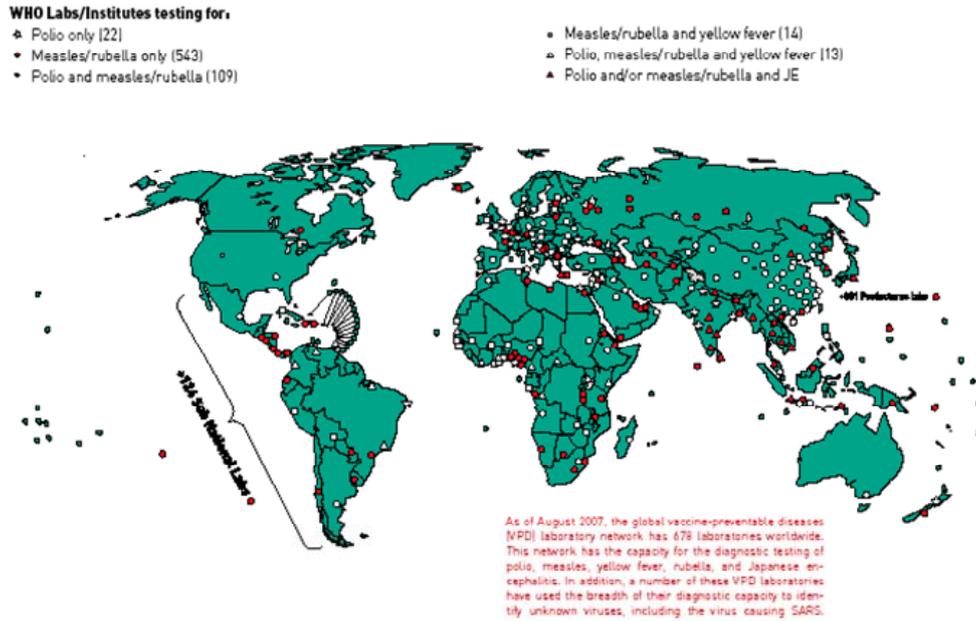
From 2000 to 2008, the number of reported cases of measles declined globally by 67%, from 852,937 to 281,972. However, the gains in reported measles incidence for 2008 were concentrated in the African and Eastern Mediterranean regions, while three regions, Europe and the Western Pacific saw indications of a resurgence of measles, with reported cases increasing by 29% and 32%, respectively, compared to 2007.

Surveillance quality is improving. By the end of 2009, 173 countries (90%) were implementing case-based surveillance and 152 countries were reporting monthly surveillance data to WHO. As an indicator of the sensitivity of measles surveillance systems, WHO established a minimal reporting rate of two discarded suspected measles cases per 100,000 population nationally. Among the 128 countries reporting sufficient data to calculate this indicator, 52 countries (27%) met this sensitivity target for December 2008-November 2009 (data as of January 13, 2009.)

Laboratory Network

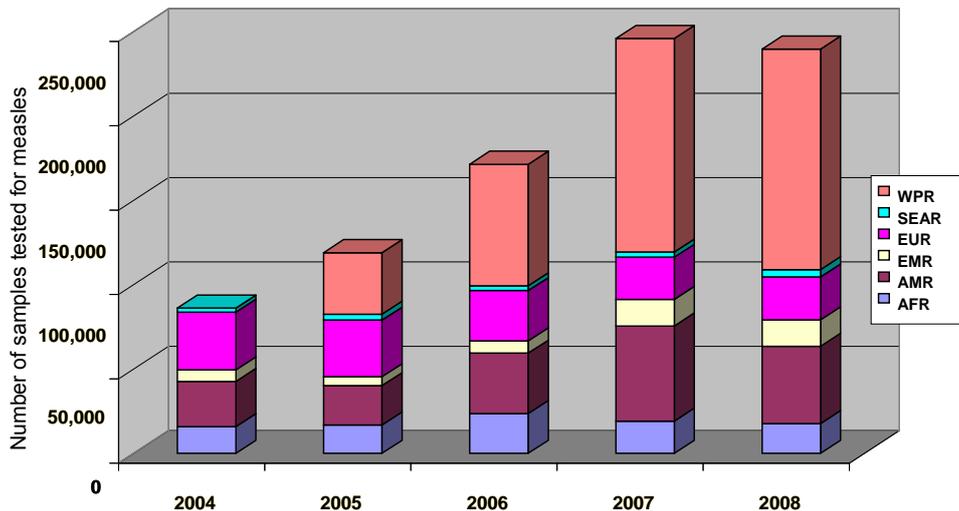
The Measles and Rubella Laboratory Network (LabNet) consists of 679 laboratories serving 183 countries compared with the 71 countries served by the LabNet in 2000. The primary focus of these laboratories is to confirm measles and rubella cases by identifying the presence of measles virus-specific or rubella virus-specific immunoglobulin M (IgM) antibodies. National laboratories used for polio, yellow fever and Japanese Encephalitis surveillance are frequently the same laboratories or at least in the same institute, as those used for measles and rubella surveillance (Figure 6).

