



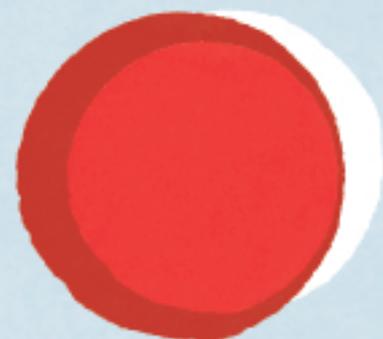
**MEASLES
& RUBELLA**
INITIATIVE



ANNUAL REPORT



2012



CONTENTS



ACRONYMS

AEFI	Adverse events following immunization
AFR	WHO African Region
AMR	WHO Region of the Americas
CDC	(United States) Centers for Disease Control and Prevention
CRS	Congenital rubella syndrome
EMTCT	Eliminating mother-to-child transmission of HIV
EPI	Expanded programme on immunization
EMR	WHO Eastern Mediterranean Region
EUR	WHO European Region
GAVI	The GAVI Alliance
GVAP	Global Vaccine Action Plan
IEC	International Expert Committee
IgM	Immunoglobulin M
M	Measles vaccine
MCV	Measles-containing vaccine
MCV1	First dose of measles-containing vaccine
MCV2	Second dose of measles-containing vaccine
MMR	Measles-mumps-rubella vaccine
MR	Measles-rubella vaccine
MUAC	Mid-upper arm circumference
PAHO	Pan American Health Organization
RCV	Rubella-containing vaccine
RCV1	First dose of rubella-containing vaccine
RCV2	Second dose of rubella-containing vaccine
RED	Reaching every district
RI	Routine immunization
SAGE	Strategic Advisory Group of Experts
SEAR	WHO South-East Asian Region
SIA	Supplementary immunization activity
TIV	Trivalent influenza vaccine
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WPR	WHO Western Pacific Region

Executive summary	3
Introduction	4
Global goals and strategic plan: measles, rubella and CRS	5
Summary of progress against the Strategic Plan indicators	7
2012 global and regional highlights	8
The Measles and Rubella Initiative in 2012	11
Progress towards measles and rubella control and elimination goals	13
Progress on implementation of the five strategies	15
Achieve and maintain high levels of population immunity	15
First dose of measles-containing vaccine	15
Second dose of measles-containing vaccine	17
Supplementary immunization activities	17
Rubella introduction	20
Procurement of vaccines and injection devices and vaccine security	22
Monitor disease using effective surveillance and evaluate programmatic efforts to ensure progress	24
Laboratory Results	26
Develop and maintain outbreak preparedness, respond rapidly to outbreaks and manage cases	28
Outbreak response	28
Communicate and engage to build public confidence and demand for immunization	31
Perform the research and development needed	33
Report on implementation of the founding principles	34
Country ownership and sustainability	34
Routine immunization and health systems strengthening	36
Equity	40
Linkages	40
Towards a world without measles, rubella or CRS	41
Annex: Vaccines and supplies procured	43



ARTWORK AND DESIGN:

The illustrations were produced by acclaimed illustrator Sophie Blackall for The Measles & Rubella Initiative.

Photograph on page 30 © UNICEF/NYHQ2012-1748; photograph on page 34 © UNICEF/NYHQ2012-2147; photograph on page 37 © UNICEF/NYHQ2012-1631; photograph on page 40 © UNICEF/NYHQ2012-2112.

Photograph on page 13 is courtesy of PAHO.

Photograph on page 33 is courtesy of Georgia Tech.

All other photographs are courtesy of C. McNab/The Measles & Rubella Initiative.

DISCLAIMER: The boundaries and names shown and the designations used on the maps in this document do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. © WHO 2013. All rights reserved.

This Annual Report was designed by Sara Gillingham Studio.

Executive summary

“With strong partnerships, resources and political will, we can, and must work together to achieve and maintain the elimination of measles, rubella and CRS globally”

— Heads of Agencies of the American Red Cross, US Centers for Disease Control and Prevention, the United Nations Foundation, UNICEF and World Health Organization

The year 2012 saw important gains in measles control. The Western Pacific Region, including China, reported a 93 per cent decline in measles cases between 2008 and 2012, bringing the region to the verge of measles elimination. It was the year southern African countries brought their outbreaks under control through national campaigns. Cambodia used measles opportunities to identify children who were missed during routine immunization. It was also the year India, building on lessons and experience to stop transmission of polio, continued their drive to immunize 134 million children against measles in a phased campaign, followed by introduction of a second dose of measles vaccine in the routine system.

Critically, 2012 was also the year 194 countries, through the resolution at the World Health Assembly adopting the Global Vaccine Action Plan, committed to the measles and rubella global and regional goals to reduce mortality and eliminate the disease. The Measles & Rubella Initiative provided a roadmap to do that, and for the first time released a new global strategic plan for measles and rubella, building on expert recommendations to include rubella vaccination and surveillance in measles activities. The GAVI Alliance pledged to help fund the plan, offering opportunities to introduce rubella-containing vaccine to 49 countries, funds for measles campaigns in six of the most challenging countries, and funds to help stop measles outbreaks.

With progress came challenges. More than 20 million infants did not receive measles or any other routine vaccines. While measles deaths have dropped by an

astounding 71 per cent since 2000, an estimated 158,000 children died of measles-related complications in 2011—about 430 child deaths a day, from a virus that can be countered with an effective, inexpensive vaccine. A large outbreak in the Democratic Republic of the Congo that flared to well over 130,000 cases in 2011 continued in 2012. Ukraine had the highest reported measles incidence in the world in 2012, one of several European countries that had outbreaks in 2011 and 2012, putting the goal of eliminating measles in Europe by 2015 at risk. Measles outbreaks in Afghanistan, Pakistan and Yemen, demonstrated how quickly measles travels and kills when routine immunization is weak. Several supplementary immunization campaigns—a strategic investment of time and money—failed to reach the goal of 95 per cent of children in every district. And about 103,000 children were born with congenital rubella syndrome, leaving many deaf and blind with heart and other conditions that poor families simply cannot afford to treat.

The Initiative has prepared an annual report each year since 2001, but this report is different. For the first time, The Measles & Rubella Initiative is reporting progress in measles and rubella control against the five strategic priorities of the new *Global Measles and Rubella Strategic Plan 2012-2020*. The report exposes the strengths and weak points in the global effort to immunize every child against measles and rubella. These tell us how to focus efforts in 2013 and beyond, including a return to the basics of reaching all children with routine immunization.

Measles and rubella move fast. We can—and must—now move faster.

Introduction



Global progress in the past decade against measles has been stunning. As more countries immunize more children, measles deaths have been reduced by 71 per cent—from an estimated 548,000 in 2000 to 158,000 in 2011. No single other health intervention has returned these mortality reduction results in such a short space of time. In 2012, countries had the opportunity to make even more progress through introduction of a second dose in routine immunization, high-quality nationwide campaigns and, critically, to further expand measles activities to include a rubella-containing vaccine.

The year 2012 also saw continuing challenges, with stagnating routine immunization coverage in some countries, and large measles outbreaks in several, putting measles control and elimination goals in some regions at risk. More than 20 million infants did not receive measles vaccine in 2011. These children—the poorest, with poorer nutrition, weaker immune systems and least served by the health system—are the very children who need measles, rubella and other vaccines the most.

The partners of The Measles & Rubella Initiative (M&RI) report annually on progress and challenges in measles control and elimination, but this annual report is different from previous years. In 2012 the Initiative launched a new *Global Measles & Rubella Strategic Plan 2012-2020*, which provides a new framework for reporting, including indicators for measles and, for the first time, rubella control and elimination. The *Strategic Plan* includes five strategies and four guiding principles. This report systematically describes progress and challenges in each of these areas.

The report uses various data sources to measure progress. These include WHO surveillance data for measles and rubella, data summarized through the WHO/UNICEF Joint Reporting Form process from 2011, mortality estimates using a new model, data reported from 2012 supplementary immunization activities, reports from regions and countries, information from partners such as the GAVI Alliance, and research data.

The Annual Report's structure follows the structure of the *Strategic Plan*. The report first describes the global and regional measles and rubella control and elimination goals and milestones, and summarizes progress against the Strategic Plan indicators. The report then summarizes global and regional highlights and challenges in 2012. Following this, the report looks systematically at progress and challenges in each of the five strategic areas including population immunity, disease monitoring, outbreak preparedness and response, communication and engagement, and research and development. Next, it briefly examines progress in adherence to the guiding principles including country ownership and sustainability, routine immunization and health system strengthening, equity and linkages to other health interventions. Finally, the report makes conclusions about the actions required to bring the world closer to achieving the global measles and rubella goals, as reconfirmed in the Global Vaccine Action Plan adopted by 194 WHO Member States in May 2012.

Global goals and strategic plan: measles, rubella and CRS



The importance of raising measles and rubella vaccination coverage, dramatically reducing measles deaths and indeed eliminating measles and rubella from most of the world are recognized in several global and regional documents.

Millennium Development Goal 4 aims to reduce deaths among children overall by two-thirds by 2015 compared with the level in 1990. Routine measles vaccination coverage was selected as an indicator of progress towards this goal because of the potential of measles vaccination to first, reduce mortality among children, and secondly, to serve as a marker of access to children's health services.¹ In 2011, 84 per cent of world's infants received the first dose of measles vaccine before their first birthday. About one in five children's lives saved since 1990 are due to measles vaccination.²

In 2010 the World Health Assembly resolved to reduce measles mortality by 95 per cent or more in comparison with 2000 estimates and to achieve the measles and rubella/congenital rubella syndrome (CRS) goals.

Five of the six WHO regions, representing 183 countries, have set measles elimination goals by or before 2020. Three of the six regions have set rubella elimination or control targets. The relevant WHO regional committees have endorsed these goals (see *Figure 1*).

In May 2012, the 194 Member States of the World Health Assembly resolved to endorse the Global Vaccine Action Plan (GVAP), which affirmed the elimination and control goals for measles and rubella by 2020.

In order to reach these goals, the five founding partners of The Measles & Rubella Initiative released a new *Global Measles & Rubella Strategic Plan 2012-2020* in April 2012. The plan recommends five main strategies. These are:

1. To achieve and maintain high levels of population immunity by providing high vaccination coverage with two doses of measles and rubella-containing vaccine
2. To monitor disease using effective surveillance and evaluate programmatic efforts to ensure progress
3. Develop and maintain outbreak preparedness and respond rapidly to outbreaks
4. Communicate and engage to build public confidence and demand for immunization
5. Perform the research and development needed to support cost-effective operations and improve vaccination and diagnostic tools.

The plan also describes four guiding principles. These are:

- Country ownership and sustainability
- Routine immunization and health system strengthening
- Equity
- Linkages

¹ United Nations, *The Millennium Development Goals Report 2012*, United Nations, New York, 2012

² About 23 per cent of the reduction of deaths among children aged less than 5 years between 1990 and 2008 was averted as a result of the reduction in measles deaths. van den Ent, Maya M, et al., 'Measles mortality reduction contributes substantially to reduction of all cause mortality among children less than five years of age, 1990-2008', *Journal of Infectious Diseases*, vol. 204, no. S1, 15 July 2011, pp. S18-23

The plan identifies 68 low and middle-income priority countries that have either not attained 90 per cent coverage with a first dose of measles-containing vaccine, or have not introduced rubella-containing vaccine into routine immunization programmes.

The plan identifies the following milestones towards the regional and global goals:

Milestones

By 2015

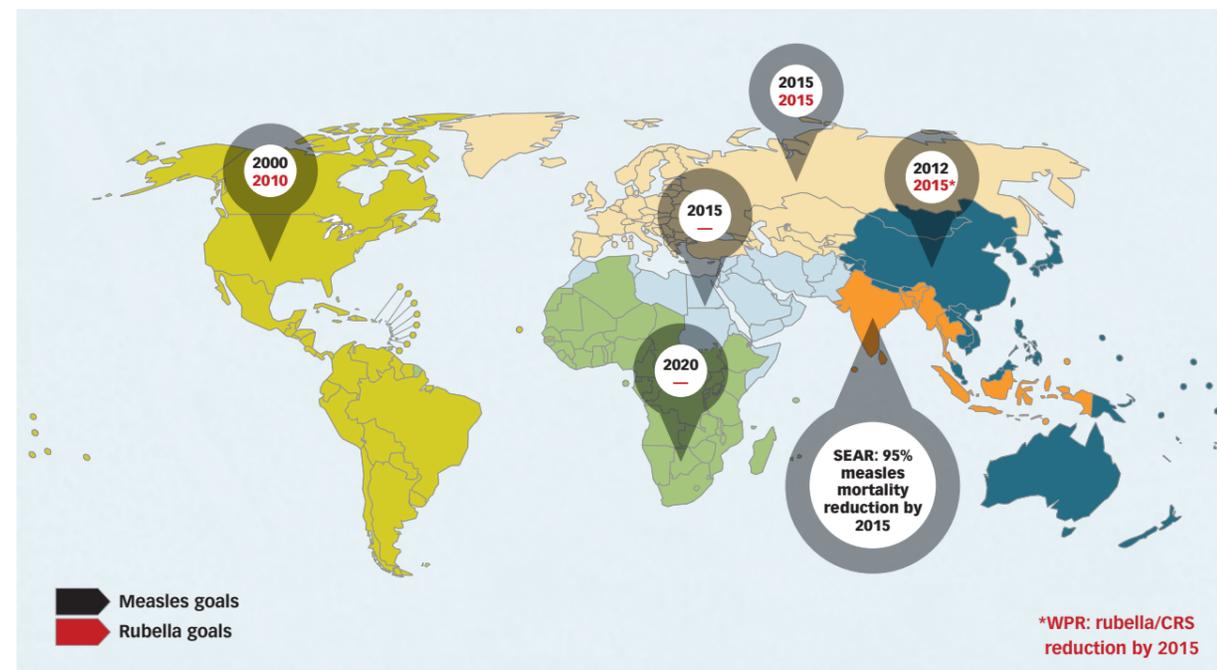
- Reduce annual measles incidence to less than five cases per million and maintain that level
- Exceed 90 per cent coverage with the first dose of measles-containing vaccine nationally and exceed 80 per cent vaccination coverage in every district or equivalent administrative unit
- Achieve at least 95 per cent coverage with measles vaccine, measles-rubella vaccine, or measles-mumps-rubella (MMR) vaccine during supplementary immunization activities (SIAs) in every district
- Establish a rubella/CRS elimination goal in at least three additional WHO regions
- Establish a target date for the global eradication of measles

By 2020

- Sustain the achievement of the 2015 goals
- Achieve at least 95 per cent coverage with both first and second routine doses of measles or measles-rubella containing vaccines in each district and nationally
- Establish a target date for the global eradication of rubella and CRS

The plan also identifies key indicators against which to measure progress towards the milestones and goals. These are summarized in Table 1, and this Annual Report will look at these in more detail.

