

# Can Measles and Rubella be Eradicated?

15th ADVANCED COURSE OF  
VACCINOLOGY- 22 May 2014

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# Outline

- Measles and rubella disease burden, goals, and control strategies
- Feasibility of eradication
- Key Challenges
- Opportunities
- Conclusion

# Measles is Highly Contagious with Severe Complications



Corneal scarring  
causing blindness

## Encephalitis

Older children, adults  
~ 0.1% of cases



## Pneumonia & diarrhea

Diarrhea common in developing countries

Pneumonia ~ 5-10% of cases, usually bacterial, major cause of death

# Measles disease burden

- 1980: estimated 2 million deaths
- **2012: 330 lives lost every day =122,000 deaths\***
- Case-fatality ratio 0.1 – 10%
- The vast majority of measles deaths occur in developing countries.
- Major component to achieving MDG4



\*Weekly Epidemiological Record, 7 Feb 2014; 89:45-52



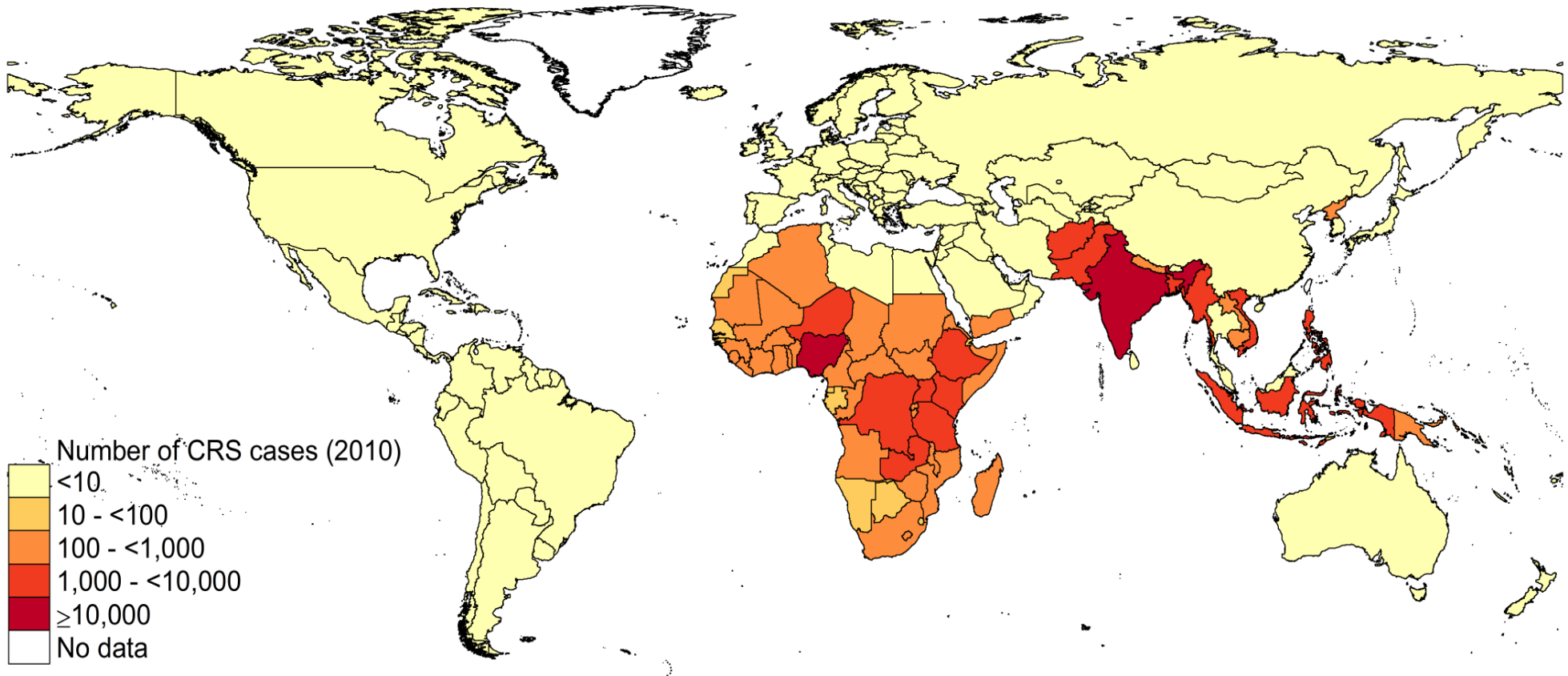
# Rubella and Congenital Rubella Syndrome



Child with CRS,  
autism, mental retardation, and  
deafness

- **Rubella** is a mild febrile maculopapular rash illness
  - 20-50% of infections are asymptomatic
  - Complications of encephalitis and arthritis are rare
- Rubella infection in early pregnancy
  - Miscarriages, fetal death, or infants born with congenital defects
  - Clinical presentation is correlated to stage of gestational infection
- **Congenital rubella syndrome**
  - Hearing Impairment, cataracts, heart defects
  - Microcephaly, mental retardation, developmental delay
  - Case-fatality of 20-30% in developing countries

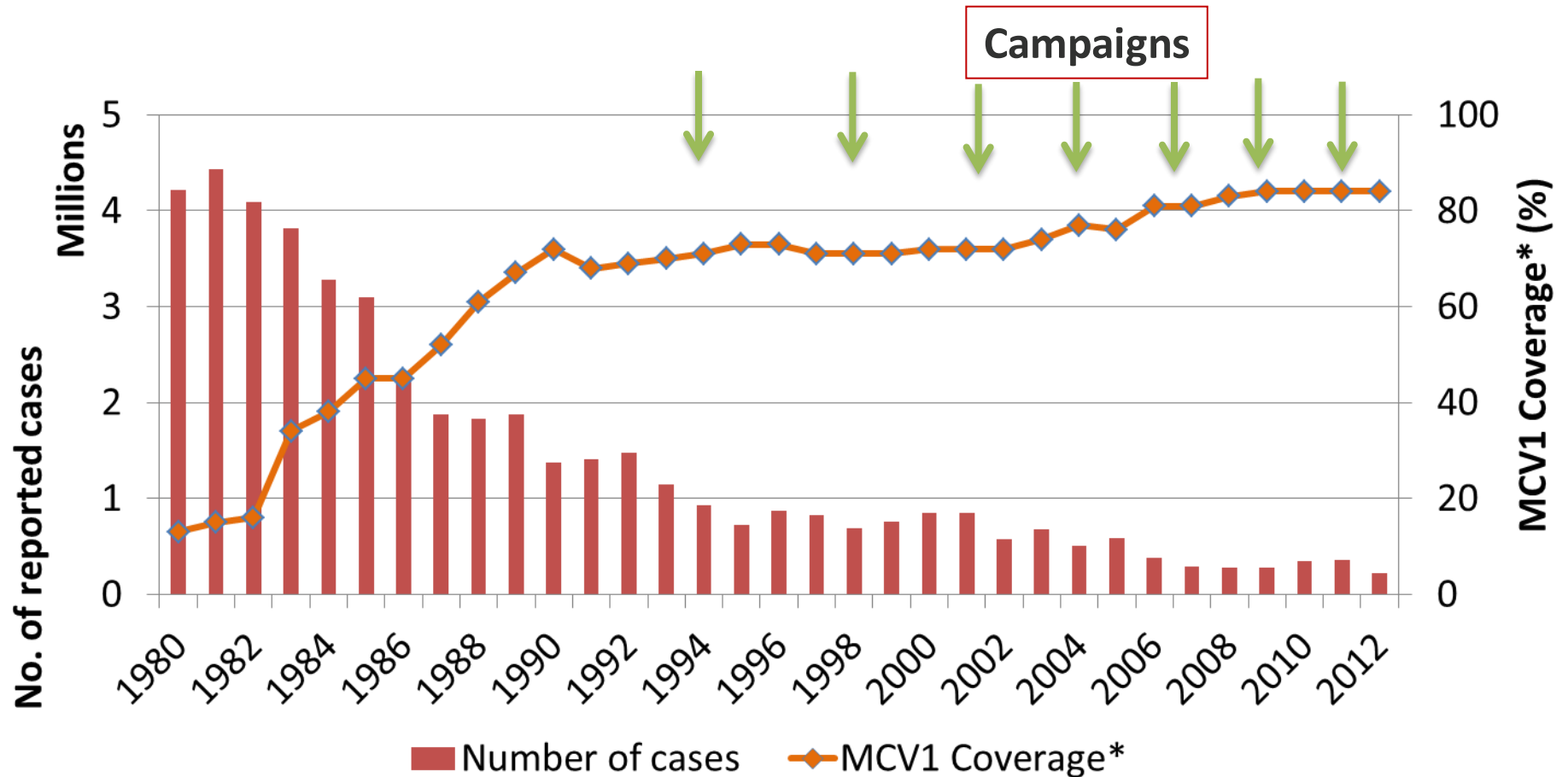
# Estimated Number of CRS cases born in 2010



