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Report on the

Intercountry meeting on measles/rubella control and elimination

Sharm El Sheik, Egypt
28 November–1 December 2010

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1. INTRODUCTION

An intercountry meeting on measles/rubella control/elimination was organized by the World Health Organization (WHO) Regional Office for the Eastern Mediterranean in Sharm El Sheikh, Egypt, from 28 November to 1 December, 2010. The participants in this four-day meeting included technical advisory group members, representatives of UNICEF, the Centers for Disease Control and Prevention (CDC, Atlanta), and a representative of the Measles Initiative.

The objectives of the meeting were to:

- review and follow up on the progress of Member States in implementing measles/rubella elimination/control;
- review measles case-based surveillance and the measles laboratory surveillance network;
- discuss new advances and strategies related to measles and rubella elimination/control;
- review and update national plans for strengthening the measles/rubella elimination and control programme;
- review the measles elimination validation process.

The opening message of Dr Hussein A. Gezairy, WHO Regional Director for the Eastern Mediterranean, was delivered by Dr Jaouad Mahjour, Director of the Division of Communicable Disease Control, WHO Regional Office for the Eastern Mediterranean. Dr Gezairy said that the Region had made commendable progress towards achieving the measles elimination goal since 1997, when the Regional Committee for the Eastern Mediterranean had passed a resolution adopting the regional target of measles elimination by 2010. Routine immunization coverage of the first dose of measles-containing vaccine for the Region had increased, from 78% in 1997 to 84% in 2009. Nineteen countries provided a routine second dose of measles vaccine with variable levels of coverage. All countries in the Region had completed the nationwide measles catch-up campaign, and 384 million children in the Region were vaccinated against measles through supplementary immunization activities between 1994 and 2009. As a result, the number of reported measles cases had dropped dramatically, especially during the past four years, and measles mortality was reduced by 93% between 2000 and 2008. Measles and rubella case-based surveillance was enhanced throughout the Region. Nineteen countries were implementing nationwide measles laboratory case-based surveillance and Morocco was on track to do so, while Pakistan, Somalia and southern Sudan were starting to implement it.

Dr Gezairy said that, however, it should be remembered that the regional elimination target had not been achieved, although eight countries were moving towards validating elimination. Routine vaccination coverage in many countries still had not reached a level that supported achievement of elimination, measles surveillance was still not up to the standard that supported validation of measles elimination, even in most countries with nationwide surveillance, and some countries of the Region still experienced measles outbreaks, even among the age groups that were vaccinated during activities with reported high coverage. A lot of quality issues still needed to be looked at and corrective measures applied.

In fact, the Region was still facing challenges that would require sustained effort and higher input by Member States, as well as continuous collaboration and support from partners in order to sustain the gains in reducing measles mortality and avoid a resurgence of measles (as happened in southern Africa), well as to achieve measles elimination. Routine immunization still needed strengthening in all countries to achieve the required 95% coverage with 2 doses of measles vaccine in all districts. Intensive efforts and innovative approaches were still needed in order to reach the inaccessible areas, especially those that were inaccessible due to security and safety issues. Several countries still needed to conduct follow-up measles campaigns that would require a considerable amount of resources to be allocated by the countries and mobilized by partners.

During the EPI managers' meeting in July 2010, it had been agreed to postpone the target date of regional elimination of measles to the year 2015, with validating measles elimination in the countries that were ready to do so at any point of time.

The Chair was shared on a rotating basis. The agenda, programme and list of participants are included as Annexes 1, 2 and 3, respectively.

2. GLOBAL AND REGIONAL UPDATES ON MEASLES CONTROL/ ELIMINATION

2.1 Global overview

Dr Peter Strebel, WHO/HQ

Remarkable progress has been made towards achieving regional measles elimination goals and in reducing measles deaths worldwide. From 2000 to 2008, an estimated 4.3 million additional child deaths were averted as a result of increases in routine immunization coverage and implementation of measles supplementary immunization days (SIAs). These achievements are the result of intensified efforts of high-burden countries supported by the Measles Initiative. However, beginning in 2009, the African Region has experienced a resurgence of measles affecting 28 countries with more than 200 000 reported cases. These outbreaks highlight the fragility of the gains. There is a growing risk that the critical contribution of measles mortality reduction to achieving Millennium Development Goal 4 (approximately 25% of the overall reduction) will be lost because of declining political and financial commitment to measles control.

An ad hoc advisory committee convened by WHO met in July 2010 to discuss the feasibility of global eradication of measles. After a comprehensive review, they confirmed that worldwide interruption of measles transmission was biologically and technically feasible, would contribute to strengthening of immunization systems and be one of the most cost-effective public health investments. In November 2010, the Strategic Advisory Group of Experts (SAGE) reviewed the report from this committee and concluded that measles can and should be eradicated. They recommended frequent review of progress and establishment of a target date for measles eradication based on demonstration of progress towards the 2015 global targets and regional elimination goals. Eradication of measles represents a unique disease control and developmental opportunity and should be carried out in the context of

strengthening routine immunization and primary health care services. In addition, the programme efficiencies of using combined measles-rubella vaccine and integrated fever-rash surveillance, provide the opportunity for measles eradication activities to accelerate rubella control and the prevention of congenital rubella syndrome.

Standard definitions, surveillance indicators and measures for monitoring progress towards regional elimination of measles have been agreed upon through a series of meetings and conference calls with WHO regional focal points, immunization partners and measles experts. These will be published in the Weekly Epidemiological Record on 3 December 2010 and can be used to reinforce the use of laboratory-backed surveillance and outbreak investigations to direct immunization programme activities and monitor progress towards measles elimination.

2.2 Eliminating measles by 2010: progress and reasons for moving the target year

Dr Boubker Naouri, EMRO/VPI

Great achievements have been made since 1997 when the Regional Committee for the Eastern Mediterranean passed the resolution to eliminate measles virus transmission in the Region by 2010. While implementation of the measles elimination strategy has varied by country because of financial, security, and managerial constraints; all countries have exhibited strong commitment and determination to achieve measles elimination. Measles-related deaths were significantly reduced as a result of overall regional high immunization coverage with MCV1, which has increased from 74% coverage during 1999 to 84% during 2009. In 2010, some countries seem to be in the measles elimination phase by reaching and maintaining high population immunity against measles that led to a significant decrease of measles cases. Other countries seem still at measles elimination control phase with a high burden of disease due mainly to wars that limit the access of children to vaccinations. Overall, it is estimated that 1.9 million children were not vaccinated in 2009; >96% of these unvaccinated children reside in Pakistan (46%).

During the 2010 Expanded Programme on Immunization (EPI) managers' meeting, the regional technical advisory committee (RTAG) recommended to move the target year of measles elimination from 2010 to 2015. The vaccine-preventable disease programme of the Regional Office developed a regional strategic plan for measles elimination for the period 2011–2015 with benchmarks and milestones to be reached at both regional and country levels. This strategic plan was provided to the EPI managers, surveillance officers and measles laboratory focal points for review and for use as a comprehensive document to develop a country strategic plan for measles elimination by 2015. The future challenges to meet the measles elimination goal by 2015 are: 1) achieving and maintaining high measles coverage in all districts; and 2) reaching measles elimination in conflict-affected areas and measles activities funding in priority countries. There are many enabling factors to reach this goal: 1) political commitment and ownership of the measles programme by member countries of the Gulf Cooperation Council (GCC) and middle-income countries; 2) support from international funding partners; 3) pool procurement of vaccine; and 4) a well-functioning regional measles/rubella laboratory network.

Discussion

- The Region should develop an advocacy programme for resource mobilization as a result of a lack of funds to support countries in 2011–2012.
- South Sudan is not eligible for GAVI support.
- The main challenges that the Region faces toward achieving measles elimination by 2015 are: insecurity that limits access to vaccination, communities not seeking care and physical/geographical barriers.
- Reaching 95% coverage for MCV1 and MCV2 in all districts could achieve measles elimination but must include hard-to-reach children.

