Measles Elimination and Prevention of Congenital Rubella Syndrome in the Eastern Mediterranean Region

Plan of Action

2006-2010

World Health Organization

Glossary

Measles Elimination – interruption of indigenous measles virus transmission (i.e. measles is no longer an endemic disease) in a large geographic area as a result of deliberate efforts; continued intervention measures are required.

Eradication - interruption measles transmission worldwide as a result of deliberate efforts; intervention methods may no longer be needed. Eradication represents the sum of successful elimination efforts in all countries.

Routine immunization - regular provision of immunization services to successive cohorts of infants through vaccination at fixed sites, door to door canvassing, outreach activities, or periodic pulse campaigns. Except for pulse campaigns, these activities usually involve screening of vaccination records (selective).

MCV 1-Refers to the first dose of a measles containing vaccine.

Supplementary immunization - Mass campaigns targeting a high proportion of susceptible children (≥90%) in a wide geographic area (e.g., province wide or nationwide) with a purpose of rapidly reducing the number of susceptible children. A **supplemental dose** of vaccine is offered. Screening of vaccination status and prior disease history is not conducted (non-selective). Depending on the objective of the measles programme objectives, these campaigns need to be repeated unless routine coverage with at least 2 dose of measles containing vaccine is very high (≥95%).

Catch-up campaign - A one-time mass immunization campaign ("catch-up") targets multiple cohorts in which most susceptible children have accumulated, should be conducted to interrupt measles transmission. During a catch-up campaign all children in the target age range receive a supplementary dose of measles vaccine regardless of prior disease or vaccination history.

Follow – up campaign - After the successful completion of a "catch-up" campaign, increases in susceptibility to measles should be monitored using the same methods used to evaluate the pre-campaign pattern of susceptibility. "Follow-up" campaigns should be conducted periodically (e.g. every 2-5 years) to reduce the accumulation of susceptible individuals

Rubella control - reduction of rubella morbidity and CRS to a minimum acceptable level as a result of deliberate efforts; continued intervention measures are required to maintain the reduction.

Rubella and CRS elimination- interruption of circulation of rubella virus and elimination CRS in a large geographic area as a result of deliberate efforts; continued intervention measures are required.

GAVI - Global Alliance for Vaccines and Immunization

1. Background

Measles is a highly contagious disease with high mortality in developing countries. Prior to the introduction of measles vaccine in the Expanded Program on Immunization, measles was a leading cause of childhood death. There have been a series of regional and global targets for measles mortality reduction that have been established in the past decade including:

1989 World Health Assembly;
Reduction in measles incidence of 90% from pre-immunization levels by 1995.

1990: World Summit for Children (Heads of State and other world leaders)
Reduction by 95% per cent in measles deaths and reduction by 90% of measles cases compared to pre-immunization levels by 1995

1997 EMRO Regional Committee
Eliminate measles virus transmission in EMRO region by 2010.

2000: WHA-Millennium Development Goal
Reduce by two thirds between 1990 and 2015, the under five mortality" using MCV coverage as an indicator.

2002, WHA-United Nations General Assembly Special Session (UNGASS):
Reduce measles deaths by 50% by 2005 compared to levels in 1999.

In 1999, WHO estimated 104,000 deaths occurred each year in the EMRO region due to measles. At that time, member states in the EMRO region developed a five year plan for measles mortality reduction. Based on projected impact of planned activities, it is expected that member states will reach the UNGASS goal of 50% mortality reduction by the year 2005. However, considerable constraints exist before reaching the goal of measles elimination in 2010.

2. **Regional strategy for measles elimination**: During the Forty-first Session of the Regional Committee for the Eastern Mediterranean (1997), the Regional Committee passed a resolution to eliminate measles by the year 2010. In 1999, EMRO developed a five-year plan for measles elimination based on the the WHO-UNICEF joint strategy for measles mortality reduction. This plan included the following key elements:
    a. **Strengthening routine infant immunization**
        i. 90% coverage MCV1 in all districts
    b. **Second opportunity for measles immunization including:**
        i. A one time catch-up campaign for all susceptible age cohorts
        ii. Follow-up campaigns every 3 to 4 years or the introduction of a second dose of measles vaccine into the routine EPI schedule (for countries that can achieve > 90% MCV1 coverage
    c. **Strengthening surveillance for measles**
    d. **Optimal case management for children with measles**

Based on measles immunization coverage rates and measles surveillance status and poliomyelitis eradication status, member states were originally classified into 2 groups (control and elimination-phase) and strategies were tailored to constraints experienced in these 2 groups. In particular, strategies for control-phase countries were primarily

focused on mortality reduction while elimination phase countries were focused on interruption of virus circulation. Practical experience has revealed that the strategies for mortality reduction versus elimination are essentially the same.

Regional strategy for rubella: In the previous five-year plan, countries were encouraged to use measles control activities as an opportunity to prevent congenital rubella syndrome. However, a regional strategy for the prevention of CRS was not developed and specific recommendations for use of rubella vaccine were not elucidated. Many countries followed recommendations of the Regional Committee to prevent CRS by including rubella containing vaccine into measles elimination activities including 17 countries that have included rubella vaccine into the EPI schedule. Many of these countries have introduced rubella vaccine into EPI without national goals or a well-defined strategy to prevent CRS.