Total: 103,000 CRS cases

# 94% Reduction in reported measles cases

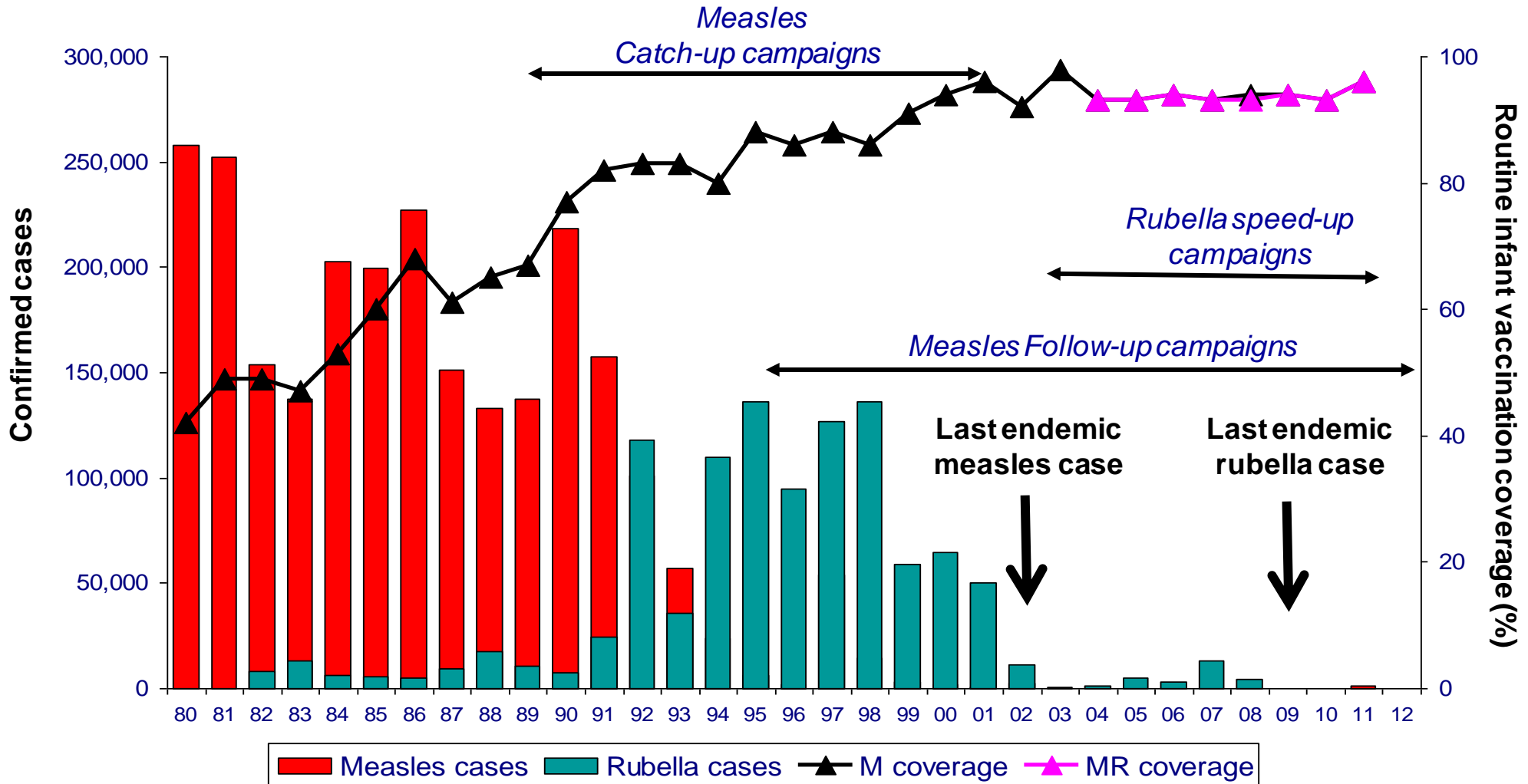
Measles global annual reported cases and MCV1 coverage\*, 1980-2012



\* MCV1 coverage: coverage with first dose of measles-containing vaccine as estimated by WHO and UNICEF

# The Americas

Measles vaccination coverage among children <1 year of age\* and reported measles and rubella cases, 1970-2012



\*MR in children aged 1 year as countries introduced measles-rubella containing vaccines

Source: Country reports to FCH-IM/PAHO.



# Feasibility of Measles Eradication

1. Biological feasibility

2. Programmatic feasibility

3. Vaccine market analysis

4. Impact on health systems

5. Economic analysis

6. Risk analysis for post-measles era

7. Global context and political feasibility

Global Consultation meeting (2010)

**SAGE**

Recommend global measles goal

WHA set global measles goal?

# Biologic Criteria for Feasibility of Measles Eradication I

- **Humans are essential for life cycle**
  - Primates besides humans can be infected but are insufficient in numbers to maintain virus. No other animal reservoir
- **Cases can be reliably diagnosed**
  - Clinical case definition is non-specific. There are many causes of rash illness with fever
  - Accurate and sensitive diagnostic tests
- **Evidence supports similar conclusion for rubella**

# Biologic Criteria for Feasibility of Measles Eradication II

- **An Effective Intervention**

- Measles vaccines are safe and effective
- Vaccines provide long-term protection against all known genotypes
- Current vaccines have eliminated measles in the Americas
- **Similar even stronger arguments for rubella vaccines**

# International Task Force on Disease Eradication

## Carter Center, June 4, 2009

*"measles eradication is biologically feasible using tools that are currently available, as already demonstrated in the Americas, although implementation challenges remain in each of the remaining five regions" \**

- Rubella has been assessed and considered eradicable

\* WER , October 30, 2009

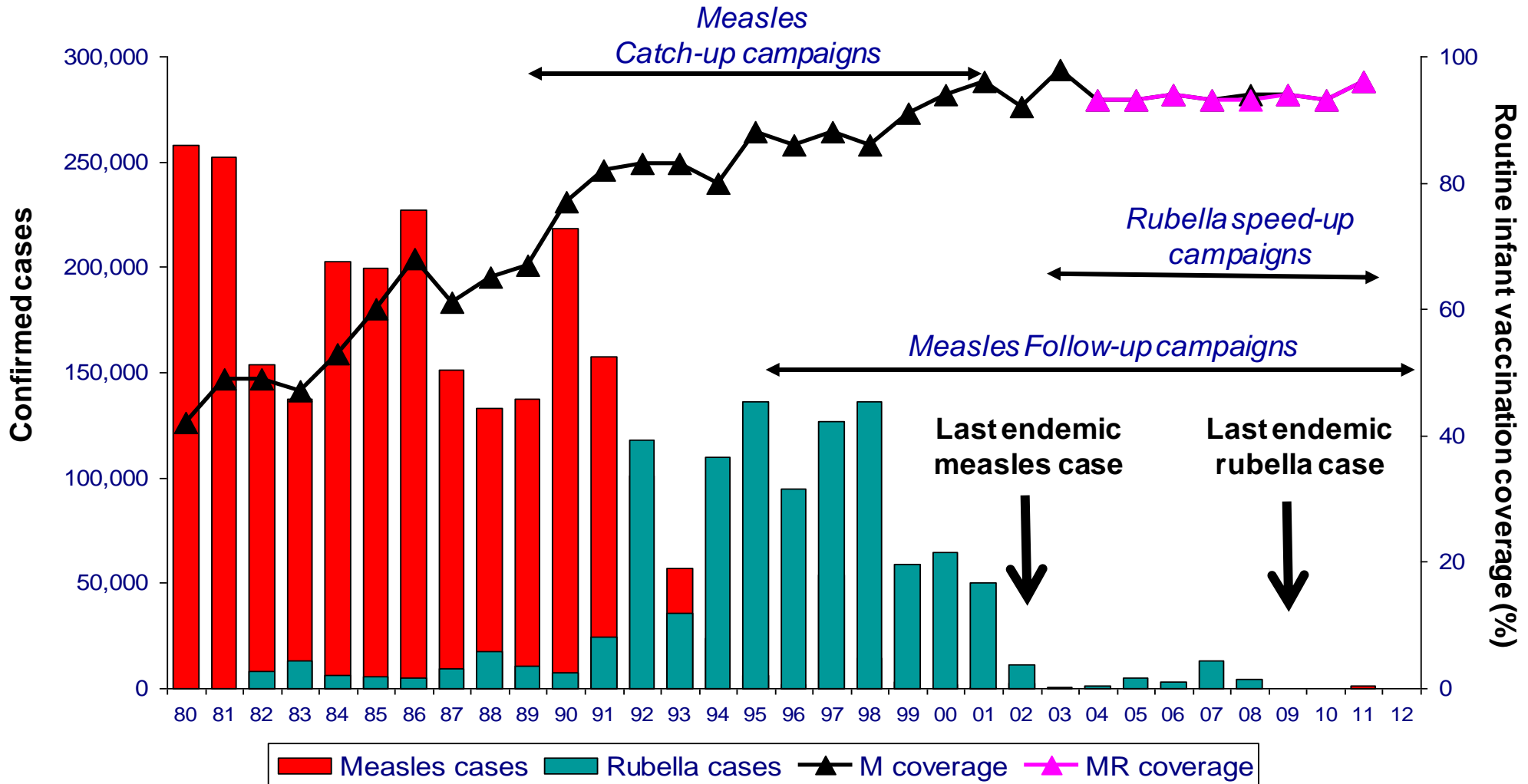
## 2. Programmatic Feasibility

WHO Region	Elimination target	Main Challenge
Americas	2000	<i>Achieved in 2002</i>
Europe	2015	Lack of commitment
E. Mediterranean	2015	Conflict areas
W. Pacific	2012	Adult cases
Africa	2020	Weak systems
SE Asia	No date set	Scaling-up in India