Figure 6: Global Vaccine Preventable Diseases Laboratory Network



In 2008, almost 240,000 serum samples were tested globally for measles IgM, reflecting a slight decrease from 2007 (250,000). Measles negative samples are routinely also tested for rubella resulting in approximately 430,000 measles and rubella assays being completed in the LabNet for 2008 (Figure 7). Timeliness and quality of the testing is high with more than 80% of laboratories reporting at least 80% of their results within 7 days. Of the 198 laboratories that received the global annual proficiency-testing panel in 2008, 98.2% passed the measles component and 99% passed the rubella component. Most of the remaining sub-national laboratories participated in national proficiency testing programmes with a similar high level of performance.

Figure 7: Increasing LabNet Workload, Measles Serology Samples Tested 2004-2008



Training

In 2008-2009, surveillance training workshops were held in five WHO regions to both meet the training needs of laboratories, which are experiencing high staff turnover, and introduce new skill sets. Strengthening the capacity of laboratories for virus detection is essential for improving molecular surveillance. Workshops were held in the Western Pacific, European, South East Asian, African and Eastern Mediterranean regions to provide skills for virus detection and sequencing.

Tracking measles viruses

The tracking of virus globally can help determine whether outbreaks are caused by endemic or imported virus strains and can monitor progress of measles control goals. There has been a marked increase in the collection of measles molecular epidemiological data since 2003 as more laboratories develop capacity for molecular techniques and the programmatic value in tracking viruses has been recognized. In 2006, a WHO genotype database was established to track measles viruses detected by the LabNet. By October 2009, genotype information from 7,096 measles viruses had been submitted to the database comprising all of the 23 genotypes from 117 countries. This more than doubled the breadth of database, which had 2899 viruses submitted from 77 countries by October 2008. Surveillance gaps in molecular surveillance still occur, but these are gradually being filled.

3.6 Promoting injection safety and AEFI surveillance

Measles vaccination campaigns pose particular safety challenges due to their objective of immunizing large populations over a short period of time, often at locations outside the normal healthcare setting. Two important measures to maintain an excellent safety record are safe injection supplies and training, and appropriate management of adverse events following immunization (AEFI).

Improving Injection Safety

WHO and UNICEF recommend the use of auto-disable (AD) syringes for all immunizations to prevent the risk of spreading blood borne diseases through reuse of needles and syringes. In all campaigns supported by the Measles Initiative, AD syringes are used for vaccination and safety boxes for safe disposal. Measles campaigns provide the opportunity to provide training in use of AD syringes and injection safety, improving knowledge of health staff and promoting best practices for campaign and routine immunizations.

Strengthening AEFI Surveillance through Campaigns

Prevention and management of AEFI is an important part of immunization safety during measles campaigns. An AEFI is any adverse event that occurs after vaccination, whether it is caused by the immunization or not. In 2009, all countries reported implementing AEFI surveillance during measles campaigns and most countries reported no serious AEFI. Serious AEFI cases were reported in: Egypt (6 cases), Ethiopia (13 cases), Cameroon (3 cases), Swaziland (3 cases), Tajikistan (1 case), and China (8 cases.) These cases were not linked to measles vaccination except in Ethiopia, where 13 cases occurred in the same area and investigation indicated that the vaccine vials used for these children were likely to have been contaminated.