3. ACHIEVING AND SUSTAINING HIGH POPULATION IMMUNITY AGAINST MEASLES

3.1 Reaching high measles population immunity to achieve elimination

Dr N. Teleb, RA, EMRO/VPI

Ensuring high population immunity is the cornerstone for achieving measles elimination in the Region and elsewhere. As all countries of the Region have conducted nationwide measles catch-up vaccination campaigns targeting wide age cohorts, ensuring high population immunity to achieve and maintain measles elimination now necessitate sustaining the achievements of the catch-up campaign through high vaccination coverage with 2 doses of MCV; preferably during the second year of life, through:

- achieving ≥95% coverage with MCV1 in all districts through strong routine immunization services; and
- achieving ≥95% coverage with second dose of measles vaccine in all districts through:
- routine second dose of measles vaccine; or
- periodic follow-up supplementary immunization days until the high homogeneous coverage with 2 routine doses of measles vaccine (≥95% at the lowest administrative level of the country) achieved.

Measles virus is extremely infectious; a small percentage of susceptible individuals can maintain viral circulation. Therefore, to achieve the required herd immunity, at least 95% of the homogeneous population (at the lowest administrative level) should be immune. Depending on age of administration, 5%–15% of the infants do not respond to the first dose of measles vaccine. Therefore, administration of a second dose of measles-containing vaccine is important to reduce the number of unvaccinated children and the number of non-responders. Delivery of MCV1 through the routine strategy is essential in order to protect infants as soon as possible after they lose protection from maternal antibodies. Therefore, strengthening routine immunization to deliver MCV1 for every child is the first priority and most cost-effective approach in measles elimination programmes.

Selecting the suitable strategy for delivering the second dose of measles-containing vaccine depends mainly on the potential for achieving the highest coverage which, in turn, depends on the strength of the routine immunization programme. Routine MCV2 alone is to

be used if at least 95% of the children have access to routine vaccination services, as indicated by coverage of MCV1. If routine MCV2 coverage is <95%, additional follow up SIAs should continue. Routine MCV2 is preferably to be administered during the second year of life to avoid accumulation of susceptible children. However, the decision about age at vaccination with routine MCV2 should take into consideration the opportunity of achieving the highest coverage. Delivering MCV2 through SIAs is considered the most appropriate strategy if the opportunity to reach high coverage with routine MCV2 is low, as indicated by the coverage of MCV1. In this case, periodic follow-up campaigns will be more effective as they can reach very high coverage, cover the primary vaccine failure and reach zero-dose children.

To date, MCV1 is being administered at 9 months of age in 8 countries. Routine MCV2 is being provided in 18 countries with very low coverage reported in Afghanistan, Pakistan and Yemen. MCV2 is administered as follow-up campaigns in 4 countries, in addition to Afghanistan and Yemen that implement the combination of routine second dose and follow-up campaigns.

According to reported data, activities in most countries are going as recommended for achieving population immunity required for achieving and maintaining elimination. However, in view of the high number of confirmed cases reported by some countries, which is not expected from the immunity profile (based on reported coverage figures), it is clear that there is discrepancy between disease incidence and reported coverage in some countries.

This observation might put a question mark on the quality of campaign data and routine vaccine coverage data, and/or quality of the delivered vaccine (vaccine potency). There is a crucial need to ensure quality, monitor susceptibility and ensure timely action.

3.2 Maintaining immunity against measles in Yemen: strategies for measles vaccine delivery

Dr Ghada Showqi Al Haboub, Ministry of Health, Yemen

The vaccination schedule in Yemen is MVC1 at 9 months of age and MCV2 at 18 months of age. The type of vaccine which has been used is single measles. The coverage of MCV1 was 69% and MCV2 was 44% in 2009. About 20% of MCV1 coverage was conducted throughout outreach activities. Routine coverage of measles was enhanced through campaigns as follows.

- In 2006, a national catch up campaign with coverage 98% targeted children 9 months–15 years.
- In 2007 and January 2009, a mop-up campaign was conducted with coverage of 91% and 92%.
- In December 2009, a national follow-up campaign with coverage of 96% targeted children 9 months–5 years.

Future plans include a: in May 2011 a mop-up campaign in the high-risk areas; and a national follow-up campaign in 2012.

Discussion

The susceptibility profile tool can be affected by surveillance and coverage data quality so is not dependable. Routine coverage can be monitored but mass campaign coverage may present some difficulty, particularly if several nongovernmental organizations are involved.

3.3 Challenges and achievements to reach high measles immunity among all population groups in Bahrain

Dr Jalila Jaouad, MOH/Bahrain

Measles elimination is one of the Ministry of Health's priorities. The marked reduction in the incidence of measles can be attributed to the introduction of the MMR vaccine in the immunization schedule in 1985 and to the high (>95%) measles (MMR1 and MMR2) coverage attained. In addition, the surveillance system is strong enough to ensure monitoring of control measures. The number of measles cases has shown a marked reduction in the past decade. The total number of cases in 2010 was two cases. One of the cases was a Bahraini child below vaccination age and the other case was a non-Bahraini unvaccinated adult. Bahrain is implementing different strategies to ensure sustained high immunity profile in community and studying various strategies to overcome existing challenges.

3.4 Country experience to fill the immunity gap among the high-risk groups

Dr Khaled Baradie, Ministry of Health, Syrian Arab Republic

Measles is a mandatory notifiable disease. The measles programme consists of three main components: 1) maintaining high immunity in the community through routine vaccination and SIA; 2) conducting case-based surveillance (case detection, laboratory confirmation, reporting, interventions); and 3) ensuring proper case management. Table 1 shows vaccination ages.

Table 1. Age of vaccination

Vaccine	Age of vaccination	Vaccine formulation	Year introduced
MCV1	12 months	MMR	01.01.2008
MCV2	18 months	MMR	01.01.2008

MCV2 coverage increased from 96% in 2000 to 98% in 2009. Routine immunization coverage is monitored through reporting, the accumulation of susceptible individuals and the analysis of confirmed measles cases (line-listing), supervision and local surveys. Routine immunization coverage is improved through tracing defaulters at health centres, conducting training to reduce missed opportunities, health education activities and enhancing supervision.

Discussion

In countries that appear close to elimination, measles cases may still occur among non-nationals. Those cases should be well investigated, including testing in a proficiency laboratory and efforts should be made to identify the source of infection. These cases should be classified as "imported" if the exposure occurred outside of the country within 7 to 21 days prior to the onset of rash. If these cases are classified as imported, they should not be included when computing measles incidence. All member countries of the GCC, except Kuwait and Oman, provide the second routine dose of measles at the age of 4–6 years. Kuwait and Oman are providing the second dose at the age of 15–18 months.

3.5 Updates on measles follow-up campaign

Mr Qadir Bux Abbassi, MOH/Pakistan

Pakistan conducted mass measles campaign in five phases during 2007–2008, targeting children of 09 months to under 13 years. More than 66 million children were vaccinated in the five phases. Overall administrative and cluster surveys conducted by UN monitors showed more than 95% coverage nationwide. After achieving an appropriate level of coverage the country included a second dose of measles in its schedule with the introduction of a case-based surveillance system to measure the impact of disease reduction in 2009.

Since completion of the catch-up campaign, the routine measles coverage did not reach the desired level. MCV1 coverage remained stagnant at about 80% for the last 4 years, while MCV2 coverage remains at about 30%. Consequently, unprotected cohorts of children accumulated over the last 3 years leading to outbreaks in different parts of the country, especially Sindh, Balochistan and the Khyber Pakhtunkhwa provinces. Considering the re-emergence of the disease, the country planned to conduct a follow-up campaign in 2010–2011 targeting children 09 months to below 5 years of age.

Initially, the plan was to conduct the follow-up campaign in Sindh province in November–December 2010 and in the rest of the country in 2011, although it was not implemented due to the July 2010 floods, which affected more than 20 million people in four provinces. However, an immediate immunization response was initiated among the accessible flood-affected population, i.e. internally-displaced persons (IDPs) camps and temporary shelters. The vaccines and injection equipments were secured by the government, while WHO provided operational costs and UNICEF supported social mobilization activities.