# The Americas

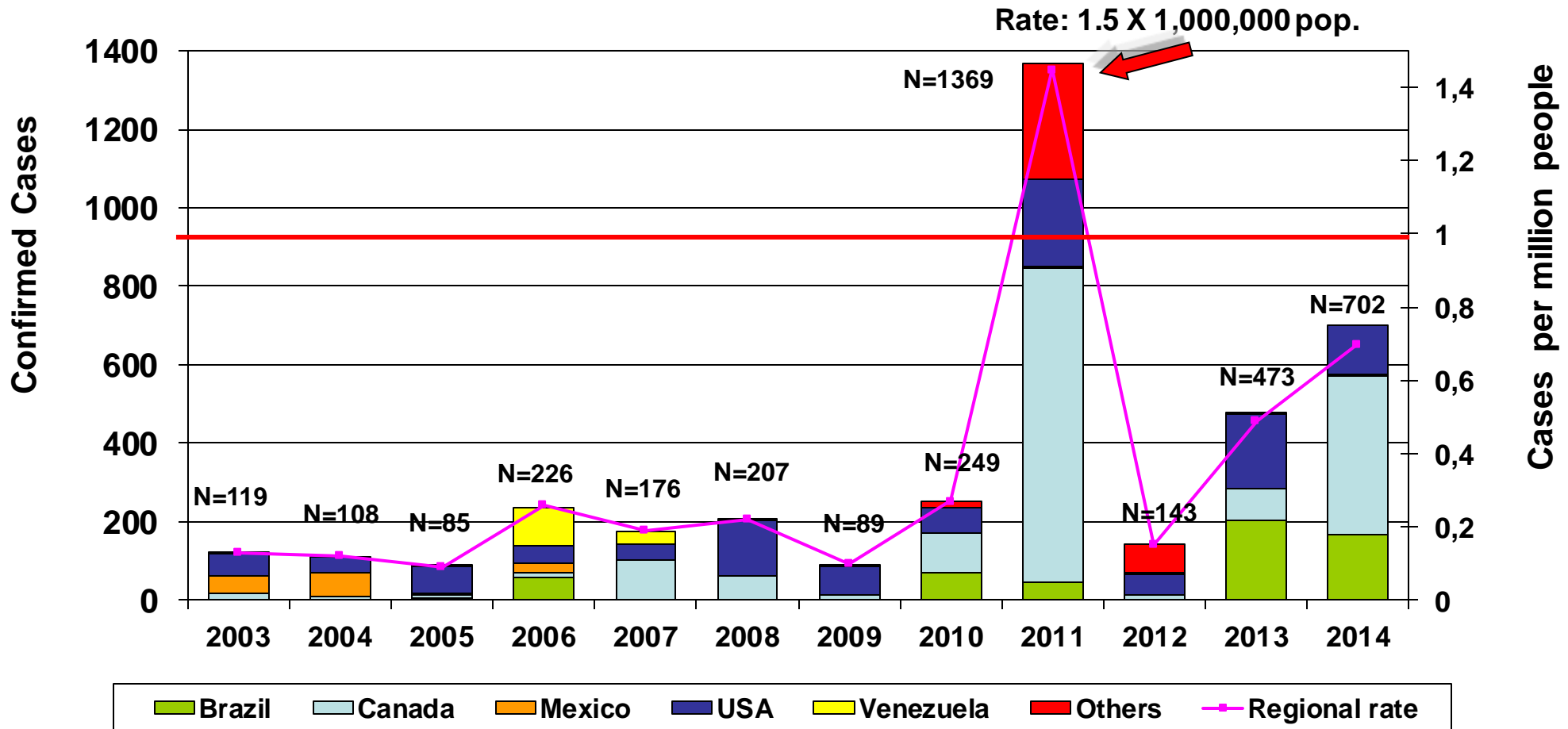
Measles vaccination coverage among children <1 year of age\* and reported measles and rubella cases, 1970-2012



\*MR in children aged 1 year as countries introduced measles-rubella containing vaccines

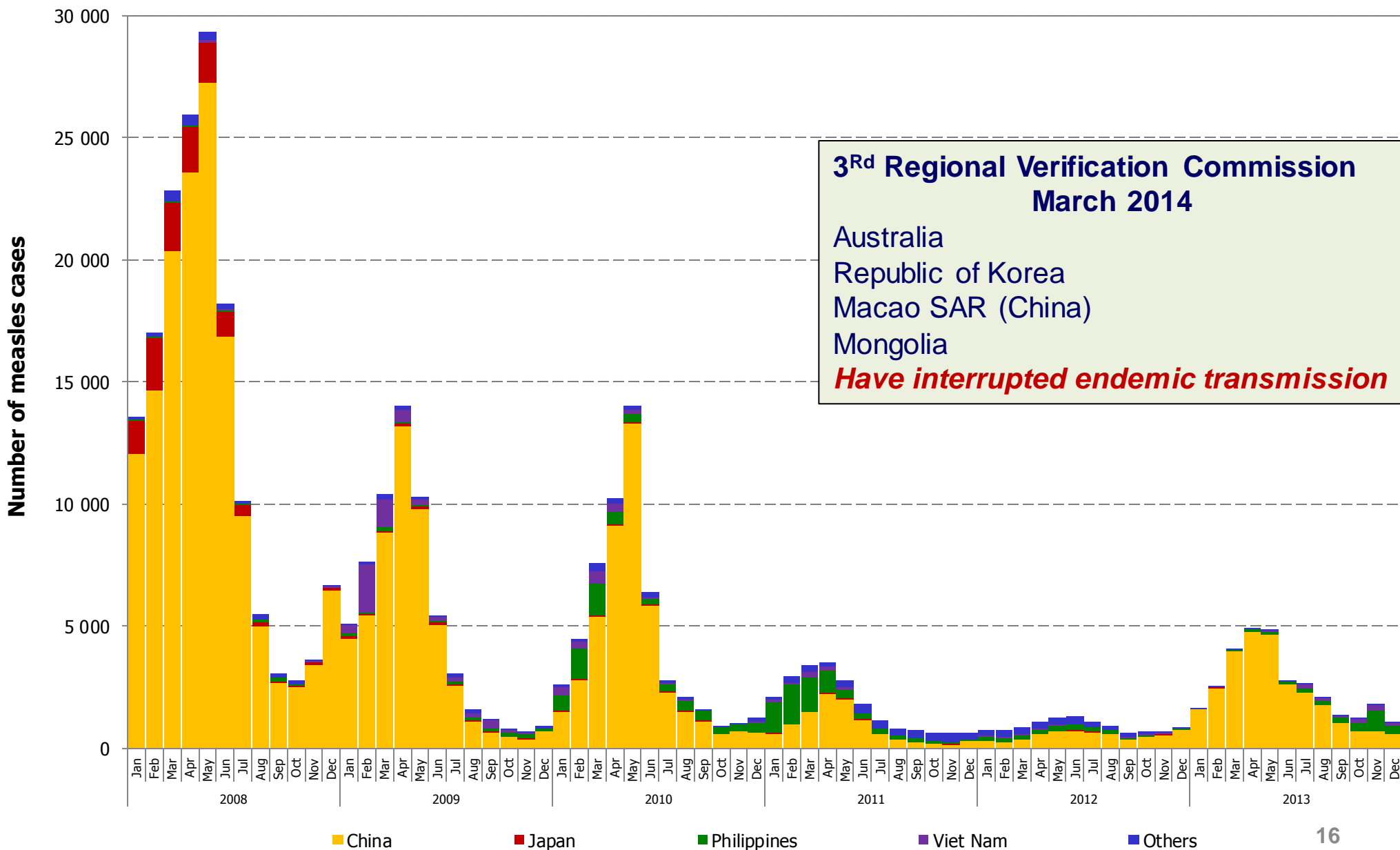
Source: Country reports to FCH-IM/PAHO.