3. Regional consultation

In the previous five-year plan, countries were encouraged to use measles control activities as an opportunity to prevent congenital rubella syndrome. However regional goals for the prevention of CRS were not developed and specific recommendations for use of rubella vaccine were not elucidated. Subsequently, many countries have introduced rubella vaccine into their EPI program without national goals or a well-defined strategy to prevent CRS. In September 2004, regional consultation was convened to review progress in the regional strategy for measles elimination and prevention of CRS. The objectives of the consultation included the following:

a. Review the progress in measles and rubella control
b. Updating the 5-year plan for measles
c. Review the regional strategy for rubella.

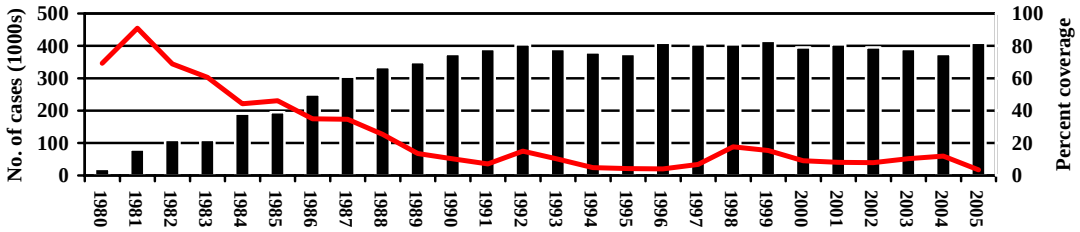
The consultation was attended by a panel of experts from member states, the Regional Technical Advisory Group, as well by staff from the Centers for Disease Control and Prevention (CDC), Atlanta, the Department of Vaccines and Biologicals, WHO headquarters, and the Eastern Mediterranean Regional Office (Appendix 1). This plan reviews progress on the regional goal for measles elimination and efforts to prevent congenital rubella syndrome. It updates the previous plan for measles elimination and includes recommendations from the regional consultation on the prevention of congenital rubella syndrome.

4. Situation analysis for surveillance and control of measles

Based on measles immunization coverage rates and measles surveillance status and poliomyelitis eradication status, member states were originally classified into 2 groups (control and elimination-phase) and strategies were tailored to constraints experienced in these 2 groups. In particular, strategies for control-phase countries were primarily focused on mortality reduction while elimination phase countries were focused on interruption of virus circulation. Practical experience has revealed that the strategies for mortality reduction versus elimination are essentially the same.

Implementation of measles elimination activities has varied considerably in the region. Several countries have implemented the full strategy and remarkably reduced measles case counts and mortality. In these countries sporadic transmission is observed often due to importation of disease. Some continue to experience periodic outbreaks despite implementation of the full strategy while others have experienced resource constraints

Figure 1. Trends in measles cases and vaccination coverage 1980-2005



to implement key program activities.

a. Routine infant immunization

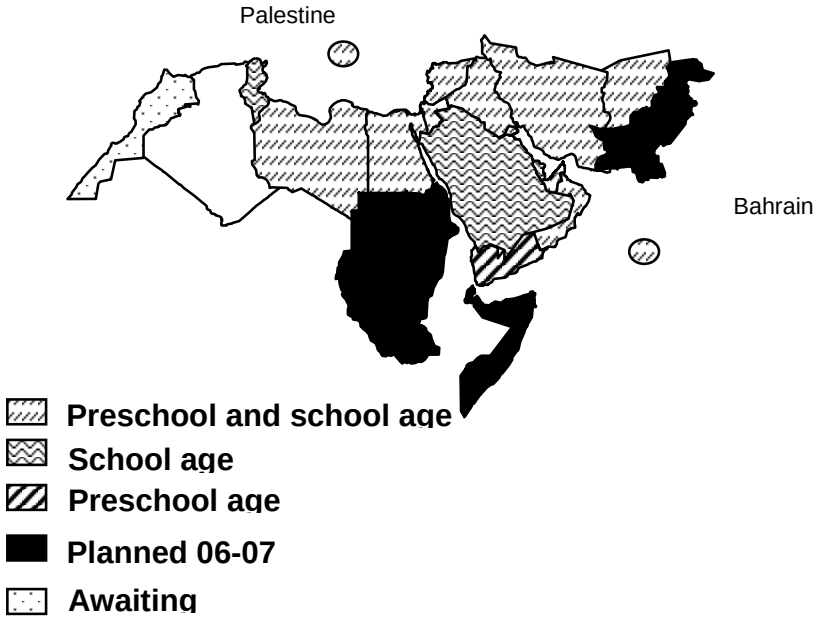
Since 1999, measles vaccination coverage has ranged from 78% to 83% and case counts have ranged from 39,000 to 77,000 case reports per year (Figure 1). At the country level, MCV1 coverage varies widely with a range of 40% in Somalia to >99% in Syria, Qatar, and Bahrain in 2004 (Appendix 2). It is estimated approximately 3.4 million children did not receive measles vaccine in 2004. Most of the unvaccinated children reside in 6 countries including 46% of infants from Pakistan, 15% from Afghanistan, and 11% from Sudan.