Active monitoring of health events among vaccinated children is essential to provide treatment and prevent further cases, as well mitigate the spread of misperceptions of vaccine safety when AEFI are determined to have occurred independently of vaccination. Measles campaigns provide the opportunity to review current practice and establish a surveillance system for adverse events or to strengthen an existing system and to increase awareness about vaccine safety. Countries that do not have a national functioning AEFI surveillance system have used campaigns to introduce AEFI surveillance activities, which then are extended to the routine immunization system.

4. Looking forward: Risk of measles resurgence requires renewed commitment to close funding gap

Financial support to the Measles Initiative has decreased from US\$ 150 million in 2007 to slightly more than US\$ 20 million in 2009. In addition, many priority countries have not been able to raise the expected 50% of operational costs for SIAs. With measles vaccinations saving some 4.3 million lives in the past decade, the disease could make a deadly comeback if funding and political will are not sustained. Even the current reduced rate of 450 deaths a day is still hundreds too many for a disease that can be easily prevented. According to WHO estimates, the combined effect of decreased political and financial commitment could result in an estimated 1.7 million measles-related deaths between 2010 and 2013.

A funding gap of \$59 million for 2010 measles vaccination activities comes at the worst time: more children than ever are scheduled to be vaccinated in 2010. The shortfall has been partially managed by securing resources through innovative mechanisms such as drawing on national emergency response funds. However, unmet need for 2010 immunization activities in priority countries has forced some countries to delay activities.

“Next year, some of the most populous countries – China, Indonesia, Pakistan, Bangladesh, Viet Nam, Nigeria, and Ethiopia – are planning national immunization campaigns. We’re looking at a pivotal year for measles vaccination and the financial commitments haven’t kept up with the demand.”