# Distribution of Confirmed Measles Cases Following the Interruption of Endemic Transmission, the Americas, 2003-2014\*



Source: MESS, ISIS and country reports.  
 \* Data as of epidemiological week 16 2014

# Measles Cases by Month and Year, WPR, 2008–2013



# **Economic Analysis of Measles Eradication**

**- David Bishai and Ann Levin/Colleen Burgess**

- Cost effectiveness analysis carried out by two groups
- Field evaluations in 6 countries:
  - Brazil, Bangladesh, Columbia, Ethiopia, Tajikistan, Uganda
  - Global analysis of costs
- **Results**
  - Baseline: 90% mortality reduction
  - Measles eradication by 2020 was highly cost-effective in all 6 countries and globally (cost-saving in Brazil & Columbia)
  - Eradication is highly CE even when 2 doses of MCV are continued post eradication,
  - Intermediate targets 95% and 98% mortality reduction also highly CE
- Measles eradication ranks among top best buys in public health

# SAGE, November 2010

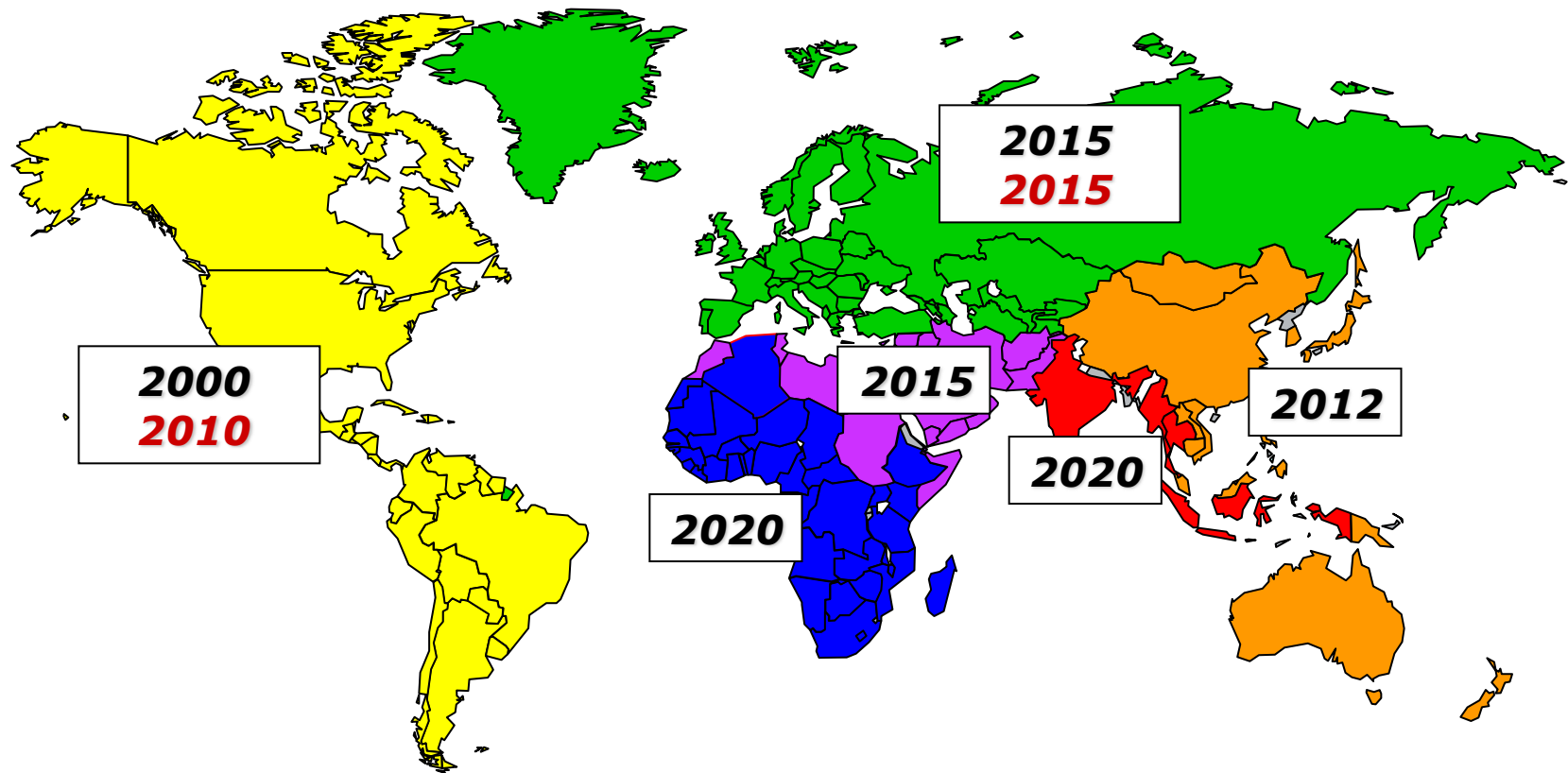


- Measles can and should be eradicated
- *Measurable progress towards 2015 global targets and existing regional elimination goals is required before establishing a target date*
- Requested frequent updates on progress
- November 2012 SAGE:
  - African, E. Mediterranean, European, SE Asian Regions are **NOT on track** to achieve Regional goals

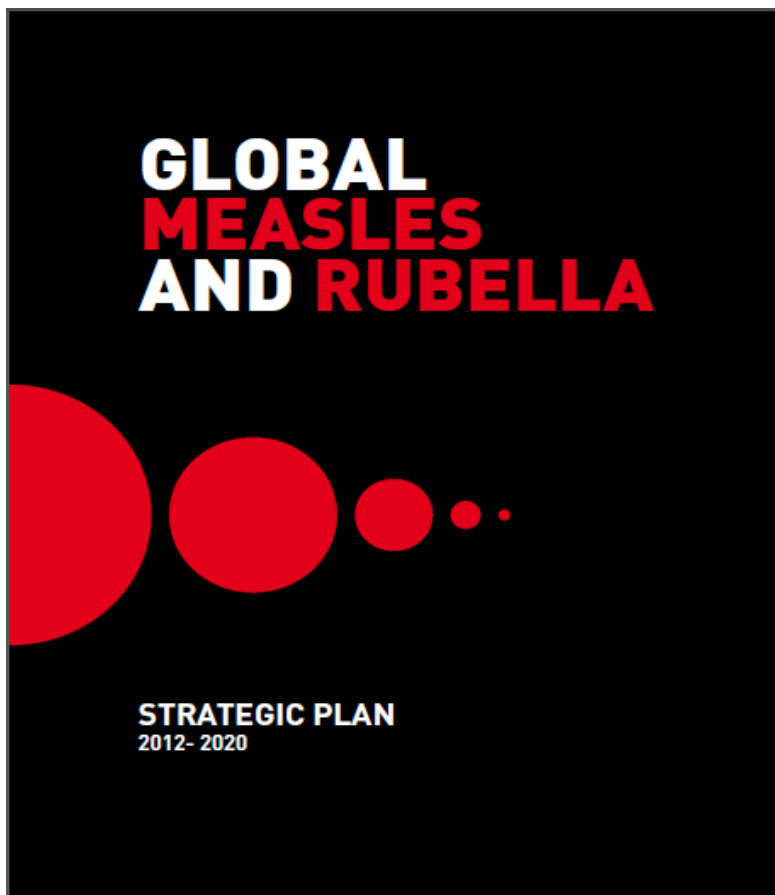


# Measles and *Rubella* Elimination Goals by WHO Region, May 2014

Americas, Europe, E. Mediterranean, W. Pacific, Africa have measles elimination goals  
**Americas and Europe have rubella elimination goals**