Considerable resources are available to improve MCV coverage in these countries. Six of the seven countries with MCV1 coverage < 80% are receiving GAVI support to strengthen routine Infant immunization. Key elements of the regional strategy to improve coverage include the Reach Every District (RED) approach and technical support to strengthen program management at the national and provincial levels.

b. **Catch-up campaigns.**

Since 1999, 18 countries have conducted nationwide campaigns to reduce the susceptibility profile of older age cohorts including 14 countries that targeted preschool and school-aged children, 3 countries that targeted school-aged children and 1 country that targeted preschool children (Figure 1).

Figure 1. Catch-up campaigns for measles in the EMR region



Since 1999, > 105,000,000 children have been vaccinated in catch-up campaigns (Appendix 6). Generally, reported vaccination coverage in these campaigns has been good, however the success of these campaigns in stopping circulation of measles virus has been variable, the Kingdom of Saudi Arabia has experienced large outbreaks of measles in 2004-05 suggesting the catch-up campaign has had a limited impact and that follow-up control measures are needed. Approximately half of the countries have elected to include rubella vaccine in these campaigns.

c. Second opportunity for measles immunization

The strategy for providing a second opportunity for measles immunization varies by country. Currently, 17 countries provide a second dose of measles vaccine in the EPI schedule; Most of these countries are using MMR vaccine (Appendix 2). It is anticipated the remaining countries will conduct periodic SIAs to maintain population-based immunity for measles.

d. Surveillance for measles

All countries in the region have been encouraged to conduct case-based surveillance for measles with laboratory testing of all suspect cases after completion of the initial catch-up campaigns. Currently, all 22 countries are reporting case-based surveillance data at the national level. Reporting to the regional office includes monthly reporting of case counts according to an agreed-upon standardized format (Appendix 3). EMRO provides feedback through a monthly surveillance bulletin.

Considerable resources have been utilized to establish measles and rubella laboratory capacity (serologic testing for IgM-class antibodies). All countries have a national laboratory for measles and two Regional Reference Laboratories which support National for test validation and for virus genotyping. Standard laboratory procedures have been established and are followed. All countries are participating in the Global measles and rubella proficiency testing program. Of the 18 countries who participated in the proficiency testing program in 2005, 17 passed with >90% scores. Laboratory accreditation reviews were undertaken 7 countries were fully accredited and one provisionally accredited, three more labs are on schedule for accreditation before the

end of 2006. In 2005 eight countries regional laboratory training for serological and virus isolation techniques are including biosafety and laboratory management. Vero/SLAM cells were distributed to 11 of the 12 countries with cell culture capacity in addition in these countries PCR and sequencing training is planned to be provided in March-April 2007. In order to facilitate logistic issue facing the labnetwork for specimen referral it proposed increase the number of Regional Reference Laboratories and sub-National laboratories.

e. Measles mortality reduction

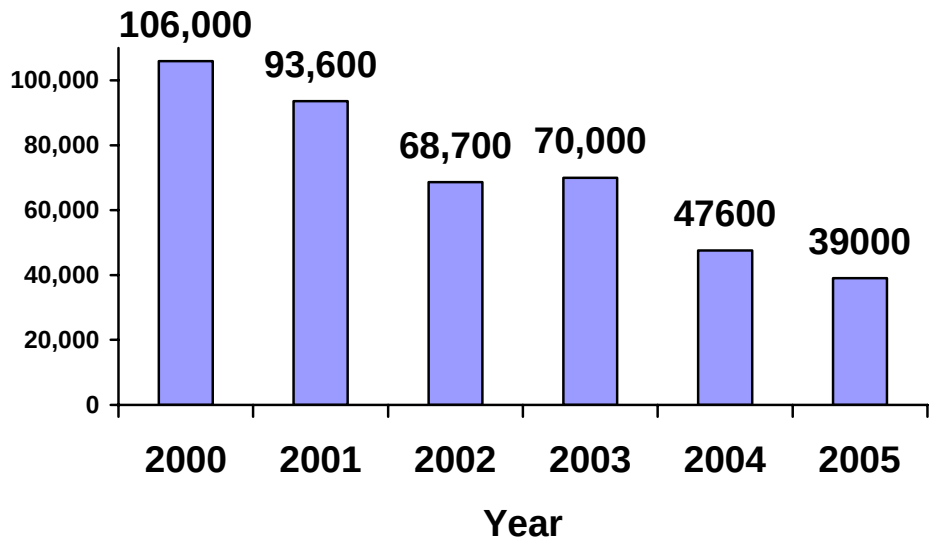
WHO has estimated measles disease burden based on calculated susceptibility profiles, likelihood of measles virus infection by age group and country-specific case fatality ratios. An expert panel reviewed and endorsed the model in the fall of '04 and encouraged countries to use the model to monitor progress in measles mortality reduction.

Key parameters included in the WHO model include:

- MCV1 coverage
- MCV2 coverage
- Campaign coverage
- Distribution of measles cases by age group
- Studies with information on country-specific case fatality ratios.

Using this model, it is estimated there has been a 63% reduction in measles mortality by 2005 when compared to baseline data in 1999 (Figure 2). Based on planned catch-up campaigns in, it is anticipated that > 90% reduction in measles mortality will be achieved by 2010.