FIGURE 1. Measles and rubella control and elimination goals



Summary of progress against indicators in the Strategic Plan 2012-2020

TABLE 1. Progress Indicators

INDICATOR	2012	2011	2000
	(# meeting indicator / # reporting and percentage)		
Number and proportion of countries with measles incidence less than five cases per million population	*	104 / 188 = 55%	64 / 169 = 38%
Number and proportion of countries with coverage levels of first dose MCV and RCV >90% nationally and >80% in all districts			
Number/proportion with MCV1 ≥90%	*	123 / 194 = 63%	83/191 = 43%
Number/proportion with all districts having MCV1 ≥80%	*	53 / 156 = 34%	Not available
Number and proportion of countries conducting SIAs that year that achieve at least 95% coverage with M, MR or MMR in every district	3/18 = 17% **	3/23 = 13% **	Not available
Number of estimated measles deaths, the percentage reduction since 2000, and number of deaths averted through vaccination			
Estimated measles deaths	*	158,000	548,000
Percentage reduction since 2000	*	71%	Baseline
Cumulative number of deaths averted through measles vaccination since 2000	*	10,700,000	929,936
Number and proportion of measles-rubella priority countries providing funds to cover at least 50% of the operational cost of follow-up SIAs	21/32 = 66%	5/13 = 38%	—
Number and proportion of MCV and RCV SIAs that include additional child health interventions	26 / 32 = 81%	21 / 39 = 54%	—
Number of new countries introducing RCV into their routine immunization programme	2	1	—

* This data will be available later in 2013

** Data from countries that reported

2012 global and regional highlights



Global successes and challenges

- More than 105 million children were vaccinated against measles in mass campaigns, of which 9.9 million received the combined measles and rubella vaccine for the first time.
- Global measles deaths were reduced by 71 per cent and measles incidence fell by 58 per cent (2000-2011).
- First dose measles coverage reached 84 per cent of the global birth cohort).
- The Western Pacific Region marked an 93 per cent decline in measles cases between 2008 and 2012, bringing the region to the verge of eliminating measles.
- Elimination of measles, rubella and CRS was verified by the International Expert Committee in the Americas.
- Eight additional countries introduced the second measles dose in their routine programme for a total of 146 of the WHO's 194 Member States.
- 21 of 32 countries M&RI supported to implement measles campaigns mobilized at least 50 per cent of the operational costs for the largest proportion of countries yet, demonstrating growing country ownership.
- For the first time, nine countries conducted wide-age range national campaigns to stop their measles outbreaks affecting people over five years of age.

- 26 of 32 countries M&RI supported to implement measles campaigns included one or more additional child health interventions, including Vitamin A, tetanus toxoid vaccine or deworming tablets. 15 included oral polio vaccination.
- 94 per cent of countries are using the recommended measles case-based surveillance and 98 per cent have access to standardized quality-controlled measles testing.
- Bangladesh and Nepal introduced rubella-containing vaccine.
- The GAVI Alliance pledged more than US\$700 million in support for measles and rubella activities.

And yet:

- At least 20 million children did not receive a first measles vaccine dose before their first birthday.
- About 430 children still die from measles each day, and more than 100,000 are born with congenital rubella syndrome every year.
- 59 countries had not yet introduced rubella-containing vaccines; 49 of them are GAVI-eligible.
- The Strategic Advisory Group of Experts determined that at the current pace, three regions (African, Eastern Mediterranean and European) are not on track to achieve their regional measles elimination goals.

Regional Successes and Challenges

African Region

- Recorded an 84 per cent decline in measles mortality (2000 to 2011)—the most progress globally.
- 16 countries held measles campaigns reaching over 47 million children.
- 42 per cent of countries recorded an incidence of less than 5 per million in 2012.
- 12 of 16 countries locally raised more than 50 per cent of the operational costs in 2012 campaigns.
- Three countries (Namibia, Niger and Zambia) conducted wide-age range campaigns to reach a growing older susceptible population.
- Large outbreaks continued in countries with weak underlying immunization systems (e.g., Angola, the Democratic Republic of the Congo and Ethiopia).

Americas Region

- Achieved and maintained measles elimination since 2002 and rubella/CRS elimination since 2009.
- Successfully managed an outbreak in Ecuador caused by an importation.
- Pockets of under-immunized populations remain at risk of virus importations, which result in costly outbreak response activities.

Eastern Mediterranean Region

- Thirteen of 23 countries (56 per cent) have measles incidence of less than 5 per million population.
- Six countries held measles campaigns and reached more than 23 million children.
- Three countries conducted wide-age range campaigns to reach a growing older susceptible population.
- National measles elimination validation committees have been established in 10 countries.
- Rapid political change in a number of countries is resulting in declines in immunization coverage.
- A measles resurgence in Afghanistan, Pakistan, Somalia, the Sudan and Yemen due to weak routine immunization systems, delayed follow-up campaigns and low-quality SIAs.
- Measles epidemiological and molecular surveillance must be improved to a standard that supports validating measles elimination.

European Region

- Established the Regional Verification Commission for Measles and Rubella Elimination.
- Reported measles cases declined by 40 per cent compared with the previous year.
- Thirty-nine of 54 countries (74 per cent) recorded a measles incidence of less than 5 per million.
- A few countries continued to experience persistent indigenous transmission and even widespread outbreaks (e.g., Romania, the Russian Federation, Spain and Ukraine).
- With more than 13,000 cases, Ukraine contributed to 56 per cent of the measles cases in Europe. The country suffered the politicization of immunization and failure to procure vaccines.
- Rubella has been largely controlled in many countries; however, a few still reported a high incidence and outbreaks.
- With more than 20,000 cases of rubella, Romania contributed to 74 per cent of cases in the region.
- There are challenges with insufficient political commitment for measles elimination (in Western Europe) and health system reform (in Eastern Europe).
- Vaccine hesitancy is a dominant issue in many countries.



South-East Asia Region

- The region has reduced measles-related mortality by 48 per cent and incidence by 30 per cent (2000-2011).
- Given the success in eliminating polio, there is a renewed focus in the region on strengthening routine immunization and controlling measles.
- India embarked on the second phase of a measles campaign aimed at reaching 134 million children in 14 states. As a result reported measles incidence decreased and mortality—currently the highest in the world—is expected to decrease.
- Bangladesh and Nepal introduced measles-rubella vaccination campaigns.
- Routine immunization coverage has remained stagnant for the past five years.
- The region is the only one that has not established a target year for achieving measles elimination.
- India and Indonesia are particularly challenging because of their large and diverse populations.
- Challenges to measles elimination include system weaknesses, and vaccinating the traditionally hard-to-reach populations (e.g. urban slum dwellers, ethnic minorities, migrants) and children in hard-to-reach areas (e.g. remote villages, conflict areas, border regions).

Western Pacific Region

- Measles cases in the region have fallen by 93 per cent (2008-2012) and the region is considered to be on the verge of eliminating measles.
- China, which accounts for 75 per cent of the region's population, reduced measles cases by 92 per cent through a national campaign and routine activities.
- Thirty-three of 37 countries (89 per cent) have probably interrupted endemic transmission of measles.
- Cambodia used measles campaigns to identify and provide better immunization services for underserved communities.
- Established a 14-member Regional Verification Commission for Measles Elimination in January.
- CRS surveillance presents a challenge because of lack of diagnostic capacity and extensive underreporting in the region's developing countries.



The Measles and Rubella Initiative in 2012

The Measles & Rubella Initiative is a global partnership committed to ensuring no child dies from measles or is born with congenital rubella syndrome. The initiative is led by the American Red Cross, the United Nations Foundation, the Centers for Disease Control and Prevention, UNICEF and the World Health Organization. It was founded as the Measles Initiative in 2001 and vowed to support countries (particularly in Africa) to reduce measles deaths as rapidly as possible. The partnership has since expanded greatly and in 2012 became The Measles & Rubella Initiative.

The Measles & Rubella Initiative:

- Released a new *Global Measles and Rubella Strategic Plan 2012-2020*.
- Supported 32 countries to implement measles campaigns that reached more than 105 million children with bundled vaccines, operational costs or technical assistance.
- Contributed to social mobilization efforts involving about 165,000 volunteers who mobilized millions of families in 16 countries which mobilized millions of households for measles campaigns and routine immunization.
- Welcomed new partners including the GAVI Alliance, International Pediatric Association and the American Academy of Pediatrics.
- Provided GAVI and countries the technical assistance required to apply for and use the newly pledged measles and rubella support of US\$700 million.
- Published, in *The Lancet*, a new method to more accurately measure measles mortality.
- Published, in *Vaccine*, the research priorities for global measles and rubella control.
- Supported studies that identified clear ways that measles activities strengthen routine immunization.
- Tested more than 205,000 serum samples globally for measles and rubella immunoglobulin M (IgM) antibodies for surveillance through the WHO Measles and Rubella Laboratory Network.
- Finalized supply arrangements for 2013-2016 (through UNICEF Supply Division) for measles-containing vaccines, including measles vaccines;

measles and rubella vaccines; and measles, mumps and rubella vaccines in support of the global measles and rubella elimination goals.

- Communicated the successes and challenges of measles and rubella control and elimination through a strengthened communication platform aimed at reaching a range of stakeholders.



About The Measles and Rubella Initiative

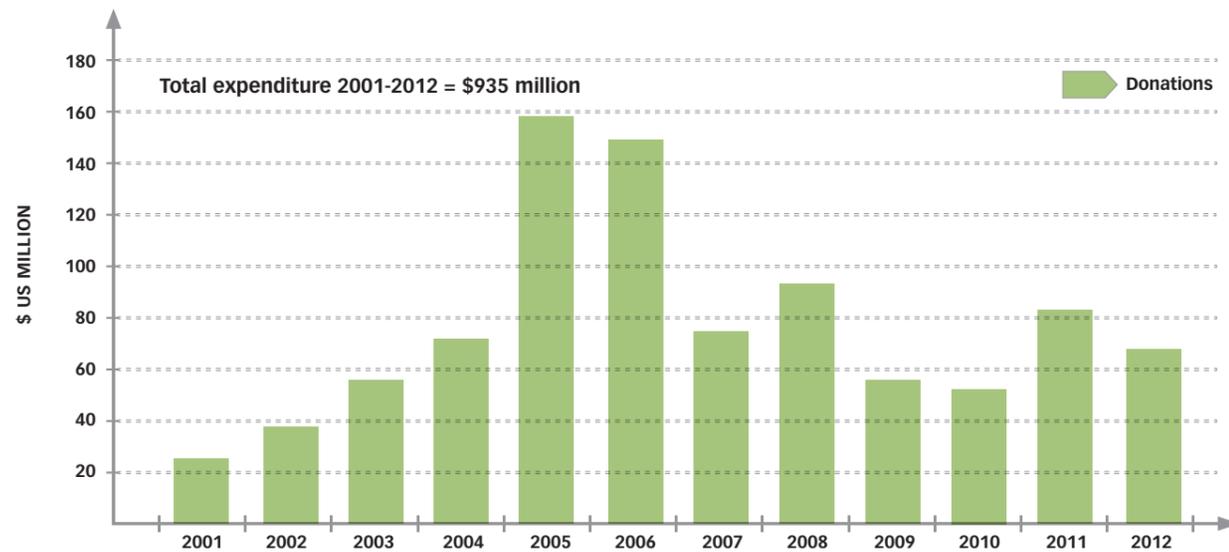
The M&RI aims to reach the measles and rubella elimination goals of the Global Vaccine Action Plan by supporting countries to raise coverage of measles, rubella and other vaccines. The Initiative funds and helps to plan, implement and monitor quality supplementary campaigns. The M&RI partners also help to investigate outbreaks and provide technical and financial support for effective outbreak response. Recognizing that routine immunization is a foundation of vaccine delivery, the M&RI proposes and participates in solutions to strengthen immunization delivery including through proven activities that can be introduced in campaigns. Given the importance of surveillance as a key strategy to achieve disease control and elimination goals, the M&RI also supports a global laboratory network for measles and rubella accessible by 191 countries. Since 2001, the Initiative has supported 80 countries to deliver more than 1.1 billion doses of measles vaccine, helped to raise measles vaccination coverage to 84 per cent globally, and reduced measles deaths by 71 per cent. These efforts have contributed significantly to reducing child mortality as per Millennium Development Goal 4.

Key supporters of The Measles & Rubella Initiative include countries and governments affected by measles, rubella and congenital rubella syndrome; the chapters of the American Red Cross; Anne Ray Charitable Trust; American Academy of Pediatrics; BD; the Bill & Melinda Gates Foundation; the Canadian

International Development Agency (CIDA); the Church of Jesus Christ of Latter-day Saints; the GAVI Alliance; Global Payments, Inc.; Herman and Katherine Peters Foundation; International Federation of Pharmaceutical Manufacturers & Associations; International Federation of Red Cross and Red Crescent Societies; the International Pediatric Association; Izumi Foundation; Jeppesen; the Lions Clubs International Foundation; Japan International Cooperation Agency; The Merck Company Foundation;

the Norwegian Ministry of Foreign Affairs, The ONE Campaign; The Rockefeller Foundation; Sabin Vaccine Institute; The Task Force for Global Health; (United Kingdom) Department for International Development; the Vodafone Foundation; the World Bank and the Women's National Basketball Association. The Measles & Rubella Initiative is also grateful to its many individual private donors.

The Measles & Rubella Initiative Annual Expenditure, 2001-2012



The Measles & Rubella Initiative donors

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
BI-LATERALS													
CIDA													
CDC													
JICA													
Norway													
DFID													
CIVIL SOCIETY													
ARC*													
LDS													
Lions													
UN													
UNICEF													
UNF*													
FOUNDATIONS													
Bill and Melinda Gates													
PRIVATE SECTOR													
BD													
Merck													
Vodafone													
OTHER													
GAVI/IFFIm													

*Includes American Red Cross, UN Foundation and other partners

Progress towards measles and rubella control and elimination goals



Goals

By end 2015:

- Reduce global measles mortality by at least 95 per cent compared with 2000 estimates.
- Achieve regional measles and rubella/CRS elimination goals.

Measles mortality estimates

Global progress in the past decade against measles deaths has been stunning. As more countries immunize more children, measles deaths were reduced by 71 per cent between 2000 and 2011. No single other health intervention has returned these mortality reduction results in such a short space of time.

In 2012, WHO launched a new model to estimate measles deaths. Many countries, particularly those with the highest disease burden, lack data on the number of measles deaths. WHO's new model estimates mortality using reported numbers of cases, measles vaccination coverage through routine vaccination and SIAs, the age distribution of reported cases, and age-specific, country-specific case-fatality ratios. This, combined with the addition of 2011 measles vaccination coverage, case data for all countries, and data updates for the period before 2011 for some countries, led to new mortality estimates for 2000–2011. These were published in the *The Lancet* in April 2012.³

During 2000–2011, estimated measles deaths decreased 71 per cent, from 548,000 to 158,000. All regions and India had substantial reductions in estimated measles mortality, ranging from 36 per cent to 90 per cent (see

Table 3 on page 23). Compared with estimated mortality assuming the complete absence of measles vaccination, 10.7 million deaths were averted by measles vaccination from 2000–11.

Recent actions have also led to positive results in India, which has traditionally accounted for a large proportion of measles deaths. The country's 36 per cent decrease in estimated measles mortality during 2001–2011 is mainly an outcome of the national National Measles Catch-up Programme to provide a second dose of measles vaccine. This began in 2010 with MCV2 introduction in routine services in states with reported MCV1 coverage more than or equal to 80 per cent, and with SIAs followed by MCV2 introduction in routine services in states with reported MCV1 coverage of less than 80 per cent. Further mortality reductions are expected to be recorded for 2012 and 2013 as more children are protected with measles vaccine through the Catch-Up Programme.