-Kathy Calvin, Chief Executive Officer for the UN Foundation

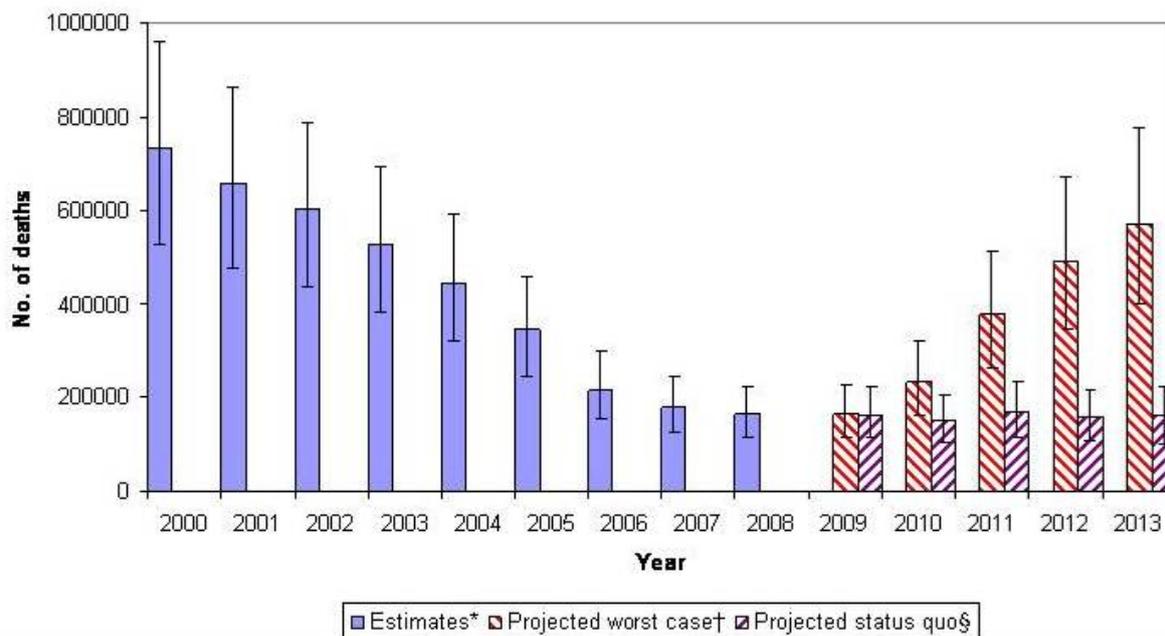
The risk of resurgence

To evaluate the impact of inadequate resources, WHO projected global measles mortality for the period 2009–2013 for two scenarios. The worst-case scenario assumed that routine MCV1 coverage in 47 priority countries remained at 2008 levels during 2009–2013 and that none of these countries carried out nationwide SIAs during 2010–2013. The *status quo* scenario assumed that routine MCV1 coverage increased 1% per year among priority countries with <90% coverage in 2008 and that SIAs are conducted during 2010–2013 in 46/47 priority countries. India was excluded from the second scenario because of uncertainty about the timing and extent of implementation of recommendations for delivering a second dose. Both scenarios assume that all non-priority countries continue to increase routine coverage of MCV1 at current rates and conduct regular high-quality SIAs as required.

Results from these projections suggest that if priority countries are unable to maintain current recommended strategies during 2010–2013, the annual number of measles deaths may rebound, resulting in approximately 1.7 million measles-related deaths, with >500 000 deaths in 2013 alone (*Fig. 11*). If the priority countries (excluding India) implement high-quality SIAs and continue to increase routine coverage of MCV1, projected global mortality during 2010–2013 may remain at 2008 levels, resulting in approximately 0.6 million measles-related deaths (*Fig. 11*).

The WHO Strategic Advisory Group of Experts (SAGE) expressed grave concern about the rapid decline in funding for measles control at their April 2009 meeting. The group recognized that responsibility for sustaining the impressive gains in reducing measles mortality lies with both country governments and international donors. In the absence of adequate resources to carry out programme activities planned for 2010 and beyond, several members discussed that measles would likely rebound and the resulting increase in mortality among young children that would jeopardize achievement of MDG4.

Figure 8: Estimated number of measles deaths worldwide, 2000–2008 and projected of possible resurgence in measles deaths worldwide, 2009–2013 (See above for scenario descriptions)



* Bounds indicate 95% uncertainty intervals that account for uncertainty in key input variables
 Source: WHO/IVB. More information at <http://www.who.int/wer/2009/wer8449.pdf>

Sustaining the contribution of measles vaccination to Millennium Development Goal (MDG) 4

From 2000 to 2008, child mortality decreased by 1.6 million, from an estimated 10.4 million to 8.8 million deaths; during the same period measles deaths declined by over 0.5 million (31% of total) suggesting that the decline in measles has played a part in the overall decline in child mortality. If the strategy to accelerate reductions in measles mortality cannot be sustained, global measles mortality will increase, resulting in a slowing down of progress towards reaching MDG 4. While the number of measles deaths over the next four years will likely be less than the worst case scenario projections, the estimated 1.1 million additional deaths that could occur in the absence of financial support for SIAs quantifies concerns about the impact of the \$106 million shortfall for activities during 2010-2011. The inability of many countries with a high burden to continue supporting improvements in routine immunization, regular measles SIAs and laboratory-supported surveillance has already caused some countries to delay activities and will put millions of susceptible children at risk of infection unless additional resources can be mobilized.

High-level advocacy is critical to ensure that political commitment is sustained and immunization and measles control are given priority on national agendas. In addition, increased funding from donors could help improve coverage of routine MCV, implement high-quality SIAs and link measles control activities with other efforts to improve child survival and strengthen health systems.

"Measles is incredibly resilient and our success is fragile, if we drop our guard, this disease will regain a foothold and spread like wildfire once again. We must stay vigilant."
 -Bonnie McElveen-Hunter, Chairman of the American Red Cross.