Figure 2. Estimates of measles mortality reduction in EMRO region, 1999-2005



5. Situation analysis for surveillance and control of rubella

a. Prevention of CRS

The regional goal for prevention of CRS, among countries that have introduced rubella vaccine, is to reduce the incidence of CRS to < 1 per 100,000 live births. Overall, 17 countries have introduced rubella vaccine into their EPI schedule (Appendix 2). Among these countries, 8 have included a 2 dose schedule with MR/MMR while 9 are using a single dose of rubella (R/MR/MMR) at the timing for the second dose for measles vaccine. Most countries do not monitor coverage for the second dose of measles/MMR, thus data on rubella coverage is not well monitored. Among the countries that have included rubella vaccine into EPI, several have not conducted catch-up campaigns using rubella vaccine including Egypt, Jordan, and Yemen.

There is limited data on the burden of disease associated with rubella in the EMR. Generally, surveillance for rubella is weak and only 8 countries have developed surveillance systems to monitor cases of rubella and/or CRS. currently some countries are reporting rubella through measles information reports, but no reports of CRS cases to the regional office. The epidemiology of acute rubella infection is not well defined in the EMR; limited data among countries that have not introduced vaccine suggests that periodic outbreaks occur every 3 to 4 years and that most persons are immune by the time they are adults. Some countries, particularly those that have not included a rubella component in their catch-up campaigns, have experienced a shift in the age distribution of disease after introduction of rubella vaccine into EPI. For example, Egypt introduced MMR vaccine at 18 months in 1999 and achieved high coverage over the next 6 years after vaccine introduction. The country experienced a rubella outbreak among older children and adolescents in 2002-03. More recently, outbreaks have been reported among older age groups increasing the likelihood of an infection among WCBA. This change in the epidemiology of rubella after vaccine introduction has the potential to cause an unintended increase in CRS cases and emphasizes the importance of developing a comprehensive strategy to prevent CRS before vaccine introduction.

6. Update on regional laboratory network

a. Regional reference laboratories

currently, there are 2 RRLs in Oman, and Tunisia. There are plans to establish a third laboratory in Egypt in the coming months. The regional reference laboratories serve as centers of excellence for the region and global community.

The functions of the regional reference laboratories include:

i. Collaboration and evaluation of new diagnostic assays
ii. Referral of virus strains to global laboratories; collaborating in develop
iii. Training and advising national laboratory staff
iv. Coordinating proficiency testing
v. Quality control: Validation of their own and national laboratory results using a standardized gold standard
vi. Internal quality assurance: Assessing sensitivity and specificity of their work through proficiency testing

b. National laboratories

All countries will have a national laboratory for measles and rubella with all laboratories being accredited for measles by the end of 2006. National laboratories should be closely linked with the national programme managers to ensure that patients with suspect measles have laboratory testing as outlined in the section on surveillance (above).

To achieve the objectives the laboratories should have:

- Strong links to the immunization and surveillance units at the Ministry of Health;
- Accredited capability to perform testing
- Well trained scientists and technicians
- Adequate laboratory facilities and resources to cover running costs
  Suitable equipment to conduct routine serological assays

The duties of the national laboratory include:

- Confirmation of the diagnosis of clinically suspected measles using commercial IgM ELISA kits
- Quality assurance: Performs annual proficiency test; refers selected specimens to reference laboratory for validation
- Referral of virus strains to global laboratories and performance of epidemiologically essential serological survey
- Training activities

7. Targets for measles and rubella

Recommended targets for measles elimination and CRS prevention include:

a. 90% MCV/RCV1 coverage in all districts

b. 50% reduction in measles mortality by 2005 (using WHO estimates)

c. 90% reduction in measles mortality by 2009

d. Achieve and maintain interruption of indigenous measles transmission by 2010

e. Reduction of CRS incidence rate to less than 1 per 100,000 live-births in countries introduced rubella vaccine.

8. Recommendations for measles elimination and prevention of CRS

To avoid the risk of affecting transmission dynamics and thereby increase susceptibility for rubella in childbearing age women, it is essential that childhood vaccination programs achieve and maintain high levels of coverage. A strategy of universal child immunization alone may lead to an increase in the incidence of CRS if coverage is low due to a poorly implemented programme.

In addition, all countries should review the potential impact of childhood rubella vaccination if the vaccine is introduced only in the private sector. Countries should take the necessary measures to ensure that a high coverage with the childhood programme is achieved and that women of childbearing age are immune.

a. **Routine immunization**

i. All countries should aim to achieve and maintain high (> 90%) immunization coverage (in each district and nationally) with MCV1 administered through routine services ("keep-up").

ii. All countries are encouraged to provide the first dose of measles vaccine after 12 months of life if they can achieve high coverage. The first dose of measles can be given as early as 9 months of age. However, numerous studies have demonstrated decreased efficacy (85%) when compared to efficacy when given after 12 months of age (>95%).

iii. Countries that elect to introduce a combination rubella vaccine into EPI should provide the rubella component (MR or MMR) with the first dose of measles vaccine and are encouraged to use a combination for both doses of measles in EPI.

iv. Before introducing a rubella vaccine into EPI, countries should: assess rubella susceptibility profiles among key populations (e.g. proportion of older children and women of childbearing age susceptible to rubella) and ensure that they have the ability to achieve high immunity in these populations after introduction of vaccine into EPI.

v. Countries should not introduce rubella vaccine into EPI unless they have achieved MCV1 coverage > 80% in all districts for 3 consecutive years. In addition, countries should ensure they maintain high coverage (> 90%) nation wide with MCV1 and that resources are available to sustain the programme once the vaccine is introduced.

vi. Countries using rubella vaccine should establish a national plan for CRS prevention that includes goals and objective, assessment of disease burden, and a plan to older age children and women of childbearing age are protected against rubella, Only 9 countries established CRS surveillance.

b. **Catch-up vaccination programs**:

High MCV1 coverage, coupled with a second opportunity for measles immunization in successive birth cohorts is necessary to maintain high population-based immunity.

i. All countries should conduct a one time catch-up vaccination program for measles among susceptible populations to ensure wide scale population-based immunization among multiple age cohorts.

ii. Member states that plan to include rubella vaccine into EPI are encouraged to use a combination measles/rubella vaccine for catch-up campaigns.