Despite the progress, recent years have also seen setbacks. In 2011, estimated global measles mortality increased from the 2010 estimate due to the resurgence and large outbreaks of measles in some countries.

Americas: maintaining measles elimination

In September 2012, the process of verifying and documenting the absence of endemic measles, rubella and CRS reached an important milestone when the International Expert Committee (IEC) verified the regional achievement of elimination during the 28th Pan American Sanitary Conference of the Pan American Health Organization/WHO. The IEC had gathered evidence from all countries, and travelled to countries that had experienced measles elimination challenges in 2012 (Argentina, Colombia, Ecuador and Haiti). The region's ministers of health approved an emergency plan of action which calls on Member States to strengthen active surveillance of measles, rubella and CRS, ensure timely outbreak response measures for imported viruses, and maintain immunization coverage of 95 per cent or more.

Delegates from PAHO/WHO Member States affirmed their support for the global elimination of these diseases and requested that the organization mobilize resources to maintain the region's achievements. This request suggested that, as long as there is no global elimination goal, the risk remains of reintroduction of the viruses into the Americas.

Over the next few years, the Region of the Americas will host a series of international events, such as the 2014 FIFA World Cup and the 2016 Summer Olympics in Brazil. This raises an alert about the possibility of infected individuals entering the country from other regions, which could lead to outbreaks and the consequent health and financial costs of controlling them.

Western Pacific: on the edge of measles elimination

The Western Pacific Region (WPR), comprised of 37 countries and areas, has made remarkable progress towards measles elimination and rubella control in recent years, and recorded a 93 per cent decline in measles cases between 2008 and 2012. By the end of 2012, 33 of 37 countries and areas may have interrupted endemic measles virus transmission.

The Region has accelerated rubella control, through the combination of measles and rubella immunization and surveillance activities. In all but seven countries in 2011, reported rubella incidence was lower than the regional

2015 goal of 10 cases per million. As of 2012, 30 of 37 countries and areas are using measles-rubella vaccines or MMR vaccines in their national routine immunization programmes, which will be used in all countries by 2015.

In 2012, the WPR Regional Committee endorsed a resolution on measles elimination and rubella control, urging Member States to interrupt endemic measles virus transmission as soon as possible and secure the gains made to date. In 2012, the Western Pacific Regional Office developed a new measles elimination field guide, providing countries intensified or innovative strategies to rapidly close remaining programmatic gaps. The region also uses measles elimination as a strong entry point to promote equity in delivering immunization services.

A 14-member Regional Verification Commission for Measles Elimination in the Western Pacific Region was established in January 2012. The commission, with support from WHO and in consultation with Member States, has been working on finalizing the regional mechanisms on verification of measles elimination.

Some critical challenges remain in WPR to interrupt endemic transmission in all countries and areas, requiring greater political commitment, resources and intensified efforts. In 2012 measles outbreaks persisted in some areas in two countries, namely Malaysia and the Philippines.

The regional experience also reveals that, unlike polio, measles is affecting high-income countries in WPR where public perception and vaccine acceptance can hamper the measles elimination programme.

CRS surveillance also presents a challenging area for further action, and CRS cases are underreported in most developing countries in the region.

3 E. Simons, Ferrari et al., 'Assessment of the 2010 global measles mortality reduction goal: results from a model of surveillance data', *The Lancet*, vol. 379, no. 9832, 9 June 2012, pp. 2173–2178



Progress on implementation of the five strategies



Achieve and maintain high levels of population immunity

Because measles is highly infectious and will quickly find populations which are not immune, the Strategic Plan recommends that measles (and rubella if introduced) vaccine coverage must reach or exceed 95 per cent before 2020 with each of the two doses nationally and in every district in order to reach measles and rubella goals.

The interim indicators to track progress are three-fold:

1. The number and proportion of countries whose coverage levels of first dose MCV and RCV exceed 90 per cent nationally and 80 per cent in all districts.
2. The number and proportion of countries providing MCV2 through routine services with coverage levels of MCV2 (and RCV2) that exceed 90 per cent nationally and 80 per cent in all districts.
3. The number and proportion of countries conducting SIAs that year that achieve at least 95 per cent coverage with measles, MR or MMR vaccines in every district.

First dose of measles-containing vaccine

While many countries have made tremendous progress towards increasing population immunity, much more work is required in others to achieve recommended coverage nationally and in districts.

Between 2000 and 2011, global average coverage with the first dose of MCV1 increased from 72 per cent to 84 per cent. The percentage of countries that achieved

more than 90 per cent MCV1 coverage rose from 43 per cent in 2000 to 63 per cent in 2011.

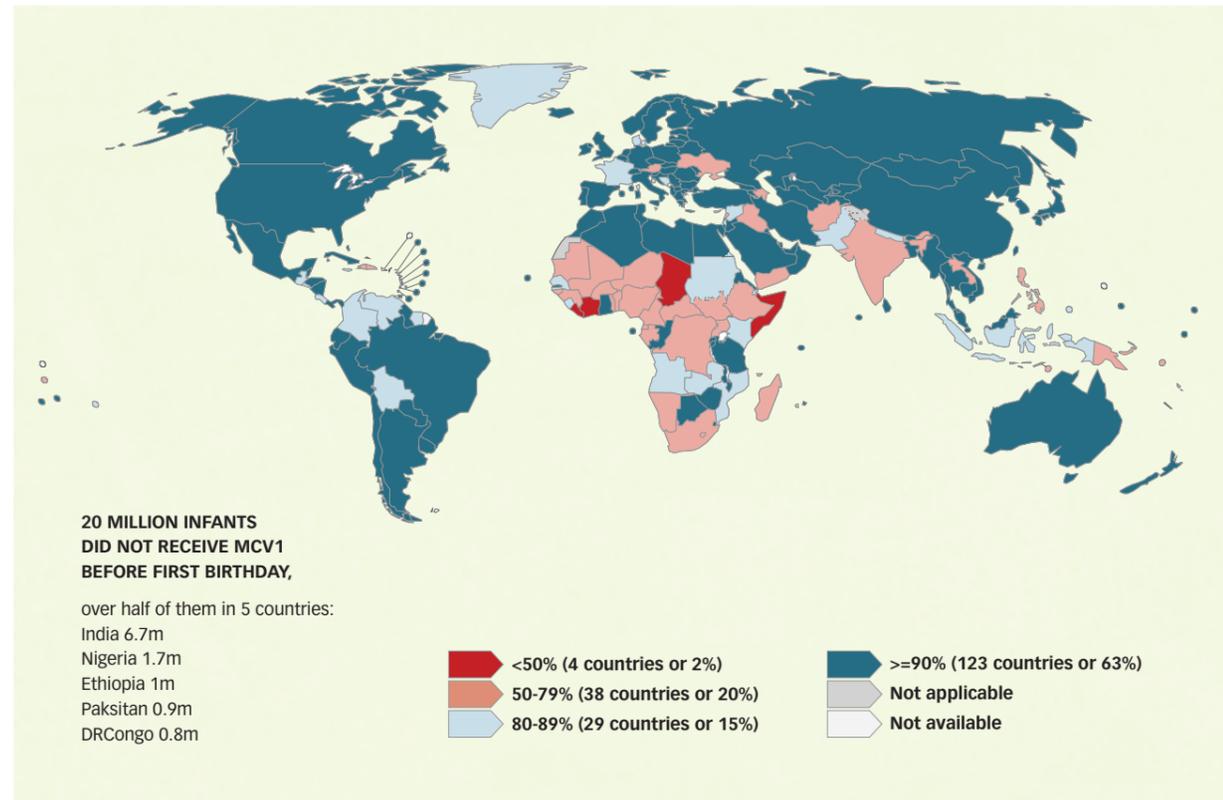
Of the 156 countries reporting district-level MCV1 coverage, the proportion reaching or exceeding 80 per cent MCV1 coverage in 80 per cent or more districts increased from 49 per cent (72 of 148) in 2003 to 56 per cent (87 of 156) in 2011. In 2011, 34 per cent (53 of 156) reported they met or exceeded 80 per cent MCV1 coverage in all districts.

In 2011, the American, European and Western Pacific regions maintained an average MCV1 coverage more than 90 per cent.

However, an estimated 20 million infants did not receive the first routine measles vaccination in 2011 (16 per cent of surviving infants worldwide). More than half of them (11 million) live in five countries: India (6.7 million), Nigeria (1.7 million), Ethiopia (1 million), Pakistan (900,000) and the Democratic Republic of the Congo (800,000).

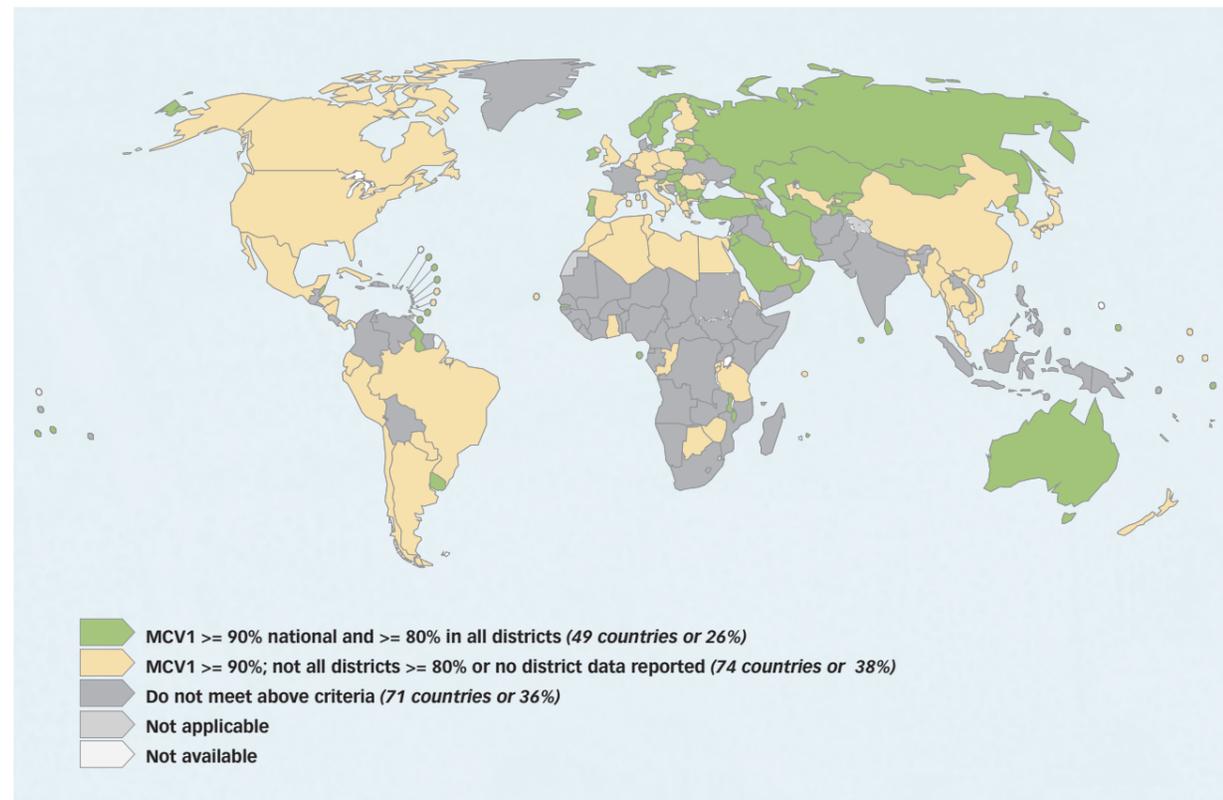
4 WHO and UNICEF use annual data from administrative records and surveys reported by national governments to estimate MCV1 coverage among children aged 1 year. WHO/UNICEF estimates of national immunization coverage are available at <www.who.int/immunization_monitoring/routine/immunization_coverage/en/index4.html>. Since 2003, countries also have reported the number of districts with 80 per cent MCV1 coverage or higher.

FIGURE 2: Immunization coverage with measles containing vaccines in infants, 2011



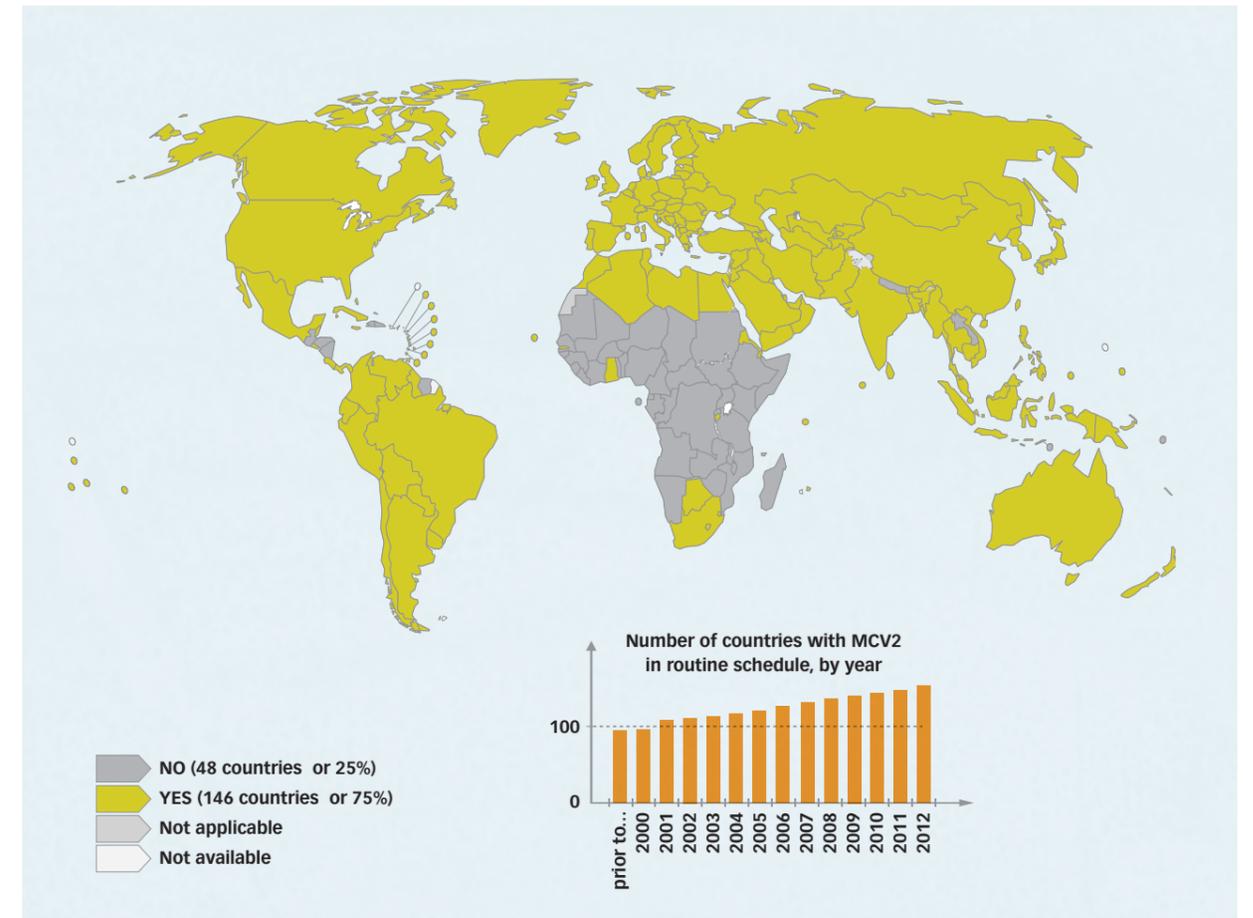
Source: WHO/UNICEF coverage estimates 2011 revision, July 2012

FIGURE 3: 2011 Measles immunization coverage at national and district level, 2011



Source: WHO/UNICEF coverage estimates 2011 revision, July 2012

FIGURE 4: Countries giving 2 doses of measles vaccine in their routine national immunization system, 2012



Source: WHO/IVB database, 194 WHO Member States. Data as of March 2013. Data for 2012 is provisional

Second dose of measles containing vaccine

By 2011, all countries were providing two doses of measles vaccine through routine immunization or SIAs. From 2000 to 2012, the number of countries providing MCV2 through routine services increased from 97 (50 per cent) to 146 (75 per cent). In 2012, Bangladesh, Burundi, Cambodia, Eritrea, the Gambia, Ghana, Myanmar and Zambia introduced a second dose of measles-containing vaccine in their routine vaccination programme, financially supported by GAVI. Under GAVI application guidelines, countries must achieve more than 80 per cent coverage with the measles first dose before applying for support to introduce a second dose. At least 30 countries in the African Region are expected to introduce MCV2 in routine immunization by the end of 2015.