During the flood response vaccination activity, the measles follow-up campaign plan was revised, in consultation with WHO and UNICEF, and it was converted to mass vaccination campaign with the addition of other antigens. The new targets were set for measles to cover all children aged 06–59 months and children 0–59 months for administration of mOPV1. In addition to this children under two years of age were given due dose of vaccines and pregnant women were given TT vaccine. Based on the results achieved the flood-affected districts were prioritized and phase 1 implementation was planned for 40 districts.

Out of 40 districts vaccination could only started in 35 districts, while the remaining five districts carried out a vaccination campaign from 25 October to 5 November 2010. The Government supplied vaccines and injection equipments worth US$ 6 million, WHO provided about US$ 2 million for operational costs and UNICEF about US$ 135 000 for social mobilization.

The country has also planned the second phase of the campaign in 26 districts targeted in Punjab, Sindh and Khyber Pakhtunkhwa provinces and the tentative schedule will be 28 December 2010 to 10 January 2011. The vaccines and injection equipment and operational costs, as well social mobilization have been secured for implementation of this round with assistance of WHO and UNICEF through USAID support.

Pakistan has also planned a phase 3 campaign in the first quarter of 2011 in the remaining 79 districts and 18 towns of Karachi. For this phase vaccines and injection equipment, operations and social mobilization cost equivalent to US$ 8.7 million and this has not yet been secured. The implementation status of case-based measles surveillance has also been provided with key indicators.

3.6 Child Health Day in Somalia: an opportunity to improve measles population immunity

Dr A. Kebbede, WHO/Somalia

EPI coverage in Somalia is very low 31%. This is due to the limited resources, de-motivated staff, weak service delivery and poor management, a non-functioning government, disrupted socioeconomic system and insecurity and conflicts. Unusual circumstances in Somalia require an unusual strategy: the combination of fixed sites, Child Health Days (CHD) and Reach Every District (RED) approach to improve access to, and utilization of, routine immunization. These factors led WHO, UNICEF and other partners to implement a Child Health Day with the strategy focusing on the needs of the population and offering real impact and outcomes in terms of lives saved. Two CHDs are conducted yearly. After two years, measles coverage has increased significantly to reach an average of about 59%.

Discussion

Lack of funds might affect the success of measles activities in Sudan. Actions are needed to secure funds for priority countries. As a result of the lack of support from GAVI, Sudan will not be able to introduce the rubella vaccine.

3.7 Improving measles population immunity in the Region: regional strategy for measles elimination 2011-2015

Dr Boubker Naouri, EMRO/VPI

As the regional goal for measles elimination was set for 2015, interim objectives and milestones should be reached. Interim objectives for 2012 include:

- first dose measles vaccination coverage - 90% at national level and 80% in all districts
- reported measles incidence - less than 5 cases per million population
- 95% measles mortality reduction compared to 2000.

Regional strategies to reach high measles population immunity are:

- MCV1 at 12 months
- routine MCV2 at 15–18 months or 4–6 years
- MCV2 routine or follow-up campaigns
- mop-up campaigns where coverage is below 95%
- follow-up campaigns if MCV1 and/or MCV2 are below 95% or not reaching 95% in all districts.

The milestones for countries are presented in Tables 2, 3 and 4.

Table 2. Elimination countries' benchmarks 2011–2015

Benchmark	2011	2012	2013	2014	2015
All countries to reach MCV1 >95% in all districts.					
Case-based surveillance meets the target for the three main indicators: reporting rate, proportion of suspected cases tested and case investigation completed.					
Incidence <1 per 1 000 000 population.					
Case-based surveillance meets *all* the performance indicators targets.					
Interruption of measles transmission to be achieved and maintained (0 cases/1 000 000 population).					
Validation of measles elimination.					

Table 3. Near elimination countries' benchmarks, 2011–2015

Benchmark	2011	2012	2013	2014	2015
All countries to reach MCV1 >95% in all districts.					
Nationwide measles case-based implemented in Morocco.					
Nationwide measles case-based surveillance system that meets all the performance targets.					
Incidence <1 case per 1 000 000 population.					
All countries to reach MCV1 and MCV2 >95% in all districts.					
Interruption of measles transmission to be achieved and maintained (0 case/1 million population).					
Validation of measles elimination					

Table 4. High-burden countries' benchmarks, 2011–2015

Benchmark	2011	2012	2013	2014	2015
Nationwide case-based surveillance implemented in Pakistan					
Measles coverage with MCV1 to reach 60% in South Sudan and Somalia					
Measles coverage with MCV1 to reach 80% in Afghanistan and 90% in Iraq and Djibouti					
Measles MCV1 coverage to reach >95% in Iraq, Pakistan (all districts) and in 80% of the districts in Afghanistan and 80% coverage in Somalia and South Sudan. Measles MCV2 coverage to reach 80% in Iraq, Pakistan and Afghanistan in all districts.					
Case-based surveillance to meet the main performance indicator targets in all countries					
Measles coverage with MCV1 to reach 95% in all districts in all countries					
Case-based surveillance meets all the performance indicators targets in all countries					
All countries reached incidence rate below 10 cases/1 000 000 population					
Case-based surveillance meets all the performance indicators in South Sudan and Somalia					
All countries reached incidence <5 cases/1 000 000					
All countries interrupted measles transmission					

Immunization activities for the strategic plan 2011–2015 are to:

- develop specific strategies to bridge the immunity gap in some countries;
- validate vaccination coverage;
- 83 500 000 children need to be vaccinated through SIA (CHD, ASCI) in nine countries.

4. GROUP WORK: UPDATING COUNTRY PLANS TO ENSURE HIGH POPULATION IMMUNITY

Participants were divided into four groups to update country plans to ensure high population immunity (in line with regional milestones and action plans). The first group comprised Kuwait, Bahrain, Qatar, Saudi Arabia and Oman; the second group comprised Egypt, Jordan, Libya, occupied Palestinian territory, Iraq, Syrian Arab Republic and Tunisia; the third group Lebanon, Morocco and Sudan and the fourth group Afghanistan, Djibouti, Pakistan and South Sudan. The recommendations of the group work are included as Tables 5, 6, 7 and 8.

Table 5. Group 1 recommendations (Kuwait, Bahrain, Qatar, Saudi Arabia and Oman)

Population immunity key findings	Gap immunity	General actions to be taken	Action to be taken - expatriate populations	Resident populations	Action to be taken by the Regional Office
Some countries with ongoing transmission despite immunity profile with low susceptibility	Special groups Non-stated nationalities (illegal immigrants) Border communities Mass gatherings All age groups: Saudi Arabia, Qatar, Kuwait Expatriate populations: Adults (most measles cases in adults are expatriates)	Vaccination coverage: surveys, DQA More epidemiologic analysis: Coordination of EPI/laboratory Catch-up campaigns: Multiple age cohorts (Qatar, Saudi Arabia, Kuwait) Outreach services for special populations: Kuwait	Incoming expatriates Mandatory vaccination regardless of vaccination status for residency visa Option 1: on arrival Option 2: in country of origin	MR/MMR on renewal of residency visa School/preschool vaccination Special campaigns in schools with expatriate Campaigns for adult populations based on epidemiology of disease MR/MMR on renewal of residency visa School/preschool vaccination Special campaigns in schools with expatriate Campaigns for adult populations based on epidemiology of disease	Recommendations endorsed by the Regional Committee Technical support for coverage surveys Technical support for in-depth epidemiologic analysis

Table 6. Group 2 recommendations (Egypt, Jordan, Libyan Arab Republic, occupied Palestinian territory, Iraq, Syrian Arab Republic and Tunisia)