It is important that these campaigns are of high quality and achieve high coverage. In particular, program managers are encouraged to use the WHO guidelines for measles campaigns when planning and implementing campaign activities (ref *to be found*). High quality supplemental measles campaigns,

coupled with high routine coverage is highly effective in stopping measles virus transmission. Catch-up campaign planning must include

- Detailed logistics planning to assure sufficient trained personnel, transportation, vaccine, syringes and needles and cold chain equipment are available
- Thorough training of the campaign staff to assure proper handling of and reconstitution of the vaccine, appropriate injection techniques, safe disposal of syringes and needles and monitoring of adverse events temporally associated with the campaign
- Detailed communications planning to assure adequate campaign publicity
- Special strategies for reaching hard to reach populations
- Detailed planning for evaluation of the impact of the campaign including campaign coverage estimates by district and evaluation of the reduction of measles morbidity and mortality.

Several countries have experienced sustained measles virus transmission despite reporting high campaign coverage and high coverage in routine EPI. In Most of these countries disease occurs over a wide range in age cohorts and the majority of children report no history of vaccination suggesting that campaign coverage was misleading or that there may have been problems with vaccine administration during the campaign. Such outbreaks have been observed in KSA, Lebanon, Egypt and Syria.

Countries that continue to experience periodic outbreaks in the post-campaign setting should review campaign data and susceptibility profiles based on routine coverage. Data on the age distribution of measles cases can identify target populations that may need additional supplemental immunization activities.

c. **Second opportunity for measles immunization:**

i. All countries should provide a second opportunity for measles immunization either through a second dose of measles in the EPI schedule or periodic supplemental immunization activities.

ii. Countries that elect to implement a 2 dose schedule should ensure they can vaccinate >90% of the target population and implement a process to monitor MCV2 coverage.

iii. Countries that have not achieved MCV1 coverage > 90% in all districts should use periodic SIAs as a second opportunity for measles immunization. The timing for periodic SIAs is dependant on MCV1 coverage. If routine MCV1 coverage is low, follow-up campaigns should be planned closer together (every 3 yrs). Countries with high MCV1 coverage should conduct periodic SIAs every 4-6 years.

d. **Ensuring rubella immunity among women of child-bearing age**:

i. Member states that have introduced rubella vaccine into EPI are encouraged to monitor rubella susceptibility among women of childbearing age through:

1. Review of screening data or serosurveys looking at age specific susceptibility,
2. Review of surveillance data to characterize the age distribution of acute disease

3. Available data on CRS.

ii. If it is determined that there is increased susceptibility among WCBA, programs should be implemented to vaccinate at any opportunity including pre-marital, post-partum, pre-employment, university settings, work place or routine health care visits, or supplementary immunization activities.

e. **Surveillance for measles, rubella, and CRS**
many countries have multiple reporting systems for measles such as programs managed by the communicable disease program, EPI program and school health program. Ideally, countries should integrate these efforts in a unified system.

Measles/rubella surveillance:

i. All countries should have a simple and sensitive surveillance system for measles. Countries are encouraged to utilize infrastructure of the polio eradication program to develop measles surveillance systems.

ii. All countries are encouraged to conduct case-based surveillance for measles using the WHO case definition for measles (Appendix 5).

iii. Countries that have completed catch-up campaigns should conduct comprehensive surveillance with case investigation of all suspect cases including laboratory testing to confirm disease.

iv. Countries that have not conducted comprehensive catch-up campaigns should establish sentinel surveillance networks with at least one sentinel surveillance site in each province/governorate. Ideally laboratory testing should be conducted on a sample of patients to confirm the etiology of disease. These sentinel surveillance sites should be used to characterize the age distribution of patients with laboratory confirmed disease and define target populations for catch-up campaigns.

v. Laboratory testing should be conducted using ELISA to detect IgM-class antibody to measles. Serum samples that are negative for IgM should be tested for rubella (Appendix 7).

vi. Clinical samples should also be collected and sent to regional reference laboratories in Oman or Tunisia for virus isolation studies.

vii. All laboratories should participate in regional QC programs and become accredited by the end of 2006.