Supplementary Immunization Activities (SIAs)

More than 1.1 billion children received a measles vaccination through SIAs between 2000 and 2012.

In 2012 alone, more than 105 million children received measles vaccination during SIAs in 32 countries. Of those, 20 countries achieved the target of more than 95 per cent national measles vaccine coverage. Seven countries' SIAs (22 per cent) included rubella vaccination. Twenty-two countries integrated at least one other beneficial child health intervention into measles or measles-rubella vaccine SIAs in 2012 including vitamin A and deworming medication. Eighteen countries (56 per cent) included oral polio vaccination, contributing to the global effort to eradicate polio (see Table 2 on page 18).

However, challenges remain. Just three of the 18 countries reporting district-level data achieved more than 95 per cent coverage in every district during their 2012 SIAs. Administrative coverage is recorded at more than 99 per cent in 19 of the countries, indicating planning challenges to derive an accurate denominator target population. This underscores the need to improve reliable SIA monitoring and evaluation.

TABLE 2: Measles and rubella supplementary immunization activities* and the delivery of other child health interventions by country and World Health Organization region, 2012

WHO REGION/ COUNTRY	AGE GROUP TARGETED	EXTENT OF SIA	CHILDREN REACHED IN TARGETED AGE GROUP		OTHER INTERVENTIONS DELIVERED							
			NO.	(%)	ORAL POLIO VACCINE	VITAMIN A	INSECTICIDE-TREATED BEDNETS	DEWORMING MEDICATION	TETANUS TOXOID VACCINATION	OTHER	RUBELLA VACCINATION	
AFRICA												
Burundi	6-59 M	National	1,459,304	(103)		Yes		Yes		Praziquantel		
Cameroon	9-59 M	National	3,570,032	(102)		Yes						
Chad	6-59 M	National	2,270,772	(112)		Yes						
Democratic Republic of the Congo	Varied by health zone	Rollover-national in 3/11 provinces and ORI	6,577,639	(102)		Yes						
Eritrea	9-47 M	National	277,928	(75)		Yes	Yes			MUAC		
Gabon	6-59 M	National	168,749	(68)								
Guinea	9-59 M	National	2,098,829	(95)		Yes	Yes	Yes				
Guinea-Bissau	9-59 M	National	220,263	(80)								
Kenya	9-59 M	National	5,995,049	(107)		Yes	Yes					
Namibia	9 M-14 Y	National	885,259	(91)		Yes	Yes					
Niger	9 M-14 Y	National	7,736,066	(102)			Yes	Yes				
Sao Tome and Principe	9-59 M	National	22,476	(105)								
Sierra Leone	9-59 M	National	1,179,605	(102)			Yes	Yes		eMTCT		
Uganda	6-59 M	National	6,283,441	(100)		Yes	Yes	Yes				
Zambia	9 M-14 Y	National	7,503,515	(116)		Yes	Yes	Yes				
Zimbabwe	6-59 M	National	1,613,437	(103)		Yes	Yes					
EASTERN MEDITERRANEAN												
Afghanistan	9 M-9 Y	National	10,879,129	(110)		Yes						
Djibouti	9-59 M	National	90,603	(95)								
Pakistan	9 M-9 Y	Rollover-national	1,954,175	(102)		Yes				Penta		
Somalia	6-59 M	Child Health Days	509,042	(88)		Yes	Yes	Yes	Yes			
South Sudan	6-59 M	National	1,708,418	(90)		Yes	Yes					
Yemen	6 M-9 Y	National	7,984,779	(93)		Yes	Yes					
AMERICAN												
Haiti	1-14 Y	National	2,963,911	(118)		Yes	Yes	Yes			Yes	
El Salvador	1-4 Y	National	112,827	(95)						TIV	Yes	
Honduras	1-4 Y	National	696,712	(82)		Yes	Yes			Mumps	Yes	
Nicaragua	1-4 Y	National	1,753,136	(101)			Yes	Yes			Yes	
SOUTH EAST ASIA												
India (thru Oct 2012)	9 M-10 Y	Rollover-national	17,742,647	(79)								
Myanmar	9-59 M	National	6,267,535	(97)								
Nepal (phase 1+2)	9 M-14 y	Rollover-national	4,046,950	(100)		Yes					Yes	
WESTERN PACIFIC												
Mongolia	3-14 Y	National	522,429	(93)							Yes	
Papua New Guinea	6-35 M	National	552,872	(88)		Yes	Yes	Yes	Yes			
Solomon Islands	12-59 M	National	67,832	(101)			Yes	Yes			Yes	
TOTAL			105,715,361									
COUNTS						18	18	1	11	2	0	7
% of all SIAs						56%	56%	3%	34%	6%	0%	22%

Rubella introduction

By 2011, 130 Member States (67 per cent) were providing at least one dose of rubella-containing vaccine (RCV), an increase from 99 countries (52 per cent) in 2000. By the end of 2012, four more countries—Bangladesh, Lao People’s Democratic Republic, Nepal and Solomon Islands—had introduced RCV either in the routine programme, SIAs or both. This leaves 59 countries remaining that have not yet introduced RCV, of which 49 are GAVI-eligible as of 2013. Rubella vaccine coverage is almost identical to that of measles, as all countries except Tunisia use the vaccine combined with measles vaccines or measles and mumps vaccines.

The burden of congenital rubella syndrome—estimated at about 103,000 cases in 2010—is greatest in WHO regions where most of the countries are not using rubella vaccine and have no regional control goal (see Table 4). The WHO position paper on rubella vaccine recommends countries use the opportunity offered by accelerated measles control and elimination activities to introduce RCVs, and provides the policy basis for prevention of both through SIAs. The preferred approach is through a wide age-range campaign for all children 9 months to 14 years of age, followed by introduction of RCV in the routine immunization programme. In light of the remaining global burden of CRS and proven efficacy and

safety of RCVs, SIAs play a major role in rapidly increasing population immunity through specifically targeting children who missed routine immunization and covering multiple birth cohorts at one time.

Challenges to RCV introduction include some hesitation about introduction due to the ‘paradoxical effect’. This is the phenomena whereby sub-optimal rubella vaccination could increase the number of CRS cases in communities where women of reproductive age remain susceptible and the rubella virus continues to circulate. The recommended WHO strategy limits the risk, as a quality wide-age range measles-rubella vaccine campaign protects sufficient people otherwise susceptible to infection to interrupt rubella virus circulation. In addition, including RCV in the routine immunization programme, regular high-quality campaigns and strategies to reach women of child-bearing age will reduce the risk for CRS to zero or very low levels. Hence, the risk for CRS in countries without rubella vaccination is higher than the risk of the paradoxical effect.



Bangladesh: Introduction of rubella and measles second dose

Bangladesh’s recent introduction of rubella and measles second dose (MSD) vaccines into the routine schedule provides useful lessons for other countries.

Before introducing rubella-containing vaccine, Bangladesh used the measles surveillance infrastructure to determine rubella incidence and the age distribution of rubella cases. Demonstration of this burden prompted initiation of CRS surveillance and introduction of rubella vaccine.

In October 2012, Bangladesh replaced a single-antigen measles vaccine with a measles-rubella vaccine in the routine immunization schedule (at 9 months). To protect women of childbearing age, Bangladesh also added a measles-rubella vaccine to the routine dose of tetanus toxoid vaccine given to adolescent girls at 15 years of age. The vaccine was financed with government funds. At the same time, financially supported by the GAVI Alliance, Bangladesh introduced MCV2 into the routine immunization schedule for children 18 months of age.

Prior to each of these introductions, Bangladesh trained all EPI managers and vaccinators. The country used training opportunities to provide refresher training to mid-level EPI managers and

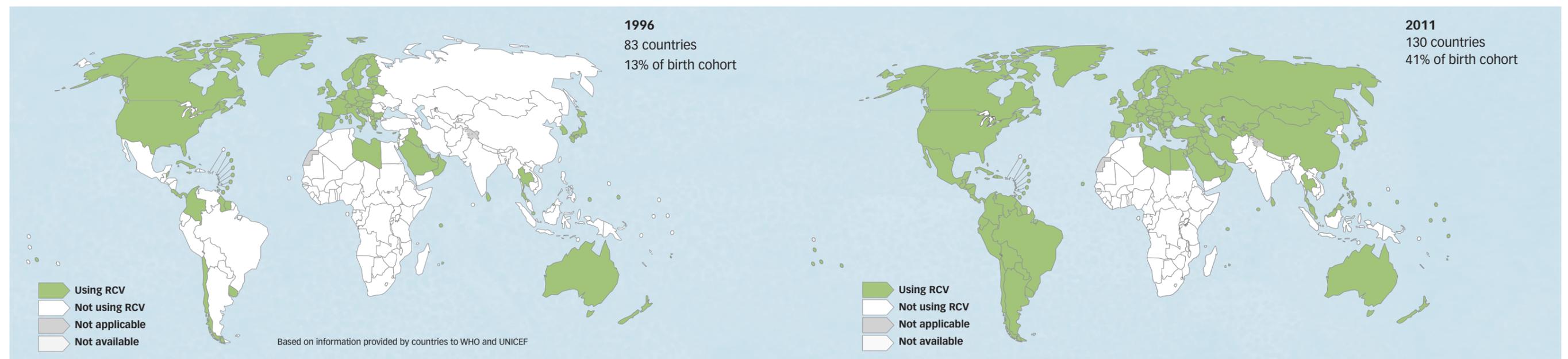
vaccinators on other important immunization topics such as supervision, monitoring, injection safety and management of adverse events following immunization (AEFI). The GAVI Alliance (with a MSD introduction grant), UNICEF and WHO supported these activities.

The transition from measles to measles-rubella vaccines at 9 months was smooth, and administrative data shows that in November 2012 more than 90 per cent of the targeted children were vaccinated.

As per the WHO rubella position paper, Bangladesh plans to conduct a nationwide measles-rubella vaccination campaign targeting all children aged 9 months to 14 years of age in 2013 with GAVI’s financial support.

Bangladesh began CRS surveillance in January 2013, which will provide the baseline data to measure the impact of introducing rubella immunization. Bangladesh has mobilized its 130 large hospitals as CRS surveillance sites, expanding beyond acute flaccid paralysis surveillance. Staff in ophthalmology, cardiology, neonatology, otolaryngology and paediatric units of these hospitals have been oriented.

FIGURE 5: Countries using rubella vaccine in their national immunization system



Source: WHO/IVB database and the “World Population Prospects: the 2010 Revision”, New York, UN

Procurement of vaccines and injection devices and vaccine security

During 2012, UNICEF Supply Division procured more than 200 million doses of measles monovalent, MR vaccines and MMR vaccines for routine and SIA activities. Measles-containing vaccines were procured in line with M&RI's planned supplementary immunization activities, country routine requirements, GAVI-funded measles second dose application approvals, and emergency and outbreak response needs.

2012 was an intense year with multiple changes in country requests and campaign requirements due to continued global outbreaks, increased requests from countries not traditionally procuring through UNICEF, switches from measles to MR vaccine, and the expansion of target age groups for multiple SIA activities, all of which had not been forecasted. Supply Division successfully managed to meet these demands through close coordination with the M&RI and industry.

During 2012, UNICEF Supply Division also finalized supply arrangements for 2013-2016 for measles-containing vaccines—including measles, MR and MMR vaccines—in support of the global measles and rubella elimination goals. Supply awards were made to three manufacturers for measles vaccine in 10-dose presentation, one manufacturer for MR vaccine in 10-dose presentation and three manufacturers for MMR vaccines in single-, two- and 10-dose presentations. UNICEF has traditionally procured MMR vaccine with Leningrad-Zagreb, Urabe and Jeryl Lynn mumps strains, which will continue to be accessible. However, MMR vaccine with Urabe strain will no longer be available on the market beginning in 2016.

Although Supply Division requested manufacturers to include proposals for measles and MR vaccine in five-dose vials in their 2012 tender submissions, no manufacturer offered this presentation. The only supplier with WHO pre-qualified vaccine in five-dose vials will not be in a position to supply this presentation in the short-term (possibly not until 2014-2015) because it is

maximizing the production of measles and MR vaccine to be able to meet the growing global demand (hence maximizing production in ten-dose rather than five-dose vials). Nonetheless, Supply Division will continue its efforts to further quantify the actual demand for this product and engage with industry on the possibility of supplying a five-dose presentation in the longer-term.

Currently, the MR market landscape does not meet the requirements of vaccine security—ensuring uninterrupted and sustainable supply of affordable, quality vaccines—because only a single manufacturer produces WHO pre-qualified MR vaccine. Any potential new MR manufacturers would not be able to produce pre-qualified vaccine until at least 2016. In addition, MR supply is closely linked with measles monovalent vaccine supply, as the single MR manufacturer is also the largest measles vaccine manufacturer, and the vaccines share production facilities. Therefore, maintaining effective cooperation with the current manufacturer is a key to continued success.

As rubella vaccine introduction scales up and GAVI increases its funding support to measles and rubella elimination goals, careful planning and coordination with countries and all partners will be critical to ensure supply is available for planned activities. In 2013 in particular, global supply of measles vaccine through UNICEF may potentially be constrained due to the increased demand as a result of similar challenges faced in 2012: continued outbreak response campaigns, wider-age range supplementary activities and increased procurement for countries which traditionally have not procured through UNICEF. UNICEF will work closely with manufacturers, M&RI and countries to secure additional supply, if required, as demand forecasts become more certain.⁷ See the Annex for more information about Unicef Supply Division procurements.