Annex 1: Measles and Measles-Rubella Bundled Vaccine Supplies Procured through UNICEF Supply Division

Measles-containing vaccine and supplies procured through UNICEF Supply Division for SIAs in 2009								
#	Country	Vaccine	Quantity (ds)	Cost of vaccines	Cost of AD syringes	Cost of reconstitution syringes	Cost of safety boxes	Total cost
1	Afghanistan	Mea-10	5,807,440	\$1,103,414	\$365,869	\$20,907	\$41,523	\$1,531,712
2	Angola	Mea-10	5,300,000	\$1,007,000	\$333,900	\$19,080	\$37,895	\$1,397,875
3	Bangladesh	Mea-10	4,637,300	\$881,087	\$292,150	\$16,694	\$33,157	\$1,223,088
4	Botswana	Mea-10	258,800	\$72,464	\$16,304	\$932	\$1,850	\$91,551
5	Burkina Faso	Mea-10	4,323,500	\$821,465	\$272,381	\$15,565	\$30,913	\$1,140,323
6	Cameroon	Mea-10	3,822,900	\$737,820	\$240,843	\$13,762	\$27,334	\$1,019,759
7	Cape Verde	Mea-10	67,600	\$18,928	\$4,259	\$243	\$483	\$23,914
8	Chad	Mea-10	390,000	\$108,300	\$24,570	\$1,404	\$2,789	\$137,063
9	DR Congo	Mea-10	4,753,800	\$903,222	\$299,489	\$17,114	\$33,990	\$1,253,815
10	East Timor	Mea-10	230,000	\$43,700	\$14,490	\$828	\$1,645	\$60,663
11	Eritrea	Mea-10	403,800	\$77,933	\$25,439	\$1,454	\$2,887	\$107,714
12	Ethiopia	Mea-10	800,000	\$152,000	\$50,400	\$2,880	\$5,720	\$211,000
13	Fiji	Mea-10	37,000	\$7,141	\$2,331	\$133	\$265	\$9,870
14	Guinea-Bissau	Mea-10	309,000	\$86,520	\$19,467	\$1,112	\$2,209	\$109,309
15	Guinea-Conakry	Mea-10	2,452,990	\$466,068	\$154,538	\$8,831	\$17,539	\$646,976
16	Iraq	Mea-10	1,000,000	\$280,000	\$63,000	\$3,600	\$7,150	\$353,750
17	Kenya	Mea-10	7,378,900	\$1,401,991	\$464,871	\$26,564	\$52,759	\$1,946,185
18	Nigeria	Mea-10	5,000,000	\$950,000	\$315,000	\$18,000	\$35,750	\$1,318,750
19	Sierra Leone	Mea-10	1,110,500	\$214,327	\$69,962	\$3,998	\$7,940	\$296,226
20	Southern Sudan	Mea-10	300,000	\$84,000	\$18,900	\$1,080	\$2,145	\$106,125
21	Tajikistan	MR-10	2,623,000	\$1,338,302	\$165,249	\$9,443	\$18,754	\$1,531,748
22	Uganda	Mea-10	5,909,620	\$1,122,828	\$372,306	\$21,275	\$42,254	\$1,558,662
23	Yemen	Mea-10	4,235,300	\$804,707	\$266,824	\$15,247	\$30,282	\$1,117,060
24	Zimbabwe	Mea-10	2,085,800	\$396,302	\$131,405	\$7,509	\$14,913	\$550,130

Annex 2: Key Measles Statistics 2000-2009

Overview of Key Statistics, 2000-2009

- Global **routine measles vaccination coverage** reached **83%** in 2008, up from 71% in 2000. However, most of the gains in routine coverage occurred over 2000-2006.
- Measles vaccination **prevented over 12.7 million deaths globally** over 2000-2008. Of these:
 - an estimated **8.4 million (66%) deaths were averted by maintaining routine immunization coverage at the 2000 level, and**
 - an additional **4.3 million (33%) estimated deaths were averted as a result of increases in routine immunization coverage and implementation of SIAs.**
- Between 2000 and 2008, global measles mortality decreased by **78%** from 733,000 deaths in 2000 to 164,000 in 2008. Regional mortality dropped by:
 - Africa: **92%**
 - Eastern Mediterranean: **93%**
 - South-East Asia: **46% (80% if India is excluded)**
 - Western Pacific: **92%**
- Approximately **759 million children aged 9 months to 14 years* were vaccinated through SIAs** by the end of 2009.
- Of 32 countries supported by the Measles Initiative that conducted measles SIAs in 2009, 27 (84%) used this opportunity to deliver additional interventions.
- In 2008, 173/193 (90%) WHO Member States had implemented case-based surveillance
- Over **22 million children missed receiving measles vaccination** through routine services in 2008

*some catch-up SIA age ranges extended up to 18 years

Annex 3: Core Partners and Contributing Organizations

The Measles Initiative comprises five core partners: the American Red Cross, UNICEF, UNF, CDC, and WHO. The Initiative provides technical and financial support to governments and communities for measles vaccination campaigns, routine immunization, and surveillance. The Initiative also strengthens political and social commitment, and communicates the positive impact and success of measles mortality reduction activities. The partners work closely with the countries and local communities and are coordinated at the national level through the Inter-agency Coordinating Committee (ICC).