# Strategic Plan, 2012-2020



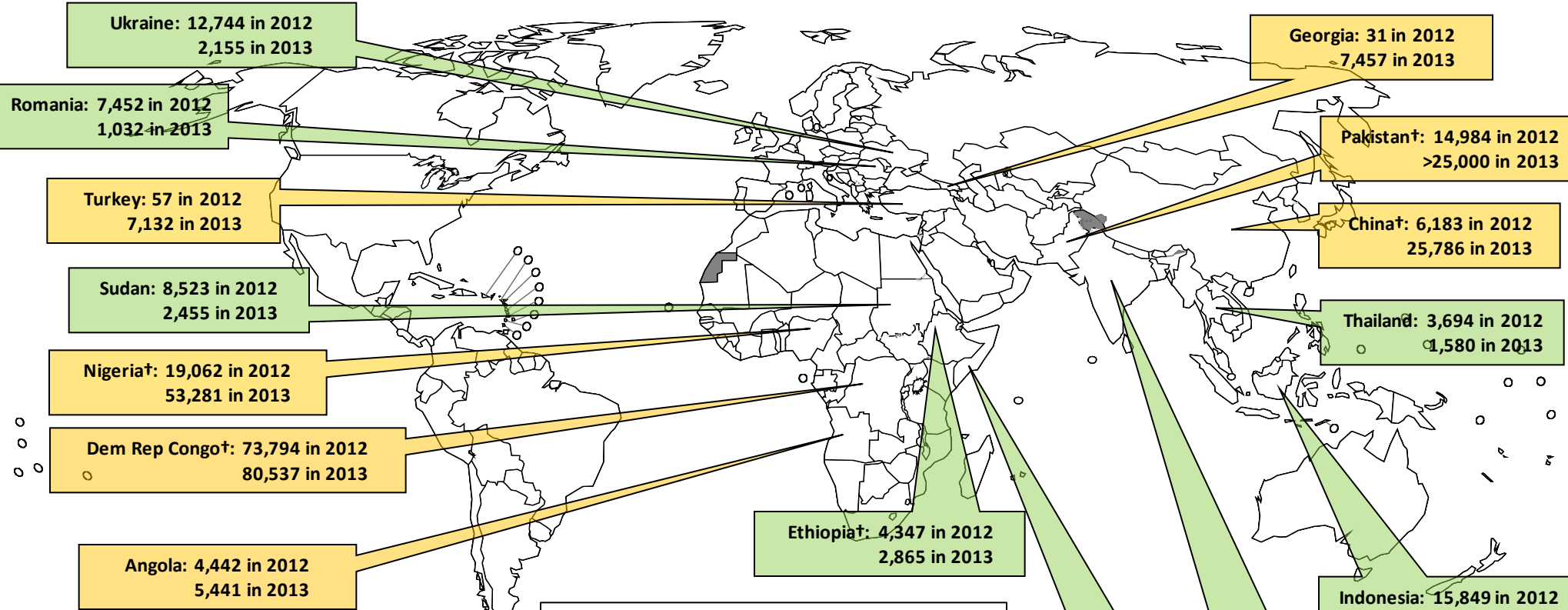
- **Vision:**
  - Achieve and maintain a world without measles, rubella and congenital rubella syndrome
- **Strategies:**
  - High vaccination coverage with two doses of M and R containing vaccines
  - Effective surveillance, monitoring and evaluation
  - Outbreak preparedness and response & case management
  - Communication to build public confidence and demand for immunization
  - Research and development
- **Guiding principles:**
  - Country ownership and sustainability
  - Routine immunization and health systems strengthening
  - Equity
  - Linkages (polio eradication, new vaccines, other proven child survival interventions, surveillance activities)

# **Key Challenges**

# # 1: Large Measles Outbreaks

Reported Measles Incidence Rate\* (Sep 2012 – Aug 2013)

Reported Measles Cases in 15 Large Outbreaks since Jan 2012



\*Rate per 1'000'000 population

Reported cases through end Aug 2013 except where noted †:

- China conf + comp through 20 Oct 2013
- DRC through Oct 2013
- Nigeria through Oct 2013
- Pakistan through end May 2013
- Somalia through end July 2013

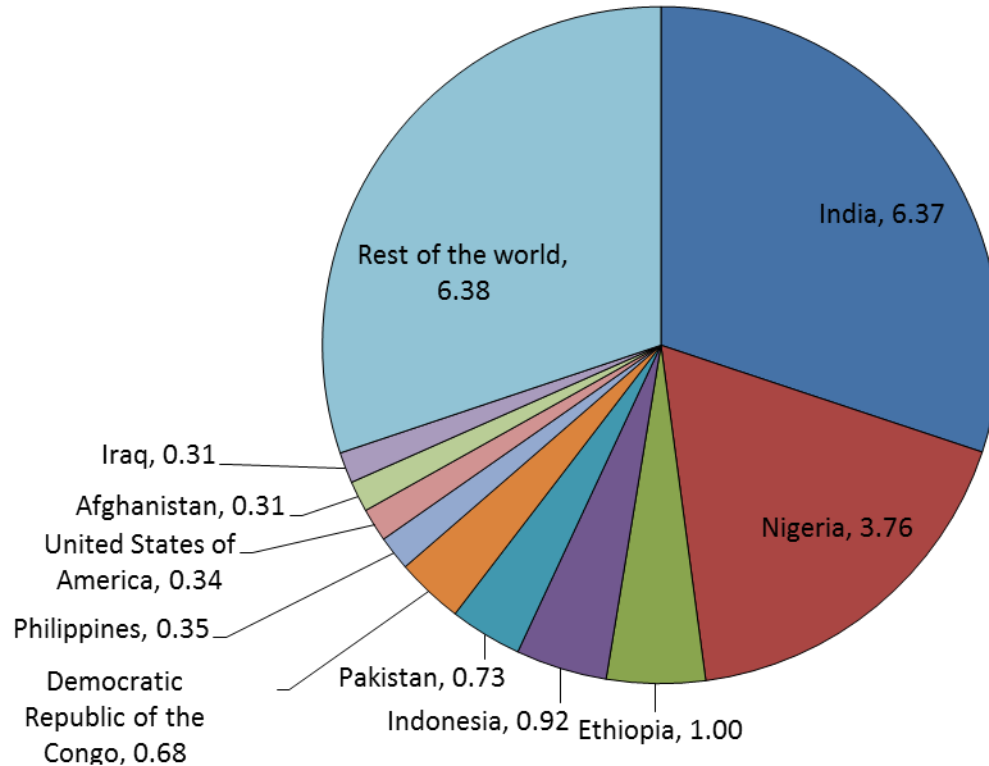
	<1	(89 countries or 46%)
	≥1 - <5	(29 countries or 15%)
	≥5 - <10	(16 countries or 8%)
	≥10 - <50	(31 countries or 16%)
	≥50	(15 countries or 8%)
	No data reported to WHO HQ	
	Not applicable	

Data in WHO HQ as of 8 October 2013

The boundaries and names shown and the designations used on this map 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.



## # 2: Weak Immunization Systems

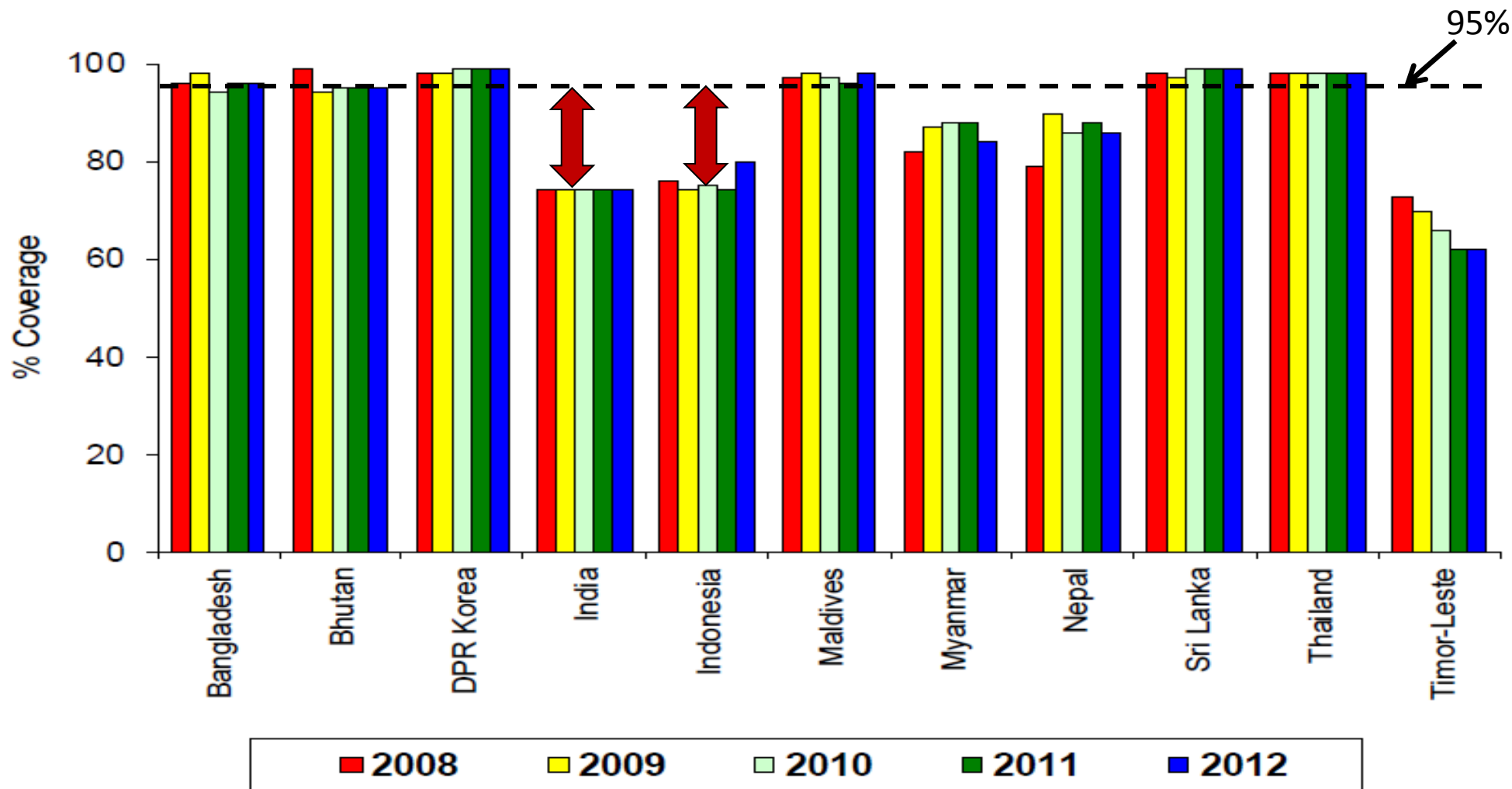


- 21 million infants missed MCV1 in 2012
- 2/3 live in
  - India
  - Nigeria
  - Ethiopia
  - Indonesia
  - Pakistan
  - DRC