CRS surveillance:

viii. Member states who introduce rubella vaccine into EPI should establish surveillance for CRS to monitor and assist in establishing burden of disease and to monitor the impact of vaccine introduction. Surveillance for CRS (as outlined in WHO guidelines) should be initiated in reference facilities treating children with cataracts, deafness or congenital heart

disease.

ix. CRS surveillance should be enhanced in the outbreak setting, particular in the timeframe of 6-12 months post-outbreak to identify births to women who may have been infected during the outbreak. Pregnant women who have a history of exposure to rubella during her pregnancy should be counseled and followed prospectively. Infants who meet the WHO case definition of CRS (Appendix 6) should have serologic testing to confirm disease

f. **Outbreak investigations**:

i. All outbreaks should be thoroughly investigated using WHO guidelines outbreak investigations. Laboratory testing should be conducted to confirm the outbreak on a sample (5-10) of patients.

ii. Outbreak investigation should include an analysis of patients by age group and vaccination status. In highly vaccinated populations, most case-patients will report prior receipt of vaccine.

iii. .

g. **Vitamin A supplementation:**
Vitamin A supplements every 4-6 months not only protects against blindness, but also reduces the risk of all-cause mortality by 23%, measles mortality by 50%, and diarrhea disease mortality by about 33%. In vitamin A deficiency areas, a measles outbreak provide an important opportunity to administer vitamin A supplementation to all children whose age puts them at risk of measles, whether they have been immunized or not.

i. In vitamin A deficient countries, vitamin A supplements should be provided at the time of routine vaccination with measles (e.g., at 9 months). In addition, measles supplementary campaigns should be used as an opportunity to provide vitamin A capsules. Countries are encouraged to report data on administration of vitamin A through the VPI reporting system.

ii. All countries are encouraged to assess the prevalence of vitamin A deficiency and include vitamin A supplementation into their EPI program according to recommended guidelines if VAD is found to be a problem.

h. **Case management**: Numerous studies have demonstrated the benefits of vitamin A administration for children with measles. Other key measures to improve clinical outcome include other supportive measures such as antibiotics for secondary infections, IV fluids for children that appear dehydrated, and nutritional support. The dose of vitamin A varies by age group (Table 3).

Table 3: Recommended Vitamin A Schedule for measles treatment

	IMMEDIATELY ON DIAGNOSIS	NEXT DAY
Infants <6 months	50 000 IU	50 000 IU
Infants 6-11 months	100 000 IU	100 000 IU
Children 12 months plus	200 000 IU	200 000 IU

9. Activities supporting the strategies

a. **Resource mobilization:**
Considerable resource constraints exist to implement key catch-up campaigns over the next 4 years. Overall, it is estimated that almost 100 million children will need to be vaccinated at a cost of more than USD 90 million. To assist in the mobilization of resources, the regional office is establishing a "partnership for measles" in with key organizations including the United Nations Foundation, UNICEF, the US Centers for Disease Control and Prevention, and other partners.

Table 4. Cost for planned campaigns for 2005-06 in EMRO

	Age group	Vacc	Time for campaign	Target population	Cost of vaccine and syringes	Operational costs	Total
Afghanistan	9 mos <3	M	05	2,300,000	1,087,875	1,598,377	2,686,252
Djibout	9 mos - 15 years	M	05	582,824	194,372	285,584	479,955
Morocco	9 mos - 15 years	MR	06	9,909,153	3,304,703	4,855,485	8,160,188
Pakistan	9 mos - 15 years	M	06	61,722,411	20,584,424	30,243,981	50,828,405
Somalia	9 mos - 15 years	M	05-06	4,320,763	1,440,974	2,117,174	3,558,148
Sudan (Darfour)	6 mos - 15 years	M	05	1,684,595	526,100	1,481,907	2,008,007
Southern Sudan	6 mos - 15 years	M	05-06	4,500,000	4,044,520	7,860213	11,904,733
Yemen	9 mos - 15 years	M	05-06	9,647,018	3,217,281	4,727,039	7,944,320
Total				94,666,764			87,570,008

In addition to the regional partnership, resources are available through GAVI.

b. **Planning**

All countries are encouraged to develop and update on an annual basis a comprehensive plan of action (e.g., 3-5 years) for measles and rubella that includes the following:

i. situation analysis including susceptibility profiles
ii. recommended strategies
iii. rationale for targeting specific age groups or geographic areas in supplementary campaigns
iv. vaccine supply and quality and logistics management
v. supervision and monitoring
vi. key indicators for disease reduction
vii. time lines for implementation
viii. resource needs

Countries planning supplementary immunization activities should develop an operational plan at least 6 months before the start of the campaign.

c. Injection safety and AEFI surveillance

10. Indicators

Table 5: The quality of the surveillance system will be monitored using the following indicators:

Indicator	**Target**
• % of suspect cases with serologic testing	≥ 80% are tested
• % completeness (age, onset, residence, vaccination status)	≥ 80% of case records with information
• % cases notified ≤ 7 days of rash onset	≥ 80%
• % cases investigated ≤ 48 hours of notification	≥ 80%
• % cases with adequate specimens (3-28 days after rash onset)	≥ 80%
• % cases with lab results within 7 days	≥ 80%
• % cases with laboratory confirmation	≥ 80%
• % discarded cases with lab specimens among the total discarded	≥ 80%
• % confirmed cases with infection source identified	≥ 80%
• % of outbreak investigated	≥ 80%

i.