The remarkable progress towards reducing measles deaths is the result of the hard work and commitment of national governments and all partners working to reduce measles mortality. Current partners will need to continue to work together while developing new associations to secure the necessary support and financial resources to further reduce global measles deaths.

The success of the Measles Initiative in supporting countries to reduce measles mortality is dependent on strong partnerships. Additional partners include: Becton, Dickinson and Company; the Bill and Melinda Gates Foundation; the Canadian International Development Agency (CIDA); the Church of Jesus Christ of Latter-day Saints; the GAVI Alliance; Global Payments, Inc.; International Federation of Red Cross and Red Crescent Societies; the Izumi Foundation; the Japanese Agency for Development Cooperation (JICA); the Kessler Family Foundation; Merck & Co.; Herman and Katherine Peters Foundation, the Vodafone Foundation; and countries and governments affected by measles.

Role of Core Partners

WHO plays a leading role in strategy development, consensus building and partner coordination. It provides technical leadership and strategic planning for the management and coordination of global measles control activities and is responsible for ensuring that all components of the WHO/UNICEF strategy are technically sound and successfully implemented.

UNICEF uses its logistical and procurement capacity to support purchasing as well as delivery of syringes, vaccine and other commodities to vaccination sites. The agency also supports program implementation by providing cold-chain logistics and maintenance and social mobilization.

CDC provides technical assistance for epidemiological and laboratory surveillance. The agency also provides funds for purchasing bundled measles vaccine and promoting safe immunization practices and to support staff and operational costs for the implementing agencies.

The American Red Cross leads the global partnership coordination with UNF, provides funding and communication support, and works with national Red Cross/Red Crescent Societies to mobilize parents and caretakers to immunize their children during campaigns and through routine immunization.

The UNF manages the funds of the Measles Initiative through an agreement with the United Nations. Under this agreement, the UNF manages and coordinates proposals for donor and implementing partners; provides matching funds for other donor funds, and disburses and accounts for these funds through the UN financial system, and provides communication and fundraising resources.

Annex 4: The Feasibility of Measles Eradication

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. The following requirements for determining the feasibility of measles eradication have been completed or are planned for completion in 2010:

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. The Task Force highlighted the crucial role of effective routine immunization services and the need for operational research to guide programme strategies.

Programmatic and operational feasibility. The Region of the Americas has demonstrated 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, however, this will be discussed by the latter's Regional Committee at its Sixty-third session in 2010.

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

Resources. The WHO 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 95% mortality reduction by 2015 from 2000 levels.

System strengthening. Positive benefits of measles control activities on health systems include integration of vaccination with other public health interventions and the development of surveillance platform capabilities for other vaccine-preventable diseases such as yellow fever and Japanese encephalitis. The WHO Secretariat has commissioned independent analysis of the impact of eradication activities on health systems that aims to identify strategies to maximize positive synergies and reinforce routine immunization systems for a sustainable impact.

Platform of support. Given the decline in funding for measles control since 2008, increased advocacy and broader consultation is needed among technical experts, representatives from countries, public health partner agencies and key donors to gain financial and political support. WHO will commission an analysis of the necessary political components for eradication in 2010.

Post-eradication risk assessment. The risk of measles transmission during the post-eradication era has become an increasing concern in the decision to invest in measles eradication. An independent evaluation supported by WHO is assessing the potential hazard posed by laboratories holding known or unknown measles-containing specimens, laboratories producing the live-virus measles vaccine, and theoretical bioterrorism. The analysis also addresses options for vaccination and containment policies in a post-measles era.