⁷ Vaccine pricing data for a specific supplier is available at http://www.UNICEF.org/supply/index_57476.html
Historical vaccine procurement data is available at http://www.UNICEF.org/supply/index_38554.html
A full list of all WHO prequalified vaccines is available at http://www.who.int/immunization_standards/vaccine_quality/PQ_vaccine_list_en/en/index.html

TABLE 3. Estimates of coverage with the first dose of MCV administered through routine immunization services among children aged 1 year, reported measles cases and incidence, and estimated measles mortality 2000 and 2011

WHO REGION	2000					2011								
	% COVERAGE WITH THE FIRST DOSE OF MEASLES-CONTAINING VACCINE A	NUMBER OF REPORTED MEASLES CASES B	MEASLES INCIDENCE (CASES PER MILLION POPULATION) C D	% COUNTRIES WITH INCIDENCE < 5 PER MILLION	ESTIMATED MEASLES DEATHS (95% CI)	% COVERAGE WITH THE FIRST DOSE OF MEASLES-CONTAINING VACCINE A	NUMBER OF REPORTED MEASLES CASES B	% DECLINE FROM 2000	MEASLES INCIDENCE (CASES PER MILLION POPULATION) C D	% DECLINE FROM 2000	% COUNTRIES WITH INCIDENCE < 5 PER MILLION	ESTIMATED MEASLES DEATHS (95% CI)	% MORTALITY REDUCTION 2000 TO 2011	% TOTAL MEASLES DEATHS IN 2011
African	54	520,102	838	8	338,500 (216,300-736,100)	75	194,364	63	227	73	46	55,200 (22,600-338,400)	84	35
Americas	92	1,755	2	89	<100	92	1,372	22	2	31	94	<100	-	0
Eastern Mediterranean	72	38,592	88	17	59,600 (31,600-100,500)	83	35,923	7	61	31	45	30,200 (19,000-55,800)	49	19
European	91	37,421	50	45	400 (140-2,400)	94	37,073	1	43	14	44	140 (16-1,800)	62	0
South-East Asia	61	78,558	51	0	137,100 (94,800-205,300)	79	65,161	17	36	30	27	70,700 (51,800-100,400)	48	45
South-East Asia (excluding India)	77	39,723	80	0	48,800 (23,700-97,300)	93	35,822	10	61	24	30	14,500 (8,000-30,000)	70	9
India	55	38,835	37	0	88,300 (71,100-108,000)	74	29,339	24	24	36	0	56,200 (43,800-70,300)	36	36
Western Pacific	85	177,052	106	30	12,800 (4,200-64,600)	96	21,050	88	12	89	62	1,300 (180-43,900)	90	1
TOTAL	72	853,480	146	38	548,300 (347,000-1,108,900)	84	354,922	58	52	65	55	157,700 (93,600-540,300)	71	100

a Coverage data: WHO/UNICEF estimates of national immunization coverage. Geneva, World Health Organization, 2012 (update of 14 July 2012). (Available at http://www.who.int/immunization_monitoring/routine/immunization_coverage/en/index4.html, accessed 1 November 2012)

b Reported case data: Measles reported cases. Geneva, World Health Organization, 2011 (update of 4 October 2012) (http://apps.who.int/immunization_monitoring/en/globalsummary/timeseries/tsincidencecemea.htm, accessed 1 November 2012)

c Population data: United Nations, Department of Economic and Social Affairs, Population Division (2011). World Population Prospects: The 2010 Revision, CD-ROM Edition

d Any country not reporting data on measles cases for that year were removed from both the numerator and denominator

Monitor disease using effective surveillance and evaluate programmatic efforts to ensure progress

The epidemiological standards for epidemiological surveillance for measles and rubella are based on case-based surveillance with laboratory confirmation, in-depth outbreak investigations, and identification of viral genotypes from every outbreak. National integrated measles and rubella surveillance systems must cover each nation completely, and perform with sufficient sensitivity to detect any ongoing transmission. Surveillance data should then be used to improve programme performance.

The indicator the M&RI uses to track surveillance performance is the number and proportion of countries with measles incidence of less than 5 cases per million population.

Surveillance for measles and rubella has steadily improved globally. It has demonstrated the reduction in measles cases, even as surveillance has become more sensitive in more countries, including laboratory-confirmation through the WHO Measles and Rubella Laboratory Network.

Measles

The improvements global measles surveillance over time are notable. Between 2000 and 2011, the number of Member States annually reporting measles surveillance data to WHO increased from 169 (88 per cent) to 188 (97 per cent). Between 2004 and 2011, the number of Member States using the recommended case-based

surveillance increased from 120 (62 per cent) to 183 (94 per cent)⁸. From 2000 to 2011, the number of Member States with access to standardized quality-controlled measles testing by the WHO Measles and Rubella Laboratory Network increased from 71 (37 per cent) to 191 (98 per cent)⁹.

From 2000 to 2011, the number of measles cases reported worldwide each year decreased 58 per cent (from 853,480 in 2000 to 354,922 in 2011), and measles incidence decreased 65 per cent, from 146 to 52 cases per million population per year. All WHO regions reported declining cases and incidence (see Table 3).

Success is particularly marked in the American and Western Pacific regions. From 2000-2011, the Americas maintained measles incidence at less than 5 cases per million. In the Western Pacific in 2011, reported measles incidence hit an historic low at 12 cases per million; between 2010 and 2011, cases were more than halved, from 49,460 to 21,050.

While the global measles case trends were positive from 2000 to 2008, outbreaks in most regions between 2009 and 2011 caused global cases counts to increase. In the Eastern Mediterranean Region, cases increased from 10,072 to 35,923. In the South-East Asian Region, cases increased from 52,529 to 65,161. In the African Region, the increase was from 186,675 to 194,364, and the European Region saw an increase from 30,625 to 37,073 (see Figure 6).

FIGURE 6: Reported measles cases by WHO Region, 2000-2011

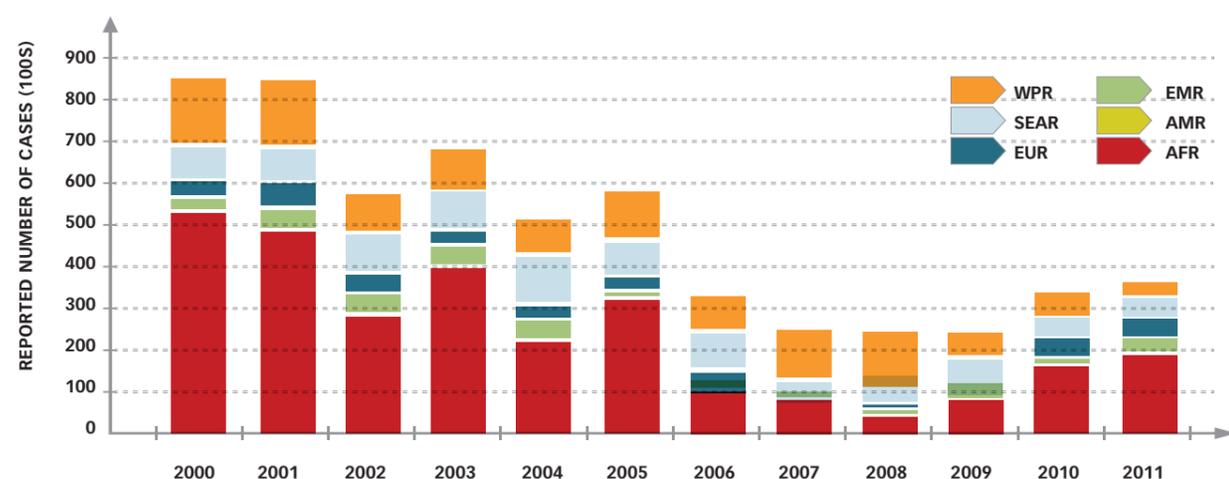


TABLE 4: CRS burden estimates, globally and by region, in 1996 and 2010, compared to CRS reporting to WHO and UNICEF in 2011

REGION	ESTIMATED NUMBERS OF CRS CASES		REPORTED NO. OF CRS CASES	MEMBER STATES REPORTING CRS IN 2011	
	1996	2010		NO.	%
Africa	31,133	40,680	0	16	35
Americas	9,701	3	2	34	97
Eastern Mediterranean	9,265	5,720	2	9	43
Europe	9,509	12	6	40	77
South-East Asia	50,637	47,527	3	4	40
Western Pacific	10,098	9,127	201	18	67
GLOBAL	120,342	103,068	214	121	63

Source: unpublished, Adams E, Vynnycky E and data reported to WHO and UNICEF

In addition, the percentage of countries with reported measles incidence of less than 5 cases per million decreased, from a high of 122 of 183 reporting countries (67 per cent) in 2008 to 104 of 188 reporting countries (55 per cent) in 2011.

The single reason for the upsurge in cases were immunity gaps in too many countries, including among people over age 5 who may not have been vaccinated with two doses of measles vaccine. The reasons for the gap include weak routine systems, sub-optimal SIAs (such as in Africa and the Eastern Mediterranean regions), lack of demand for vaccination (such as in the European Region) and insufficient political commitment as disease is disappearing and focus is shifting to other public health priorities.

A note on surveillance

Surveillance data can be biased by under-reporting because not all patients with measles seek care, not all of those who seek care are reported by healthcare workers, and some reports of cases may not reach the central level. The proportion of true cases that are actually reported varies from fewer than 5 per cent to up to 50 per cent, depending on multiple reasons such as disease incidence, overall quality of the surveillance system and communications activities.

Surveillance systems capture measles deaths even less well than measles cases. The gap largely comes about because a measles-associated death is defined as any death occurring in the four to six weeks after rash onset that is not clearly due to other causes (e.g. trauma), while cases reported through the surveillance system typically are seen in the first few days after rash onset. Most of the measles-associated deaths are from respiratory causes

(e.g., croup, pneumonia), diarrhea or encephalitis. Often, at the time of death, the earlier episode of measles may be forgotten or is not noted on the death certificate.

Rubella

During 2000-2011, global reported rubella cases decreased 83 per cent, from 670,894 to 114,449. The greatest decrease in reported rubella cases was a 98 per cent decrease in the European Region, from 804,567 to 9,671, and a 99.9 per cent decrease in the Americas, from 58,755 in 2000 to only nine cases in 2011. In other regions, the number of cases increased during this period as more Member States began reporting rubella cases. Given rubella vaccine use, the numbers suggest significant under-reporting. Fewer Member States report CRS cases, though the number increased from 75 (39 per cent) in 2000 to 121 (63 per cent) in 2011. Compared to model estimates, the number of reported CRS case is very low, with 214 reported CRS cases in 2011 versus an estimated 103,068 CRS cases in 2010 (see Table 4).

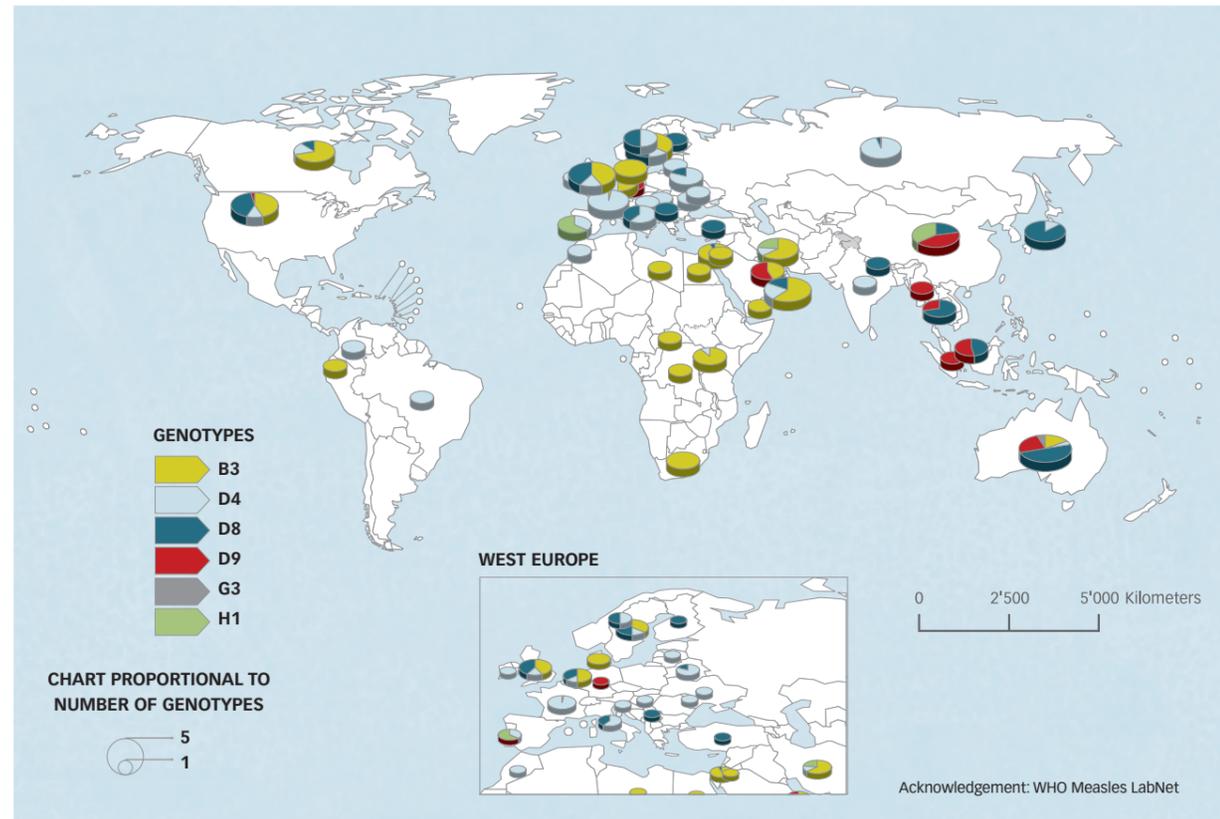
More rubella cases are reported as better surveillance systems are established in countries. As part of the rubella roll-out supported by GAVI, the M&RI is providing technical support to establish rubella and CRS surveillance systems in countries.

7 Vaccine pricing data for a specific supplier is available at <www.unicef.org/supply/index_57476.html>. Historical vaccine procurement data is available at <www.unicef.org/supply/index_38554.html>. A full list of all WHO-prequalified vaccines is available at <www.who.int/immunization_standards/vaccine_quality/PQ_vaccine_list_en/en/index.html>.

8 Member States without case-based measles surveillance include Algeria, the Comoros, Guinea-Bissau, India, Mauritius, Monaco, Morocco, San Marino, Seychelles, Somalia, Sao Tome and Principe, and Thailand.

9 Member States without access to standardized quality-controlled testing by the WHO Measles and Rubella Laboratory Network in 2011 included Cape Verde, Sao Tome and Principe, and Seychelles.

FIGURE 7: Distribution of measles genotypes, 2012.



Laboratory Results

A critical component of laboratory surveillance for measles is the genetic characterization of circulating wild-type viruses. Genetic sequencing information is useful in tracking global transmission patterns of measles including importation and subsequent spread of virus, and for documenting the interruption of transmission. Disappearance of an endemic virus lineages or genotype(s) is one of the criteria for verifying measles elimination in a country or region. Currently, there are seven predominant measles genotypes circulating globally, although they can be roughly attributed to geographic areas.