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9. Appendices

Appendix 1
Consultation to Review Measles/Rubella Regional Plan of Action

EMRO, Cairo, 13-15 September 2004

List of Participants

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Appendix 2: Measles Vaccination Coverage and Disease Burden in EMR Countries 2005

Reported measles information to EMRO 2005															
Report_country_name	Tot Pop in Thousands	Births	MCV1	Cases	Lab tested Measles	Measles Lab. confirmed	Total Districts	NUM.<50% MCV1		NUM.50% to79%MCV1		NUM.>=80% to 90%MCV1		NUM.>=90%MCV1	
Afghanistan	22,098	1,215,335	64	1296	63	28	329	114	35%	129	39%	32	10%	54	16%
Bahrain	725	15,198	99	4	82	4	4	0	0%	0	0%	0	0%	4	100%
Djibouti	817	19,950	65	298	nr	nr	6	2	33%	4	67%	0	0%	0	0%
Egypt	70,668	1,826,929	98	77	nr	24	253	1	0%	1	0%	1	0%	250	99%
Iran (Islamic Republic of)	68,467	1,353,325	94	7	466	7	324	0	0%	0	0%	0	0%	324	100%
Iraq	27,963	1,091,156	90	908	450	184	113	12	11%	39	35%	28	25%	34	30%
Jordan	5,485	155,391	95	28	501	21	21	0	0%	1	5%	0	0%	20	95%
Kuwait	2,867	40,781	99	10	nr	9	63	0	0%	0	0%	5	8%	58	92%
Lebanon	4,435	65,405	96	618	413	294	26	26	100%	0	0%	0	0%	0	0%
Libyan Arab Jamahiriya	6,098	146,445	97	292	60	10	35	0	0%	0	0%	17	49%	18	51%
Morocco	29,892	634,398	97	nr	nr	nr	67	0	0%	2	3%	17	25%	48	72%
Oman	2,509	49,417	98	25	667	19	60	0	0%	0	0%	0	0%	59	98%
Pakistan	155,400	5,688,724	78	2981	nr	nr	121	17	14%	57	47%	27	22%	20	17%
Palestine	3,638	106,218	99	1	574	1	15	0	0%	0	0%	0	0%	15	100%
Qatar	796	13,483	99	74	35	9	2	0	0%	0	0%	0	0%	2	100%
Saudi Arabia	22,674	753,000	96	373	817	373	20	0	0%	0	0%	0	0%	20	100%
Somalia	8,298	298,981	35	nr	nr	nr	113	113	100%	0	0%	0	0%	0	0%
Sudan	34,512	1,243,259	60	1374	nr	nr	111	13	12%	53	48%	26	23%	19	17%
Syrian Arab Republic	18,183	548,692	98	375	580	325	71	0	0%	7	10%	9	13%	55	77%
Tunisia	10,031	169,686	96	15	155	0	232	0	0%	6	3%	33	14%	193	83%
United Arab Emirates	4,210	63,065	92	29	39	23	9	0	0%	0	0%	0	0%	9	100%
Yemen	20,738	707,015	76	6285	25	17	333	76	23%	131	39%	35	11%	91	27%

Appendix 3

Case-based surveillance of measles

Country

Reporting Period **From:** **To:** Data to be sent by laboratory foca

Country (1)	Province (2)	District (2)	EPID No. (3)	Age_years (4)	Date onset (5)	Measles vaccination status (6)	Date last measles vaccination (7)	Clinical diagnosis (8)	Epi-linkied (9)	Measles IgM results (10)	Rubella IgM results (11)	Comments	Date Specimen Collected	Type of specimen collected	Date specimen received in laboratory

1. Use WHO country codes
2. Use national codes
3. Unique identifier in surveillance data base
4. Age in years
5. Onset of rash (dd/mo/yr)
6. Vaccination (Yes, No, Unk)
7. Date of last measles vaccination
8. Clinical diagnosis (1=measles, 2=rash febrile illness, 3= other)
9. Epi-linked to a confirmed measles case
10. Measle IgM (+, -, equivocal)
11. Rubella IgM (+, - or equivocal)

Appendix 5: Case Definitions for Measles

Measles

The recommended case definition depends on the phase of measles control a given country is undergoing.

Measles clinical case definition:

Any person in whom a clinician suspects measles infection

OR

Any person with fever, and maculopapular rash (i.e. non-vesicular), and cough, coryza (i.e. runny nose) or conjunctivitis (i.e. red eyes)

Measles laboratory criteria for diagnosis

Presence of measles-specific IgM antibodies.

Measles case classification

Clinically confirmed: A case that meets the clinical case definition

Laboratory-confirmed (Only for outbreak confirmation and during the elimination phase): A case that meets the clinical case definition and that is laboratory-confirmed.

Epidemiologically confirmed A case that meets the clinical case definition and that is linked epidemiologically to a laboratory-confirmed case. Epidemiological linkage is defined here as direct contact with another laboratory-confirmed measles case in which rash onset occurred 7-18 days before the present case.

Discarded A suspected case that does not meet the clinical or lab definition

Appendix 6: Case Definition for Rubella and CRS

Rubella and Congenital Rubella Syndrome

1. Congenital Rubella Syndrome (CRS):

1.1. Suspected CRS case: Any infant less than one year of age in whom a health worker suspects CRS. A health worker should suspect CRS when an infant (0-11 months of age) presents with heart
Disease and/or suspicion of deafness and/or one or more of the following eye signs: cataract, diminished vision, nystagmus, squint, microphtalmus, or congenital glaucoma. A health worker should also suspect CRS when an infant's mother has a history of suspected or confirmed rubella during pregnancy, even when the infant shows no signs of CRS.