Country	Target	Population immunity performance	What are the gaps?	What action needs to be taken to improve and sustain immunity	Time line for action					Support needed to reach objective
					2011	2012	2013	2014	2015	
Egypt	To achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	> 95% at national level	Some districts with coverage <95%	Situation analysis for districts <95% and strength fever and rash surveillance	Develop guideline	Achieved	Achieved	Achieved	Achieved	Training, advocacy meetings, validation of elimination (under processing) surveillance should take first priority
Jordan	To achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	> 95% at national level	Gypses, borders, newcomers	Validation of vaccination coverage	Achieved	Achieved	Achieved	Achieved	Achieved	Validation of vaccination coverage
Libyan Arab Jamahiriya	To achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	> 95% at national level forMCV1 and <than 95% for MCV2	Expatriot, vaccination status of newcomers coverage data accuracy	Conducting SIAS sustained basic PGM	SNID	SNID	Evaluation	Evaluation	Evaluation	Elimination validation, training of different EPI issues
Occupied Palestinian territory	To achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	>95%	No gaps	Sustain high coverage rate in addition to strength surveillance	Achieved	Achieved	Achieved	Achieved	Achieved	Serosurvey for MMR by 2015

Iraq	To achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	Achieved nationally	Unstable situation in some pockets in addition 60% of districts coverage was <95%	Enhance routine coverage superadded by cyclical campaigns targeting risk groups according to epidemiological analysis	85%	95%	95%	Achieved	Achieved	Technical support and in need support for serosurvey next year
Syrian Arab Republic	To achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	> 95% at national level	Moving from urban to rural	Mopping up SIAS at other districts and HRA	Mopping up in HRD	Achieved	Achieved	Achieved	Achieved	Technical support and in need for , training the health worker
Tunisia	To achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	>95%	Importation of measles cases by tourists	Increase in no. of HF which submit vaccine in addition to decreased fertility rate also sustain high coverage rate in all districts	Serosurvey 2nd quarter	Achieved	Achieved	Achieved	Achieved	Financial support to edit guidelines on validation of measles elimination, technical and financial support to conduct LQ as survey and DQS to conduct a sero survey for children <5, conducting a global review of measles and Rubella strategy.

Table 7. Group 3 recommendations (Lebanon, Morocco, Sudan)

Country	Target	Population immunity performance	Gaps	What action needs to be taken to improve and sustain immunity	Time line for action					Support needed to reach the objective
					2011	2012	2013	2014	2015	
Lebanon	To achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	2009, MCV1 coverage 93% Catch-up camp: 2001, 2008, 9 months-15 years, coverage 76% Cluster coverage survey 9.9%	Variable coverage at district level, while national is 76%, there is districts less than 50%, Private sector reporting, no defaulter Under reporting affect the supply chain Remote areas (difficult acess) with no H. facility	Private and public reporting Update cmyp, Update and integrate information system within PHC and distributer centres, defaulter system Activation of NITAG Capacity-building for staff on vaccination Establish immunization measles validation committee Local catch-up camp Sustain role of media Efforts to reduce DOR	Third dose introduction 4–6 years	Catch-up camp to maintain MCV2 > 90%	Sustain MCV1, 2 > 90%	Sustain MCV1 ,2 > 95%	Sustain MCV2 > 95%	Political support, Technical support Validation of elimination committee, Financial support Coordination between related ministries
Morocco		MCV1, 9 months, 94% MR, 6 years, 91%, variable at district levels Catch-up camp, MR 9 months–15 years, 2008, 99%, Rubella catch-up, 15–24 (only female), cov, 83%	Rural districts with difficult access, Measles among elder group (how to vaccinate).	Vaccination coverage review, EPI review, Data analysis, Strengthen national immunization committee	EPI review	95% MCV1 coverage				Technical assistance for EPI review

Yemen		MCV1 9 million, coverage 69% MCV2 18 million coverage, 44%, Catch- up camp 2006(98%), Follow-up campaign 2009(96%)	Conflict areas , social barriers, health services 60%	*Social mobilization, Orientation for health workers Enhance routine coverage through routine and integrated out-reach Reduce drop out (missed opportunity MCV1 age shift to 12 months in 2012 Enhance NITAG	Mop-up in high-risk areas	Follow-up campaign				Technical assistance, Financial support for campaigns
Sudan		MCV1 at 9 million, MCV1:83%, 12% of localities only achieve 95%, pocket of susceptible, catch-up campaign 2004–2005: 97% coverage, follow up campaign 2007–2008: 98%, 2010: 95%	GAVI Phasing out, MCV1 less than the target for elimination, 88% of localities achieve less 95%, Insecurity and conflict areas, Open borders with neighbouring countries and importation of cases Pocket of susceptible	Introduce second dose routine, Follow up campaign Sustained outreach activities, Enhancing of defaulter tracing activities Increase people demand to measles vaccination by using the mass media and interpersonal communication , resource mobilization (advocacy/partners)	Follow-up camp, introduction of routine second dose, MCV1: 87%, 50% of localities reach 95%	MCV1: 90% , 70% loc reach 95%	Follow-up campaign, MCV1: 93%, 87% of local reach 95%	Follow -up camp, MCV1 : 95%, 95% of loc reach 95%	Achieve and maintain MCV1:95%, 100% of loc reach 95%	Financial support for campaign, support for the second dose, social mobilization, technical support

Table 8. Group 4 recommendations (Afghanistan, Djibouti, Pakistan, South Sudan)

Country	Target	Current situation 2010	What are the gaps	What action needs to be taken to improve and sustain population immunity	Time line for action					Support needed to achieve the target
					2011	2012	2013	2014	2015	
Afghanistan	Achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	MCV1: 76% MCV2: 41%- District > 90: 79 districts District 80 - 90: 81 dist Dis < 50: 38 dist Dist with no coverage: 9	* security * coordination (75%–80% are in secure areas)	Categorize secure/unsecure area Categorize low/high performing districts Strategy: MCV1 1. RED/microplan 2. Coordination with nongovernmental organization for outreach/mobile 3. Immunization weeks: advocacy/awareness + acceleration 4. Expansion of health subcentres 5. New package of IMCI (with UNICEF) 6. About 2 million nomads/IDPS need special approach Strategy MCV2		MCV1: 90% in secure areas 85% in all districts in secure areas MCV2 95% coverage >90% in all districts		95% nationally 90% for all districts		
Djibouti	Achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	MCV1: 84% MCV2, NA All districts > 80%		Mobile strategy in all districts, except DJI More staff in health facilities Improve fixed strategy Child Health day: 98%MCV1 RED + acceleration MCV2: planned for 2011 Follow-up campaign 2001 September		MCV1: 90% in all towns 85% in all districts		95% Djibouti 90 in all districts		

Pakistan	Achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	MCV1: 80%, MCV2: 30% 93 (out of 135) districts with 91% of population 64 districts (out of 93) already achieved =>95% MCV1 coverage 14 districts (out of 93) achieved =>95% MCV2 coverage	1. Focus on 29 districts Involve local administration Regular monitoring Integrating microplanning Use polio structure Expanding fixed sites Reduce outreach and increase fixed sites Empower the system 2. 42 districts with 10% pop * secure areas: 95 % by 2013 * Insecure areas: (2.5% pop) - flexible plan using window of opportunity - RED where possible - Use local people: ulamas, religious leaders MCV2: Follow-up campaign in	For MCV1: 29 districts to be prioritized to reach 95% MCV1 coverage by 2011 through different strategies like emergency polio eradication plan 42 district with 10% of the total country population: districts without security issues would need: 1) infrastructural development, 2) RED approach; 3) improved management and accountability districts having security issue would adopt integrated service delivery approach using every opportunity to access the population For MCV2: 1) Strenthening RI using same strategy for MCV1 2) Completing ongoing follow-up campaign by 2011 (first quarter) 3) Second follow-up campaign by 2014						

			phased approach 1st : 2nd: 3rd: monitor immunity profile at district level and react accordingly > possible second follow-up Routine MCV2: same plan. Coverage survey to validate MCV1 and MCV2							
Somalia	To achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	MCV1: 59 MCV2: NA District > 90:0 District 80–90:0 District < 80: all	* Security * Immunity gap	North: 100% RED Central/South: Start RED All: Consider increasing age group to 10–15 Then follow up through CHD Look into quality of CHD data	MCV1: 75%	MCV1: 85%	MCV1: 90%	MCV1: 90%		
S.Sudan	Achieve 95% coverage of MCV1 and MCV2 in 95% of districts by 2015 through different strategies	MCV1: 71% MCV2: NA	* Immunity gap	MCV1: Expand RED to remaining districts Child survival initiative: January–April MCV2: Follow-up campaign for all children born after 2005 needed. Campaign should be conducted not later than 2012.		MCV1:95% MCV2: in 2012 for 90% coverage				