21 million infants not immunized (MCV1), 2012



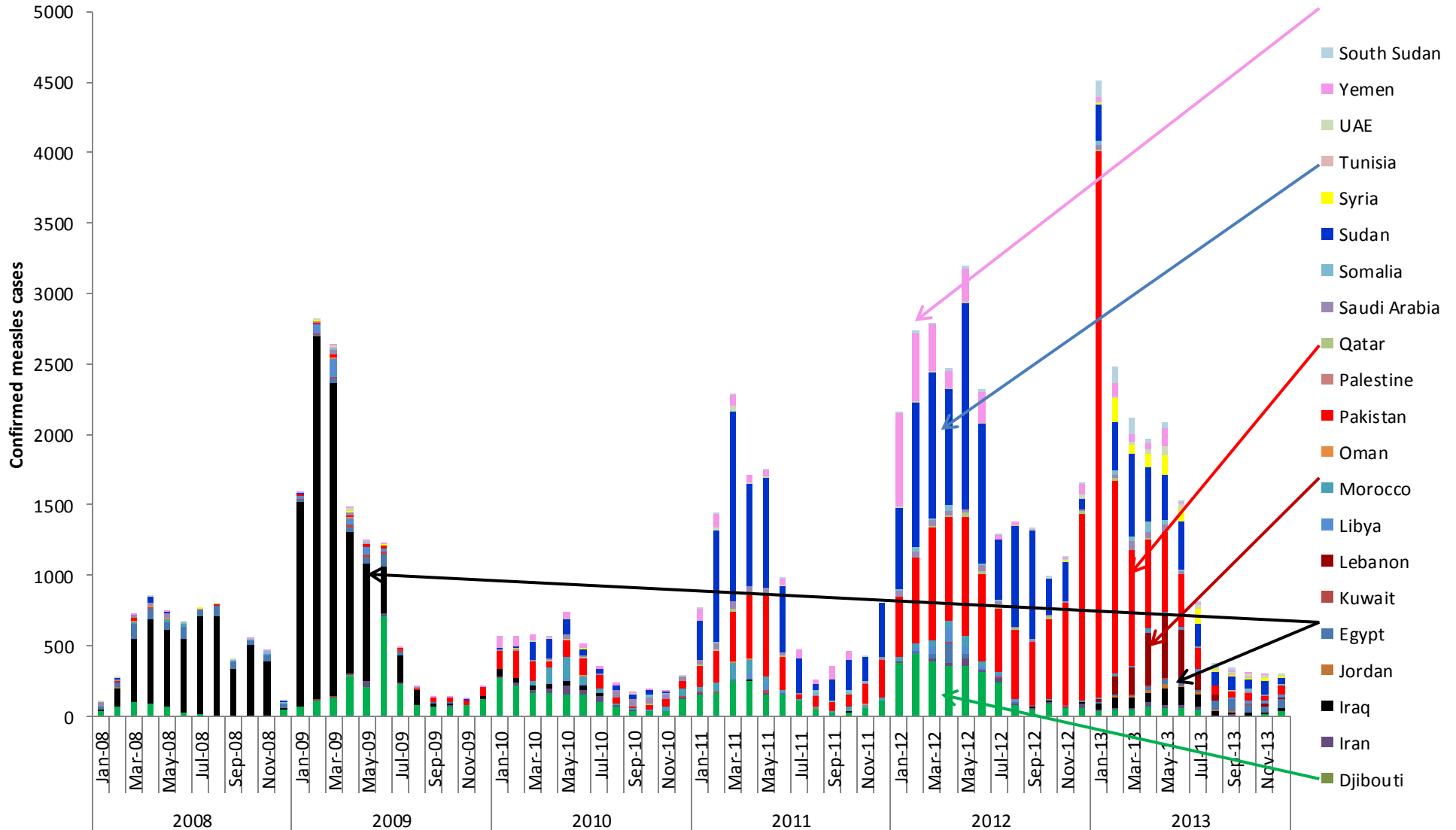
# MCV1 Coverage for SEAR countries, 2008-