Generally speaking, B3 is a West African virus that spread to southern Africa in 2009 and has subsequently been found extensively in Europe, Australia, Malaysia and the Americas. D4 is endemic in India and has been detected in big outbreaks in Europe (e.g., France, Germany, Switzerland and the United Kingdom, as well as recently in Romania and Ukraine) and has spread over most of the world. H1 is endemic in China but more has been more recently found in bordering countries and is

occasionally imported into other countries. D8 and D9 have been predominantly South-East Asian. There may be genotypes circulating that molecular surveillance has not picked up because of the very limited spread of these genotypes or even their disappearance due to the regional vaccination efforts.

In total, about 14,000 virus strains with genotype information have been reported to WHO and shared with the WHO Global LabNet. In 2012, the predominant genotypes have been B3, D4, D8, D9 and H1. Some geographic distribution was observed: The Americas reported outbreaks caused by B3, D4, D8 and D9 genotypes, depending on the country of origin of the index case. The Western Pacific region reported B3, D4, D9 and H1. The European region reported the D4 genotype but also B3, D8 and sporadically D9 and H1. The African Region reported predominantly B3. The South-East Asia Region reported mostly genotypes D4, D8 and D9, and the Eastern Mediterranean Region reported B3, D4, D9 and H1 genotypes from outbreaks in that region.

Fewer countries that have reported laboratory-confirmed measles cases have been reporting genotyping data (35 per cent in 2012 vs. 60 per cent in 2011), possibly because incidence is dropping and more cases are sporadic cases without any further spread. Index cases are difficult to detect in time for a suitable sample to be collected as the presence of virus in the blood lasts only a few days after onset. The Centers for Disease Control and Prevention has conducted a study to explain this decrease in molecular follow up.

Measles and Rubella Laboratory Network

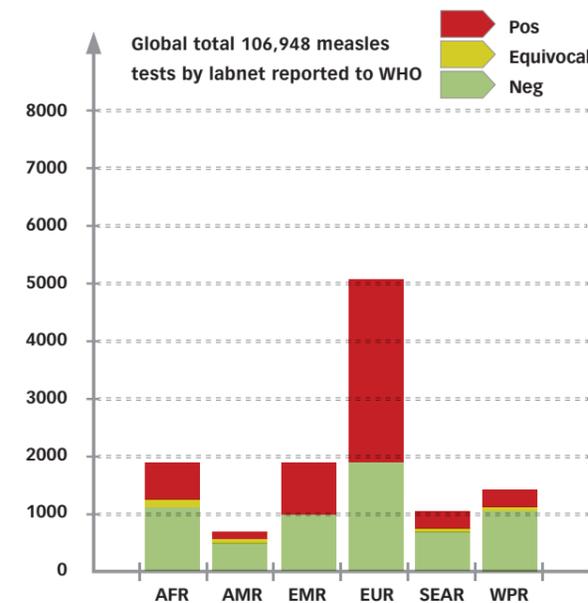
The Measles and Rubella Laboratory Network continued to support measles and rubella control in 2012 through regional and country-level training workshops, technical support in five regions and continued quality assurance activities involving the participating laboratories. In 2012, the Network included 690 national and subnational WHO-certified laboratories serving 191 (98 per cent) of the 194 Member States, grown considerably from fewer than 40 laboratories and 71 Member States in 1998. 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 IgM antibodies.

National laboratories used for polio, yellow fever and Japanese encephalitis surveillance are frequently the same laboratories or are at least in the same institute as those used for measles and rubella surveillance, allowing for synergies between different vaccine preventable disease surveillance programmes. More than 205,000 serum samples were tested globally by the network laboratories for measles and rubella IgM antibodies in 2012.

The overall performance of the Laboratory Network is high: All network laboratories have been accredited fully or provisionally. A total of 214 laboratories participated in 2012 in the WHO proficiency test programme. For both measles and rubella 96 per cent of laboratories had a 100 per cent score.

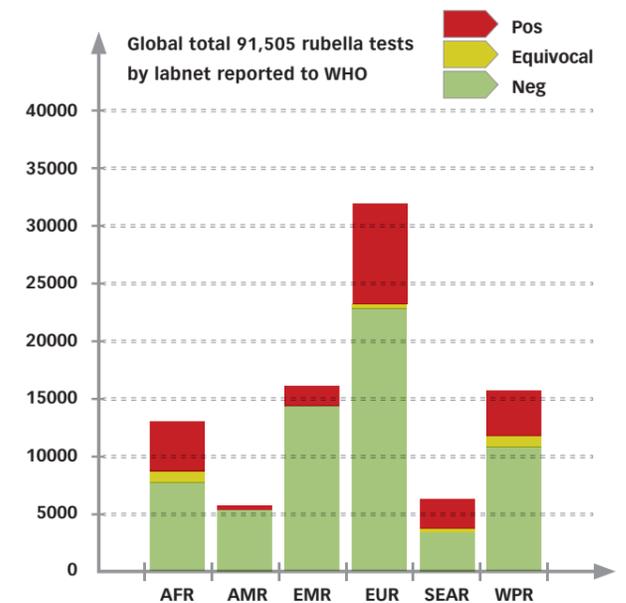


Measles laboratory tests by region 2012



Data as of February 2013

Rubella laboratory tests by region 2012



Data as of February 2013

Develop and maintain outbreak preparedness, respond rapidly to outbreaks and manage cases

"Measles is the canary in the coal mine."

—Dr. Seth Berkley, The GAVI Alliance CEO

"Measles outbreaks are a stress test for the health system."

—Professor David Durrheim, Professor of Public Health Medicine, University of Newcastle, Australia

Outbreak response

Measles outbreaks appear in communities with low measles vaccination coverage—whether in Uganda or the Ukraine, Australia or Angola. As the measles virus is one of the most infectious human diseases, and the disease is easily recognizable, measles outbreaks are an early warning signal of low immunization coverage. Countries may use the measles outbreaks to learn the causes of the outbreaks, determine problems in the immunization and health system and address these through policy change or improvements in programme implementation. The *Measles & Rubella Strategic Plan 2012-2020* underscores the importance of rapid response to outbreaks including investigation, laboratory confirmation of suspected cases, detailed analysis of surveillance data and risk assessment. An effective response should include case management to prevent illness and death, and may include targeted SIAs.

Large outbreaks

Overall, the number and size of outbreaks decreased in 2012. In the African Region for example, just 5 of 46 countries reported large outbreaks of major concern.

Since December 2011, large measles outbreaks were reported by the Democratic Republic of the Congo (73,794 cases), Ukraine (13,517 cases), Indonesia (10,675 cases), the Sudan (7,584 cases), Pakistan (7,151 cases), Ethiopia (4,646 cases), Angola (4,442 cases), Nigeria (4,157 cases), Romania (4,136 cases), Thailand (4,060 cases), Afghanistan (3,287 cases), Kenya (2,436 cases), Myanmar (2,346 cases), Yemen (2,245 cases) and Malaysia (2,226 cases) (see Figure 11). The Democratic Republic of the Congo has been most affected by large measles outbreaks for two years in a row.

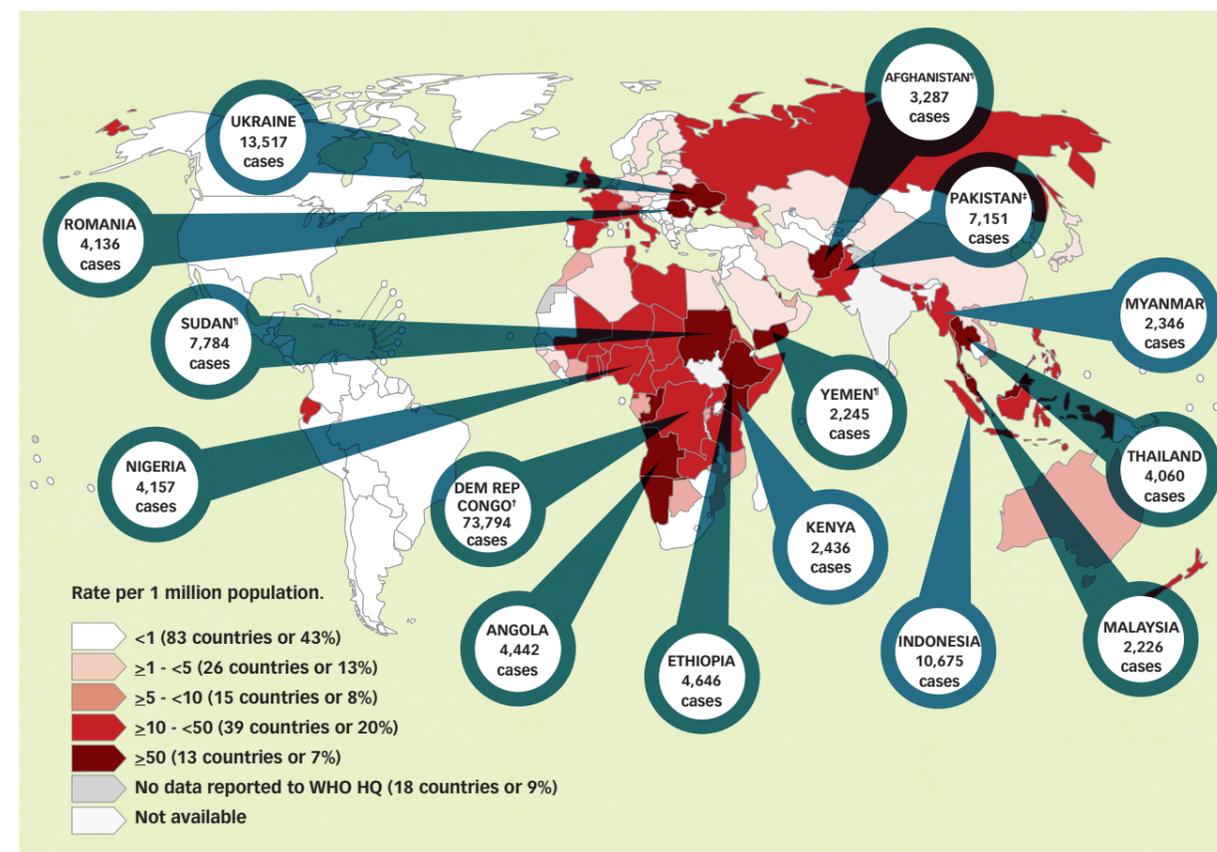
Field investigations of recent measles outbreaks found most cases were among unvaccinated persons,

suggesting the main underlying cause was persistent gaps in immunization coverage in some populations, despite overall increased measles vaccine coverage. All five countries with the largest number of infants who did not receive MCV1 through routine immunization services in 2011 had large outbreaks of measles during 2011, highlighting the importance of a strong immunization system. In addition, poor-quality SIAs and delays in planned SIAs have resulted in low coverage, contributing to the increased number of measles-susceptible children and on-going measles virus transmission.

Increasingly, measles cases have been reported in children over 5 years of age. Although the measles case fatality rate is lower in older children, a reservoir of susceptible children over 5 is a risk for continued measles epidemics and deaths among younger children who are infected by older age groups. In 2012, nine of 32 countries conducted wide-age range SIAs because epidemiological data indicated that an under-5 campaign would not sufficiently control the disease.



FIGURE 11: Reported measles incidence rate, December 2011 to November 2012, and number of reported measles cases in 15 largest outbreaks since December 2011



Data from sources other than monthly data exchange file format:
 †Data for DRC from aggregate case reports
 ‡Data for Pakistan from country report 28/1/2013
 ¶Data for EMRO from Nov 2012 Measles-Rubella Bulletin

Data source: monthly surveillance data exchange file and country reports received at WHO IVB Data in HQ as of January 2013

Outbreaks put measles-free

Americas countries at risk

The global resurgence of measles has impacted the epidemiology of the disease in the Americas, the only region in the world that has eliminated measles. The 2011-2012 measles epidemic in Ecuador and other countries in the Americas demonstrate the effects of virus importations. The largest country-wide measles outbreak occurred in Ecuador and affected 327 people, most of them children. The Ministry of Health launched a wide-scale vaccination campaign between October 2011 and January 2012, targeting children aged 6 months to 14 years. The immunization campaign led to an abrupt cessation of morbidity but the epidemic continued for another six months, until July 2012. A total of 69 positive cases of measles were diagnosed in 2012. The last phase of the outbreak was characterized by the increasing

proportion of new cases found among children that were too young to be vaccinated. The last confirmed case detected from Ecuador was an infant (unvaccinated, 7 months) from the rural Amazonian province of Morona Santiago who experienced rash onset on week 28. In 2012, after witnessing large-scale and sustained outbreaks in the previous year, the numbers of confirmed cases in the last year have been reduced to 136 cases. All the cases in 2012 were linked to importations and reported from seven countries including Argentina (1), Brazil (1), Canada (7), Colombia (1), Ecuador (68), United States (55) and Bolivarian Republic of Venezuela (1). Most of the outbreaks in the region were related to importations of D8, D4 and B3 viruses. Eleven rubella cases were reported, of which three were import-associated cases and seven had an unknown source of infection.



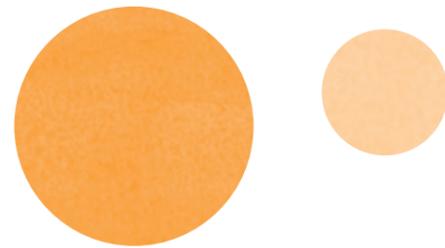
New outbreak response fund and operational procedures for early 2013

A measles outbreak fund, funded by GAVI and managed by the M&RI, will be in effect in early 2013 and is intended to prevent measles deaths, limit spread of the virus and enable rapid response during an outbreak.

All countries that have a significant measles outbreak of national public health importance and cannot respond to the outbreak fast enough with local funding (domestic epidemic response funds or donor funding) may request funding for outbreak response. In order to access this funding, countries need to provide: (1) the outbreak investigation and risk assessment including evidence of a laboratory confirmed measles outbreak; (2) a plan of

action that describes outbreak response activities and (3) evidence of commitment from the Ministry of Finance for sharing some of the costs.

The fund's standard operating procedures also include possible financing for technical assistance for outbreak investigation and response activities, evaluation of the quality of investigation and response and to develop a plan to address causes of outbreaks, catalytic funding to support linkages of outbreak response activities to other on-going routine and surveillance strengthening activities and the development of a national outbreak preparedness plan to improve rapid response and management of future outbreaks.



Communicate and engage to build public confidence and demand for immunization

All countries conducting measles or MR SIAs in 2012 developed an advocacy, communication and social mobilization plan. Good plans, engaging and informing leaders, community influencers and families are essential to achieve the targeted coverage results. More and more, countries use data to shape the communication strategies. Data from disease surveillance, rapid-coverage assessments, independent monitoring and surveys are used to identify awareness, motivation for vaccination, source of information and reasons for missed vaccinations. The collection, analysis and use of social data contain the evidence for systematic finding,

understanding and addressing causes of missed children. This requires considerable investment. Some countries use capacity and knowledge from the Global Polio Eradication Initiative to collect and analyse data.

Partners in the M&RI—including the Red Cross, the Lions Clubs International Foundation and the Church of Jesus Christ of Latter-day Saints—contribute to communication and social mobilization efforts using resources and the strength of their often-vast in-country networks of volunteers. In 2012, almost 165,000 volunteers mobilized millions of families in 16 countries.