5. IMPROVING MEASLES SURVEILLANCE

5.1 Where we are and what should be done differently to meet the measles surveillance standard for validation of elimination by 2015

Dr Boubker Naouri, EMRO/WHO

Monitoring progress towards the achievement of measles elimination can only be accomplished in the presence of a well-performing surveillance system. Both epidemiologic and laboratory-based surveillance must provide the needed sensitivity and specificity to ensure the detection of measles virus. Countries with elimination goals should monitor the quality of their surveillance systems by periodically calculating indicators of surveillance performance. A minimum set of recommended core indicators have been defined. The main measles surveillance performance indicators are: reporting rate, laboratory confirmation, viral detection and adequacy of case investigation.

The analysis of performance indicators showed that between 2007 and January–September 2010, only 5 (27%) countries met the reporting, rate, 11 (50%) reported that at least 80% of case investigations were adequate and 18 (80%) countries reported that they tested at least 80% of reported suspected cases.

Surveillance gaps in the Region include:

- no uniform case definition
- no reports on investigation/control of measles outbreaks
- lack of documentation
- no EPI, surveillance or laboratory regular meetings
- case classification: EPI manager, surveillance officer, laboratory staff
- no collection of specimens for virus detection to monitor the interruption of endemic transmission/importations
- conducting investigation within 48 hours not tracked
- data management: “missing data” or “unknown”?
- no data for action.

Priorities for the Region are:

- reviewing country surveillance
- addressing priority countries: Lebanon, Pakistan, Morocco, Somalia, southern Sudan
- meeting the performance targets to validate measles elimination
- improving regional data management

5.2 Required measles laboratory surveillance activities in the context of validation of measles elimination

Dr Hinda Ahmed, VPI/EMRO

The regional measles and rubella laboratory network (LabNet) performs an important role in measles and rubella surveillance by confirming suspected cases using standardized and validated testing and reporting procedures. LabNet undergoes regular quality assurance and proficiency testing.

Laboratory measles case-based surveillance is implemented in all Member States, although three countries conduct sentinel sites surveillance. From January to September 2010 LabNet has tested 5096 for IgM antibody and 79 for virus isolation and detection where B3 was first identified in Saudi Arabia and Somalia and new subtype within the B3 genotype was detected in Libyan Arab Jamahiriya and published in international Journal. Specimen shipment costs have been reduced as LabNet use serum and virus isolates dried onto filter papers to send for validation or for genotypes.

Training and capacity-building remains a core component of LabNet, especially as new techniques are implemented and the need to meet the challenge (a total of 12 laboratory professionals have been trained in 2010. New procedures for molecular proficiency tested have been developed by CDC's global laboratory and have been implemented in four countries in the Region obtaining excellent results.

Laboratory capacities are available for enhanced measles surveillance, challenges and requirements of laboratory surveillance for validation in measles elimination, including monitoring indicators for measles elimination and strong capacity in molecular techniques for timely detection of imported and import-related cases. Genetic characterization of wild measles viruses provides a means to facilitate the study of transmission pathways of the virus and is an essential component of laboratory-based measles surveillance activities.

5.3 Improving case investigation, data collection and reporting for validating measles elimination 2011–2015

Raef Bekhit, VPI/EMRO

Improvements in case investigation and data collection are important, as case investigation with laboratory confirmation represents the backbone of measles surveillance. Data needs to be reported in a timely way for analysis and as a result of data analysis recommendations are formed at national and regional level. Countries should start utilizing the proposed surveillance indicators for measles elimination validation; raise awareness of stakeholders; monitor performance and quality of the measles elimination programme; and programme managers are encouraged to provide feedback on performance indicators on a monthly basis to all levels. Progress can only be monitored in the presence of concrete system indicators to monitor the surveillance system. There are four indicators for monitoring surveillance system performance–reporting rate; laboratory confirmation; viral detection; and adequacy of investigation.

There are also four indicators for monitoring progress towards elimination with targets– measles incidence; vaccination coverage; endemic measles virus strain; and outbreak investigation. The proposed elimination indicators should not be used in isolation. Rather, an assessment of all four is necessary to make reliable conclusions. Once a particular country has approached targets that are suggestive of elimination, an in-depth review is recommended to confirm that they have indeed achieved elimination.

Indicators which are currently unmeasurable include: investigations of all suspected measles outbreaks that include contact tracing and active case-finding; percentage of outbreaks with samples collected for virus detection (80%); percentage of suspected cases investigated within 48 hours of notification (80%); and nationality of cases (national/non-national). Surveillance feedback is provided through a monthly bulletin reporting case counts by country and case classification; key indicators; and mapping of quarterly occurring measles and rubella cases.

Discussion

The performance criteria of measles elimination were reviewed by all WHO Regions, with the coordination of the WHO headquarters. The countries need to collect all data elements to measure and monitor these indicators for which it is necessary to validate measles elimination.

5.4 Progress toward implementation of nationwide measles case-based surveillance in Morocco

Dr A. Rguig-MOH/Morocco

In 2010, Morocco moved from a sentinel to national case-based measles surveillance. Guidelines, operational manual procedures were developed, followed by training at regional, provincial and district level. The status of main activities is as follows.

- Elaboration of procedure manual for monitoring measles in the elimination phase.
- Regional training of trainers workshops on measles case-based surveillance.
- Training of workers at provincial and prefectural level.
- Awareness meetings for the military sector.
- Edition of a poster "case definition".
- Awareness meetings for the five university hospital centres.
- Missions of supervision.
- Seminar to assess the measles case-based surveillance.
- Editing national guidelines for measles surveillance in the elimination phase.

Morocco established a nationwide measles case-based surveillance based on reports of rash and fever illness with immediate reporting of all suspect measles/rubella cases and zero weekly reporting.

The main components of measles surveillance are summarized below. Data analysis is systematically conducted at all levels.

- Province: by the epidemiology provincial unit
- Region: by the epidemiology Regional observatory
- National: by the epidemiological surveillance department.

Feedback if provided using a quarterly bulletin: “info-rougeole”, that is dispatched from national level to all regions and provinces (by mail and hard copy). It is also dispatched from provinces to primary health care and hospitals (by mail and hard copy).

The analysis main performance indicators showed that the reporting rate does not reach the target of two suspect cases per 100 000 at national level. However, more that 80% of suspect cases were confirmed by laboratory testing, but only 46% of cases for which a specimen was collected for viral detection.

The main challenge for implementing a nationwide measles case-based surveillance in Morocco is the high number of suspected cases that need to be tested. In fact, the incidence rate of measles in Morocco is greater than 10 cases per 1 million in 2010. Testing all suspect cases while measles is endemic and outbreaks are still occurring will require more funds. A strategy of reducing the number of suspected cases needs to be determined to reduce the cost.

5.5 Status of measles surveillance in Egypt

Dr Ibrahim Moussa, MOH/Egypt

Egypt implemented a nationwide measles case-based surveillance with laboratory confirmation. Rash and fever are used as case definition and suspected measles cases are tested in the WHO accredited national measles laboratory. Suspect cases with rash and fever that are negative for IgM and specific for measles are tested for rubella. Measles data are analysed in the three levels: district, province and national level. Feedback is provided monthly to provinces. Implementation of a congenital rubella syndrome surveillance system is underway.