Source: WHO/UNICEF estimates, 2013

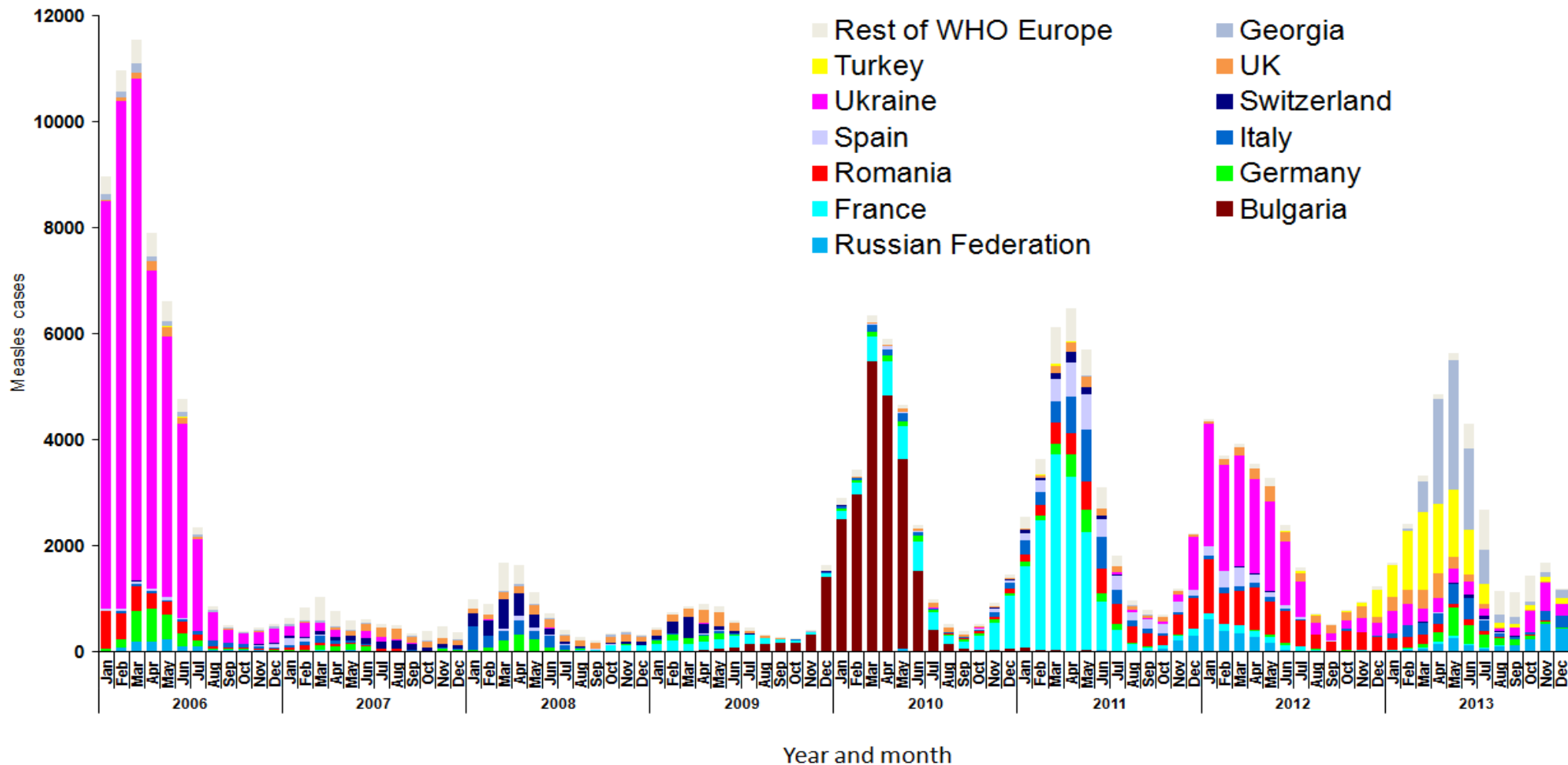
# # 3. Civil Unrest

## Monthly distribution of confirmed Measles cases in the EMR 2008-2013



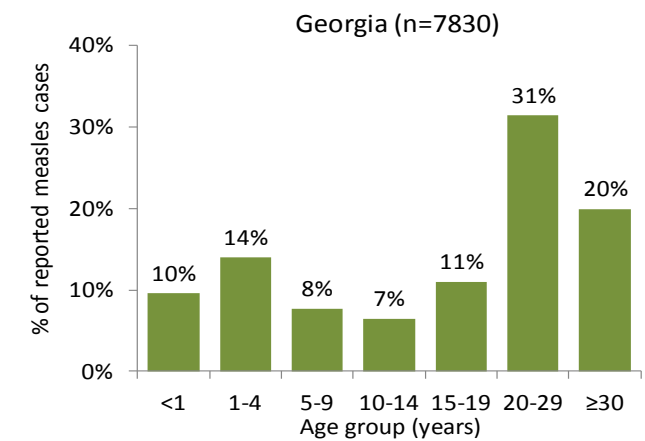
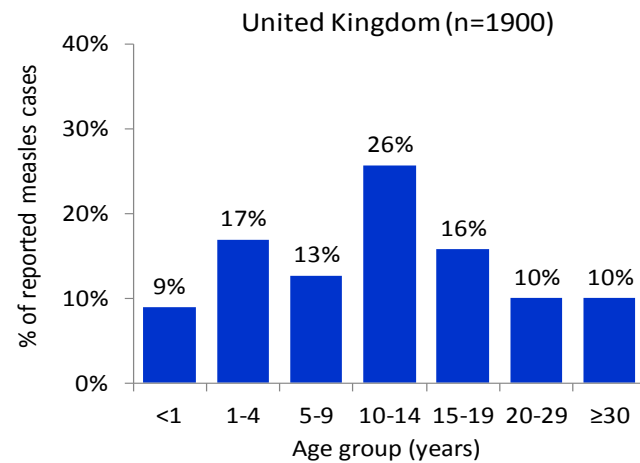
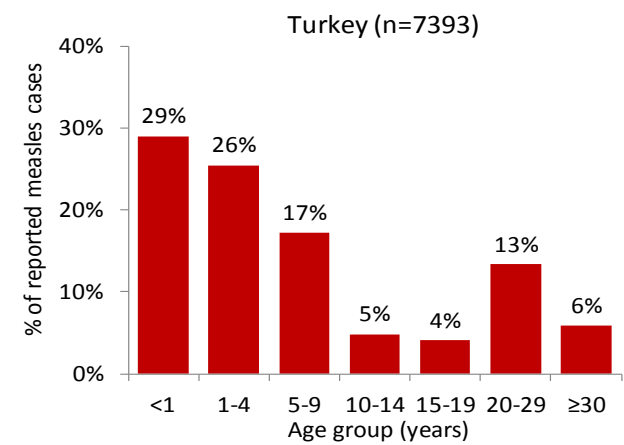
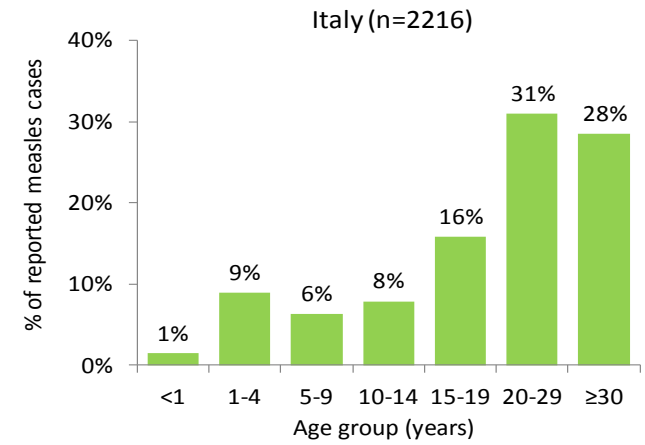
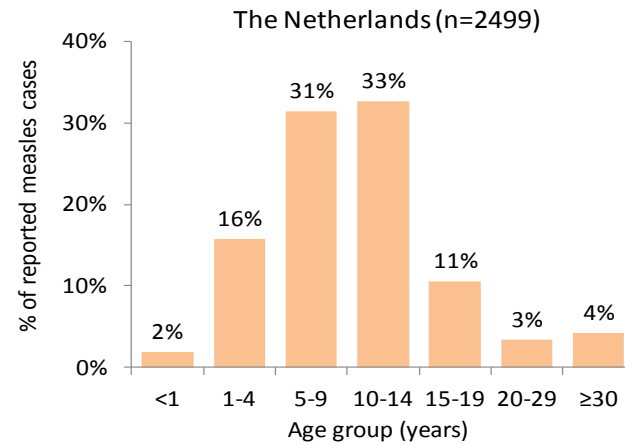
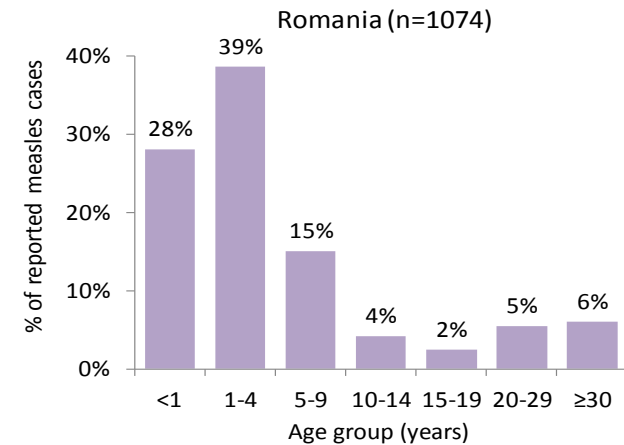
# # 4: Competing Public Health Priorities

Measles cases by month and year,  
WHO European Region, 2005-2013



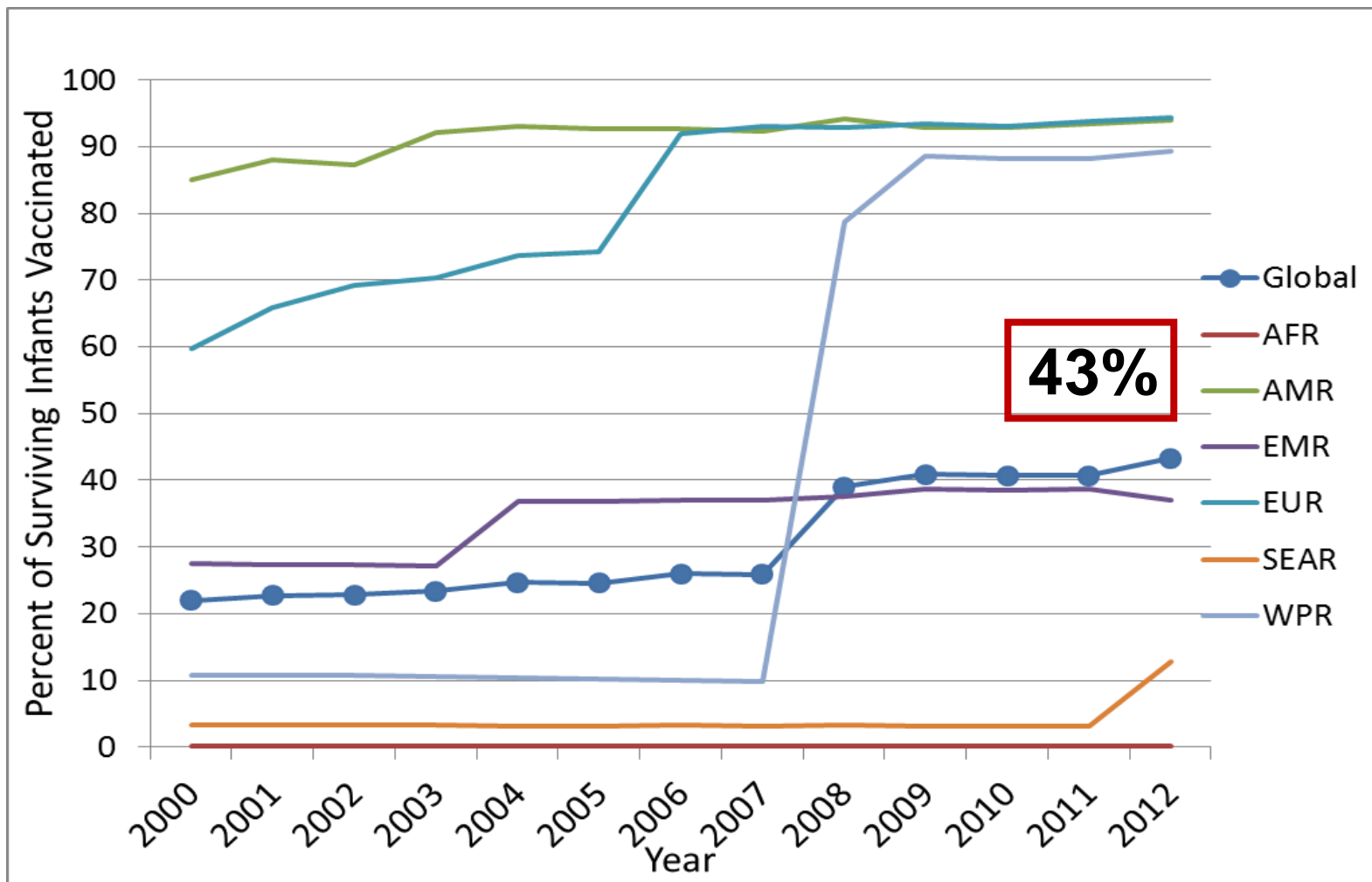
Source: MR reporting to WHO European region  
Update Date : 24-Feb-2014