TABLE 5: Volunteer and health worker involvement in measles SIAs in 2012*

COUNTRY	VOLUNTEERS	HEALTH WORKERS
Afghanistan	71,872	nd
Burundi	16,530	3,600
Cameroon	4,284	7,828
Chad	3,916	3,916
Eritrea	nd	1,763
Guinea	3,567	5,096
Guinea-Bissau	964	964
Kenya	9,712	30,128
Mongolia	0	3,801
Myanmar	0	10,000
Namibia	2,452	2,854
Papua New Guinea	3,436	2,883
Sao Tome and Principe	146	66
Sierra Leone	nd	9,677
Solomon Islands	20	473
South Sudan	5,839	1,460
Uganda	19,129	36,333
Yemen	13,871	27,341
Zambia	7,256	7,256
Zimbabwe	1,900	10,488
Total	164,894	168,927

nd = no data

*Based on reporting from 20 countries

House-to-house mobilization in urban areas

Red Cross and Red Crescent societies conducted house-to-house mobilization in urban and some rural areas of Africa in five countries in 2012. This involves a systematic visit to every house in order to engage directly with families, explain the threat of measles, the benefits of immunization and the dates of the campaigns. Selection criteria used by American Red Cross give priority to underserved populations, especially slums, areas with low coverage or high cases based on case based measles surveillance data and geographically remote areas. Mapping of neighbourhoods, noting migrants, nomadic and otherwise marginalized populations, serves to identify the high-risk areas that need special attention.

A tailored approach to communication and social mobilization that includes house-to-house mobilization has improved vaccination coverage levels in some communities to more than the 95 per cent coverage level required for herd immunity. The approach costs more money, given the need for additional planning, human resources and travel. House-to-house canvassing adds more cost (\$0.57 per targeted child) in sparsely settled rural areas (based on Namibian data) compared to urban (estimated at \$0.16).

Social Mobilization Net involvement in measles and routine immunization in India

UNICEF India, supported by the Global Polio Eradication Initiative, established the Social Mobilization Net in high-risk areas of Uttar Pradesh and Bihar. Areas are demarcated into blocks and communities, and women are engaged as community mobilization coordinators, with supervision at block, district and regional levels. They are responsible for a specific number of families in their community. They track newborns, mobilize families and speak with families who have concerns or are vaccine-hesitant. They also engage community, traditional and religious leaders. Since India no longer has circulating wild polio virus, the Social Mobilization Net is now also used for routine immunization and measles SIAs. Throughout 2012, India undertook phased SIAs in groups of states

in an ongoing effort to reach 134 million children. The Social Mobilization Net has supported the measles SIAs in high-risk areas through:

- Capacity building (including micro-planning, district/block and frontline workers) and support to Anganwadi workers during immunization sessions.
- Involvement of health, Integrated Child Development Services, education and other departments in SIA.
- Compilation of lists of children due for vaccination (Due List) and distribution of invitation cards to families with eligible children.
- Focused interpersonal communication for vaccine-hesitant families; community/mothers meeting sessions; meetings with religious and community leaders.
- Participation at district task force meetings, pre- and post- review meetings.
- Monitoring vaccination activities including house-to-house rapid coverage assessments.

Trust in immunization in the European Region

Maintaining political and public will to attain the 2015 measles elimination goal has presented an unprecedented challenge in the European Region. Indeed, complacency about the value of immunization has led to low rates of vaccination coverage particularly in western European countries and measles outbreaks in 2011 and 2012. Together with Member States, WHO/Europe and UNICEF has intensified communication and advocacy activities to increase and sustain demand for immunization services and mobilize the resources needed to support them. A toolkit to assist countries to tailor their immunization programme service delivery to meet the needs of susceptible populations was tested in Bulgaria in 2012. The toolkit should be published in early 2013.

Perform the research and development needed to support cost-effective operations and improve vaccination and diagnostic tools

Research and development is critical because it underpins the strategies to eliminate measles and rubella and shapes evidence-based policy. In 2012, a list of high priority research topics was published in *Vaccine*.¹⁰ The working group on measles and rubella has taken up the task to identify the top three to five research priorities to address technical and programmatic barriers to eradication. During its November 2012 meeting, the Strategic Advisory Group of Experts (SAGE) reviewed the results of a field trial of measles aerosol vaccine and concluded that the development of a combined measles-rubella aerosol vaccine should be pursued, including demonstration studies of field acceptability and potential to increase coverage in resource limited areas.¹¹ In 2012, progress was made to develop a bed-side diagnostic test for measles and rubella (a 'point of care assay'). This work is being led by the Health Protection Agency in the United Kingdom.¹²

During their meeting in November 2012, SAGE reviewed the progress and challenges to achieving global and regional measles and rubella goals. SAGE commended

countries and regions for the remarkable progress made in reducing measles mortality globally during past three decades, contributing significantly to Millennium Development Goal 4. However, despite this progress, a careful assessment of the comprehensive reports presented indicates that based on current trends and programme performance, the 2015 global targets as well as regional elimination targets in Europe (2015), the Eastern Mediterranean (2015) and Africa (2020) will not be achieved on time. SAGE urged countries and partners to raise the visibility of measles and rubella elimination activities and to ensure that they receive adequate priority and resources as a central component of the GVAP.¹⁰

10 J Goodson, et al., 'Research priorities for global measles and rubella control and eradication', *Vaccine*, vol. 30, no. 32, 6 July 2012, pp.4709-4716.

11 World Health Organization, 'Meeting of the Strategic Advisory Group of Experts on Immunization, November 2012—conclusions and recommendations', *The Weekly Epidemiological Record*, vol. 88, no. 1, 4 January 2013, pp. 11-13.

12 Warrenner L, et al., 'A point-of-care test for measles diagnosis: detection of measles-specific IgM antibodies and viral nucleic acid', *Bulletin of the World Health Organization*, vol. 89, no. 9, 1 September 2011, pp. 675-82.



Report on Implementation of the Founding Principles



Country Ownership And Sustainability

Country ownership and sustainability is one of the four founding principles of the *Strategic Plan*. The M&RI partnership works towards country ownership and sustainability through building relations with partners and coordination among different players.

For sustainability of measles and rubella control and elimination efforts, the partnership has advocated successfully for the inclusion of measles and rubella activities in the relevant national immunization and health plans, the comprehensive multi-year plan, health sector plans and the budget. Routine measles and rubella services and SIAs should be integrated in national immunization plans.

Regarding funding, the M&RI asks that countries conducting SIAs mobilize 50 per cent of operational costs locally. In 2012, 21 of 32 countries mobilized at least 50 per cent of the operational costs—the largest proportion of countries yet, demonstrating growing country ownership. Over time, this ownership will be increasingly important as countries introduce MR vaccine in campaigns and then need to pay for MR vaccine and operations as part of their routine immunization programmes.



Building country ownership in Niger

Niger, one of the poorest countries of the world with a gross domestic product per capita of US\$374, reported a funding gap for its 2012 measles SIA and had not guaranteed a required local contribution towards the campaign. The country had planned a wide-age group of 9 months to 14 years based on measles epidemiology. The M&RI partners undertook an advocacy visit to the country in September. Staff members from the American Red Cross, United Nations Foundation, UNICEF and WHO met with the Minister of Finance, State Minister of Planning, Minister of Health, Council of Ministers, Minister of Labor and Minister of Gender. The delegation also met with bilateral representatives and non-governmental partners in the country, including Helen Keller International, Japan International Cooperation Agency, Médecins Sans Frontières, Lions Clubs International, Korea International Cooperation Agency and Nigerian Embassy. The delegation underscored the importance of national government responsibility and leadership to financially support a portion of measles campaign costs in order to ensure high coverage of the target population they had identified. The group also made the case for measles vaccination beyond 12 months for children not yet vaccinated during routine services. As a result, Niger issued a decree to finance the gap (more than US\$2.2 million) from government resources. The country also changed its policy to support vaccination of children beyond 12 months of age if not already vaccinated.

Kenya's contribution to measles

Success in Kenya's 2012 measles campaign would depend on engagement and leadership from different key areas of Kenyan government and society. Garnering the required support took time, but efforts paid off. The government was initially hesitant to approach donors and development partners for financial support, resulting in delays and the postponement of the SIA from June to November. UNICEF and WHO country representatives conducted repeated meetings with the Ministry of Public Health and Sanitation to encourage a country contribution to the SIAs. The Division of Vaccine and Immunization worked with WHO and UNICEF to map resources and prepare status updates using epidemiological and social data, including the justification for the measles SIA, budget breakdown, funding sources and shortfalls. Persistent efforts resulted in a Government of Kenya US\$2.5 million allocation for the procurement of vaccine and devices for the measles SIA. High-level delegates from the Ministry of Health then presented updates on the status of the preparation activities during development partner monthly meetings, which helped to motivate development partners on the need to fill the funding gaps.



Routine immunization and health systems strengthening

Immunization and health systems are critical to the elimination of measles. Increased and homogenous vaccination coverage improves the population immunity, ensures impact when countries introduce a second dose in routine immunization and lengthens the interval between vaccination campaigns.

M&RI has initiated studies into this critical area. Several studies have shown that SIAs can contribute to routine immunization strengthening, including in Bangladesh, Brazil, India, Tajikistan and Viet Nam. However, these opportunities are not always used despite the fact that some of them incur only marginal increases in SIA costs. SIAs also have the potential to be disruptive by diverting attention and resources away from routine immunization

services or interrupting their delivery. This has been observed in places with weaker health systems and infrastructure, such as Cameroon and Ethiopia, which are most likely to rely on SIAs to achieve high levels of population immunity to measles.¹³ Therefore, the M&RI encourages countries to take the opportunities of measles or MR SIAs to support routine immunization strengthening and designate a routine immunization focal point for SIA activities to ensure appropriate action.¹⁴

¹³ Hanvoravongchai P, et al., 'Impact of Measles Elimination Activities on Immunization Services and Health Systems: Findings from six countries', *The Journal of Infectious Diseases*, vol. 204, suppl. 1, 1 July 2011, pp. S82-89

¹⁴ Field R, et al Using SIAs to Strengthen Routine Immunization and Surveillance Planning Module, in process

FIGURE 9: Examples of how SIAs can improve routine immunization and result in sustainable improvements



India: RI strengthening as part of SIA planning and implementation

India has planned 2012-2013 measles catch-up campaigns in such a way as to use opportunities to strengthen routine immunization. A new JSI/UNICEF study demonstrated that some aspects of the routine immunization system were significantly improved as a result of SIA activities. These included the availability and use of hub cutters for injection safety, AEFI knowledge among health workers, vaccine handling practices (including keeping vaccine cool during the session) and recording practices. The study showed that other areas in routine immunization already performed well and remained strong. For example, 95 per cent of the health workers knew vaccine eligibility criteria for infants and measles vaccine contraindications before and after the campaign. There was no expired vaccine found at routine immunization sessions before or after the SIA. Some other indicators did not improve with the implementation of the campaign. For example, availability of routine

immunization micro plans and maps remained weak, as did supervision (see Table 6).

Some aspects of routine immunization strengthening may be easier to improve using SIA opportunities than others. Measles SIAs may be able to make a realistic impact on highly overlapping routine immunization topics such as health worker knowledge of adverse events and vaccine handling. Other aspects of routine immunization may be too constrained or be hampered by other systematic issues and not possible to positively impact through SIAs (e.g., routine immunization supervision may not have changed due to lack of funds for transport).

The success of using SIA opportunities to strengthen the routine immunization system indicates the need to appoint 'synergy focal points' throughout the SIA process. A 'champion' focused on actively ensuring routine immunization strengthening activities occur during the measles SIA is critical to ensuring opportunities for synergy are acted upon.



TABLE 6: India Study—Indicators which changed significantly before versus after SIA

CATEGORY	INDICATOR	BEFORE SIA	AFTER SIA
Vaccine safety	Health worker knows a child with AEFI should be given first aid; referred	70%	100%
	Health worker has AEFI contact information	65%	85%
	Health worker has working hub cutter	80%	100%
Record-keeping	Health worker kept measles vial in hole of ice pack during RI session	20%	55%
	Health worker properly filled register, health card, tally at RI session	52%	84%
Cold chain	Health worker received cold chain training during the past 6 months	25%	58%
Waste management	Health worker received waste management training in past 6 months	45%	74%
Child tracking	Health worker received training on child tracking in past 6 months	20%	42%

Table 7: India Study—Indicators which did not significantly change after SIA

CATEGORY	INDICATOR	BEFORE SIA	AFTER SIA
Vaccination eligibility	HW knows infants who just received Measles RI dose is eligible for measles SIA dose	95%	95%
Vaccination eligibility	HW knows infants who just received Measles RI dose is eligible for measles SIA dose	95%	95%
	HW knows correct measles vaccine contraindications	85%	90%
Waste management	Waste management bags available at RI session	85%	95%
Vaccine handling	Vials at session have properly marked reconstitution information (date, time)	87%	95%
	No expired vaccine found at RI session	100%	100%
	Correct diluent used for MCV or BCG vaccines at session	100%	100%
Injection safety	During injection, HW did not touch needle	90%	90%
	Hub cutter used to cut used syringe during RI session	90%	90%
	HW used correct route of injection during RI session	90%	90%
AEFI	HW know AEFI management center location	75%	90%
Planning	Health worker received target population training in past 6 months	20%	30%
	Facility catchment map available	20%	20%
	Facility microplan available	35%	50%
Supervision	Supervisory visit documentation available	15%	35%
AEFIs	Beneficiary told about possible AEFIs and who to contact	39%	32%

Using SIA opportunities to strengthen routine immunization in Myanmar

Myanmar conducted its measles campaign in March 2012 and successfully used the SIA to improve routine immunization in micro planning, create demand for immunizations, enhance skills among health workers, increase availability of AEFI kits to enable more frequent vaccination and involve community leaders in immunization.

Better quality micro planning

As the measles campaign required health workers to organize themselves to reach to every single child, health workers reviewed their plans using new micro- planning formats. Trainings for improved micro planning focused on identifying all migratory populations, new settlements specifically in peri-urban areas, construction sites, scattered populations, hard-to-reach areas and insecure areas. As a result, additional populations were identified in the micro plans and fewer areas were missed. The revised micro plans are now being used in routine immunization and intensified immunization activities, as Myanmar rolled out two new vaccines in 2012: pentavalent and measles second dose.

Greater community leadership and demand for immunization

The measles campaign was endorsed by celebrities and high-profile persons and included a well-organized media campaign with media workshops, TV, radio, print and electronic messages. The messages included the benefits of all immunization antigens. Media workshops promoted immunization as a child's right. The government of Myanmar issued instructions to all village and ward heads to ensure that parents were informed on the date and place of

vaccination and that vaccination teams are provided all possible help in organizing vaccination sessions. These community leaders helped to distribute invitation cards to around 6 million houses two to three days prior to the campaign and made logistics arrangements for health workers, including a space to vaccinate (often their own homes), chairs and tables, food for teams, microphones, songs for entertainment, accommodation for mobile teams to sleep, authorization to use monasteries as vaccination sites, transportation in hard-to-reach areas and, above all, tracking of missed children. This helped boost parents' knowledge of the benefit and value of immunizations and enhanced community trust in routine immunizations.

Enhanced skills and confidence of health workers

As expanded programme on immunization trainings are costly and quite infrequent, the measles campaign trainings included all components of the programme. This included micro planning, cold chain, vaccine management, vaccine vial monitor, AEFI, reporting, recording, social mobilization and vaccine-preventable disease surveillance. As a result, health workers now have enhanced technical knowledge and skills for routine immunization.