The analysis of measles surveillance indicators shows improvement of the performance of the measles/rubella surveillance system. However, the reporting rate of suspect measles cases is still under 2 suspect cases per 100 000 at national level. Efforts should also be made to improve detection of the measles virus from at least 80% of suspect cases.

5.6 Challenges facing implementing measles surveillance among foreign workers in Qatar

Dr Husam Rezeq, MOH/Qatar

A booming industry attracts a multinational labour force to work in Qatar. Most foreign workers are from South Asia. In entering the country, there is neither screening nor a review of any vaccination documents. A situation analysis was conducted to strengthen surveillance among the foreign workers. A distribution of measles algorithm (case definition) was provided to health facilities serving non-national workers.

Future actions include:

- sending NITAG recommendation letter to H.E the minister responsible for vaccination of foreign workers
- reactivating legislation
- strengthening surveillance quality
- conducting a WHO Regional Office consultation visit
- improving pathways of services
- training and guidance
- integrating health interventions

Discussion

Qatar reported that they are in a process of developing specific strategies to reach the community for vaccination and provide access to measles surveillance data.

5.7 Performance of measles surveillance under a difficult security situation in Afghanistan

Dr A. Dost

Afghanistan is using a national rash and fever surveillance system. Surveillance data are case-based with laboratory confirmation. Provinces report measles/rubella line-lists to national level on a monthly basis and data are computerized and analysed at the national level. Monthly feedback is provided to provinces by the national level.

The quality of measles surveillance is improving. The analysis of the surveillance performance indicators shows that from 2006 to 2010 a reporting rate (sensitivity) higher (except for 2009) than 2 measles suspected cases by 100 000 at national level. The proportion of suspected cases that were laboratory-tested keeps improving over time, reaching 70% suspect cases tested in 2010. The proportion of cases completely and adequately investigated reached the target of above 80% between 2008 and 2010.

Other achievements made by the Ministry of Health to improve measles/rubella surveillance system have included:

- training 1250 people in charge of health facility staff for measles/AEFI surveillance in 2009 and 469 in 2010
- ensuring an on time response to all suspected outbreaks
- strengthening the national measles surveillance committee
- linking the database of surveillance with laboratory data
- collecting 5–10 specimens of all outbreaks and now collecting samples from each sporadic cases
- providing regular report/feedback.

Despite these achievements, the Ministry of Health is still facing difficult challenges for the implementation of well-performing nationwide measles/rubella surveillance. Among these challenges are:

- inaccessibility to health care services, including immunization (15%–25% of population include nomads and IDPs)
- high staff turnover
- health facilities in nine districts are not accessible
- circulation of wild polio virus.

5.8 Measles surveillance in Sudan: a success story

Dr Amani Abdelmonem, EPI Sudan

Surveillance during the control phase (before 2004) was passive, located within the Epidemiology Department with other communicable diseases and monthly reporting of clinical measles cases was conducted without the collection of blood samples or epidemic investigation.

The responsibility moved to EPI during 2005, when the only samples collected were from outbreak foci. The Ministry of Health was motivated, due to a large outbreak in 2004, to adopt the four strategies of measles elimination and to establish a measles case-based surveillance in 2006 by building over the infrastructure of the AFP surveillance (staff, experience and logistic). This system was built up by appointing a focal person, training of the staff, provision of all system reporting forms, manual, line-lists and inputs from partners, WHO and Sudan Paediatrics Association.

The implementation process started through assigning a case definition and designing a reporting system. Analysis of the performance of the system shows the progress in the main indicators. This was also confirmed by monitoring the susceptibility profile for all levels. The laboratory component of the surveillance was built on the experience of the polio laboratory by provision of required logistics. The measles national laboratory was accredited and had 100% proficiency. Overall, the system is monitored through regular weekly meetings, supportive supervision and collection of feedback from paediatricians and a quarterly bulletin.

Challenges to maintaining this success can be summarized in difficulty in accessing areas of conflict, maintaining financial support and staff exhaustion.

In conclusion, Sudan has developed a sensitive surveillance system to detect measles cases and to provide evidence for EPI to make decisions regarding immunization activities and outbreak response, help in monitoring the immunity profile, and monitor progress towards elimination. The lessons learned have been the importance of national ownership, WHO financial and technical support, integration with AFP utilizing infrastructure and resources, involvement of all EPI sections and partners.

5.9 Tracing chains of transmission in the Region of the Americas: 2010

Dr Bettina Bankamp, CDC Atlanta, USA

Virologic surveillance is of increasing importance for measles control, especially in countries approaching elimination. Virologic surveillance can help to assess the success of vaccination programmes and to monitor the presence or absence of endemic lineages of measles virus. The Region of the Americas can serve as one example for the role of virologic surveillance.

As of September 2010, there have been 51 measles cases in the USA, mostly in US residents who were unvaccinated due to religious or personal reasons. 43 confirmed cases were linked to 25 independent importations of genotypes B3, D3, D4, D8, D9 and H1. It was possible to identify the genotypes for 77% of the outbreaks from 2002 to 2010. Genotypes D4 and D5 are major lineages circulating in Europe and Japan and have been repeatedly imported over the last couple of years. D8 was imported from India, H1 from Canada after the Winter Olympics. There have been no indigenous genotypes in the Region of the Americas for years. This year, genotype B3 was imported into Argentina from South Africa after the World Soccer Cup and later from Argentina to Brazil. An importation of genotype D4 into Brazil was very similar in sequence to currently circulating viruses in Europe. The identification of many different genotypes confirms the observation that the measles cases were the result of independent importations and not endemic circulation.

Improving virologic surveillance requires an increase in the number and quality of samples for testing. Results must be reported in a timely manner to ensure that up-to-date information is available to all participating laboratories. It is important to continue and expand training programmes for network laboratories.

6. BRIEFING ON NEW DEVELOPMENTS IN PROCEDURES AND MOLECULAR TECHNIQUES FOR MEASLES VIROLOGIC SURVEILLANCE

6.1 Laboratory surveillance of measles in the elimination phase

Dr Suleiman Al-Busaidy, Head of the RRL Muscat, Oman

LabNet plays an important role in measles elimination. It is crucial to obtain accurate and timely result reports to implement action whenever needed. The regional national measles/rubella LabNet is well coordinated with regional reference laboratories. There is continuous transfer of information regarding validation of tested samples, identification of any problems with assays in routine use, monitoring of trends in performance. Capacity can be enhanced by training workshops. There is an opportunity to identify circulating measles virus genotypes in the Region, tracking possible transmission pathways and providing information to the EPI measles programme for documentation regarding interruption of measles virus genotype or endemic circulation.

6.2 Measles virus genotype D4 in the Region

Henda Triki, Head of the RRL Tunis, Tunisia

Regional LabNet activities have substantially improved over the last four years due to the increased capacity of the laboratory network for virus detection and genotyping. Among the different genotypes identified in the Region, all major epidemics were associated with genotypes D4 or B3, with genotype D4 being the most prevalent. Overall genetic variability within genotype D4 and the genetic characteristics of the sequences isolated from the Region is currently being studied

The phylogenetic analyses of the currently available D4 N-gene sequences from the Region and other regions of the world showed a very high genetic diversity within Genotype D4. The three clusters are characterized A, B and C.

On the 79 sequences from the Region, 46 (58%) grouped together in cluster A. Most of the sequences in this cluster originated from Iraq, Islamic Republic of Iran and Pakistan. Thus, the cluster seems to have a consistent geographical specificity to the Region.

Two other sequences from Iraq detected in 2004 and 2007, were quite distant and grouped with other sequences from Syrian Arab Republic, Jordan, Egypt, Sudan and India. Given the high nucleotide divergence with the other D4 sequences, the isolates from this cluster may eventually be classified into a separate subtype necessitating sequencing of the complete H gene of representative sequences from this cluster.

Other D4 lineages were detected in the other countries of the Region. It is necessary to continue and intensify measles virological surveillance to monitor the persistence or the extinction of these lineages and thus to evaluate the effectiveness of measles elimination activities.