1.2. Clinically-confirmed CRS case: An infant in whom a qualified physician detects two of the complications listed in (a) below or one in (a) and one in (b):

(a) Cataract(s), congenital glaucoma, congenital heart disease, loss of hearing, pigmentary retinopathy.

(a) Purpura, splenomegaly, microcephaly, mental retardation, meningocephalitis, radiolucent bone
disease, jaundice the onset of which is within 24 hours after birth.

1.3. Laboratory-confirmed CRS case: An infant with clinically-confirmed CRS who has a positive blood test for rubella-specific IgM; (100% of such infants will be positive at age 0-5 months; 60% at age 6-11 months). Where special laboratory resources are available, detection of rubella virus in specimens from the pharynx or urine of an infant with suspected CRS provides laboratory confirmation of CRS (60% of such infants shed rubella virus at age 1-4 months, 30% at 5-8 months; 10% at 9-11 months).

1.4. Congenital rubella infection (CRI): When a mother has suspected or confirmed rubella in pregnancy, her infant should have a rubella-specific IgM blood test. An infant who does not have clinical signs of CRS but has a positive rubella-specific IgM test is classified as having congenital rubella infection.

2. Rubella
2.1. Suspected Rubella case: Any patient of any age in whom a health worker suspects rubella. A health worker should suspect rubella when a patient presents with; fever, maculopapular rash; and cevical, sub-occipital, or post-auricular adhenopathy or arthralgia/arthritis.

2.2. Clinical confirmation: Rubella can not be confirmed clinically: laboratory confirmation is required.

2.3. Laboratory confirmed rubella case: Because the difficulty of clinical diagnosis of rubella, laboratory confirmation is required. A laboratory confirmed case is a suspected case with a positive blood test for rubella-specific IgM. The blood specimen should be obtained within 28 days of rash onset.

2.4 Epidemiologically-confirmed rubella case: A patient with a febrile rash illness that is linked epidemiologically to a laboratory-confirmed rubella case.

(Appendix 7)

. Summary of catch-up and follow-up campaigns in EMR 1994-2006 (including planned campaigns).

COUNTRY	Year	Type	Number children vaccinated	percent of target
Afghanistan	1999	High Risk Area	74,200	53%
Afghanistan	2002	Catch-up	8,791,569	74%
Afghanistan	2003	Catch-up	5,338,285	96%
Bahrain	1998	Catch-up	127,092	97%
Bahrain	1999	Catch-up	63,000	90%
Djbouti	2002	Catch-up	72,854	80%
Djbouti	2003	Catch-up	77,854	83%
Djbouti	2006	Catch-up	186,317	85%
Egypt	1998	High Risk Area	1,864,549	99%
Egypt	2001	Catch-up(4)	5,616,000	78%
Egypt	2003	Catch-up	3,220,000	92%
Islamic rep of Iran(3)	1997	High Risk Area	6,518,295	99%
Islamic rep of Iran(3)	2003	Catch-up	33,422,642	102%
Iraq	1995	High Risk Area	2,388,439	74%
Iraq	2002	Catch-up	3,619,402	99%
Iraq	2004	Catch-up	5,161,813	99%
Iraq	2005	Catch-up	2,629,299	98%
Jordan	1997	Catch-up	1,090,250	99%
Jordan	1998	Catch-up	251,581	63%
Kuwait	1994	Catch-up	295,239	94%
Kuwait	1998	Follow-up	154,814	93%
Lebanon	2000	Catch-up	1,059,873	93%
Libya	2005	Catch-up	2,695,000	98%
Oman	1994	Catch-up	705,000	94%
Pakistan	2005	6 districts in Kashmir	1,232,000	77%
Qatar	2000	Catch-up	80,065	94%
Saudi Arabia	1998	Catch-up	1,623,624	96%
Saudi Arabia	2000	Catch-up	2,421,715	97%
Somalia	2005	Catch-up(North west zone) Somaliland	468,967	73%
Somalia	2005	Catch-up for(South central Zone) Somalia	531,284	70%
Somalia	2006	Bahadir,Galgaduud,Hiran, Lower Shabelle,Middle	1,021,565	64%
Somalia	2006	Sool (NWZ)	**55992**	87%
Somalia	2005	Catch-up for(North east Zone) Putland	142,571	90%
Sudan	1998	High Risk Area	115,200	48%
Sudan	1999	High Risk Area	980,000	98%
Sudan	2004	campaign Phase 1	1,438,765	99%
Sudan	2005	campaign Phase 2	2,686,285	95%
Sudan	2005	campaign Phase 3	4,020,994	100%
Sudan	2005	campaign Phase 4	3,899,914	93%
S.Sudan	2005	Juba, Terekeka, Budi and Kapoeta	280,775	81%
Syria	1998	Catch-up	6,636,752	99%
Tunisia	1998	Catch-up	1,754,239	95%
Tunisia	2001	Follow-up	514,900	94%
Tunisia	2002	Catch-up	126,412	99%
UAE	1998	Catch-up	154,960	92%
UAE	1999	Catch-up	168,435	90%
UAE	2001	Catch-up	893,000	94%
Yemen	2001	Catch-up	2,205,453	94%
Yemen	2006	Catch-up	9,310,000	98%

Appendix 8: Flow chart for Measles/Rubella case classification
Elimination Phase