# Percentage of measles cases by age group, 2013



# # 5: Making the Case for Rubella/CRS Elimination

Proportion of infants receiving RCV by WHO region, 2000–2012

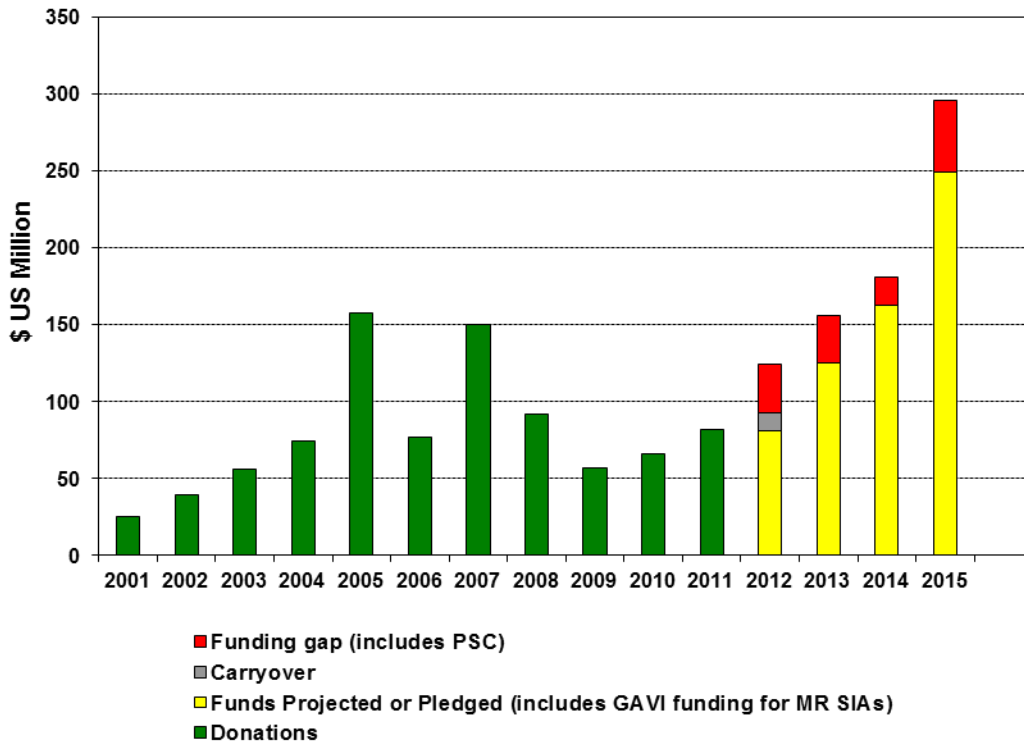




**Opportunities**

# Opportunities

Measles Rubella Initiative Annual Donations 2001-2011 and Financial Resource Requirements, Projections, Funding Gap 2012-2015\*



- **WHO position paper on rubella vaccine (July 2011)**

- Link rubella with measles
- Preferred strategy: MR mass campaign
- Facilitate introduction in 60 countries (51 GAVI-eligible)

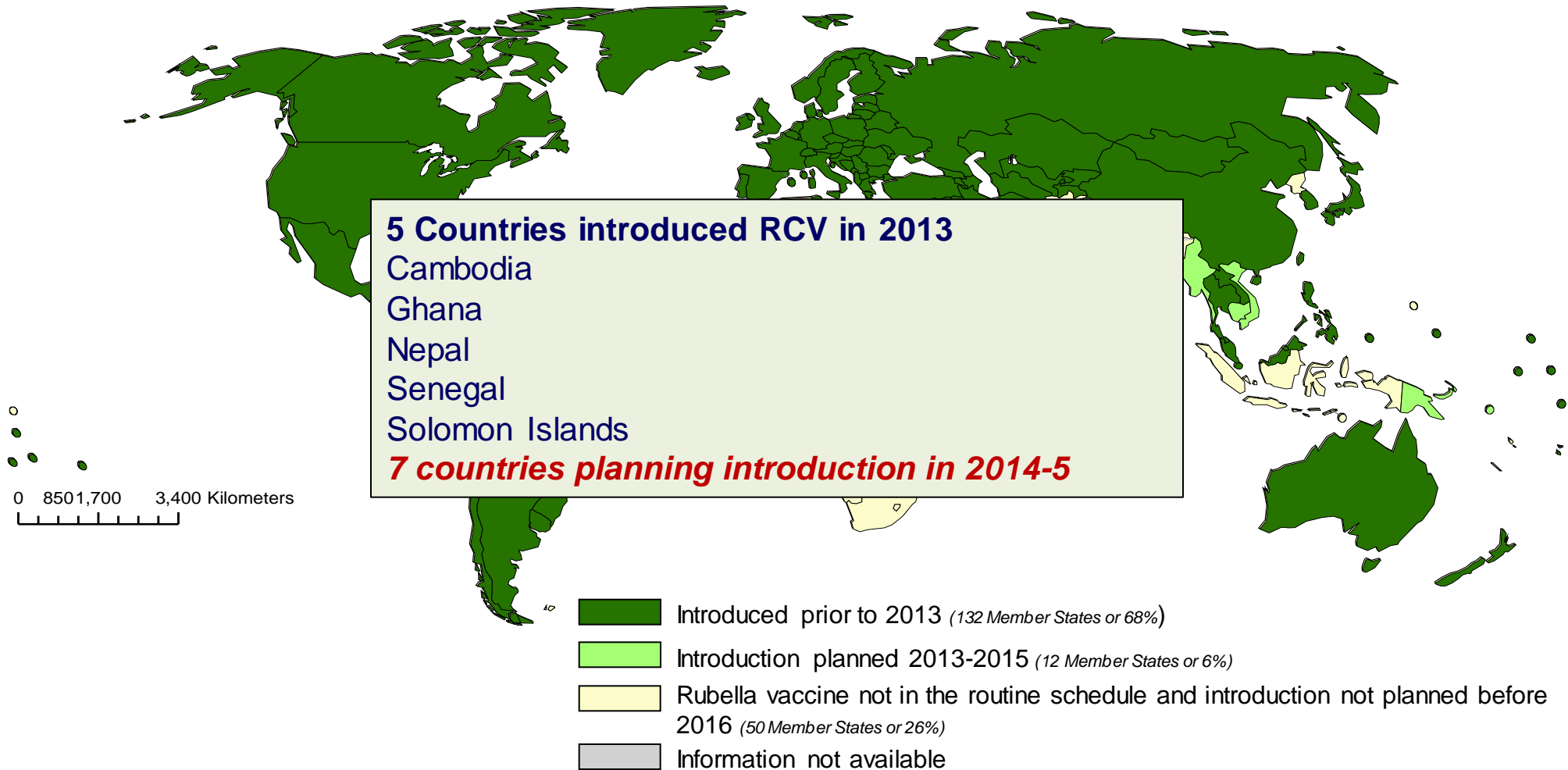
- **November 2012 GAVI Board:**

- Open a window for rubella vaccine
- \$554 million for MR vaccine and operational costs

- **Decade of Vaccines/Action Plan**

- 2012 World Health Assembly
- Goals:
  - **Measles and rubella eliminated in at least 5 of 6 WHO regions**

# Distribution of countries using rubella vaccine in their routine immunization schedule in 2012 and countries planning introduction during 2013-2015



## GVAP Accountability: Regional Scorecard on elimination

WHO Region	Elimination Target	2012		Comment
		MCV1 coverage	Measles/Rubella incidence (/million)	
AMR	2000 – measles 2010 – rubella	94%	0.2 0.015	On track
WPR	2012 – measles	97%	5.9	On track
EUR	2015 – measles 2015 – rubella	94%	31.0 32.8	Off track
EMR	2015 – measles	83%	59.2	Off track
SEAR	2020 – measles	78%	25.3	New target
AFR	2020 – measles	73%	123.5	Off track

# Summary

- Measles and rubella both cause substantial morbidity and mortality
- Measles and rubella eradication are biologically feasible and highly cost-effective
- While there are substantial programmatic, logistical and political challenges that needs to be overcome
- There are also unique opportunities to rapidly progress towards regional elimination goals and build momentum for global eradication

# Acknowledgements



Canadian International  
Development Agency

BILL & MELINDA  
GATES *foundation*



Anne Ray Charitable Trust



Lions Clubs International  
**FOUNDATION**



Japan International Cooperation Agency