6.3 New procedures of molecular techniques and validation for quality control

Dr Bettina Bankamp, CDC Atlanta, USA

Quality control for molecular techniques is essential to ensure the accuracy of results reported to WHO. Network laboratories have expressed an increasing need for quality control and CDC has begun to develop strategies to meet this demand. The methods have been tested by several network laboratories especially from the Region and improvements will continue based on the feedback from those laboratories.

Strategies for warning with RNA and for avoiding contamination include RNAse-free reagents and materials, storing RNA at low temperature and separating pre- and post DNA steps. Quality control for genotyping RT-PCR includes using negative controls and the CDC positive control as well as proper interpretation of agarose gels. Quality control for real-time RT-PCR includes using negative controls and the CDC positive control, RNAse P reactions and RNAse P controls as well as correct interpretation of data. Quality control for sequencing analysis includes assessment of sequence quality using the quality scores of the AB sequencing analysis program, as well as checking for gaps, insertions and ambiguous calls.

Practice panels for genotyping have been tested by a number of network laboratories with good success. In the future, FTA cards will be used to transport practice panels.

6.4 Trial proficiency panel of measles virus on filter paper for genotyping

Dr Latifa Tajounte, National Measles Laboratory, Rabat, Morocco

The global measles laboratory in CDC, Atlanta, has prepared proficiency panel (PT) for molecular techniques and shipped to the national measles laboratory (NML). The panel consisted of five samples in which the measles virus was dried on FTA filter paper for extraction of RNA, performing RT-PCR and sequencing, as well as dried extracted measles virus be run by RT-PCR, sequencing and sequence analyses.

At the NML CDC instruction of trial proficiency tests for molecular techniques were followed. RNA extraction, RT-PCR, purification and sequencing assays were performed according to the protocols enclosed with the PT. All five samples were analysed by the program "seqsCape" version 2.5. The alignment and the tree were established by Clustal X program version 1.8, algorithme Neighbor-Joining, boostrap 100 replicates and visualized by Mega program, version 3. The test results were sent to CDC Atlanta for validation. The panels consisted of three measles virus genotype D3, one B3, one C2 and two negatives. The obtained results were 100% in concordance with CDC results.

6.5 Global update on measles and rubella LabNet

Mr David Featherstone, Global VPD Laboratory Network coordinator, WHO/HQ

The number of laboratories within the network totals 679 with 183 Member States now served by a proficient laboratory. Over 98% of laboratories passed the WHO proficiency testing programme, with most achieving a 100% score. The workload for the laboratories as assessed by the number of measles serum specimens tested dropped from a peak in 2007 of 250 000 to approximately 160 000 in 2009, mostly due to the decrease in measles cases in China. As measles cases decline globally approximately 80% of all samples are also tested for rubella after testing negative for measles IgM. In terms of timeliness of reporting, most laboratories met the criterion of 80% of reports within 7 days of receiving the sample.

A number of new procedures are in the process of being validated, including an external quality assurance programme for measles and rubella PCR, standards for measles serosurvey, and rapid point of care assays. Newly validated processes are in the process of being implemented, including real time PCR for measles and rubella, new sequencing primers and the roll out of alternative sampling techniques.

Member States are moving to meet the enhanced surveillance indicators for achieving elimination. Training and capacity-building remains an important component of the LabNet, especially as new techniques are implemented and there is a need to meet the challenge of staff attrition. Case-based surveillance, including laboratory diagnosis, has been implemented in most (94%). In terms of the global sequence database for measles and rubella, significant progress has been made with more than 8000 measles and 600 rubella virus sequences

currently in the databases. There are still gaps, especially for countries reporting rubella sequences.

6.6 Enhancing measles laboratory surveillance and revised PT scoring system

Dr Hinda Ahmed, EMRO/WHO

Remarkable progress is being made by the regional measles and rubella LabNet. LabNet is getting more and more efficiently advanced by using up-to-date laboratory techniques and following standardized protocol for measles laboratory surveillance. Training and capacity-building for LabNet is a core component and as new techniques are developed they are introduced to LabNet, according to available facilities. In 2010, 12 countries participated in laboratory training either at intercountry workshops or on an individual basis.

Good communication exists between LabNet, WHO and CDC specialized measles global laboratory. Laboratory surveillance remains a central activity in measles elimination. Standardized approaches to laboratory testing and interpretation of results are critical as is strengthened coordination and communication of laboratory and epidemiological surveillance.

Careful investigation is needed for problematic cases; confirmatory tests may be done by other tests for differential diagnosis or by confirmation with virus detection or isolation. Documentation of different laboratory activities is very important for the validation of measles elimination. In 2010, a revised scoring system was being developed for the proficiency test and the incompleteness of required data information of the proficiency panel will affect the scores of test results.

Molecular epidemiological studies are a key component of verification of measles elimination as endemic genotype can change relatively quickly. Constant monitoring of cases and outbreaks is necessary, efforts should be made to collect specimen for virus isolation in connection to blood sample within 5 days of rash onset. The EPI data information should accompany specimens when shipping to regional reference laboratories for genotyping viruses and results must be submitted to the MeaNS Sequence Database (HPA), which will automatically report to the WHO database for measles and rubella.

6.7 Challenges in standardization of measles serosurvey

Mr David Featherstone, Global VPD Laboratory Network coordinator, WHO/HQ

A serosurvey may be appropriate if any doubts exist about other ways of measuring population susceptibility such as: doubts about reliability of coverage data, inability to collect case-based data and incompatibility of data. Serosurveys can be conducted when using appropriate protocols, assays and expertise available to perform them. It is important to note that it requires collection of a representative adequate number of samples from all age groups and the ability to standardize, control and analyse the survey.

There are two proposed ways to design sampling: stratified random sampling technique using finely stratified age-groups, or opportunistic anonymised residual serum samples from individuals attending selected hospitals and public laboratories, and sample size is determined

according to expected prevalence of susceptible, precision desired to accurately estimated population immuno-profile, the need to make comparisons between subpopulations and collect data information age, sex, place, etc.

Regarding assays to be used for the serosurvey it is important to use an ELISA IgG which has been well calibrated in the past (e.g. Siemens), or the PRNT which is gold standard assay. Standardization, analysis and interpretation are important elements.

Alternatives to serosurveys for measuring population immunity should be fully investigated before embarking on a comprehensive serosurvey. Assay selection, quality control and the use of international standard serum are key issues for accurate sero-epidemiology studies.

7. RECOMMENDATIONS

Regional elimination of measles by 2015

1. Eliminate measles no later than 2015 (in line with national targets). Develop a strategic plan and share it with the Regional Office by the end of March 2011. Country strategic plans should include clear targets and strategies to reach required immunity and surveillance indicators should be in line with the regional strategic plan; be linked to a budget; and specify the technical support needed from the Regional Office.
2. Establish a National Committee for Validation of Measles Elimination by the end of the second quarter of 2011.

Reaching and maintaining high measles population immunity

3. Consider benchmarks proposed in the regional strategy in developing elimination plans.
4. Include specific strategies in country plans to ensure high immunity among foreign workers, nomads, refugees, populations living in security-compromised areas, etc.
5. Conduct adequate activities, including improving routine coverage and conducting regular follow-up campaigns in countries that are unable to achieve and sustain high population immunity at the lowest administrative level as evidence by low coverage or ongoing virus transmission.
6. Monitor the quality of coverage data using WHO tools (data quality surveys, etc.). Some countries despite reporting high routine coverage and/or conducting regular follow-up campaigns have not interrupted measles virus transmission. This suggests poor quality of routine coverage data and follow-up campaigns.
7. Ensure proper planning, implementation, monitoring and evaluation of campaign activities, in consultation with WHO and UNICEF.