AEFI management

In the measles campaign, every vaccination team was provided with AEFI management kits and AEFI reporting formats. These AEFI management kits are now available at routine immunization sessions, and health workers are more confident to use measles vaccine which they did not use previously in all sessions due to their fear of AEFI.





Equity

Because measles is one of the most transmissible human pathogens, it readily finds susceptible populations. Under-served populations, potentially with less access to nutrition, sanitation and health care, may be most susceptible to measles deaths, illness and deaths from other health risks. A measles outbreak requires a response, and also provides an important opportunity to identify underserved communities and highlight gaps in the immunization programme. Recognizing the potential for measles elimination to promote equity, countries are encouraged to use the occurrence of measles cases as an indicator of inequities in access to preventive health services and use this intelligence for planning more equitable health service delivery.



Linkages

Campaigns provide a platform of micro plans, human resources, cold chain and transportation to integrate other child health interventions. The distribution of insecticide treated nets, vitamin A, deworming and polio vaccination together with measles vaccination helps rapidly improve coverage, reach the most vulnerable, decrease costs, improve efficiency and prevent deaths. This further contributes towards the achievement of MDG 4 to reduce under-5 child mortality by 2015. Of the 32 countries supported by M&RI that conducted SIAs in 2012, 25 (78 per cent) included one or more child health interventions, in addition to measles or measles-rubella vaccinations. Another 18 (56 per cent) included oral polio vaccination (see Table 2).

Best practices in Cambodia

Relatively poor and with remote populations, Cambodia is one of the most challenging countries in the Western Pacific Region, and yet it has proven diseases can be eliminated in these conditions. The last endemic polio case was reported in 1997. The country reported its last measles case in November 2011 and celebrated a measles-free 12 months. To achieve this success, the country conducted a focused EPI review in October 2010 to identify where and why children missed their vaccinations and

then developed a 'high-risk-community strategy' aiming to improve immunization services targeting underserved populations. High-risk communities were identified before and during the measles SIAs in 2011 and prioritized for actions, including micro planning, monitoring and supervision. The country also developed another innovative strategy, built up a system to introduce MCV2 in 2012 and used the visit at 18 months to catch up all missed routine EPI doses.

Towards a world without measles, rubella or CRS



Countries and partners have made tremendous progress in reducing measles mortality and incidence, contributing significantly to MDG 4 and to the progress made in all regions. In addition, there has been a steady increase in the number of countries using rubella vaccine in their routine childhood immunization programme. However, despite the tremendous progress, the SAGE has warned that based on current trends and programme performance, the 2015 global targets as well as regional elimination targets in the European (2015), Eastern Mediterranean (2015) and African (2020) regions will not be achieved on time. Focused actions are required to achieve the measles and rubella goals enshrined in the Global Vaccine Action Plan.

Strengthening routine immunization systems

Globally, routine immunization with MCV1 is 84 per cent, but coverage has stagnated in some countries, and more than 20 million children are missed. Measles and rubella elimination activities provide a unique opportunity to strengthen routine immunization systems. Innovative work is reported from Cambodia and India where measles SIAs were used to measurably improve routine immunization service delivery. Countries and partners should provide additional resources to plan and implement specific strategies to be conducted before, during and after SIAs that will strengthen routine service delivery. To this end, the M&RI will enhance its support to countries, including support for quality SIA planning, implementation and monitoring that includes more sustainable routine immunization strengthening, and outbreak investigations that identify the gaps in

immunization services and propose action plans to fill them. The larger task of raising routine immunization coverage to meet the goals of the Global Vaccine Action Plan is one for countries to prioritise, working with immunization partners.

Rubella vaccine introduction

The introduction of rubella vaccine starting with a wide-age-range measles-rubella SIA with substantial funding support for GAVI-eligible countries is a unique and unprecedented opportunity to rapidly increase population immunity against both rubella and measles and move countries closer to elimination goals. Every country introducing rubella vaccine should ensure that their planning and implementation is of the highest quality and includes all the strategies recommended by SAGE. Each MR campaign should follow established 'best practices' and be independently evaluated to ensure homogeneous vaccination coverage of more than 95 per cent. Considering the high cost of CRS to society and the fact that CRS burden is highest in countries that do not yet use rubella vaccine, the case for the introduction of rubella vaccine is clear. M&RI partners will work with countries to make sure they can take full opportunity of the GAVI opportunities.

On the road towards a world without measles and rubella

The rapid resurgence of measles in Africa, Eastern Mediterranean and Europe underline the challenges the measles virus poses to the world. High and homogenous vaccination in each community is required to stop transmission. The Americas has successfully

demonstrated that measles and probably rubella can be eliminated, and that this can be sustained over time. As a result of the strong leadership of countries in the Western Pacific, the region may be the second in the world to eliminate measles. Strong political leadership, coordination, motivated frontline workers and active involvement of community members in immunization may ensure high-quality activities in the remaining regions. The M&RI is committed to support countries to implement quality SIAs through quality planning, monitoring and evaluation; to use opportunities provided by the SIAs to contribute to routine immunization

strengthening; to strengthen surveillance systems, to learn from measles outbreaks and diagnose policy issues and operational issues in immunization systems that need change to improve the immunization system; and to conduct rubella burden assessments. Together with countries and partners, these actions can help lead the way to a world without measles, rubella and congenital rubella syndrome.

¹⁵ World Health Organization, 'Measles vaccines: WHO position paper,' The Weekly Epidemiological Record, vol. 84, no. 35, 28 August 2009, pp. 349–360.



ANNEX



Measles-containing vaccine and supplies procured through UNICEF Supply Division for SIAs, Child Health Days and Emergency Response (outbreaks and humanitarian emergencies) in 2012

COUNTRY	VACCINE	DOSES VACCINE	VALUE VACCINE (US\$)	COST OF AD SYRINGES	COST OF RECONSTITUTION SYRINGES	COST OF RUP SYRINGES	COST OF SAFETY BOXES	TOTAL
SUPPLEMENTARY IMMUNIZATION ACTIVITIES								
Afghanistan	Measles	14,044,500	\$3,216,190.50	603,461.60	20,362.24	51,546.00	116,412.58	\$4,007,972.92
Burundi	Measles	1,614,000	\$311,502.00	\$72,468.60	5,453.71		\$8,700.55	\$398,124.86
Cameroon	Measles	3,339,000	\$764,631.00	\$154,642.00		\$18,748.80	\$18,878.63	\$956,900.43
Chad	Measles	2,771,000	\$886,720.00	\$141,372.00		\$16,909.20	\$14,011.56	\$1,059,012.76
Djibouti	Measles	258,700	\$49,929.10	\$10,428.00	\$1,213.06		\$2,754.18	\$64,324.34
Eritrea	Measles	445,000	\$85,885.00	\$18,920.85	\$1,526.48		\$2,684.12	\$109,016.45
Ethiopia	Measles	2,800,000	\$641,200.00					\$641,200.00
Fiji	MR	120,000	\$59,880.00	\$1,872.00	\$168.78			\$61,920.78
Gabon	Measles	297,200	\$57,359.60	\$10,138.75	\$3,406.59		\$1,670.92	\$72,575.86
Guinea	Measles	2,440,000	\$829,600.00	\$107,116.00	\$8,244.76		\$13,148.86	\$958,109.62
Guinea-Bissau	Measles	281,000	\$95,540.00	\$13,458.50	\$974.00		\$1,834.90	\$111,807.40
Haiti	MR	2,310,940	\$1,141,604.36	\$108,570.00			\$14,455.91	\$1,264,630.27
Kenya	Measles	7,058,000	\$1,616,282.00					\$1,616,282.00
Mongolia	MR	685,000	\$341,815.00	15,771.36	1,100.68		2,074.38	\$360,761.42
Myanmar	Measles	773,000	\$1,491,890.00	\$361,335.00	\$28,738.40		\$39,529.16	\$1,921,492.56
Nepal	MR	1,730,000	\$863,270.00					\$863,270.00
Niger	Measles	8,474,000	\$1,940,546.00	\$372,026.16		\$47,510.40	\$64,728.12	\$2,424,810.68
Pakistan	Measles	5,987,500	\$1,371,137.50	\$323,367.40	\$24,825.41		\$41,001.26	\$1,760,331.57
Papua New Guinea	Measles	355,800	\$68,669.40					\$68,669.40
Rwanda				\$73,456.40	\$5,417.74		\$10,664.00	\$89,538.14
Sao Tome and Principe	Measles	27,800	\$6,366.20					\$6,366.20
Sierra Leone	Measles	1,390,000	\$318,310.00	\$62,411.00		\$7,784.00	\$8,859.50	\$397,364.50
State of Palestine	Rubella	600,000	\$174,000.00					\$174,000.00
Uganda	Measles	9,093,000	\$2,082,297.00	\$417,299.85		50,937.60	\$51,023.32	\$2,601,557.77
Yemen	Measles	8,552,200	\$1,958,453.80	\$391,493.40	\$28,900.59			\$2,378,847.79
Zambia	Measles	7,601,500	\$1,740,743.50	\$175,600.00	\$25,945.98		\$37,772.47	\$1,980,061.95
Zimbabwe	Measles	1,766,600	\$404,551.40	\$76,781.10			\$10,616.52	\$491,949.02

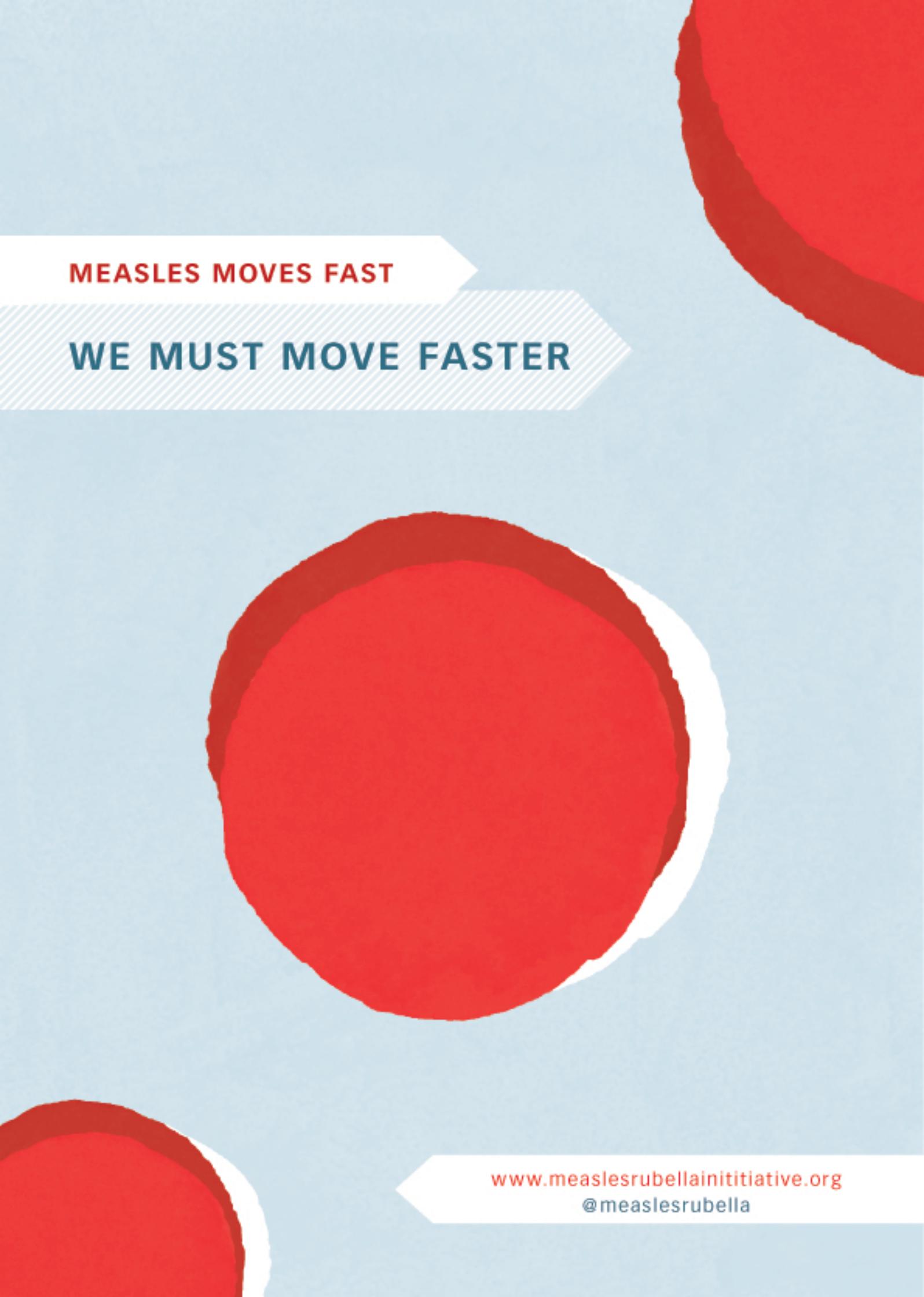
Chart continues on next page

COUNTRY	VACCINE	DOSES VACCINE	VALUE VACCINE (US\$)	COST OF AD SYRINGES	COST OF RECONSTITUTION SYRINGES	COST OF RUP SYRINGES	COST OF SAFETY BOXES	TOTAL
---------	---------	---------------	----------------------	---------------------	---------------------------------	----------------------	----------------------	-------

CHILD HEALTH DAYS

Mozambique	Measles	1,800,000	\$412,200.00					\$412,200.00
Somalia	Measles	979,500	\$189,043.50					\$189,043.50
EMERGENCY RESPONSE								
Burkina Faso	Measles	209,500	\$47,975.50					\$47,975.50
Cameroon	Measles	38,000	\$8,702.00					\$8,702.00
Chad	Measles			\$34,148.83	\$2,298.35		\$4,168.98	\$40,616.16
Comoros	Measles	8,300	\$1,900.70					\$1,900.70
Congo	Measles	317,000	\$72,593.00					\$72,593.00
Democratic Republic of the Congo	Measles	1,750,000	\$400,750.00	\$93,383.54	\$6,748.41		\$33,840.62	\$534,722.57
Guinea Bissau	Measles	26,300	\$6,022.70					\$6,022.70
Lebanon	Measles	200,000	\$45,800.00	9,558.40	529.74		845.24	\$56,733.38
Mauritania	Measles	60,000	\$13,740.00					\$13,740.00
North Sudan	Measles	200,000	\$38,600.00					\$38,600.00
South Sudan	Measles	330,000	\$75,570.00	\$64,923.30	8,529.25		\$24,128.00	\$173,150.55
Syria	Measles	1,500,000	\$510,000.00	\$76,330.00		\$63,072.00	\$43,500.00	\$692,902.00
TOTAL		99,191,340	\$24,341,270.76	\$3,790,334.04	\$174,384.17	\$256,508.00	\$567,303.78	\$29,129,800.75

Note: This is a list of measles containing vaccines and injection devices that is procured through UNICEF Supply Division, and has been partially funded by The Measles & Rubella Initiative.



MEASLES MOVES FAST

WE MUST MOVE FASTER

www.measlesrubellainitiative.org
[@measlesrubella](https://twitter.com/measlesrubella)