Establishing a surveillance system up to the standards of measles elimination

8. Morocco, Pakistan, Somalia and South Sudan should implement nationwide measles case-based surveillance by 2011.

9. Strengthen measles surveillance activities to meet surveillance performance indicators by 2012, using the definitions and performance indicators included in the regional strategic plan.
10. Countries approaching elimination, should classify all measles cases according to the method of confirmation and source of infection. The scoring system is being revised to be in line with testing routine samples. Test results and the new scoring system in 2011 PT panel evaluation will include the following parameters.
    - Completeness of providing all data to determine test validity, including: kit lot numbers, cut-off values, positive and negative controls
    - Use of valid kits
    - Monitoring of transcription errors
    - Correct interpretation of results.
    - LabNet is required to meet elimination criteria surveillance indicators, including ≥80% of laboratory-confirmed measles outbreaks have adequate samples for virus detection tested in an accredited laboratory.
    - LabNet is required to report sequence data within 2 months of sample collection to the MeaNS sequence databases and WHO database.
    - LabNet should maintain high quality standards of molecular testing. To transfer virus isolates and PCR products for sequencing analyses LabNet is encouraged to use filter papers to reduce shipment costs.

To WHO Regional Office

11. Provide continuous financial and technical support to priority countries, in collaboration with the Measles Partnership.
12. Monitor the progress of the countries toward measles elimination and provide feedback and technical/financial support.
13. Conduct a workshop on the surveillance of measles by the third quarter of 2011.
14. Establish, by the end of January 2011, the Regional Committee for the Validation of Measles Elimination.
15. Strengthen data management, analysis and dissemination.

Annex 1

Agenda

1. Review and follow up on the progress of the Member States in implementing measles/rubella elimination/control.
2. Review measles case-based surveillance and the measles laboratory surveillance network.
3. Discuss new advances and strategies related to measles and rubella elimination/control.
4. Review and update national plans for strengthening measles/rubella elimination and the control programme.
5. Review the measles elimination validation process.

Annex 2

PROGRAMME

Sunday, 28 November 2010

08:30–09:00	Registration	
09:00–09:30	Opening Session	
	• Opening remarks • Introduction of participants • Message from RD • Election of the Chairman and adoption of the agenda	*Dr J. Mahjour, DCD, WHO/EMRO*
	Session 1: Global and regional updates	
09:30–09:50	Measles global updates	*Dr P. Strebel, WHO/HQ*
09:50–10:10	Eliminate measles by 2010: progress and reasons for moving the target year	*Dr B.Naouri , WHO/EMRO*
10:10–10:30	Discussion	
	Session 2: Achieving and sustaining high population immunity against measles	
11:00–11:20	Reaching high measles population immunity to achieve elimination	*Dr N. Teleb, WHO/EMRO*
11:20–11:40	Discussion	
11:40–12:00	Maintaining immunity against measles in Yemen: strategies of measles vaccine delivery	*Dr G. Al Haboub, Yemen*
12:00–12:20	Bridging immunity gaps among special population groups to reach measles elimination in Iran	*Dr M. Zahrei, EPI/Iran*
12:20–12:40	Discussion	
13:40–14:00	Challenges and achievements to reach high measles immunity among all population groups in Bahrain	*Dr J. Jawad, EPI/Bahrain*

14:00–14:20	Country experience to fill the measles immunity gap among high risk populations	*Dr K. Baradie, EPI/Syria*
14:20–14:40	Discussion	
15:10-15:30	Updates on measles follow-up campaigns in Pakistan	*Mr Q. Abassi/Pakistan*
15:30–15:50	Child Health Day in Somalia: an opportunity to improve measles population immunity	*Dr A. Kebbede, EPI/Somalia*
15:50–16:10	Discussion	

Monday, 29 November, 2010

Session 2: Achieving and sustaining high population immunity against measles (cont'd)

09:00–09:30	Improving measles population immunity in the Region: regional strategy for measles elimination 2011–2015	*Dr B.Naouri, WHO/EMRO*
09:30–10:00	Discussion	
10:30–10:45	Orientation on group work 1: Updating country plans to ensure high population immunity (in line with regional milestones and action plans	*D r H. Ahmed, WHO/EMRO*
10:45–15:00	Group work: Updating country plans to ensure high population immunity • Group 1: Bahrain, Islamic Republic of Iran, Jordan, Oman, Tunisia, occupied Palestinian territory • Group 2: Egypt, Libyan Arab Jamahiriya, Kuwait, Saudi Arabia, Syrian Arab Republic • Group 3: Lebanon, Morocco, Qatar, Sudan, Yemen, United Arab Emirates • Group 4: Afghanistan, Djibouti, Iraq, Pakistan, Somalia, southern Sudan	
15:15–16:45	Presentations and discussion of the group work: one country per group: 10 minutes presentation and 20 minutes discussion each.	

Tuesday , 30 November, 2010

	Session 3: Improving measles surveillance	
08:30–08:50	Where we are and what should be done differently to meet the measles surveillance standard for validation of elimination in each country	*Dr B.Naouri, WHO/EMRO*
08:50–09:10	Required measles laboratory surveillance activities in the context of validation of measles elimination	*Dr H. Ahmed, WHO/EMRO*
09:10–09:30	Improving case investigation, data collection and reporting for validating measles elimination	*Mr R. Bekhit, WHO/EMRO*
09:30–10:00	Discussion	
10:30–10:50	Progress toward implementation of nationwide measles case-based surveillance in Morocco	*Dr M. Ziani, Surveillance officer/Morocco*
10:50–11:10	Status of measles surveillance in Egypt	*Dr I. Moussa, EPI/Egypt*
11:10–11:30	Challenges facing implementing measles surveillance among foreign workers in Qatar	*Dr H. Rezeq, Qatar*
11:30–12:00	Discussion	
12:00–12:20	Performance of measles surveillance under difficult security situation in Afghanistan	*Dr A. Dost, EPI/Afghanistan*
12:20–12:40	Measles surveillance in Sudan, a success story	*Dr A. Mostafa, EPI/Sudan*
12:40–13:00	Discussion	
14:00–14:15	Virologic surveillance of measles for monitoring transmission pathways	*Dr B. Bankamp, CDC Atlanta/USA*
14:15–14:25	Discussion	
14:25–14:35	Orientation on the group work	*Dr H. Ahmed, WHO/EMRO*

15:00–16:45	Group work: Updating national plans to reach elimination validation criteria • Group 1: Bahrain, Islamic Republic of Iran, Jordan, Oman, Tunisia, occupied Palestinian territory • Group 2: Egypt, Libyan Arab Republic, Kuwait, Saudi Arabia, Syrian Arab Republic • Group 3: Lebanon, Morocco, Qatar, Sudan, Yemen • Group 4: Afghanistan, Djibouti, Iraq, Pakistan, Somalia, southern Sudan	

Wednesday, 1 December, 2010

Session 3: Improving measles surveillance (cont'd)

08:30–10:00	Presentations and discussion of the group work: Two countries per group: 10 minutes presentation and 20 minutes discussion each.	

Briefing on new developments in procedures and molecular techniques for measles virologic surveillance

10:30–10:50	Laboratory surveillance of measles in elimination phase	*Dr S. Al-Busaidy, RL/Oman*
10:50–11:10	Measles virus genotypes D4 in the Region	*Dr H. Triki, RRL/Tunisia*
11:10–11:30	New procedures of molecular techniques and validation for quality control	*Dr B. Bankamp, CDC Atlanta,USA*
11:30–12:00	Discussion	
12:00-12:20	Measles virus on filter paper for genotyping	*Dr L. Tajounte, NML/Morocco*
12:20–12:40	Global Update, Lab Net	*Dr D. Featherstone, WHO/HQ*
12:40–13:00	Discussion	
13:00–13:20	Enhancing measles laboratory surveillance and revised PT scoring system	*Dr H. Ahmed, WHO/EMRO*

13:20–13:30	Discussion and distribution of PT 2010	
14:30–14:45	Challenges in standardization of measles serosurvey	*Mr D. Featherstone*, *WHO/HQ*
14:45–15:00	Discussion	
15:00–15:30	Final session: recommendations and closing	
15:30–16:00	Recommendations	
16:00	Distribution of prizes and closing	

Annex 3

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